Exhibit No.:	
Issues:	Response to Staff Sales Averaging Technique, Response to OPC Base Usage Averaging Technique, Response to OPC Concern with April 2017 residential base usage data point.
Witness:	Gregory P. Roach
Exhibit Type:	Rebuttal-Revenue Requirement
Sponsoring Party:	Missouri-American Water Company
Case No.:	WR-2017-0285 SR-2017-0286
Date:	January 17, 2018

MISSOURI PUBLIC SERVICE COMMISSION

CASE NO. WR-2017-0285
CASE NO. SR-2017-0286

REBUTTAL TESTIMONY
REVENUE REQUIREMENT

OF

GREGORY P. ROACH

ON BEHALF OF

MISSOURI-AMERICAN WATER COMPANY

REBUTTAL TESTIMONY
REVENUE REQUIREMENT
GREGORY P. ROACH
MISSOURI-AMERICAN WATER COMPANY
CASE NO. WR-2017-0285
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REBUTTAL TESTIMONY
REVENUE REQUIREMENT

GREGORY P. ROACH

I. INTRODUCTION

Q. Please state your name and business address.

A. My name is Gregory P. Roach and my business address is 153 North Emerson Avenue, Greenwood, Indiana 46143.

Q. Are you the same Gregory P. Roach who previously submitted direct testimony in this proceeding?

A. Yes.

Q. What is the purpose of your revenue requirement rebuttal testimony in this proceeding?

A. The purpose of my revenue requirement rebuttal testimony is to respond to the direct testimony of Missouri Public Service Commission (Commission) Staff (Staff) witness Natelle Dietrich related to the Staff's treatment of residential declining use in their revenue requirement determination as well as the Office of the Public Counsel (OPC) witness Lena Mantle related to OPC's treatment of residential declining use in their revenue requirement determination.

II. OVERVIEW

Q. What is the scope and conclusions of your rebuttal testimony presented below?

A. My testimony will respond to a) the simple five-year residential sales averaging technique proposed by Staff through the testimony of Natelle Dietrich, Ashley Sarver, and Jarrod Robertson, b) the simple averaging of residential base usage values proposed by the OPC through the testimony of Lena Mantle and c) address OPC's claimed concerns related to the impact of April 2017, residential base usage values used in the MAWC residential base usage trending analysis. Based on evidence presented herein, I recommend that the Commission reject application of either the Staff or OPC averaging techniques for setting Pro Forma Test Year sales and residential billing determinants in this case due to serious deficiencies in those approaches. Lastly, I provide analysis which illustrates that the OPC's concern with the April 2017 residential base usage value has no significant impact on the results of the MAWC analysis.

III. RESPONSE TO STAFF FIVE-YEAR AVERAGING TECHNIQUE

Q. What method did Staff use to determine Test Year sales volumes and revenues?

A. The Staff applied a simple five-year average (2012-2016) for the purposes of determining Test Year sales volumes, billing determinants and revenues in their case.

Q. What was the Staff's justification for using a simple five-year average for purposes of determining sales volumes, billing determinants and revenues in their case?

A. Based on Ms. Dietrich's direct testimony, Staff has justified the application of a five-year average as follows: "MAWC states that usage on a per customer basis is declining and that trend will continue. Staff suggests that usage patterns have changed over the

years for various reasons that might cause usage to fluctuate. In its direct case, MAWC performs a regression on certain usage data and uses a ten-year average for the rest of non-base usage. Staff recommends a five-year average of usage to determine the normalized usage for the residential class." (p. 4)

Q. Did the Staff provide any analysis or data to support use of a five-year simple average?

A. No. Staff failed to provide any analytical support for their position.

Q. Did you address the impact of applying a five-year averaging technique for purposes of determining Test Year sales volumes and billing determinants in your direct testimony?

A. Yes I did.

Q. What is the impact on pro-forma estimated Test Year sales volumes and billing determinants through application of a five-year average for those values?

A. As delineated in Section IV MAWC Residential Usage Forecast vs Five Year Average of my direct testimony in this case (pages 15-18), the application of a simple five-year average overstates pro forma sales volumes for the Test Year by approximately 7%. Table GPR-1R below delineates the magnitude of that 7% overstatement of Test Year usage due to application of a five-year simple average.

