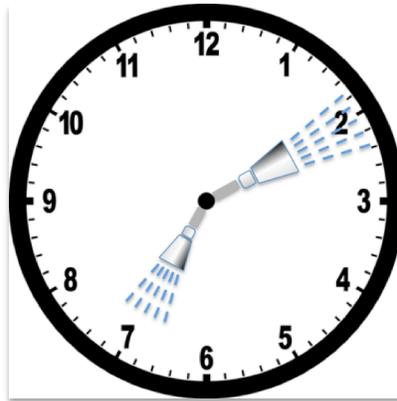


# Residential Showering Time-of-Day Analysis



An Independent MaP Research Report

January 2017



Authors

Bill Gauley, P.Eng., Principal, Gauley Associates Ltd.

John Koeller, P.E., Principal, Koeller & Company

## TABLE OF CONTENTS

<b>1.0 Introduction.....</b>	<b>1</b>
<b>2.0 Time of Day - 1999REUS vs. 2016REUS.....</b>	<b>2</b>
<b>3.0 Summary and Conclusion.....</b>	<b>4</b>

### FIGURES

**Figure 1 – Single-Family Residential Showering Time of Day (separate 1999 & 2016 REUS data)**

**Figure 2 – Single-Family Residential Showering Time of Day (combined 1999 & 2016 REUS data)**

## RESIDENTIAL SHOWERING TIME-OF-DAY ANALYSIS

### 1.0 Introduction

The 1999 and 2016 Residential End Uses of Water Studies (REUS), completed by Aquacraft, Inc.,<sup>1</sup> data logged water use in a large number of single-family homes<sup>2</sup> across the USA and Canada to quantify the volume associated with individual water uses within each home. The data collected identified not only flow rate and flow duration of each water use but also the time of day the demand occurred.

REUS2016<sup>3</sup> determined that showering currently accounts for about 19% of indoor residential water demands; that people take an average of 0.69 showers per day; and that the average shower duration is about 7.8 minutes long.

An analysis was completed by Gauley/Koeller on the shower-based data collected as part of the REUS1999<sup>4</sup> and REUS2016 to identify the time of day when showering events occur. It is hoped that the results of this analysis will be useful to anyone involved in modeling residential diurnal water demand patterns.

---

<sup>1</sup> REUS reports were published in 1999 and 2016, however, data were collected in the years preceding publication.

<sup>2</sup> 1,187 homes were logged in 1999 and 762 homes were logged in 2016.

<sup>3</sup> Water Research Foundation's 2016 Residential End Uses of Water Study Update – Version 2 (Mayer et al. 2016), <http://www.waterrf.org/Pages/Projects.aspx?PID=4309>

<sup>4</sup> Water Research Foundation's 1999 Residential End Uses of Water (Mayer et al. 1999), [http://www.waterrf.org/PublicReportLibrary/RFR90781\\_1999\\_241A.pdf](http://www.waterrf.org/PublicReportLibrary/RFR90781_1999_241A.pdf)

## 2.0 Time of Day – 1999 REUS vs. 2016 REUS

The analysis divided the approximately 42,500 shower events recorded in the 1999 REUS and the approximately 15,500 shower events recorded in the 2016 REUS into discrete hourly increments<sup>5</sup>. Only flow rates between 1.0 and 4.0 gallons per minute (gpm) were considered in the analysis as approximately 97% of the shower-based events identified by Aquacraft's Trace Wizard software program fell within this flow rate range<sup>6</sup> and there was some uncertainty if all events with very high or very low flow rates were truly shower-based events.

From these data, the percentage of shower events occurring in each hourly increment was calculated. As expected, most residential showering occurs early in the morning as people wake and prepare to start their day. What was less expected (at least by the authors of this report) was the relatively high percentage of shower events occurring later in the morning and in the early evening. In fact, the only time of day when very few showers occur is during the period between midnight and 5:00 a.m.

Figure 1 displays the results separately for the REUS1999 and REUS2016 studies. As can be seen, the pattern of shower use is very similar for both data sets, with only a slight shift towards later time-of-day showering in 2016. While this shift in time-of-day showering may be accurate, it might also be because precisely the same municipalities did not participate in both Residential End Uses of Water Studies and the "normal workday hours" may be slightly different for the two studies.

