	A	B	C	D	E	F	G	H	I	J	K	L
1	UCL Statistics for Uncensored Full Data Sets											
2												
3	User Selected Options											
4	Date/Time of Computation			3/3/2015 9:02:29 AM								
5	From File			EPC_204SurfEU5.xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	Arsenic											
12												
13	General Statistics											
14	Total Number of Observations					11	Number of Distinct Observations					4
15							Number of Missing Observations					0
16	Minimum					3	Mean					17.61
17	Maximum					107	Median					10
18	SD					29.77	Std. Error of Mean					8.975
19	Coefficient of Variation					1.69	Skewness					3.267
20												
21	Normal GOF Test											
22	Shapiro Wilk Test Statistic					0.411	Shapiro Wilk GOF Test					
23	5% Shapiro Wilk Critical Value					0.85	Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.51	Lilliefors GOF Test					
25	5% Lilliefors Critical Value					0.267	Data Not Normal at 5% Significance Level					
26	Data Not Normal at 5% Significance Level											
27												
28	Assuming Normal Distribution											
29	95% Normal UCL						95% UCLs (Adjusted for Skewness)					
30	95% Student's-t UCL					33.88	95% Adjusted-CLT UCL (Chen-1995)					41.82
31							95% Modified-t UCL (Johnson-1978)					35.35
32												
33	Gamma GOF Test											
34	A-D Test Statistic					2.345	Anderson-Darling Gamma GOF Test					
35	5% A-D Critical Value					0.751	Data Not Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.483	Kolmogrov-Smirnoff Gamma GOF Test					
37	5% K-S Critical Value					0.262	Data Not Gamma Distributed at 5% Significance Level					
38	Data Not Gamma Distributed at 5% Significance Level											
39												
40	Gamma Statistics											
41	k hat (MLE)					1.044	k star (bias corrected MLE)					0.82
42	Theta hat (MLE)					16.87	Theta star (bias corrected MLE)					21.48
43	nu hat (MLE)					22.97	nu star (bias corrected)					18.04
44	MLE Mean (bias corrected)					17.61	MLE Sd (bias corrected)					19.45
45							Approximate Chi Square Value (0.05)					9.417
46	Adjusted Level of Significance					0.0278	Adjusted Chi Square Value					8.419
47												
48	Assuming Gamma Distribution											
49	95% Approximate Gamma UCL (use when n>=50))					33.73	95% Adjusted Gamma UCL (use when n<50)					37.72
50												
51	Lognormal GOF Test											
52	Shapiro Wilk Test Statistic					0.675	Shapiro Wilk Lognormal GOF Test					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.85		Data Not Lognormal at 5% Significance Level				
54					Lilliefors Test Statistic	0.416		**Lilliefors Lognormal GOF Test**				
55					5% Lilliefors Critical Value	0.267		Data Not Lognormal at 5% Significance Level				
56					**Data Not Lognormal at 5% Significance Level**							
57												
58					**Lognormal Statistics**							
59					Minimum of Logged Data	1.099				Mean of logged Data		2.318
60					Maximum of Logged Data	4.673				SD of logged Data		0.897
61												
62					**Assuming Lognormal Distribution**							
63					95% H-UCL	33.68				90% Chebyshev (MVUE) UCL		26.88
64					95% Chebyshev (MVUE) UCL	32.49				97.5% Chebyshev (MVUE) UCL		40.27
65					99% Chebyshev (MVUE) UCL	55.57						
66												
67					**Nonparametric Distribution Free UCL Statistics**							
68					**Data do not follow a Discernible Distribution (0.05)**							
69												
70					**Nonparametric Distribution Free UCLs**							
71					95% CLT UCL	32.37				95% Jackknife UCL		33.88
72					95% Standard Bootstrap UCL	N/A				95% Bootstrap-t UCL		N/A
73					95% Hall's Bootstrap UCL	N/A				95% Percentile Bootstrap UCL		N/A
74					95% BCA Bootstrap UCL	N/A						
75					90% Chebyshev(Mean, Sd) UCL	44.53				95% Chebyshev(Mean, Sd) UCL		56.73
76					97.5% Chebyshev(Mean, Sd) UCL	73.66				99% Chebyshev(Mean, Sd) UCL		106.9
77												
78					**Suggested UCL to Use**							
79					95% Chebyshev (Mean, Sd) UCL	56.73						
80												
81					Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.							
82					These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)							
83					and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.							
