

**Regulatory Impact Analysis for the Proposed
Long Term 1 Enhanced Surface Water Treatment and
Filter Backwash Rule**

EPA document No. 815-R-00-005

Appendices

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Appendix A-1
Benefits Analysis Assuming
2.0 Baseline Log Removal
Daily Drinking Water Rate: 1.2 Liters

Benefits Analysis Assuming 2.0 Baseline Log Removal at 1.2 Liters Per Day Ingestion Rate

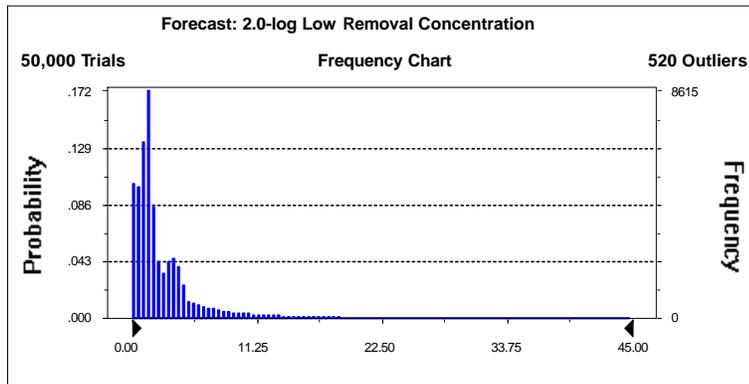
Forecast: 2.0-log Low Removal Concentration

Summary:

Display Range is from 0.00 to 45.00
 Entire Range is from 0.00 to 1,165.25
 After 50,000 Trials, the Std. Error of the Mean is 0.07

Statistics:

	<u>Value</u>
Trials	50000
Mean	4.52
Median	1.77
Mode	---
Standard Deviation	14.96
Variance	223.68
Skewness	32.82
Kurtosis	1,936.03
Coeff. of Variability	3.31
Range Minimum	0.00
Range Maximum	1,165.25
Range Width	1,165.24
Mean Std. Error	0.07



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00
10%	0.44
20%	0.89
30%	1.28
40%	1.48
50%	1.77
60%	2.31
70%	3.47
80%	4.49
90%	8.58
100%	1,165.25

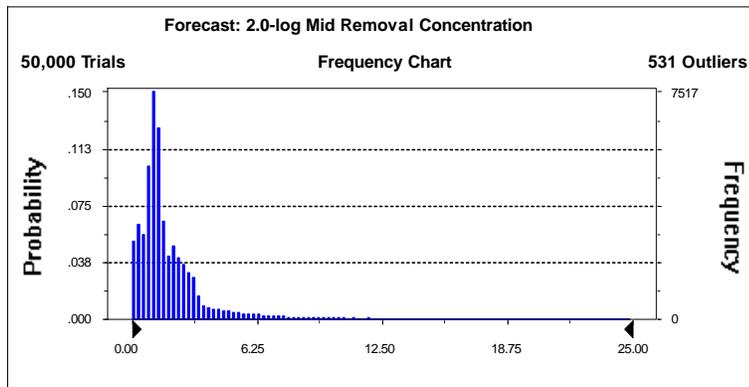
Forecast: 2.0-log Mid Removal Concentration

Summary:

Display Range is from 0.00 to 25.00
 Entire Range is from 0.00 to 655.27
 After 50,000 Trials, the Std. Error of the Mean is 0.04

Statistics:

	<u>Value</u>
Trials	50000
Mean	2.80
Median	1.40
Mode	---
Standard Deviation	8.37
Variance	70.01
Skewness	33.24
Kurtosis	1,971.99
Coeff. of Variability	2.99
Range Minimum	0.00
Range Maximum	655.27
Range Width	655.26
Mean Std. Error	0.04



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00
10%	0.44
20%	0.89
30%	1.04
40%	1.21
50%	1.40
60%	1.64
70%	2.21
80%	2.87
90%	4.83
100%	655.27

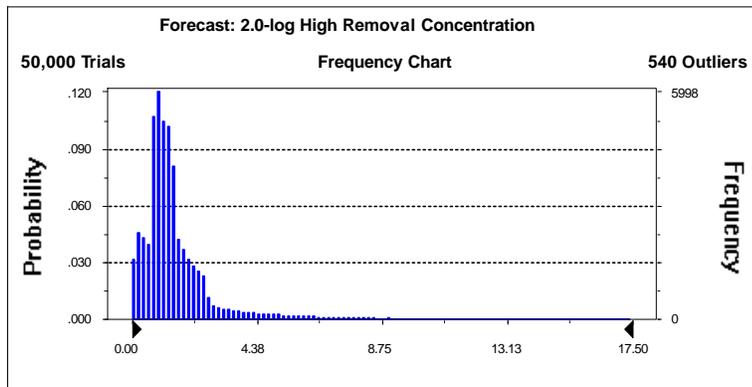
Forecast: 2.0-log High Removal Concentration

Summary:

Display Range is from 0.00 to 17.50
 Entire Range is from 0.00 to 463.89
 After 50,000 Trials, the Std. Error of the Mean is 0.03

Statistics:

	<u>Value</u>
Trials	50000
Mean	2.13
Median	1.24
Mode	---
Standard Deviation	5.90
Variance	34.81
Skewness	33.56
Kurtosis	1,999.99
Coeff. of Variability	2.77
Range Minimum	0.00
Range Maximum	463.89
Range Width	463.89
Mean Std. Error	0.03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00
10%	0.44
20%	0.79
30%	0.92
40%	1.07
50%	1.24
60%	1.41
70%	1.67
80%	2.17
90%	3.42
100%	463.89

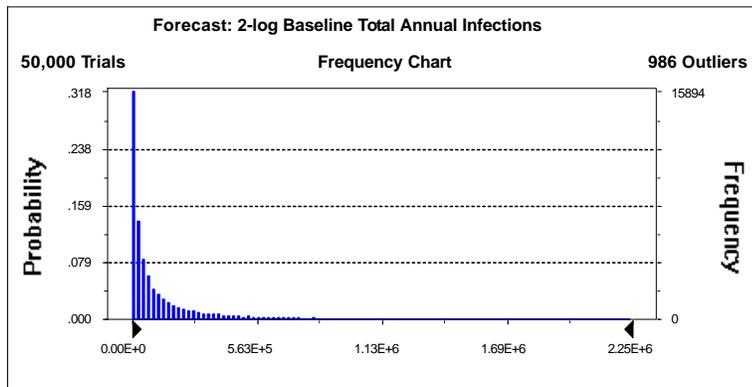
Forecast: 2-log Baseline Total Annual Infections

Summary:

Display Range is from 0.00E+0 to 2.25E+6
 Entire Range is from 3.13E+0 to 1.26E+7
 After 50,000 Trials, the Std. Error of the Mean is 3.22E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	2.58E+05
Median	5.56E+04
Mode	---
Standard Deviation	7.20E+05
Variance	5.18E+11
Skewness	7.53
Kurtosis	81.59
Coeff. of Variability	2.79
Range Minimum	3.13E+00
Range Maximum	1.27E+07
Range Width	1.27E+07
Mean Std. Error	3.22E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	3.13E+00
10%	4.55E+03
20%	1.10E+04
30%	2.04E+04
40%	3.42E+04
50%	5.56E+04
60%	8.90E+04
70%	1.47E+05
80%	2.64E+05
90%	5.83E+05
100%	1.27E+07

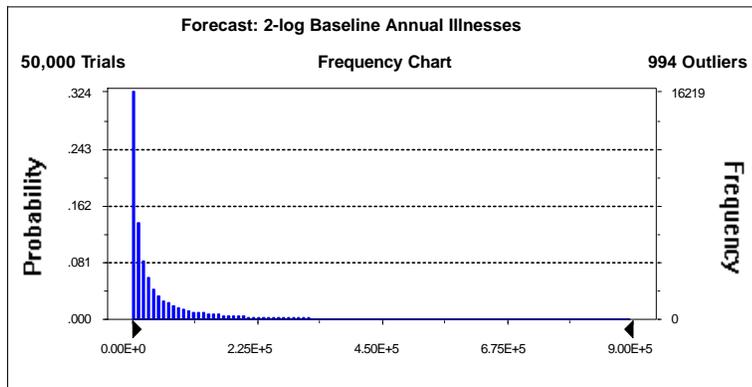
Forecast: 2-log Baseline Annual Illnesses

Summary:

Display Range is from 0.00E+0 to 9.00E+5
 Entire Range is from 1.17E+0 to 6.54E+6
 After 50,000 Trials, the Std. Error of the Mean is 1.33E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.03E+05
Median	2.17E+04
Mode	---
Standard Deviation	2.98E+05
Variance	8.85E+10
Skewness	8.16
Kurtosis	98.75
Coeff. of Variability	2.88
Range Minimum	1.17E+00
Range Maximum	6.54E+06
Range Width	6.54E+06
Mean Std. Error	1.33E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	1.17E+00
10%	1.73E+03
20%	4.20E+03
30%	7.86E+03
40%	1.34E+04
50%	2.17E+04
60%	3.49E+04
70%	5.80E+04
80%	1.04E+05
90%	2.31E+05
100%	6.54E+06

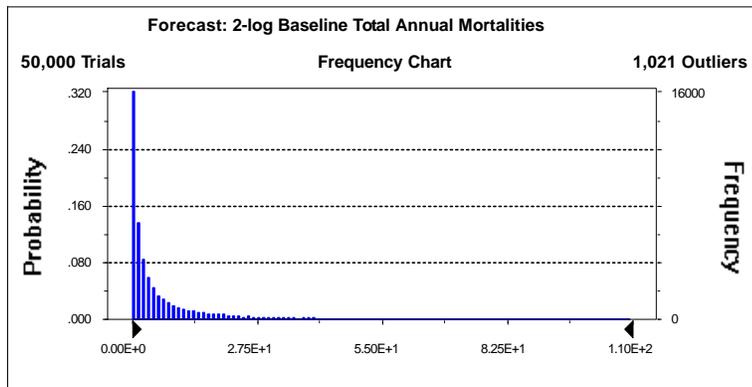
Forecast: 2-log Baseline Total Annual Mortalities

Summary:

Display Range is from 0.00E+0 to 1.10E+2
 Entire Range is from 1.47E-4 to 8.17E+2
 After 50,000 Trials, the Std. Error of the Mean is 1.66E-1

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.29E+01
Median	2.71E+00
Mode	---
Standard Deviation	3.72E+01
Variance	1.38E+03
Skewness	8.16
Kurtosis	98.75
Coeff. of Variability	2.88
Range Minimum	1.47E-04
Range Maximum	8.17E+02
Range Width	8.17E+02
Mean Std. Error	1.66E-01



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	1.47E-04
10%	2.16E-01
20%	5.25E-01
30%	9.83E-01
40%	1.67E+00
50%	2.71E+00
60%	4.36E+00
70%	7.25E+00
80%	1.30E+01
90%	2.89E+01
100%	8.17E+02

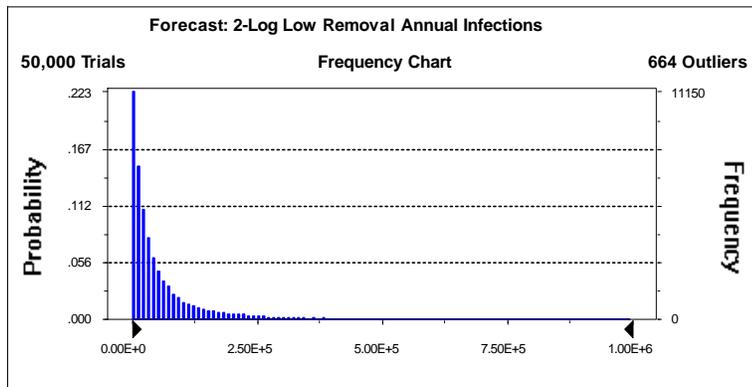
Forecast: 2-Log Low Removal Annual Infections

Summary:

Display Range is from 0.00E+0 to 1.00E+6
 Entire Range is from 3.13E+0 to 1.13E+7
 After 50,000 Trials, the Std. Error of the Mean is 1.38E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.01E+05
Median	3.19E+04
Mode	---
Standard Deviation	3.09E+05
Variance	9.58E+10
Skewness	13.06
Kurtosis	278.79
Coeff. of Variability	3.05
Range Minimum	3.13E+00
Range Maximum	1.14E+07
Range Width	1.14E+07
Mean Std. Error	1.38E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	3.13E+00
10%	3.99E+03
20%	8.74E+03
30%	1.47E+04
40%	2.22E+04
50%	3.19E+04
60%	4.59E+04
70%	6.73E+04
80%	1.05E+05
90%	2.06E+05
100%	1.14E+07

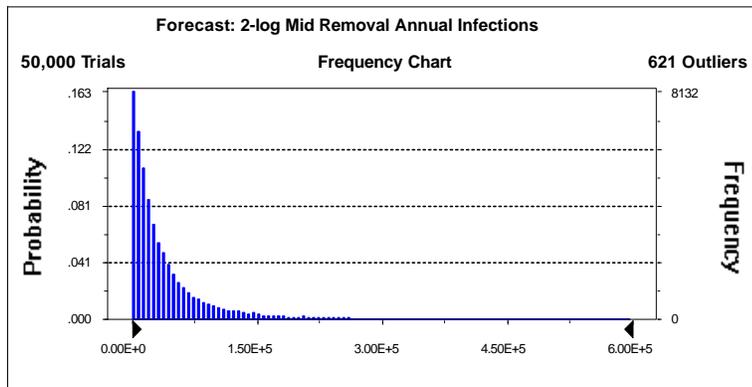
Forecast: 2-log Mid Removal Annual Infections

Summary:

Display Range is from 0.00E+0 to 6.00E+5
 Entire Range is from 3.13E+0 to 9.15E+6
 After 50,000 Trials, the Std. Error of the Mean is 8.67E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	6.46E+04
Median	2.46E+04
Mode	---
Standard Deviation	1.94E+05
Variance	3.76E+10
Skewness	16.53
Kurtosis	468.66
Coeff. of Variability	3.00
Range Minimum	3.13E+00
Range Maximum	9.15E+06
Range Width	9.15E+06
Mean Std. Error	8.67E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	3.13E+00
10%	3.61E+03
20%	7.52E+03
30%	1.22E+04
40%	1.76E+04
50%	2.46E+04
60%	3.42E+04
70%	4.76E+04
80%	7.03E+04
90%	1.28E+05
100%	9.15E+06

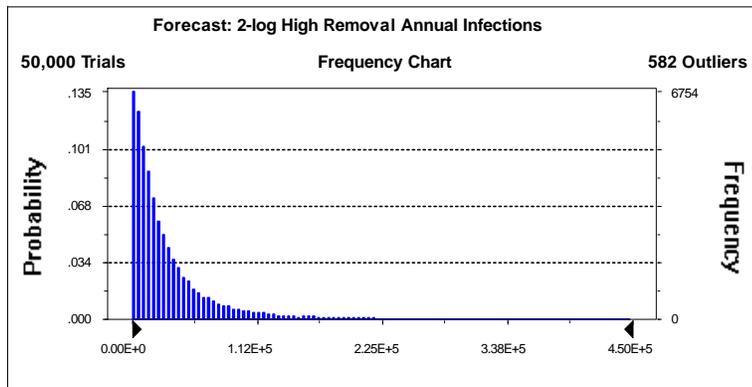
Forecast: 2-log High Removal Annual Infections

Summary:

Display Range is from 0.00E+0 to 4.50E+5
 Entire Range is from 3.13E+0 to 7.55E+6
 After 50,000 Trials, the Std. Error of the Mean is 6.45E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	4.96E+04
Median	2.10E+04
Mode	---
Standard Deviation	1.44E+05
Variance	2.08E+10
Skewness	18.44
Kurtosis	592.02
Coeff. of Variability	2.91
Range Minimum	3.13E+00
Range Maximum	7.55E+06
Range Width	7.55E+06
Mean Std. Error	6.45E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	3.13E+00
10%	3.33E+03
20%	6.77E+03
30%	1.07E+04
40%	1.52E+04
50%	2.10E+04
60%	2.85E+04
70%	3.89E+04
80%	5.60E+04
90%	9.73E+04
100%	7.55E+06

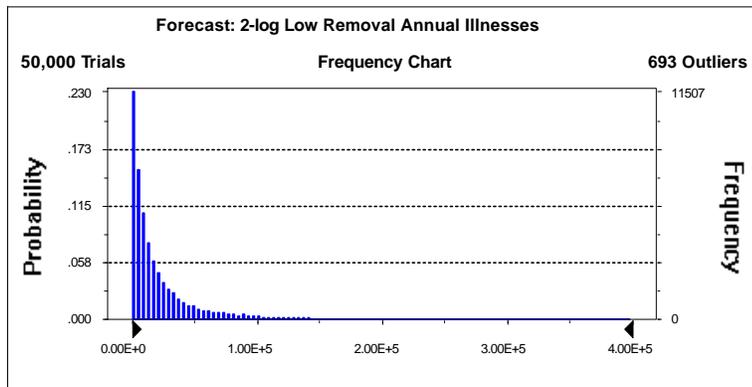
Forecast: 2-log Low Removal Annual Illnesses

Summary:

Display Range is from 0.00E+0 to 4.00E+5
 Entire Range is from 1.17E+0 to 5.37E+6
 After 50,000 Trials, the Std. Error of the Mean is 5.71E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	4.06E+04
Median	1.25E+04
Mode	---
Standard Deviation	1.28E+05
Variance	1.63E+10
Skewness	13.88
Kurtosis	323.48
Coeff. of Variability	3.14
Range Minimum	1.17E+00
Range Maximum	5.37E+06
Range Width	5.37E+06
Mean Std. Error	5.71E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	1.17E+00
10%	1.52E+03
20%	3.36E+03
30%	5.67E+03
40%	8.63E+03
50%	1.25E+04
60%	1.80E+04
70%	2.66E+04
80%	4.17E+04
90%	8.19E+04
100%	5.37E+06

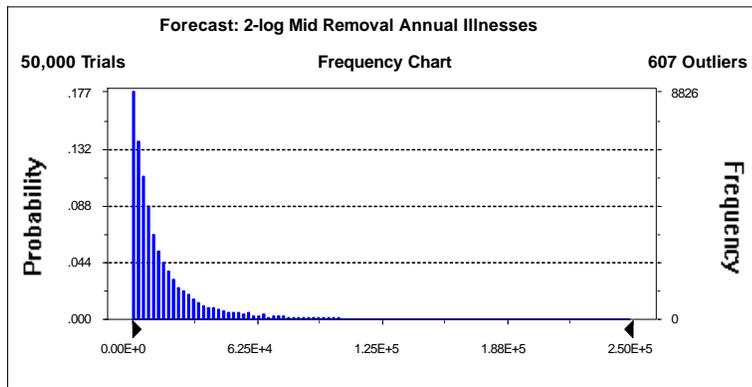
Forecast: 2-log Mid Removal Annual Illnesses

Summary:

Display Range is from 0.00E+0 to 2.50E+5
 Entire Range is from 1.17E+0 to 4.32E+6
 After 50,000 Trials, the Std. Error of the Mean is 3.58E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	2.59E+04
Median	9.55E+03
Mode	---
Standard Deviation	8.00E+04
Variance	6.40E+09
Skewness	17.58
Kurtosis	550.94
Coeff. of Variability	3.09
Range Minimum	1.17E+00
Range Maximum	4.32E+06
Range Width	4.32E+06
Mean Std. Error	3.58E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	1.17E+00
10%	1.37E+03
20%	2.87E+03
30%	4.67E+03
40%	6.83E+03
50%	9.55E+03
60%	1.33E+04
70%	1.89E+04
80%	2.81E+04
90%	5.11E+04
100%	4.32E+06

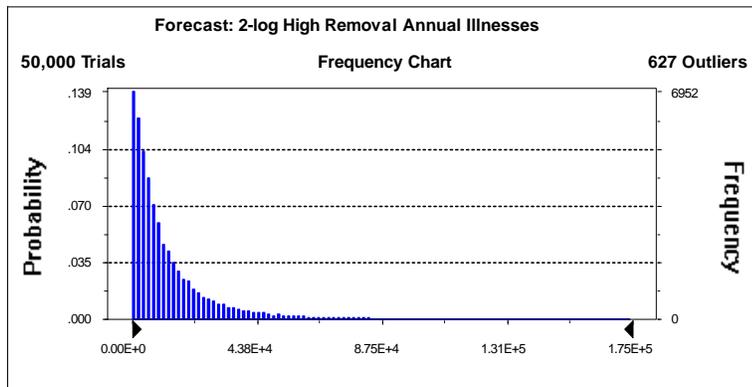
Forecast: 2-log High Removal Annual Illnesses

Summary:

Display Range is from 0.00E+0 to 1.75E+5
 Entire Range is from 1.17E+0 to 3.57E+6
 After 50,000 Trials, the Std. Error of the Mean is 2.66E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.99E+04
Median	8.14E+03
Mode	---
Standard Deviation	5.95E+04
Variance	3.54E+09
Skewness	19.65
Kurtosis	703.98
Coeff. of Variability	3.00
Range Minimum	1.17E+00
Range Maximum	3.57E+06
Range Width	3.57E+06
Mean Std. Error	2.66E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	1.17E+00
10%	1.26E+03
20%	2.59E+03
30%	4.10E+03
40%	5.90E+03
50%	8.14E+03
60%	1.11E+04
70%	1.54E+04
80%	2.24E+04
90%	3.91E+04
100%	3.57E+06

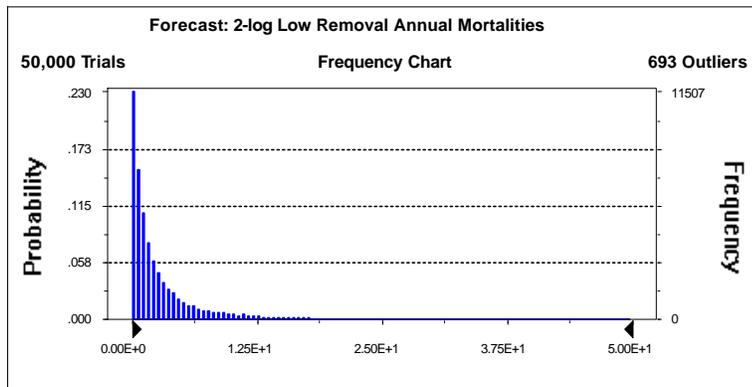
Forecast: 2-log Low Removal Annual Mortalities

Summary:

Display Range is from 0.00E+0 to 5.00E+1
 Entire Range is from 1.47E-4 to 6.72E+2
 After 50,000 Trials, the Std. Error of the Mean is 7.14E-2

Statistics:

	<u>Value</u>
Trials	50000
Mean	5.08E+00
Median	1.56E+00
Mode	---
Standard Deviation	1.60E+01
Variance	2.55E+02
Skewness	13.88
Kurtosis	323.48
Coeff. of Variability	3.14
Range Minimum	1.47E-04
Range Maximum	6.72E+02
Range Width	6.72E+02
Mean Std. Error	7.14E-02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	1.47E-04
10%	1.90E-01
20%	4.20E-01
30%	7.09E-01
40%	1.08E+00
50%	1.56E+00
60%	2.24E+00
70%	3.32E+00
80%	5.21E+00
90%	1.02E+01
100%	6.72E+02

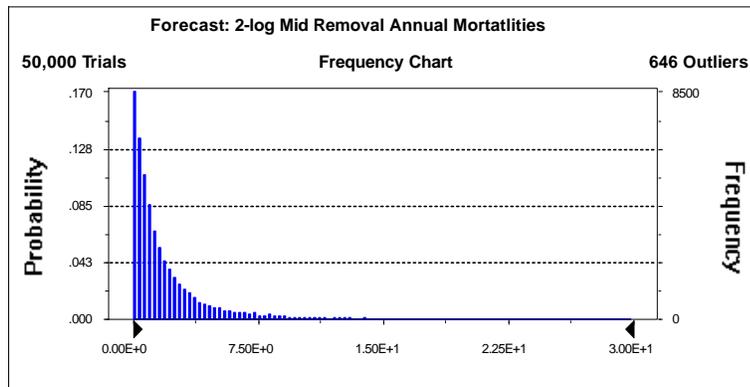
Forecast: 2-log Mid Removal Annual Mortalities

Summary:

Display Range is from 0.00E+0 to 3.00E+1
 Entire Range is from 1.47E-4 to 5.41E+2
 After 50,000 Trials, the Std. Error of the Mean is 4.47E-2

Statistics:

	<u>Value</u>
Trials	50000
Mean	3.24E+00
Median	1.19E+00
Mode	---
Standard Deviation	1.00E+01
Variance	1.00E+02
Skewness	17.58
Kurtosis	550.94
Coeff. of Variability	3.09
Range Minimum	1.47E-04
Range Maximum	5.41E+02
Range Width	5.41E+02
Mean Std. Error	4.47E-02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	1.47E-04
10%	1.71E-01
20%	3.59E-01
30%	5.84E-01
40%	8.54E-01
50%	1.19E+00
60%	1.67E+00
70%	2.36E+00
80%	3.51E+00
90%	6.39E+00
100%	5.41E+02

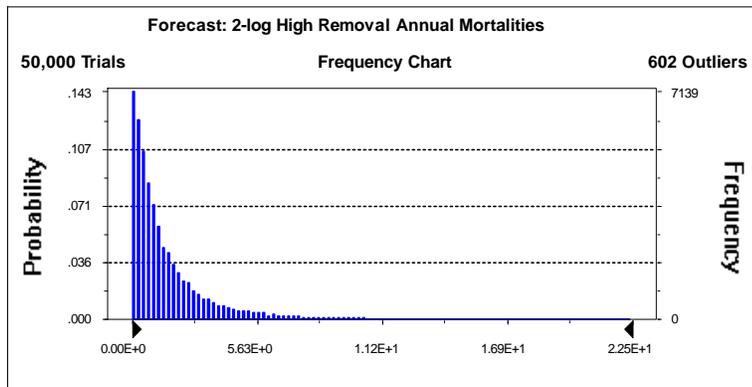
Forecast: 2-log High Removal Annual Mortalities

Summary:

Display Range is from 0.00E+0 to 2.25E+1
 Entire Range is from 1.47E-4 to 4.46E+2
 After 50,000 Trials, the Std. Error of the Mean is 3.33E-2

Statistics:

	<u>Value</u>
Trials	50000
Mean	2.48E+00
Median	1.02E+00
Mode	---
Standard Deviation	7.44E+00
Variance	5.54E+01
Skewness	19.65
Kurtosis	703.98
Coeff. of Variability	3.00
Range Minimum	1.47E-04
Range Maximum	4.46E+02
Range Width	4.46E+02
Mean Std. Error	3.33E-02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	1.47E-04
10%	1.57E-01
20%	3.23E-01
30%	5.13E-01
40%	7.37E-01
50%	1.02E+00
60%	1.39E+00
70%	1.93E+00
80%	2.80E+00
90%	4.88E+00
100%	4.46E+02

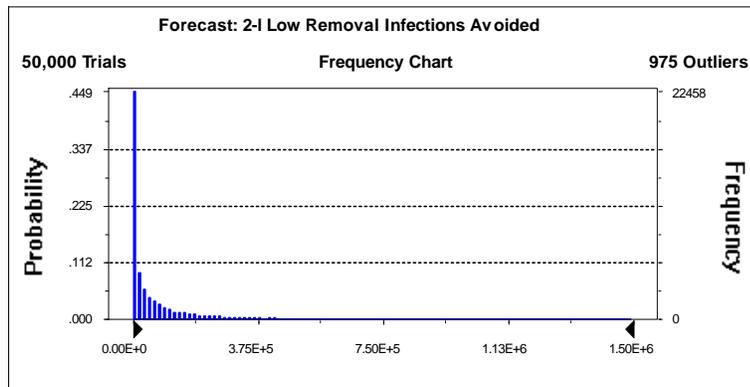
Forecast: 2-I Low Removal Infections Avoided

Summary:

Display Range is from 0.00E+0 to 1.50E+6
 Entire Range is from 0.00E+0 to 5.08E+6
 After 50,000 Trials, the Std. Error of the Mean is 1.92E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.57E+05
Median	2.25E+04
Mode	0.00E+00
Standard Deviation	4.29E+05
Variance	1.84E+11
Skewness	5.97
Kurtosis	48.69
Coeff. of Variability	2.74
Range Minimum	0.00E+00
Range Maximum	5.08E+06
Range Width	5.08E+06
Mean Std. Error	1.92E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	9.21E+03
50%	2.25E+04
60%	4.42E+04
70%	8.25E+04
80%	1.62E+05
90%	3.83E+05
100%	5.08E+06

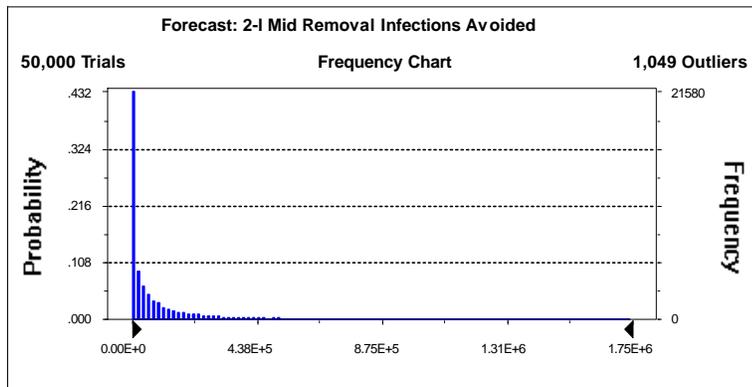
Forecast: 2-I Mid Removal Infections Avoided

Summary:

Display Range is from 0.00E+0 to 1.75E+6
 Entire Range is from 0.00E+0 to 7.16E+6
 After 50,000 Trials, the Std. Error of the Mean is 2.43E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.94E+05
Median	2.97E+04
Mode	0.00E+00
Standard Deviation	5.43E+05
Variance	2.95E+11
Skewness	6.43
Kurtosis	57.14
Coeff. of Variability	2.81
Range Minimum	0.00E+00
Range Maximum	7.16E+06
Range Width	7.16E+06
Mean Std. Error	2.43E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	1.29E+04
50%	2.97E+04
60%	5.59E+04
70%	1.02E+05
80%	1.97E+05
90%	4.63E+05
100%	7.16E+06

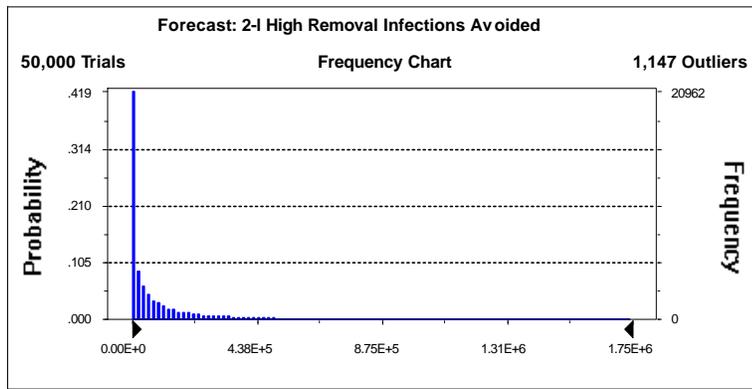
Forecast: 2-I High Removal Infections Avoided

Summary:

Display Range is from 0.00E+0 to 1.75E+6
 Entire Range is from 0.00E+0 to 8.21E+6
 After 50,000 Trials, the Std. Error of the Mean is 2.64E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	2.09E+05
Median	3.30E+04
Mode	0.00E+00
Standard Deviation	5.91E+05
Variance	3.49E+11
Skewness	6.65
Kurtosis	61.58
Coeff. of Variability	2.83
Range Minimum	0.00E+00
Range Maximum	8.21E+06
Range Width	8.21E+06
Mean Std. Error	2.64E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	1.44E+04
50%	3.30E+04
60%	6.14E+04
70%	1.11E+05
80%	2.13E+05
90%	4.95E+05
100%	8.21E+06

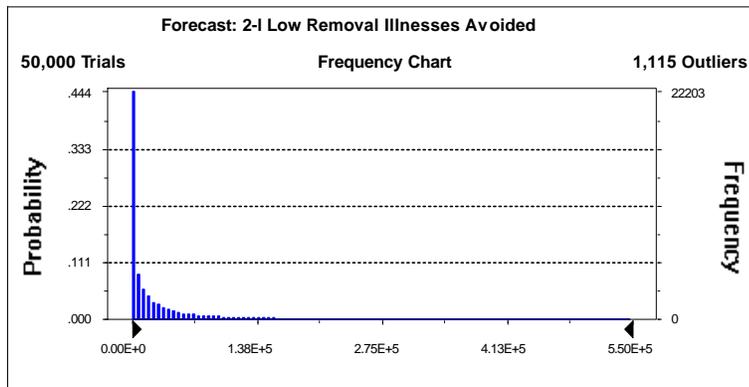
Forecast: 2-I Low Removal Illnesses Avoided

Summary:

Display Range is from 0.00E+0 to 5.50E+5
 Entire Range is from 0.00E+0 to 3.06E+6
 After 50,000 Trials, the Std. Error of the Mean is 7.93E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	6.28E+04
Median	8.73E+03
Mode	0.00E+00
Standard Deviation	1.77E+05
Variance	3.14E+10
Skewness	6.53
Kurtosis	60.62
Coeff. of Variability	2.82
Range Minimum	0.00E+00
Range Maximum	3.06E+06
Range Width	3.06E+06
Mean Std. Error	7.93E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	3.55E+03
50%	8.73E+03
60%	1.72E+04
70%	3.23E+04
80%	6.40E+04
90%	1.52E+05
100%	3.06E+06

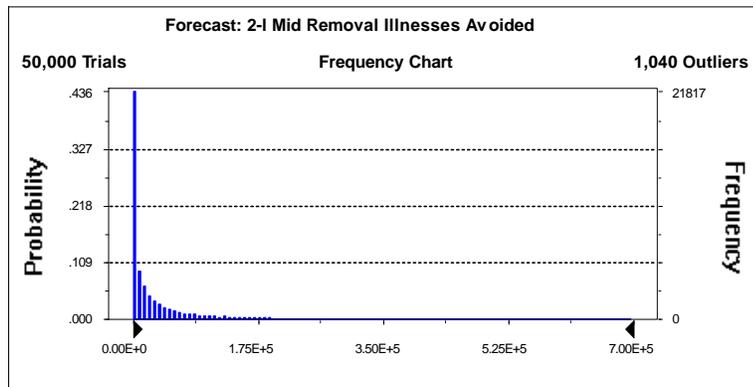
Forecast: 2-I Mid Removal Illnesses Avoided

Summary:

Display Range is from 0.00E+0 to 7.00E+5
 Entire Range is from 0.00E+0 to 4.14E+6
 After 50,000 Trials, the Std. Error of the Mean is 1.00E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	7.75E+04
Median	1.15E+04
Mode	0.00E+00
Standard Deviation	2.25E+05
Variance	5.05E+10
Skewness	7.02
Kurtosis	70.82
Coeff. of Variability	2.90
Range Minimum	0.00E+00
Range Maximum	4.14E+06
Range Width	4.14E+06
Mean Std. Error	1.00E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	4.92E+03
50%	1.15E+04
60%	2.17E+04
70%	4.01E+04
80%	7.81E+04
90%	1.84E+05
100%	4.14E+06

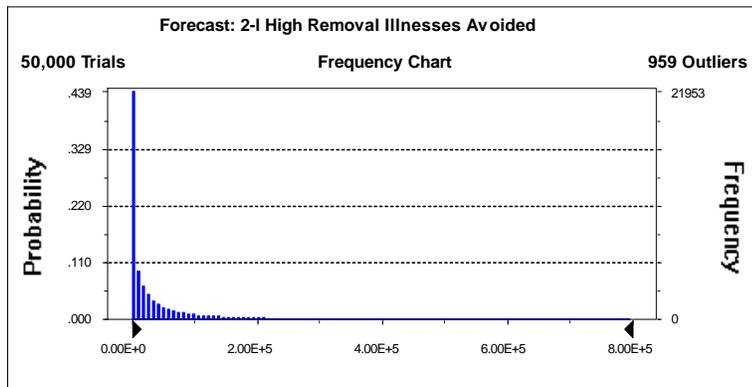
Forecast: 2-I High Removal Illnesses Avoided

Summary:

Display Range is from 0.00E+0 to 8.00E+5
 Entire Range is from 0.00E+0 to 4.60E+6
 After 50,000 Trials, the Std. Error of the Mean is 1.09E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	8.36E+04
Median	1.28E+04
Mode	0.00E+00
Standard Deviation	2.44E+05
Variance	5.97E+10
Skewness	7.26
Kurtosis	76.01
Coeff. of Variability	2.92
Range Minimum	0.00E+00
Range Maximum	4.60E+06
Range Width	4.60E+06
Mean Std. Error	1.09E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	5.51E+03
50%	1.28E+04
60%	2.39E+04
70%	4.36E+04
80%	8.42E+04
90%	1.96E+05
100%	4.60E+06

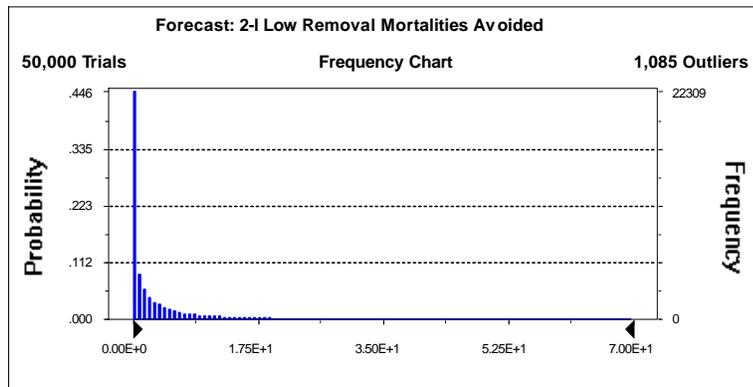
Forecast: 2-I Low Removal Mortalities Avoided

Summary:

Display Range is from 0.00E+0 to 7.00E+1
 Entire Range is from 0.00E+0 to 3.83E+2
 After 50,000 Trials, the Std. Error of the Mean is 9.91E-2

Statistics:

	<u>Value</u>
Trials	50000
Mean	7.85E+00
Median	1.09E+00
Mode	0.00E+00
Standard Deviation	2.22E+01
Variance	4.91E+02
Skewness	6.53
Kurtosis	60.62
Coeff. of Variability	2.82
Range Minimum	0.00E+00
Range Maximum	3.83E+02
Range Width	3.83E+02
Mean Std. Error	9.91E-02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	4.44E-01
50%	1.09E+00
60%	2.15E+00
70%	4.04E+00
80%	8.00E+00
90%	1.89E+01
100%	3.83E+02

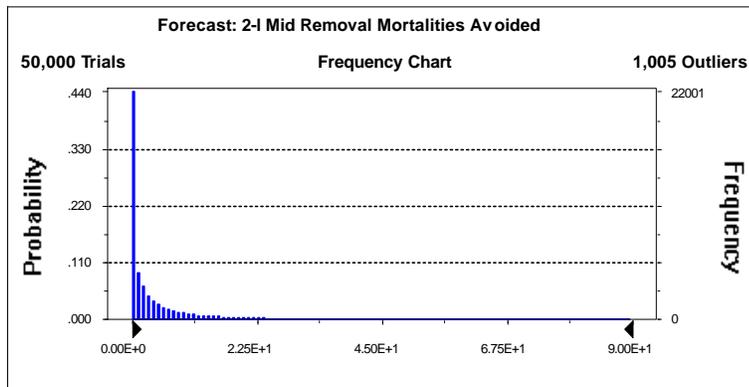
Forecast: 2-I Mid Removal Mortalities Avoided

Summary:

Display Range is from 0.00E+0 to 9.00E+1
 Entire Range is from 0.00E+0 to 5.17E+2
 After 50,000 Trials, the Std. Error of the Mean is 1.26E-1

Statistics:

	<u>Value</u>
Trials	50000
Mean	9.69E+00
Median	1.44E+00
Mode	0.00E+00
Standard Deviation	2.81E+01
Variance	7.89E+02
Skewness	7.02
Kurtosis	70.82
Coeff. of Variability	2.90
Range Minimum	0.00E+00
Range Maximum	5.17E+02
Range Width	5.17E+02
Mean Std. Error	1.26E-01



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	6.15E-01
50%	1.44E+00
60%	2.72E+00
70%	5.01E+00
80%	9.76E+00
90%	2.29E+01
100%	5.17E+02

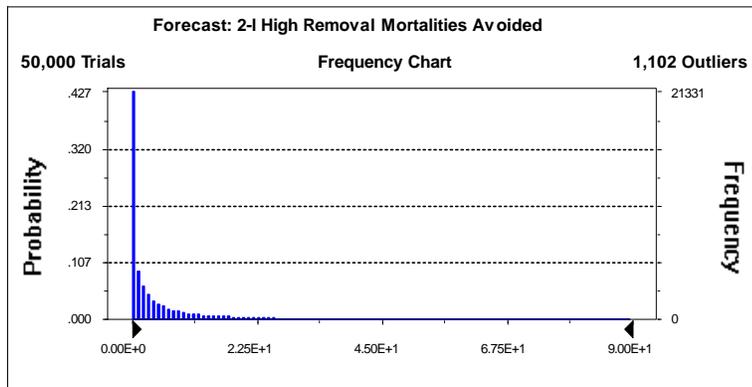
Forecast: 2-I High Removal Mortalities Avoided

Summary:

Display Range is from 0.00E+0 to 9.00E+1
 Entire Range is from 0.00E+0 to 5.74E+2
 After 50,000 Trials, the Std. Error of the Mean is 1.37E-1

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.04E+01
Median	1.59E+00
Mode	0.00E+00
Standard Deviation	3.05E+01
Variance	9.33E+02
Skewness	7.26
Kurtosis	76.01
Coeff. of Variability	2.92
Range Minimum	0.00E+00
Range Maximum	5.74E+02
Range Width	5.74E+02
Mean Std. Error	1.37E-01



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	6.89E-01
50%	1.59E+00
60%	2.99E+00
70%	5.46E+00
80%	1.05E+01
90%	2.45E+01
100%	5.74E+02

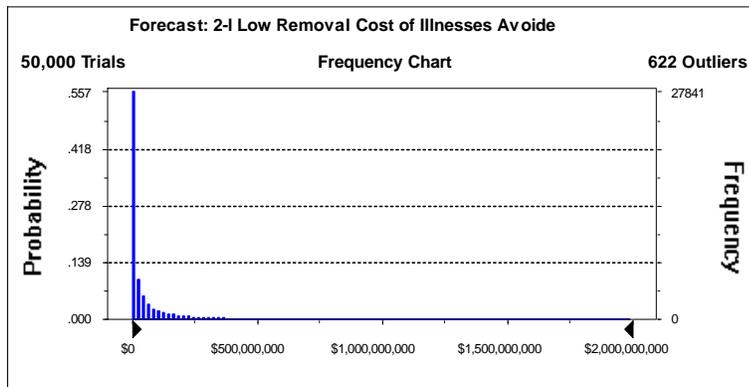
Forecast: 2-I Low Removal Cost of Illnesses Avoided

Summary:

Display Range is from \$0 to \$2,000,000,000
 Entire Range is from \$0 to \$36,621,782,556
 After 50,000 Trials, the Std. Error of the Mean is \$3,147,549

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$150,279,683
Median	\$12,953,135
Mode	\$0
Standard Deviation	\$703,813,337
Variance	5E+17
Skewness	19.90
Kurtosis	654.84
Coeff. of Variability	4.68
Range Minimum	\$0
Range Maximum	\$36,621,782,556
Range Width	\$36,621,782,556
Mean Std. Error	\$3,147,548.93



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$4,982,698
50%	\$12,953,135
60%	\$27,001,550
70%	\$53,158,991
80%	\$111,927,721
90%	\$288,195,683
100%	\$36,621,782,556

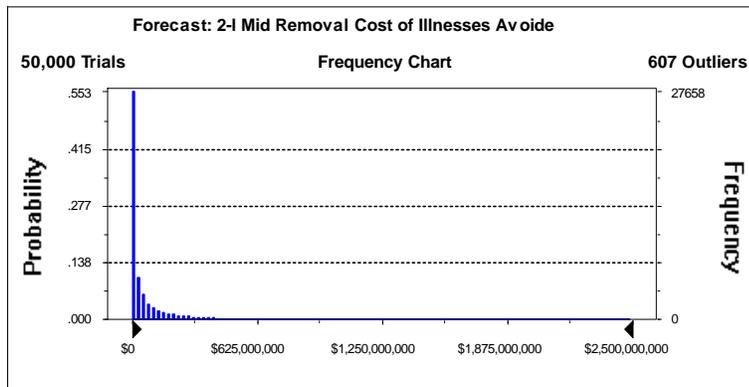
Forecast: 2-I Mid Removal Cost of Illnesses Avoided

Summary:

Display Range is from \$0 to \$2,500,000,000
 Entire Range is from \$0 to \$50,319,509,881
 After 50,000 Trials, the Std. Error of the Mean is \$3,947,690

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$185,299,812
Median	\$16,996,124
Mode	\$0
Standard Deviation	\$882,730,367
Variance	8E+17
Skewness	21.19
Kurtosis	757.37
Coeff. of Variability	4.76
Range Minimum	\$0
Range Maximum	\$50,319,509,881
Range Width	\$50,319,509,881
Mean Std. Error	\$3,947,690.21



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$6,908,514
50%	\$16,996,124
60%	\$34,237,639
70%	\$65,792,677
80%	\$137,141,577
90%	\$350,896,338
100%	\$50,319,509,881

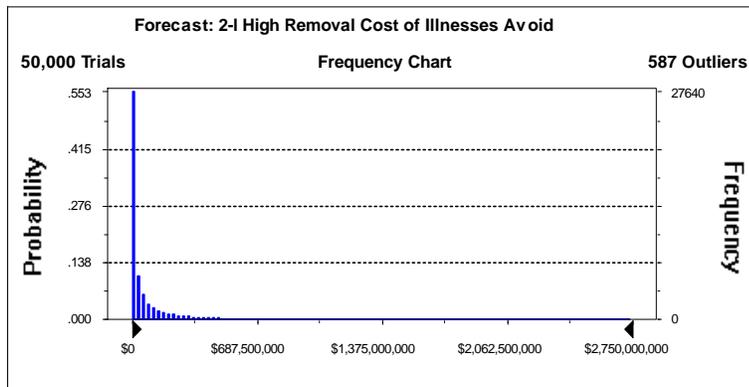
Forecast: 2-I High Removal Cost of Illnesses Avoided

Summary:

Display Range is from \$0 to \$2,750,000,000
 Entire Range is from \$0 to \$56,301,478,907
 After 50,000 Trials, the Std. Error of the Mean is \$4,274,354

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$199,529,508
Median	\$18,789,260
Mode	\$0
Standard Deviation	\$955,774,710
Variance	9E+17
Skewness	21.83
Kurtosis	813.38
Coeff. of Variability	4.79
Range Minimum	\$0
Range Maximum	\$56,301,478,907
Range Width	\$56,301,478,907
Mean Std. Error	\$4,274,354.45



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$7,740,252
50%	\$18,789,260
60%	\$37,583,443
70%	\$71,507,596
80%	\$148,367,357
90%	\$376,673,307
100%	\$56,301,478,907

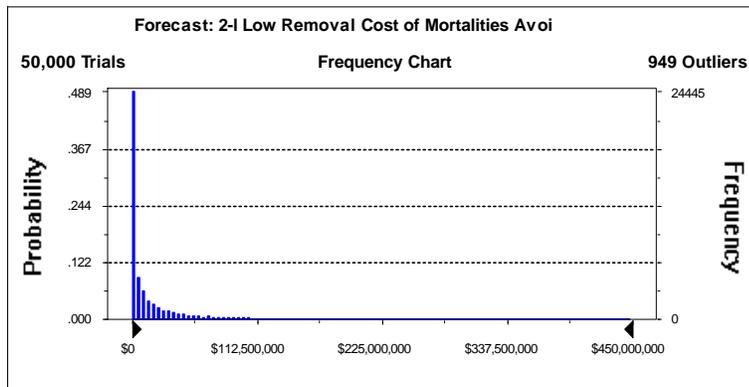
Forecast: 2-I Low Removal Cost of Mortalities Avoided

Summary:

Display Range is from \$0 to \$450,000,000
 Entire Range is from \$0 to \$3,736,738,487
 After 50,000 Trials, the Std. Error of the Mean is \$657,672

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$44,973,322
Median	\$4,942,589
Mode	\$0
Standard Deviation	\$147,060,012
Variance	2E+16
Skewness	8.59
Kurtosis	110.19
Coeff. of Variability	3.27
Range Minimum	\$0
Range Maximum	\$3,736,738,487
Range Width	\$3,736,738,487
Mean Std. Error	\$657,672.37



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$1,875,086
50%	\$4,942,589
60%	\$10,215,635
70%	\$20,017,216
80%	\$40,982,544
90%	\$101,717,743
100%	\$3,736,738,487

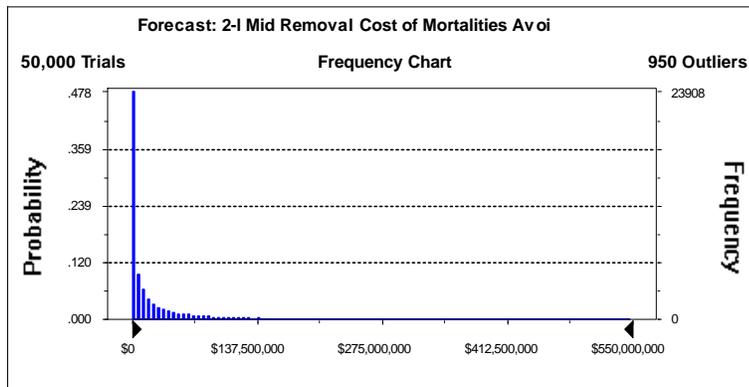
Forecast: 2-I Mid Removal Cost of Mortalities Avoided

Summary:

Display Range is from \$0 to \$550,000,000
 Entire Range is from \$0 to \$4,932,678,482
 After 50,000 Trials, the Std. Error of the Mean is \$829,598

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$55,539,355
Median	\$6,525,751
Mode	\$0
Standard Deviation	\$185,503,801
Variance	3E+16
Skewness	9.03
Kurtosis	121.79
Coeff. of Variability	3.34
Range Minimum	\$0
Range Maximum	\$4,932,678,482
Range Width	\$4,932,678,482
Mean Std. Error	\$829,598.22



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$2,591,468
50%	\$6,525,751
60%	\$13,023,896
70%	\$24,826,661
80%	\$50,103,818
90%	\$123,340,471
100%	\$4,932,678,482

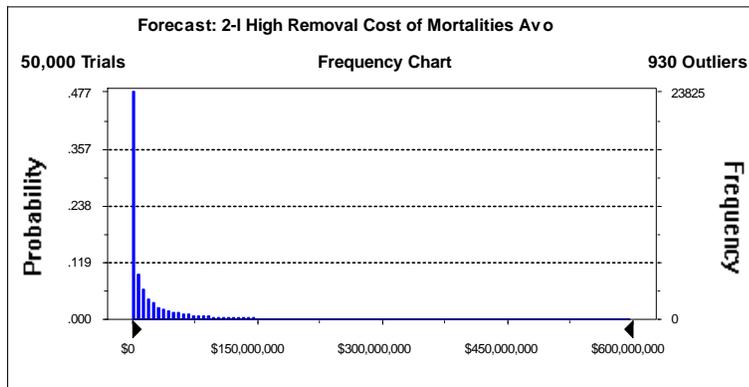
Forecast: 2-I High Removal Cost of Mortalities Avoided

Summary:

Display Range is from \$0 to \$600,000,000
 Entire Range is from \$0 to \$5,434,235,621
 After 50,000 Trials, the Std. Error of the Mean is \$900,361

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$59,841,844
Median	\$7,222,767
Mode	\$0
Standard Deviation	\$201,326,908
Variance	4E+16
Skewness	9.24
Kurtosis	127.40
Coeff. of Variability	3.36
Range Minimum	\$0
Range Maximum	\$5,434,235,621
Range Width	\$5,434,235,621
Mean Std. Error	\$900,361.30



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$2,894,821
50%	\$7,222,767
60%	\$14,317,845
70%	\$27,125,391
80%	\$54,146,611
90%	\$132,001,515
100%	\$5,434,235,621

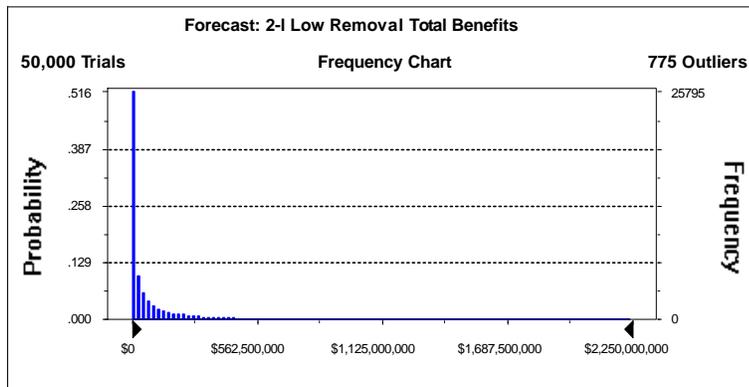
Forecast: 2-I Low Removal Total Benefits

Summary:

Display Range is from \$0 to \$2,250,000,000
 Entire Range is from \$0 to \$37,059,284,915
 After 50,000 Trials, the Std. Error of the Mean is \$3,508,691

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$195,253,005
Median	\$19,893,985
Mode	\$0
Standard Deviation	\$784,567,240
Variance	6E+17
Skewness	16.57
Kurtosis	482.42
Coeff. of Variability	4.02
Range Minimum	\$0
Range Maximum	\$37,059,284,915
Range Width	\$37,059,284,915
Mean Std. Error	\$3,508,691.36



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$7,737,404
50%	\$19,893,985
60%	\$40,086,958
70%	\$78,406,925
80%	\$162,880,091
90%	\$405,817,947
100%	\$37,059,284,915

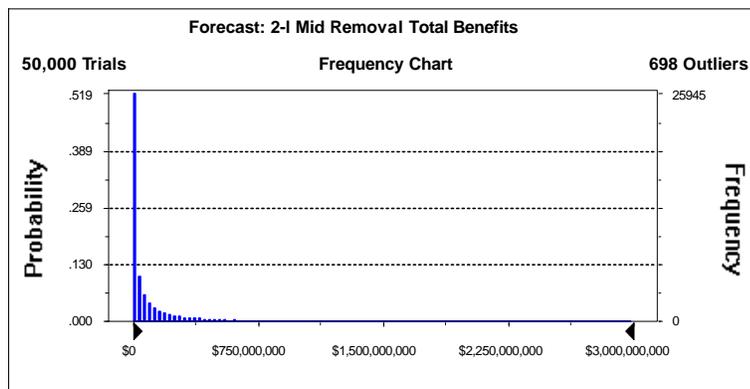
Forecast: 2-I Mid Removal Total Benefits

Summary:

Display Range is from \$0 to \$3,000,000,000
 Entire Range is from \$0 to \$50,920,652,228
 After 50,000 Trials, the Std. Error of the Mean is \$4,407,307

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$240,839,167
Median	\$26,087,406
Mode	\$0
Standard Deviation	\$985,503,786
Variance	1E+18
Skewness	17.67
Kurtosis	561.13
Coeff. of Variability	4.09
Range Minimum	\$0
Range Maximum	\$50,920,652,228
Range Width	\$50,920,652,228
Mean Std. Error	\$4,407,306.91



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$10,679,484
50%	\$26,087,406
60%	\$50,888,680
70%	\$97,544,185
80%	\$198,992,479
90%	\$493,275,767
100%	\$50,920,652,228

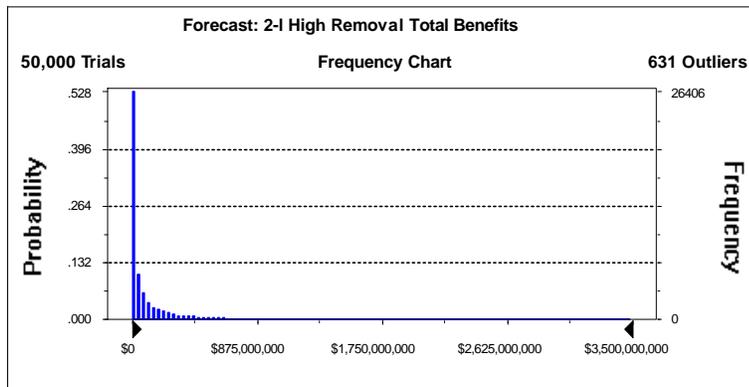
Forecast: 2-I High Removal Total Benefits

Summary:

Display Range is from \$0 to \$3,500,000,000
 Entire Range is from \$0 to \$56,974,084,885
 After 50,000 Trials, the Std. Error of the Mean is \$4,774,929

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$259,371,352
Median	\$28,838,936
Mode	\$0
Standard Deviation	\$1,067,706,540
Variance	1E+18
Skewness	18.22
Kurtosis	605.21
Coeff. of Variability	4.12
Range Minimum	\$0
Range Maximum	\$56,974,084,885
Range Width	\$56,974,084,885
Mean Std. Error	\$4,774,928.81



Percentiles:

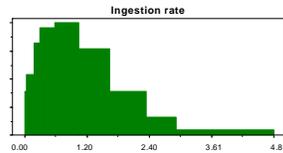
<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$11,926,779
50%	\$28,838,936
60%	\$56,014,638
70%	\$106,237,384
80%	\$215,323,182
90%	\$529,046,302
100%	\$56,974,084,885

Assumptions

Assumption: Daily Water Consumption

Custom distribution with parameters:				Relative Prob.	
Continuous range	0.00	to	0.05	0.010000	
Continuous range	0.05	to	0.18	0.040000	
Continuous range	0.18	to	0.30	0.050000	
Continuous range	0.30	to	0.58	0.150000	
Continuous range	0.58	to	1.05	0.250000	
Continuous range	1.05	to	1.64	0.250000	
Continuous range	1.64	to	2.35	0.150000	
Continuous range	2.35	to	2.92	0.050000	
Continuous range	2.92	to	4.81	0.050000	
Total Relative Probability				1.000000	

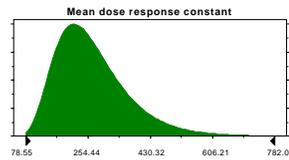
Mean value in simulation was 1.25



Assumption: Mean dose response constant

Lognormal distribution with parameters:
 5% - tile 132.00
 95% - tile 465.40

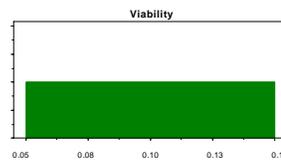
Selected range is from 0.00 to +Infinity
 Mean value in simulation was 266.77



Assumption: Viability

Uniform distribution with parameters:
 Minimum 0.05
 Maximum 0.15

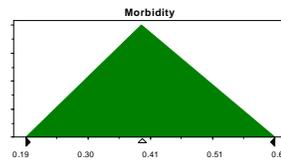
Mean value in simulation was 0.10



Assumption: Morbidity

Triangular distribution with parameters:
 Minimum 0.19
 Likeliest 0.39
 Maximum 0.62

Selected range is from 0.19 to 0.62
 Mean value in simulation was 0.40



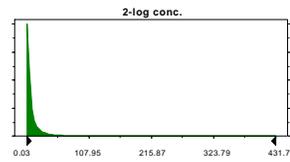
Assumption: Mean Daily Cyst Concentration in Distributed Water

Lognormal distribution with parameters:

Mean 12.60
Standard Dev. 44.30

Selected range is from 0.00 to +Infinity

Mean value in simulation was 12.69

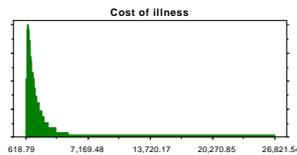


Assumption: Cost of illness

Custom distribution with parameters:

				<u>Relative Prob.</u>
Continuous range	618.79	to	736.35	0.050000
Continuous range	736.35	to	799.67	0.050000
Continuous range	799.67	to	860.41	0.050000
Continuous range	860.41	to	921.94	0.050000
Continuous range	921.94	to	985.38	0.050000
Continuous range	985.38	to	1,055.42	0.050000
Continuous range	1,055.42	to	1,132.61	0.050000
Continuous range	1,132.61	to	1,217.08	0.050000
Continuous range	1,217.08	to	1,306.32	0.050000
Continuous range	1,306.32	to	1,410.82	0.050000
Continuous range	1,410.82	to	1,526.87	0.050000
Continuous range	1,526.87	to	1,663.45	0.050000
Continuous range	1,663.45	to	1,828.49	0.050000
Continuous range	1,828.49	to	2,024.49	0.050000
Continuous range	2,024.49	to	2,279.26	0.050000
Continuous range	2,279.26	to	2,609.62	0.050000
Continuous range	2,609.62	to	3,062.70	0.050000
Continuous range	3,062.70	to	3,777.19	0.050000
Continuous range	3,777.19	to	5,148.57	0.050000
Continuous range	5,148.57	to	26,821.54	0.050000
Total Relative Probability				1.000000

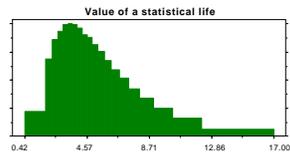
Mean value in simulation was 2,403.25



Assumption: Value of a statistical life

Custom distribution with parameters:			<u>Relative Prob.</u>	
Continuous range	0.42	to	1.84	0.050000
Continuous range	1.84	to	2.30	0.050000
Continuous range	2.30	to	2.66	0.050000
Continuous range	2.66	to	2.99	0.050000
Continuous range	2.99	to	3.31	0.050000
Continuous range	3.31	to	3.62	0.050000
Continuous range	3.62	to	3.93	0.050000
Continuous range	3.93	to	4.25	0.050000
Continuous range	4.25	to	4.60	0.050000
Continuous range	4.60	to	4.95	0.050000
Continuous range	4.95	to	5.33	0.050000
Continuous range	5.33	to	5.75	0.050000
Continuous range	5.75	to	6.21	0.050000
Continuous range	6.21	to	6.73	0.050000
Continuous range	6.73	to	7.34	0.050000
Continuous range	7.34	to	8.07	0.050000
Continuous range	8.07	to	9.00	0.050000
Continuous range	9.00	to	10.26	0.050000
Continuous range	10.26	to	12.25	0.050000
Continuous range	12.25	to	17.00	0.050000
Total Relative Probability			1.000000	

Mean value in simulation was 5.70



Appendix A-2
Benefits Analysis Assuming
2.0 Baseline Log Removal
Daily Drinking Water Rate: 0.9 Liters

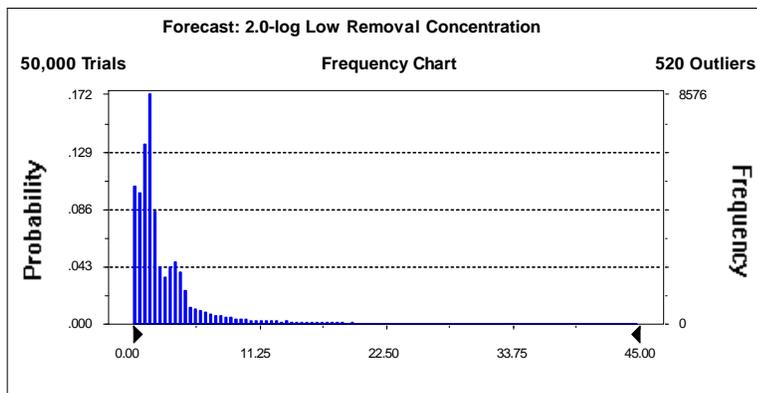
Benefits Analysis Assuming 2.0 Baseline Log Removal at 0.9 Liters Per Day Ingestion Rate

Forecast: 2.0-log Low Removal Concentration

Summary:

Display Range is from 0.00 to 45.00
 Entire Range is from 0.01 to 1,067.33
 After 50,000 Trials, the Std. Error of the Mean is 0.06

Statistics:	<u>Value</u>
Trials	50000
Mean	4.50
Median	1.77
Mode	---
Standard Deviation	13.75
Variance	189.00
Skewness	25.34
Kurtosis	1,250.65
Coeff. of Variability	3.06
Range Minimum	0.01
Range Maximum	1,067.33
Range Width	1,067.33
Mean Std. Error	0.06



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.01
10%	0.44
20%	0.89
30%	1.28
40%	1.48
50%	1.77
60%	2.32
70%	3.47
80%	4.49
90%	8.58
100%	1,067.33

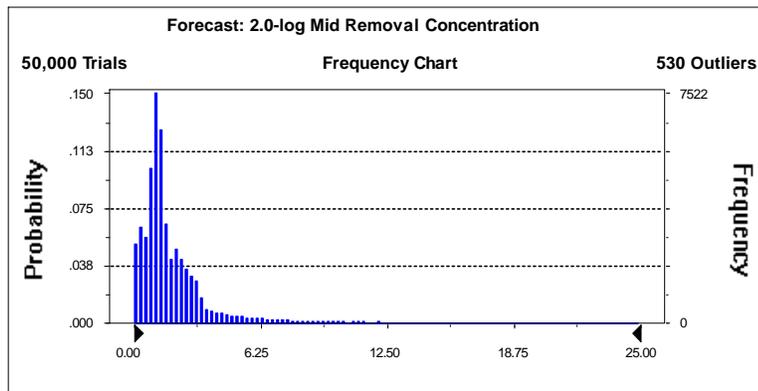
Forecast: 2.0-log Mid Removal Concentration

Summary:

Display Range is from 0.00 to 25.00
 Entire Range is from 0.01 to 600.21
 After 50,000 Trials, the Std. Error of the Mean is 0.03

Statistics:

	<u>Value</u>
Trials	50000
Mean	2.79
Median	1.40
Mode	---
Standard Deviation	7.68
Variance	59.05
Skewness	25.71
Kurtosis	1,277.67
Coeff. of Variability	2.75
Range Minimum	0.01
Range Maximum	600.21
Range Width	600.20
Mean Std. Error	0.03



Percentiles:

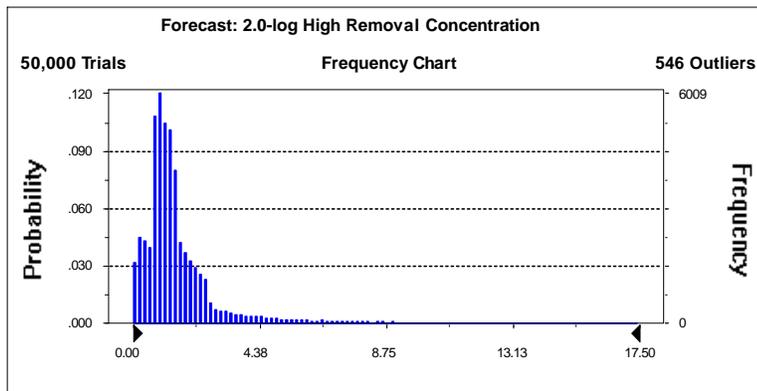
<u>Percentile</u>	<u>Value</u>
0%	0.01
10%	0.44
20%	0.89
30%	1.04
40%	1.21
50%	1.40
60%	1.64
70%	2.21
80%	2.87
90%	4.82
100%	600.21

Forecast: 2.0-log High Removal Concentration

Summary:

Display Range is from 0.00 to 17.50
 Entire Range is from 0.01 to 424.91
 After 50,000 Trials, the Std. Error of the Mean is 0.02

Statistics:	<u>Value</u>
Trials	50000
Mean	2.12
Median	1.24
Mode	---
Standard Deviation	5.41
Variance	29.32
Skewness	25.99
Kurtosis	1,298.80
Coeff. of Variability	2.55
Range Minimum	0.01
Range Maximum	424.91
Range Width	424.91
Mean Std. Error	0.02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.01
10%	0.44
20%	0.79
30%	0.92
40%	1.07
50%	1.24
60%	1.41
70%	1.67
80%	2.17
90%	3.42
100%	424.91

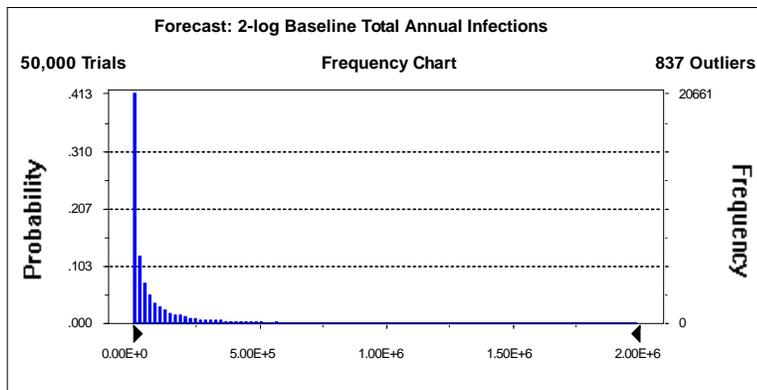
Forecast: 2-log Baseline Total Annual Infections

Summary:

Display Range is from 0.00E+0 to 2.00E+6
 Entire Range is from 0.00E+0 to 1.25E+7
 After 50,000 Trials, the Std. Error of the Mean is 2.75E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.95E+05
Median	3.27E+04
Mode	0.00E+00
Standard Deviation	6.15E+05
Variance	3.78E+11
Skewness	8.59
Kurtosis	105.97
Coeff. of Variability	3.15
Range Minimum	0.00E+00
Range Maximum	1.25E+07
Range Width	1.25E+07
Mean Std. Error	2.75E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	8.76E+02
20%	4.17E+03
30%	9.77E+03
40%	1.85E+04
50%	3.27E+04
60%	5.64E+04
70%	9.88E+04
80%	1.84E+05
90%	4.25E+05
100%	1.25E+07

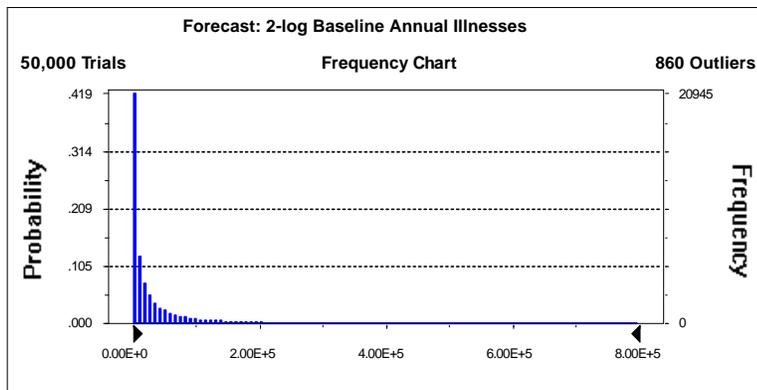
Forecast: 2-log Baseline Annual Illnesses

Summary:

Display Range is from 0.00E+0 to 8.00E+5
 Entire Range is from 0.00E+0 to 6.28E+6
 After 50,000 Trials, the Std. Error of the Mean is 1.14E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	7.85E+04
Median	1.28E+04
Mode	0.00E+00
Standard Deviation	2.54E+05
Variance	6.46E+10
Skewness	9.19
Kurtosis	124.03
Coeff. of Variability	3.24
Range Minimum	0.00E+00
Range Maximum	6.28E+06
Range Width	6.28E+06
Mean Std. Error	1.14E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	3.32E+02
20%	1.61E+03
30%	3.76E+03
40%	7.15E+03
50%	1.28E+04
60%	2.20E+04
70%	3.84E+04
80%	7.25E+04
90%	1.69E+05
100%	6.28E+06

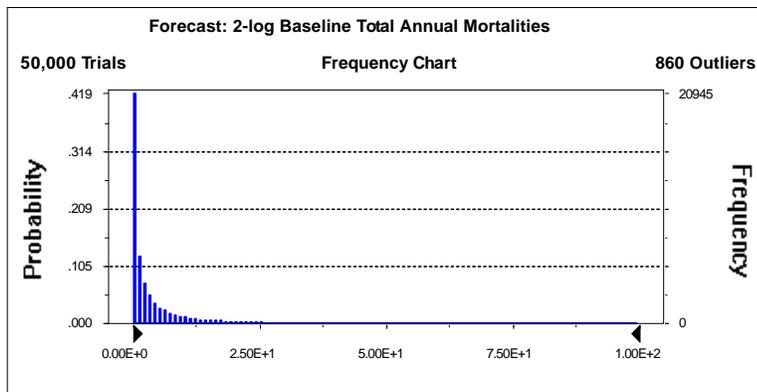
Forecast: 2-log Baseline Total Annual Mortalities

Summary:

Display Range is from 0.00E+0 to 1.00E+2
 Entire Range is from 0.00E+0 to 7.85E+2
 After 50,000 Trials, the Std. Error of the Mean is 1.42E-1

Statistics:

	<u>Value</u>
Trials	50000
Mean	9.81E+00
Median	1.60E+00
Mode	0.00E+00
Standard Deviation	3.18E+01
Variance	1.01E+03
Skewness	9.19
Kurtosis	124.03
Coeff. of Variability	3.24
Range Minimum	0.00E+00
Range Maximum	7.85E+02
Range Width	7.85E+02
Mean Std. Error	1.42E-01



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	4.14E-02
20%	2.01E-01
30%	4.70E-01
40%	8.94E-01
50%	1.60E+00
60%	2.75E+00
70%	4.80E+00
80%	9.06E+00
90%	2.12E+01
100%	7.85E+02

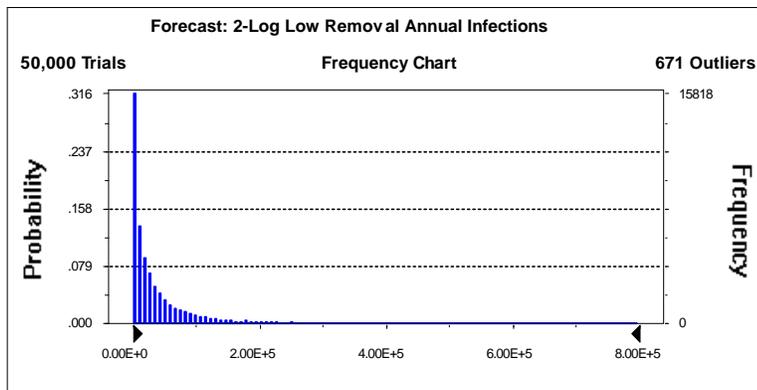
Forecast: 2-Log Low Removal Annual Infections

Summary:

Display Range is from 0.00E+0 to 8.00E+5
 Entire Range is from 0.00E+0 to 9.48E+6
 After 50,000 Trials, the Std. Error of the Mean is 1.14E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	7.61E+04
Median	2.01E+04
Mode	0.00E+00
Standard Deviation	2.55E+05
Variance	6.51E+10
Skewness	13.35
Kurtosis	280.27
Coeff. of Variability	3.35
Range Minimum	0.00E+00
Range Maximum	9.48E+06
Range Width	9.48E+06
Mean Std. Error	1.14E+03



Percentiles:

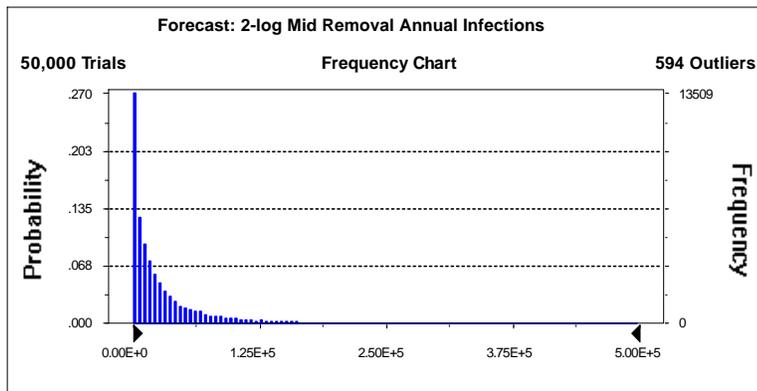
<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	7.08E+02
20%	3.32E+03
30%	7.23E+03
40%	1.25E+04
50%	2.01E+04
60%	3.05E+04
70%	4.71E+04
80%	7.72E+04
90%	1.54E+05
100%	9.48E+06

Forecast: 2-log Mid Removal Annual Infections

Summary:

Display Range is from 0.00E+0 to 5.00E+5
 Entire Range is from 0.00E+0 to 6.84E+6
 After 50,000 Trials, the Std. Error of the Mean is 6.96E+2

Statistics:	<u>Value</u>
Trials	50000
Mean	4.83E+04
Median	1.57E+04
Mode	0.00E+00
Standard Deviation	1.56E+05
Variance	2.42E+10
Skewness	15.39
Kurtosis	386.51
Coeff. of Variability	3.22
Range Minimum	0.00E+00
Range Maximum	6.84E+06
Range Width	6.84E+06
Mean Std. Error	6.96E+02



Percentiles:

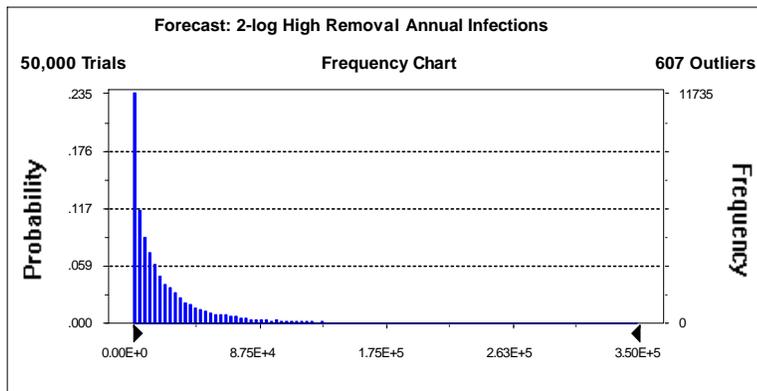
<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	6.10E+02
20%	2.84E+03
30%	6.03E+03
40%	1.02E+04
50%	1.57E+04
60%	2.31E+04
70%	3.41E+04
80%	5.31E+04
90%	9.75E+04
100%	6.84E+06

Forecast: 2-log High Removal Annual Infections

Summary:

Display Range is from 0.00E+0 to 3.50E+5
 Entire Range is from 0.00E+0 to 5.36E+6
 After 50,000 Trials, the Std. Error of the Mean is 5.11E+2

Statistics:	<u>Value</u>
Trials	50000
Mean	3.70E+04
Median	1.35E+04
Mode	0.00E+00
Standard Deviation	1.14E+05
Variance	1.30E+10
Skewness	16.29
Kurtosis	441.46
Coeff. of Variability	3.09
Range Minimum	0.00E+00
Range Maximum	5.36E+06
Range Width	5.36E+06
Mean Std. Error	5.11E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	5.52E+02
20%	2.59E+03
30%	5.35E+03
40%	8.95E+03
50%	1.35E+04
60%	1.95E+04
70%	2.82E+04
80%	4.25E+04
90%	7.52E+04
100%	5.36E+06

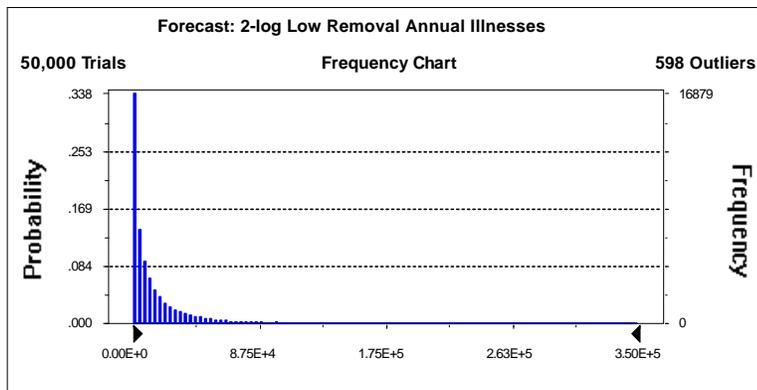
Forecast: 2-log Low Removal Annual Illnesses

Summary:

Display Range is from 0.00E+0 to 3.50E+5
 Entire Range is from 0.00E+0 to 3.81E+6
 After 50,000 Trials, the Std. Error of the Mean is 4.72E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	3.06E+04
Median	7.77E+03
Mode	0.00E+00
Standard Deviation	1.06E+05
Variance	1.11E+10
Skewness	14.09
Kurtosis	312.64
Coeff. of Variability	3.45
Range Minimum	0.00E+00
Range Maximum	3.81E+06
Range Width	3.81E+06
Mean Std. Error	4.72E+02



Percentiles:

