

**SUMMIT**  
CONSULTING SERVICES Inc.



# ALASKA WATER + SEWER CHALLENGE

Water Innovations for Healthy  
Arctic Homes

September 19-21, 2016

Summit Consulting Services

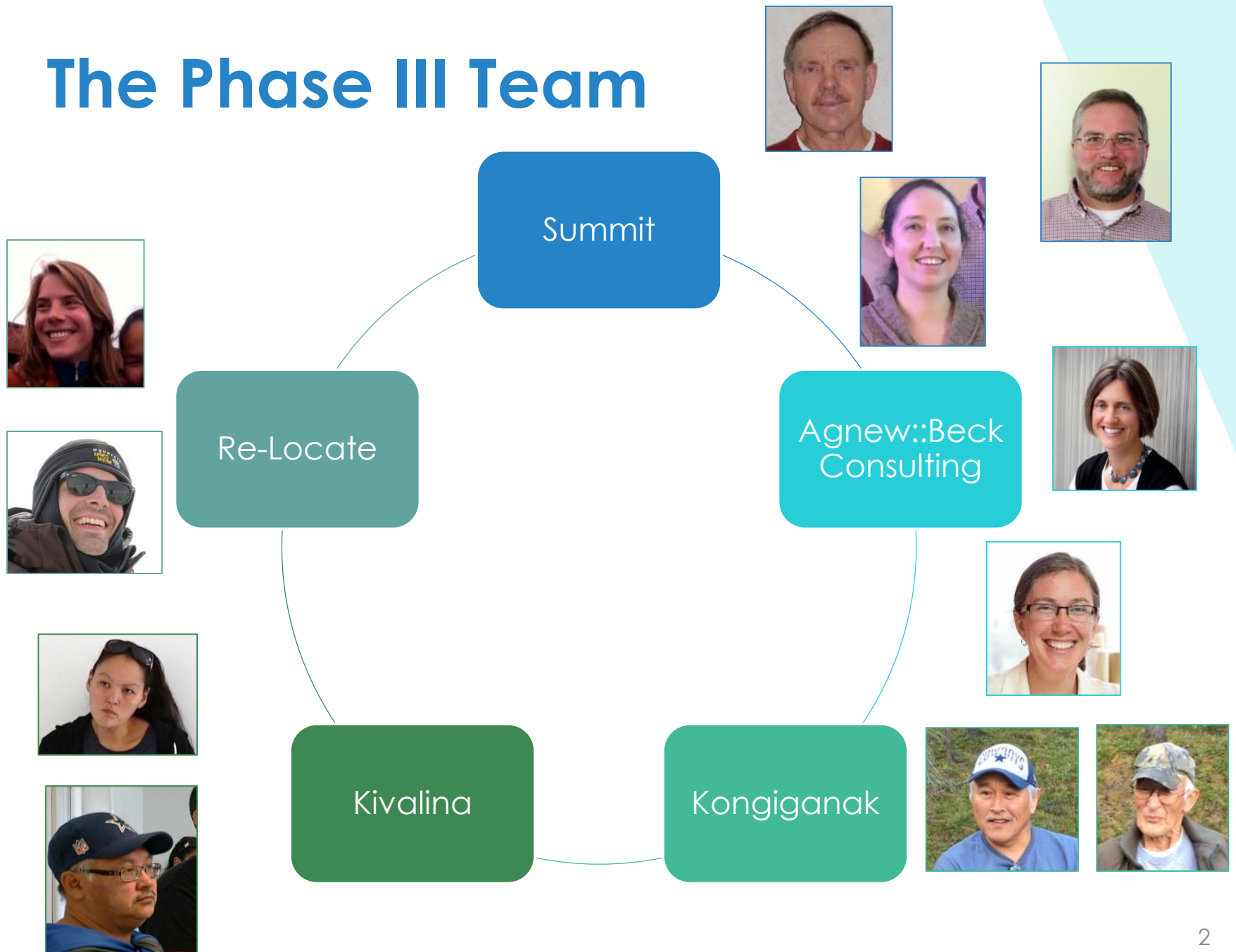
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# RELOCATE

