	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 7:24:06 PM								
5	From File			EPC_013Sub_EU08.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					15	Number of Distinct Observations					15
15							Number of Missing Observations					0
16	Minimum					17679	Mean					22458
17	Maximum					31310	Median					21226
18	SD					3636	Std. Error of Mean					938.8
19	Coefficient of Variation					0.162	Skewness					1.043
20												
21	Normal GOF Test											
22	Shapiro Wilk Test Statistic					0.929	Shapiro Wilk GOF Test					
23	5% Shapiro Wilk Critical Value					0.881	Data appear Normal at 5% Significance Level					
24	Lilliefors Test Statistic					0.166	Lilliefors GOF Test					
25	5% Lilliefors Critical Value					0.229	Data appear Normal at 5% Significance Level					
26	Data appear 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					24112	95% Adjusted-CLT UCL (Chen-1995)					24273
31							95% Modified-t UCL (Johnson-1978)					24154
32												
33	Gamma GOF Test											
34	A-D Test Statistic					0.298	Anderson-Darling Gamma GOF Test					
35	5% A-D Critical Value					0.734	Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic					0.159	Kolmogrov-Smirnoff Gamma GOF Test					
37	5% K-S Critical Value					0.221	Detected data appear Gamma Distributed at 5% Significance Level					
38	Detected data appear Gamma Distributed at 5% Significance Level											
39												
40	Gamma Statistics											
41	k hat (MLE)					43.8	k star (bias corrected MLE)					35.08
42	Theta hat (MLE)					512.7	Theta star (bias corrected MLE)					640.1
43	nu hat (MLE)					1314	nu star (bias corrected)					1053
44	MLE Mean (bias corrected)					22458	MLE Sd (bias corrected)					3792
45							Approximate Chi Square Value (0.05)					978.2
46	Adjusted Level of Significance					0.0324	Adjusted Chi Square Value					969.4
47												
48	Assuming Gamma Distribution											
49	95% Approximate Gamma UCL (use when n>=50))					24164	95% Adjusted Gamma UCL (use when n<50)					24384
50												
51	Lognormal GOF Test											
52	Shapiro Wilk Test Statistic					0.963	Shapiro Wilk Lognormal GOF Test					

	A	B	C	D	E	F	G	H	I	J	K	L
53					5% Shapiro Wilk Critical Value	0.881	Data appear Lognormal at 5% Significance Level					
54					Lilliefors Test Statistic	0.148	**Lilliefors Lognormal GOF Test**					
55					5% Lilliefors Critical Value	0.229	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59					Minimum of Logged Data	9.78				Mean of logged Data		10.01
60					Maximum of Logged Data	10.35				SD of logged Data		0.154
61												
62	**Assuming Lognormal Distribution**											
63					95% H-UCL	24181				90% Chebyshev (MVUE) UCL		25144
64					95% Chebyshev (MVUE) UCL	26365				97.5% Chebyshev (MVUE) UCL		28058
65					99% Chebyshev (MVUE) UCL	31385						
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	24002				95% Jackknife UCL		24112
72					95% Standard Bootstrap UCL	23940				95% Bootstrap-t UCL		24499
73					95% Hall's Bootstrap UCL	24787				95% Percentile Bootstrap UCL		23942
74					95% BCA Bootstrap UCL	24238						
75					90% Chebyshev(Mean, Sd) UCL	25275				95% Chebyshev(Mean, Sd) UCL		26550
76					97.5% Chebyshev(Mean, Sd) UCL	28321				99% Chebyshev(Mean, Sd) UCL		31799
77												
78	**Suggested UCL to Use**											
79					95% Student's-t UCL	24112						
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	15				Number of Distinct Observations		15
91										Number of Missing Observations		0
92					Minimum	205				Mean		910.1
93					Maximum	1927				Median		850
94					SD	463.1				Std. Error of Mean		119.6
95					Coefficient of Variation	0.509				Skewness		0.955
96												
97	**Normal GOF Test**											
98					Shapiro Wilk Test Statistic	0.917	**Shapiro Wilk GOF Test**					
99					5% Shapiro Wilk Critical Value	0.881	Data appear Normal at 5% Significance Level					
100					Lilliefors Test Statistic	0.166	**Lilliefors GOF Test**					
101					5% Lilliefors Critical Value	0.229	Data appear Normal at 5% Significance Level					
102	**Data appear 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	1121				95% Adjusted-CLT UCL (Chen-1995)		1138
107										95% Modified-t UCL (Johnson-1978)		1126
108												
109	**Gamma GOF Test**											
110					A-D Test Statistic	0.302	**Anderson-Darling Gamma GOF Test**					
111					5% A-D Critical Value	0.74	Detected data appear Gamma Distributed at 5% Significance Level					
112					K-S Test Statistic	0.135	**Kolmogrov-Smirnoff Gamma GOF Test**					
113					5% K-S Critical Value	0.223	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)	4.067				k star (bias corrected MLE)		3.298
118					Theta hat (MLE)	223.8				Theta star (bias corrected MLE)		275.9
119					nu hat (MLE)	122				nu star (bias corrected)		98.94
120					MLE Mean (bias corrected)	910.1				MLE Sd (bias corrected)		501.1
121										Approximate Chi Square Value (0.05)		76.99
