

**BEFORE THE  
PHILADELPHIA WATER, SEWER AND STORM WATER RATE BOARD**

**PHILADELPHIA WATER                    )  
DEPARTMENT                            )       **FY17-2018 RATES****

**PUBLIC ADVOCATE  
HEARING EXHIBIT   v**

April 12, 2016

### NEW Tiered Discount Option with Usage Levels

(Tiered by income and/or household size)

Income Tier	Usage Level	Affordability Threshold	Discount	Proposed Plan						
				FY'18 Median Bill Amount	Median Income	Lost Revenue	Discounted Current Bill	Arrears Contribution	Total Bill	Income %
0-50% of FPL	Low (0 to 2 Ccf)	2.0%	91%	\$ 36.87	\$ 5,000	\$ 327,702	\$ 12.00	\$ 5.00	\$ 17.00	4.08%
	Medium (2+ to 8 Ccf)		95%	\$ 67.78	\$ 5,000	\$ 1,470,098	\$ 12.00	\$ 5.00	\$ 17.00	4.08%
	High (8+ Ccf)		97%	\$ 114.15	\$ 5,000	\$ 1,346,070	\$ 12.00	\$ 5.00	\$ 17.00	4.08%
50-100% of FPL	Low (0 to 2 Ccf)	3.0%	20%	\$ 36.87	\$ 13,800	\$ 454,682	\$ 29.49	\$ 5.00	\$ 34.49	3.00%
	Medium (2+ to 8 Ccf)		57%	\$ 67.78	\$ 13,800	\$ 4,764,689	\$ 29.15	\$ 5.00	\$ 34.15	2.97%
	High (8+ Ccf)		75%	\$ 114.15	\$ 13,800	\$ 5,279,074	\$ 28.54	\$ 5.00	\$ 33.54	2.92%
100-150% of FPL	Low (0 to 2 Ccf)	4.0%	0%	\$ 36.87	\$ 22,800	\$ -	\$ 36.87	\$ 25.00	\$ 61.87	3.26%
	Medium (2+ to 8 Ccf)		25%	\$ 67.78	\$ 22,800	\$ 3,173,019	\$ 50.84	\$ 25.00	\$ 75.84	3.99%
	High (8+ Ccf)		56%	\$ 114.15	\$ 22,800	\$ 5,984,908	\$ 50.23	\$ 25.00	\$ 75.23	3.96%
200% of FPL		4.0%	None	\$ 75.51	\$ 31,900	\$ -	\$ 75.51	\$ 30.00	\$ 105.51	3.97%
250% of FPL		4.0%	None	\$ 75.51	\$ 40,800	\$ -	\$ 75.51	\$ 60.00	\$ 135.51	3.99%
				<b>TOTAL LOST REVENUE @ 100% SUBSCRIPTION</b>						
				\$ 22,800,242						

### Total Plan Cost

- at 100% subscription
- at RFC 80% confidence level
- at PGW subscription

Resulting Rate Increase	Avg Customer Bill Increase
4.59%	\$ 2.48
3.28%	\$ -
2.76%	\$ -

**Crystal Ball Report - Full**

Simulation started on 2/3/2016 at 2:57 PM

Simulation stopped on 2/3/2016 at 2:57 PM

Run preferences:  
Number of trials run 20,000  
Monte Carlo  
Random seed  
Precision control on  
Confidence level 95.00%

Run statistics:  
Total running time (sec) 15.61  
Trials/second (average) 1,281  
Random numbers per sec 3,844

Crystal Ball data:  
Assumptions 3  
Correlations 2  
Correlation matrices 1  
Decision variables 0  
Forecasts 1

**Forecasts**

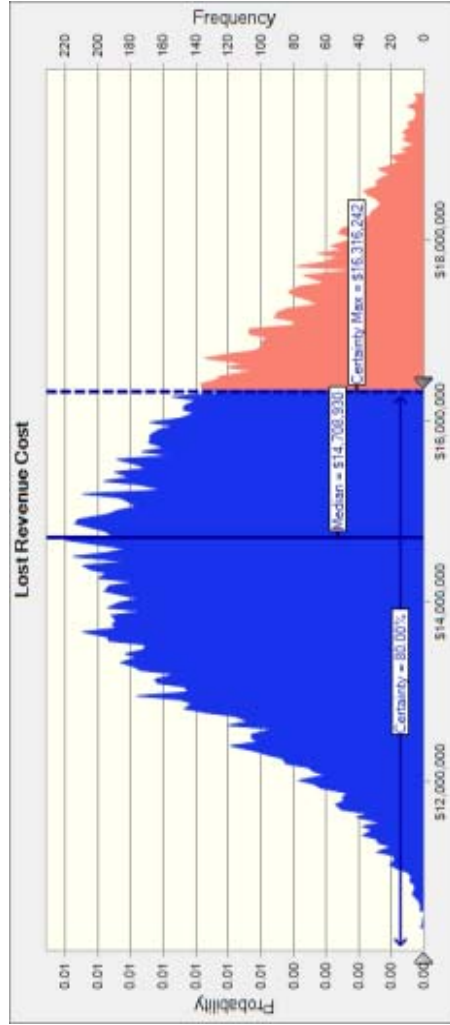
**Worksheet: [PWD Affordability Program Cost Model v121715\_wCOStest.xlsx]COS considerations**

