

This presentation premiered at WaterSmart Innovations

watersmartinnovations.com



Developing a Field Testing Standard for Performance of Residential Greywater Reuse Systems:

Case Study of Canplas' Recover Greywater Reuse System
in Homes in Southern Ontario.

Carl Robb

Canplas Industries Ltd.

Madeleine Craig

Ryerson University

October 9, 2014

INTRODUCTION

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- Carl Robb
 - ▣ Canplas Industries Ltd.



- Madeleine Craig
 - ▣ M.A.Sc. Building Science, Ryerson University



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PRESENTATION OVERVIEW

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- Introduction

- Greywater Reuse System Field Performance Testing

- Greywater Reuse
- Previous Work
- Research Objectives

- Canplas' Recover System Pilot Study

- Methodology
- Preliminary Results

- Next Steps

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RESEARCH MOTIVATION

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- By 2025, 45% of the world could be living under water stressed conditions (Daigger, 2009)

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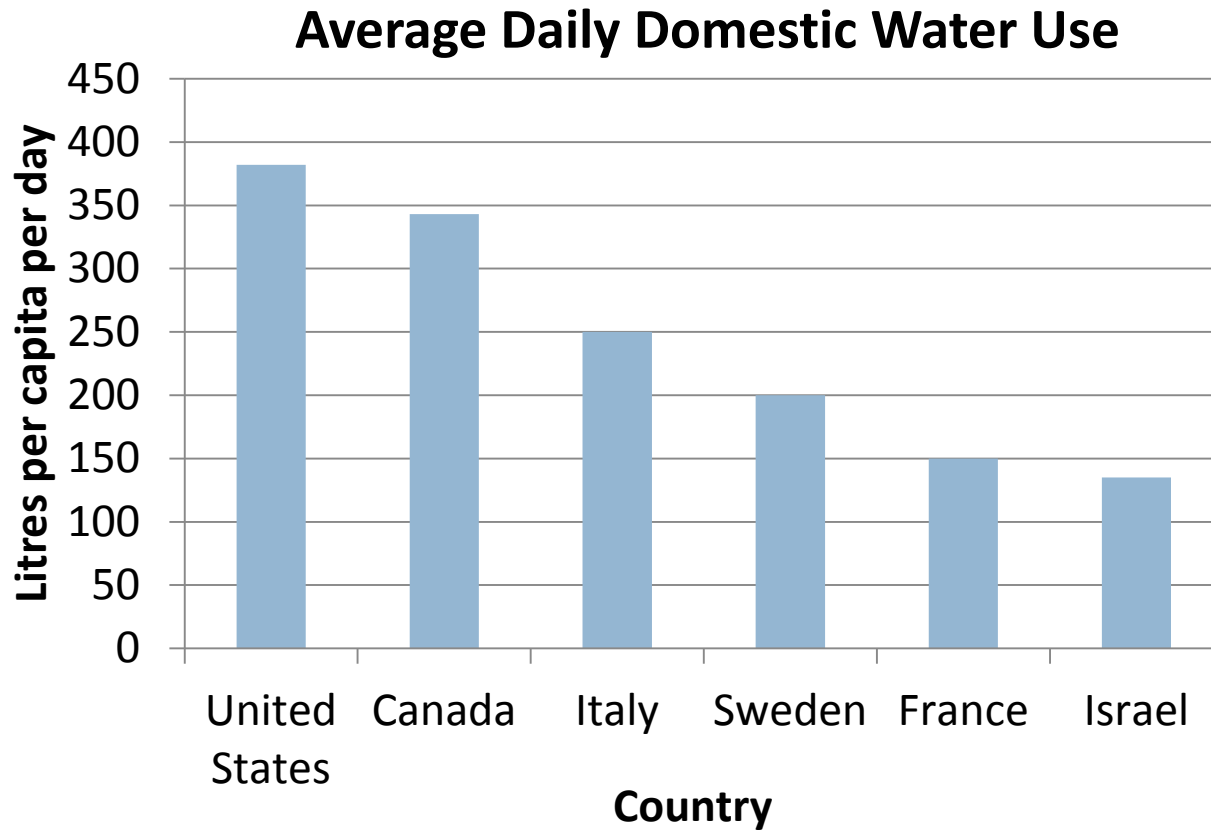
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- Canadian centralized water treatment and conveyance systems (Brandes et. al, 2010)
 - ▣ require \$31 billion to repair
 - ▣ \$57 billion to expand
 - ▣ energy intensive