122					Adjusted Level of Significance	0.0324				Adjusted Chi Square Value		74.61
123												
124	**Assuming Gamma Distribution**											
125					95% Approximate Gamma UCL (use when n>=50))	1169				95% Adjusted Gamma UCL (use when n<50)		1207
126												
127	**Lognormal GOF Test**											
128					Shapiro Wilk Test Statistic	0.941	**Shapiro Wilk Lognormal GOF Test**					
129					5% Shapiro Wilk Critical Value	0.881	Data appear Lognormal at 5% Significance Level					
130					Lilliefors Test Statistic	0.166	**Lilliefors Lognormal GOF Test**					
131					5% Lilliefors Critical Value	0.229	Data appear Lognormal at 5% Significance Level					
132	**Data appear Lognormal at 5% Significance Level**											
133												
134	**Lognormal Statistics**											
135					Minimum of Logged Data	5.323				Mean of logged Data		6.686
136					Maximum of Logged Data	7.564				SD of logged Data		0.551
137												
138	**Assuming Lognormal Distribution**											
139					95% H-UCL	1273				90% Chebyshev (MVUE) UCL		1328
140					95% Chebyshev (MVUE) UCL	1512				97.5% Chebyshev (MVUE) UCL		1768
141					99% Chebyshev (MVUE) UCL	2271						
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	1107				95% Jackknife UCL		1121
148					95% Standard Bootstrap UCL	1100				95% Bootstrap-t UCL		1176
149					95% Hall's Bootstrap UCL	1215				95% Percentile Bootstrap UCL		1118
150					95% BCA Bootstrap UCL	1134						
151					90% Chebyshev(Mean, Sd) UCL	1269				95% Chebyshev(Mean, Sd) UCL		1431
152					97.5% Chebyshev(Mean, Sd) UCL	1657				99% Chebyshev(Mean, Sd) UCL		2100
153												
154	**Suggested UCL to Use**											
155					95% Student's-t UCL	1121						
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					15	Number of Distinct Observations				5	
167							Number of Missing Observations				0	
168	Minimum					0.0122	Mean				0.409	
169	Maximum					0.5	Median				0.409	
170	SD					0.116	Std. Error of Mean				0.03	
171	Coefficient of Variation					0.284	Skewness				-3.142	
172												
173	Normal GOF Test											
174	Shapiro Wilk Test Statistic					0.547	Shapiro Wilk GOF Test					
175	5% Shapiro Wilk Critical Value					0.881	Data Not Normal at 5% Significance Level					
176	Lilliefors Test Statistic					0.433	Lilliefors GOF Test					
177	5% Lilliefors Critical Value					0.229	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					0.462	95% Adjusted-CLT UCL (Chen-1995)				0.432	
183							95% Modified-t UCL (Johnson-1978)				0.457	
184												
185	Gamma GOF Test											
186	A-D Test Statistic					4.02	Anderson-Darling Gamma GOF Test					
187	5% A-D Critical Value					0.744	Data Not Gamma Distributed at 5% Significance Level					
188	K-S Test Statistic					0.51	Kolmogrov-Smirnoff Gamma GOF Test					
189	5% K-S Critical Value					0.223	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)					3.011	k star (bias corrected MLE)				2.453	
194	Theta hat (MLE)					0.136	Theta star (bias corrected MLE)				0.167	
195	nu hat (MLE)					90.34	nu star (bias corrected)				73.6	
196	MLE Mean (bias corrected)					0.409	MLE Sd (bias corrected)				0.261	
197							Approximate Chi Square Value (0.05)				54.85	
198	Adjusted Level of Significance					0.0324	Adjusted Chi Square Value				52.86	
199												
200	Assuming Gamma Distribution											
201	95% Approximate Gamma UCL (use when n>=50))					0.548	95% Adjusted Gamma UCL (use when n<50)				0.569	
202												
203	Lognormal GOF Test											
204	Shapiro Wilk Test Statistic					0.356	Shapiro Wilk Lognormal GOF Test					
205	5% Shapiro Wilk Critical Value					0.881	Data Not Lognormal at 5% Significance Level					
206	Lilliefors Test Statistic					0.508	Lilliefors Lognormal GOF Test					
207	5% Lilliefors Critical Value					0.229	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	-4.408				Mean of logged Data		-1.07
212					Maximum of Logged Data	-0.693				SD of logged Data		0.927
213												
214						Assuming Lognormal Distribution						
215					95% H-UCL	1.012				90% Chebyshev (MVUE) UCL		0.903
216					95% Chebyshev (MVUE) UCL	1.082				97.5% Chebyshev (MVUE) UCL		1.33
217					99% Chebyshev (MVUE) UCL	1.818						
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	0.458				95% Jackknife UCL		0.462
224					95% Standard Bootstrap UCL	0.457				95% Bootstrap-t UCL		0.444
225					95% Hall's Bootstrap UCL	0.443				95% Percentile Bootstrap UCL		0.447
226					95% BCA Bootstrap UCL	0.44						
227					90% Chebyshev(Mean, Sd) UCL	0.499				95% Chebyshev(Mean, Sd) UCL		0.539
228					97.5% Chebyshev(Mean, Sd) UCL	0.596				99% Chebyshev(Mean, Sd) UCL		0.707
229												
230						Suggested UCL to Use						
231					95% Chebyshev (Mean, Sd) UCL	0.539						
232												
233						Recommended UCL exceeds the maximum observation						
234												
235						Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.						