Furthermore, even a casual glance at the sales from 2012 to 2016 would reveal a downward trend with the highest usage being both in 2012 and being significantly higher than in any other year. Even to an untrained eye, one would want to investigate

Table GPR-1R
Missouri American Water Company
2012-2016 Residential Water Sales & Billed Water Revenues

Res Water Sales (TG)

	2012	2013	2014	2015	2016	5 Year Avg
Actuals	38,080,966	33,393,428	32,455,304	31,362,239	30,933,541	**33,245,096**
Test Year 2016						**30,933,541**
Variance						**(2,311,554)**
% Var						**-7%**

Q. Did you address the catalyst for the 2.3 trillion gallon overstatement of Test Year sales volumes and billing determinants due to application of a five-year averaging technique in your direct testimony?

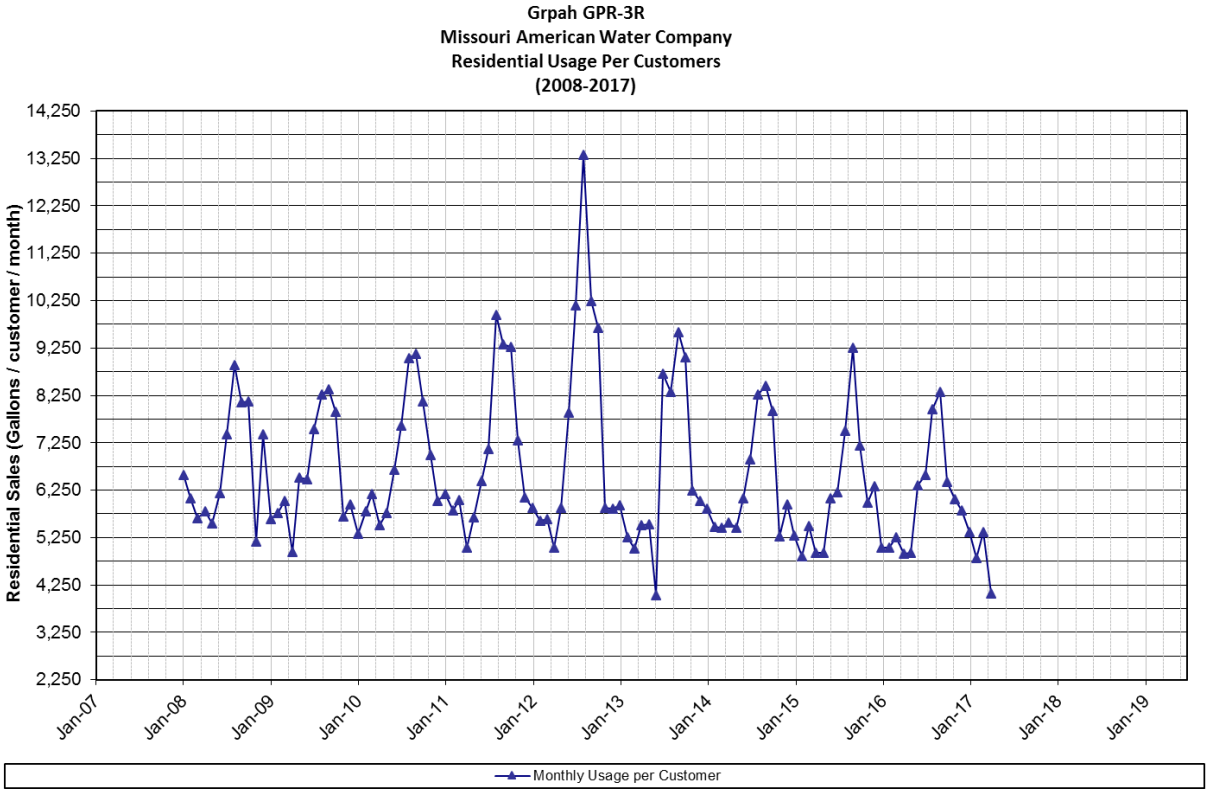
A. Yes I did. As illustrated in Table GPR-2R below, the 2012-2016 five year averaging period, using cooling degree-days as the measure, was 12% warmer than the 40-year average and 3.2% warmer than the 10-year average. So too, using monthly precipitation as the measure, this same time period was 24.7% dryer than the 40 year average and 9.1% dryer than the 10 year average. A significant portion of the 2012-2016 departure from the 40 and 10-year averages was due specifically to the abnormally hot and dry summer of 2012.