DOMESTIC WATER USE

4



Adapted from Environment Canada (2013)

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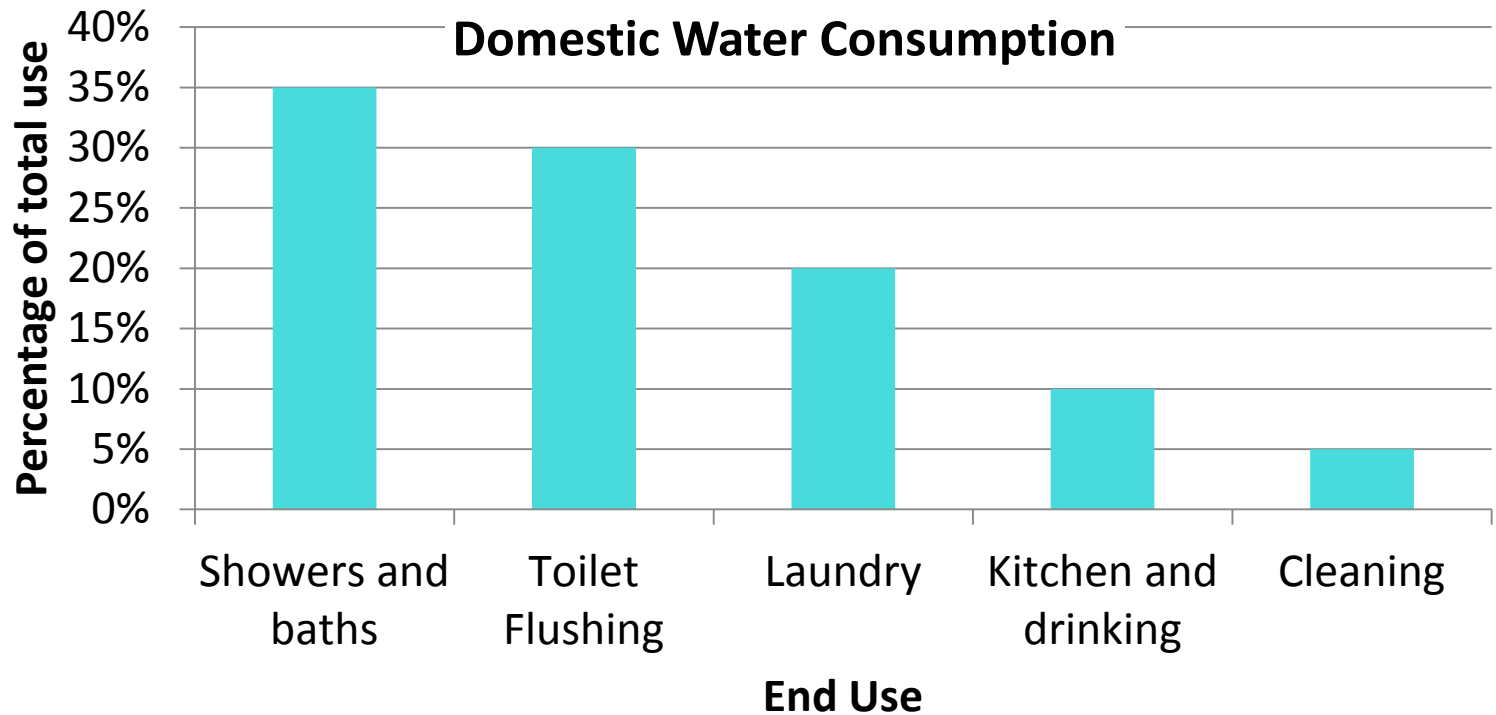
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CANADIAN DOMESTIC WATER USE

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- 343Lcd of fresh water daily through domestic use

(Statistics Canada, 2011)



Adapted from Environment Canada (2013)

