

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

**ELECTRONIC APPLICATION OF GRAYSON)
COUNTY WATER DISTRICT FOR A)
DEVIATION FROM METER TESTING) CASE NO. 2019-00115
REQUIREMENTS OF 807 KAR 5:066,)
SECTION 16(1))**

MOTION TO SUBSTITUTE EXHIBIT

Grayson County Water District (“GCWD”), by counsel, hereby moves the Kentucky Public Service Commission (“Commission”) to substitute GCWD’s Sample Meter Testing Plan (“Plan”) attached to its filed Application as Exhibit 1. In support of its motion, GCWD states:

1. On April 11, 2019, GCWD filed an application for a deviation from the requirements of 807 KAR 5:066, Section 16(1) regarding the frequency of testing its 5/8- x 3/4-inch Badger meters. Pursuant to GCWD’s Plan, GCWD proposes to test annually a representative sample of its Badger meters that have been in service at least 13 years to ensure that all Badger meters within their respective age groups meet the accuracy requirements set forth in 807 KAR 5:066, Section 15. GCWD’s Plan included the sample test results of 13-year-old Badger meters installed in 2005 as Appendix A.

2. While preparing a response to Question 2 of the Commission Staff’s Second Request for Information, GCWD discovered that it had miscoded a small number of meters installed in 2005. The meters were Sensus meters, but were mistakenly coded as Badger meters when GCWD changed its billing software. The Affidavit of Kevin Shaw, Manager of GCWD, attached as Exhibit 1, more fully addresses the mistake that occurred.

3. After discovering this error, GCWD determined that it needed to update its Plan because two of the meters that were mistakenly coded as Badger meters were randomly selected

as the sample tested meters.¹ Accordingly, to remedy this error, GCWD has updated its Plan (hereinafter referred to as the “Revised Plan”), which is attached as Exhibit 2. As shown in Appendix A-1 of the Revised Plan, GCWD randomly selected two Badger meters installed in 2005 and removed in 2018 to replace the two Sensus meters. GCWD then performed the ANSI Standard testing at maximum, intermediate, and minimum flow rates using the test results of the new sample. The ANSI Standard results at each of these flow rates are shown in Appendix A-2, A-3, and A-4. The updated sample continues to be accepted at each of the flow rates using the ANSI Standard methods described in GCWD’s Plan. The ANSI Standard results in the Revised Plan contain no material differences from the ANSI Standard results GCWD submitted in its original Plan.

4. In addition to the changes to Appendix A of GCWD’s Plan, GCWD made one other minor change in its Revised Plan. Because of the coding error, there are a different total number of meters installed in 2005 and in service in 2018 than GCWD originally reported. Thus, on the top of page 6 of the Revised Plan, GCWD has corrected the total number of 13-year-old Badger meters in service in 2018. This small change in lot size does not necessitate a change in sample size under the ANSI Standard. GCWD made no other changes in its Revised Plan.

5. Importantly, the corrections that GCWD made to its Revised Plan do not affect the overall conclusions of the Plan and GCWD’s Application. The sample test results of the Badger meters installed in 2005 continue to show that GCWD’s meters remain very accurate at 13 years of age. GCWD is simply updating the Commission in the interest of full candor and so that the Commission has the most accurate information on which to base its decision.

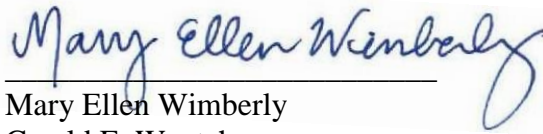
¹ The serial numbers of the sample tested Sensus meters that were miscoded as Badger meters are 32303985 and 32303989. These meters have been replaced by serial numbers 29584532 and 29584501.

6. To further correct this mistake, GCWD will also file a supplemental response to Question 2(d) of the Commission Staff's First Request for Information. GCWD's Application does not require an update.

WHEREFORE, Grayson County Water District respectfully requests that the Commission grant its Motion to Substitute Exhibit.

