

Exhibit No.:
Issues: Weather Normalization

Witness: Edward L. Spitznagel
Exhibit Type: Surrebuttal
Sponsoring Party: Missouri-American Water Company
Case No.: WR-2007-0216 SR-2007-0217
Date: July 27, 2007

MISSOURI PUBLIC SERVICE COMMISSION

**CASE NO. WR-2007-0216
SR-2007-0217**

SURREBUTTAL TESTIMONY

OF

EDWARD L. SPITZNAGEL

ON BEHALF OF

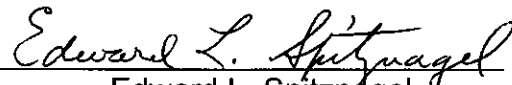
MISSOURI-AMERICAN WATER COMPANY

**BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI**

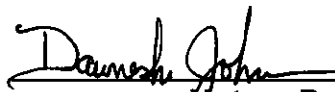
<u>IN THE MATTER OF MISSOURI-AMERICAN)</u>	
<u>WATER COMPANY FOR AUTHORITY TO)</u>	
<u>FILE TARIFFS REFLECTING INCREASED)</u>	CASE NO. WR-2007-0216
<u>RATES FOR WATER AND SEWER)</u>	CASE NO. SR-2007-0217
<u>SERVICE)</u>	

AFFIDAVIT OF EDWARD L. SPITZNAGEL

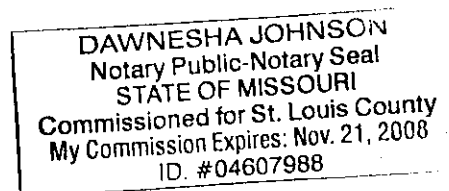
Edward L. Spitznagel, being first duly sworn, deposes and says that he is the witness who sponsors the accompanying testimony entitled "Surrebuttal Testimony of Edward L. Spitznagel"; that said testimony was prepared by him and/or under his direction and supervision; that if inquiries were made as to the facts in said testimony, he would respond as therein set forth; and that the aforesaid testimony are true and correct to the best of his knowledge.


Edward L. Spitznagel

State of Missouri
County of St. Louis
SUBSCRIBED and sworn to
Before me this 25 day of July 2007.



Notary Public



My commission expires:

**SURREBUTTAL TESTIMONY
EDWARD L. SPITZNAGEL
MISSOURI-AMERICAN WATER COMPANY
CASE NO. WR-2007-0216**

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SURREBUTTAL TESTIMONY

EDWARD L. SPITZNAGEL, JR.

WITNESS INTRODUCTION

1 **Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS, AND EMPLOYER.**

2 **A. My name is Edward L. Spitznagel, Jr., and my business address is Campus Box**
3 **1146, One Brookings Drive, St Louis, Missouri 63130. I am employed by**
4 **Washington University.**

5
6 **Q. ARE YOU THE SAME EDWARD L. SPITZNAGEL, JR., WHO PREVIOUSLY**
7 **SUBMITTED PREPARED DIRECT AND REBUTTAL TESTIMONY IN THIS**
8 **PROCEEDING?**

9 **A. Yes, I am.**

10

PURPOSE

11
12 **Q. WHAT IS THE PURPOSE OF THIS TESTIMONY?**

13 **A. The purpose of this testimony is to rebut certain aspects of the rebuttal testimony of**
14 **Dennis L. Patterson, Witness for the Missouri Public Service Commission (PSC)**
15 **Staff. Specifically, I will address his statements that:**

16 **THE COMPANY'S BILLING DATA ARE DEFICIENT**

17 **COMPANY'S WEATHER NORMALIZED GCD ARE BIASED**

18 **INAPPROPRIATE WEATHER VARIABLE**

19 **THE PDSI IS INAPPROPRIATE FOR ANALYZING UTILITY WATER USAGE**

1 **THE NORTHEAST PRAIRIE PDSI AND CMI DO NOT APPLY TO THE ST**
2 **LOUIS BILLING**
3 **THIRTY-YEAR AVERAGES OF PDSI ARE NOT CONSISTENT WITH**
4 **CURRENT MEASUREMENTS**

