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Exhibit No.:	
Issues:	Weather Normalization, Water Utilization Trend Estimates
Witness:	Edward L. Spitznagel, Jr.
Exhibit Type:	Surrebuttal
Sponsoring Party:	Missouri-American Water Company
Case No.:	WR-2010-0131 SR-2010-0135
Date:	May 6, 2010

MISSOURI PUBLIC SERVICE COMMISSION

CASE NO. WR-2010-0131
CASE NO. SR-2010-0135

SURREBUTTAL TESTIMONY

OF

EDWARD L. SPITZNAGEL, JR.

ON BEHALF OF

MISSOURI-AMERICAN WATER COMPANY

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF MISSOURI

IN THE MATTER OF MISSOURI-AMERICAN WATER COMPANY FOR AUTHORITY TO FILE TARIFFS REFLECTING INCREASED RATES FOR WATER AND SEWER SERVICE	)))))	**CASE NO. WR-2010-0131** **CASE NO. SR-2010-0135**

AFFIDAVIT OF EDWARD L. SPITZNAGEL, JR.

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

Edward L. Spitznagel, Jr.

State of Missouri
County of St. Louis
SUBSCRIBED and sworn to
Before me this 30th day of April 2010.

Notary Public

My commission expires:

STACI A. OLSEN
Notary Public – Notary Seal
STATE OF MISSOURI
St. Charles County
Commission Number 09519210
My commission expires March 20, 2013

SURREBUTTAL TESTIMONY

EDWARD L. SPITZNAGEL, JR.

WITNESS INTRODUCTION

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

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

Q. WHAT IS YOUR PRESENT POSITION?

A. I am Professor of Mathematics in the College of Arts and Sciences at Washington University. I also hold a joint appointment in the Division of Biostatistics of the Washington University School of Medicine.

Q. ARE YOU THE SAME EDWARD L. SPITZNAGEL, JR WHO FILED DIRECT AND REBUTTAL TESTIMONY IN THIS CASE?

A. Yes, I am.

PURPOSE AND SCOPE

Q. WHAT IS THE PURPOSE OF YOUR SURREBUTTAL TESTIMONY?

A. I will respond to the rebuttal testimony of Staff expert Jerry Scheible, who has used a six-year average prediction method to estimate future water sales by Missouri-American Water Company ("Missouri-American" or "Company"). I will demonstrate

that there is statistically significant evidence that water usage does depend upon an important weather variable, that is the Palmer Drought Severity Index (PDSI). I will also demonstrate that there is a statistically significant downward trend in per-customer per-day water consumption. A simple average of historical usage amounts will not adequately capture and predict for these variables. I will demonstrate the significance of both of these variables for the St. Louis County residential customers, who are the largest-consuming class of MAWC customers, in number and total volume. Generally, my arguments for the St. Louis County residential customers will hold true for the other customer classes for which I propose a weather normalization or trend adjustment.

Q. PLEASE DESCRIBE YOUR EVIDENCE FOR WATER CONSUMPTION BEING DEPENDENT UPON THE PALMER DROUGHT SEVERITY INDEX.

A. This evidence is contained on pages 1 and 2 of Schedule_ELS-2 from my Direct Testimony, in which both year (since 1990) and PDSI (averaged over the weather-sensitive months of May through December and referred to as PDSI5_12) are statistically significant predictors in a multiple regression model. The overall model is statistically significant with a P-value of 0.0031. Said another way, there is a probability of only about 1 in 323 that the correlation of these factors in the model to actual results could occur by chance alone. The year term is statistically significant with a P-value of 0.0051, and the PDSI5_12 term is statistically significant with a P-value of 0.0159. By consensus among scientists and statisticians any P-Value under 0.05 is considered statistically significant. In addition, because the year term

is negative, the use of a six-year average of past usage produces an over-estimate of consumption.

Q. DO YOU SEE THE SAME DEPENDENCE OF CONSUMPTION ON YEAR AND MOISTURE OVER THE ENTIRE RANGE OF AVAILABLE DATA?

A. Yes, a total of 20 years of consumption, from 1990 through 2009 is now available. On page 1 of Appendix A attached to this surrebuttal testimony, I have produced a scatterplot of consumption in gallons per customer day (GCD) against year. There is a clear downward trend over time, which is characterized by the regression line superimposed on the scatterplot. A simple six year average will not adequately or accurately reflect this downward trend. The downward slope of the regression line is −2.36 GCD per year, and this is statistically significant with a P-value of 0.0005.

Three years, 1993, 2008, and 2009, have utilization well below the trend line. These three years were years with an abundance of moisture, indicating that a utilization model that incorporates moisture in addition to time should give a much more accurate prediction of water usage. Indeed, when PDSI5_12 is added to the regression model, on Page 2, the downward slope of the regression line changes slightly, to −2.26 GCD/year, but now has a much stronger P-value of 0.0000009. The P-value for PDSI5_12 is 0.000004 (or the probability of this correlation occurring purely by chance is one in 250,000).

The P-value of the model itself is 0.00000005, and the fraction of variability explained by the model is R-square = 0.86. That is, 86% of the variability in consumption (GCD) is explained by just two variables, time (year), and soil moisture (PDSI5_12).

Q. PROFESSOR SPITZNAGEL, WHILE YOUR STATISTICAL ANALYSIS CONFIRMS THAT THERE IS A DOWNWARD TREND IN CONSUMPTION, ARE YOU AWARE OF ANY OTHER FACTORS THAT WOULD SUPPORT THIS CONCLUSION?

A. Yes. As a matter of common sense, it is reasonable to assume that consumption per customer has been steadily trending downward over the past twenty years due to educational efforts regarding conservation, greater awareness and concern for the environment, the advent of water conserving appliances, such as low-flow shower heads and toilets, dish and clothes washers, etc.

Q. IN SUMMARY, IS MR. SCHEIBLE'S ESTIMATE OF FUTURE WATER CONSUMPTION BIASED, AND IF SO, IN WHICH DIRECTION?

A. Because his estimate does not take into account the downward trend in consumption over time, it is biased upward, overestimating future water use.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.