

## Supplementary Material

### Water Quality During Extended Stagnation and Flushing in a College Residential Hall

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**Table S1:** Limit of Detection (LOD) and Limit of Quantification (LOQ) for the elemental analysis as measured by ICP-OES.

<i>Element</i>	<i>LOQ</i>	<i>LOD</i>
<i>Aluminum</i>	0.86	0.26
<i>Arsenic</i>	4.95	1.49
<i>Beryllium</i>	0.51	0.15
<i>Cadmium</i>	0.35	0.10
<i>Cobalt</i>	1.13	0.91
<i>Chromium</i>	3.02	0.91
<i>Copper</i>	2.78	0.83
<i>Iron</i>	3.15	0.95
<i>Mercury</i>	1.17	0.35
<i>Manganese</i>	0.52	0.16
<i>Nickel</i>	0.74	0.52
<i>Lead</i>	1.91	0.57
<i>Selenium</i>	3.87	1.16
<i>Zinc</i>	0.75	0.23

**Table S2:** Total chlorine residual (mg/L as Cl<sub>2</sub>). ND = below the limit of detection for the HACH® Pocket Colorimeter, 0.02 mg/L as Cl<sub>2</sub>

Trip #	1	2	3	4**	5** (pre-flush)	5** (post-flush)	6**	7
Location								
1: basement bathroom	0.02	ND	ND	0.06	0.03	0.04	ND	0.03
2: kitchen	ND	ND	ND	ND	0.09	0.46*	ND	0.31*
3: 2 <sup>nd</sup> floor sink	ND	ND	ND	ND	0.07	0.46*	ND	0.02
4: 2 <sup>nd</sup> floor sink	ND	ND	ND	ND	0.05	0.04	ND	0.04
5: 2 <sup>nd</sup> floor sink	ND	ND	ND	ND	0.04	0.33*	ND	0.04
6: 2 <sup>nd</sup> floor sink	ND	ND	ND	ND	0.08	0.07	ND	0.08
7: shower	ND	ND	ND	ND	0.03	0.03	0.05	0.02
8: shower	0.02	ND	ND	ND	ND	0.03	ND	0.02
9: 3 <sup>rd</sup> floor bathroom	ND	ND	ND	ND	ND	0.37*	ND	0.65*
10: 3 <sup>rd</sup> floor bathroom	0.02	ND	ND	ND	0.02	0.12	ND	0.06

\*Concentration exceeded the legally undetectable total chlorine limit of 0.2 mg/L

\*\*Plastic vials instead of glass were used with the low-range chlorine kit for trips 4-6

**Table S3:** Average outdoor and first-draw water temperatures on sampling dates

<i>Trip #</i>	<i>Average outdoor temperature(°C) <sup>46</sup></i>	<i>Average hot water temperature (°C)</i>	<i>Average cold water temperature (°C)</i>
1	2.22	19.28	19.55
2	12.78	19.33	19.25
3	23.89	29.00	28.68
4	27.78	31.18	30.88
5	18.30	25.42*	25.43*
6	23.33	26.98	26.85
7	22.22	27.0	26.65

\*Water temperature was measured for the first-draw samples during Trip 5, before full-building flushing was performed.

**Table S4:** Ion concentrations before and after flushing. ND = not detected. Ions were additionally analyzed at two locations during 5 of the 7 sampling events (data not shown). One interesting observation within this limited data set was the increase in concentrations of  $\text{SO}_4^{2-}$  and  $\text{NO}_3^-$  after flushing in both hot and cold water. Several of these ions have implied roles in ecology, but health impacts are minimal, and observed levels were not health-relevant.

Anion concentrations (ppm)