5
6 **Q. PLEASE RESPOND TO THE ASSERTION THAT “THE COMPANY’S BILLING**
7 **DATA ARE DEFICIENT.”**

8 **A. Mr. Patterson states that “in the years since 2001, numerous customers were not**
9 **captured in the billing data” This is due to the fact that customers billed close to**
10 **a month or year boundary may sometimes be billed to one side or the other of that**
11 **boundary. That is, the data provided to me by the company is in terms of bills**
12 **rather than customers on the books. This is not a problem because they also**
13 **provide usage billed to those customer, so it is still possible to calculate the usage**
14 **per customer. Both Mr. Patterson and I did our calculations on an annual basis.**
15 **Since usage in the late fall and winter months is not weather-sensitive, there is no**
16 **problem for the weather normalization if a customer billed in late December of one**
17 **year (say, 2003) was not billed in December of the following year (2004) but slipped**
18 **across the year boundary into January (2005).**

19
20 **Q. PLEASE RESPOND TO THE ASSERTION THAT “COMPANY’S WEATHER**
21 **NORMALIZED GCD ARE BIASED.”**

22 **A. In 2002, the company added approximately 23,100 residential quarterly-billed**
23 **customers with the acquisition of the Florissant and Webster Groves municipal**

1 systems. Please see the table between Lines 3 and 4 on Page 8 of the Direct
2 Testimony of Dennis Patterson. Mr. Patterson calculated the usage of these
3 customers to be 0.752 that of the older SLCWC customers. He was concerned with
4 the fact that the usage from 2002 onward, if averaged over new and old customers,
5 would drag the trend line downward, below actual usage. He illustrates his concern
6 with the graph between Lines 1 and 2 on Page 4 of the Rebuttal Testimony of
7 Dennis Patterson. As can be seen, for 2006, the red triangle is approximately $\frac{1}{8}$
8 unit lower than that of the diamond representing his data, and for 2007, which is the
9 year for which he and I have computed normalized consumption, it is approximately
10 $\frac{1}{4}$ unit lower. This is the bias that he is referring to.

11
12 **Q. DO YOU ORDINARILY INCLUDE THE CONSUMPTION OF RECENTLY**
13 **ACQUIRED COMPANIES IN YOUR WEATHER NORMALIZED CALCULATIONS?**

14 A. No, I do not, because of the bias issue that Mr. Patterson has raised, plus the
15 difficulty of estimating the effect of weather and a possible time trend if only a few
16 years of data are available. For example, I am currently doing weather
17 normalization for Kentucky-American Water Company in Lexington, KY, and I
18 excluded consumption for two acquisitions they made in 2001 and 2006. I
19 recommended to Kentucky-American that they estimate consumption for those
20 recently acquired customers using simple averages.

1 **Q. COULD YOU PERFORM THE SAME TYPE OF CALCULATION WITH**
2 **FLORISSANT AND WEBSTER GROVES REMOVED FROM THE ST. LOUIS**
3 **COUNTY DATA?**

4 **A.** Yes.

5
6 **Q. HOW LARGE A BIAS IS LIKELY TO RESULT FROM INCLUSION OF THESE**
7 **RECENTLY ACQUIRED CUSTOMERS IN THE SLCWC DATA?**

