	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 7:27:17 PM								
5	From File			EPC_013Sub_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	25184				95% Bootstrap-t UCL		30138
73					95% Hall's Bootstrap UCL	41105				95% Percentile Bootstrap UCL		25614
74					95% BCA Bootstrap UCL	26819						
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	974.4				95% Bootstrap-t UCL		1376
149					95% Hall's Bootstrap UCL	2080				95% Percentile Bootstrap UCL		1030
150					95% BCA Bootstrap UCL	1104						
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					4
167							Number of Missing Observations					0
168	Minimum					0.33	Mean					6.191
169	Maximum					42	Median					3
170	SD					11.91	Std. Error of Mean					3.59
171	Coefficient of Variation					1.923	Skewness					3.285
172												
173	**Normal GOF Test**											
174	Shapiro Wilk Test Statistic					0.398	**Shapiro Wilk GOF Test**					
175	5% Shapiro Wilk Critical Value					0.85	Data Not Normal at 5% Significance Level					
176	Lilliefors Test Statistic					0.515	**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					12.7	95% Adjusted-CLT UCL (Chen-1995)					15.9
183							95% Modified-t UCL (Johnson-1978)					13.29
184												
185	**Gamma GOF Test**											
186	A-D Test Statistic					2.377	**Anderson-Darling Gamma GOF Test**					
187	5% A-D Critical Value					0.76	Data Not Gamma Distributed at 5% Significance Level					
188	K-S Test Statistic					0.485	**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)					0.808	k star (bias corrected MLE)					0.649
194	Theta hat (MLE)					7.659	Theta star (bias corrected MLE)					9.546
195	nu hat (MLE)					17.78	nu star (bias corrected)					14.27
196	MLE Mean (bias corrected)					6.191	MLE Sd (bias corrected)					7.688
197							Approximate Chi Square Value (0.05)					6.755
198	Adjusted Level of Significance					0.0278	Adjusted Chi Square Value					5.932
199												
200	**Assuming Gamma Distribution**											
201	95% Approximate Gamma UCL (use when n>=50))					13.08	95% Adjusted Gamma UCL (use when n<50)					14.89
202												
203	**Lognormal GOF Test**											
204	Shapiro Wilk Test Statistic					0.689	**Shapiro Wilk Lognormal GOF Test**					
205	5% Shapiro Wilk Critical Value					0.85	Data Not Lognormal at 5% Significance Level					
206	Lilliefors Test Statistic					0.406	**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		1.09
212					Maximum of Logged Data	3.738				SD of logged Data		1.101
213												
214						Assuming Lognormal Distribution						
215					95% H-UCL	16.57				90% Chebyshev (MVUE) UCL		10.39
216					95% Chebyshev (MVUE) UCL	12.81				97.5% Chebyshev (MVUE) UCL		16.18
217					99% Chebyshev (MVUE) UCL	22.78						
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	12.1				95% Jackknife UCL		12.7
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	16.96				95% Chebyshev(Mean, Sd) UCL		21.84
228					97.5% Chebyshev(Mean, Sd) UCL	28.61				99% Chebyshev(Mean, Sd) UCL		41.91
229												
230						Suggested UCL to Use						
231					95% Chebyshev (Mean, Sd) UCL	21.84						
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		4
243										Number of Missing Observations		0
244					Minimum	0.0215				Mean		0.334
245					Maximum	0.5				Median		0.334
246					SD	0.121				Std. Error of Mean		0.0365
247					Coefficient of Variation	0.363				Skewness		-1.568
248												
249						Normal GOF Test						
250					Shapiro Wilk Test Statistic	0.683				Shapiro Wilk GOF Test		
251					5% Shapiro Wilk Critical Value	0.85				Data Not Normal at 5% Significance Level		