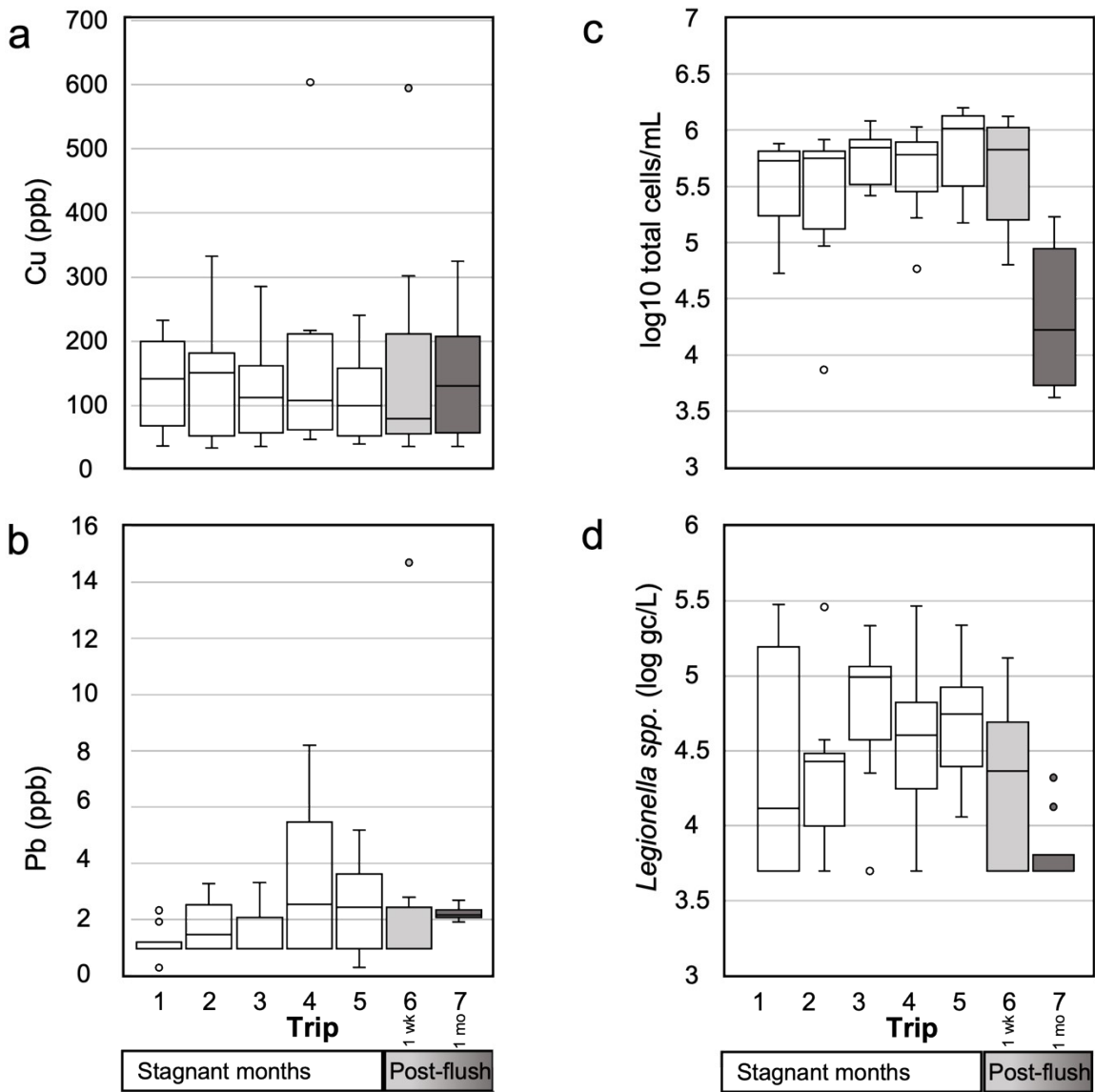
<i>Sample</i>	<i>F<sup>-</sup></i>	<i>Cl<sup>-</sup></i>	<i>NO<sub>2</sub>-N</i>	<i>Br</i>	<i>NO<sub>3</sub><sup>-</sup></i>	<i>PO<sub>4</sub><sup>3-</sup></i>	<i>SO<sub>4</sub><sup>2-</sup></i>
Hot, stagnant	ND	44.31	ND	0.47	0.68	0.29	49.93
Hot, flushed	ND	54.77	ND	0.36	4.42	0.24	56.31
Cold, stagnant	ND	40.96	ND	0.30	1.51	0.60	48.58
Cold, flushed	ND	61.11	ND	0.33	3.81	0.59	64.54

Cation concentrations (ppm)