236						These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)						
237						and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.						
238						For additional insight the user may want to consult a statistician.						
239												
240						Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be						
241						reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.						
242												
243												
244	Vanadium											
245												
246						General Statistics						
247					Total Number of Observations	15				Number of Distinct Observations		13
248										Number of Missing Observations		0
249					Minimum	78				Mean		94.47
250					Maximum	118				Median		96
251					SD	11.51				Std. Error of Mean		2.973
252					Coefficient of Variation	0.122				Skewness		0.516
253												
254						Normal GOF Test						
255					Shapiro Wilk Test Statistic	0.956				Shapiro Wilk GOF Test		
256					5% Shapiro Wilk Critical Value	0.881				Data appear Normal at 5% Significance Level		
257					Lilliefors Test Statistic	0.123				Lilliefors GOF Test		
258					5% Lilliefors Critical Value	0.229				Data appear Normal at 5% Significance Level		
259						Data appear Normal at 5% Significance Level						
260												

	A	B	C	D	E	F	G	H	I	J	K	L
261	Assuming Normal Distribution											
262	95% Normal UCL						95% UCLs (Adjusted for Skewness)					
263					95% Student's-t UCL	99.7				95% Adjusted-CLT UCL (Chen-1995)		99.78
264										95% Modified-t UCL (Johnson-1978)		99.77
265												
266	Gamma GOF Test											
267					A-D Test Statistic	0.232	Anderson-Darling Gamma GOF Test					
268					5% A-D Critical Value	0.734	Detected data appear Gamma Distributed at 5% Significance Level					
269					K-S Test Statistic	0.107	Kolmogrov-Smirnoff Gamma GOF Test					
270					5% K-S Critical Value	0.221	Detected data appear Gamma Distributed at 5% Significance Level					
271	Detected data appear Gamma Distributed at 5% Significance Level											
272												
273	Gamma Statistics											
274					k hat (MLE)	73.78				k star (bias corrected MLE)		59.07
275					Theta hat (MLE)	1.28				Theta star (bias corrected MLE)		1.599
276					nu hat (MLE)	2214				nu star (bias corrected)		1772
277					MLE Mean (bias corrected)	94.47				MLE Sd (bias corrected)		12.29
278										Approximate Chi Square Value (0.05)		1675
279					Adjusted Level of Significance	0.0324				Adjusted Chi Square Value		1664
280												
281	Assuming Gamma Distribution											
282				95% Approximate Gamma UCL (use when n>=50))		99.92				95% Adjusted Gamma UCL (use when n<50)		100.6
283												
284	Lognormal GOF Test											
285					Shapiro Wilk Test Statistic	0.967	Shapiro Wilk Lognormal GOF Test					
286					5% Shapiro Wilk Critical Value	0.881	Data appear Lognormal at 5% Significance Level					
287					Lilliefors Test Statistic	0.11	Lilliefors Lognormal GOF Test					
288					5% Lilliefors Critical Value	0.229	Data appear Lognormal at 5% Significance Level					
289	Data appear Lognormal at 5% Significance Level											
290												
291	Lognormal Statistics											
292					Minimum of Logged Data	4.357				Mean of logged Data		4.541
293					Maximum of Logged Data	4.771				SD of logged Data		0.12
294												
295	Assuming Lognormal Distribution											
296					95% H-UCL	100				90% Chebyshev (MVUE) UCL		103.3
297					95% Chebyshev (MVUE) UCL	107.3				97.5% Chebyshev (MVUE) UCL		112.8
298					99% Chebyshev (MVUE) UCL	123.7						
299												
300	Nonparametric Distribution Free UCL Statistics											
301	Data appear to follow a Discernible Distribution at 5% Significance Level											
302												
303	Nonparametric Distribution Free UCLs											
304					95% CLT UCL	99.36				95% Jackknife UCL		99.7
305					95% Standard Bootstrap UCL	99.13				95% Bootstrap-t UCL		100.1
306					95% Hall's Bootstrap UCL	100.5				95% Percentile Bootstrap UCL		99.27
307					95% BCA Bootstrap UCL	99.4						
308					90% Chebyshev(Mean, Sd) UCL	103.4				95% Chebyshev(Mean, Sd) UCL		107.4
309					97.5% Chebyshev(Mean, Sd) UCL	113				99% Chebyshev(Mean, Sd) UCL		124
310												
311	Suggested UCL to Use											
312					95% Student's-t UCL	99.7						

	A	B	C	D	E	F	G	H	I	J	K	L
313												
314	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
315	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
316	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
317	For additional insight the user may want to consult a statistician.											
318												