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GREYWATER REUSE PROCESS

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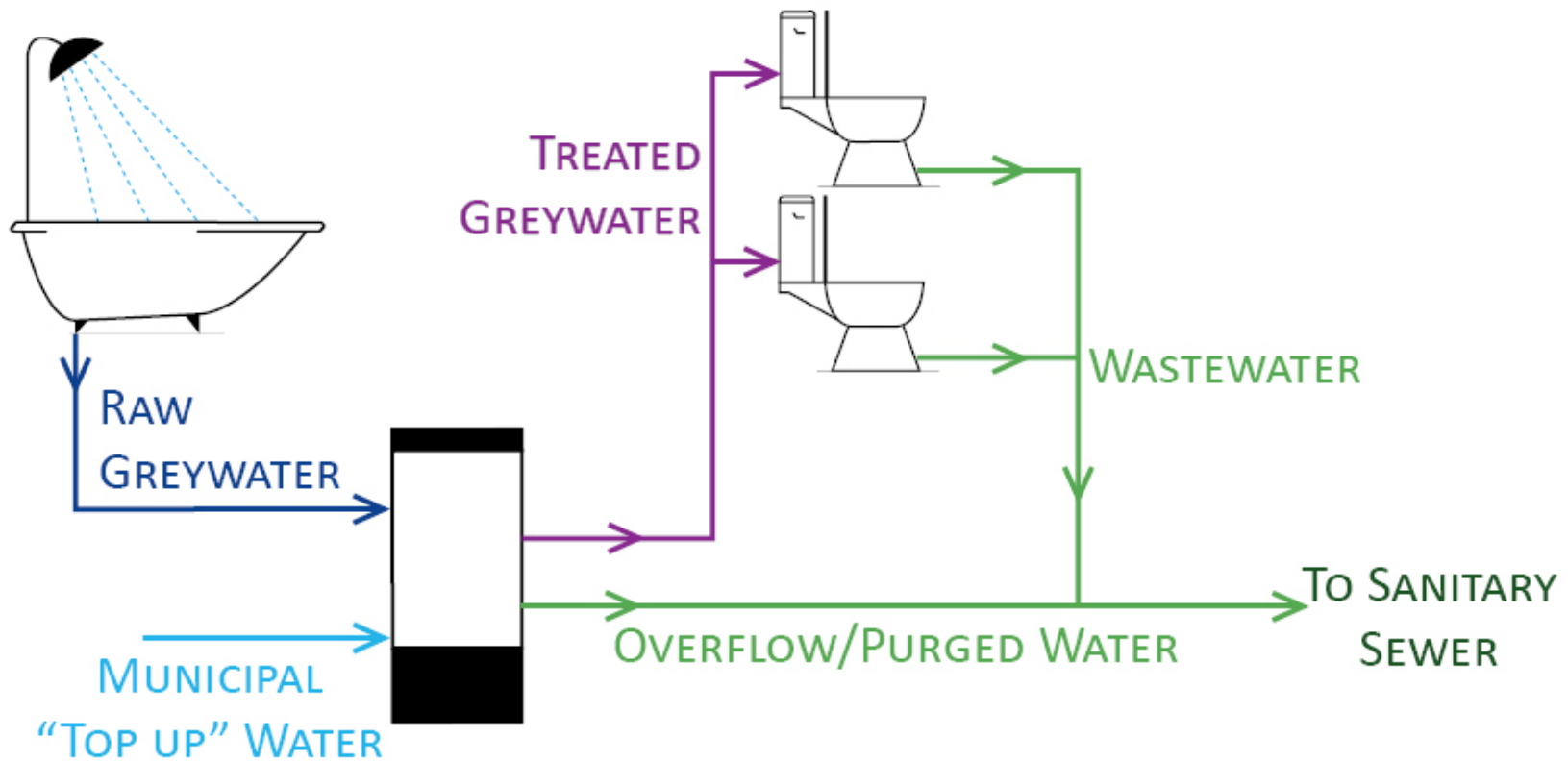
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PREVIOUS WORK: PERFORMANCE

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- *NSF / ANSI 350.1 & 40 Standards*

- Water Quality, maintenance, reliability

- *De Luca & City of Guelph, 2012*

- Performance of 2 Greywater Recycling Systems

- *Sharvelle et al., 2014*

- Performance in residence at Colorado State University

RESEARCH OBJECTIVES

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- Metrics that quantify field performance of GWRS

- Performance of Canplas *Recover* system

- Trends in performance data?
 - ▣ factors that affect performance (i.e. number of users)?