# The Phase III Team



# The Cabin Lab



# Quick Tour



The Entry Way

<http://on.bubb.li/433755aponfyr14n7h3mx56/>

The Kitchen

<http://on.bubb.li/433755aalfovrb1a7vbd cjb/>

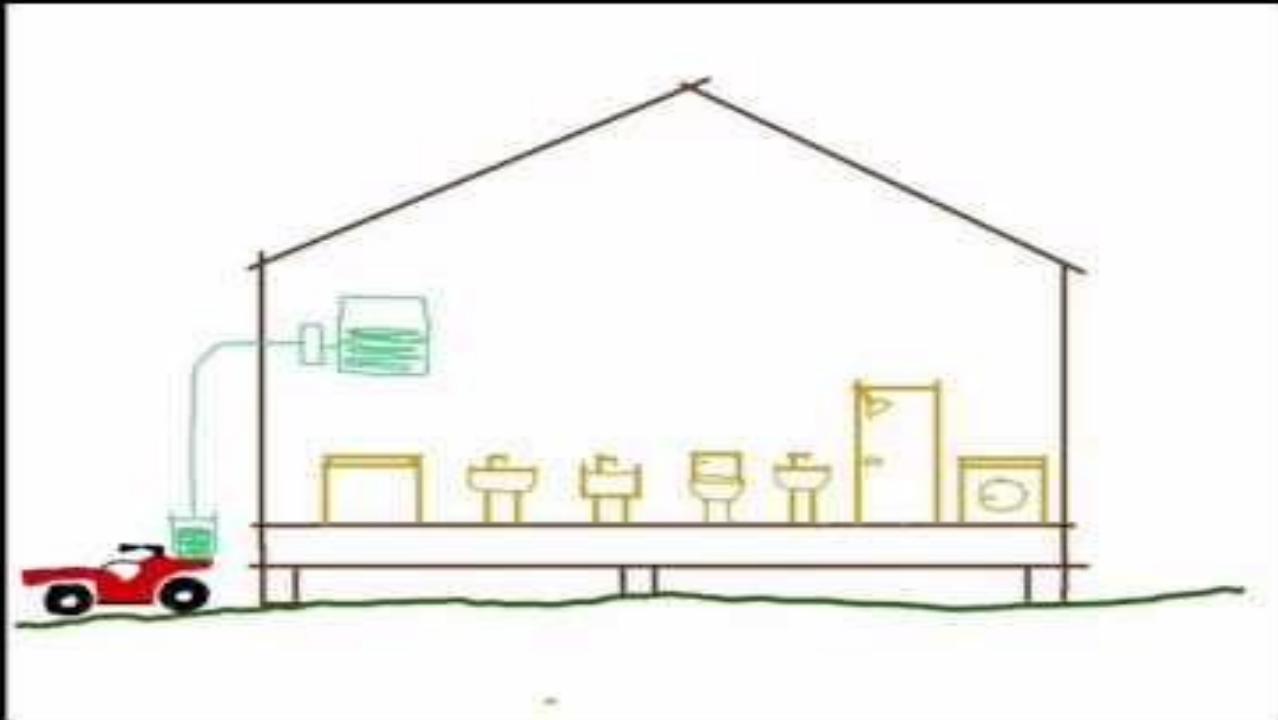
The Bathroom

<http://on.bubb.li/433755alx558y70ppj8l8l4/>

# Design Highlights

- Fits within the home
- Treats water for drinking
- Treats wash water using an Aqua2Use greywater treatment system
- Includes two toilet options
- Includes freeze-thaw protection
- Designed to be installed and maintained with local labor