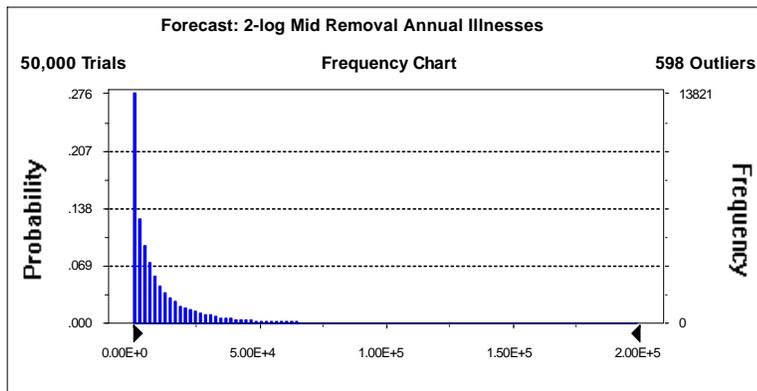
<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	2.69E+02
20%	1.27E+03
30%	2.79E+03
40%	4.86E+03
50%	7.77E+03
60%	1.19E+04
70%	1.85E+04
80%	3.06E+04
90%	6.13E+04
100%	3.81E+06

Forecast: 2-log Mid Removal Annual Illnesses

Summary:

Display Range is from 0.00E+0 to 2.00E+5
 Entire Range is from 0.00E+0 to 2.75E+6
 After 50,000 Trials, the Std. Error of the Mean is 2.88E+2

Statistics:	<u>Value</u>
Trials	50000
Mean	1.94E+04
Median	6.09E+03
Mode	0.00E+00
Standard Deviation	6.44E+04
Variance	4.15E+09
Skewness	16.10
Kurtosis	418.54
Coeff. of Variability	3.32
Range Minimum	0.00E+00
Range Maximum	2.75E+06
Range Width	2.75E+06
Mean Std. Error	2.88E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	2.33E+02
20%	1.09E+03
30%	2.33E+03
40%	3.93E+03
50%	6.09E+03
60%	9.02E+03
70%	1.34E+04
80%	2.11E+04
90%	3.91E+04
100%	2.75E+06

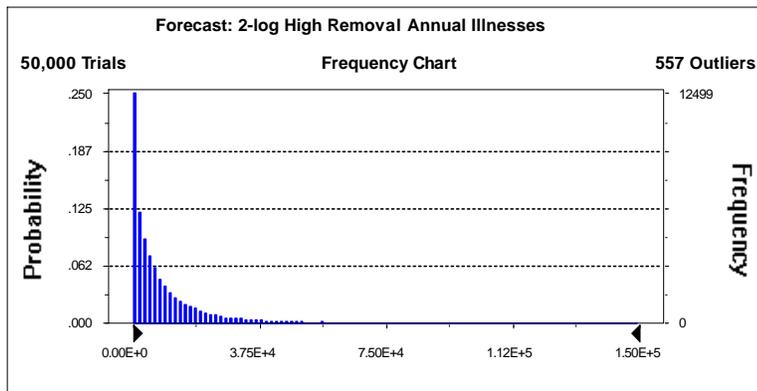
Forecast: 2-log High Removal Annual Illnesses

Summary:

Display Range is from 0.00E+0 to 1.50E+5
 Entire Range is from 0.00E+0 to 2.16E+6
 After 50,000 Trials, the Std. Error of the Mean is 2.11E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.49E+04
Median	5.21E+03
Mode	0.00E+00
Standard Deviation	4.72E+04
Variance	2.23E+09
Skewness	16.96
Kurtosis	471.27
Coeff. of Variability	3.18
Range Minimum	0.00E+00
Range Maximum	2.16E+06
Range Width	2.16E+06
Mean Std. Error	2.11E+02



Percentiles:

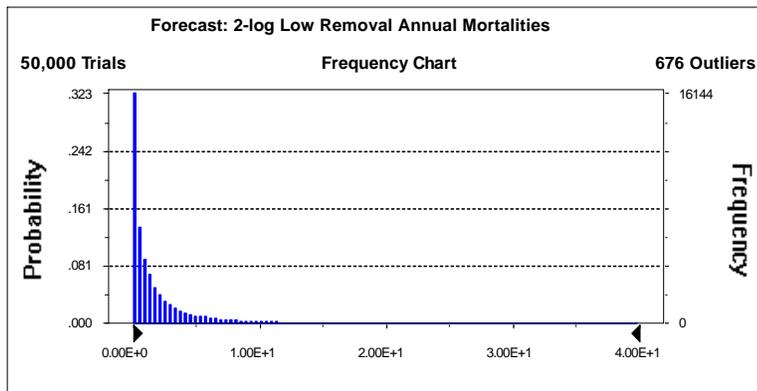
<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	2.09E+02
20%	9.80E+02
30%	2.05E+03
40%	3.44E+03
50%	5.21E+03
60%	7.59E+03
70%	1.11E+04
80%	1.70E+04
90%	3.04E+04
100%	2.16E+06

Forecast: 2-log Low Removal Annual Mortalities

Summary:

Display Range is from 0.00E+0 to 4.00E+1
 Entire Range is from 0.00E+0 to 4.77E+2
 After 50,000 Trials, the Std. Error of the Mean is 5.90E-2

Statistics:	<u>Value</u>
Trials	50000
Mean	3.82E+00
Median	9.72E-01
Mode	0.00E+00
Standard Deviation	1.32E+01
Variance	1.74E+02
Skewness	14.09
Kurtosis	312.64
Coeff. of Variability	3.45
Range Minimum	0.00E+00
Range Maximum	4.77E+02
Range Width	4.77E+02
Mean Std. Error	5.90E-02



Percentiles:

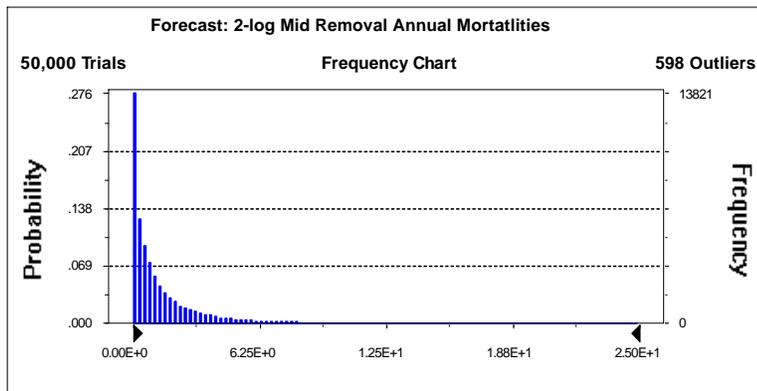
<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	3.37E-02
20%	1.59E-01
30%	3.48E-01
40%	6.07E-01
50%	9.72E-01
60%	1.49E+00
70%	2.31E+00
80%	3.82E+00
90%	7.66E+00
100%	4.77E+02

Forecast: 2-log Mid Removal Annual Mortalities

Summary:

Display Range is from 0.00E+0 to 2.50E+1
 Entire Range is from 0.00E+0 to 3.44E+2
 After 50,000 Trials, the Std. Error of the Mean is 3.60E-2

Statistics:	<u>Value</u>
Trials	50000
Mean	2.42E+00
Median	7.61E-01
Mode	0.00E+00
Standard Deviation	8.05E+00
Variance	6.48E+01
Skewness	16.10
Kurtosis	418.54
Coeff. of Variability	3.32
Range Minimum	0.00E+00
Range Maximum	3.44E+02
Range Width	3.44E+02
Mean Std. Error	3.60E-02



Percentiles:

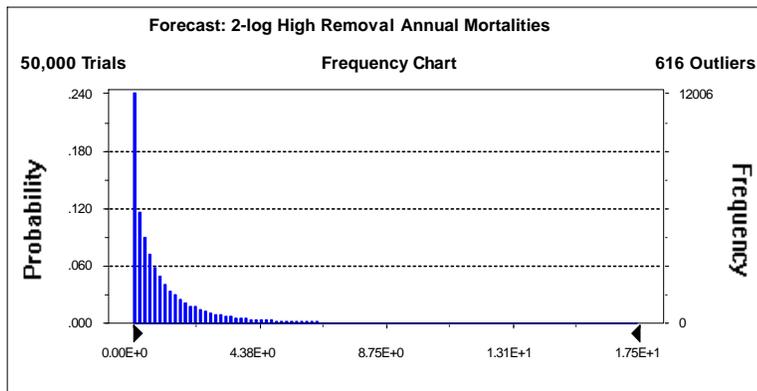
<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	2.91E-02
20%	1.37E-01
30%	2.92E-01
40%	4.92E-01
50%	7.61E-01
60%	1.13E+00
70%	1.67E+00
80%	2.63E+00
90%	4.89E+00
100%	3.44E+02

Forecast: 2-log High Removal Annual Mortalities

Summary:

Display Range is from 0.00E+0 to 1.75E+1
 Entire Range is from 0.00E+0 to 2.69E+2
 After 50,000 Trials, the Std. Error of the Mean is 2.64E-2

Statistics:	<u>Value</u>
Trials	50000
Mean	1.86E+00
Median	6.51E-01
Mode	0.00E+00
Standard Deviation	5.91E+00
Variance	3.49E+01
Skewness	16.96
Kurtosis	471.27
Coeff. of Variability	3.18
Range Minimum	0.00E+00
Range Maximum	2.69E+02
Range Width	2.69E+02
Mean Std. Error	2.64E-02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	2.62E-02
20%	1.23E-01
30%	2.57E-01
40%	4.30E-01
50%	6.51E-01
60%	9.49E-01
70%	1.38E+00
80%	2.12E+00
90%	3.79E+00
100%	2.69E+02

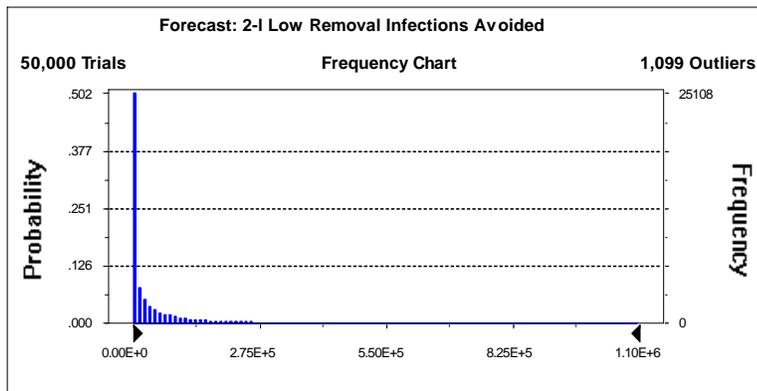
Forecast: 2-I Low Removal Infections Avoided

Summary:

Display Range is from 0.00E+0 to 1.10E+6
 Entire Range is from 0.00E+0 to 5.08E+6
 After 50,000 Trials, the Std. Error of the Mean is 1.66E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.19E+05
Median	1.08E+04
Mode	0.00E+00
Standard Deviation	3.71E+05
Variance	1.37E+11
Skewness	6.94
Kurtosis	65.46
Coeff. of Variability	3.10
Range Minimum	0.00E+00
Range Maximum	5.08E+06
Range Width	5.08E+06
Mean Std. Error	1.66E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	2.59E+03
50%	1.08E+04
60%	2.53E+04
70%	5.24E+04
80%	1.10E+05
90%	2.76E+05
100%	5.08E+06

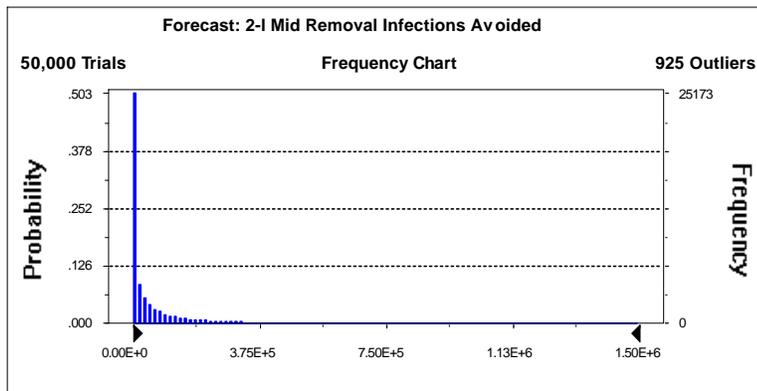
Forecast: 2-I Mid Removal Infections Avoided

Summary:

Display Range is from 0.00E+0 to 1.50E+6
 Entire Range is from 0.00E+0 to 7.16E+6
 After 50,000 Trials, the Std. Error of the Mean is 2.10E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.47E+05
Median	1.45E+04
Mode	0.00E+00
Standard Deviation	4.68E+05
Variance	2.19E+11
Skewness	7.48
Kurtosis	77.26
Coeff. of Variability	3.18
Range Minimum	0.00E+00
Range Maximum	7.16E+06
Range Width	7.16E+06
Mean Std. Error	2.10E+03



Percentiles:

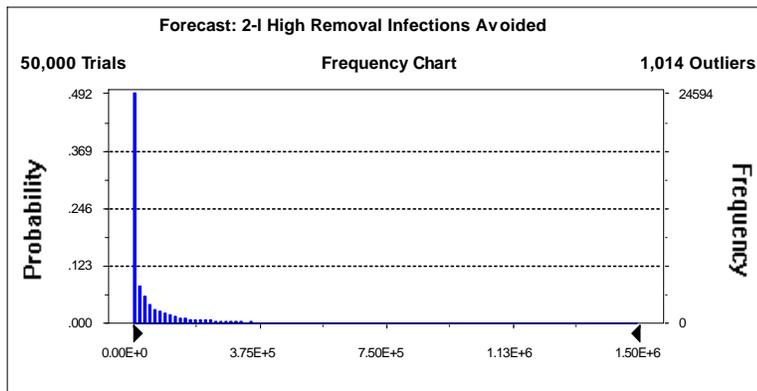
<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	3.55E+03
50%	1.45E+04
60%	3.25E+04
70%	6.55E+04
80%	1.34E+05
90%	3.34E+05
100%	7.16E+06

Forecast: 2-I High Removal Infections Avoided

Summary:

Display Range is from 0.00E+0 to 1.50E+6
 Entire Range is from 0.00E+0 to 8.21E+6
 After 50,000 Trials, the Std. Error of the Mean is 2.27E+3

Statistics:	<u>Value</u>
Trials	50000
Mean	1.58E+05
Median	1.62E+04
Mode	0.00E+00
Standard Deviation	5.09E+05
Variance	2.59E+11
Skewness	7.74
Kurtosis	83.34
Coeff. of Variability	3.21
Range Minimum	0.00E+00
Range Maximum	8.21E+06
Range Width	8.21E+06
Mean Std. Error	2.27E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	3.94E+03
50%	1.62E+04
60%	3.58E+04
70%	7.15E+04
80%	1.45E+05
90%	3.57E+05
100%	8.21E+06

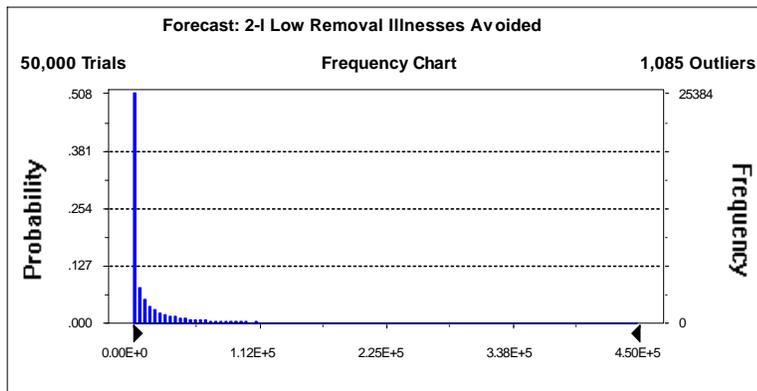
Forecast: 2-I Low Removal Illnesses Avoided

Summary:

Display Range is from 0.00E+0 to 4.50E+5
 Entire Range is from 0.00E+0 to 2.75E+6
 After 50,000 Trials, the Std. Error of the Mean is 6.84E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	4.80E+04
Median	4.21E+03
Mode	0.00E+00
Standard Deviation	1.53E+05
Variance	2.34E+10
Skewness	7.44
Kurtosis	77.62
Coeff. of Variability	3.19
Range Minimum	0.00E+00
Range Maximum	2.75E+06
Range Width	2.75E+06
Mean Std. Error	6.84E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	9.82E+02
50%	4.21E+03
60%	9.84E+03
70%	2.06E+04
80%	4.29E+04
90%	1.10E+05
100%	2.75E+06

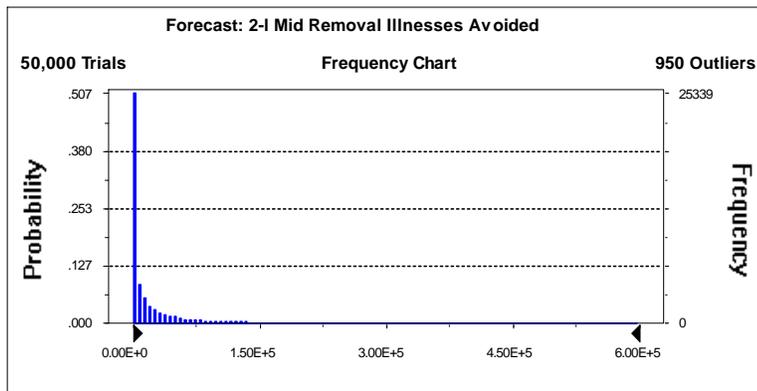
Forecast: 2-I Mid Removal Illnesses Avoided

Summary:

Display Range is from 0.00E+0 to 6.00E+5
 Entire Range is from 0.00E+0 to 4.00E+6
 After 50,000 Trials, the Std. Error of the Mean is 8.65E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	5.91E+04
Median	5.63E+03
Mode	0.00E+00
Standard Deviation	1.93E+05
Variance	3.74E+10
Skewness	8.02
Kurtosis	91.39
Coeff. of Variability	3.27
Range Minimum	0.00E+00
Range Maximum	4.00E+06
Range Width	4.00E+06
Mean Std. Error	8.65E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	1.36E+03
50%	5.63E+03
60%	1.27E+04
70%	2.56E+04
80%	5.24E+04
90%	1.32E+05
100%	4.00E+06

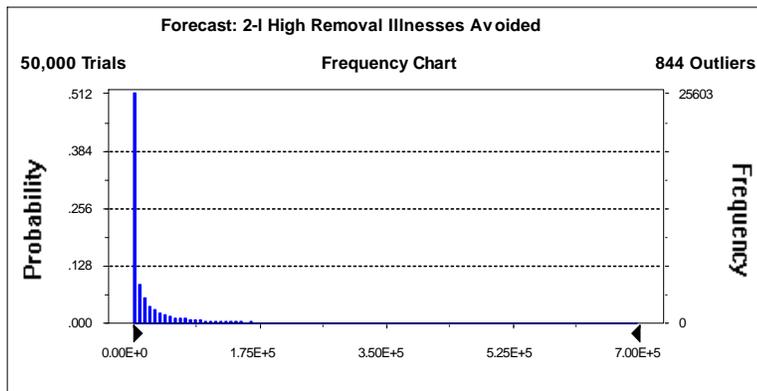
Forecast: 2-I High Removal Illnesses Avoided

Summary:

Display Range is from 0.00E+0 to 7.00E+5
 Entire Range is from 0.00E+0 to 4.58E+6
 After 50,000 Trials, the Std. Error of the Mean is 9.40E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	6.37E+04
Median	6.24E+03
Mode	0.00E+00
Standard Deviation	2.10E+05
Variance	4.41E+10
Skewness	8.30
Kurtosis	98.44
Coeff. of Variability	3.30
Range Minimum	0.00E+00
Range Maximum	4.58E+06
Range Width	4.58E+06
Mean Std. Error	9.40E+02



Percentiles:

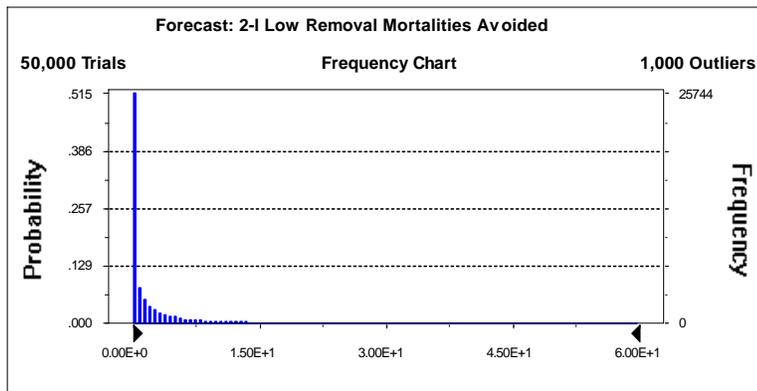
<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	1.53E+03
50%	6.24E+03
60%	1.40E+04
70%	2.80E+04
80%	5.68E+04
90%	1.42E+05
100%	4.58E+06

Forecast: 2-I Low Removal Mortalities Avoided

Summary:

Display Range is from 0.00E+0 to 6.00E+1
 Entire Range is from 0.00E+0 to 3.44E+2
 After 50,000 Trials, the Std. Error of the Mean is 8.55E-2

Statistics:	<u>Value</u>
Trials	50000
Mean	6.00E+00
Median	5.26E-01
Mode	0.00E+00
Standard Deviation	1.91E+01
Variance	3.66E+02
Skewness	7.44
Kurtosis	77.62
Coeff. of Variability	3.19
Range Minimum	0.00E+00
Range Maximum	3.44E+02
Range Width	3.44E+02
Mean Std. Error	8.55E-02



Percentiles:

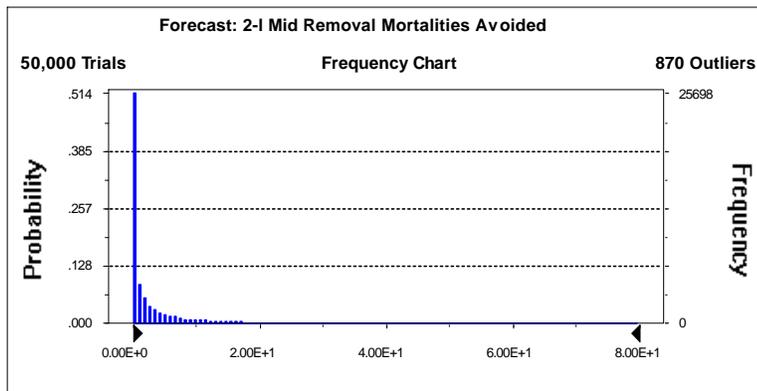
<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	1.23E-01
50%	5.26E-01
60%	1.23E+00
70%	2.57E+00
80%	5.36E+00
90%	1.37E+01
100%	3.44E+02

Forecast: 2-I Mid Removal Mortalities Avoided

Summary:

Display Range is from 0.00E+0 to 8.00E+1
 Entire Range is from 0.00E+0 to 5.00E+2
 After 50,000 Trials, the Std. Error of the Mean is 1.08E-1

Statistics:	<u>Value</u>
Trials	50000
Mean	7.39E+00
Median	7.04E-01
Mode	0.00E+00
Standard Deviation	2.42E+01
Variance	5.85E+02
Skewness	8.02
Kurtosis	91.39
Coeff. of Variability	3.27
Range Minimum	0.00E+00
Range Maximum	5.00E+02
Range Width	5.00E+02
Mean Std. Error	1.08E-01



Percentiles:

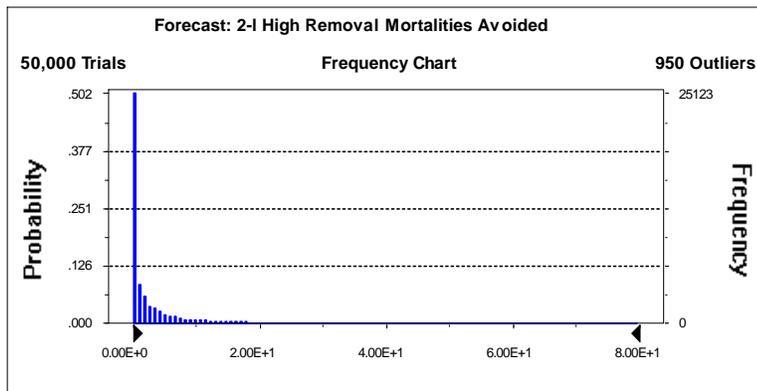
<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	1.70E-01
50%	7.04E-01
60%	1.58E+00
70%	3.20E+00
80%	6.55E+00
90%	1.66E+01
100%	5.00E+02

Forecast: 2-I High Removal Mortalities Avoided

Summary:

Display Range is from 0.00E+0 to 8.00E+1
 Entire Range is from 0.00E+0 to 5.72E+2
 After 50,000 Trials, the Std. Error of the Mean is 1.17E-1

Statistics:	<u>Value</u>
Trials	50000
Mean	7.96E+00
Median	7.80E-01
Mode	0.00E+00
Standard Deviation	2.63E+01
Variance	6.90E+02
Skewness	8.30
Kurtosis	98.44
Coeff. of Variability	3.30
Range Minimum	0.00E+00
Range Maximum	5.72E+02
Range Width	5.72E+02
Mean Std. Error	1.17E-01



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	1.91E-01
50%	7.80E-01
60%	1.75E+00
70%	3.50E+00
80%	7.09E+00
90%	1.78E+01
100%	5.72E+02

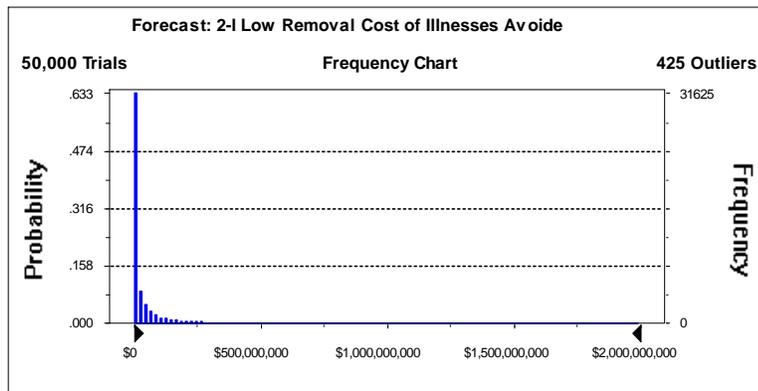
Forecast: 2-I Low Removal Cost of Illnesses Avoided

Summary:

Display Range is from \$0 to \$2,000,000,000
 Entire Range is from \$0 to \$44,388,336,736
 After 50,000 Trials, the Std. Error of the Mean is \$3,104,811

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$115,690,274
Median	\$6,142,051
Mode	\$0
Standard Deviation	\$694,256,789
Variance	5E+17
Skewness	28.18
Kurtosis	1,188.68
Coeff. of Variability	6.00
Range Minimum	\$0
Range Maximum	\$44,388,336,736
Range Width	\$44,388,336,736
Mean Std. Error	\$3,104,810.75



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$1,389,053
50%	\$6,142,051
60%	\$15,421,057
70%	\$33,297,990
80%	\$73,847,045
90%	\$204,715,085
100%	\$44,388,336,736

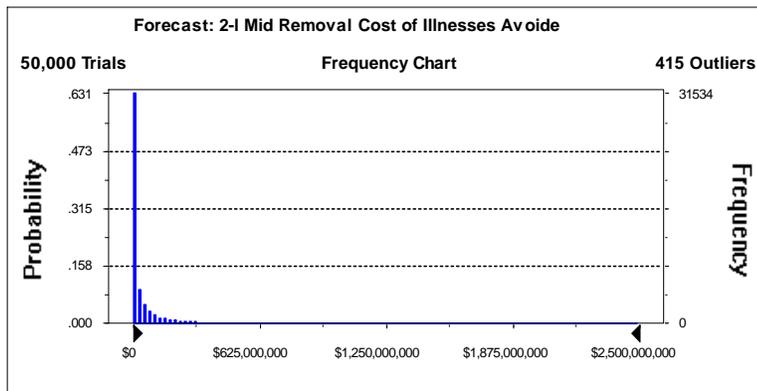
Forecast: 2-I Mid Removal Cost of Illnesses Avoided

Summary:

Display Range is from \$0 to \$2,500,000,000
 Entire Range is from \$0 to \$65,537,053,036
 After 50,000 Trials, the Std. Error of the Mean is \$3,934,333

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$142,645,312
Median	\$8,211,345
Mode	\$0
Standard Deviation	\$879,743,559
Variance	8E+17
Skewness	30.77
Kurtosis	1,468.89
Coeff. of Variability	6.17
Range Minimum	\$0
Range Maximum	\$65,537,053,036
Range Width	\$65,537,053,036
Mean Std. Error	\$3,934,332.80



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$1,908,799
50%	\$8,211,345
60%	\$19,813,696
70%	\$41,557,311
80%	\$90,989,061
90%	\$249,407,603
100%	\$65,537,053,036

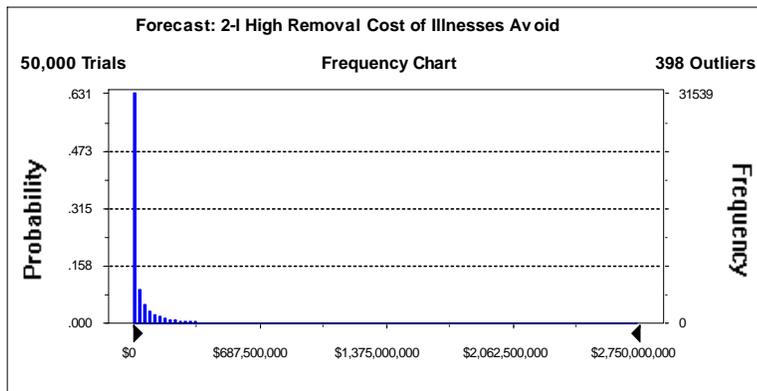
Forecast: 2-I High Removal Cost of Illnesses Avoided

Summary:

Display Range is from \$0 to \$2,750,000,000
 Entire Range is from \$0 to \$75,404,102,352
 After 50,000 Trials, the Std. Error of the Mean is \$4,276,041

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$153,553,908
Median	\$9,103,897
Mode	\$0
Standard Deviation	\$956,151,805
Variance	9E+17
Skewness	32.03
Kurtosis	1,621.09
Coeff. of Variability	6.23
Range Minimum	\$0
Range Maximum	\$75,404,102,352
Range Width	\$75,404,102,352
Mean Std. Error	\$4,276,040.87



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$2,135,020
50%	\$9,103,897
60%	\$21,787,078
70%	\$45,380,514
80%	\$98,546,967
90%	\$267,769,929
100%	\$75,404,102,352

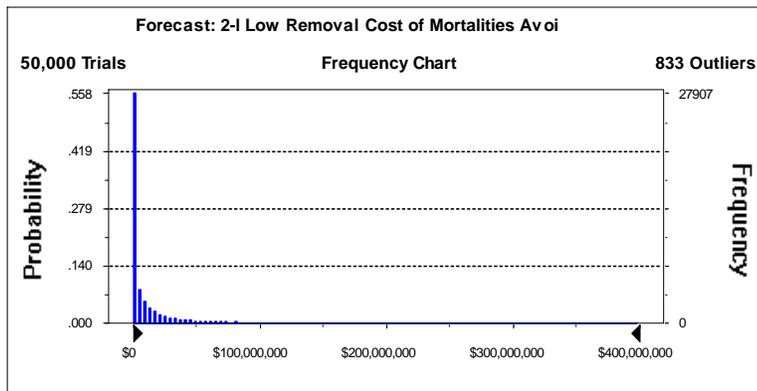
Forecast: 2-I Low Removal Cost of Mortalities Avoided

Summary:

Display Range is from \$0 to \$400,000,000
 Entire Range is from \$0 to \$4,806,023,136
 After 50,000 Trials, the Std. Error of the Mean is \$577,406

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$34,354,912
Median	\$2,310,697
Mode	\$0
Standard Deviation	\$129,111,971
Variance	2E+16
Skewness	11.00
Kurtosis	200.93
Coeff. of Variability	3.76
Range Minimum	\$0
Range Maximum	\$4,806,023,136
Range Width	\$4,806,023,136
Mean Std. Error	\$577,406.29



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$521,194
50%	\$2,310,697
60%	\$5,736,998
70%	\$12,485,646
80%	\$27,074,657
90%	\$72,866,441
100%	\$4,806,023,136

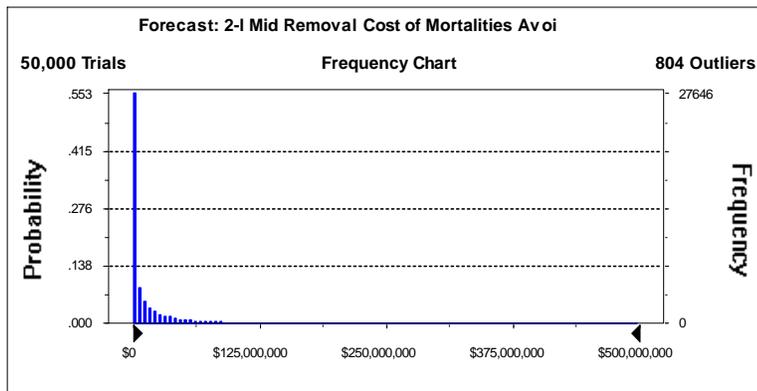
Forecast: 2-I Mid Removal Cost of Mortalities Avoided

Summary:

Display Range is from \$0 to \$500,000,000
 Entire Range is from \$0 to \$6,484,236,070
 After 50,000 Trials, the Std. Error of the Mean is \$727,229

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$42,348,205
Median	\$3,115,164
Mode	\$0
Standard Deviation	\$162,613,342
Variance	3E+16
Skewness	11.65
Kurtosis	227.33
Coeff. of Variability	3.84
Range Minimum	\$0
Range Maximum	\$6,484,236,070
Range Width	\$6,484,236,070
Mean Std. Error	\$727,228.97



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$710,342
50%	\$3,115,164
60%	\$7,429,826
70%	\$15,586,378
80%	\$33,336,987
90%	\$88,340,800
100%	\$6,484,236,070

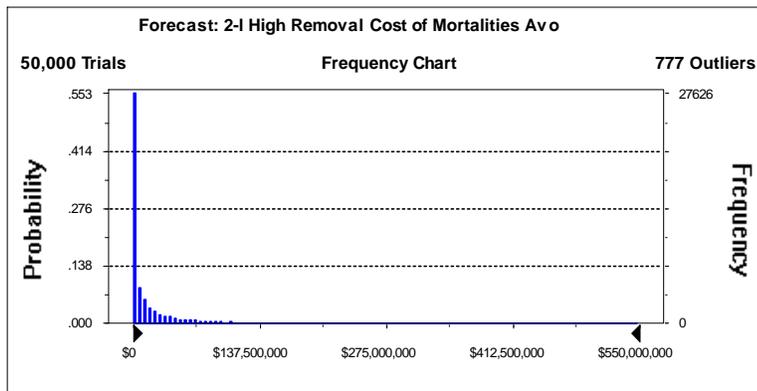
Forecast: 2-I High Removal Cost of Mortalities Avoided

Summary:

Display Range is from \$0 to \$550,000,000
 Entire Range is from \$0 to \$7,204,028,842
 After 50,000 Trials, the Std. Error of the Mean is \$788,063

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$45,584,919
Median	\$3,465,651
Mode	\$0
Standard Deviation	\$176,216,305
Variance	3E+16
Skewness	11.92
Kurtosis	238.69
Coeff. of Variability	3.87
Range Minimum	\$0
Range Maximum	\$7,204,028,842
Range Width	\$7,204,028,842
Mean Std. Error	\$788,063.27



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$788,828
50%	\$3,465,651
60%	\$8,172,703
70%	\$17,055,438
80%	\$36,035,748
90%	\$94,639,901
100%	\$7,204,028,842

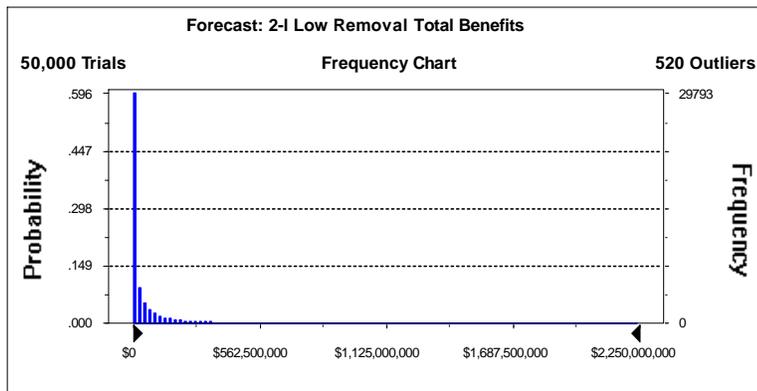
Forecast: 2-I Low Removal Total Benefits

Summary:

Display Range is from \$0 to \$2,250,000,000
 Entire Range is from \$0 to \$45,018,581,587
 After 50,000 Trials, the Std. Error of the Mean is \$3,398,874

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$150,045,186
Median	\$9,307,401
Mode	\$0
Standard Deviation	\$760,011,226
Variance	6E+17
Skewness	24.02
Kurtosis	921.64
Coeff. of Variability	5.07
Range Minimum	\$0
Range Maximum	\$45,018,581,587
Range Width	\$45,018,581,587
Mean Std. Error	\$3,398,873.53



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$2,162,714
50%	\$9,307,401
60%	\$23,354,606
70%	\$49,235,939
80%	\$107,627,444
90%	\$289,188,220
100%	\$45,018,581,587

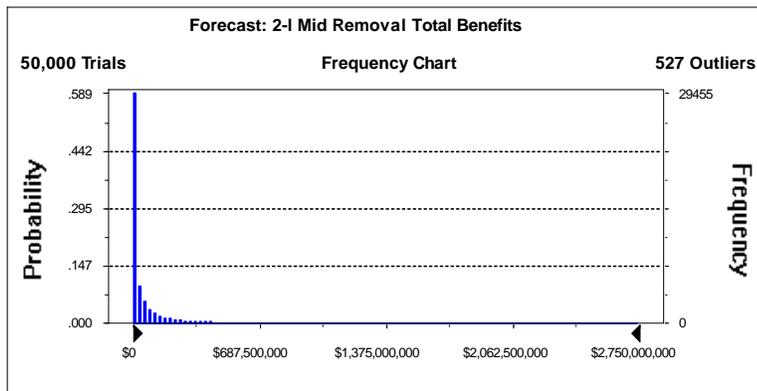
Forecast: 2-I Mid Removal Total Benefits

Summary:

Display Range is from \$0 to \$2,750,000,000
 Entire Range is from \$0 to \$66,467,576,531
 After 50,000 Trials, the Std. Error of the Mean is \$4,302,135

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$184,993,517
Median	\$12,452,258
Mode	\$0
Standard Deviation	\$961,986,596
Variance	9E+17
Skewness	26.16
Kurtosis	1,132.35
Coeff. of Variability	5.20
Range Minimum	\$0
Range Maximum	\$66,467,576,531
Range Width	\$66,467,576,531
Mean Std. Error	\$4,302,134.85



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$2,937,435
50%	\$12,452,258
60%	\$30,038,892
70%	\$61,359,152
80%	\$132,233,073
90%	\$351,625,046
100%	\$66,467,576,531

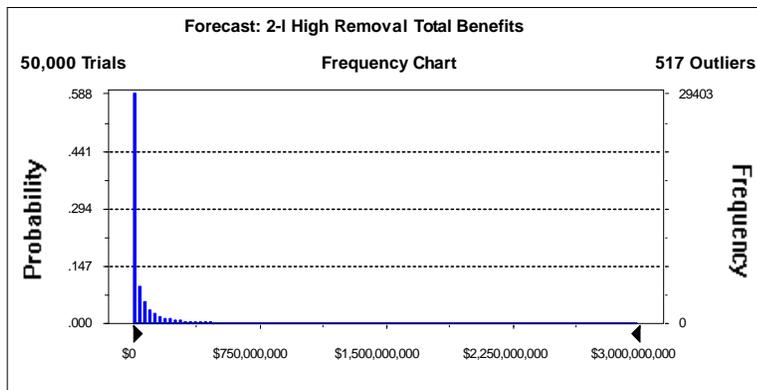
Forecast: 2-I High Removal Total Benefits

Summary:

Display Range is from \$0 to \$3,000,000,000
 Entire Range is from \$0 to \$76,474,722,491
 After 50,000 Trials, the Std. Error of the Mean is \$4,673,277

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$199,138,827
Median	\$13,813,217
Mode	\$0
Standard Deviation	\$1,044,976,489
Variance	1E+18
Skewness	27.21
Kurtosis	1,247.10
Coeff. of Variability	5.25
Range Minimum	\$0
Range Maximum	\$76,474,722,491
Range Width	\$76,474,722,491
Mean Std. Error	\$4,673,276.93



Percentiles:

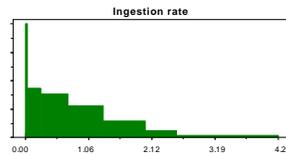
<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$3,261,072
50%	\$13,813,217
60%	\$33,072,493
70%	\$67,043,785
80%	\$143,516,646
90%	\$376,416,904
100%	\$76,474,722,491

Assumptions

Assumption: Daily Water Consumption

Custom distribution with parameters:				<u>Relative Prob.</u>
Single point	0.00			0.050000
Continuous range	0.00	to	0.03	0.050000
Continuous range	0.03	to	0.27	0.150000
Continuous range	0.27	to	0.71	0.250000
Continuous range	0.71	to	1.31	0.250000
Continuous range	1.31	to	2.02	0.150000
Continuous range	2.02	to	2.55	0.050000
Continuous range	2.55	to	4.25	0.050000
Total Relative Probability				1.000000

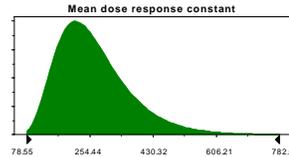
Mean value in simulation was 0.93



Assumption: Mean dose response constant

Lognormal distribution with parameters:	
5% - tile	132.00
95% - tile	465.40

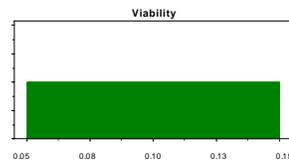
Selected range is from 0.00 to +Infinity
 Mean value in simulation was 266.72



Assumption: Viability

Uniform distribution with parameters:	
Minimum	0.05
Maximum	0.15

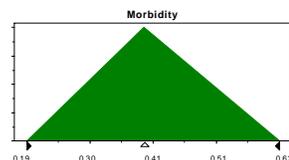
Mean value in simulation was 0.10



Assumption: Morbidity

Triangular distribution with parameters:	
Minimum	0.19
Likeliest	0.39
Maximum	0.62

Selected range is from 0.19 to 0.62
 Mean value in simulation was 0.40

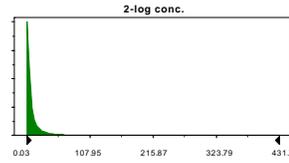


Assumption: Mean Daily Cyst Concentration in Distributed Water

Lognormal distribution with parameters:

Mean 12.60
Standard Dev. 44.30

Selected range is from 0.00 to +Infinity
Mean value in simulation was 12.64

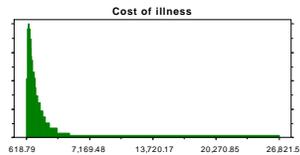


Assumption: Cost of Illness

Custom distribution with parameters:

				<u>Relative Prob.</u>
Continuous range	618.79	to	736.35	0.050000
Continuous range	736.35	to	799.67	0.050000
Continuous range	799.67	to	860.41	0.050000
Continuous range	860.41	to	921.94	0.050000
Continuous range	921.94	to	985.38	0.050000
Continuous range	985.38	to	1,055.42	0.050000
Continuous range	1,055.42	to	1,132.61	0.050000
Continuous range	1,132.61	to	1,217.08	0.050000
Continuous range	1,217.08	to	1,306.32	0.050000
Continuous range	1,306.32	to	1,410.82	0.050000
Continuous range	1,410.82	to	1,526.87	0.050000
Continuous range	1,526.87	to	1,663.45	0.050000
Continuous range	1,663.45	to	1,828.49	0.050000
Continuous range	1,828.49	to	2,024.49	0.050000
Continuous range	2,024.49	to	2,279.26	0.050000
Continuous range	2,279.26	to	2,609.62	0.050000
Continuous range	2,609.62	to	3,062.70	0.050000
Continuous range	3,062.70	to	3,777.19	0.050000
Continuous range	3,777.19	to	5,148.57	0.050000
Continuous range	5,148.57	to	26,821.54	0.050000
Total Relative Probability				1.000000

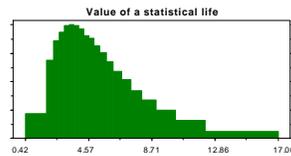
Mean value in simulation was 2,403.24



Assumption: Value of a Statistical Life

Custom distribution with parameters:				<u>Relative Prob.</u>	
Continuous range	0.42	to	1.84	0.050000	
Continuous range	1.84	to	2.30	0.050000	
Continuous range	2.30	to	2.66	0.050000	
Continuous range	2.66	to	2.99	0.050000	
Continuous range	2.99	to	3.31	0.050000	
Continuous range	3.31	to	3.62	0.050000	
Continuous range	3.62	to	3.93	0.050000	
Continuous range	3.93	to	4.25	0.050000	
Continuous range	4.25	to	4.60	0.050000	
Continuous range	4.60	to	4.95	0.050000	
Continuous range	4.95	to	5.33	0.050000	
Continuous range	5.33	to	5.75	0.050000	
Continuous range	5.75	to	6.21	0.050000	
Continuous range	6.21	to	6.73	0.050000	
Continuous range	6.73	to	7.34	0.050000	
Continuous range	7.34	to	8.07	0.050000	
Continuous range	8.07	to	9.00	0.050000	
Continuous range	9.00	to	10.26	0.050000	
Continuous range	10.26	to	12.25	0.050000	
Continuous range	12.25	to	17.00	0.050000	
Total Relative Probability					1.000000

Mean value in simulation was 5.70



Appendix A-3
Benefits Analysis Assuming
2.0 Baseline Log Removal
Daily Drinking Water Rate: 1.9 Liters

Benefits Analysis Assuming 2.0 Baseline Log Removal at 1.9 Liters Per Day Ingestion Rate

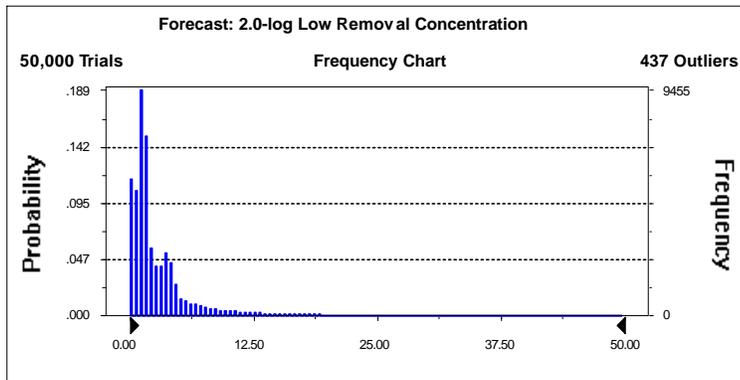
Forecast: 2.0-log Low Removal Concentration

Summary:

Display Range is from 0.00 to 50.00
 Entire Range is from 0.00 to 2,185.52
 After 50,000 Trials, the Std. Error of the Mean is 0.07

Statistics:

	<u>Value</u>
Trials	50000
Mean	4.51
Median	1.77
Mode	---
Standard Deviation	15.78
Variance	249.06
Skewness	60.66
Kurtosis	7,469.22
Coeff. of Variability	3.50
Range Minimum	0.00
Range Maximum	2,185.52
Range Width	2,185.52
Mean Std. Error	0.07



Percentiles:

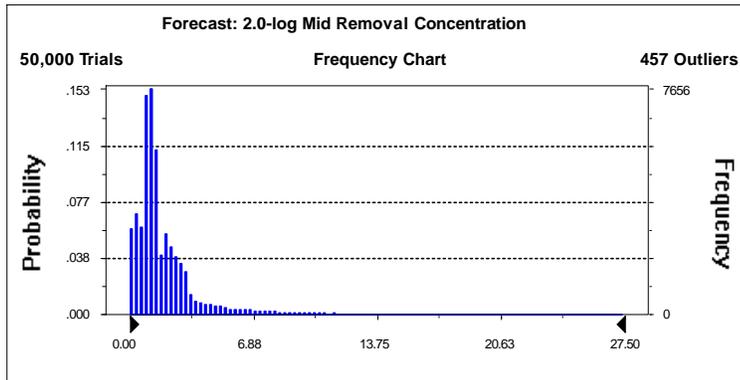
<u>Percentile</u>	<u>Value</u>
0%	0.00
10%	0.44
20%	0.89
30%	1.28
40%	1.48
50%	1.77
60%	2.32
70%	3.47
80%	4.49
90%	8.58
100%	2,185.52

Forecast: 2.0-log Mid Removal Concentration

Summary:

Display Range is from 0.00 to 27.50
 Entire Range is from 0.00 to 1,229.01
 After 50,000 Trials, the Std. Error of the Mean is 0.04

Statistics:	<u>Value</u>
Trials	50000
Mean	2.80
Median	1.40
Mode	---
Standard Deviation	8.83
Variance	78.04
Skewness	61.41
Kurtosis	7,600.48
Coeff. of Variability	3.16
Range Minimum	0.00
Range Maximum	1,229.01
Range Width	1,229.01
Mean Std. Error	0.04



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00
10%	0.44
20%	0.89
30%	1.04
40%	1.21
50%	1.40
60%	1.64
70%	2.21
80%	2.87
90%	4.82
100%	1,229.01

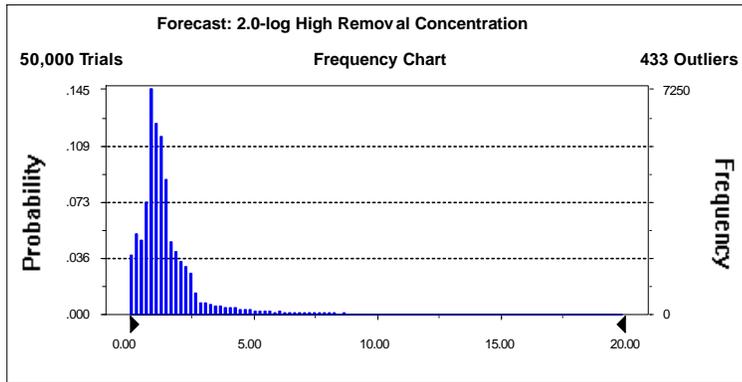
Forecast: 2.0-log High Removal Concentration

Summary:

Display Range is from 0.00 to 20.00
 Entire Range is from 0.00 to 870.07
 After 50,000 Trials, the Std. Error of the Mean is 0.03

Statistics:

	<u>Value</u>
Trials	50000
Mean	2.13
Median	1.24
Mode	---
Standard Deviation	6.23
Variance	38.84
Skewness	62.00
Kurtosis	7,702.60
Coeff. of Variability	2.93
Range Minimum	0.00
Range Maximum	870.07
Range Width	870.07
Mean Std. Error	0.03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00
10%	0.44
20%	0.78
30%	0.92
40%	1.07
50%	1.24
60%	1.41
70%	1.67
80%	2.17
90%	3.42
100%	870.07

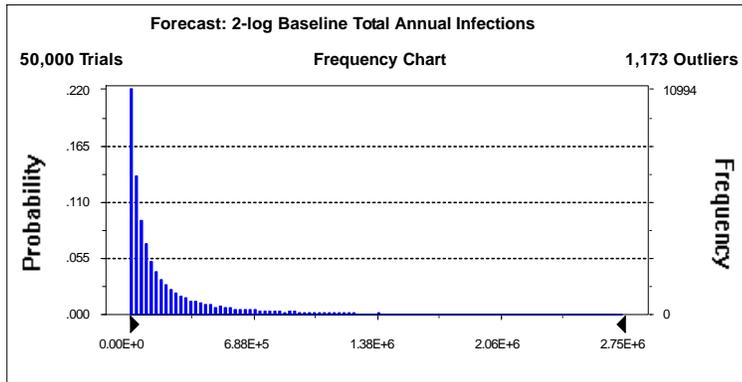
Forecast: 2-log Baseline Total Annual Infections

Summary:

Display Range is from 0.00E+0 to 2.75E+6
 Entire Range is from 9.26E+1 to 1.28E+7
 After 50,000 Trials, the Std. Error of the Mean is 3.92E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	3.75E+05
Median	1.03E+05
Mode	---
Standard Deviation	8.78E+05
Variance	7.70E+11
Skewness	6.08
Kurtosis	54.24
Coeff. of Variability	2.34
Range Minimum	9.26E+01
Range Maximum	1.28E+07
Range Width	1.28E+07
Mean Std. Error	3.92E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	9.26E+01
10%	1.14E+04
20%	2.44E+04
30%	4.24E+04
40%	6.71E+04
50%	1.03E+05
60%	1.58E+05
70%	2.48E+05
80%	4.25E+05
90%	8.96E+05
100%	1.28E+07

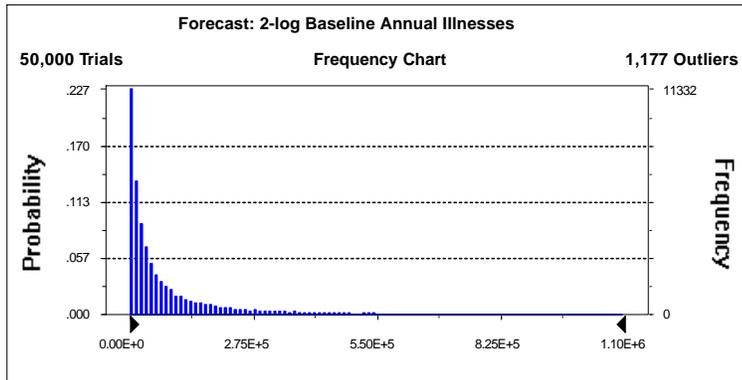
Forecast: 2-log Baseline Annual Illnesses

Summary:

Display Range is from 0.00E+0 to 1.10E+6
 Entire Range is from 2.65E+1 to 7.37E+6
 After 50,000 Trials, the Std. Error of the Mean is 1.62E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.50E+05
Median	4.02E+04
Mode	---
Standard Deviation	3.62E+05
Variance	1.31E+11
Skewness	6.58
Kurtosis	65.56
Coeff. of Variability	2.41
Range Minimum	2.65E+01
Range Maximum	7.37E+06
Range Width	7.37E+06
Mean Std. Error	1.62E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	2.65E+01
10%	4.32E+03
20%	9.41E+03
30%	1.64E+04
40%	2.62E+04
50%	4.02E+04
60%	6.17E+04
70%	9.74E+04
80%	1.68E+05
90%	3.54E+05
100%	7.37E+06

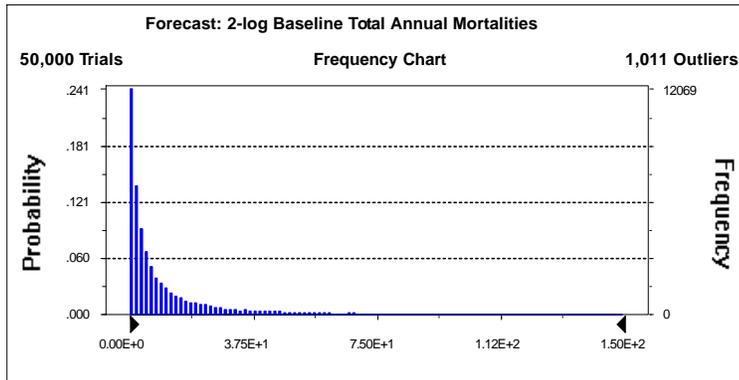
Forecast: 2-log Baseline Total Annual Mortalities

Summary:

Display Range is from 0.00E+0 to 1.50E+2
 Entire Range is from 3.32E-3 to 9.21E+2
 After 50,000 Trials, the Std. Error of the Mean is 2.02E-1

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.87E+01
Median	5.03E+00
Mode	---
Standard Deviation	4.52E+01
Variance	2.04E+03
Skewness	6.58
Kurtosis	65.56
Coeff. of Variability	2.41
Range Minimum	3.32E-03
Range Maximum	9.21E+02
Range Width	9.21E+02
Mean Std. Error	2.02E-01



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	3.32E-03
10%	5.40E-01
20%	1.18E+00
30%	2.05E+00
40%	3.27E+00
50%	5.03E+00
60%	7.71E+00
70%	1.22E+01
80%	2.10E+01
90%	4.43E+01
100%	9.21E+02

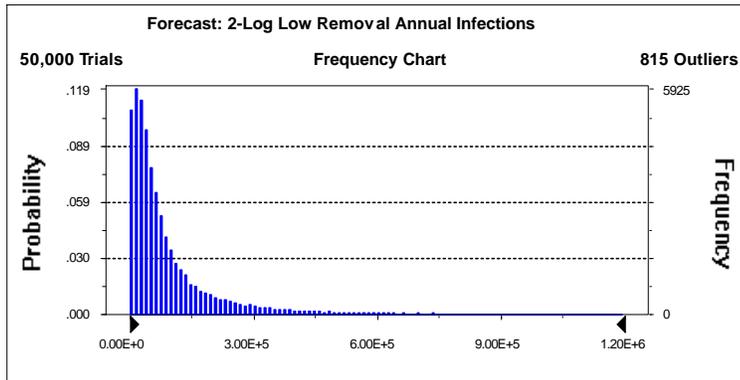
Forecast: 2-Log Low Removal Annual Infections

Summary:

Display Range is from 0.00E+0 to 1.20E+6
 Entire Range is from 9.26E+1 to 1.27E+7
 After 50,000 Trials, the Std. Error of the Mean is 1.70E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.48E+05
Median	5.76E+04
Mode	---
Standard Deviation	3.79E+05
Variance	1.44E+11
Skewness	10.86
Kurtosis	191.74
Coeff. of Variability	2.56
Range Minimum	9.26E+01
Range Maximum	1.27E+07
Range Width	1.27E+07
Mean Std. Error	1.70E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	9.26E+01
10%	1.12E+04
20%	2.14E+04
30%	3.17E+04
40%	4.33E+04
50%	5.76E+04
60%	7.66E+04
70%	1.06E+05
80%	1.60E+05
90%	3.01E+05
100%	1.27E+07

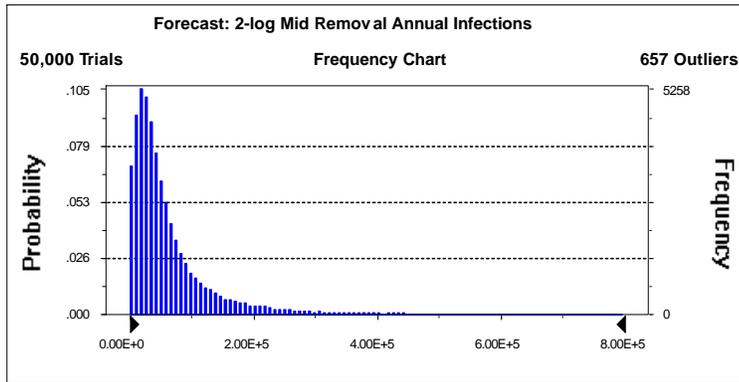
Forecast: 2-log Mid Removal Annual Infections

Summary:

Display Range is from 0.00E+0 to 8.00E+5
 Entire Range is from 9.26E+1 to 1.25E+7
 After 50,000 Trials, the Std. Error of the Mean is 1.07E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	9.46E+04
Median	4.41E+04
Mode	---
Standard Deviation	2.39E+05
Variance	5.72E+10
Skewness	14.64
Kurtosis	388.22
Coeff. of Variability	2.53
Range Minimum	9.26E+01
Range Maximum	1.26E+07
Range Width	1.26E+07
Mean Std. Error	1.07E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	9.26E+01
10%	1.07E+04
20%	1.88E+04
30%	2.64E+04
40%	3.46E+04
50%	4.41E+04
60%	5.63E+04
70%	7.36E+04
80%	1.04E+05
90%	1.79E+05
100%	1.26E+07

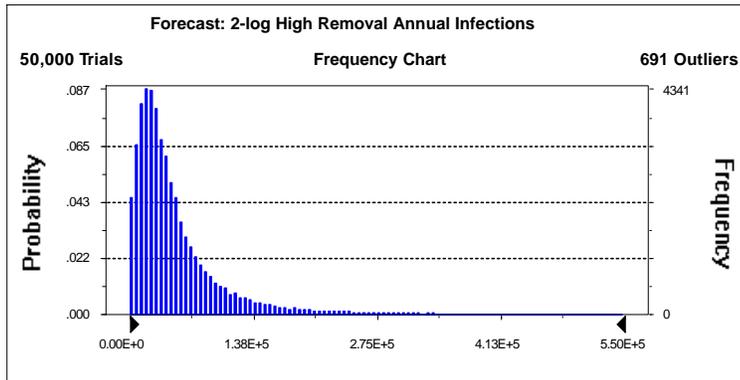
Forecast: 2-log High Removal Annual Infections

Summary:

Display Range is from 0.00E+0 to 5.50E+5
 Entire Range is from 9.26E+1 to 1.22E+7
 After 50,000 Trials, the Std. Error of the Mean is 8.05E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	7.27E+04
Median	3.74E+04
Mode	---
Standard Deviation	1.80E+05
Variance	3.24E+10
Skewness	18.34
Kurtosis	685.05
Coeff. of Variability	2.48
Range Minimum	9.26E+01
Range Maximum	1.23E+07
Range Width	1.23E+07
Mean Std. Error	8.05E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	9.26E+01
10%	1.02E+04
20%	1.70E+04
30%	2.33E+04
40%	2.99E+04
50%	3.74E+04
60%	4.67E+04
70%	5.95E+04
80%	8.12E+04
90%	1.32E+05
100%	1.23E+07

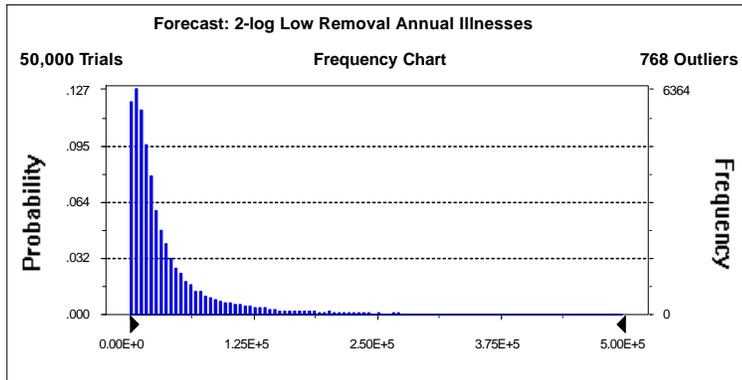
Forecast: 2-log Low Removal Annual Illnesses

Summary:

Display Range is from 0.00E+0 to 5.00E+5
 Entire Range is from 2.65E+1 to 5.62E+6
 After 50,000 Trials, the Std. Error of the Mean is 7.01E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	5.93E+04
Median	2.25E+04
Mode	---
Standard Deviation	1.57E+05
Variance	2.45E+10
Skewness	11.82
Kurtosis	237.33
Coeff. of Variability	2.64
Range Minimum	2.65E+01
Range Maximum	5.62E+06
Range Width	5.62E+06
Mean Std. Error	7.01E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	2.65E+01
10%	4.21E+03
20%	8.12E+03
30%	1.22E+04
40%	1.68E+04
50%	2.25E+04
60%	3.03E+04
70%	4.21E+04
80%	6.36E+04
90%	1.20E+05
100%	5.62E+06

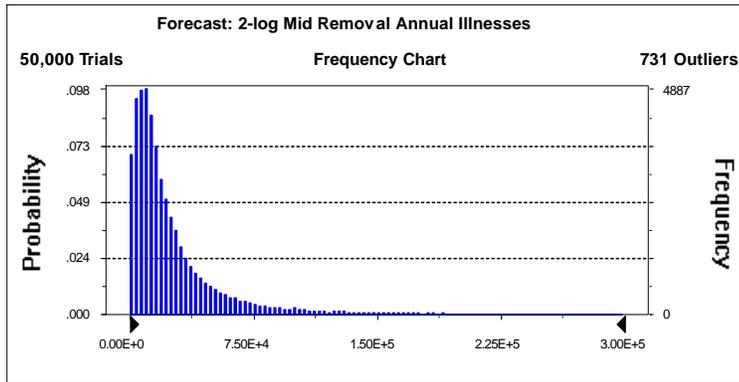
Forecast: 2-log Mid Removal Annual Illnesses

Summary:

Display Range is from 0.00E+0 to 3.00E+5
 Entire Range is from 2.65E+1 to 4.33E+6
 After 50,000 Trials, the Std. Error of the Mean is 4.41E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	3.78E+04
Median	1.72E+04
Mode	---
Standard Deviation	9.87E+04
Variance	9.74E+09
Skewness	15.46
Kurtosis	421.63
Coeff. of Variability	2.61
Range Minimum	2.65E+01
Range Maximum	4.33E+06
Range Width	4.33E+06
Mean Std. Error	4.41E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	2.65E+01
10%	4.00E+03
20%	7.11E+03
30%	1.01E+04
40%	1.34E+04
50%	1.72E+04
60%	2.23E+04
70%	2.93E+04
80%	4.17E+04
90%	7.15E+04
100%	4.33E+06

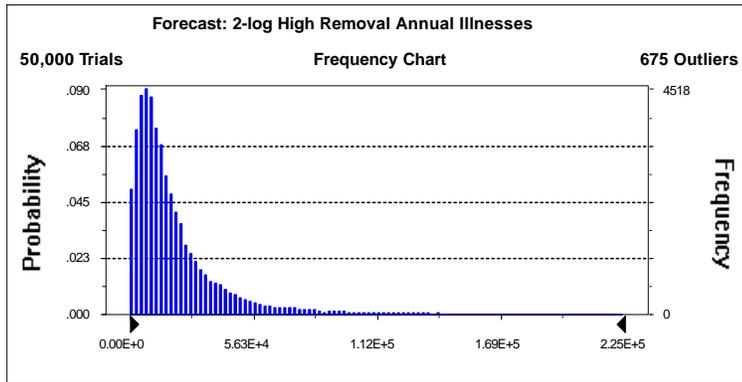
Forecast: 2-log High Removal Annual Illnesses

Summary:

Display Range is from 0.00E+0 to 2.25E+5
 Entire Range is from 2.65E+1 to 4.22E+6
 After 50,000 Trials, the Std. Error of the Mean is 3.31E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	2.91E+04
Median	1.46E+04
Mode	---
Standard Deviation	7.41E+04
Variance	5.49E+09
Skewness	18.29
Kurtosis	613.52
Coeff. of Variability	2.55
Range Minimum	2.65E+01
Range Maximum	4.22E+06
Range Width	4.22E+06
Mean Std. Error	3.31E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	2.65E+01
10%	3.81E+03
20%	6.43E+03
30%	8.94E+03
40%	1.15E+04
50%	1.46E+04
60%	1.85E+04
70%	2.38E+04
80%	3.27E+04
90%	5.31E+04
100%	4.22E+06

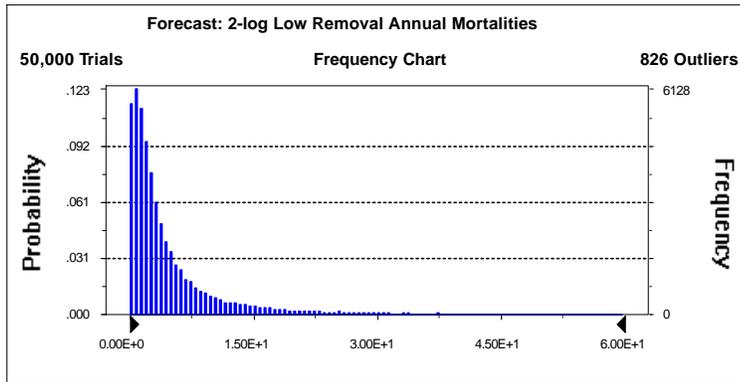
Forecast: 2-log Low Removal Annual Mortalities

Summary:

Display Range is from 0.00E+0 to 6.00E+1
 Entire Range is from 3.32E-3 to 7.02E+2
 After 50,000 Trials, the Std. Error of the Mean is 8.76E-2

Statistics:

	<u>Value</u>
Trials	50000
Mean	7.41E+00
Median	2.81E+00
Mode	---
Standard Deviation	1.96E+01
Variance	3.84E+02
Skewness	11.82
Kurtosis	237.33
Coeff. of Variability	2.64
Range Minimum	3.32E-03
Range Maximum	7.02E+02
Range Width	7.02E+02
Mean Std. Error	8.76E-02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	3.32E-03
10%	5.27E-01
20%	1.02E+00
30%	1.53E+00
40%	2.10E+00
50%	2.81E+00
60%	3.79E+00
70%	5.26E+00
80%	7.94E+00
90%	1.50E+01
100%	7.02E+02

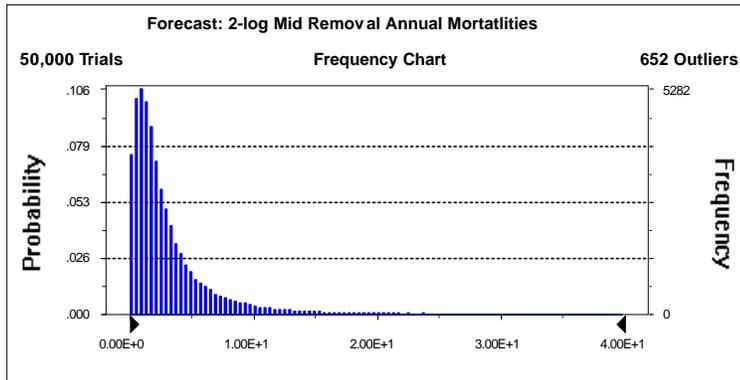
Forecast: 2-log Mid Removal Annual Mortalities

Summary:

Display Range is from 0.00E+0 to 4.00E+1
 Entire Range is from 3.32E-3 to 5.41E+2
 After 50,000 Trials, the Std. Error of the Mean is 5.52E-2

Statistics:

	<u>Value</u>
Trials	50000
Mean	4.73E+00
Median	2.15E+00
Mode	---
Standard Deviation	1.23E+01
Variance	1.52E+02
Skewness	15.46
Kurtosis	421.63
Coeff. of Variability	2.61
Range Minimum	3.32E-03
Range Maximum	5.41E+02
Range Width	5.41E+02
Mean Std. Error	5.52E-02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	3.32E-03
10%	5.00E-01
20%	8.89E-01
30%	1.27E+00
40%	1.67E+00
50%	2.15E+00
60%	2.78E+00
70%	3.67E+00
80%	5.21E+00
90%	8.94E+00
100%	5.41E+02

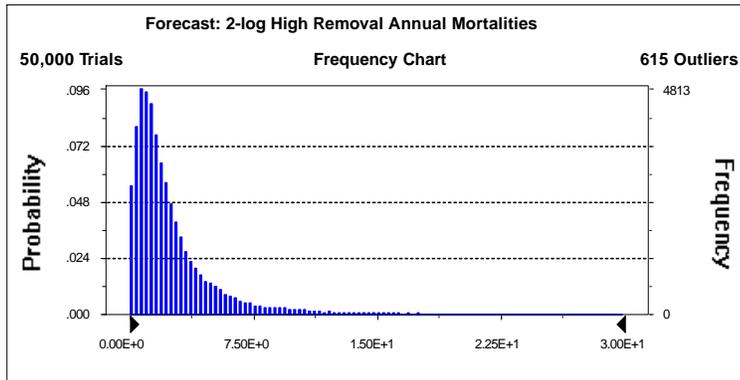
Forecast: 2-log High Removal Annual Mortalities

Summary:

Display Range is from 0.00E+0 to 3.00E+1
 Entire Range is from 3.32E-3 to 5.27E+2
 After 50,000 Trials, the Std. Error of the Mean is 4.14E-2

Statistics:

	<u>Value</u>
Trials	50000
Mean	3.63E+00
Median	1.82E+00
Mode	---
Standard Deviation	9.26E+00
Variance	8.58E+01
Skewness	18.29
Kurtosis	613.52
Coeff. of Variability	2.55
Range Minimum	3.32E-03
Range Maximum	5.27E+02
Range Width	5.27E+02
Mean Std. Error	4.14E-02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	3.32E-03
10%	4.76E-01
20%	8.04E-01
30%	1.12E+00
40%	1.44E+00
50%	1.82E+00
60%	2.31E+00
70%	2.98E+00
80%	4.09E+00
90%	6.64E+00
100%	5.27E+02

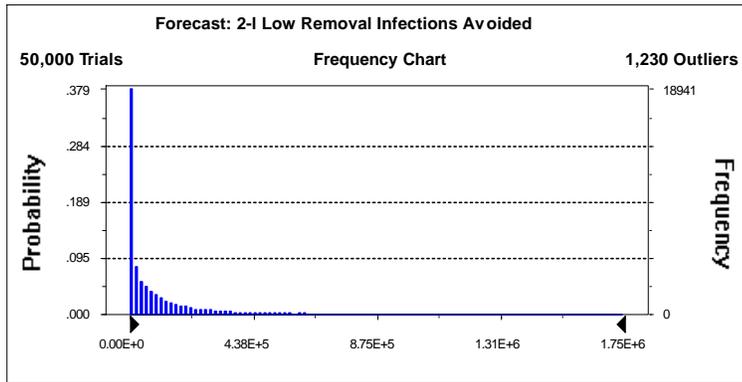
Forecast: 2-I Low Removal Infections Avoided

Summary:

Display Range is from 0.00E+0 to 1.75E+6
 Entire Range is from 0.00E+0 to 5.08E+6
 After 50,000 Trials, the Std. Error of the Mean is 2.34E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	2.27E+05
Median	4.71E+04
Mode	0.00E+00
Standard Deviation	5.23E+05
Variance	2.73E+11
Skewness	4.71
Kurtosis	30.98
Coeff. of Variability	2.31
Range Minimum	0.00E+00
Range Maximum	5.08E+06
Range Width	5.08E+06
Mean Std. Error	2.34E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	2.12E+04
50%	4.71E+04
60%	8.43E+04
70%	1.43E+05
80%	2.69E+05
90%	6.02E+05
100%	5.08E+06

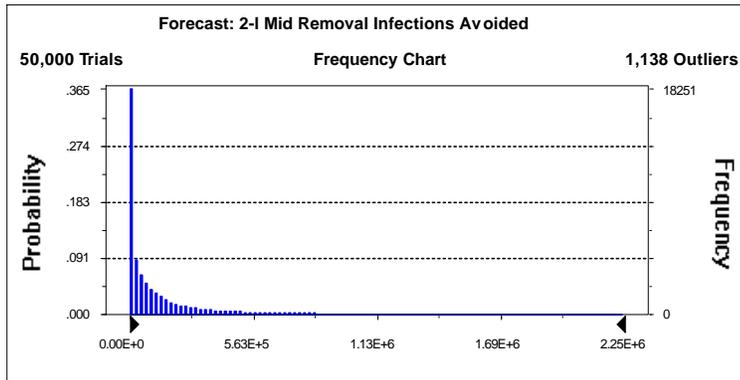
Forecast: 2-I Mid Removal Infections Avoided

Summary:

Display Range is from 0.00E+0 to 2.25E+6
 Entire Range is from 0.00E+0 to 7.16E+6
 After 50,000 Trials, the Std. Error of the Mean is 2.96E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	2.80E+05
Median	6.06E+04
Mode	0.00E+00
Standard Deviation	6.63E+05
Variance	4.39E+11
Skewness	5.10
Kurtosis	36.69
Coeff. of Variability	2.36
Range Minimum	0.00E+00
Range Maximum	7.16E+06
Range Width	7.16E+06
Mean Std. Error	2.96E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	3.05E+04
50%	6.06E+04
60%	1.05E+05
70%	1.76E+05
80%	3.26E+05
90%	7.27E+05
100%	7.16E+06

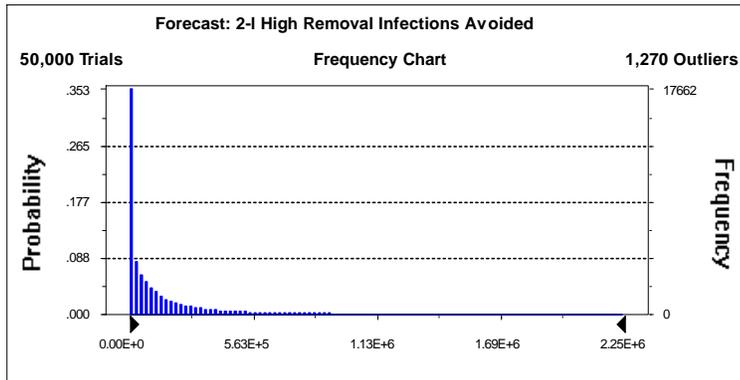
Forecast: 2-I High Removal Infections Avoided

Summary:

Display Range is from 0.00E+0 to 2.25E+6
 Entire Range is from 0.00E+0 to 8.21E+6
 After 50,000 Trials, the Std. Error of the Mean is 3.22E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	3.02E+05
Median	6.71E+04
Mode	0.00E+00
Standard Deviation	7.21E+05
Variance	5.20E+11
Skewness	5.30
Kurtosis	39.85
Coeff. of Variability	2.38
Range Minimum	0.00E+00
Range Maximum	8.21E+06
Range Width	8.21E+06
Mean Std. Error	3.22E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	3.43E+04
50%	6.71E+04
60%	1.15E+05
70%	1.92E+05
80%	3.51E+05
90%	7.75E+05
100%	8.21E+06

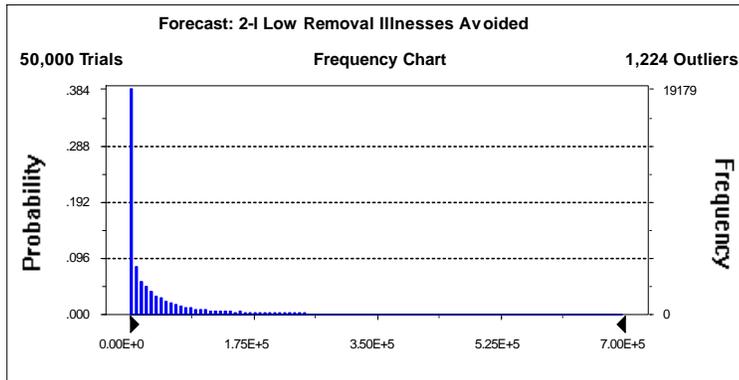
Forecast: 2-I Low Removal Illnesses Avoided

Summary:

Display Range is from 0.00E+0 to 7.00E+5
 Entire Range is from 0.00E+0 to 2.97E+6
 After 50,000 Trials, the Std. Error of the Mean is 9.62E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	9.06E+04
Median	1.81E+04
Mode	0.00E+00
Standard Deviation	2.15E+05
Variance	4.63E+10
Skewness	5.13
Kurtosis	38.07
Coeff. of Variability	2.38
Range Minimum	0.00E+00
Range Maximum	2.97E+06
Range Width	2.97E+06
Mean Std. Error	9.62E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	8.21E+03
50%	1.81E+04
60%	3.28E+04
70%	5.61E+04
80%	1.06E+05
90%	2.37E+05
100%	2.97E+06

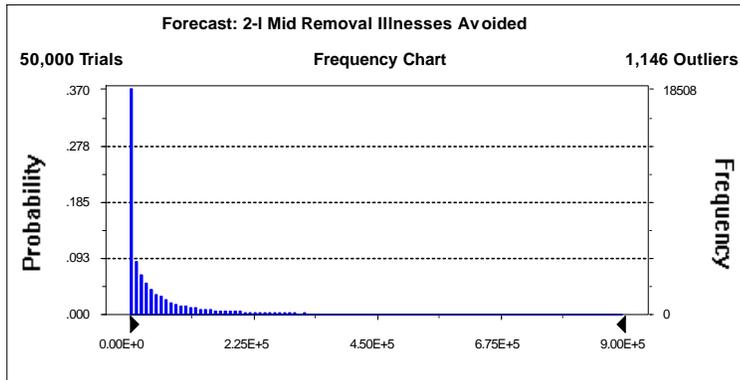
Forecast: 2-I Mid Removal Illnesses Avoided

Summary:

Display Range is from 0.00E+0 to 9.00E+5
 Entire Range is from 0.00E+0 to 4.06E+6
 After 50,000 Trials, the Std. Error of the Mean is 1.22E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.12E+05
Median	2.34E+04
Mode	0.00E+00
Standard Deviation	2.73E+05
Variance	7.45E+10
Skewness	5.54
Kurtosis	44.47
Coeff. of Variability	2.44
Range Minimum	0.00E+00
Range Maximum	4.06E+06
Range Width	4.06E+06
Mean Std. Error	1.22E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	1.18E+04
50%	2.34E+04
60%	4.08E+04
70%	6.90E+04
80%	1.28E+05
90%	2.87E+05
100%	4.06E+06