84					For additional insight the user may want to consult a statistician.							
85												
86												
87	**Chromium**											
88												
89					**General Statistics**							
90					Total Number of Observations	11				Number of Distinct Observations		3
91										Number of Missing Observations		0
92					Minimum	7.3				Mean		13.11
93					Maximum	28.9				Median		12
94					SD	5.424				Std. Error of Mean		1.635
95					Coefficient of Variation	0.414				Skewness		2.857
96												
97					**Normal GOF Test**							
98					Shapiro Wilk Test Statistic	0.498		**Shapiro Wilk GOF Test**				
99					5% Shapiro Wilk Critical Value	0.85		Data Not Normal at 5% Significance Level				
100					Lilliefors Test Statistic	0.49		**Lilliefors GOF Test**				
101					5% Lilliefors Critical Value	0.267		Data Not Normal at 5% Significance Level				
102					**Data Not Normal at 5% Significance Level**							
103												
104					**Assuming Normal Distribution**							

	A	B	C	D	E	F	G	H	I	J	K	L
105	95% Normal UCL						95% UCLs (Adjusted for Skewness)					
106					95% Student's-t UCL	16.07				95% Adjusted-CLT UCL (Chen-1995)		17.3
107										95% Modified-t UCL (Johnson-1978)		16.31
108												
109	Gamma GOF Test											
110					A-D Test Statistic	2.572	Anderson-Darling Gamma GOF Test					
111					5% A-D Critical Value	0.73	Data Not Gamma Distributed at 5% Significance Level					
112					K-S Test Statistic	0.472	Kolmogrov-Smirnoff Gamma GOF Test					
113					5% K-S Critical Value	0.255	Data Not Gamma Distributed at 5% Significance Level					
114	Data Not Gamma Distributed at 5% Significance Level											
115												
116	Gamma Statistics											
117					k hat (MLE)	9.478				k star (bias corrected MLE)		6.954
118					Theta hat (MLE)	1.383				Theta star (bias corrected MLE)		1.885
119					nu hat (MLE)	208.5				nu star (bias corrected)		153
120					MLE Mean (bias corrected)	13.11				MLE Sd (bias corrected)		4.971
121										Approximate Chi Square Value (0.05)		125.4
122					Adjusted Level of Significance	0.0278				Adjusted Chi Square Value		121.3
123												
124	Assuming Gamma Distribution											
125					95% Approximate Gamma UCL (use when n>=50))	15.99				95% Adjusted Gamma UCL (use when n<50)		16.53
126												
127	Lognormal GOF Test											
128					Shapiro Wilk Test Statistic	0.59	Shapiro Wilk Lognormal GOF Test					
129					5% Shapiro Wilk Critical Value	0.85	Data Not Lognormal at 5% Significance Level					
130					Lilliefors Test Statistic	0.453	Lilliefors Lognormal GOF Test					
131					5% Lilliefors Critical Value	0.267	Data Not Lognormal at 5% Significance Level					
132	Data Not Lognormal at 5% Significance Level											
133												
134	Lognormal Statistics											
135					Minimum of Logged Data	1.988				Mean of logged Data		2.52
136					Maximum of Logged Data	3.364				SD of logged Data		0.317
137												
138	Assuming Lognormal Distribution											
139					95% H-UCL	15.91				90% Chebyshev (MVUE) UCL		16.77
140					95% Chebyshev (MVUE) UCL	18.47				97.5% Chebyshev (MVUE) UCL		20.84
141					99% Chebyshev (MVUE) UCL	25.49						
142												
143	Nonparametric Distribution Free UCL Statistics											
144	Data do not follow a Discernible Distribution (0.05)											
145												
146	Nonparametric Distribution Free UCLs											
147					95% CLT UCL	15.8				95% Jackknife UCL		16.07
148					95% Standard Bootstrap UCL	N/A				95% Bootstrap-t UCL		N/A
149					95% Hall's Bootstrap UCL	N/A				95% Percentile Bootstrap UCL		N/A
150					95% BCA Bootstrap UCL	N/A						
151					90% Chebyshev(Mean, Sd) UCL	18.02				95% Chebyshev(Mean, Sd) UCL		20.24
152					97.5% Chebyshev(Mean, Sd) UCL	23.32				99% Chebyshev(Mean, Sd) UCL		29.38
153												
154	Suggested UCL to Use											
155					95% Student's-t UCL	16.07				or 95% Modified-t UCL		16.31
156												

