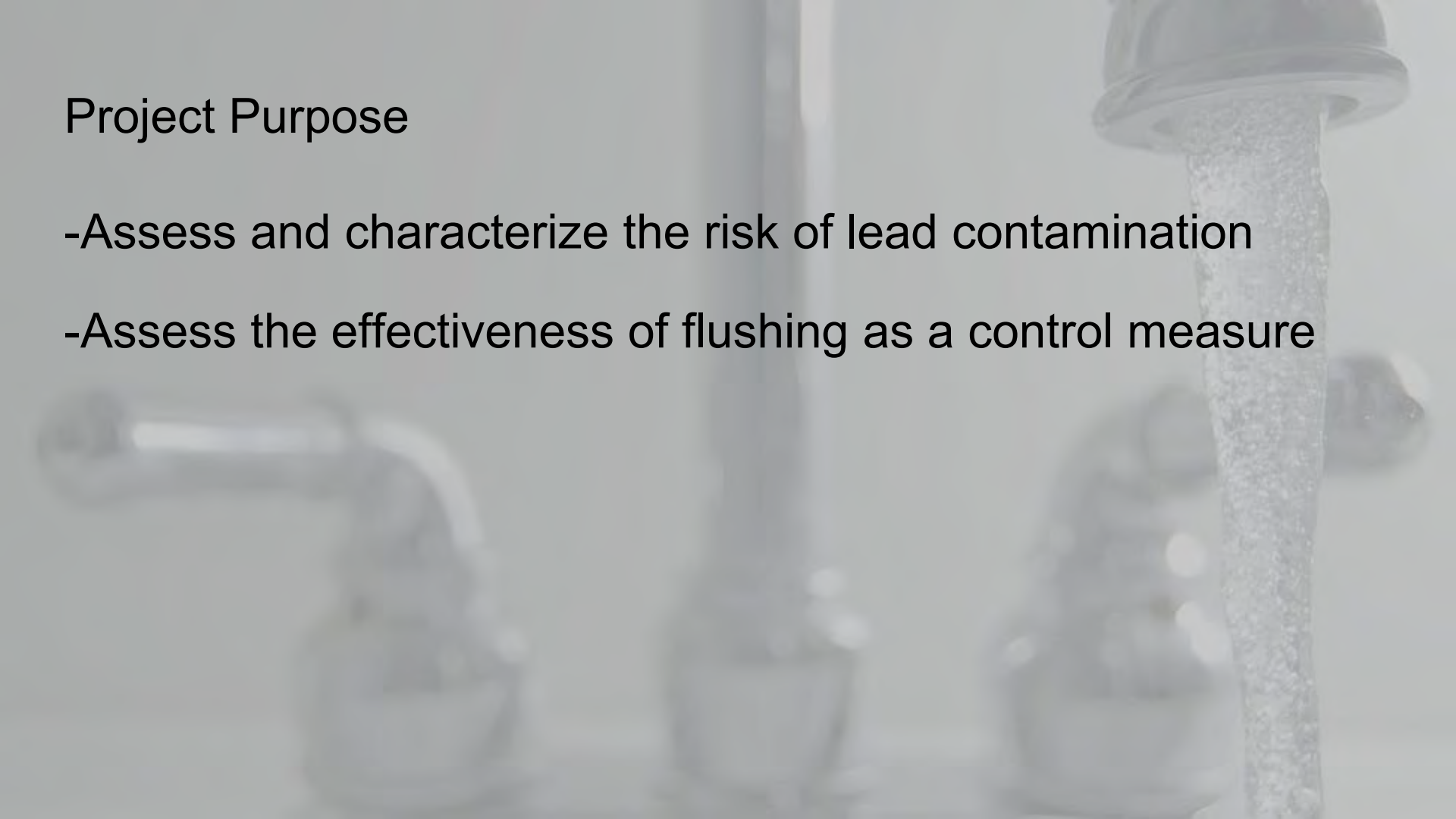
Assessing the Risk of Lead Exposure to Children from Drinking Water in Metro Vancouver Child Care Facilities

Thomas Quach



Project Purpose

-Assess and characterize the risk of lead contamination

-Assess the effectiveness of flushing as a control measure

Presentation Overview

Background

Project Methodology

Project Findings

Recommended Future Projects

Background: Sources of Exposure

Pre-1970 - vehicle exhaust contained lead from leaded gasoline

-U.S. E.P.A. began phase-out in 1970's

-Canada *Gasoline Regulations* enacted 1990

Average daily lead exposure: 20% from drinking water sources

Background: Drinking Water Concerns

Flint, Michigan:

