

2017 ANNUAL METER TESTING REPORT
FOR
HARDIN COUNTY WATER DISTRICT NO. 2
5/8- x 3/4-INCH DISPLACEMENT METERS

CASE NO. 2016-00432

Hardin County Water District No. 2
Elizabethtown, KY

December 31, 2018

2017 ANNUAL METER TESTING REPORT

SECTION 1.0 EXECUTIVE SUMMARY

Hardin County Water District No. 2 (“HCWD2”) is filing this 2017 Annual Meter Testing Report as required by the Public Service Commission’s (“Commission”) Order dated March 22, 2018 in Case No. 2016-00432.

This 2017 Annual Meter Testing Report provides information for the following meter lots:

- 2006 Meters (meters which were installed during calendar year 2006), Year 11 Test Results
- 2007 Meters (meters which were installed during calendar year 2007), Year 10 Test Results

All meter lots passed at each flow rate using the relevant ANSI Standard.

SECTION 2.0 INTRODUCTION

HCWD2 is a water utility located in Hardin County, Kentucky. Its territory includes all of Hardin County, except for the city of Radcliff and the northern part of Hardin County, and portions of Larue and Hart Counties.

On December 29, 2016, HCWD2 filed an application with the Commission requesting a declaratory order that the sample testing of 5/8- x 3/4-inch meters older than 10 years in accordance with its sample meter testing plan (“Plan”) complies with the testing requirements of 807 KAR 5:066, Section 16(1). In the alternative, HCWD2 requested a deviation from the testing frequency requirements of 807 KAR 5:066, Section 16(1), in order to implement sample testing of 5/8- x 3/4-inch meters older than 10 years in accordance with the Plan. The case was assigned Case No. 2016-00432.

As part of HCWD2’s Plan, HCWD2 committed to submitting an annual report to the Commission detailing the test results. The report would include the sample test results for each year and detail whether each sample was accepted using approved statistical testing methods. The report would 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.

On March 22, 2018, the Commission issued a final order in Case No. 2016-00432. The Commission approved HCWD2's Plan with limited modifications and granted HCWD2 a deviation from the testing frequency requirements of 807 KAR 5:066, Section 16(1). The Commission also required HCWD2's annual reports of its sample testing to include the following:

1. The serial number, manufacturer, and model/form/type of each meter tested;
2. The date that each meter was tested;
3. The total water flow through the meter from the date it was placed in service through the date of sample testing as recorded at the time of testing;
4. Any raw data collected from each test necessary for the Commission to perform the calculations detailed in the ANSI/ASQ Standards or on which Hardin No. 2 relied in conducting or analyzing its sample testing;
5. The results of Hardin No. 2's calculations and an explanation of whether each sample was passed at each flow rate using the relevant ANSI/ASQ Standards;
6. An explanation of any abnormal meter results that were excluded or otherwise not used in determining whether a sample passed;
7. A detailed explanation, as discussed above, of the basics of excluding a meter or a group of meters from a sample group or replacing them, including the test results at each flow level for the excluded meter;
8. The total number of meters in a particular lot in service at the time Hardin No. 2 performed the sample testing; and
9. Any other information Hardin No. 2 has deemed relevant and necessary to review the accuracy of the meters tested.

This 2017 Annual Meter Testing Report provides information for the following meter lots:

- 2006 Meters (meters which were installed during calendar year 2006), Year 11 Test Results
- 2007 Meters (meters which were installed during calendar year 2007,, Year 10 Test Results

All meter lots passed at each flow rate using the relevant ANSI Standard.

SECTION 3.0 2006 METERS, YEAR 11 TEST RESULTS

HCWD2 began performing the year 11 testing for meters it installed during calendar year 2006 (the "2006 meters") in September 2017. At the time it performed the testing, HCWD2 had 533 11-year-old meters. HCWD2 followed

the same procedure set forth in the ANSI Standard as it detailed in HCWD2's Plan filed December 29, 2016. Following the procedure set forth in the ANSI Standard, HCWD2 again tested a sample size of 35 meters at maximum and intermediate flow rates and seven meters at minimum flow rates. All meters installed in 2006 were Sensus SR I meters.