	A	B	C	D	E	F	G	H	I	J	K	L
157	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
158	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
159	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
160	For additional insight the user may want to consult a statistician.											
161												
162												
163	**PAH, Total**											
164												
165	**General Statistics**											
166	Total Number of Observations					11	Number of Distinct Observations				1	
167							Number of Missing Observations				0	
168	Minimum					0.0204	Mean				0.0204	
169	Maximum					0.0204	Median				0.0204	
170												
171	**Warning: There is only one distinct observation value in this data set - resulting in '0' variance!**											
172	**ProUCL (or any other software) should not be used on such a data set!**											
173	**The data set for variable PAH, Total was not processed!**											
174												
175	**If possible, compute and collect Data Quality Objectives (DQOs) based sample size and analytical results.**											
176	**The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).**											
177												
178												
179												
180	**Uranium-238**											
181												
182	**General Statistics**											
183	Total Number of Observations					11	Number of Distinct Observations				4	
184							Number of Missing Observations				0	
185	Minimum					1.5	Mean				4.544	
186	Maximum					9.723	Median				4.544	
187	SD					2.016	Std. Error of Mean				0.608	
188	Coefficient of Variation					0.444	Skewness				1.506	
189												
190	**Normal GOF Test**											
191	Shapiro Wilk Test Statistic					0.695	**Shapiro Wilk GOF Test**					
192	5% Shapiro Wilk Critical Value					0.85	Data Not Normal at 5% Significance Level					
193	Lilliefors Test Statistic					0.409	**Lilliefors GOF Test**					
194	5% Lilliefors Critical Value					0.267	Data Not Normal at 5% Significance Level					
195	**Data Not Normal at 5% Significance Level**											
196												
197	**Assuming Normal Distribution**											
198	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
199	95% Student's-t UCL					5.646	95% Adjusted-CLT UCL (Chen-1995)				5.839	
200							95% Modified-t UCL (Johnson-1978)				5.692	
201												
202	**Gamma GOF Test**											
203	A-D Test Statistic					1.65	**Anderson-Darling Gamma GOF Test**					
204	5% A-D Critical Value					0.731	Data Not Gamma Distributed at 5% Significance Level					
205	K-S Test Statistic					0.374	**Kolmogrov-Smirnoff Gamma GOF Test**					
206	5% K-S Critical Value					0.256	Data Not Gamma Distributed at 5% Significance Level					
207	**Data Not Gamma Distributed at 5% Significance Level**											
208												

	A	B	C	D	E	F	G	H	I	J	K	L
209						Gamma Statistics						
210					k hat (MLE)	5.762				k star (bias corrected MLE)		4.251
211					Theta hat (MLE)	0.789				Theta star (bias corrected MLE)		1.069
212					nu hat (MLE)	126.8				nu star (bias corrected)		93.53
213					MLE Mean (bias corrected)	4.544				MLE Sd (bias corrected)		2.204
214										Approximate Chi Square Value (0.05)		72.22
215					Adjusted Level of Significance	0.0278				Adjusted Chi Square Value		69.18
216												
217						Assuming Gamma Distribution						
218				95% Approximate Gamma UCL (use when n>=50))		5.885				95% Adjusted Gamma UCL (use when n<50)		6.144
219												
220						Lognormal GOF Test						
221					Shapiro Wilk Test Statistic	0.745				Shapiro Wilk Lognormal GOF Test		
222					5% Shapiro Wilk Critical Value	0.85				Data Not Lognormal at 5% Significance Level		
223					Lilliefors Test Statistic	0.395				Lilliefors Lognormal GOF Test		
224					5% Lilliefors Critical Value	0.267				Data Not Lognormal at 5% Significance Level		
225						Data Not Lognormal at 5% Significance Level						
226												
227						Lognormal Statistics						
228					Minimum of Logged Data	0.405				Mean of logged Data		1.425
229					Maximum of Logged Data	2.274				SD of logged Data		0.461
230												
231						Assuming Lognormal Distribution						
232					95% H-UCL	6.299				90% Chebyshev (MVUE) UCL		6.514
233					95% Chebyshev (MVUE) UCL	7.392				97.5% Chebyshev (MVUE) UCL		8.612
234					99% Chebyshev (MVUE) UCL	11.01						
235												
236						Nonparametric Distribution Free UCL Statistics						
237						Data do not follow a Discernible Distribution (0.05)						
238												
239						Nonparametric Distribution Free UCLs						
240					95% CLT UCL	5.544				95% Jackknife UCL		5.646
241					95% Standard Bootstrap UCL	N/A				95% Bootstrap-t UCL		N/A
242					95% Hall's Bootstrap UCL	N/A				95% Percentile Bootstrap UCL		N/A
243					95% BCA Bootstrap UCL	N/A						
244					90% Chebyshev(Mean, Sd) UCL	6.368				95% Chebyshev(Mean, Sd) UCL		7.194
245					97.5% Chebyshev(Mean, Sd) UCL	8.34				99% Chebyshev(Mean, Sd) UCL		10.59
246												
247						Suggested UCL to Use						
248					95% Student's-t UCL	5.646				or 95% Modified-t UCL		5.692
249												
250						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
251						These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)						
252						and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.						
