

Bristol Town Administrator

From: Bristol Clerk
Sent: Tuesday, June 23, 2020 8:11 AM
To: Treasurer; Bristol Town Administrator
Subject: FW: 21 Spring Street Water Bill
Attachments: Water Usage Analysis for Property at 21 Spring Street.docx

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Town Clerk
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From: Michael Golden <dynamyt07@gmail.com>
Sent: Monday, June 22, 2020 9:45 PM
To: Bristol Clerk <clerk@bristolvt.org>
Subject: 21 Spring Street Water Bill

Please forward this email and attachment to all Bristol selectboard members. This is in regard to my contesting the water bill for my property at 21 Spring Street.

Dear selectboard members -

I realized after we spoke I made an error in my statement about the size and quantity of the leak required to use the amount of water beyond 1800 to 2100 gallons (which I calculated as my normal usage for 90 days).

While I did miss-state the data when asked, my logical analysis report is correct for the extraneous water used for the calculations. The water leakage beyond normal use calculated for my residence would be about 10.24 oz per minute, or 231 gallons per day. You may reference my attached report. Please realize that was a "back of the napkin" analysis to show the gross water leakage required. As stated in the meeting numerous times, I asked for the data used to calculate my bill so I could possibly find the error or provide a possible scenario, and it was not available. Hence, there is no way to actually know, except that the previous billing cycles seem to coincide, as does the recent billing cycle. Given those facts and that there are no leaks in my home capable of the quantity of water I was billed for, I do not see a reason to not correct the mistake.

I also stated in my analysis, I am willing to install a calibrated and registered digital flow meter and show the data real time on the web for anyone to view or download, and I am also willing to do a full water usage analysis using every water outlet in the home, average daily or monthly usage for this residence, and prove it. I was trying to be polite and point out an error in your billing system, so please forgive my intrusion to your monthly meeting.

Thank you for your time, I look forward to hearing from you.

Mike Golden

Water Usage Analysis for Property at 21 Spring Street, Bristol, Vt

Purpose:

Determine plausible theories for use of 21,000 gallons of water in the period of 90 days occurring from 12/10/2019 to 03/10/20.

Problem Statement:

Water usage is claimed to be 21,000 gallons for a period of 91 days. This is a logical analysis to show issues within the water system on the property and possible ways water in that amount could be utilized without causing property damage. Conclusions will take the facts and assumptions into consideration to develop any logical theory that could prove or disprove the use of 21,000 gallons of water at the 21 Spring Street property.

Statement of facts:

Number of occupants: One adult male, full time resident
One 10-year-old child, part-time resident (approx. 50%)

Average water usage for 90 days: Approximately 1800 gallons over 90 days using the prior 99 day usage total of gallons that were charged to the property.

Number of water taps in residence: 9

Number used for this test: 7

Bathroom: Sink = 1, Toilet = 1, Shower = 1,
Washing machine: 2
Kitchen: Sink = 1, Dishwasher = 1

- The full-time resident spends many hours each week (after work) in a basement workshop within 12ft of all the water drains, the main sewer drain line, and all water taps installed on the property.
- Water feed lines are copper, no leaks. Water drain lines are PVC, no leaks.
- There is improper venting which causes water to back up in the sinks and shower.
- Line pressure regulator was installed on water feed line in October of 2015, as line pressure was found to be in excess of 100PSI (with higher pulses) and causing leaks in the hot water boiler and water fixtures on the property.
- All daily used water fixtures, attachment lines, and shut-off valves, and new toilet flush valve were installed within the past 5 years.
- All water faucets and shower head are low flow; except for an outside spigot for a hose, which has an interior, in-line shut-off valve that was closed for the duration of time for this analysis.
- Washing machine and dish washer are new within the past 3 years, energy efficient and low water usage rated and shown on provided manuals. Both are in proper working order.

- The outside faucet tap is shut-off during winter months with a cut-off valve inside the residence.
- Resident is an equipment engineer with 28 years of experience in manufacturing, design, failure analysis of systems and mechanical assemblies, and RCCA (**Root Cause Corrective Action**). Expertise in electronics, programming languages and system controls, mechanical design and fabrication, residential and commercial power and wiring (more than twice the hours for apprentice and master license under the direction of the former Vermont State Electrical Inspector, Richard McGrath, master electrician, BSEE), residential plumbing, residential and commercial energy efficiency studies and corrective actions, residential building and construction practices. Resident has authored, conducted, and certified design and system acceptance testing for several systems and machines for many federal agencies and performs engineering consulting through Post & Beam Equipment Repair. Resident holds a degree in Mechanical Engineering from Vermont Technical College, 1991.