(A) Meters Tested

The following 2006 meters were tested in year 11:

Test Results of 2006 Sample Meters - Year 11					
Serial No.	Maximum	Intermediate	Minimum	Total Water Flow	Testing Date
59510842	99.3	101		393,194.0	9/22/2017
59511044	99.6	100		537,205.0	9/22/2017
61012039	99.7	100		365,573.0	9/22/2017
33783497	99.6	100	98	365,573.0	9/29/2017
58857817	99.1	101		562,573.0	9/22/2017
59511144	100.0	100		862,673.2	9/22/2017
59511140	99.6	101	90	585,696.0	9/29/2017
59510887	99.8	101		654,497.0	10/3/2017
59510964	99.9	101		703,066.2	10/10/2017
58857768	99.4	101		665,522.8	10/10/2017
59510914	100.1	101		1,001,279.1	9/22/2017
58857886	99.8	100		208,968.1	9/22/2017
58857890	99.1	99		705,173.0	9/27/2017
59510754	99.6	101		799,963.0	9/27/2017
59510881	99.6	100	88	1,047,497.7	10/3/2017
58857837	99.3	101		510,788.0	9/29/2017
59511050	99.0	100		563,285.0	9/27/2017
59066913	99.3	101		551,087.0	9/21/2017
59510976	99.6	101	89	344,415.6	10/10/2017
59510998	99.6	101		616,331.1	10/10/2017
59510686	99.5	101		634,259.4	10/10/2017
69065098	99.7	101		251,175.7	10/3/2017
33783484	99.7	100	99	448,721.0	9/22/2017
33783498	99.4	100		367,784.0	9/21/2017
33783485	99.7	99		436,902.0	9/22/2017
32525655	99.4	100	98	464,693.0	9/29/2017
33325978	99.0	100		347,630.0	9/21/2017

33326016	99.1	100		327,026.0	10/10/2017
33783490	99.4	101		358,116.0	9/22/2017
33783502	99.2	101		548,367.0	10/10/2017
33783501	98.6	99		572,860.0	10/10/2017
33911465	99.0	100		391,337.0	10/10/2017
33911488	98.9	99	98	494,731.0	10/10/2017
33911464	99.6	100		331,642.9	9/27/2017
33911457	99.6	100		592,068.0	9/27/2017

(B) Maximum Flow Test Results

Meters were tested at a maximum flow rate using the same procedure set forth in the ANSI Standard and detailed in HCWD2’s Plan filed December 29, 2016. Following the procedure set forth in the ANSI Standard, HCWD2 again tested a sample size of 35 meters at maximum flow rates. The sample was accepted.

ANSI Standard for Maximum Flow		
1	Sample Size: n	35
2	Sum of Measurements	3480.8
3	Sum of Squared Measurements	346174.3
4	Correction Factor (CF)	346170.5
5	Corrected Sum of Squares (SS)	3.767429
6	Variance (V)	0.110807
7	Estimate of Lot Standard Deviation	0.332876
8	Sample Mean	99.45143
9	Upper Specification Limit	101.5
10	Lower Specification Limit	98.5
11	Quality Index: QU (upper)	6.15415
12	Quality Index: QL (lower)	2.858203
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	0.118%
15	Total Est. Percent NcF in Lot (P)	0.118%
16	Max. Allowable Percent NcF (M)	5.580%
17	Acceptability Criterion (to accept, P<M)	Accepted

(C) Intermediate Flow Test Results

Meters were tested at an intermediate flow rate using the same procedure set forth in the ANSI Standard and detailed in HCWD2’s Plan filed December 29, 2016. Following the procedure set forth in the ANSI Standard, HCWD2 again tested a sample size of 35 meters at intermediate flow rates. The sample was accepted.

ANSI Standard for Intermediate Flow		
1	Sample Size: n	35
2	Sum of Measurements	3512
3	Sum of Squared Measurements	352420
4	Correction Factor (CF)	352404.1
5	Corrected Sum of Squares (SS)	15.88571
6	Variance (V)	0.467227
7	Estimate of Lot Standard Deviation	0.68354
8	Sample Mean	100.3429
9	Upper Specification Limit	101.5
10	Lower Specification Limit	98.5
11	Quality Index: QU (upper)	1.692868
12	Quality Index: QL (lower)	2.696049
ANSI Standard Table B-5 used to derive values below		
13	Est. of Lot Percent NcF above Upper	4.320%
14	Est. of Lot Percent NcF below Lower	0.220%
15	Total Est. Percent NcF in Lot (P)	4.540%
16	Max. Allowable Percent NcF (M)	5.580%
17	Acceptability Criterion (to accept, P<M)	Accepted

(D) Minimum Flow Test Results

Meters were tested at a minimum flow rate using the same procedure set forth in the ANSI Standard and detailed in HCWD2’s Response to Commission Staff’s Second Request for Information, Question No. 5 filed on June 5, 2017. Following the procedure set forth in the ANSI Standard, HCWD2 tested a sample size of seven meters at minimum flow rates. The sample was accepted.