-Acidic drinking water with no corrosion inhibitor

-Lead distribution pipes corroded

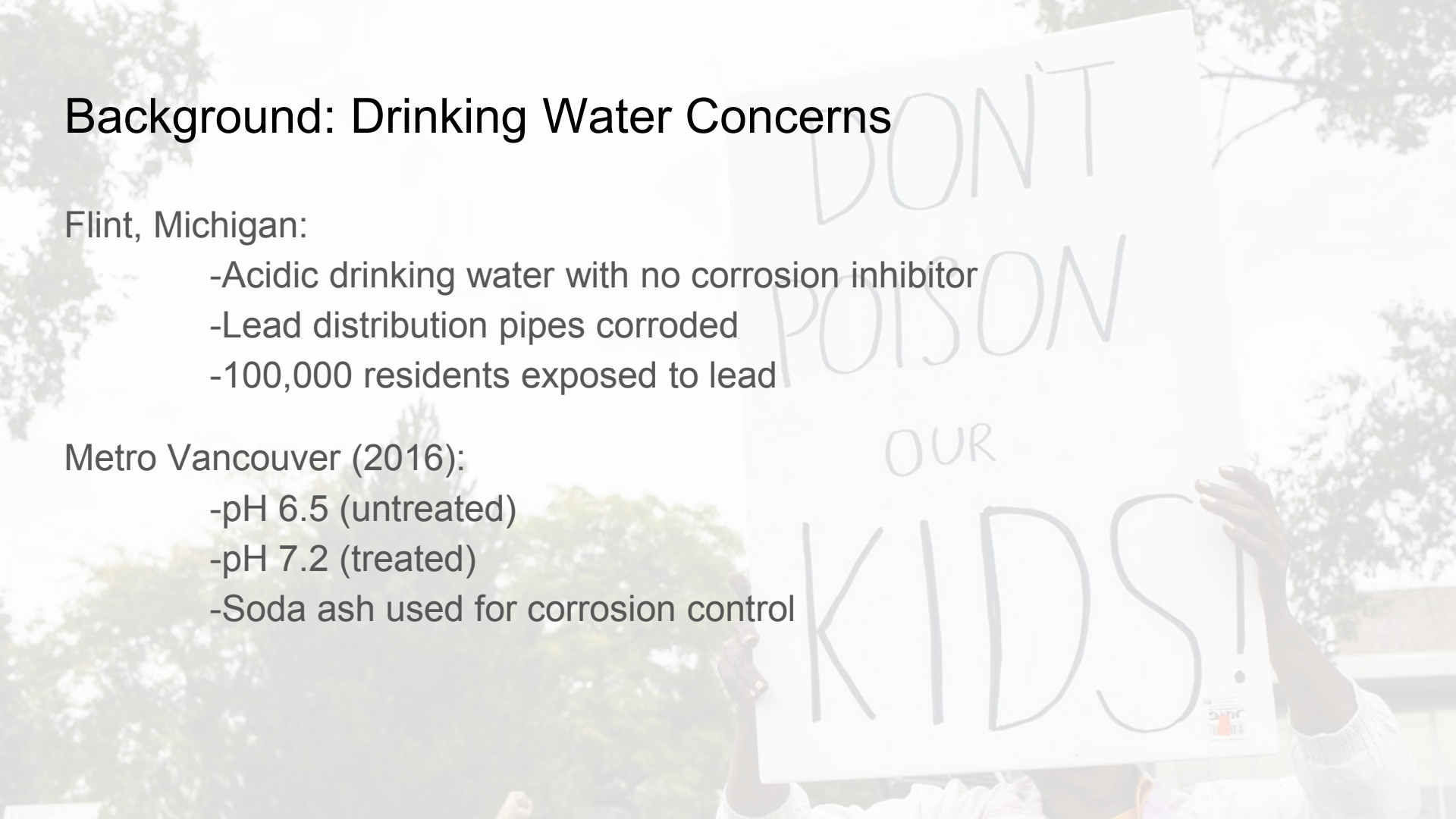
-100,000 residents exposed to lead

Metro Vancouver (2016):

-pH 6.5 (untreated)

-pH 7.2 (treated)

