

Assignment 1 Data Analysis - Gage Tower East

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PLAN 597

October 10, 2014

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PLAN597: Assignment #1 – Data Analysis

1. Description of data

The building of study is Gage Tower East (C), and the analysis focuses on quarterly water consumption data (ft³) from September 14, 2001 to September 16, 2014.

Gage Tower East is a student residence that is at capacity during Winter and Spring academic terms (September-April). The Summer academic term (May-August) is quieter, with suites providing short-term accommodation to the public. Gage Tower East underwent a renovation in summer 2009, which included installation of low-flow showerheads throughout. In summer 2014, 100% of toilets and sinks were replaced with low-flow versions.

As the summer 2014 renovations occurred very recently, not enough time has passed to determine whether the new installations have resulted in a decrease in water consumption. For this reason, quarterly readings were chosen as the building is older (built in 1972) and trends over this longer period more clearly illustrate seasonal/yearly patterns. No data cleaning was necessary for these readings.

2. Summary statistics

Table 1. Summary statistics

Table 1 shows summary statistics for the data collected. There is a large variance between readings, largely due to seasonal differences in water consumption.

Summary Statistics	Volume (ft ³)
Average/Mean	155,630.3
Median	135,030.0
Variance	5,165,622,864.9
Standard deviation	71,872.3

3. Histogram

Figure 1. Frequency of water consumption volumes

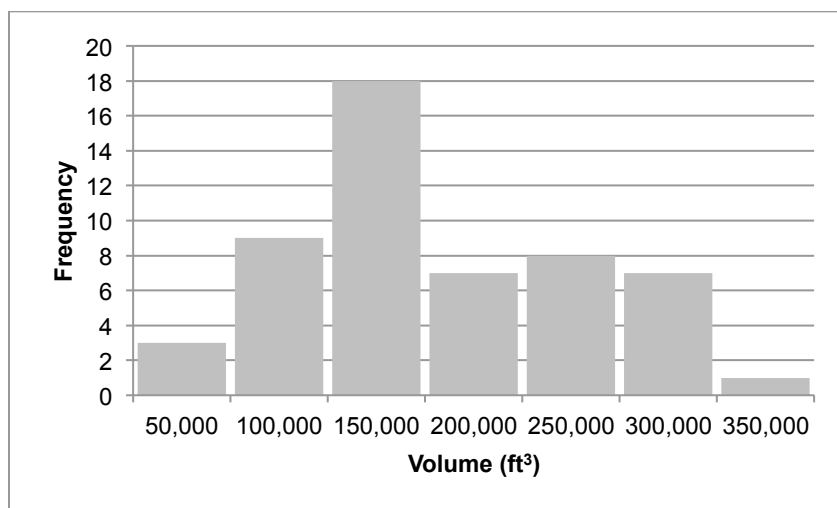
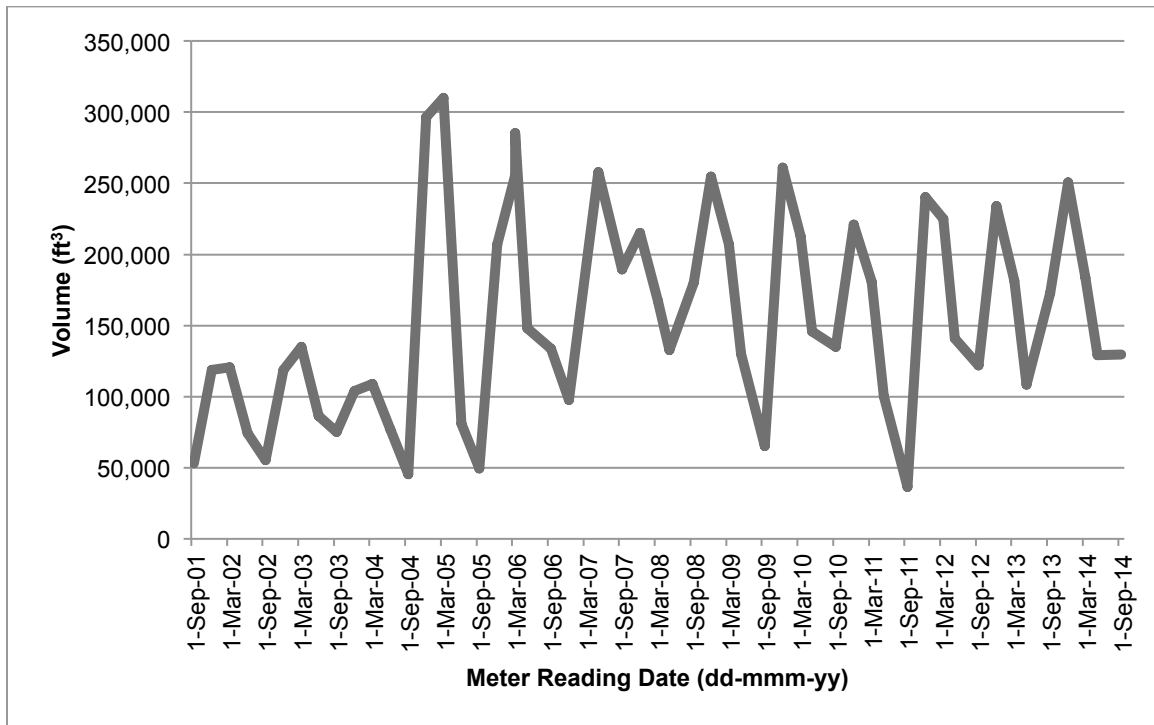