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PERFORMANCE TESTING METRICS



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PILOT STUDY

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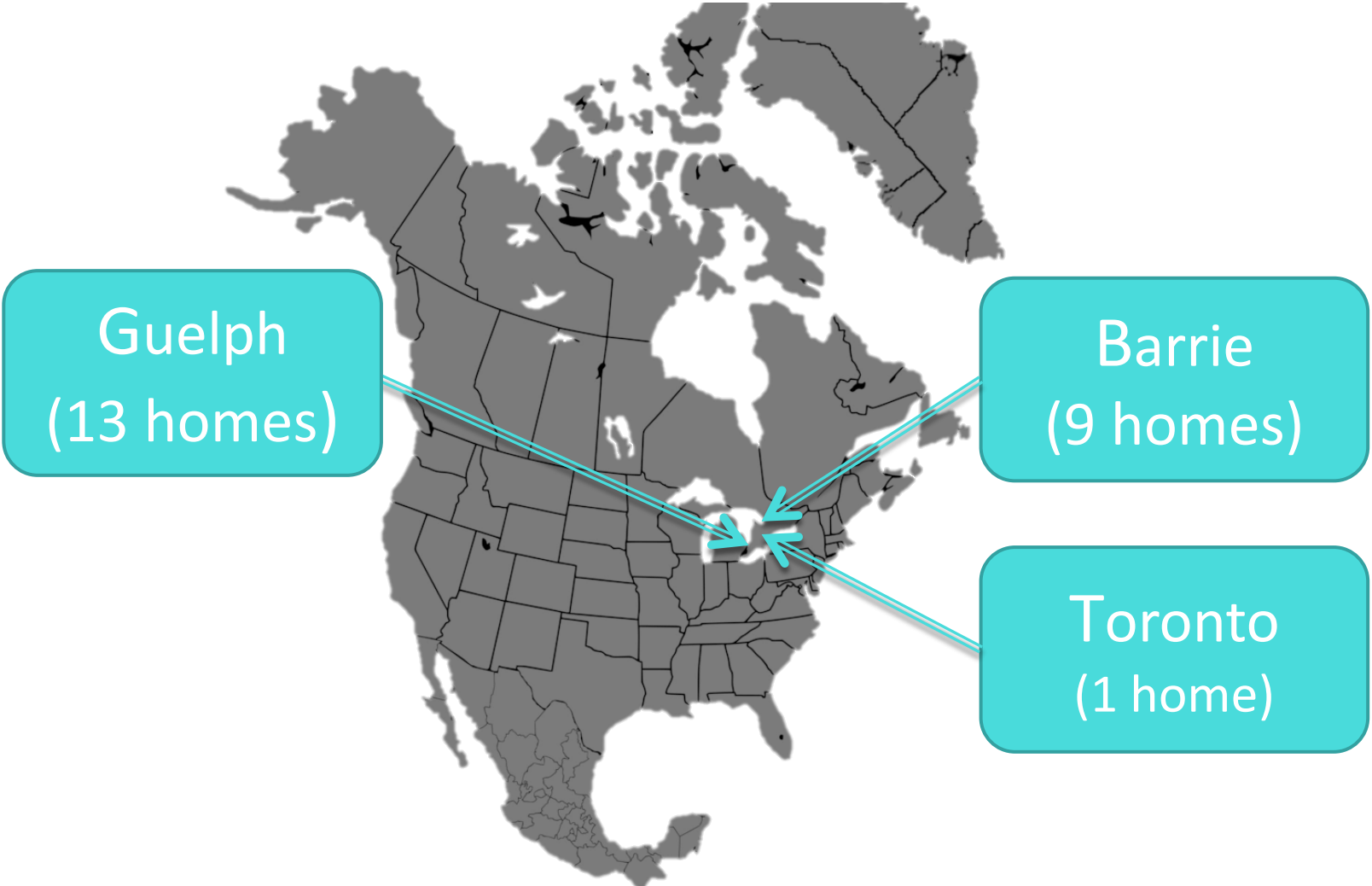
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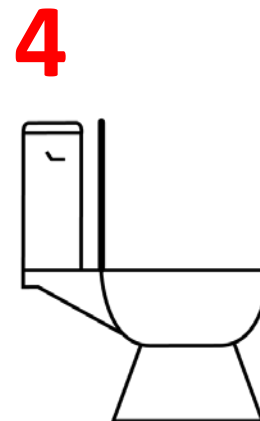
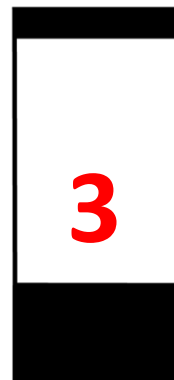
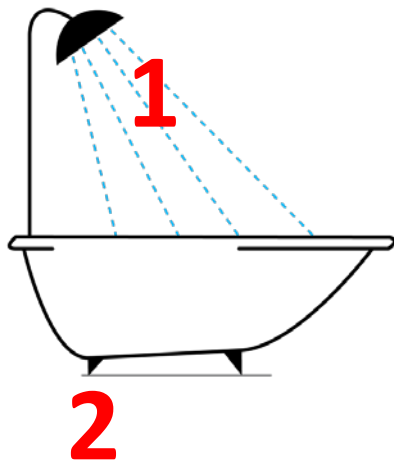
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WATER QUALITY

