

APPENDIX N

**ADDITIONAL MATERIAL SUPPORTING THE SCREENING LEVEL
ECOLOGICAL RISK ASSESSMENT**

Appendix M, Attachment 1

Summary Statistics - Surface Soil

Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35

East Aurora and Orchard Park, New York

Constituent	Range of Non-Detect Values	Frequency of Detection	Minimum	Sample ID of Minimum	Maximum	Sample ID of Maximum	95% UCL ¹	Mean ²
Detected Constituents								
Metals (mg/kg)								
Aluminum	-- - --	26 / 26	4100	TP-1-1.5	14000	SB18-02	10511	9700
Antimony	-- - --	26 / 26	0.097	SB14-02	0.31	SB4-02	0.177	0.16296
Arsenic	-- - --	26 / 26	5.1	SB11-02	11	SB18-02	8.516	7.9769
Barium	-- - --	26 / 26	28	SB14-02	100	SB11-00	66.51	59.538
Beryllium	-- - --	26 / 26	0.32	TP-1-1.5	1.4	SB9-02	0.674	0.59808
Cadmium	-- - --	26 / 26	0.18	SB12-02	0.82	SB18-02	0.495	0.44385
Calcium ³	-- - --	26 / 26	1400	SB14-02	180000	TP-1-1.5	52938	21650
Chromium	-- - --	26 / 26	6.7	TP-1-1.5	22	SB4-02	15.77	14.465
Cobalt	-- - --	26 / 26	6.5	SB14-02, SB9-02	16	SB4-02	10.98	10.119
Copper	-- - --	26 / 26	16	SB12-02	50	SB8-02	33.88	30.885
Iron	-- - --	26 / 26	15000	SB9-02, TP-1-1.5	33000	SB18-02	23926	22346
Lead	-- - --	26 / 26	8.8	SB14-02	26	TP-2-1	18.53	17.069
Magnesium ³	-- - --	26 / 26	2000	SB14-02	17000	SB5-01	6831	5507.7
Manganese	-- - --	26 / 26	190	SB12-02	1200	SB9-02, TP-2-1	707.1	591.54
Mercury	-- - --	26 / 26	0.019	SB5-01	0.1	SB11-00	0.0577	0.050577
Nickel	-- - --	26 / 26	18	SB9-02	55	SB4-02	35.57	31.731
Potassium ³	-- - --	26 / 26	580	SB7-01	1200	SB17-2, SB18-02, SB4-02	957.9	896.15
Selenium	-- - --	26 / 26	0.82	SB11-02	1.9	SB4-02	1.293	1.1962
Silver	-- - --	26 / 26	0.021	SB14-02	0.1	SB10-02	0.057	0.049731
Sodium ³	110 - 130	16 / 26	40	SB8-02	170	SB9-02	85.08	53.769
Thallium	-- - --	26 / 26	0.23	SB12-02	0.93	SB18-02	0.506	0.445
Vanadium	-- - --	26 / 26	13	TP-1-1.5	28	SB10-02	22.09	20.654
Zinc	-- - --	26 / 26	52	SB12-02	140	SB18-02, SB6-02	99.72	92.115
PCBs (mg/kg)								
Aroclor 1260	0.035 - 0.043	1 / 26	0.017	SB14-00	0.017	SB14-00	--	0.00625
Low Molecular Weight (LMW) Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)								
1-Methylnaphthalene	0.37 - 0.81	1 / 26	0.23	SB17-2	0.23	SB17-2	--	0.068654
2-Methylnaphthalene	0.37 - 0.81	1 / 26	0.43	SB17-2	0.43	SB17-2	--	0.076346
Acenaphthene	0.37 - 0.81	1 / 26	1.7	SB17-2	1.7	SB17-2	--	0.12519
Anthracene	0.37 - 0.81	1 / 26	3.2	SB17-2	3.2	SB17-2	--	0.18288
Fluorene	0.37 - 0.81	1 / 26	1.7	SB17-2	1.7	SB17-2	--	0.12519
Naphthalene	0.37 - 0.81	1 / 26	1.8	SB17-2	1.8	SB17-2	--	0.12904
Total LMW PAHs	-- - --	1 / 26	9.25	SB17-2	9.25	SB17-2	--	1.95885
High Molecular Weight (HMW) Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)								
Benz(a)anthracene	0.37 - 0.81	1 / 26	4	SB17-2	4	SB17-2	--	0.21365
Benzo(a)pyrene	0.37 - 0.43	3 / 26	0.17	SB14-00	2.8	SB17-2	0.579	0.17981
Benzo(b)fluoranthene	0.37 - 0.43	2 / 26	0.28	SB3-1	3	SB17-2	1.017	0.18135
Benzo (g,h,i) perylene	0.37 - 0.81	2 / 26	0.24	SB14-00	1.6	SB17-2	0.608	0.12827
Benzo(k)fluoranthene	0.37 - 0.81	1 / 26	1.5	SB17-2	1.5	SB17-2	--	0.1175

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Summary Statistics - Surface Soil

Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35

East Aurora and Orchard Park, New York

Constituent	Range of Non-Detect Values	Frequency of Detection	Minimum	Sample ID of Minimum	Maximum	Sample ID of Maximum	95% UCL ¹	Mean ²
Chrysene	0.37 - 0.81	1 / 26	3.4	SB17-2	3.4	SB17-2	--	0.19058
Fluoranthene	0.37 - 0.43	7 / 25	0.2	SB16-2	0.63	SB3-1	0.296	0.1264
Indeno(1,2,3-cd)pyrene	0.37 - 0.81	2 / 26	0.2	SB14-00	1.4	SB17-2	0.525	0.11904
Pyrene	0.37 - 0.43	2 / 25	0.13	SB14-00	0.32	SB3-1	0.639	0.073
Total HMW PAHs	-- - --	8 / 26	1.865	SB16-2	17.89	SB17-2	5.426	2.69519
Non-PAH SVOCs (mg/kg)								
2,4-Dimethylphenol	0.37 - 0.81	1 / 26	0.23	SB18-00	0.23	SB18-00	--	0.068462
Benzoic Acid	1.9 - 4.1	1 / 26	2.4	SB18-00	2.4	SB18-00	--	0.2775
Carbazole	0.37 - 0.81	1 / 26	1.3	SB17-2	1.3	SB17-2	--	0.10981
Dibenzofuran	0.37 - 0.81	1 / 26	1.1	SB17-2	1.1	SB17-2	--	0.10212
Undetected Constituents								
PCBs (mg/kg)								
Aroclor 1016	0.035 - 0.043	0 / 26	--		--	--	--	0.0058462
Aroclor 1221	0.069 - 0.086	0 / 26	--		--	--	--	0.0058462
Aroclor 1232	0.035 - 0.043	0 / 26	--		--	--	--	0.0058462
Aroclor 1242	0.035 - 0.043	0 / 26	--		--	--	--	0.0058462
Aroclor 1248	0.035 - 0.043	0 / 26	--		--	--	--	0.0058462
Aroclor 1254	0.035 - 0.043	0 / 26	--		--	--	--	0.0058462
Low Molecular Weight (LMW) Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)								
Acenaphthylene	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
Phenanthrene	0.37 - 0.81	0 / 25	--		--	--	--	0.0622
High Molecular Weight (HMW) Polycyclic Aromatic Hydrocarbons (PAHs) (mg/kg)								
Dibenz(a,h)anthracene	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
Non-PAH SVOCs (mg/kg)								
2,3,4,6-Tetrachlorophenol	0.37 - 0.81	0 / 26	--		--	--	--	0.068654
2,4,5-Trichlorophenol	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
2,4,6-Trichlorophenol	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
2,4-Dichlorophenol	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
2,4-Dinitrophenol	0.74 - 1.6	0 / 26	--		--	--	--	0.061923
2,4-Dinitrotoluene	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
2,6-Dinitrotoluene	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
2-Chloronaphthalene	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
2-Chlorophenol	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
2-Methylphenol	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
2-Nitroaniline	0.74 - 1.6	0 / 26	--		--	--	--	0.061923
2-Nitrophenol	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
3,3'-Dichlorobenzidine	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
3+4-Methylphenol	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
3-Nitroaniline	0.74 - 1.6	0 / 26	--		--	--	--	0.061923
4,6-Dinitro-2-Methylphenol	0.74 - 1.6	0 / 26	--		--	--	--	0.15538
4-Bromophenyl Phenyl Ether	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
4-Chloro-3-Methylphenol	0.37 - 0.81	0 / 26	--		--	--	--	0.061923

Appendix M, Attachment 1

Summary Statistics - Surface Soil

Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35

East Aurora and Orchard Park, New York

Constituent	Range of Non-Detect Values	Frequency of Detection	Minimum	Sample ID of Minimum	Maximum	Sample ID of Maximum	95% UCL ¹	Mean ²
4-Chloroaniline	0.37 - 0.81	0 / 26	--		--	--	--	0.075
4-Chlorophenyl Phenyl Ether	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
4-Nitroaniline	0.74 - 1.6	0 / 26	--		--	--	--	0.061923
4-Nitrophenol	0.74 - 1.6	0 / 26	--		--	--	--	0.068654
Aniline	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
Azobenzene	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
Benzyl Alcohol	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
bis(2-chloroethoxy) methane	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
Bis(2-chloroethyl)ether	0.37 - 0.81	0 / 25	--		--	--	--	0.061923
Bis(2-chloroisopropyl)ether	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
Bis(2-ethylhexyl)phthalate	0.37 - 0.81	0 / 25	--		--	--	--	0.061923
Butyl benzyl phthalate	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
Diethyl Phthalate	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
Dimethyl Phthalate	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
Di-n-butyl Phthalate	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
Di-n-octyl Phthalate	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
Hexachlorobenzene	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
Hexachlorocyclopentadiene	0.37 - 0.81	0 / 26	--		--	--	--	0.1
Hexachloroethane	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
Isophorone	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
Nitrobenzene	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
N-Nitrosodimethylamine	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
N-Nitrosodi-n-propylamine	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
N-Nitrosodiphenylamine	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
Pentachlorophenol	0.74 - 1.6	0 / 26	--		--	--	--	0.080962
Phenol	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
Pyridine	0.37 - 0.81	0 / 26	--		--	--	--	0.11173
1,2,4-Trichlorobenzene	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
1,2-Dichlorobenzene	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
1,3-Dichlorobenzene	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
1,4-Dichlorobenzene	0.37 - 0.81	0 / 26	--		--	--	--	0.061923
Hexachloro-1,3,-butadiene	0.37 - 0.81	0 / 26	--		--	--	--	0.061923

Notes:

1 - 95% upper confidence limits (UCLs) or the mean; calculated using EPA ProUCL software version 5.1

2 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

3 - Macronutrient; not evaluated for ecological risk

mg/kg - milligrams per kilogram

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
UCL Statistics for Data Sets with Non-Detects			
User Selected Options			
Date/Time of Computation	ProUCL 5.110/11/2016 3:20:10 PM		
From File	Nike_ProUCL_Input_100616_SO_SS.xls		
Full Precision	OFF		
Confidence Coefficient	95%		
Number of Bootstrap Operations	2000		
1-METHYLNAPHTHALENE (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	9
Number of Detects	1	Number of Non-Detects	25
Number of Distinct Detects	1	Number of Distinct Non-Detects	8
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set! It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable 1-METHYLNAPHTHALENE (MG/KG) was not processed!			
2,4-DIMETHYLPHENOL (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	9
Number of Detects	1	Number of Non-Detects	25
Number of Distinct Detects	1	Number of Distinct Non-Detects	8
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set! It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable 2,4-DIMETHYLPHENOL (MG/KG) was not processed!			
2-METHYLNAPHTHALENE (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	8
Number of Detects	1	Number of Non-Detects	25
Number of Distinct Detects	1	Number of Distinct Non-Detects	8
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set! It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable 2-METHYLNAPHTHALENE (MG/KG) was not processed!			
ACENAPHTHENE (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	9
Number of Detects	1	Number of Non-Detects	25
Number of Distinct Detects	1	Number of Distinct Non-Detects	8
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set! It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable ACENAPHTHENE (MG/KG) was not processed!			
ALUMINIUM (MG/KG)			

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	14
		Number of Missing Observations	0
Minimum	4100	Mean	9700
Maximum	14000	Median	10000
SD	2421	Std. Error of Mean	474.8
Coefficient of Variation	0.25	Skewness	-0.567
Normal GOF Test			
Shapiro Wilk Test Statistic	0.956	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.148	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	10511	95% Adjusted-CLT UCL (Chen-1995)	10425
		95% Modified-t UCL (Johnson-1978)	10502
Gamma GOF Test			
A-D Test Statistic	0.844	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.744	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.181	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.171	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	14	k star (bias corrected MLE)	12.41
Theta hat (MLE)	692.8	Theta star (bias corrected MLE)	781.6
nu hat (MLE)	728.1	nu star (bias corrected)	645.4
MLE Mean (bias corrected)	9700	MLE Sd (bias corrected)	2753
		Approximate Chi Square Value (0.05)	587.4
Adjusted Level of Significance	0.0398	Adjusted Chi Square Value	583.8
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	10657	95% Adjusted Gamma UCL (use when n<50)	10723
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.894	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.193	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.17	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.319	Mean of logged Data	9.144
Maximum of Logged Data	9.547	SD of logged Data	0.289
Assuming Lognormal Distribution			
95% H-UCL	10833	90% Chebyshev (MVUE) UCL	11422
95% Chebyshev (MVUE) UCL	12184	97.5% Chebyshev (MVUE) UCL	13242
99% Chebyshev (MVUE) UCL	15319		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	10481	95% Jackknife UCL	10511
95% Standard Bootstrap UCL	10480	95% Bootstrap-t UCL	10433
95% Hall's Bootstrap UCL	10459	95% Percentile Bootstrap UCL	10442
95% BCA Bootstrap UCL	10431		
90% Chebyshev(Mean, Sd) UCL	11125	95% Chebyshev(Mean, Sd) UCL	11770
97.5% Chebyshev(Mean, Sd) UCL	12665	99% Chebyshev(Mean, Sd) UCL	14425

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Suggested UCL to Use			
95% Student's-t UCL	10511		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness.</p> <p>These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
<p>Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positively skewed data sets.</p>			
ANTHRACENE (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	9
Number of Detects	1	Number of Non-Detects	25
Number of Distinct Detects	1	Number of Distinct Non-Detects	8
<p>Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set! It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).</p> <p>The data set for variable ANTHRACENE (MG/KG) was not processed!</p>			
ANTIMONY (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	0.097	Mean	0.163
Maximum	0.31	Median	0.155
SD	0.0426	Std. Error of Mean	0.00835
Coefficient of Variation	0.261	Skewness	1.516
Normal GOF Test			
Shapiro Wilk Test Statistic	0.88	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.147	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	0.177	95% Adjusted-CLT UCL (Chen-1995)	0.179
		95% Modified-t UCL (Johnson-1978)	0.178
Gamma GOF Test			
A-D Test Statistic	0.5	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.126	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.171	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	17.19	k star (bias corrected MLE)	15.23
Theta hat (MLE)	0.00948	Theta star (bias corrected MLE)	0.0107
nu hat (MLE)	893.7	nu star (bias corrected)	791.9
MLE Mean (bias corrected)	0.163	MLE Sd (bias corrected)	0.0418
		Approximate Chi Square Value (0.05)	727.6
Adjusted Level of Significance	0.0398	Adjusted Chi Square Value	723.5
Assuming Gamma Distribution			

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ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
95% Approximate Gamma UCL (use when n>=50))	0.177	95% Adjusted Gamma UCL (use when n<50)	0.178
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.958	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.125	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-2.333	Mean of logged Data	-1.844
Maximum of Logged Data	-1.171	SD of logged Data	0.243
Assuming Lognormal Distribution			
95% H-UCL	0.178	90% Chebyshev (MVUE) UCL	0.186
95% Chebyshev (MVUE) UCL	0.197	97.5% Chebyshev (MVUE) UCL	0.212
99% Chebyshev (MVUE) UCL	0.241		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.177	95% Jackknife UCL	0.177
95% Standard Bootstrap UCL	0.176	95% Bootstrap-t UCL	0.181
95% Hall's Bootstrap UCL	0.187	95% Percentile Bootstrap UCL	0.177
95% BCA Bootstrap UCL	0.179		
90% Chebyshev(Mean, Sd) UCL	0.188	95% Chebyshev(Mean, Sd) UCL	0.199
97.5% Chebyshev(Mean, Sd) UCL	0.215	99% Chebyshev(Mean, Sd) UCL	0.246
Suggested UCL to Use			
95% Student's-t UCL	0.177		
<p>When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test</p> <p>When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL</p> <p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.</p> <p>Recommendations are based upon data size, data distribution, and skewness.</p> <p>These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).</p> <p>However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
AROCLOR 1260 (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	9
Number of Detects	1	Number of Non-Detects	25
Number of Distinct Detects	1	Number of Distinct Non-Detects	8
<p>Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!</p> <p>It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).</p> <p>The data set for variable AROCLOR 1260 (MG/KG) was not processed!</p>			
ARSENIC (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	22
		Number of Missing Observations	0
Minimum	5.1	Mean	7.977
Maximum	11	Median	8.05
SD	1.61	Std. Error of Mean	0.316
Coefficient of Variation	0.202	Skewness	-0.197

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Normal GOF Test			
Shapiro Wilk Test Statistic	0.967	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.0826	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	8.516	95% Adjusted-CLT UCL (Chen-1995)	8.483
		95% Modified-t UCL (Johnson-1978)	8.514
Gamma GOF Test			
A-D Test Statistic	0.397	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.11	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.171	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	23.94	k star (bias corrected MLE)	21.2
Theta hat (MLE)	0.333	Theta star (bias corrected MLE)	0.376
nu hat (MLE)	1245	nu star (bias corrected)	1102
MLE Mean (bias corrected)	7.977	MLE Sd (bias corrected)	1.733
		Approximate Chi Square Value (0.05)	1026
Adjusted Level of Significance	0.0398	Adjusted Chi Square Value	1021
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	8.568	95% Adjusted Gamma UCL (use when n<50)	8.609
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.942	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.122	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.629	Mean of logged Data	2.056
Maximum of Logged Data	2.398	SD of logged Data	0.213
Assuming Lognormal Distribution			
95% H-UCL	8.616	90% Chebyshev (MVUE) UCL	8.994
95% Chebyshev (MVUE) UCL	9.452	97.5% Chebyshev (MVUE) UCL	10.09
99% Chebyshev (MVUE) UCL	11.34		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	8.496	95% Jackknife UCL	8.516
95% Standard Bootstrap UCL	8.501	95% Bootstrap-t UCL	8.514
95% Hall's Bootstrap UCL	8.486	95% Percentile Bootstrap UCL	8.481
95% BCA Bootstrap UCL	8.477		
90% Chebyshev(Mean, Sd) UCL	8.924	95% Chebyshev(Mean, Sd) UCL	9.353
97.5% Chebyshev(Mean, Sd) UCL	9.949	99% Chebyshev(Mean, Sd) UCL	11.12
Suggested UCL to Use			
95% Student's-t UCL	8.516		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positively skewed data sets.			
BARIUM (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	23
		Number of Missing Observations	0
Minimum	28	Mean	59.54
Maximum	100	Median	57.5
SD	20.8	Std. Error of Mean	4.079
Coefficient of Variation	0.349	Skewness	0.402
Normal GOF Test			
Shapiro Wilk Test Statistic	0.942	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.15	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	66.51	95% Adjusted-CLT UCL (Chen-1995)	66.59
		95% Modified-t UCL (Johnson-1978)	66.56
Gamma GOF Test			
A-D Test Statistic	0.417	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.745	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.131	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.171	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	8.488	k star (bias corrected MLE)	7.534
Theta hat (MLE)	7.014	Theta star (bias corrected MLE)	7.902
nu hat (MLE)	441.4	nu star (bias corrected)	391.8
MLE Mean (bias corrected)	59.54	MLE Sd (bias corrected)	21.69
		Approximate Chi Square Value (0.05)	346.9
Adjusted Level of Significance	0.0398	Adjusted Chi Square Value	344.1
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	67.24	95% Adjusted Gamma UCL (use when n<50)	67.78
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.96	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.128	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.332	Mean of logged Data	4.027
Maximum of Logged Data	4.605	SD of logged Data	0.357
Assuming Lognormal Distribution			
95% H-UCL	68.22	90% Chebyshev (MVUE) UCL	72.39
95% Chebyshev (MVUE) UCL	78.19	97.5% Chebyshev (MVUE) UCL	86.23
99% Chebyshev (MVUE) UCL	102		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Nonparametric Distribution Free UCLs			
95% CLT UCL	66.25	95% Jackknife UCL	66.51
95% Standard Bootstrap UCL	65.96	95% Bootstrap-t UCL	67.19
95% Hall's Bootstrap UCL	66.29	95% Percentile Bootstrap UCL	66.27
95% BCA Bootstrap UCL	66.5		
90% Chebyshev(Mean, Sd) UCL	71.77	95% Chebyshev(Mean, Sd) UCL	77.32
97.5% Chebyshev(Mean, Sd) UCL	85.01	99% Chebyshev(Mean, Sd) UCL	100.1
Suggested UCL to Use			
95% Student's-t UCL	66.51		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
BENZ(A)ANTHRACENE (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	9
Number of Detects	1	Number of Non-Detects	25
Number of Distinct Detects	1	Number of Distinct Non-Detects	8
<p>Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set! It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).</p> <p style="text-align: center;">The data set for variable BENZ(A)ANTHRACENE (MG/KG) was not processed!</p>			
Benzo (g,h,i) perylene (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	10
Number of Detects	2	Number of Non-Detects	24
Number of Distinct Detects	2	Number of Distinct Non-Detects	8
Minimum Detect	0.24	Minimum Non-Detect	0.37
Maximum Detect	1.6	Maximum Non-Detect	0.81
Variance Detects	0.925	Percent Non-Detects	92.31%
Mean Detects	0.92	SD Detects	0.962
Median Detects	0.92	CV Detects	1.045
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-0.479	SD of Logged Detects	1.341
<p>Warning: Data set has only 2 Detected Values. This is not enough to compute meaningful or reliable statistics and estimates.</p>			
Normal GOF Test on Detects Only			
Not Enough Data to Perform GOF Test			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.292	KM Standard Error of Mean	0.0725
KM SD	0.262	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.416	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.412	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.51	95% KM Chebyshev UCL	0.608
97.5% KM Chebyshev UCL	0.745	99% KM Chebyshev UCL	1.014
Gamma GOF Tests on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.409	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.653	Theta star (bias corrected MLE)	N/A

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
nu hat (MLE)	5.635	nu star (bias corrected)	N/A
Mean (detects)	0.92		
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.292	SD (KM)	0.262
Variance (KM)	0.0684	SE of Mean (KM)	0.0725
k hat (KM)	1.249	k star (KM)	1.131
nu hat (KM)	64.96	nu star (KM)	58.79
theta hat (KM)	0.234	theta star (KM)	0.259
80% gamma percentile (KM)	0.465	90% gamma percentile (KM)	0.653
95% gamma percentile (KM)	0.839	99% gamma percentile (KM)	1.266
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (58.79, α)	42.16	Adjusted Level of Significance (β)	0.0398
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	0.408	95% Gamma Adjusted KM-UCL (use when $n < 50$)	0.417
Lognormal GOF Test on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.32	Mean in Log Scale	-1.362
SD in Original Scale	0.293	SD in Log Scale	0.624
95% t UCL (assumes normality of ROS data)	0.418	95% Percentile Bootstrap UCL	0.423
95% BCA Bootstrap UCL	0.502	95% Bootstrap t UCL	0.52
95% H-UCL (Log ROS)	0.403		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.354	KM Geo Mean	0.258
KM SD (logged)	0.365	95% Critical H Value (KM-Log)	1.86
KM Standard Error of Mean (logged)	0.101	95% H-UCL (KM -Log)	0.316
KM SD (logged)	0.365	95% Critical H Value (KM-Log)	1.86
KM Standard Error of Mean (logged)	0.101		
DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.263	Mean in Log Scale	-1.498
SD in Original Scale	0.276	SD in Log Scale	0.427
95% t UCL (Assumes normality)	0.355	95% H-Stat UCL	0.288
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.608		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
BENZO(A)PYRENE (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	10
Number of Detects	3	Number of Non-Detects	23
Number of Distinct Detects	3	Number of Distinct Non-Detects	7
Minimum Detect	0.17	Minimum Non-Detect	0.37
Maximum Detect	2.8	Maximum Non-Detect	0.43
Variance Detects	2.174	Percent Non-Detects	88.46%
Mean Detects	1.1	SD Detects	1.474
Median Detects	0.33	CV Detects	1.34
Skewness Detects	1.709	Kurtosis Detects	N/A