Table GPR-2R
Missouri American Water Company
Comparison of 10 and 40 Year Weather to 2012-2016
Summer Season (May - Sept)

Time Period Measured	Cooling Degree Days	Precipatation	Maximum Monthly Temperature	Mean Maximum Daily Temperature	Mean Minimum Daily Temperature	Mean Average Daily Temperature
Mean % Change 5 to 40 Years	12.0%	-24.7%	1.9%	1.7%	2.3%	1.9%
S. Dev % Change 5 to 40 Years	-8.9%	-15.6%	-1.8%	-9.1%	-10.5%	-10.3%
Mean % Change 5 to 10 Years	3.2%	-9.1%	0.8%	0.6%	0.5%	0.6%
S. Dev % Change 5 to 10 Years	-9.2%	-7.4%	-5.4%	10.2%	7.6%	9.8%

Q. What is your conclusion related to the Staff employing a period of relatively hotter and dryer weather during the five-year average period used by Staff to determine Test Year sales volumes and billing determinants?

A. The warmer and dryer climatic conditions of the 2012-2016 five-year period employed by Staff to apply their averaging technique results in estimates for sales volumes and revenues driven primarily by warmer and dryer than normal climatic conditions. Graph GPR-3R below illustrates that concept. This graph demonstrates that over the nine summer periods of 2008-2016, the Staff five-year averaging technique for sales volumes and billing determinants would be based on summer sales volumes influenced by warmer and dryer conditions which drove summer residential usage per customer that ranks as the first, third and fourth greatest usage levels in the nine years I reviewed.



Q. Did Staff make any provision for reductions in residential usage because of the continual replacement of less efficient water using devices and appliances with more efficient water using devices and appliances or other usage factors that would reduce residential water usage?

A. No. Staff ignored the impact of continual replacement of water using devices and appliances with their more efficient counterparts by asserting without support, "…usage patterns have changed over the years for various reasons that might cause usage to fluctuate." (Dietrich Direct, p. 4)

Q. Is the reduction in usage per customer a national trend that has been widely recognized?

A. Yes, it is as my direct testimony explains in detail. If Staff had some reason to believe that Missouri was singularly exempt from this trend, it should have been incumbent on Staff to demonstrate and explain such an anomalous result.

Q. What has been the historic impact on MAWC's actual vs. authorized revenues due to setting MAWC Test Year sales volumes and billing determinants at levels that do not consider climatic and residential usage declines?

A. In general, prior MAWC rate cases have resulted in Commission decisions setting Test Year sales and billing determinants based on some application of a multi-year averaging technique. Since these multi-year averaging techniques fail to consider the impact of climatic conditions or device/appliance replacement induced non-discretionary and non-weather sensitive residential usage declines, MAWC's were under its authorized revenue for the period 2008 - 2016 by approximately $69.4 million. Similarly, for that same period, MAWC was under its authorized total water sales by approximately 88.9 billion gallons. There is a direct relationship between MAWC's inability to collect its authorized revenue over the period of 2007-2016 to water usage reductions attributed to the 88.9 billion-gallon short fall in total sales levels set in the MAWC cases over the period of 2007 through 2016. Table GPR-4R below illustrates this relationship over the period of 2007 through 2016.

Table GPR-4R
Missouri American Water Company
Actual Revenue/Water Sales Compared to Authorized
(2007-2016)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total 2008-2016
MAWC Total Billed Annual Revenue*	177,389,283	180,166,727	203,017,639	222,749,546	240,218,004	274,501,000	261,186,872	266,484,898	264,979,705	283,508,099	2,374,201,772
Total Authorized Revenue**	168,290,426	197,386,326	224,188,475	236,684,056	247,231,384	258,154,279	265,880,783	273,892,338	283,861,950	287,994,720	2,443,564,736
Revenue Recovery to Authorized (Under)/Over	$9,098,857	($17,219,599)	(21,170,837)	(13,934,510)	(7,013,380)	16,346,721	(4,693,911)	(7,407,439)	($18,882,245)	($4,486,621)	($69,362,964)
	5.41%	-8.72%	-9.44%	-5.89%	-2.84%	6.33%	-1.77%	-2.70%	-6.65%	-1.56%	
MAWC Total Annual Water Sales (000 Gallons)	68,751,967	60,992,457	58,144,902	60,275,866	60,561,458	64,866,418	58,124,580	56,927,366	55,658,515	55,768,403	600,071,932
Total Authorized Water Sales*	84,846,470	86,852,062	83,324,702	71,286,441	61,618,498	60,559,014	60,272,780	60,272,780	60,272,780	59,647,313	688,952,841
Water Sales to Authorized (Under)/Over	(16,094,503)	(25,859,605)	(25,179,800)	(11,010,575)	(1,057,040)	4,307,404	(2,148,200)	(3,345,414)	(4,614,265)	(3,878,910)	(88,880,909)
	-18.97%	-29.77%	-30.22%	-15.45%	-1.72%	7.11%	-3.56%	-5.55%	-7.66%	-6.50%	