Dated: August 28, 2019

Respectfully submitted,



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Counsel for Grayson County Water District

CERTIFICATE OF SERVICE

In accordance with 807 KAR 5:001, Section 8, I certify that Grayson County Water District's August 28, 2019 electronic filing of this Motion is a true and accurate copy of the same document being filed in paper medium; that the electronic filing has been transmitted to the Commission on August 28, 2019; that there are currently no parties that the Commission has excused from participation by electronic means in this proceeding; and that an original paper medium of this Application will be delivered to the Commission within two business days.

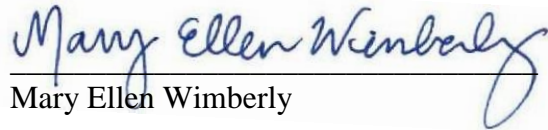

Mary Ellen Wimberly

EXHIBIT 1

Badger and Sensus meters with very similar serial numbers. A small number of Sensus meters were miscoded as Badger meters.

7. GCWD believes that these errors are limited to the meters installed in 2005. It is possible, however, that there are similar errors in future data sets. If the Commission grants GCWD its requested deviation, GCWD will review all meter information as thoroughly as possible to ensure the accuracy of the information it is reporting to the Commission.



KEVIN SHAW

Subscribed and sworn to before me, a Notary Public in and before said County and State,
this 28th day of August 2019.



Notary Public (SEAL)

My Commission Expires: September 15, 2021

Notary ID: 586979

EXHIBIT 2

SAMPLE METER TESTING PLAN
FOR
GRAYSON COUNTY WATER DISTRICT
5/8- x 3/4-INCH BADGER MODEL 25 METERS

Grayson County Water District
Leitchfield, KY

Revised August 28, 2019

SAMPLE METER TESTING PLAN

SECTION 1.0 INTRODUCTION

Grayson County Water District (“GCWD”) is a water utility located in Grayson County, Kentucky. GCWD currently removes all meters after 13 years of service and replaces them with a new or rebuilt meter. New meters are tested for accuracy by the manufacturer before being placed into service.

GCWD requests a deviation from the testing frequency requirements of 807 KAR 5:066, Section 16(1), to implement sample testing of 5/8- x 3/4-inch Badger meters 13 years of age and older in accordance with this Sample Meter Testing Plan (the “Plan”). Statistical sample testing permits conclusions to be reached concerning an entire group of meters after testing a small, but statistically significant, percentage of the group’s total number. By adopting this Plan, GCWD will maintain accurate meters while using its meters for a longer period of time, thus significantly reducing the costs associated with replacing meters on a 13-year cycle.

GCWD is only seeking a deviation from 807 KAR 5:066, Section 16(1) to extend the service life of its 5/8- x 3/4-inch Badger meters. Currently, GCWD has a limited number of Sensus meters in its system. GCWD will continue to change out its Sensus meters after 13 years.

SECTION 2.0 RULES AND REGULATIONS

807 KAR 5:066, Section 15(2) requires “[a]ll new meters, and any meter removed from service for any cause . . . be tested for accuracy as specified herein prior to being placed in service.” The regulation includes a table with accuracy limits for maximum, intermediate, and minimum flow rates. For maximum and intermediate rates, the accuracy limit is 98.5-101.5 percent. At a minimum flow rate, the accuracy limit is 95-101 percent for new and rebuilt meters. Repaired meters must meet a minimum flow rate accuracy limit of 90. The Commission has allowed extensions of meter testing periods based on test results that judged minimum flow rates at a limit of 90 percent.¹ Under 807 KAR 5:066, Section 16(1), 5/8- x 3/4-inch meters may not remain in service without testing for longer than 10 years. The Commission previously granted GCWD a deviation from 807 KAR 5:066, Section 16(1) in Case No. 97-434 and allowed GCWD’s 5/8- x 3/4-inch meters to remain in service without testing for a period of 13 years.²