# Drinking Water





# Drinking Water Treatment



Washable  
Silver Zeolite  
Filter



1 Micron  
Cartridge  
Filter



Ultrafiltration  
Membrane

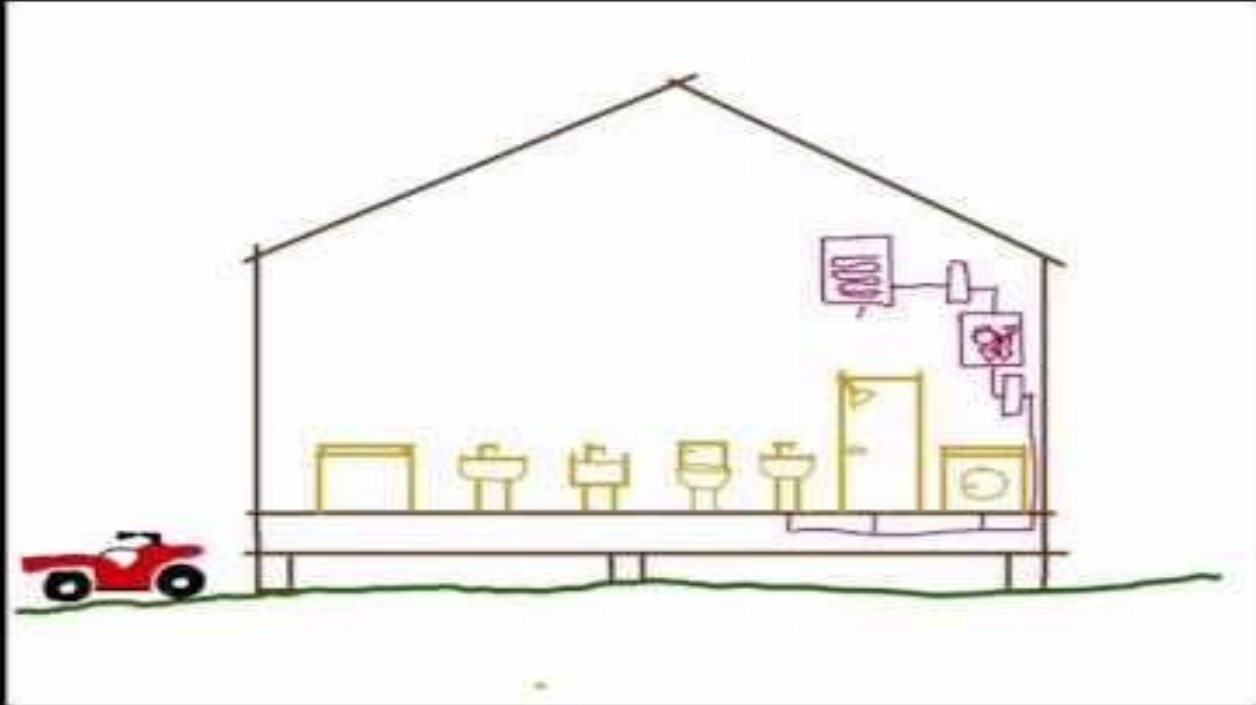


Quantum  
Silecte  
Disinfection



Carbon  
Polishing Filter

# Wash Water





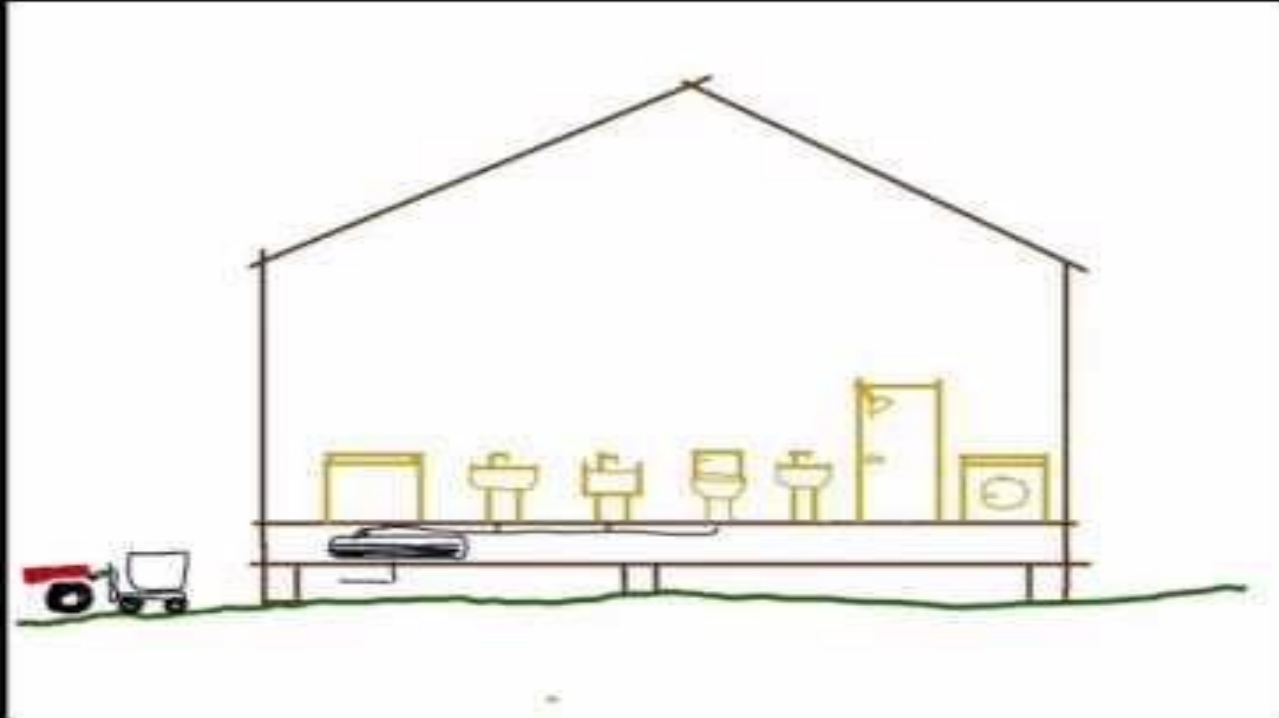