**Cell: E13**

**Forecast: Lost Revenue Cost**

**Summary:**

- Certainty level is 80.000%
- Certainty range is from \$10,040,885 to \$16,316,242
- Entire range is from \$10,370,131 to \$20,069,533
- Base case is \$22,800,242
- After 20,000 trials, the std. error of the mean is \$12,224



<b>Statistics:</b>	<b>Forecast values</b>
Trials	20,000
Base Case	\$22,800,242
Mean	\$14,795,861
Median	\$14,708,930
Mode	---
Standard Deviation	\$1,728,710

Variance	\$2,988,439,461,272
Skewness	0.2173
Kurtosis	2.54
Coeff. of Variation	0.1168
Minimum	\$10,370,131
Maximum	\$20,069,533
Range Width	\$9,699,402
Mean Std. Error	\$12,224

Cell: E13

**Forecast: Lost Revenue Cost (cont'd)**

Percentiles:	Forecast values
0%	\$10,370,131
10%	\$12,599,881
20%	\$13,242,222
30%	\$13,746,270
40%	\$14,243,924
50%	\$14,708,917
60%	\$15,185,026
70%	\$15,711,927
80%	\$16,316,242
90%	\$17,159,889
100%	\$20,069,533

End of Forecasts

**Assumptions**

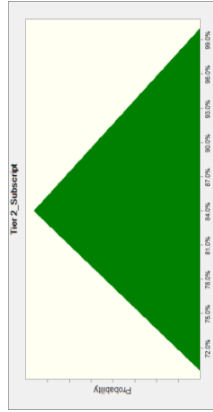
**Worksheet: [PWD Affordability Program Cost Model v121715\_wCOStest.xlsx]Acct Impact**

**Assumption: Tier 2\_Subscript**

**Cell: O23**

Triangular distribution with parameters:

- Minimum 70.0%
- Likeliest 84.0%
- Maximum 100.0%



Correlated with:

- Tier 3\_Subscript (O24)
- Tier1\_Subscript (O22)

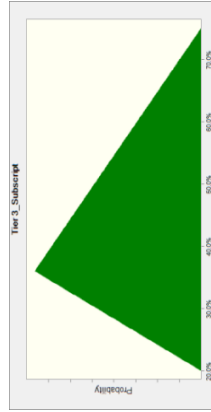
Coefficient  
0.50  
0.50

**Assumption: Tier 3\_Subscript**

**Cell: O24**

Triangular distribution with parameters:

- Minimum 20.0%
- Likeliest 36.0%
- Maximum 75.0%



Correlated with:

- Tier 2\_Subscript (O23)

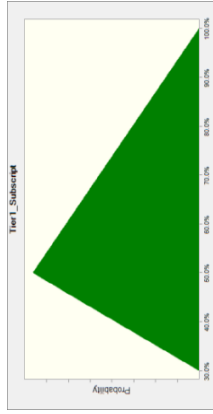
Coefficient  
0.50

**Assumption: Tier1\_Subscript**

**Cell: O22**

Triangular distribution with parameters:

30.0%  
50.0%  
100.0%



Correlated with:  
Tier 2\_Subscript (O23)

Coefficient  
0.50

End of Assumptions



Statistics	Lost Revenue Cost	Tier 2_Subscript	Tier 3_Subscript	Tier1_Subscript
Trials	20000	20000	20000	20000
Base Case	\$22,800,242	100.0%	100.0%	100.0%
Mean	\$14,795,861	84.7%	43.8%	60.1%
Median	\$14,708,930	84.6%	42.5%	58.2%
Mode	---	---	---	---
Standard Deviation	\$1,728,710	6.1%	11.5%	14.6%
Variance	\$2,988,439,461,272	0.4%	1.3%	2.1%
Skewness	0.2173	0.0649	0.3468	0.3898
Kurtosis	2.54	2.39	2.37	2.43
Coeff. of Variation	0.1168	0.0724	0.2631	0.2431
Minimum	\$10,370,131	70.2%	20.2%	30.1%
Maximum	\$20,069,533	99.9%	75.0%	99.6%
Range Width	\$9,699,402	29.7%	54.8%	69.5%
Mean Std. Error	\$12,224	0.0%	0.1%	0.1%