* Inclusive of Waste Water Revenue and Exclusive of Other Water Revenue
**Per Commission Orders Exclusive of Other Water Revenue

Q. Would Staff's proposal to employ a five-averaging technique to set pro-forma test year sales and billing determinants in this case result in continuation of the ongoing 2007-2016 trend of MAWC's inability to earn its authorized revenue due to overstatement of sales and billing units?

A. Yes, it would. By employing a five-year averaging period influenced by above average temperatures and limited rainfall, while ignoring the impact of continual replacement of water using devices and appliances with their more efficient counterparts to set Test Year sales and billing determinants, would result in rates that would never allow MAWC to earn its authorized revenue requirement under conditions of average climatic conditions. Further, the impact of continual replacement of water using devices and appliances with their more efficient counterparts further exacerbates this situation with an ever-greater impact with each successive month beyond the Test Year in which the rates were established.

Q. Has the trend of water using device and appliance replacement with more efficient counterparts run its course?

A. No, the impact of water using device and appliance replacement has not reached its conclusion. Rather, based on several analyzes summarized in my direct testimony in this proceeding, the potential term for the device and appliance replacement trend to fully convert all installed water using fixtures and appliances is as much as an additional 40 years. This implies that MAWC will continue to experience the impact of continual residential declining use on sales volumes and revenues for the foreseeable future.

Q. What is your recommendation to the Commission related to utilization of the Staff proposed five-year simple average technique for setting Test Year sales and billing determinants levels?

A. I urge the Commission to reject adoption of the Staff's five-year simple average technique for setting Pro Forma Test Year sales and billing determinants in this proceeding. First the Staff's five-year simple average technique, as applied to residential customers in particular, ignores the underlying trend of reductions to residential customer usage due to continual replacement of water using devices and appliances with their more efficient counterparts. Second the Staff's proposed technique employs residential usage during a five-year period that has been overstated due to customer's responses to warmer and dryer than average climatic conditions. For those two reasons, the Staff proposed five-year simple averaging technique is inappropriate for setting rates in this proceeding.

IV. RESPONSE TO OPC FIVE-YEAR BASE AVERAGING TECHNIQUE

Q. Have you reviewed the direct testimony of OPC witness Lena Mantle?

A. Yes, I have.

Q. What is the thrust of Ms. Mantle's testimony as it applies to base usage and the determination of Test Year Residential base usage values?

A. First, it is significant that OPC acknowledges that Residential total usage can be analyzed as having base (defined as non-discretionary and non-weather sensitive usage) as well as non-base (defined as discretionary and weather sensitive usage)

components. Ms. Mantle analyzes the residential base usage values for the months of February through April for the years 2007 through 2017. Ms. Mantle concludes at p. 2 of her direct testimony, "My review of ten years of historical usage showed a distinct drop in use per customer in the base usage months from 2011 to 2012. Beginning in 2012, the usage remained fairly constant." Based on these observations, Ms. Mantle proposes that Test Year Pro Forma residential sales and billing determinants for each rate district be calculated with a simple average of the monthly base usage per customer (February – April with one exception for April 2017) for the period of 2012 through 2017.

Q. What is the major disadvantage of the OPC proposed approach to setting Pro Forma Test Year sales and billing determinants?

A. While the OPC proposal acknowledges the analytical separation of residential usage into base and non-base components, OPC fails to incorporate the time series and trending nature of the residential base usage data set by using their proposed simple average technique. As the residential base usage data set is composed of trending time series data, Ms. Mantle's proposed averaging methodology would set residential base usage somewhere near the middle point of the time series data set, i.e.,2014 values. As a result, application of the simple averaging technique 1) ignores the overall 10 plus year trend of declining residential base usage per customer and 2) sets the residential base usage value at levels experienced in approximately 2014, ignoring four successive years of additional residential base usage declines.

Q. Ms. Mantle chose to analyze and average a set of monthly residential base usage values over the period of 2007 through 2017. What complication occurs with the data when being analyzed on a discreet monthly basis?