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WATER QUALITY PARAMETERS

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Craig (2014)

- Turbidity
- Hardness
- Odour
- Colour
- Total & Free Chlorine
- Temperature
- pH



maxxam.ca (2014)

- BOD₅
- COD
- Fecal Coliforms
- Total Coliforms

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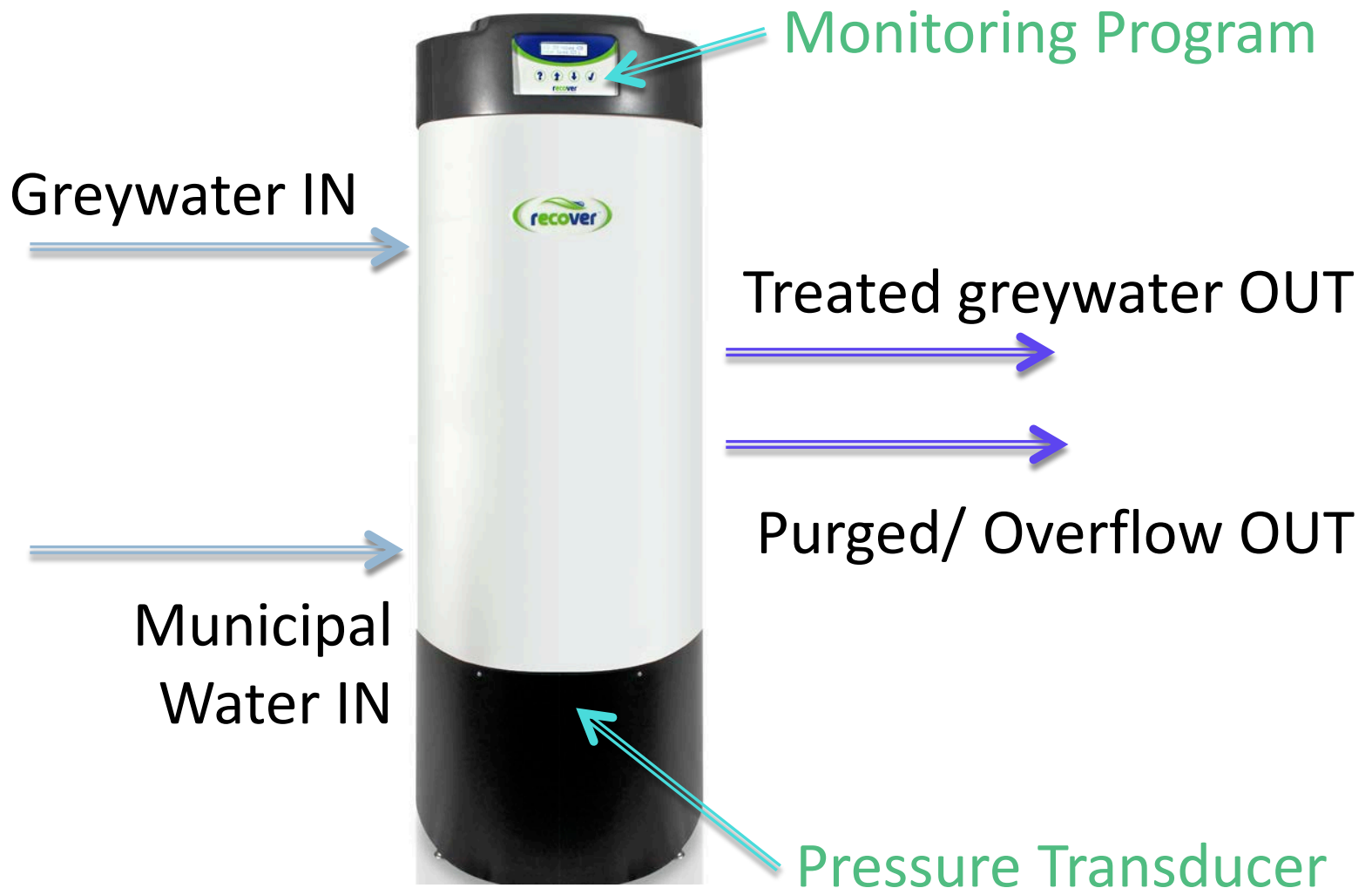
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WATER BALANCE