Appendix M, Attachment 2-1				
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area				
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35				
East Aurora and Orchard Park, New York				
Mean of Logged Detects		-0.617	SD of Logged Detects	
			1.464	
Warning: Data set has only 3 Detected Values.				
This is not enough to compute meaningful or reliable statistics and estimates.				
Normal GOF Test on Detects Only				
Shapiro Wilk Test Statistic	0.795	Shapiro Wilk GOF Test		
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.366	Lilliefors GOF Test		
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level		
Detected Data appear Normal at 5% Significance Level				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	0.348	KM Standard Error of Mean		0.135
KM SD	0.497	95% KM (BCA) UCL		N/A
95% KM (t) UCL	0.579	95% KM (Percentile Bootstrap) UCL		N/A
95% KM (z) UCL	0.571	95% KM Bootstrap t UCL		N/A
90% KM Chebyshev UCL	0.754	95% KM Chebyshev UCL		0.938
97.5% KM Chebyshev UCL	1.193	99% KM Chebyshev UCL		1.694
Gamma GOF Tests on Detected Observations Only				
Not Enough Data to Perform GOF Test				
Gamma Statistics on Detected Data Only				
k hat (MLE)	0.829	k star (bias corrected MLE)		N/A
Theta hat (MLE)	1.326	Theta star (bias corrected MLE)		N/A
nu hat (MLE)	4.976	nu star (bias corrected)		N/A
Mean (detects)	1.1			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	0.01	Mean		0.408
Maximum	2.8	Median		0.222
SD	0.577	CV		1.415
k hat (MLE)	0.628	k star (bias corrected MLE)		0.581
Theta hat (MLE)	0.649	Theta star (bias corrected MLE)		0.701
nu hat (MLE)	32.65	nu star (bias corrected)		30.22
Adjusted Level of Significance (β)	0.0398			
Approximate Chi Square Value (30.22, α)	18.66	Adjusted Chi Square Value (30.22, β)		18.06
95% Gamma Approximate UCL (use when $n \geq 50$)	0.66	95% Gamma Adjusted UCL (use when $n < 50$)		N/A
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.348	SD (KM)		0.497
Variance (KM)	0.247	SE of Mean (KM)		0.135
k hat (KM)	0.491	k star (KM)		0.46
nu hat (KM)	25.55	nu star (KM)		23.93
theta hat (KM)	0.709	theta star (KM)		0.756
80% gamma percentile (KM)	0.569	90% gamma percentile (KM)		0.958
95% gamma percentile (KM)	1.377	99% gamma percentile (KM)		2.417
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (23.93, α)	13.8	Adjusted Chi Square Value (23.93, β)		13.29
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	0.604	95% Gamma Adjusted KM-UCL (use when $n < 50$)		0.627
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.915	Shapiro Wilk GOF Test		
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.298	Lilliefors GOF Test		
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level		

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ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.39	Mean in Log Scale	-1.328
SD in Original Scale	0.525	SD in Log Scale	0.797
95% t UCL (assumes normality of ROS data)	0.565	95% Percentile Bootstrap UCL	0.574
95% BCA Bootstrap UCL	0.697	95% Bootstrap t UCL	0.838
95% H-UCL (Log ROS)	0.523		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.345	KM Geo Mean	0.26
KM SD (logged)	0.576	95% Critical H Value (KM-Log)	2.032
KM Standard Error of Mean (logged)	0.299	95% H-UCL (KM -Log)	0.388
KM SD (logged)	0.576	95% Critical H Value (KM-Log)	2.032
KM Standard Error of Mean (logged)	0.299		
DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.303	Mean in Log Scale	-1.498
SD in Original Scale	0.51	SD in Log Scale	0.527
95% t UCL (Assumes normality)	0.474	95% H-Stat UCL	0.317
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.579		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.</p> <p>Recommendations are based upon data size, data distribution, and skewness.</p> <p>These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).</p> <p>However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
BENZO(B)FLUORANTHENE (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	9
Number of Detects	2	Number of Non-Detects	24
Number of Distinct Detects	2	Number of Distinct Non-Detects	7
Minimum Detect	0.28	Minimum Non-Detect	0.37
Maximum Detect	3	Maximum Non-Detect	0.43
Variance Detects	3.699	Percent Non-Detects	92.31%
Mean Detects	1.64	SD Detects	1.923
Median Detects	1.64	CV Detects	1.173
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-0.0872	SD of Logged Detects	1.677
Warning: Data set has only 2 Detected Values.			
This is not enough to compute meaningful or reliable statistics and estimates.			
Normal GOF Test on Detects Only			
Not Enough Data to Perform GOF Test			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.385	KM Standard Error of Mean	0.145
KM SD	0.523	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.632	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.623	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.82	95% KM Chebyshev UCL	1.017
97.5% KM Chebyshev UCL	1.291	99% KM Chebyshev UCL	1.828
Gamma GOF Tests on Detected Observations Only			

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Not Enough Data to Perform GOF Test			
Gamma Statistics on Detected Data Only			
k hat (MLE)	0.993	k star (bias corrected MLE)	N/A
Theta hat (MLE)	1.652	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	3.971	nu star (bias corrected)	N/A
Mean (detects)	1.64		
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.385	SD (KM)	0.523
Variance (KM)	0.274	SE of Mean (KM)	0.145
k hat (KM)	0.541	k star (KM)	0.504
nu hat (KM)	28.11	nu star (KM)	26.2
theta hat (KM)	0.711	theta star (KM)	0.763
80% gamma percentile (KM)	0.632	90% gamma percentile (KM)	1.039
95% gamma percentile (KM)	1.473	99% gamma percentile (KM)	2.541
Gamma Kaplan-Meier (KM) Statistics			
		Adjusted Level of Significance (β)	0.0398
Approximate Chi Square Value (26.20, α)	15.54	Adjusted Chi Square Value (26.20, β)	14.99
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	0.649	95% Gamma Adjusted KM-UCL (use when $n < 50$)	0.672
Lognormal GOF Test on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.44	Mean in Log Scale	-1.192
SD in Original Scale	0.564	SD in Log Scale	0.796
95% t UCL (assumes normality of ROS data)	0.629	95% Percentile Bootstrap UCL	0.642
95% BCA Bootstrap UCL	0.747	95% Bootstrap t UCL	0.88
95% H-UCL (Log ROS)	0.597		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.182	KM Geo Mean	0.307
KM SD (logged)	0.456	95% Critical H Value (KM-Log)	1.929
KM Standard Error of Mean (logged)	0.126	95% H-UCL (KM -Log)	0.406
KM SD (logged)	0.456	95% Critical H Value (KM-Log)	1.929
KM Standard Error of Mean (logged)	0.126		
DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.311	Mean in Log Scale	-1.493
SD in Original Scale	0.549	SD in Log Scale	0.534
95% t UCL (Assumes normality)	0.495	95% H-Stat UCL	0.321
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	1.017		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
BENZO(K)FLUORANTHENE (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	9
Number of Detects	1	Number of Non-Detects	25
Number of Distinct Detects	1	Number of Distinct Non-Detects	8

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!			
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable BENZO(K)FLUORANTHENE (MG/KG) was not processed!			
BENZOIC ACID (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	6
Number of Detects	1	Number of Non-Detects	25
Number of Distinct Detects	1	Number of Distinct Non-Detects	5
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!			
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable BENZOIC ACID (MG/KG) was not processed!			
BERYLLIUM (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	25
		Number of Missing Observations	0
Minimum	0.32	Mean	0.598
Maximum	1.4	Median	0.59
SD	0.227	Std. Error of Mean	0.0445
Coefficient of Variation	0.379	Skewness	1.761
Normal GOF Test			
Shapiro Wilk Test Statistic	0.86	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.162	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	0.674	95% Adjusted-CLT UCL (Chen-1995)	0.688
		95% Modified-t UCL (Johnson-1978)	0.677
Gamma GOF Test			
A-D Test Statistic	0.341	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.745	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.111	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.171	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	8.612	k star (bias corrected MLE)	7.644
Theta hat (MLE)	0.0694	Theta star (bias corrected MLE)	0.0782
nu hat (MLE)	447.8	nu star (bias corrected)	397.5
MLE Mean (bias corrected)	0.598	MLE Sd (bias corrected)	0.216
		Approximate Chi Square Value (0.05)	352.3
Adjusted Level of Significance	0.0398	Adjusted Chi Square Value	349.5
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	0.675	95% Adjusted Gamma UCL (use when n<50)	0.68
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.964	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0923	Lilliefors Lognormal GOF Test	

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
5% Lilliefors Critical Value	0.17	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.139	Mean of logged Data	-0.573
Maximum of Logged Data	0.336	SD of logged Data	0.344
Assuming Lognormal Distribution			
95% H-UCL	0.679	90% Chebyshev (MVUE) UCL	0.72
95% Chebyshev (MVUE) UCL	0.775	97.5% Chebyshev (MVUE) UCL	0.853
99% Chebyshev (MVUE) UCL	1.005		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.671	95% Jackknife UCL	0.674
95% Standard Bootstrap UCL	0.669	95% Bootstrap-t UCL	0.7
95% Hall's Bootstrap UCL	0.741	95% Percentile Bootstrap UCL	0.674
95% BCA Bootstrap UCL	0.687		
90% Chebyshev(Mean, Sd) UCL	0.731	95% Chebyshev(Mean, Sd) UCL	0.792
97.5% Chebyshev(Mean, Sd) UCL	0.876	99% Chebyshev(Mean, Sd) UCL	1.041
Suggested UCL to Use			
95% Student's-t UCL	0.674		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
CADMIUM (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	22
		Number of Missing Observations	0
Minimum	0.18	Mean	0.444
Maximum	0.82	Median	0.41
SD	0.153	Std. Error of Mean	0.03
Coefficient of Variation	0.344	Skewness	0.639
Normal GOF Test			
Shapiro Wilk Test Statistic	0.961	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.126	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	0.495	95% Adjusted-CLT UCL (Chen-1995)	0.497
		95% Modified-t UCL (Johnson-1978)	0.496
Gamma GOF Test			
A-D Test Statistic	0.201	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.745	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0853	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.171	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Gamma Statistics			
k hat (MLE)	8.739	k star (bias corrected MLE)	7.756
Theta hat (MLE)	0.0508	Theta star (bias corrected MLE)	0.0572
nu hat (MLE)	454.4	nu star (bias corrected)	403.3
MLE Mean (bias corrected)	0.444	MLE Sd (bias corrected)	0.159
		Approximate Chi Square Value (0.05)	357.8
Adjusted Level of Significance	0.0398	Adjusted Chi Square Value	354.9
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.5	95% Adjusted Gamma UCL (use when n<50)	0.504
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.979	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0863	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.715	Mean of logged Data	-0.871
Maximum of Logged Data	-0.198	SD of logged Data	0.355
Assuming Lognormal Distribution			
95% H-UCL	0.509	90% Chebyshev (MVUE) UCL	0.54
95% Chebyshev (MVUE) UCL	0.583	97.5% Chebyshev (MVUE) UCL	0.642
99% Chebyshev (MVUE) UCL	0.759		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.493	95% Jackknife UCL	0.495
95% Standard Bootstrap UCL	0.492	95% Bootstrap-t UCL	0.499
95% Hall's Bootstrap UCL	0.503	95% Percentile Bootstrap UCL	0.492
95% BCA Bootstrap UCL	0.497		
90% Chebyshev(Mean, Sd) UCL	0.534	95% Chebyshev(Mean, Sd) UCL	0.575
97.5% Chebyshev(Mean, Sd) UCL	0.631	99% Chebyshev(Mean, Sd) UCL	0.742
Suggested UCL to Use			
95% Student's-t UCL	0.495		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.</p> <p>Recommendations are based upon data size, data distribution, and skewness.</p> <p>These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).</p> <p>However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
CALCIUM (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	24
		Number of Missing Observations	0
Minimum	1400	Mean	21650
Maximum	180000	Median	5600
SD	36601	Std. Error of Mean	7178
Coefficient of Variation	1.691	Skewness	3.508
Normal GOF Test			
Shapiro Wilk Test Statistic	0.57	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.29	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.17	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	33911	95% Adjusted-CLT UCL (Chen-1995)	38734
		95% Modified-t UCL (Johnson-1978)	34734
Gamma GOF Test			
A-D Test Statistic	1.194	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.794	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.235	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.179	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	0.646	k star (bias corrected MLE)	0.597
Theta hat (MLE)	33494	Theta star (bias corrected MLE)	36238
nu hat (MLE)	33.61	nu star (bias corrected)	31.07
MLE Mean (bias corrected)	21650	MLE Sd (bias corrected)	28010
		Approximate Chi Square Value (0.05)	19.33
Adjusted Level of Significance	0.0398	Adjusted Chi Square Value	18.72
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	34789	95% Adjusted Gamma UCL (use when n<50)	35926
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.917	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.209	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.17	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	7.244	Mean of logged Data	9.037
Maximum of Logged Data	12.1	SD of logged Data	1.393
Assuming Lognormal Distribution			
95% H-UCL	51985	90% Chebyshev (MVUE) UCL	41514
95% Chebyshev (MVUE) UCL	50918	97.5% Chebyshev (MVUE) UCL	63970
99% Chebyshev (MVUE) UCL	89608		
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution (0.05)			
Nonparametric Distribution Free UCLs			
95% CLT UCL	33457	95% Jackknife UCL	33911
95% Standard Bootstrap UCL	33408	95% Bootstrap-t UCL	47256
95% Hall's Bootstrap UCL	78882	95% Percentile Bootstrap UCL	35223
95% BCA Bootstrap UCL	40377		
90% Chebyshev(Mean, Sd) UCL	43184	95% Chebyshev(Mean, Sd) UCL	52938
97.5% Chebyshev(Mean, Sd) UCL	66477	99% Chebyshev(Mean, Sd) UCL	93070
Suggested UCL to Use			
95% Chebyshev (Mean, Sd) UCL	52938		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
CARBAZOLE (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	9
Number of Detects	1	Number of Non-Detects	25
Number of Distinct Detects	1	Number of Distinct Non-Detects	8

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!			
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable CARBAZOLE (MG/KG) was not processed!			
CHROMIUM (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	14
		Number of Missing Observations	0
Minimum	6.7	Mean	14.47
Maximum	22	Median	14
SD	3.885	Std. Error of Mean	0.762
Coefficient of Variation	0.269	Skewness	0.167
Normal GOF Test			
Shapiro Wilk Test Statistic	0.976	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.125	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	15.77	95% Adjusted-CLT UCL (Chen-1995)	15.75
		95% Modified-t UCL (Johnson-1978)	15.77
Gamma GOF Test			
A-D Test Statistic	0.232	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.103	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.171	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	13.65	k star (bias corrected MLE)	12.1
Theta hat (MLE)	1.059	Theta star (bias corrected MLE)	1.195
nu hat (MLE)	710	nu star (bias corrected)	629.4
MLE Mean (bias corrected)	14.47	MLE Sd (bias corrected)	4.158
		Approximate Chi Square Value (0.05)	572.2
Adjusted Level of Significance	0.0398	Adjusted Chi Square Value	568.6
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	15.91	95% Adjusted Gamma UCL (use when n<50)	16.01
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.966	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.109	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.902	Mean of logged Data	2.635
Maximum of Logged Data	3.091	SD of logged Data	0.285
Assuming Lognormal Distribution			
95% H-UCL	16.09	90% Chebyshev (MVUE) UCL	16.95
95% Chebyshev (MVUE) UCL	18.07	97.5% Chebyshev (MVUE) UCL	19.61
99% Chebyshev (MVUE) UCL	22.65		

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	15.72	95% Jackknife UCL	15.77
95% Standard Bootstrap UCL	15.7	95% Bootstrap-t UCL	15.9
95% Hall's Bootstrap UCL	15.79	95% Percentile Bootstrap UCL	15.68
95% BCA Bootstrap UCL	15.76		
90% Chebyshev(Mean, Sd) UCL	16.75	95% Chebyshev(Mean, Sd) UCL	17.79
97.5% Chebyshev(Mean, Sd) UCL	19.22	99% Chebyshev(Mean, Sd) UCL	22.05
Suggested UCL to Use			
95% Student's-t UCL	15.77		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
CHRYSENE (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	9
Number of Detects	1	Number of Non-Detects	25
Number of Distinct Detects	1	Number of Distinct Non-Detects	8
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set! It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable CHRYSENE (MG/KG) was not processed!			
COBALT (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	17
		Number of Missing Observations	0
Minimum	6.5	Mean	10.12
Maximum	16	Median	10
SD	2.56	Std. Error of Mean	0.502
Coefficient of Variation	0.253	Skewness	0.581
Normal GOF Test			
Shapiro Wilk Test Statistic	0.942	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.172	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.17	Data Not Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	10.98	95% Adjusted-CLT UCL (Chen-1995)	11.01
		95% Modified-t UCL (Johnson-1978)	10.99
Gamma GOF Test			
A-D Test Statistic	0.407	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.141	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.171	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	16.71	k star (bias corrected MLE)	14.81

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Theta hat (MLE)	0.606	Theta star (bias corrected MLE)	0.683
nu hat (MLE)	868.8	nu star (bias corrected)	769.9
MLE Mean (bias corrected)	10.12	MLE Sd (bias corrected)	2.63
		Approximate Chi Square Value (0.05)	706.5
Adjusted Level of Significance	0.0398	Adjusted Chi Square Value	702.5
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	11.03	95% Adjusted Gamma UCL (use when n<50)	11.09
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.957	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.125	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.872	Mean of logged Data	2.284
Maximum of Logged Data	2.773	SD of logged Data	0.251
Assuming Lognormal Distribution			
95% H-UCL	11.08	90% Chebyshev (MVUE) UCL	11.63
95% Chebyshev (MVUE) UCL	12.31	97.5% Chebyshev (MVUE) UCL	13.26
99% Chebyshev (MVUE) UCL	15.12		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	10.94	95% Jackknife UCL	10.98
95% Standard Bootstrap UCL	10.91	95% Bootstrap-t UCL	11.06
95% Hall's Bootstrap UCL	11.04	95% Percentile Bootstrap UCL	10.94
95% BCA Bootstrap UCL	10.98		
90% Chebyshev(Mean, Sd) UCL	11.63	95% Chebyshev(Mean, Sd) UCL	12.31
97.5% Chebyshev(Mean, Sd) UCL	13.25	99% Chebyshev(Mean, Sd) UCL	15.11
Suggested UCL to Use			
95% Student's-t UCL	10.98		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
COPPER (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	18
		Number of Missing Observations	0
Minimum	16	Mean	30.88
Maximum	50	Median	29
SD	8.932	Std. Error of Mean	1.752
Coefficient of Variation	0.289	Skewness	0.406
Normal GOF Test			
Shapiro Wilk Test Statistic	0.967	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.122	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	33.88	95% Adjusted-CLT UCL (Chen-1995)	33.91
		95% Modified-t UCL (Johnson-1978)	33.9
Gamma GOF Test			
A-D Test Statistic	0.2	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0877	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.171	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	12.37	k star (bias corrected MLE)	10.97
Theta hat (MLE)	2.496	Theta star (bias corrected MLE)	2.815
nu hat (MLE)	643.4	nu star (bias corrected)	570.5
MLE Mean (bias corrected)	30.88	MLE Sd (bias corrected)	9.324
		Approximate Chi Square Value (0.05)	516.1
Adjusted Level of Significance	0.0398	Adjusted Chi Square Value	512.7
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	34.14	95% Adjusted Gamma UCL (use when n<50)	34.37
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.979	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.077	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.773	Mean of logged Data	3.389
Maximum of Logged Data	3.912	SD of logged Data	0.295
Assuming Lognormal Distribution			
95% H-UCL	34.46	90% Chebyshev (MVUE) UCL	36.35
95% Chebyshev (MVUE) UCL	38.81	97.5% Chebyshev (MVUE) UCL	42.24
99% Chebyshev (MVUE) UCL	48.96		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	33.77	95% Jackknife UCL	33.88
95% Standard Bootstrap UCL	33.74	95% Bootstrap-t UCL	34.02
95% Hall's Bootstrap UCL	33.87	95% Percentile Bootstrap UCL	33.77
95% BCA Bootstrap UCL	33.73		
90% Chebyshev(Mean, Sd) UCL	36.14	95% Chebyshev(Mean, Sd) UCL	38.52
97.5% Chebyshev(Mean, Sd) UCL	41.82	99% Chebyshev(Mean, Sd) UCL	48.31
Suggested UCL to Use			
95% Student's-t UCL	33.88		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.</p> <p>Recommendations are based upon data size, data distribution, and skewness.</p> <p>These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).</p> <p>However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
DIBENZOFURAN (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	9
Number of Detects	1	Number of Non-Detects	25

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Number of Distinct Detects	1	Number of Distinct Non-Detects	8
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!			
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable DIBENZOFURAN (MG/KG) was not processed!			
FLUORANTHENE (MG/KG)			
General Statistics			
Total Number of Observations	25	Number of Distinct Observations	12
Number of Detects	7	Number of Non-Detects	18
Number of Distinct Detects	5	Number of Distinct Non-Detects	7
Minimum Detect	0.2	Minimum Non-Detect	0.37
Maximum Detect	0.63	Maximum Non-Detect	0.43
Variance Detects	0.0229	Percent Non-Detects	72%
Mean Detects	0.297	SD Detects	0.151
Median Detects	0.23	CV Detects	0.51
Skewness Detects	2.345	Kurtosis Detects	5.644
Mean of Logged Detects	-1.292	SD of Logged Detects	0.393
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.64	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.803	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.361	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.304	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.257	KM Standard Error of Mean	0.0228
KM SD	0.0844	95% KM (BCA) UCL	0.295
95% KM (t) UCL	0.296	95% KM (Percentile Bootstrap) UCL	0.299
95% KM (z) UCL	0.295	95% KM Bootstrap t UCL	0.4
90% KM Chebyshev UCL	0.325	95% KM Chebyshev UCL	0.356
97.5% KM Chebyshev UCL	0.399	99% KM Chebyshev UCL	0.484
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.091	Anderson-Darling GOF Test	
5% A-D Critical Value	0.709	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.367	Kolmogorov-Smirnov GOF	
5% K-S Critical Value	0.313	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	6.5	k star (bias corrected MLE)	3.809
Theta hat (MLE)	0.0457	Theta star (bias corrected MLE)	0.078
nu hat (MLE)	91	nu star (bias corrected)	53.33
Mean (detects)	0.297		
Gamma ROS Statistics using Imputed Non-Detects			
<u>GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs</u>			
<u>GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)</u>			
<u>For such situations, GROS method may yield incorrect values of UCLs and BTVs</u>			
<u>This is especially true when the sample size is small.</u>			
<u>For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates</u>			
Minimum	0.152	Mean	0.264
Maximum	0.63	Median	0.247
SD	0.0944	CV	0.358
k hat (MLE)	10.89	k star (bias corrected MLE)	9.606
Theta hat (MLE)	0.0242	Theta star (bias corrected MLE)	0.0275
nu hat (MLE)	544.3	nu star (bias corrected)	480.3
Adjusted Level of Significance (β)	0.0395		
Approximate Chi Square Value (480.28, α)	430.5	Adjusted Chi Square Value (480.28, β)	427.3