Percentiles	Lost Revenue Cost	Tier 2_Subscript	Tier 3_Subscript	Tier1_Subscript
0%	\$10,370,131	70.2%	20.2%	30.1%
10%	\$12,599,881	76.5%	29.4%	42.1%
20%	\$13,242,222	79.2%	33.3%	47.0%
30%	\$13,746,270	81.2%	36.4%	50.8%
40%	\$14,243,924	83.0%	39.3%	54.3%
50%	\$14,708,917	84.6%	42.5%	58.2%
60%	\$15,185,026	86.2%	46.0%	62.6%
70%	\$15,711,927	88.1%	49.8%	67.5%
80%	\$16,316,242	90.3%	54.4%	73.5%
90%	\$17,159,889	93.1%	60.3%	81.1%
100%	\$20,069,533	99.9%	75.0%	99.6%

Trial values	Lost Revenue Cost	Tier 2_Subscript	Tier 3_Subscript	Tier1_Subscript	Tier 2	Tier 3	Tier 1	ertainty Ra
1	\$17,922,454	93.2%	58.1%	89.7%	9	5	8	N
2	\$14,242,001	88.1%	40.4%	41.0%	8	4	4	C
3	\$14,687,017	86.2%	38.0%	68.5%	8	3	6	C
4	\$14,183,617	89.6%	38.6%	39.3%	8	3	3	C
5	\$16,935,553	92.4%	52.5%	77.1%	9	5	7	N
6	\$15,569,030	87.0%	41.8%	82.7%	8	4	8	C
7	\$15,384,833	84.3%	52.4%	55.2%	8	5	5	C
8	\$12,902,465	83.5%	25.1%	58.3%	8	2	5	C
9	\$13,699,927	81.2%	40.3%	47.3%	8	4	4	C
10	\$13,325,337	76.7%	43.8%	40.1%	7	4	4	C
11	\$15,903,770	85.8%	61.4%	40.5%	8	6	4	C
12	\$14,506,854	83.8%	44.0%	53.5%	8	4	5	C
13	\$12,622,925	77.1%	36.5%	37.6%	7	3	3	C
14	\$14,465,066	87.4%	37.1%	60.2%	8	3	6	C
15	\$16,475,488	84.5%	65.5%	51.3%	8	6	5	N
16	\$15,600,544	88.5%	54.3%	42.6%	8	5	4	C
17	\$17,581,797	94.5%	62.0%	63.2%	9	6	6	N
18	\$16,589,446	85.0%	63.3%	59.6%	8	6	5	N
19	\$15,162,599	76.1%	54.2%	70.2%	7	5	7	C
20	\$15,943,867	84.7%	53.6%	68.4%	8	5	6	C
21	\$13,464,865	84.4%	34.0%	47.5%	8	3	4	C
22	\$15,005,403	86.3%	46.1%	54.6%	8	4	5	C
23	\$13,798,872	80.4%	28.9%	86.1%	8	2	8	C
24	\$10,664,564	71.6%	22.3%	35.2%	7	2	3	C
25	\$16,491,452	89.9%	55.2%	63.5%	8	5	6	N
26	\$12,571,394	82.8%	25.9%	47.8%	8	2	4	C
27	\$14,290,860	86.9%	39.0%	50.8%	8	3	5	C
28	\$16,121,265	86.9%	54.7%	63.5%	8	5	6	C
29	\$17,774,400	99.0%	55.6%	72.7%	9	5	7	N
30	\$15,907,861	92.2%	50.1%	52.1%	9	5	5	C
31	\$17,322,765	94.6%	49.3%	91.6%	9	4	9	N
32	\$12,919,823	81.7%	30.6%	48.8%	8	3	4	C
33	\$14,735,120	86.5%	37.3%	71.4%	8	3	7	C
34	\$15,077,965	86.9%	47.1%	52.2%	8	4	5	C
35	\$13,455,665	83.1%	30.8%	60.8%	8	3	6	C
36	\$17,345,794	84.6%	61.3%	90.8%	8	6	9	N
37	\$16,943,830	89.3%	62.2%	59.6%	8	6	5	N
38	\$14,446,557	81.2%	45.3%	56.6%	8	4	5	C
39	\$15,091,260	87.2%	43.1%	63.4%	8	4	6	C
40	\$13,092,570	79.0%	31.8%	59.8%	7	3	5	C
41	\$16,997,353	93.8%	56.3%	63.3%	9	5	6	N
42	\$14,274,502	82.0%	48.6%	38.6%	8	4	3	C
43	\$14,510,022	82.1%	43.1%	61.8%	8	4	6	C
44	\$15,170,658	90.3%	47.7%	41.9%	9	4	4	C
45	\$15,620,549	86.6%	48.9%	65.2%	8	4	6	C
46	\$13,733,413	80.4%	41.5%	47.6%	8	4	4	C
47	\$17,070,717	85.3%	58.0%	89.0%	8	5	8	N
48	\$17,239,452	93.2%	54.4%	78.8%	9	5	7	N
49	\$12,085,752	77.1%	30.1%	39.3%	7	3	3	C
50	\$15,176,091	85.9%	47.7%	57.1%	8	4	5	C
51	\$14,153,148	86.7%	41.2%	40.4%	8	4	4	C
52	\$16,794,301	88.5%	62.8%	55.8%	8	6	5	N
53	\$16,739,600	87.3%	54.4%	82.3%	8	5	8	N
54	\$13,867,894	85.4%	28.3%	73.2%	8	2	7	C
55	\$13,586,219	84.1%	28.3%	68.9%	8	2	6	C
56	\$16,197,462	86.5%	49.9%	80.9%	8	4	8	C
57	\$13,229,766	82.9%	29.3%	58.7%	8	2	5	C
58	\$14,513,989	81.9%	48.3%	47.7%	8	4	4	C
59	\$16,038,353	91.1%	44.2%	77.3%	9	4	7	C
60	\$12,621,334	77.0%	31.7%	51.9%	7	3	5	C
61	\$14,262,802	86.4%	34.9%	63.5%	8	3	6	C
62	\$12,789,424	74.9%	39.4%	41.7%	7	3	4	C
63	\$16,260,857	91.6%	46.1%	76.9%	9	4	7	C
64	\$12,951,066	76.7%	36.7%	49.1%	7	3	4	C
65	\$12,859,644	74.0%	39.8%	46.0%	7	3	4	C
66	\$15,054,796	86.3%	43.9%	62.7%	8	4	6	C
67	\$15,841,821	85.2%	59.8%	45.0%	8	5	4	C
68	\$14,820,526	83.3%	45.3%	61.2%	8	4	6	C
69	\$14,087,152	81.9%	35.0%	72.8%	8	3	7	C
70	\$16,046,476	93.7%	42.7%	73.2%	9	4	7	C
71	\$13,781,594	77.5%	40.1%	62.7%	7	4	6	C
72	\$18,288,480	92.0%	70.3%	70.0%	9	7	7	N
73	\$17,077,267	86.4%	64.5%	66.6%	8	6	6	N
74	\$15,939,650	92.4%	39.9%	82.2%	9	3	8	C