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WATER BALANCE PRELIM.

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Day	Real Date	Event	Hour	Minute	am/pm	Quantity (L)
Sunday	08/24/14	Full Purge	3	1	am	-19.375
		Fresh Added	3	3	am	9.750
		Gray Added	8	10	am	30.375
		Chlorination	8	11	am	0.000
		Filter Clean	8	11	am	0.000
		Flush	8	23	am	-9.250
		Flush	8	55	am	-5.875
		Flush	8	59	am	-13.125
		Mini Purge	9	10	am	0.000
		Flush	12	20	pm	-5.000
		Chlorination	2	0	pm	0.000
		Flush	7	49	pm	-4.125
		Fresh Added	7	50	pm	4.750

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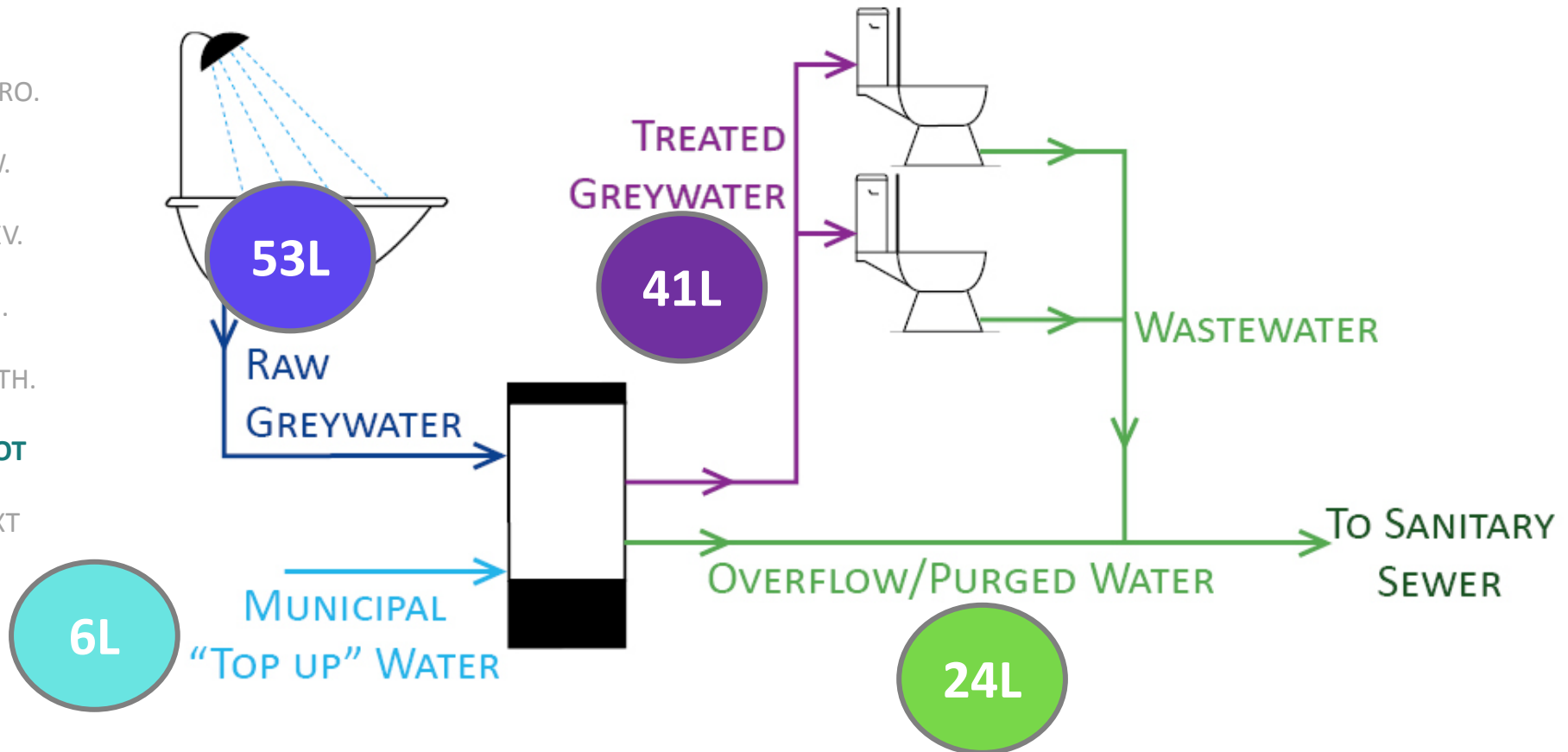
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WATER BALANCE RESULTS*