A. As Ms. Mantle identifies in her direct testimony, the discreet monthly base usage values (February through April) can exhibit swings from month to month. The reasons these swings occur are due primarily to the impact of quarterly billing peculiarities from one month to the next. These peculiarities would include weather conditions impacting meter reads or altering meter reading routes, planned schedule modifications to meter reading routes and similar meter reading/billing program scheme changes that impact the residential usage data from month to month. Typically, movement of usage data from one month to another is the result of these meter reading/billing peculiarities, which is evident in the residential base usage data set.

Q. How did MAWC avoid the impact of meter reading/billing peculiarities in its ten-year regression based trending analysis of residential base usage summarized in your direct testimony?

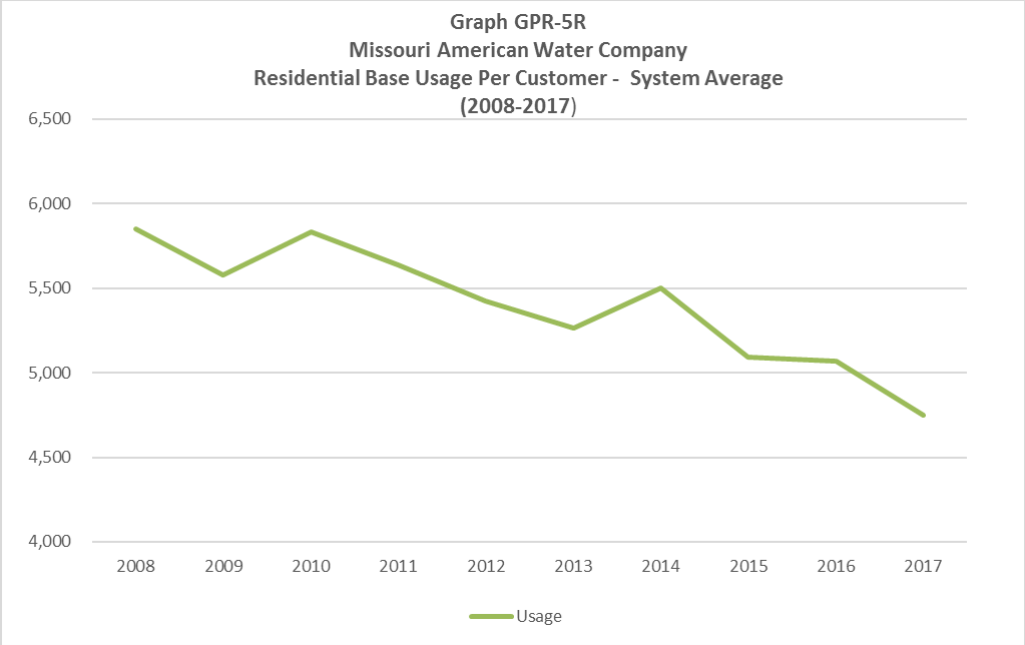
A. MAWC and its affiliated companies have been analyzing residential base usage for nearly a decade. As part of the constant improvement of our analysis, we have settled on analyzing the annual average residential base usage value for the base period as opposed to each discreet monthly value. This approach mitigates the impact of the meter reading/billing peculiarities that flow from month to month which introduce variance to the data that has nothing to do with the underlying residential base usage trend. Our experience indicates that a biased analysis, and resulting biased conclusions, will result from employing discreet monthly residential base usage values due to the

variance associated with the monthly meter reading/billing peculiarities. The underlying monthly meter reading/billing variance will overwhelm or mask the underlying trend of the data. Our approach eliminates that bias through annual aggregation and analysis of the residential base usage data.

Q. Could you illustrate how your annual aggregation of the residential base usage data mitigates the impact of meter reading/billing peculiarities when analyzing residential base usage?