Figure 1 demonstrates the distribution of how much water is consumed during a given quarterly period, and is skewed slightly towards the right, indicating a greater frequency of low- to mid-range volumes. The highest frequency (18) of water volumes occurs around the middle range, between 100,000-150,000 ft³. If the goal is reducing water consumption, Gage Tower East's readings are already more weighted towards the lower end of the scale, with fewer high volume readings.

4. Water consumption over time

Figure 2. Water consumption in Gage Tower East, 2001-2014 (Quarterly)



Seasonal patterns are evident in Figure 2 with an obvious cycle, showing peaks in consumption matching peak times of capacity. Low points most often occur in May or September, when students have just moved out or are moving back in. There are a number of interesting points in the graph, for example the lower consumption rates in 2001-2004, or the high point in early 2005, that merit further investigation, as they appear to be outliers when compared with the rest of the data. Information about occupancy rates or major repairs may be useful.

The major renovation for Gage Tower East took place in summer 2014, with the installation of low-flow toilets and sinks—given that the latest reading available was Sept 16, 2014, it is too soon to determine any decrease in consumption using this data set and graph.

UBC Housing confirmed that low-flow showerheads were installed in summer 2009, however there seems to be no significant decrease in water consumption rates after this date. Two of the lowest consumption readings occur after this point in time, although both in September, which may just indicate a lower-than-normal summer occupancy rate.

5. Pre- vs. post-renovation water consumption

A comparison of pre- and post-renovation data with regard to the summer 2014 renovation is not significant, as not enough time has passed to be able to see a measured decrease in water consumption.

For interests' sake, Table 2 compares summary statistics from before and after the summer 2009 renovation—although the mean of water consumption readings has increased post-renovation. It's interesting to note that variance decreased post-renovation.

Table 2. Comparison of summary statistics pre- and post- summer 2009 renovation

2001-2008 Summary Statistics		2009-2014 Summary Statistics	
Average/Mean	147809.1	Average/Mean	165831.7
Median	126535	Median	172880
Variance	6357787769	Variance	3636719497
Standard deviation	79735.7	Standard deviation	60305.2

6. Findings & Concluding remarks

As mentioned, the differences in Table 2 are significant but do not show the expected decrease in water consumption after the summer 2009 renovations—which may be due to an increase in capacity in more recent years. Also, the lower consumption rates in 2001-2004 may skew the summary statistics for 2001-2008, making the mean and median lower and the variance higher.

Also, before summer 2014 renovations are observable, another full year of data needs collection for proper comparison to previous years.