8 **A.** In Line 28 on Page 1 of Supplemental Direct Testimony of Dennis L. Patterson, Mr.
9 Patterson estimated that in 2002 there were 320,060 billed customers. As I
10 mentioned above, in his Direct Testimony, he estimated the total number of
11 customers in Florissant and Webster Groves combined to be 23,100. He refers to
12 these as "new customers." Therefore there were $320,060 - 23,100 = 296,960$ "old
13 customers" in 2002. If we let x stand for the average usage in GCD of the "old
14 customers," and we use his ratio of usage 0.752 for the new customers relative to
15 the old customers, the average usage of new and old customers combined is
16 $(296,960 x + 23,100 \times 0.752 x) / 320,060 = 0.9821 x$. For the year 2002, the value
17 of x estimated by Mr. Patterson is 276.25, making the average usage of new and
18 old customers combined equal to $0.9821 \times 276.25 = 271.31$. The difference 276.25
19 $- 271.31 = 4.94$ corresponds to the one-unit drop in Mr. Patterson's figure between
20 Lines 1 and 2 on Page 4 of Rebuttal Testimony of Dennis L. Patterson. The bias in
21 2007 is the distance between the red triangle and the diamond above it, which is
22 approximately $1/4$ of the one-unit drop in Mr. Patterson's figure. Thus, the
23 estimated bias in my method is approximately $-4.94/4 = -1.235$ GCD, which is very

1 small compared with the difference between Mr. Patterson's weather-normalized
2 estimate for 2007 of 272.02 (Revised Schedule 2-1 of Supplemental Direct
3 Testimony of Dennis L. Patterson) and my estimate for 2007 of 260.681 in Line 7 on
4 Page 7 of my direct testimony.

5
6 **Q. PLEASE RESPOND TO THE ASSERTIONS "INAPPROPRIATE WEATHER**
7 **VARIABLE" AND "THE PDSI IS INAPPROPRIATE FOR ANALYZING UTILITY**
8 **WATER USAGE."**

9 **A.** When I first was employed doing weather normalization of water usage in 1993, it
10 was for Missouri water companies, in Joplin and St. Joseph. I used the simple
11 available moisture model adopted by the Commission, which I believe was
12 developed by Dennis Patterson. It can be described in words as:

13 Today's moisture = yesterday's moisture – 0.06
14 + today's rainfall,
15 Rounded down to 0.36 if above 0.36

16 Where the units are inches.

17
18 As I described on Pages 3 and 4 of my direct testimony, I was employed in 1997 by
19 Kentucky-American Water Company to develop an optimal weather normalization
20 method for them. The history behind this request is that in 1996 I was an expert
21 witness in a Kentucky-American rate hearing in which the Commonwealth of
22 Kentucky had employed an attorney named Scott Rubin to make weather-
23 normalized estimates. I found serious flaws in his methods, and based on my

1 testimony, the Commission decided to reject Mr. Rubin's estimates. They charged
2 Kentucky-American to develop the best possible method for weather normalization,
3 and Kentucky-American engaged my services to develop the method. (To date, I
4 have provided normalized estimates for Kentucky-American in a total of four rate
5 cases, including one that is on-going. They have also asked me to predict
6 consumption for their own planning purposes.)

7
8 Using data from 14 different operating companies within American Water Works
9 Service Company, including 5 Missouri companies, I did head-to-head tests of the
10 Missouri available moisture index (described above) and four NOAA indices. The
11 NOAA-supplied Palmer Drought Severity Index (PDSI) did the best in predicting
12 utilization. I therefore used it in the 1997 Kentucky-American normalization and
13 have continued to use it in other cases, in Kentucky, Tennessee, Missouri, New
14 Jersey, and Iowa. (Despite its name, "Drought Severity Index", the PDSI measures
15 both surplus of moisture, by values greater than zero, and deficit of moisture, by
16 values less than zero.)

17
18 While Mr. Patterson has many objections to the nature of the PDSI, I found it simply
19 to be better than all other candidates, including the available moisture index used in
20 Missouri. Mr. Patterson's current weather normalization has at its core the same
21 Missouri algorithm I described above, except that he now calculates "shortfall" and
22 includes hours of daylight and temperature in his calculations. He does not provide
23 any studies that establish his new measure is better than Missouri's original

1 available moisture measure, or better than the NOAA-supplied Palmer Drought
2 Severity Index. Until such a study is done, I believe the PDSI is the best choice for
3 weather normalization. Despite Mr. Patterson's objections that the PDSI was not
4 designed for weather-normalization of water consumption, my 1997 study showed
5 that it worked better than any other index.