# Wash Water Treatment



# Wash Water Treatment (alt)



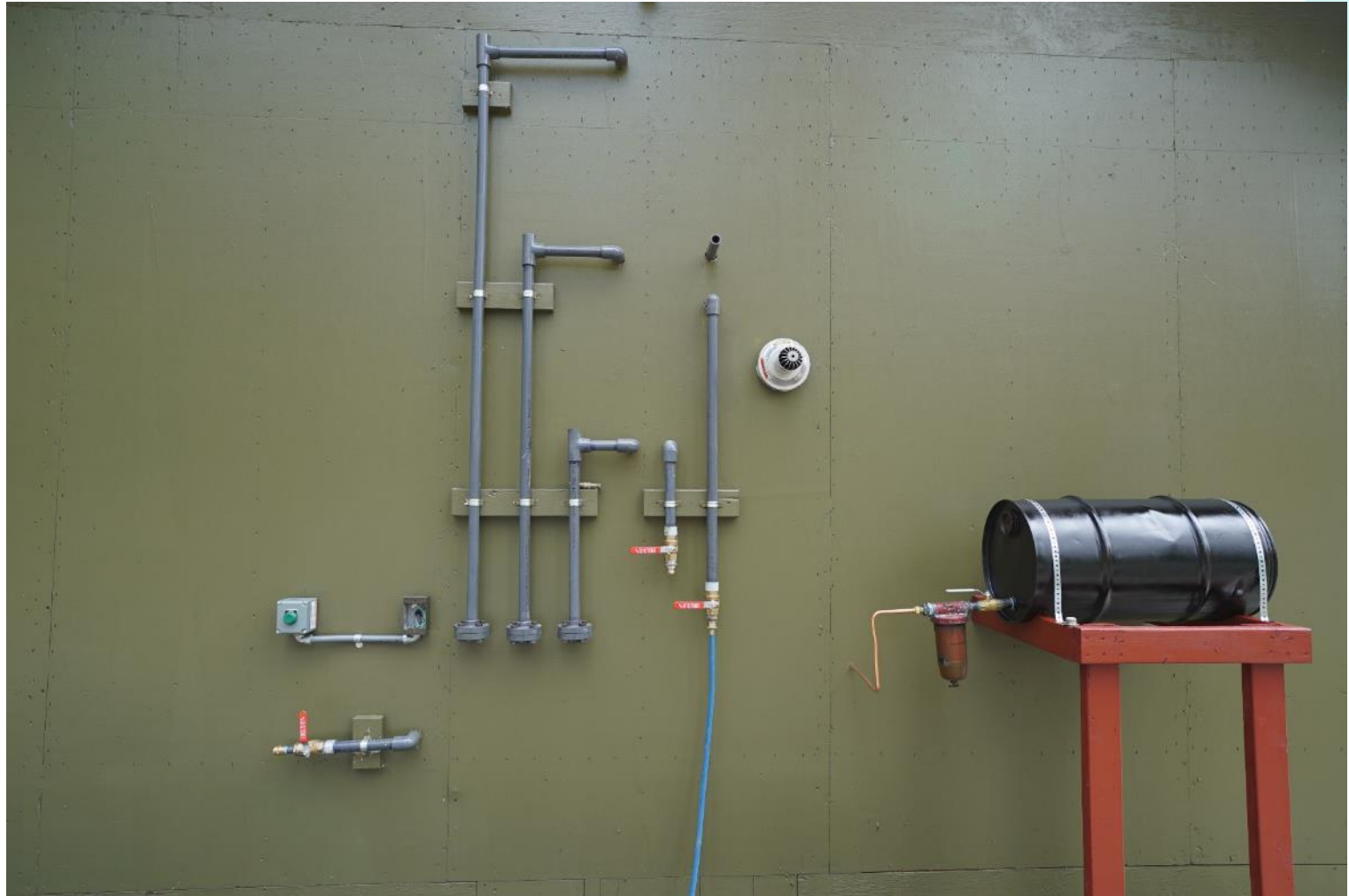
# Waste Water



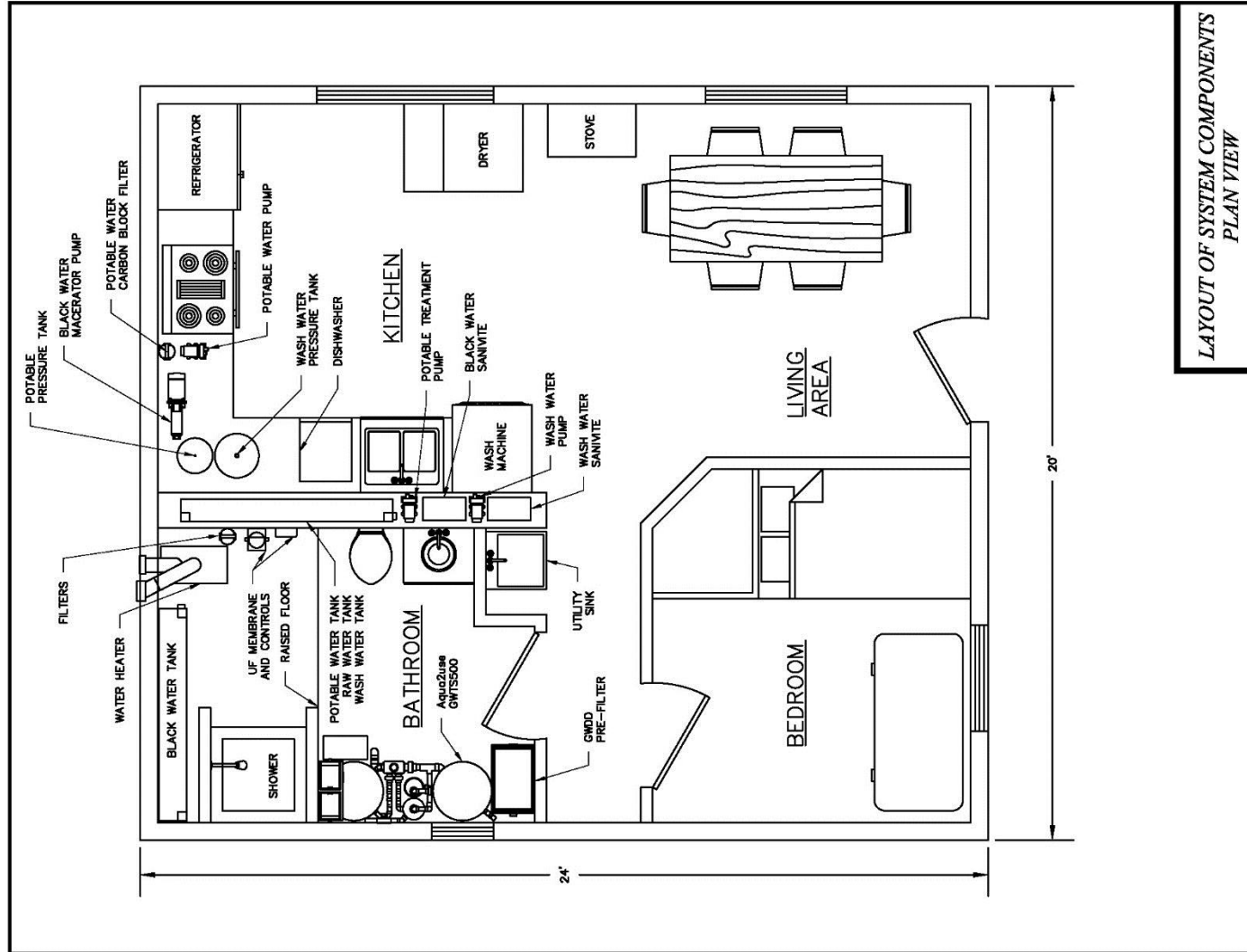
# Toilet Options



# Water in, water out



# Floor Plan





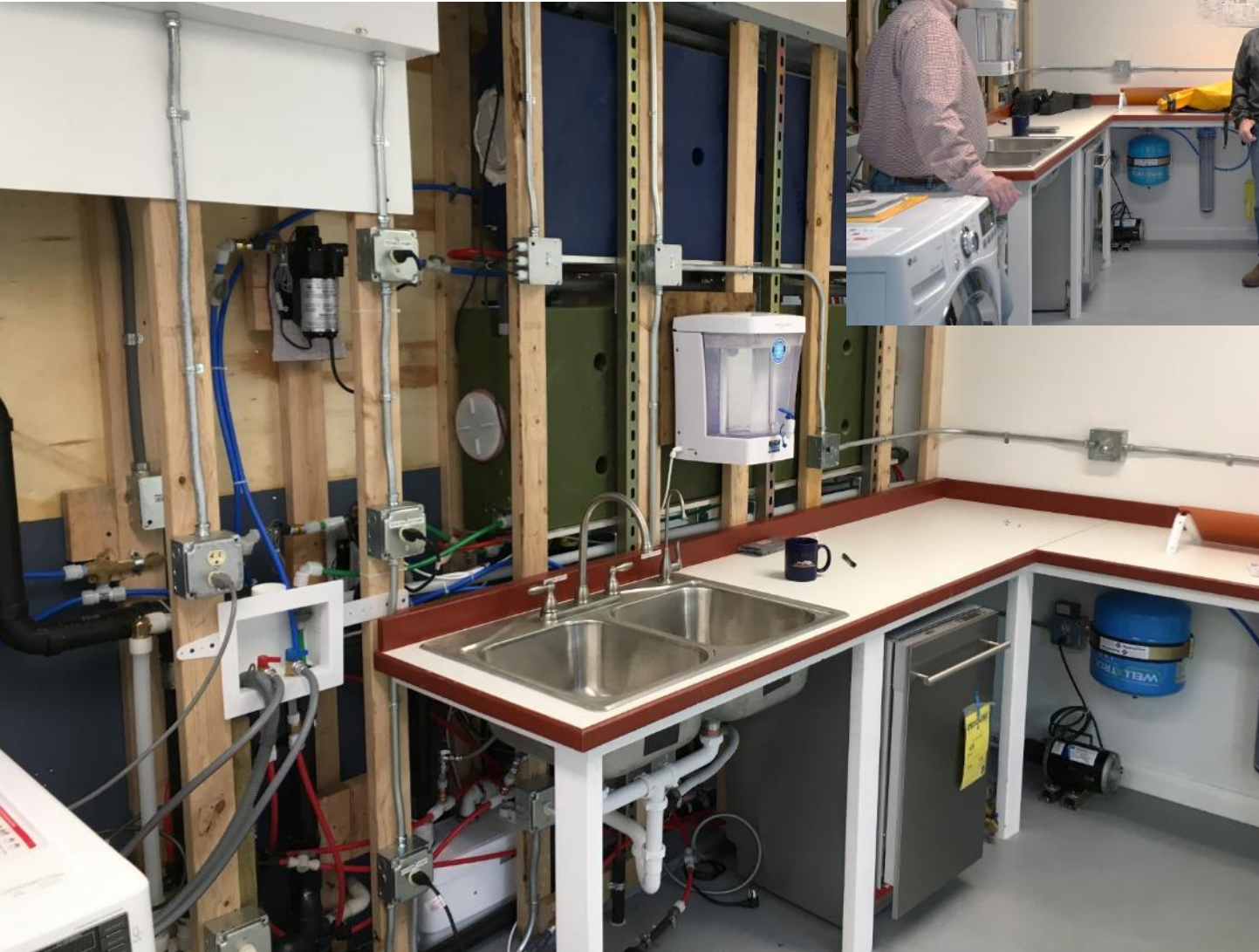