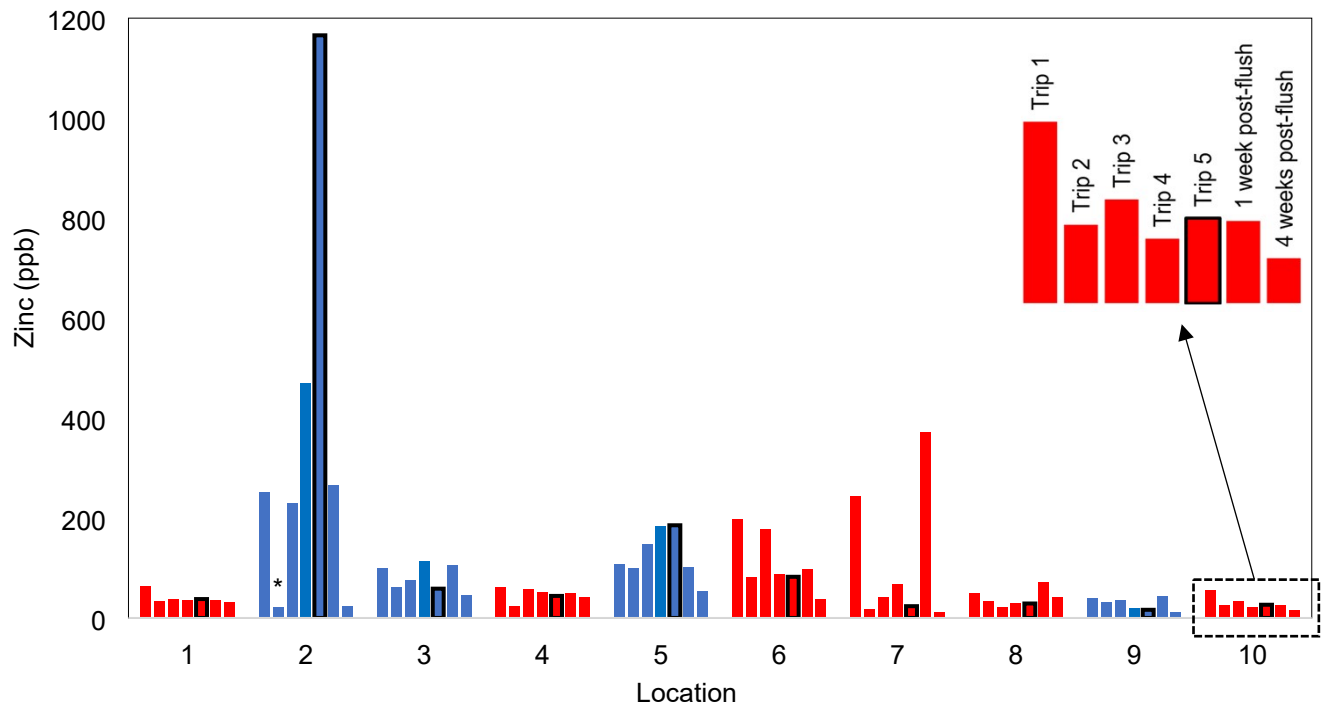
<i>Sample</i>	<i>Li<sup>+</sup></i>	<i>Na<sup>+</sup></i>	<i>NH<sub>3</sub>-N</i>	<i>K<sup>+</sup></i>	<i>Ca<sup>2+</sup></i>	<i>Mg<sup>2+</sup></i>
Hot, stagnant	ND	38.99	ND	ND	1.00	ND
Hot, flushed	ND	42.42	ND	ND	ND	ND
Cold, stagnant	ND	4.34	ND	ND	22.21	5.64
Cold, flushed	ND	4.91	ND	ND	24.21	6.51

**Table S5:** Maximum metal concentrations measured during flushing, often associated with collected slugs of discolored water.

Metal	Concentration (ppb)	Relevant Limit (ppb)		Location
<b>Aluminum</b>	341.9	50-200	(SMCL)	1 <sup>st</sup> floor BR hot
<b>Arsenic</b>	9.5	NA- hot water		1 <sup>st</sup> floor BR hot
<b>Cadmium</b>	18.1	NA- hot water		1 <sup>st</sup> floor BR hot
<b>Copper</b>	7,842	NA- hot water		3 <sup>rd</sup> floor BR hot
<b>Iron</b>	22,945	300	(SMCL)	3 <sup>rd</sup> floor BR hot
<b>Manganese</b>	1,240	1,000	(1-day health advisory)	2 <sup>nd</sup> floor BR cold
<b>Nickel</b>	156.5	100	(MCL)	Kitchen cold (basement)
<b>Lead</b>	150.5	1	(AAP Child level)	Dish sprayer (basement)
<b>Zinc</b>	2,166	5,000	(SMCL)	Dish sprayer (basement)



**Figure S1.** First draw (a) copper concentrations, (b) lead concentrations, (c) Total Cell Counts, and (d) *Legionella* spp. at 10 locations. For each box plot, n=10. Boxes represent Q1/median/Q3 values, with whiskers representing range and outliers as individual points. Each box represents a sampling trip (Trip 1 – April, Trip 2 – May, Trip 3 – June, Trip 4 – July, Trip 5 – August, Trip 6 – 1 week post-flush [light-grey], and Trip 7 - 4 weeks-post flush [dark-grey], in order). For lead, concentrations below the Limit of Detection (LOD=0.57 ppb) are shown as half the LOD. Concentrations below the Limit of Quantification (LOQ=1.91 ppb) are shown as half the LOQ. \*A nearby toilet was flushed before sampling. For *Legionella* spp., concentrations below the Limit of Detection (LOD=4 log<sub>10</sub> gc/L = 10 gc/mL) are shown as half the LOD (5 gc/mL = 3.7 log<sub>10</sub> gc/mL).



**Figure S2.** Zinc concentrations from first draw samples at 10 locations that drew either hot (red) or cold (blue) water. Each bar represents a sampling trip, and the location numbers are as defined in Figure 1. Bars outlined in black are the final sampling event prior to flushing. \*On this trip, a toilet near Location 2 was flushed immediately before sampling, potentially interfering with this result.





**Figure S3:** Example of discolored water encountered during flushing on upper floors.