6
7 **Q. PLEASE RESPOND TO THE ASSERTION THAT "THE NORTHEAST PRAIRIE**
8 **PDSI AND CMI DO NOT APPLY TO THE ST LOUIS BILLING."**

9 A. Missouri is divided by NOAA into six climate divisions. St. Louis County is in
10 Division 02, which NOAA calls "Northeast Prairie," and is in the southeast corner of
11 that division, as Mr. Patterson remarks in Lines 12 and 13 on Page 7 of Rebuttal
12 Testimony of Dennis L. Patterson. NOAA defines its climate divisions to be
13 approximately uniform with respect to weather, as can be seen more clearly by
14 examining maps of California, Oregon, and Washington, where the climate divisions
15 are determined by mountain ranges and valleys. I have to conclude that NOAA
16 found that St. Louis County is more similar to Climate Division 02 than to any other.

17
18 Any large metropolitan area will tend to have its own microclimate, as Mr. Patterson
19 says, also on Page 7 of Rebuttal Testimony of Dennis L. Patterson. However, it is
20 not necessary that the rainfall and temperature in St. Louis County equal that of
21 Division 02 overall, just that they correlate well with the Division 02 values.

1 Mr. Patterson's objection to using the Northeast Prairie PDSI for the much smaller
2 St. Louis County area points up a weakness in his own method. He uses a point
3 estimate of precipitation and temperature from one weather station, at Lambert
4 International Airport. The airport is in the north part of the county which is close to
5 the border with St. Charles County and therefore is not close to the geographical
6 center of the county. Precipitation can be highly variable over the county
7 particularly in spot thundershowers, which are not well represented by
8 measurements made at a single point.

9
10 **Q. PLEASE RESPOND TO THE ASSERTION THAT "THIRTY-YEAR AVERAGES**
11 **OF PDSI ARE NOT CONSISTENT WITH CURRENT MEASUREMENTS."**

12 A. Mr. Patterson does not quantify this assertion as to the degree of inconsistency he
13 believes exists. He bases the assertion on the fact that temperature and rainfall
14 enter into the calculation of PDSI, and that adjustments are made to temperature
15 and rainfall. On Page 9 of Rebuttal Testimony of Dennis L. Patterson, he refers to
16 adjustments that were made to data from 1971 through 2000 in determining thirty-
17 year climate normals. Since I have obtained snapshots of PDSI data at the various
18 times I was engaged to do weather normalizations, I compared the earliest
19 snapshot I have, taken on February 10, 1997, with the most recent, taken on July 6,
20 2007. I did this for Missouri Climate Division 02, whose PDSI values I used in the
21 current weather normalization. This enabled me to determine the changes that
22 occurred over a ten year period for the first 21 years of the data I used in the St.
23 Louis County normalization. This comparison is made in my workpapers file

1 PDSI-Comparison_1997-2007.xls. With the exception of the last five months of
2 1996 (Aug-Dec), all changes made were extremely small, the largest in magnitude
3 being a change of -0.05 , which occurred twice in 1986. In 91.7% of cases (231 out
4 of 252) there was in fact no change at all.

5
6 My experience has been that the final few months of any report I snapshot are
7 subject to change, but NOAA makes the changes relatively quickly. For example,
8 the last five PDSI values in my data from 1996 had been changed to their current
9 2007 values (except October's PDSI was 0.78 and eventually became 0.79) by the
10 time I had taken my next snapshot, in April of 1999.

11
12 The most recent PDSI values I have used in the current study were from the twelve
13 months of 2005. They were acquired on October 29, 2006, suggesting that any
14 necessary revisions would by then have taken place. In corroboration, the most
15 recent snapshot I have is from July 6, 2007, and all twelve PDSI values from 2005
16 agree with the ones obtained on October 29, 2006 and used in the weather
17 normalization.

18
19 I therefore conclude that my weather normalization calculations were not affected
20 by the alleged inconsistency between thirty-year averages and current
21 measurements.

22
23 **Q. DOES THIS CONCLUDE YOUR TESTIMONY?**

1 A. Yes, it does.

2