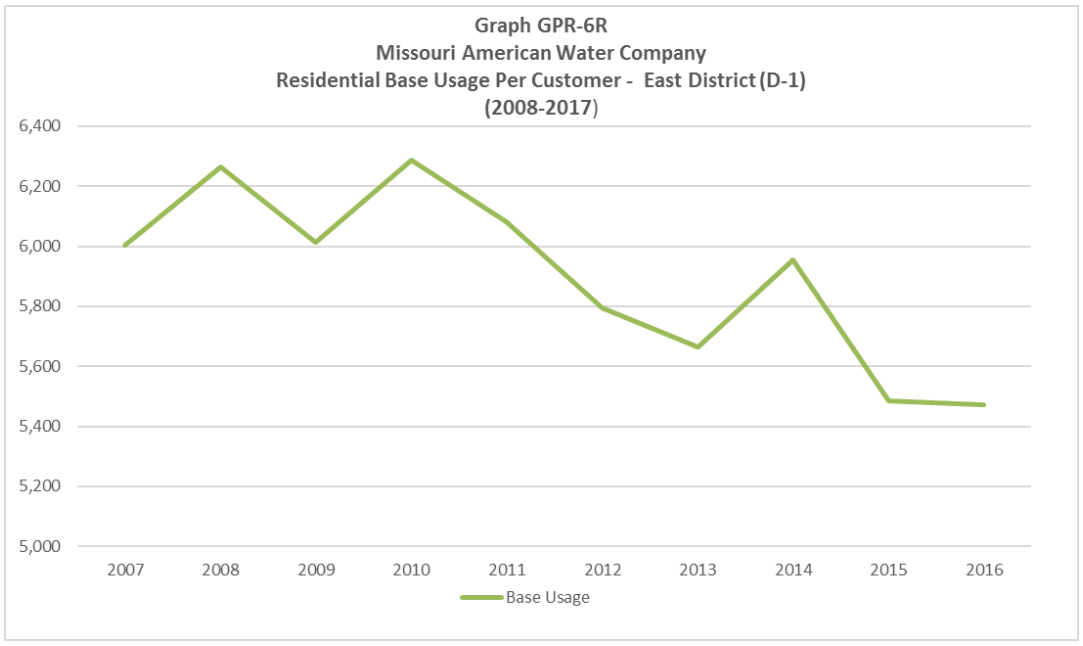
A. Yes, I can. Reviewing Graph GPR-3R above, note the saw tooth shape of the data for the months of February through April of every year in the data set. This graphically illustrates the concept of meter reading/billing peculiarities in the data. Presented immediately below is Graph GPR-5R illustrating the same period, with the same data, but aggregating the residential base usage into annual values by averaging each year's monthly February through April value into a single annual value. When analyzing the residential base usage data in this manner, eliminating the month-to-month meter reading/billing variance, statistical modeling reveals a clear annual declining trend to the data. Graph GPR-5R illustrates a decline of base residential usage in each succeeding year from 2010 through 2017, aside from 2014 when residential base usage values were skewed by the effects of the prolonged arctic climatic event deemed the "polar vortex" by the media. During the base period in 2014, a majority of the American Water affiliate companies experienced an increase in residential base usage

due to customers following media instructions to drip water from in-home fixtures to prevent plumbing freeze and damage due to the prolonged arctic cold period.

