

	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Data Sets with Non-Detects											
2												
3	User Selected Options											
4	Date/Time of Computation			8/9/2016 10:44:03 AM								
5	From File			ProUCL input 01-006(n).xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10	Plutonium-239/240											
11												
12	General Statistics											
13	Total Number of Observations				11		Number of Distinct Observations				11	
14	Number of Detects				9		Number of Non-Detects				2	
15	Number of Distinct Detects				9		Number of Distinct Non-Detects				2	
16	Minimum Detect				0.0169		Minimum Non-Detect				0.002	
17	Maximum Detect				8.22		Maximum Non-Detect				0.013	
18	Variance Detects				11.22		Percent Non-Detects				18.18%	
19	Mean Detects				2.291		SD Detects				3.349	
20	Median Detects				0.849		CV Detects				1.462	
21	Skewness Detects				1.486		Kurtosis Detects				0.494	
22	Mean of Logged Detects				-0.555		SD of Logged Detects				2.075	
23												
24	Normal GOF Test on Detects Only											
25	Shapiro Wilk Test Statistic				0.68		Shapiro Wilk GOF Test					
26	5% Shapiro Wilk Critical Value				0.829		Detected Data Not Normal at 5% Significance Level					
27	Lilliefors Test Statistic				0.338		Lilliefors GOF Test					
28	5% Lilliefors Critical Value				0.295		Detected Data Not Normal at 5% Significance Level					
29	Detected Data Not Normal at 5% Significance Level											
30												
31	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
32	Mean		1.875		Standard Error of Mean				0.956			
33	SD		2.989		95% KM (BCA) UCL				3.39			
34	95% KM (t) UCL		3.607		95% KM (Percentile Bootstrap) UCL				3.436			
35	95% KM (z) UCL		3.447		95% KM Bootstrap t UCL				8.816			
36	90% KM Chebyshev UCL		4.743		95% KM Chebyshev UCL				6.042			
37	97.5% KM Chebyshev UCL		7.845		99% KM Chebyshev UCL				11.39			
38												
39	Gamma GOF Tests on Detected Observations Only											
40	A-D Test Statistic			0.384		Anderson-Darling GOF Test						
41	5% A-D Critical Value			0.777		Detected data appear Gamma Distributed at 5% Significance Level						
42	K-S Test Statistic			0.189		Kolmogrov-Smirnoff GOF						
43	5% K-S Critical Value			0.295		Detected data appear Gamma Distributed at 5% Significance Level						
44	Detected data appear Gamma Distributed at 5% Significance Level											
45												
46	Gamma Statistics on Detected Data Only											
47	k hat (MLE)		0.464		k star (bias corrected MLE)				0.384			
48	Theta hat (MLE)		4.934		Theta star (bias corrected MLE)				5.972			
49	nu hat (MLE)		8.356		nu star (bias corrected)				6.904			
50	MLE Mean (bias corrected)		2.291		MLE Sd (bias corrected)				3.699			
51												
52	Gamma Kaplan-Meier (KM) Statistics											

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53	k hat (KM)					0.393	nu hat (KM)					8.651	
54	Approximate Chi Square Value (8.65, α)					3.117	Adjusted Chi Square Value (8.65, β)					2.601	
55	95% Gamma Approximate KM-UCL (use when n>=50)					5.202	95% Gamma Adjusted KM-UCL (use when n<50)					6.235	
56													
57	Gamma ROS Statistics using Imputed Non-Detects												
58	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs												
59	GROS may not be used when kstar of detected data is small such as < 0.1												
60	For such situations, GROS method tends to yield inflated values of UCLs and BTVs												
61	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates												
62	Minimum					0.01	Mean					1.876	
63	Maximum					8.22	Median					0.206	
64	SD					3.134	CV					1.671	
65	k hat (MLE)					0.35	k star (bias corrected MLE)					0.315	
66	Theta hat (MLE)					5.359	Theta star (bias corrected MLE)					5.952	
67	nu hat (MLE)					7.702	nu star (bias corrected)					6.934	
68	MLE Mean (bias corrected)					1.876	MLE Sd (bias corrected)					3.341	
69							Adjusted Level of Significance (β)					0.0278	
70	Approximate Chi Square Value (6.93, α)					2.135	Adjusted Chi Square Value (6.93, β)					1.728	
71	95% Gamma Approximate UCL (use when n>=50)					6.094	95% Gamma Adjusted UCL (use when n<50)					7.528	
72													
73	Lognormal GOF Test on Detected Observations Only												
74	Shapiro Wilk Test Statistic					0.948	Shapiro Wilk GOF Test						
75	5% Shapiro Wilk Critical Value					0.829	Detected Data appear Lognormal at 5% Significance Level						
76	Lilliefors Test Statistic					0.134	Lilliefors GOF Test						
77	5% Lilliefors Critical Value					0.295	Detected Data appear Lognormal at 5% Significance Level						
78	Detected Data appear Lognormal at 5% Significance Level												
79													
80	Lognormal ROS Statistics Using Imputed Non-Detects												
81	Mean in Original Scale					1.875	Mean in Log Scale					-1.451	
82	SD in Original Scale					3.135	SD in Log Scale					2.723	
83	95% t UCL (assumes normality of ROS data)					3.588	95% Percentile Bootstrap UCL					3.458	
84	95% BCA Bootstrap UCL					3.97	95% Bootstrap t UCL					8.829	
85	95% H-UCL (Log ROS)					3439							
86													
87	UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed												
88	KM Mean (logged)					-1.584	95% H-UCL (KM -Log)					5528	
89	KM SD (logged)					2.81	95% Critical H Value (KM-Log)					7.039	
90	KM Standard Error of Mean (logged)					0.899							
91													
92	DL/2 Statistics												
93	DL/2 Normal						DL/2 Log-Transformed						
94	Mean in Original Scale					1.875	Mean in Log Scale					-1.54	
95	SD in Original Scale					3.135	SD in Log Scale					2.902	
96	95% t UCL (Assumes normality)					3.588	95% H-Stat UCL					11245	
97	DL/2 is not a recommended method, provided for comparisons and historical reasons												
98													
99	Nonparametric Distribution Free UCL Statistics												
100	Detected Data appear Gamma Distributed at 5% Significance Level												
101													
102	Suggested UCL to Use												
103	95% KM (Chebyshev) UCL					6.042	95% GROS Adjusted Gamma UCL					7.528	
104	95% Adjusted Gamma KM-UCL					6.235							

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105												
106	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
107	Recommendations are based upon data size, data distribution, and skewness.											
108	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
109	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
110												