¹ *In the Matter of: Electronic Application of Hardin County Water District No. 2 for a Declaratory Order That Sample Testing Satisfies the Testing Requirements of 807 KAR 5:066, Section 16(1) or, in the Alternative, for an Order Granting a Deviation from 807 KAR 5:066, Section 16(1)*, Case No. 2016-00432, Order (Ky. PSC Mar. 22, 2018); *In the Matter of: Joint Application of Warren County Water District, Simpson County Water District, and Butler County Water System, Inc. for a Deviation from Approved Meter Testing Program*, Case No. 2011-00220, Application at Appendix A (Ky. PSC June 28, 2011), *overruled on other grounds by Warren County Water District, et al. v. Commonwealth of Kentucky, Public Service Commission*, Civil Action No. 13-CI-401 (Ky. Franklin Cir. Ct. 2014); *In the Matter of: Kentucky-American Water Company’s Request for Permission to Deviate from 807 KAR 5:066, Section 16(1)*, Case No. 2009-00253, Order at 6 (Ky. PSC Oct. 5, 2011).

² *In the Matter of: The Joint Application of Warren County Water District, Simpson County Water District, Grayson County Water District and Butler County Water Systems, Inc. For a Deviation from 807 KAR 5:066, Section 16(1)*, Case No. 97-434, Order (Ky. PSC Apr. 28, 1999).

GCWD requests a deviation from 807 KAR 5:066, Section 16(1) to implement sample testing of its 5/8- x 3/4-inch Badger meters and allow those meters to remain in service for 15 years. The Plan will ensure meter accuracy by annually sample testing each meter age group that is 13 years old or greater for at least the first three years of sample testing. Granting the requested deviation will ensure the accuracy of GCWD’s meters while significantly reducing costs.

SECTION 3.0 PROCEDURE

GCWD’s statistical sample meter testing for maximum, intermediate, and minimum flow rates will follow *American National Standard Institute ANSI/ASQ Z1.9-2003 (R2013) (Sampling Procedures and Tables for Inspection by Variables for Percent Nonconforming)* (hereinafter referred to as the “ANSI Standard”). Like the water utility in Case No. 2016-0032, GCWD uses the ANSI Standard Double Specification Limit method to determine acceptance of the meters at maximum and intermediate flow rates and the ANSI Standard Single Specification Limit method with lessened scrutiny to test meters at minimum flow rates.

The size of the sample will be determined by the ANSI Standard. GCWD will use an Excel spreadsheet, its billing system, or another computerized process to randomly select meters for testing.

The **Acceptance Quality Limit (“AQL”)** is defined as the quality level that is the worst tolerable product average when a continuing series of lots is submitted for acceptance sampling. This value is selected by the utility as recognition of the level of errors that are acceptable and is derived from **Table A-1**. For maximum and intermediate flow rates, GCWD will use an **AQL of 2.5**, as has been previously approved by the Commission.³ For minimum flow rates, GCWD will use an **AQL of 10.0**.⁴

³ See, e.g., *In the Matter of: Electronic Application of Hardin County Water District No. 2 for a Declaratory Order That Sample Testing Satisfies the Testing Requirements of 807 KAR 5:066, Section 16(1) or, in the Alternative, for an Order Granting a Deviation from 807 KAR 5:066, Section 16(1)*, Case No. 2016-00432, Order (Ky. PSC Mar. 22, 2018); *In the Matter of: Application of Farmers Rural Electric Cooperative for Adoption of a Sample Meter Testing Program*, Case No. 2013-00186, Order at 4 (Ky. PSC Aug. 8, 2014); *In the Matter of: Application of Kenergy Corp. for Approval of Sample Meter Testing Plan*, Case No. 2010-00034, Order (Ky. PSC May 14, 2010); *In the Matter of: Application of Grayson Rural Electric Cooperative Corporation for a Deviation from 807 KAR 5:041, Section 15(3), Sample Master Meter Testing Program*, Case No. 2009-00103, Order (Ky. PSC Sept. 25, 2009); *In the Matter of: Application of Salt River Electric Cooperative Corporation to Adopt a Sample Meter Testing Program*, Case No. 2005-00536, Order (Ky. PSC Feb. 6, 2006); *In the Matter of: Application of Fleming-Mason Energy Cooperative for Approval to Adopt a Sample Meter Testing Plan*, Case No. 2004-00173, Order (Ky. PSC Aug. 25, 2004); *In the Matter of: The Application of Louisville Gas and Electric Company for Approval of a Permanent Statistical Meter Sampling Plan*, Case No. 2000-278 (Ky. PSC Nov. 7, 2001); *In the Matter of: The Application of Columbia Gas of Kentucky, Inc. for Authority to Implement a Permanent Statistical meter Sampling Plan for Residential, Industrial and Commercial Class meters and for Authority to Deviate from 807 KAR 5:006, Section 25(5)(b)*, Case No. 2000-429 (Ky. PSC Feb. 26, 2001).