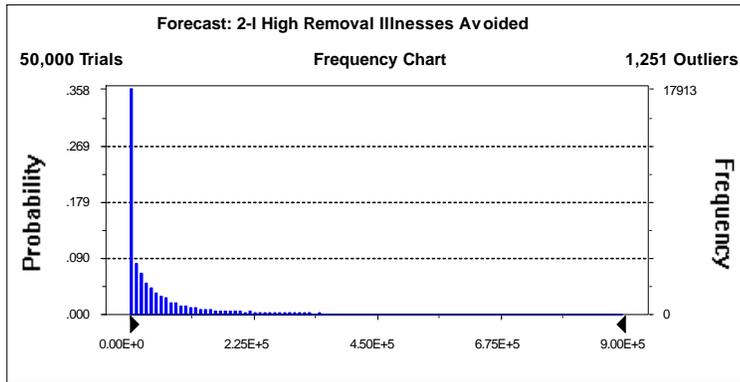
Forecast: 2-I High Removal Illnesses Avoided

Summary:

Display Range is from 0.00E+0 to 9.00E+5
 Entire Range is from 0.00E+0 to 4.55E+6
 After 50,000 Trials, the Std. Error of the Mean is 1.33E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.21E+05
Median	2.58E+04
Mode	0.00E+00
Standard Deviation	2.97E+05
Variance	8.81E+10
Skewness	5.74
Kurtosis	48.08
Coeff. of Variability	2.46
Range Minimum	0.00E+00
Range Maximum	4.55E+06
Range Width	4.55E+06
Mean Std. Error	1.33E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	1.32E+04
50%	2.58E+04
60%	4.47E+04
70%	7.51E+04
80%	1.38E+05
90%	3.06E+05
100%	4.55E+06

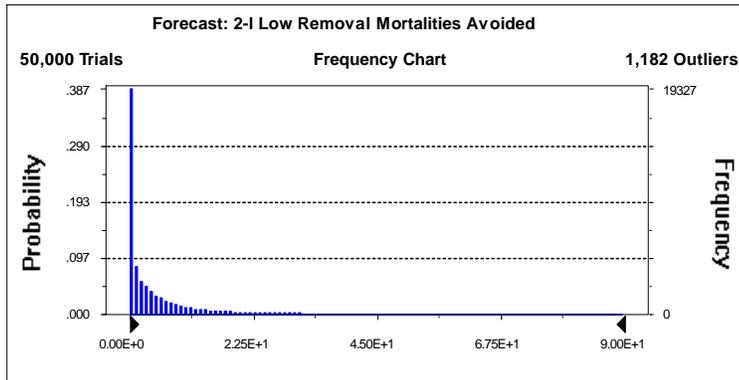
Forecast: 2-I Low Removal Mortalities Avoided

Summary:

Display Range is from 0.00E+0 to 9.00E+1
 Entire Range is from 0.00E+0 to 3.71E+2
 After 50,000 Trials, the Std. Error of the Mean is 1.20E-1

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.13E+01
Median	2.26E+00
Mode	0.00E+00
Standard Deviation	2.69E+01
Variance	7.23E+02
Skewness	5.13
Kurtosis	38.07
Coeff. of Variability	2.38
Range Minimum	0.00E+00
Range Maximum	3.71E+02
Range Width	3.71E+02
Mean Std. Error	1.20E-01



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	1.03E+00
50%	2.26E+00
60%	4.10E+00
70%	7.02E+00
80%	1.32E+01
90%	2.97E+01
100%	3.71E+02

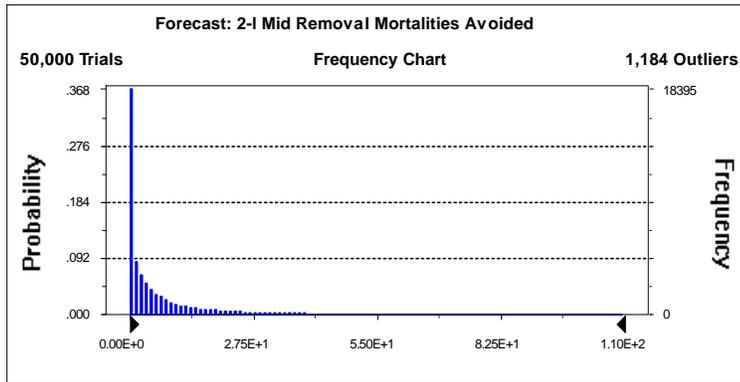
Forecast: 2-I Mid Removal Mortalities Avoided

Summary:

Display Range is from 0.00E+0 to 1.10E+2
 Entire Range is from 0.00E+0 to 5.08E+2
 After 50,000 Trials, the Std. Error of the Mean is 1.53E-1

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.40E+01
Median	2.92E+00
Mode	0.00E+00
Standard Deviation	3.41E+01
Variance	1.16E+03
Skewness	5.54
Kurtosis	44.47
Coeff. of Variability	2.44
Range Minimum	0.00E+00
Range Maximum	5.08E+02
Range Width	5.08E+02
Mean Std. Error	1.53E-01



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	1.47E+00
50%	2.92E+00
60%	5.10E+00
70%	8.63E+00
80%	1.61E+01
90%	3.59E+01
100%	5.08E+02

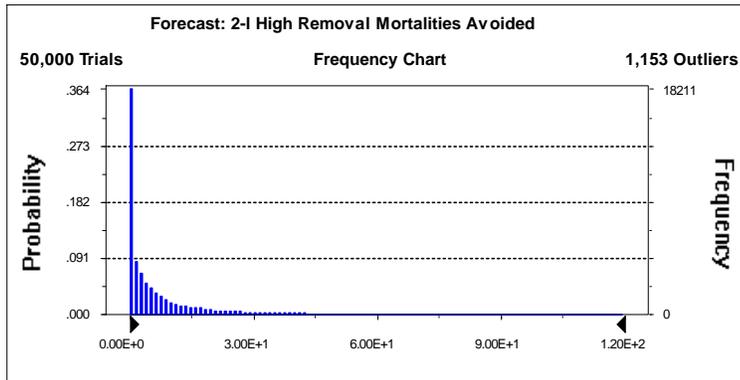
Forecast: 2-I High Removal Mortalities Avoided

Summary:

Display Range is from 0.00E+0 to 1.20E+2
 Entire Range is from 0.00E+0 to 5.69E+2
 After 50,000 Trials, the Std. Error of the Mean is 1.66E-1

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.51E+01
Median	3.23E+00
Mode	0.00E+00
Standard Deviation	3.71E+01
Variance	1.38E+03
Skewness	5.74
Kurtosis	48.08
Coeff. of Variability	2.46
Range Minimum	0.00E+00
Range Maximum	5.69E+02
Range Width	5.69E+02
Mean Std. Error	1.66E-01



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	1.65E+00
50%	3.23E+00
60%	5.59E+00
70%	9.39E+00
80%	1.73E+01
90%	3.83E+01
100%	5.69E+02

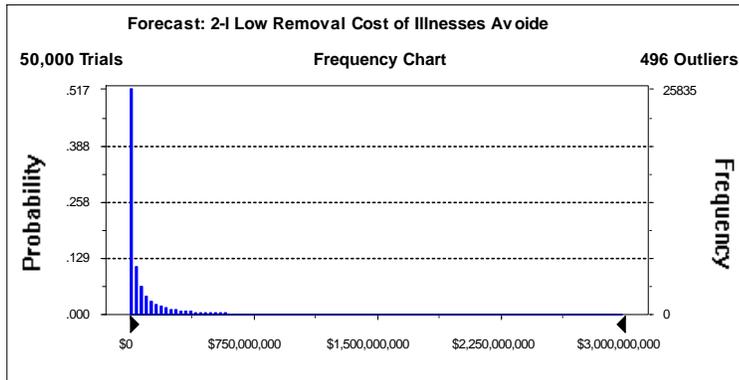
Forecast: 2-I Low Removal Cost of Illnesses Avoided

Summary:

Display Range is from \$0 to \$3,000,000,000
 Entire Range is from \$0 to \$67,826,458,558
 After 50,000 Trials, the Std. Error of the Mean is \$4,625,401

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$219,158,762
Median	\$26,786,645
Mode	\$0
Standard Deviation	\$1,034,271,189
Variance	1E+18
Skewness	23.28
Kurtosis	905.62
Coeff. of Variability	4.72
Range Minimum	\$0
Range Maximum	\$67,826,458,558
Range Width	\$67,826,458,558
Mean Std. Error	\$4,625,401.37



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$11,808,307
50%	\$26,786,645
60%	\$50,580,809
70%	\$92,899,874
80%	\$182,984,023
90%	\$448,950,017
100%	\$67,826,458,558

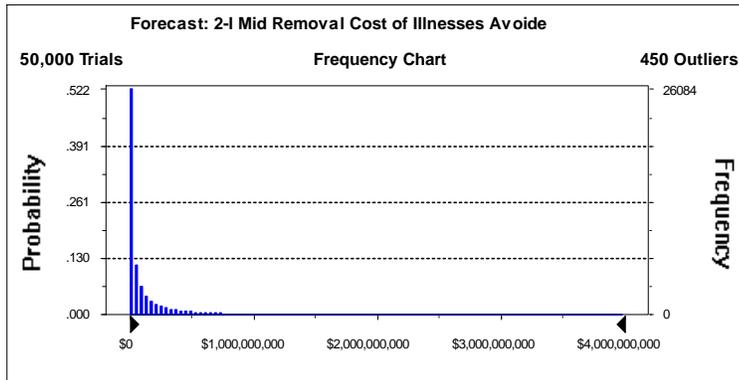
Forecast: 2-I Mid Removal Cost of Illnesses Avoided

Summary:

Display Range is from \$0 to \$4,000,000,000
 Entire Range is from \$0 to \$90,024,378,536
 After 50,000 Trials, the Std. Error of the Mean is \$5,850,201

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$271,168,737
Median	\$34,782,396
Mode	\$0
Standard Deviation	\$1,308,144,673
Variance	2E+18
Skewness	24.91
Kurtosis	1,057.56
Coeff. of Variability	4.82
Range Minimum	\$0
Range Maximum	\$90,024,378,536
Range Width	\$90,024,378,536
Mean Std. Error	\$5,850,200.83



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$16,440,555
50%	\$34,782,396
60%	\$63,582,347
70%	\$114,526,918
80%	\$224,384,109
90%	\$546,240,087
100%	\$90,024,378,536

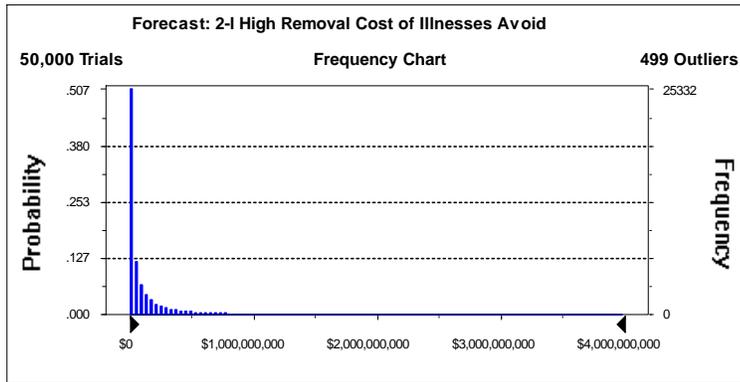
Forecast: 2-I High Removal Cost of Illnesses Avoided

Summary:

Display Range is from \$0 to \$4,000,000,000
 Entire Range is from \$0 to \$99,387,100,716
 After 50,000 Trials, the Std. Error of the Mean is \$6,351,840

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$292,383,609
Median	\$38,514,312
Mode	\$0
Standard Deviation	\$1,420,314,610
Variance	2E+18
Skewness	25.59
Kurtosis	1,124.07
Coeff. of Variability	4.86
Range Minimum	\$0
Range Maximum	\$99,387,100,716
Range Width	\$99,387,100,716
Mean Std. Error	\$6,351,840.03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$18,400,415
50%	\$38,514,312
60%	\$69,700,404
70%	\$124,435,260
80%	\$242,326,374
90%	\$585,176,426
100%	\$99,387,100,716

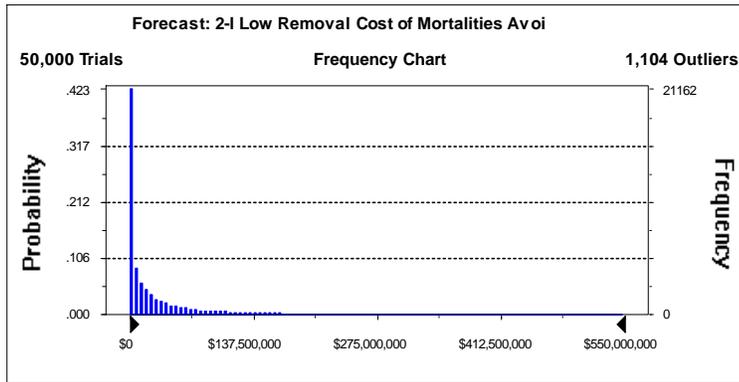
Forecast: 2-I Low Removal Cost of Mortalities Avoided

Summary:

Display Range is from \$0 to \$550,000,000
 Entire Range is from \$0 to \$4,534,511,076
 After 50,000 Trials, the Std. Error of the Mean is \$791,872

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$63,975,741
Median	\$10,157,902
Mode	\$0
Standard Deviation	\$177,067,865
Variance	3E+16
Skewness	7.38
Kurtosis	89.37
Coeff. of Variability	2.77
Range Minimum	\$0
Range Maximum	\$4,534,511,076
Range Width	\$4,534,511,076
Mean Std. Error	\$791,871.56



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$4,410,747
50%	\$10,157,902
60%	\$19,519,705
70%	\$35,706,679
80%	\$68,098,184
90%	\$156,045,271
100%	\$4,534,511,076

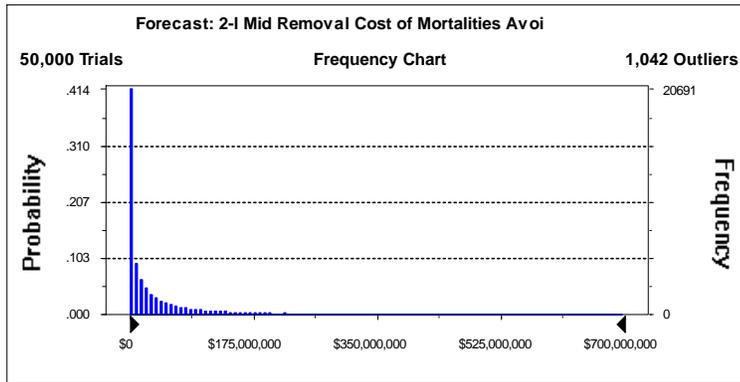
Forecast: 2-I Mid Removal Cost of Mortalities Avoided

Summary:

Display Range is from \$0 to \$700,000,000
 Entire Range is from \$0 to \$5,851,392,050
 After 50,000 Trials, the Std. Error of the Mean is \$999,215

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$79,090,982
Median	\$13,255,425
Mode	\$0
Standard Deviation	\$223,431,273
Variance	5E+16
Skewness	7.80
Kurtosis	99.33
Coeff. of Variability	2.82
Range Minimum	\$0
Range Maximum	\$5,851,392,050
Range Width	\$5,851,392,050
Mean Std. Error	\$999,215.03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$6,220,669
50%	\$13,255,425
60%	\$24,478,750
70%	\$43,946,599
80%	\$83,154,988
90%	\$189,271,663
100%	\$5,851,392,050

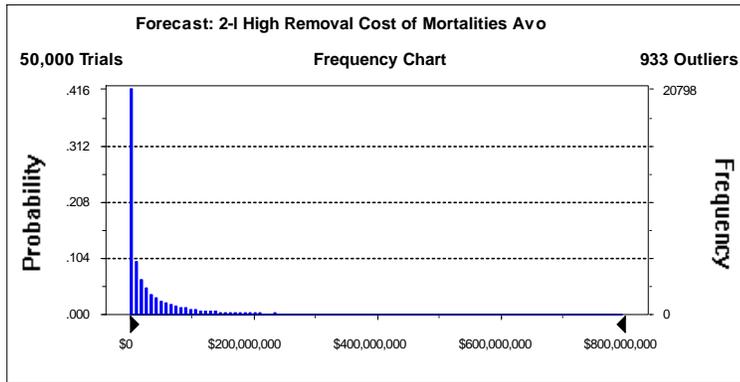
Forecast: 2-I High Removal Cost of Mortalities Avoided

Summary:

Display Range is from \$0 to \$800,000,000
 Entire Range is from \$0 to \$6,390,302,731
 After 50,000 Trials, the Std. Error of the Mean is \$1,084,171

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$85,251,882
Median	\$14,707,842
Mode	\$0
Standard Deviation	\$242,428,061
Variance	6E+16
Skewness	7.99
Kurtosis	104.34
Coeff. of Variability	2.84
Range Minimum	\$0
Range Maximum	\$6,390,302,731
Range Width	\$6,390,302,731
Mean Std. Error	\$1,084,171.25



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$6,980,594
50%	\$14,707,842
60%	\$26,850,342
70%	\$47,930,261
80%	\$89,652,657
90%	\$202,296,310
100%	\$6,390,302,731

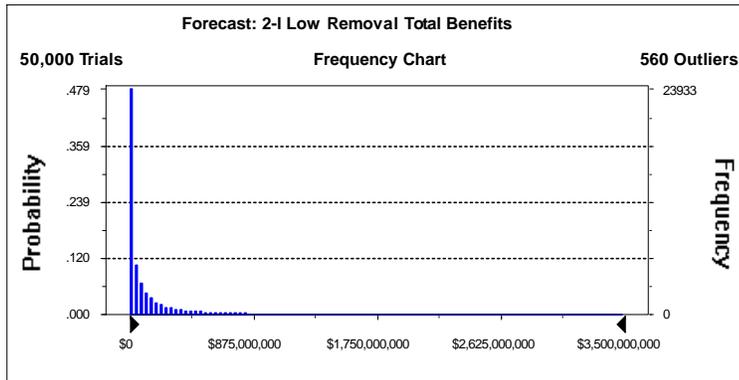
Forecast: 2-I Low Removal Total Benefits

Summary:

Display Range is from \$0 to \$3,500,000,000
 Entire Range is from \$0 to \$69,592,049,044
 After 50,000 Trials, the Std. Error of the Mean is \$5,025,006

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$283,134,504
Median	\$41,015,952
Mode	\$0
Standard Deviation	\$1,123,625,506
Variance	1E+18
Skewness	20.26
Kurtosis	729.82
Coeff. of Variability	3.97
Range Minimum	\$0
Range Maximum	\$69,592,049,044
Range Width	\$69,592,049,044
Mean Std. Error	\$5,025,006.02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$18,048,170
50%	\$41,015,952
60%	\$76,154,137
70%	\$137,865,115
80%	\$266,247,863
90%	\$632,868,193
100%	\$69,592,049,044

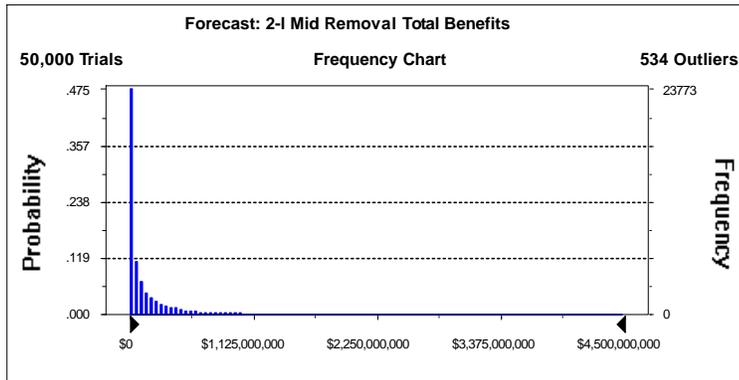
Forecast: 2-I Mid Removal Total Benefits

Summary:

Display Range is from \$0 to \$4,500,000,000
 Entire Range is from \$0 to \$92,367,803,059
 After 50,000 Trials, the Std. Error of the Mean is \$6,356,253

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$350,259,719
Median	\$53,112,479
Mode	\$0
Standard Deviation	\$1,421,301,280
Variance	2E+18
Skewness	21.66
Kurtosis	850.39
Coeff. of Variability	4.06
Range Minimum	\$0
Range Maximum	\$92,367,803,059
Range Width	\$92,367,803,059
Mean Std. Error	\$6,356,252.56



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$25,514,350
50%	\$53,112,479
60%	\$95,298,333
70%	\$170,299,627
80%	\$324,767,253
90%	\$768,815,361
100%	\$92,367,803,059

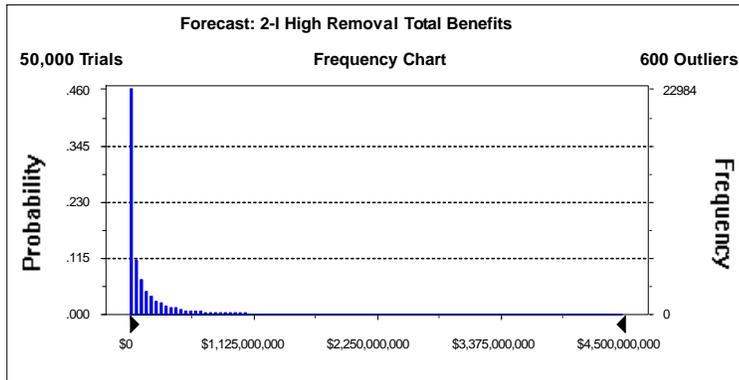
Forecast: 2-I High Removal Total Benefits

Summary:

Display Range is from \$0 to \$4,500,000,000
 Entire Range is from \$0 to \$101,974,246,252
 After 50,000 Trials, the Std. Error of the Mean is \$6,902,104

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$377,635,490
Median	\$58,664,731
Mode	\$0
Standard Deviation	\$1,543,357,453
Variance	2E+18
Skewness	22.24
Kurtosis	903.01
Coeff. of Variability	4.09
Range Minimum	\$0
Range Maximum	\$101,974,246,252
Range Width	\$101,974,246,252
Mean Std. Error	\$6,902,104.36



Percentiles:

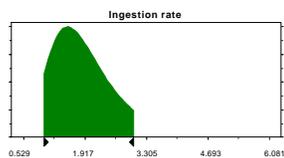
<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$28,662,842
50%	\$58,664,731
60%	\$104,573,248
70%	\$185,554,231
80%	\$350,225,066
90%	\$821,648,824
100%	\$101,974,246,252

Assumptions

Assumption: Daily Drinking Water Consumption

Lognormal distribution with parameters:
 Mean 1.948
 Standard Dev. 0.827

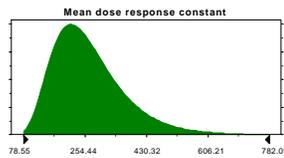
Selected range is from 1.000 to 3.000
 Mean value in simulation was 1.830



Assumption: Mean dose response constant

Lognormal distribution with parameters:
 5% - tile 132.00
 95% - tile 465.40

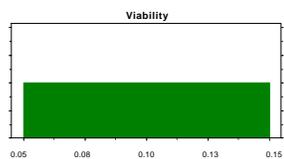
Selected range is from 0.00 to +Infinity
 Mean value in simulation was 266.73



Assumption: Viability

Uniform distribution with parameters:
 Minimum 0.05
 Maximum 0.15

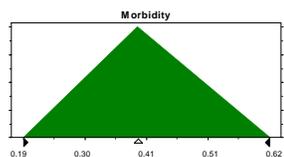
Mean value in simulation was 0.10



Assumption: Morbidity

Triangular distribution with parameters:
 Minimum 0.19
 Likeliest 0.39
 Maximum 0.62

Selected range is from 0.19 to 0.62
 Mean value in simulation was 0.40

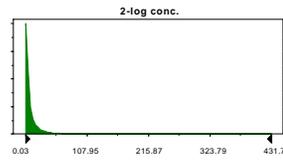


Assumption: Mean daily Cyst Concentration in Distributed Water

Lognormal distribution with parameters:

Mean 12.60
Standard Dev. 44.30

Selected range is from 0.00 to +Infinity
Mean value in simulation was 12.67

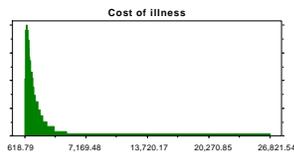


Assumption: Cost of Illness

Custom distribution with parameters:

				<u>Relative Prob.</u>
Continuous range	618.79	to	736.35	0.050000
Continuous range	736.35	to	799.67	0.050000
Continuous range	799.67	to	860.41	0.050000
Continuous range	860.41	to	921.94	0.050000
Continuous range	921.94	to	985.38	0.050000
Continuous range	985.38	to	1,055.42	0.050000
Continuous range	1,055.42	to	1,132.61	0.050000
Continuous range	1,132.61	to	1,217.08	0.050000
Continuous range	1,217.08	to	1,306.32	0.050000
Continuous range	1,306.32	to	1,410.82	0.050000
Continuous range	1,410.82	to	1,526.87	0.050000
Continuous range	1,526.87	to	1,663.45	0.050000
Continuous range	1,663.45	to	1,828.49	0.050000
Continuous range	1,828.49	to	2,024.49	0.050000
Continuous range	2,024.49	to	2,279.26	0.050000
Continuous range	2,279.26	to	2,609.62	0.050000
Continuous range	2,609.62	to	3,062.70	0.050000
Continuous range	3,062.70	to	3,777.19	0.050000
Continuous range	3,777.19	to	5,148.57	0.050000
Continuous range	5,148.57	to	26,821.54	0.050000
Total Relative Probability				1.000000

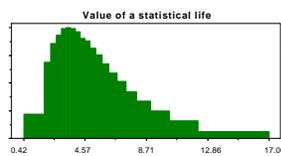
Mean value in simulation was 2,403.29



Assumption: Value of a statistical life

Custom distribution with parameters:			<u>Relative Prob.</u>	
Continuous range	0.42	to	1.84	0.050000
Continuous range	1.84	to	2.30	0.050000
Continuous range	2.30	to	2.66	0.050000
Continuous range	2.66	to	2.99	0.050000
Continuous range	2.99	to	3.31	0.050000
Continuous range	3.31	to	3.62	0.050000
Continuous range	3.62	to	3.93	0.050000
Continuous range	3.93	to	4.25	0.050000
Continuous range	4.25	to	4.60	0.050000
Continuous range	4.60	to	4.95	0.050000
Continuous range	4.95	to	5.33	0.050000
Continuous range	5.33	to	5.75	0.050000
Continuous range	5.75	to	6.21	0.050000
Continuous range	6.21	to	6.73	0.050000
Continuous range	6.73	to	7.34	0.050000
Continuous range	7.34	to	8.07	0.050000
Continuous range	8.07	to	9.00	0.050000
Continuous range	9.00	to	10.26	0.050000
Continuous range	10.26	to	12.25	0.050000
Continuous range	12.25	to	17.00	0.050000
Total Relative Probability				1.000000

Mean value in simulation was 5.70



Appendix B-1
Benefits Analysis Assuming
2.5 Baseline Log Removal
Daily Drinking Water Rate: 1.2 Liters

Benefits Analysis Assuming 2.5 Baseline Log Removal at 1.2 Liters Per Day Ingestion Rate

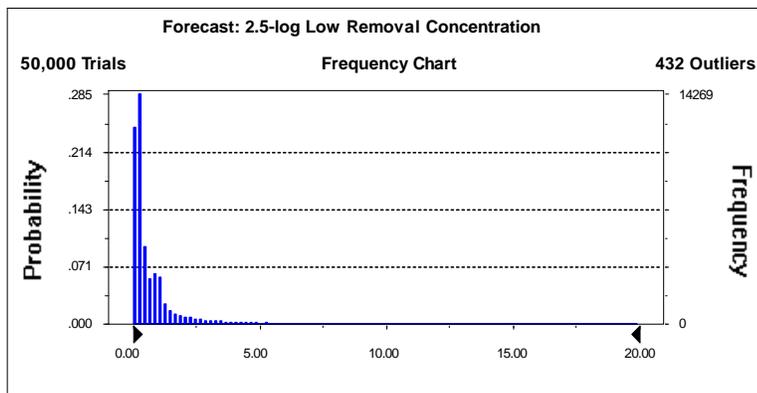
Forecast: 2.5-log Low Removal Concentration

Summary:

Display Range is from 0.00 to 20.00
 Entire Range is from 0.00 to 483.69
 After 50,000 Trials, the Std. Error of the Mean is 0.03

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.45
Median	0.37
Mode	---
Standard Deviation	6.53
Variance	42.63
Skewness	27.15
Kurtosis	1,231.83
Coeff. of Variability	4.50
Range Minimum	0.00
Range Maximum	483.69
Range Width	483.69
Mean Std. Error	0.03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00
10%	0.07
20%	0.15
30%	0.24
40%	0.29
50%	0.37
60%	0.52
70%	0.87
80%	1.18
90%	2.56
100%	483.69

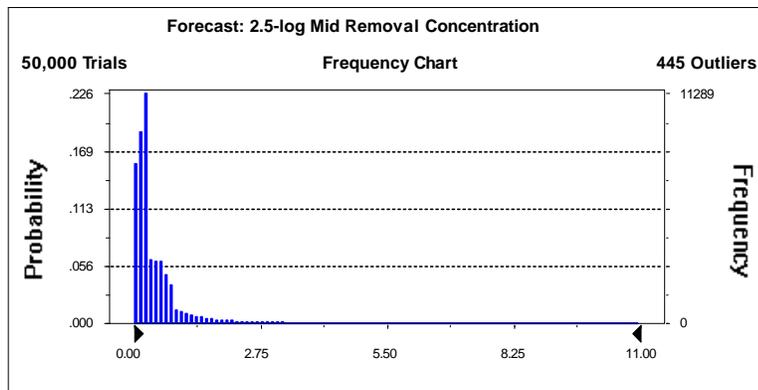
Forecast: 2.5-log Mid Removal Concentration

Summary:

Display Range is from 0.00 to 11.00
 Entire Range is from 0.00 to 272.00
 After 50,000 Trials, the Std. Error of the Mean is 0.02

Statistics:

	<u>Value</u>
Trials	50000
Mean	0.87
Median	0.29
Mode	---
Standard Deviation	3.66
Variance	13.42
Skewness	27.28
Kurtosis	1,240.78
Coeff. of Variability	4.21
Range Minimum	0.00
Range Maximum	272.00
Range Width	272.00
Mean Std. Error	0.02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00
10%	0.07
20%	0.15
30%	0.20
40%	0.24
50%	0.29
60%	0.37
70%	0.56
80%	0.75
90%	1.44
100%	272.00

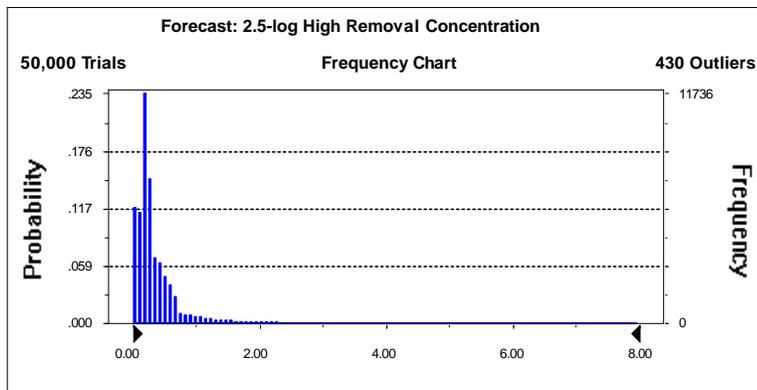
Forecast: 2.5-log High Removal Concentration

Summary:

Display Range is from 0.00 to 8.00
 Entire Range is from 0.00 to 192.56
 After 50,000 Trials, the Std. Error of the Mean is 0.01

Statistics:

	<u>Value</u>
Trials	50000
Mean	0.65
Median	0.25
Mode	---
Standard Deviation	2.59
Variance	6.70
Skewness	27.38
Kurtosis	1,247.67
Coeff. of Variability	4.01
Range Minimum	0.00
Range Maximum	192.56
Range Width	192.56
Mean Std. Error	0.01



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00
10%	0.07
20%	0.15
30%	0.18
40%	0.21
50%	0.25
60%	0.30
70%	0.42
80%	0.57
90%	1.02
100%	192.56

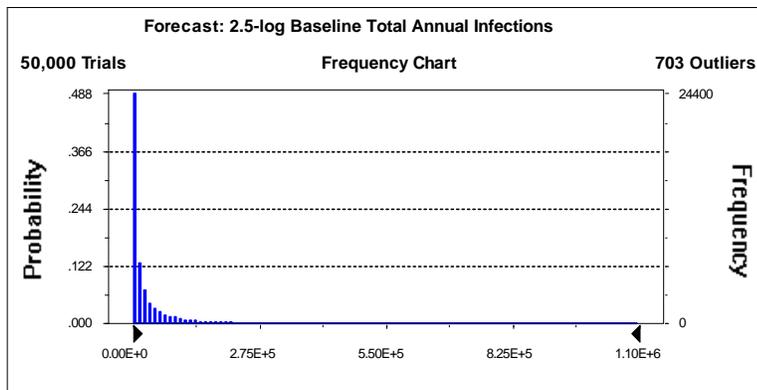
Forecast: 2.5-log Baseline Total Annual Infections

Summary:

Display Range is from 0.00E+0 to 1.10E+6
 Entire Range is from 8.28E-2 to 1.25E+7
 After 50,000 Trials, the Std. Error of the Mean is 1.70E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	9.02E+04
Median	1.17E+04
Mode	---
Standard Deviation	3.81E+05
Variance	1.45E+11
Skewness	13.86
Kurtosis	284.63
Coeff. of Variability	4.22
Range Minimum	8.28E-02
Range Maximum	1.26E+07
Range Width	1.26E+07
Mean Std. Error	1.70E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	8.28E-02
10%	7.13E+02
20%	1.92E+03
30%	3.84E+03
40%	6.80E+03
50%	1.17E+04
60%	1.98E+04
70%	3.48E+04
80%	6.78E+04
90%	1.67E+05
100%	1.26E+07

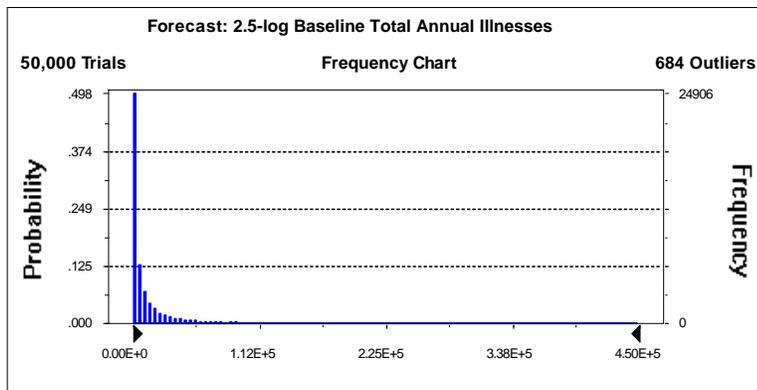
Forecast: 2.5-log Baseline Total Annual Illnesses

Summary:

Display Range is from 0.00E+0 to 4.50E+5
 Entire Range is from 2.34E-2 to 7.18E+6
 After 50,000 Trials, the Std. Error of the Mean is 6.99E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	3.60E+04
Median	4.54E+03
Mode	---
Standard Deviation	1.56E+05
Variance	2.44E+10
Skewness	15.09
Kurtosis	356.62
Coeff. of Variability	4.34
Range Minimum	2.34E-02
Range Maximum	7.18E+06
Range Width	7.18E+06
Mean Std. Error	6.99E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	2.34E-02
10%	2.75E+02
20%	7.36E+02
30%	1.49E+03
40%	2.65E+03
50%	4.54E+03
60%	7.79E+03
70%	1.38E+04
80%	2.69E+04
90%	6.60E+04
100%	7.18E+06

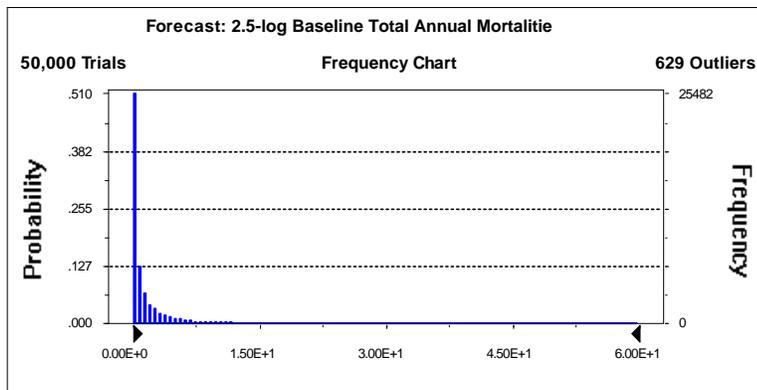
Forecast: 2.5-log Baseline Total Annual Mortalities

Summary:

Display Range is from 0.00E+0 to 6.00E+1
 Entire Range is from 2.92E-6 to 8.97E+2
 After 50,000 Trials, the Std. Error of the Mean is 8.74E-2

Statistics:

	<u>Value</u>
Trials	50000
Mean	4.50E+00
Median	5.68E-01
Mode	---
Standard Deviation	1.95E+01
Variance	3.82E+02
Skewness	15.09
Kurtosis	356.62
Coeff. of Variability	4.34
Range Minimum	2.92E-06
Range Maximum	8.97E+02
Range Width	8.97E+02
Mean Std. Error	8.74E-02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	2.92E-06
10%	3.43E-02
20%	9.20E-02
30%	1.86E-01
40%	3.31E-01
50%	5.68E-01
60%	9.74E-01
70%	1.72E+00
80%	3.36E+00
90%	8.25E+00
100%	8.97E+02

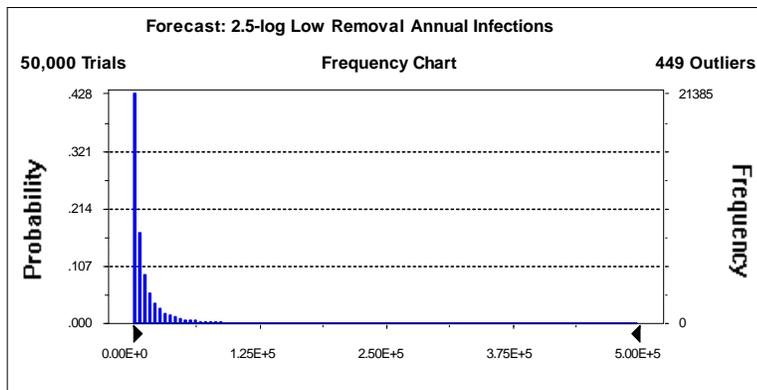
Forecast: 2.5-log Low Removal Annual Infections

Summary:

Display Range is from 0.00E+0 to 5.00E+5
 Entire Range is from 8.28E-2 to 9.85E+6
 After 50,000 Trials, the Std. Error of the Mean is 7.24E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	3.31E+04
Median	6.73E+03
Mode	---
Standard Deviation	1.62E+05
Variance	2.62E+10
Skewness	25.29
Kurtosis	1,048.11
Coeff. of Variability	4.90
Range Minimum	8.28E-02
Range Maximum	9.85E+06
Range Width	9.85E+06
Mean Std. Error	7.24E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	8.28E-02
10%	6.51E+02
20%	1.60E+03
30%	2.84E+03
40%	4.44E+03
50%	6.73E+03
60%	1.01E+04
70%	1.55E+04
80%	2.65E+04
90%	5.70E+04
100%	9.85E+06

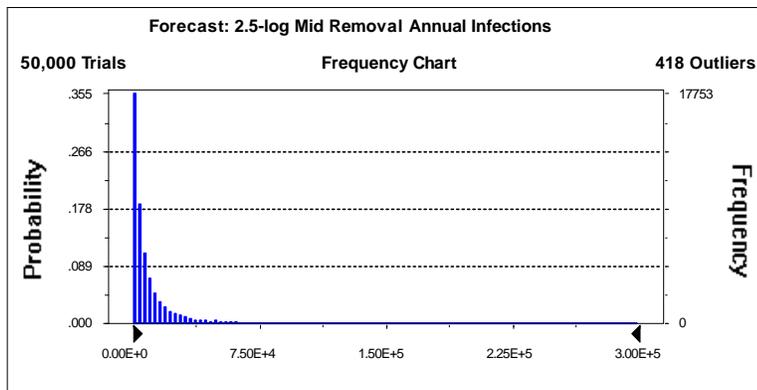
Forecast: 2.5-log Mid Removal Annual Infections

Summary:

Display Range is from 0.00E+0 to 3.00E+5
 Entire Range is from 8.28E-2 to 7.23E+6
 After 50,000 Trials, the Std. Error of the Mean is 4.52E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	2.02E+04
Median	5.20E+03
Mode	---
Standard Deviation	1.01E+05
Variance	1.02E+10
Skewness	31.52
Kurtosis	1,629.11
Coeff. of Variability	4.99
Range Minimum	8.28E-02
Range Maximum	7.23E+06
Range Width	7.23E+06
Mean Std. Error	4.52E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	8.28E-02
10%	6.02E+02
20%	1.42E+03
30%	2.38E+03
40%	3.59E+03
50%	5.20E+03
60%	7.46E+03
70%	1.09E+04
80%	1.74E+04
90%	3.44E+04
100%	7.23E+06

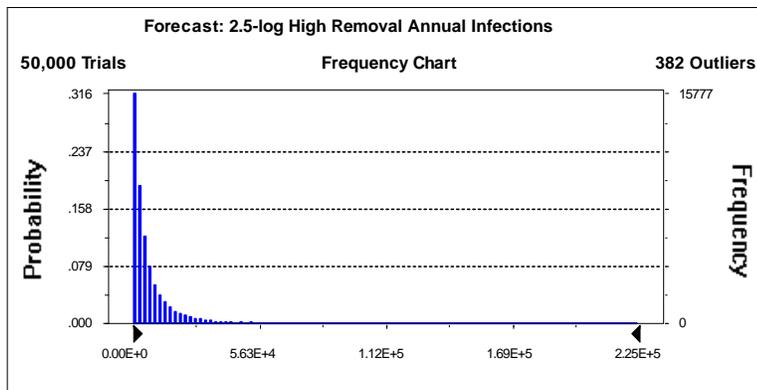
Forecast: 2.5-log High Removal Annual Infections

Summary:

Display Range is from 0.00E+0 to 2.25E+5
 Entire Range is from 8.28E-2 to 5.71E+6
 After 50,000 Trials, the Std. Error of the Mean is 3.35E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.51E+04
Median	4.43E+03
Mode	---
Standard Deviation	7.49E+04
Variance	5.61E+09
Skewness	34.62
Kurtosis	1,951.46
Coeff. of Variability	4.95
Range Minimum	8.28E-02
Range Maximum	5.71E+06
Range Width	5.71E+06
Mean Std. Error	3.35E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	8.28E-02
10%	5.72E+02
20%	1.29E+03
30%	2.11E+03
40%	3.13E+03
50%	4.43E+03
60%	6.22E+03
70%	8.82E+03
80%	1.36E+04
90%	2.57E+04
100%	5.71E+06

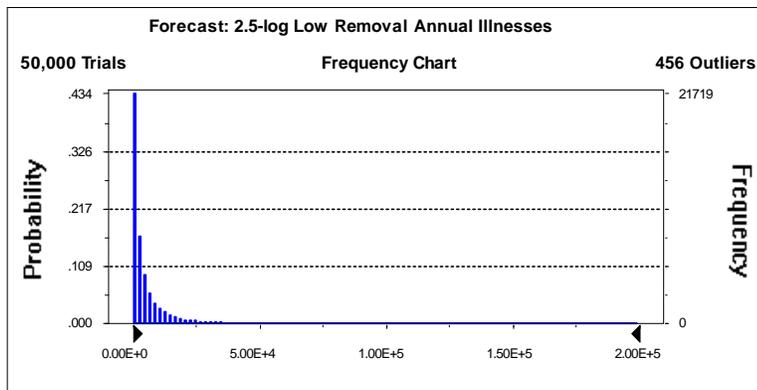
Forecast: 2.5-log Low Removal Annual Illnesses

Summary:

Display Range is from 0.00E+0 to 2.00E+5
 Entire Range is from 2.34E-2 to 4.66E+6
 After 50,000 Trials, the Std. Error of the Mean is 2.94E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.32E+04
Median	2.63E+03
Mode	---
Standard Deviation	6.57E+04
Variance	4.32E+09
Skewness	25.86
Kurtosis	1,127.51
Coeff. of Variability	4.98
Range Minimum	2.34E-02
Range Maximum	4.66E+06
Range Width	4.66E+06
Mean Std. Error	2.94E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	2.34E-02
10%	2.49E+02
20%	6.14E+02
30%	1.10E+03
40%	1.73E+03
50%	2.63E+03
60%	3.97E+03
70%	6.14E+03
80%	1.04E+04
90%	2.26E+04
100%	4.66E+06

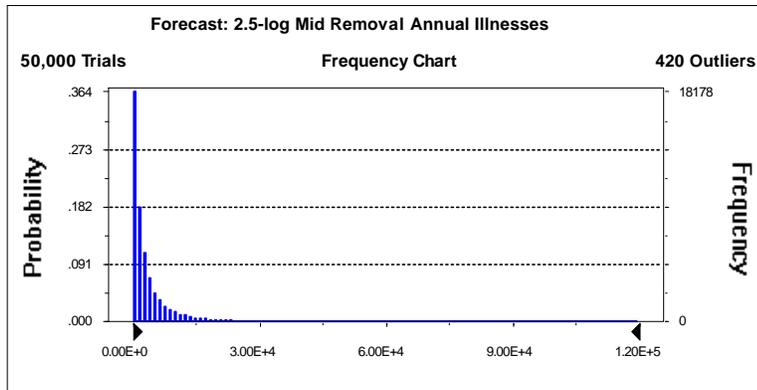
Forecast: 2.5-log Mid Removal Annual Illnesses

Summary:

Display Range is from 0.00E+0 to 1.20E+5
 Entire Range is from 2.34E-2 to 3.15E+6
 After 50,000 Trials, the Std. Error of the Mean is 1.82E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	8.08E+03
Median	2.02E+03
Mode	---
Standard Deviation	4.06E+04
Variance	1.65E+09
Skewness	31.10
Kurtosis	1,620.69
Coeff. of Variability	5.03
Range Minimum	2.34E-02
Range Maximum	3.15E+06
Range Width	3.15E+06
Mean Std. Error	1.82E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	2.34E-02
10%	2.31E+02
20%	5.40E+02
30%	9.15E+02
40%	1.39E+03
50%	2.02E+03
60%	2.94E+03
70%	4.32E+03
80%	6.91E+03
90%	1.37E+04
100%	3.15E+06

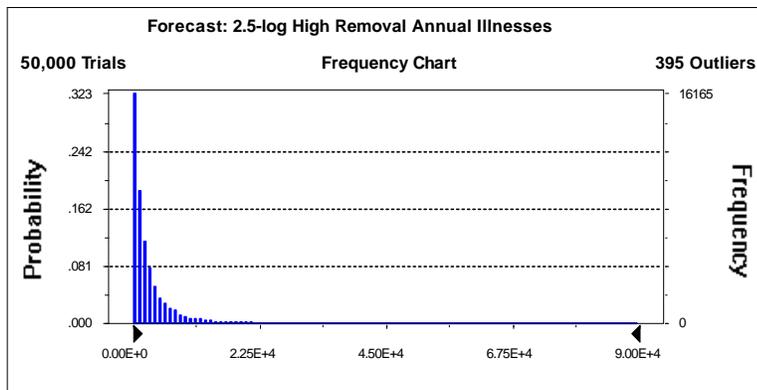
Forecast: 2.5-log High Removal Annual Illnesses

Summary:

Display Range is from 0.00E+0 to 9.00E+4
 Entire Range is from 2.34E-2 to 2.40E+6
 After 50,000 Trials, the Std. Error of the Mean is 1.34E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	6.04E+03
Median	1.73E+03
Mode	---
Standard Deviation	3.00E+04
Variance	8.98E+08
Skewness	33.62
Kurtosis	1,879.78
Coeff. of Variability	4.97
Range Minimum	2.34E-02
Range Maximum	2.40E+06
Range Width	2.40E+06
Mean Std. Error	1.34E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	2.34E-02
10%	2.18E+02
20%	4.92E+02
30%	8.13E+02
40%	1.21E+03
50%	1.73E+03
60%	2.44E+03
70%	3.50E+03
80%	5.44E+03
90%	1.03E+04
100%	2.40E+06

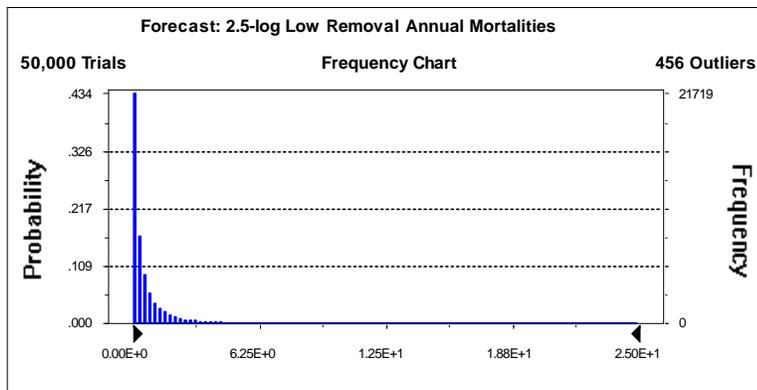
Forecast: 2.5-log Low Removal Annual Mortalities

Summary:

Display Range is from 0.00E+0 to 2.50E+1
 Entire Range is from 2.92E-6 to 5.82E+2
 After 50,000 Trials, the Std. Error of the Mean is 3.67E-2

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.65E+00
Median	3.28E-01
Mode	---
Standard Deviation	8.21E+00
Variance	6.75E+01
Skewness	25.86
Kurtosis	1,127.51
Coeff. of Variability	4.98
Range Minimum	2.92E-06
Range Maximum	5.82E+02
Range Width	5.82E+02
Mean Std. Error	3.67E-02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	2.92E-06
10%	3.11E-02
20%	7.67E-02
30%	1.37E-01
40%	2.16E-01
50%	3.28E-01
60%	4.96E-01
70%	7.67E-01
80%	1.30E+00
90%	2.82E+00
100%	5.82E+02

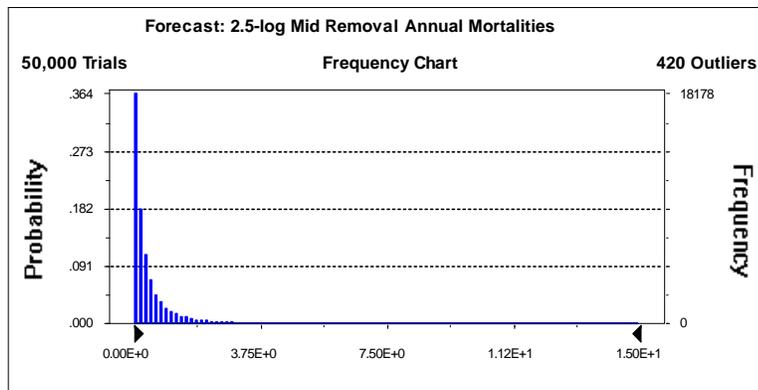
Forecast: 2.5-log Mid Removal Annual Mortalities

Summary:

Display Range is from 0.00E+0 to 1.50E+1
 Entire Range is from 2.92E-6 to 3.94E+2
 After 50,000 Trials, the Std. Error of the Mean is 2.27E-2

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.01E+00
Median	2.53E-01
Mode	---
Standard Deviation	5.08E+00
Variance	2.58E+01
Skewness	31.10
Kurtosis	1,620.69
Coeff. of Variability	5.03
Range Minimum	2.92E-06
Range Maximum	3.94E+02
Range Width	3.94E+02
Mean Std. Error	2.27E-02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	2.92E-06
10%	2.89E-02
20%	6.75E-02
30%	1.14E-01
40%	1.74E-01
50%	2.53E-01
60%	3.67E-01
70%	5.39E-01
80%	8.63E-01
90%	1.71E+00
100%	3.94E+02

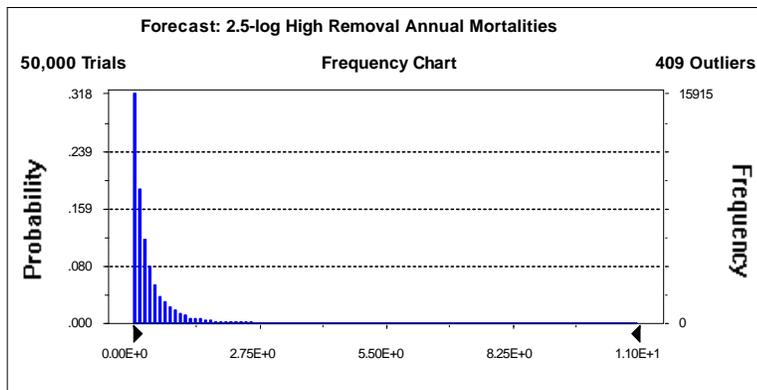
Forecast: 2.5-log High Removal Annual Mortalities

Summary:

Display Range is from 0.00E+0 to 1.10E+1
 Entire Range is from 2.92E-6 to 3.00E+2
 After 50,000 Trials, the Std. Error of the Mean is 1.68E-2

Statistics:

	<u>Value</u>
Trials	50000
Mean	7.54E-01
Median	2.16E-01
Mode	---
Standard Deviation	3.75E+00
Variance	1.40E+01
Skewness	33.62
Kurtosis	1,879.78
Coeff. of Variability	4.97
Range Minimum	2.92E-06
Range Maximum	3.00E+02
Range Width	3.00E+02
Mean Std. Error	1.68E-02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	2.92E-06
10%	2.72E-02
20%	6.15E-02
30%	1.02E-01
40%	1.51E-01
50%	2.16E-01
60%	3.05E-01
70%	4.37E-01
80%	6.80E-01
90%	1.29E+00
100%	3.00E+02

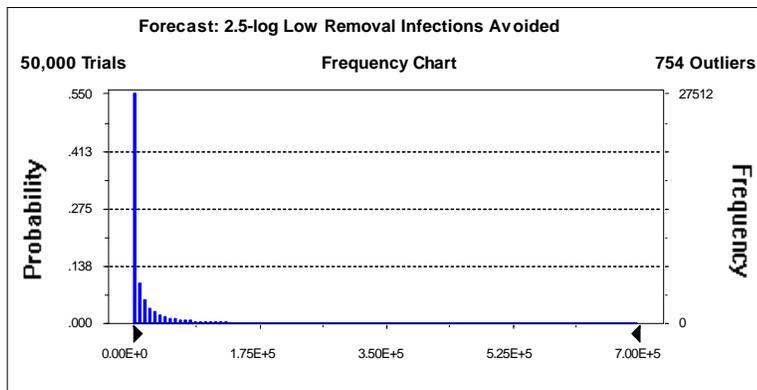
Forecast: 2.5-log Low Removal Infections Avoided

Summary:

Display Range is from 0.00E+0 to 7.00E+5
 Entire Range is from 0.00E+0 to 5.08E+6
 After 50,000 Trials, the Std. Error of the Mean is 1.02E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	5.71E+04
Median	4.71E+03
Mode	0.00E+00
Standard Deviation	2.29E+05
Variance	5.23E+10
Skewness	10.73
Kurtosis	159.73
Coeff. of Variability	4.00
Range Minimum	0.00E+00
Range Maximum	5.08E+06
Range Width	5.08E+06
Mean Std. Error	1.02E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	1.85E+03
50%	4.71E+03
60%	1.00E+04
70%	1.98E+04
80%	4.21E+04
90%	1.12E+05
100%	5.08E+06

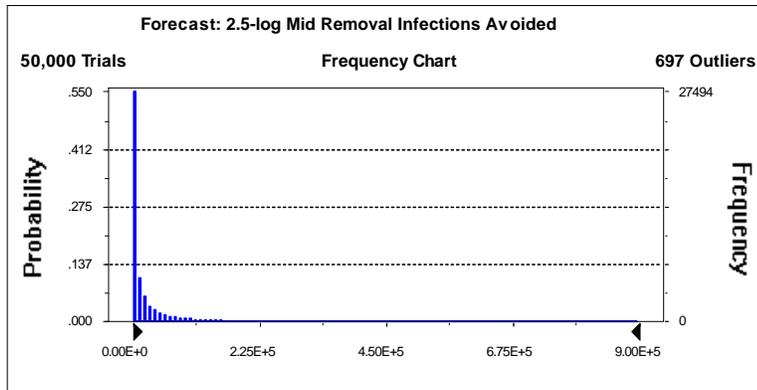
Forecast: 2.5-log Mid Removal Infections Avoided

Summary:

Display Range is from 0.00E+0 to 9.00E+5
 Entire Range is from 0.00E+0 to 7.15E+6
 After 50,000 Trials, the Std. Error of the Mean is 1.29E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	6.99E+04
Median	6.27E+03
Mode	0.00E+00
Standard Deviation	2.88E+05
Variance	8.31E+10
Skewness	11.61
Kurtosis	189.07
Coeff. of Variability	4.12
Range Minimum	0.00E+00
Range Maximum	7.15E+06
Range Width	7.15E+06
Mean Std. Error	1.29E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	2.61E+03
50%	6.27E+03
60%	1.27E+04
70%	2.44E+04
80%	5.12E+04
90%	1.35E+05
100%	7.15E+06

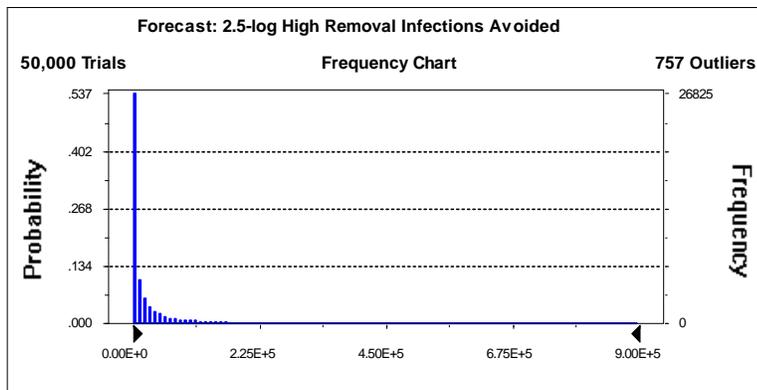
Forecast: 2.5-log High Removal Infections Avoided

Summary:

Display Range is from 0.00E+0 to 9.00E+5
 Entire Range is from 0.00E+0 to 8.20E+6
 After 50,000 Trials, the Std. Error of the Mean is 1.40E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	7.50E+04
Median	6.95E+03
Mode	0.00E+00
Standard Deviation	3.13E+05
Variance	9.80E+10
Skewness	12.06
Kurtosis	206.00
Coeff. of Variability	4.17
Range Minimum	0.00E+00
Range Maximum	8.20E+06
Range Width	8.20E+06
Mean Std. Error	1.40E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	2.93E+03
50%	6.95E+03
60%	1.39E+04
70%	2.65E+04
80%	5.51E+04
90%	1.44E+05
100%	8.20E+06

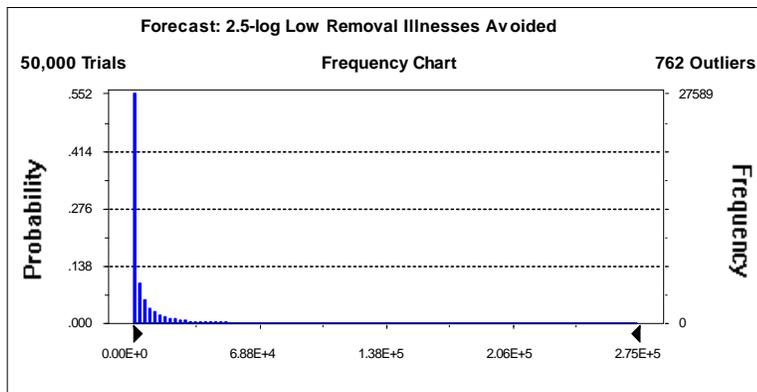
Forecast: 2.5-log Low Removal Illnesses Avoided

Summary:

Display Range is from 0.00E+0 to 2.75E+5
 Entire Range is from 0.00E+0 to 2.89E+6
 After 50,000 Trials, the Std. Error of the Mean is 4.21E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	2.28E+04
Median	1.84E+03
Mode	0.00E+00
Standard Deviation	9.41E+04
Variance	8.86E+09
Skewness	11.78
Kurtosis	203.03
Coeff. of Variability	4.12
Range Minimum	0.00E+00
Range Maximum	2.89E+06
Range Width	2.89E+06
Mean Std. Error	4.21E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	7.14E+02
50%	1.84E+03
60%	3.91E+03
70%	7.78E+03
80%	1.66E+04
90%	4.39E+04
100%	2.89E+06

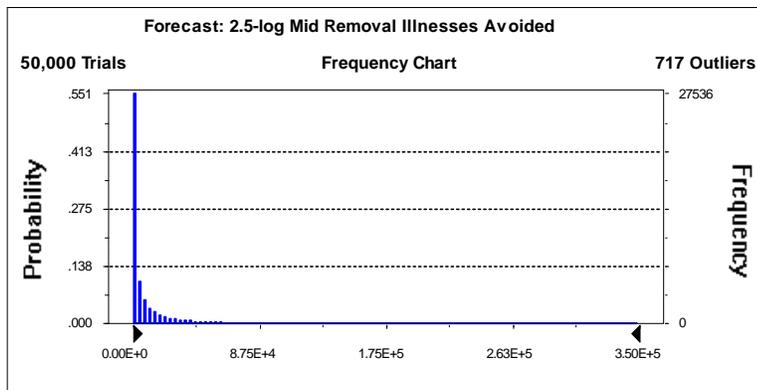
Forecast: 2.5-log Mid Removal Illnesses Avoided

Summary:

Display Range is from 0.00E+0 to 3.50E+5
 Entire Range is from 0.00E+0 to 4.03E+6
 After 50,000 Trials, the Std. Error of the Mean is 5.31E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	2.79E+04
Median	2.44E+03
Mode	0.00E+00
Standard Deviation	1.19E+05
Variance	1.41E+10
Skewness	12.79
Kurtosis	243.48
Coeff. of Variability	4.25
Range Minimum	0.00E+00
Range Maximum	4.03E+06
Range Width	4.03E+06
Mean Std. Error	5.31E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	9.89E+02
50%	2.44E+03
60%	4.93E+03
70%	9.60E+03
80%	2.02E+04
90%	5.29E+04
100%	4.03E+06

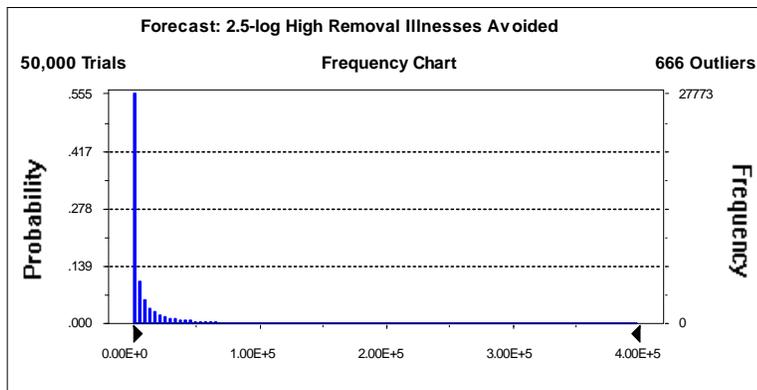
Forecast: 2.5-log High Removal Illnesses Avoided

Summary:

Display Range is from 0.00E+0 to 4.00E+5
 Entire Range is from 0.00E+0 to 4.78E+6
 After 50,000 Trials, the Std. Error of the Mean is 5.76E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	3.00E+04
Median	2.71E+03
Mode	0.00E+00
Standard Deviation	1.29E+05
Variance	1.66E+10
Skewness	13.30
Kurtosis	265.80
Coeff. of Variability	4.30
Range Minimum	0.00E+00
Range Maximum	4.78E+06
Range Width	4.78E+06
Mean Std. Error	5.76E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	1.11E+03
50%	2.71E+03
60%	5.41E+03
70%	1.04E+04
80%	2.18E+04
90%	5.65E+04
100%	4.78E+06

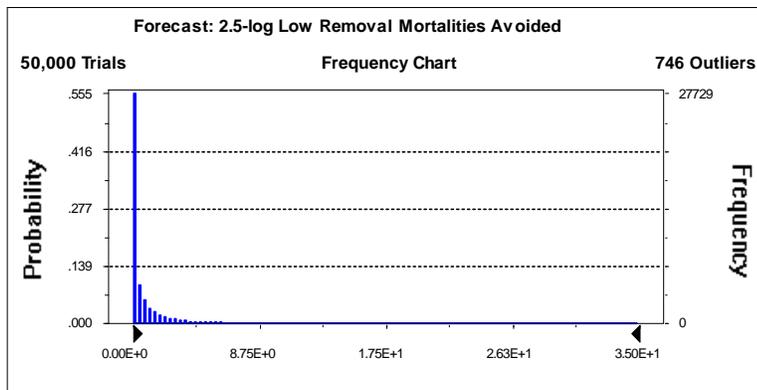
Forecast: 2.5-log Low Removal Mortalities Avoided

Summary:

Display Range is from 0.00E+0 to 3.50E+1
 Entire Range is from 0.00E+0 to 3.61E+2
 After 50,000 Trials, the Std. Error of the Mean is 5.26E-2

Statistics:

	<u>Value</u>
Trials	50000
Mean	2.85E+00
Median	2.29E-01
Mode	0.00E+00
Standard Deviation	1.18E+01
Variance	1.38E+02
Skewness	11.78
Kurtosis	203.03
Coeff. of Variability	4.12
Range Minimum	0.00E+00
Range Maximum	3.61E+02
Range Width	3.61E+02
Mean Std. Error	5.26E-02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	8.92E-02
50%	2.29E-01
60%	4.89E-01
70%	9.73E-01
80%	2.07E+00
90%	5.48E+00
100%	3.61E+02

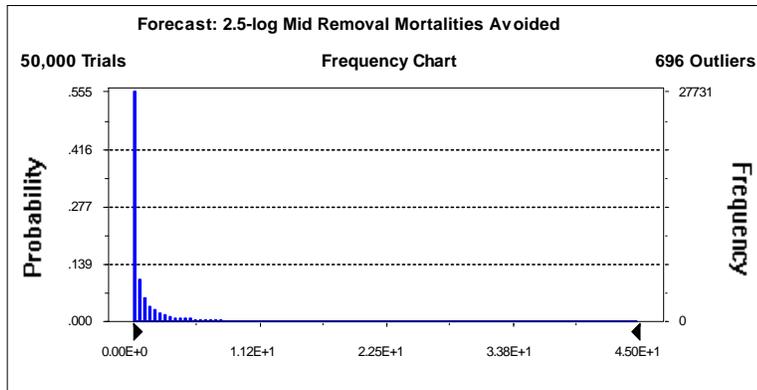
Forecast: 2.5-log Mid Removal Mortalities Avoided

Summary:

Display Range is from 0.00E+0 to 4.50E+1
 Entire Range is from 0.00E+0 to 5.03E+2
 After 50,000 Trials, the Std. Error of the Mean is 6.64E-2

Statistics:

	<u>Value</u>
Trials	50000
Mean	3.49E+00
Median	3.05E-01
Mode	0.00E+00
Standard Deviation	1.48E+01
Variance	2.20E+02
Skewness	12.79
Kurtosis	243.48
Coeff. of Variability	4.25
Range Minimum	0.00E+00
Range Maximum	5.03E+02
Range Width	5.03E+02
Mean Std. Error	6.64E-02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	1.24E-01
50%	3.05E-01
60%	6.16E-01
70%	1.20E+00
80%	2.52E+00
90%	6.62E+00
100%	5.03E+02

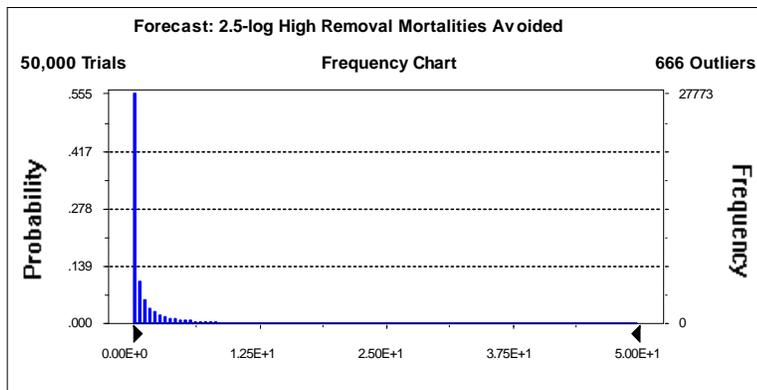
Forecast: 2.5-log High Removal Mortalities Avoided

Summary:

Display Range is from 0.00E+0 to 5.00E+1
 Entire Range is from 0.00E+0 to 5.97E+2
 After 50,000 Trials, the Std. Error of the Mean is 7.20E-2

Statistics:

	<u>Value</u>
Trials	50000
Mean	3.75E+00
Median	3.38E-01
Mode	0.00E+00
Standard Deviation	1.61E+01
Variance	2.59E+02
Skewness	13.30
Kurtosis	265.80
Coeff. of Variability	4.30
Range Minimum	0.00E+00
Range Maximum	5.97E+02
Range Width	5.97E+02
Mean Std. Error	7.20E-02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	1.39E-01
50%	3.38E-01
60%	6.77E-01
70%	1.30E+00
80%	2.72E+00
90%	7.06E+00
100%	5.97E+02

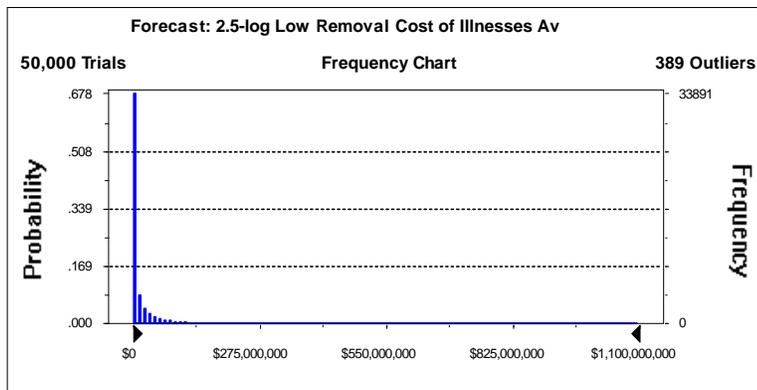
Forecast: 2.5-log Low Removal Cost of Illnesses Avoided

Summary:

Display Range is from \$0 to \$1,100,000,000
 Entire Range is from \$0 to \$34,726,013,368
 After 50,000 Trials, the Std. Error of the Mean is \$1,684,881

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$53,924,577
Median	\$2,777,608
Mode	\$0
Standard Deviation	\$376,750,934
Variance	1E+17
Skewness	41.15
Kurtosis	2,847.82
Coeff. of Variability	6.99
Range Minimum	\$0
Range Maximum	\$34,726,013,368
Range Width	\$34,726,013,368
Mean Std. Error	\$1,684,881.40



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$1,012,429
50%	\$2,777,608
60%	\$6,123,553
70%	\$12,993,273
80%	\$28,999,108
90%	\$81,381,632
100%	\$34,726,013,368

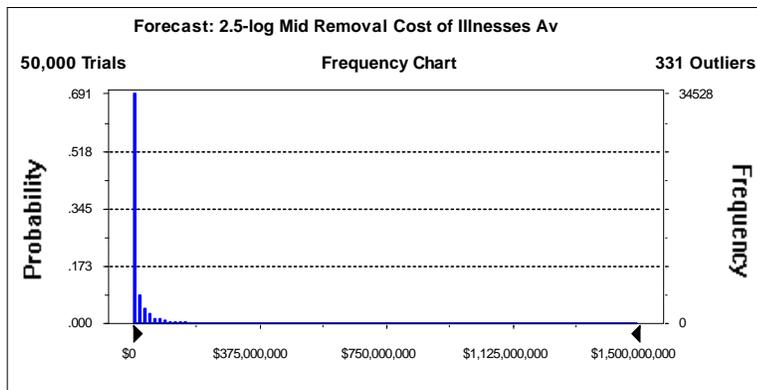
Forecast: 2.5-log Mid Removal Cost of Illnesses Avoided

Summary:

Display Range is from \$0 to \$1,500,000,000
 Entire Range is from \$0 to \$50,939,458,450
 After 50,000 Trials, the Std. Error of the Mean is \$2,182,364

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$66,206,685
Median	\$3,653,712
Mode	\$0
Standard Deviation	\$487,991,441
Variance	2E+17
Skewness	47.50
Kurtosis	3,764.72
Coeff. of Variability	7.37
Range Minimum	\$0
Range Maximum	\$50,939,458,450
Range Width	\$50,939,458,450
Mean Std. Error	\$2,182,364.07



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$1,401,121
50%	\$3,653,712
60%	\$7,759,084
70%	\$16,094,168
80%	\$35,515,465
90%	\$98,791,494
100%	\$50,939,458,450

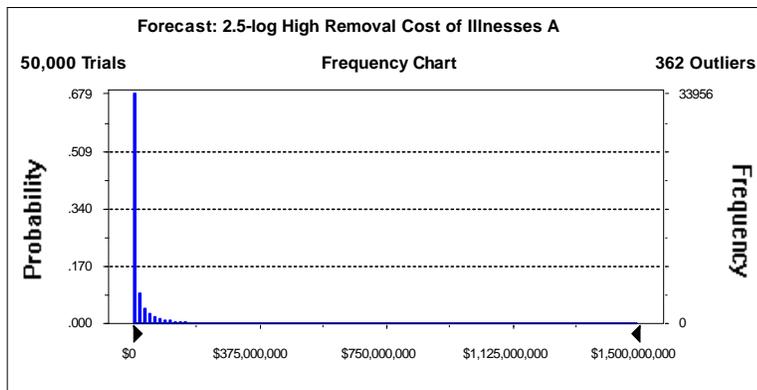
Forecast: 2.5-log High Removal Cost of Illnesses Avoided

Summary:

Display Range is from \$0 to \$1,500,000,000
 Entire Range is from \$0 to \$58,460,977,952
 After 50,000 Trials, the Std. Error of the Mean is \$2,395,560

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$71,117,633
Median	\$4,024,415
Mode	\$0
Standard Deviation	\$535,663,581
Variance	3E+17
Skewness	50.36
Kurtosis	4,210.59
Coeff. of Variability	7.53
Range Minimum	\$0
Range Maximum	\$58,460,977,952
Range Width	\$58,460,977,952
Mean Std. Error	\$2,395,560.36



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$1,566,492
50%	\$4,024,415
60%	\$8,512,888
70%	\$17,506,617
80%	\$38,378,831
90%	\$105,796,913
100%	\$58,460,977,952

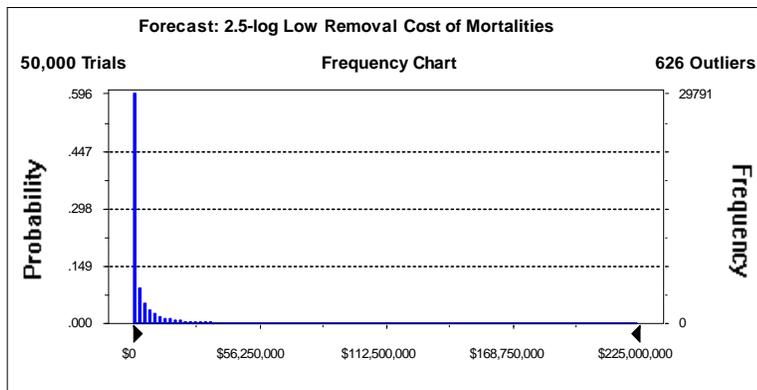
Forecast: 2.5-log Low Removal Cost of Mortalities

Summary:

Display Range is from \$0 to \$225,000,000
 Entire Range is from \$0 to \$3,945,432,545
 After 50,000 Trials, the Std. Error of the Mean is \$348,913

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$16,205,178
Median	\$1,063,083
Mode	\$0
Standard Deviation	\$78,019,277
Variance	6E+15
Skewness	16.45
Kurtosis	435.98
Coeff. of Variability	4.81
Range Minimum	\$0
Range Maximum	\$3,945,432,545
Range Width	\$3,945,432,545
Mean Std. Error	\$348,912.81



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$377,982
50%	\$1,063,083
60%	\$2,327,363
70%	\$4,807,819
80%	\$10,544,760
90%	\$28,849,138
100%	\$3,945,432,545

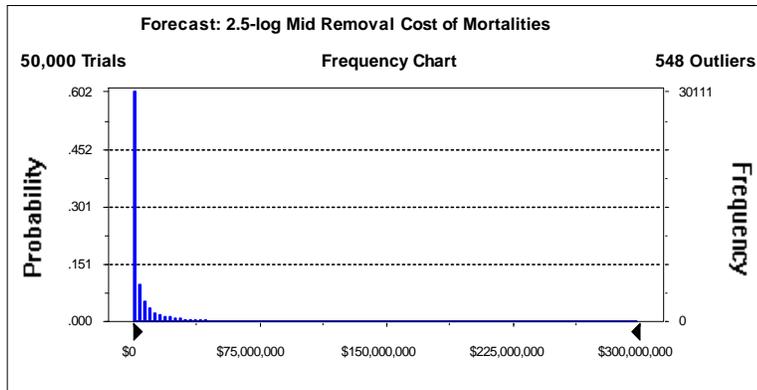
Forecast: 2.5-log Mid Removal Cost of Mortalities

Summary:

Display Range is from \$0 to \$300,000,000
 Entire Range is from \$0 to \$5,225,360,838
 After 50,000 Trials, the Std. Error of the Mean is \$441,155

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$19,863,056
Median	\$1,393,646
Mode	\$0
Standard Deviation	\$98,645,197
Variance	1E+16
Skewness	17.69
Kurtosis	502.64
Coeff. of Variability	4.97
Range Minimum	\$0
Range Maximum	\$5,225,360,838
Range Width	\$5,225,360,838
Mean Std. Error	\$441,154.73



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$523,692
50%	\$1,393,646
60%	\$2,955,175
70%	\$5,953,004
80%	\$12,858,614
90%	\$34,827,818
100%	\$5,225,360,838

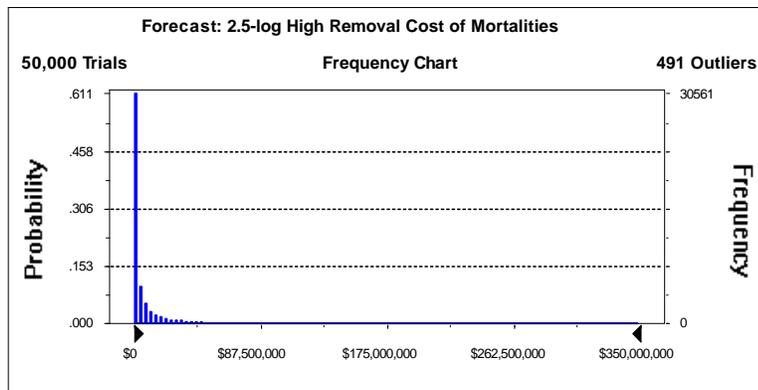
Forecast: 2.5-log High Removal Cost of Mortalities

Summary:

Display Range is from \$0 to \$350,000,000
 Entire Range is from \$0 to \$5,763,998,662
 After 50,000 Trials, the Std. Error of the Mean is \$479,247

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$21,320,018
Median	\$1,542,681
Mode	\$0
Standard Deviation	\$107,162,902
Variance	1E+16
Skewness	18.27
Kurtosis	534.26
Coeff. of Variability	5.03
Range Minimum	\$0
Range Maximum	\$5,763,998,662
Range Width	\$5,763,998,662
Mean Std. Error	\$479,247.07



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$584,949
50%	\$1,542,681
60%	\$3,250,206
70%	\$6,495,239
80%	\$13,888,143
90%	\$37,282,176
100%	\$5,763,998,662

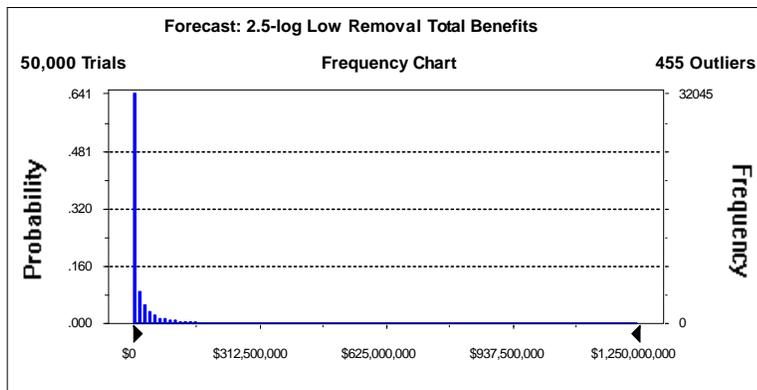
Forecast: 2.5-log Low Removal Total Benefits