252					Lilliefors Test Statistic	0.409				Lilliefors GOF Test		
253					5% Lilliefors Critical Value	0.267				Data Not Normal at 5% Significance Level		
254						Data Not Normal at 5% Significance Level						
255												
256						Assuming Normal Distribution						
257					95% Normal UCL					95% UCLs (Adjusted for Skewness)		
258					95% Student's-t UCL	0.4				95% Adjusted-CLT UCL (Chen-1995)		0.375
259										95% Modified-t UCL (Johnson-1978)		0.397
260												

	A	B	C	D	E	F	G	H	I	J	K	L
261	Gamma GOF Test											
262					A-D Test Statistic	2.478	Anderson-Darling Gamma GOF Test					
263					5% A-D Critical Value	0.734	Data Not Gamma Distributed at 5% Significance Level					
264					K-S Test Statistic	0.487	Kolmogrov-Smirnoff Gamma GOF Test					
265					5% K-S Critical Value	0.257	Data Not Gamma Distributed at 5% Significance Level					
266	Data Not Gamma Distributed at 5% Significance Level											
267												
268	Gamma Statistics											
269					k hat (MLE)	2.941			k star (bias corrected MLE)			2.2
270					Theta hat (MLE)	0.113			Theta star (bias corrected MLE)			0.152
271					nu hat (MLE)	64.71			nu star (bias corrected)			48.4
272					MLE Mean (bias corrected)	0.334			MLE Sd (bias corrected)			0.225
273									Approximate Chi Square Value (0.05)			33.43
274					Adjusted Level of Significance	0.0278			Adjusted Chi Square Value			31.41
275												
276	Assuming Gamma Distribution											
277					95% Approximate Gamma UCL (use when n>=50))	0.483			95% Adjusted Gamma UCL (use when n<50)			0.514
278												
279	Lognormal GOF Test											
280					Shapiro Wilk Test Statistic	0.475	Shapiro Wilk Lognormal GOF Test					
281					5% Shapiro Wilk Critical Value	0.85	Data Not Lognormal at 5% Significance Level					
282					Lilliefors Test Statistic	0.491	Lilliefors Lognormal GOF Test					
283					5% Lilliefors Critical Value	0.267	Data Not Lognormal at 5% Significance Level					
284	Data Not Lognormal at 5% Significance Level											
285												
286	Lognormal Statistics											
287					Minimum of Logged Data	-3.839			Mean of logged Data			-1.277
288					Maximum of Logged Data	-0.693			SD of logged Data			0.864
289												
290	Assuming Lognormal Distribution											
291					95% H-UCL	0.857			90% Chebyshev (MVUE) UCL			0.706
292					95% Chebyshev (MVUE) UCL	0.85			97.5% Chebyshev (MVUE) UCL			1.05
293					99% Chebyshev (MVUE) UCL	1.443						
294												
295	Nonparametric Distribution Free UCL Statistics											
296	Data do not follow a Discernible Distribution (0.05)											
297												
298	Nonparametric Distribution Free UCLs											
299					95% CLT UCL	0.394			95% Jackknife UCL			0.4
300					95% Standard Bootstrap UCL	N/A			95% Bootstrap-t UCL			N/A
301					95% Hall's Bootstrap UCL	N/A			95% Percentile Bootstrap UCL			N/A
302					95% BCA Bootstrap UCL	N/A						
303					90% Chebyshev(Mean, Sd) UCL	0.443			95% Chebyshev(Mean, Sd) UCL			0.493
304					97.5% Chebyshev(Mean, Sd) UCL	0.562			99% Chebyshev(Mean, Sd) UCL			0.697
305												
306	Suggested UCL to Use											
307					95% Chebyshev (Mean, Sd) UCL	0.493						
308												
309	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
310	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
311	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
312	For additional insight the user may want to consult a statistician.											

	A	B	C	D	E	F	G	H	I	J	K	L
313												
314	Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be											
315	reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.											