⁴ The use of an AQL of 10.0 for minimum flow rates was approved by the Commission in Case No. 2016-00432.

Table A-1
AQL Conversion Table

For specified AQL values falling within these ranges			Use this AQL value
–	to	0.109	0.10
0.110	to	0.164	0.15
0.165	to	0.279	0.25
0.280	to	0.439	0.40
0.440	to	0.669	0.65
0.700	to	1.09	1.0
1.10	to	1.64	1.5
1.65	to	2.79	2.5
2.80	to	4.39	4.0
4.40	to	6.99	6.5
7.00	to	10.9	10.0

Under the ANSI Standard, the sample size is determined by the inspection level and lot size. Part A7 of the ANSI Standard states that Inspection Level II shall generally be used. Part A7.1 notes that Inspection Level I may be specified when less discrimination is needed. Like the water utility in Case No. 2016-00432, GCWD will use **Inspection Level II** to test the maximum and intermediate flow rates and **Inspection Level I** to test the minimum flow rates. Lessened scrutiny is appropriate for minimum flow rates because of the very small amounts of water used at low flow rates.

Using the inspection level and lot size, **Table A-2** provides the Sample Size Code Letter that is referenced in **Table B-3** and **Table B-4**. For the maximum and intermediate flow rates, the **AQL** and **Table B-3** are then used to determine the sample size for the lot. For the minimum flow rates, the **AQL** and **Table B-4** are then used to determine the sample size for the lot.

For the maximum and intermediate flow rates, the upper and lower accuracy limits of 807 KAR 5:066, Section 15(2) require the use of the **Double Specification Limit** method as outlined in the ANSI Standard. For each lot, calculations will be based on the Double Specification Limit Variability Unknown-Standard Deviation Method. **Example B-3** in the ANSI Standard demonstrates this calculation method when the same AQL value is used for the upper and lower limit.

For the minimum flow rates, the single lower accuracy limit of 807 KAR 5:066, Section 15(2) necessitates the use of the **Single Specification Limit** method as outlined in the ANSI Standard. The calculation will be based on the Single Specification Limit-Form 2 Variability Unknown-Standard Deviation Method. **Example B-2** in the ANSI Standard demonstrates this calculation method.

Table A-2¹
Sample Size Code Letters²

Lot Size	Inspection Levels				
	Special S3 S4		General I II III		
2 to 8	B	B	B	B	C
9 to 15	B	B	B	B	D
16 to 25	B	B	B	C	E
26 to 50	B	B	C	D	F
51 to 90	B	B	D	E	G
91 to 150	B	C	E	F	H
151 to 280	B	D	F	G	I
281 to 400	C	E	G	H	J
401 to 500	C	E	G	I	J
501 to 1,200	D	F	H	J	K
1,201 to 3,200	E	G	I	K	L
3,201 to 10,000	F	H	J	L	M
10,001 to 35,000	G	I	K	M	N
35,001 to 150,000	H	J	L	N	P
150,001 to 500,000	H	K	M	P	P
500,001 and over	H	K	N	P	P

¹The theory governing inspection by variables depends on the properties of the normal distribution and, therefore, this method of inspection is only applicable when there is reason to believe that the frequency distribution is normal.