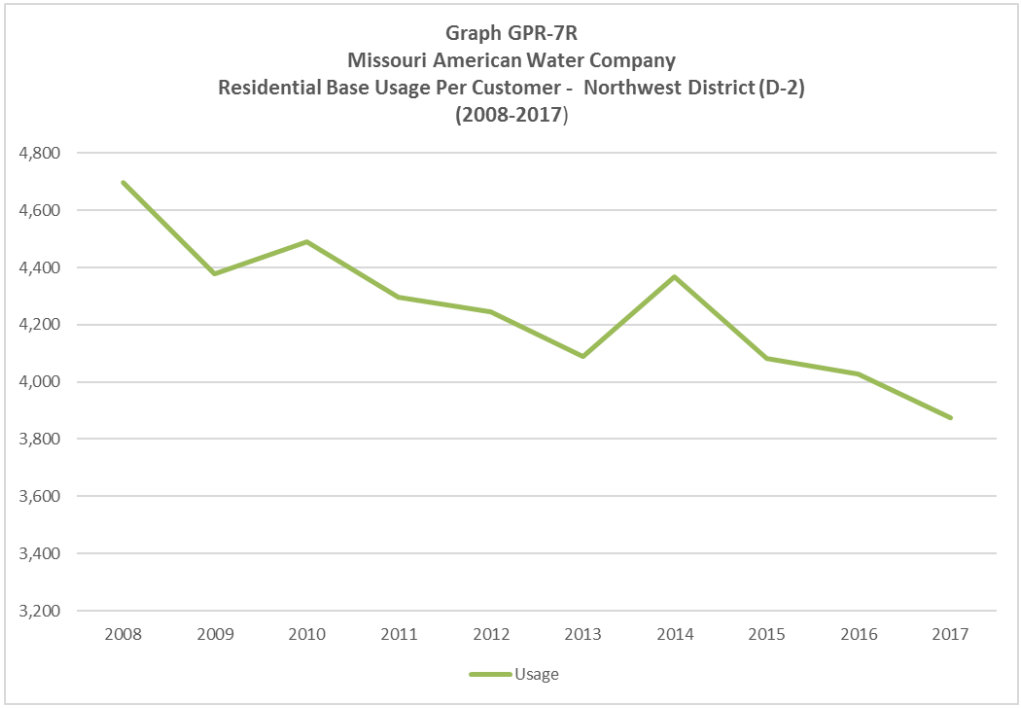


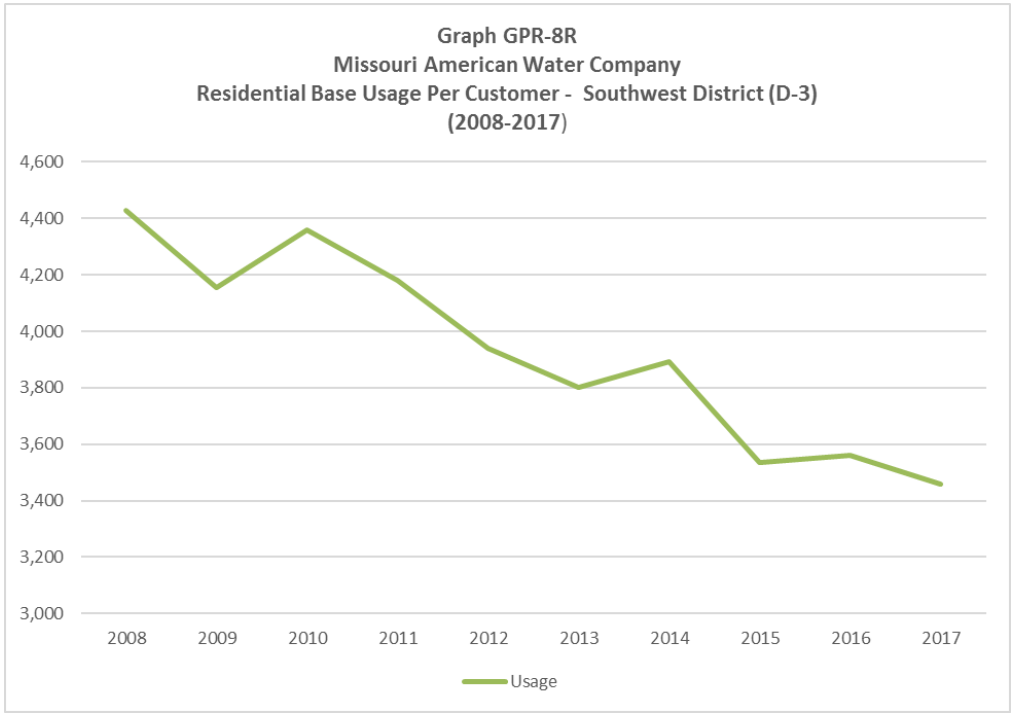
Q. Does this annual residential base usage annual aggregation technique result in identification of a trend similar to the system total for each of the rate districts?

A. Yes, it does. Presented below in Graphs GPR-6R through GPR-8R are data series similar to the total system average shown in GPR-5R, illustrating each of the three



separate rate districts analyzed in this proceeding. For each rate district, the graphs indicate a similar trend to the total system average trend and shows the impact of the polar vortex in 2014 on residential base usage.





Q. What is the impact on Pro Forma Test Year Residential Base Usage determination through application of the averaging technique proposed by OPC?

A. The residential base usage averaging technique proposed by OPC to set Test Year Pro Forma sales and billing determinants, as compared to that proposed by MAWC, would increase Test Year residential base usage by approximately 453 million gallons or 2%. Table GPR-9R below provides the numerical comparison of MAWC to OPC residential base usage estimates for the Test Year. Employing the OPC averaging technique for residential sales and billing determinants would set residential rates at levels diluted by too many billing units for failing to incorporate the complete impact of the trend of residential base usage. Adopting the OPC base usage averaging technique would nearly guarantee that MAWC experience continuation of the trend of authorized revenue under collection illustrated in Table GPR-4R above.

Table GPR-9R
Missouri American Water Company
Test Year Pro Forma Base Usage Per Customer @ 12/2016

	Resdential Base Usage Per Customer		Difference		Test Year Impact	
District	MAWC	OPC	Gallons	%	Number of Customers	Total Gallons (000)
D1-East Central	5397	5512	115	2.13%	358,000	494,040
D2-Northwest	4043	4002	-41	-1.01%	34,000	-16,728
D3-Southwest	3552	3493	-59	-1.66%	34,000	-24,072
MAWC						453,240

Q. What is your recommendation to the Commission related to the OPC proposal for setting residential base usage levels for Pro Forma Test year sales and billing determinants?