*PRELIMINARY, AVERAGE RESULTS FROM ONE HOUSE

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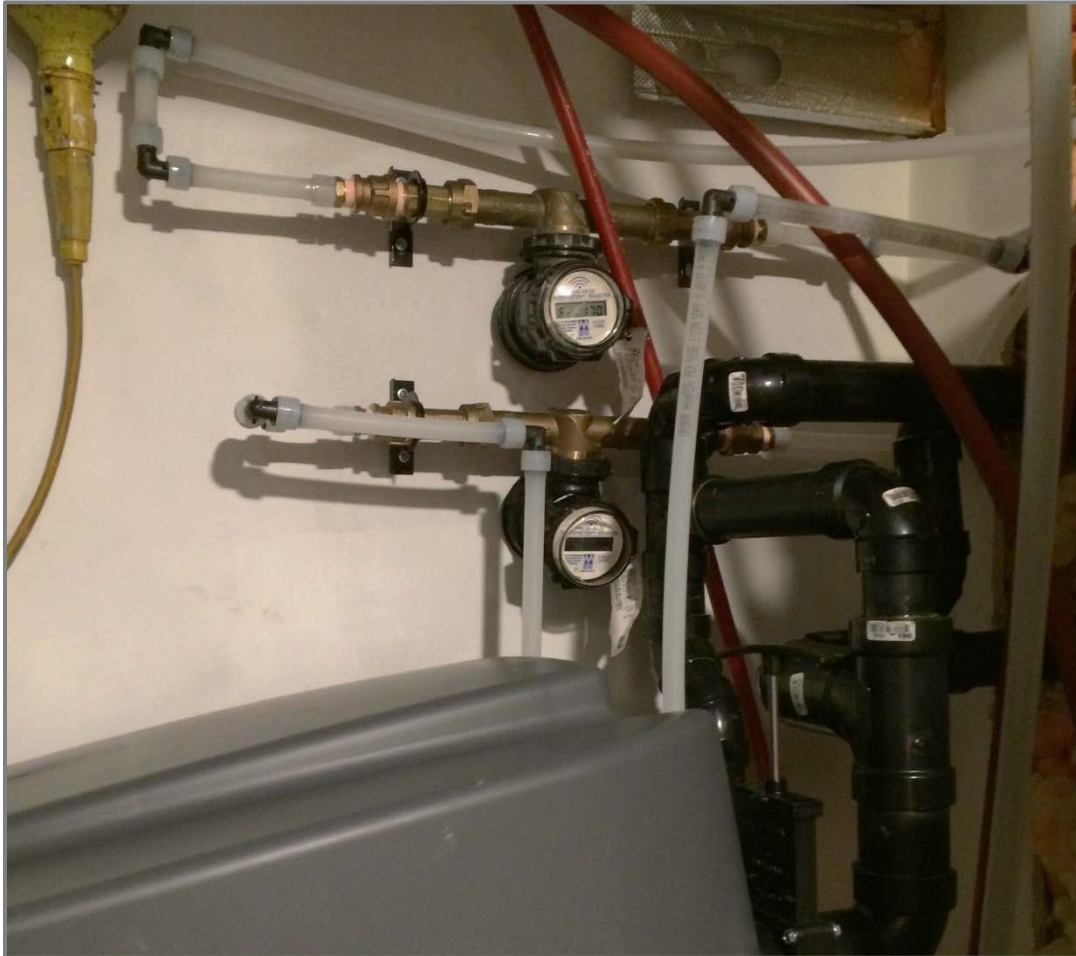