Explanation of data and assumptions:

This analysis will assume the water tap with the highest drain rate that could fail unnoticed, as no water leaks or water damage were found on the property, and none have occurred. Any other water taps on the property are in full view for most of the time the residents occupy the property and would have been shut off immediately. The toilet was leak tested using the die provided by the Town of Bristol water technician, and two water technicians inspected the property upon arrival to check the water meter installed within the residence at 21 Spring Street. The toilet was also leak tested by Michael and Sean Golden using a water mark in the toilet water tank and taking photos over a timed period. No leakage occurred during either test.

The highest water drain rate is the toilet, which is capable of filling at 1gpm (gallon per minute), with a flush rate of 1.6 gpf (gallons per flush). The toilet tank water level is set below the 1.6 gallon volume to conserve water, but this analysis will assume a volume of 1.6gpf. Because the toilet is the only water source capable of a flow and drain rate with enough volume to amass 18,200 gallons that is not in full or partial view to the occupants, the toilet will be used for this analysis.

Assumed hour totals are calculated as a sum only as a means of presentation to develop conclusions. It was not physically possible for either resident to be present for the total number of hours in succession during this 91-day period, and the water did not flow for the total number of hours calculated in succession. Assumed hours are in whole numbers and have been rounded up to determine plausibility. For this volume of water to escape unnoticed, it would require water to have been flowing when no one occupied the residence, or it would have been stopped immediately by the full-time resident, or the part-time resident would have notified the full-time resident of the occurrence. This analysis assumes full water flow rate of the toilet inlet valve, but even partial flow would have caused noise in the drain lines and toilet water tank to alert either resident should this have occurred when either resident was present.

Calculated Assumptions:

Given the average 90-day usage of approximately 2800 gallons for this property:
21,000 gallons – 2800 gallons = **18,200 gallons** is unaccounted for.

During this 90-day period, the full-time resident was away from the property for 7 consecutive days from February 2nd 2020 through Feb 9th 2020. During this absence there was no access to the property by any persons, so the assumed water usage is zero (0) gallons given no water leaks were discovered on the property. No evidence of water usage on those days was presented to the contrary.

The resident is away from the property approximately 55 hours for work 5 days per calendar week (7 days). The full-time resident is away approximately 10 hours per week (7 days) for miscellaneous (shopping, walking, other errands).

91 days – 7 days absent = 84 days of possible occupancy (during this 91-day period that the full-time resident could be present).

84 days x 24 hours = 1992 hours that the property could be occupied and running water could have been detected by either resident.

Hours absent for work:

- Weekdays during 84-day time period that resident was working = **65 work days**
- 55 hours / 5 days = **11 hours per work day**

Total work hours absent during 84-day period:

65 work days x 11 hours = **715 hours absent for work** for full-time resident.

Hours absent for miscellaneous:

- 10 hours absent each calendar week for miscellaneous errands

Total work hours absent during 84-day period:

10 hours x 13 weeks = **130 hours absent for miscellaneous** for full-time resident.

Total hours absent for full-time resident during 84-day period under analysis:

715 hours + 130 hours = **845 hours absent during 84-day period under analysis.**

The part time resident (10 year-old boy) occupied the property for 28 days during the 84-day period under analysis.

- Absent 8 hours per day for school on weekdays
- Part-time resident occupied the property for
- Present for 3 hours each week when not occupying the residence
-

Facts:

For the following calculations, the toilet drain is assumed wide open. For this to occur, the flapper valve (or flush valve) would need to be removed completely or supported in some manner to achieve a wide-open flow rate. The flow rate into the water tank from the toilet inlet is assumed at full flow, which was measured at approximately 1gpm by the residents and documented. If the drain rate were lower than the fill rate at full flow, the water tank would overflow and cause flooding within the structure, which did not occur. With these assumptions the following can be assumed true:

Number of gallons per day with flapper valve wide open:

24hours x 60 minutes = **1440 minutes per day** 1440 minutes x 1gpm = **1440 gallons per day** (24 hours)

18,200 gallons / 1440gallons per day = **12.64 days** at full flow rate.

12.64 days x 24 = **303.3 hours** at full flow rate

303.3 hours x 60 = **18,200 minutes** at full flow rate

Because the calculations prove, they are assumed correct.

In the past 90 days, at no time were the resident aware of the toilet running for 18,200 minutes, 303.2 hours, or 12.64 days at full flow rate, and no leaks were discovered on the property. The residents