	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			3/2/2015 7:18:26 PM								
5	From File			EPC_013Surf_EU03.xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**Iron**											
12												
13	**General Statistics**											
14	Total Number of Observations					11	Number of Distinct Observations					11
15							Number of Missing Observations					0
16	Minimum					15990	Mean					21906
17	Maximum					41021	Median					20547
18	SD					6865	Std. Error of Mean					2070
19	Coefficient of Variation					0.313	Skewness					2.47
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic					0.712	**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value					0.85	Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.282	**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					25657	95% Adjusted-CLT UCL (Chen-1995)					26957
31							95% Modified-t UCL (Johnson-1978)					25914
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic					0.846	**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value					0.729	Data Not Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.241	**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value					0.255	Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data follow Appr. Gamma Distribution at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)					14.9	k star (bias corrected MLE)					10.89
42	Theta hat (MLE)					1470	Theta star (bias corrected MLE)					2011
43	nu hat (MLE)					327.7	nu star (bias corrected)					239.7
44	MLE Mean (bias corrected)					21906	MLE Sd (bias corrected)					6637
45							Approximate Chi Square Value (0.05)					204.8
46	Adjusted Level of Significance					0.0278	Adjusted Chi Square Value					199.6
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50)					25631	95% Adjusted Gamma UCL (use when n<50)					26306
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.832	**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	0.223		**Lilliefors Lognormal GOF Test**				
55					5% Lilliefors Critical Value	0.267		Data appear Lognormal at 5% Significance Level				
56					**Data appear Approximate Lognormal at 5% Significance Level**							
57												
58					**Lognormal Statistics**							
59					Minimum of Logged Data	9.68				Mean of logged Data		9.961
60					Maximum of Logged Data	10.62				SD of logged Data		0.256
61												
62					**Assuming Lognormal Distribution**							
63					95% H-UCL	25545				90% Chebyshev (MVUE) UCL		26906
64					95% Chebyshev (MVUE) UCL	29212				97.5% Chebyshev (MVUE) UCL		32413
65					99% Chebyshev (MVUE) UCL	38700						
66												
67					**Nonparametric Distribution Free UCL Statistics**							
68					**Data appear to follow a Discernible Distribution at 5% Significance Level**							
69												
70					**Nonparametric Distribution Free UCLs**							
71					95% CLT UCL	25310				95% Jackknife UCL		25657
72					95% Standard Bootstrap UCL	25229				95% Bootstrap-t UCL		29884
73					95% Hall's Bootstrap UCL	41444				95% Percentile Bootstrap UCL		25647
74					95% BCA Bootstrap UCL	26941						
75					90% Chebyshev(Mean, Sd) UCL	28115				95% Chebyshev(Mean, Sd) UCL		30927
76					97.5% Chebyshev(Mean, Sd) UCL	34831				99% Chebyshev(Mean, Sd) UCL		42499
77												
78					**Suggested UCL to Use**							
79					95% Adjusted Gamma UCL	26306						
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	**Manganese**											
88												
89					**General Statistics**							
90					Total Number of Observations	11				Number of Distinct Observations		11
91										Number of Missing Observations		0
92					Minimum	306				Mean		718.9
93					Maximum	2248				Median		601
94					SD	541.9				Std. Error of Mean		163.4
95					Coefficient of Variation	0.754				Skewness		2.597
96												
97					**Normal GOF Test**							
98					Shapiro Wilk Test Statistic	0.678		**Shapiro Wilk GOF Test**				
99					5% Shapiro Wilk Critical Value	0.85		Data Not Normal at 5% Significance Level				
100					Lilliefors Test Statistic	0.309		**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	1015				95% Adjusted-CLT UCL (Chen-1995)		1124
107										95% Modified-t UCL (Johnson-1978)		1036
108												
109	**Gamma GOF Test**											
110					A-D Test Statistic	0.622	**Anderson-Darling Gamma GOF Test**					
111					5% A-D Critical Value	0.733	Detected data appear Gamma Distributed at 5% Significance Level					
112					K-S Test Statistic	0.215	**Kolmogrov-Smirnoff Gamma GOF Test**					
113					5% K-S Critical Value	0.257	Detected data appear Gamma Distributed at 5% Significance Level					
114	**Detected data appear Gamma Distributed at 5% Significance Level**											
115												
116	**Gamma Statistics**											
117					k hat (MLE)	3.11				k star (bias corrected MLE)		2.322
118					Theta hat (MLE)	231.2				Theta star (bias corrected MLE)		309.6
119					nu hat (MLE)	68.41				nu star (bias corrected)		51.09
120					MLE Mean (bias corrected)	718.9				MLE Sd (bias corrected)		471.8
121										Approximate Chi Square Value (0.05)		35.67
122					Adjusted Level of Significance	0.0278				Adjusted Chi Square Value		33.58
123												
124	**Assuming Gamma Distribution**											
125				95% Approximate Gamma UCL (use when n>=50)		1030				95% Adjusted Gamma UCL (use when n<50)		1094
126												
127	**Lognormal GOF Test**											
128					Shapiro Wilk Test Statistic	0.907	**Shapiro Wilk Lognormal GOF Test**					
129					5% Shapiro Wilk Critical Value	0.85	Data appear Lognormal at 5% Significance Level					