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
95% Gamma Approximate UCL (use when n>=50)	0.294	95% Gamma Adjusted UCL (use when n<50)	0.296
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.257	SD (KM)	0.0844
Variance (KM)	0.00712	SE of Mean (KM)	0.0228
k hat (KM)	9.296	k star (KM)	8.207
nu hat (KM)	464.8	nu star (KM)	410.4
theta hat (KM)	0.0277	theta star (KM)	0.0313
80% gamma percentile (KM)	0.328	90% gamma percentile (KM)	0.377
95% gamma percentile (KM)	0.42	99% gamma percentile (KM)	0.511
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (410.36, α)	364.4	Adjusted Chi Square Value (410.36, β)	361.5
95% Gamma Approximate KM-UCL (use when n>=50)	0.29	95% Gamma Adjusted KM-UCL (use when n<50)	0.292
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.728	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.803	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.348	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.304	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.265	Mean in Log Scale	-1.366
SD in Original Scale	0.0877	SD in Log Scale	0.256
95% t UCL (assumes normality of ROS data)	0.295	95% Percentile Bootstrap UCL	0.295
95% BCA Bootstrap UCL	0.31	95% Bootstrap t UCL	0.318
95% H-UCL (Log ROS)	0.289		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.392	KM Geo Mean	0.249
KM SD (logged)	0.235	95% Critical H Value (KM-Log)	1.775
KM Standard Error of Mean (logged)	0.0728	95% H-UCL (KM -Log)	0.278
KM SD (logged)	0.235	95% Critical H Value (KM-Log)	1.775
KM Standard Error of Mean (logged)	0.0728		
DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.227	Mean in Log Scale	-1.522
SD in Original Scale	0.0881	SD in Log Scale	0.247
95% t UCL (Assumes normality)	0.257	95% H-Stat UCL	0.246
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	0.296	KM H-UCL	0.278
95% KM (BCA) UCL	0.295		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.</p> <p>Recommendations are based upon data size, data distribution, and skewness.</p> <p>These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).</p> <p>However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
FLUORENE (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	9
Number of Detects	1	Number of Non-Detects	25
Number of Distinct Detects	1	Number of Distinct Non-Detects	8
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!			
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
The data set for variable FLUORENE (MG/KG) was not processed!			
INDENO(1,2,3-CD)PYRENE (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	10
Number of Detects	2	Number of Non-Detects	24
Number of Distinct Detects	2	Number of Distinct Non-Detects	8
Minimum Detect	0.2	Minimum Non-Detect	0.37
Maximum Detect	1.4	Maximum Non-Detect	0.81
Variance Detects	0.72	Percent Non-Detects	92.31%
Mean Detects	0.8	SD Detects	0.849
Median Detects	0.8	CV Detects	1.061
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-0.636	SD of Logged Detects	1.376
Warning: Data set has only 2 Detected Values.			
This is not enough to compute meaningful or reliable statistics and estimates.			
Normal GOF Test on Detects Only			
Not Enough Data to Perform GOF Test			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.246	KM Standard Error of Mean	0.064
KM SD	0.231	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.355	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.351	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.438	95% KM Chebyshev UCL	0.525
97.5% KM Chebyshev UCL	0.646	99% KM Chebyshev UCL	0.883
Gamma GOF Tests on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.352	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.592	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	5.408	nu star (bias corrected)	N/A
Mean (detects)	0.8		
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.246	SD (KM)	0.231
Variance (KM)	0.0533	SE of Mean (KM)	0.064
k hat (KM)	1.138	k star (KM)	1.032
nu hat (KM)	59.16	nu star (KM)	53.67
theta hat (KM)	0.216	theta star (KM)	0.238
80% gamma percentile (KM)	0.395	90% gamma percentile (KM)	0.562
95% gamma percentile (KM)	0.729	99% gamma percentile (KM)	1.116
Gamma Kaplan-Meier (KM) Statistics			
		Adjusted Level of Significance (β)	0.0398
Approximate Chi Square Value (53.67, α)	37.84	Adjusted Chi Square Value (53.67, β)	36.96
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	0.349	95% Gamma Adjusted KM-UCL (use when $n < 50$)	0.357
Lognormal GOF Test on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.271	Mean in Log Scale	-1.543
SD in Original Scale	0.257	SD in Log Scale	0.64
95% t UCL (assumes normality of ROS data)	0.357	95% Percentile Bootstrap UCL	0.361
95% BCA Bootstrap UCL	0.411	95% Bootstrap t UCL	0.445

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ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
95% H-UCL (Log ROS)	0.343		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.535	KM Geo Mean	0.216
KM SD (logged)	0.374	95% Critical H Value (KM-Log)	1.867
KM Standard Error of Mean (logged)	0.104	95% H-UCL (KM -Log)	0.266
KM SD (logged)	0.374	95% Critical H Value (KM-Log)	1.867
KM Standard Error of Mean (logged)	0.104		
DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.254	Mean in Log Scale	-1.51
SD in Original Scale	0.237	SD in Log Scale	0.403
95% t UCL (Assumes normality)	0.333	95% H-Stat UCL	0.279
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.525		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
IRON (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	15000	Mean	22346
Maximum	33000	Median	22000
SD	4715	Std. Error of Mean	924.8
Coefficient of Variation	0.211	Skewness	0.216
Normal GOF Test			
Shapiro Wilk Test Statistic	0.957	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.118	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	23926	95% Adjusted-CLT UCL (Chen-1995)	23909
		95% Modified-t UCL (Johnson-1978)	23932
Gamma GOF Test			
A-D Test Statistic	0.445	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.142	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.171	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	22.98	k star (bias corrected MLE)	20.35
Theta hat (MLE)	972.4	Theta star (bias corrected MLE)	1098
nu hat (MLE)	1195	nu star (bias corrected)	1058
MLE Mean (bias corrected)	22346	MLE Sd (bias corrected)	4953
		Approximate Chi Square Value (0.05)	983.9
Adjusted Level of Significance	0.0398	Adjusted Chi Square Value	979.2

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ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	24039	95% Adjusted Gamma UCL (use when n<50)	24155
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.949	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.157	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	9.616	Mean of logged Data	9.992
Maximum of Logged Data	10.4	SD of logged Data	0.215
Assuming Lognormal Distribution			
95% H-UCL	24144	90% Chebyshev (MVUE) UCL	25211
95% Chebyshev (MVUE) UCL	26505	97.5% Chebyshev (MVUE) UCL	28300
99% Chebyshev (MVUE) UCL	31828		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	23867	95% Jackknife UCL	23926
95% Standard Bootstrap UCL	23846	95% Bootstrap-t UCL	24026
95% Hall's Bootstrap UCL	24067	95% Percentile Bootstrap UCL	23808
95% BCA Bootstrap UCL	23808		
90% Chebyshev(Mean, Sd) UCL	25120	95% Chebyshev(Mean, Sd) UCL	26377
97.5% Chebyshev(Mean, Sd) UCL	28121	99% Chebyshev(Mean, Sd) UCL	31548
Suggested UCL to Use			
95% Student's-t UCL	23926		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
LEAD (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	8.8	Mean	17.07
Maximum	26	Median	17
SD	4.35	Std. Error of Mean	0.853
Coefficient of Variation	0.255	Skewness	0.112
Normal GOF Test			
Shapiro Wilk Test Statistic	0.96	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.144	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	18.53	95% Adjusted-CLT UCL (Chen-1995)	18.49
		95% Modified-t UCL (Johnson-1978)	18.53
Gamma GOF Test			
A-D Test Statistic	0.524	Anderson-Darling Gamma GOF Test	

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.157	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.171	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	15.38	k star (bias corrected MLE)	13.63
Theta hat (MLE)	1.11	Theta star (bias corrected MLE)	1.252
nu hat (MLE)	799.7	nu star (bias corrected)	708.8
MLE Mean (bias corrected)	17.07	MLE Sd (bias corrected)	4.623
		Approximate Chi Square Value (0.05)	648
Adjusted Level of Significance	0.0398	Adjusted Chi Square Value	644.2
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	18.67	95% Adjusted Gamma UCL (use when n<50)	18.78
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.954	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.162	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.175	Mean of logged Data	2.804
Maximum of Logged Data	3.258	SD of logged Data	0.266
Assuming Lognormal Distribution			
95% H-UCL	18.83	90% Chebyshev (MVUE) UCL	19.79
95% Chebyshev (MVUE) UCL	21.02	97.5% Chebyshev (MVUE) UCL	22.72
99% Chebyshev (MVUE) UCL	26.06		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	18.47	95% Jackknife UCL	18.53
95% Standard Bootstrap UCL	18.41	95% Bootstrap-t UCL	18.53
95% Hall's Bootstrap UCL	18.45	95% Percentile Bootstrap UCL	18.53
95% BCA Bootstrap UCL	18.38		
90% Chebyshev(Mean, Sd) UCL	19.63	95% Chebyshev(Mean, Sd) UCL	20.79
97.5% Chebyshev(Mean, Sd) UCL	22.4	99% Chebyshev(Mean, Sd) UCL	25.56
Suggested UCL to Use			
95% Student's-t UCL	18.53		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
MAGNESIUM (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	23
		Number of Missing Observations	0
Minimum	2000	Mean	5508
Maximum	17000	Median	4400
SD	3541	Std. Error of Mean	694.5
Coefficient of Variation	0.643	Skewness	1.685
Normal GOF Test			
Shapiro Wilk Test Statistic	0.836	Shapiro Wilk GOF Test	

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
5% Shapiro Wilk Critical Value	0.92	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.171	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.17	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	6694	95% Adjusted-CLT UCL (Chen-1995)	6895
		95% Modified-t UCL (Johnson-1978)	6732
Gamma GOF Test			
A-D Test Statistic	0.502	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.75	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.116	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.172	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	3.203	k star (bias corrected MLE)	2.859
Theta hat (MLE)	1720	Theta star (bias corrected MLE)	1927
nu hat (MLE)	166.5	nu star (bias corrected)	148.7
MLE Mean (bias corrected)	5508	MLE Sd (bias corrected)	3257
		Approximate Chi Square Value (0.05)	121.5
Adjusted Level of Significance	0.0398	Adjusted Chi Square Value	119.9
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	6740	95% Adjusted Gamma UCL (use when n<50)	6831
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.964	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.108	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	7.601	Mean of logged Data	8.45
Maximum of Logged Data	9.741	SD of logged Data	0.567
Assuming Lognormal Distribution			
95% H-UCL	6908	90% Chebyshev (MVUE) UCL	7368
95% Chebyshev (MVUE) UCL	8236	97.5% Chebyshev (MVUE) UCL	9440
99% Chebyshev (MVUE) UCL	11807		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	6650	95% Jackknife UCL	6694
95% Standard Bootstrap UCL	6635	95% Bootstrap-t UCL	7084
95% Hall's Bootstrap UCL	7186	95% Percentile Bootstrap UCL	6662
95% BCA Bootstrap UCL	6758		
90% Chebyshev(Mean, Sd) UCL	7591	95% Chebyshev(Mean, Sd) UCL	8535
97.5% Chebyshev(Mean, Sd) UCL	9845	99% Chebyshev(Mean, Sd) UCL	12418
Suggested UCL to Use			
95% Adjusted Gamma UCL	6831		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
MANGANESE (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	20
		Number of Missing Observations	0
Minimum	190	Mean	591.5
Maximum	1200	Median	530
SD	288.1	Std. Error of Mean	56.51
Coefficient of Variation	0.487	Skewness	0.907
Normal GOF Test			
Shapiro Wilk Test Statistic	0.897	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.175	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.17	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	688.1	95% Adjusted-CLT UCL (Chen-1995)	695.2
		95% Modified-t UCL (Johnson-1978)	689.7
Gamma GOF Test			
A-D Test Statistic	0.377	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.747	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.119	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.172	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	4.588	k star (bias corrected MLE)	4.084
Theta hat (MLE)	128.9	Theta star (bias corrected MLE)	144.8
nu hat (MLE)	238.6	nu star (bias corrected)	212.4
MLE Mean (bias corrected)	591.5	MLE Sd (bias corrected)	292.7
		Approximate Chi Square Value (0.05)	179.7
Adjusted Level of Significance	0.0398	Adjusted Chi Square Value	177.7
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	699.3	95% Adjusted Gamma UCL (use when n<50)	707.1
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.964	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.101	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	5.247	Mean of logged Data	6.27
Maximum of Logged Data	7.09	SD of logged Data	0.492
Assuming Lognormal Distribution			
95% H-UCL	723.1	90% Chebyshev (MVUE) UCL	772
95% Chebyshev (MVUE) UCL	852.9	97.5% Chebyshev (MVUE) UCL	965.3
99% Chebyshev (MVUE) UCL	1186		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	684.5	95% Jackknife UCL	688.1
95% Standard Bootstrap UCL	682.5	95% Bootstrap-t UCL	702.8
95% Hall's Bootstrap UCL	701.7	95% Percentile Bootstrap UCL	687.7
95% BCA Bootstrap UCL	692.7		

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
90% Chebyshev(Mean, Sd) UCL	761.1	95% Chebyshev(Mean, Sd) UCL	837.9
97.5% Chebyshev(Mean, Sd) UCL	944.4	99% Chebyshev(Mean, Sd) UCL	1154
Suggested UCL to Use			
95% Adjusted Gamma UCL	707.1		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
MERCURY (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	22
		Number of Missing Observations	0
Minimum	0.019	Mean	0.0506
Maximum	0.1	Median	0.047
SD	0.0213	Std. Error of Mean	0.00418
Coefficient of Variation	0.421	Skewness	0.636
Normal GOF Test			
Shapiro Wilk Test Statistic	0.941	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.138	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	0.0577	95% Adjusted-CLT UCL (Chen-1995)	0.058
		95% Modified-t UCL (Johnson-1978)	0.0578
Gamma GOF Test			
A-D Test Statistic	0.352	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.746	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.125	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.171	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	5.961	k star (bias corrected MLE)	5.298
Theta hat (MLE)	0.00849	Theta star (bias corrected MLE)	0.00955
nu hat (MLE)	309.9	nu star (bias corrected)	275.5
MLE Mean (bias corrected)	0.0506	MLE Sd (bias corrected)	0.022
		Approximate Chi Square Value (0.05)	238.1
Adjusted Level of Significance	0.0398	Adjusted Chi Square Value	235.8
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.0585	95% Adjusted Gamma UCL (use when n<50)	0.0591
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.971	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.12	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-3.963	Mean of logged Data	-3.07
Maximum of Logged Data	-2.303	SD of logged Data	0.428
Assuming Lognormal Distribution			

Appendix M, Attachment 2-1				
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area				
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35				
East Aurora and Orchard Park, New York				
95% H-UCL	0.0599	90% Chebyshev (MVUE) UCL	0.0638	
95% Chebyshev (MVUE) UCL	0.0698	97.5% Chebyshev (MVUE) UCL	0.0781	
99% Chebyshev (MVUE) UCL	0.0943			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	0.0574	95% Jackknife UCL	0.0577	
95% Standard Bootstrap UCL	0.0574	95% Bootstrap-t UCL	0.0584	
95% Hall's Bootstrap UCL	0.0578	95% Percentile Bootstrap UCL	0.0573	
95% BCA Bootstrap UCL	0.0576			
90% Chebyshev (Mean, Sd) UCL	0.0631	95% Chebyshev (Mean, Sd) UCL	0.0688	
97.5% Chebyshev (Mean, Sd) UCL	0.0767	99% Chebyshev (Mean, Sd) UCL	0.0921	
Suggested UCL to Use				
95% Student's-t UCL	0.0577			
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>				
NAPHTHALENE (MG/KG)				
General Statistics				
Total Number of Observations	26	Number of Distinct Observations	9	
Number of Detects	1	Number of Non-Detects	25	
Number of Distinct Detects	1	Number of Distinct Non-Detects	8	
<p>Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set! It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).</p> <p style="text-align: center;">The data set for variable NAPHTHALENE (MG/KG) was not processed!</p>				
NICKEL (MG/KG)				
General Statistics				
Total Number of Observations	26	Number of Distinct Observations	20	
		Number of Missing Observations	0	
Minimum	18	Mean	31.73	
Maximum	55	Median	29	
SD	10.37	Std. Error of Mean	2.033	
Coefficient of Variation	0.327	Skewness	1.018	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.883	Shapiro Wilk GOF Test		
5% Shapiro Wilk Critical Value	0.92	Data Not Normal at 5% Significance Level		
Lilliefors Test Statistic	0.182	Lilliefors GOF Test		
5% Lilliefors Critical Value	0.17	Data Not Normal at 5% Significance Level		
Data Not Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		95% UCLs (Adjusted for Skewness)		
95% Student's-t UCL	35.2	95% Adjusted-CLT UCL (Chen-1995)	35.51	
		95% Modified-t UCL (Johnson-1978)	35.27	
Gamma GOF Test				
A-D Test Statistic	0.701	Anderson-Darling Gamma GOF Test		
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.144	Kolmogorov-Smirnov Gamma GOF Test		
5% K-S Critical Value	0.171	Detected data appear Gamma Distributed at 5% Significance Level		

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	10.85	k star (bias corrected MLE)	9.624
Theta hat (MLE)	2.924	Theta star (bias corrected MLE)	3.297
nu hat (MLE)	564.2	nu star (bias corrected)	500.4
MLE Mean (bias corrected)	31.73	MLE Sd (bias corrected)	10.23
		Approximate Chi Square Value (0.05)	449.6
Adjusted Level of Significance	0.0398	Adjusted Chi Square Value	446.4
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	35.32	95% Adjusted Gamma UCL (use when n<50)	35.57
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.947	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.123	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.89	Mean of logged Data	3.41
Maximum of Logged Data	4.007	SD of logged Data	0.306
Assuming Lognormal Distribution			
95% H-UCL	35.48	90% Chebyshev (MVUE) UCL	37.48
95% Chebyshev (MVUE) UCL	40.11	97.5% Chebyshev (MVUE) UCL	43.76
99% Chebyshev (MVUE) UCL	50.93		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	35.08	95% Jackknife UCL	35.2
95% Standard Bootstrap UCL	35	95% Bootstrap-t UCL	35.63
95% Hall's Bootstrap UCL	35.67	95% Percentile Bootstrap UCL	35.04
95% BCA Bootstrap UCL	35.19		
90% Chebyshev(Mean, Sd) UCL	37.83	95% Chebyshev(Mean, Sd) UCL	40.59
97.5% Chebyshev(Mean, Sd) UCL	44.43	99% Chebyshev(Mean, Sd) UCL	51.96
Suggested UCL to Use			
95% Adjusted Gamma UCL	35.57		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
POTASSIUM (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	18
		Number of Missing Observations	0
Minimum	580	Mean	896.2
Maximum	1200	Median	875
SD	184.2	Std. Error of Mean	36.13
Coefficient of Variation	0.206	Skewness	0.217
Normal GOF Test			
Shapiro Wilk Test Statistic	0.945	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.135	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Normal at 5% Significance Level	

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	957.9	95% Adjusted-CLT UCL (Chen-1995)	957.2
		95% Modified-t UCL (Johnson-1978)	958.1
Gamma GOF Test			
A-D Test Statistic	0.398	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.137	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.171	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	24.44	k star (bias corrected MLE)	21.64
Theta hat (MLE)	36.67	Theta star (bias corrected MLE)	41.41
nu hat (MLE)	1271	nu star (bias corrected)	1125
MLE Mean (bias corrected)	896.2	MLE Sd (bias corrected)	192.6
		Approximate Chi Square Value (0.05)	1049
Adjusted Level of Significance	0.0398	Adjusted Chi Square Value	1044
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	961.9	95% Adjusted Gamma UCL (use when n<50)	966.4
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.955	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.13	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	6.363	Mean of logged Data	6.778
Maximum of Logged Data	7.09	SD of logged Data	0.208
Assuming Lognormal Distribution			
95% H-UCL	965.4	90% Chebyshev (MVUE) UCL	1007
95% Chebyshev (MVUE) UCL	1057	97.5% Chebyshev (MVUE) UCL	1127
99% Chebyshev (MVUE) UCL	1263		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	955.6	95% Jackknife UCL	957.9
95% Standard Bootstrap UCL	955.4	95% Bootstrap-t UCL	960.6
95% Hall's Bootstrap UCL	956.4	95% Percentile Bootstrap UCL	954.6
95% BCA Bootstrap UCL	951.5		
90% Chebyshev(Mean, Sd) UCL	1005	95% Chebyshev(Mean, Sd) UCL	1054
97.5% Chebyshev(Mean, Sd) UCL	1122	99% Chebyshev(Mean, Sd) UCL	1256
Suggested UCL to Use			
95% Student's-t UCL	957.9		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
PYRENE (MG/KG)			
General Statistics			
Total Number of Observations	25	Number of Distinct Observations	9

Appendix M, Attachment 2-1									
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area									
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35									
East Aurora and Orchard Park, New York									
Number of Detects		2		Number of Non-Detects		23			
Number of Distinct Detects		2		Number of Distinct Non-Detects		7			
Minimum Detect		0.13		Minimum Non-Detect		0.37			
Maximum Detect		0.32		Maximum Non-Detect		0.43			
Variance Detects		0.0181		Percent Non-Detects		92%			
Mean Detects		0.225		SD Detects		0.134			
Median Detects		0.225		CV Detects		0.597			
Skewness Detects		N/A		Kurtosis Detects		N/A			
Mean of Logged Detects		-1.59		SD of Logged Detects		0.637			
Warning: Data set has only 2 Detected Values.									
This is not enough to compute meaningful or reliable statistics and estimates.									
Normal GOF Test on Detects Only									
Not Enough Data to Perform GOF Test									
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs									
KM Mean		0.225		KM Standard Error of Mean		0.095			
KM SD		0.095		95% KM (BCA) UCL		N/A			
95% KM (t) UCL		0.388		95% KM (Percentile Bootstrap) UCL		N/A			
95% KM (z) UCL		0.381		95% KM Bootstrap t UCL		N/A			
90% KM Chebyshev UCL		0.51		95% KM Chebyshev UCL		0.639			
97.5% KM Chebyshev UCL		0.818		99% KM Chebyshev UCL		1.17			
Gamma GOF Tests on Detected Observations Only									
Not Enough Data to Perform GOF Test									
Gamma Statistics on Detected Data Only									
k hat (MLE)		5.254		k star (bias corrected MLE)		N/A			
Theta hat (MLE)		0.0428		Theta star (bias corrected MLE)		N/A			
nu hat (MLE)		21.02		nu star (bias corrected)		N/A			
Mean (detects)		0.225							
Estimates of Gamma Parameters using KM Estimates									
Mean (KM)		0.225		SD (KM)		0.095			
Variance (KM)		0.00903		SE of Mean (KM)		0.095			
k hat (KM)		5.609		k star (KM)		4.963			
nu hat (KM)		280.5		nu star (KM)		248.1			
theta hat (KM)		0.0401		theta star (KM)		0.0453			
80% gamma percentile (KM)		0.303		90% gamma percentile (KM)		0.36			
95% gamma percentile (KM)		0.413		99% gamma percentile (KM)		0.524			
Gamma Kaplan-Meier (KM) Statistics									
Approximate Chi Square Value (248.15, α)		212.7		Adjusted Level of Significance (β)		0.0395			
95% Gamma Approximate KM-UCL (use when $n \geq 50$)		0.263		Adjusted Chi Square Value (248.15, β)		210.4			
				95% Gamma Adjusted KM-UCL (use when $n < 50$)		0.265			
Lognormal GOF Test on Detected Observations Only									
Not Enough Data to Perform GOF Test									
Lognormal ROS Statistics Using Imputed Non-Detects									
Mean in Original Scale		0.247		Mean in Log Scale		-1.59			
SD in Original Scale		0.157		SD in Log Scale		0.639			
95% t UCL (assumes normality of ROS data)		0.3		95% Percentile Bootstrap UCL		0.299			
95% BCA Bootstrap UCL		0.302		95% Bootstrap t UCL		0.31			
95% H-UCL (Log ROS)		0.328							
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution									
KM Mean (logged)		-1.59		KM Geo Mean		0.204			
KM SD (logged)		0.45		95% Critical H Value (KM-Log)		1.919			
KM Standard Error of Mean (logged)		0.45		95% H-UCL (KM -Log)		0.269			
KM SD (logged)		0.45		95% Critical H Value (KM-Log)		1.919			
KM Standard Error of Mean (logged)		0.45							

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.202	Mean in Log Scale	-1.611
SD in Original Scale	0.0293	SD in Log Scale	0.136
95% t UCL (Assumes normality)	0.212	95% H-Stat UCL	0.211
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	0.639		
Warning: Recommended UCL exceeds the maximum observation			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
SELENIUM (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	14
		Number of Missing Observations	0
Minimum	0.82	Mean	1.196
Maximum	1.9	Median	1.15
SD	0.289	Std. Error of Mean	0.0567
Coefficient of Variation	0.242	Skewness	0.786
Normal GOF Test			
Shapiro Wilk Test Statistic	0.934	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.13	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	1.293	95% Adjusted-CLT UCL (Chen-1995)	1.299
		95% Modified-t UCL (Johnson-1978)	1.294
Gamma GOF Test			
A-D Test Statistic	0.318	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.111	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.171	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	18.89	k star (bias corrected MLE)	16.74
Theta hat (MLE)	0.0633	Theta star (bias corrected MLE)	0.0715
nu hat (MLE)	982.3	nu star (bias corrected)	870.3
MLE Mean (bias corrected)	1.196	MLE Sd (bias corrected)	0.292
		Approximate Chi Square Value (0.05)	802.8
Adjusted Level of Significance	0.0398	Adjusted Chi Square Value	798.6
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	1.297	95% Adjusted Gamma UCL (use when n<50)	1.304
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.962	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Lognormal at 5% Significance Level	