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WATER BALANCE VALIDATION

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- Flow Meters
- Usage Log

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ENERGY USE

Belkin WeMo Insight Switch

P3 Kill A Watt EZ Electricity Monitor

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belkin.com (2014)



p3international.com (2014)

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ENERGY USE

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Date	Time ON	Power Consumption ON	Time STANDBY	Power Consumption STANDBY	Cost in Canada
	(Hours:Minutes)	(kWh)	(Hours:Minutes)	(kWh)	\$
Aug. 24	0:23	0.02987	23:36	0.04261	\$0.007
Aug. 25	0:28	0.02807	23:31	0.05344	\$0.008
Aug. 26	0:37	0.04057	23:22	0.05362	\$0.009

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ENERGY USE RESULTS*

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*PRELIMINARY, AVERAGE RESULTS FROM ONE MONTH

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- ▣ Uses on average → **2.64 Watts**

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- ▣ Average energy use per day → **0.051kWh**

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- ▣ Equates to 18.9kWh per year → **\$2.55**

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DURABILITY & MAINTENANCE

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When & how could a system fail?

- ▣ Filter issues?
- ▣ Mechanical issues?
- ▣ Flooding?
- ▣ Pressure?

What maintenance is expected by users?

- ▣ Maintenance Log

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INSTALLATION

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- Cost
- Interview plumbers
- 'Ease of Installation'
- Roughed-in vs. retrofit

Craig (2014)

M.Craig, WSI 2014

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USER SATISFACTION

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□ User Satisfaction Survey

- System operations
- System aesthetics
- Maintenance
- Water Aesthetics
- Noise
- Payback period



Craig (2014)

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DATA ANALYSIS

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□ Part 1: User Survey

Canplas Greywater Recover System User Survey #1

User Information

Please fill out the following information for each resident.
The order of completion for each user is not important.

Resident #1

Data collection of Resident 1's use of the recover system.

Please indicate the age of Resident 1.

How much time does Resident 1 typically spend at home during the day?

- At home all day
- Away 8+ hours - work/school Full time
- Away 4+ hours - work/school Part time

How does Resident 1 typically bathe?

- shower
- bath

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DATA ANALYSIS

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□ Part 2

▣ Correlating user profiles to collected data:

- # of users *vs.* water savings?

- Age of users *vs.* water quality?

- Effect of high-efficiency fixtures

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IN REVIEW

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- Method for field testing performance of residential single family greywater reuse systems

- Currently collecting pilot study field data

- Stay tuned for results...
 - ▣ Standard testing methodology for field performance of GWRS
 - ▣ Performance data of Canplas' Recover System

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Thanks!
Questions & Comments?

PREVIOUS WORK: PERFORMANCE

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□ *De Luca & City of Guelph, 2012*

□ Performance of 2 Greywater Recycling Systems

□ Appropriate technology

- Reliability, soundness, flexibility
- Affordability
- Sustainability

□ Specific to systems tested

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