130					Lilliefors Test Statistic	0.179	**Lilliefors Lognormal GOF Test**					
131					5% Lilliefors Critical Value	0.267	Data appear Lognormal at 5% Significance Level					
132	**Data appear Lognormal at 5% Significance Level**											
133												
134	**Lognormal Statistics**											
135					Minimum of Logged Data	5.724				Mean of logged Data		6.408
136					Maximum of Logged Data	7.718				SD of logged Data		0.562
137												
138	**Assuming Lognormal Distribution**											
139					95% H-UCL	1062				90% Chebyshev (MVUE) UCL		1064
140					95% Chebyshev (MVUE) UCL	1229				97.5% Chebyshev (MVUE) UCL		1459
141					99% Chebyshev (MVUE) UCL	1909						
142												
143	**Nonparametric Distribution Free UCL Statistics**											
144	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
145												
146	**Nonparametric Distribution Free UCLs**											
147					95% CLT UCL	987.7				95% Jackknife UCL		1015
148					95% Standard Bootstrap UCL	981				95% Bootstrap-t UCL		1365
149					95% Hall's Bootstrap UCL	2082				95% Percentile Bootstrap UCL		1017
150					95% BCA Bootstrap UCL	1153						
151					90% Chebyshev(Mean, Sd) UCL	1209				95% Chebyshev(Mean, Sd) UCL		1431
152					97.5% Chebyshev(Mean, Sd) UCL	1739				99% Chebyshev(Mean, Sd) UCL		2345
153												
154	**Suggested UCL to Use**											
155					95% Adjusted Gamma UCL	1094						
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	**Molybdenum**											
164												
165	**General Statistics**											
166	Total Number of Observations					11	Number of Distinct Observations					3
167							Number of Missing Observations					0
168	Minimum					0.33	Mean					6.303
169	Maximum					42	Median					3
170	SD					11.87	Std. Error of Mean					3.578
171	Coefficient of Variation					1.883	Skewness					3.288
172												
173	**Normal GOF Test**											
174	Shapiro Wilk Test Statistic					0.387	**Shapiro Wilk GOF Test**					
175	5% Shapiro Wilk Critical Value					0.85	Data Not Normal at 5% Significance Level					
176	Lilliefors Test Statistic					0.519	**Lilliefors GOF Test**					
177	5% Lilliefors Critical Value					0.267	Data Not Normal at 5% Significance Level					
178	**Data Not Normal at 5% Significance Level**											
179												
180	**Assuming Normal Distribution**											
181	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
182	95% Student's-t UCL					12.79	95% Adjusted-CLT UCL (Chen-1995)					15.98
183							95% Modified-t UCL (Johnson-1978)					13.38
184												
185	**Gamma GOF Test**											
186	A-D Test Statistic					2.693	**Anderson-Darling Gamma GOF Test**					
187	5% A-D Critical Value					0.759	Data Not Gamma Distributed at 5% Significance Level					
188	K-S Test Statistic					0.497	**Kolmogrov-Smirnoff Gamma GOF Test**					
189	5% K-S Critical Value					0.264	Data Not Gamma Distributed at 5% Significance Level					
190	**Data Not Gamma Distributed at 5% Significance Level**											
191												
192	**Gamma Statistics**											
193	k hat (MLE)					0.839	k star (bias corrected MLE)					0.671
194	Theta hat (MLE)					7.513	Theta star (bias corrected MLE)					9.397
195	nu hat (MLE)					18.46	nu star (bias corrected)					14.76
196	MLE Mean (bias corrected)					6.303	MLE Sd (bias corrected)					7.696
197							Approximate Chi Square Value (0.05)					7.092
198	Adjusted Level of Significance					0.0278	Adjusted Chi Square Value					6.245
199												
200	**Assuming Gamma Distribution**											
201	95% Approximate Gamma UCL (use when n>=50))					13.11	95% Adjusted Gamma UCL (use when n<50)					14.89
202												
203	**Lognormal GOF Test**											
204	Shapiro Wilk Test Statistic					0.623	**Shapiro Wilk Lognormal GOF Test**					
205	5% Shapiro Wilk Critical Value					0.85	Data Not Lognormal at 5% Significance Level					
206	Lilliefors Test Statistic					0.423	**Lilliefors Lognormal GOF Test**					
207	5% Lilliefors Critical Value					0.267	Data Not Lognormal at 5% Significance Level					
208	**Data Not Lognormal at 5% Significance Level**											

	A	B	C	D	E	F	G	H	I	J	K	L
209												
210						Lognormal Statistics						
211					Minimum of Logged Data	-1.109				Mean of logged Data		1.138
212					Maximum of Logged Data	3.738				SD of logged Data		1.087
213												
214						Assuming Lognormal Distribution						
215					95% H-UCL	16.74				90% Chebyshev (MVUE) UCL		10.69
216					95% Chebyshev (MVUE) UCL	13.17				97.5% Chebyshev (MVUE) UCL		16.61
217					99% Chebyshev (MVUE) UCL	23.37						
218												
219						Nonparametric Distribution Free UCL Statistics						
220						Data do not follow a Discernible Distribution (0.05)						
221												
222						Nonparametric Distribution Free UCLs						
223					95% CLT UCL	12.19				95% Jackknife UCL		12.79
224					95% Standard Bootstrap UCL	N/A				95% Bootstrap-t UCL		N/A
225					95% Hall's Bootstrap UCL	N/A				95% Percentile Bootstrap UCL		N/A
226					95% BCA Bootstrap UCL	N/A						
227					90% Chebyshev(Mean, Sd) UCL	17.04				95% Chebyshev(Mean, Sd) UCL		21.9
228					97.5% Chebyshev(Mean, Sd) UCL	28.65				99% Chebyshev(Mean, Sd) UCL		41.9
229												
230						Suggested UCL to Use						
231					95% Chebyshev (Mean, Sd) UCL	21.9						
232												
233						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
234						These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)						
235						and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.						