Summary:

Display Range is from \$0 to \$1,250,000,000
 Entire Range is from \$0 to \$35,878,277,573
 After 50,000 Trials, the Std. Error of the Mean is \$1,883,533

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$70,129,754
Median	\$4,210,079
Mode	\$0
Standard Deviation	\$421,170,851
Variance	2E+17
Skewness	34.55
Kurtosis	2,144.74
Coeff. of Variability	6.01
Range Minimum	\$0
Range Maximum	\$35,878,277,573
Range Width	\$35,878,277,573
Mean Std. Error	\$1,883,533.31



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$1,558,451
50%	\$4,210,079
60%	\$9,152,893
70%	\$19,381,738
80%	\$41,608,695
90%	\$114,284,837
100%	\$35,878,277,573

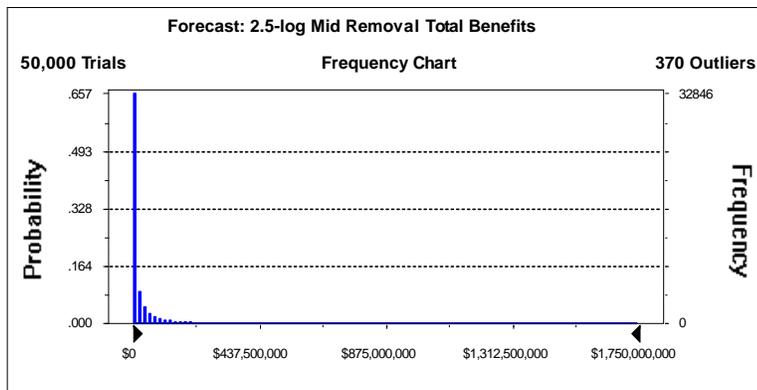
Forecast: 2.5-log Mid Removal Total Benefits

Summary:

Display Range is from \$0 to \$1,750,000,000
 Entire Range is from \$0 to \$52,629,710,481
 After 50,000 Trials, the Std. Error of the Mean is \$2,433,059

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$86,069,741
Median	\$5,559,938
Mode	\$0
Standard Deviation	\$544,048,420
Variance	3E+17
Skewness	40.07
Kurtosis	2,862.08
Coeff. of Variability	6.32
Range Minimum	\$0
Range Maximum	\$52,629,710,481
Range Width	\$52,629,710,481
Mean Std. Error	\$2,433,058.50



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$2,172,719
50%	\$5,559,938
60%	\$11,620,278
70%	\$23,945,847
80%	\$50,879,711
90%	\$138,471,147
100%	\$52,629,710,481

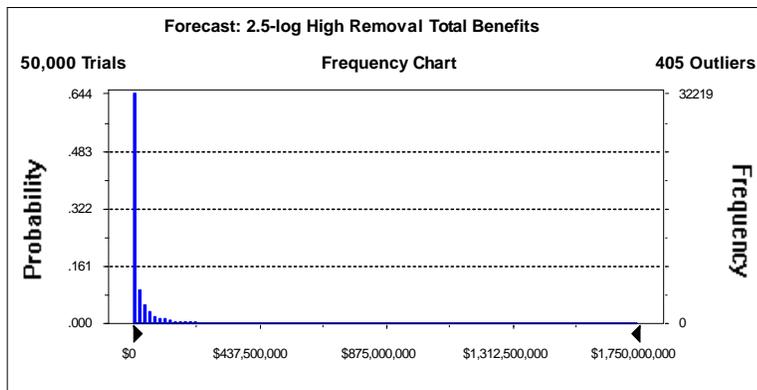
Forecast: 2.5-log High Removal Total Benefits

Summary:

Display Range is from \$0 to \$1,750,000,000
 Entire Range is from \$0 to \$60,400,805,930
 After 50,000 Trials, the Std. Error of the Mean is \$2,667,793

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$92,437,651
Median	\$6,151,511
Mode	\$0
Standard Deviation	\$596,536,629
Variance	4E+17
Skewness	42.58
Kurtosis	3,213.18
Coeff. of Variability	6.45
Range Minimum	\$0
Range Maximum	\$60,400,805,930
Range Width	\$60,400,805,930
Mean Std. Error	\$2,667,792.91



Percentiles:

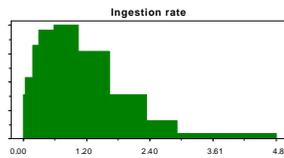
<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$2,435,190
50%	\$6,151,511
60%	\$12,737,996
70%	\$26,004,623
80%	\$54,951,049
90%	\$148,148,504
100%	\$60,400,805,930

Assumptions

Assumption: Daily Water Consumption

Custom distribution with parameters:				<u>Relative Prob.</u>
Continuous range	0.00	to	0.05	0.010000
Continuous range	0.05	to	0.18	0.040000
Continuous range	0.18	to	0.30	0.050000
Continuous range	0.30	to	0.58	0.150000
Continuous range	0.58	to	1.05	0.250000
Continuous range	1.05	to	1.64	0.250000
Continuous range	1.64	to	2.35	0.150000
Continuous range	2.35	to	2.92	0.050000
Continuous range	2.92	to	4.81	0.050000
Total Relative Probability				1.000000

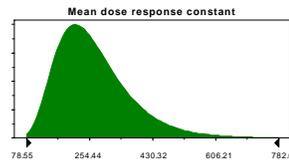
Mean value in simulation was 1.25



Assumption: Mean dose response constant

Lognormal distribution with parameters:
 5% - tile 132.00
 95% - tile 465.40

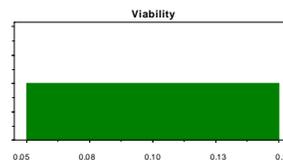
Selected range is from 0.00 to +Infinity
 Mean value in simulation was 266.77



Assumption: Viability

Uniform distribution with parameters:
 Minimum 0.05
 Maximum 0.15

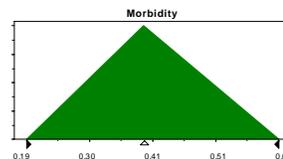
Mean value in simulation was 0.10



Assumption: Morbidity

Triangular distribution with parameters:
 Minimum 0.19
 Likeliest 0.39
 Maximum 0.62

Selected range is from 0.19 to 0.62
 Mean value in simulation was 0.40

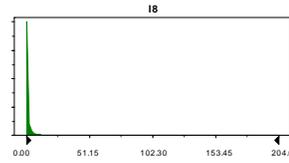


Assumption: Mean Daily Cyst Concentration in Distributed Water

Lognormal distribution with parameters:

Mean 4.26
Standard Dev. 24.53

Selected range is from 0.00 to +Infinity
Mean value in simulation was 4.25

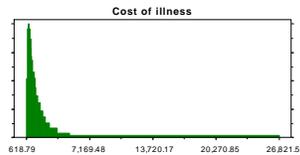


Assumption: Cost of illness

Custom distribution with parameters:

				<u>Relative Prob.</u>
Continuous range	618.79	to	736.35	0.050000
Continuous range	736.35	to	799.67	0.050000
Continuous range	799.67	to	860.41	0.050000
Continuous range	860.41	to	921.94	0.050000
Continuous range	921.94	to	985.38	0.050000
Continuous range	985.38	to	1,055.42	0.050000
Continuous range	1,055.42	to	1,132.61	0.050000
Continuous range	1,132.61	to	1,217.08	0.050000
Continuous range	1,217.08	to	1,306.32	0.050000
Continuous range	1,306.32	to	1,410.82	0.050000
Continuous range	1,410.82	to	1,526.87	0.050000
Continuous range	1,526.87	to	1,663.45	0.050000
Continuous range	1,663.45	to	1,828.49	0.050000
Continuous range	1,828.49	to	2,024.49	0.050000
Continuous range	2,024.49	to	2,279.26	0.050000
Continuous range	2,279.26	to	2,609.62	0.050000
Continuous range	2,609.62	to	3,062.70	0.050000
Continuous range	3,062.70	to	3,777.19	0.050000
Continuous range	3,777.19	to	5,148.57	0.050000
Continuous range	5,148.57	to	26,821.54	0.050000
Total Relative Probability				1.000000

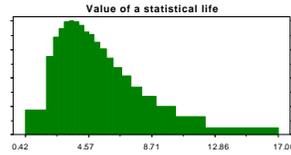
Mean value in simulation was 2,403.25



Assumption: Value of a statistical life

Custom distribution with parameters:			<u>Relative Prob.</u>	
Continuous range	0.42	to	1.84	0.050000
Continuous range	1.84	to	2.30	0.050000
Continuous range	2.30	to	2.66	0.050000
Continuous range	2.66	to	2.99	0.050000
Continuous range	2.99	to	3.31	0.050000
Continuous range	3.31	to	3.62	0.050000
Continuous range	3.62	to	3.93	0.050000
Continuous range	3.93	to	4.25	0.050000
Continuous range	4.25	to	4.60	0.050000
Continuous range	4.60	to	4.95	0.050000
Continuous range	4.95	to	5.33	0.050000
Continuous range	5.33	to	5.75	0.050000
Continuous range	5.75	to	6.21	0.050000
Continuous range	6.21	to	6.73	0.050000
Continuous range	6.73	to	7.34	0.050000
Continuous range	7.34	to	8.07	0.050000
Continuous range	8.07	to	9.00	0.050000
Continuous range	9.00	to	10.26	0.050000
Continuous range	10.26	to	12.25	0.050000
Continuous range	12.25	to	17.00	0.050000
Total Relative Probability			1.000000	

Mean value in simulation was 5.70



Appendix B-2
Benefits Analysis Assuming
2.5 Baseline Log Removal
Daily Drinking Water Rate: 0.9 Liters

Benefits Analysis Assuming 2.5 Baseline Log Removal at 0.9 Liters Per Day Ingestion Rate

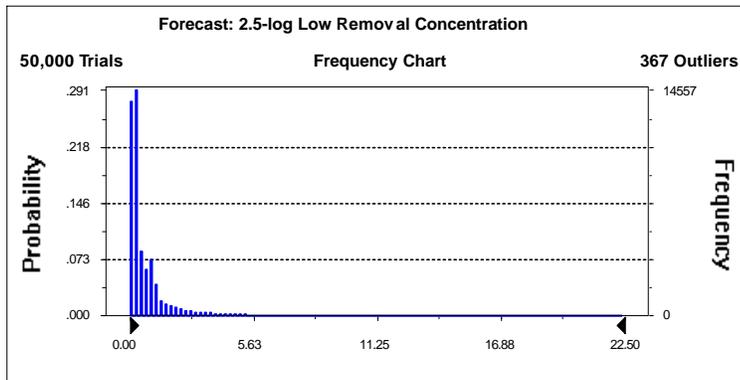
Forecast: 2.5-log Low Removal Concentration

Summary:

Display Range is from 0.00 to 22.50
 Entire Range is from 0.00 to 694.71
 After 50,000 Trials, the Std. Error of the Mean is 0.03

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.48
Median	0.37
Mode	---
Standard Deviation	7.81
Variance	60.96
Skewness	42.04
Kurtosis	2,774.60
Coeff. of Variability	5.29
Range Minimum	0.00
Range Maximum	694.71
Range Width	694.71
Mean Std. Error	0.03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00
10%	0.07
20%	0.15
30%	0.24
40%	0.29
50%	0.37
60%	0.52
70%	0.87
80%	1.18
90%	2.56
100%	694.71

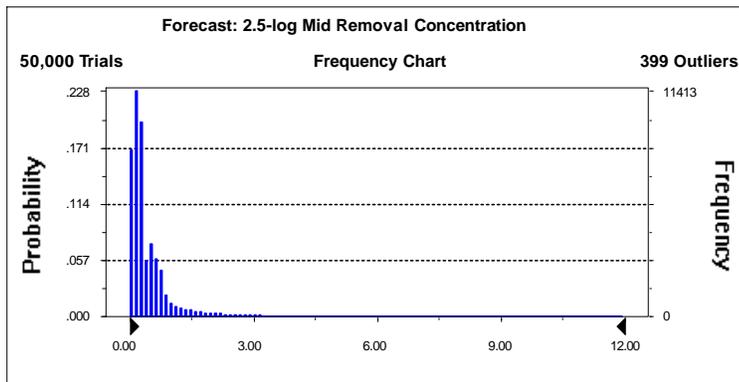
Forecast: 2.5-log Mid Removal Concentration

Summary:

Display Range is from 0.00 to 12.00
 Entire Range is from 0.00 to 390.66
 After 50,000 Trials, the Std. Error of the Mean is 0.02

Statistics:

	<u>Value</u>
Trials	50000
Mean	0.88
Median	0.29
Mode	---
Standard Deviation	4.38
Variance	19.22
Skewness	42.20
Kurtosis	2,789.56
Coeff. of Variability	4.96
Range Minimum	0.00
Range Maximum	390.66
Range Width	390.66
Mean Std. Error	0.02



Percentiles:

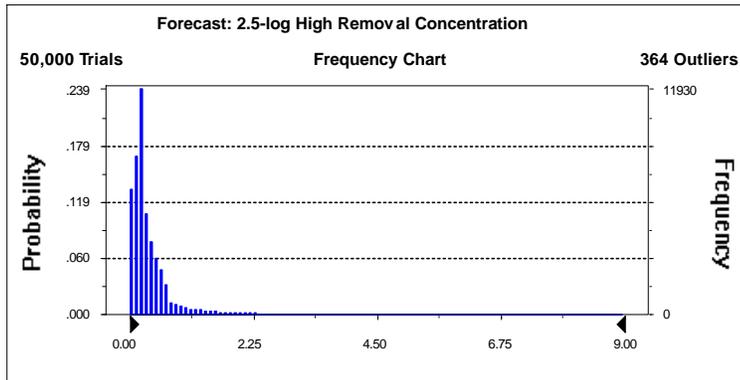
<u>Percentile</u>	<u>Value</u>
0%	0.00
10%	0.07
20%	0.15
30%	0.20
40%	0.24
50%	0.29
60%	0.37
70%	0.56
80%	0.75
90%	1.44
100%	390.66

Forecast: 2.5-log High Removal Concentration

Summary:

Display Range is from 0.00 to 9.00
 Entire Range is from 0.00 to 276.57
 After 50,000 Trials, the Std. Error of the Mean is 0.01

Statistics:	<u>Value</u>
Trials	50000
Mean	0.66
Median	0.25
Mode	---
Standard Deviation	3.10
Variance	9.61
Skewness	42.32
Kurtosis	2,801.05
Coeff. of Variability	4.73
Range Minimum	0.00
Range Maximum	276.57
Range Width	276.57
Mean Std. Error	0.01



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00
10%	0.07
20%	0.15
30%	0.18
40%	0.21
50%	0.25
60%	0.30
70%	0.42
80%	0.57
90%	1.02
100%	276.57

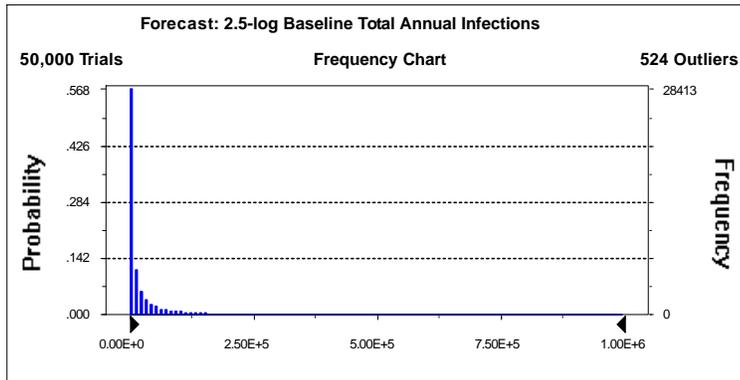
Forecast: 2.5-log Baseline Total Annual Infections

Summary:

Display Range is from 0.00E+0 to 1.00E+6
 Entire Range is from 0.00E+0 to 1.27E+7
 After 50,000 Trials, the Std. Error of the Mean is 1.45E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	6.75E+04
Median	6.65E+03
Mode	0.00E+00
Standard Deviation	3.25E+05
Variance	1.05E+11
Skewness	16.99
Kurtosis	429.30
Coeff. of Variability	4.81
Range Minimum	0.00E+00
Range Maximum	1.27E+07
Range Width	1.27E+07
Mean Std. Error	1.45E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	1.37E+02
20%	7.14E+02
30%	1.81E+03
40%	3.60E+03
50%	6.65E+03
60%	1.21E+04
70%	2.25E+04
80%	4.60E+04
90%	1.23E+05
100%	1.27E+07

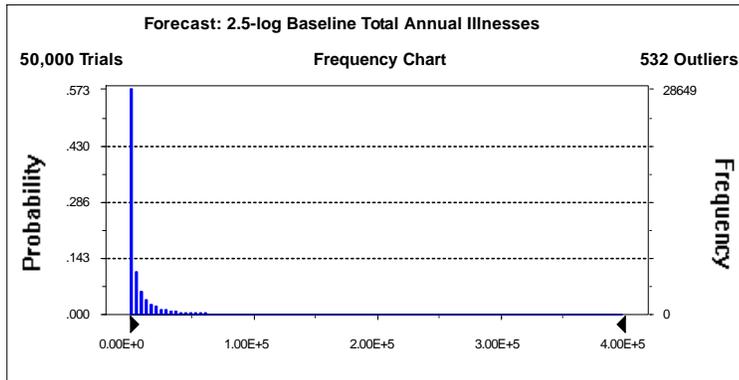
Forecast: 2.5-log Baseline Total Annual Illnesses

Summary:

Display Range is from 0.00E+0 to 4.00E+5
 Entire Range is from 0.00E+0 to 7.15E+6
 After 50,000 Trials, the Std. Error of the Mean is 6.00E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	2.71E+04
Median	2.58E+03
Mode	0.00E+00
Standard Deviation	1.34E+05
Variance	1.80E+10
Skewness	18.29
Kurtosis	527.39
Coeff. of Variability	4.95
Range Minimum	0.00E+00
Range Maximum	7.15E+06
Range Width	7.15E+06
Mean Std. Error	6.00E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	5.24E+01
20%	2.76E+02
30%	7.00E+02
40%	1.38E+03
50%	2.58E+03
60%	4.71E+03
70%	8.80E+03
80%	1.80E+04
90%	4.85E+04
100%	7.15E+06

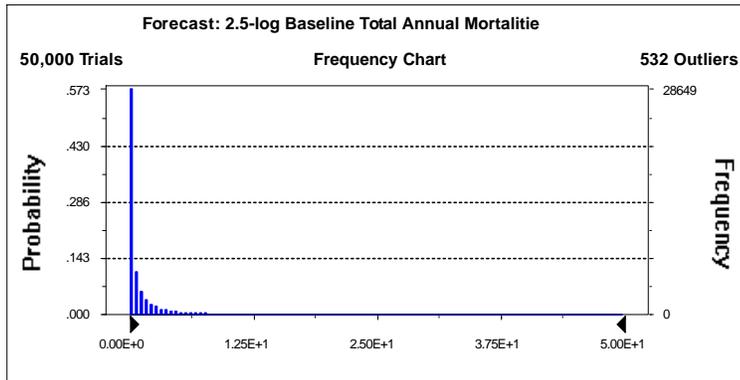
Forecast: 2.5-log Baseline Total Annual Mortalities

Summary:

Display Range is from 0.00E+0 to 5.00E+1
 Entire Range is from 0.00E+0 to 8.94E+2
 After 50,000 Trials, the Std. Error of the Mean is 7.50E-2

Statistics:

	<u>Value</u>
Trials	50000
Mean	3.39E+00
Median	3.23E-01
Mode	0.00E+00
Standard Deviation	1.68E+01
Variance	2.81E+02
Skewness	18.29
Kurtosis	527.39
Coeff. of Variability	4.95
Range Minimum	0.00E+00
Range Maximum	8.94E+02
Range Width	8.94E+02
Mean Std. Error	7.50E-02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	6.55E-03
20%	3.45E-02
30%	8.75E-02
40%	1.73E-01
50%	3.23E-01
60%	5.89E-01
70%	1.10E+00
80%	2.26E+00
90%	6.06E+00
100%	8.94E+02

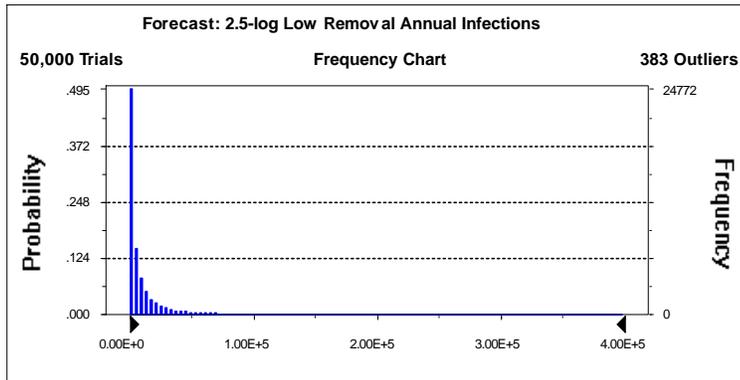
Forecast: 2.5-log Low Removal Annual Infections

Summary:

Display Range is from 0.00E+0 to 4.00E+5
 Entire Range is from 0.00E+0 to 1.21E+7
 After 50,000 Trials, the Std. Error of the Mean is 6.41E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	2.48E+04
Median	4.08E+03
Mode	0.00E+00
Standard Deviation	1.43E+05
Variance	2.06E+10
Skewness	33.49
Kurtosis	1,849.91
Coeff. of Variability	5.79
Range Minimum	0.00E+00
Range Maximum	1.21E+07
Range Width	1.21E+07
Mean Std. Error	6.41E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	1.15E+02
20%	5.86E+02
30%	1.36E+03
40%	2.48E+03
50%	4.08E+03
60%	6.50E+03
70%	1.06E+04
80%	1.86E+04
90%	4.25E+04
100%	1.21E+07

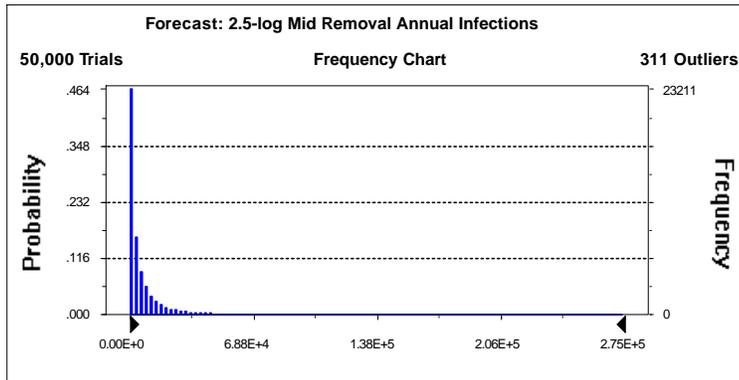
Forecast: 2.5-log Mid Removal Annual Infections

Summary:

Display Range is from 0.00E+0 to 2.75E+5
 Entire Range is from 0.00E+0 to 1.05E+7
 After 50,000 Trials, the Std. Error of the Mean is 4.19E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.52E+04
Median	3.22E+03
Mode	0.00E+00
Standard Deviation	9.37E+04
Variance	8.78E+09
Skewness	48.53
Kurtosis	4,033.95
Coeff. of Variability	6.17
Range Minimum	0.00E+00
Range Maximum	1.05E+07
Range Width	1.05E+07
Mean Std. Error	4.19E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	1.02E+02
20%	5.16E+02
30%	1.16E+03
40%	2.03E+03
50%	3.22E+03
60%	4.90E+03
70%	7.65E+03
80%	1.26E+04
90%	2.59E+04
100%	1.05E+07

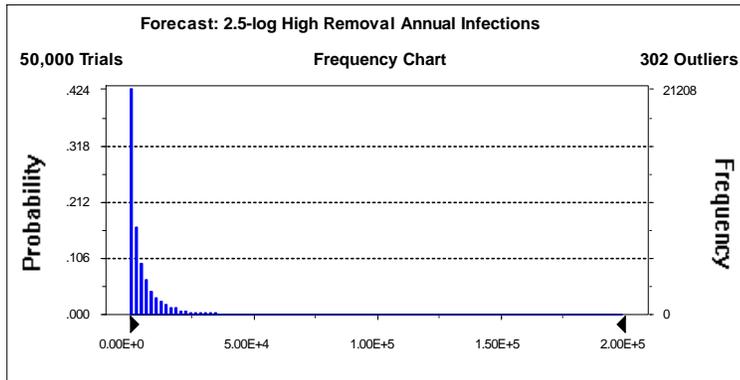
Forecast: 2.5-log High Removal Annual Infections

Summary:

Display Range is from 0.00E+0 to 2.00E+5
 Entire Range is from 0.00E+0 to 9.10E+6
 After 50,000 Trials, the Std. Error of the Mean is 3.22E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.14E+04
Median	2.77E+03
Mode	0.00E+00
Standard Deviation	7.19E+04
Variance	5.17E+09
Skewness	58.87
Kurtosis	5,875.62
Coeff. of Variability	6.33
Range Minimum	0.00E+00
Range Maximum	9.10E+06
Range Width	9.10E+06
Mean Std. Error	3.22E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	9.35E+01
20%	4.70E+02
30%	1.04E+03
40%	1.79E+03
50%	2.77E+03
60%	4.16E+03
70%	6.29E+03
80%	9.99E+03
90%	1.94E+04
100%	9.10E+06

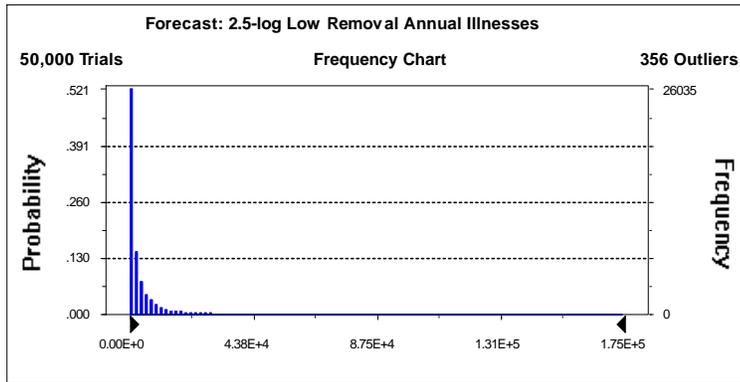
Forecast: 2.5-log Low Removal Annual Illnesses

Summary:

Display Range is from 0.00E+0 to 1.75E+5
 Entire Range is from 0.00E+0 to 4.89E+6
 After 50,000 Trials, the Std. Error of the Mean is 2.64E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	9.94E+03
Median	1.58E+03
Mode	0.00E+00
Standard Deviation	5.90E+04
Variance	3.49E+09
Skewness	35.76
Kurtosis	2,157.57
Coeff. of Variability	5.94
Range Minimum	0.00E+00
Range Maximum	4.89E+06
Range Width	4.89E+06
Mean Std. Error	2.64E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	4.38E+01
20%	2.24E+02
30%	5.25E+02
40%	9.58E+02
50%	1.58E+03
60%	2.54E+03
70%	4.18E+03
80%	7.42E+03
90%	1.68E+04
100%	4.89E+06

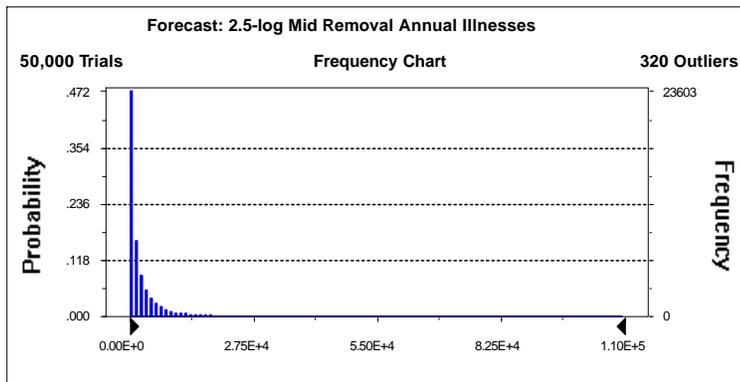
Forecast: 2.5-log Mid Removal Annual Illnesses

Summary:

Display Range is from 0.00E+0 to 1.10E+5
 Entire Range is from 0.00E+0 to 4.11E+6
 After 50,000 Trials, the Std. Error of the Mean is 1.72E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	6.09E+03
Median	1.24E+03
Mode	0.00E+00
Standard Deviation	3.84E+04
Variance	1.48E+09
Skewness	49.73
Kurtosis	4,111.90
Coeff. of Variability	6.31
Range Minimum	0.00E+00
Range Maximum	4.11E+06
Range Width	4.11E+06
Mean Std. Error	1.72E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	3.93E+01
20%	1.98E+02
30%	4.45E+02
40%	7.85E+02
50%	1.24E+03
60%	1.92E+03
70%	3.01E+03
80%	5.01E+03
90%	1.03E+04
100%	4.11E+06

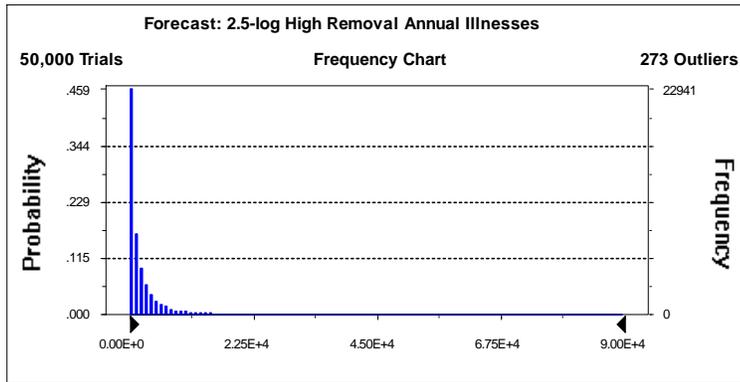
Forecast: 2.5-log High Removal Annual Illnesses

Summary:

Display Range is from 0.00E+0 to 9.00E+4
 Entire Range is from 0.00E+0 to 3.54E+6
 After 50,000 Trials, the Std. Error of the Mean is 1.32E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	4.56E+03
Median	1.07E+03
Mode	0.00E+00
Standard Deviation	2.94E+04
Variance	8.65E+08
Skewness	58.95
Kurtosis	5,675.07
Coeff. of Variability	6.45
Range Minimum	0.00E+00
Range Maximum	3.54E+06
Range Width	3.54E+06
Mean Std. Error	1.32E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	3.60E+01
20%	1.80E+02
30%	3.98E+02
40%	6.92E+02
50%	1.07E+03
60%	1.62E+03
70%	2.48E+03
80%	3.98E+03
90%	7.81E+03
100%	3.54E+06

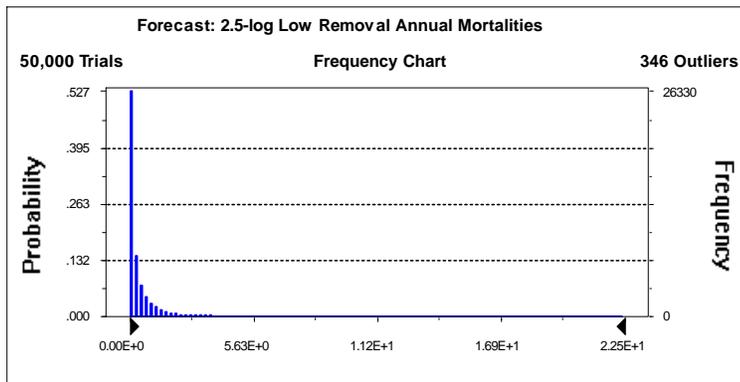
Forecast: 2.5-log Low Removal Annual Mortalities

Summary:

Display Range is from 0.00E+0 to 2.25E+1
 Entire Range is from 0.00E+0 to 6.11E+2
 After 50,000 Trials, the Std. Error of the Mean is 3.30E-2

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.24E+00
Median	1.98E-01
Mode	0.00E+00
Standard Deviation	7.38E+00
Variance	5.45E+01
Skewness	35.76
Kurtosis	2,157.57
Coeff. of Variability	5.94
Range Minimum	0.00E+00
Range Maximum	6.11E+02
Range Width	6.11E+02
Mean Std. Error	3.30E-02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	5.47E-03
20%	2.81E-02
30%	6.57E-02
40%	1.20E-01
50%	1.98E-01
60%	3.17E-01
70%	5.23E-01
80%	9.27E-01
90%	2.10E+00
100%	6.11E+02

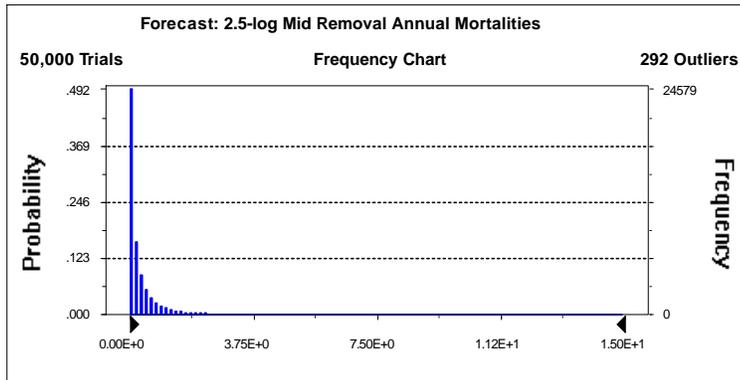
Forecast: 2.5-log Mid Removal Annual Mortalities

Summary:

Display Range is from 0.00E+0 to 1.50E+1
 Entire Range is from 0.00E+0 to 5.13E+2
 After 50,000 Trials, the Std. Error of the Mean is 2.15E-2

Statistics:

	<u>Value</u>
Trials	50000
Mean	7.62E-01
Median	1.55E-01
Mode	0.00E+00
Standard Deviation	4.80E+00
Variance	2.31E+01
Skewness	49.73
Kurtosis	4,111.90
Coeff. of Variability	6.31
Range Minimum	0.00E+00
Range Maximum	5.13E+02
Range Width	5.13E+02
Mean Std. Error	2.15E-02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	4.91E-03
20%	2.47E-02
30%	5.57E-02
40%	9.81E-02
50%	1.55E-01
60%	2.40E-01
70%	3.76E-01
80%	6.26E-01
90%	1.29E+00
100%	5.13E+02

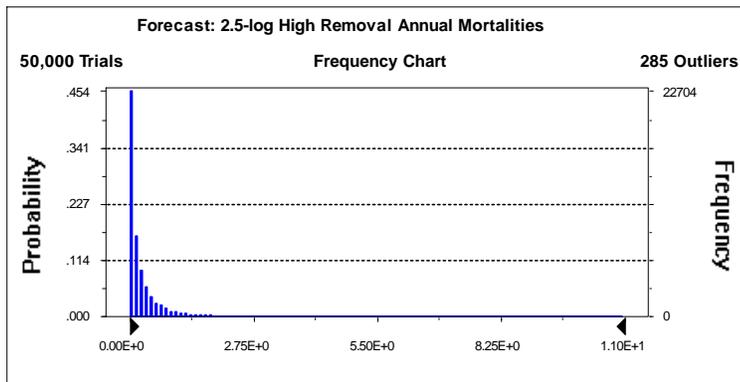
Forecast: 2.5-log High Removal Annual Mortalities

Summary:

Display Range is from 0.00E+0 to 1.10E+1
 Entire Range is from 0.00E+0 to 4.43E+2
 After 50,000 Trials, the Std. Error of the Mean is 1.64E-2

Statistics:

	<u>Value</u>
Trials	50000
Mean	5.70E-01
Median	1.34E-01
Mode	0.00E+00
Standard Deviation	3.68E+00
Variance	1.35E+01
Skewness	58.95
Kurtosis	5,675.07
Coeff. of Variability	6.45
Range Minimum	0.00E+00
Range Maximum	4.43E+02
Range Width	4.43E+02
Mean Std. Error	1.64E-02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	4.50E-03
20%	2.25E-02
30%	4.98E-02
40%	8.65E-02
50%	1.34E-01
60%	2.02E-01
70%	3.10E-01
80%	4.97E-01
90%	9.77E-01
100%	4.43E+02

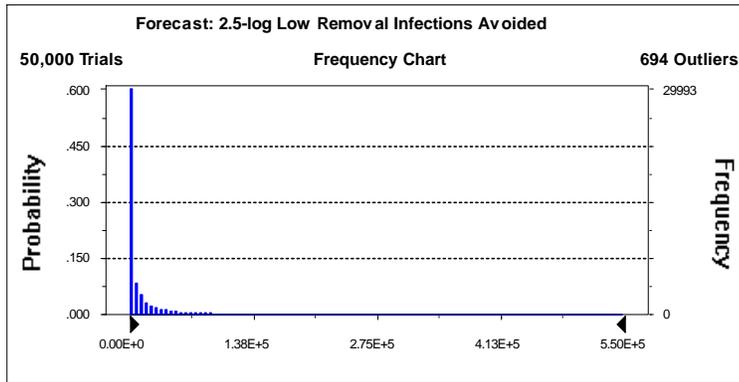
Forecast: 2.5-log Low Removal Infections Avoided

Summary:

Display Range is from 0.00E+0 to 5.50E+5
 Entire Range is from 0.00E+0 to 5.08E+6
 After 50,000 Trials, the Std. Error of the Mean is 8.62E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	4.28E+04
Median	2.26E+03
Mode	0.00E+00
Standard Deviation	1.93E+05
Variance	3.71E+10
Skewness	12.83
Kurtosis	230.96
Coeff. of Variability	4.51
Range Minimum	0.00E+00
Range Maximum	5.08E+06
Range Width	5.08E+06
Mean Std. Error	8.62E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	5.07E+02
50%	2.26E+03
60%	5.50E+03
70%	1.22E+04
80%	2.76E+04
90%	8.06E+04
100%	5.08E+06

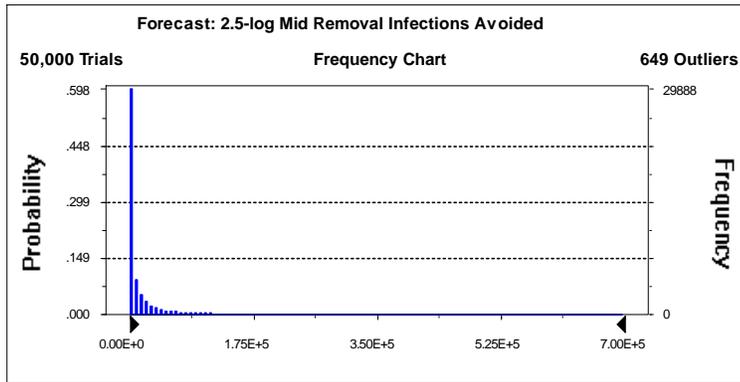
Forecast: 2.5-log Mid Removal Infections Avoided

Summary:

Display Range is from 0.00E+0 to 7.00E+5
 Entire Range is from 0.00E+0 to 7.16E+6
 After 50,000 Trials, the Std. Error of the Mean is 1.09E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	5.23E+04
Median	3.04E+03
Mode	0.00E+00
Standard Deviation	2.43E+05
Variance	5.93E+10
Skewness	14.02
Kurtosis	281.00
Coeff. of Variability	4.65
Range Minimum	0.00E+00
Range Maximum	7.16E+06
Range Width	7.16E+06
Mean Std. Error	1.09E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	6.98E+02
50%	3.04E+03
60%	7.12E+03
70%	1.51E+04
80%	3.38E+04
90%	9.75E+04
100%	7.16E+06

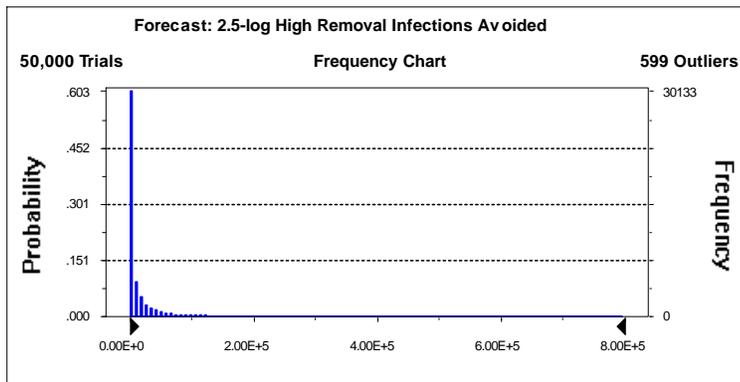
Forecast: 2.5-log High Removal Infections Avoided

Summary:

Display Range is from 0.00E+0 to 8.00E+5
 Entire Range is from 0.00E+0 to 8.21E+6
 After 50,000 Trials, the Std. Error of the Mean is 1.18E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	5.62E+04
Median	3.37E+03
Mode	0.00E+00
Standard Deviation	2.64E+05
Variance	7.00E+10
Skewness	14.60
Kurtosis	307.12
Coeff. of Variability	4.71
Range Minimum	0.00E+00
Range Maximum	8.21E+06
Range Width	8.21E+06
Mean Std. Error	1.18E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	7.83E+02
50%	3.37E+03
60%	7.85E+03
70%	1.65E+04
80%	3.65E+04
90%	1.04E+05
100%	8.21E+06

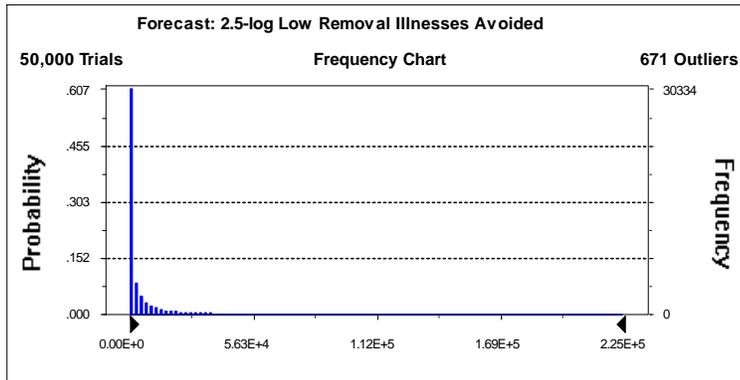
Forecast: 2.5-log Low Removal Illnesses Avoided

Summary:

Display Range is from 0.00E+0 to 2.25E+5
 Entire Range is from 0.00E+0 to 2.76E+6
 After 50,000 Trials, the Std. Error of the Mean is 3.57E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.72E+04
Median	8.68E+02
Mode	0.00E+00
Standard Deviation	7.97E+04
Variance	6.36E+09
Skewness	13.79
Kurtosis	275.88
Coeff. of Variability	4.64
Range Minimum	0.00E+00
Range Maximum	2.76E+06
Range Width	2.76E+06
Mean Std. Error	3.57E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	1.95E+02
50%	8.68E+02
60%	2.13E+03
70%	4.75E+03
80%	1.08E+04
90%	3.17E+04
100%	2.76E+06

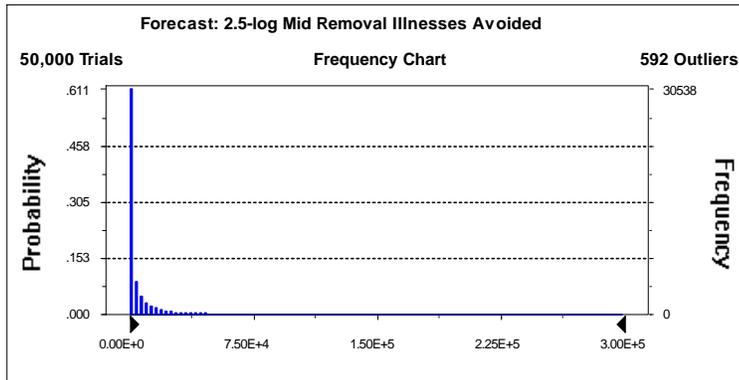
Forecast: 2.5-log Mid Removal Illnesses Avoided

Summary:

Display Range is from 0.00E+0 to 3.00E+5
 Entire Range is from 0.00E+0 to 3.78E+6
 After 50,000 Trials, the Std. Error of the Mean is 4.50E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	2.10E+04
Median	1.17E+03
Mode	0.00E+00
Standard Deviation	1.01E+05
Variance	1.01E+10
Skewness	15.06
Kurtosis	335.90
Coeff. of Variability	4.79
Range Minimum	0.00E+00
Range Maximum	3.78E+06
Range Width	3.78E+06
Mean Std. Error	4.50E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	2.69E+02
50%	1.17E+03
60%	2.75E+03
70%	5.90E+03
80%	1.32E+04
90%	3.83E+04
100%	3.78E+06

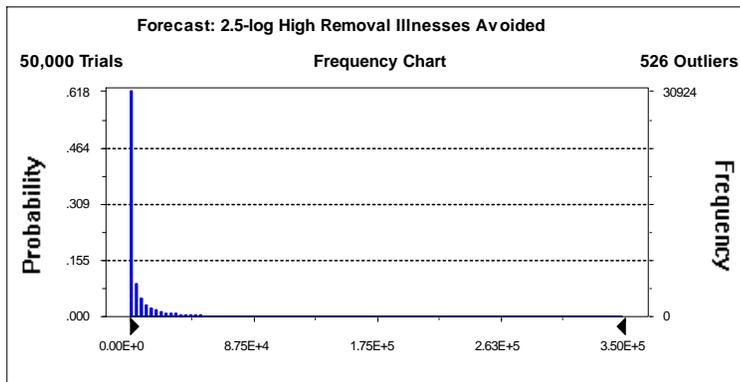
Forecast: 2.5-log High Removal Illnesses Avoided

Summary:

Display Range is from 0.00E+0 to 3.50E+5
 Entire Range is from 0.00E+0 to 4.56E+6
 After 50,000 Trials, the Std. Error of the Mean is 4.89E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	2.26E+04
Median	1.30E+03
Mode	0.00E+00
Standard Deviation	1.09E+05
Variance	1.20E+10
Skewness	15.70
Kurtosis	370.00
Coeff. of Variability	4.85
Range Minimum	0.00E+00
Range Maximum	4.56E+06
Range Width	4.56E+06
Mean Std. Error	4.89E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	3.01E+02
50%	1.30E+03
60%	3.04E+03
70%	6.44E+03
80%	1.43E+04
90%	4.11E+04
100%	4.56E+06

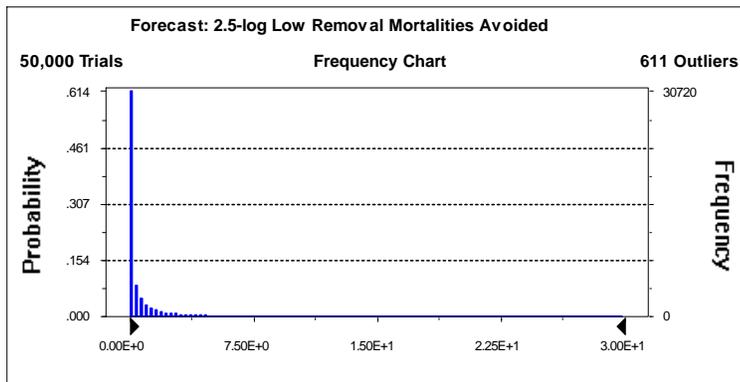
Forecast: 2.5-log Low Removal Mortalities Avoided

Summary:

Display Range is from 0.00E+0 to 3.00E+1
 Entire Range is from 0.00E+0 to 3.45E+2
 After 50,000 Trials, the Std. Error of the Mean is 4.46E-2

Statistics:

	<u>Value</u>
Trials	50000
Mean	2.15E+00
Median	1.08E-01
Mode	0.00E+00
Standard Deviation	9.97E+00
Variance	9.93E+01
Skewness	13.79
Kurtosis	275.88
Coeff. of Variability	4.64
Range Minimum	0.00E+00
Range Maximum	3.45E+02
Range Width	3.45E+02
Mean Std. Error	4.46E-02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	2.43E-02
50%	1.08E-01
60%	2.66E-01
70%	5.93E-01
80%	1.35E+00
90%	3.97E+00
100%	3.45E+02

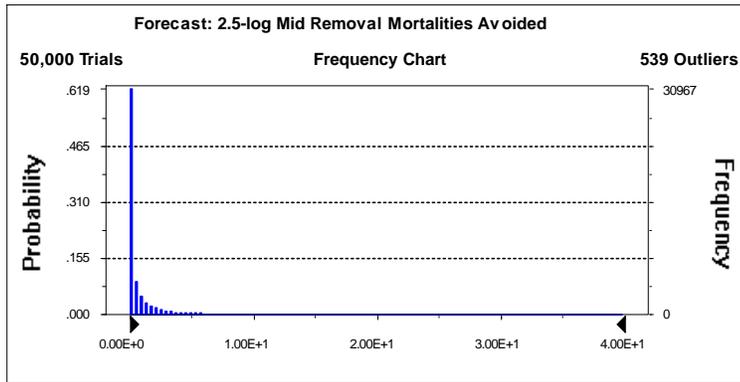
Forecast: 2.5-log Mid Removal Mortalities Avoided

Summary:

Display Range is from 0.00E+0 to 4.00E+1
 Entire Range is from 0.00E+0 to 4.73E+2
 After 50,000 Trials, the Std. Error of the Mean is 5.63E-2

Statistics:

	<u>Value</u>
Trials	50000
Mean	2.63E+00
Median	1.47E-01
Mode	0.00E+00
Standard Deviation	1.26E+01
Variance	1.58E+02
Skewness	15.06
Kurtosis	335.90
Coeff. of Variability	4.79
Range Minimum	0.00E+00
Range Maximum	4.73E+02
Range Width	4.73E+02
Mean Std. Error	5.63E-02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	3.36E-02
50%	1.47E-01
60%	3.44E-01
70%	7.37E-01
80%	1.65E+00
90%	4.79E+00
100%	4.73E+02

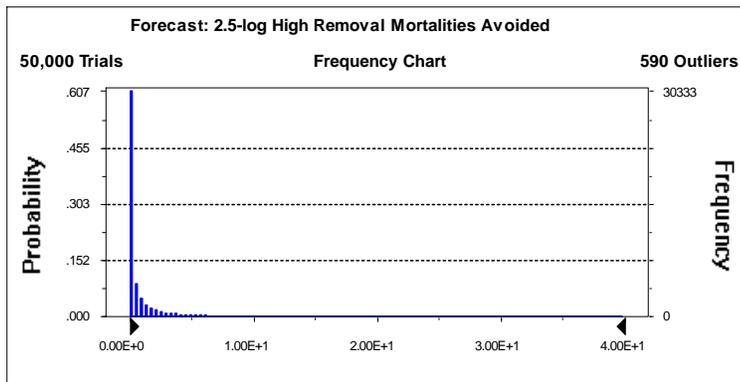
Forecast: 2.5-log High Removal Mortalities Avoided

Summary:

Display Range is from 0.00E+0 to 4.00E+1
 Entire Range is from 0.00E+0 to 5.70E+2
 After 50,000 Trials, the Std. Error of the Mean is 6.11E-2

Statistics:

	<u>Value</u>
Trials	50000
Mean	2.82E+00
Median	1.63E-01
Mode	0.00E+00
Standard Deviation	1.37E+01
Variance	1.87E+02
Skewness	15.70
Kurtosis	370.00
Coeff. of Variability	4.85
Range Minimum	0.00E+00
Range Maximum	5.70E+02
Range Width	5.70E+02
Mean Std. Error	6.11E-02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	3.76E-02
50%	1.63E-01
60%	3.80E-01
70%	8.05E-01
80%	1.79E+00
90%	5.13E+00
100%	5.70E+02

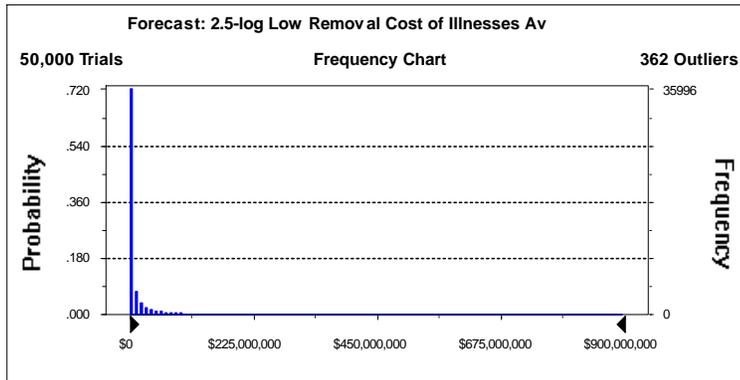
Forecast: 2.5-log Low Removal Cost of Illnesses Avoided

Summary:

Display Range is from \$0 to \$900,000,000
 Entire Range is from \$0 to \$31,020,851,896
 After 50,000 Trials, the Std. Error of the Mean is \$1,368,539

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$40,246,272
Median	\$1,315,074
Mode	\$0
Standard Deviation	\$306,014,617
Variance	9E+16
Skewness	42.47
Kurtosis	3,010.86
Coeff. of Variability	7.60
Range Minimum	\$0
Range Maximum	\$31,020,851,896
Range Width	\$31,020,851,896
Mean Std. Error	\$1,368,538.97



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$280,213
50%	\$1,315,074
60%	\$3,323,205
70%	\$7,735,387
80%	\$18,595,741
90%	\$59,242,195
100%	\$31,020,851,896

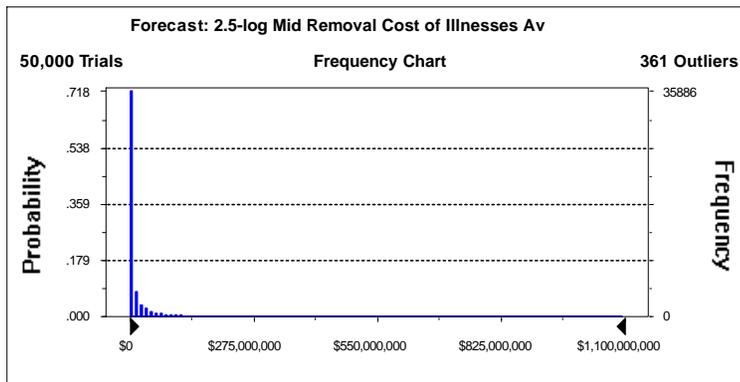
Forecast: 2.5-log Mid Removal Cost of Illnesses Avoided

Summary:

Display Range is from \$0 to \$1,100,000,000
 Entire Range is from \$0 to \$38,356,626,391
 After 50,000 Trials, the Std. Error of the Mean is \$1,687,958

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$49,184,456
Median	\$1,742,132
Mode	\$0
Standard Deviation	\$377,438,891
Variance	1E+17
Skewness	42.67
Kurtosis	3,034.27
Coeff. of Variability	7.67
Range Minimum	\$0
Range Maximum	\$38,356,626,391
Range Width	\$38,356,626,391
Mean Std. Error	\$1,687,958.03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$379,898
50%	\$1,742,132
60%	\$4,298,821
70%	\$9,627,873
80%	\$22,821,566
90%	\$72,144,445
100%	\$38,356,626,391

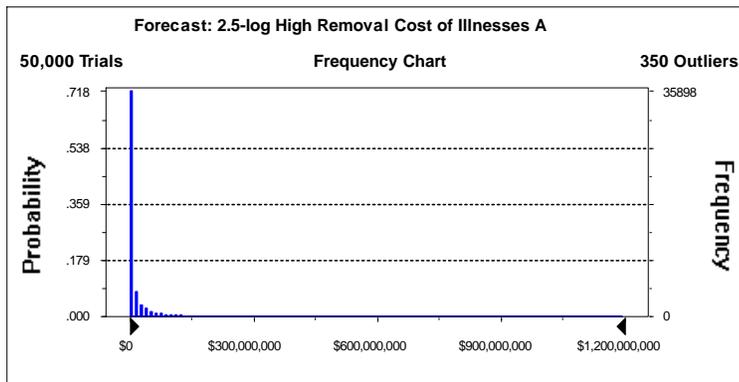
Forecast: 2.5-log High Removal Cost of Illnesses Avoided

Summary:

Display Range is from \$0 to \$1,200,000,000
 Entire Range is from \$0 to \$41,211,942,525
 After 50,000 Trials, the Std. Error of the Mean is \$1,814,091

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$52,741,676
Median	\$1,928,440
Mode	\$0
Standard Deviation	\$405,643,023
Variance	2E+17
Skewness	42.66
Kurtosis	3,031.07
Coeff. of Variability	7.69
Range Minimum	\$0
Range Maximum	\$41,211,942,525
Range Width	\$41,211,942,525
Mean Std. Error	\$1,814,090.75



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$423,412
50%	\$1,928,440
60%	\$4,736,538
70%	\$10,506,544
80%	\$24,626,970
90%	\$77,438,618
100%	\$41,211,942,525

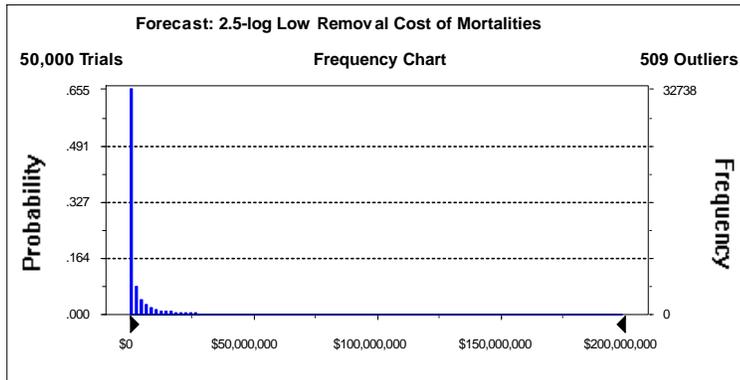
Forecast: 2.5-log Low Removal Cost of Mortalities Avoided

Summary:

Display Range is from \$0 to \$200,000,000
 Entire Range is from \$0 to \$2,871,673,609
 After 50,000 Trials, the Std. Error of the Mean is \$288,903

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$12,181,075
Median	\$492,990
Mode	\$0
Standard Deviation	\$64,600,708
Variance	4E+15
Skewness	17.20
Kurtosis	443.40
Coeff. of Variability	5.30
Range Minimum	\$0
Range Maximum	\$2,871,673,609
Range Width	\$2,871,673,609
Mean Std. Error	\$288,903.15



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$100,861
50%	\$492,990
60%	\$1,284,706
70%	\$2,911,405
80%	\$6,840,193
90%	\$20,957,079
100%	\$2,871,673,609

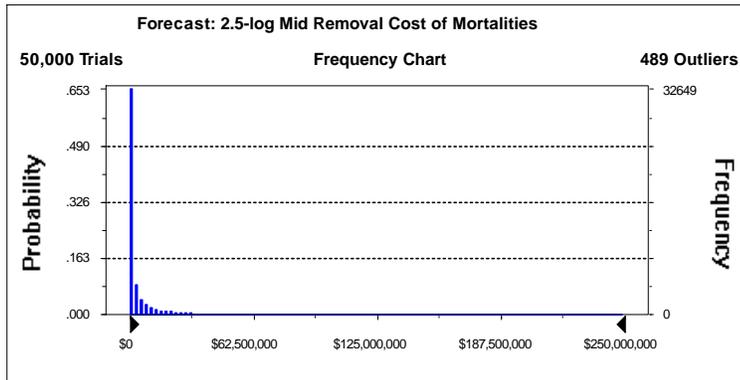
Forecast: 2.5-log Mid Removal Cost of Mortalities Avoided

Summary:

Display Range is from \$0 to \$250,000,000
 Entire Range is from \$0 to \$3,813,800,878
 After 50,000 Trials, the Std. Error of the Mean is \$362,754

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$14,918,309
Median	\$656,195
Mode	\$0
Standard Deviation	\$81,114,223
Variance	7E+15
Skewness	18.05
Kurtosis	488.47
Coeff. of Variability	5.44
Range Minimum	\$0
Range Maximum	\$3,813,800,878
Range Width	\$3,813,800,878
Mean Std. Error	\$362,753.83



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$139,094
50%	\$656,195
60%	\$1,652,180
70%	\$3,636,209
80%	\$8,378,293
90%	\$25,345,837
100%	\$3,813,800,878

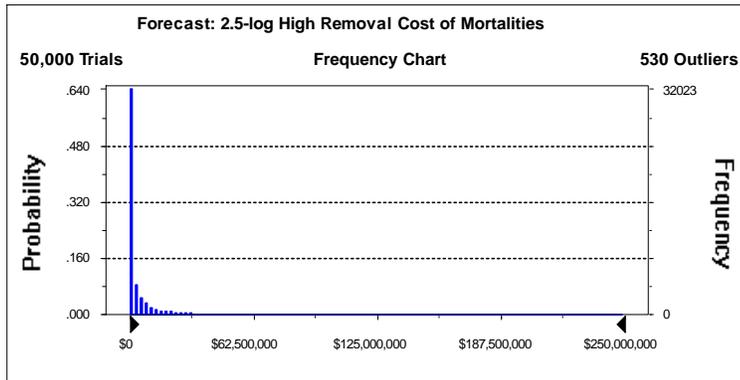
Forecast: 2.5-log High Removal Cost of Mortalities Avoided

Summary:

Display Range is from \$0 to \$250,000,000
 Entire Range is from \$0 to \$4,211,423,924
 After 50,000 Trials, the Std. Error of the Mean is \$393,921

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$16,013,901
Median	\$731,097
Mode	\$0
Standard Deviation	\$88,083,317
Variance	8E+15
Skewness	18.51
Kurtosis	510.95
Coeff. of Variability	5.50
Range Minimum	\$0
Range Maximum	\$4,211,423,924
Range Width	\$4,211,423,924
Mean Std. Error	\$393,920.57



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$155,144
50%	\$731,097
60%	\$1,818,894
70%	\$3,964,176
80%	\$9,083,101
90%	\$27,111,349
100%	\$4,211,423,924

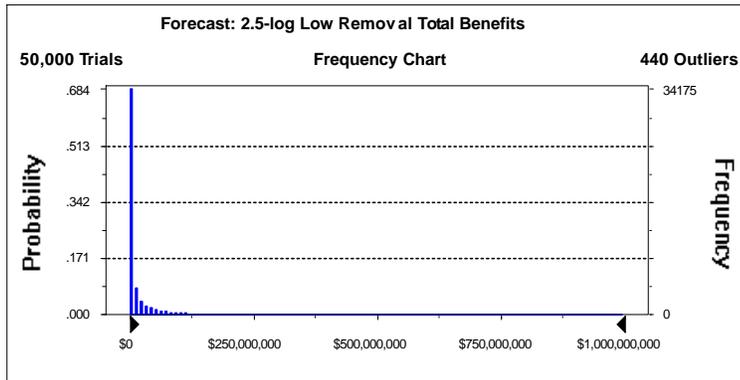
Forecast: 2.5-log Low Removal Total Benefits

Summary:

Display Range is from \$0 to \$1,000,000,000
 Entire Range is from \$0 to \$32,146,287,714
 After 50,000 Trials, the Std. Error of the Mean is \$1,529,667

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$52,427,347
Median	\$2,003,902
Mode	\$0
Standard Deviation	\$342,044,041
Variance	1E+17
Skewness	35.31
Kurtosis	2,241.84
Coeff. of Variability	6.52
Range Minimum	\$0
Range Maximum	\$32,146,287,714
Range Width	\$32,146,287,714
Mean Std. Error	\$1,529,667.45



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$429,659
50%	\$2,003,902
60%	\$4,978,620
70%	\$11,441,446
80%	\$27,269,011
90%	\$84,607,219
100%	\$32,146,287,714

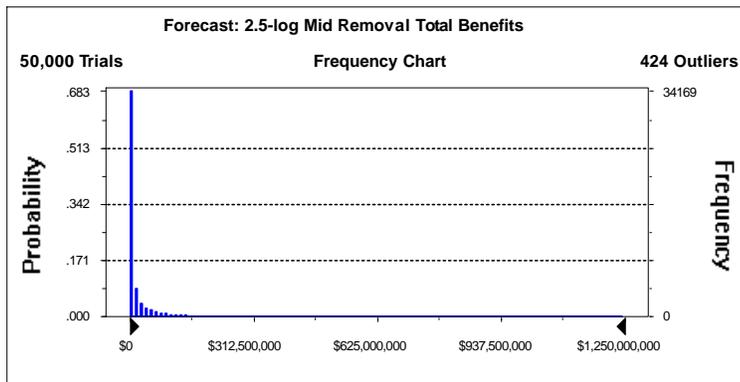
Forecast: 2.5-log Mid Removal Total Benefits

Summary:

Display Range is from \$0 to \$1,250,000,000
 Entire Range is from \$0 to \$39,748,203,945
 After 50,000 Trials, the Std. Error of the Mean is \$1,892,946

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$64,102,764
Median	\$2,682,943
Mode	\$0
Standard Deviation	\$423,275,507
Variance	2E+17
Skewness	35.38
Kurtosis	2,239.02
Coeff. of Variability	6.60
Range Minimum	\$0
Range Maximum	\$39,748,203,945
Range Width	\$39,748,203,945
Mean Std. Error	\$1,892,945.62



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$587,090
50%	\$2,682,943
60%	\$6,414,336
70%	\$14,259,365
80%	\$33,425,224
90%	\$102,407,303
100%	\$39,748,203,945

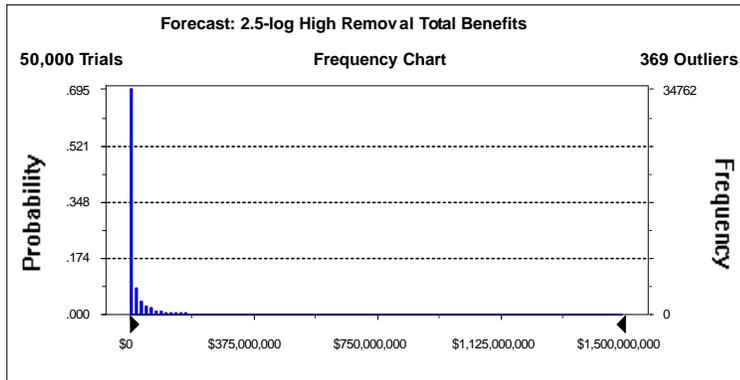
Forecast: 2.5-log High Removal Total Benefits

Summary:

Display Range is from \$0 to \$1,500,000,000
 Entire Range is from \$0 to \$42,707,110,885
 After 50,000 Trials, the Std. Error of the Mean is \$2,038,307

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$68,755,577
Median	\$2,974,644
Mode	\$0
Standard Deviation	\$455,779,250
Variance	2E+17
Skewness	35.32
Kurtosis	2,224.97
Coeff. of Variability	6.63
Range Minimum	\$0
Range Maximum	\$42,707,110,885
Range Width	\$42,707,110,885
Mean Std. Error	\$2,038,306.77



Percentiles:

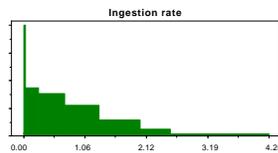
<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$653,918
50%	\$2,974,644
60%	\$7,071,493
70%	\$15,524,015
80%	\$36,095,164
90%	\$109,420,656
100%	\$42,707,110,885

Assumptions

Assumption: Daily Water Consumption

Custom distribution with parameters:				<u>Relative Prob.</u>
Single point	0.00			0.050000
Continuous range	0.00	to	0.03	0.050000
Continuous range	0.03	to	0.27	0.150000
Continuous range	0.27	to	0.71	0.250000
Continuous range	0.71	to	1.31	0.250000
Continuous range	1.31	to	2.02	0.150000
Continuous range	2.02	to	2.55	0.050000
Continuous range	2.55	to	4.25	0.050000
Total Relative Probability				1.000000

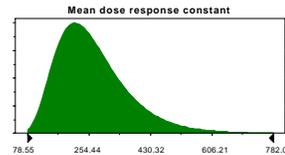
Mean value in simulation was 0.93



Assumption: Mean dose response constant

Lognormal distribution with parameters:	
5% - tile	132.00
95% - tile	465.40

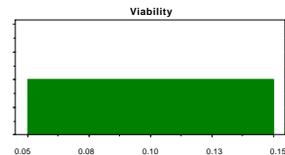
Selected range is from 0.00 to +Infinity
 Mean value in simulation was 266.72



Assumption: Viability

Uniform distribution with parameters:	
Minimum	0.05
Maximum	0.15

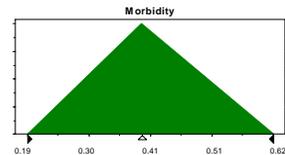
Mean value in simulation was 0.10



Assumption: Morbidity

Triangular distribution with parameters:	
Minimum	0.19
Likeliest	0.39
Maximum	0.62

Selected range is from 0.19 to 0.62
 Mean value in simulation was 0.40

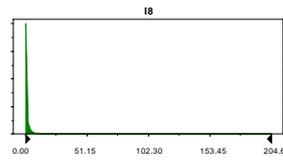


Assumption: Mean Daily Cyst Concentration in Distributed Water

Lognormal distribution with parameters:

Mean 4.26
Standard Dev. 24.53

Selected range is from 0.00 to +Infinity
Mean value in simulation was 4.33

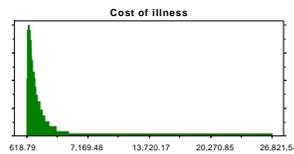


Assumption: Cost of Illness

Custom distribution with parameters:

			<u>Relative Prob.</u>
Continuous range	618.79	to	736.35 0.050000
Continuous range	736.35	to	799.67 0.050000
Continuous range	799.67	to	860.41 0.050000
Continuous range	860.41	to	921.94 0.050000
Continuous range	921.94	to	985.38 0.050000
Continuous range	985.38	to	1,055.42 0.050000
Continuous range	1,055.42	to	1,132.61 0.050000
Continuous range	1,132.61	to	1,217.08 0.050000
Continuous range	1,217.08	to	1,306.32 0.050000
Continuous range	1,306.32	to	1,410.82 0.050000
Continuous range	1,410.82	to	1,526.87 0.050000
Continuous range	1,526.87	to	1,663.45 0.050000
Continuous range	1,663.45	to	1,828.49 0.050000
Continuous range	1,828.49	to	2,024.49 0.050000
Continuous range	2,024.49	to	2,279.26 0.050000
Continuous range	2,279.26	to	2,609.62 0.050000
Continuous range	2,609.62	to	3,062.70 0.050000
Continuous range	3,062.70	to	3,777.19 0.050000
Continuous range	3,777.19	to	5,148.57 0.050000
Continuous range	5,148.57	to	26,821.54 0.050000
Total Relative Probability			1.000000

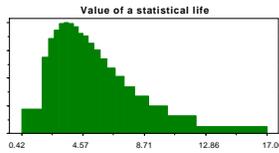
Mean value in simulation was 2,403.24



Assumption: Value of a Statistical Life

Custom distribution with parameters:			<u>Relative Prob.</u>	
Continuous range	0.42	to	1.84	0.050000
Continuous range	1.84	to	2.30	0.050000
Continuous range	2.30	to	2.66	0.050000
Continuous range	2.66	to	2.99	0.050000
Continuous range	2.99	to	3.31	0.050000
Continuous range	3.31	to	3.62	0.050000
Continuous range	3.62	to	3.93	0.050000
Continuous range	3.93	to	4.25	0.050000
Continuous range	4.25	to	4.60	0.050000
Continuous range	4.60	to	4.95	0.050000
Continuous range	4.95	to	5.33	0.050000
Continuous range	5.33	to	5.75	0.050000
Continuous range	5.75	to	6.21	0.050000
Continuous range	6.21	to	6.73	0.050000
Continuous range	6.73	to	7.34	0.050000
Continuous range	7.34	to	8.07	0.050000
Continuous range	8.07	to	9.00	0.050000
Continuous range	9.00	to	10.26	0.050000
Continuous range	10.26	to	12.25	0.050000
Continuous range	12.25	to	17.00	0.050000
Total Relative Probability				1.000000

Mean value in simulation was 5.70



Appendix B-3
Benefits Analysis Assuming
2.5 Baseline Log Removal
Daily Drinking Water Rate: 1.9 Liters

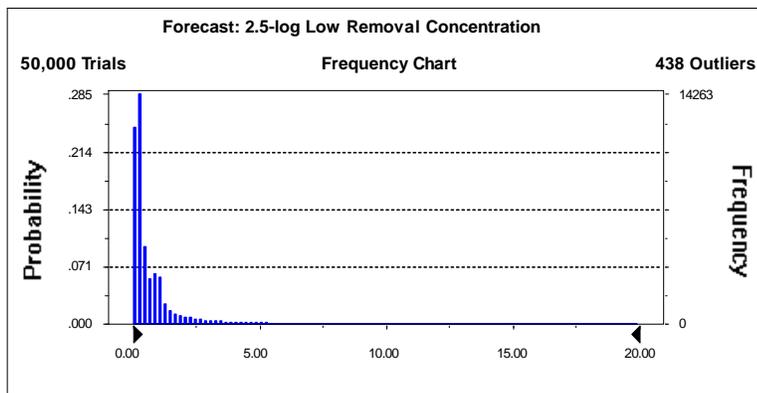
Benefits Analysis Assuming 2.5 Baseline Log Removal at 1.9 Liters Per Day Ingestion Rate

Forecast: 2.5-log Low Removal Concentration

Summary:

Display Range is from 0.00 to 20.00
 Entire Range is from 0.00 to 666.55
 After 50,000 Trials, the Std. Error of the Mean is 0.03

Statistics:	<u>Value</u>
Trials	50000
Mean	1.44
Median	0.37
Mode	---
Standard Deviation	6.68
Variance	44.68
Skewness	39.20
Kurtosis	2,861.26
Coeff. of Variability	4.64
Range Minimum	0.00
Range Maximum	666.55
Range Width	666.55
Mean Std. Error	0.03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00
10%	0.07
20%	0.15
30%	0.24
40%	0.29
50%	0.37
60%	0.52
70%	0.87
80%	1.18
90%	2.56
100%	666.55

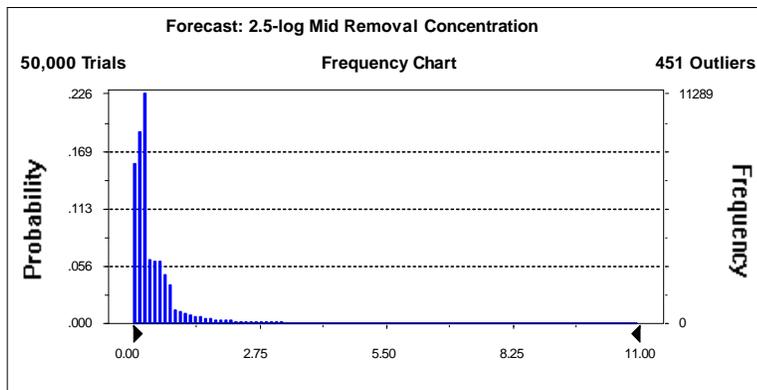
Forecast: 2.5-log Mid Removal Concentration

Summary:

Display Range is from 0.00 to 11.00
 Entire Range is from 0.00 to 374.83
 After 50,000 Trials, the Std. Error of the Mean is 0.02

Statistics:

	<u>Value</u>
Trials	50000
Mean	0.87
Median	0.29
Mode	---
Standard Deviation	3.75
Variance	14.07
Skewness	39.40
Kurtosis	2,882.18
Coeff. of Variability	4.34
Range Minimum	0.00
Range Maximum	374.83
Range Width	374.83
Mean Std. Error	0.02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00
10%	0.07
20%	0.15
30%	0.20
40%	0.24
50%	0.29
60%	0.37
70%	0.56
80%	0.75
90%	1.44
100%	374.83

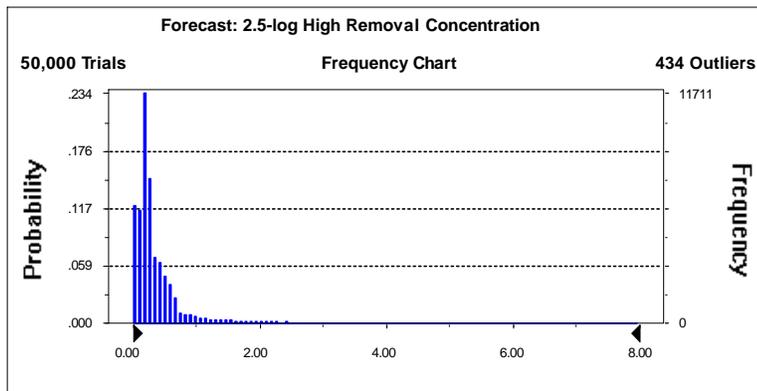
Forecast: 2.5-log High Removal Concentration

Summary:

Display Range is from 0.00 to 8.00
 Entire Range is from 0.00 to 265.36
 After 50,000 Trials, the Std. Error of the Mean is 0.01

Statistics:

	<u>Value</u>
Trials	50000
Mean	0.64
Median	0.25
Mode	---
Standard Deviation	2.65
Variance	7.03
Skewness	39.55
Kurtosis	2,898.30
Coeff. of Variability	4.13
Range Minimum	0.00
Range Maximum	265.36
Range Width	265.36
Mean Std. Error	0.01



Percentiles:

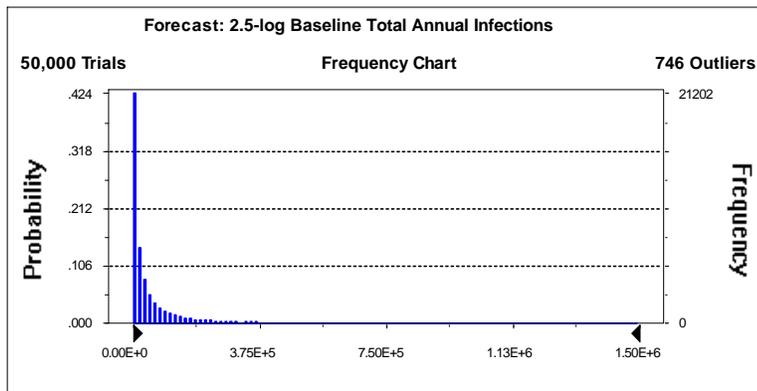
<u>Percentile</u>	<u>Value</u>
0%	0.00
10%	0.07
20%	0.15
30%	0.18
40%	0.21
50%	0.25
60%	0.30
70%	0.42
80%	0.57
90%	1.02
100%	265.36

Forecast: 2.5-log Baseline Total Annual Infections

Summary:

Display Range is from 0.00E+0 to 1.50E+6
 Entire Range is from 4.84E+0 to 1.26E+7
 After 50,000 Trials, the Std. Error of the Mean is 2.05E+3

Statistics:	<u>Value</u>
Trials	50000
Mean	1.31E+05
Median	2.18E+04
Mode	---
Standard Deviation	4.59E+05
Variance	2.10E+11
Skewness	10.51
Kurtosis	165.06
Coeff. of Variability	3.50
Range Minimum	4.84E+00
Range Maximum	1.26E+07
Range Width	1.26E+07
Mean Std. Error	2.05E+03



Percentiles:

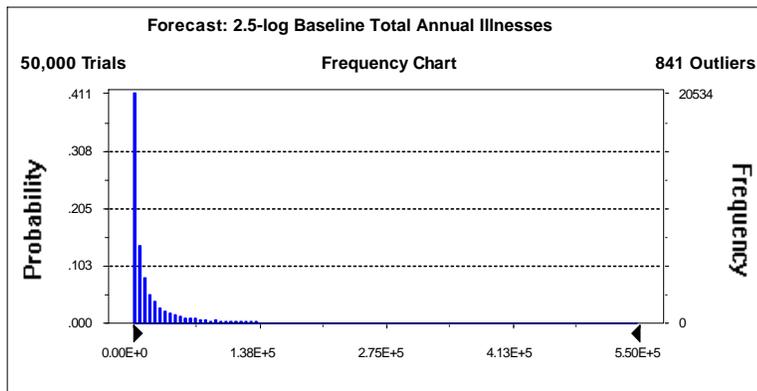
<u>Percentile</u>	<u>Value</u>
0%	4.84E+00
10%	1.78E+03
20%	4.18E+03
30%	7.80E+03
40%	1.33E+04
50%	2.18E+04
60%	3.60E+04
70%	6.02E+04
80%	1.11E+05
90%	2.65E+05
100%	1.26E+07

Forecast: 2.5-log Baseline Total Annual Illnesses

Summary:

Display Range is from 0.00E+0 to 5.50E+5
 Entire Range is from 2.04E+0 to 5.72E+6
 After 50,000 Trials, the Std. Error of the Mean is 8.17E+2

Statistics:	<u>Value</u>
Trials	50000
Mean	5.21E+04
Median	8.54E+03
Mode	---
Standard Deviation	1.83E+05
Variance	3.33E+10
Skewness	10.35
Kurtosis	160.65
Coeff. of Variability	3.50
Range Minimum	2.04E+00
Range Maximum	5.72E+06
Range Width	5.72E+06
Mean Std. Error	8.17E+02



Percentiles:

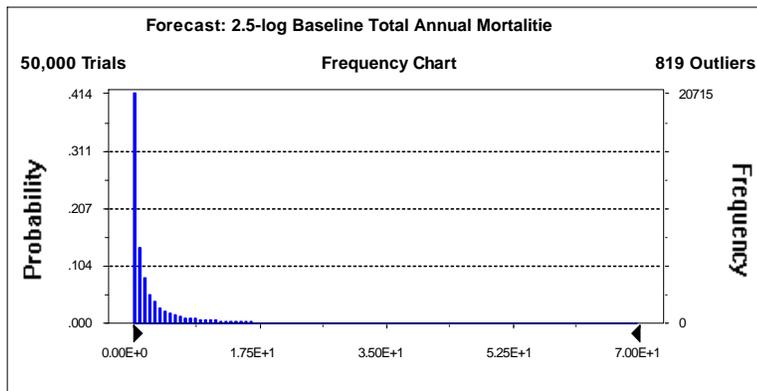
<u>Percentile</u>	<u>Value</u>
0%	2.04E+00
10%	6.75E+02
20%	1.62E+03
30%	3.02E+03
40%	5.18E+03
50%	8.54E+03
60%	1.41E+04
70%	2.38E+04
80%	4.40E+04
90%	1.05E+05
100%	5.72E+06

Forecast: 2.5-log Baseline Total Annual Mortalitie

Summary:

Display Range is from 0.00E+0 to 7.00E+1
 Entire Range is from 2.55E-4 to 7.15E+2
 After 50,000 Trials, the Std. Error of the Mean is 1.02E-1

Statistics:	<u>Value</u>
Trials	50000
Mean	6.52E+00
Median	1.07E+00
Mode	---
Standard Deviation	2.28E+01
Variance	5.21E+02
Skewness	10.35
Kurtosis	160.65
Coeff. of Variability	3.50
Range Minimum	2.55E-04
Range Maximum	7.15E+02
Range Width	7.15E+02
Mean Std. Error	1.02E-01



Percentiles:

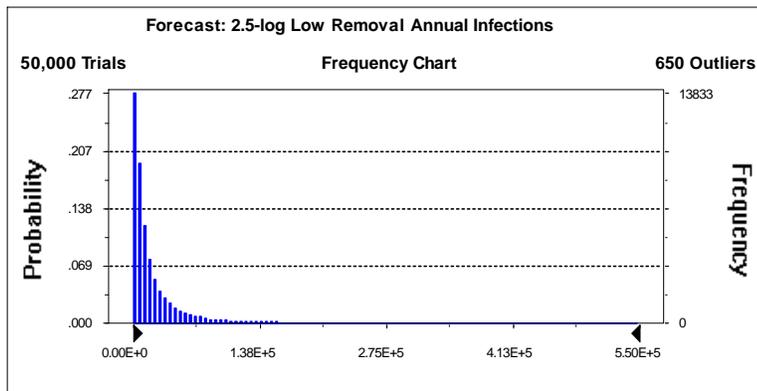
<u>Percentile</u>	<u>Value</u>
0%	2.55E-04
10%	8.44E-02
20%	2.02E-01
30%	3.78E-01
40%	6.47E-01
50%	1.07E+00
60%	1.76E+00
70%	2.97E+00
80%	5.50E+00
90%	1.31E+01
100%	7.15E+02

Forecast: 2.5-log Low Removal Annual Infections

Summary:

Display Range is from 0.00E+0 to 5.50E+5
 Entire Range is from 4.84E+0 to 9.78E+6
 After 50,000 Trials, the Std. Error of the Mean is 8.32E+2

Statistics:	<u>Value</u>
Trials	50000
Mean	4.79E+04
Median	1.22E+04
Mode	---
Standard Deviation	1.86E+05
Variance	3.46E+10
Skewness	18.07
Kurtosis	564.59
Coeff. of Variability	3.88
Range Minimum	4.84E+00
Range Maximum	9.78E+06
Range Width	9.78E+06
Mean Std. Error	8.32E+02



Percentiles:

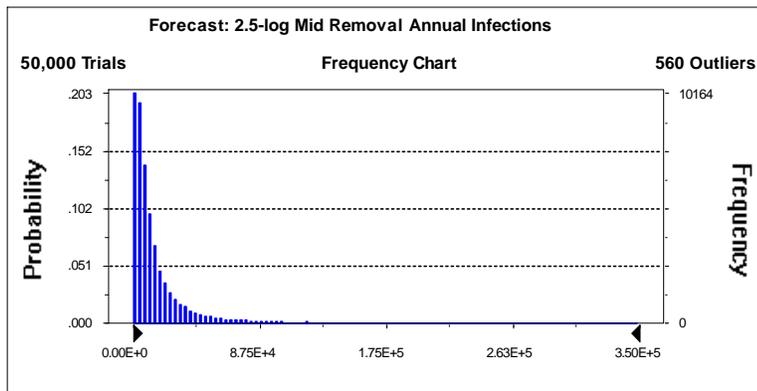
<u>Percentile</u>	<u>Value</u>
0%	4.84E+00
10%	1.76E+03
20%	3.82E+03
30%	6.05E+03
40%	8.71E+03
50%	1.22E+04
60%	1.72E+04
70%	2.54E+04
80%	4.09E+04
90%	8.63E+04
100%	9.78E+06

Forecast: 2.5-log Mid Removal Annual Infections

Summary:

Display Range is from 0.00E+0 to 3.50E+5
 Entire Range is from 4.84E+0 to 7.16E+6
 After 50,000 Trials, the Std. Error of the Mean is 5.07E+2

Statistics:	<u>Value</u>
Trials	50000
Mean	2.93E+04
Median	9.38E+03
Mode	---
Standard Deviation	1.13E+05
Variance	1.28E+10
Skewness	22.14
Kurtosis	868.26
Coeff. of Variability	3.87
Range Minimum	4.84E+00
Range Maximum	7.16E+06
Range Width	7.16E+06
Mean Std. Error	5.07E+02



Percentiles:

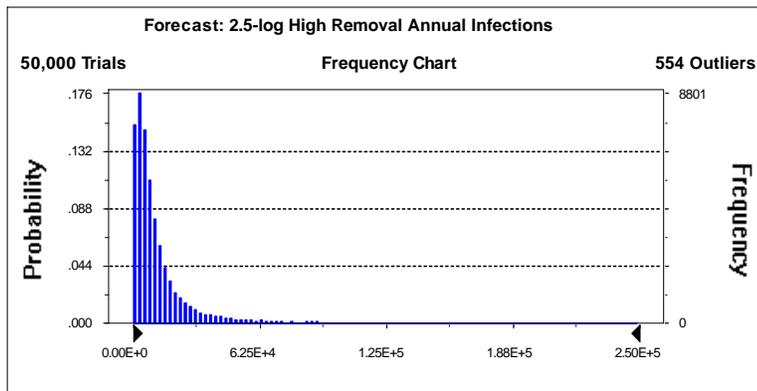
<u>Percentile</u>	<u>Value</u>
0%	4.84E+00
10%	1.73E+03
20%	3.45E+03
30%	5.14E+03
40%	7.02E+03
50%	9.38E+03
60%	1.25E+04
70%	1.73E+04
80%	2.59E+04
90%	5.07E+04
100%	7.16E+06

Forecast: 2.5-log High Removal Annual Infections

Summary:

Display Range is from 0.00E+0 to 2.50E+5
 Entire Range is from 4.84E+0 to 5.64E+6
 After 50,000 Trials, the Std. Error of the Mean is 3.71E+2

Statistics:	Value
Trials	50000
Mean	2.19E+04
Median	7.96E+03
Mode	---
Standard Deviation	8.30E+04
Variance	6.89E+09
Skewness	24.22
Kurtosis	1,042.58
Coeff. of Variability	3.79
Range Minimum	4.84E+00
Range Maximum	5.64E+06
Range Width	5.64E+06
Mean Std. Error	3.71E+02



Percentiles:

Percentile	Value
0%	4.84E+00
10%	1.70E+03
20%	3.20E+03
30%	4.59E+03
40%	6.13E+03
50%	7.96E+03
60%	1.04E+04
70%	1.38E+04
80%	1.99E+04
90%	3.69E+04
100%	5.64E+06

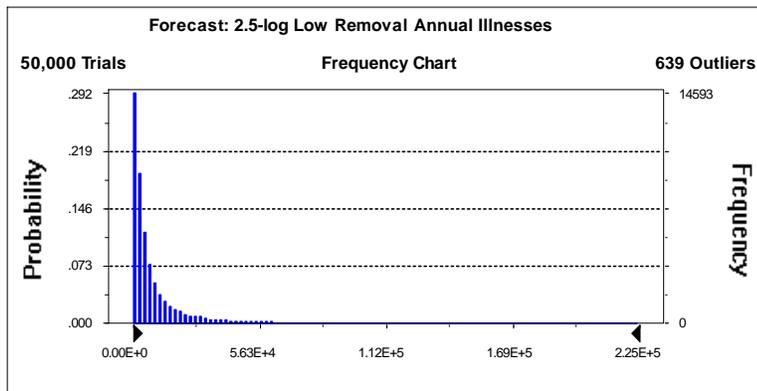
Forecast: 2.5-log Low Removal Annual Illnesses

Summary:

Display Range is from 0.00E+0 to 2.25E+5
 Entire Range is from 2.04E+0 to 3.12E+6
 After 50,000 Trials, the Std. Error of the Mean is 3.22E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.90E+04
Median	4.79E+03
Mode	---
Standard Deviation	7.20E+04
Variance	5.18E+09
Skewness	15.82
Kurtosis	414.62
Coeff. of Variability	3.78
Range Minimum	2.04E+00
Range Maximum	3.12E+06
Range Width	3.12E+06
Mean Std. Error	3.22E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	2.04E+00
10%	6.69E+02
20%	1.45E+03
30%	2.32E+03
40%	3.38E+03
50%	4.79E+03
60%	6.78E+03
70%	1.00E+04
80%	1.63E+04
90%	3.44E+04
100%	3.12E+06

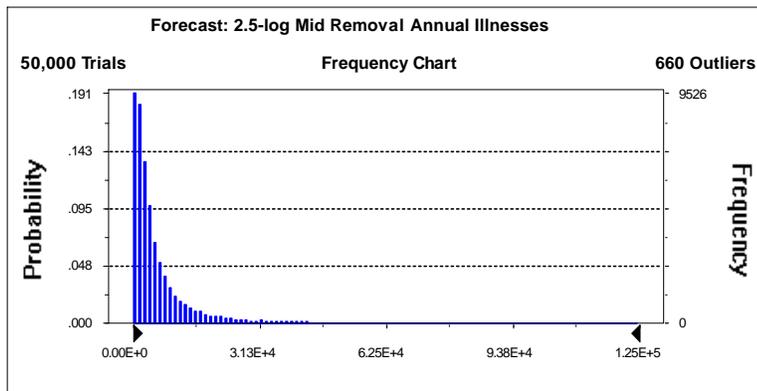
Forecast: 2.5-log Mid Removal Annual Illnesses

Summary:

Display Range is from 0.00E+0 to 1.25E+5
 Entire Range is from 2.04E+0 to 2.16E+6
 After 50,000 Trials, the Std. Error of the Mean is 1.93E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.16E+04
Median	3.68E+03
Mode	---
Standard Deviation	4.33E+04
Variance	1.87E+09
Skewness	18.58
Kurtosis	587.44
Coeff. of Variability	3.72
Range Minimum	2.04E+00
Range Maximum	2.16E+06
Range Width	2.16E+06
Mean Std. Error	1.93E+02



Percentiles:

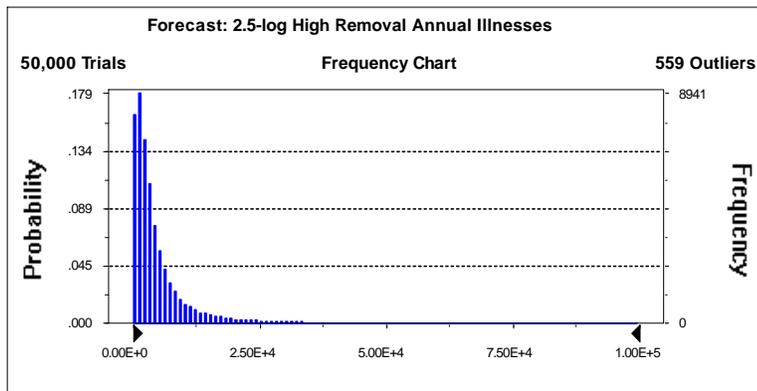
<u>Percentile</u>	<u>Value</u>
0%	2.04E+00
10%	6.55E+02
20%	1.31E+03
30%	1.96E+03
40%	2.72E+03
50%	3.68E+03
60%	4.93E+03
70%	6.88E+03
80%	1.04E+04
90%	2.02E+04
100%	2.16E+06

Forecast: 2.5-log High Removal Annual Illnesses

Summary:

Display Range is from 0.00E+0 to 1.00E+5
 Entire Range is from 2.04E+0 to 1.70E+6
 After 50,000 Trials, the Std. Error of the Mean is 1.41E+2

Statistics:	<u>Value</u>
Trials	50000
Mean	8.68E+03
Median	3.13E+03
Mode	---
Standard Deviation	3.15E+04
Variance	9.93E+08
Skewness	19.99
Kurtosis	685.41
Coeff. of Variability	3.63
Range Minimum	2.04E+00
Range Maximum	1.70E+06
Range Width	1.70E+06
Mean Std. Error	1.41E+02



Percentiles:

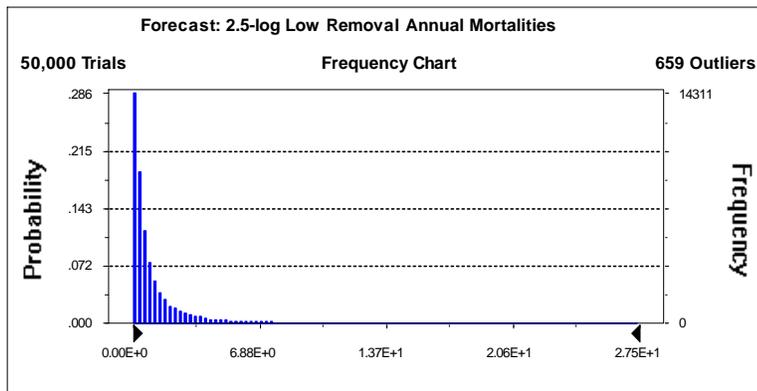
<u>Percentile</u>	<u>Value</u>
0%	2.04E+00
10%	6.37E+02
20%	1.21E+03
30%	1.75E+03
40%	2.37E+03
50%	3.13E+03
60%	4.07E+03
70%	5.50E+03
80%	7.97E+03
90%	1.48E+04
100%	1.70E+06

Forecast: 2.5-log Low Removal Annual Mortalities

Summary:

Display Range is from 0.00E+0 to 2.75E+1
 Entire Range is from 2.55E-4 to 3.90E+2
 After 50,000 Trials, the Std. Error of the Mean is 4.02E-2

Statistics:	<u>Value</u>
Trials	50000
Mean	2.38E+00
Median	5.98E-01
Mode	---
Standard Deviation	8.99E+00
Variance	8.09E+01
Skewness	15.82
Kurtosis	414.62
Coeff. of Variability	3.78
Range Minimum	2.55E-04
Range Maximum	3.90E+02
Range Width	3.90E+02
Mean Std. Error	4.02E-02



Percentiles:

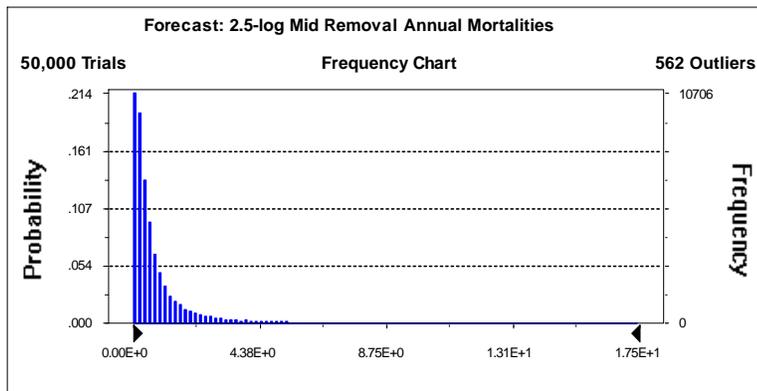
<u>Percentile</u>	<u>Value</u>
0%	2.55E-04
10%	8.36E-02
20%	1.82E-01
30%	2.91E-01
40%	4.22E-01
50%	5.98E-01
60%	8.48E-01
70%	1.25E+00
80%	2.04E+00
90%	4.30E+00
100%	3.90E+02

Forecast: 2.5-log Mid Removal Annual Mortalities

Summary:

Display Range is from 0.00E+0 to 1.75E+1
 Entire Range is from 2.55E-4 to 2.70E+2
 After 50,000 Trials, the Std. Error of the Mean is 2.42E-2

Statistics:	<u>Value</u>
Trials	50000
Mean	1.45E+00
Median	4.60E-01
Mode	---
Standard Deviation	5.41E+00
Variance	2.92E+01
Skewness	18.58
Kurtosis	587.44
Coeff. of Variability	3.72
Range Minimum	2.55E-04
Range Maximum	2.70E+02
Range Width	2.70E+02
Mean Std. Error	2.42E-02



Percentiles:

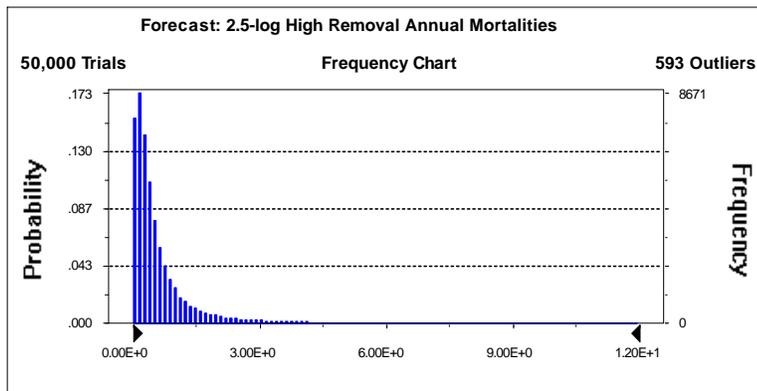
<u>Percentile</u>	<u>Value</u>
0%	2.55E-04
10%	8.19E-02
20%	1.63E-01
30%	2.46E-01
40%	3.39E-01
50%	4.60E-01
60%	6.17E-01
70%	8.60E-01
80%	1.30E+00
90%	2.53E+00
100%	2.70E+02

Forecast: 2.5-log High Removal Annual Mortalities

Summary:

Display Range is from 0.00E+0 to 1.20E+1
 Entire Range is from 2.55E-4 to 2.13E+2
 After 50,000 Trials, the Std. Error of the Mean is 1.76E-2

Statistics:	<u>Value</u>
Trials	50000
Mean	1.08E+00
Median	3.91E-01
Mode	---
Standard Deviation	3.94E+00
Variance	1.55E+01
Skewness	19.99
Kurtosis	685.41
Coeff. of Variability	3.63
Range Minimum	2.55E-04
Range Maximum	2.13E+02
Range Width	2.13E+02
Mean Std. Error	1.76E-02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	2.55E-04
10%	7.97E-02
20%	1.51E-01
30%	2.19E-01
40%	2.96E-01
50%	3.91E-01
60%	5.09E-01
70%	6.88E-01
80%	9.97E-01
90%	1.85E+00
100%	2.13E+02

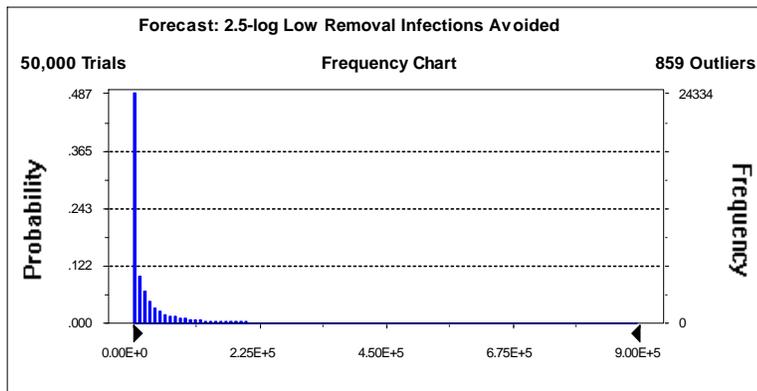
Forecast: 2.5-log Low Removal Infections Avoided

Summary:

Display Range is from 0.00E+0 to 9.00E+5
 Entire Range is from 0.00E+0 to 5.08E+6
 After 50,000 Trials, the Std. Error of the Mean is 1.26E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	8.31E+04
Median	9.98E+03
Mode	0.00E+00
Standard Deviation	2.81E+05
Variance	7.89E+10
Skewness	8.41
Kurtosis	97.71
Coeff. of Variability	3.38
Range Minimum	0.00E+00
Range Maximum	5.08E+06
Range Width	5.08E+06
Mean Std. Error	1.26E+03



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	4.12E+03
50%	9.98E+03
60%	1.94E+04
70%	3.47E+04
80%	7.09E+04
90%	1.80E+05
100%	5.08E+06

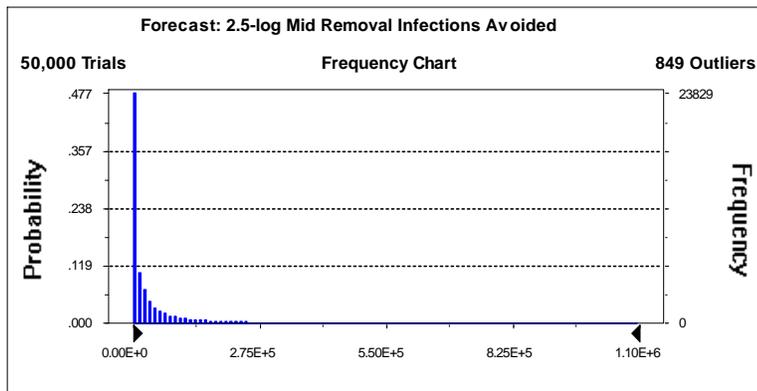
Forecast: 2.5-log Mid Removal Infections Avoided

Summary:

Display Range is from 0.00E+0 to 1.10E+6
 Entire Range is from 0.00E+0 to 7.16E+6
 After 50,000 Trials, the Std. Error of the Mean is 1.58E+3

Statistics:

	<u>Value</u>
Trials	50000
Mean	1.02E+05
Median	1.29E+04
Mode	0.00E+00
Standard Deviation	3.53E+05
Variance	1.24E+11
Skewness	9.03
Kurtosis	114.76
Coeff. of Variability	3.47
Range Minimum	0.00E+00
Range Maximum	7.16E+06
Range Width	7.16E+06
Mean Std. Error	1.58E+03



Percentiles:

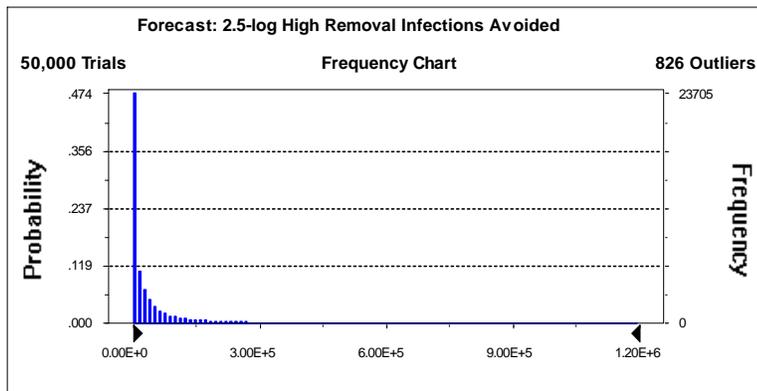
<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	5.99E+03
50%	1.29E+04
60%	2.40E+04
70%	4.27E+04
80%	8.60E+04
90%	2.17E+05
100%	7.16E+06

Forecast: 2.5-log High Removal Infections Avoided

Summary:

Display Range is from 0.00E+0 to 1.20E+6
 Entire Range is from 0.00E+0 to 8.13E+6
 After 50,000 Trials, the Std. Error of the Mean is 1.71E+3

Statistics:	<u>Value</u>
Trials	50000
Mean	1.09E+05
Median	1.43E+04
Mode	0.00E+00
Standard Deviation	3.82E+05
Variance	1.46E+11
Skewness	9.35
Kurtosis	124.32
Coeff. of Variability	3.50
Range Minimum	0.00E+00
Range Maximum	8.13E+06
Range Width	8.13E+06
Mean Std. Error	1.71E+03



Percentiles:

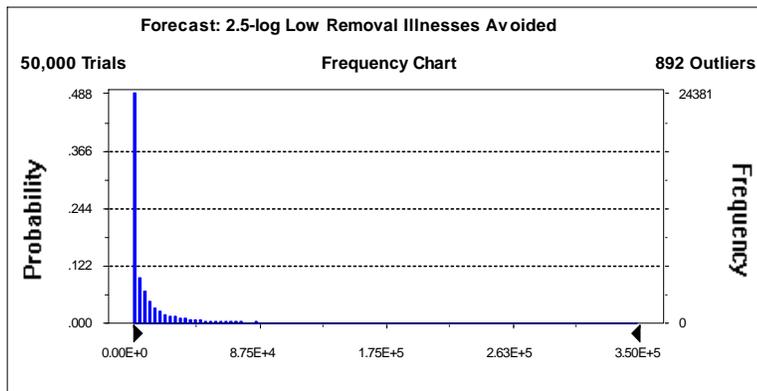
<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	6.75E+03
50%	1.43E+04
60%	2.63E+04
70%	4.65E+04
80%	9.23E+04
90%	2.31E+05
100%	8.13E+06

Forecast: 2.5-log Low Removal Illnesses Avoided

Summary:

Display Range is from 0.00E+0 to 3.50E+5
 Entire Range is from 0.00E+0 to 2.88E+6
 After 50,000 Trials, the Std. Error of the Mean is 5.06E+2

Statistics:	<u>Value</u>
Trials	50000
Mean	3.31E+04
Median	3.86E+03
Mode	0.00E+00
Standard Deviation	1.13E+05
Variance	1.28E+10
Skewness	8.71
Kurtosis	108.67
Coeff. of Variability	3.42
Range Minimum	0.00E+00
Range Maximum	2.88E+06
Range Width	2.88E+06
Mean Std. Error	5.06E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	1.61E+03
50%	3.86E+03
60%	7.58E+03
70%	1.37E+04
80%	2.79E+04
90%	7.08E+04
100%	2.88E+06

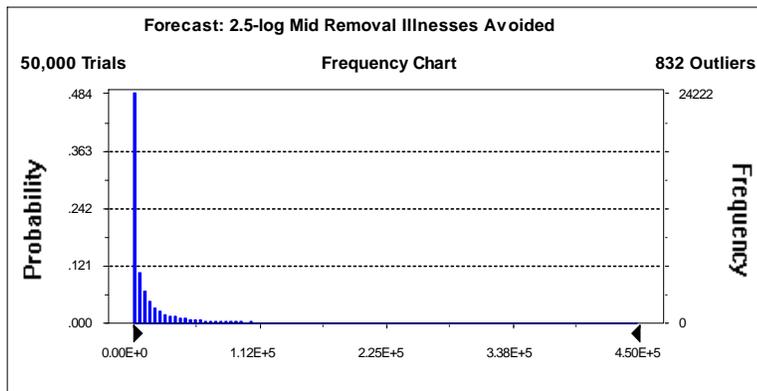
Forecast: 2.5-log Mid Removal Illnesses Avoided

Summary:

Display Range is from 0.00E+0 to 4.50E+5
 Entire Range is from 0.00E+0 to 3.95E+6
 After 50,000 Trials, the Std. Error of the Mean is 6.33E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	4.05E+04
Median	5.00E+03
Mode	0.00E+00
Standard Deviation	1.42E+05
Variance	2.00E+10
Skewness	9.24
Kurtosis	124.19
Coeff. of Variability	3.49
Range Minimum	0.00E+00
Range Maximum	3.95E+06
Range Width	3.95E+06
Mean Std. Error	6.33E+02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	2.31E+03
50%	5.00E+03
60%	9.39E+03
70%	1.68E+04
80%	3.38E+04
90%	8.54E+04
100%	3.95E+06

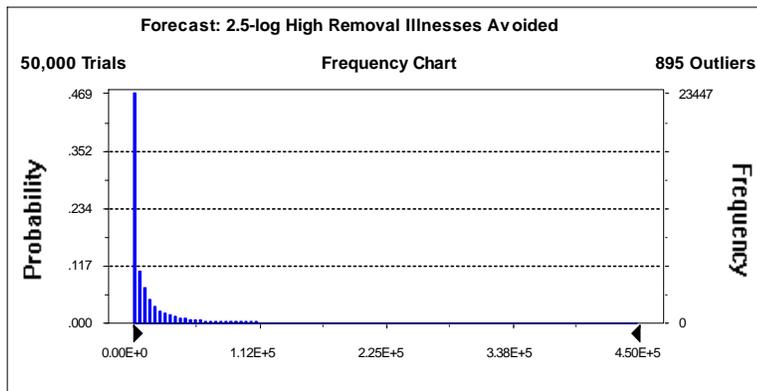
Forecast: 2.5-log High Removal Illnesses Avoided

Summary:

Display Range is from 0.00E+0 to 4.50E+5
 Entire Range is from 0.00E+0 to 4.42E+6
 After 50,000 Trials, the Std. Error of the Mean is 6.84E+2

Statistics:

	<u>Value</u>
Trials	50000
Mean	4.35E+04
Median	5.54E+03
Mode	0.00E+00
Standard Deviation	1.53E+05
Variance	2.34E+10
Skewness	9.50
Kurtosis	132.01
Coeff. of Variability	3.52
Range Minimum	0.00E+00
Range Maximum	4.42E+06
Range Width	4.42E+06
Mean Std. Error	6.84E+02



Percentiles:

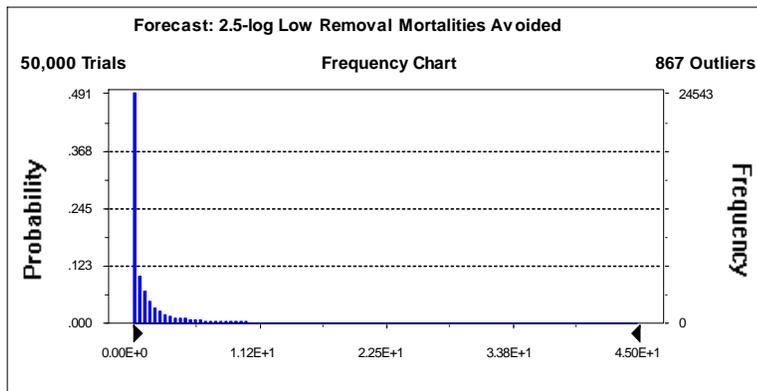
<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	2.60E+03
50%	5.54E+03
60%	1.03E+04
70%	1.84E+04
80%	3.63E+04
90%	9.10E+04
100%	4.42E+06

Forecast: 2.5-log Low Removal Mortalities Avoided

Summary:

Display Range is from 0.00E+0 to 4.50E+1
 Entire Range is from 0.00E+0 to 3.60E+2
 After 50,000 Trials, the Std. Error of the Mean is 6.33E-2

Statistics:	<u>Value</u>
Trials	50000
Mean	4.14E+00
Median	4.82E-01
Mode	0.00E+00
Standard Deviation	1.42E+01
Variance	2.00E+02
Skewness	8.71
Kurtosis	108.67
Coeff. of Variability	3.42
Range Minimum	0.00E+00
Range Maximum	3.60E+02
Range Width	3.60E+02
Mean Std. Error	6.33E-02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	2.01E-01
50%	4.82E-01
60%	9.47E-01
70%	1.71E+00
80%	3.48E+00
90%	8.86E+00
100%	3.60E+02

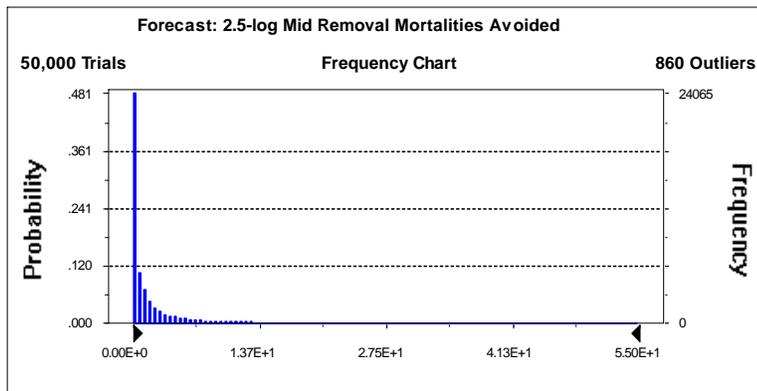
Forecast: 2.5-log Mid Removal Mortalities Avoided

Summary:

Display Range is from 0.00E+0 to 5.50E+1
 Entire Range is from 0.00E+0 to 4.94E+2
 After 50,000 Trials, the Std. Error of the Mean is 7.91E-2

Statistics:

	<u>Value</u>
Trials	50000
Mean	5.07E+00
Median	6.25E-01
Mode	0.00E+00
Standard Deviation	1.77E+01
Variance	3.13E+02
Skewness	9.24
Kurtosis	124.19
Coeff. of Variability	3.49
Range Minimum	0.00E+00
Range Maximum	4.94E+02
Range Width	4.94E+02
Mean Std. Error	7.91E-02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	2.89E-01
50%	6.25E-01
60%	1.17E+00
70%	2.10E+00
80%	4.23E+00
90%	1.07E+01
100%	4.94E+02

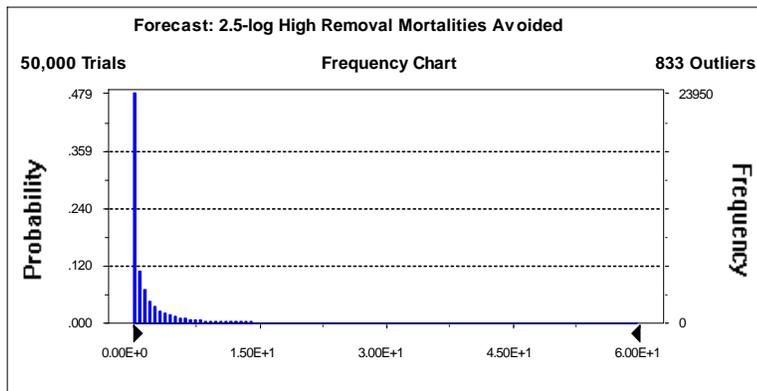
Forecast: 2.5-log High Removal Mortalities Avoided

Summary:

Display Range is from 0.00E+0 to 6.00E+1
 Entire Range is from 0.00E+0 to 5.52E+2
 After 50,000 Trials, the Std. Error of the Mean is 8.55E-2

Statistics:

	<u>Value</u>
Trials	50000
Mean	5.43E+00
Median	6.93E-01
Mode	0.00E+00
Standard Deviation	1.91E+01
Variance	3.66E+02
Skewness	9.50
Kurtosis	132.01
Coeff. of Variability	3.52
Range Minimum	0.00E+00
Range Maximum	5.52E+02
Range Width	5.52E+02
Mean Std. Error	8.55E-02



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	0.00E+00
10%	0.00E+00
20%	0.00E+00
30%	0.00E+00
40%	3.26E-01
50%	6.93E-01
60%	1.29E+00
70%	2.29E+00
80%	4.54E+00
90%	1.14E+01
100%	5.52E+02

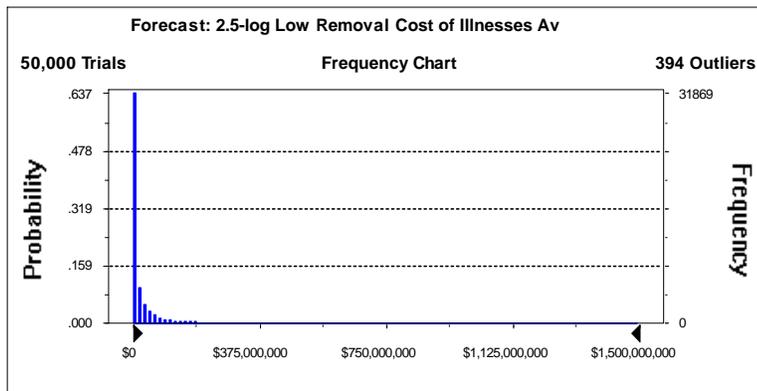
Forecast: 2.5-log Low Removal Cost of Illnesses Avoided

Summary:

Display Range is from \$0 to \$1,500,000,000
 Entire Range is from \$0 to \$38,705,369,360
 After 50,000 Trials, the Std. Error of the Mean is \$2,417,166

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$81,251,606
Median	\$5,773,987
Mode	\$0
Standard Deviation	\$540,494,748
Variance	3E+17
Skewness	32.50
Kurtosis	1,586.48
Coeff. of Variability	6.65
Range Minimum	\$0
Range Maximum	\$38,705,369,360
Range Width	\$38,705,369,360
Mean Std. Error	\$2,417,166.00



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$2,312,642
50%	\$5,773,987
60%	\$11,620,242
70%	\$23,070,737
80%	\$48,658,765
90%	\$134,090,528
100%	\$38,705,369,360

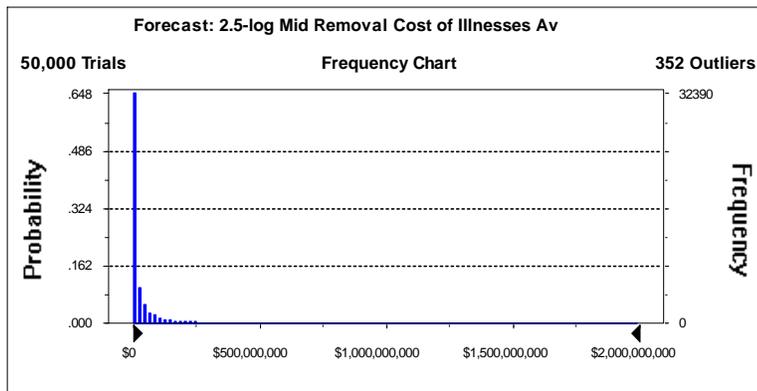
Forecast: 2.5-log Mid Removal Cost of Illnesses Avoided

Summary:

Display Range is from \$0 to \$2,000,000,000
 Entire Range is from \$0 to \$48,700,832,204
 After 50,000 Trials, the Std. Error of the Mean is \$3,022,058

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$99,511,710
Median	\$7,502,740
Mode	\$0
Standard Deviation	\$675,752,748
Variance	5E+17
Skewness	33.61
Kurtosis	1,677.47
Coeff. of Variability	6.79
Range Minimum	\$0
Range Maximum	\$48,700,832,204
Range Width	\$48,700,832,204
Mean Std. Error	\$3,022,058.16



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$3,252,992
50%	\$7,502,740
60%	\$14,659,066
70%	\$28,459,959
80%	\$59,437,375
90%	\$162,077,154
100%	\$48,700,832,204

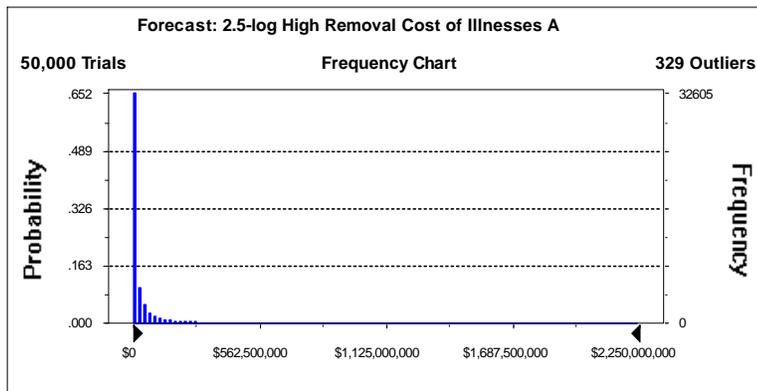
Forecast: 2.5-log High Removal Cost of Illnesses Avoided

Summary:

Display Range is from \$0 to \$2,250,000,000
 Entire Range is from \$0 to \$52,674,772,885
 After 50,000 Trials, the Std. Error of the Mean is \$3,263,554

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$106,754,170
Median	\$8,298,629
Mode	\$0
Standard Deviation	\$729,752,886
Variance	5E+17
Skewness	34.07
Kurtosis	1,716.21
Coeff. of Variability	6.84
Range Minimum	\$0
Range Maximum	\$52,674,772,885
Range Width	\$52,674,772,885
Mean Std. Error	\$3,263,554.12



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$3,665,289
50%	\$8,298,629
60%	\$16,056,614
70%	\$30,889,110
80%	\$64,079,324
90%	\$173,052,778
100%	\$52,674,772,885

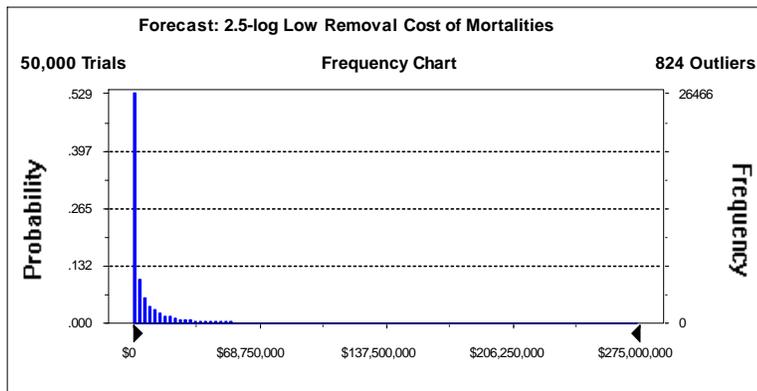
Forecast: 2.5-log Low Removal Cost of Mortalities Avoided

Summary:

Display Range is from \$0 to \$275,000,000
 Entire Range is from \$0 to \$2,791,263,725
 After 50,000 Trials, the Std. Error of the Mean is \$408,281

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$23,677,506
Median	\$2,191,814
Mode	\$0
Standard Deviation	\$91,294,466
Variance	8E+15
Skewness	10.62
Kurtosis	166.80
Coeff. of Variability	3.86
Range Minimum	\$0
Range Maximum	\$2,791,263,725
Range Width	\$2,791,263,725
Mean Std. Error	\$408,281.26



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$884,084
50%	\$2,191,814
60%	\$4,466,478
70%	\$8,575,792
80%	\$17,484,786
90%	\$47,066,505
100%	\$2,791,263,725

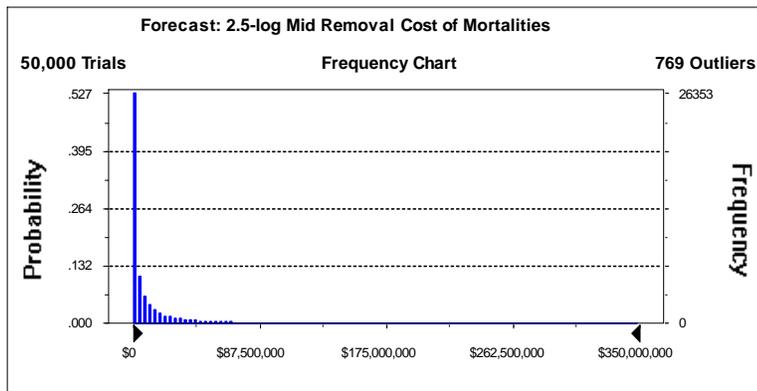
Forecast: 2.5-log Mid Removal Cost of Mortalities Avoided

Summary:

Display Range is from \$0 to \$350,000,000
 Entire Range is from \$0 to \$3,569,095,322
 After 50,000 Trials, the Std. Error of the Mean is \$508,362

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$28,967,931
Median	\$2,861,543
Mode	\$0
Standard Deviation	\$113,673,199
Variance	1E+16
Skewness	11.13
Kurtosis	184.57
Coeff. of Variability	3.92
Range Minimum	\$0
Range Maximum	\$3,569,095,322
Range Width	\$3,569,095,322
Mean Std. Error	\$508,362.00



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$1,253,773
50%	\$2,861,543
60%	\$5,603,109
70%	\$10,564,043
80%	\$21,251,338
90%	\$56,823,722
100%	\$3,569,095,322

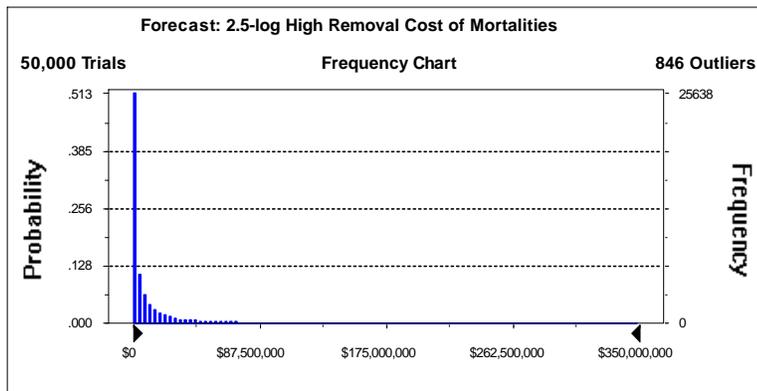
Forecast: 2.5-log High Removal Cost of Mortalities Avoided

Summary:

Display Range is from \$0 to \$350,000,000
 Entire Range is from \$0 to \$3,884,163,551
 After 50,000 Trials, the Std. Error of the Mean is \$548,265

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$31,063,847
Median	\$3,170,808
Mode	\$0
Standard Deviation	\$122,595,730
Variance	2E+16
Skewness	11.35
Kurtosis	192.95
Coeff. of Variability	3.95
Range Minimum	\$0
Range Maximum	\$3,884,163,551
Range Width	\$3,884,163,551
Mean Std. Error	\$548,264.77



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$1,409,499
50%	\$3,170,808
60%	\$6,131,548
70%	\$11,497,409
80%	\$22,898,406
90%	\$60,655,484
100%	\$3,884,163,551

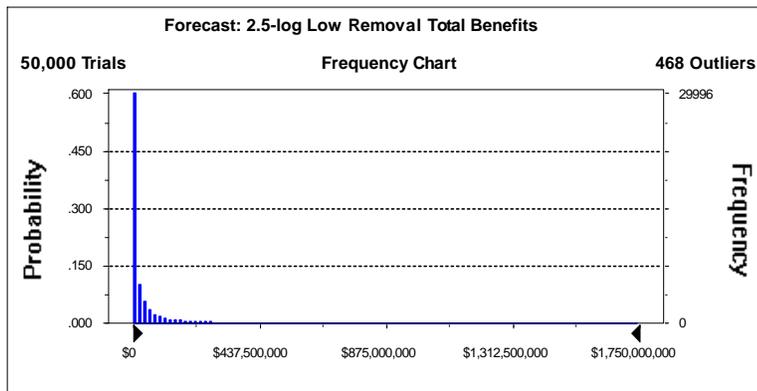
Forecast: 2.5-log Low Removal Total Benefits

Summary:

Display Range is from \$0 to \$1,750,000,000
 Entire Range is from \$0 to \$40,373,039,092
 After 50,000 Trials, the Std. Error of the Mean is \$2,627,822

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$104,929,112
Median	\$8,799,886
Mode	\$0
Standard Deviation	\$587,598,906
Variance	3E+17
Skewness	28.33
Kurtosis	1,288.57
Coeff. of Variability	5.60
Range Minimum	\$0
Range Maximum	\$40,373,039,092
Range Width	\$40,373,039,092
Mean Std. Error	\$2,627,822.19



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$3,526,031
50%	\$8,799,886
60%	\$17,508,508
70%	\$33,870,315
80%	\$70,193,475
90%	\$189,899,544
100%	\$40,373,039,092

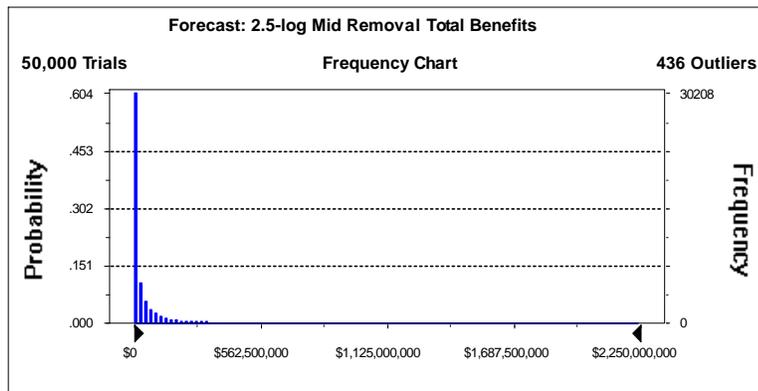
Forecast: 2.5-log Mid Removal Total Benefits

Summary:

Display Range is from \$0 to \$2,250,000,000
 Entire Range is from \$0 to \$50,799,169,079
 After 50,000 Trials, the Std. Error of the Mean is \$3,283,708

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$128,479,642
Median	\$11,450,070
Mode	\$0
Standard Deviation	\$734,259,406
Variance	5E+17
Skewness	29.32
Kurtosis	1,363.98
Coeff. of Variability	5.71
Range Minimum	\$0
Range Maximum	\$50,799,169,079
Range Width	\$50,799,169,079
Mean Std. Error	\$3,283,707.89



Percentiles:

<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$5,029,367
50%	\$11,450,070
60%	\$21,897,090
70%	\$41,768,139
80%	\$85,642,336
90%	\$229,425,725
100%	\$50,799,169,079

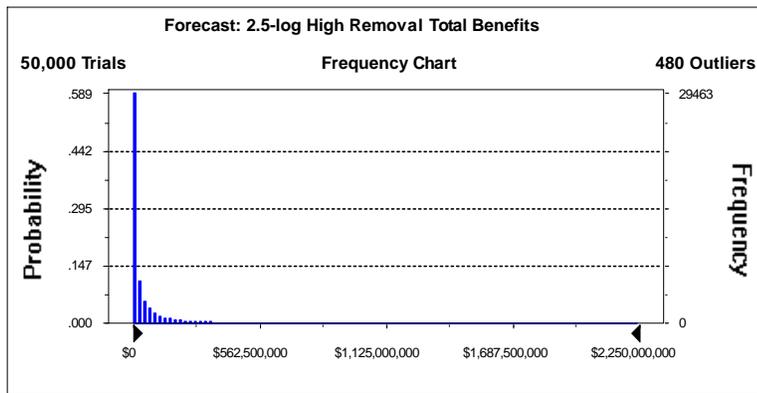
Forecast: 2.5-log High Removal Total Benefits

Summary:

Display Range is from \$0 to \$2,250,000,000
 Entire Range is from \$0 to \$54,944,332,015
 After 50,000 Trials, the Std. Error of the Mean is \$3,545,475

Statistics:

	<u>Value</u>
Trials	50000
Mean	\$137,818,017
Median	\$12,678,634
Mode	\$0
Standard Deviation	\$792,792,394
Variance	6E+17
Skewness	29.73
Kurtosis	1,395.81
Coeff. of Variability	5.75
Range Minimum	\$0
Range Maximum	\$54,944,332,015
Range Width	\$54,944,332,015
Mean Std. Error	\$3,545,475.37



Percentiles:

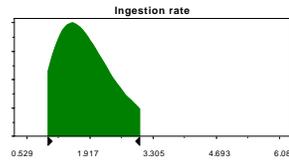
<u>Percentile</u>	<u>Value</u>
0%	\$0
10%	\$0
20%	\$0
30%	\$0
40%	\$5,670,035
50%	\$12,678,634
60%	\$24,029,311
70%	\$45,427,245
80%	\$92,076,366
90%	\$245,149,688
100%	\$54,944,332,015

Assumptions

Assumption: Daily Drinking Water Consumption

Lognormal distribution with parameters:
 Mean 1.948
 Standard Dev. 0.827

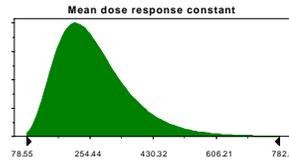
Selected range is from 1.000 to 3.000
 Mean value in simulation was 1.830



Assumption: Mean dose response constant

Lognormal distribution with parameters:
 5% - tile 132.00
 95% - tile 465.40

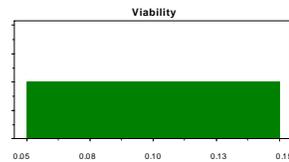
Selected range is from 0.00 to +Infinity
 Mean value in simulation was 266.73



Assumption: Viability

Uniform distribution with parameters:
 Minimum 0.05
 Maximum 0.15

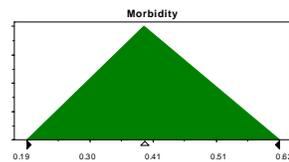
Mean value in simulation was 0.10



Assumption: Morbidity

Triangular distribution with parameters:
 Minimum 0.19
 Likeliest 0.39
 Maximum 0.62

Selected range is from 0.19 to 0.62
 Mean value in simulation was 0.40

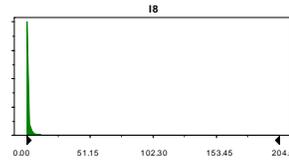


Assumption: Mean daily Cyst Concentration in Distributed Water

Lognormal distribution with parameters:

Mean 4.26
Standard Dev. 24.53

Selected range is from 0.00 to +Infinity
Mean value in simulation was 4.23

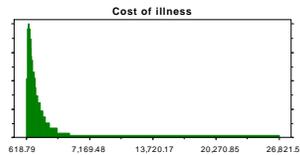


Assumption: Cost of Illness

Custom distribution with parameters:

				<u>Relative Prob.</u>
Continuous range	618.79	to	736.35	0.050000
Continuous range	736.35	to	799.67	0.050000
Continuous range	799.67	to	860.41	0.050000
Continuous range	860.41	to	921.94	0.050000
Continuous range	921.94	to	985.38	0.050000
Continuous range	985.38	to	1,055.42	0.050000
Continuous range	1,055.42	to	1,132.61	0.050000
Continuous range	1,132.61	to	1,217.08	0.050000
Continuous range	1,217.08	to	1,306.32	0.050000
Continuous range	1,306.32	to	1,410.82	0.050000
Continuous range	1,410.82	to	1,526.87	0.050000
Continuous range	1,526.87	to	1,663.45	0.050000
Continuous range	1,663.45	to	1,828.49	0.050000
Continuous range	1,828.49	to	2,024.49	0.050000
Continuous range	2,024.49	to	2,279.26	0.050000
Continuous range	2,279.26	to	2,609.62	0.050000
Continuous range	2,609.62	to	3,062.70	0.050000
Continuous range	3,062.70	to	3,777.19	0.050000
Continuous range	3,777.19	to	5,148.57	0.050000
Continuous range	5,148.57	to	26,821.54	0.050000
Total Relative Probability				1.000000

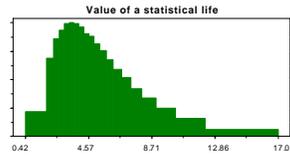
Mean value in simulation was 2,403.29



Assumption: Value of a statistical life

Custom distribution with parameters:				<u>Relative Prob.</u>	
Continuous range	0.42	to	1.84	0.050000	
Continuous range	1.84	to	2.30	0.050000	
Continuous range	2.30	to	2.66	0.050000	
Continuous range	2.66	to	2.99	0.050000	
Continuous range	2.99	to	3.31	0.050000	
Continuous range	3.31	to	3.62	0.050000	
Continuous range	3.62	to	3.93	0.050000	
Continuous range	3.93	to	4.25	0.050000	
Continuous range	4.25	to	4.60	0.050000	
Continuous range	4.60	to	4.95	0.050000	
Continuous range	4.95	to	5.33	0.050000	
Continuous range	5.33	to	5.75	0.050000	
Continuous range	5.75	to	6.21	0.050000	
Continuous range	6.21	to	6.73	0.050000	
Continuous range	6.73	to	7.34	0.050000	
Continuous range	7.34	to	8.07	0.050000	
Continuous range	8.07	to	9.00	0.050000	
Continuous range	9.00	to	10.26	0.050000	
Continuous range	10.26	to	12.25	0.050000	
Continuous range	12.25	to	17.00	0.050000	
Total Relative Probability					1.000000

Mean value in simulation was 5.70



Appendix C

Appendix C-1: 0.3 NTU, 1 Max Compliance Forecast (Used for RIA)

Projected Percent of Systems that Would Modify Treatment to Meet 0.3 NTU, 1 Max

Performance
Limitations
Identified @
CCP Plants (% of
time)

		1 NTU Max				
System Population Size Categories		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
Number of Systems in Each Size Category		2,804	2,860	1,399	2,631	1,899
Number using conventional and direct filtration		836	1,117	810	1,655	1,478
Projected # of Systems Required to Modify Treatment		341	456	331	675	603

		-----%-----				
32%	Chemical Addition install coagulant aid polymer feed capability install backwash water polymer feed capability install pH adjustment for enhancing alkalinity purposes	5.0	5.0	15.0	25.0	25.0
15%	Coagulant Improvements primary coagulant feed points, control, measurement	20.0	20.0	20.0	20.0	20.0
14%	Rapid Mixing rapid mix improvements-mechanical rapid mix improvements- mechanical + structural	20.0	20.0	15.0	10.0	5.0
29%	Flocculant Improvements flocculation improvements-mechanical flocculation improvements- mechanical + structural	20.0	20.0	20.0	15.0	15.0
51%	Settling Improvements equipment modification-weirs, inf/effl, etc. add tube settlers	20.0	20.0	20.0	15.0	15.0
45%	Filtration Improvements filter media additions (6"-12" typical) filter media overhaul (entire replacement includes underdrain, gravel, media) backwashing-increase flow/velocity (10-20% increase) backwashing-install surface wash post backwash-sequence (install additional filter (s)) post backwash filter-to-waste	20.0	20.0	10.0	10.0	10.0
20%		15.0	10.0	10.0	10.0	10.0
		15.0	15.0	10.0	5.0	5.0
		10.0	10.0	20.0	20.0	20.0
		0.0	0.0	0.0	0.0	0.0
		5.0	5.0	5.0	5.0	5.0
17%		filter rate-of-flow controller replacement individual filter turbidimeter installation membrane (microfiltration)	15.0	15.0	15.0	15.0
		80.0	80.0	80.0	80.0	80.0
		0.0	0.0	0.0	0.0	0.0
34%	Process Management Changes plant staffing-increase (up to 1) staff qualifications	25.0	20.0	20.0	20.0	10.0
31%		10.0	10.0	10.0	5.0	5.0
2%	Laboratory Modifications bench top turbidimeter purchase-replace obsolete units jar test apparatus purchase alternative process control testing equipment- particle counter	20.0	20.0	20.0	20.0	20.0
		20.0	20.0	20.0	20.0	15.0
		0.0	0.0	0.0	5.0	5.0
100%	Process Control Testing Modification staff training (consultant as trainer)	50.0	50.0	50.0	35.0	35.0

Appendix C-2: 0.2 NTU, 1 Max Compliance Forecast (Used for RIA)

Projected Percent of Systems that Would Modify Treatment to Meet 0.2 NTU, 1 Max

Performance
Limitations
Identified @
CCP Plants (% of
time)

		1 NTU Max				
System Population Size Categories		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
Number of Systems in Each Size Category		2,804	2,860	1,399	2,631	1,899
Number using conventional and direct filtration		836	1,117	810	1,655	1,478
Projected # of Systems Required to Modify Treatment		341	456	331	675	603

		------%-----				
32%	Chemical Addition install coagulant aid polymer feed capability install backwash water polymer feed capability install pH adjustment for enhancing alkalinity purposes	15.0	15.0	15.0	25.0	25.0
15%	Coagulant Improvements primary coagulant feed points, control, measurement	20.0	20.0	20.0	20.0	20.0
14%	Rapid Mixing rapid mix improvements-mechanical rapid mix improvements- mechanical + structural	20.0	20.0	20.0	15.0	15.0
29%	Flocculant Improvements flocculation improvements-mechanical flocculation improvements- mechanical + structural	20.0	20.0	20.0	15.0	15.0
51%	Settling Improvements equipment modification-weirs, inf/effl, etc. add tube settlers	20.0	20.0	20.0	15.0	15.0
45%	Filtration Improvements filter media additions (6"-12" typical) filter media overhaul (entire replacement includes underdrain, gravel, media) backwashing-increase flow/velocity (10-20% increase) backwashing-install surface wash post backwash-sequence (install additional filter (s)) post backwash filter-to-waste	20.0	20.0	10.0	10.0	10.0
20%		15.0	10.0	10.0	10.0	10.0
		15.0	15.0	10.0	5.0	5.0
		10.0	10.0	20.0	20.0	20.0
		0.0	0.0	0.0	0.0	0.0
		5.0	5.0	5.0	5.0	5.0
		15.0	15.0	15.0	15.0	20.0
17%	individual filter turbidimeter installation membrane (microfiltration)	80.0	80.0	80.0	80.0	80.0
34%	Process Management Changes plant staffing-increase (up to 1) staff qualifications	25.0	20.0	20.0	20.0	10.0
31%		10.0	10.0	10.0	5.0	5.0
2%	Laboratory Modifications bench top turbidimeter purchase-replace obsolete units jar test apparatus purchase alternative process control testing equipment- particle counter	20.0	20.0	20.0	20.0	20.0
		20.0	20.0	20.0	20.0	15.0
		0.0	0.0	0.0	5.0	5.0
100%	Process Control Testing Modification staff training (consultant as trainer)	50.0	50.0	50.0	35.0	35.0

Appendix C-3: 0.1 NTU, 1 Max Compliance Forecast (Used for RIA)

Projected Percent of Systems that Would Modify Treatment to Meet 0.1 NTU, 1 Max

Performance
Limitations
Identified @
CCP Plants (% of
time)

System Population Size Categories Number of Systems in Each Size Category		1 NTU Max				
		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
Number using conventional and direct filtration		2,804	2,860	1,399	2,631	1,899
Projected # of Systems Required to Modify Treatment		836	1,117	810	1,655	1,478
		341	456	331	675	603

		------%-----				
32%	Chemical Addition install coagulant aid polymer feed capability install backwash water polymer feed capability install pH adjustment for enhancing alkalinity purposes	0.0	0.0	0.0	0.0	0.0
15%	Coagulant Improvements primary coagulant feed points, control, measurement	0.0	0.0	0.0	0.0	0.0
14%	Rapid Mixing rapid mix improvements-mechanical rapid mix improvements- mechanical + structural	0.0	0.0	0.0	0.0	0.0
29%	Flocculant Improvements flocculation improvements-mechanical flocculation improvements- mechanical + structural	0.0	0.0	0.0	0.0	0.0
51%	Settling Improvements equipment modification-weirs, inf/effl, etc. add tube settlers	0.0	0.0	0.0	0.0	0.0
45%	Filtration Improvements filter media additions (6"-12" typical) filter media overhaul (entire replacement includes underdrain, gravel, media) backwashing-increase flow/velocity (10-20% increase) backwashing-install surface wash post backwash-sequence (install additional filter (s)) post backwash filter-to-waste	0.0	0.0	0.0	0.0	0.0
20%		0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0
17%	filter rate-of-flow controller replacement individual filter turbidimeter installation membrane (microfiltration)	80.0	80.0	80.0	80.0	80.0
		95.0	95.0	95.0	95.0	95.0
34%	Process Management Changes plant staffing-increase (up to 1) staff qualifications	25.0	20.0	20.0	20.0	10.0
31%		10.0	10.0	10.0	5.0	5.0
2%	Laboratory Modifications bench top turbidimeter purchase-replace obsolete units jar test apparatus purchase alternative process control testing equipment- particle counter	20.0	20.0	20.0	20.0	20.0
		0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	5.0	5.0
100%	Process Control Testing Modification staff training (consultant as trainer)	50.0	50.0	50.0	35.0	35.0

Appendix C-4: System-Level Costs of Treatment Technologies (Capital Costs)
Projected System Capital Costs of Systems Required to Modify Treatment

Performance
 Limitations
 Identified @
 CCP Plants (% of
 time)

		1 NTU Max				
		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
System Population Size Categories						
Number of Systems in Each Size Category		836	1117	810	1655	1478
Projected # of Systems Required to Modify Treatment		341	456	331	675	603

		-----\$1,000-----				
32%	Chemical Addition install coagulant aid polymer feed capability install backwash water polymer feed capability install pH adjustment for enhancing alkalinity purposes	9.0	9.0	9.0	9.0	9.0
15%	Coagulant Improvements primary coagulant feed points, control, measurement	9.0	9.0	9.0	9.0	9.0
14%	Rapid Mixing rapid mix improvements-mechanical rapid mix improvements-structural	2.4	2.4	3.2	3.8	6.2
29%	Flocculant Improvements flocculation improvements-mechanical flocculation improvements-structural	2.9	2.9	3.8	4.6	9.1
51%	Settling Improvements equipment modification-weirs, inf/effl, etc. add tube settlers	8.4	9.1	12.7	16.4	32.1
45%	Filtration Improvements filter media additions (2-6" typical) filter overhaul	15.9	22.4	39.2	52.8	100.4
20%	backwashing-increase flow/velocity (10-20% increase) backwashing-install surface wash post backwash-sequence (install additional filter (s)) post backwash filter-to-waste	0.5	1.3	3.2	6.8	14.7
17%	filter control systems individual filter turbidimeter installation membrane (microfiltration)	3.0	10.7	28.8	70.5	207.1
34%	Administrative Culture Improvements plant staffing-increase (1 or 2 persons) staff qualifications	0.4	0.9	1.7	3.3	12.2
31%	Laboratory Modifications bench top turbidimeter purchase-replace obsolete units jar test apparatus purchase alternative process control testing equipment- (streaming current monitor, Zetameter, etc.)	7.3	28.5	76.3	186.2	423.5
2%	Process Control Testing Modification staff training (consultant as trainer)	9.9	15.3	22.6	65.3	144.5
100%		10.4	17.2	30.5	117.3	162.3
		16.2	37.6	63.2	66.3	89.9
		3.1	5.2	10.5	46.5	55.5
		2.1	4.2	7.0	29.2	36.4
		3.9	3.9	3.9	7.9	10.8
		56.5	162.4	341.5	741.0	1635.9
		0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0
		1.3	1.3	1.3	1.3	1.3
		2.3	2.3	2.3	2.3	2.3
		8.5	8.5	8.5	8.5	8.5
		4.9	4.9	4.9	4.9	4.9

Appendix C-5: System-Level Costs of Treatment Technologies (Annual O&M Costs)
Projected System O&M Costs of Systems Required to Modify Treatment

Performance
 Limitations
 Identified @
 CCP Plants (% of
 time)

		1 NTU Max				
		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
System Population Size Categories						
Number of Systems in Each Size Category		836	1117	810	1655	1478
Projected # of Systems Required to Modify Treatment		341	456	331	675	603

		-----\$1,000-----				
32%	Chemical Addition					
	install coagulant aid polymer feed capability	2.9	2.9	2.9	2.9	4.1
	install backwash water polymer feed capability	2.9	2.9	2.9	2.9	4.1
	install pH adjustment for enhancing alkalinity purposes	5.6	5.7	6.0	6.8	12.2
15%	Coagulant Improvements					
	primary coagulant feed points, control, measurement	2.9	2.9	2.9	2.9	4.1
14%	Rapid Mixing					
	rapid mix improvements-mechanical	2.8	2.8	3.0	3.2	5.3
	rapid mix improvements-structural	2.8	2.8	3.0	3.2	5.3
29%	Flocculant Improvements					
	flocculation improvements-mechanical	2.7	2.9	2.9	3.0	4.8
	flocculation improvements-structural	2.9	2.9	2.9	3.0	4.8
51%	Settling Improvements					
	equipment modification-weirs, inf/effl, etc.	0.7	0.7	2.2	2.2	6.4
	add tube settlers	0.7	0.7	2.2	2.2	6.4
45%	Filtration Improvements					
20%	filter media additions (12" typical)	0.0	0.0	0.0	0.0	0.0
	filter overhaul	0.0	0.0	0.0	0.0	0.0
	backwashing-increase flow/velocity (10-20% increase)	3.9	4.3	4.6	6.2	17.6
	backwashing-install surface wash	1.7	2.0	2.2	4.6	5.8
	post backwash-sequence (install additional filter (s))	6.5	7.8	9.4	9.8	18.1
	post backwash filter-to-waste	3.8	4.1	4.4	5.9	8.6
17%	filter control systems	2.7	3.2	4.0	8.6	18.3
	individual filter turbidimeter installation	0.8	0.8	0.8	0.8	0.8
	membrane (microfiltration)	13.6	23.7	46.5	90.1	251.1
34%	Administrative Culture Improvements					
31%	plant staffing-increase (1 or 2 persons)	14.8	14.8	29.7	29.7	42.4
2%	staff qualifications	0.7	0.7	0.7	0.7	1.1
	Laboratory Modifications					
	bench top turbidimeter purchase-replace obsolete units	0.1	0.1	0.1	0.1	0.1
	jar test apparatus purchase	0.0	0.0	0.0	0.0	0.0
	alternative process control testing equipment- (streaming current monitor, Zetameter, etc.)	1.5	1.5	1.5	1.5	2.1
100%	Process Control Testing Modification					
	staff training (consultant as trainer)	0.0	0.0	0.0	0.0	0.0

Appendix C-6: Total Capital Costs for All Systems Requiring Treatment Modifications

Projected Costs to Meet 0.3 NTU

Performance
Limitations
Identified @
CCP Plants (%
of time)

		1 NTU Max				
		System Population Size Categories				
		Number of Systems in Each Size Category				
		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
		836	1117	810	1655	1478
		Projected # of Systems Required to Modify Treatment				
		341	456	331	675	603
32%	Chemical Addition	-----\$1,000-----				
	install coagulant aid polymer feed capability	153.7	205.6	447.7	1521.5	1359.2
	install backwash water polymer feed capability	153.7	205.6	149.2	304.3	271.8
	install pH adjustment for enhancing alkalinity purposes	554.9	742.1	404.0	549.2	245.3
15%	Coagulant Improvements					
	primary coagulant feed points, control, measurement	614.9	822.3	596.9	1217.2	1087.4
14%	Rapid Mixing					
	rapid mix improvements-mechanical	166.7	222.9	156.8	254.4	187.3
	rapid mix improvements-structural	48.6	65.0	62.4	154.7	54.7
29%	Flocculant Improvements					
	flocculation improvements-mechanical	569.6	826.6	842.8	1660.2	2901.7
	flocculation improvements-structural	270.9	510.8	648.9	1780.5	3027.6
51%	Settling Improvements					
	equipment modification-weirs, inf/effl, etc.	35.4	123.0	209.0	690.9	1326.5
	add tube settlers	50.4	243.8	477.0	2378.6	6245.6
45%	Filtration Improvements					
20%	filter media additions (2-6" typical)	28.3	85.1	54.9	220.0	736.9
	filter media overhaul	375.1	1300.3	2524.9	12566.5	25535.0
	backwashing-increase flow/velocity (10-20% increase)	0.0	0.0	0.0	0.0	0.0
	backwashing-install surface wash	505.3	1044.9	748.4	2203.3	4357.2
	post backwash-sequence (install additional filter (s))	354.2	784.8	2015.9	15838.7	19578.0
	post backwash filter-to-waste	0.0	0.0	0.0	0.0	0.0
	filter control systems	52.1	118.4	173.6	1570.8	1673.5
17%	individual filter turbidimeter installation	109.4	285.6	348.9	2959.4	4384.8
	membrane (microfiltration)	2636.0	3522.0	2554.0	10409.7	12788.6
		0.0	0.0	0.0	0.0	0.0
34%	Administrative Culture Improvements					
31%	plant staffing-increase (1 or 2 persons)	0.0	0.0	0.0	0.0	0.0
2%	staff qualifications	0.0	0.0	0.0	0.0	0.0
	Laboratory Modifications					
	bench top turbidimeter purchase-replace obsolete units	88.2	118.0	85.6	174.6	156.0
	jar test apparatus purchase	159.8	213.6	155.1	316.2	211.9
	alternative process control testing equipment-(streaming current monitor, Zetameter, etc.)	0.0	0.0	0.0	288.0	257.3
100%	Process Control Testing Modification					
	staff training (consultant as trainer)	833.5	1114.6	809.0	1154.9	1031.7

Appendix C-7: Total Capital Costs for All Systems Requiring Treatment Modifications

Projected Costs to Meet 0.2 NTU

Performance
Limitations
Identified @
CCP Plants (%
of time)

		1 NTU Max				
		System Population Size Categories				
		Number of Systems in Each Size Category				
		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
		836	1117	810	1655	1478
		Projected # of Systems Required to Modify Treatment				
		341	456	331	675	603
32%	Chemical Addition install coagulant aid polymer feed capability install backwash water polymer feed capability install pH adjustment for enhancing alkalinity purposes	-----\$1,000-----				
		461.2	616.7	447.7	1521.5	1359.2
		153.7	205.6	149.2	304.3	271.8
		277.5	371.0	269.3	823.9	736.0
15%	Coagulant Improvements primary coagulant feed points, control, measurement	614.9	822.3	596.9	1217.2	1087.4
14%	Rapid Mixing rapid mix improvements-mechanical rapid mix improvements-structural	166.7	222.9	209.0	381.5	561.9
		48.6	65.0	62.4	154.7	54.7
29%	Flocculant Improvements flocculation improvements-mechanical flocculation improvements-structural	569.6	826.6	842.8	1660.2	2901.7
		270.9	510.8	648.9	1780.5	3027.6
51%	Settling Improvements equipment modification-weirs, inf/effl, etc. add tube settlers	35.4	123.0	209.0	690.9	1326.5
		50.4	243.8	477.0	2378.6	6245.6
45%	Filtration Improvements filter media additions (2-6" typical)	28.3	85.1	54.9	220.0	736.9
20%	filter media overhaul	375.1	1300.3	2524.9	12566.5	25535.0
		0.0	0.0	0.0	0.0	0.0
	backwashing-increase flow/velocity (10-20% increase)	505.3	1044.9	748.4	2203.3	4357.2
	backwashing-install surface wash	354.2	784.8	2015.9	15838.7	19578.0
	post backwash-sequence (install additional filter (s))	0.0	0.0	0.0	0.0	0.0
	post backwash filter-to-waste	52.1	118.4	173.6	1570.8	1673.5
17%	filter control systems	109.4	285.6	348.9	2959.4	4384.8
	individual filter turbidimeter installation	2636.0	3522.0	2554.0	10409.7	12788.6
	membrane (microfiltration)	3854.9	14814.6	22606.1	100036.9	197291.2
34%	Administrative Culture Improvements	0.0	0.0	0.0	0.0	0.0
31%	plant staffing-increase (1 or 2 persons)	0.0	0.0	0.0	0.0	0.0
2%	staff qualifications	0.0	0.0	0.0	0.0	0.0
	Laboratory Modifications	88.2	118.0	85.6	174.6	156.0
	bench top turbidimeter purchase-replace obsolete units	159.8	213.6	155.1	316.2	211.9
	jar test apparatus purchase	0.0	0.0	0.0	288.0	257.3
	alternative process control testing equipment- (streaming current monitor, Zetameter, etc.)	0.0	0.0	0.0	288.0	257.3
100%	Process Control Testing Modification staff training (consultant as trainer)	833.5	1114.6	809.0	1154.9	1031.7

Appendix C-8: Total Capital Costs for All Systems Requiring Treatment Modifications

Projected Costs to Meet 0.1 NTU

Performance
Limitations
Identified @
CCP Plants (%
of time)

		1 NTU Max				
		System Population Size Categories				
		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
Number of Systems in Each Size Category		836	1117	810	1655	1478
Projected # of Systems Required to Modify Treatment		341	456	331	675	603
		-----\$1,000-----				
32%	Chemical Addition	0.0	0.0	0.0	0.0	0.0
	install coagulant aid polymer feed capability	0.0	0.0	0.0	0.0	0.0
	install backwash water polymer feed capability	0.0	0.0	0.0	0.0	0.0
	install pH adjustment for enhancing alkalinity purposes	0.0	0.0	0.0	0.0	0.0
15%	Coagulant Improvements	0.0	0.0	0.0	0.0	0.0
	primary coagulant feed points, control, measurement	0.0	0.0	0.0	0.0	0.0
14%	Rapid Mixing	0.0	0.0	0.0	0.0	0.0
	rapid mix improvements-mechanical	0.0	0.0	0.0	0.0	0.0
	rapid mix improvements-structural	0.0	0.0	0.0	0.0	0.0
29%	Flocculant Improvements	0.0	0.0	0.0	0.0	0.0
	flocculation improvements-mechanical	0.0	0.0	0.0	0.0	0.0
	flocculation improvements-structural	0.0	0.0	0.0	0.0	0.0
51%	Settling Improvements	0.0	0.0	0.0	0.0	0.0
	equipment modification-weirs, inf/effl, etc.	0.0	0.0	0.0	0.0	0.0
	add tube settlers	0.0	0.0	0.0	0.0	0.0
45%	Filtration Improvements	0.0	0.0	0.0	0.0	0.0
20%	filter media additions (2-6" typical)	0.0	0.0	0.0	0.0	0.0
	filter media overhaul	0.0	0.0	0.0	0.0	0.0
	backwashing-increase flow/velocity (10-20% increase)	0.0	0.0	0.0	0.0	0.0
	backwashing-install surface wash	0.0	0.0	0.0	0.0	0.0
	post backwash-sequence (install additional filter (s))	0.0	0.0	0.0	0.0	0.0
	post backwash filter-to-waste	0.0	0.0	0.0	0.0	0.0
17%	filter control systems	0.0	0.0	0.0	0.0	0.0
	individual filter turbidimeter installation	2636.0	3522.0	2554.0	10409.7	12788.6
	membrane (microfiltration)	18310.7	70369.2	107378.9	475175.2	937133.1
34%	Administrative Culture Improvements	0.0	0.0	0.0	0.0	0.0
31%	plant staffing-increase (1 or 2 persons)	0.0	0.0	0.0	0.0	0.0
2%	staff qualifications	0.0	0.0	0.0	0.0	0.0
Laboratory Modifications		88.2	118.0	85.6	174.6	156.0
	bench top turbidimeter purchase-replace obsolete units	0.0	0.0	0.0	0.0	0.0
	jar test apparatus purchase	0.0	0.0	0.0	288.0	257.3
	alternative process control testing equipment-(streaming current monitor, Zetameter, etc.)	0.0	0.0	0.0	0.0	0.0
100%	Process Control Testing Modification	833.5	1114.6	809.0	1154.9	1031.7
	staff training (consultant as trainer)	0.0	0.0	0.0	0.0	0.0
Other Costs		0.0	0.0	0.0	0.0	0.0
	individual filter assessments	0.0	0.0	0.0	0.0	0.0
	Comprehensive Performance Evaluation	0.0	0.0	0.0	0.0	0.0

Appendix C-9: Covered Finished Water Storage Costs

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Total
Number of Systems in Each Size Category	2804	2860	1399	2631	1899	11593
Projected # of Systems Required to Modify Treatment	140	143	70	132	95	580

Input Assumptions

Average Flow (MGD)	0.007	0.028	0.075	0.213	0.748
Finished water reservoir volume (ft3)	936	3743	10027	28476	100000
Area of Reservoir Cover (ft2)	94	375	1003	1424	5000
Floating Cover Capital Cost (\$2.00/ft2)	188	750	2006	2848	10000
O&M Costs	3370	2860	4423	4067	7501

	-----\$1,000-----					
Total Capital Costs	26	107	140	375	950	1598
Total O&M Costs	472	409	309	535	712	2438
Total Costs (3%)	474	416	319	560	776	2545
Total Costs (7%)	475	419	323	570	802	2589

O&M costs assume daily inspections, weekly maintenance and repair, and quarterly cleaning activities

Appendix C-10a: FBR Compliance Forecast for FBR Alternative R1

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total
TOTAL RECYCLE PLANTS (Conventional & Direct)	501.9	670	486	993	887	3,538	830	141	127	1,098	4,636
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1,021	4311
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	342	1,099
						-----%					
Install piping to move recycle to headworks	25.0	25.0	25.0	25.0	25.0		25.0	25.0	25.0		
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Install variable speed pump	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Install flow equalization basin	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Construct lagoon	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT	359	480	348	711	635	2,534	517	93	68	679	3,212
						-----%					
Install piping to move recycle to headworks	15.0	15.0	15.0	15.0	15.0		20	20	20		
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
DIRECT FILTRATION PLANTS ONLY	35	47	34	70	62	248	58	10	9	77	325
						-----%					
Install sedimentation basin for backwash treatment	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Construct lagoon	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		

Appendix C-10b: FBR Compliance Forecast for FBR Alternative R2

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total
TOTAL RECYCLE PLANTS (Conventional & Direct)	501.9	670	486	993	887	3,538	830	141	127	1,098	4,636
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1,021	4311
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	342	1,099
-----%											
Install piping to move recycle to headworks	25.0	25.0	25.0	25.0	25.0		25.0	25.0	25.0		
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	5.0		1.0	3.0	1.0		
Install variable speed pump	0.0	0.0	0.0	0.0	5.0		1.0	2.0	1.0		
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	5.0		2.0	1.0	1.0		
Install flow equalization basin	10.0	10.0	10.0	10.0	5.0		15.0	3.0	0.0		
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Install piping for NPDES discharge of FBW water	5.0	5.0	5.0	5.0	5.0		1.0	1.0	1.0		
Install piping for POTW discharge of FBW water	5.0	5.0	5.0	5.0	5.0		0.0	0.0	0.0		
Construct lagoon	20.0	20.0	20.0	20.0	10.0		0.0	0.0	0.0		
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT	359	480	348	711	635	2,534	517	93	68	679	3,212
-----%											
Install piping to move recycle to headworks	15.0	15.0	15.0	15.0	15.0		20	20	20		
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
DIRECT FILTRATION PLANTS ONLY	35	47	34	70	62	248	58	10	9	77	325
-----%											
Install sedimentation basin for backwash treatment	1.0	1.0	1.0	1.0	1.0		3.0	4.0	4.0		
Install piping for NPDES discharge of FBW water	2.0	2.0	2.0	2.0	2.0		3.0	2.0	2.0		
Install piping for POTW discharge of FBW water	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0		
Construct lagoon	3.0	3.0	3.0	3.0	3.0		0.0	0.0	0.0		

Appendix C-10c: FBR Compliance Forecast for FBR Alternative R3

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total
TOTAL RECYCLE PLANTS (Conventional & Direct)	501.9	670	486	993	887	3,538	830	141	127	1,098	4,636
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1,021	4311
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	342	1,099
						-----%					
Install piping to move recycle to headworks	25.0	25.0	25.0	25.0	25.0		25.0	25.0	25.0		
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Install variable speed pump	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Install flow equalization basin	100.0	100.0	100.0	100.0	100.0		100.0	100.0	100.0		
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Construct lagoon	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT	359	480	348	711	635	2,534	517	93	68	679	3,212
						-----%					
Install piping to move recycle to headworks	15.0	15.0	15.0	15.0	15.0		20	20	20		
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
DIRECT FILTRATION PLANTS ONLY	35	47	34	70	62	248	58	10	9	77	325
						-----%					
Install sedimentation basin for backwash treatment	1.0	1.0	1.0	1.0	1.0		3.0	4.0	4.0		
Install piping for NPDES discharge of FBW water	2.0	2.0	2.0	2.0	2.0		3.0	2.0	2.0		
Install piping for POTW discharge of FBW water	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0		
Construct lagoon	3.0	3.0	3.0	3.0	3.0		0.0	0.0	0.0		

Appendix C-10d: FBR Compliance Forecast for FBR Alternative R4

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total
TOTAL RECYCLE PLANTS (Conventional & Direct)	501.9	670	486	993	887	3,538	830	141	127	1,098	4,636
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1,021	4311
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	342	1,099
						-----%					
Install piping to move recycle to headworks	25.0	25.0	25.0	25.0	25.0		25.0	25.0	25.0		
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Install variable speed pump	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Install flow equalization basin	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Install sedimentation basin	100.0	100.0	100.0	100.0	100.0		100.0	100.0	100.0		
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Construct lagoon	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT	359	480	348	711	635	2,534	517	93	68	679	3,212
						-----%					
Install piping to move recycle to headworks	15.0	15.0	15.0	15.0	15.0		20	20	20		
Install sedimentation basin	11.7	11.7	11.7	11.7	11.7		14.9	23.9	60.3		
DIRECT FILTRATION PLANTS ONLY	35	47	34	70	62	248	58	10	9	77	325
						-----%					
Install sedimentation basin for backwash treatment	7.0	7.0	7.0	7.0	7.0		7.0	7.0	7.0		
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Construct lagoon	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		

Appendix C-11: FBR System-Level Capital Costs for Recycle Modifications

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001- 100,000	100,001- 1,000,000	Subtotal Large Systems	Total
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050
	-----\$1,000-----										
Install piping to move recycle to headworks	8.1	13.6	13.9	18.4	32.6		84.9	294.0	2855.4		
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Install variable speed pump	9.0	9.2	9.7	10.8	14.7		32.8	73.5	280.6		
Rerate filter based on evaluation with state	4.1	4.1	4.1	6.1	6.1		6.1	10.2	10.2		
Install flow equalization basin	10.1	23.9	53.1	190.8	255.1		508.2	619.4	1222.1		
Install sedimentation basin	232.4	237.0	247.7	272.3	357.4		743.9	1589.2	5372.2		
Install piping for NPDES discharge of FBW water	7.5	7.5	7.5	7.5	9.8		11.2	16.3	37.7		
Install piping for POTW discharge of FBW water	7.5	7.5	7.5	7.5	9.8		11.2	16.3	37.7		
Construct lagoon	8.1	9.3	9.9	18.9	32.0		58.1	123.9	548.3		
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT	359	480	348	711	635	2534	517	93	68	679	3212
	-----\$1,000-----										
Install piping to move recycle to headworks	8.1	13.6	13.9	18.4	32.6		84.9	294.0	2855.4		
Install sedimentation basin	232.4	237.0	247.7	272.3	357.4		743.9	1589.2	5372.2		
DIRECT FILTRATION PLANTS ONLY	35	47	34	70	62	248	58	10	9	77	325
	-----\$1,000-----										
Install sedimentation basin for backwash treatment	232.4	237.0	247.7	272.3	357.4		743.9	1589.2	5372.2		
Install piping for NPDES discharge of FBW water	7.5	7.5	7.5	7.5	9.8		11.2	16.3	37.7		
Install piping for POTW discharge of FBW water	7.5	7.5	7.5	7.5	9.8		11.2	16.3	37.7		
Construct lagoon	8.1	9.3	9.9	18.9	32.0		58.1	123.9	548.3		
	0.022	0.088	0.24	0.59	1.8		7.37	19.87	83.59		

Appendix C-12: FBR System-Level O&M Costs for Recycle Modifications

	<100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001- 100,000	100,001- 1,000,000	Subtotal Large Systems	Total
System Population Size Categories											
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050
	-----\$1,000-----										
Install piping to move recycle to headworks	2.6	2.7	2.9	3.3	4.5		10.4	23.0	87.8		
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Install variable speed pump	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0		
Install flow equalization basin	6.5	6.6	6.8	6.8	7.0		8.7	10.0	10.9		
Install sedimentation basin	4.7	4.9	5.3	6.3	10.5		21.9	35.3	113.9		
Install piping for NPDES discharge of FBW water	0.4	0.4	0.4	0.4	1.0		1.0	1.1	1.5		
Install piping for POTW discharge of FBW water	1.6	5.6	14.5	35.4	108.5		433.4	1181.8	4971.4		
Construct lagoon	1.1	1.1	1.1	1.1	2.4		4.1	8.1	20.4		
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT	359	480	348	711	635	2534	517	93	68	679	3212
	-----\$1,000-----										
Install piping to move recycle to headworks	2.6	2.7	2.9	3.3	4.5		10.4	23.0	87.8		
Install sedimentation basin	4.7	4.9	5.3	6.3	10.5		21.9	35.3	113.9		
DIRECT FILTRATION PLANTS ONLY	35	47	34	70	62	248	58	10	9	77	325
	-----\$1,000-----										
Install sedimentation basin for backwash treatment	4.7	4.9	5.3	6.3	10.5		21.9	35.3	113.9		
Install piping for NPDES discharge of FBW water	0.4	0.4	0.4	0.4	1.0		1.0	1.1	1.5		
Install piping for POTW discharge of FBW water	1.6	5.6	14.5	35.4	108.5		433.4	1181.8	4971.4		
Construct lagoon	1.1	1.1	1.1	1.1	2.4		4.1	8.1	20.4		

Appendix C-13a: FBR Total Capital Costs for All Systems Requiring Modifications, for FBR Alternative R1

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001-50,000 ^a	50,001-100,000 ^b	100,001-1,000,000 ^c	Subtotal Large Systems	Total
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050
						-----\$1,000-----					
Install piping to move recycle to headworks	218.7	489.0	359.9	978.9	1545.8	3592.3	5450.1	2800.2	35355.5	43605.8	47198.2
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install variable speed pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install flow equalization basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal						3592.3				43605.8	47198.2
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT											
	359	480	348	711	635	2534	517	93	68	679	3212
						-----\$1,000-----					
Install piping to move recycle to headworks	439.2	982.3	722.9	1966.4	3105.1	7215.9	8783.4	5484.5	39059.4	53327.3	60543.2
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal						7215.9				53327.3	60543.2
DIRECT FILTRATION PLANTS ONLY											
	35	47	34	70	62	248	58	10	9	77	325
						-----\$1,000-----					
Install sedimentation basin for backwash treatment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal						0.0				0.0	0.0
Total Cost											107741.4

- Notes-
- a. In the direct recycle section, the recycle location costs include two additional plants that belong to systems serving more than one million, and the other direct recycle costs include one additional plant.
 - b. In the direct filtration section, the costs include one additional plant that belongs to a system serving more than one million.
 - c. In the direct filtration section, the costs include two additional plants that belong to systems serving more than one million.