1	Sample Size: n	7
2	Sum of Measurements	660
3	Sum of Squared Measurements	62378
4	Correction Factor (CF)	62228.571
5	Corrected Sum of Squares (SS)	149.42857
6	Variance (V)	24.904762
7	Estimate of Lot Standard Deviation	4.9904671
8	Sample Mean	94.285714
9	Lower Specification Limit	90
10	Quality Index: QL (lower)	0.8587802
ANSI Standard Table B-5 used to derive values below		
11	Est. of Lot Percent NcF (P)	20.070%
12	Max. Allowable Percent NcF (M)	30.500%
13	Acceptability Criterion (to accept, P<M)	Accepted

(E) Abnormal Meter Results

Two 2006 meters were replaced in 2017 because of damage that does not reflect on the meter group’s accuracy as a whole.

Meter Serial No. 12596484 was replaced because the low voltage cord that connects the meter register to the transmitter had been severed. The transmitter is located underneath the plastic meter lid and sends the radio signal through the lid. The meter test results of Serial No. 12596484 were 98.9 at maximum flow and 101 at intermediate flow. Serial No. 12596484 was replaced by Serial No. 58857768.

Meter Serial No. 59510797 was replaced because the meter had been tampered with and was no longer working. Because of the damage, HCWD2 was unable to get test results for Serial No. 59510797. Serial No 59510797 was replaced by Serial No. 33783497.

SECTION 4.0 2007 METERS, YEAR 10 TEST RESULTS

HCWD2 began performing the year 10 testing for the meters it installed during calendar year 2007 (the “2007 meters”) in October 2017. At the time it performed the testing, HCWD2 had 1,074 10-year-old meters. HCWD2 followed the same procedure set forth in the ANSI Standard as it detailed in HCWD2’s Plan filed December 29, 2016. Following the procedure set forth in the ANSI Standard, HCWD2 tested a sample size of 35 meters at maximum and intermediate flow rates and seven meters at minimum flow rates. As set forth in HCWD2’s Plan, HCWD2 selected the meters using a random, computerized process. All meters installed in 2007 were Sensus SR I meters.

(A) Meters Tested

The following 2007 meters were tested in year 10:

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Test Results of 2007 Sample Meters - Year 10

Serial No.	Maximum	Intermediate	Minimum	Total Water Flow	Testing Date
55527044	99.6	101		370,353.0	10/18/2017
61471216	99.1	101		265,198.5	10/18/2017
62388294	98.8	101		586,696.0	10/18/2017
72070208	99.2	101	95	237,683.1	10/18/2017
62388100	99.4	101		489,108.4	10/18/2017
58946445	99.0	101		338,053.0	10/18/2017
59067021	99.0	101	92	331,873.2	10/25/2017
58857691	99.4	101		613,741.0	10/25/2017
62103179	99.0	101		544,459.5	10/25/2017
61512281	99.8	100			
61512182	99.1	101		1,061,294.4	10/25/2017
62388301	99.7	101		555,833.6	10/25/2017
62388274	99.4	101	98	339,278.2	10/25/2017
61471178	98.7	101		323,575.6	10/25/2017
60697629	99.9	101		414,810.2	10/25/2017
60697616	99.1	101		641,321.7	10/25/2017
62238284	99.3	100		526,407.4	10/31/2017
62238187	99.5	100	91	235,351.5	10/31/2017
61512303	99.4	101		454,414.0	10/31/2017
60697510	99.0	101	95	304,443.4	10/31/2017
06434871	99.8	100		467,735.0	11/28/2017
59510926	99.9	101		490,474.0	11/2/2017
61471365	99.6	101		509,229.5	11/2/2017
61512258	99.9	101	95	573,377.8	11/2/2017
62388273	99.4	101		420,017.0	11/2/2017
62388217	99.2	101		448,114.5	11/27/2017
61512164	99.5	100		525,274.4	11/27/2017
61512227	99.1	101		623,918.0	11/27/2017
58946455	99.7	101		507,381.6	10/18/2017
61512275	99.5	100		539,884.3	11/28/2017
57988478	99.7	101		217,431.8	11/2/2017
61471193	100.0	100		528,881.6	11/28/2017
58346522	99.6	101		783,683.3	11/28/2017
61471282	99.3	101		773,507.0	11/27/2017
59495744	99.8	101	96	293,823.0	11/27/2017

(B) Maximum Flow Test Results

Meters were tested at a maximum flow rate using the same procedure set forth in the ANSI Standard and detailed in HCWD2’s Plan filed December 29, 2016. Following the procedure set forth in the ANSI Standard, HCWD2 again tested a sample size of 35 meters at maximum flow rates. The sample was accepted.