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Lilliefors Test Statistic	0.0966	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-0.198	Mean of logged Data	0.152
Maximum of Logged Data	0.642	SD of logged Data	0.234
Assuming Lognormal Distribution			
95% H-UCL	1.3	90% Chebyshev (MVUE) UCL	1.361
95% Chebyshev (MVUE) UCL	1.436	97.5% Chebyshev (MVUE) UCL	1.541
99% Chebyshev (MVUE) UCL	1.746		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	1.289	95% Jackknife UCL	1.293
95% Standard Bootstrap UCL	1.288	95% Bootstrap-t UCL	1.298
95% Hall's Bootstrap UCL	1.308	95% Percentile Bootstrap UCL	1.29
95% BCA Bootstrap UCL	1.302		
90% Chebyshev(Mean, Sd) UCL	1.366	95% Chebyshev(Mean, Sd) UCL	1.443
97.5% Chebyshev(Mean, Sd) UCL	1.55	99% Chebyshev(Mean, Sd) UCL	1.76
Suggested UCL to Use			
95% Student's-t UCL	1.293		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
SILVER (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	19
		Number of Missing Observations	0
Minimum	0.021	Mean	0.0497
Maximum	0.1	Median	0.045
SD	0.0191	Std. Error of Mean	0.00374
Coefficient of Variation	0.384	Skewness	1.204
Normal GOF Test			
Shapiro Wilk Test Statistic	0.886	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.18	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.17	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	0.0561	95% Adjusted-CLT UCL (Chen-1995)	0.0568
		95% Modified-t UCL (Johnson-1978)	0.0563
Gamma GOF Test			
A-D Test Statistic	0.519	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.745	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.14	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.171	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	7.746	k star (bias corrected MLE)	6.878

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
<i>Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35</i>			
<i>East Aurora and Orchard Park, New York</i>			
Theta hat (MLE)	0.00642	Theta star (bias corrected MLE)	0.00723
nu hat (MLE)	402.8	nu star (bias corrected)	357.6
MLE Mean (bias corrected)	0.0497	MLE Sd (bias corrected)	0.019
		Approximate Chi Square Value (0.05)	314.8
Adjusted Level of Significance	0.0398	Adjusted Chi Square Value	312.2
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	0.0565	95% Adjusted Gamma UCL (use when n<50)	0.057
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.954	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.131	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-3.863	Mean of logged Data	-3.067
Maximum of Logged Data	-2.303	SD of logged Data	0.37
Assuming Lognormal Distribution			
95% H-UCL	0.0572	90% Chebyshev (MVUE) UCL	0.0608
95% Chebyshev (MVUE) UCL	0.0658	97.5% Chebyshev (MVUE) UCL	0.0728
99% Chebyshev (MVUE) UCL	0.0865		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.0559	95% Jackknife UCL	0.0561
95% Standard Bootstrap UCL	0.0558	95% Bootstrap-t UCL	0.0574
95% Hall's Bootstrap UCL	0.059	95% Percentile Bootstrap UCL	0.0558
95% BCA Bootstrap UCL	0.0569		
90% Chebyshev(Mean, Sd) UCL	0.061	95% Chebyshev(Mean, Sd) UCL	0.0661
97.5% Chebyshev(Mean, Sd) UCL	0.0731	99% Chebyshev(Mean, Sd) UCL	0.087
Suggested UCL to Use			
95% Adjusted Gamma UCL	0.057		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness.</p> <p>These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
SODIUM (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	19
Number of Detects	16	Number of Non-Detects	10
Number of Distinct Detects	16	Number of Distinct Non-Detects	3
Minimum Detect	40	Minimum Non-Detect	110
Maximum Detect	170	Maximum Non-Detect	130
Variance Detects	1561	Percent Non-Detects	38.46%
Mean Detects	77.13	SD Detects	39.52
Median Detects	65	CV Detects	0.512
Skewness Detects	1.453	Kurtosis Detects	1.549
Mean of Logged Detects	4.243	SD of Logged Detects	0.45
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.815	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.887	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.177	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.213	Detected Data appear Normal at 5% Significance Level	
Detected Data appear Approximate Normal at 5% Significance Level			

Appendix M, Attachment 2-1				
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area				
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35				
East Aurora and Orchard Park, New York				
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs				
KM Mean	72.3	KM Standard Error of Mean	7.483	
KM SD	33.1	95% KM (BCA) UCL	83.79	
95% KM (t) UCL	85.08	95% KM (Percentile Bootstrap) UCL	84.49	
95% KM (z) UCL	84.6	95% KM Bootstrap t UCL	88.16	
90% KM Chebyshev UCL	94.74	95% KM Chebyshev UCL	104.9	
97.5% KM Chebyshev UCL	119	99% KM Chebyshev UCL	146.7	
Gamma GOF Tests on Detected Observations Only				
A-D Test Statistic	0.651	Anderson-Darling GOF Test		
5% A-D Critical Value	0.741	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.176	Kolmogorov-Smirnov GOF		
5% K-S Critical Value	0.216	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics on Detected Data Only				
k hat (MLE)	5.037	k star (bias corrected MLE)	4.134	
Theta hat (MLE)	15.31	Theta star (bias corrected MLE)	18.66	
nu hat (MLE)	161.2	nu star (bias corrected)	132.3	
Mean (detects)	77.13			
Gamma ROS Statistics using Imputed Non-Detects				
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs				
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)				
For such situations, GROS method may yield incorrect values of UCLs and BTVs				
This is especially true when the sample size is small.				
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates				
Minimum	34.36	Mean	72.77	
Maximum	170	Median	64.7	
SD	33.54	CV	0.461	
k hat (MLE)	6.074	k star (bias corrected MLE)	5.399	
Theta hat (MLE)	11.98	Theta star (bias corrected MLE)	13.48	
nu hat (MLE)	315.8	nu star (bias corrected)	280.7	
Adjusted Level of Significance (β)	0.0398			
Approximate Chi Square Value (280.73, α)	242.9	Adjusted Chi Square Value (280.73, β)	240.6	
95% Gamma Approximate UCL (use when n>=50)	84.1	95% Gamma Adjusted UCL (use when n<50)	84.91	
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	72.3	SD (KM)	33.1	
Variance (KM)	1095	SE of Mean (KM)	7.483	
k hat (KM)	4.772	k star (KM)	4.247	
nu hat (KM)	248.1	nu star (KM)	220.8	
theta hat (KM)	15.15	theta star (KM)	17.02	
80% gamma percentile (KM)	98.99	90% gamma percentile (KM)	119.3	
95% gamma percentile (KM)	138	99% gamma percentile (KM)	177.7	
Gamma Kaplan-Meier (KM) Statistics				
Approximate Chi Square Value (220.84, α)	187.4	Adjusted Chi Square Value (220.84, β)	185.4	
95% Gamma Approximate KM-UCL (use when n>=50)	85.18	95% Gamma Adjusted KM-UCL (use when n<50)	86.11	
Lognormal GOF Test on Detected Observations Only				
Shapiro Wilk Test Statistic	0.914	Shapiro Wilk GOF Test		
5% Shapiro Wilk Critical Value	0.887	Detected Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.165	Lilliefors GOF Test		
5% Lilliefors Critical Value	0.213	Detected Data appear Lognormal at 5% Significance Level		
Detected Data appear Lognormal at 5% Significance Level				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	72.47	Mean in Log Scale	4.204	
SD in Original Scale	32.87	SD in Log Scale	0.388	
95% t UCL (assumes normality of ROS data)	83.49	95% Percentile Bootstrap UCL	83.31	
95% BCA Bootstrap UCL	84.96	95% Bootstrap t UCL	87.02	
95% H-UCL (Log ROS)	83.5			

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	4.195	KM Geo Mean	66.39
KM SD (logged)	0.396	95% Critical H Value (KM-Log)	1.883
KM Standard Error of Mean (logged)	0.095	95% H-UCL (KM -Log)	83.36
KM SD (logged)	0.396	95% Critical H Value (KM-Log)	1.883
KM Standard Error of Mean (logged)	0.095		
DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	70.15	Mean in Log Scale	4.179
SD in Original Scale	31.96	SD in Log Scale	0.36
95% t UCL (Assumes normality)	80.86	95% H-Stat UCL	79.6
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Approximate Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	85.08		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
THALLIUM (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	20
		Number of Missing Observations	0
Minimum	0.23	Mean	0.445
Maximum	0.93	Median	0.42
SD	0.167	Std. Error of Mean	0.0328
Coefficient of Variation	0.376	Skewness	1.324
Normal GOF Test			
Shapiro Wilk Test Statistic	0.888	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.202	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.17	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	0.501	95% Adjusted-CLT UCL (Chen-1995)	0.508
		95% Modified-t UCL (Johnson-1978)	0.502
Gamma GOF Test			
A-D Test Statistic	0.45	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.745	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.152	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.171	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	8.527	k star (bias corrected MLE)	7.569
Theta hat (MLE)	0.0522	Theta star (bias corrected MLE)	0.0588
nu hat (MLE)	443.4	nu star (bias corrected)	393.6
MLE Mean (bias corrected)	0.445	MLE Sd (bias corrected)	0.162

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Adjusted Level of Significance		0.0398	Approximate Chi Square Value (0.05)
			Adjusted Chi Square Value
			348.6
			345.8
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)		0.502	95% Adjusted Gamma UCL (use when n<50)
			0.506
Lognormal GOF Test			
Shapiro Wilk Test Statistic		0.968	Shapiro Wilk Lognormal GOF Test
5% Shapiro Wilk Critical Value		0.92	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic		0.133	Lilliefors Lognormal GOF Test
5% Lilliefors Critical Value		0.17	Data appear Lognormal at 5% Significance Level
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data		-1.47	Mean of logged Data
Maximum of Logged Data		-0.0726	SD of logged Data
			-0.869
			0.345
Assuming Lognormal Distribution			
95% H-UCL		0.505	90% Chebyshev (MVUE) UCL
95% Chebyshev (MVUE) UCL		0.577	97.5% Chebyshev (MVUE) UCL
99% Chebyshev (MVUE) UCL		0.749	
			0.536
			0.635
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL		0.499	95% Jackknife UCL
95% Standard Bootstrap UCL		0.497	95% Bootstrap-t UCL
95% Hall's Bootstrap UCL		0.523	95% Percentile Bootstrap UCL
95% BCA Bootstrap UCL		0.508	
90% Chebyshev(Mean, Sd) UCL		0.543	95% Chebyshev(Mean, Sd) UCL
97.5% Chebyshev(Mean, Sd) UCL		0.65	99% Chebyshev(Mean, Sd) UCL
			0.588
			0.771
Suggested UCL to Use			
95% Adjusted Gamma UCL		0.506	
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
VANADIUM (MG/KG)			
General Statistics			
Total Number of Observations		26	Number of Distinct Observations
			14
			Number of Missing Observations
			0
Minimum		13	Mean
Maximum		28	Median
SD		4.289	Std. Error of Mean
Coefficient of Variation		0.208	Skewness
			20.65
			21
			0.841
			-0.161
Normal GOF Test			
Shapiro Wilk Test Statistic		0.958	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value		0.92	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic		0.131	Lilliefors GOF Test
5% Lilliefors Critical Value		0.17	Data appear Normal at 5% Significance Level
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL			95% UCLs (Adjusted for Skewness)
95% Student's-t UCL		22.09	95% Adjusted-CLT UCL (Chen-1995)
			95% Modified-t UCL (Johnson-1978)
			22.01
			22.09

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Gamma GOF Test			
A-D Test Statistic	0.482	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.146	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.171	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	22.8	k star (bias corrected MLE)	20.19
Theta hat (MLE)	0.906	Theta star (bias corrected MLE)	1.023
nu hat (MLE)	1186	nu star (bias corrected)	1050
MLE Mean (bias corrected)	20.65	MLE Sd (bias corrected)	4.596
		Approximate Chi Square Value (0.05)	975.9
Adjusted Level of Significance	0.0398	Adjusted Chi Square Value	971.1
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	22.22	95% Adjusted Gamma UCL (use when n<50)	22.33
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.943	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.147	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.565	Mean of logged Data	3.006
Maximum of Logged Data	3.332	SD of logged Data	0.218
Assuming Lognormal Distribution			
95% H-UCL	22.35	90% Chebyshev (MVUE) UCL	23.34
95% Chebyshev (MVUE) UCL	24.56	97.5% Chebyshev (MVUE) UCL	26.24
99% Chebyshev (MVUE) UCL	29.54		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	22.04	95% Jackknife UCL	22.09
95% Standard Bootstrap UCL	22	95% Bootstrap-t UCL	22.08
95% Hall's Bootstrap UCL	21.97	95% Percentile Bootstrap UCL	22
95% BCA Bootstrap UCL	21.92		
90% Chebyshev(Mean, Sd) UCL	23.18	95% Chebyshev(Mean, Sd) UCL	24.32
97.5% Chebyshev(Mean, Sd) UCL	25.91	99% Chebyshev(Mean, Sd) UCL	29.02
Suggested UCL to Use			
95% Student's-t UCL	22.09		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.</p> <p>Recommendations are based upon data size, data distribution, and skewness.</p> <p>These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).</p> <p>However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
<p>Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positively skewed data sets.</p>			
ZINC (MG/KG)			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	21
		Number of Missing Observations	0
Minimum	52	Mean	92.12
Maximum	140	Median	90

Appendix M, Attachment 2-1			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
SD	22.7	Std. Error of Mean	4.451
Coefficient of Variation	0.246	Skewness	0.495
Normal GOF Test			
Shapiro Wilk Test Statistic	0.95	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.172	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.17	Data Not Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	99.72	95% Adjusted-CLT UCL (Chen-1995)	99.9
		95% Modified-t UCL (Johnson-1978)	99.79
Gamma GOF Test			
A-D Test Statistic	0.368	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.143	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.171	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	17.19	k star (bias corrected MLE)	15.23
Theta hat (MLE)	5.36	Theta star (bias corrected MLE)	6.049
nu hat (MLE)	893.7	nu star (bias corrected)	791.9
MLE Mean (bias corrected)	92.12	MLE Sd (bias corrected)	23.6
		Approximate Chi Square Value (0.05)	727.6
Adjusted Level of Significance	0.0398	Adjusted Chi Square Value	723.5
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	100.3	95% Adjusted Gamma UCL (use when n<50)	100.8
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.965	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.92	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.135	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.17	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.951	Mean of logged Data	4.494
Maximum of Logged Data	4.942	SD of logged Data	0.249
Assuming Lognormal Distribution			
95% H-UCL	100.9	90% Chebyshev (MVUE) UCL	105.8
95% Chebyshev (MVUE) UCL	112	97.5% Chebyshev (MVUE) UCL	120.6
99% Chebyshev (MVUE) UCL	137.5		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	99.44	95% Jackknife UCL	99.72
95% Standard Bootstrap UCL	99.44	95% Bootstrap-t UCL	100.3
95% Hall's Bootstrap UCL	100.4	95% Percentile Bootstrap UCL	99.27
95% BCA Bootstrap UCL	99.92		
90% Chebyshev(Mean, Sd) UCL	105.5	95% Chebyshev(Mean, Sd) UCL	111.5
97.5% Chebyshev(Mean, Sd) UCL	119.9	99% Chebyshev(Mean, Sd) UCL	136.4
Suggested UCL to Use			
95% Student's-t UCL	99.72		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			

Appendix M, Attachment 2-1									
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Launch Area									
<i>Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35</i>									
<i>East Aurora and Orchard Park, New York</i>									
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL									
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness.									
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.									

Appendix M, Attachment 2-2			
ProUCL Report for Surface Soil (Total PAHs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
UCL Statistics for Data Sets with Non-Detects			
User Selected Options			
Date/Time of Computation	ProUCL 5.110/19/2016 11:56:37 AM		
From File	WorkSheet.xls		
Full Precision	OFF		
Confidence Coefficient	95%		
Number of Bootstrap Operations	2000		
LMW PAHs			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	9
Number of Detects	1	Number of Non-Detects	25
Number of Distinct Detects	1	Number of Distinct Non-Detects	8
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set! It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable LMW PAHs was not processed!			
HMW PAHs			
General Statistics			
Total Number of Observations	26	Number of Distinct Observations	14
Number of Detects	8	Number of Non-Detects	18
Number of Distinct Detects	7	Number of Distinct Non-Detects	7
Minimum Detect	1.865	Minimum Non-Detect	1.85
Maximum Detect	17.89	Maximum Non-Detect	2.15
Variance Detects	30.81	Percent Non-Detects	69.23%
Mean Detects	4.259	SD Detects	5.551
Median Detects	2.08	CV Detects	1.303
Skewness Detects	2.747	Kurtosis Detects	7.622
Mean of Logged Detects	1.065	SD of Logged Detects	0.773
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.496	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.818	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.401	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.283	Detected Data Not Normal at 5% Significance Level	
Detected Data Not Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	2.607	KM Standard Error of Mean	0.647
KM SD	3.084	95% KM (BCA) UCL	3.889
95% KM (t) UCL	3.712	95% KM (Percentile Bootstrap) UCL	3.811
95% KM (z) UCL	3.671	95% KM Bootstrap t UCL	24.09
90% KM Chebyshev UCL	4.547	95% KM Chebyshev UCL	5.426
97.5% KM Chebyshev UCL	6.646	99% KM Chebyshev UCL	9.041

Appendix M, Attachment 2-2			
ProUCL Report for Surface Soil (Total PAHs) - Launch Area			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	1.771	Anderson-Darling GOF Test	
5% A-D Critical Value	0.729	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.428	Kolmogorov-Smirnov GOF	
5% K-S Critical Value	0.299	Detected Data Not Gamma Distributed at 5% Significance Level	
Detected Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	1.445	k star (bias corrected MLE)	0.986
Theta hat (MLE)	2.948	Theta star (bias corrected MLE)	4.318
nu hat (MLE)	23.12	nu star (bias corrected)	15.78
Mean (detects)	4.259		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	0.01	Mean	1.319
Maximum	17.89	Median	0.01
SD	3.553	CV	2.694
k hat (MLE)	0.233	k star (bias corrected MLE)	0.232
Theta hat (MLE)	5.655	Theta star (bias corrected MLE)	5.686
nu hat (MLE)	12.13	nu star (bias corrected)	12.06
Adjusted Level of Significance (β)	0.0398		
Approximate Chi Square Value (12.06, α)	5.267	Adjusted Chi Square Value (12.06, β)	4.972
95% Gamma Approximate UCL (use when $n \geq 50$)	3.02	95% Gamma Adjusted UCL (use when $n < 50$)	3.199
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	2.607	SD (KM)	3.084
Variance (KM)	9.509	SE of Mean (KM)	0.647
k hat (KM)	0.715	k star (KM)	0.658
nu hat (KM)	37.18	nu star (KM)	34.22
theta hat (KM)	3.647	theta star (KM)	3.962
80% gamma percentile (KM)	4.293	90% gamma percentile (KM)	6.64
95% gamma percentile (KM)	9.075	99% gamma percentile (KM)	14.92
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (34.22, α)	21.84	Adjusted Chi Square Value (34.22, β)	21.19
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	4.085	95% Gamma Adjusted KM-UCL (use when $n < 50$)	4.211
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.606	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.818	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.41	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.283	Detected Data Not Lognormal at 5% Significance Level	
Detected Data Not Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	1.893	Mean in Log Scale	0.145

Appendix M, Attachment 2-2			
ProUCL Report for Surface Soil (Total PAHs) - Launch Area			
<i>Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35</i>			
<i>East Aurora and Orchard Park, New York</i>			
SD in Original Scale	3.362	SD in Log Scale	0.834
95% t UCL (assumes normality of ROS data)	3.019	95% Percentile Bootstrap UCL	3.138
95% BCA Bootstrap UCL	3.915	95% Bootstrap t UCL	6.244
95% H-UCL (Log ROS)	2.402		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	0.762	KM Geo Mean	2.142
KM SD (logged)	0.45	95% Critical H Value (KM-Log)	1.924
KM Standard Error of Mean (logged)	0.0945	95% H-UCL (KM -Log)	2.818
KM SD (logged)	0.45	95% Critical H Value (KM-Log)	1.924
KM Standard Error of Mean (logged)	0.0945		
DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	2.003	Mean in Log Scale	0.327
SD in Original Scale	3.314	SD in Log Scale	0.648
95% t UCL (Assumes normality)	3.113	95% H-Stat UCL	2.247
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Data do not follow a Discernible Distribution at 5% Significance Level			
Suggested UCL to Use			
95% KM (Chebyshev) UCL	5.426		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.</p> <p>Recommendations are based upon data size, data distribution, and skewness.</p> <p>These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).</p> <p>However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
UCL Statistics for Data Sets with Non-Detects			
User Selected Options			
Date/Time of Computation	ProUCL 5.110/18/2016 4:41:40 PM		
From File	Nike_ProUCL_Input_SS_Bkgd.xls		
Full Precision	OFF		
Confidence Coefficient	95%		
Number of Bootstrap Operations	2000		
3+4-Methylphenol (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	9
Number of Detects	1	Number of Non-Detects	13
Number of Distinct Detects	1	Number of Distinct Non-Detects	8
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set! It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable 3+4-Methylphenol (MG/KG) was not processed!			
ALUMINUM (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	7600	Mean	11114
Maximum	14000	Median	11500
SD	1663	Std. Error of Mean	444.5
Coefficient of Variation	0.15	Skewness	-0.405
Normal GOF Test			
Shapiro Wilk Test Statistic	0.955	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.203	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	11901	95% Adjusted-CLT UCL (Chen-1995)	11794
		95% Modified-t UCL (Johnson-1978)	11893
Gamma GOF Test			
A-D Test Statistic	0.456	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.733	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.216	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.228	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	45.2	k star (bias corrected MLE)	35.56
Theta hat (MLE)	245.9	Theta star (bias corrected MLE)	312.6
nu hat (MLE)	1266	nu star (bias corrected)	995.7
MLE Mean (bias corrected)	11114	MLE Sd (bias corrected)	1864
		Approximate Chi Square Value (0.05)	923.4
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	914.2
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	11984	95% Adjusted Gamma UCL (use when n<50)	12105
Lognormal GOF Test			

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Shapiro Wilk Test Statistic	0.931	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.211	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	8.936	Mean of logged Data	9.305
Maximum of Logged Data	9.547	SD of logged Data	0.158
Assuming Lognormal Distribution			
95% H-UCL	12034	90% Chebyshev (MVUE) UCL	12528
95% Chebyshev (MVUE) UCL	13166	97.5% Chebyshev (MVUE) UCL	14052
99% Chebyshev (MVUE) UCL	15792		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	11845	95% Jackknife UCL	11901
95% Standard Bootstrap UCL	11825	95% Bootstrap-t UCL	11859
95% Hall's Bootstrap UCL	11805	95% Percentile Bootstrap UCL	11807
95% BCA Bootstrap UCL	11786		
90% Chebyshev(Mean, Sd) UCL	12448	95% Chebyshev(Mean, Sd) UCL	13052
97.5% Chebyshev(Mean, Sd) UCL	13890	99% Chebyshev(Mean, Sd) UCL	15537
Suggested UCL to Use			
95% Student's-t UCL	11901		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p> <p>Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positively skewed data sets.</p>			
ANTIMONY (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	0.12	Mean	0.236
Maximum	0.58	Median	0.22
SD	0.113	Std. Error of Mean	0.0302
Coefficient of Variation	0.48	Skewness	2.272
Normal GOF Test			
Shapiro Wilk Test Statistic	0.748	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.244	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.226	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	0.289	95% Adjusted-CLT UCL (Chen-1995)	0.305
		95% Modified-t UCL (Johnson-1978)	0.292
Gamma GOF Test			
A-D Test Statistic	0.711	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.737	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.181	Kolmogorov-Smirnov Gamma GOF Test	