Appendix C-13b: FBR Total Capital Costs for All Systems Requiring Modifications, for FBR Alternative R2

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001-50,000 ^a	50,001-100,000 ^b	100,001-1,000,000 ^c	Subtotal Large Systems	Total
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050
						-----\$1,000-----					
Install piping to move recycle to headworks	218.7	489.0	359.9	978.9	1545.8	3592.3	5450.1	2800.2	35355.5	43605.8	47198.2
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install variable speed pump	0.0	0.0	0.0	0.0	139.9	139.9	83.8	56.0	139.0	278.8	418.6
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	58.0	58.0	31.2	3.9	5.0	40.2	98.1
Install flow equalization basin	108.2	343.0	551.5	4052.1	2420.2	7475.0	19489.4	707.9	0.0	20197.3	27672.3
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install piping for NPDES discharge of FBW water	40.5	54.0	39.2	80.0	92.7	306.4	28.6	6.2	18.7	53.5	359.9
Install piping for POTW discharge of FBW water	40.5	54.0	39.2	80.0	92.7	306.4	0.0	0.0	0.0	0.0	306.4
Construct lagoon	174.9	265.7	205.3	804.8	606.7	2057.5	0.0	0.0	0.0	0.0	2057.5
Subtotal						13935.5				64175.6	78111.1
						-----\$1,000-----					
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT	359	480	348	711	635	2534	517	93	68	679	3212
Install piping to move recycle to headworks	439.2	982.3	722.9	1966.4	3105.1	7215.9	8783.4	5484.5	39059.4	53327.3	60543.2
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal						7215.9				53327.3	60543.2
						-----\$1,000-----					
DIRECT FILTRATION PLANTS ONLY	35	47	34	70	62	248	58	10	9	77	325
Install sedimentation basin for backwash treatment	81.7	111.2	84.2	189.3	221.9	688.3	1296.2	692.1	2337.1	4325.5	5013.7
Install piping for NPDES discharge of FBW water	5.3	7.1	5.1	10.5	12.1	40.1	19.5	3.5	8.2	31.3	71.4
Install piping for POTW discharge of FBW water	2.6	3.5	2.6	5.2	6.1	20.1	6.5	1.8	4.1	12.4	32.4
Construct lagoon	8.6	13.0	10.1	39.5	59.6	130.8	0.0	0.0	0.0	0.0	130.8
Subtotal						879.2				4369.1	5248.3
Total Cost											143902.6

- Notes-
- a. In the direct recycle section, the recycle location costs include two additional plants that belong to systems serving more than one million, and the other direct recycle costs include one additional plant.
 - b. In the direct filtration section, the costs include one additional plant that belongs to a system serving more than one million.
 - c. In the direct filtration section, the costs include two additional plants that belong to systems serving more than one million.

Appendix C-13c: FBR Total Capital Costs for All Systems Requiring Modifications, for FBR Alternative R3

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001-50,000 ^a	50,001-100,000 ^b	100,001-1,000,000 ^c	Subtotal Large Systems	Total
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050
						-----\$1,000-----					
Install piping to move recycle to headworks	218.7	489.0	359.9	978.9	1545.8	3592.3	5450.1	2800.2	35355.5	43605.8	47198.2
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install variable speed pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install flow equalization basin	1082.4	3430.5	5514.8	40520.5	48403.4	98951.6	129929.1	23596.6	60529.4	214055.2	313006.8
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal						102544.0				257661.0	360204.9
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT						-----\$1,000-----					
	359	480	348	711	635	2534	517	93	68	679	3212
Install piping to move recycle to headworks	439.2	982.3	722.9	1966.4	3105.1	7215.9	8783.4	5484.5	39059.4	53327.3	60543.2
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal						7215.9				53327.3	60543.2
DIRECT FILTRATION PLANTS ONLY						-----\$1,000-----					
	35	47	34	70	62	248	58	10	9	77	325
Install sedimentation basin for backwash treatment	81.7	111.2	84.2	189.3	221.9	688.3	1296.2	692.1	2337.1	4325.5	5013.7
Install piping for NPDES discharge of FBW water	5.3	7.1	5.1	10.5	12.1	40.1	19.5	3.5	8.2	31.3	71.4
Install piping for POTW discharge of FBW water	2.6	3.5	2.6	5.2	6.1	20.1	6.5	1.8	4.1	12.4	32.4
Construct lagoon	8.6	13.0	10.1	39.5	59.6	130.8	0.0	0.0	0.0	0.0	130.8
Subtotal						879.2				4369.1	5248.3
Total Cost											425996.5

- Notes-
- a. In the direct recycle section, the recycle location costs include two additional plants that belong to systems serving more than one million, and the other direct recycle costs include one additional plant.
 - b. In the direct filtration section, the costs include one additional plant that belongs to a system serving more than one million.
 - c. In the direct filtration section, the costs include two additional plants that belong to systems serving more than one million.

Appendix C-13d: FBR Total Capital Costs for All Systems Requiring Modifications, for FBR Alternative R4

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001-50,000 ^a	50,001-100,000 ^b	100,001-1,000,000 ^c	Subtotal Large Systems	Total
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050
						-----\$1,000-----					
Install piping to move recycle to headworks	218.7	489.0	359.9	978.9	1545.8	3592.3	5450.1	2800.2	35355.5	43605.8	47198.2
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install variable speed pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install flow equalization basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install sedimentation basin	24950.4	33968.8	25742.8	57849.4	67803.4	210314.8	190180.9	60539.5	266077.2	516797.6	727112.4
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal						213907.1				560403.4	774310.5
						-----\$1,000-----					
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT	359	480	348	711	635	2534	517	93	68	679	3212
Install piping to move recycle to headworks	439.2	982.3	722.9	1966.4	3105.1	7215.9	8783.4	5484.5	39059.4	53327.3	60543.2
Install sedimentation basin	9773.0	13305.4	10083.3	22659.4	26558.3	82379.4	57307.6	35424.0	221566.3	314297.8	396677.2
Subtotal						89595.3				367625.1	457220.4
						-----\$1,000-----					
DIRECT FILTRATION PLANTS ONLY	35	47	34	70	62	248	58	10	9	77	325
Install sedimentation basin for backwash treatment	571.6	778.2	589.7	1325.2	1553.2	4817.9	3024.6	1211.1	4090.0	8325.7	13143.6
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal						4817.9				8325.7	13143.6
Total Cost											1244674.5

- Notes-
- a. In the direct recycle section, the recycle location costs include two additional plants that belong to systems serving more than one million, and the other direct recycle costs include one additional plant.
 - b. In the direct filtration section, the costs include one additional plant that belongs to a system serving more than one million.
 - c. In the direct filtration section, the costs include two additional plants that belong to systems serving more than one million.

Appendix D

Appendix D-1: Total Annualized Capital Costs (\$000s) at 3% Cost of Capital
Projected Costs to Meet 0.3 NTU

Performance
 Limitations
 Identified @
 CCP Plants (%
 of time)

		1 NTU Max				
		System Population Size Categories				
		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
		Number of Systems in Each Size Category				
		836	1117	810	1655	1478
		Projected # of Systems Required to Modify Treatment				
		341	456	331	675	603
32%	Chemical Addition	-----\$1,000-----				
	install coagulant aid polymer feed capability	10.3	13.8	30.1	102.3	91.4
	install backwash water polymer feed capability	10.3	13.8	10.0	20.5	18.3
	install pH adjustment for enhancing alkalinity purposes	37.3	49.9	27.2	36.9	16.5
15%	Coagulant Improvements					
	primary coagulant feed points, control, measurement	41.3	55.3	40.1	81.8	73.1
14%	Rapid Mixing					
	rapid mix improvements-mechanical	11.2	15.0	10.5	17.1	12.6
	rapid mix improvements-structural	3.3	4.4	4.2	10.4	3.7
29%	Flocculant Improvements					
	flocculation improvements-mechanical	38.3	55.6	56.6	111.6	195.0
	flocculation improvements-structural	18.2	34.3	43.6	119.7	203.5
51%	Settling Improvements					
	equipment modification-weirs, inf/effl, etc.	2.4	8.3	14.0	46.4	89.2
	add tube settlers	3.4	16.4	32.1	159.9	419.8
45%	Filtration Improvements					
20%	filter media additions (2-6" typical)	1.9	5.7	3.7	14.8	49.5
	filter media overhaul	25.2	87.4	169.7	844.7	1716.4
	backwashing-increase flow/velocity (10-20% increase)	0.0	0.0	0.0	0.0	0.0
	backwashing-install surface wash	34.0	70.2	50.3	148.1	292.9
	post backwash-sequence (install additional filter (s))	23.8	52.8	135.5	1064.6	1316.0
	post backwash filter-to-waste	0.0	0.0	0.0	0.0	0.0
	post backwash filter-control systems	3.5	8.0	11.7	105.6	112.5
17%	filter control systems	7.4	19.2	23.5	198.9	294.7
	*individual filter turbidimeter installation	423.1	565.3	409.9	1670.8	2052.6
	membrane (microfiltration)	0.0	0.0	0.0	0.0	0.0
34%	Administrative Culture Improvements					
31%	plant staffing-increase (1 or 2 persons)	0.0	0.0	0.0	0.0	0.0
2%	staff qualifications	0.0	0.0	0.0	0.0	0.0
	Laboratory Modifications					
	bench top turbidimeter purchase-replace obsolete units	5.9	7.9	5.8	11.7	10.5
	jar test apparatus purchase	10.7	14.4	10.4	21.3	14.2
	alternative process control testing equipment-(streaming current monitor, Zetameter, etc.)	0.0	0.0	0.0	19.4	17.3
100%	Process Control Testing Modification					
	staff training (consultant as trainer)	56.0	74.9	54.4	77.6	69.3

* Capital costs for these processes and technologies are annualized over 7 years instead of 20 years.

Appendix D-2: Total Annual Operation & Maintenance Costs
Projected Costs to Meet 0.3 NTU

Performance
 Limitations
 Identified @
 CCP Plants (%
 of time)

		1 NTU Max				
		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
System Population Size Categories						
Number of Systems in Each Size Category		836	1117	810	1655	1478
Projected # of Systems Required to Modify Treatment		341	456	331	675	603
32%	Chemical Addition install coagulant aid polymer feed capability install backwash water polymer feed capability install pH adjustment for enhancing alkalinity purposes	-----\$1,000-----				
		49.6	66.3	144.4	490.7	615.2
		49.6	66.3	48.1	98.1	122.8
		380.6	520.5	297.5	459.9	369.2
15%	Coagulant Improvements primary coagulant feed points, control, measurement	198.3	265.2	192.5	392.5	492.2
14%	Rapid Mixing rapid mix improvements-mechanical rapid mix improvements-structural	191.2	255.6	146.6	213.1	159.7
		47.8	63.9	48.9	106.6	31.9
29%	Flocculant Improvements flocculation improvements-mechanical flocculation improvements-structural	187.5	260.1	188.8	299.0	433.0
		48.6	65.0	47.2	99.7	144.3
51%	Settling Improvements equipment modification-weirs, inf/effl, etc. add tube settlers	50.6	67.6	147.2	225.2	574.8
		12.6	16.9	36.8	75.1	191.6
45%	Filtration Improvements filter media additions (2-6" typical)	0.0	0.0	0.0	0.0	0.0
20%	filter media overhaul	0.0	0.0	0.0	0.0	0.0
	backwashing-increase flow/velocity (10-20% increase)	0.0	0.0	0.0	0.0	0.0
	backwashing-install surface wash	198.0	292.6	151.7	209.7	531.2
	post backwash-sequence (install additional filter (s))	59.0	92.9	148.3	618.7	700.1
	post backwash filter-to-waste	0.0	0.0	0.0	0.0	0.0
	filter control systems	64.2	92.9	72.5	199.4	257.9
17%	individual filter turbidimeter installation	140.7	215.9	197.2	866.2	2210.8
	membrane (microfiltration)	551.7	737.2	534.6	1092.2	975.4
		0.0	0.0	0.0	0.0	0.0
34%	Administrative Culture Improvements plant staffing-increase (1 or 2 persons)	1264.1	1352.4	1963.3	4003.7	2554.7
31%	staff qualifications	22.9	30.7	22.2	24.1	32.5
2%						
	Laboratory Modifications bench top turbidimeter purchase-replace obsolete units	5.2	7.0	5.1	10.3	9.2
	jar test apparatus purchase	0.0	0.0	0.0	0.0	0.0
	alternative process control testing equipment- (streaming current monitor, Zetameter, etc.)	0.0	0.0	0.0	50.0	63.9
100%	Process Control Testing Modification staff training (consultant as trainer)	0.0	0.0	0.0	0.0	0.0

Appendix D-3: Annual System-Level Treatment Costs at 3% Cost of Capital
Projected Costs to Meet 0.3 NTU

Performance
 Limitations
 Identified @
 CCP Plants (%
 of time)

		1 NTU Max				
System Population Size Categories		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
Number of Systems in Each Size Category		836	1117	810	1655	1478
Projected # of Systems Required to Modify Treatment		341	456	331	675	603

		-----\$1,000-----				
32%	Chemical Addition					
	install coagulant aid polymer feed capability	59.9	80.1	174.5	592.9	706.6
	install backwash water polymer feed capability	59.9	80.1	58.2	118.6	141.1
	install pH adjustment for enhancing alkalinity purposes	417.9	570.3	324.6	496.9	385.7
15%	Coagulant Improvements					
	primary coagulant feed points, control, measurement	239.6	320.4	232.6	474.3	565.2
14%	Rapid Mixing					
	rapid mix improvements-mechanical	202.4	270.6	157.2	230.2	172.3
	rapid mix improvements-structural	51.1	68.3	53.1	117.0	35.6
29%	Flocculant Improvements					
	flocculation improvements-mechanical	225.8	315.6	245.4	410.6	628.0
	flocculation improvements-structural	66.8	99.4	90.8	219.4	347.8
51%	Settling Improvements					
	equipment modification-weirs, inf/effl, etc.	52.9	75.9	161.3	271.6	664.0
	add tube settlers	16.0	33.3	68.9	234.9	611.4
45%	Filtration Improvements					
20%	filter media additions (2-6" typical)	1.9	5.7	3.7	14.8	49.5
	filter media overhaul	25.2	87.4	169.7	844.7	1716.4
		0.0	0.0	0.0	0.0	0.0
	backwashing-increase flow/velocity (10-20% increase)	231.9	362.8	202.0	357.8	824.1
	backwashing-install surface wash	82.8	145.6	283.8	1683.3	2016.0
	post backwash-sequence (install additional filter (s))	0.0	0.0	0.0	0.0	0.0
	post backwash filter-to-waste	67.7	100.8	84.1	304.9	370.4
17%	filter control systems	148.0	235.1	220.7	1065.1	2505.5
	individual filter turbidimeter installation	974.8	1302.5	944.5	2763.0	3028.1
	membrane (microfiltration)	0.0	0.0	0.0	0.0	0.0
34%	Administrative Culture Improvements					
31%	plant staffing-increase (1 or 2 persons)	1264.1	1352.4	1963.3	4003.7	2554.7
2%	staff qualifications	22.9	30.7	22.2	24.1	32.5
	Laboratory Modifications					
	bench top turbidimeter purchase-replace obsolete units	11.1	14.9	10.8	22.0	19.7
	jar test apparatus purchase	10.7	14.4	10.4	21.3	14.2
	alternative process control testing equipment-(streaming current monitor, Zetameter, etc.)	0.0	0.0	0.0	69.4	81.2
100%	Process Control Testing Modification					
	staff training (consultant as trainer)	56.0	74.9	54.4	77.6	69.3

Appendix D-4: Total Annualized Capital Costs (\$000s) at 3% Cost of Capital
Projected Costs to Meet 0.2 NTU

Performance
 Limitations
 Identified @
 CCP Plants (%
 of time)

		1 NTU Max				
System Population Size Categories		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
Number of Systems in Each Size Category		836	1117	810	1655	1478
Projected # of Systems Required to Modify Treatment		341	456	331	675	603

		-----\$1,000-----				
32%	Chemical Addition install coagulant aid polymer feed capability install backwash water polymer feed capability install pH adjustment for enhancing alkalinity purposes	31.0	41.5	30.1	102.3	91.4
		10.3	13.8	10.0	20.5	18.3
		18.7	24.9	18.1	55.4	49.5
15%	Coagulant Improvements primary coagulant feed points, control, measurement	41.3	55.3	40.1	81.8	73.1
14%	Rapid Mixing rapid mix improvements-mechanical rapid mix improvements-structural	11.2	15.0	14.0	25.6	37.8
		3.3	4.4	4.2	10.4	3.7
29%	Flocculant Improvements flocculation improvements-mechanical flocculation improvements-structural	38.3	55.6	56.6	111.6	195.0
		18.2	34.3	43.6	119.7	203.5
51%	Settling Improvements equipment modification-weirs, inf/effl, etc. add tube settlers	2.4	8.3	14.0	46.4	89.2
		3.4	16.4	32.1	159.9	419.8
45%	Filtration Improvements	1.9	5.7	3.7	14.8	49.5
20%	filter media additions (2-6" typical)	25.2	87.4	169.7	844.7	1716.4
	filter media overhaul	0.0	0.0	0.0	0.0	0.0
	backwashing-increase flow/velocity (10-20% increase)	34.0	70.2	50.3	148.1	292.9
	backwashing-install surface wash	23.8	52.8	135.5	1064.6	1316.0
	post backwash-sequence (install additional filter (s))	0.0	0.0	0.0	0.0	0.0
	post backwash filter-to-waste	3.5	8.0	11.7	105.6	112.5
17%	filter control systems	7.4	19.2	23.5	198.9	294.7
	*individual filter turbidimeter installation	423.1	565.3	409.9	1670.8	2052.6
	membrane (microfiltration)	259.1	995.8	1519.5	6724.1	13261.1
34%	Administrative Culture Improvements	0.0	0.0	0.0	0.0	0.0
31%	plant staffing-increase (1 or 2 persons)	0.0	0.0	0.0	0.0	0.0
2%	staff qualifications	0.0	0.0	0.0	0.0	0.0
	Laboratory Modifications	5.9	7.9	5.8	11.7	10.5
	bench top turbidimeter purchase-replace obsolete units	10.7	14.4	10.4	21.3	14.2
	jar test apparatus purchase	0.0	0.0	0.0	19.4	17.3
	alternative process control testing equipment- (streaming current monitor, Zetameter, etc.)					
100%	Process Control Testing Modification staff training (consultant as trainer)	56.0	74.9	54.4	77.6	69.3

* Capital costs for these processes and technologies are annualized over 7 years instead of 20 years.

Appendix D-5: Total Annual Operation & Maintenance Costs
Projected Costs to Meet 0.2 NTU

Performance
 Limitations
 Identified @
 CCP Plants (%
 of time)

		1 NTU Max				
		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
System Population Size Categories						
Number of Systems in Each Size Category		836	1117	810	1655	1478
Projected # of Systems Required to Modify Treatment		341	456	331	675	603

		-----\$1,000-----				
32%	Chemical Addition install coagulant aid polymer feed capability install backwash water polymer feed capability install pH adjustment for enhancing alkalinity purposes	148.7	198.9	144.4	490.7	615.2
		49.6	66.3	48.1	98.1	122.8
		190.3	260.2	198.3	689.9	1107.7
15%	Coagulant Improvements primary coagulant feed points, control, measurement	198.3	265.2	192.5	392.5	492.2
14%	Rapid Mixing rapid mix improvements-mechanical rapid mix improvements-structural	191.2	255.6	195.5	319.7	479.0
		47.8	63.9	48.9	106.6	31.9
29%	Flocculant Improvements flocculation improvements-mechanical flocculation improvements-structural	187.5	260.1	188.8	299.0	433.0
		48.6	65.0	47.2	99.7	144.3
51%	Settling Improvements equipment modification-weirs, inf/effl, etc. add tube settlers	50.6	67.6	147.2	225.2	574.8
		12.6	16.9	36.8	75.1	191.6
45%	Filtration Improvements filter media additions (2-6" typical)	0.0	0.0	0.0	0.0	0.0
20%	filter media overhaul	0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0
	backwashing-increase flow/velocity (10-20% increase)	198.0	292.6	151.7	209.7	531.2
	backwashing-install surface wash	59.0	92.9	148.3	618.7	700.1
	post backwash-sequence (install additional filter (s))	0.0	0.0	0.0	0.0	0.0
	post backwash filter-to-waste	64.2	92.9	72.5	199.4	257.9
17%	filter control systems	140.7	215.9	197.2	866.2	2210.8
	individual filter turbidimeter installation	551.7	737.2	534.6	1092.2	975.4
	membrane (microfiltration)	930.7	2164.1	3081.1	12167.8	30288.2
34%	Administrative Culture Improvements plant staffing-increase (1 or 2 persons)	1264.1	1352.4	1963.3	4003.7	2554.7
31%	staff qualifications	22.9	30.7	22.2	24.1	32.5
2%						
	Laboratory Modifications bench top turbidimeter purchase-replace obsolete units	5.2	7.0	5.1	10.3	9.2
	jar test apparatus purchase	0.0	0.0	0.0	0.0	0.0
	alternative process control testing equipment- (streaming current monitor, Zetameter, etc.)	0.0	0.0	0.0	50.0	63.9
100%	Process Control Testing Modification staff training (consultant as trainer)	0.0	0.0	0.0	0.0	0.0

Appendix D-6: Annual System-Level Treatment Costs at 3% Cost of Capital
Projected Costs to Meet 0.2 NTU

Performance
 Limitations
 Identified @
 CCP Plants (%
 of time)

		1 NTU Max				
System Population Size Categories		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
Number of Systems in Each Size Category		836	1117	810	1655	1478
Projected # of Systems Required to Modify Treatment		341	456	331	675	603

		-----\$1,000-----				
32%	Chemical Addition install coagulant aid polymer feed capability install backwash water polymer feed capability install pH adjustment for enhancing alkalinity purposes	179.7	240.3	174.5	592.9	706.6
		59.9	80.1	58.2	118.6	141.1
		209.0	285.2	216.4	745.3	1157.1
15%	Coagulant Improvements primary coagulant feed points, control, measurement	239.6	320.4	232.6	474.3	565.2
14%	Rapid Mixing rapid mix improvements-mechanical rapid mix improvements-structural	202.4	270.6	209.6	345.3	516.8
		51.1	68.3	53.1	117.0	35.6
29%	Flocculant Improvements flocculation improvements-mechanical flocculation improvements-structural	225.8	315.6	245.4	410.6	628.0
		66.8	99.4	90.8	219.4	347.8
51%	Settling Improvements equipment modification-weirs, inf/effl, etc. add tube settlers	52.9	75.9	161.3	271.6	664.0
		16.0	33.3	68.9	234.9	611.4
45%	Filtration Improvements filter media additions (2-6" typical)	1.9	5.7	3.7	14.8	49.5
20%	filter media overhaul	25.2	87.4	169.7	844.7	1716.4
		0.0	0.0	0.0	0.0	0.0
	backwashing-increase flow/velocity (10-20% increase)	231.9	362.8	202.0	357.8	824.1
	backwashing-install surface wash	82.8	145.6	283.8	1683.3	2016.0
	post backwash-sequence (install additional filter (s))	0.0	0.0	0.0	0.0	0.0
	post backwash filter-to-waste	67.7	100.8	84.1	304.9	370.4
17%	filter control systems	148.0	235.1	220.7	1065.1	2505.5
	individual filter turbidimeter installation	974.8	1302.5	944.5	2763.0	3028.1
	membrane (microfiltration)	1189.8	3159.9	4600.6	18891.8	43549.3
34%	Administrative Culture Improvements plant staffing-increase (1 or 2 persons)	1264.1	1352.4	1963.3	4003.7	2554.7
31%	staff qualifications	22.9	30.7	22.2	24.1	32.5
2%						
	Laboratory Modifications bench top turbidimeter purchase-replace obsolete units	11.1	14.9	10.8	22.0	19.7
	jar test apparatus purchase	10.7	14.4	10.4	21.3	14.2
	alternative process control testing equipment- (streaming current monitor, Zetameter, etc.)	0.0	0.0	0.0	69.4	81.2
100%	Process Control Testing Modification staff training (consultant as trainer)	56.0	74.9	54.4	77.6	69.3

Appendix D-7: Total Annualized Capital Costs (\$000s) at 3% Cost of Capital
Projected Costs to Meet 0.1 NTU

Performance
 Limitations
 Identified @
 CCP Plants (%
 of time)

		1 NTU Max				
System Population Size Categories		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
Number of Systems in Each Size Category		836	1117	810	1655	1478
Projected # of Systems Required to Modify Treatment		341	456	331	675	603

		-----\$1,000-----				
32%	Chemical Addition install coagulant aid polymer feed capability install backwash water polymer feed capability install pH adjustment for enhancing alkalinity purposes	0.0	0.0	0.0	0.0	0.0
15%	Coagulant Improvements primary coagulant feed points, control, measurement	0.0	0.0	0.0	0.0	0.0
14%	Rapid Mixing rapid mix improvements-mechanical rapid mix improvements-structural	0.0	0.0	0.0	0.0	0.0
29%	Flocculant Improvements flocculation improvements-mechanical flocculation improvements-structural	0.0	0.0	0.0	0.0	0.0
51%	Settling Improvements equipment modification-weirs, inf/effl, etc. add tube settlers	0.0	0.0	0.0	0.0	0.0
45%	Filtration Improvements filter media additions (2-6" typical) filter media overhaul backwashing-increase flow/velocity (10-20% increase) backwashing-install surface wash post backwash-sequence (install additional filter (s)) post backwash filter-to-waste filter control systems *individual filter turbidimeter installation membrane (microfiltration)	0.0	0.0	0.0	0.0	0.0
20%		0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0
17%		423.1	565.3	409.9	1670.8	2052.6
		1230.8	4729.9	7217.5	31939.2	62990.1
34%		Administrative Culture Improvements plant staffing-increase (1 or 2 persons)	0.0	0.0	0.0	0.0
31%	staff qualifications	0.0	0.0	0.0	0.0	0.0
2%	Laboratory Modifications bench top turbidimeter purchase-replace obsolete units jar test apparatus purchase alternative process control testing equipment- (streaming current monitor, Zetameter, etc.)	5.9	7.9	5.8	11.7	10.5
		0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	19.4	17.3
100%	Process Control Testing Modification staff training (consultant as trainer)	56.0	74.9	54.4	77.6	69.3

* Capital costs for these processes and technologies are annualized over 7 years instead of 20 years.

Appendix D-8: Total Annual Operation & Maintenance Costs
Projected Costs to Meet 0.1 NTU

Performance
 Limitations
 Identified @
 CCP Plants (%
 of time)

		1 NTU Max				
		System Population Size Categories				
		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
		Number of Systems in Each Size Category				
		836	1117	810	1655	1478
		Projected # of Systems Required to Modify Treatment				
		341	456	331	675	603
32%	Chemical Addition	-----\$1,000-----				
	install coagulant aid polymer feed capability	0.0	0.0	0.0	0.0	0.0
	install backwash water polymer feed capability	0.0	0.0	0.0	0.0	0.0
	install pH adjustment for enhancing alkalinity purposes	0.0	0.0	0.0	0.0	0.0
15%	Coagulant Improvements					
	primary coagulant feed points, control, measurement	0.0	0.0	0.0	0.0	0.0
14%	Rapid Mixing					
	rapid mix improvements-mechanical	0.0	0.0	0.0	0.0	0.0
	rapid mix improvements-structural	0.0	0.0	0.0	0.0	0.0
29%	Flocculant Improvements					
	flocculation improvements-mechanical	0.0	0.0	0.0	0.0	0.0
	flocculation improvements-structural	0.0	0.0	0.0	0.0	0.0
51%	Settling Improvements					
	equipment modification-weirs, inf/effl, etc.	0.0	0.0	0.0	0.0	0.0
	add tube settlers	0.0	0.0	0.0	0.0	0.0
45%	Filtration Improvements					
20%	filter media additions (2-6" typical)	0.0	0.0	0.0	0.0	0.0
	filter media overhaul	0.0	0.0	0.0	0.0	0.0
	backwashing-increase flow/velocity (10-20% increase)	0.0	0.0	0.0	0.0	0.0
	backwashing-install surface wash	0.0	0.0	0.0	0.0	0.0
	post backwash-sequence (install additional filter (s))	0.0	0.0	0.0	0.0	0.0
	post backwash filter-to-waste	0.0	0.0	0.0	0.0	0.0
17%	filter control systems	0.0	0.0	0.0	0.0	0.0
	individual filter turbidimeter installation	551.7	737.2	534.6	1092.2	975.4
	membrane (microfiltration)	4421.0	10279.6	14635.3	57796.9	143869.2
34%	Administrative Culture Improvements					
31%	plant staffing-increase (1 or 2 persons)	1264.1	1352.4	1963.3	4003.7	2554.7
2%	staff qualifications	22.9	30.7	22.2	24.1	32.5
	Laboratory Modifications					
	bench top turbidimeter purchase-replace obsolete units	5.2	7.0	5.1	10.3	9.2
	jar test apparatus purchase	0.0	0.0	0.0	0.0	0.0
	alternative process control testing equipment-(streaming current monitor, Zetameter, etc.)	0.0	0.0	0.0	50.0	63.9
100%	Process Control Testing Modification					
	staff training (consultant as trainer)	0.0	0.0	0.0	0.0	0.0

Appendix D-9: Annual System-Level Treatment Costs at 3% Cost of Capital
Projected Costs to Meet 0.1 NTU

Performance
 Limitations
 Identified @
 CCP Plants (%
 of time)

		1 NTU Max				
System Population Size Categories		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
Number of Systems in Each Size Category		836	1117	810	1655	1478
Projected # of Systems Required to Modify Treatment		341	456	331	675	603

		-----\$1,000-----				
32%	Chemical Addition install coagulant aid polymer feed capability install backwash water polymer feed capability install pH adjustment for enhancing alkalinity purposes	0.0	0.0	0.0	0.0	0.0
15%	Coagulant Improvements primary coagulant feed points, control, measurement	0.0	0.0	0.0	0.0	0.0
14%	Rapid Mixing rapid mix improvements-mechanical rapid mix improvements-structural	0.0	0.0	0.0	0.0	0.0
29%	Flocculant Improvements flocculation improvements-mechanical flocculation improvements-structural	0.0	0.0	0.0	0.0	0.0
51%	Settling Improvements equipment modification-weirs, inf/effl, etc. add tube settlers	0.0	0.0	0.0	0.0	0.0
45%	Filtration Improvements filter media additions (2-6" typical) filter media overhaul backwashing-increase flow/velocity (10-20% increase) backwashing-install surface wash post backwash-sequence (install additional filter (s)) post backwash filter-to-waste filter control systems individual filter turbidimeter installation membrane (microfiltration)	0.0	0.0	0.0	0.0	0.0
20%		0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0
17%		974.8	1302.5	944.5	2763.0	3028.1
		5651.7	15009.6	21852.8	89736.1	206859.2
34%		Administrative Culture Improvements plant staffing-increase (1 or 2 persons) staff qualifications	1264.1	1352.4	1963.3	4003.7
31%	22.9		30.7	22.2	24.1	32.5
2%	Laboratory Modifications bench top turbidimeter purchase-replace obsolete units jar test apparatus purchase alternative process control testing equipment- (streaming current monitor, Zetameter, etc.)	11.1	14.9	10.8	22.0	19.7
		0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	69.4	81.2
100%	Process Control Testing Modification staff training (consultant as trainer)	56.0	74.9	54.4	77.6	69.3

Appendix D-10a: FBR Total Annualized Capital Costs (\$000s) at 3% Cost of Capital for FBR Alternative R1

System Population Size Categories	<100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total					
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636					
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311					
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050					
						-----\$1,000-----										
Install piping to move recycle to headworks	14.7	32.9	24.2	65.8	103.9	241.5	366.3	188.2	2376.4	2931.0	3172.5					
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install variable speed pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install flow equalization basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						241.5				2931.0	3172.5					
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT						359	480	348	711	635	2534	517	93	68	679	3212
						-----\$1,000-----										
Install piping to move recycle to headworks	29.5	66.0	48.6	132.2	208.7	485.0	590.4	368.6	2625.4	3584.4	4069.5					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						485.0				3584.4	4069.5					
DIRECT FILTRATION PLANTS ONLY						35	47	34	70	62	248	58	10	9	77	325
						-----\$1,000-----										
Install sedimentation basin for backwash treatment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						0.0				0.0	0.0					
Total Cost											7241.9					

Appendix D-10b: FBR Total Annualized Capital Costs (\$000s) at 3% Cost of Capital for FBR Alternative R2

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total					
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636					
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311					
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050					
						-----\$1,000-----										
Install piping to move recycle to headworks	14.7	32.9	24.2	65.8	103.9	241.5	366.3	188.2	2376.4	2931.0	3172.5					
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install variable speed pump	0.0	0.0	0.0	0.0	9.4	9.4	5.6	3.8	9.3	18.7	28.1					
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	3.9	3.9	2.1	0.3	0.3	2.7	6.6					
Install flow equalization basin	7.3	23.1	37.1	272.4	162.7	502.4	1310.0	47.6	0.0	1357.6	1860.0					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for NPDES discharge of FBW water	2.7	3.6	2.6	5.4	6.2	20.6	1.9	0.4	1.3	3.6	24.2					
Install piping for POTW discharge of FBW water	2.7	3.6	2.6	5.4	6.2	20.6	0.0	0.0	0.0	0.0	20.6					
Construct lagoon	11.8	17.9	13.8	54.1	40.8	138.3	0.0	0.0	0.0	0.0	138.3					
Subtotal						936.7				4313.6	5250.3					
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT						359	480	348	711	635	2534	517	93	68	679	3212
						-----\$1,000-----										
Install piping to move recycle to headworks	29.5	66.0	48.6	132.2	208.7	485.0	590.4	368.6	2625.4	3584.4	4069.5					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						485.0				3584.4	4069.5					
DIRECT FILTRATION PLANTS ONLY						35	47	34	70	62	248	58	10	9	77	325
						-----\$1,000-----										
Install sedimentation basin for backwash treatment	5.5	7.5	5.7	12.7	14.9	46.3	87.1	46.5	157.1	290.7	337.0					
Install piping for NPDES discharge of FBW water	0.4	0.5	0.3	0.7	0.8	2.7	1.3	0.2	0.6	2.1	4.8					
Install piping for POTW discharge of FBW water	0.2	0.2	0.2	0.4	0.4	1.3	0.4	0.1	0.3	0.8	2.2					
Construct lagoon	0.6	0.9	0.7	2.7	4.0	8.8	0.0	0.0	0.0	0.0	8.8					
Subtotal						59.1				293.7	352.8					
Total Cost											9672.5					

Appendix D-10c: FBR Total Annualized Capital Costs (\$000s) at 3% Cost of Capital for FBR Alternative R3

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total					
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636					
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311					
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050					
						-----\$1,000-----										
Install piping to move recycle to headworks	14.7	32.9	24.2	65.8	103.9	241.5	366.3	188.2	2376.4	2931.0	3172.5					
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install variable speed pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install flow equalization basin	72.8	230.6	370.7	2723.6	3253.5	6651.1	8733.3	1586.1	4068.5	14387.9	21039.0					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						6892.6				17318.9	24211.4					
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT						359	480	348	711	635	2534	517	93	68	679	3212
						-----\$1,000-----										
Install piping to move recycle to headworks	29.5	66.0	48.6	132.2	208.7	485.0	590.4	368.6	2625.4	3584.4	4069.5					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						485.0				3584.4	4069.5					
DIRECT FILTRATION PLANTS ONLY						35	47	34	70	62	248	58	10	9	77	325
						-----\$1,000-----										
Install sedimentation basin for backwash treatment	5.5	7.5	5.7	12.7	14.9	46.3	87.1	46.5	157.1	290.7	337.0					
Install piping for NPDES discharge of FBW water	0.4	0.5	0.3	0.7	0.8	2.7	1.3	0.2	0.6	2.1	4.8					
Install piping for POTW discharge of FBW water	0.2	0.2	0.2	0.4	0.4	1.3	0.4	0.1	0.3	0.8	2.2					
Construct lagoon	0.6	0.9	0.7	2.7	4.0	8.8	0.0	0.0	0.0	0.0	8.8					
Subtotal						59.1				293.7	352.8					
Total Cost											28633.7					

Appendix D-10d: FBR Total Annualized Capital Costs (\$000s) at 3% Cost of Capital for FBR Alternative R4

System Population Size Categories	<100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total					
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636					
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311					
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050					
						-----\$1,000-----										
Install piping to move recycle to headworks	14.7	32.9	24.2	65.8	103.9	241.5	366.3	188.2	2376.4	2931.0	3172.5					
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install variable speed pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install flow equalization basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install sedimentation basin	1677.1	2283.2	1730.3	3888.4	4557.5	14136.5	12783.1	4069.2	17884.6	34736.9	48873.4					
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						14377.9				37667.9	52045.8					
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT						359	480	348	711	635	2534	517	93	68	679	3212
						-----\$1,000-----										
Install piping to move recycle to headworks	29.5	66.0	48.6	132.2	208.7	485.0	590.4	368.6	2625.4	3584.4	4069.5					
Install sedimentation basin	656.9	894.3	677.8	1523.1	1785.1	5537.2	3852.0	2381.0	14892.7	21125.8	26662.9					
Subtotal						6022.2				24710.2	30732.4					
DIRECT FILTRATION PLANTS ONLY						35	47	34	70	62	248	58	10	9	77	325
						-----\$1,000-----										
Install sedimentation basin for backwash treatment	38.4	52.3	39.6	89.1	104.4	323.8	203.3	81.4	274.9	559.6	883.5					
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						323.8				559.6	883.5					
Total Cost											83661.7					

Appendix D-11a: FBR Total Annual Operation & Maintenance Costs for FBR Alternative R1

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total					
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636					
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311					
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050					
						-----\$1,000-----										
Install piping to move recycle to headworks	71.1	98.5	74.1	173.1	212.5	629.3	666.6	219.2	1087.0	1972.8	2602.1					
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install variable speed pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install flow equalization basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						629.3				1972.8	2602.1					
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT						359	480	348	711	635	2534	517	93	68	679	3212
						-----\$1,000-----										
Install piping to move recycle to headworks	142.8	197.9	148.8	347.6	426.9	1264.1	1074.2	429.3	1200.9	2704.4	3968.6					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						1264.1				2704.4	3968.6					
DIRECT FILTRATION PLANTS ONLY						35	47	34	70	62	248	58	10	9	77	325
						-----\$1,000-----										
Install sedimentation basin for backwash treatment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						0.0				0.0	0.0					
Total Cost											6570.7					

- Notes-
- a. In the direct recycle section, the recycle location costs include two additional plants that belong to systems serving more than one million, and the other direct recycle costs include one additional plant.
 - b. In the direct filtration section, the costs include one additional plant that belongs to a system serving more than one million.
 - c. In the direct filtration section, the costs include two additional plants that belong to systems serving more than one million.

Appendix D-11b: FBR Total Annual Operation & Maintenance Costs for FBR Alternative R2

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total					
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636					
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311					
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050					
						-----\$1,000-----										
Install piping to move recycle to headworks	71.1	98.5	74.1	173.1	212.5	629.3	666.6	219.2	1087.0	1972.8	2602.1					
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install variable speed pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install flow equalization basin	70.0	94.9	70.9	144.9	66.7	447.4	332.0	11.4	0.0	343.4	790.8					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for NPDES discharge of FBW water	2.1	2.8	2.0	4.1	9.7	20.6	2.6	0.4	0.8	3.8	24.4					
Install piping for POTW discharge of FBW water	8.7	40.1	75.2	376.4	1028.9	1529.4	0.0	0.0	0.0	0.0	1529.4					
Construct lagoon	24.5	32.7	23.7	48.5	46.4	175.7	0.0	0.0	0.0	0.0	175.7					
Subtotal						2802.5				2320.0	5122.4					
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT						359	480	348	711	635	2534	517	93	68	679	3212
						-----\$1,000-----										
Install piping to move recycle to headworks	142.8	197.9	148.8	347.6	426.9	1264.1	1074.2	429.3	1200.9	2704.4	3968.6					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						1264.1				2704.4	3968.6					
DIRECT FILTRATION PLANTS ONLY						35	47	34	70	62	248	58	10	9	77	325
						-----\$1,000-----										
Install sedimentation basin for backwash treatment	1.6	2.3	1.8	4.4	6.5	16.6	38.2	15.4	49.5	103.1	119.7					
Install piping for NPDES discharge of FBW water	0.3	0.4	0.3	0.5	1.3	2.7	1.8	0.2	0.3	2.4	5.1					
Install piping for POTW discharge of FBW water	0.6	2.6	4.9	24.6	67.3	100.1	251.8	128.7	540.7	921.1	1021.2					
Construct lagoon	1.2	1.6	1.2	2.4	4.6	10.9	0.0	0.0	0.0	0.0	10.9					
Subtotal						130.3				1026.6	1156.9					
Total Cost											10247.9					

- Notes-
- a. In the direct recycle section, the recycle location costs include two additional plants that belong to systems serving more than one million, and the other direct recycle costs include one additional plant.
 - b. In the direct filtration section, the costs include one additional plant that belongs to a system serving more than one million.
 - c. In the direct filtration section, the costs include two additional plants that belong to systems serving more than one million.

Appendix D-11c: FBR Total Annual Operation & Maintenance Costs for FBR Alternative R3

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total					
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636					
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311					
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050					
						-----\$1,000-----										
Install piping to move recycle to headworks	71.1	98.5	74.1	173.1	212.5	629.3	666.6	219.2	1087.0	1972.8	2602.1					
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install variable speed pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install flow equalization basin	699.7	948.8	709.2	1449.5	1333.3	5140.5	2213.2	380.2	539.7	3133.2	8273.7					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						5769.9				5105.9	10875.8					
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT						359	480	348	711	635	2534	517	93	68	679	3212
						-----\$1,000-----										
Install piping to move recycle to headworks	142.8	197.9	148.8	347.6	426.9	1264.1	1074.2	429.3	1200.9	2704.4	3968.6					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						1264.1				2704.4	3968.6					
DIRECT FILTRATION PLANTS ONLY						35	47	34	70	62	248	58	10	9	77	325
						-----\$1,000-----										
Install sedimentation basin for backwash treatment	1.6	2.3	1.8	4.4	6.5	16.6	38.2	15.4	49.5	103.1	119.7					
Install piping for NPDES discharge of FBW water	0.3	0.4	0.3	0.5	1.3	2.7	1.8	0.2	0.3	2.4	5.1					
Install piping for POTW discharge of FBW water	0.6	2.6	4.9	24.6	67.3	100.1	251.8	128.7	540.7	921.1	1021.2					
Construct lagoon	1.2	1.6	1.2	2.4	4.6	10.9	0.0	0.0	0.0	0.0	10.9					
Subtotal						130.3				1026.6	1156.9					
Total Cost											16001.3					

- Notes-
- a. In the direct recycle section, the recycle location costs include two additional plants that belong to systems serving more than one million, and the other direct recycle costs include one additional plant.
 - b. In the direct filtration section, the costs include one additional plant that belongs to a system serving more than one million.
 - c. In the direct filtration section, the costs include two additional plants that belong to systems serving more than one million.

Appendix D-11d: FBR Total Annual Operation & Maintenance Costs for FBR Alternative R4

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total					
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636					
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311					
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050					
						-----\$1,000-----										
Install piping to move recycle to headworks	71.1	98.5	74.1	173.1	212.5	629.3	666.6	219.2	1087.0	1972.8	2602.1					
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install variable speed pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install flow equalization basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install sedimentation basin	502.9	700.7	550.4	1341.3	1990.2	5085.6	5598.1	1346.3	5639.3	12583.7	17669.3					
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						5714.9				14556.5	20271.4					
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT						359	480	348	711	635	2534	517	93	68	679	3212
						-----\$1,000-----										
Install piping to move recycle to headworks	142.8	197.9	148.8	347.6	426.9	1264.1	1074.2	429.3	1200.9	2704.4	3968.6					
Install sedimentation basin	197.0	274.5	215.6	525.4	779.6	1992.0	1686.9	787.8	4695.9	7170.6	9162.6					
Subtotal						3256.1				9875.1	13131.2					
DIRECT FILTRATION PLANTS ONLY						35	47	34	70	62	248	58	10	9	77	325
						-----\$1,000-----										
Install sedimentation basin for backwash treatment	11.5	16.1	12.6	30.7	45.6	116.5	89.0	26.9	86.7	202.6	319.1					
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						116.5				202.6	319.1					
Total Cost											33721.8					

- Notes-
- a. In the direct recycle section, the recycle location costs include two additional plants that belong to systems serving more than one million, and the other direct recycle costs include one additional plant.
 - b. In the direct filtration section, the costs include one additional plant that belongs to a system serving more than one million.
 - c. In the direct filtration section, the costs include two additional plants that belong to systems serving more than one million.

Appendix D-12a: FBR Annual System-Level Treatment Costs at 3% Cost of Capital for FBR Alternative R1

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total					
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636					
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311					
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050					
						-----\$1,000-----										
Install piping to move recycle to headworks	85.8	131.4	98.3	238.9	316.5	870.8	1032.9	407.4	3463.5	4903.8	5774.6					
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install variable speed pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install flow equalization basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal	85.8	131.4	98.3	238.9	316.5	870.8	1032.9	407.4	3463.5	4903.8	5774.6					
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT						359	480	348	711	635	2534	517	93	68	679	3212
						-----\$1,000-----										
Install piping to move recycle to headworks	172.3	264.0	197.4	479.8	635.7	1749.1	1664.6	798.0	3826.3	6288.9	8038.0					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal	172.3	264.0	197.4	479.8	635.7	1749.1	1664.6	798.0	3826.3	6288.9	8038.0					
DIRECT FILTRATION PLANTS ONLY						35	47	34	70	62	248	58	10	9	77	325
						-----\$1,000-----										
Install sedimentation basin for backwash treatment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal Recycle Location Costs	258	395	296	719	952	2620	2698	1205	7290	11193	13813					
Subtotal Direct Recycle Costs	0	0	0	0	0	0	0	0	0	0	0					
Subtotal Direct Filtration Costs	0	0	0	0	0	0	0	0	0	0	0					
Total Cost	258	395	296	719	952	2620	2698	1205	7290	11193	13813					

Appendix D-12b: FBR Annual System-Level Treatment Costs at 3% Cost of Capital for FBR Alternative R2

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total					
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636					
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311					
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050					
						-----\$1,000-----										
Install piping to move recycle to headworks	85.8	131.4	98.3	238.9	316.5	870.8	1032.9	407.4	3463.5	4903.8	5774.6					
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install variable speed pump	0.0	0.0	0.0	0.0	9.4	9.4	5.6	3.8	9.3	18.7	28.1					
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	3.9	3.9	2.1	0.3	0.3	2.7	6.6					
Install flow equalization basin	77.3	117.9	108.0	417.3	229.3	949.8	1642.0	59.0	0.0	1701.0	2650.8					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for NPDES discharge of FBW water	4.8	6.4	4.6	9.5	15.9	41.2	4.5	0.8	2.0	7.4	48.6					
Install piping for POTW discharge of FBW water	11.5	43.8	77.8	381.8	1035.2	1550.0	0.0	0.0	0.0	0.0	1550.0					
Construct lagoon	36.2	50.6	37.5	102.6	87.2	314.0	0.0	0.0	0.0	0.0	314.0					
Subtotal	215.5	350.1	326.2	1150.0	1697.3	3739.2	2687.1	471.3	3475.1	6633.6	10372.7					
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT						359	480	348	711	635	2534	517	93	68	679	3212
						-----\$1,000-----										
Install piping to move recycle to headworks	172.3	264.0	197.4	479.8	635.7	1749.1	1664.6	798.0	3826.3	6288.9	8038.0					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal	172.3	264.0	197.4	479.8	635.7	1749.1	1664.6	798.0	3826.3	6288.9	8038.0					
DIRECT FILTRATION PLANTS ONLY						35	47	34	70	62	248	58	10	9	77	325
						-----\$1,000-----										
Install sedimentation basin for backwash treatment	7.1	9.8	7.5	17.1	21.4	62.9	125.3	61.9	206.6	393.8	456.7					
Install piping for NPDES discharge of FBW water	0.6	0.8	0.6	1.2	2.1	5.4	3.1	0.5	0.9	4.5	9.8					
Install piping for POTW discharge of FBW water	0.8	2.9	5.1	25.0	67.8	101.4	252.2	128.8	541.0	922.0	1023.4					
Construct lagoon	1.8	2.5	1.8	5.0	8.6	19.7	0.0	0.0	0.0	0.0	19.7					
Subtotal	10.3	16.0	15.0	48.4	99.8	189.4	380.6	191.2	748.5	1320.2	1509.7					
Subtotal Recycle Location Costs	258	395	296	719	952	2620	2698	1205	7290	11193	13813					
Subtotal Direct Recycle Costs	130	219	228	911	1381	2868	1654	64	12	1730	4598					
Subtotal Direct Filtration Costs	10	16	15	48	100	189	381	191	748	1320	1510					
Total Cost	398	630	539	1678	2433	5678	4732	1460	8050	14243	19920					

Appendix D-12c: FBR Annual System-Level Treatment Costs at 3% Cost of Capital for FBR Alternative R3

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total					
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636					
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311					
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050					
						-----\$1,000-----										
Install piping to move recycle to headworks	85.8	131.4	98.3	238.9	316.5	870.8	1032.9	407.4	3463.5	4903.8	5774.6					
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install variable speed pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install flow equalization basin	772.5	1179.4	1079.9	4173.1	4586.7	11791.6	10946.5	1966.3	4608.2	17521.0	29312.7					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal	858.3	1310.8	1178.2	4412.0	4903.2	12662.4	11979.4	2373.7	8071.7	22424.8	35087.2					
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT						359	480	348	711	635	2534	517	93	68	679	3212
						-----\$1,000-----										
Install piping to move recycle to headworks	172.3	264.0	197.4	479.8	635.7	1749.1	1664.6	798.0	3826.3	6288.9	8038.0					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal	172.3	264.0	197.4	479.8	635.7	1749.1	1664.6	798.0	3826.3	6288.9	8038.0					
DIRECT FILTRATION PLANTS ONLY						35	47	34	70	62	248	58	10	9	77	325
						-----\$1,000-----										
Install sedimentation basin for backwash treatment	7.1	9.8	7.5	17.1	21.4	62.9	125.3	61.9	206.6	393.8	456.7					
Install piping for NPDES discharge of FBW water	0.6	0.8	0.6	1.2	2.1	5.4	3.1	0.5	0.9	4.5	9.8					
Install piping for POTW discharge of FBW water	0.8	2.9	5.1	25.0	67.8	101.4	252.2	128.8	541.0	922.0	1023.4					
Construct lagoon	1.8	2.5	1.8	5.0	8.6	19.7	0.0	0.0	0.0	0.0	19.7					
Subtotal	10.3	16.0	15.0	48.4	99.8	189.4	380.6	191.2	748.5	1320.2	1509.7					
Subtotal Recycle Location Costs	258	395	296	719	952	2620	2698	1205	7290	11193	13813					
Subtotal Direct Recycle Costs	773	1179	1080	4173	4587	11792	10947	1966	4608	17521	29313					
Subtotal Direct Filtration Costs	10	16	15	48	100	189	381	191	748	1320	1510					
Total Cost	1041	1591	1391	4940	5639	14601	14025	3363	12646	30034	44635					

Appendix D-12d: FBR Annual System-Level Treatment Costs at 3% Cost of Capital for FBR Alternative R4

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total					
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636					
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311					
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050					
						-----\$1,000-----										
Install piping to move recycle to headworks	85.8	131.4	98.3	238.9	316.5	870.8	1032.9	407.4	3463.5	4903.8	5774.6					
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install variable speed pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install flow equalization basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install sedimentation basin	2180.0	2983.9	2280.7	5229.7	6547.7	19222.1	18381.3	5415.5	23523.9	47320.7	66542.7					
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal	2265.8	3115.3	2379.0	5468.6	6864.1	20092.8	19414.2	5822.9	26987.3	52224.4	72317.3					
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT						359	480	348	711	635	2534	517	93	68	679	3212
						-----\$1,000-----										
Install piping to move recycle to headworks	172.3	264.0	197.4	479.8	635.7	1749.1	1664.6	798.0	3826.3	6288.9	8038.0					
Install sedimentation basin	853.9	1168.8	893.4	2048.5	2564.7	7529.2	5538.9	3168.8	19588.7	28296.4	35825.5					
Subtotal	172.3	264.0	197.4	479.8	635.7	9278.3	1664.6	798.0	3826.3	34585.2	43863.6					
DIRECT FILTRATION PLANTS ONLY						35	47	34	70	62	248	58	10	9	77	325
						-----\$1,000-----										
Install sedimentation basin for backwash treatment	49.9	68.4	52.2	119.8	150.0	440.3	292.3	108.3	361.6	762.3	1202.6					
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal	49.9	68.4	52.2	119.8	150.0	440.3	292.3	108.3	361.6	762.3	1202.6					
Subtotal Recycle Location Costs	258	395	296	719	952	2620	2698	1205	7290	11193	13813					
Subtotal Direct Recycle Costs	3034	4153	3174	7278	9112	26751	23920	8584	43113	75617	102368					
Subtotal Direct Filtration Costs	50	68	52	120	150	440	292	108	362	762	1203					
Total Cost	2488	3448	2629	6068	7650	29812	21371	6729	31175	87572	117383					

Appendix E

Appendix E-1: Total Annualized Capital Costs at 7% Cost of Capital
Projected Costs to Meet 0.3 NTU

Performance
 Limitations
 Identified @
 CCP Plants (%
 of time)

		1 NTU Max				
		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
System Population Size Categories						
Number of Systems in Each Size Category		836	1117	810	1655	1478
Projected # of Systems Required to Modify Treatment		341	456	331	675	603
32%	Chemical Addition	-----\$1,000-----				
	install coagulant aid polymer feed capability	14.5	19.4	42.3	143.6	128.3
	install backwash water polymer feed capability	14.5	19.4	14.1	28.7	25.7
	install pH adjustment for enhancing alkalinity purposes	52.4	70.0	38.1	51.8	23.2
15%	Coagulant Improvements					
	primary coagulant feed points, control, measurement	58.0	77.6	56.3	114.9	102.6
14%	Rapid Mixing					
	rapid mix improvements-mechanical	15.7	21.0	14.8	24.0	17.7
	rapid mix improvements-structural	4.6	6.1	5.9	14.6	5.2
29%	Flocculant Improvements					
	flocculation improvements-mechanical	53.8	78.0	79.6	156.7	273.9
	flocculation improvements-structural	25.6	48.2	61.3	168.1	285.8
51%	Settling Improvements					
	equipment modification-weirs, inf/effl, etc.	3.3	11.6	19.7	65.2	125.2
	add tube settlers	4.8	23.0	45.0	224.5	589.5
45%	Filtration Improvements					
20%	filter media additions (2-6" typical)	2.7	8.0	5.2	20.8	69.6
	filter media overhaul	35.4	122.7	238.3	1186.2	2410.3
	backwashing-increase flow/velocity (10-20% increase)	0.0	0.0	0.0	0.0	0.0
	backwashing-install surface wash	47.7	98.6	70.6	208.0	411.3
	post backwash-sequence (install additional filter (s))	33.4	74.1	190.3	1495.1	1848.0
	post backwash filter-to-waste	0.0	0.0	0.0	0.0	0.0
	filter control systems	4.9	11.2	16.4	148.3	158.0
17%	filter control systems	10.3	27.0	32.9	279.4	413.9
	*individual filter turbidimeter installation	489.1	653.5	473.9	1931.6	2373.0
	membrane (microfiltration)	0.0	0.0	0.0	0.0	0.0
34%	Administrative Culture Improvements					
31%	plant staffing-increase (1 or 2 persons)	0.0	0.0	0.0	0.0	0.0
2%	staff qualifications	0.0	0.0	0.0	0.0	0.0
	Laboratory Modifications					
	bench top turbidimeter purchase-replace obsolete units	8.3	11.1	8.1	16.5	14.7
	jar test apparatus purchase	15.1	20.2	14.6	29.8	20.0
	alternative process control testing equipment-(streaming current monitor, Zetameter, etc.)	0.0	0.0	0.0	27.2	24.3
100%	Process Control Testing Modification					
	staff training (consultant as trainer)	78.7	105.2	76.4	109.0	97.4

* Capital costs are annualized over 7 years instead of 20 years.

Appendix E-2: Total Annual Operation O & M Costs

Projected Costs to Meet 0.3 NTU

Performance
Limitations
Identified @
CCP Plants (%
of time)

		1 NTU Max				
		System Population Size Categories				
		Number of Systems in Each Size Category				
		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
Projected # of Systems Required to Modify Treatment		836	1117	810	1655	1478
32%	Chemical Addition install coagulant aid polymer feed capability install backwash water polymer feed capability install pH adjustment for enhancing alkalinity purposes	-----\$1,000-----				
		49.6	66.3	144.4	490.7	615.2
		49.6	66.3	48.1	98.1	122.8
		380.6	520.5	297.5	459.9	369.2
15%	Coagulant Improvements primary coagulant feed points, control, measurement	198.3	265.2	192.5	392.5	492.2
14%	Rapid Mixing rapid mix improvements-mechanical rapid mix improvements-structural	191.2	255.6	146.6	213.1	159.7
		47.8	63.9	48.9	106.6	31.9
29%	Flocculant Improvements flocculation improvements-mechanical flocculation improvements-structural	187.5	260.1	188.8	299.0	433.0
		48.6	65.0	47.2	99.7	144.3
51%	Settling Improvements equipment modification-weirs, inf/effl, etc. add tube settlers	50.6	67.6	147.2	225.2	574.8
		12.6	16.9	36.8	75.1	191.6
45%	Filtration Improvements filter media additions (2-6" typical)	0.0	0.0	0.0	0.0	0.0
20%	filter media overhaul	0.0	0.0	0.0	0.0	0.0
	backwashing-increase flow/velocity (10-20% increase)	0.0	0.0	0.0	0.0	0.0
	backwashing-install surface wash	198.0	292.6	151.7	209.7	531.2
	post backwash-sequence (install additional filter (s))	59.0	92.9	148.3	618.7	700.1
	post backwash filter-to-waste	0.0	0.0	0.0	0.0	0.0
	filter control systems	64.2	92.9	72.5	199.4	257.9
17%	individual filter turbidimeter installation	140.7	215.9	197.2	866.2	2210.8
	membrane (microfiltration)	551.7	737.2	534.6	1092.2	975.4
		0.0	0.0	0.0	0.0	0.0
34%	Administrative Culture Improvements plant staffing-increase (1 or 2 persons)	1264.1	1352.4	1963.3	4003.7	2554.7
31%	staff qualifications	22.9	30.7	22.2	24.1	32.5
2%						
	Laboratory Modifications bench top turbidimeter purchase-replace obsolete units	5.2	7.0	5.1	10.3	9.2
	jar test apparatus purchase	0.0	0.0	0.0	0.0	0.0
	alternative process control testing equipment- (streaming current monitor, Zetameter, etc.)	0.0	0.0	0.0	50.0	63.9
100%	Process Control Testing Modification staff training (consultant as trainer)	0.0	0.0	0.0	0.0	0.0
	Total	3522.2	4468.8	4392.8	9534.1	10470.5

Appendix E-3: Total Annual Treatment Costs at 7% Cost of Capital
Projected Costs to Meet 0.3 NTU

Performance
 Limitations
 Identified @
 CCP Plants (%
 of time)

		1 NTU Max				
System Population Size Categories		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
Number of Systems in Each Size Category		836	1117	810	1655	1478
Projected # of Systems Required to Modify Treatment		341	456	331	675	603

		-----\$1,000-----				
32%	Chemical Addition install coagulant aid polymer feed capability install backwash water polymer feed capability install pH adjustment for enhancing alkalinity purposes	64.1	85.7	186.6	634.3	743.5
		64.1	85.7	62.2	126.9	148.5
		433.0	590.5	335.6	511.8	392.4
15%	Coagulant Improvements primary coagulant feed points, control, measurement	256.3	342.8	248.8	507.4	594.8
14%	Rapid Mixing rapid mix improvements-mechanical rapid mix improvements-structural	206.9	276.7	161.4	237.1	177.4
		52.4	70.0	54.8	121.2	37.1
29%	Flocculant Improvements flocculation improvements-mechanical flocculation improvements-structural	241.3	338.1	268.3	455.7	706.9
		74.2	113.2	108.4	267.7	430.1
51%	Settling Improvements equipment modification-weirs, inf/effl, etc. add tube settlers	53.9	79.2	167.0	290.4	700.0
		17.4	39.9	81.8	299.6	781.1
45%	Filtration Improvements filter media additions (2-6" typical)	2.7	8.0	5.2	20.8	69.6
20%	filter media overhaul	35.4	122.7	238.3	1186.2	2410.3
		0.0	0.0	0.0	0.0	0.0
	backwashing-increase flow/velocity (10-20% increase)	245.7	391.2	222.3	417.6	942.5
	backwashing-install surface wash	92.5	167.0	338.6	2113.8	2548.1
	post backwash-sequence (install additional filter (s))	0.0	0.0	0.0	0.0	0.0
	post backwash filter-to-waste	69.2	104.1	88.9	347.6	415.9
17%	filter control systems	151.0	242.9	230.1	1145.5	2624.7
	individual filter turbidimeter installation	1040.8	1390.7	1008.5	3023.8	3348.4
	membrane (microfiltration)	0.0	0.0	0.0	0.0	0.0
34%	Administrative Culture Improvements plant staffing-increase (1 or 2 persons)	1264.1	1352.4	1963.3	4003.7	2554.7
31%	staff qualifications	22.9	30.7	22.2	24.1	32.5
2%						
	Laboratory Modifications bench top turbidimeter purchase-replace obsolete units	13.5	18.1	13.1	26.8	23.9
	jar test apparatus purchase	15.1	20.2	14.6	29.8	20.0
	alternative process control testing equipment- (streaming current monitor, Zetameter, etc.)	0.0	0.0	0.0	77.2	88.2
100%	Process Control Testing Modification staff training (consultant as trainer)	78.7	105.2	76.4	109.0	97.4

Appendix E-4: Total Annualized Capital Costs at 7% Cost of Capital
Projected Costs to Meet 0.2 NTU

Performance
 Limitations
 Identified @
 CCP Plants (%
 of time)

		1 NTU Max				
System Population Size Categories		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
Number of Systems in Each Size Category		836	1117	810	1655	1478
Projected # of Systems Required to Modify Treatment		341	456	331	675	603

		-----\$1,000-----				
32%	Chemical Addition install coagulant aid polymer feed capability install backwash water polymer feed capability install pH adjustment for enhancing alkalinity purposes	43.5	58.2	42.3	143.6	128.3
		14.5	19.4	14.1	28.7	25.7
		26.2	35.0	25.4	77.8	69.5
15%	Coagulant Improvements primary coagulant feed points, control, measurement	58.0	77.6	56.3	114.9	102.6
14%	Rapid Mixing rapid mix improvements-mechanical rapid mix improvements-structural	15.7	21.0	19.7	36.0	53.0
		4.6	6.1	5.9	14.6	5.2
29%	Flocculant Improvements flocculation improvements-mechanical flocculation improvements-structural	53.8	78.0	79.6	156.7	273.9
		25.6	48.2	61.3	168.1	285.8
51%	Settling Improvements equipment modification-weirs, inf/effl, etc. add tube settlers	3.3	11.6	19.7	65.2	125.2
		4.8	23.0	45.0	224.5	589.5
45%	Filtration Improvements filter media additions (2-6" typical)	2.7	8.0	5.2	20.8	69.6
20%	filter media overhaul	35.4	122.7	238.3	1186.2	2410.3
		0.0	0.0	0.0	0.0	0.0
	backwashing-increase flow/velocity (10-20% increase)	47.7	98.6	70.6	208.0	411.3
	backwashing-install surface wash	33.4	74.1	190.3	1495.1	1848.0
	post backwash-sequence (install additional filter (s))	0.0	0.0	0.0	0.0	0.0
	post backwash filter-to-waste	4.9	11.2	16.4	148.3	158.0
17%	filter control systems	10.3	27.0	32.9	279.4	413.9
	*individual filter turbidimeter installation	489.1	653.5	473.9	1931.6	2373.0
	membrane (microfiltration)	363.9	1398.4	2133.9	9442.8	18622.9
34%	Administrative Culture Improvements plant staffing-increase (1 or 2 persons)	0.0	0.0	0.0	0.0	0.0
31%	staff qualifications	0.0	0.0	0.0	0.0	0.0
2%						
	Laboratory Modifications bench top turbidimeter purchase-replace obsolete units	8.3	11.1	8.1	16.5	14.7
	jar test apparatus purchase	15.1	20.2	14.6	29.8	20.0
	alternative process control testing equipment- (streaming current monitor, Zetameter, etc.)	0.0	0.0	0.0	27.2	24.3
100%	Process Control Testing Modification staff training (consultant as trainer)	78.7	105.2	76.4	109.0	97.4

* Capital costs for these processes and technologies are annualized over 7 years instead of 20 years.

Appendix E-5: Total Annual Operation & Maintenance Costs

Projected Costs to Meet 0.2 NTU

Performance
Limitations
Identified @
CCP Plants (%
of time)

		1 NTU Max				
		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
System Population Size Categories						
Number of Systems in Each Size Category		836	1117	810	1655	1478
Projected # of Systems Required to Modify Treatment		341	456	331	675	603

32%	Chemical Addition	-----\$1,000-----				
	install coagulant aid polymer feed capability	148.7	198.9	144.4	490.7	615.2
	install backwash water polymer feed capability	49.6	66.3	48.1	98.1	122.8
	install pH adjustment for enhancing alkalinity purposes	190.3	260.2	198.3	689.9	1107.7
15%	Coagulant Improvements					
	primary coagulant feed points, control, measurement	198.3	265.2	192.5	392.5	492.2
14%	Rapid Mixing					
	rapid mix improvements-mechanical	191.2	255.6	195.5	319.7	479.0
	rapid mix improvements-structural	47.8	63.9	48.9	106.6	31.9
29%	Flocculant Improvements					
	flocculation improvements-mechanical	187.5	260.1	188.8	299.0	433.0
	flocculation improvements-structural	48.6	65.0	47.2	99.7	144.3
51%	Settling Improvements					
	equipment modification-weirs, inf/effl, etc.	50.6	67.6	147.2	225.2	574.8
	add tube settlers	12.6	16.9	36.8	75.1	191.6
45%	Filtration Improvements					
20%	filter media additions (2-6" typical)	0.0	0.0	0.0	0.0	0.0
	filter media overhaul	0.0	0.0	0.0	0.0	0.0
	backwashing-increase flow/velocity (10-20% increase)	198.0	292.6	151.7	209.7	531.2
	backwashing-install surface wash	59.0	92.9	148.3	618.7	700.1
	post backwash-sequence (install additional filter (s))	0.0	0.0	0.0	0.0	0.0
	post backwash filter-to-waste	64.2	92.9	72.5	199.4	257.9
17%	filter control systems	140.7	215.9	197.2	866.2	2210.8
	individual filter turbidimeter installation	551.7	737.2	534.6	1092.2	975.4
	membrane (microfiltration)	930.7	2164.1	3081.1	12167.8	30288.2
34%	Administrative Culture Improvements					
31%	plant staffing-increase (1 or 2 persons)	1264.1	1352.4	1963.3	4003.7	2554.7
2%	staff qualifications	22.9	30.7	22.2	24.1	32.5
	Laboratory Modifications					
	bench top turbidimeter purchase-replace obsolete units	5.2	7.0	5.1	10.3	9.2
	jar test apparatus purchase	0.0	0.0	0.0	0.0	0.0
	alternative process control testing equipment-(streaming current monitor, Zetameter, etc.)	0.0	0.0	0.0	50.0	63.9
100%	Process Control Testing Modification					
	staff training (consultant as trainer)	0.0	0.0	0.0	0.0	0.0

Appendix E-6: Total Annual Treatment Costs at 7% Cost of Capital
Projected Costs to Meet 0.2 NTU

Performance
 Limitations
 Identified @
 CCP Plants (%
 of time)

		1 NTU Max				
System Population Size Categories		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
Number of Systems in Each Size Category		836	1117	810	1655	1478
Projected # of Systems Required to Modify Treatment		341	456	331	675	603

		-----\$1,000-----				
32%	Chemical Addition install coagulant aid polymer feed capability install backwash water polymer feed capability install pH adjustment for enhancing alkalinity purposes	192.3	257.1	186.6	634.3	743.5
		64.1	85.7	62.2	126.9	148.5
		216.5	295.3	223.7	767.7	1177.1
15%	Coagulant Improvements primary coagulant feed points, control, measurement	256.3	342.8	248.8	507.4	594.8
14%	Rapid Mixing rapid mix improvements-mechanical rapid mix improvements-structural	206.9	276.7	215.2	355.7	532.1
		52.4	70.0	54.8	121.2	37.1
29%	Flocculant Improvements flocculation improvements-mechanical flocculation improvements-structural	241.3	338.1	268.3	455.7	706.9
		74.2	113.2	108.4	267.7	430.1
51%	Settling Improvements equipment modification-weirs, inf/effl, etc. add tube settlers	53.9	79.2	167.0	290.4	700.0
		17.4	39.9	81.8	299.6	781.1
45%	Filtration Improvements filter media additions (2-6" typical)	2.7	8.0	5.2	20.8	69.6
20%	filter media overhaul	35.4	122.7	238.3	1186.2	2410.3
		0.0	0.0	0.0	0.0	0.0
	backwashing-increase flow/velocity (10-20% increase)	245.7	391.2	222.3	417.6	942.5
	backwashing-install surface wash	92.5	167.0	338.6	2113.8	2548.1
	post backwash-sequence (install additional filter (s))	0.0	0.0	0.0	0.0	0.0
	post backwash filter-to-waste	69.2	104.1	88.9	347.6	415.9
17%	filter control systems	151.0	242.9	230.1	1145.5	2624.7
	individual filter turbidimeter installation	1040.8	1390.7	1008.5	3023.8	3348.4
	membrane (microfiltration)	1294.6	3562.5	5215.0	21610.5	48911.1
34%	Administrative Culture Improvements plant staffing-increase (1 or 2 persons)	1264.1	1352.4	1963.3	4003.7	2554.7
31%	staff qualifications	22.9	30.7	22.2	24.1	32.5
2%						
	Laboratory Modifications bench top turbidimeter purchase-replace obsolete units	13.5	18.1	13.1	26.8	23.9
	jar test apparatus purchase	15.1	20.2	14.6	29.8	20.0
	alternative process control testing equipment- (streaming current monitor, Zetameter, etc.)	0.0	0.0	0.0	77.2	88.2
100%	Process Control Testing Modification staff training (consultant as trainer)	78.7	105.2	76.4	109.0	97.4

Appendix E-7: Total Annualized Capital Costs at 7% Cost of Capital
Projected Costs to Meet 0.1 NTU

Performance
 Limitations
 Identified @
 CCP Plants (%
 of time)

		1 NTU Max				
System Population Size Categories		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
Number of Systems in Each Size Category		836	1117	810	1655	1478
Projected # of Systems Required to Modify Treatment		341	456	331	675	603

		-----\$1,000-----				
32%	Chemical Addition install coagulant aid polymer feed capability install backwash water polymer feed capability install pH adjustment for enhancing alkalinity purposes	0.0	0.0	0.0	0.0	0.0
15%	Coagulant Improvements primary coagulant feed points, control, measurement	0.0	0.0	0.0	0.0	0.0
14%	Rapid Mixing rapid mix improvements-mechanical rapid mix improvements-structural	0.0	0.0	0.0	0.0	0.0
29%	Flocculant Improvements flocculation improvements-mechanical flocculation improvements-structural	0.0	0.0	0.0	0.0	0.0
51%	Settling Improvements equipment modification-weirs, inf/effl, etc. add tube settlers	0.0	0.0	0.0	0.0	0.0
45%	Filtration Improvements filter media additions (2-6" typical) filter media overhaul backwashing-increase flow/velocity (10-20% increase) backwashing-install surface wash post backwash-sequence (install additional filter (s)) post backwash filter-to-waste filter control systems *individual filter turbidimeter installation membrane (microfiltration)	0.0	0.0	0.0	0.0	0.0
20%		0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	0.0	0.0
17%		489.1	653.5	473.9	1931.6	2373.0
		1728.4	6642.4	10135.8	44853.2	88458.7
34%		Administrative Culture Improvements plant staffing-increase (1 or 2 persons) staff qualifications	0.0	0.0	0.0	0.0
31%	0.0		0.0	0.0	0.0	0.0
2%	Laboratory Modifications bench top turbidimeter purchase-replace obsolete units jar test apparatus purchase alternative process control testing equipment- (streaming current monitor, Zetameter, etc.)	8.3	11.1	8.1	16.5	14.7
		0.0	0.0	0.0	0.0	0.0
		0.0	0.0	0.0	27.2	24.3
100%	Process Control Testing Modification staff training (consultant as trainer)	78.7	105.2	76.4	109.0	97.4

* Capital costs for these processes and technologies are annualized over 7 years instead of 20 years.