²Sample size code letters given in body of table are applicable when the indicated inspection levels are to be used.

Table B-3 Standard Deviation Method
Master Table for Normal and Tightened Inspection for Plans Based on Variability Unknown
(Double Specification Limit and Form 2—Single Specification Limit)

Sample Size Code Letter	Sample Size	Acceptance Quality Limits (normal inspection)											
		T	.10	.15	.25	.40	.65	1.00	1.50	2.50	4.00	6.50	10.00
		M	M	M	M	M	M	M	M	M	M	M	M
B	3	↓	↓	↓	↓	↓	↓	↓	↓	7.59	18.86	26.94	33.69
C	4	↓	↓	↓	↓	↓	↓	1.49	5.46	10.88	16.41	22.84	29.43
D	5	↓	↓	↓	↓	0.041	1.34	3.33	5.82	9.80	14.37	20.19	26.55
E	7	↓	0.005	0.087	0.421	1.05	2.13	3.54	5.34	8.40	12.19	17.34	23.30
F	10	0.077	0.179	0.349	0.714	1.27	2.14	3.27	4.72	7.26	10.53	15.17	20.73
G	15	0.186	0.311	0.491	0.839	1.33	2.09	3.06	4.32	6.55	9.48	13.74	18.97
H	20	0.228	0.356	0.531	0.864	1.33	2.03	2.93	4.10	6.18	8.95	13.01	18.07
I	25	0.250	0.378	0.551	0.874	1.32	2.00	2.86	3.97	5.98	8.65	12.60	17.55
J	35	0.253	0.373	0.534	0.833	1.24	1.87	2.66	3.70	5.58	8.11	11.89	16.67
K	50	0.243	0.355	0.503	0.778	1.16	1.73	2.47	3.44	5.21	7.61	11.23	15.87
L	75	0.225	0.326	0.461	0.711	1.06	1.59	2.27	3.17	4.83	7.10	10.58	15.07
M	100	0.218	0.315	0.444	0.684	1.02	1.52	2.18	3.06	4.67	6.88	10.29	14.71
N	150	0.202	0.292	0.412	0.636	0.946	1.42	2.05	2.88	4.42	6.56	9.86	14.18
P	200	0.204	0.294	0.414	0.637	0.945	1.42	2.04	2.86	4.39	6.52	9.80	14.11
		.10	.15	.25	.40	.65	1.00	1.50	2.50	4.00	6.50	10.00	
Acceptance Quality Limits (tightened inspection)													

Table B-4 Standard Deviation Method
Master Table for Reduced Inspection for Plans Based on Variability Unknown
(Double Specification Limit and Form 2—Single Specification Limit)

Sample Size Code Letter	Sample Size	Acceptance Quality Limits										
		.10	.15	.25	.40	.65	1.00	1.50	2.50	4.00	6.50	10.00
		M	M	M	M	M	M	M	M	M	M	M
B	3	↓	↓	↓	↓	↓	↓	7.59	18.86	26.94	33.69	40.47
C	3	↓	↓	↓	↓	↓	↓	7.59	18.86	26.94	33.69	40.47
D	3	↓	↓	↓	↓	↓	↓	7.59	18.86	26.94	33.69	40.47
E	3	↓	↓	↓	↓	↓	↓	7.59	18.86	26.94	33.69	40.47
F	4	↓	↓	↓	↓	1.49	5.46	10.88	16.41	22.84	29.43	36.79
G	5	↓	↓	0.041	1.34	3.33	5.82	9.80	14.37	20.19	26.55	33.94
H	7	0.087	0.421	1.06	2.13	3.54	5.34	8.40	12.19	17.34	23.30	30.50
I	10	0.349	0.714	1.27	2.14	3.27	4.72	7.26	10.53	15.17	20.73	27.65
J	15	0.491	0.839	1.33	2.09	3.06	4.32	6.55	9.48	13.74	18.97	25.63
K	20	0.531	0.864	1.33	2.03	2.93	4.10	6.18	8.95	13.01	18.07	24.58
L	25	0.551	0.874	1.32	2.00	2.86	3.97	5.98	8.65	12.60	17.55	23.97
M	30	0.567	0.885	1.32	1.98	2.82	3.91	5.87	8.48	12.37	17.25	23.61
N	50	0.503	0.778	1.16	1.73	2.47	3.44	5.21	7.61	11.23	15.87	21.99
P	75	0.461	0.711	1.06	1.59	2.27	3.17	4.83	7.10	10.58	15.07	21.05