75	\$13,553,219	76.8%	45.0%	43.3%	7	4	4 C
76	\$15,718,629	85.5%	51.4%	64.7%	8	5	6 C
77	\$11,484,459	74.8%	24.1%	45.3%	7	2	4 C
78	\$15,293,665	85.1%	50.6%	54.8%	8	5	5 C
79	\$14,757,131	81.9%	45.0%	64.7%	8	4	6 C
80	\$16,985,733	96.0%	53.5%	63.9%	9	5	6 N
81	\$13,821,658	80.6%	33.0%	74.2%	8	3	7 C
82	\$17,850,885	93.3%	64.3%	68.9%	9	6	6 N
83	\$17,788,838	99.5%	56.2%	69.9%	9	5	6 N
84	\$13,663,057	83.5%	31.1%	65.3%	8	3	6 C
85	\$12,128,210	77.5%	29.8%	40.2%	7	2	4 C
86	\$15,899,443	86.2%	59.2%	45.6%	8	5	4 C
87	\$15,306,798	89.7%	39.5%	72.2%	8	3	7 C
88	\$13,105,930	75.2%	39.5%	50.8%	7	3	5 C
89	\$14,427,090	77.8%	42.1%	76.5%	7	4	7 C
90	\$14,616,461	89.5%	37.4%	57.0%	8	3	5 C
91	\$13,072,545	80.1%	33.1%	51.8%	8	3	5 C
92	\$14,180,581	85.6%	36.5%	59.0%	8	3	5 C
93	\$13,712,253	79.7%	36.7%	63.1%	7	3	6 C
94	\$11,782,787	74.2%	31.4%	35.4%	7	3	3 C
95	\$15,824,933	86.4%	53.1%	60.0%	8	5	6 C
96	\$14,058,211	82.4%	35.9%	67.3%	8	3	6 C
97	\$16,651,488	95.5%	44.5%	81.1%	9	4	8 N
98	\$13,103,279	85.3%	29.2%	46.9%	8	2	4 C
99	\$13,999,300	84.8%	40.6%	44.1%	8	4	4 C
100	\$14,974,818	89.0%	42.6%	55.3%	8	4	5 C