-Soda ash used for corrosion control



Background: Effects on Children

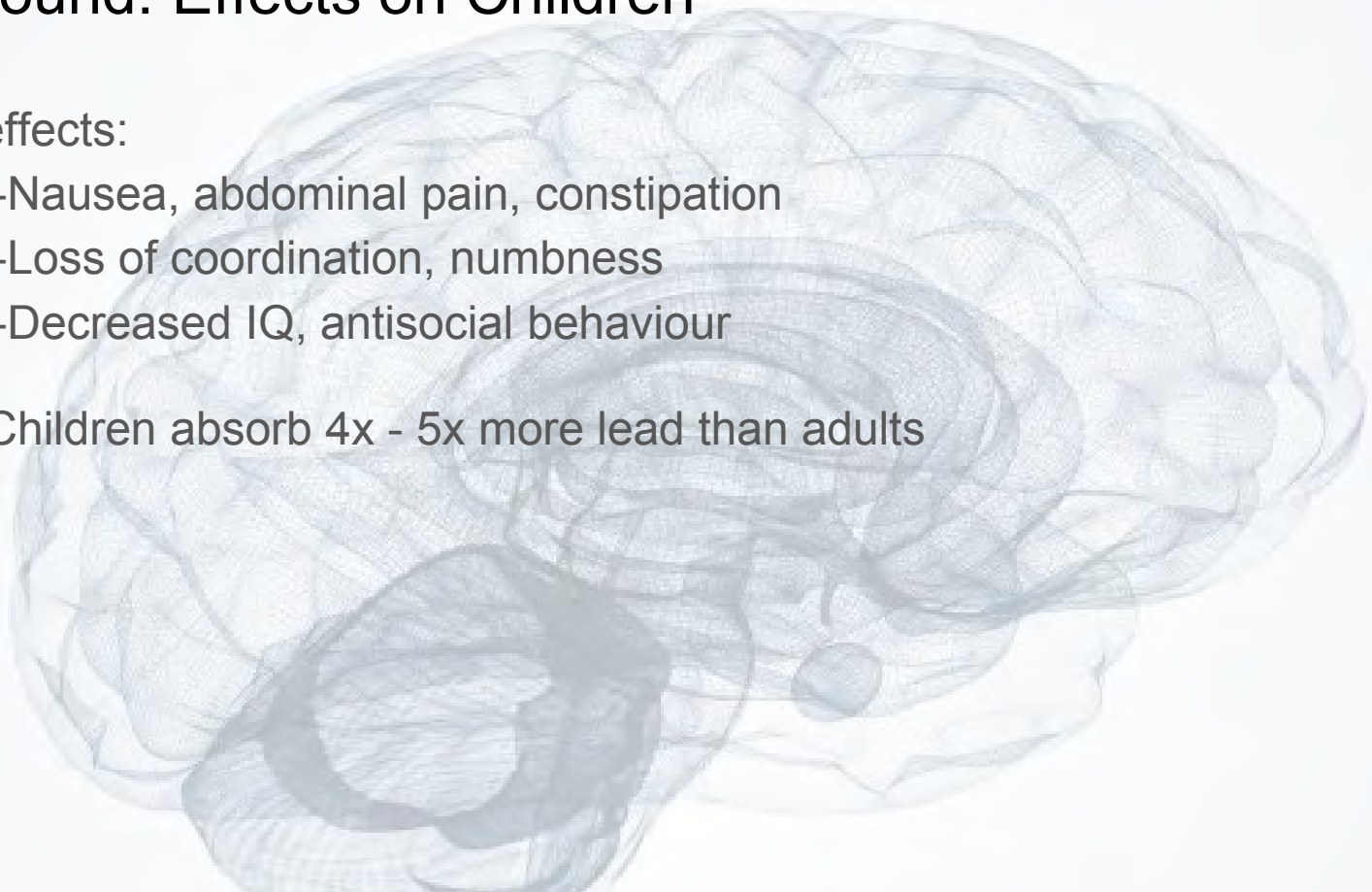
Chronic effects:

-Nausea, abdominal pain, constipation

-Loss of coordination, numbness

-Decreased IQ, antisocial behaviour

W.H.O.: Children absorb 4x - 5x more lead than adults



Background: Involved Agencies

BCCDC:

Dr. Reza Afshari, Senior Scientist

Fraser Health Authority:

Annette Dellinger, Child Care Licensing Manager

Methods: Sample & Data Collection

Candidate list provided by Fraser Health Authority

Initial Contact:

-Telephone, e-mail, site visit

Total 31% participation rate of 52 contacted

-Accepted: 16

-Declined: 13

-No Reply: 23

Methods: Sample & Data Collection

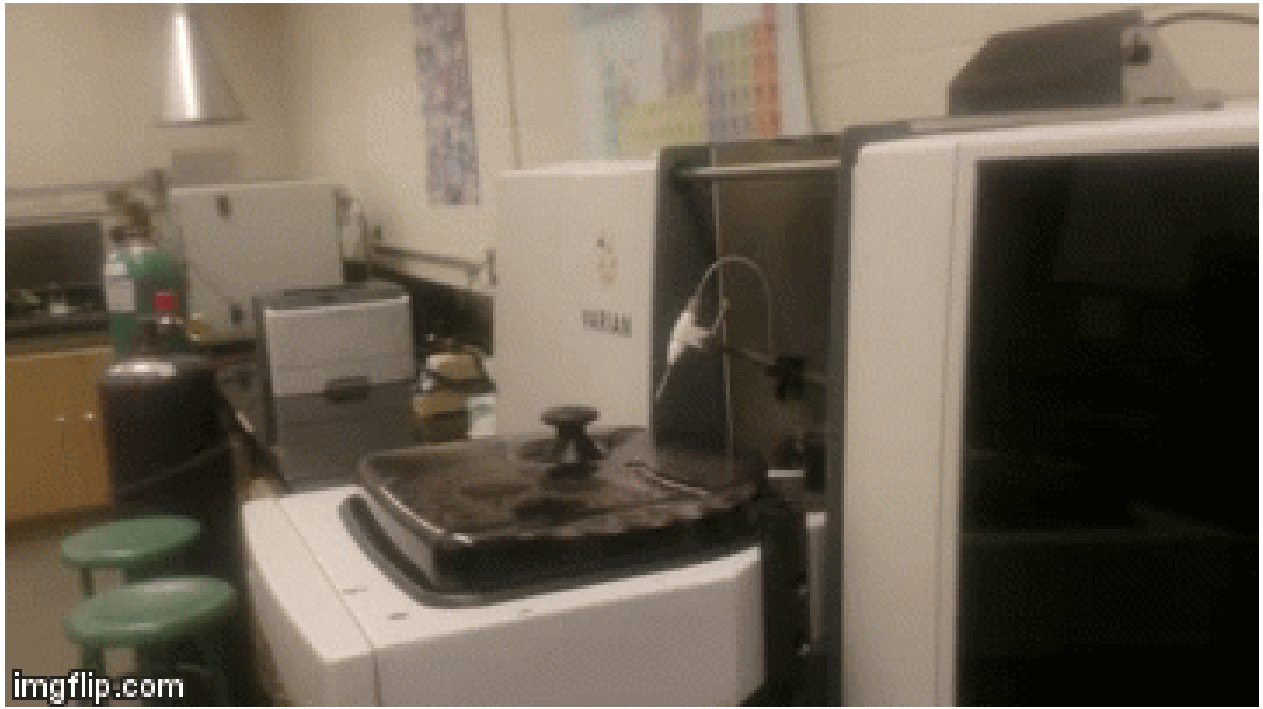
Interview Data:

-Facility Age, Facility Type (In-Home vs. Institutional), Fixture Types

Water Samples:

- 3x 250 mL flush portions at zero minutes, 1 minute, 5 minutes
- 1x 250 mL re-stagnation portion at 2 hours

Methods: Analysis via AAS



Project Findings

Table 1: Facility type & age

Facility Number	Facility Type	Facility Age (years)
000	In-Home	c. 20
001	In-Home	c. 30
002	In-Home	c. 30
003	Institution	c. 50
004	Institution	c. 60
005	Institution	c. 40
006	Institution	92
007	Institution	Unknown
008	Institution	Unknown
009	Institution	Unknown
010	In-Home	c. 15
011	Institution	c. 10
012	Institution	c. 5
013	Institution	c. 10
014	Institution	21
015	Institution	Unknown