Figure 2 shows the results when the data from REUS1999 and REUS2016 are combined. As stated earlier, the most common time for showering is in the morning as many people begin their day. Almost one-third (29.5%) of shower events occur during the three hours between 6:00 and 9:00 a.m. The busiest three hours in the evening – between 7:00 and 10:00 p.m. - account for 14.5% of daily showers. And during the dead of night - between 1:00 and 4:00 a.m. - only 1.5% of showering takes place.

---

<sup>5</sup> Shower data from Residential End Uses of Water Studies provided by Co-Principal Investigator, Peter Mayer, P.E.

<sup>6</sup> Water demand data collected as part of the 1999 and 2016 REUS are analyzed using the Aquacraft Trace Wizard software program (<http://www.aquacraft.com/downloads/trace-wizard-description/>)

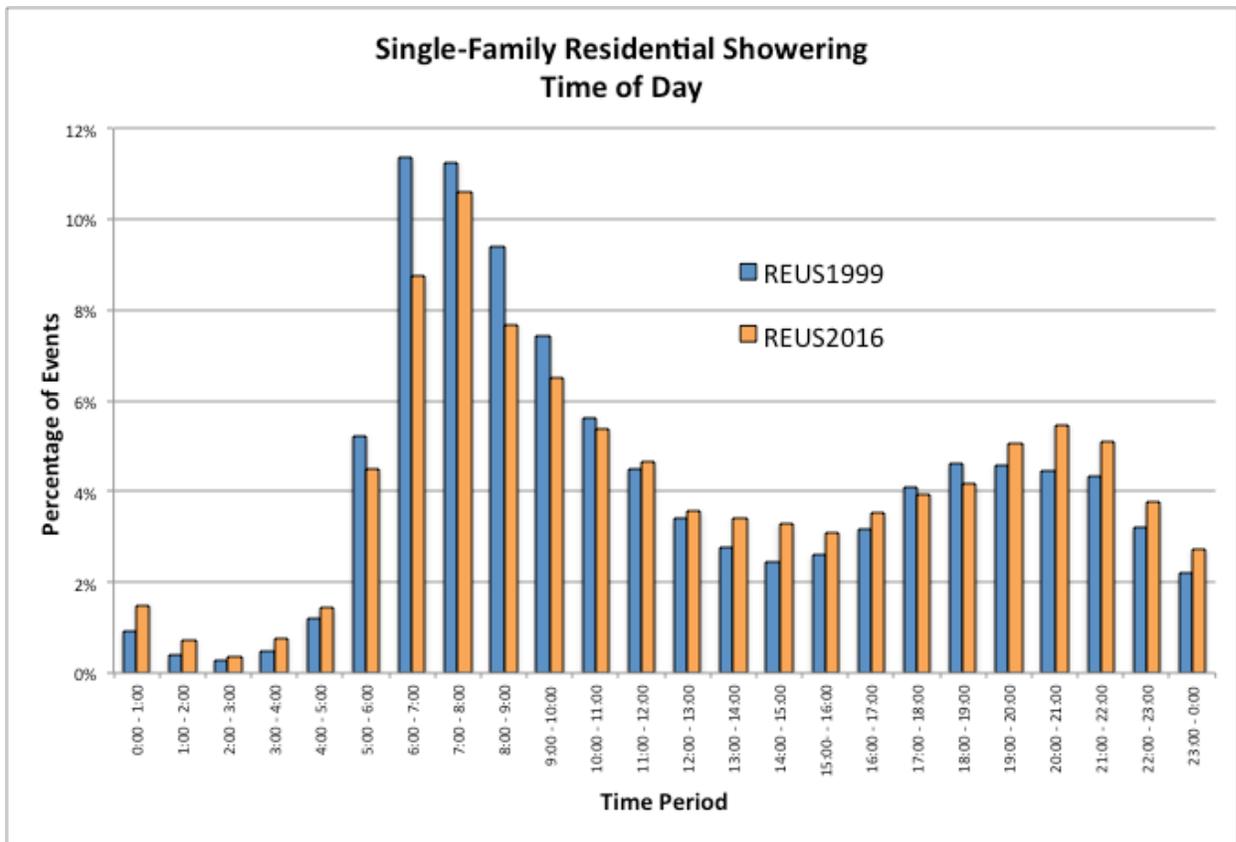


Figure 2

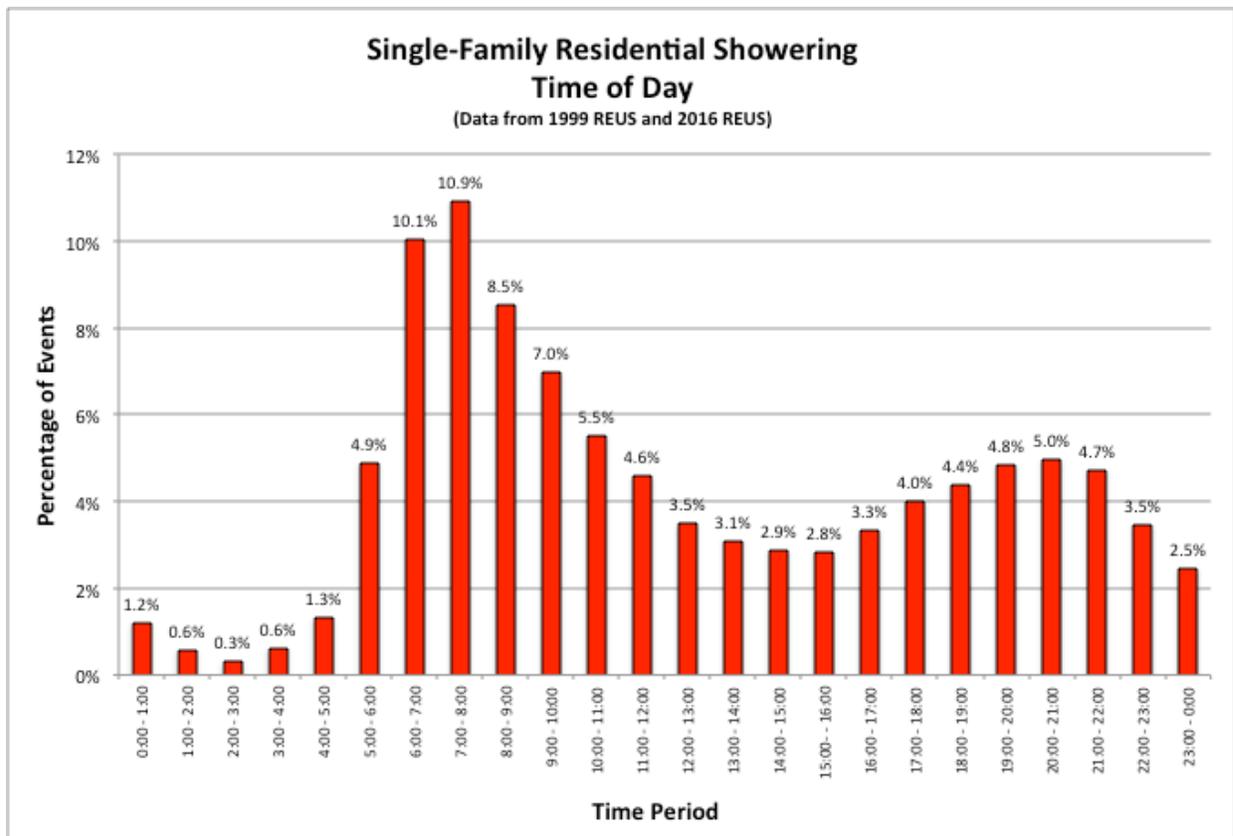


Figure 1

### 3.0 Summary and Conclusions

The diurnal pattern of shower use was very similar using both the 1999 and 2016 data. As expected, most shower events occur in the early morning between 6:00 and 9:00 a.m. with a smaller 'peak' shower-based demand occurring in the early evening between 7:00 and 10:00 p.m. Very few shower events occur between midnight and 5:00 a.m.

While the overall residential diurnal water demand pattern (i.e., including all indoor water demands) has been known for many years, the results of this analysis will help analysts separate shower-based demands from overall demands, thereby providing a better understanding of the contribution of toilet flushing, faucet use, etc., throughout the day.

Please send any questions you may have regarding the content of this report to the authors:

Bill Gauley, P.Eng., Principal, Gauley Associates Ltd., [bill@gauley.ca](mailto:bill@gauley.ca)

John Koeller, P.E., Principal, Koeller & Company, [koeller@earthlink.net](mailto:koeller@earthlink.net)