# Kitchen + Bathroom



# Bathroom



# Kitchen

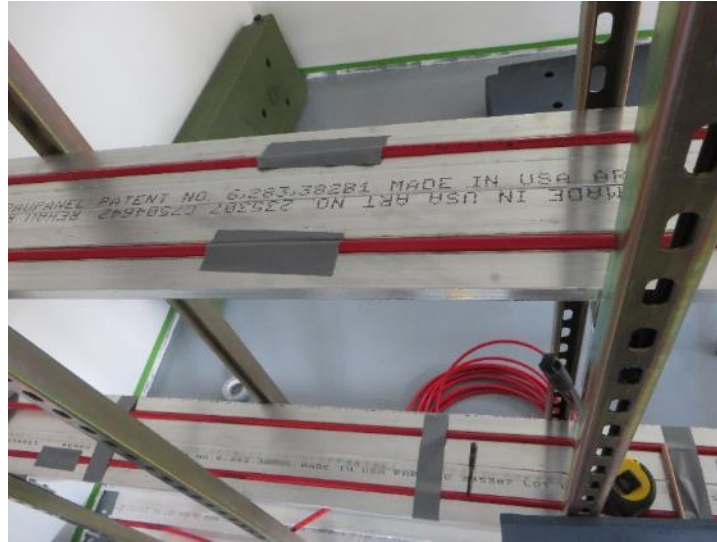




# Front Room



# Freeze – Thaw Protection



# What we have heard from end users

System needs to fit within the home

Water must be clean

Reduce water hauling

Easy to modify

Make it kid proof

Limit condensation