In 2018, GCWD had 27 13-year-old Badger meters in service. For the maximum and intermediate flow rates, Table A-2 specifies a sample size code letter of “D” for samples of that size. Using the sample size code letter and an AQL of 2.5, Table B-3 shows that a sample size of 5 and an acceptability criterion of 9.80 should be used for maximum and intermediate flow rates. For the minimum flow rates, Table A-2 specifies a sample size code letter of “C” for samples of that size. Using the sample size code letter and an AQL of 10.0, Table B-4 shows that a sample size of 3 and an acceptability criterion of 40.47 should be used for minimum flow rates.

Inspection lots will consist of 5/8- x 3/4-inch Badger meters of a certain age. All of GCWD’s meters that will be tested throughout the duration of the Plan are Badger Model 25 meters. In 2018, GCWD sample tested its 13-year-old Badger meters (those installed in 2005). The results of this sample testing are shown in Appendix A to this Plan. After testing these meters, GCWD removed all 13-year-old meters from service.

If the Commission grants GCWD a deviation in 2019, GCWD will conduct sample testing pursuant to this Plan on the following schedule: In Year 1, the 13-year-old meters (those installed in 2006) will be sample tested. In Year 2, the 13- and 14-year-old meters (those installed in 2006 and 2007) will be sample tested. In Year 3, the 13-, 14-, and 15-year-old meters (those installed in 2006, 2007, and 2008) will be sample tested.

Randomly selected meters from each lot will be tested by a Commission-certified technician using GCWD’s Commission-certified meter test bench. If a randomly selected meter has been vandalized or tampered with, that meter will be replaced by another random selection. Similarly, if a randomly selected meter has suffered a mechanical or other failure that is not equally likely to occur at the same or a similar rate in the lot as a whole, it will be removed and replaced by another random selection. In its annual meter testing reports to the Commission, GCWD will report any vandalized, tampered, or failed meter that was replaced and explain why it was not used to determine the acceptability of the sample.

The sampled meters will be tested under three different flow rates: a maximum flow rate of 15 gallons per minute (“gpm”), an intermediate flow rate of 2 gpm, and a minimum flow rate of 1/4 gpm. Any tested meter that does not meet all of the flow rate standards in 807 KAR 5:066, Section 15 will be removed from service.

At all flow rates, meter acceptance will be determined using the ANSI Standard methods described in this Plan. If the sample is not accepted under the ANSI Standard and a poorly performing sub-group can be identified for separation from the original control group, the deviate sub-group will be removed from service within six months. If, by removal of a specific sub-group of meters, GCWD can demonstrate that the original control group of meters now meets the applicability standard, the remaining meters in the original control group shall remain in service. If a deviate sub-group of meters cannot be identified to improve the control group’s accuracy, GCWD will test and remove the entire control group of meters within 12 months of the group’s failure to meet the applicable governing standard.

SECTION 4.0 FUTURE PLANS AND REPORTING PROCEDURES

This Plan seeks to verify that meters left in place beyond 13 years are accurate and to determine an appropriate meter life. Because Badger represents that GCWD's meters remain accurate for 15 years and the Commission approved a 15-year meter life in Case No. 2016-00432, GCWD seeks to first extend its meters' service life to 15 years. After obtaining data on the accuracy of these meters after 15 years of use, it may request the Commission consider further extensions of the meters' service life.