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
5% K-S Critical Value	0.229	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	6.182	k star (bias corrected MLE)	4.905
Theta hat (MLE)	0.0381	Theta star (bias corrected MLE)	0.0481
nu hat (MLE)	173.1	nu star (bias corrected)	137.3
MLE Mean (bias corrected)	0.236	MLE Sd (bias corrected)	0.106
		Approximate Chi Square Value (0.05)	111.3
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	108.1
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	0.291	95% Adjusted Gamma UCL (use when n<50)	0.299
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.897	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.183	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-2.12	Mean of logged Data	-1.528
Maximum of Logged Data	-0.545	SD of logged Data	0.407
Assuming Lognormal Distribution			
95% H-UCL	0.295	90% Chebyshev (MVUE) UCL	0.312
95% Chebyshev (MVUE) UCL	0.347	97.5% Chebyshev (MVUE) UCL	0.397
99% Chebyshev (MVUE) UCL	0.493		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.285	95% Jackknife UCL	0.289
95% Standard Bootstrap UCL	0.284	95% Bootstrap-t UCL	0.323
95% Hall's Bootstrap UCL	0.53	95% Percentile Bootstrap UCL	0.286
95% BCA Bootstrap UCL	0.312		
90% Chebyshev(Mean, Sd) UCL	0.326	95% Chebyshev(Mean, Sd) UCL	0.367
97.5% Chebyshev(Mean, Sd) UCL	0.424	99% Chebyshev(Mean, Sd) UCL	0.536
Suggested UCL to Use			
95% Adjusted Gamma UCL	0.299		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness.</p> <p>These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
ARSENIC (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	12
		Number of Missing Observations	0
Minimum	5.1	Mean	8.464
Maximum	15	Median	7.8
SD	2.405	Std. Error of Mean	0.643
Coefficient of Variation	0.284	Skewness	1.609
Normal GOF Test			
Shapiro Wilk Test Statistic	0.854	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.219	Lilliefors GOF Test	

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
5% Lilliefors Critical Value	0.226	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	9.602	95% Adjusted-CLT UCL (Chen-1995)	9.817
		95% Modified-t UCL (Johnson-1978)	9.648
Gamma GOF Test			
A-D Test Statistic	0.593	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.734	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.197	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.228	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	15.54	k star (bias corrected MLE)	12.26
Theta hat (MLE)	0.545	Theta star (bias corrected MLE)	0.69
nu hat (MLE)	435.2	nu star (bias corrected)	343.3
MLE Mean (bias corrected)	8.464	MLE Sd (bias corrected)	2.417
		Approximate Chi Square Value (0.05)	301.3
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	296.1
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	9.642	95% Adjusted Gamma UCL (use when n<50)	9.812
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.933	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.18	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.629	Mean of logged Data	2.103
Maximum of Logged Data	2.708	SD of logged Data	0.258
Assuming Lognormal Distribution			
95% H-UCL	9.673	90% Chebyshev (MVUE) UCL	10.21
95% Chebyshev (MVUE) UCL	11	97.5% Chebyshev (MVUE) UCL	12.11
99% Chebyshev (MVUE) UCL	14.28		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	9.521	95% Jackknife UCL	9.602
95% Standard Bootstrap UCL	9.476	95% Bootstrap-t UCL	10.2
95% Hall's Bootstrap UCL	11.25	95% Percentile Bootstrap UCL	9.521
95% BCA Bootstrap UCL	9.814		
90% Chebyshev(Mean, Sd) UCL	10.39	95% Chebyshev(Mean, Sd) UCL	11.27
97.5% Chebyshev(Mean, Sd) UCL	12.48	99% Chebyshev(Mean, Sd) UCL	14.86
Suggested UCL to Use			
95% Student's-t UCL	9.602		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
BARIUM (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	12
		Number of Missing Observations	0
Minimum	34	Mean	74.36
Maximum	180	Median	62
SD	37.32	Std. Error of Mean	9.974
Coefficient of Variation	0.502	Skewness	1.903
Normal GOF Test			
Shapiro Wilk Test Statistic	0.817	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.242	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.226	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	92.02	95% Adjusted-CLT UCL (Chen-1995)	96.18
		95% Modified-t UCL (Johnson-1978)	92.87
Gamma GOF Test			
A-D Test Statistic	0.466	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.738	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.208	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.229	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	5.523	k star (bias corrected MLE)	4.387
Theta hat (MLE)	13.46	Theta star (bias corrected MLE)	16.95
nu hat (MLE)	154.6	nu star (bias corrected)	122.8
MLE Mean (bias corrected)	74.36	MLE Sd (bias corrected)	35.5
		Approximate Chi Square Value (0.05)	98.24
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	95.32
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	92.97	95% Adjusted Gamma UCL (use when n<50)	95.82
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.958	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.181	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	3.526	Mean of logged Data	4.216
Maximum of Logged Data	5.193	SD of logged Data	0.431
Assuming Lognormal Distribution			
95% H-UCL	94.34	90% Chebyshev (MVUE) UCL	99.8
95% Chebyshev (MVUE) UCL	111.6	97.5% Chebyshev (MVUE) UCL	127.9
99% Chebyshev (MVUE) UCL	160.1		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	90.76	95% Jackknife UCL	92.02
95% Standard Bootstrap UCL	90.41	95% Bootstrap-t UCL	101.1
95% Hall's Bootstrap UCL	167.2	95% Percentile Bootstrap UCL	90.57

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
95% BCA Bootstrap UCL	97.29		
90% Chebyshev(Mean, Sd) UCL	104.3	95% Chebyshev(Mean, Sd) UCL	117.8
97.5% Chebyshev(Mean, Sd) UCL	136.6	99% Chebyshev(Mean, Sd) UCL	173.6
Suggested UCL to Use			
95% Adjusted Gamma UCL	95.82		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
BENZ(A)ANTHRACENE (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	9
Number of Detects	1	Number of Non-Detects	13
Number of Distinct Detects	1	Number of Distinct Non-Detects	8
<p>Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set! It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).</p>			
The data set for variable BENZ(A)ANTHRACENE (MG/KG) was not processed!			
BENZO(A)PYRENE (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	9
Number of Detects	1	Number of Non-Detects	13
Number of Distinct Detects	1	Number of Distinct Non-Detects	8
<p>Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set! It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).</p>			
The data set for variable BENZO(A)PYRENE (MG/KG) was not processed!			
BENZO(B)FLUORANTHENE (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	9
Number of Detects	1	Number of Non-Detects	13
Number of Distinct Detects	1	Number of Distinct Non-Detects	8
<p>Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set! It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).</p>			
The data set for variable BENZO(B)FLUORANTHENE (MG/KG) was not processed!			
BENZO(K)FLUORANTHENE (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	9
Number of Detects	1	Number of Non-Detects	13
Number of Distinct Detects	1	Number of Distinct Non-Detects	8
<p>Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set! It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).</p>			
The data set for variable BENZO(K)FLUORANTHENE (MG/KG) was not processed!			

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
BENZYL ALCOHOL (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	9
Number of Detects	2	Number of Non-Detects	12
Number of Distinct Detects	2	Number of Distinct Non-Detects	7
Minimum Detect	0.2	Minimum Non-Detect	0.37
Maximum Detect	0.29	Maximum Non-Detect	0.48
Variance Detects	0.00405	Percent Non-Detects	85.71%
Mean Detects	0.245	SD Detects	0.0636
Median Detects	0.245	CV Detects	0.26
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-1.424	SD of Logged Detects	0.263
Warning: Data set has only 2 Detected Values.			
This is not enough to compute meaningful or reliable statistics and estimates.			
Normal GOF Test on Detects Only			
Not Enough Data to Perform GOF Test			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.245	KM Standard Error of Mean	0.045
KM SD	0.045	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.325	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.319	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.38	95% KM Chebyshev UCL	0.441
97.5% KM Chebyshev UCL	0.526	99% KM Chebyshev UCL	0.693
Gamma GOF Tests on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Gamma Statistics on Detected Data Only			
k hat (MLE)	29.3	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.00836	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	117.2	nu star (bias corrected)	N/A
Mean (detects)	0.245		
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	0.245	SD (KM)	0.045
Variance (KM)	0.00203	SE of Mean (KM)	0.045
k hat (KM)	29.64	k star (KM)	23.34
nu hat (KM)	830	nu star (KM)	653.5
theta hat (KM)	0.00827	theta star (KM)	0.0105
80% gamma percentile (KM)	0.286	90% gamma percentile (KM)	0.312
95% gamma percentile (KM)	0.334	99% gamma percentile (KM)	0.378
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (653.46, α)	595.2	Adjusted Level of Significance (β)	0.0312
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	0.269	Adjusted Chi Square Value (653.46, β)	587.8
		95% Gamma Adjusted KM-UCL (use when $n < 50$)	0.272
Lognormal GOF Test on Detected Observations Only			
Not Enough Data to Perform GOF Test			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	0.245	Mean in Log Scale	-1.424
SD in Original Scale	0.0479	SD in Log Scale	0.195
95% t UCL (assumes normality of ROS data)	0.268	95% Percentile Bootstrap UCL	0.266
95% BCA Bootstrap UCL	0.267	95% Bootstrap t UCL	0.27
95% H-UCL (Log ROS)	0.271		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	-1.424	KM Geo Mean	0.241

Appendix M, Attachment 2-3				
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background				
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35				
East Aurora and Orchard Park, New York				
	KM SD (logged)	0.186	95% Critical H Value (KM-Log)	1.808
	KM Standard Error of Mean (logged)	0.186	95% H-UCL (KM -Log)	0.269
	KM SD (logged)	0.186	95% Critical H Value (KM-Log)	1.808
	KM Standard Error of Mean (logged)	0.186		
DL/2 Statistics				
DL/2 Normal			DL/2 Log-Transformed	
	Mean in Original Scale	0.209	Mean in Log Scale	-1.575
	SD in Original Scale	0.0283	SD in Log Scale	0.123
	95% t UCL (Assumes normality)	0.222	95% H-Stat UCL	0.222
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
	95% KM (t) UCL	0.325	KM H-UCL	0.269
	95% KM (BCA) UCL	N/A		
Warning: One or more Recommended UCL(s) not available!				
Warning: Recommended UCL exceeds the maximum observation				
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
Recommendations are based upon data size, data distribution, and skewness.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.				
BERYLLIUM (MG/KG)				
General Statistics				
	Total Number of Observations	14	Number of Distinct Observations	12
			Number of Missing Observations	0
	Minimum	0.42	Mean	0.663
	Maximum	0.91	Median	0.635
	SD	0.137	Std. Error of Mean	0.0365
	Coefficient of Variation	0.206	Skewness	0.166
Normal GOF Test				
	Shapiro Wilk Test Statistic	0.968	Shapiro Wilk GOF Test	
	5% Shapiro Wilk Critical Value	0.874	Data appear Normal at 5% Significance Level	
	Lilliefors Test Statistic	0.151	Lilliefors GOF Test	
	5% Lilliefors Critical Value	0.226	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL			95% UCLs (Adjusted for Skewness)	
	95% Student's-t UCL	0.727	95% Adjusted-CLT UCL (Chen-1995)	0.725
			95% Modified-t UCL (Johnson-1978)	0.728
Gamma GOF Test				
	A-D Test Statistic	0.273	Anderson-Darling Gamma GOF Test	
	5% A-D Critical Value	0.734	Detected data appear Gamma Distributed at 5% Significance Level	
	K-S Test Statistic	0.153	Kolmogorov-Smirnov Gamma GOF Test	
	5% K-S Critical Value	0.228	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
	k hat (MLE)	24.74	k star (bias corrected MLE)	19.49
	Theta hat (MLE)	0.0268	Theta star (bias corrected MLE)	0.034
	nu hat (MLE)	692.9	nu star (bias corrected)	545.7
	MLE Mean (bias corrected)	0.663	MLE Sd (bias corrected)	0.15
			Approximate Chi Square Value (0.05)	492.5
	Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	485.8

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.734	95% Adjusted Gamma UCL (use when n<50)	0.745
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.963	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.169	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-0.868	Mean of logged Data	-0.432
Maximum of Logged Data	-0.0943	SD of logged Data	0.212
Assuming Lognormal Distribution			
95% H-UCL	0.739	90% Chebyshev (MVUE) UCL	0.776
95% Chebyshev (MVUE) UCL	0.828	97.5% Chebyshev (MVUE) UCL	0.899
99% Chebyshev (MVUE) UCL	1.039		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.723	95% Jackknife UCL	0.727
95% Standard Bootstrap UCL	0.722	95% Bootstrap-t UCL	0.731
95% Hall's Bootstrap UCL	0.732	95% Percentile Bootstrap UCL	0.719
95% BCA Bootstrap UCL	0.722		
90% Chebyshev(Mean, Sd) UCL	0.772	95% Chebyshev(Mean, Sd) UCL	0.822
97.5% Chebyshev(Mean, Sd) UCL	0.891	99% Chebyshev(Mean, Sd) UCL	1.026
Suggested UCL to Use			
95% Student's-t UCL	0.727		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
BIS(2-ETHYLHEXYL) PHTHALATE (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	9
Number of Detects	2	Number of Non-Detects	12
Number of Distinct Detects	2	Number of Distinct Non-Detects	7
Minimum Detect	0.21	Minimum Non-Detect	0.37
Maximum Detect	1.5	Maximum Non-Detect	0.48
Variance Detects	0.832	Percent Non-Detects	85.71%
Mean Detects	0.855	SD Detects	0.912
Median Detects	0.855	CV Detects	1.067
Skewness Detects	N/A	Kurtosis Detects	N/A
Mean of Logged Detects	-0.578	SD of Logged Detects	1.39
Warning: Data set has only 2 Detected Values.			
This is not enough to compute meaningful or reliable statistics and estimates.			
Normal GOF Test on Detects Only			
Not Enough Data to Perform GOF Test			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	0.302	KM Standard Error of Mean	0.126
KM SD	0.332	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.525	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.509	95% KM Bootstrap t UCL	N/A

Appendix M, Attachment 2-3				
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background				
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35				
East Aurora and Orchard Park, New York				
90% KM Chebyshev UCL	0.679	95% KM Chebyshev UCL	0.849	
97.5% KM Chebyshev UCL	1.086	99% KM Chebyshev UCL	1.552	
Gamma GOF Tests on Detected Observations Only				
Not Enough Data to Perform GOF Test				
Gamma Statistics on Detected Data Only				
k hat (MLE)	1.33	k star (bias corrected MLE)	N/A	
Theta hat (MLE)	0.643	Theta star (bias corrected MLE)	N/A	
nu hat (MLE)	5.319	nu star (bias corrected)	N/A	
Mean (detects)	0.855			
Estimates of Gamma Parameters using KM Estimates				
Mean (KM)	0.302	SD (KM)	0.332	
Variance (KM)	0.11	SE of Mean (KM)	0.126	
k hat (KM)	0.827	k star (KM)	0.697	
nu hat (KM)	23.16	nu star (KM)	19.53	
theta hat (KM)	0.365	theta star (KM)	0.433	
80% gamma percentile (KM)	0.497	90% gamma percentile (KM)	0.759	
95% gamma percentile (KM)	1.03	99% gamma percentile (KM)	1.676	
Gamma Kaplan-Meier (KM) Statistics				
		Adjusted Level of Significance (β)	0.0312	
Approximate Chi Square Value (19.53, α)	10.51	Adjusted Chi Square Value (19.53, β)	9.637	
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	0.562	95% Gamma Adjusted KM-UCL (use when $n < 50$)	0.612	
Lognormal GOF Test on Detected Observations Only				
Not Enough Data to Perform GOF Test				
Lognormal ROS Statistics Using Imputed Non-Detects				
Mean in Original Scale	0.317	Mean in Log Scale	-1.427	
SD in Original Scale	0.353	SD in Log Scale	0.663	
95% t UCL (assumes normality of ROS data)	0.484	95% Percentile Bootstrap UCL	0.489	
95% BCA Bootstrap UCL	0.594	95% Bootstrap t UCL	0.932	
95% H-UCL (Log ROS)	0.456			
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution				
KM Mean (logged)	-1.42	KM Geo Mean	0.242	
KM SD (logged)	0.506	95% Critical H Value (KM-Log)	2.015	
KM Standard Error of Mean (logged)	0.191	95% H-UCL (KM -Log)	0.365	
KM SD (logged)	0.506	95% Critical H Value (KM-Log)	2.015	
KM Standard Error of Mean (logged)	0.191			
DL/2 Statistics				
DL/2 Normal		DL/2 Log-Transformed		
Mean in Original Scale	0.299	Mean in Log Scale	-1.439	
SD in Original Scale	0.346	SD in Log Scale	0.538	
95% t UCL (Assumes normality)	0.463	95% H-Stat UCL	0.373	
DL/2 is not a recommended method, provided for comparisons and historical reasons				
Nonparametric Distribution Free UCL Statistics				
Data do not follow a Discernible Distribution at 5% Significance Level				
Suggested UCL to Use				
95% KM (Chebyshev) UCL	0.849			
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness.</p> <p>These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>				
CADMIUM (MG/KG)				

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	0.32	Mean	0.683
Maximum	2.3	Median	0.525
SD	0.484	Std. Error of Mean	0.129
Coefficient of Variation	0.709	Skewness	3.276
Normal GOF Test			
Shapiro Wilk Test Statistic	0.55	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.327	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.226	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	0.912	95% Adjusted-CLT UCL (Chen-1995)	1.017
		95% Modified-t UCL (Johnson-1978)	0.931
Gamma GOF Test			
A-D Test Statistic	1.528	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.74	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.25	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.23	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	4.131	k star (bias corrected MLE)	3.293
Theta hat (MLE)	0.165	Theta star (bias corrected MLE)	0.207
nu hat (MLE)	115.7	nu star (bias corrected)	92.21
MLE Mean (bias corrected)	0.683	MLE Sd (bias corrected)	0.376
		Approximate Chi Square Value (0.05)	71.07
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	68.61
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	0.886	95% Adjusted Gamma UCL (use when n<50)	0.918
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.793	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.204	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-1.139	Mean of logged Data	-0.507
Maximum of Logged Data	0.833	SD of logged Data	0.453
Assuming Lognormal Distribution			
95% H-UCL	0.858	90% Chebyshev (MVUE) UCL	0.908
95% Chebyshev (MVUE) UCL	1.019	97.5% Chebyshev (MVUE) UCL	1.174
99% Chebyshev (MVUE) UCL	1.478		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.896	95% Jackknife UCL	0.912
95% Standard Bootstrap UCL	0.882	95% Bootstrap-t UCL	1.388
95% Hall's Bootstrap UCL	1.768	95% Percentile Bootstrap UCL	0.922
95% BCA Bootstrap UCL	1.059		
90% Chebyshev(Mean, Sd) UCL	1.071	95% Chebyshev(Mean, Sd) UCL	1.247
97.5% Chebyshev(Mean, Sd) UCL	1.49	99% Chebyshev(Mean, Sd) UCL	1.97

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Suggested UCL to Use			
95% Student's-t UCL	0.912	or 95% Modified-t UCL	0.931
or 95% H-UCL	0.858		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness.</p> <p>These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p> <p>ProUCL computes and outputs H-statistic based UCLs for historical reasons only.</p> <p>H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.</p> <p>It is therefore recommended to avoid the use of H-statistic based 95% UCLs.</p> <p>Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.</p>			
CALCIUM (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	12
		Number of Missing Observations	0
Minimum	1300	Mean	2586
Maximum	4500	Median	2200
SD	1047	Std. Error of Mean	279.9
Coefficient of Variation	0.405	Skewness	0.944
Normal GOF Test			
Shapiro Wilk Test Statistic	0.855	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.247	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.226	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	3081	95% Adjusted-CLT UCL (Chen-1995)	3121
		95% Modified-t UCL (Johnson-1978)	3093
Gamma GOF Test			
A-D Test Statistic	0.633	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.736	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.201	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.229	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	7.311	k star (bias corrected MLE)	5.792
Theta hat (MLE)	353.7	Theta star (bias corrected MLE)	446.4
nu hat (MLE)	204.7	nu star (bias corrected)	162.2
MLE Mean (bias corrected)	2586	MLE Sd (bias corrected)	1074
		Approximate Chi Square Value (0.05)	133.7
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	130.3
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	3136	95% Adjusted Gamma UCL (use when n<50)	3218
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.928	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.176	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Minimum of Logged Data	7.17	Mean of logged Data	7.788
Maximum of Logged Data	8.412	SD of logged Data	0.381
Assuming Lognormal Distribution			
95% H-UCL	3192	90% Chebyshev (MVUE) UCL	3381
95% Chebyshev (MVUE) UCL	3744	97.5% Chebyshev (MVUE) UCL	4248
99% Chebyshev (MVUE) UCL	5239		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	3046	95% Jackknife UCL	3081
95% Standard Bootstrap UCL	3034	95% Bootstrap-t UCL	3223
95% Hall's Bootstrap UCL	3049	95% Percentile Bootstrap UCL	3079
95% BCA Bootstrap UCL	3093		
90% Chebyshev(Mean, Sd) UCL	3425	95% Chebyshev(Mean, Sd) UCL	3806
97.5% Chebyshev(Mean, Sd) UCL	4334	99% Chebyshev(Mean, Sd) UCL	5371
Suggested UCL to Use			
95% Adjusted Gamma UCL	3218		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
CHROMIUM (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	7.5	Mean	15.04
Maximum	20	Median	14
SD	3.284	Std. Error of Mean	0.878
Coefficient of Variation	0.218	Skewness	-0.342
Normal GOF Test			
Shapiro Wilk Test Statistic	0.898	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.196	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	16.59	95% Adjusted-CLT UCL (Chen-1995)	16.39
		95% Modified-t UCL (Johnson-1978)	16.58
Gamma GOF Test			
A-D Test Statistic	0.743	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.734	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.218	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.228	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data follow Appr. Gamma Distribution at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	19.82	k star (bias corrected MLE)	15.62
Theta hat (MLE)	0.759	Theta star (bias corrected MLE)	0.963
nu hat (MLE)	555	nu star (bias corrected)	437.4
MLE Mean (bias corrected)	15.04	MLE Sd (bias corrected)	3.804
		Approximate Chi Square Value (0.05)	389.9
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	383.9

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	16.87	95% Adjusted Gamma UCL (use when n<50)	17.13
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.838	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.241	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.226	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.015	Mean of logged Data	2.685
Maximum of Logged Data	2.996	SD of logged Data	0.245
Assuming Lognormal Distribution			
95% H-UCL	17.13	90% Chebyshev (MVUE) UCL	18.05
95% Chebyshev (MVUE) UCL	19.4	97.5% Chebyshev (MVUE) UCL	21.27
99% Chebyshev (MVUE) UCL	24.95		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	16.48	95% Jackknife UCL	16.59
95% Standard Bootstrap UCL	16.43	95% Bootstrap-t UCL	16.56
95% Hall's Bootstrap UCL	16.51	95% Percentile Bootstrap UCL	16.39
95% BCA Bootstrap UCL	16.32		
90% Chebyshev(Mean, Sd) UCL	17.67	95% Chebyshev(Mean, Sd) UCL	18.86
97.5% Chebyshev(Mean, Sd) UCL	20.52	99% Chebyshev(Mean, Sd) UCL	23.77
Suggested UCL to Use			
95% Student's-t UCL	16.59		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positively skewed data sets.			
CHRYSENE (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	9
Number of Detects	1	Number of Non-Detects	13
Number of Distinct Detects	1	Number of Distinct Non-Detects	8
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set! It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable CHRYSENE (MG/KG) was not processed!			
COBALT (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	5.9	Mean	10.66
Maximum	15	Median	10.5
SD	3.427	Std. Error of Mean	0.916