Trial values	Lost Revenue Cost	Tier 2_Subscript	Tier 3_Subscript	Tier1_Subscript	Tier 2	Tier 3	Tier 1	ertainty Ra
7016	\$16,315,488	84.9%	62.0%	54.7%	8	6	5	C
9440	\$16,316,242	88.5%	53.4%	67.7%	8	5	6	C
2575	\$16,316,527	89.6%	55.5%	58.3%	8	5	5	N
1292	\$16,316,599	91.5%	45.4%	81.2%	9	4	8	N
2722	\$16,316,700	86.4%	56.1%	67.2%	8	5	6	N
14380	\$16,317,518	90.5%	52.7%	63.2%	9	5	6	N
19991	\$16,317,795	88.9%	55.3%	61.1%	8	5	6	N
4264	\$16,318,067	84.8%	61.1%	58.0%	8	6	5	N
3706	\$16,319,070	93.0%	49.5%	64.3%	9	4	6	N

FPL	AMI
\$ 11,770	
\$ 15,930	\$ 63,100
\$ 20,090	\$ 71,000
\$ 24,250	
2.56	2.56

1 person household  
 2 person household  
 3 person household  
 4 person household  
 Avg. Persons per Household

FPL	AMI	30% of AMI	50% of AMI
\$ 9,130	\$ 20,257		
\$ 18,260	\$ 33,762		
\$ 27,389	\$ 47,267		
\$ 36,519	\$ 67,524		
\$ 45,649			

50% of FPL (income in \$)  
 100% of FPL  
 150% of FPL  
 200% of FPL  
 250% of FPL

FPL	AMI	<30% AMI	31% - 50% AMI	51% - 70% of AMI	71% - 100% of AMI	> 100% of AMI
12.7%	29.4%					
26.8%	45.1%					
37.9%	57.8%					
48.1%	72.1%					
56.7%	100.0%					
100.0%						

0-50% of FPL (& households)  
 50-100% of FPL  
 100-150% of FPL  
 150-200% of FPL  
 200-250% of FPL  
 > 250% of FPL  
 Total Households

Accts - FPL	Accts - AMI	<30% AMI	31% - 50% AMI	51% - 70% of AMI	71% - 100% of AMI	> 100% of AMI
8.1%	23.3%					
21.8%	38.9%					
34.7%	51.9%					
49.9%	67.4%					
68.7%	100.0%					
100.0%						

0-50% of FPL (paying water bill)  
 50-100% of FPL  
 100-150% of FPL  
 150-200% of FPL  
 200-250% of FPL  
 > 250% of FPL

\$ 906.12
\$ 75.51
\$ 6.65

Average Customer Bill (annual)  
 Average Customer Bill (monthly)  
 Cost per Ccf

67.43  
 12.0%

FPL	AMI	<30% AMI (median income level for tier)	31% - 50% AMI	51% - 70% of AMI	71% - 100% of AMI	> 100% of AMI
\$ 5,000	\$ 12,000					
\$ 13,800	\$ 26,800					
\$ 22,800	\$ 40,000					
\$ 31,900	\$ 57,000					
\$ 40,800	\$ 104,825					
\$ 83,260						

0-50% of FPL (median income level for tier)  
 50-100% of FPL  
 100-150% of FPL  
 150-200% of FPL  
 200-250% of FPL  
 > 250% of FPL

Hshlds (Cum) Households	Accts (Cum)	Eligible Accts	w/ Subscript	Percentage
73,662	4,393	4,393	4,393	1.0%
155,445	24,947	20,554	20,554	5.8%
219,826	64,382	56,156	31,209	13.2%
278,988	59,162	102,488	46,332	24.0%
328,870	49,881	166,329	63,841	39.0%
580,017	251,147	427,000	260,671	100.0%
580,017	427,000	427,000	427,000	100.0%

Approximation of Customers by income - FPL

Subscript	PGW
100.0%	50%
100.0%	84%
100.0%	36%
100.0%	
100.0%	