253						For additional insight the user may want to consult a statistician.						
254												
255												
256	Vanadium											
257												
258						General Statistics						
259					Total Number of Observations	11				Number of Distinct Observations		8
260										Number of Missing Observations		0

	A	B	C	D	E	F	G	H	I	J	K	L
261					Minimum	95					Mean	114.1
262					Maximum	132					Median	118
263					SD	13.02					Std. Error of Mean	3.925
264					Coefficient of Variation	0.114					Skewness	-0.398
265												
266					Normal GOF Test							
267					Shapiro Wilk Test Statistic	0.908	Shapiro Wilk GOF Test					
268					5% Shapiro Wilk Critical Value	0.85	Data appear Normal at 5% Significance Level					
269					Lilliefors Test Statistic	0.195	Lilliefors GOF Test					
270					5% Lilliefors Critical Value	0.267	Data appear Normal at 5% Significance Level					
271					Data appear Normal at 5% Significance Level							
272												
273					Assuming Normal Distribution							
274			95% Normal UCL				95% UCLs (Adjusted for Skewness)					
275					95% Student's-t UCL	121.2					95% Adjusted-CLT UCL (Chen-1995)	120
276											95% Modified-t UCL (Johnson-1978)	121.1
277												
278					Gamma GOF Test							
279					A-D Test Statistic	0.525	Anderson-Darling Gamma GOF Test					
280					5% A-D Critical Value	0.727	Detected data appear Gamma Distributed at 5% Significance Level					
281					K-S Test Statistic	0.211	Kolmogrov-Smirnoff Gamma GOF Test					
282					5% K-S Critical Value	0.255	Detected data appear Gamma Distributed at 5% Significance Level					
283					Detected data appear Gamma Distributed at 5% Significance Level							
284												
285					Gamma Statistics							
286					k hat (MLE)	81.68					k star (bias corrected MLE)	59.47
287					Theta hat (MLE)	1.397					Theta star (bias corrected MLE)	1.919
288					nu hat (MLE)	1797					nu star (bias corrected)	1308
289					MLE Mean (bias corrected)	114.1					MLE Sd (bias corrected)	14.8
290											Approximate Chi Square Value (0.05)	1225
291					Adjusted Level of Significance	0.0278					Adjusted Chi Square Value	1212
292												
293					Assuming Gamma Distribution							
294					95% Approximate Gamma UCL (use when n>=50))	121.8					95% Adjusted Gamma UCL (use when n<50)	123.1
295												
296					Lognormal GOF Test							
297					Shapiro Wilk Test Statistic	0.894	Shapiro Wilk Lognormal GOF Test					
298					5% Shapiro Wilk Critical Value	0.85	Data appear Lognormal at 5% Significance Level					
299					Lilliefors Test Statistic	0.213	Lilliefors Lognormal GOF Test					
300					5% Lilliefors Critical Value	0.267	Data appear Lognormal at 5% Significance Level					
301					Data appear Lognormal at 5% Significance Level							
302												
303					Lognormal Statistics							
304					Minimum of Logged Data	4.554					Mean of logged Data	4.731
305					Maximum of Logged Data	4.883					SD of logged Data	0.117
306												
307					Assuming Lognormal Distribution							
308					95% H-UCL	122					90% Chebyshev (MVUE) UCL	126.2
309					95% Chebyshev (MVUE) UCL	131.7					97.5% Chebyshev (MVUE) UCL	139.3
310					99% Chebyshev (MVUE) UCL	154.3						
311												
312					Nonparametric Distribution Free UCL Statistics							

	A	B	C	D	E	F	G	H	I	J	K	L
313	Data appear to follow a Discernible Distribution at 5% Significance Level											
314												
315	Nonparametric Distribution Free UCLs											
316					95% CLT UCL	120.5				95% Jackknife UCL		121.2
317					95% Standard Bootstrap UCL	120.3				95% Bootstrap-t UCL		120.4
318					95% Hall's Bootstrap UCL	119.6				95% Percentile Bootstrap UCL		120.4
319					95% BCA Bootstrap UCL	119.8						
320					90% Chebyshev(Mean, Sd) UCL	125.9				95% Chebyshev(Mean, Sd) UCL		131.2
321					97.5% Chebyshev(Mean, Sd) UCL	138.6				99% Chebyshev(Mean, Sd) UCL		153.1
322												
323	Suggested UCL to Use											
324					95% Student's-t UCL	121.2						
325												
326	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
327	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
328	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
329	For additional insight the user may want to consult a statistician.											
330												
331	Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be											
332	reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.											
333												