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Coefficient of Variation	0.321	Skewness	0.0641
Normal GOF Test			
Shapiro Wilk Test Statistic	0.889	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.192	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	12.29	95% Adjusted-CLT UCL (Chen-1995)	12.19
		95% Modified-t UCL (Johnson-1978)	12.29
Gamma GOF Test			
A-D Test Statistic	0.561	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.735	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.199	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.229	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	9.933	k star (bias corrected MLE)	7.852
Theta hat (MLE)	1.074	Theta star (bias corrected MLE)	1.358
nu hat (MLE)	278.1	nu star (bias corrected)	219.9
MLE Mean (bias corrected)	10.66	MLE Sd (bias corrected)	3.806
		Approximate Chi Square Value (0.05)	186.5
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	182.5
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	12.57	95% Adjusted Gamma UCL (use when n<50)	12.85
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.9	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.188	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	1.775	Mean of logged Data	2.316
Maximum of Logged Data	2.708	SD of logged Data	0.338
Assuming Lognormal Distribution			
95% H-UCL	12.85	90% Chebyshev (MVUE) UCL	13.61
95% Chebyshev (MVUE) UCL	14.94	97.5% Chebyshev (MVUE) UCL	16.78
99% Chebyshev (MVUE) UCL	20.4		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	12.17	95% Jackknife UCL	12.29
95% Standard Bootstrap UCL	12.16	95% Bootstrap-t UCL	12.28
95% Hall's Bootstrap UCL	12.09	95% Percentile Bootstrap UCL	12.09
95% BCA Bootstrap UCL	12.15		
90% Chebyshev(Mean, Sd) UCL	13.41	95% Chebyshev(Mean, Sd) UCL	14.66
97.5% Chebyshev(Mean, Sd) UCL	16.38	99% Chebyshev(Mean, Sd) UCL	19.78
Suggested UCL to Use			
95% Student's-t UCL	12.29		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			

Appendix M, Attachment 2-3				
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background				
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35				
East Aurora and Orchard Park, New York				
<p style="text-align: center;">These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>				
COPPER (MG/KG)				
General Statistics				
Total Number of Observations	14	Number of Distinct Observations	13	
		Number of Missing Observations	0	
Minimum	13	Mean	29.86	
Maximum	53	Median	27.5	
SD	12.48	Std. Error of Mean	3.336	
Coefficient of Variation	0.418	Skewness	0.566	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.944	Shapiro Wilk GOF Test		
5% Shapiro Wilk Critical Value	0.874	Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.138	Lilliefors GOF Test		
5% Lilliefors Critical Value	0.226	Data appear Normal at 5% Significance Level		
Data appear Normal at 5% Significance Level				
Assuming Normal Distribution				
95% Normal UCL		95% UCLs (Adjusted for Skewness)		
95% Student's-t UCL	35.77	95% Adjusted-CLT UCL (Chen-1995)	35.88	
		95% Modified-t UCL (Johnson-1978)	35.85	
Gamma GOF Test				
A-D Test Statistic	0.186	Anderson-Darling Gamma GOF Test		
5% A-D Critical Value	0.737	Detected data appear Gamma Distributed at 5% Significance Level		
K-S Test Statistic	0.112	Kolmogorov-Smirnov Gamma GOF Test		
5% K-S Critical Value	0.229	Detected data appear Gamma Distributed at 5% Significance Level		
Detected data appear Gamma Distributed at 5% Significance Level				
Gamma Statistics				
k hat (MLE)	6.205	k star (bias corrected MLE)	4.923	
Theta hat (MLE)	4.812	Theta star (bias corrected MLE)	6.065	
nu hat (MLE)	173.7	nu star (bias corrected)	137.9	
MLE Mean (bias corrected)	29.86	MLE Sd (bias corrected)	13.46	
		Approximate Chi Square Value (0.05)	111.7	
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	108.6	
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50)	36.84	95% Adjusted Gamma UCL (use when n<50)	37.9	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.975	Shapiro Wilk Lognormal GOF Test		
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.0935	Lilliefors Lognormal GOF Test		
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level		
Data appear Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	2.565	Mean of logged Data	3.314	
Maximum of Logged Data	3.97	SD of logged Data	0.427	
Assuming Lognormal Distribution				
95% H-UCL	38.14	90% Chebyshev (MVUE) UCL	40.35	
95% Chebyshev (MVUE) UCL	45.08	97.5% Chebyshev (MVUE) UCL	51.65	
99% Chebyshev (MVUE) UCL	64.55			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
95% CLT UCL	35.34	95% Jackknife UCL	35.77
95% Standard Bootstrap UCL	35.13	95% Bootstrap-t UCL	36.77
95% Hall's Bootstrap UCL	35.8	95% Percentile Bootstrap UCL	35.07
95% BCA Bootstrap UCL	35.5		
90% Chebyshev(Mean, Sd) UCL	39.87	95% Chebyshev(Mean, Sd) UCL	44.4
97.5% Chebyshev(Mean, Sd) UCL	50.69	99% Chebyshev(Mean, Sd) UCL	63.05
Suggested UCL to Use			
95% Student's-t UCL	35.77		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
FLUORANTHENE (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	8
Number of Detects	1	Number of Non-Detects	13
Number of Distinct Detects	1	Number of Distinct Non-Detects	8
<p>Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set! It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).</p> <p>The data set for variable FLUORANTHENE (MG/KG) was not processed!</p>			
IRON (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	19000	Mean	24571
Maximum	34000	Median	23500
SD	4957	Std. Error of Mean	1325
Coefficient of Variation	0.202	Skewness	0.719
Normal GOF Test			
Shapiro Wilk Test Statistic	0.889	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.189	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	26918	95% Adjusted-CLT UCL (Chen-1995)	27023
		95% Modified-t UCL (Johnson-1978)	26960
Gamma GOF Test			
A-D Test Statistic	0.578	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.734	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.167	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.228	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	28	k star (bias corrected MLE)	22.05
Theta hat (MLE)	877.5	Theta star (bias corrected MLE)	1114
nu hat (MLE)	784	nu star (bias corrected)	617.4
MLE Mean (bias corrected)	24571	MLE Sd (bias corrected)	5233
		Approximate Chi Square Value (0.05)	560.7

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	553.6
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	27053	95% Adjusted Gamma UCL (use when n<50)	27403
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.912	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.154	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	9.852	Mean of logged Data	10.09
Maximum of Logged Data	10.43	SD of logged Data	0.194
Assuming Lognormal Distribution			
95% H-UCL	27120	90% Chebyshev (MVUE) UCL	28404
95% Chebyshev (MVUE) UCL	30145	97.5% Chebyshev (MVUE) UCL	32562
99% Chebyshev (MVUE) UCL	37309		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	26751	95% Jackknife UCL	26918
95% Standard Bootstrap UCL	26701	95% Bootstrap-t UCL	27206
95% Hall's Bootstrap UCL	26770	95% Percentile Bootstrap UCL	26643
95% BCA Bootstrap UCL	27000		
90% Chebyshev(Mean, Sd) UCL	28546	95% Chebyshev(Mean, Sd) UCL	30346
97.5% Chebyshev(Mean, Sd) UCL	32845	99% Chebyshev(Mean, Sd) UCL	37753
Suggested UCL to Use			
95% Student's-t UCL	26918		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
LEAD (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	12
		Number of Missing Observations	0
Minimum	11	Mean	20.79
Maximum	37	Median	18.5
SD	7.495	Std. Error of Mean	2.003
Coefficient of Variation	0.361	Skewness	0.917
Normal GOF Test			
Shapiro Wilk Test Statistic	0.925	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.166	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	24.33	95% Adjusted-CLT UCL (Chen-1995)	24.61
		95% Modified-t UCL (Johnson-1978)	24.42
Gamma GOF Test			

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
A-D Test Statistic	0.271	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.735	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.132	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.229	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	9.003	k star (bias corrected MLE)	7.121
Theta hat (MLE)	2.309	Theta star (bias corrected MLE)	2.919
nu hat (MLE)	252.1	nu star (bias corrected)	199.4
MLE Mean (bias corrected)	20.79	MLE Sd (bias corrected)	7.789
		Approximate Chi Square Value (0.05)	167.7
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	163.9
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	24.71	95% Adjusted Gamma UCL (use when n<50)	25.29
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.976	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.11	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.398	Mean of logged Data	2.978
Maximum of Logged Data	3.611	SD of logged Data	0.345
Assuming Lognormal Distribution			
95% H-UCL	25.09	90% Chebyshev (MVUE) UCL	26.58
95% Chebyshev (MVUE) UCL	29.22	97.5% Chebyshev (MVUE) UCL	32.88
99% Chebyshev (MVUE) UCL	40.08		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	24.08	95% Jackknife UCL	24.33
95% Standard Bootstrap UCL	23.93	95% Bootstrap-t UCL	25.16
95% Hall's Bootstrap UCL	24.81	95% Percentile Bootstrap UCL	23.93
95% BCA Bootstrap UCL	24.36		
90% Chebyshev(Mean, Sd) UCL	26.8	95% Chebyshev(Mean, Sd) UCL	29.52
97.5% Chebyshev(Mean, Sd) UCL	33.3	99% Chebyshev(Mean, Sd) UCL	40.72
Suggested UCL to Use			
95% Student's-t UCL	24.33		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
MAGNESIUM (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	12
		Number of Missing Observations	0
Minimum	2000	Mean	2879
Maximum	4000	Median	2650
SD	693	Std. Error of Mean	185.2
Coefficient of Variation	0.241	Skewness	0.615
Normal GOF Test			

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Shapiro Wilk Test Statistic	0.874	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.188	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Normal at 5% Significance Level	
Data appear Approximate Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	3207	95% Adjusted-CLT UCL (Chen-1995)	3216
		95% Modified-t UCL (Johnson-1978)	3212
Gamma GOF Test			
A-D Test Statistic	0.683	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.734	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.188	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.228	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	19.57	k star (bias corrected MLE)	15.42
Theta hat (MLE)	147.1	Theta star (bias corrected MLE)	186.7
nu hat (MLE)	547.9	nu star (bias corrected)	431.8
MLE Mean (bias corrected)	2879	MLE Sd (bias corrected)	733
		Approximate Chi Square Value (0.05)	384.6
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	378.7
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	3232	95% Adjusted Gamma UCL (use when n<50)	3282
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.904	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.177	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	7.601	Mean of logged Data	7.939
Maximum of Logged Data	8.294	SD of logged Data	0.233
Assuming Lognormal Distribution			
95% H-UCL	3247	90% Chebyshev (MVUE) UCL	3418
95% Chebyshev (MVUE) UCL	3663	97.5% Chebyshev (MVUE) UCL	4004
99% Chebyshev (MVUE) UCL	4672		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	3183	95% Jackknife UCL	3207
95% Standard Bootstrap UCL	3165	95% Bootstrap-t UCL	3249
95% Hall's Bootstrap UCL	3172	95% Percentile Bootstrap UCL	3179
95% BCA Bootstrap UCL	3207		
90% Chebyshev(Mean, Sd) UCL	3434	95% Chebyshev(Mean, Sd) UCL	3686
97.5% Chebyshev(Mean, Sd) UCL	4035	99% Chebyshev(Mean, Sd) UCL	4721
Suggested UCL to Use			
95% Student's-t UCL	3207		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
<p style="text-align: center;">These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
MANGANESE (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	220	Mean	862.9
Maximum	5100	Median	470
SD	1237	Std. Error of Mean	330.6
Coefficient of Variation	1.434	Skewness	3.562
Normal GOF Test			
Shapiro Wilk Test Statistic	0.444	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.404	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.226	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	1448	95% Adjusted-CLT UCL (Chen-1995)	1743
		95% Modified-t UCL (Johnson-1978)	1501
Gamma GOF Test			
A-D Test Statistic	1.896	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.751	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.28	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.233	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	1.456	k star (bias corrected MLE)	1.192
Theta hat (MLE)	592.4	Theta star (bias corrected MLE)	723.9
nu hat (MLE)	40.78	nu star (bias corrected)	33.37
MLE Mean (bias corrected)	862.9	MLE Sd (bias corrected)	790.3
		Approximate Chi Square Value (0.05)	21.17
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	19.88
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	1361	95% Adjusted Gamma UCL (use when n<50)	1448
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.789	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.211	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level	
Data appear Approximate Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	5.394	Mean of logged Data	6.379
Maximum of Logged Data	8.537	SD of logged Data	0.73
Assuming Lognormal Distribution			
95% H-UCL	1244	90% Chebyshev (MVUE) UCL	1215
95% Chebyshev (MVUE) UCL	1425	97.5% Chebyshev (MVUE) UCL	1716
99% Chebyshev (MVUE) UCL	2289		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
95% CLT UCL	1407	95% Jackknife UCL	1448
95% Standard Bootstrap UCL	1394	95% Bootstrap-t UCL	3679
95% Hall's Bootstrap UCL	3419	95% Percentile Bootstrap UCL	1501
95% BCA Bootstrap UCL	1854		
90% Chebyshev(Mean, Sd) UCL	1855	95% Chebyshev(Mean, Sd) UCL	2304
97.5% Chebyshev(Mean, Sd) UCL	2928	99% Chebyshev(Mean, Sd) UCL	4153
Suggested UCL to Use			
95% H-UCL	1244		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p> <p style="color: red;">ProUCL computes and outputs H-statistic based UCLs for historical reasons only. H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide. It is therefore recommended to avoid the use of H-statistic based 95% UCLs. Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.</p>			
MERCURY (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	14
		Number of Missing Observations	0
Minimum	0.031	Mean	0.0674
Maximum	0.1	Median	0.067
SD	0.0218	Std. Error of Mean	0.00583
Coefficient of Variation	0.324	Skewness	0.0561
Normal GOF Test			
Shapiro Wilk Test Statistic	0.957	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.125	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	0.0777	95% Adjusted-CLT UCL (Chen-1995)	0.077
		95% Modified-t UCL (Johnson-1978)	0.0777
Gamma GOF Test			
A-D Test Statistic	0.24	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.735	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.14	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.229	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	9.503	k star (bias corrected MLE)	7.514
Theta hat (MLE)	0.00709	Theta star (bias corrected MLE)	0.00896
nu hat (MLE)	266.1	nu star (bias corrected)	210.4
MLE Mean (bias corrected)	0.0674	MLE Sd (bias corrected)	0.0246
		Approximate Chi Square Value (0.05)	177.8
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	173.9
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	0.0797	95% Adjusted Gamma UCL (use when n<50)	0.0815
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.952	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level	

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Lilliefors Test Statistic	0.149	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-3.474	Mean of logged Data	-2.751
Maximum of Logged Data	-2.303	SD of logged Data	0.35
Assuming Lognormal Distribution			
95% H-UCL	0.0819	90% Chebyshev (MVUE) UCL	0.0868
95% Chebyshev (MVUE) UCL	0.0955	97.5% Chebyshev (MVUE) UCL	0.108
99% Chebyshev (MVUE) UCL	0.131		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.0769	95% Jackknife UCL	0.0777
95% Standard Bootstrap UCL	0.0765	95% Bootstrap-t UCL	0.0777
95% Hall's Bootstrap UCL	0.0768	95% Percentile Bootstrap UCL	0.0767
95% BCA Bootstrap UCL	0.0766		
90% Chebyshev(Mean, Sd) UCL	0.0848	95% Chebyshev(Mean, Sd) UCL	0.0928
97.5% Chebyshev(Mean, Sd) UCL	0.104	99% Chebyshev(Mean, Sd) UCL	0.125
Suggested UCL to Use			
95% Student's-t UCL	0.0777		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
NICKEL (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	12
		Number of Missing Observations	0
Minimum	19	Mean	33.29
Maximum	62	Median	29.5
SD	12.74	Std. Error of Mean	3.406
Coefficient of Variation	0.383	Skewness	1.132
Normal GOF Test			
Shapiro Wilk Test Statistic	0.893	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.183	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	39.32	95% Adjusted-CLT UCL (Chen-1995)	39.99
		95% Modified-t UCL (Johnson-1978)	39.49
Gamma GOF Test			
A-D Test Statistic	0.336	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.736	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.142	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.229	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	8.34	k star (bias corrected MLE)	6.6

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Theta hat (MLE)	3.991	Theta star (bias corrected MLE)	5.043
nu hat (MLE)	233.5	nu star (bias corrected)	184.8
MLE Mean (bias corrected)	33.29	MLE Sd (bias corrected)	12.96
		Approximate Chi Square Value (0.05)	154.4
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	150.7
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	39.85	95% Adjusted Gamma UCL (use when n<50)	40.83
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.958	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.119	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.944	Mean of logged Data	3.444
Maximum of Logged Data	4.127	SD of logged Data	0.355
Assuming Lognormal Distribution			
95% H-UCL	40.38	90% Chebyshev (MVUE) UCL	42.78
95% Chebyshev (MVUE) UCL	47.13	97.5% Chebyshev (MVUE) UCL	53.16
99% Chebyshev (MVUE) UCL	65.01		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	38.89	95% Jackknife UCL	39.32
95% Standard Bootstrap UCL	38.7	95% Bootstrap-t UCL	42.25
95% Hall's Bootstrap UCL	41.74	95% Percentile Bootstrap UCL	38.93
95% BCA Bootstrap UCL	39.71		
90% Chebyshev(Mean, Sd) UCL	43.5	95% Chebyshev(Mean, Sd) UCL	48.13
97.5% Chebyshev(Mean, Sd) UCL	54.55	99% Chebyshev(Mean, Sd) UCL	67.17
Suggested UCL to Use			
95% Student's-t UCL	39.32		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness.</p> <p>These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
PHENANTHRENE (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	9
Number of Detects	1	Number of Non-Detects	13
Number of Distinct Detects	1	Number of Distinct Non-Detects	8
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!			
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable PHENANTHRENE (MG/KG) was not processed!			
POTASSIUM (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	420	Mean	819.3

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Maximum	1100	Median	805
SD	189.7	Std. Error of Mean	50.69
Coefficient of Variation	0.232	Skewness	-0.29
Normal GOF Test			
Shapiro Wilk Test Statistic	0.952	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.143	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	909.1	95% Adjusted-CLT UCL (Chen-1995)	898.5
		95% Modified-t UCL (Johnson-1978)	908.4
Gamma GOF Test			
A-D Test Statistic	0.372	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.734	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.147	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.228	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	18.01	k star (bias corrected MLE)	14.19
Theta hat (MLE)	45.5	Theta star (bias corrected MLE)	57.72
nu hat (MLE)	504.1	nu star (bias corrected)	397.4
MLE Mean (bias corrected)	819.3	MLE Sd (bias corrected)	217.5
		Approximate Chi Square Value (0.05)	352.2
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	346.6
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	924.4	95% Adjusted Gamma UCL (use when n<50)	939.5
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.91	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.142	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	6.04	Mean of logged Data	6.68
Maximum of Logged Data	7.003	SD of logged Data	0.255
Assuming Lognormal Distribution			
95% H-UCL	938.5	90% Chebyshev (MVUE) UCL	990.1
95% Chebyshev (MVUE) UCL	1067	97.5% Chebyshev (MVUE) UCL	1173
99% Chebyshev (MVUE) UCL	1382		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	902.7	95% Jackknife UCL	909.1
95% Standard Bootstrap UCL	897.9	95% Bootstrap-t UCL	912.8
95% Hall's Bootstrap UCL	899.6	95% Percentile Bootstrap UCL	895.7
95% BCA Bootstrap UCL	892.9		
90% Chebyshev (Mean, Sd) UCL	971.4	95% Chebyshev (Mean, Sd) UCL	1040
97.5% Chebyshev (Mean, Sd) UCL	1136	99% Chebyshev (Mean, Sd) UCL	1324
Suggested UCL to Use			
95% Student's-t UCL	909.1		

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positively skewed data sets.			
PYRENE (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	8
Number of Detects	1	Number of Non-Detects	13
Number of Distinct Detects	1	Number of Distinct Non-Detects	8
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!			
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable PYRENE (MG/KG) was not processed!			
SELENIUM (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	0.73	Mean	1.302
Maximum	1.9	Median	1.25
SD	0.309	Std. Error of Mean	0.0827
Coefficient of Variation	0.238	Skewness	0.233
Normal GOF Test			
Shapiro Wilk Test Statistic	0.974	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.146	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	1.449	95% Adjusted-CLT UCL (Chen-1995)	1.444
		95% Modified-t UCL (Johnson-1978)	1.449
Gamma GOF Test			
A-D Test Statistic	0.242	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.734	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.123	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.228	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	18.48	k star (bias corrected MLE)	14.57
Theta hat (MLE)	0.0705	Theta star (bias corrected MLE)	0.0894
nu hat (MLE)	517.5	nu star (bias corrected)	407.9
MLE Mean (bias corrected)	1.302	MLE Sd (bias corrected)	0.341
		Approximate Chi Square Value (0.05)	362.1
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	356.4
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	1.467	95% Adjusted Gamma UCL (use when n<50)	1.49
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.965	Shapiro Wilk Lognormal GOF Test	

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.14	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-0.315	Mean of logged Data	0.237
Maximum of Logged Data	0.642	SD of logged Data	0.246
Assuming Lognormal Distribution			
95% H-UCL	1.482	90% Chebyshev (MVUE) UCL	1.563
95% Chebyshev (MVUE) UCL	1.68	97.5% Chebyshev (MVUE) UCL	1.843
99% Chebyshev (MVUE) UCL	2.163		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	1.438	95% Jackknife UCL	1.449
95% Standard Bootstrap UCL	1.434	95% Bootstrap-t UCL	1.451
95% Hall's Bootstrap UCL	1.454	95% Percentile Bootstrap UCL	1.431
95% BCA Bootstrap UCL	1.443		
90% Chebyshev(Mean, Sd) UCL	1.55	95% Chebyshev(Mean, Sd) UCL	1.663
97.5% Chebyshev(Mean, Sd) UCL	1.819	99% Chebyshev(Mean, Sd) UCL	2.125
Suggested UCL to Use			
95% Student's-t UCL	1.449		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
SILVER (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	0.024	Mean	0.0601
Maximum	0.11	Median	0.051
SD	0.0283	Std. Error of Mean	0.00755
Coefficient of Variation	0.47	Skewness	0.574
Normal GOF Test			
Shapiro Wilk Test Statistic	0.904	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.166	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	0.0735	95% Adjusted-CLT UCL (Chen-1995)	0.0738
		95% Modified-t UCL (Johnson-1978)	0.0737
Gamma GOF Test			
A-D Test Statistic	0.405	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.738	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.152	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.229	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
k hat (MLE)	4.966	k star (bias corrected MLE)	3.949
Theta hat (MLE)	0.0121	Theta star (bias corrected MLE)	0.0152
nu hat (MLE)	139	nu star (bias corrected)	110.6
MLE Mean (bias corrected)	0.0601	MLE Sd (bias corrected)	0.0303
		Approximate Chi Square Value (0.05)	87.31
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	84.57
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	0.0762	95% Adjusted Gamma UCL (use when n<50)	0.0786
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.946	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.142	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	-3.73	Mean of logged Data	-2.915
Maximum of Logged Data	-2.207	SD of logged Data	0.477
Assuming Lognormal Distribution			
95% H-UCL	0.0792	90% Chebyshev (MVUE) UCL	0.0838
95% Chebyshev (MVUE) UCL	0.0945	97.5% Chebyshev (MVUE) UCL	0.109
99% Chebyshev (MVUE) UCL	0.139		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	0.0726	95% Jackknife UCL	0.0735
95% Standard Bootstrap UCL	0.0726	95% Bootstrap-t UCL	0.0757
95% Hall's Bootstrap UCL	0.0727	95% Percentile Bootstrap UCL	0.0725
95% BCA Bootstrap UCL	0.0729		
90% Chebyshev(Mean, Sd) UCL	0.0828	95% Chebyshev(Mean, Sd) UCL	0.0931
97.5% Chebyshev(Mean, Sd) UCL	0.107	99% Chebyshev(Mean, Sd) UCL	0.135
Suggested UCL to Use			
95% Student's-t UCL	0.0735		
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
SODIUM (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	7
Number of Detects	6	Number of Non-Detects	8
Number of Distinct Detects	5	Number of Distinct Non-Detects	4
Minimum Detect	43	Minimum Non-Detect	110
Maximum Detect	150	Maximum Non-Detect	140
Variance Detects	2035	Percent Non-Detects	57.14%
Mean Detects	107.8	SD Detects	45.12
Median Detects	120	CV Detects	0.418
Skewness Detects	-0.64	Kurtosis Detects	-1.532
Mean of Logged Detects	4.585	SD of Logged Detects	0.513
Normal GOF Test on Detects Only			
Shapiro Wilk Test Statistic	0.881	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.188	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level	