316												
317												
318	Vanadium											
319												
320						General Statistics						
321					Total Number of Observations	11				Number of Distinct Observations		9
322										Number of Missing Observations		0
323					Minimum	72				Mean		91.09
324					Maximum	116				Median		92
325					SD	14.07				Std. Error of Mean		4.241
326					Coefficient of Variation	0.154				Skewness		0.434
327												
328						Normal GOF Test						
329					Shapiro Wilk Test Statistic	0.94				Shapiro Wilk GOF Test		
330					5% Shapiro Wilk Critical Value	0.85				Data appear Normal at 5% Significance Level		
331					Lilliefors Test Statistic	0.169				Lilliefors GOF Test		
332					5% Lilliefors Critical Value	0.267				Data appear Normal at 5% Significance Level		
333						Data appear Normal at 5% Significance Level						
334												
335						Assuming Normal Distribution						
336					95% Normal UCL					95% UCLs (Adjusted for Skewness)		
337					95% Student's-t UCL	98.78				95% Adjusted-CLT UCL (Chen-1995)		98.66
338										95% Modified-t UCL (Johnson-1978)		98.87
339												
340						Gamma GOF Test						
341					A-D Test Statistic	0.331				Anderson-Darling Gamma GOF Test		
342					5% A-D Critical Value	0.728				Detected data appear Gamma Distributed at 5% Significance Level		
343					K-S Test Statistic	0.181				Kolmogrov-Smirnoff Gamma GOF Test		
344					5% K-S Critical Value	0.255				Detected data appear Gamma Distributed at 5% Significance Level		
345						Detected data appear Gamma Distributed at 5% Significance Level						
346												
347						Gamma Statistics						
348					k hat (MLE)	47.06				k star (bias corrected MLE)		34.29
349					Theta hat (MLE)	1.936				Theta star (bias corrected MLE)		2.657
350					nu hat (MLE)	1035				nu star (bias corrected)		754.3
351					MLE Mean (bias corrected)	91.09				MLE Sd (bias corrected)		15.56
352										Approximate Chi Square Value (0.05)		691.6
353					Adjusted Level of Significance	0.0278				Adjusted Chi Square Value		681.8
354												
355						Assuming Gamma Distribution						
356					95% Approximate Gamma UCL (use when n>=50))	99.35				95% Adjusted Gamma UCL (use when n<50)		100.8
357												
358						Lognormal GOF Test						
359					Shapiro Wilk Test Statistic	0.949				Shapiro Wilk Lognormal GOF Test		
360					5% Shapiro Wilk Critical Value	0.85				Data appear Lognormal at 5% Significance Level		
361					Lilliefors Test Statistic	0.17				Lilliefors Lognormal GOF Test		
362					5% Lilliefors Critical Value	0.267				Data appear Lognormal at 5% Significance Level		
363						Data appear Lognormal at 5% Significance Level						
364												

	A	B	C	D	E	F	G	H	I	J	K	L
365	**Lognormal Statistics**											
366					Minimum of Logged Data	4.277				Mean of logged Data		4.501
367					Maximum of Logged Data	4.754				SD of logged Data		0.153
368												
369	**Assuming Lognormal Distribution**											
370					95% H-UCL	99.57				90% Chebyshev (MVUE) UCL		103.7
371					95% Chebyshev (MVUE) UCL	109.4				97.5% Chebyshev (MVUE) UCL		117.3
372					99% Chebyshev (MVUE) UCL	132.9						
373												
374	**Nonparametric Distribution Free UCL Statistics**											
375	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
376												
377	**Nonparametric Distribution Free UCLs**											
378					95% CLT UCL	98.07				95% Jackknife UCL		98.78
379					95% Standard Bootstrap UCL	97.65				95% Bootstrap-t UCL		99.46
380					95% Hall's Bootstrap UCL	98.03				95% Percentile Bootstrap UCL		97.82
381					95% BCA Bootstrap UCL	97.91						
382					90% Chebyshev(Mean, Sd) UCL	103.8				95% Chebyshev(Mean, Sd) UCL		109.6
383					97.5% Chebyshev(Mean, Sd) UCL	117.6				99% Chebyshev(Mean, Sd) UCL		133.3
384												
385	**Suggested UCL to Use**											
386					95% Student's-t UCL	98.78						
387												
388	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
389	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
390	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
391	For additional insight the user may want to consult a statistician.											
392												