# End user input to system design

Utility sink

Two toilet options

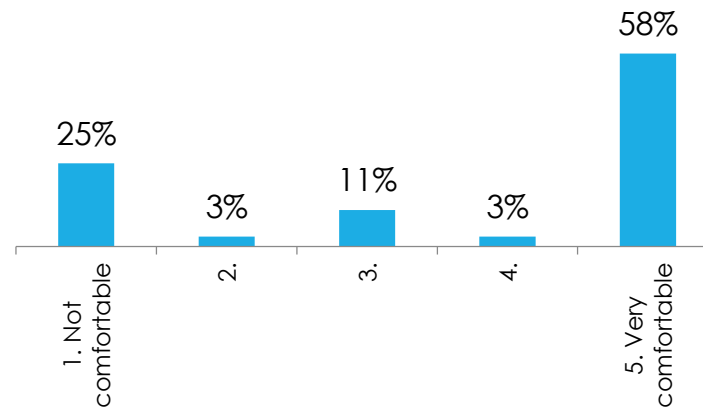
Integration with rain water catchment

Kid-proofing options (color coding, tap placement)

Reusable filters



# Comfort with water reuse



Comfort with recycled water use for handwashing

# Daily Water Flows (Range)

Raw water used: **10 – 17 gallons**

Drinking water used: **3 gallons**

Wash water in circulation: **57 gallons**

Wastewater produced: **9.5 – 16.5 gallons**

*The raw water consumption and wastewater produced vary by the type of toilet used.*