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
Detected Data appear Normal at 5% Significance Level			
Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs			
KM Mean	82.05	KM Standard Error of Mean	13.94
KM SD	39.21	95% KM (BCA) UCL	120
95% KM (t) UCL	106.7	95% KM (Percentile Bootstrap) UCL	120
95% KM (z) UCL	105	95% KM Bootstrap t UCL	105.4
90% KM Chebyshev UCL	123.9	95% KM Chebyshev UCL	142.8
97.5% KM Chebyshev UCL	169.1	99% KM Chebyshev UCL	220.7
Gamma GOF Tests on Detected Observations Only			
A-D Test Statistic	0.48	Anderson-Darling GOF Test	
5% A-D Critical Value	0.698	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.242	Kolmogorov-Smirnov GOF	
5% K-S Critical Value	0.333	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics on Detected Data Only			
k hat (MLE)	5.386	k star (bias corrected MLE)	2.804
Theta hat (MLE)	20.02	Theta star (bias corrected MLE)	38.45
nu hat (MLE)	64.63	nu star (bias corrected)	33.65
Mean (detects)	107.8		
Gamma ROS Statistics using Imputed Non-Detects			
GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs			
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)			
For such situations, GROS method may yield incorrect values of UCLs and BTVs			
This is especially true when the sample size is small.			
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates			
Minimum	42.16	Mean	83.52
Maximum	150	Median	70
SD	37.28	CV	0.446
k hat (MLE)	5.901	k star (bias corrected MLE)	4.684
Theta hat (MLE)	14.15	Theta star (bias corrected MLE)	17.83
nu hat (MLE)	165.2	nu star (bias corrected)	131.2
Adjusted Level of Significance (β)	0.0312		
Approximate Chi Square Value (131.16, α)	105.7	Adjusted Chi Square Value (131.16, β)	102.7
95% Gamma Approximate UCL (use when $n \geq 50$)	103.6	95% Gamma Adjusted UCL (use when $n < 50$)	106.7
Estimates of Gamma Parameters using KM Estimates			
Mean (KM)	82.05	SD (KM)	39.21
Variance (KM)	1537	SE of Mean (KM)	13.94
k hat (KM)	4.379	k star (KM)	3.489
nu hat (KM)	122.6	nu star (KM)	97.68
theta hat (KM)	18.74	theta star (KM)	23.52
80% gamma percentile (KM)	115	90% gamma percentile (KM)	141
95% gamma percentile (KM)	165	99% gamma percentile (KM)	216.8
Gamma Kaplan-Meier (KM) Statistics			
Approximate Chi Square Value (97.68, α)	75.88	Adjusted Chi Square Value (97.68, β)	73.33
95% Gamma Approximate KM-UCL (use when $n \geq 50$)	105.6	95% Gamma Adjusted KM-UCL (use when $n < 50$)	109.3
Lognormal GOF Test on Detected Observations Only			
Shapiro Wilk Test Statistic	0.849	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.256	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level	
Detected Data appear Lognormal at 5% Significance Level			
Lognormal ROS Statistics Using Imputed Non-Detects			
Mean in Original Scale	81.44	Mean in Log Scale	4.308
SD in Original Scale	38.01	SD in Log Scale	0.436
95% t UCL (assumes normality of ROS data)	99.43	95% Percentile Bootstrap UCL	99.03
95% BCA Bootstrap UCL	100.1	95% Bootstrap t UCL	104.3

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
95% H-UCL (Log ROS)	104.1		
Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution			
KM Mean (logged)	4.296	KM Geo Mean	73.42
KM SD (logged)	0.468	95% Critical H Value (KM-Log)	2.007
KM Standard Error of Mean (logged)	0.182	95% H-UCL (KM -Log)	106.3
KM SD (logged)	0.468	95% Critical H Value (KM-Log)	2.007
KM Standard Error of Mean (logged)	0.182		
DL/2 Statistics			
DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	80.86	Mean in Log Scale	4.309
SD in Original Scale	37.2	SD in Log Scale	0.408
95% t UCL (Assumes normality)	98.46	95% H-Stat UCL	101.2
DL/2 is not a recommended method, provided for comparisons and historical reasons			
Nonparametric Distribution Free UCL Statistics			
Detected Data appear Normal Distributed at 5% Significance Level			
Suggested UCL to Use			
95% KM (t) UCL	106.7		
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>			
THALLIUM (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	12
		Number of Missing Observations	0
Minimum	0.25	Mean	0.596
Maximum	1.8	Median	0.49
SD	0.387	Std. Error of Mean	0.103
Coefficient of Variation	0.648	Skewness	2.679
Normal GOF Test			
Shapiro Wilk Test Statistic	0.661	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.364	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.226	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	0.779	95% Adjusted-CLT UCL (Chen-1995)	0.846
		95% Modified-t UCL (Johnson-1978)	0.792
Gamma GOF Test			
A-D Test Statistic	1.082	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.74	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.301	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.23	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	4.163	k star (bias corrected MLE)	3.318
Theta hat (MLE)	0.143	Theta star (bias corrected MLE)	0.18
nu hat (MLE)	116.6	nu star (bias corrected)	92.91
MLE Mean (bias corrected)	0.596	MLE Sd (bias corrected)	0.327
		Approximate Chi Square Value (0.05)	71.68
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	69.21

Appendix M, Attachment 2-3				
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background				
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35				
East Aurora and Orchard Park, New York				
Assuming Gamma Distribution				
95% Approximate Gamma UCL (use when n>=50))	0.773	95% Adjusted Gamma UCL (use when n<50)	0.801	
Lognormal GOF Test				
Shapiro Wilk Test Statistic	0.88	Shapiro Wilk Lognormal GOF Test		
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level		
Lilliefors Test Statistic	0.262	Lilliefors Lognormal GOF Test		
5% Lilliefors Critical Value	0.226	Data Not Lognormal at 5% Significance Level		
Data appear Approximate Lognormal at 5% Significance Level				
Lognormal Statistics				
Minimum of Logged Data	-1.386	Mean of logged Data	-0.642	
Maximum of Logged Data	0.588	SD of logged Data	0.473	
Assuming Lognormal Distribution				
95% H-UCL	0.766	90% Chebyshev (MVUE) UCL	0.81	
95% Chebyshev (MVUE) UCL	0.913	97.5% Chebyshev (MVUE) UCL	1.056	
99% Chebyshev (MVUE) UCL	1.336			
Nonparametric Distribution Free UCL Statistics				
Data appear to follow a Discernible Distribution at 5% Significance Level				
Nonparametric Distribution Free UCLs				
95% CLT UCL	0.766	95% Jackknife UCL	0.779	
95% Standard Bootstrap UCL	0.761	95% Bootstrap-t UCL	1.134	
95% Hall's Bootstrap UCL	1.677	95% Percentile Bootstrap UCL	0.769	
95% BCA Bootstrap UCL	0.869			
90% Chebyshev(Mean, Sd) UCL	0.907	95% Chebyshev(Mean, Sd) UCL	1.047	
97.5% Chebyshev(Mean, Sd) UCL	1.242	99% Chebyshev(Mean, Sd) UCL	1.625	
Suggested UCL to Use				
95% Student's-t UCL	0.779	or 95% Modified-t UCL	0.792	
or 95% H-UCL	0.766			
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>				
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.				
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.				
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.				
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.				
VANADIUM (MG/KG)				
General Statistics				
Total Number of Observations	14	Number of Distinct Observations	9	
		Number of Missing Observations	0	
Minimum	16	Mean	24.36	
Maximum	30	Median	24.5	
SD	3.934	Std. Error of Mean	1.051	
Coefficient of Variation	0.162	Skewness	-0.939	
Normal GOF Test				
Shapiro Wilk Test Statistic	0.882	Shapiro Wilk GOF Test		
5% Shapiro Wilk Critical Value	0.874	Data appear Normal at 5% Significance Level		
Lilliefors Test Statistic	0.25	Lilliefors GOF Test		
5% Lilliefors Critical Value	0.226	Data Not Normal at 5% Significance Level		
Data appear Approximate Normal at 5% Significance Level				
Assuming Normal Distribution				

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	26.22	95% Adjusted-CLT UCL (Chen-1995)	25.8
		95% Modified-t UCL (Johnson-1978)	26.18
Gamma GOF Test			
A-D Test Statistic	0.95	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.733	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.272	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.228	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	36.46	k star (bias corrected MLE)	28.69
Theta hat (MLE)	0.668	Theta star (bias corrected MLE)	0.849
nu hat (MLE)	1021	nu star (bias corrected)	803.4
MLE Mean (bias corrected)	24.36	MLE Sd (bias corrected)	4.547
		Approximate Chi Square Value (0.05)	738.6
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	730.4
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50)	26.49	95% Adjusted Gamma UCL (use when n<50)	26.79
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.831	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.283	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.226	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	2.773	Mean of logged Data	3.179
Maximum of Logged Data	3.401	SD of logged Data	0.178
Assuming Lognormal Distribution			
95% H-UCL	26.69	90% Chebyshev (MVUE) UCL	27.88
95% Chebyshev (MVUE) UCL	29.47	97.5% Chebyshev (MVUE) UCL	31.67
99% Chebyshev (MVUE) UCL	35.99		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	26.09	95% Jackknife UCL	26.22
95% Standard Bootstrap UCL	25.99	95% Bootstrap-t UCL	26
95% Hall's Bootstrap UCL	25.95	95% Percentile Bootstrap UCL	26
95% BCA Bootstrap UCL	25.79		
90% Chebyshev(Mean, Sd) UCL	27.51	95% Chebyshev(Mean, Sd) UCL	28.94
97.5% Chebyshev(Mean, Sd) UCL	30.92	99% Chebyshev(Mean, Sd) UCL	34.82
Suggested UCL to Use			
95% Student's-t UCL	26.22		
When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test			
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
Recommendations are based upon data size, data distribution, and skewness.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.			
Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positively skewed data sets.			

Appendix M, Attachment 2-3			
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
ZINC (MG/KG)			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	12
		Number of Missing Observations	0
Minimum	71	Mean	95.93
Maximum	130	Median	97
SD	18	Std. Error of Mean	4.811
Coefficient of Variation	0.188	Skewness	0.205
Normal GOF Test			
Shapiro Wilk Test Statistic	0.938	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.163	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Normal at 5% Significance Level	
Data appear Normal at 5% Significance Level			
Assuming Normal Distribution			
95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	104.4	95% Adjusted-CLT UCL (Chen-1995)	104.1
		95% Modified-t UCL (Johnson-1978)	104.5
Gamma GOF Test			
A-D Test Statistic	0.445	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.734	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.178	Kolmogorov-Smirnov Gamma GOF Test	
5% K-S Critical Value	0.228	Detected data appear Gamma Distributed at 5% Significance Level	
Detected data appear Gamma Distributed at 5% Significance Level			
Gamma Statistics			
k hat (MLE)	30.36	k star (bias corrected MLE)	23.9
Theta hat (MLE)	3.16	Theta star (bias corrected MLE)	4.013
nu hat (MLE)	850.1	nu star (bias corrected)	669.3
MLE Mean (bias corrected)	95.93	MLE Sd (bias corrected)	19.62
		Approximate Chi Square Value (0.05)	610.2
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	602.8
Assuming Gamma Distribution			
95% Approximate Gamma UCL (use when n>=50))	105.2	95% Adjusted Gamma UCL (use when n<50)	106.5
Lognormal GOF Test			
Shapiro Wilk Test Statistic	0.93	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.173	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level	
Data appear Lognormal at 5% Significance Level			
Lognormal Statistics			
Minimum of Logged Data	4.263	Mean of logged Data	4.547
Maximum of Logged Data	4.868	SD of logged Data	0.19
Assuming Lognormal Distribution			
95% H-UCL	105.7	90% Chebyshev (MVUE) UCL	110.6
95% Chebyshev (MVUE) UCL	117.2	97.5% Chebyshev (MVUE) UCL	126.5
99% Chebyshev (MVUE) UCL	144.6		
Nonparametric Distribution Free UCL Statistics			
Data appear to follow a Discernible Distribution at 5% Significance Level			
Nonparametric Distribution Free UCLs			
95% CLT UCL	103.8	95% Jackknife UCL	104.4
95% Standard Bootstrap UCL	103.5	95% Bootstrap-t UCL	104.9
95% Hall's Bootstrap UCL	104.8	95% Percentile Bootstrap UCL	103.7
95% BCA Bootstrap UCL	103.6		

Appendix M, Attachment 2-3									
ProUCL Report for Surface Soil (Metals, PCBs, SVOCs) - Background									
<i>Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35</i>									
<i>East Aurora and Orchard Park, New York</i>									
90% Chebyshev(Mean, Sd) UCL				110.4	95% Chebyshev(Mean, Sd) UCL				116.9
97.5% Chebyshev(Mean, Sd) UCL				126	99% Chebyshev(Mean, Sd) UCL				143.8
Suggested UCL to Use									
95% Student's-t UCL				104.4					
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. Recommendations are based upon data size, data distribution, and skewness. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.</p>									

Appendix M, Attachment 2-4			
ProUCL Report for Surface Soil (Total PAHs) - Background			
Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35			
East Aurora and Orchard Park, New York			
UCL Statistics for Data Sets with Non-Detects			
User Selected Options			
Date/Time of Computation	ProUCL 5.110/19/2016 12:00:52 PM		
From File	backgroundproucl_input.xls		
Full Precision	OFF		
Confidence Coefficient	95%		
Number of Bootstrap Operations	2000		
LMW PAHs			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	6
Number of Detects	1	Number of Non-Detects	13
Number of Distinct Detects	1	Number of Distinct Non-Detects	5
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set! It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable LMW PAHs was not processed!			
HMW PAHs			
General Statistics			
Total Number of Observations	14	Number of Distinct Observations	6
Number of Detects	1	Number of Non-Detects	13
Number of Distinct Detects	1	Number of Distinct Non-Detects	5
Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set! It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).			
The data set for variable HMW PAHs was not processed!			

Appendix M, Attachment 3-1
Total PAH Calculations for Surface Soil - Launch Area
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

StationID	SB1	SB2	SB3	SB4	SB5	SB5	SB6	SB6	SB7	SB8	SB9	SB10	SB11	SB11	SB12	SB13	SB13	SB14	SB14	SB15	SB16	SB17	SB18	SB18	TP-1	TP-2	TP-3	
SampleID	SB1-02	SB2-02	SB3-1	SB4-02	SB5-00	SB5-01	SB6-02	SB6-02DUP	SB7-01	SB8-02	SB9-02	SB10-02	SB11-00	SB11-02	SB12-02	SB13-00	SB13-02	SB14-00	SB14-02	SB15-2	SB16-2	SB17-2	SB18-00	SB18-02	TP-1-1.5	TP-2-1	TP-3-1	
SampleDate	4/12/2016	4/12/2016	4/11/2016	4/14/2016	5/23/2016	4/18/2016	4/12/2016	4/12/2016	4/14/2016	4/12/2016	4/12/2016	4/13/2016	4/14/2016	4/14/2016	4/12/2016	5/23/2016	4/12/2016	4/12/2016	4/12/2016	4/11/2016	4/11/2016	4/11/2016	4/12/2016	4/12/2016	4/12/2016	4/13/2016	4/14/2016	
SampleDepth (m)	0 - 2	0 - 2	0 - 1	0 - 2	0 - 0.2	0 - 1	0 - 2	0 - 2	0 - 1	0 - 2	0 - 2	0 - 2	0 - 0.2	0 - 2	0 - 2	0 - 0.2	0 - 2	0 - 0.2	0 - 2	0 - 2	0 - 2	0 - 2	0 - 2	0 - 0.2	0 - 2	0 - 1.5	0 - 1	0 - 1
SampleType	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	
RAW																												
LMW PAHs (MG/KG)																												
1-METHYLNAPHTHALENE	0.41 U	0.4 U	0.81 U	0.43 U	0.42 U	0.38 U	0.4 U	0.39 U	0.4 U	0.39 U	0.38 U	0.42 U	0.41 U	0.41 U	0.4 U	0.39 U	0.39 U	0.42 U	0.4 U	0.41 U	0.37 U	0.23 J	0.41 U	0.4 U	0.37 U	0.41 U	0.39 U	0.41 U
2-METHYLNAPHTHALENE	0.41 U	0.4 U	0.81 U	0.43 U	0.42 U	0.38 U	0.4 U	0.39 U	0.4 U	0.39 U	0.38 U	0.42 U	0.41 U	0.41 U	0.4 U	0.39 U	0.39 U	0.42 U	0.4 U	0.41 U	0.37 U	0.43	0.41 U	0.4 U	0.37 U	0.41 U	0.39 U	0.41 U
ACENAPHTHENE	0.41 U	0.4 U	0.81 U	0.43 U	0.42 U	0.38 U	0.4 U	0.39 U	0.4 U	0.39 U	0.38 U	0.42 U	0.41 U	0.41 U	0.4 U	0.39 U	0.39 U	0.42 U	0.4 U	0.41 U	0.37 U	1.7	0.41 U	0.4 U	0.37 U	0.41 U	0.39 U	0.41 U
ACENAPHTHYLENE	0.41 U	0.4 U	0.81 U	0.43 U	0.42 U	0.38 U	0.4 U	0.39 U	0.4 U	0.39 U	0.38 U	0.42 U	0.41 U	0.41 U	0.4 U	0.39 U	0.39 U	0.42 U	0.4 U	0.41 U	0.37 U	0.38 U	0.41 U	0.4 U	0.37 U	0.41 U	0.39 U	0.41 U
ANTHRACENE	0.41 U	0.4 U	0.81 U	0.43 U	0.42 U	0.38 U	0.4 U	0.39 U	0.4 U	0.39 U	0.38 U	0.42 U	0.41 U	0.41 U	0.4 U	0.39 U	0.39 U	0.42 U	0.4 U	0.41 U	0.37 U	3.2	0.41 U	0.4 U	0.37 U	0.41 U	0.39 U	0.41 U
FLUORENE	0.41 U	0.4 U	0.81 U	0.43 U	0.42 U	0.38 U	0.4 U	0.39 U	0.4 U	0.39 U	0.38 U	0.42 U	0.41 U	0.41 U	0.4 U	0.39 U	0.39 U	0.42 U	0.4 U	0.41 U	0.37 U	1.7	0.41 U	0.4 U	0.37 U	0.41 U	0.39 U	0.41 U
NAPHTHALENE	0.41 U	0.4 U	0.81 U	0.43 U	0.42 U	0.38 U	0.4 U	0.39 U	0.4 U	0.39 U	0.38 U	0.42 U	0.41 U	0.41 U	0.4 U	0.39 U	0.39 U	0.42 U	0.4 U	0.41 U	0.37 U	1.8	0.41 U	0.4 U	0.37 U	0.41 U	0.39 U	0.41 U
PHENANTHRENE	0.41 U	0.4 U	0.81 U	0.43 U	0.42 U	0.38 U	0.4 U	0.39 U	0.4 U	0.39 U	0.38 U	0.42 U	0.41 U	0.41 U	0.4 U	0.39 U	0.39 U	0.42 U	0.4 U	0.41 U	0.37 U	8.1 R	0.41 U	0.4 U	0.37 U	0.41 U	0.39 U	0.41 U
HMW PAHs (MG/KG)																												
BENZ(A)ANTHRACENE	0.41 U	0.4 U	0.81 U	0.43 U	0.42 U	0.38 U	0.4 U	0.39 U	0.4 U	0.39 U	0.38 U	0.42 U	0.41 U	0.41 U	0.4 U	0.39 U	0.39 U	0.42 U	0.4 U	0.41 U	0.37 U	4	0.41 U	0.4 U	0.37 U	0.41 U	0.39 U	0.41 U
BENZO (G,H,I) PERYLENE	0.41 U	0.4 U	0.81 U	0.43 U	0.42 U	0.38 U	0.4 U	0.39 U	0.4 U	0.39 U	0.38 U	0.42 U	0.41 U	0.41 U	0.4 U	0.39 U	0.39 U	0.24 J	0.4 U	0.41 U	0.37 U	1.6	0.41 U	0.4 U	0.37 U	0.41 U	0.39 U	0.41 U
BENZO(A)PYRENE	0.41 U	0.4 U	0.33 J	0.43 U	0.42 U	0.38 U	0.4 U	0.39 U	0.4 U	0.39 U	0.38 U	0.42 U	0.41 U	0.41 U	0.4 U	0.39 U	0.39 U	0.17 J	0.4 U	0.41 U	0.37 U	2.8	0.41 U	0.4 U	0.37 U	0.41 U	0.39 U	0.41 U
BENZO(B)FLUORANTHENE	0.41 U	0.4 U	0.28 J	0.43 U	0.42 U	0.38 U	0.4 U	0.39 U	0.4 U	0.39 U	0.38 U	0.42 U	0.41 U	0.41 U	0.4 U	0.39 U	0.39 U	0.42 U	0.4 U	0.41 U	0.37 U	3	0.41 U	0.4 U	0.37 U	0.41 U	0.39 U	0.41 U
BENZO(K)FLUORANTHENE	0.41 U	0.4 U	0.81 U	0.43 U	0.42 U	0.38 U	0.4 U	0.39 U	0.4 U	0.39 U	0.38 U	0.42 U	0.41 U	0.41 U	0.4 U	0.39 U	0.39 U	0.42 U	0.4 U	0.41 U	0.37 U	1.5	0.41 U	0.4 U	0.37 U	0.41 U	0.39 U	0.41 U
CHRYSENE	0.41 U	0.4 U	0.81 U	0.43 U	0.42 U	0.38 U	0.4 U	0.39 U	0.4 U	0.39 U	0.38 U	0.42 U	0.41 U	0.41 U	0.4 U	0.39 U	0.39 U	0.42 U	0.4 U	0.41 U	0.37 U	3.4	0.41 U	0.4 U	0.37 U	0.41 U	0.39 U	0.41 U
FLUORANTHENE	0.41 U	0.4 U	0.63 J	0.43 U	0.42 U	0.38 U	0.4 U	0.39 U	0.4 U	0.39 U	0.38 U	0.42 U	0.41 U	0.23 J	0.4 U	0.39 U	0.39 U	0.32 J	0.4 U	0.23 J	0.2 J	5.8 R	0.24 J	0.4 U	0.37 U	0.41 U	0.23 J	0.41 U
INDENO(1,2,3-CD)PYRENE	0.41 U	0.4 U	0.81 U	0.43 U	0.42 U	0.38 U	0.4 U	0.39 U	0.4 U	0.39 U	0.38 U	0.42 U	0.41 U	0.41 U	0.4 U	0.39 U	0.39 U	0.2 J	0.4 U	0.41 U	0.37 U	1.4	0.41 U	0.4 U	0.37 U	0.41 U	0.39 U	0.41 U
PYRENE	0.41 U	0.4 U	0.32 J	0.43 U	0.42 U	0.38 U	0.4 U	0.39 U	0.4 U	0.39 U	0.38 U	0.42 U	0.41 U	0.41 U	0.4 U	0.39 U	0.39 U	0.13 J	0.4 U	0.41 U	0.37 U	1.1 R	0.41 U	0.4 U	0.37 U	0.41 U	0.39 U	0.41 U
DIBENZ(A,H)ANTHRACENE	0.41 U	0.4 U	0.81 U	0.43 U	0.42 U	0.38 U	0.4 U	0.39 U	0.4 U	0.39 U	0.38 U	0.42 U	0.41 U	0.41 U	0.4 U	0.39 U	0.39 U	0.42 U	0.4 U	0.41 U	0.37 U	0.38 U	0.41 U	0.4 U	0.37 U	0.41 U	0.39 U	0.41 U
DETECTS																												
LMW PAHs (MG/KG)																												
1-METHYLNAPHTHALENE																						0.23						
2-METHYLNAPHTHALENE																						0.43						
ACENAPHTHENE																						1.7						
Acenaphthylene																												
ANTHRACENE																						3.2						
FLUORENE																						1.7						
NAPHTHALENE																						1.8						
Phenanthrene																												
HMW PAHs (MG/KG)																												
BENZ(A)ANTHRACENE																						4						
BENZO (G,H,I) PERYLENE																		0.24				1.6						
BENZO(A)PYRENE			0.33															0.17				2.8						
BENZO(B)FLUORANTHENE			0.28																			3						
BENZO(K)FLUORANTHENE																						1.5						
CHRYSENE																						3.4						
FLUORANTHENE			0.63										0.23									0.32			0.23	0.2		0.23
INDENO(1,2,3-CD)PYRENE																						0.2						
PYRENE			0.32																			0.13						
DIBENZ(A,H)ANTHRACENE																												
NON-DETECTS																												
LMW PAHs (MG/KG)																												
1-METHYLNAPHTHALENE	0.205 U	0.2 U	0.405 U	0.215 U	0.21 U	0.19 U	0.2 U		0.2 U	0.195 U	0.19 U	0.21 U	0.205 U	0.205 U	0.2 U	0.195 U	0.195 U	0.21 U	0.2 U	0.205 U	0.185 U		0.205 U	0.2 U	0.185 U	0.205 U	0.195 U	0.195 U
2-METHYLNAPHTHALENE	0.205 U	0.2 U	0.405 U	0.215 U	0.21 U	0.19 U	0.2 U		0.2 U	0.195 U	0.19 U	0.21 U	0.205 U	0.205 U	0.2 U	0.195 U	0.195 U	0.21 U	0.2 U	0.205 U	0.185 U		0.205 U	0.2 U	0.185 U	0.205 U	0.195 U	0.195 U
ACENAPHTHENE	0.205 U	0.2 U	0.405 U	0.215 U	0.21 U	0.19 U	0.2 U		0.2 U	0.195 U	0.19 U	0.21 U	0.205 U	0.205 U	0.2 U	0.195 U	0.195 U	0.21 U	0.2 U	0.205 U	0.185 U		0.205 U	0.2 U	0.185 U	0.205 U	0.195 U	0.195 U
Acenaphthylene	0.205 U	0.2 U	0.405 U	0.215 U	0.21 U	0.19 U	0.2 U		0.2 U	0.195 U	0.19 U	0.21 U	0.205 U	0.205 U	0.2 U	0.195 U	0.195 U	0.21 U	0.2 U	0.205 U	0.185 U	0.19 U	0.205 U	0.2 U	0.185 U	0.205 U	0.195 U	0.195 U
ANTHRACENE	0.205 U	0.2 U	0.405 U	0.215 U	0.21 U	0.19 U	0.2 U		0.2 U	0.195 U	0.19 U	0.21 U	0.205 U	0.205 U	0.2 U	0.195 U	0.195 U	0.21 U	0.2 U	0.205 U	0.185 U		0.205 U	0.2 U	0.185 U	0.205 U	0.195 U	0.195 U
FLUORENE	0.205 U	0.2 U	0.405 U	0.215 U	0.21 U	0.19 U	0.2 U		0.2 U	0																		