ANSI Standard for Maximum Flow		
1	Sample Size: n	35
2	Sum of Measurements	3479.4
3	Sum of Squared Measurements	345896.1
4	Correction Factor (CF)	345892.1
5	Corrected Sum of Squares (SS)	3.955429
6	Variance (V)	0.116336
7	Estimate of Lot Standard Deviation	0.341081
8	Sample Mean	99.41143
9	Upper Specification Limit	101.5
10	Lower Specification Limit	98.5
11	Quality Index: QU (upper)	6.123391
12	Quality Index: QL (lower)	2.672178
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	0.246%
15	Total Est. Percent NcF in Lot (P)	0.246%
16	Max. Allowable Percent NcF (M)	5.580%
17	Acceptability Criterion (to accept, P<M)	Accepted

(C) Intermediate Flow Test Results

Meters were tested at an intermediate flow rate using the same procedure set forth in the ANSI Standard and detailed in HCWD2’s Plan filed December 29, 2016. Following the procedure set forth in the ANSI Standard, HCWD2 again tested a sample size of 35 meters at intermediate flow rates. The sample was accepted.

ANSI Standard for Intermediate Flow		
1	Sample Size: n	35
2	Sum of Measurements	3528
3	Sum of Squared Measurements	355628
4	Correction Factor (CF)	355622.4
5	Corrected Sum of Squares (SS)	5.6
6	Variance (V)	0.164706
7	Estimate of Lot Standard Deviation	0.40584
8	Sample Mean	100.8
9	Upper Specification Limit	101.5
10	Lower Specification Limit	98.5
11	Quality Index: QU (upper)	1.724819
12	Quality Index: QL (lower)	5.667262
ANSI Standard Table B-5 used to derive values below		
13	Est. of Lot Percent NcF above Upper	4.040%
14	Est. of Lot Percent NcF below Lower	0.000%
15	Total Est. Percent NcF in Lot (P)	4.040%
16	Max. Allowable Percent NcF (M)	5.580%
17	Acceptability Criterion (to accept, P<M)	Accepted

(D) Minimum Flow Test Results

Meters were tested at a minimum flow rate using the same procedure set forth in the ANSI Standard and detailed in HCWD2’s Response to Commission Staff’s Second Request for Information, Question No. 5 filed on June 5, 2017. Following the procedure set forth in the ANSI Standard, HCWD2 tested a sample size of seven meters at minimum flow rates. The sample was accepted.

1	Sample Size: n	7
2	Sum of Measurements	662
3	Sum of Squared Measurements	62640
4	Correction Factor (CF)	62606.286
5	Corrected Sum of Squares (SS)	33.714286
6	Variance (V)	5.6190476
7	Estimate of Lot Standard Deviation	2.370453
8	Sample Mean	94.571429
9	Lower Specification Limit	90
10	Quality Index: QL (lower)	1.9285042
ANSI Standard Table B-5 used to derive values below		
11	Est. of Lot Percent NcF (P)	0.760%
12	Max. Allowable Percent NcF (M)	30.500%
13	Acceptability Criterion (to accept, P<M)	Accepted

(E) Abnormal Meter Results

There were no abnormal meter results with respect to the 2007 meters. None of the meters in the sample group had been damaged.

SECTION 5.0 CONCLUSION

As shown above, HCWD2’s 2017 Annual Meter Testing Report shows that the following meter lots passed at each flow rate using the relevant ANSI Standard:

- 2006 Meters, Year 11 Test Results
- 2007 Meters, Year 10 Test Results

In 2018, HCWD2 performed sample meter testing for the 2006, 2007, and 2008 meters and is filing a 2018 Annual Meter Testing Report that shows the Year 12 test results for the 2006 meters, Year 11 test results for the 2007 meters, and the Year 10 test results for the 2008 meters.