A. I recommend the Commission reject the OPC proposed averaging technique for setting Pro Forma Test Year residential sales and billing determinants due to the technique's

overstatement of Test Year values resulting in rates that would not allow MAWC to meet its authorized revenue ordered in this proceeding.

V. APRIL 2017 RESIDENTIAL BASE USAGE VALUE IMPACT ON MAWC ANALYSIS RESULTS

Q. The OPC has raised a concern related to the April 2017 Residential Base Usage Value. Have you reviewed that data and if so what have you concluded?

A. Yes, I have. Presented in Table GPR-10R below are the monthly residential base usage values used by MAWC in its analysis and provided to the OPC for months of January through May for the years 2012 through 2017. Presented in Table GPR-10R are two columns for 2017 labeled as 2017A for "actual" and 2017N for "normalized". It is clear that the data for April 2017 reported in column 2017A, (which is the data point that gave the OPC concern), was influenced by a discreet monthly meter reading/billing peculiarity. For purposes of estimating the impact of the April 2017 actual data point on the results of the MAWC analysis of residential base usage, I have developed a "normalized" value for April 2017. The normalized April 2017 value was calculated as the difference between the May 2017 data point and the average of the 2015 and 2016 May values added to the April 2017 actual data point. In this way, usage that should have been billed in April, that appeared to be included in the May 2017 data, has been allocated back to April 2017. This normalization calculation increases the value for April 2017 by 326 gallons/customer/year and the Feb-April 2017 average by 109 gallons/customer/year.

Table GPR-10R
Missouri American Water Company
Total MAWC System Level
Test Year Pro Forma Base Usage Per Customer Jan-May

Month	2012	2013	2014	2015	2016	2017A	2017N
Jan	5,886	5,924	5,866	5,285	5,042	5,370	5,370
Feb	5,598	5,250	5,482	4,857	5,045	4,819	4,819
Mar	5,637	5,018	5,464	5,486	5,252	5,358	5,358
Apr	5,046	5,521	5,561	4,929	4,915	4,074	4,401
May	5,886	5,521	5,454	4,923	4,932	5,254	4,928
Feb-Apr	5,427	5,263	5,502	5,091	5,071	4,751	4,860

Q. Have you analyzed the impact of using a "normalized" data point for April 2017 on the result of your residential base usage trend analysis?

A. Yes, I have. Using the revised or normalized data point for April 2017 derived above results in a revised value for the annual residential base usage value for 2017, I have estimated a new regression model based on the revised data point. Reported in Table GPR-11R below are the results of the regression model and residential base usage forecast based on the original data point and revised 2017 data point. This table illustrates that modification of the April 2017 data point results in .005 change to the R2 and (72) gallon change to the gallons/customer/year forecasted decline. As such, this data point did not materially influence the results of the MAWC residential base usage analysis presented in my direct testimony and MAWC has not modified its analysis as filed.

Table GPR-11R
Missouri American Water Company
Total MAWC System Level
Residential Base Usage Analysis Results

	R2	Time	%	g/cust/yr	g/cust/day
Original Data Point	0.912	-8.47	-1.89%	-1,356	-3.72
Normalized Data Point	0.917	-8.77	-1.78%	-1,284	-3.52
Change			-0.11%	-72	-0.20

VI. RECOMMENDATIONS

Q. What are your recommendations for the Commission related to setting Pro Forma Test Year sales and billing determinants in this proceeding?

A. I recommend that the Commission reject both the Staff and OPC proposed averaging techniques for setting Pro Forma Test Year sales and billing determinants in this proceeding. The Commission should reject the Staff's simple averaging technique due to its biased results influenced by the unusually warm and dry climatic factors during the period averaged and the Staff's reticence to incorporate the effects of reduced residential usage due to the ever-greater saturation of more efficient water using fixtures and devices. The Commission should reject the OPC proposed residential base usage averaging technique as it relies on monthly data heavily influenced by discreet monthly meter reading/billing peculiarities that do not allow for visibility to the underlying annual trend of declines in residential base usage resulting from ever-greater saturation of more efficient water using fixtures and devices.

Q. Does this conclude your revenue requirement rebuttal testimony?

A. Yes, it does.