Appendix E-8: Total Annual Operation & Maintenance Costs
Projected Costs to Meet 0.1 NTU

Performance
 Limitations
 Identified @
 CCP Plants (%
 of time)

		1 NTU Max				
		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
System Population Size Categories						
Number of Systems in Each Size Category		836	1117	810	1655	1478
Projected # of Systems Required to Modify Treatment		341	456	331	675	603

32%	Chemical Addition	-----\$1,000-----				
	install coagulant aid polymer feed capability	0.0	0.0	0.0	0.0	0.0
	install backwash water polymer feed capability	0.0	0.0	0.0	0.0	0.0
	install pH adjustment for enhancing alkalinity purposes	0.0	0.0	0.0	0.0	0.0
15%	Coagulant Improvements					
	primary coagulant feed points, control, measurement	0.0	0.0	0.0	0.0	0.0
14%	Rapid Mixing					
	rapid mix improvements-mechanical	0.0	0.0	0.0	0.0	0.0
	rapid mix improvements-structural	0.0	0.0	0.0	0.0	0.0
29%	Flocculant Improvements					
	flocculation improvements-mechanical	0.0	0.0	0.0	0.0	0.0
	flocculation improvements-structural	0.0	0.0	0.0	0.0	0.0
51%	Settling Improvements					
	equipment modification-weirs, inf/effl, etc.	0.0	0.0	0.0	0.0	0.0
	add tube settlers	0.0	0.0	0.0	0.0	0.0
45%	Filtration Improvements					
20%	filter media additions (2-6" typical)	0.0	0.0	0.0	0.0	0.0
	filter media overhaul	0.0	0.0	0.0	0.0	0.0
	backwashing-increase flow/velocity (10-20% increase)	0.0	0.0	0.0	0.0	0.0
	backwashing-install surface wash	0.0	0.0	0.0	0.0	0.0
	post backwash-sequence (install additional filter (s))	0.0	0.0	0.0	0.0	0.0
	post backwash filter-to-waste	0.0	0.0	0.0	0.0	0.0
17%	filter control systems	0.0	0.0	0.0	0.0	0.0
	individual filter turbidimeter installation	551.7	737.2	534.6	1092.2	975.4
	membrane (microfiltration)	4421.0	10279.6	14635.3	57796.9	143869.2
34%	Administrative Culture Improvements					
31%	plant staffing-increase (1 or 2 persons)	1264.1	1352.4	1963.3	4003.7	2554.7
2%	staff qualifications	22.9	30.7	22.2	24.1	32.5
	Laboratory Modifications					
	bench top turbidimeter purchase-replace obsolete units	5.2	7.0	5.1	10.3	9.2
	jar test apparatus purchase	0.0	0.0	0.0	0.0	0.0
	alternative process control testing equipment-(streaming current monitor, Zetameter, etc.)	0.0	0.0	0.0	50.0	63.9
100%	Process Control Testing Modification					
	staff training (consultant as trainer)	0.0	0.0	0.0	0.0	0.0

Appendix E-9: Total Annual Treatment Costs at 7% Cost of Capital
Projected Costs to Meet 0.1 NTU

Performance
 Limitations
 Identified @
 CCP Plants (%
 of time)

System Population Size Categories Number of Systems in Each Size Category Projected # of Systems Required to Modify Treatment	1 NTU Max				
	<100	101-500	501-1,000	1,001-3,300	3,301-10,000
	836	1117	810	1655	1478

		-----\$1,000-----				
32%	Chemical Addition install coagulant aid polymer feed capability install backwash water polymer feed capability install pH adjustment for enhancing alkalinity purposes	0.0	0.0	0.0	0.0	0.0
15%	Coagulant Improvements primary coagulant feed points, control, measurement	0.0	0.0	0.0	0.0	0.0
14%	Rapid Mixing rapid mix improvements-mechanical rapid mix improvements-structural	0.0	0.0	0.0	0.0	0.0
29%	Flocculant Improvements flocculation improvements-mechanical flocculation improvements-structural	0.0	0.0	0.0	0.0	0.0
51%	Settling Improvements equipment modification-weirs, inf/effl, etc. add tube settlers	0.0	0.0	0.0	0.0	0.0
45%	Filtration Improvements filter media additions (2-6" typical) filter media overhaul	0.0	0.0	0.0	0.0	0.0
20%	backwashing-increase flow/velocity (10-20% increase)	0.0	0.0	0.0	0.0	0.0
	backwashing-install surface wash	0.0	0.0	0.0	0.0	0.0
	post backwash-sequence (install additional filter (s))	0.0	0.0	0.0	0.0	0.0
	post backwash filter-to-waste	0.0	0.0	0.0	0.0	0.0
17%	filter control systems	0.0	0.0	0.0	0.0	0.0
	individual filter turbidimeter installation	1040.8	1390.7	1008.5	3023.8	3348.4
	membrane (microfiltration)	6149.4	16922.0	24771.1	102650.1	232327.9
34%	Administrative Culture Improvements plant staffing-increase (1 or 2 persons)	1264.1	1352.4	1963.3	4003.7	2554.7
31%	staff qualifications	22.9	30.7	22.2	24.1	32.5
2%	Laboratory Modifications bench top turbidimeter purchase-replace obsolete units	13.5	18.1	13.1	26.8	23.9
	jar test apparatus purchase	0.0	0.0	0.0	0.0	0.0
	alternative process control testing equipment- (streaming current monitor, Zetameter, etc.)	0.0	0.0	0.0	77.2	88.2
100%	Process Control Testing Modification staff training (consultant as trainer)	78.7	105.2	76.4	109.0	97.4

Appendix E-10a: FBR Total Annualized Capital Costs at 7% Cost of Capital for FBR Alternative R1

System Population Size Categories	<100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001-50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total					
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636					
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311					
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050					
						-----\$1,000-----										
Install piping to move recycle to headworks	20.6	46.2	34.0	92.4	145.9	339.1	514.5	264.3	3337.3	4116.1	4455.2					
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install variable speed pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install flow equalization basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						339.1				4116.1	4455.2					
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT						359	480	348	711	635	2534	517	93	68	679	3212
						-----\$1,000-----										
Install piping to move recycle to headworks	41.5	92.7	68.2	185.6	293.1	681.1	829.1	517.7	3686.9	5033.7	5714.9					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						681.1				5033.7	5714.9					
DIRECT FILTRATION PLANTS ONLY						35	47	34	70	62	248	58	10	9	77	325
						-----\$1,000-----										
Install sedimentation basin for backwash treatment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						0.0				0.0	0.0					
Total Cost											10170.0					

Appendix E-10b: FBR Total Annualized Capital Costs at 7% Cost of Capital for FBR Alternative R2

System Population Size Categories	<100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001-50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total					
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636					
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311					
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050					
						-----\$1,000-----										
Install piping to move recycle to headworks	20.6	46.2	34.0	92.4	145.9	339.1	514.5	264.3	3337.3	4116.1	4455.2					
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install variable speed pump	0.0	0.0	0.0	0.0	13.2	13.2	7.9	5.3	13.1	26.3	39.5					
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	5.5	5.5	2.9	0.4	0.5	3.8	9.3					
Install flow equalization basin	10.2	32.4	52.1	382.5	228.4	705.6	1839.7	66.8	0.0	1906.5	2612.1					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for NPDES discharge of FBW water	3.8	5.1	3.7	7.6	8.8	28.9	2.7	0.6	1.8	5.1	34.0					
Install piping for POTW discharge of FBW water	3.8	5.1	3.7	7.6	8.8	28.9	0.0	0.0	0.0	0.0	28.9					
Construct lagoon	16.5	25.1	19.4	76.0	57.3	194.2	0.0	0.0	0.0	0.0	194.2					
Subtotal						1315.4				6057.7	7373.1					
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT						359	480	348	711	635	2534	517	93	68	679	3212
						-----\$1,000-----										
Install piping to move recycle to headworks	41.5	92.7	68.2	185.6	293.1	681.1	829.1	517.7	3686.9	5033.7	5714.9					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						681.1				5033.7	5714.9					
DIRECT FILTRATION PLANTS ONLY						35	47	34	70	62	248	58	10	9	77	325
						-----\$1,000-----										
Install sedimentation basin for backwash treatment	7.7	10.5	8.0	17.9	20.9	65.0	122.4	65.3	220.6	408.3	473.3					
Install piping for NPDES discharge of FBW water	0.5	0.7	0.5	1.0	1.1	3.8	1.8	0.3	0.8	3.0	6.7					
Install piping for POTW discharge of FBW water	0.2	0.3	0.2	0.5	0.6	1.9	0.6	0.2	0.4	1.2	3.1					
Construct lagoon	0.8	1.2	1.0	3.7	5.6	12.3	0.0	0.0	0.0	0.0	12.3					
Subtotal						83.0				412.4	495.4					
Total Cost											13583.4					

Appendix E-10c: FBR Total Annualized Capital Costs at 7% Cost of Capital for FBR Alternative R3

System Population Size Categories	<100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001-50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total					
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636					
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311					
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050					
						-----\$1,000-----										
Install piping to move recycle to headworks	20.6	46.2	34.0	92.4	145.9	339.1	514.5	264.3	3337.3	4116.1	4455.2					
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install variable speed pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install flow equalization basin	102.2	323.8	520.6	3824.9	4568.9	9340.3	12264.4	2227.4	5713.5	20205.3	29545.6					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						9679.4				24321.4	34000.8					
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT						359	480	348	711	635	2534	517	93	68	679	3212
						-----\$1,000-----										
Install piping to move recycle to headworks	41.5	92.7	68.2	185.6	293.1	681.1	829.1	517.7	3686.9	5033.7	5714.9					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						681.1				5033.7	5714.9					
DIRECT FILTRATION PLANTS ONLY						35	47	34	70	62	248	58	10	9	77	325
						-----\$1,000-----										
Install sedimentation basin for backwash treatment	7.7	10.5	8.0	17.9	20.9	65.0	122.4	65.3	220.6	408.3	473.3					
Install piping for NPDES discharge of FBW water	0.5	0.7	0.5	1.0	1.1	3.8	1.8	0.3	0.8	3.0	6.7					
Install piping for POTW discharge of FBW water	0.2	0.3	0.2	0.5	0.6	1.9	0.6	0.2	0.4	1.2	3.1					
Construct lagoon	0.8	1.2	1.0	3.7	5.6	12.3	0.0	0.0	0.0	0.0	12.3					
Subtotal						83.0				412.4	495.4					
Total Cost											40211.1					

Appendix E-10d: FBR Total Annualized Capital Costs at 7% Cost of Capital for FBR Alternative R4

System Population Size Categories	<100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001-50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050
Install piping to move recycle to headworks	20.6	46.2	34.0	92.4	145.9	339.1	514.5	264.3	3337.3	4116.1	4455.2
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install variable speed pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install flow equalization basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install sedimentation basin	2355.1	3206.4	2429.9	5460.6	6400.2	19852.2	17951.7	5714.5	25115.8	48782.0	68634.3
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal						20191.3				52898.1	73089.4
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT	359	480	348	711	635	2534	517	93	68	679	3212
Install piping to move recycle to headworks	41.5	92.7	68.2	185.6	293.1	681.1	829.1	517.7	3686.9	5033.7	5714.9
Install sedimentation basin	922.5	1255.9	951.8	2138.9	2506.9	7776.0	5409.4	3343.8	20914.3	29667.5	37443.5
Subtotal						8457.2				34701.2	43158.4
DIRECT FILTRATION PLANTS ONLY	35	47	34	70	62	248	58	10	9	77	325
Install sedimentation basin for backwash treatment	54.0	73.5	55.7	125.1	146.6	454.8	285.5	114.3	386.1	785.9	1240.7
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal						454.8				785.9	1240.7
Total Cost											117488.5

Appendix E-11a: FBR Total Annual Operation & Maintenance Costs for FBR Alternative R1

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total					
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636					
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311					
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050					
						-----\$1,000-----										
Install piping to move recycle to headworks	71.1	98.5	74.1	173.1	212.5	629.3	666.6	219.2	1087.0	1972.8	2602.1					
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install variable speed pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install flow equalization basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						629.3				1972.8	2602.1					
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT						359	480	348	711	635	2534	517	93	68	679	3212
						-----\$1,000-----										
Install piping to move recycle to headworks	142.8	197.9	148.8	347.6	426.9	1264.1	1074.2	429.3	1200.9	2704.4	3968.6					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						1264.1				2704.4	3968.6					
DIRECT FILTRATION PLANTS ONLY						35	47	34	70	62	248	58	10	9	77	325
						-----\$1,000-----										
Install sedimentation basin for backwash treatment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						0.0				0.0	0.0					
Total Cost											6570.7					

- Notes-
- a. In the direct recycle section, the recycle location costs include two additional plants that belong to systems serving more than one million, and the other direct recycle costs include one additional plant.
 - b. In the direct filtration section, the costs include one additional plant that belongs to a system serving more than one million.
 - c. In the direct filtration section, the costs include two additional plants that belong to systems serving more than one million.

Appendix E-11b: FBR Total Annual Operation & Maintenance Costs for FBR Alternative R2

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total					
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636					
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311					
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050					
						-----\$1,000-----										
Install piping to move recycle to headworks	71.1	98.5	74.1	173.1	212.5	629.3	666.6	219.2	1087.0	1972.8	2602.1					
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install variable speed pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install flow equalization basin	70.0	94.9	70.9	144.9	66.7	447.4	332.0	11.4	0.0	343.4	790.8					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for NPDES discharge of FBW water	2.1	2.8	2.0	4.1	9.7	20.6	2.6	0.4	0.8	3.8	24.4					
Install piping for POTW discharge of FBW water	8.7	40.1	75.2	376.4	1028.9	1529.4	0.0	0.0	0.0	0.0	1529.4					
Construct lagoon	24.5	32.7	23.7	48.5	46.4	175.7	0.0	0.0	0.0	0.0	175.7					
Subtotal						2802.5				2320.0	5122.4					
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT						359	480	348	711	635	2534	517	93	68	679	3212
						-----\$1,000-----										
Install piping to move recycle to headworks	142.8	197.9	148.8	347.6	426.9	1264.1	1074.2	429.3	1200.9	2704.4	3968.6					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						1264.1				2704.4	3968.6					
DIRECT FILTRATION PLANTS ONLY						35	47	34	70	62	248	58	10	9	77	325
						-----\$1,000-----										
Install sedimentation basin for backwash treatment	1.6	2.3	1.8	4.4	6.5	16.6	38.2	15.4	49.5	103.1	119.7					
Install piping for NPDES discharge of FBW water	0.3	0.4	0.3	0.5	1.3	2.7	1.8	0.2	0.3	2.4	5.1					
Install piping for POTW discharge of FBW water	0.6	2.6	4.9	24.6	67.3	100.1	251.8	128.7	540.7	921.1	1021.2					
Construct lagoon	1.2	1.6	1.2	2.4	4.6	10.9	0.0	0.0	0.0	0.0	10.9					
Subtotal						130.3				1026.6	1156.9					
Total Cost											10247.9					

- Notes-
- a. In the direct recycle section, the recycle location costs include two additional plants that belong to systems serving more than one million, and the other direct recycle costs include one additional plant.
 - b. In the direct filtration section, the costs include one additional plant that belongs to a system serving more than one million.
 - c. In the direct filtration section, the costs include two additional plants that belong to systems serving more than one million.

Appendix E-11c: FBR Total Annual Operation & Maintenance Costs for FBR Alternative R3

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total					
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636					
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311					
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050					
						-----\$1,000-----										
Install piping to move recycle to headworks	71.1	98.5	74.1	173.1	212.5	629.3	666.6	219.2	1087.0	1972.8	2602.1					
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install variable speed pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install flow equalization basin	699.7	948.8	709.2	1449.5	1333.3	5140.5	2213.2	380.2	539.7	3133.2	8273.7					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						5769.9				5105.9	10875.8					
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT						359	480	348	711	635	2534	517	93	68	679	3212
						-----\$1,000-----										
Install piping to move recycle to headworks	142.8	197.9	148.8	347.6	426.9	1264.1	1074.2	429.3	1200.9	2704.4	3968.6					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						1264.1				2704.4	3968.6					
DIRECT FILTRATION PLANTS ONLY						35	47	34	70	62	248	58	10	9	77	325
						-----\$1,000-----										
Install sedimentation basin for backwash treatment	1.6	2.3	1.8	4.4	6.5	16.6	38.2	15.4	49.5	103.1	119.7					
Install piping for NPDES discharge of FBW water	0.3	0.4	0.3	0.5	1.3	2.7	1.8	0.2	0.3	2.4	5.1					
Install piping for POTW discharge of FBW water	0.6	2.6	4.9	24.6	67.3	100.1	251.8	128.7	540.7	921.1	1021.2					
Construct lagoon	1.2	1.6	1.2	2.4	4.6	10.9	0.0	0.0	0.0	0.0	10.9					
Subtotal						130.3				1026.6	1156.9					
Total Cost											16001.3					

- Notes-
- a. In the direct recycle section, the recycle location costs include two additional plants that belong to systems serving more than one million, and the other direct recycle costs include one additional plant.
 - b. In the direct filtration section, the costs include one additional plant that belongs to a system serving more than one million.
 - c. In the direct filtration section, the costs include two additional plants that belong to systems serving more than one million.

Appendix E-11d: FBR Total Annual Operation & Maintenance Costs for FBR Alternative R4

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total					
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636					
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311					
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050					
						-----\$1,000-----										
Install piping to move recycle to headworks	71.1	98.5	74.1	173.1	212.5	629.3	666.6	219.2	1087.0	1972.8	2602.1					
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install variable speed pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install flow equalization basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install sedimentation basin	502.9	700.7	550.4	1341.3	1990.2	5085.6	5598.1	1346.3	5639.3	12583.7	17669.3					
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						5714.9				14556.5	20271.4					
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT						359	480	348	711	635	2534	517	93	68	679	3212
						-----\$1,000-----										
Install piping to move recycle to headworks	142.8	197.9	148.8	347.6	426.9	1264.1	1074.2	429.3	1200.9	2704.4	3968.6					
Install sedimentation basin	197.0	274.5	215.6	525.4	779.6	1992.0	1686.9	787.8	4695.9	7170.6	9162.6					
Subtotal						3256.1				9875.1	13131.2					
DIRECT FILTRATION PLANTS ONLY						35	47	34	70	62	248	58	10	9	77	325
						-----\$1,000-----										
Install sedimentation basin for backwash treatment	11.5	16.1	12.6	30.7	45.6	116.5	89.0	26.9	86.7	202.6	319.1					
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal						116.5				202.6	319.1					
Total Cost											33721.8					

- Notes-
- a. In the direct recycle section, the recycle location costs include two additional plants that belong to systems serving more than one million, and the other direct recycle costs include one additional plant.
 - b. In the direct filtration section, the costs include one additional plant that belongs to a system serving more than one million.
 - c. In the direct filtration section, the costs include two additional plants that belong to systems serving more than one million.

Appendix E-12a: FBR Total Annual Treatment Costs at 7% Cost of Capital for FBR Alternative R1

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050
-----\$1,000-----											
Install piping to move recycle to headworks	91.7	144.7	108.1	265.5	358.5	968.4	1181.0	483.5	4424.3	6088.9	7057.3
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install variable speed pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install flow equalization basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	91.7	144.7	108.1	265.5	358.5	968.4	1181.0	483.5	4424.3	6088.9	7057.3
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT	359	480	348	711	635	2534	517	93	68	679	3212
-----\$1,000-----											
Install piping to move recycle to headworks	184.2	290.6	217.1	533.3	720.0	1945.2	1903.3	947.0	4887.8	7738.2	9683.4
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	184.2	290.6	217.1	533.3	720.0	1945.2	1903.3	947.0	4887.8	7738.2	9683.4
DIRECT FILTRATION PLANTS ONLY	35	47	34	70	62	248	58	10	9	77	325
-----\$1,000-----											
Install sedimentation basin for backwash treatment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal Recycle Location Costs	276	435	325	799	1079	2914	3084	1431	9312	13827	16741
Subtotal Direct Recycle Costs	0	0	0	0	0	0	0	0	0	0	0
Subtotal Direct Filtration Costs	0	0	0	0	0	0	0	0	0	0	0
Total Cost	276	435	325	799	1079	2914	3084	1431	9312	13827	16741

Appendix E-12b: FBR Total Annual Treatment Costs at 7% Cost of Capital for FBR Alternative R2

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total					
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636					
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311					
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050					
						-----\$1,000-----										
Install piping to move recycle to headworks	91.7	144.7	108.1	265.5	358.5	968.4	1181.0	483.5	4424.3	6088.9	7057.3					
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install variable speed pump	0.0	0.0	0.0	0.0	13.2	13.2	7.9	5.3	13.1	26.3	39.5					
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	5.5	5.5	2.9	0.4	0.5	3.8	9.3					
Install flow equalization basin	80.2	127.3	123.0	527.4	295.1	1153.0	2171.6	78.2	0.0	2249.9	3402.8					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for NPDES discharge of FBW water	5.9	7.9	5.7	11.7	18.4	49.6	5.3	1.0	2.5	8.8	58.4					
Install piping for POTW discharge of FBW water	12.6	45.2	78.9	384.0	1037.7	1558.3	0.0	0.0	0.0	0.0	1558.3					
Construct lagoon	41.0	57.8	43.1	124.4	103.6	369.9	0.0	0.0	0.0	0.0	369.9					
Subtotal	231.4	382.9	358.7	1313.0	1832.0	4117.9	3368.8	568.4	4440.4	8377.7	12495.6					
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT						359	480	348	711	635	2534	517	93	68	679	3212
						-----\$1,000-----										
Install piping to move recycle to headworks	184.2	290.6	217.1	533.3	720.0	1945.2	1903.3	947.0	4887.8	7738.2	9683.4					
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal	184.2	290.6	217.1	533.3	720.0	1945.2	1903.3	947.0	4887.8	7738.2	9683.4					
DIRECT FILTRATION PLANTS ONLY						35	47	34	70	62	248	58	10	9	77	325
						-----\$1,000-----										
Install sedimentation basin for backwash treatment	9.4	12.8	9.8	22.3	27.5	81.6	160.5	80.7	270.1	511.4	593.0					
Install piping for NPDES discharge of FBW water	0.8	1.0	0.7	1.5	2.4	6.5	3.6	0.6	1.1	5.3	11.8					
Install piping for POTW discharge of FBW water	0.8	3.0	5.2	25.1	67.9	102.0	252.4	128.8	541.1	922.3	1024.3					
Construct lagoon	2.0	2.8	2.1	6.1	10.2	23.2	0.0	0.0	0.0	0.0	23.2					
Subtotal	13.0	19.6	17.8	55.0	108.0	213.3	416.5	210.1	812.3	1439.0	1652.3					
Subtotal Recycle Location Costs	276	435	325	799	1079	2914	3084	1431	9312	13827	16741					
Subtotal Direct Recycle Costs	140	238	251	1048	1474	3149	2188	85	16	2289	5438					
Subtotal Direct Filtration Costs	13	20	18	55	108	213	417	210	812	1439	1652					
Total Cost	429	693	594	1901	2660	6276	5689	1726	10141	17555	23831					

Appendix E-12c: FBR Total Annual Treatment Costs at 7% Cost of Capital for FBR Alternative R3

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050
-----\$1,000-----											
Install piping to move recycle to headworks	91.7	144.7	108.1	265.5	358.5	968.4	1181.0	483.5	4424.3	6088.9	7057.3
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install variable speed pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install flow equalization basin	801.9	1272.7	1229.8	5274.3	5902.2	14480.9	14477.6	2607.6	6253.3	23338.5	37819.3
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	893.6	1417.4	1337.8	5539.8	6260.7	15449.3	15658.6	3091.1	10677.6	29427.3	44876.6
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT	359	480	348	711	635	2534	517	93	68	679	3212
-----\$1,000-----											
Install piping to move recycle to headworks	184.2	290.6	217.1	533.3	720.0	1945.2	1903.3	947.0	4887.8	7738.2	9683.4
Install sedimentation basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	184.2	290.6	217.1	533.3	720.0	1945.2	1903.3	947.0	4887.8	7738.2	9683.4
DIRECT FILTRATION PLANTS ONLY	35	47	34	70	62	248	58	10	9	77	325
-----\$1,000-----											
Install sedimentation basin for backwash treatment	9.4	12.8	9.8	22.3	27.5	81.6	160.5	80.7	270.1	511.4	593.0
Install piping for NPDES discharge of FBW water	0.8	1.0	0.7	1.5	2.4	6.5	3.6	0.6	1.1	5.3	11.8
Install piping for POTW discharge of FBW water	0.8	3.0	5.2	25.1	67.9	102.0	252.4	128.8	541.1	922.3	1024.3
Construct lagoon	2.0	2.8	2.1	6.1	10.2	23.2	0.0	0.0	0.0	0.0	23.2
Subtotal	13.0	19.6	17.8	55.0	108.0	213.3	416.5	210.1	812.3	1439.0	1652.3
Subtotal Recycle Location Costs	276	435	325	799	1079	2914	3084	1431	9312	13827	16741
Subtotal Direct Recycle Costs	802	1273	1230	5274	5902	14481	14478	2608	6253	23338	37819
Subtotal Direct Filtration Costs	13	20	18	55	108	213	417	210	812	1439	1652
Total Cost	1091	1728	1573	6128	7089	17608	17978	4248	16378	38604	56212

Appendix E-12d: FBR Total Annual Treatment Costs at 7% Cost of Capital for FBR Alternative R4

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total					
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636					
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311					
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050					
						-----\$1,000-----										
Install piping to move recycle to headworks	91.7	144.7	108.1	265.5	358.5	968.4	1181.0	483.5	4424.3	6088.9	7057.3					
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install variable speed pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install flow equalization basin	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install sedimentation basin	2858.1	3907.1	2980.4	6801.9	8390.4	24937.8	23549.9	7060.8	30755.1	61365.8	86303.6					
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal	2949.8	4051.8	3088.4	7067.4	8748.9	25906.2	24730.9	7544.3	35179.4	67454.6	93360.9					
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT						359	480	348	711	635	2534	517	93	68	679	3212
						-----\$1,000-----										
Install piping to move recycle to headworks	184.2	290.6	217.1	533.3	720.0	1945.2	1903.3	947.0	4887.8	7738.2	9683.4					
Install sedimentation basin	1119.5	1530.4	1167.4	2664.3	3286.5	9768.0	7096.3	4131.5	25610.2	36838.1	46606.1					
Subtotal	1303.7	1821.0	1384.5	3197.5	4006.5	11713.3	8999.6	5078.6	30498.0	44576.3	56289.5					
DIRECT FILTRATION PLANTS ONLY						35	47	34	70	62	248	58	10	9	77	325
						-----\$1,000-----										
Install sedimentation basin for backwash treatment	65.5	89.5	68.3	155.8	192.2	571.3	374.5	141.3	472.8	988.5	1559.8					
Install piping for NPDES discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Install piping for POTW discharge of FBW water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Construct lagoon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					
Subtotal	65.5	89.5	68.3	155.8	192.2	571.3	374.5	141.3	472.8	988.5	1559.8					
Subtotal Recycle Location Costs	276	435	325	799	1079	2914	3084	1431	9312	13827	16741					
Subtotal Direct Recycle Costs	3978	5438	4148	9466	11677	34706	30646	11192	56365	98204	132910					
Subtotal Direct Filtration Costs	65	90	68	156	192	571	375	141	473	989	1560					
Total Cost	4319	5962	4541	10421	12948	38191	34105	12764	66150	113019	151210					

Appendix F

Appendix F-1: Annualized System-Level Capital Costs (cents/kilogallon) at 3% Cost of Capital

Performance
Limitations
Identified @
CCP Plants (%
of time)

		1 NTU Max				
		≤100	101-500	501-1,000	1,001-3,300	3,301-10,000
System Population Size Categories						
Number of Systems in Each Size Category		836	1117	810	1655	1478
Projected # of Systems Required to Modify Treatment		341	456	331	675	603
32%	Chemical Addition install coagulant aid polymer feed capability install backwash water polymer feed capability install pH adjustment for enhancing alkalinity purposes	-----cents-----				
		7.5	1.9	0.7	0.3	0.1
		7.5	1.9	0.7	0.3	0.1
		6.7	1.7	0.6	0.3	0.1
15%	Coagulant Improvements primary coagulant feed points, control, measurement	7.5	1.9	0.7	0.3	0.1
14%	Rapid Mixing rapid mix improvements-mechanical rapid mix improvements-structural	2.0	0.5	0.2	0.1	0.1
		2.4	0.6	0.3	0.1	0.1
29%	Flocculant Improvements flocculation improvements-mechanical flocculation improvements-structural	6.9	1.9	1.0	0.5	0.3
		13.2	4.7	3.0	1.6	1.0
51%	Settling Improvements equipment modification-weirs, inf/effl, etc. add tube settlers	0.4	0.3	0.2	0.2	0.2
		2.4	2.2	2.2	2.2	2.1
45%	Filtration Improvements filter media additions (2-6" typical)	0.3	0.2	0.1	0.1	0.1
20%	filter media overhaul	6.1	6.0	5.9	5.8	4.3
		0.0	0.0	0.0	0.0	0.0
	backwashing-increase flow/velocity (10-20% increase)	8.2	3.2	1.7	2.0	1.5
	backwashing-install surface wash	8.6	3.6	2.3	3.6	1.7
	post backwash-sequence (install additional filter (s))	13.4	7.9	4.9	2.1	0.9
	post backwash filter-to-waste	2.5	1.1	0.8	1.4	0.6
17%	filter control systems	1.8	0.9	0.5	0.9	0.4
	individual filter turbidimeter installation	7.8	2.0	0.7	0.6	0.3
	membrane (microfiltration)	46.9	34.0	26.3	23.0	16.8
34%	Administrative Culture Improvements plant staffing-increase (1 or 2 persons)	0.0	0.0	0.0	0.0	0.0
31%	staff qualifications	0.0	0.0	0.0	0.0	0.0
2%						
	Laboratory Modifications bench top turbidimeter purchase-replace obsolete units	1.1	0.3	0.1	0.0	0.0
	jar test apparatus purchase	1.9	0.5	0.2	0.1	0.0
	alternative process control testing equipment- (streaming current monitor, Zetameter, etc.)	7.1	1.8	0.7	0.3	0.1
100%	Process Control Testing Modification staff training (consultant as trainer)	4.1	1.0	0.4	0.2	0.1

Appendix F-2: Annualized System-Level Capital Costs (cents/kgal) at 7% Cost of Capital

Performance
Limitations
Identified @
CCP Plants (%
of time)

		1 NTU Max				
		System Population Size Categories				
		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
		Number of Systems in Each Size Category				
		836	1117	810	1655	1478
		Projected # of Systems Required to Modify Treatment				
		341	456	331	675	603
32%	Chemical Addition	-----cents-----				
	install coagulant aid polymer feed capability	33.6	8.5	3.1	1.1	0.3
	install backwash water polymer feed capability	33.6	8.5	3.1	1.1	0.3
	install pH adjustment for enhancing alkalinity purposes	30.3	7.7	2.8	1.0	0.3
15%	Coagulant Improvements					
	primary coagulant feed points, control, measurement	33.6	8.5	3.1	1.1	0.3
14%	Rapid Mixing					
	rapid mix improvements-mechanical	9.1	2.3	1.1	0.5	0.2
	rapid mix improvements-structural	10.6	2.7	1.3	0.6	0.3
29%	Flocculant Improvements					
	flocculation improvements-mechanical	31.1	8.5	4.4	2.0	1.1
	flocculation improvements-structural	59.2	21.1	13.6	6.4	3.5
51%	Settling Improvements					
	equipment modification-weirs, inf/effl, etc.	1.9	1.3	1.1	0.8	0.5
	add tube settlers	11.0	10.1	10.0	8.6	7.2
45%	Filtration Improvements					
20%	filter media additions (2-6" typical)	1.5	0.9	0.6	0.4	0.4
	filter media overhaul	27.3	26.8	26.4	22.6	14.6
	backwashing-increase flow/velocity (10-20% increase)	0.0	0.0	0.0	0.0	0.0
	backwashing-install surface wash	36.8	14.4	7.8	7.9	5.0
	post backwash-sequence (install additional filter (s))	38.7	16.2	10.5	14.2	5.6
	post backwash filter-to-waste	60.3	35.3	21.9	8.0	3.1
	filter control systems	11.4	4.9	3.6	5.7	1.9
17%	individual filter turbidimeter installation	8.0	3.9	2.4	3.5	1.3
	membrane (microfiltration)	28.9	7.3	2.7	1.9	0.7
		210.6	152.8	118.2	90.0	56.6
34%	Administrative Culture Improvements					
31%	plant staffing-increase (1 or 2 persons)	0.0	0.0	0.0	0.0	0.0
2%	staff qualifications	0.0	0.0	0.0	0.0	0.0
	Laboratory Modifications					
	bench top turbidimeter purchase-replace obsolete units	4.8	1.2	0.4	0.2	0.0
	jar test apparatus purchase	8.7	2.2	0.8	0.3	0.1
	alternative process control testing equipment- (streaming current monitor, Zetameter, etc.)	31.8	8.0	3.0	1.0	0.3
100%	Process Control Testing Modification					
	staff training (consultant as trainer)	18.2	4.6	1.7	0.6	0.2

Appendix F-3: Annual System-Level O&M Costs (cents/kilogallon)

Performance
Limitations
Identified @
CCP Plants (%
of time)

		1 NTU Max				
		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
System Population Size Categories						
Number of Systems in Each Size Category		836	1117	810	1655	1478
Projected # of Systems Required to Modify Treatment		341	456	331	675	603

		-----cents-----				
32%	Chemical Addition					
	install coagulant aid polymer feed capability	114.8	29.0	10.7	3.7	1.5
	install backwash water polymer feed capability	114.8	29.0	10.7	3.7	1.5
	install pH adjustment for enhancing alkalinity purposes	220.3	56.9	22.0	8.8	4.5
15%	Coagulant Improvements					
	primary coagulant feed points, control, measurement	114.8	29.0	10.7	3.7	1.5
14%	Rapid Mixing					
	rapid mix improvements-mechanical	110.6	27.9	10.8	4.1	1.9
	rapid mix improvements-structural	110.6	27.9	10.8	4.1	1.9
29%	Flocculant Improvements					
	flocculation improvements-mechanical	108.6	28.4	10.5	3.8	1.8
	flocculation improvements-structural	112.6	28.4	10.5	3.8	1.8
51%	Settling Improvements					
	equipment modification-weirs, inf/effl, etc.	29.3	7.4	8.2	2.9	2.3
	add tube settlers	29.3	7.4	8.2	2.9	2.3
45%	Filtration Improvements					
20%	filter media additions (2-6" typical)	0.0	0.0	0.0	0.0	0.0
	filter media overhaul	0.0	0.0	0.0	0.0	0.0
	backwashing-increase flow/velocity (10-20% increase)	0.0	0.0	0.0	0.0	0.0
	backwashing-install surface wash	152.8	42.6	16.8	8.0	6.5
	post backwash-sequence (install additional filter (s))	68.3	20.3	8.2	5.9	2.1
	post backwash filter-to-waste	257.3	78.1	34.4	12.6	6.6
	filter control systems	148.8	40.6	16.1	7.6	3.1
17%	individual filter turbidimeter installation	108.6	31.5	14.6	11.0	6.7
	membrane (microfiltration)	32.6	8.2	3.0	1.1	0.3
		538.7	236.4	170.7	115.9	92.0
34%	Administrative Culture Improvements					
31%	plant staffing-increase (1 or 2 persons)	585.4	147.7	108.8	38.1	15.5
2%	staff qualifications	26.5	6.7	2.5	0.9	0.4
	Laboratory Modifications					
	bench top turbidimeter purchase-replace obsolete units	3.0	0.8	0.3	0.1	0.0
	jar test apparatus purchase	0.0	0.0	0.0	0.0	0.0
	alternative process control testing equipment-(streaming current monitor, Zetameter, etc.)	58.5	14.8	5.4	1.9	0.8
100%	Process Control Testing Modification					
	staff training (consultant as trainer)	0.0	0.0	0.0	0.0	0.0

Appendix F-4: Annual System-Level Treatment Costs (cents/kgal) at 3% Cost of Capital

Performance
Limitations
Identified @
CCP Plants (%
of time)

		1 NTU Max				
		System Population Size Categories				
		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
		Number of Systems in Each Size Category				
		836	1117	810	1655	1478
		Projected # of Systems Required to Modify Treatment				
		341	456	331	675	603
32%	Chemical Addition	-----\$1,000-----				
	install coagulant aid polymer feed capability	122.3	30.9	11.4	4.0	1.6
	install backwash water polymer feed capability	122.3	30.9	11.4	4.0	1.6
	install pH adjustment for enhancing alkalinity purposes	227.1	58.6	22.6	9.0	4.6
15%	Coagulant Improvements					
	primary coagulant feed points, control, measurement	122.3	30.9	11.4	4.0	1.6
14%	Rapid Mixing					
	rapid mix improvements-mechanical	112.7	28.4	11.1	4.2	2.0
	rapid mix improvements-structural	113.0	28.5	11.1	4.2	2.0
29%	Flocculant Improvements					
	flocculation improvements-mechanical	115.5	30.3	11.4	4.3	2.1
	flocculation improvements-structural	125.8	33.1	13.5	5.4	2.8
51%	Settling Improvements					
	equipment modification-weirs, inf/effl, etc.	29.7	7.7	8.4	3.1	2.5
	add tube settlers	31.7	9.6	10.4	5.0	4.5
45%	Filtration Improvements					
20%	filter media additions (2-6" typical)	0.3	0.2	0.1	0.1	0.1
	filter media overhaul	6.1	6.0	5.9	5.8	4.3
		0.0	0.0	0.0	0.0	0.0
	backwashing-increase flow/velocity (10-20% increase)	161.0	45.8	18.6	10.0	7.9
	backwashing-install surface wash	77.0	23.9	10.6	9.5	3.8
	post backwash-sequence (install additional filter (s))	270.7	86.0	39.2	14.6	7.6
	post backwash filter-to-waste	151.3	41.7	16.9	9.0	3.7
17%	filter control systems	110.3	32.3	15.1	11.9	7.1
	individual filter turbidimeter installation	40.4	10.2	3.8	1.6	0.6
	membrane (microfiltration)	585.6	270.4	197.0	138.9	108.8
34%	Administrative Culture Improvements					
31%	plant staffing-increase (1 or 2 persons)	585.4	147.7	108.8	38.1	15.5
2%	staff qualifications	26.5	6.7	2.5	0.9	0.4
	Laboratory Modifications					
	bench top turbidimeter purchase-replace obsolete units	4.1	1.0	0.4	0.1	0.0
	jar test apparatus purchase	1.9	0.5	0.2	0.1	0.0
	alternative process control testing equipment- (streaming current monitor, Zetameter, etc.)	65.6	16.6	6.1	2.2	0.9
100%	Process Control Testing Modification					
	staff training (consultant as trainer)	4.1	1.0	0.4	0.2	0.1

Appendix F-5: Annual System-Level Treatment Costs (cents/kgal) at 7% Cost of Capital

Performance
Limitations
Identified @
CCP Plants (%
of time)

		1 NTU Max				
		System Population Size Categories				
		<100	101-500	501-1,000	1,001-3,300	3,301-10,000
		Number of Systems in Each Size Category				
		836	1117	810	1655	1478
		Projected # of Systems Required to Modify Treatment				
		341	456	331	675	603
32%	Chemical Addition	-----cents/kg-----				
	install coagulant aid polymer feed capability	148.4	37.4	13.8	4.8	1.8
	install backwash water polymer feed capability	148.4	37.4	13.8	4.8	1.8
	install pH adjustment for enhancing alkalinity purposes	250.7	64.5	24.8	9.8	4.8
15%	Coagulant Improvements					
	primary coagulant feed points, control, measurement	148.4	37.4	13.8	4.8	1.8
14%	Rapid Mixing					
	rapid mix improvements-mechanical	119.8	30.2	11.9	4.5	2.2
	rapid mix improvements-structural	121.3	30.6	12.1	4.6	2.3
29%	Flocculant Improvements					
	flocculation improvements-mechanical	139.7	36.9	14.9	5.8	2.9
	flocculation improvements-structural	171.8	49.5	24.0	10.2	5.2
51%	Settling Improvements					
	equipment modification-weirs, inf/effl, etc.	31.2	8.7	9.3	3.7	2.8
	add tube settlers	40.3	17.4	18.1	11.4	9.5
45%	Filtration Improvements					
20%	filter media additions (2-6" typical)	1.5	0.9	0.6	0.4	0.4
	filter media overhaul	27.3	26.8	26.4	22.6	14.6
		0.0	0.0	0.0	0.0	0.0
	backwashing-increase flow/velocity (10-20% increase)	189.6	57.0	24.6	15.9	11.4
	backwashing-install surface wash	107.1	36.5	18.8	20.1	7.7
	post backwash-sequence (install additional filter (s))	317.7	113.5	56.3	20.6	9.7
	post backwash filter-to-waste	160.1	45.5	19.7	13.2	5.1
17%	filter control systems	116.5	35.4	17.0	14.6	8.0
	individual filter turbidimeter installation	61.4	15.5	5.7	2.9	1.0
	membrane (microfiltration)	749.4	389.2	288.9	205.9	148.5
34%	Administrative Culture Improvements					
31%	plant staffing-increase (1 or 2 persons)	585.4	147.7	108.8	38.1	15.5
2%	staff qualifications	26.5	6.7	2.5	0.9	0.4
	Laboratory Modifications					
	bench top turbidimeter purchase-replace obsolete units	7.8	2.0	0.7	0.3	0.1
	jar test apparatus purchase	8.7	2.2	0.8	0.3	0.1
	alternative process control testing equipment- (streaming current monitor, Zetameter, etc.)	90.3	22.8	8.4	2.9	1.1
100%	Process Control Testing Modification					
	staff training (consultant as trainer)	18.2	4.6	1.7	0.6	0.2

Appendix F-6: FBR Annualized System-Level Capital Costs (cents/kilogallon) at 7% Cost of Capital for FBR Alternative R2

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total	
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636	
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311	
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050	
						-----cents-----						
Install piping to move recycle to headworks	9.5	4.0	1.5	0.8	0.5	16.3	0.3	0.4	0.9	1.56	17.84	
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	
Install variable speed pump	10.4	2.7	1.0	0.5	0.2	14.9	0.1	0.1	0.1	0.30	15.17	
Rerate filter based on evaluation with state	4.7	1.2	0.4	0.3	0.1	6.7	0.0	0.0	0.0	0.04	6.78	
Install flow equalization basin	11.7	7.0	5.7	8.3	3.7	36.5	1.8	0.8	0.4	2.97	39.48	
Install sedimentation basin	270.7	69.6	26.8	11.9	5.1	384.2	2.6	2.1	1.7	6.34	390.55	
Install piping for NPDES discharge of FBW water	8.8	2.2	0.8	0.3	0.1	12.3	0.0	0.0	0.0	0.07	12.35	
Install piping for POTW discharge of FBW water	8.8	2.2	0.8	0.3	0.1	12.3	0.0	0.0	0.0	0.07	12.35	
Construct lagoon	9.5	2.7	1.1	0.8	0.5	14.6	0.2	0.2	0.2	0.53	15.11	
Subtotal						497.7				11.9	509.6	
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT	359	480	348	711	635	2534	517	93	68	679	3212	
						-----cents-----						
Install piping to move recycle to headworks	9.5	4.0	1.5	0.8	0.5	16.3	0.3	0.4	0.9	1.56	17.84	
Install sedimentation basin	270.7	69.6	26.8	11.9	5.1	384.2	2.6	2.1	1.7	6.34	390.55	
Subtotal						16.3				1.6	17.8	
DIRECT FILTRATION PLANTS ONLY	35	47	34	70	62	248	58	10	9	77	325	
						-----cents-----						
Install sedimentation basin for backwash treatment	68.3	69.6	26.8	11.9	5.1	181.8	2.6	2.1	1.7	6.34	188.11	
Install piping for NPDES discharge of FBW water	2.2	2.2	0.8	0.3	0.1	5.7	0.0	0.0	0.0	0.07	5.79	
Install piping for POTW discharge of FBW water	2.2	2.2	0.8	0.3	0.1	5.7	0.0	0.0	0.0	0.07	5.79	
Construct lagoon	2.4	2.7	1.1	0.8	0.5	7.5	0.2	0.2	0.2	0.53	8.01	
Subtotal						200.7				7.0	207.7	
Total Cost											735.2	

Appendix F-7: FBR Annualized System-Level Capital Costs (cents/kilogallon) at 3% Cost of Capital for FBR Alternative R2

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total	
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636	
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311	
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050	
						-----cents-----						
Install piping to move recycle to headworks	6.8	2.9	1.1	0.6	0.3	11.6	0.2	0.3	0.6	1.11	12.70	
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	
Install variable speed pump	7.4	1.9	0.7	0.3	0.2	10.6	0.1	0.1	0.1	0.21	10.80	
Rerate filter based on evaluation with state	3.4	0.9	0.3	0.2	0.1	4.8	0.0	0.0	0.0	0.03	4.83	
Install flow equalization basin	8.4	5.0	4.1	5.9	2.6	26.0	1.3	0.6	0.3	2.11	28.12	
Install sedimentation basin	192.8	49.6	19.1	8.5	3.7	273.6	1.9	1.5	1.2	4.52	278.10	
Install piping for NPDES discharge of FBW water	6.3	1.6	0.6	0.2	0.1	8.7	0.0	0.0	0.0	0.05	8.80	
Install piping for POTW discharge of FBW water	6.3	1.6	0.6	0.2	0.1	8.7	0.0	0.0	0.0	0.05	8.80	
Construct lagoon	6.8	1.9	0.8	0.6	0.3	10.4	0.1	0.1	0.1	0.38	10.76	
Subtotal						354.4				8.5	362.9	
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT	359	480	348	711	635	2534	517	93	68	679	3212	
						-----cents-----						
Install piping to move recycle to headworks	6.8	2.9	1.1	0.6	0.3	11.6	0.2	0.3	0.6	1.11	12.70	
Install sedimentation basin	192.8	49.6	19.1	8.5	3.7	273.6	1.9	1.5	1.2	4.52	278.10	
Subtotal						11.6				1.1	12.7	
DIRECT FILTRATION PLANTS ONLY	35	47	34	70	62	248	58	10	9	77	325	
						-----cents-----						
Install sedimentation basin for backwash treatment	48.6	49.6	19.1	8.5	3.7	129.4	7.6	1.5	1.2	10.29	139.72	
Install piping for NPDES discharge of FBW water	1.6	1.6	0.6	0.2	0.1	4.1	0.1	0.0	0.0	0.14	4.21	
Install piping for POTW discharge of FBW water	1.6	1.6	0.6	0.2	0.1	4.1	0.1	0.0	0.0	0.14	4.21	
Construct lagoon	1.7	1.9	0.8	0.6	0.3	5.3	0.6	0.1	0.1	0.83	6.15	
Subtotal						142.9				11.4	154.3	
Total Cost											529.9	

Appendix F-8: FBR Annual System-Level O&M Costs (cents/kilogallon) for FBR Alternative R2

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total	
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636	
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311	
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050	
							-----cents-----					
Install piping to move recycle to headworks	104.5	27.4	10.5	4.2	1.6	148.2	0.9	0.6	0.6	2.14	150.36	
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	
Install variable speed pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	
Rerate filter based on evaluation with state	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	
Install flow equalization basin	257.3	66.0	25.0	8.8	2.6	359.6	0.8	0.3	0.1	1.12	360.76	
Install sedimentation basin	184.9	48.7	19.4	8.1	3.8	265.0	2.0	1.0	0.7	3.68	268.71	
Install piping for NPDES discharge of FBW water	15.3	3.9	1.4	0.5	0.4	21.4	0.1	0.0	0.0	0.13	21.56	
Install piping for POTW discharge of FBW water	64.3	55.8	53.0	45.6	39.7	258.5	105.5	137.1	0.0	242.61	501.10	
Construct lagoon	45.0	11.4	4.2	1.5	0.9	62.9	0.4	0.2	0.1	0.72	63.66	
Subtotal						1115.7				250.4	1366.1	
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT	359	480	348	711	635	2534	517	93	68	679	3212	
							-----cents-----					
Install piping to move recycle to headworks	104.5	27.4	10.5	4.2	1.6	148.2	0.9	0.6	0.6	2.14	150.36	
Install sedimentation basin	184.9	48.7	19.4	8.1	3.8	265.0	2.0	1.0	0.7	3.68	268.71	
Subtotal						148.2				2.1	150.4	
DIRECT FILTRATION PLANTS ONLY	35	47	34	70	62	248	58	10	9	77	325	
							-----cents-----					
Install sedimentation basin for backwash treatment	46.7	48.7	19.4	8.1	3.8	126.8	2.0	1.0	0.7	3.68	130.44	
Install piping for NPDES discharge of FBW water	3.9	3.9	1.4	0.5	0.4	10.0	0.1	0.0	0.0	0.13	10.13	
Install piping for POTW discharge of FBW water	16.2	55.8	53.0	45.6	39.7	210.4	38.7	32.6	32.6	103.88	314.27	
Construct lagoon	11.4	11.4	4.2	1.5	0.9	29.3	0.4	0.2	0.1	0.72	30.00	
Subtotal						376.4				108.4	484.8	
Total Cost											2001.3	

Appendix F-9: FBR Annual System-Level Treatment Costs (cents/kgal) at 3% Cost of Capital for FBR Alternative R2

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total	
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636	
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311	
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050	
							-----cents-----					
Install piping to move recycle to headworks	111.3	30.3	11.5	4.8	2.0	159.8	1.1	0.9	1.2	3.25	163.06	
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	
Install variable speed pump	7.4	1.9	0.7	0.3	0.2	10.6	0.1	0.1	0.1	0.21	10.80	
Rerate filter based on evaluation with state	3.4	0.9	0.3	0.2	0.1	4.8	0.0	0.0	0.0	0.03	4.83	
Install flow equalization basin	265.7	71.0	29.1	14.7	5.2	385.6	2.0	0.8	0.3	3.23	388.88	
Install sedimentation basin	377.7	98.3	38.5	16.6	7.5	538.6	3.8	2.4	1.9	8.19	546.81	
Install piping for NPDES discharge of FBW water	21.5	5.4	2.0	0.7	0.5	30.2	0.1	0.0	0.0	0.18	30.35	
Install piping for POTW discharge of FBW water	70.6	57.4	53.6	45.8	39.8	267.2	105.5	137.1	0.0	242.67	509.90	
Construct lagoon	51.8	13.3	4.9	2.1	1.2	73.3	0.5	0.3	0.3	1.10	74.42	
Subtotal						1470.2				258.9	1729.0	
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT	359	480	348	711	635	2534	517	93	68	679	3212	
							-----cents-----					
Install piping to move recycle to headworks	111.3	30.3	11.5	4.8	2.0	159.8	1.14	0.91	1.20	3.25	163.06	
Install sedimentation basin	377.7	98.3	38.5	16.6	7.5	538.6	3.81	2.45	1.93	8.19	546.81	
Subtotal						159.8				3.3	163.1	
DIRECT FILTRATION PLANTS ONLY	35	47	34	70	62	248	58	10	9	77	325	
							-----cents-----					
Install sedimentation basin for backwash treatment	95.3	98.3	38.5	16.6	7.5	256.2	9.6	2.4	1.9	13.96	270.16	
Install piping for NPDES discharge of FBW water	5.4	5.4	2.0	0.7	0.5	14.1	0.2	0.0	0.0	0.27	14.34	
Install piping for POTW discharge of FBW water	17.8	57.4	53.6	45.8	39.8	214.5	38.8	32.6	32.6	104.02	318.48	
Construct lagoon	13.1	13.3	4.9	2.1	1.2	34.6	1.0	0.3	0.3	1.55	36.15	
Subtotal						519.3				119.8	639.1	
Total Cost											2531.2	

Appendix F-10: FBR Annual System-Level Treatment Costs (cents/kgal) at 7% Cost of Capital for FBR Alternative R2

System Population Size Categories	≤100	101-500	501-1,000	1,001-3,300	3,301-10,000	Subtotal Small Systems	10,001- 50,000	50,001-100,000	100,001-1,000,000	Subtotal Large Systems	Total	
TOTAL RECYCLE PLANTS (Conventional & Direct)	502	670	486	993	887	3538	830	141	127	1098	4636	
CONVENTIONAL FILTRATION PLANTS ONLY:	467	623	452	923	825	3290	772	131	118	1021	4311	
CONVENTIONAL FILTRATION DIRECT RECYCLE PLANTS	107	143	104	212	190	757	255	38	50	293	1,050	
							-----cents/kg-----					
Install piping to move recycle to headworks	114.0	31.4	12.0	5.0	2.1	164.5	1.2	1.0	1.5	3.70	168.20	
Switch off pumps to reduce raw water intake during recycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	
Install variable speed pump	10.4	2.7	1.0	0.5	0.2	14.9	0.1	0.1	0.1	0.30	15.17	
Rerate filter based on evaluation with state	4.7	1.2	0.4	0.3	0.1	6.7	0.0	0.0	0.0	0.04	6.78	
Install flow equalization basin	269.1	73.0	30.8	17.1	6.2	396.2	2.6	1.1	0.4	4.09	400.24	
Install sedimentation basin	455.7	118.3	46.2	20.0	9.0	649.2	4.6	3.0	2.4	10.02	659.26	
Install piping for NPDES discharge of FBW water	24.1	6.1	2.2	0.8	0.5	33.7	0.1	0.1	0.0	0.20	33.91	
Install piping for POTW discharge of FBW water	73.1	58.0	53.9	45.9	39.9	270.8	105.6	137.1	0.0	242.69	513.45	
Construct lagoon	54.5	14.1	5.3	2.3	1.4	77.5	0.6	0.4	0.3	1.26	78.77	
Subtotal						1613.5				262.3	1875.8	
CONV. FILTRATION PLANTS WITH EXISTING RECYCLE TREATMENT	359	480	348	711	635	2534	517	93	68	679	3212	
							-----cents/kg-----					
Install piping to move recycle to headworks	114.0	31.4	12.0	5.0	2.1	164.5	1.2	1.0	1.5	3.70	168.20	
Install sedimentation basin	455.7	118.3	46.2	20.0	9.0	649.2	4.6	3.0	2.4	10.02	659.26	
Subtotal						164.5				3.7	168.2	
DIRECT FILTRATION PLANTS ONLY	35	47	34	70	62	248	58	10	9	77	325	
							-----cents/kg-----					
Install sedimentation basin for backwash treatment	115.0	118.3	46.2	20.0	9.0	308.5	4.6	3.0	2.4	10.02	318.55	
Install piping for NPDES discharge of FBW water	6.1	6.1	2.2	0.8	0.5	15.7	0.1	0.1	0.0	0.20	15.92	
Install piping for POTW discharge of FBW water	18.4	58.0	53.9	45.9	39.9	216.1	38.7	32.6	32.6	103.95	320.06	
Construct lagoon	13.8	14.1	5.3	2.3	1.4	36.7	0.6	0.4	0.3	1.26	38.00	
Subtotal						577.1				115.4	692.5	
Total Cost											2736.5	

Appendix G

Appendix G-1a
Turbidity Start-up and Monitoring Activities
Summary of Utility and State Cost Estimates at 3% Cost of Capital^a
Alternative T2

Size Categories

Compliance Activities	≤1,000 (n=2,763)	1,001 - 3,300 (n=1,655)	3,301 - 10,000 (n=1,478)	Annual Costs
UTILITIES				
Start-up Costs				
Read and Understand Rule	\$464,184	\$556,080	\$496,608	\$1,516,872
Mobilization/Planning	\$2,320,920	\$2,409,680	\$2,293,856	\$7,024,456
Training	\$0	\$1,334,592	\$3,121,536	\$4,456,128
Total Start-up Costs	\$2,785,104	\$4,300,352	\$5,912,000	\$12,997,456
Capitalization Factor ^b				0.0672
Total Annualized Start-up Costs^c				\$873,689
Annual System Monitoring Costs				
Data Collection	\$670,488	\$722,904	\$830,045	\$2,223,437
Data Review	\$670,488	\$722,904	\$830,045	\$2,223,437
Recordkeeping	\$1,856,736	\$1,112,160	\$1,418,880	\$4,387,776
Total Plant Monitoring Costs				\$8,834,650
Total Annual Utility Start-up and Monitoring Costs				\$9,708,339
STATES				
Start-up Costs				
	Unit Cost	Affected Entities		
Read and Understand Rule	\$355	56 Entities		\$19,874
Mobilization/Planning	\$3,509	56 Entities		\$196,518
Training	\$3,509	56 Entities		\$196,518
Total Start-up Costs	\$7,373			\$412,911
Capitalization Factor ^b	0.0672			0.0672
Total Annualized Start-up Costs^c	\$496			\$27,756
Annual State System Monitoring Costs				
Compliance Tracking	\$279	5,896	Systems	\$1,647,208
Recordkeeping	\$559	5,896	Systems	\$3,294,417
Total Annual System Costs	\$838			\$4,941,625
Total Annual State Start-up and Monitoring Costs				\$4,969,381
Total Annual Utility and State Start-up and Monitoring Costs				\$14,677,720

Notes:

- a. Unit cost detail is provided in Appendix G-1c,d,e,f (utilities) and Appendix G-1g (States)
- b. The capitalization factor annualizes one-time start-up expenditures over a 20-year period using the 3% cost-of-capital as the discount rate.
- c. Totals in annual cost column may not match detail due to rounding in reported unit costs.

Appendix G-1b
Turbidity Start-up and Monitoring Activities
Summary of Utility and State Cost Estimates at 7% Cost of Capital^a
Alternative T2

Size Categories

Compliance Activities	≤1,000 (n=2,763)	1,001 - 3,300 (n=1,655)	3,301 - 10,000 (n=1,478)	Annual Costs
UTILITIES				
Start-up Costs				
Read and Understand Rule	\$464,184	\$556,080	\$496,608	\$1,516,872
Mobilization/Planning	\$2,320,920	\$2,409,680	\$2,293,856	\$7,024,456
Training	\$0	\$1,334,592	\$3,121,536	\$4,456,128
Total Start-up Costs	\$2,785,104	\$4,300,352	\$5,912,000	\$12,997,456
Capitalization Factor ^b	0.0944			0.0944
Total Annualized Start-up Costs^c				\$1,226,830
Annual System Monitoring Costs				
Data Collection	\$670,488	\$722,904	\$830,045	\$2,223,437
Data Review	\$670,488	\$722,904	\$830,045	\$2,223,437
Recordkeeping	\$1,856,736	\$1,112,160	\$1,418,880	\$4,387,776
Total Plant Monitoring Costs				\$8,834,650
Total Annual Utility Start-up and Monitoring Costs				\$10,061,479
STATES				
Start-up Costs				
	Unit Cost	Affected Entities		
Read and Understand Rule	\$355	56 Entities		\$19,874
Mobilization/Planning	\$3,509	56 Entities		\$196,518
Training	\$3,509	56 Entities		\$196,518
Total Start-up Costs	\$7,373			\$412,911
Capitalization Factor ^b	0.0944			0.0944
Total Annualized Start-up Costs^c	\$696			\$38,975
Annual State System Monitoring Costs				
Compliance Tracking	\$279	5896 Systems		\$1,647,208
Recordkeeping	\$559	5896 Systems		\$3,294,417
Total Annual System Costs	\$838			\$4,941,625
Total Annual State Start-up and Monitoring Costs				\$4,980,600
Total Annual Utility and State Start-up and Monitoring Costs				\$15,042,079

Notes:

- a. Unit cost detail is provided in Appendix G-1c,d,e,f (utilities) and Appendix G-1g (states)
- b. The capitalization factor annualizes one-time start-up expenditures over a 20-year period using the 7% cost-of-capital as the discount rate.
- c. Totals in annual cost column may not match detail due to rounding in reported unit costs.

Appendix G-1c
Turbidity Start-up and Monitoring Activities
Detail of Annual Utility Activities, System Size: ≤1000
Alternative T2

Monitoring Activities	Freq.	Hrs./ Freq.	Annual Hours	Hrs.	Technical ^a Rate/ Hour	Cost	Total Costs
Start-up Cost per System							
Read & Understand Rule	1	6	6.0	6.0	\$28.00	\$168	\$168
Mobilization/Planning	1	30	30.0	30.0	\$28.00	\$840	\$840
Total Start-up Cost per System						\$1,008	\$1,008
Annual Cost per System							
Data Analysis	52	0.167	8.7	8.7	\$28.00	\$243	\$243
Data Review	52	0.167	8.7	8.7	\$28.00	\$243	\$243
Record Keeping	12	2	24.0	24.0	\$28.00	\$672	\$672
Total Annual Cost per System						\$1,157	\$1,157
Cost per Exception Occurrence							
Develop Exception Report	1	0.5	0.5	0.5	\$28.00	\$14	\$14
Meet/Review with State	1	0.5	0.5	0.5	\$28.00	\$14	\$14
Total Cost per Exception						\$28	\$28
Cost per Individual Filter Assessment	1	10	10.0	10.0	\$28.00	\$280	\$280

Notes:

a. Labor rates include 1.4 load

Appendix G-1d
Turbidity Start-up and Monitoring Activities
Detail of Annual Utility Activities, System Size: 1000-3300
Alternative T2

Monitoring Activities	Freq.	Hrs./ Freq.	Annual Hours	Management ^{a,b}			Technical ^b			Total Costs
				Hrs.	Rate/ Hour	Cost	Hrs.	Rate/ Hour	Cost	
Start-up Cost per System										
Read & Understand Rule	1	6	6.0	6.0	\$56.00	\$336	0.0	\$28.00	\$0	\$336
Mobilization/Planning	1	30	30.0	22.0	\$56.00	\$1,232	8.0	\$28.00	\$224	\$1,456
Training	1	16	16.0	12.8	\$56.00	\$717	3.2	\$28.00	\$90	\$806
Total Start-up Cost per System						\$2,285			\$314	\$2,598
Annual Cost per System										
Data Analysis	52	0.25	13.0	2.6	\$56.00	\$146	10.4	\$28.00	\$291	\$437
Data Review	52	0.25	13.0	2.6	\$56.00	\$146	10.4	\$28.00	\$291	\$437
Record Keeping	12	2	24.0	0.0	\$56.00	\$0	24.0	\$28.00	\$672	\$672
Total Annual Cost per System						\$291			\$1,254	\$1,546
Cost per Exception Occurrence										
Develop Exception Report	1	0.5	0.5	0.5	\$56.00	\$28	0.0	\$28.00	\$0	\$28
Meet/Review with State	1	0.5	0.5	0.5	\$56.00	\$28	0.0	\$28.00	\$0	\$28
Total Cost per Exception						\$56			\$0	\$56
Cost per Individual Filter Assessment	1	10	10.0	2.0	\$56.00	\$112	8.0	\$28.00	\$224	\$336

Notes:

a Labor is split between management and technical. Generally, 20% is allocated to management and 80% to technical.

b Labor rates include 1.4 load

Appendix G-1e
Turbidity Start-up and Monitoring Activities
Detail of Annual Utility Activities, System Size: 3300-10000
Alternative T2

Monitoring Activities	Freq.	Hrs./ Freq.	Annual Hours	Management ^{a,b}			Technical ^b			Total Costs
				Hrs.	Rate/ Hour	Cost	Hrs.	Rate/ Hour	Cost	
Start-up Cost per System										
Read & Understand Rule	1	6	6.0	6.0	\$56.00	\$336	0.0	\$40.00	\$0	\$336
Mobilization/Planning	1	30	30.0	22.0	\$56.00	\$1,232	8.0	\$40.00	\$320	\$1,552
Training	1	40	40.0	32.0	\$56.00	\$1,792	8.0	\$40.00	\$320	\$2,112
Total Start-up Cost per System						\$3,360			\$640	\$4,000
Annual Cost per System										
Data Analysis	52	0.25	13.0	2.6	\$56.00	\$146	10.4	\$40.00	\$416	\$562
Data Review	52	0.25	13.0	2.6	\$56.00	\$146	10.4	\$40.00	\$416	\$562
Record Keeping	12	2	24.0	0.0	\$56.00	\$0	24.0	\$40.00	\$960	\$960
Total Annual Cost per System						\$291			\$1,792	\$2,083
Cost per Exception Occurrence										
Develop Exception Report	1	0.5	0.5	0.5	\$56.00	\$28	0.0	\$40.00	\$0	\$28
Meet/Review with State	1	0.5	0.5	0.5	\$56.00	\$28	0.0	\$40.00	\$0	\$28
Total Cost per Exception						\$56			\$0	\$56
Cost per Individual Filter Assessment	1	10	10.0	2.0	\$56.00	\$112	8.0	\$40.00	\$320	\$432

Notes:

a Labor is split between management and technical. Generally, 20% is allocated to management and 80% to technical.

b Labor rates include 1.4 load

Appendix G-1f
Turbidity Start-up and Monitoring Activities
Summary of Utility Unit Costs by System Size Category
Alternative T2

Compliance Activities	Size Categories		
	≤1,000	1,001 - 3,300	3,301 - 10,000
UTILITIES			
Start-up Costs			
Read and Understand Rule	\$168	\$336	\$336
Mobilization/Planning	\$840	\$1,456	\$1,552
Training	\$0	\$806	\$2,112
Total Start-up Costs	\$1,008	\$2,598	\$4,000
Total Start-up Hours	36	52	76
Annual System Monitoring Costs			
Data Collection	\$243	\$437	\$562
Data Review	\$243	\$437	\$562
Record Keeping	\$672	\$672	\$960
Total Monitoring Costs	\$1,157	\$1,546	\$2,083
Total Monitoring Hours	41	50	50

Appendix G-1g
Turbidity Start-up and Monitoring Activities
Detail of Annual State Activities
Alternative T2

Monitoring Activities	Freq.	Hrs./ Freq.	Annual Hours	Management ^{a,b}			Technical ^{a,b}			Total Costs
				Hrs.	Rate/ Hour	Cost	Hrs.	Rate/ Hour	Cost	
Start-up Costs										
Read and Understand Rule	1	12	12	10	\$31.23	\$312	2	\$21.29	\$43	\$355
Mobilization/Planning	1	120	120	96	\$31.23	\$2,998	24	\$21.29	\$511	\$3,509
Train State Staff	1	120	120	96	\$31.23	\$2,998	24	\$21.29	\$511	\$3,509
Total Hours/Costs per State			252			\$6,309			\$1,065	\$7,373
Annual Costs (per monitored system)										
Compliance Tracking	12	1	12	2	\$31.23	\$75	10	\$21.29	\$204	\$279
Record Keeping	12	2	24	5	\$31.23	\$150	19	\$21.29	\$409	\$559
Total Hours/Annual Costs per System			36			\$225			\$613	\$838
Exception Costs (per system reporting exception)										
Analyze/Review Utility Data	1	2	2	0	\$31.23	\$12	2	\$21.29	\$34	\$47
Make Determinations, if required	1	1	1	0	\$31.23	\$6	1	\$21.29	\$17	\$23
Meet/Review with Utilities	1	0.5	0.5	0.1	\$31.23	\$3	0.4	\$21.29	\$9	\$12
Total Hours/Exception Costs per System			4			\$22			\$60	\$81

Notes:

a Labor is split between management and technical. Generally, 20% is allocated to management and 80% to technical.

b Labor rates include 1.4 load

Appendix G-2a
Summary of Utility and State Cost Estimates, Alternative T2
Turbidity Exception Costs

Compliance Component	Respondents Affected Annually	Cost per Occurrence	Annual Costs
<u>UTILITIES</u>			
Annual Reporting Exceptions	1061 Systems	28 - 56	\$45,506
Annual IFA (4% of systems)	236 Systems	280 - 432	\$78,729
Total Annual Utility Turbidity Exception Costs			\$124,235
Average Annual Cost per Utility	5896 Systems		\$21
<u>STATES</u>			
Annual Reporting Exceptions	1061 Systems	\$81	\$86,478
Annual CPE (2% of systems)	118 Systems	6000 - 12000	\$1,083,480
Total Annual State Turbidity Exception Costs			\$1,169,958
Total Annual Cost of Utility and State Turbidity Exceptions			\$1,294,193

Notes:

Exception Report: Alternative T1--Any filter >0.5 NTU after 4-hour ripening; Alternatives T1 and T2--any filter >1.0 NTU at any time; Alternative T3--any filter that exceeds 0.3 NTU in 5% or more of samples or exceeds 2.0 NTU on two consecutive measurements (includes reporting done for >1.0 NTU 3 months and >2.0 NTU 2 months).

IFA: Options T1 and T2--Any filter >1.0 NTU based on two consecutive measurements 15 minutes apart for 3 months in a row; Option T3--Any filter with 95th percentile >0.3 NTU for 3 months in a row.

CPE: Options T1, T2, and T3--Any filter >2.0 NTU based on two consecutive measurements 15 minutes apart for 2 months in a row

Appendix G-2b
Detail of Turbidity Exception Cost Estimates, Alternative T2

Size Categories

	n=	≤1,000 2763	1,001 - 3,300 1655	3,301 - 10,000 1478	Total 5896
Compliance Activities					
UTILITIES					
Exception Reports ^a		\$28	\$56	\$56	
Total Exception Cost (10%)		\$13,926	\$16,682	\$14,898	\$45,506
IFA ^{a,c}		\$280	\$336	\$432	
Total IFA Cost (4%)		\$30,946	\$22,243	\$25,540	\$78,729
STATES					
Exception Reports ^b		\$81	\$81	\$81	
Total Exception Cost (10%)		\$40,526	\$24,274	\$21,678	\$86,478
CPE ^d		\$6,000	\$12,000	\$12,000	
Total CPE Cost (2%)		\$331,560	\$397,200	\$354,720	\$1,083,480

Notes:

- a. See Appendices G-1c-e for labor and activity breakdown of utility exception report and IFA cost.
- b. See Appendix G-1g for labor and activity breakdown of State exception report cost.
- c. IFA cost assumes 10 hours labor of technical or technical and managerial labor costs
- d. CPE cost assumes 60 or 120 hours labor at \$100/hour

COST DISTRIBUTION BY SYSTEM SIZE

System Size	25-100	101-500	501 - 1000	1001 - 3300	3301 - 10000	Totals
Number of Systems	836	1117	810	1655	1478	5896
Annual Exceptions	150	201	146	298	266	1061
Annual IFAs	33	45	32	66	59	236
Annual CPEs	17	22	16	33	30	118
Utility Costs						
Total Annual Exception Reporting Cost	\$ 4,213	\$ 5,630	\$ 4,082	\$ 16,682	\$ 14,898	\$ 45,506
Total Annual IFA Cost	\$ 9,363	\$ 12,510	\$ 9,072	\$ 22,243	\$ 25,540	\$ 78,729
Total Utility Costs	\$ 13,577	\$ 18,140	\$ 13,154	\$ 38,926	\$ 40,438	\$ 124,235

Appendix G-3a

State and Utility Disinfection Benchmarking Costs and Burden at 3% Cost of Capital, Alternative A4 and Alternative B2

System Size Category	≤500	501-1,000	1,001-3,300	3,301-10,000	Total	Annualized Costs
Systems with Start-up Costs	3737	1301	2553	1859	9450	
Systems with Applicability Monitoring Costs	463	128	253	116	960	
Systems with Profile Costs	3274	1173	2300	1743	8490	
Systems with Benchmark and Consultation Costs	1084	377	740	539	2741	
Compliance Activities						
UTILITIES						
Start-up and Applicability Monitoring Costs						
Read and Understand Rule	\$224	\$224	\$269	\$346		
Mobilization Planning	\$224	\$224	\$269	\$346		
Record Keeping	\$112	\$112	\$134	\$173		
Subtotal Start-up Costs per System	\$560	\$560	\$672	\$864		
Subtotal Start-up Costs for all Systems	\$2,092,720	\$728,560	\$1,715,616	\$1,606,176	\$6,143,072	\$412,937
Applicability Monitoring: Data Collection	\$56	\$56	\$56	\$80		
Applicability Monitoring: Average Sample Cost	\$360	\$360	\$360	\$360		
Applicability Monitoring: Notification	\$28	\$28	\$56	\$56		
Subtotal Applicability Monitoring Costs per System	\$444	\$444	\$472	\$496		
Subtotal Applicability Monitoring Costs for all Systems	\$205,572	\$56,832	\$119,416	\$57,536	\$439,356	\$29,534
Total Start-up and Applicability Monitoring Costs for all Sy:	\$2,298,292	\$785,392	\$1,835,032	\$1,663,712	\$6,582,428	\$442,471
Disinfection Benchmarking Costs per System Requiring a Benchmark						
Profiling Notification	\$28	\$28	\$56	\$56		
Data Collection and Entry	\$243	\$243	\$243	\$347		
Data Review	\$121	\$121	\$243	\$243		
Subtotal Profiling Costs per System	\$392	\$392	\$541	\$645		
Total Profiling Costs for All Systems	\$1,283,408	\$459,816	\$1,245,067	\$1,124,816	\$4,113,107	\$276,483
Generate Report to State	\$1,120	\$1,120	\$1,344	\$1,728		
Meet and Review with State	\$224	\$224	\$336	\$384		
Subtotal Benchmarking Costs per System	\$1,344	\$1,344	\$1,680	\$2,112		
Total Benchmarking Costs for All Systems	\$1,456,533	\$507,078	\$1,243,822	\$1,138,600	\$4,346,033	\$292,140
Supplementary Viral Profile and Benchmarking Costs	\$16,637	\$5,792	\$135,438	\$90,466	\$248,334	\$16,693
Total Profiling and Benchmarking Costs	\$2,756,578	\$972,686	\$2,624,327	\$2,353,883	\$8,707,473	\$585,316
Total Costs for Utilities	\$5,054,870	\$1,758,078	\$4,459,359	\$4,017,595	\$15,289,901	\$1,027,787
STATES						
Total Annualized Costs for States						\$277,356
TOTAL						
Total Annualized Utility and State Disinfection Benchmarking Estimates						\$1,305,143

Notes:

Labor rates include a load factor of 1.4.

All costs are annualized by a capitalization factor (CF) of 0.06722. The CF is calculated using the cost of capital (3%), the number of years of capitalization (20 years), and current value of money (\$1).

Appendix G-3b

State and Utility Disinfection Benchmarking Costs and Burden at 7% Cost of Capital, Alternative A4 and Alternative B2

	System Size Category	≤500	501-1,000	1,001-3,300	3,301-10,000	Total	Annualized Costs
	Systems with Start-up Costs	3737	1301	2553	1859	9450	
	Systems with Applicability Monitoring Costs	463	128	253	116	960	
	Systems with Profile Costs	3274	1173	2300	1743	8490	
	Systems with Benchmark and Consultation Costs	1084	377	740	539	2741	
	Compliance Activities						
UTILITIES							
Start-up and Applicability Monitoring Costs							
Read and Understand Rule		\$224	\$224	\$269	\$346		
Mobilization Planning		\$224	\$224	\$269	\$346		
Record Keeping		\$112	\$112	\$134	\$173		
Subtotal Start-up Costs per System		\$560	\$560	\$672	\$864		
Subtotal Start-up Costs for all Systems		\$2,092,720	\$728,560	\$1,715,616	\$1,606,176	\$6,143,072	\$579,845
Applicability Monitoring: Data Collection		\$56	\$56	\$56	\$80		
Applicability Monitoring: Average Sample Cost		\$360	\$360	\$360	\$360		
Applicability Monitoring: Notification		\$28	\$28	\$56	\$56		
Subtotal Applicability Monitoring Costs per System		\$444	\$444	\$472	\$496		
Subtotal Applicability Monitoring Costs for all Systems		\$205,572	\$56,832	\$119,416	\$57,536	\$439,356	\$41,471
Total Start-up and Applicability Monitoring Costs for all Systems		\$2,298,292	\$785,392	\$1,835,032	\$1,663,712	\$6,582,428	\$621,315
Disinfection Profiling and Benchmarking Costs per System Requiring a Benchmark							
Profiling Notification		\$28	\$28	\$56	\$56		
Data Collection and Entry		\$243	\$243	\$243	\$347		
Data Review		\$121	\$121	\$243	\$243		
Subtotal Profiling Costs per System		\$392	\$392	\$541	\$645		
Total Profiling Costs for All Systems		\$1,283,408	\$459,816	\$1,245,067	\$1,124,816	\$4,113,107	\$388,236
Generate Report to State		\$1,120	\$1,120	\$1,344	\$1,728		\$0
Meet and Review with State		\$224	\$224	\$336	\$384		\$0
Subtotal Benchmarking Costs per System		\$1,344	\$1,344	\$1,680	\$2,112		\$0
Total Benchmarking Costs for All Systems		\$1,456,533	\$507,078	\$1,243,822	\$1,138,600	\$4,346,033	\$410,222
Supplementary Viral Profile and Benchmarking Costs		\$16,637	\$5,792	\$135,438	\$90,466	\$248,334	\$23,440
Total Profiling and Benchmarking Costs		\$2,756,578	\$972,686	\$2,624,327	\$2,353,883	\$8,707,473	\$821,898
Total Costs for Utilities		\$5,054,870	\$1,758,078	\$4,459,359	\$4,017,595	\$15,289,901	\$1,443,214
STATES							
Total Annualized Costs for States							\$389,462
TOTAL							
Total Annualized Utility and State Disinfection Benchmarking Estimates							\$1,832,676

Notes:

Labor rates include a load factor of 1.4.

All costs are annualized by a capitalization factor (CF) of 0.09439. The CF is calculated using the cost of capital (7%), the number of years of capitalization (20 years), and current value of money (\$1).

Appendix G-3c
Utility Disinfection Benchmarking Costs and Burden, System Size <500, Alternative A4 and Alternative B2
Compliance Activities

Activity	Activity Frequency		Management Labor ^a			Technical Labor ^a			Total Burden		
	Freq.	Hrs./ Annual	Hrs.	Rate/ Hour	Cost	Hrs.	Rate/ Hour	Cost	Total Cost	FTE ^b	
Start-up and Applicability Monitoring Costs											
Read and Understand Rule	1	8	8.0	0.0	\$0.00	\$0	8.0	\$ 28.00	\$224	\$224	0.004
Mobilization and Planning	1	8	8.0	0.0	\$0.00	\$0	8.0	\$ 28.00	\$224	\$224	0.004
Record Keeping	1	4	4.0	0.0	\$0.00	\$0	4.0	\$ 28.00	\$112	\$112	0.002
Subtotal Start-up Costs for All Systems	3737 Systems									\$2,092,720	35.93
Applicability Monitoring: Data Collection (number of samples)	1	2	2.0	0.0	\$0.00	\$0	2.0	\$ 28.00	\$56	\$56	0.00
Applicability Monitoring: Average Sample Cost										\$360	
Applicability Monitoring: Notification	1	1	1.0	0.0	\$0.00	\$0	1.0	\$ 28.00	\$28	\$28	0.00
Subtotal Applicability Monitoring Costs for All Systems^c	463 Systems									\$205,572	0.67
Total Start-up and Applicability Monitoring Costs for All Systems										\$2,298,292	37
Profile and Benchmark Costs per System Requiring a Benchmark											
Profile Notification	1	1	1.0	0.0	\$0.00	\$0	1.0	\$ 28.00	\$28	\$28	0.000
Data Collection and Entry	52	0.17	8.7	0.0	\$0.00	\$0	8.7	\$ 28.00	\$243	\$243	0.004
Data Review	52	0.08	4.3	0.0	\$0.00	\$0	4.3	\$ 28.00	\$121	\$121	0.002
Subtotal Profile Costs per System										\$392	0.01
Subtotal Profile Costs for All Systems	3274 Systems									\$1,283,408	22.04
Generate Report	1	40	40.0	0.0	\$0.00	\$0	40.0	\$ 28.00	\$1,120	\$1,120	0.02
Meet and Review with State	2	4	8.0	0.0	\$0.00	\$0	8.0	\$ 28.00	\$224	\$224	0.00
Subtotal Benchmark Costs per System										\$1,344	0.02
Subtotal Benchmark Costs for All Systems	1084 Systems									\$1,456,533	25
Supplemental Viral Profile and Benchmark	1	53.0	53.0	0.0	\$0.00	\$0	53.0	\$ 28.00	\$1,484	\$1,484	0.03
Subtotal Viral Profile and Benchmark^d	11 Systems									\$16,637	0
Total Profile and Benchmark Costs										\$2,756,578	47
Total Start-up, Applicability Monitoring, Profile and Benchmark Costs										\$5,054,870	84

Notes:

- a. Labor rates include a load factor of 1.4.
- b. Full Time Equivalent (FTE) is based on 2080 hours worked annually.
- c. The sample cost (\$180 per analysis or \$360 per sample) incorporates costs for reporting results to the State because laboratories directly report results in most states.
- d. CWSS data suggest that 0.3% of all systems will require a viral inactivation profile and benchmark because they currently use chloramines or ozone. The burden estimate equals the sum of the data collection, entry, review, and reporting burden for a disinfection profile.