# Financial Costs

Capital cost: **\$125,000 per home\***

Monthly operation cost:

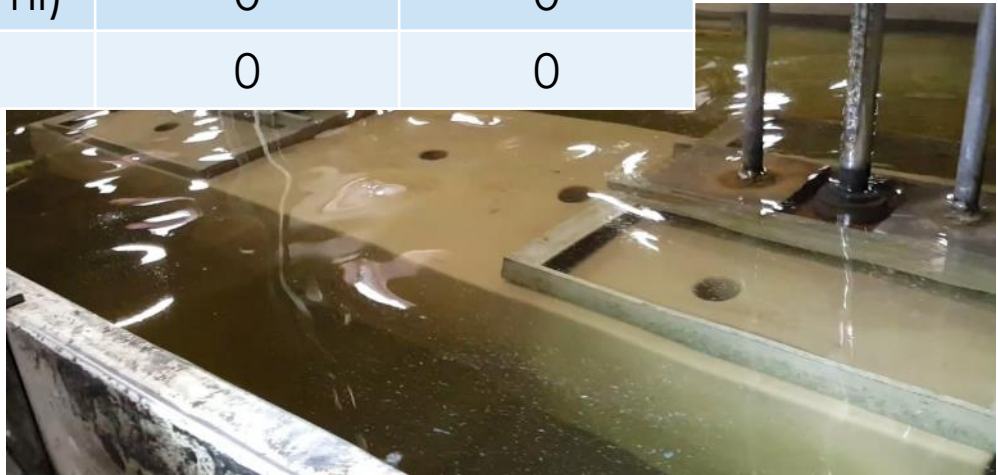
**\$183 for dry toilet / \$243 for flush toilet**

Item	Monthly cost Dry Toilet (A)	Monthly cost Flush Toilet (B)
Electricity	\$13.30	\$10.76
Consumables	\$17.92	\$13.67
Water at \$.10/galloon	\$20.10	\$34.17
Wastewater haul at \$.25/gallon	\$71.25	\$123.75
Co-op	\$40	\$40
Replacement parts (Avg.)	\$20.83	\$20.83

# Testing Results

Raw Water	8/17/2016	8/29/2016
Nitrate (mg/L)	0.3	NT
Total Coliform (MPN/100ml)	7.4	2
E-Coli (MPN/100ml)	0	0
All other parameters No Detect		

Drinking Water	8/17/2016	8/29/2016
Total Coliform (MPN/100ml)	0	0
E-Coli (MPN/100ml)	0	0



# Testing Results

Synthetic Gray Water	Desired Range	8/17/2016	8/29/2016
Total Coliform (MPN/100ml)	100-1,000	>2,400	>2,400
E-Coli (MPN/100ml)	1,000-10,000	1,700	>2,400
pH	6.5-8.5	8-9	8.4
TOC (mg/L)	50-100	1,890	430
COD (mg/L)	250-400	490	1,000
TSS (mg/L)	80-160	24	525
TURBIDITY (NTU)	50-100	34	63
BOD <sub>5</sub> (mg/L)	130-180	169	1,220
PHOSPHORUS (mg/L)	1-3	8.4	14
TKN (mg/L)	3-5	4.01	5.97



# Testing Results

Wash Water	Desired Range	8/17/2016	8/29/2016
Total Coliform (MPN/100ml)	none	81	180
E-Coli (MPN/100ml)	none	No detect	No detect
pH	6.0-9.0	8	8
TSS (mg/L)	<30	2	4.8
Color, apparent	Test only	10	20
TURBIDITY (NTU)	<10	No Detect	5.5
BOD <sub>5</sub> (mg/L)	<25	10.7	23.8
Odor	Non-offensive	present	present
Oily Film and Foam (mg/L)*	Non-detect	Not Tested	1.29

\* Tested as methylene blue active substances assay (MBAS)

# Operations + Maintenance Issues

Homeowner tasks

Co-op – system support

End user requests: re-usable parts, maintenance support and locally available parts.

Concerns: soap smell, kid proofing