Appendix M, Attachment 3-1

Total PAH Calculations for Surface Soil - Launch Area

Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
East Aurora and Orchard Park, New York

StationID	SB1	SB2	SB3	SB4	SB5	SB5	SB6	SB6	SB7	SB8	SB9	SB10	SB11	SB11	SB12	SB13	SB13	SB14	SB14	SB15	SB16	SB17	SB18	SB18	TP-1	TP-2	TP-3
SampleID	SB1-02	SB2-02	SB3-1	SB4-02	SB5-00	SB5-01	SB6-02	SB6-02DUP	SB7-01	SB8-02	SB9-02	SB10-02	SB11-00	SB11-02	SB12-02	SB13-00	SB13-02	SB14-00	SB14-02	SB15-2	SB16-2	SB17-2	SB18-00	SB18-02	TP-1-1.5	TP-2-1	TP-3-1
SampleDate	4/12/2016	4/12/2016	4/11/2016	4/14/2016	5/23/2016	4/18/2016	4/12/2016	4/12/2016	4/14/2016	4/12/2016	4/12/2016	4/13/2016	4/14/2016	4/14/2016	4/12/2016	5/23/2016	4/12/2016	4/12/2016	4/12/2016	4/11/2016	4/11/2016	4/11/2016	4/12/2016	4/12/2016	4/12/2016	4/13/2016	4/14/2016
SampleDepth (m)	0 - 2	0 - 2	0 - 1	0 - 2	0 - 0.2	0 - 1	0 - 2	0 - 2	0 - 1	0 - 2	0 - 2	0 - 2	0 - 0.2	0 - 2	0 - 2	0 - 0.2	0 - 2	0 - 0.2	0 - 2	0 - 2	0 - 2	0 - 2	0 - 0.2	0 - 2	0 - 1.5	0 - 1	0 - 1
SampleType	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Total LMW PAHs																											
Sum Detects	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	9.06	0	0	0	0	0
Sum Non-Detects (1/2 DL)	1.64	1.6	3.24	1.72	1.68	1.52	1.6		1.6	1.56	1.52	1.68	1.64	1.64	1.6	1.56	1.56	1.68	1.6	1.64	1.48	0.19	1.64	1.6	1.48	1.64	1.56
Sum Total	1.64	1.6	3.24	1.72	1.68	1.52	1.6		1.6	1.56	1.52	1.68	1.64	1.64	1.6	1.56	1.56	1.68	1.6	1.64	1.48	9.25	1.64	1.6	1.48	1.64	1.56
Total HMW PAHs																											
Sum Detects	0	0	1.56	0	0	0	0		0	0	0	0	0	0.23	0	0	0	1.06	0	0.23	0.2	17.7	0.24	0	0	0	0.23
Sum Non-Detects (1/2 DL)	2.05	2	2.43	2.15	2.1	1.9	2		2	1.95	1.9	2.1	2.05	1.845	2	1.95	1.95	1.05	2	1.845	1.665	0.19	1.845	2	1.85	2.05	1.755
Sum Total	2.05	2	3.99	2.15	2.1	1.9	2		2	1.95	1.9	2.1	2.05	2.075	2	1.95	1.95	2.11	2	2.075	1.865	17.89	2.085	2	1.85	2.05	1.985

LMW Detects Only

Minimum	9.060
Maximum	9.060
Mean	0.348
Samples	26
Detects	1
Exceedances	0
Standard Deviation	1.777

LMW Totals

Minimum	9.250
Maximum	9.250
Mean	1.959
Samples	26
Detects	1
Exceedances	0
Standard deviation	1.523
95% UCL	--

HMW Detects Only

Minimum	0.200
Maximum	17.700
Mean	0.825
Samples	26
Detects	8
Exceedances	0
Standard Deviation	3.461

HMW Totals

Minimum	1.865
Maximum	17.890
Mean	2.695
Samples	26
Detects	8
Exceedances	0
Standard deviation	3.124
95% UCL	5.426

Notes:
DL - detection limit
HMW - high molecular weight
LMW - low molecular weight
MG/KG - milligrams per kilogram
PAH - polycyclic aromatic hydrocarbon

Appendix M, Attachment 3-2
Total PAH Calculations for Surface Soil - Background
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
 East Aurora and Orchard Park, New York

StationID	BACK1		BACK1		BACK2		BACK3		BACK3		BACK4		BACK5		BACK5		BACK6		BACK7		BACK7		BACK8		BACK9		BACK10	
SampleID	BACK1-00		BACK1-02		BACK2-02		BACK3-00		BACK3-02		BACK4-01		BACK5-00		BACK5-02		BACK6-01		BACK7-00		BACK7-01		BACK8-01		BACK9-01		BACK10-01	
SampleDate	4/18/2016		4/18/2016		4/18/2016		4/18/2016		4/18/2016		4/13/2016		4/13/2016		4/13/2016		4/13/2016		4/13/2016		4/13/2016		4/13/2016		4/13/2016		4/13/2016	
SampleDepth (m)	0 - 0.2		0 - 2		0 - 2		0 - 0.2		0 - 2		0 - 1		0 - 0.2		0 - 2		0 - 1		0 - 0.2		0 - 1		0 - 1		0 - 1		0 - 1	
SampleType	N		N		N		N		N		N		N		N		N		N		N		N		N		N	
RAW																												
LMW PAHs (MG/KG)																												
1-METHYLNAPHTHALENE	0.14	U	0.13	U	0.11	U	0.15	U	0.12	U	0.12	U	0.13	U	0.12	U	0.12	U	0.14	U	0.12	U	0.12	U	0.13	U	0.11	U
2-METHYLNAPHTHALENE	0.14	U	0.13	U	0.11	U	0.15	U	0.12	U	0.12	U	0.13	U	0.12	U	0.12	U	0.14	U	0.12	U	0.12	U	0.13	U	0.11	U
ACENAPHTHENE	0.14	U	0.13	U	0.11	U	0.15	U	0.12	U	0.12	U	0.13	U	0.12	U	0.12	U	0.14	U	0.12	U	0.12	U	0.13	U	0.11	U
ACENAPHTHYLENE	0.14	U	0.13	U	0.11	U	0.15	U	0.12	U	0.12	U	0.13	U	0.12	U	0.12	U	0.14	U	0.12	U	0.12	U	0.13	U	0.11	U
ANTHRACENE	0.14	U	0.13	U	0.11	U	0.15	U	0.12	U	0.12	U	0.13	U	0.12	U	0.12	U	0.14	U	0.12	U	0.12	U	0.13	U	0.11	U
FLUORENE	0.14	U	0.13	U	0.11	U	0.15	U	0.12	U	0.12	U	0.13	U	0.12	U	0.12	U	0.14	U	0.12	U	0.12	U	0.13	U	0.11	U
NAPHTHALENE	0.14	U	0.13	U	0.11	U	0.15	U	0.12	U	0.12	U	0.13	U	0.12	U	0.12	U	0.14	U	0.12	U	0.12	U	0.13	U	0.11	U
PHENANTHRENE	0.26	J	0.13	U	0.11	U	0.15	U	0.12	U	0.12	U	0.13	U	0.12	U	0.12	U	0.14	U	0.12	U	0.12	U	0.13	U	0.11	U
HMW PAHs (MG/KG)																												
BENZ(A)ANTHRACENE	0.21	J	0.13	U	0.11	U	0.15	U	0.12	U	0.12	U	0.13	U	0.12	U	0.12	U	0.14	U	0.12	U	0.12	U	0.13	U	0.11	U
BENZO (G,H,I) PERYLENE	0.14	U	0.13	U	0.11	U	0.15	U	0.12	U	0.12	U	0.13	U	0.12	U	0.12	U	0.14	U	0.12	U	0.12	U	0.13	U	0.11	U
BENZO(A)PYRENE	0.2	J	0.13	U	0.11	U	0.15	U	0.12	U	0.12	U	0.13	U	0.12	U	0.12	U	0.14	U	0.12	U	0.12	U	0.13	U	0.11	U
BENZO(B)FLUORANTHENE	0.24	J	0.13	U	0.11	U	0.15	U	0.12	U	0.12	U	0.13	U	0.12	U	0.12	U	0.14	U	0.12	U	0.12	U	0.13	U	0.11	U
BENZO(K)FLUORANTHENE	0.18	J	0.13	U	0.11	U	0.15	U	0.12	U	0.12	U	0.13	U	0.12	U	0.12	U	0.14	U	0.12	U	0.12	U	0.13	U	0.11	U
CHRYSENE	0.22	J	0.13	U	0.11	U	0.15	U	0.12	U	0.12	U	0.13	U	0.12	U	0.12	U	0.14	U	0.12	U	0.12	U	0.13	U	0.11	U
FLUORANTHENE	0.48	J	0.13	U	0.11	U	0.15	U	0.12	U	0.12	U	0.13	U	0.12	U	0.12	U	0.14	U	0.12	U	0.12	U	0.13	U	0.11	U
INDENO(1,2,3-CD)PYRENE	0.14	U	0.13	U	0.11	U	0.15	U	0.12	U	0.12	U	0.13	U	0.12	U	0.12	U	0.14	U	0.12	U	0.12	U	0.13	U	0.11	U
PYRENE	0.39	J	0.13	U	0.11	U	0.15	U	0.12	U	0.12	U	0.13	U	0.12	U	0.12	U	0.14	U	0.12	U	0.12	U	0.13	U	0.11	U
DIBENZ(A,H)ANTHRACENE	0.14	U	0.13	U	0.11	U	0.15	U	0.12	U	0.12	U	0.13	U	0.12	U	0.12	U	0.14	U	0.12	U	0.12	U	0.13	U	0.11	U
DETECTS																												
LMW PAHs (MG/KG)																												
1-METHYLNAPHTHALENE																												
2-METHYLNAPHTHALENE																												
ACENAPHTHENE																												
ACENAPHTHYLENE																												
ANTHRACENE																												
FLUORENE																												
NAPHTHALENE																												
PHENANTHRENE	0.26	J																										
HMW PAHs (MG/KG)																												
BENZ(A)ANTHRACENE	0.21	J																										
BENZO (G,H,I) PERYLENE																												
BENZO(A)PYRENE	0.2	J																										
BENZO(B)FLUORANTHENE	0.24	J																										
BENZO(K)FLUORANTHENE	0.18	J																										
CHRYSENE	0.22	J																										
FLUORANTHENE	0.48	J																										
INDENO(1,2,3-CD)PYRENE																												
PYRENE	0.39	J																										
DIBENZ(A,H)ANTHRACENE																												
NON-DETECTS																												
LMW PAHs (MG/KG)																												
1-METHYLNAPHTHALENE	0.07	U	0.065	U	0.055	U	0.075	U	0.06	U	0.06	U	0.065	U	0.06	U	0.06	U	0.07	U	0.06	U	0.06	U	0.065	U	0.055	U
2-METHYLNAPHTHALENE	0.07	U	0.065	U	0.055	U	0.075	U	0.06	U	0.06	U	0.065	U	0.06	U	0.06	U	0.07	U	0.06	U	0.06	U	0.065	U	0.055	U
ACENAPHTHENE	0.07	U	0.065	U	0.055	U	0.075	U	0.06	U	0.06	U	0.065	U	0.06	U	0.06	U	0.07	U	0.06	U	0.06	U	0.065	U	0.055	U
ACENAPHTHYLENE	0.07	U	0.065	U	0.055	U	0.075	U	0.06	U	0.06	U	0.065	U	0.06	U	0.06	U	0.07	U	0.06	U	0.06	U	0.065	U	0.055	U
ANTHRACENE	0.07	U	0.065	U	0.055	U	0.075	U	0.06	U	0.06	U	0.065	U	0.06	U	0.06	U	0.07	U	0.06	U	0.06	U	0.065	U	0.055	U
FLUORENE	0.07	U	0.065	U	0.055	U	0.075	U	0.06	U	0.06	U	0.065	U	0.06	U	0.06	U	0.07	U	0.06	U	0.06	U	0.065	U	0.055	U
NAPHTHALENE	0.07	U	0.065	U	0.055	U	0.075	U	0.06	U	0.06	U	0.065	U	0.06	U	0.06	U	0.07	U	0.06	U	0.06	U	0.065	U	0.055	U
PHENANTHRENE			0.065	U	0.055	U	0.075	U	0.06	U	0.06	U	0.065	U	0.06	U	0.06	U	0.07	U	0.06	U	0.06	U	0.065	U	0.055	U
HMW PAHs (MG/KG)																												
BENZ(A)ANTHRACENE			0.065	U	0.055	U	0.075	U	0.06	U	0.06	U	0.065	U	0.06	U	0.06	U	0.07	U	0.06	U	0.06	U	0.065	U	0.055	U
BENZO (G,H,I) PERYLENE	0.07	U	0.065	U	0.055	U	0.075	U	0.06	U	0.06	U	0.065	U	0.06	U	0.06	U	0.07	U	0.06	U	0.06	U	0.065	U	0.055	U
BENZO(A)PYRENE			0.065	U	0.055	U	0.075	U	0.06	U	0.06	U	0.065	U	0.06	U	0.06	U	0.07	U	0.06	U	0.06	U	0.065	U	0.055	U
BENZO(B)FLUORANTHENE			0.065	U	0.055	U	0.075	U	0.06	U	0.06	U	0.065	U	0.06	U	0.06	U	0.07	U	0.06	U	0.06	U	0.065	U	0.055	U
BENZO(K)FLUORANTHENE			0.065	U	0.055	U	0.075	U	0.06	U	0.06	U	0.065	U	0.06	U	0.06	U	0.07	U	0.06	U	0.06	U	0.065	U	0.055	U
CHRYSENE			0.065	U	0.055	U	0.075	U	0.06	U	0.06	U	0.065	U	0.06	U	0.06	U	0.07	U	0.06	U	0.06	U	0.065	U	0.055	U
FLUORANTHENE			0.065	U	0.055	U	0.075	U	0.06	U	0.06	U	0.065	U	0.06	U	0.06	U	0.07	U	0.06	U	0.06	U	0.065	U	0.055	U
INDENO(1,2,3-CD)PYRENE	0.07	U	0.065	U	0.055	U	0.075	U	0.06	U	0.06	U	0.065	U	0.06	U	0.06	U	0.07	U	0.06	U	0.06	U	0.065	U	0.055	U
PYRENE			0.065	U	0.055	U	0.075	U																				

Appendix M, Attachment 3-2

Total PAH Calculations for Surface Soil - Background

Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35
East Aurora and Orchard Park, New York

StationID	BACK1	BACK1	BACK2	BACK3	BACK3	BACK4	BACK5	BACK5	BACK6	BACK7	BACK7	BACK8	BACK9	BACK10
SampleID	BACK1-00	BACK1-02	BACK2-02	BACK3-00	BACK3-02	BACK4-01	BACK5-00	BACK5-02	BACK6-01	BACK7-00	BACK7-01	BACK8-01	BACK9-01	BACK10-01
SampleDate	4/18/2016	4/18/2016	4/18/2016	4/18/2016	4/18/2016	4/13/2016	4/13/2016	4/13/2016	4/13/2016	4/13/2016	4/13/2016	4/13/2016	4/13/2016	4/13/2016
SampleDepth (m)	0 - 0.2	0 - 2	0 - 2	0 - 0.2	0 - 2	0 - 1	0 - 0.2	0 - 2	0 - 1	0 - 0.2	0 - 1	0 - 1	0 - 1	0 - 1
SampleType	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Total LMW PAHs														
Sum Detects	0.26	0	0	0	0	0	0	0	0	0	0	0	0	0
Sum Non-Detects (1/2 DL)	0.49	0.52	0.44	0.6	0.48	0.48	0.52	0.48	0.48	0.56	0.48	0.48	0.52	0.44
Sum Total	0.75	0.52	0.44	0.6	0.48	0.48	0.52	0.48	0.48	0.56	0.48	0.48	0.52	0.44
Total HMW PAHs														
Sum Detects	1.92	0	0	0	0	0	0	0	0	0	0	0	0	0
Sum Non-Detects (1/2 DL)	0.21	0.65	0.55	0.75	0.6	0.6	0.65	0.6	0.6	0.7	0.6	0.6	0.65	0.55
Sum Total	2.13	0.65	0.55	0.75	0.6	0.6	0.65	0.6	0.6	0.7	0.6	0.6	0.65	0.55

LMW Detects Only

Minimum	0.260
Maximum	0.260
Mean	0.019
Samples	14
Detects	1
Exceedances	0
Standard Deviation	0.069

LMW Totals

Minimum	0.750
Maximum	0.750
Mean	0.516
Samples	14
Detects	1
Exceedances	0
Standard deviation	0.080
95% UCL	--

HMW Detects Only

Minimum	1.920
Maximum	1.920
Mean	0.137
Samples	14
Detects	1
Exceedances	0
Standard Deviation	0.513

HMW Totals

Minimum	2.130
Maximum	2.130
Mean	0.731
Samples	14
Detects	1
Exceedances	0
Standard deviation	0.406
95% UCL	--

Notes:

- DL - detection limit
- HMW - high molecular weight
- LMW - low molecular weight
- MG/KG - milligrams per kilogram
- PAH - polycyclic aromatic hydrocarbon

Appendix M, Attachment 4-2
 Adjusted Eco-SSL Datasets and Calculations - Mammals
 Former Niagara Falls – Buffalo Defense Nike Battery BU-34/35

MAMMALS	LMW PAHs			HMW PAHs			Pentachlorophenol			Selenium			Silver			Zinc		
	Vole	Shrew	Weasel	Vole	Shrew	Weasel	Vole	Shrew	Weasel	Vole	Shrew	Weasel	Vole	Shrew	Weasel	Vole	Shrew	Weasel
Eco-SSL (NOAEL)	350	100	1200	39	11	110	16	2.8	590	2.7	0.63	2.8	1500	14	990	6800	79	10000
Org. TRV	65.6	65.6	65.6	0.615	0.615	0.615	8.42	8.42	8.42	0.143	0.143	0.143	6.02	6.02	6.02	75.4	75.4	75.4
New TRV (10th)	138	138	138	15.72	15.72	15.72	10.58	10.58	10.58	0.2388	0.2388	0.2388	74.2	74.2	74.2	37.7	37.7	37.7
Adjusted Eco-SSL (LOAEL)	736.3	210.4	2524.4	996.9	28.1	2811.7	20.1	3.5	741.4	4.5	1.1	4.7	18488.4	172.6	12202.3	3400.0	39.5	5000.0
1	450	R		40	R		9.45	R		0.145	R		188	R		82.3	R	
2	630	R		26.4	R		27.1	R		0.768	R		60.2	G		75.9	R	
3	300	R		45.9	R		12.9	R		0.776	R		80.2	G		452	R	
4	300	R		12.4	G		13.3	R		0.763	R		126	G		2514	R	
5	150	G		50	G		31.7	R		1.51	R		140	G		4927	R	
6	110	G		24	G		29.4	R		6.03	R		174	G		4878	R	
7	267	G		26.4	G		0.571	R		25.4	R		125	S		12.2	R	
8	328	G		63.4	G		29.4	R		6.39	R		140	S		81.1	R	
9	630	G		98	G		29.4	R		0.089	R					232	R	
10	1460	G		118	G		30.7	R		0.13	R					326	R	
11	1470	G		20.7	G		30.7	R		0.296	R					326	R	
12	50	G		27.3	G		74.3	R		0.434	R					353	R	
13	300	G		50	G		10	G		0.504	R					424	R	
14	700	G		3.07	S		27.1	G		0.55	R					103	G	
15	500	S		26.4	S		23.7	G		0.749	R					87.1	G	
16	630	S					27.7	G		4.18	R					2514	G	
17	300	S					42.6	G		4.57	R					4927	G	
18	300	S					30.7	G		5.01	R					4878	G	
19							29.4	G		0.265	G					2838	G	
20							29.4	G		0.763	G					8.71	G	
21							30.7	G		0.157	G					16.1	G	
22							74.3	G		0.273	G					28.2	G	
23							52.7	S		0.215	G					75.7	G	
24										0.273	G					81.1	G	
25										0.304	G					89.1	G	
26										0.221	G					424	G	
27										0.33	G					667	G	
28										0.51	G					956	G	
29										0.548	G					968	G	
30										0.435	G					87.1	S	
31										0.47	G					99.5	S	
32										0.34	G					4927	S	
33										0.58	G					99.1	S	
34										0.521	G							
35										0.54	G							
36										0.712	G							
37										0.489	G							
38										0.564	G							
39										0.747	G							
40										0.523	G							
41										0.768	G							
42										0.776	G							
43										0.763	G							
44										0.567	G							
45										0.577	G							
46										0.869	G							
47										0.869	G							
48										0.869	G							
49										1.31	G							
50										0.904	G							
51										1.54	G							
52										1.21	G							
53										0.88	G							
54										1.51	G							
55										1.23	G							
56										1.21	G							
57										1.62	G							
58										1.59	G							
59										1.59	G							
60										2.27	G							
61										6.39	G							
62										20	G							
63										0.0908	G							
64										0.0968	G							
65										0.156	G							
66										0.163	G							
67										0.166	G							
68										0.205	G							
69										0.209	G							
70										0.215	G							
71										0.232	G							
72										0.235	G							
73										0.254	G							
74										0.267	G							
75										0.274	G							
76										0.276	G							
77										0.282	G							
78										0.303	G							
79										0.307	G							
80										0.323	G							
81										0.345	G							
82										0.352	G							
83										0.378	G							
84										0.39	G							
85										0.411	G							
86										0.42	G							
87										0.425	G							
88										0.441	G							
89										0.454	G							
90										0.49	G							
91										0.493	G							
92										0.498	G							
93										0.521	G							
94										0.543	G							
95										0.55	G							
96										0.57	G							
97										0.589	G							
98										0.653	G							
99										0.667	G							
100										0.704	G							
101										0.754	G							
102										0.767	G							
103										0.769	G							
104										0.794	G							
105										0.794	G							
106										0.794	G							
107										0.794	G							
108										0.809	G							
109										0.817	G							
110										0.823	G							
111										0.903	G							
112										0.968	G							
113										0.984	G							
114										0.988	G							
115										1.02	G							
116										1.11	G							
117										1.59	G							
118																		