236						For additional insight the user may want to consult a statistician.						
237												
238												
239	PAH, Total											
240												
241						General Statistics						
242					Total Number of Observations	11				Number of Distinct Observations		1
243										Number of Missing Observations		0
244					Minimum	0.0215				Mean		0.0215
245					Maximum	0.0215				Median		0.0215
246												
247						Warning: There is only one distinct observation value in this data set - resulting in '0' variance!						
248						ProUCL (or any other software) should not be used on such a data set!						
249						The data set for variable PAH, Total was not processed!						
250												
251						If possible, compute and collect Data Quality Objectives (DQOs) based sample size and analytical results.						
252						The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).						
253												
254												
255												
256	Vanadium											
257												
258						General Statistics						
259					Total Number of Observations	11				Number of Distinct Observations		9
260										Number of Missing Observations		0

	A	B	C	D	E	F	G	H	I	J	K	L
261					Minimum	72					Mean	91.09
262					Maximum	116					Median	92
263					SD	14.07					Std. Error of Mean	4.241
264					Coefficient of Variation	0.154					Skewness	0.434
265												
266					Normal GOF Test							
267					Shapiro Wilk Test Statistic	0.94	Shapiro Wilk GOF Test					
268					5% Shapiro Wilk Critical Value	0.85	Data appear Normal at 5% Significance Level					
269					Lilliefors Test Statistic	0.169	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	98.78					95% Adjusted-CLT UCL (Chen-1995)	98.66
276											95% Modified-t UCL (Johnson-1978)	98.87
277												
278					Gamma GOF Test							
279					A-D Test Statistic	0.331	Anderson-Darling Gamma GOF Test					
280					5% A-D Critical Value	0.728	Detected data appear Gamma Distributed at 5% Significance Level					
281					K-S Test Statistic	0.181	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)	47.06					k star (bias corrected MLE)	34.29
287					Theta hat (MLE)	1.936					Theta star (bias corrected MLE)	2.657
288					nu hat (MLE)	1035					nu star (bias corrected)	754.3
289					MLE Mean (bias corrected)	91.09					MLE Sd (bias corrected)	15.56
290											Approximate Chi Square Value (0.05)	691.6
291					Adjusted Level of Significance	0.0278					Adjusted Chi Square Value	681.8
292												
293					Assuming Gamma Distribution							
294					95% Approximate Gamma UCL (use when n>=50))	99.35					95% Adjusted Gamma UCL (use when n<50)	100.8
295												
296					Lognormal GOF Test							
297					Shapiro Wilk Test Statistic	0.949	Shapiro Wilk Lognormal GOF Test					
298					5% Shapiro Wilk Critical Value	0.85	Data appear Lognormal at 5% Significance Level					
299					Lilliefors Test Statistic	0.17	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	4.277					Mean of logged Data	4.501
305					Maximum of Logged Data	4.754					SD of logged Data	0.153
306												
307					Assuming Lognormal Distribution							
308					95% H-UCL	99.57					90% Chebyshev (MVUE) UCL	103.7
309					95% Chebyshev (MVUE) UCL	109.4					97.5% Chebyshev (MVUE) UCL	117.3
310					99% Chebyshev (MVUE) UCL	132.9						
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	98.07				95% Jackknife UCL		98.78
317					95% Standard Bootstrap UCL	97.73				95% Bootstrap-t UCL		99.35
318					95% Hall's Bootstrap UCL	98.75				95% Percentile Bootstrap UCL		97.64
319					95% BCA Bootstrap UCL	98.27						
320					90% Chebyshev(Mean, Sd) UCL	103.8				95% Chebyshev(Mean, Sd) UCL		109.6
321					97.5% Chebyshev(Mean, Sd) UCL	117.6				99% Chebyshev(Mean, Sd) UCL		133.3
322												
323	Suggested UCL to Use											
324					95% Student's-t UCL	98.78						
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												