GCWD will submit an annual report to the Commission detailing the test results. The report will include the sample test results for each year and detail whether each sample was accepted at each flow rate using the ANSI Standard. The report will also include any abnormal meter results that were not used in determining the acceptability of the sample, along with an explanation of why the particular meter result was discarded. Finally, the report will include information that the Commission in Case No. 2016-00432 required the applicant to provide annually.

SECTION 5.0 COST SAVINGS/CONCLUSION

A substantial reduction in cost will be achieved by implementing the Plan. Using the meters for an additional two years of their useful lives will allow GCWD to purchase and test fewer meters, thus creating significant savings without compromising meter accuracy. The approximate savings resulting from the implementation of GCWD's Plan include (1) avoided meter capital costs achieved by purchasing, on average, fewer meters each year, and (2) reduced costs over the course of GCWD's Plan by sample testing meters instead of replacing each 13-year-old meter. First, GCWD estimates that replacing meters on a 15-year cycle instead of a 13-year cycle will result in annual meter capital cost savings of \$13,687.⁵ Second, by sample testing Badger meters until they reach 15 years of age instead of changing the Badger meters at 13 years, labor and testing costs will reduce by \$30,361.⁶ These savings will be even more dramatic in future years, as GCWD has 2,837 Badger meters that were installed in 2009 that GCWD will have to change out in 2022 if GCWD does not receive a deviation to allow it to extend its meter lives.

GCWD customers will benefit from these savings. In Case No. 2016-00432, the Commission found cost savings calculated in the same manner to be credible. The Franklin Circuit Court has found the savings associated with meter sampling plans important; in reversing Case No. 2011-00220, the Court gave greater weight to cost savings over accuracy when there was no negative effect to customers.⁷

⁵ The calculation of annual meter purchase savings is included on page B-1 of Appendix B.

⁶ The calculation of savings in labor and testing costs is calculated on page B-2 of Appendix B. The savings were calculated by subtracting the total sample testing cost of the Plan from the cost of removing and testing the 13-year-old meters that would otherwise be removed during the three-year period of GCWD's Plan.

⁷ *Warren County Water District, et al. v. Commonwealth of Kentucky, Public Service Commission*, Civil Action No. 13-CI-401 (Ky. Franklin Cir. Ct. 2014). This case reversed Case No. 2011-00220 and allowed the utilities to test meters on a 21-year cycle because savings were greater than lost revenue, even though the meters were not within 807 KAR 5:066, Section 15(2)'s accuracy limits at 21 years. The court relied on KRS 278.210(4), which provides: "If a utility demonstrates through sample testing that no statistically significant number of its meters over-register above" the 2% margin of error in KRS 278.210(3), "the meter testing frequency shall be that which is determined by the utility to be cost effective."

APPENDICES A & B

2018

METER ACCURACY TEST RESULTS FOR 13-YEAR-OLD METERS

SAMPLE TESTED BY

GRAYSON COUNTY WATER DISTRICT

APPENDIX A-1

Test Results of 2005 Sample Meters

Serial No.	Maximum	Intermediate	Minimum	Total Water Flow	Testing Date
29584552	99.6	100		144,165.7	10/31/2018
29584532	99.2	100	99	360,072.1	1/8/2019
29584565	99.3	99	99	624,340.8	1/8/2019
29584501	99.2	100		956,846.1	1/9/2019
29584499	98.8	101	98	270,186.2	1/9/2019

APPENDIX A-2

ANSI Standard for Maximum Flow

1	Sample Size: n	5
2	Sum of Measurements	496.1
3	Sum of Squared Measurements	49223.37
4	Correction Factor (CF)	49223.04
5	Corrected Sum of Squares (SS)	0.328
6	Variance (V)	0.082
7	Estimate of Lot Standard Deviation	0.286356
8	Sample Mean	99.22
9	Upper Specification Limit	101.5
10	Lower Specification Limit	98.5
11	Quality Index: QU (upper)	7.962105
12	Quality Index: QL (lower)	2.514349
ANSI Standard Table B-5 used to derive values below		
13	Est. of Lot Percent NcF above Upper	0.000%
14	Est. of Lot Percent NcF below Lower	0.000%
15	Total Est. Percent NcF in Lot (p)	0.000%
16	Max. Allowable Percent NcF (M)	9.800%
17	Acceptability Criterion (to accept, P<M)	Accepted