Appendix G-3d

State and Utility Disinfection Benchmarking Costs and Burden, System Size 500-1,000, Alternative A4 and Alternative B2

Compliance Activities

	Activity Frequency		Management Labor ^a			Technical Labor ^a			Total Burden		
	Freq.	Hrs./ Annual	Hrs.	Rate/ Hour	Cost	Hrs.	Rate/ Hour	Cost	Total Cost	FTE ^b	
Start-up and Applicability Monitoring Costs											
Read and Understand Rule	1	8	8.0	0.0	\$0.00	\$0	8.0	\$ 28.00	\$224	\$224	0.004
Mobilization and Planning	1	8	8.0	0.0	\$0.00	\$0	8.0	\$ 28.00	\$224	\$224	0.004
Record Keeping	1	4	4.0	0.0	\$0.00	\$0	4.0	\$ 28.00	\$112	\$112	0.002
Subtotal Start-up Costs for All Systems	1301	Systems							\$728,560	12.51	
Applicability Monitoring: Data Collection (number of samples)	1	2	2.0	0.0	\$0.00	\$0	2.0	\$ 28.00	\$56	\$56	0.00
Applicability Monitoring: Average Sample Cost									\$360		
Applicability Monitoring: Notification	1	1	1.0	0.0	\$0.00	\$0	1.0	\$ 28.00	\$28	\$28	0.00
Subtotal Applicability Monitoring Costs for All Systems^c	128	Systems							\$56,832	0.18	
Total Start-up & Applicability Monitoring Costs for All Systems									\$785,392	13	
Profile and Benchmark Costs per System Requiring a Benchmark											
Profile Notification	1	1	1.0	0.0	\$0.00	\$0	1.0	\$ 28.00	\$28	\$28	0.000
Data Collection and Entry	52	0.17	8.7	0.0	\$0.00	\$0	8.7	\$ 28.00	\$243	\$243	0.004
Data Review	52	0.08	4.3	0.0	\$0.00	\$0	4.3	\$ 28.00	\$121	\$121	0.002
Subtotal Profile Costs per System									\$392		0.01
Subtotal Profile Costs for All Systems	1173	Systems							\$459,816	7.90	
Generate Report	1	40	40.0	0.0	\$0.00	\$0	40.0	\$ 28.00	\$1,120	\$1,120	0.02
Meet and Review with State	2	4	8.0	0.0	\$0.00	\$0	8.0	\$ 28.00	\$224	\$224	0.00
Average Frequency Systems Incur Profile and Benchmark Costs									1.00		
Subtotal Benchmark Costs per System									\$1,344	0.02	
Subtotal Benchmark Costs for All Systems	377	Systems							\$507,078	9	
Supplemental Viral Profile and Benchmark	1	53.0	53.0	0.0	\$0.00	\$0	53.0	\$ 28.00	\$1,484	\$1,484	0.03
Subtotal Viral Profile and Benchmark^d	4	Systems							\$5,792	0	
Total Profile and Benchmark Costs									\$972,686	17	
Total Start-up, Applicability Monitoring, Profile and Benchmark Costs									\$1,758,078	29	

Notes:

- a. Labor rates include a load factor of 1.4.
- b. Full Time Equivalent (FTE) is based on 2080 hours worked annually.
- c. The sample cost (\$180 per analysis or \$360 per sample) incorporates costs for reporting results to the State because laboratories directly report results in most states.
- d. CWSS data suggest that 0.3% of all systems will require a viral inactivation profile and benchmark because they currently use chloramines or ozone. The burden estimate equals the sum of the data collection, entry, review, and reporting burden for a disinfection profile.

Appendix G-3e
State and Utility Disinfection Benchmarking Costs and Burden, System Size 1,001-3,300, Alternative A4 and Alternative B2

Compliance Activities	Activity Frequency		Management Labor ^a			Technical Labor ^a			Total Burden		
	Freq.	Hrs./ Annual	Hrs.	Rate/ Hour	Cost	Hrs.	Rate/ Hour	Cost	Total Cost	FTE ^b	
Start-up and Applicability Monitoring Costs											
Read and Understand Rule	1	8	8.0	1.6	\$56.00	\$90	6.4	\$ 28.00	\$179	\$269	0.004
Mobilization and Planning	1	8	8.0	1.6	\$56.00	\$90	6.4	\$ 28.00	\$179	\$269	0.004
Record Keeping	1	4	4.0	0.8	\$56.00	\$45	3.2	\$ 28.00	\$90	\$134	0.002
Subtotal Start-up Costs for All Systems	2553	Systems								\$1,715,616	24.55
Applicability Monitoring: Data Collection (number of samples)	1	2	2.0	0.0	\$56.00	\$0	2.0	\$ 28.00	\$56	\$56	0.00
Applicability Monitoring: Average Sample Cost										\$360	
Applicability Monitoring: Notification	1	1	1.0	1.0	\$56.00	\$56	0.0	\$ 28.00	\$0	\$56	0.00
Subtotal Applicability Monitoring Costs for All Systems^c	253	Systems								\$119,416	0.36
Total Start-up and Applicability Monitoring Costs for All Systems										\$1,835,032	25
Profile and Benchmark Costs per System Requiring a Benchmark											
Profile Notification	1	1	1.0	1.0	\$56.00	\$56	0.0	\$ 28.00	\$0	\$56	0.000
Data Collection and Entry	52	0.17	8.7	0.0	\$56.00	\$0	8.7	\$ 28.00	\$243	\$243	0.004
Data Review	52	0.08	4.3	4.3	\$56.00	\$243	0.0	\$ 28.00	\$0	\$243	0.002
Subtotal Profile Costs per System										\$541	0.01
Subtotal Profile Costs for All Systems	2300	Systems								\$1,245,067	15.48
Generate Report	1	40	40.0	8.0	\$56.00	\$448	32.0	\$ 28.00	\$896	\$1,344	0.02
Meet and Review with State	2	4	8.0	4.0	\$56.00	\$224	4.0	\$ 28.00	\$112	\$336	0.00
Average Frequency Systems Incur Profile and Benchmark Costs										1.00	
Subtotal Benchmark Costs per System										\$1,680	0.02
Subtotal Benchmark Costs for All Systems	740	Systems								\$1,243,822	17
Supplemental Viral Profile and Benchmark	1	53.0	53.0	12.3	\$56.00	\$691	40.7	\$ 28.00	\$1,139	\$1,829	0.03
Subtotal Viral Profile and Benchmark^d	74	Systems								\$135,438	2
Total Profile and Benchmark Costs										\$2,624,327	33
Total Start-up, Applicability Monitoring, Profile and Benchmark Costs										\$4,459,359	57

Notes:

- a. Labor rates include a load factor of 1.4.
- b. Full Time Equivalent (FTE) is based on 2080 hours worked annually.
- c. The sample cost (\$180 per analysis or \$360 per sample) incorporates costs for reporting results to the State because laboratories directly report results in most states.
- d. CWSS data suggest that 2.9% of all systems will require a viral inactivation profile and benchmark because they currently use chloramines or ozone. The burden estimate equals the sum of the data collection, entry, review, and reporting burden for a disinfection profile.

Appendix G-3f

State and Utility Disinfection Benchmarking Costs and Burden, System Size 3,301-10,000, Alternative A4 and Alternative B2

Compliance Activities	Activity Frequency			Management Labor ^a			Technical Labor ^a			Total Burden	
	Freq.	Hrs./ Annual Freq.	Hours	Hrs.	Rate/ Hour	Cost	Hrs.	Rate/ Hour	Cost	Total Cost	FTE ^b
Start-up and Applicability Monitoring Costs											
Read and Understand Rule	1	8	8.0	1.6	\$56.00	\$90	6.4	\$ 40.00	\$256	\$346	0.004
Mobilization and Planning	1	8	8.0	1.6	\$56.00	\$90	6.4	\$ 40.00	\$256	\$346	0.004
Record Keeping	1	4	4.0	0.8	\$56.00	\$45	3.2	\$ 40.00	\$128	\$173	0.002
Subtotal Start-up Costs for All Systems	1859			Systems						\$1,606,176	17.88
Applicability Monitoring: Data Collection (number of samples)	1	2	2.0	0.0	\$56.00	\$0	2.0	\$ 40.00	\$80	\$80	0.00
Applicability Monitoring: Average Sample Cost										\$360	
Applicability Monitoring: Notification	1	1	1.0	1.0	\$56.00	\$56	0.0	\$ 40.00	\$0	\$56	0.00
Subtotal Applicability Monitoring Costs for All Systems^c	116			Systems						\$57,536	0.17
Total Start-up and Applicability Monitoring Costs for All Systems										\$1,663,712	18
Profile and Benchmark Costs per System Requiring a Benchmark											
Profile Notification	1	1	1.0	1.0	\$56.00	\$56	0.0	\$ 40.00	\$0	\$56	0.000
Data Collection and Entry	52	0.17	8.7	0.0	\$56.00	\$0	8.7	\$ 40.00	\$347	\$347	0.004
Data Review	52	0.08	4.3	4.3	\$56.00	\$243	0.0	\$ 40.00	\$0	\$243	0.002
Subtotal Profile Costs per System										\$645	0.01
Subtotal Profile Costs for All Systems	1743			Systems						\$1,124,816	11.73
Generate Report	1	40	40.0	8.0	\$56.00	\$448	32.0	\$ 40.00	\$1,280	\$1,728	0.02
Meet and Review with State	2	4	8.0	4.0	\$56.00	\$224	4.0	\$ 40.00	\$160	\$384	0.00
Average Frequency Systems Incur Profile and Benchmark Costs										1.00	
Subtotal Benchmark Costs per System										\$2,112	0.02
Subtotal Benchmark Costs for All Systems	539			Systems						\$1,138,600	12
Supplemental Viral Profile and Benchmark	1	53.0	53.0	12.3	\$56.00	\$691	40.7	\$ 40.00	\$1,627	\$2,317	0.03
Subtotal Viral Profile and Benchmark^d	39			Systems						\$90,466	1
Total Profile and Benchmark Costs										\$2,353,883	24
Total Start-up, Applicability Monitoring, Profile and Benchmark Costs										\$4,017,595	42

Notes:

- a. Labor rates include a load factor of 1.4.
- b. Full Time Equivalent (FTE) is based on 2080 hours worked annually.
- c. The sample cost (\$180 per analysis or \$360 per sample) incorporates costs for reporting results to the State because laboratories directly report results in most states.
- d. CWSS data suggest that 2.1% of all systems will require a viral inactivation profile and benchmark because they currently use chloramines or ozone. The burden estimate equals the sum of the data collection, entry, review, and reporting burden for a disinfection profile.

**Appendix G-3g
State Disinfection Benchmarking Costs and Burden**

Compliance Activities	Activity Frequency			Management Labor ^a			Technical Labor ^a			Total Burden	
	Freq.	Hrs./ Freq.	Annual Hours	Hrs.	Rate/ Hour	Cost	Hrs.	Rate/ Hour	Cost	Total Cost	FTE ^b
STATES											
Start-Up Costs											
Read and Understand Rule	1	4	4	0.8	\$31.23	\$25	3.2	\$ 21.29	\$68	\$93	0.00
Mobilization /Planning	1	40	40	8	\$31.23	\$250	32	\$ 21.29	\$681	\$931	0.02
Train State Staff	1	20	20	16	\$31.23	\$500	4	\$ 21.29	\$85	\$585	0.01
Train Utilities and Consultants	1	80	80	16	\$31.23	\$500	64	\$ 21.29	\$1,363	\$1,863	0.04
Critical Period Determination	0	8	0	0	\$31.23	\$0	0	\$ 21.29	\$0	\$0	0.00
Total Start-Up Costs per State										\$3,472	0.07
Total Start-Up Costs for all States	56 States									\$194,419	
Profile and Benchmarking Costs per System											
Compliance Tracking ^c	1	4	4	1	\$31.23	\$31	3	\$ 21.29	\$64	\$95	0.00
Record Keeping	1	4	4	1	\$31.23	\$31	3	\$ 21.29	\$64	\$95	0.00
Total Tracking Costs per System										\$190	
Subtotal Tracking Costs	9450 Systems									\$1,797,639	
Analyze and Review Data	1	8	8	2	\$31.23	\$62	6	\$ 21.29	\$128	\$190	0.00
Make Determinations	1	8	8	2	\$31.23	\$62	6	\$ 21.29	\$128	\$190	0.00
Meet with Utilities	2	8	16	4	\$31.23	\$125	12	\$ 21.29	\$256	\$380	0.01
Total Profile and Benchmarking Costs per System										\$761	0.02
Subtotal Profile and Benchmarking Costs	2741 Systems									\$2,085,262	52.70
Supplemental Viral Profile and Benchmark ^d	1	16	16	4	\$31.23	\$125	12	\$ 21.29	\$256	\$380	0.01
Subtotal Viral Profile and Benchmark^d	128 Systems									\$48,770	0.01
Total Start-Up and Profile and Benchmarking Costs										\$4,126,091	\$53
Total Annualized Startup and Benchmarking Costs per State (3%)										\$277,356	
Total Annualized Startup and Benchmarking Costs per State (7%)										\$389,462	

Notes:

- Labor rates include a load factor of 1.4.
- Full Time Equivalent (FTE) is based on 2080 hours worked annually.
- Compliance tracking includes tracking notifications for applicability monitoring or profiling.
- CWSS data suggest that between 0.3% and 2.1% of all systems will require a viral inactivation profile and benchmark because they currently use

Appendix G-4a

State and Utility Costs for New Return Location at 3% Cost of Capital, Alternative R2

System Size Category	≤1,000	1,001-3,300	3,301-10,000	10,001 - 1 million ^b	Total ^b	Annualized Costs ^c
Systems Expected to Move Return Location	267	160	143	223	793	
Systems Requiring Determinations and Review	267	160	143	223	793	
Systems Requiring Inspections	67	40	36	56	198	

Compliance Activities

UTILITIES

Start-up and Reporting Costs per System^a

Read and understand rule	\$168	\$202	\$259	\$259		
Mobilization and planning	\$840	\$1,008	\$1,296	\$1,296		
Prepare report for State	\$168	\$196	\$256	\$272		
Record keeping	\$112	\$134	\$173	\$173		
Consultation with State	\$112	\$224	\$224	\$224		
Subtotal Cost per System	\$1,400	\$1,764	\$2,208	\$2,224		
Total Costs for Utilities	\$373,435	\$281,852	\$315,102	\$496,652	\$1,467,041	\$98,614

STATES

Start-up Costs per State

Read and understand rule					\$140	
Mobilization and planning					\$582	
Train State staff					\$466	
Subtotal Cost per State					\$1,187	
Subtotal Start-up Costs for all 56 States					\$66,492	

Review Costs for all Systems by Size Category

Review system reports	\$24,490	\$14,670	\$13,103	\$20,503	\$72,767	
Record keeping	\$24,840	\$14,880	\$13,290	\$20,796		
Meet with system	\$24,840	\$14,880	\$13,290	\$20,796	\$73,806	
Subtotal Review Costs	\$74,171	\$44,429	\$39,683	\$62,096	\$220,379	
Total Costs for States					\$286,871	\$19,283

Total Utility and State Costs

\$1,753,912 \$117,898

Notes:

a. Labor rates include a load factor of 1.4.

b. Includes two plants that belong to systems serving more than one million.

c. All costs are annualized by a capitalization factor (CF) of 0.06722. The CF is calculated using the cost of capital (3%), the number of years of capitalization (20 years), and current value of money (\$1).

Appendix G-4b

State and Utility Costs for New Return Location at 7% Cost of Capital, Alternative R2

System Size Category	≤1,000	1,001-3,300	3,301-10,000	10,001 - 1 million ^b	Total ^b	Annualized Costs ^c
Systems Expected to Move Return Location	267	160	143	223	793	
Systems Requiring Determinations and Review	267	160	143	223	793	
Systems Requiring Inspections	67	40	36	56	198	

Compliance Activities

UTILITIES

Start-up and Reporting Costs per System^a

Read and understand rule	\$168	\$202	\$259	\$259		
Mobilization and planning	\$840	\$1,008	\$1,296	\$1,296		
Prepare report for State	\$168	\$196	\$256	\$272		
Record keeping	\$112	\$134	\$173	\$173		
Consultation with State	\$112	\$224	\$224	\$224		
Subtotal Cost per System	\$1,400	\$1,764	\$2,208	\$2,224		
Total Costs for Utilities	\$373,435	\$281,852	\$315,102	\$496,652	\$1,467,041	\$138,474

STATES

Start-up Costs per State

Read and understand rule					\$140	
Mobilization and planning					\$582	
Train State staff					\$466	
Subtotal Cost per State					\$1,187	
Subtotal Start-up Costs for all 56 States					\$66,492	

Review Costs for all Systems by Size Category

Review system reports	\$24,490	\$14,670	\$13,103	\$20,503	\$72,767	
Record keeping	\$24,840	\$14,880	\$13,290	\$20,796	\$73,806	
Meet with system	\$24,840	\$14,880	\$13,290	\$20,796	\$73,806	
Subtotal Review Costs	\$74,171	\$44,429	\$39,683	\$62,096	\$220,379	
Total Costs for States					\$286,871	\$27,078

Total Utility and State Costs

\$1,753,912 \$165,552

Notes:

a. Labor rates include a load factor of 1.4.

b. Includes two plants that belong to systems serving more than one million.

c. All costs are annualized by a capitalization factor (CF) of 0.09439. The CF is calculated using the cost of capital (7%), the number of years of capitalization (20 years), and current value of money (\$1).

Appendix G4c
Utility Reporting Activities and Burden for New Return Location
Alternative R2

Detail of Utility Activities, System Size: ≤1,000

Recycle Assessment Activities	Freq.	Hrs./ Freq.	Annual Hours	Management ^{a,b}			Technical ^a			Total Burden	
				Hrs.	Rate/ Hour	Cost	Hrs.	Rate/ Hour	Cost	Costs	FTE ^b
Start-up Cost per System											
Read & Understand Rule	1	6	6	0	\$0.00	\$0	6	\$28.00	\$168	\$168	0.00
Mobilization/Planning	1	30	30	0	\$0.00	\$0	30	\$28.00	\$840	\$840	0.01
Prepare report for State	1	6	6	0	\$0.00	\$0	6	\$28.00	\$168	\$168	0.00
Meet with State	2	2	4	0	\$0.00	\$0	4	\$28.00	\$112	\$112	0.00
Record Keeping	1	4	4	0	\$0.00	\$0	4	\$28.00	\$112	\$112	0.00
Total Cost per System						\$0			\$1,400	\$1,400	0.02

Detail of Utility Activities, System Size: 1,000-3,300

Recycle Assessment Activities	Freq.	Hrs./ Freq.	Annual Hours	Management ^{a,b}			Technical ^a			Total Burden	
				Hrs.	Rate/ Hour	Cost	Hrs.	Rate/ Hour	Cost	Costs	FTE ^b
Start-up Cost per System											
Read & Understand Rule	1	6	6	1.2	\$56.00	\$67	4.8	\$28.00	\$134	\$202	0.00
Mobilization/Planning	1	30	30	6	\$56.00	\$336	24	\$28.00	\$672	\$1,008	0.01
Prepare report for State	1	6	6	1	\$56.00	\$56	5	\$28.00	\$140	\$196	0.00
Meet with State	2	2	4	4	\$56.00	\$224	0	\$28.00	\$0	\$224	0.00
Record Keeping	1	4	4	0.8	\$56.00	\$45	3.2	\$28.00	\$90	\$134	0.00
Total Cost per System						\$728			\$1,036	\$1,764	0.02

Detail of Utility Activities, System Size: 3,300-10,000

Alternative R2											
Recycle Assessment Activities	Freq.	Hrs./ Freq.	Annual Hours	Management ^{a,b}			Technical ^a			Total Burden	
				Hrs.	Rate/ Hour	Cost	Hrs.	Rate/ Hour	Cost	Costs	FTE ^b
Start-up Cost per System											
Read & Understand Rule	1	6	6	1.2	\$56.00	\$67	4.8	\$40.00	\$192	\$259	0.00
Mobilization/Planning	1	30	30	6	\$56.00	\$336	24	\$40.00	\$960	\$1,296	0.01
Prepare report for State	1	6	6	1	\$56.00	\$56	5	\$40.00	\$200	\$256	0.00
Meet with State	2	2	4	4	\$56.00	\$224	0	\$40.00	\$0	\$224	0.00
Record Keeping	1	4	4	0.8	\$56.00	\$45	3.2	\$40.00	\$128	\$173	0.00
Total Cost per System						\$728			\$1,480	\$2,208	0.02

Detail of Utility Activities, System Size: 10,000-1 million

Alternative R2											
Recycle Assessment Activities	Freq.	Hrs./ Freq.	Annual Hours	Management ^{a,b}			Technical ^a			Total Burden	
				Hrs.	Rate/ Hour	Cost	Hrs.	Rate/ Hour	Cost	Costs	FTE ^b
Start-up Cost per System											
Read & Understand Rule	1	6	6	1.2	\$56.00	\$67	4.8	\$40.00	\$192	\$259	0.00
Mobilization/Planning	1	30	30	6	\$56.00	\$336	24	\$40.00	\$960	\$1,296	0.01
Prepare report for State	1	6	6	2	\$56.00	\$112	4	\$40.00	\$160	\$272	0.00
Meet with State	2	2	4	4	\$56.00	\$224	0	\$40.00	\$0	\$224	0.00
Record Keeping	1	4	4	0.8	\$56.00	\$45	3.2	\$40.00	\$128	\$173	0.00
Total Cost per System						\$784			\$1,440	\$2,224	0.02

a Labor rates include 1.4 load

b Labor is split between management and technical. Generally, 20% is allocated to management and 80% to technical.

Appendix G-4d
State Reporting Activities for New Return Location

Compliance Activities	Activity Frequency			Management Labor ^a			Technical Labor ^a			Total Burden	
	Freq.	Hrs./ Freq.	Annual Hours	Hrs.	Rate/ Hour	Cost	Hrs.	Rate/ Hour	Cost	Total Cost	FTE ^b
STATES											
Start-up Costs											
Read and Understand Rule	1	6	6	1.2	\$31.23	\$37	4.8	\$ 21.29	\$102	\$140	0.00
Mobilization and Planning	1	25	25	5	\$31.23	\$156	20	\$ 21.29	\$426	\$582	0.01
Train State Staff	1	20	20	4	\$31.23	\$125	16	\$ 21.29	\$341	\$466	0.01
<i>Subtotal</i>	<i>56 States</i>									\$66,492	1.37
Recycle Assessment Costs per System											
Review Recycle Assessment Plan	1	4	4	0.67	\$31.23	\$21	3.33	\$ 21.29	\$71	\$92	0.00
Record Keeping	1	4	4	0.8	\$31.23	\$25	3.2	\$ 21.29	\$68	\$93	0.00
<i>Subtotal</i>	<i>793 Systems</i>									\$146,573	3.05
Meet with System	2	2	4	0.8	\$31.23	\$25	3.2	\$ 21.29	\$68	\$93	0.00
<i>Subtotal</i>	<i>793 Systems</i>									\$73,806	1.52
<i>Subtotal Recycle Assessment Costs for All Systems</i>										\$220,379	
Total Start up and Recycle Assessment Costs										\$286,871	5.95
Total Annualized Recycle Assessment Costs (3%)^c										\$19,283	
Total Annualized Recycle Assessment Costs (7%)^c										\$27,078	

Notes:

a. Labor rates include a load factor of 1.4.

b. Full Time Equivalent (FTE) is based on 2080 hours worked annually.

c. All start-up costs are annualized by a capitalization factor (CF) of 0.06722 or 0.9439. The CF is calculated using the cost of capital (3% or 7%), the number of years (20 years), and current value of money (\$1).

d. Number of conventional filtration systems expected to require different recycle return location.

Appendix G-5a
State and Utility Direct Recycle Costs at 3% Cost of Capital, Alternative R2

System Size Category	≤1,000	1,001-3,300	3,301-10,000	10,001 - 1 million ^c	Total ^c	Annualized Costs ^d
Systems Preparing Self Assessments	355	212	190	343	1100	
Systems Requiring Determinations and Review	142	85	76	57	360	
Systems Requiring Inspections	35	21	19	14	89.9	

Compliance Activities

UTILITIES

Start-up and Reporting Costs per System^a

Read and understand rule	\$280	\$403	\$518	\$518		
Mobilization and planning	\$840	\$1,008	\$1,296	\$1,296		
Prepare monitoring plan	\$224	\$269	\$346	\$691		
Daily record of flow during backwash	\$630	\$630	\$900	\$900		
Prepare report for State	\$448	\$476	\$656	\$725		
Record keeping	\$112	\$134	\$173	\$173		
Subtotal Start-up and Reporting Costs	\$898,619	\$620,363	\$737,819	\$1,477,424	\$3,734,225	
Consultation with State	\$224	\$448	\$448	\$448		
Subtotal Consultation Costs	\$31,774	\$38,066	\$33,999	\$25,502	\$129,342	
Total Costs for Utilities	\$930,394	\$658,430	\$771,819	\$1,502,925	\$3,863,568	\$259,709

STATES

Start-up Costs per State

Read and understand rule					\$140	
Mobilization and planning					\$1,397	
Train State staff					\$931	
Subtotal Start-up Costs for all 56 States					\$138,199	
Review and Follow-up Costs for all Systems						
Review monitoring plans	\$16,512	\$9,891	\$8,834	\$15,985	\$51,222	
Review self assessments	\$73,248	\$43,877	\$39,189	\$70,907	\$227,221	
Record keeping	\$33,025	\$19,782	\$17,669	\$31,969	\$102,445	
Make determination	\$66,049	\$39,564	\$35,337	\$26,505	\$167,456	
Meet with system	\$26,420	\$15,826	\$14,135	\$10,602	\$66,983	
Follow-up inspection ^b	\$6,746	\$4,041	\$3,609	\$2,707	\$17,103	
Subtotal Review and Follow-up Costs	\$222,001	\$132,981	\$118,773	\$158,675	\$632,430	
Total Costs for States					\$770,628	\$51,802

Total Utility and State Direct Recycle Costs					\$4,634,196	\$311,511
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Notes:

- a. Labor rates include a load factor of 1.4.
- b. Follow-up inspection cost assumes that 25% of systems changing treatment practices will require an on-site inspection.
- c. Includes one plant that belongs to a system serving more than one million.
- d. All costs are annualized by a capitalization factor (CF) of 0.06722. The CF is calculated using the cost of capital (3%), the number of years of capitalization (20 years), and current value of money (\$1).

Appendix G-5b
State and Utility Direct Recycle Costs at 7% Cost of Capital, Alternative R2

System Size Category	≤1,000	1,001-3,300	3,301-10,000	10,001 - 1 million ^c	Total ^c	Annualized Costs ^d
Systems Preparing Self Assessments	355	212	190	343	1100	
Systems Requiring Determinations and Review	142	85	76	57	360	
Systems Requiring Inspections	35	21	19	14	90	

Compliance Activities

UTILITIES

Start-up and Reporting Costs per System^a

Read and understand rule	\$280	\$403	\$518	\$518		
Mobilization and planning	\$840	\$1,008	\$1,296	\$1,296		
Prepare monitoring plan	\$224	\$269	\$346	\$691		
Daily record of flow during backwash	\$630	\$630	\$900	\$900		
Prepare report for State	\$448	\$476	\$656	\$725		
Record keeping	\$112	\$134	\$173	\$173		
Subtotal Start-up and Reporting Costs	\$898,619	\$620,363	\$737,819	\$1,477,424	\$3,734,225	
Consultation with State	\$224	\$448	\$448	\$448		
Subtotal Consultation Costs	\$31,774	\$38,066	\$33,999	\$25,502	\$129,342	
Total Costs for Utilities	\$930,394	\$658,430	\$771,819	\$1,502,925	\$3,863,568	\$364,682

STATES

Start-up Costs per State

Read and understand rule					\$140	
Mobilization and planning					\$1,397	
Train State staff					\$931	
Subtotal Start-up Costs for all 56 States					\$138,199	
Review and Follow-up Costs for all Systems						
Review monitoring plans	\$16,512	\$9,891	\$8,834	\$15,985	\$51,222	
Review self assessments	\$73,248	\$43,877	\$39,189	\$70,907	\$227,221	
Record keeping	\$33,025	\$19,782	\$17,669	\$31,969	\$102,445	
Make determination	\$66,049	\$39,564	\$35,337	\$26,505	\$167,456	
Meet with system	\$26,420	\$15,826	\$14,135	\$10,602	\$66,983	
Follow-up inspection ^b	\$6,746	\$4,041	\$3,609	\$2,707	\$17,103	
Subtotal Review and Follow-up Costs	\$222,001	\$132,981	\$118,773	\$158,675	\$632,430	
Total Costs for States					\$770,628	\$72,740

Total Utility and State Direct Recycle Costs					\$4,634,196	\$437,422
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Notes:

- a. Labor rates include a load factor of 1.4.
- b. Follow-up inspection cost assumes that 25% of systems changing treatment practices will require an on-site inspection.
- c. Includes one plant that belongs to a system serving more than one million.
- d. All costs are annualized by a capitalization factor (CF) of 0.09439. The CF is calculated using the cost of capital (7%), the number of years of capitalization (20 years), and current value of money (\$1).

Appendix G-5c
Utility Self Assessment Activities and Burden
Alternative R2

Detail of Utility Activities, System Size: ≤1,000

Self-Assessment Activities	Freq.	Hrs./ Freq.	Total Hours	Management ^a			Technical ^a			Total	
				Hrs.	Rate/ Hour	Cost	Hrs.	Rate/ Hour	Cost	Cost	Costs
Start-up Cost per System											
Read & Understand Rule	1	10	10	0	\$0.00	\$0	10	\$28.00	\$280	\$0	\$280
Mobilization/Planning	1	30	30	0	\$0.00	\$0	30	\$28.00	\$840	\$0	\$840
Prepare monitoring plan	1	8	8	0	\$0.00	\$0	8	\$28.00	\$224	\$0	\$224
Daily record of flow during backwash	30	0.75	22.5	0	\$0.00	\$0	22.5	\$28.00	\$630	\$0	\$630
Prepare report for State	1	16	16	0	\$0.00	\$0	16	\$28.00	\$448	\$0	\$448
Meet with State	2	4	8	0	\$0.00	\$0	8	\$28.00	\$224	\$0	\$224
Record keeping	1	4	4	0	\$0.00	\$0	4	\$28.00	\$112	\$0	\$112
Total Cost per System						\$0			\$2,758		\$2,758

Detail of Utility Activities, System Size: 1,001-3,300

Self-Assessment Activities	Freq.	Hrs./ Freq.	Total Hours	Management ^a			Technical ^a			Total	
				Hrs.	Rate/ Hour	Cost	Hrs.	Rate/ Hour	Cost	Cost	Costs
Start-up Cost per System											
Read & Understand Rule	1	12	12	2.4	\$56.00	\$134	9.6	\$28.00	\$269	\$0	\$403
Mobilization/Planning	1	30	30	6	\$56.00	\$336	24	\$28.00	\$672	\$0	\$1,008
Prepare monitoring plan	1	8	8	1.6	\$56.00	\$90	6.4	\$28.00	\$179	\$0	\$269
Daily record of flow during backwash	30	0.75	22.5	0	\$56.00	\$0	22.5	\$28.00	\$630	\$0	\$630
Prepare report for state	1	16	16	1	\$56.00	\$56	15	\$28.00	\$420	\$0	\$476
Meet with state	2	4	8	8	\$56.00	\$448	0	\$28.00	\$0	\$0	\$448
Record keeping	1	4	4	0.8	\$56.00	\$45	3.2	\$28.00	\$90	\$0	\$134
Total Cost per System						\$1,109			\$2,260		\$3,368

Detail of Utility Activities, System Size: 3,301-10,000

Self-Assessment Activities	Freq.	Hrs./ Freq.	Total Hours	Management ^a			Technical ^a			Total	
				Hrs.	Rate/ Hour	Cost	Hrs.	Rate/ Hour	Cost	Cost	Costs
Start-up Cost per System											
Read & Understand Rule	1	12	12	2.4	\$56.00	\$134	9.6	\$40.00	\$384	\$0	\$518
Mobilization/Planning	1	30	30	6	\$56.00	\$336	24	\$40.00	\$960	\$0	\$1,296
Prepare monitoring plan	1	8	8	1.6	\$56.00	\$90	6.4	\$40.00	\$256	\$0	\$346
Daily record of flow during backwash	30	0.75	22.5	0	\$56.00	\$0	22.5	\$40.00	\$900	\$0	\$900
Prepare report for state	1	16	16	1	\$56.00	\$56	15	\$40.00	\$600	\$0	\$656
Meet with state	2	4	8	8	\$56.00	\$448	0	\$40.00	\$0	\$0	\$448
Record keeping	1	4	4	0.8	\$56.00	\$45	3.2	\$40.00	\$128	\$0	\$173
Total Cost per System						\$1,109			\$3,228		\$4,337

Detail of Utility Activities, System Size: 10,001-1 million

Self-Assessment Activities	Freq.	Hrs./ Freq.	Total Hours	Management ^a			Technical ^a			Total	
				Hrs.	Rate/ Hour	Cost	Hrs.	Rate/ Hour	Cost	Cost	Costs
Start-up Cost per System											
Read & Understand Rule	1	12	12	2.4	\$56.00	\$134	9.6	\$40.00	\$384	\$0	\$518
Mobilization/Planning	1	30	30	6	\$56.00	\$336	24	\$40.00	\$960	\$0	\$1,296
Prepare monitoring plan	1	16	16	3.2	\$56.00	\$179	12.8	\$40.00	\$512	\$0	\$691
Daily record of flow during backwash	30	0.75	22.5	0	\$56.00	\$0	22.5	\$40.00	\$900	\$0	\$900
Prepare report for state	1	16	16	5.33	\$56.00	\$299	10.7	\$40.00	\$427	\$0	\$725
Meet with state	2	4	8	8	\$56.00	\$448	0	\$40.00	\$0	\$0	\$448
Record keeping	1	4	4	0.8	\$56.00	\$45	3.2	\$40.00	\$128	\$0	\$173
Total Cost per System						\$1,441			\$3,311		\$4,752

a Labor rates include 1.4 load

Appendix G-5d
State Self Assessment Activities and Burden, Alternative R2

Compliance Activities	Activity Frequency			Management Labor ^a			Technical Labor ^a			Total Burden	
	Freq.	Hrs./ Freq.	Annual Hours	Hrs.	Rate/ Hour	Cost	Hrs.	Rate/ Hour	Cost	Total Cost	FTE ^b
Start-up Costs											
Read and Understand Rule	1	6	6	1.2	\$31.23	\$37	4.8	\$ 21.29	\$102	\$140	0.00
Mobilization and Planning	1	60	60	12	\$31.23	\$375	48	\$ 21.29	\$1,022	\$1,397	0.03
Train State Staff	1	40	40	8	\$31.23	\$250	32	\$ 21.29	\$681	\$931	0.02
<i>Subtotal</i>	56 States									\$138,199	2.85
Self Assessment Costs per System											
Review Monitoring Plan	1	2	2	0.4	\$31.23	\$12	1.6	\$ 21.29	\$34	\$47	0.00
Review Self Assessment	1	9	9	1.5	\$31.23	\$47	7.5	\$ 21.29	\$160	\$207	0.00
Record Keeping	1	4	4	0.8	\$31.23	\$25	3.2	\$ 21.29	\$68	\$93	0.00
<i>Subtotal</i>	1100 Systems									\$380,888	7.93
Make determination	1	20	20	4	\$31.23	\$125	16	\$ 21.29	\$341	\$466	0.01
<i>Subtotal</i>	360 Systems									\$167,456	3.46
Meet with System	2	4	8	1.6	\$31.23	\$50	6.4	\$ 21.29	\$136	\$186	0.00
<i>Subtotal</i>	360 Systems									\$66,983	1.38
Follow-up Inspection	1	8	8	2	\$31.23	\$62	6	\$ 21.29	\$128	\$190	0.00
<i>Subtotal</i>	90 Systems									\$17,103	0.35
<i>Subtotal Self Assessment Costs for All Systems</i>										\$632,430	
Total Start up and Self Assessment Costs										\$770,628	15.97
Total Annualized Self Assessment Costs (3%)^c										\$51,802	
Total Annualized Self Assessment Costs (7%)^c										\$72,740	

Notes:

- a. Labor rates include a load factor of 1.4.
- b. Full Time Equivalent (FTE) is based on 2080 hours worked annually.
- c. All start-up costs are annualized by a capitalization factor (CF) of 0.06722 or 0.9439. The CF is calculated using the cost of capital (3% or 7%), the number of years (20 years), and current value of money (\$1).
- d. Number of Direct Recycle systems expected to exceed capacity and require treatment changes.
- e. Only 25% of systems described in "d" above are assumed to require a follow-up inspection.

Appendix G-6a

State and Utility Direct Filtration Recycle Assessment Costs at 3% Cost of Capital, Alternative R2

	System Size Category	≤1,000	1,001-3,300	3,301-10,000	10,001 - 1 million ^d	Total ^d	Annualized Costs ^e
Direct Filtration Systems Reporting Recycling Practices		116	70	62	80	328	
Systems Requiring Determinations and Review		8	5	4	6	23	
Systems Requiring Inspections		2	1	1	1	6	

Compliance Activities

UTILITIES

Start-up and Reporting Costs per System^a

Read and understand rule	\$224	\$269	\$346	\$346		
Mobilization and planning	\$420	\$504	\$648	\$648		
Prepare recycle assessment report for State	\$168	\$196	\$256	\$544		
Record keeping	\$112	\$134	\$173	\$173		
Subtotal Start-up and Reporting Costs	\$107,233	\$76,691	\$88,317	\$136,575	\$408,816	
Consultation with State	\$224	\$448	\$448	\$448		
Subtotal Consultation Costs^b	\$1,820	\$2,180	\$1,947	\$2,504	\$8,451	
Total Costs for Utilities	\$109,053	\$78,871	\$90,264	\$139,079	\$417,267	\$28,049

STATES

Start-up Costs per State

Read and understand rule					\$140	
Mobilization and planning					\$582	
Train State staff					\$466	
Subtotal Start-up Costs for all 56 States					\$66,492	
Review Costs for all Systems by Size Category						
Review system reports	\$15,983	\$9,574	\$8,551	\$10,997	\$45,105	
Record keeping	\$10,808	\$6,474	\$5,782	\$7,436		
Make determination	\$3,783	\$2,266	\$2,024	\$2,603	\$10,675	
Meet with system	\$1,513	\$906	\$810	\$1,041	\$4,270	
Follow-up inspection ^c	\$386	\$231	\$207	\$266	\$1,090	
Subtotal Recycle Assessment Costs	\$32,472	\$19,451	\$17,373	\$22,342	\$91,640	
Total Costs for States					\$158,131	\$10,630
Total Utility and State Recycle Assessment Costs					\$575,398	\$38,678

Notes:

a. Labor rates include a load factor of 1.4.

b. Determination and consultation costs assume that 7% of systems in each size category will need to alter treatment practices.

c. Follow-up inspection cost assumes that 25% of systems changing treatment practices will require an on-site inspection.

d. Costs include three plants that belong to systems serving more than 1 million.

e. All costs are annualized by a capitalization factor (CF) of 0.06722. The CF is calculated using the cost of capital (3%), the number of years of capitalization (20 years), and current value of money (\$1).

Appendix G-6b

State and Utility Direct Filtration Recycle Assessment Costs at 7% Cost of Capital, Alternative R2

	System Size Category	≤1,000	1,001-3,300	3,301-10,000	10,001 - 1 million ^d	Total ^d	Annualized Costs ^e
Direct Filtration Systems Reporting Recycling Practices		116	70	62	80	328	
Systems Requiring Determinations and Review		8	5	4	6	23	
Systems Requiring Inspections		2	1	1	1	6	

Compliance Activities

UTILITIES

Start-up and Reporting Costs per System^a

Read and understand rule	\$224	\$269	\$346	\$346		
Mobilization and planning	\$420	\$504	\$648	\$648		
Prepare recycle assessment report for State	\$168	\$196	\$256	\$544		
Record keeping	\$112	\$134	\$173	\$173		
Subtotal Start-up and Reporting Costs	\$107,233	\$76,691	\$88,317	\$136,575	\$408,816	
Consultation with State	\$224	\$448	\$448	\$448		
Subtotal Consultation Costs^b	\$1,820	\$2,180	\$1,947	\$2,504	\$8,451	
Total Costs for Utilities	\$109,053	\$78,871	\$90,264	\$139,079	\$417,267	\$39,386

STATES

Start-up Costs per State

Read and understand rule					\$140	
Mobilization and planning					\$582	
Train State staff					\$466	
Subtotal Start-up Costs for all 56 States					\$66,492	

Review Costs for all Systems by Size Category

Review system reports	\$15,983	\$9,574	\$8,551	\$10,997	\$45,105	
Record keeping	\$10,808	\$6,474	\$5,782	\$7,436		
Make determination	\$3,783	\$2,266	\$2,024	\$2,603	\$10,675	
Meet with system	\$1,513	\$906	\$810	\$1,041	\$4,270	
Follow-up inspection ^c	\$386	\$231	\$207	\$266	\$1,090	
Subtotal Recycle Assessment Costs	\$32,472	\$19,451	\$17,373	\$22,342	\$91,640	
Total Costs for States					\$158,131	\$14,926

Total Utility and State Recycle Assessment Costs					\$575,398	\$54,312
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Notes:

- Labor rates include a load factor of 1.4.
- Determination and consultation costs assume that 7% of systems in each size category will need to alter treatment practices.
- Follow-up inspection cost assumes that 25% of systems changing treatment practices will require an on-site inspection.
- Costs include three plants that belong to systems serving more than 1 million.
- All costs are annualized by a capitalization factor (CF) of 0.09439. The CF is calculated using the cost of capital (7%), the number of years of capitalization (20 years), and current value of money (\$1).

Appendix G6c
Utility Direct Filtration Recycle Assessment Activities and Burden
Alternative R2

Detail of Utility Activities, System Size: ≤1,000

Recycle Assessment Activities	Freq.	Hrs./ Freq.	Annual Hours	Management ^{a,b}			Technical ^a			Total Burden	
				Hrs.	Rate/ Hour	Cost	Hrs.	Rate/ Hour	Cost	Costs	FTE ^b
Start-up Cost per System											
Read & Understand Rule	1	8	8	0	\$0.00	\$0	8	\$28.00	\$224	\$224	0.00
Mobilization/Planning	1	15	15	0	\$0.00	\$0	15	\$28.00	\$420	\$420	0.01
Prepare report for State	1	6	6	0	\$0.00	\$0	6	\$28.00	\$168	\$168	0.00
Meet with State	2	4	8	0	\$0.00	\$0	8	\$28.00	\$224	\$224	0.00
Record Keeping	1	4	4	0	\$0.00	\$0	4	\$28.00	\$112	\$112	0.00
Total Cost per System						\$0			\$1,148	\$1,148	0.02

Detail of Utility Activities, System Size: 1,000-3,300

Alternative R2

Recycle Assessment Activities	Freq.	Hrs./ Freq.	Annual Hours	Management ^{a,b}			Technical ^a			Total Burden	
				Hrs.	Rate/ Hour	Cost	Hrs.	Rate/ Hour	Cost	Costs	FTE ^b
Start-up Cost per System											
Read & Understand Rule	1	8	8	1.6	\$56.00	\$90	6.4	\$28.00	\$179	\$269	0.00
Mobilization/Planning	1	15	15	3	\$56.00	\$168	12	\$28.00	\$336	\$504	0.01
Prepare report for State	1	6	6	1	\$56.00	\$56	5	\$28.00	\$140	\$196	0.00
Meet with State	2	4	8	8	\$56.00	\$448	0	\$28.00	\$0	\$448	0.00
Record Keeping	1	4	4	0.8	\$56.00	\$45	3.2	\$28.00	\$90	\$134	0.00
Total Cost per System						\$806			\$745	\$1,551	0.02

Detail of Utility Activities, System Size: 3,300-10,000

Alternative R2

Recycle Assessment Activities	Freq.	Hrs./ Freq.	Annual Hours	Management ^{a,b}			Technical ^a			Total Burden	
				Hrs.	Rate/ Hour	Cost	Hrs.	Rate/ Hour	Cost	Costs	FTE ^b
Start-up Cost per System											
Read & Understand Rule	1	8	8	1.6	\$56.00	\$90	6.4	\$40.00	\$256	\$346	0.00
Mobilization/Planning	1	15	15	3	\$56.00	\$168	12	\$40.00	\$480	\$648	0.01
Prepare report for State	1	6	6	1	\$56.00	\$56	5	\$40.00	\$200	\$256	0.00
Meet with State	2	4	8	8	\$56.00	\$448	0	\$40.00	\$0	\$448	0.00
Record Keeping	1	4	4	0.8	\$56.00	\$45	3.2	\$40.00	\$128	\$173	0.00
Total Cost per System						\$806			\$1,064	\$1,870	0.02

Detail of Utility Activities, System Size: 10,000-1 million

Alternative R2

Recycle Assessment Activities	Freq.	Hrs./ Freq.	Annual Hours	Management ^{a,b}			Technical ^a			Total Burden	
				Hrs.	Rate/ Hour	Cost	Hrs.	Rate/ Hour	Cost	Costs	FTE ^b
Start-up Cost per System											
Read & Understand Rule	1	8	8	1.6	\$56.00	\$90	6.4	\$40.00	\$256	\$346	0.00
Mobilization/Planning	1	15	15	3	\$56.00	\$168	12	\$40.00	\$480	\$648	0.01
Prepare report for State	1	12	12	4	\$56.00	\$224	8	\$40.00	\$320	\$544	0.01
Meet with State	2	4	8	8	\$56.00	\$448	0	\$40.00	\$0	\$448	0.00
Record Keeping	1	4	4	0.8	\$56.00	\$45	3.2	\$40.00	\$128	\$173	0.00
Total Cost per System						\$974			\$1,184	\$2,158	0.02

a Labor rates include 1.4 load

b Labor is split between management and technical. Generally, 20% is allocated to management and 80% to technical.

Appendix G-6d
State Direct Filtration Recycle Assessment Review Activities and Burden, Alternative R2

Compliance Activities	Activity Frequency			Management Labor ^a			Technical Labor ^a			Total Burden	
	Freq.	Hrs./ Freq.	Annual Hours	Hrs.	Hour Rate/	Cost	Hrs.	Hour Rate/	Cost	Total Cost	FTE ^b
Start-up Costs											
Read and Understand Rule	1	6	6	1.2	\$31.23	\$37	4.8	\$ 21.29	\$102	\$140	0.00
Mobilization and Planning	1	25	25	5	\$31.23	\$156	20	\$ 21.29	\$426	\$582	0.01
Train State Staff	1	20	20	4	\$31.23	\$125	16	\$ 21.29	\$341	\$466	0.01
<i>Subtotal</i>	56 States									\$66,492	1.37
Recycle Assessment Costs per System											
Review Recycle Assessment	1	6	6	1	\$31.23	\$31	5	\$ 21.29	\$106	\$138	0.00
Record Keeping	1	4	4	0.8	\$31.23	\$25	3.2	\$ 21.29	\$68	\$93	0.00
<i>Subtotal</i>	328 Systems									\$75,605	1.57
Make determination	1	20	20	4	\$31.23	\$125	16	\$ 21.29	\$341	\$466	0.01
<i>Subtotal</i>	23 Systems ^d									\$10,675	0.22
Meet with System	2	4	8	1.6	\$31.23	\$50	6.4	\$ 21.29	\$136	\$186	0.00
<i>Subtotal</i>	23 Systems ^d									\$4,270	0.09
Follow-up Inspection	1	8	8	2	\$31.23	\$62	6	\$ 21.29	\$128	\$190	0.00
<i>Subtotal</i>	6 Systems ^e									\$1,090	0.02
<i>Subtotal Recycle Assessment Costs for All Systems</i>										\$91,640	
Total Start up and Recycle Assessment Costs										\$158,131	3.28
Total Annualized Recycle Assessment Costs (3%)^c										\$10,630	
Total Annualized Recycle Assessment Costs (7%)^c										\$14,926	

Notes:

- a. Labor rates include a load factor of 1.4.
- b. Full Time Equivalent (FTE) is based on 2080 hours worked annually.
- c. All start-up costs are annualized by a capitalization factor (CF) of 0.06722 or 0.9439. The CF is calculated using the cost of capital (3% or 7%), the number of years (20 years), and current value of money (\$1).
- d. Number of Direct Recycle systems expected to exceed capacity and require treatment changes.
- e. Only 25% of systems described in "d" above are assumed to require a follow-up inspection.

Appendix H

Appendix H-1: Annual Household Cost per Systems Serving Population <100, Alternative T2A4

Treatment change	Cost per system (\$/kgal)	Percent of systems	Percent of systems											
			5	10	15	20	25	30	35	40	45	50		
Chemical Addition														
install coagulant aid polymer feed capability	1.48	5	1.48											
install backwash water polymer feed capability	1.48	5	1.48											
install pH adjustment for enhancing alkalinity purposes	2.51	20	2.51							2.51	2.51	2.51		
Coagulant Improvements														
primary coagulant feed points, control, measurement	1.48	20		1.48	1.48	1.48	1.48							
Rapid Mixing														
rapid mix improvements-mechanical	1.20	20			1.20	1.20	1.20	1.20						
rapid mix improvements-structural	1.21	5		1.21										
Flocculant Improvements														
flocculation improvements-mechanical	1.40	20			1.40	1.40	1.40	1.40						
flocculation improvements-structural	1.72	5		1.72										
Settling Improvements														
equipment modification-weirs, inf/effl, etc.	0.31	20												0.31
add tube settlers	0.40	5		0.40										
Filtration Improvements														
filter media additions (2-6" typical)	0.02	20												
filter media overhaul	0.27	15												
backwashing-increase flow/velocity (10-20% increase)	1.90	15	1.90	1.90	1.90									
backwashing-install surface wash	1.07	10	1.07	1.07										
post backwash-sequence (install additional filter (s))	3.18	0												
post backwash filter-to-waste	1.60	5	1.60											
filter control systems	1.17	15	1.17	1.17	1.17									
individual filter turbidimeter installation	0.61	80*	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61
membrane (microfiltration)	7.49	0												
Administrative Culture Improvements														
plant staffing-increase (1 or 2 persons)	5.85	25	5.85	5.85	5.85	5.85	5.85							
staff qualifications	0.27	10						0.27	0.27					
Laboratory Modifications														
bench top turbidimeter purchase-replace obsolete units	0.08	20	0.08	0.08	0.08	0.08								
jar test apparatus purchase	0.09	20	0.09	0.09	0.09	0.09								
alternative process control testing equipment-(streaming current monitor, Zetameter, etc.)	0.90	0												
	0.00	0												
Process Control Testing Modification														
staff training (advanced)	0.1821638	50	0.18216	0.1822	0.1822	0.1822	0.1822	0.1822	0.1822	0.1822	0.1822	0.1822	0.1822	0.18216
Total Treatment Cost per System (\$/kgal)			18.02	15.77	13.96	10.90	10.73	3.66	3.57	3.30	3.30	1.11		
Total Treatment Cost per System (\$)	2533		45653	39936	35352	27598	27178	9264	9039	8367	8367	2808		
Reporting Cost per System(\$)			1356	1356	1356	1356	1356	1356	1356	1356	1356	1356		
Total Cost per System (\$)			47009	41293	36708	28954	28534	10620	10395	9723	9723	4164		
Cost per Household (\$/hh)	22		2177	1913	1700	1341	1322	492	481	450	450	193		
Number of Systems			17	17	17	17	17	17	17	17	17	17		
Aggregate Number of Systems			17	34	51	68	85	102	119	136	153	171		
Number of Households	2971		148	148	148	148	148	148	148	148	148	148		
Aggregate Number of Households			148	297	445	594	742	891	1039	1188	1336	1485		

*Note: this is 80% of all systems that monitor for turbidity, which includes all of the systems changing treatment and A23xx additional sys+A23+A23tems

Appendix H-1: Annual Household Cost per Systems Serving Population <100, Alternative T2A4

Continued

Treatment change	55	60	65	70	75	80	85	90	95	100	Turbidi- meter only	Systems Monitoring without Treatment	DBP Only	Covered Finished Only
Chemical Addition install coagulant aid polymer feed capability install backwash water polymer feed capability install pH adjustment for enhancing alkalinity purposes														
Coagulant Improvements primary coagulant feed points, control, measurement														
Rapid Mixing rapid mix improvements-mechanical rapid mix improvements-structural														
Flocculant Improvements flocculation improvements-mechanical flocculation improvements-structural														
Settling Improvements equipment modification-weirs, inf/effl, etc. add tube settlers	0.31	0.31	0.31											
Filtration Improvements filter media additions (2-6" typical) filter media overhaul backwashing-increase flow/velocity (10-20% increase) backwashing-install surface wash post backwash-sequence (install additional filter (s)) post backwash filter-to-waste filter control systems individual filter turbidimeter installation membrane (microfiltration)				0.27	0.27	0.27	0.02	0.02	0.02	0.02				
	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61			
Administrative Culture Improvements plant staffing-increase (1 or 2 persons) staff qualifications														
Laboratory Modifications bench top turbidimeter purchase-replace obsolete units jar test apparatus purchase alternative process control testing equipment- (streaming current monitor, Zetameter, etc.)														
Process Control Testing Modification staff training (advanced)														
Total Treatment Cost per System (\$/kgal)	0.93	0.93	0.93	0.89	0.89	0.89	0.63	0.63	0.63	0.63	0.61			
Total Treatment Cost per System (\$)	2347	2347	2347	2248	2248	2248	1595	1595	1595	1595	1556			
Reporting Cost per System(\$)	1356	1356	1356	1356	1356	1356	1356	1356	1356	1356	1356	1356	151	24
Total Cost per System (\$)	3703	3703	3703	3604	3604	3604	2951	2951	2951	2951	2912	1356	151	24
Cost per Household (\$/hh)	171	171	171	167	167	167	137	137	137	137	135	63	7	1
Number of Systems	17	17	17	17	17	17	17	17	17	17	17	328	167	986
Aggregate Number of Systems	188	205	222	239	256	273	290	307	324	341	669	836	1822	2804
Number of Households	148	148	148	148	148	148	148	148	148	148	2855	1456	8588	428
Aggregate Number of Households	1633	1782	1930	2079	2227	2376	2524	2673	2821	2970	5825	7281	15869	16297

*Note: this is 80% of all systems that monitor for turbidity, which includes all of the systems changing treatment and A23xx additional sys+A23+A23tems

Appendix H-2: Annual Household Cost per Systems Serving Population 101-500, Alternative T2A4

Continued

Treatment change	55	60	65	70	75	80	85	90	95	100	Turbidi- meter only	Systems Monitoring without Treatment	DBP Only	Covered Finished Only
Chemical Addition install coagulant aid polymer feed capability install backwash water polymer feed capability install pH adjustment for enhancing alkalinity purposes														
Coagulant Improvements primary coagulant feed points, control, measurement														
Rapid Mixing rapid mix improvements-mechanical rapid mix improvements-structural														
Flocculant Improvements flocculation improvements-mechanical flocculation improvements-structural														
Settling Improvements equipment modification-weirs, inf/effl, etc. add tube settlers	0.09	0.09	0.09											
Filtration Improvements filter media additions (2-6" typical) filter media overhaul backwashing-increase flow/velocity (10-20% increase) backwashing-install surface wash post backwash-sequence (install additional filter (s)) post backwash filter-to-waste filter control systems individual filter turbidimeter installation membrane (microfiltration)	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16			
Administrative Culture Improvements plant staffing-increase (1 or 2 persons) staff qualifications														
Laboratory Modifications bench top turbidimeter purchase-replace obsolete units jar test apparatus purchase alternative process control testing equipment- (streaming current monitor, Zetameter, etc.)														
Process Control Testing Modification staff training (advanced)														
Total Treatment Cost per System (\$/kgal)	0.25	0.25	0.25	0.43	0.43	0.17	0.17	0.17	0.17	0.16	0.16			
Total Treatment Cost per System (\$)	2510	2510	2510	4316	4316	1706	1706	1706	1706	1606	1606			
Reporting Cost per System(\$)	1394	1394	1394	1394	1394	1394	1394	1394	1394	1394	1394	1394	148	21
Total Cost per System (\$)	3903	3903	3903	5710	5710	3100	3100	3100	3100	3000	3000	1394	148	21
Cost per Household (\$/hh)	36	36	36	53	53	29	29	29	29	28	28	13	1	0
Number of Systems	23	23	23	23	23	23	23	23	23	23	438	223	1422	321
Aggregate Number of Systems	251	274	296	319	342	365	388	410	433	456	894	1117	2539	2860
Number of Households	1760	1760	1760	1760	1760	1760	1760	1760	1760	1760	33788	17249	109797	1239
Aggregate Number of Households	19365	21125	22886	24646	26407	28167	29928	31688	33449	35209	68997	86247	196043	197282

Appendix H-3: Annual Household Cost per Systems Serving Population 501-1,000, Alternative T2A4

Treatment change	Cost per system (\$/kgal)	Percent of systems	5	10	15	20	25	30	35	40	45	50
Chemical Addition												
install coagulant aid polymer feed capability	0.14	15						0.14	0.14	0.14		
install backwash water polymer feed capability	0.14	5						0.14				
install pH adjustment for enhancing alkalinity purposes	0.25	15						0.25	0.25	0.25		
Coagulant Improvements												
primary coagulant feed points, control, measurement	0.14	20	0.14	0.14	0.14	0.14						
Rapid Mixing												
rapid mix improvements-mechanical	0.11	15		0.11	0.11	0.11						
rapid mix improvements-structural	0.11	5	0.11									
Flocculant Improvements												
flocculation improvements-mechanical	0.15	20		0.15	0.15	0.15	0.15					
flocculation improvements-structural	0.24	5	0.24									
Settling Improvements												
equipment modification-weirs, inf/effl, etc.	0.09	20									0.09	0.09
add tube settlers	0.18	5	0.18									
Filtration Improvements												
filter media additions (2-6" typical)	0.01	10										
filter media overhaul	0.26	10										
backwashing-increase flow/velocity (10-20% increase)	0.25	10	0.25	0.25								
backwashing-install surface wash	0.19	20	0.19	0.19	0.19	0.19						
post backwash-sequence (install additional filter (s))	0.56	0										
post backwash filter-to-waste	0.20	5	0.20									
filter control systems	0.17	15	0.17	0.17	0.17							
individual filter turbidimeter installation	0.06	80*	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
membrane (microfiltration)	2.89	0										
Administrative Culture Improvements												
plant staffing-increase (1 or 2 persons)	1.09	20	1.09	1.09	1.09	1.09						
staff qualifications	0.20	10					0.20	0.20				
Laboratory Modifications												
bench top turbidimeter purchase-replace obsolete units	0.01	20	0.01	0.01	0.01	0.01						
jar test apparatus purchase	0.01	20	0.01	0.01	0.01	0.01						
alternative process control testing equipment- (streaming current monitor, Zetameter, etc.)	0.08	0										
Process Control Testing Modification												
staff training (advanced)	0.02	50	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Total Treatment Cost per System (\$/kgal)			2.67	2.20	1.95	1.78	0.43	0.81	0.47	0.47	0.17	0.17
Total Treatment Cost per System (\$)	27266		72800	59985	53169	48533	11724	22085	12815	12815	4635	4635
Reporting Cost per System(\$)			1403	1403	1403	1403	1403	1403	1403	1403	1403	1403
Total Cost per System (\$)			74204	61389	54572	49937	13128	23489	14218	14218	6039	6039
Cost per Household (\$/hh)	286		259	214	191	174	46	82	50	50	21	21
Number of Systems			17	17	17	17	17	17	17	17	17	17
Aggregate Number of Systems			17	33	50	66	83	99	116	132	149	166
Number of Households	81131		4057	4057	4057	4057	4057	4057	4057	4057	4057	4057
Aggregate Number of Households			4057	8114	12171	16228	20285	24342	28399	32456	36513	40570

Appendix H-3: Annual Household Cost per Systems Serving Population 501-1,000, Alternative T2A4

Continued

Treatment change	55	60	65	70	75	80	85	90	95	100	Turbidi- meter only	Systems Monitoring without Treatment	DBP Only	Covered Finished Only
Chemical Addition														
install coagulant aid polymer feed capability														
install backwash water polymer feed capability														
install pH adjustment for enhancing alkalinity purposes														
Coagulant Improvements														
primary coagulant feed points, control, measurement														
Rapid Mixing														
rapid mix improvements-mechanical														
rapid mix improvements-structural														
Flocculant Improvements														
flocculation improvements-mechanical														
flocculation improvements-structural														
Settling Improvements														
equipment modification-weirs, inf/effl, etc.	0.09	0.09												
add tube settlers														
Filtration Improvements														
filter media additions (2-6" typical)					0.01	0.01								
filter media overhaul			0.26	0.26										
backwashing-increase flow/velocity (10-20% increase)														
backwashing-install surface wash														
post backwash-sequence (install additional filter (s))														
post backwash filter-to-waste														
filter control systems														
individual filter turbidimeter installation	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06			
membrane (microfiltration)														
Administrative Culture Improvements														
plant staffing-increase (1 or 2 persons)														
staff qualifications														
Laboratory Modifications														
bench top turbidimeter purchase-replace obsolete units														
jar test apparatus purchase														
alternative process control testing equipment- (streaming current monitor, Zetameter, etc.)														
Process Control Testing Modification														
staff training (advanced)														
Total Treatment Cost per System (\$/kgal)	0.15	0.15	0.32	0.32	0.07	0.07	0.06	0.06	0.06	0.06	0.06			
Total Treatment Cost per System (\$)	4090	4090	8725	8725	1909	1909	1636	1636	1636	1636	1636			
Reporting Cost per System(\$)	1403	1403	1403	1403	1403	1403	1403	1403	1403	1403	1403	1403	144	16
Total Cost per System (\$)	5493	5493	10129	10129	3312	3312	3039	3039	3039	3039	3039	1403	144	16
Cost per Household (\$/hh)	19	19	35	35	12	12	11	11	11	11	11	5	1	0
Number of Systems	17	17	17	17	17	17	17	17	17	17	17	317	162	41
Aggregate Number of Systems	182	199	215	232	248	265	281	298	314	331	648	810	1358	1399
Number of Households	4057	4057	4057	4057	4057	4057	4057	4057	4057	4057	77709	39712	134262	506
Aggregate Number of Households	44627	48684	52741	56798	60855	64913	68970	73027	77084	81141	158849	198562	332824	333330

Appendix H-4: Annual Household Cost per Systems Serving Population 1,001-3,300, Alternative T2A4

Continued

Treatment change	55	60	65	70	75	80	85	90	95	100	Turbidi- meter only	Systems Monitoring without Treatment	DBP Only	Covered Finished Only
Chemical Addition														
install coagulant aid polymer feed capability														
install backwash water polymer feed capability														
install pH adjustment for enhancing alkalinity purposes														
Coagulant Improvements														
primary coagulant feed points, control, measurement														
Rapid Mixing														
rapid mix improvements-mechanical														
rapid mix improvements-structural														
Flocculant Improvements														
flocculation improvements-mechanical														
flocculation improvements-structural														
Settling Improvements														
equipment modification-weirs, inf/effl, etc.	0.04	0.04												
add tube settlers														
Filtration Improvements														
filter media additions (2-6" typical)					0.001	0.001								
filter media overhaul			0.23	0.23										
backwashing-increase flow/velocity (10-20% increase)														
backwashing-install surface wash														
post backwash-sequence (install additional filter (s))														
post backwash filter-to-waste														
filter control systems														
individual filter turbidimeter installation	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03			
membrane (microfiltration)														
Administrative Culture Improvements														
plant staffing-increase (1 or 2 persons)														
staff qualifications														
Laboratory Modifications														
bench top turbidimeter purchase-replace obsolete units														
jar test apparatus purchase														
alternative process control testing equipment- (streaming current monitor, Zetameter, etc.)														
Process Control Testing Modification														
staff training (advanced)														
Total Treatment Cost per System (\$/kgal)	0.07	0.07	0.26	0.26	0.03	0.03	0.03	0.03	0.03	0.03	0.03			
Total Treatment Cost per System (\$)	5442	5442	20214	20214	2410	2410	2332	2332	2332	2332	2332			
Reporting Cost per System(\$)	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	193	29
Total Cost per System (\$)	7445	7445	22217	22217	4413	4413	4335	4335	4335	4335	4335	2003	193	29
Cost per Household (\$/hh)	10	10	29	29	6	6	6	6	6	6	6	3	0	0
Number of Systems	34	34	34	34	34	34	34	34	34	34	649	331	947	29
Aggregate Number of Systems	371	405	439	473	506	540	574	608	641	675	1324	1655	2602	2631
Number of Households	23986	23986	23986	23986	23986	23986	23986	23986	23986	23986	461233	235236	673088	1027
Aggregate Number of Households	263841	287827	311812	335798	359783	383769	407755	431740	455726	479711	940945	1176181	1849269	1850296

Appendix H-5: Annual Household Cost per Systems Serving Population 3,301-10,000, Alternative T2A4

Treatment change	Cost per system (\$/kgal)	Percent of systems	5	10	15	20	25	30	35	40	45	50
Chemical Addition												
install coagulant aid polymer feed capability	0.02	25					0.02	0.02	0.02	0.02	0.02	
install backwash water polymer feed capability	0.004	5					0.004					
install pH adjustment for enhancing alkalinity purposes	0.02	5					0.02					
	0.05											
Coagulant Improvements												
primary coagulant feed points, control, measurement	0.02	20	0.02	0.02	0.02	0.02						
Rapid Mixing												
rapid mix improvements-mechanical	0.01	5		0.01								
rapid mix improvements-structural	0.02	1	0.02									
Flocculant Improvements												
flocculation improvements-mechanical	0.03	15		0.03	0.03	0.03						
flocculation improvements-structural	0.04	5	0.04									
Settling Improvements												
equipment modification-weirs, inf/effl, etc.	0.03	15										0.03
add tube settlers	0.09	5	0.09									
Filtration Improvements												
filter media additions (2-6" typical)	0.004	10										
filter media overhaul	0.15	10										
backwashing-increase flow/velocity (10-20% increase)	0.11	5	0.11									
backwashing-install surface wash	0.08	20	0.08	0.08	0.08	0.08						
post backwash-sequence (install additional filter (s))	0.10	0										
post backwash filter-to-waste	0.05	5	0.05									
filter control systems	0.08	20	0.08	0.08	0.08	0.08						
individual filter turbidimeter installation	0.01	80*	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
membrane (microfiltration)	1.49	0										
Administrative Culture Improvements												
plant staffing-increase (1 or 2 persons)	0.16	10	0.16	0.16								
staff qualifications	0.00	5			0.00							
Laboratory Modifications												
bench top turbidimeter purchase-replace obsolete units	0.001	20	0.001	0.001	0.001	0.001						
jar test apparatus purchase	0.001	15	0.001	0.001	0.001							
alternative process control testing equipment- (streaming current monitor, Zetameter, etc.)	0.01	5	0.01									
Process Control Testing Modification												
staff training (advanced)	0.002	35	0.00169013	0.00169	0.0016901	0.0017	0.0017	0.0017	0.0017			
Total Treatment Cost per System (\$/kgal)			0.67	0.39	0.23	0.22	0.06	0.03	0.03	0.03	0.03	0.04
Total Treatment Cost per System (\$)	273020		183782	107336	62002	60724	15225	8652	8652	8191	8191	10921
Reporting Cost per System(\$)			2728	2728	2728	2728	2728	2728	2728	2728	2728	2728
Total Cost per System (\$)			186510	110064	64730	63452	17952	11380	11380	10919	10919	13649
Cost per Household (\$/hh)	2277		82	48	28	28	8	5	5	5	5	6
Number of Systems			30	30	30	30	30	30	30	30	30	30
Aggregate Number of Systems			30	60	90	121	151	181	211	241	271	302
Number of Households	1329942		66479	66479	66479	66479	66479	66479	66479	66479	66479	66479
Aggregate Number of Households			66479	132958	199437	265916	332395	398875	465354	531833	598312	664791

Appendix H-5: Annual Household Cost per Systems Serving Population 3,301-10,000, Alternative T2A4

Continued

Treatment change	55	60	65	70	75	80	85	90	95	100	Turbidi- meter only	Systems Monitoring without Treatment	DBP Only	Covered Finished Only
Chemical Addition														
install coagulant aid polymer feed capability														
install backwash water polymer feed capability														
install pH adjustment for enhancing alkalinity purposes														
Coagulant Improvements														
primary coagulant feed points, control, measurement														
Rapid Mixing														
rapid mix improvements-mechanical														
rapid mix improvements-structural														
Flocculant Improvements														
flocculation improvements-mechanical														
flocculation improvements-structural														
Settling Improvements														
equipment modification-weirs, inf/effl, etc.	0.03	0.03												
add tube settlers														
Filtration Improvements														
filter media additions (2-6" typical)					0.004	0.004								
filter media overhaul			0.15	0.15										
backwashing-increase flow/velocity (10-20% increase)														
backwashing-install surface wash														
post backwash-sequence (install additional filter (s))														
post backwash filter-to-waste														
filter control systems														
individual filter turbidimeter installation	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01			
membrane (microfiltration)														
Administrative Culture Improvements														
plant staffing-increase (1 or 2 persons)														
staff qualifications														
Laboratory Modifications														
bench top turbidimeter purchase-replace obsolete units														
jar test apparatus purchase														
alternative process control testing equipment- (streaming current monitor, Zetameter, etc.)														
Process Control Testing Modification														
staff training (advanced)														
Total Treatment Cost per System (\$/kgal)	0.04	0.04	0.16	0.16	0.01	0.01	0.01	0.01	0.01	0.01	0.01			
Total Treatment Cost per System (\$)	10921	10921	43683	43683	3884	3884	2730	2730	2730	2730	2730			
Reporting Cost per System(\$)	2728	2728	2728	2728	2728	2728	2728	2728	2728	2728	2728	2728	244	40
Total Cost per System (\$)	13649	13649	46411	46411	6612	6612	5458	5458	5458	5458	5458	2728	244	40
Cost per Household (\$/hh)	6	6	20	20	3	3	2	2	2	2	2	1	0.1	0.0
Number of Systems	30	30	30	30	30	30	30	30	30	30	30	579	296	412
Aggregate Number of Systems	332	362	392	422	452	482	513	543	573	603	1182	1478	1890	1899
Number of Households	66479	66479	66479	66479	66479	66479	66479	66479	66479	66479	1277545	651782	908658	19624
Aggregate Number of Households	731270	797749	864228	930707	997186	1063665	1130144	1196624	1263103	1329582	2607127	3258908	4167566	4187190

**Appendix H-6: Annual Household Cost
per Systems, FBR Alternative R2**

Cost of Capital:

7%

System Size Categories:	<100					101-500				
	\$1,000s	%systems	#systems	#HH	\$1,000/HH	\$1,000s	%systems	#systems	#HH	\$1,000/HH
Direct Recycle Plants										
Combination: Recycle to headworks and equalization basin	10.89	10.00	10.74	93.47	0.52	12.92	10.00	14.33	1106.69	0.12
Install piping to move recycle to headworks ¹	3.42	15.00	16.10	140.21	0.16	4.04	15.00	21.50	1660.04	0.04
Switch off pumps to reduce raw water intake during recycle	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
install variable speed pump	0.85	0.00	0.00	0.00	0.05	0.87	0.00	0.00	0.00	0.01
Rerate filter based on evaluation with state	0.38	0.00	0.00	0.00	0.03	0.38	0.00	0.00	0.00	0.01
Install flow equalization basin	7.47	0.00	0.00	0.00	0.36	8.88	0.00	0.00	0.00	0.08
Install piping for NPDES discharge of FBW water	1.10	5.00	5.37	46.74	0.06	1.10	5.00	7.17	553.35	0.01
Install piping for POTW discharge of FBW water	2.34	5.00	5.37	46.74	0.12	6.31	5.00	7.17	553.35	0.06
Construct lagoon	1.91	20.00	21.47	186.95	0.10	2.02	20.00	28.67	2213.38	0.02
Assessment only	0.00	45.00	48.31	420.63	0.01	0.00	45.00	64.50	4980.11	0.00
Plants With Existing Recycle Treatment										
Install piping to move recycle to headworks ³	3.42	15.00	53.91	469.40	0.16	4.04	15.00	71.98	5557.51	0.04
Direct Filtration Plants Only										
Install sedimentation basin for backwash treatment	26.62	1.00	0.35	3.06	1.24	27.26	1.00	0.47	36.22	0.25
Install piping for NPDES discharge of FBW water	1.10	2.00	0.70	6.12	0.06	1.10	2.00	0.94	72.43	0.01
Install piping for POTW discharge of FBW water	2.34	1.00	0.35	3.06	0.11	6.31	1.00	0.47	36.22	0.06
Construct lagoon	1.91	3.00	1.05	9.18	0.09	2.02	3.00	1.41	108.65	0.02
Report only	0.00	93.00	32.67	284.49	0.01	0.00	93.00	43.62	3368.19	0.00

**Appendix H-6: Annual Household Cost
per Systems, FBR Alternative R2**

Cost of Capital: 7%

System Size Categories:	501-1,000					1,001-3,300				
	\$1,000s	%systems	#systems	#HH	\$1,000/HH	\$1,000s	%systems	#systems	#HH	\$1,000/HH
Direct Recycle Plants										
Combination: Recycle to headworks and equalization basin	15.99	10.00	10.39	2548	0.06	29.83	10.00	21.24	15096	0.04
Install piping to move recycle to headworks ¹	4.16	15.00	15.59	3822	0.01	5.00	15.00	31.86	22644	0.01
Switch off pumps to reduce raw water intake during recycle	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0	0.00
install variable speed pump	0.91	0.00	0.00	0	0.00	1.02	0.00	0.00	0	0.00
Rerate filter based on evaluation with state	0.38	0.00	0.00	0	0.00	0.58	0.00	0.00	0	0.00
Install flow equalization basin	11.83	0.00	0.00	0	0.04	24.83	0.00	0.00	0	0.03
Install piping for NPDES discharge of FBW water	1.10	5.00	5.20	1274	0.00	1.10	5.00	10.62	7548	0.00
Install piping for POTW discharge of FBW water	15.17	5.00	5.20	1274	0.05	36.15	5.00	10.62	7548	0.05
Construct lagoon	2.07	20.00	20.79	5096	0.01	2.93	20.00	42.48	30192	0.00
Assessment only	0.00	45.00	46.77	11466	0.00	0.00	45.00	95.59	67932	0.00
Plants With Existing Recycle Treatment										
Install piping to move recycle to headworks ³	4.16	15.00	52.19	12796	0.01	5.00	15.00	106.67	75808	0.01
Direct Filtration Plants Only										
Install sedimentation basin for backwash treatment	28.68	1.00	0.34	83	0.10	32.02	1.00	0.70	494	0.04
Install piping for NPDES discharge of FBW water	1.10	2.00	0.68	167	0.00	1.10	2.00	1.39	988	0.00
Install piping for POTW discharge of FBW water	15.17	1.00	0.34	83	0.05	36.15	1.00	0.70	494	0.05
Construct lagoon	2.07	3.00	1.02	250	0.01	2.93	3.00	2.09	1482	0.00
Report only	0.00	93.00	31.63	7755	0.00	0.00	93.00	64.65	45944	0.00

**Appendix H-6: Annual Household Cost
per Systems, FBR Alternative R2**

Cost of Capital:

7%

System Size Categories:	3,301-10,000					10,001-50,000				
	\$1,000s	%systems	#systems	#HH	\$1,000/HH	\$1,000s	%systems	#systems	#HH	\$1,000/HH
Direct Recycle Plants										
Combination: Recycle to headworks and equalization basin	38.67	5.00	9.49	20918	0.02	75.03	15.00	38.20	325459	0.01
Install piping to move recycle to headworks ¹	7.56	20.00	37.95	83670	0.00	18.41	10.00	25.47	216972	0.00
Switch off pumps to reduce raw water intake during recycle	0.00	5.00	9.49	20918	0.00	0.00	1.00	2.55	21697	0.00
install variable speed pump	1.39	5.00	9.49	20918	0.00	3.10	1.00	2.55	21697	0.00
Rerate filter based on evaluation with state	0.58	5.00	9.49	20918	0.00	0.58	2.00	5.09	43394	0.00
Install flow equalization basin	31.11	0.00	0.00	0	0.01	56.63	0.00	0.00	0	0.01
Install piping for NPDES discharge of FBW water	1.94	5.00	9.49	20918	0.00	2.08	1.00	2.55	21697	0.00
Install piping for POTW discharge of FBW water	109.39	5.00	9.49	20918	0.05	434.50	0.00	0.00	0	0.05
Construct lagoon	5.46	10.00	18.97	41835	0.00	9.55	0.00	0.00	0	0.00
Assessment only	0.00	40.00	75.89	167341	0.00	0.00	70.00	178.27	1518807	0.00
Plants With Existing Recycle Treatment										
Install piping to move recycle to headworks ³	7.56	15.00	95.28	210085	0.00	18.41	20.00	103.41	881039	0.00
Direct Filtration Plants Only										
Install sedimentation basin for backwash treatment	44.22	1.00	0.62	1369	0.02	92.11	3.00	1.74	14847	0.01
Install piping for NPDES discharge of FBW water	1.94	2.00	1.24	2738	0.00	2.08	3.00	1.74	14847	0.00
Install piping for POTW discharge of FBW water	109.39	1.00	0.62	1369	0.05	434.50	1.00	0.58	4949	0.05
Construct lagoon	5.46	3.00	1.86	4107	0.00	9.55	0.00	0.00	0	0.00
Report only	0.00	93.00	57.74	127324	0.00	0.00	93.00	54.02	460244	0.00

**Appendix H-6: Annual Household Cost
per Systems, FBR Alternative R2**

Cost of Capital:

7%

System Size Categories:	50,001-100,000					> 100,000				
	\$1,000s	%systems	#systems	#HH	\$1,000/HH	\$1,000s	%systems	#systems	#HH	\$1,000/HH
Direct Recycle Plants										
Combination: Recycle to headworks and equalization basin	119.22	3.00	1.14	29399	0.00	483.57	0.00	0.00	0	0.01
Install piping to move recycle to headworks ¹	50.77	22.00	8.38	215594	0.00	357.32	25.00	12.38	1135706	0.00
Switch off pumps to reduce raw water intake during recycle	0.00	3.00	1.14	29399	0.00	0.00	1.00	0.50	45428	0.00
install variable speed pump	6.94	2.00	0.76	19599	0.00	26.48	1.00	0.50	45428	0.00
Rerate filter based on evaluation with state	0.96	1.00	0.38	9800	0.00	0.96	1.00	0.50	45428	0.00
Install flow equalization basin	68.45	0.00	0.00	0	0.00	126.26	0.00	0.00	0	0.00
Install piping for NPDES discharge of FBW water	2.66	1.00	0.38	9800	0.00	5.08	1.00	0.50	45428	0.00
Install piping for POTW discharge of FBW water	1183.33	0.00	0.00	0	0.05	4974.95	0.00	0.00	0	0.05
Construct lagoon	19.85	0.00	0.00	0	0.00	72.13	0.00	0.00	0	0.00
Assessment only	0.00	68.00	25.90	666382	0.00	0.00	71.00	35.16	3225406	0.00
Plants With Existing Recycle Treatment										
Install piping to move recycle to headworks ³	50.77	20.00	18.65	479849	0.00	357.32	20.00	13.68	1254685	0.00
Direct Filtration Plants Only										
Install sedimentation basin for backwash treatment	185.35	4.00	0.40	10174	0.01	620.96	4.00	0.36	32565	0.01
Install piping for NPDES discharge of FBW water	2.66	2.00	0.20	5087	0.00	5.08	2.00	0.18	16283	0.00
Install piping for POTW discharge of FBW water	1183.33	1.00	0.10	2543	0.05	4974.95	1.00	0.09	8141	0.05
Construct lagoon	19.85	0.00	0.00	0	0.00	72.13	0.00	0.00	0	0.00
Report only	0.00	93.00	9.20	236545	0.00	0.00	93.00	8.25	757137	0.00