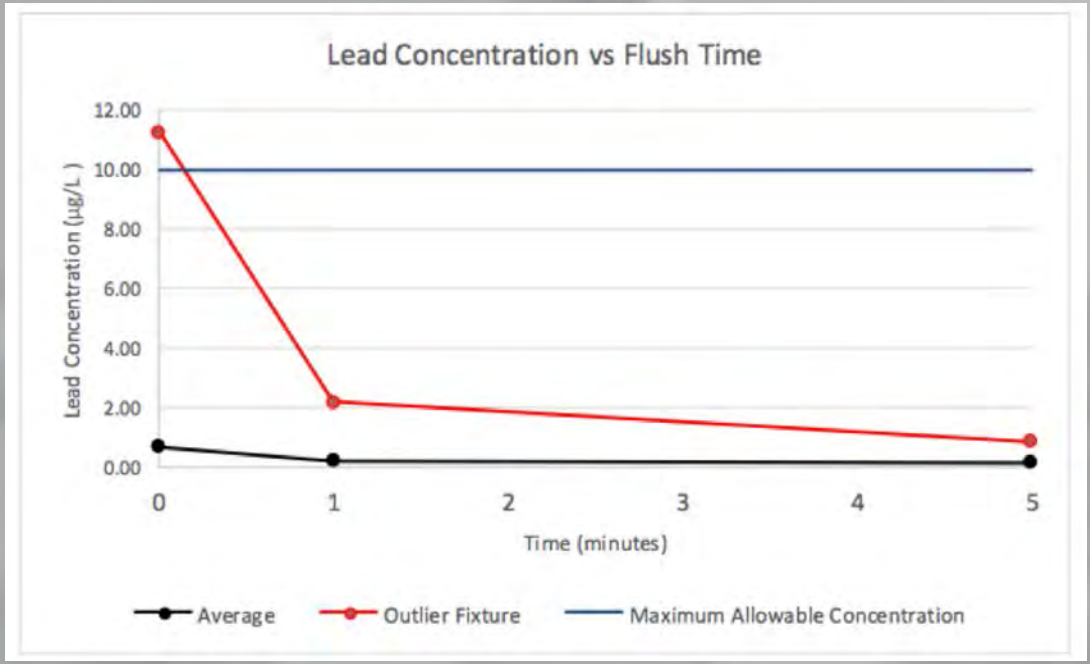
Project Findings

Table 2: Fixtures & Lead Concentrations

Facility Number	Fixture Number	Fixture Type	Lead Concentration (µg/L)			
			T=0	T=1	T=5	T=120
000	1	Kitchen Sink	<0.10U	<0.10U	<0.10U	<0.10U
000	2	Washroom Sink	<0.10U	<0.10U	<0.10U	<0.10U
001	3	Kitchen Sink	<0.10U	<0.10U	<0.10U	<0.10U
002	4	Kitchen Sink	<0.10U	<0.10U	<0.10U	<0.10U
003	5	Countertop Sink	<0.10U	<0.10U	<0.10U	<0.10U
004	6	Countertop Sink	1.17	0.5	0.37	0.64
004	7	Countertop Sink	11.27	2.19	0.87	n/a[2]
004	8	Water Fountain	0.32	0.11	0.13	0.19
005	9	Kitchen Sink	0.81	<0.10U	<0.10U	0.51
006	10	Kitchen Sink	0.2	<0.10U	<0.10U	<0.10U
007	11	Kitchen Sink	0.21	<0.10U	<0.10U	0.34
008	12	Kitchen Sink	<0.10U	<0.10U	<0.10U	<0.10U
009	13	Kitchen Sink	0.11	<0.10U	<0.10U	0.64
009	14	Countertop Sink	<0.10U	<0.10U	<0.10U	<0.10U
010	15	Countertop Sink	<0.10U	<0.10U	0.21	<0.10U
011	16	Countertop Sink	0.15	0.11	0.12	<0.10U
012	17	Countertop Sink	0.16	0.13	<0.10U	<0.10U
013	18	Countertop Sink	<0.10U	<0.10U	<0.10U	<0.10U
014	19	Countertop Sink	<0.10U	<0.10U	<0.10U	<0.10U
014	20	Countertop Sink	<0.10U	<0.10U	<0.10U	<0.10U
014	21	Countertop Sink	<0.10U	<0.10U	<0.10U	<0.10U
015	22	Countertop Sink	<0.10U	<0.10U	<0.10U	<0.10U
015	23	Countertop Sink	<0.10U	<0.10U	<0.10U	<0.10U

[1]Values below the detection limit are expressed as "<0.10U".
[2]Sample collection was not performed due to lack of sampling capacity.

Project Findings



Project Findings: Limitations

Participation:

-Low Participation Rate & Participation Bias

Scheduling:

-Time restrictions - limited to business hours

Operator Knowledge Gaps

Project Findings: Public Health Significance

-Lead contamination is present in certain facilities

-Under normal circumstances, below Health Canada’s 10 µg/L

-Flushing for 1 minute results in significant decrease in lead

Recommended Future Projects

Comparison of municipalities

- Sampling & analysis of Vancouver, White Rock, etc.

In-depth assessment of institution sub-types & age

- In-school daycares vs. commercial buildings

Thank You