APPENDIX A-3

ANSI Standard for Intermediate Flow

1	Sample Size: n	5
2	Sum of Measurements	500.0
3	Sum of Squared Measurements	50002
4	Correction Factor (CF)	50000
5	Corrected Sum of Squares (SS)	2
6	Variance (V)	0.5
7	Estimate of Lot Standard Deviation	0.707107
8	Sample Mean	100
9	Upper Specification Limit	101.5
10	Lower Specification Limit	98.5
11	Quality Index: QU (upper)	2.12132
12	Quality Index: QL (lower)	2.12132
ANSI Standard Table B-5 used to derive values below		
13	Est. of Lot Percent NcF above Upper	0.000%
14	Est. of Lot Percent NcF below Lower	0.000%
15	Total Est. Percent NcF in Lot (p)	0.000%
16	Max. Allowable Percent NcF (M)	9.800%
17	Acceptability Criterion (to accept, P<M)	Accepted

APPENDIX A-4

ANSI Standard for Minimum Flow

1	Sample Size: n	3
2	Sum of Measurements	296
3	Sum of Squared Measurements	29206
4	Correction Factor (CF)	29205.333
5	Corrected Sum of Squares (SS)	0.6666667
6	Variance (V)	0.3333333
7	Estimate of Lot Standard Deviation	0.5773503
8	Sample Mean	98.666667
9	Lower Specification Limit	90
10	Quality Index: QL (lower)	15.011107
ANSI Standard Table B-5 used to derive values below		
11	Est. of Lot Percent NcF	0.000%
12	Max. Allowable Percent NcF (M)	40.470%
13	Acceptability Criterion (to accept, P<M)	Accepted

APPENDIX B

Estimate of Annual Meter Purchase Savings From Moving to a 15 Year Replacement Program

Annual Meter Purchase Reduction

Number of 5/8- x 3/4-Inch Badger Meters in System (Approximate)	6,800	
Number Replaced Annually Over a 13 Yr. Change-Out Cycle		523
Number Replaced Annually Over a 15 Yr. Change-Out Cycle		453
Annual Reduction in Number of Meters Purchased		<u>70</u>

Cost of Meter and Meter Endpoint 196.25

Annual Meter Capital Cost Savings **\$13,687**

Sample Testing Costs of GCWD's Sample Meter Testing Plan

	Year of Installation of Meters to be Sample Tested			Total Meters Tested	Cost of Sample Testing	Yearly Cost of Sample Meter Testing
	2006	2007	2008			
2019	3			3	\$25.28	\$75.84
2020	3	10		13	\$25.28	\$328.64
2021	3	10	35	48	\$25.28	\$1,213.44
TOTAL Sample Testing Cost						\$1,617.92

1. The horizontal axis of the chart shows the year of installation of meters to be sample tested.
2. The vertical axis shows the year of sample testing.
3. The numbers in the chart are the number of meters of each age group that will be sample tested each year.
4. Sample size is determined using the ANSI Standard Inspection Level II and Table A-2 and Table B-3.
5. The cost of sample testing includes the field staff, truck, and testing cost.

Meter Changeout Costs for GCWD's Plan

	13-year-old Meters	Cost to Changeout Meter	Total Cost to Changeout Meters
2019	12	\$25.28	\$303.36
2020	100	\$25.28	\$2,528.00
2021	1153	\$25.28	\$29,147.84
TOTAL Avoided 13-Year Meter Changeout Cost			\$31,979.20

Savings over GCWD's Plan

TOTAL Avoided 13-Year Meter Changeout Cost	
- TOTAL Sample Testing Cost	
	\$30,361.28