



City of Guelph Residential Greywater Reuse Feasibility Study

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City of Guelph

- Growing city with approx. 120,000 residents
- One of Canada's largest communities solely reliant on groundwater
- **Sustainability** a guiding principle of local growth management strategy



Water Sustainability: A Guelph Priority

2006 Water Supply Master Plan

Targets:

- 10% reduction in daily water use by 2010
- 15% reduction in daily water use by 2017
- 20% reduction in daily water use by 2025

2007 Community Energy Plan / Strategic Plan

GOAL: "To use less water and energy per capita than any comparable Canadian City"



Guelph Water Conservation & Efficiency Strategy

- 10 year, \$20 million Water Sustainability Strategy
- Goal: Reduce water use by **8.7 MLD by 2019**
- **Co-benefits:**
 - **GHG Reductions : 2,412 tonnes/yr CO₂ E**
 - **Operational Savings : \$141,000/yr**
- Multi-sector approach (res, multi-res, ICI, new dev, municipal)
- Emphasis on public and youth education
- Water loss mitigation strategy
- Support for innovation and capacity building



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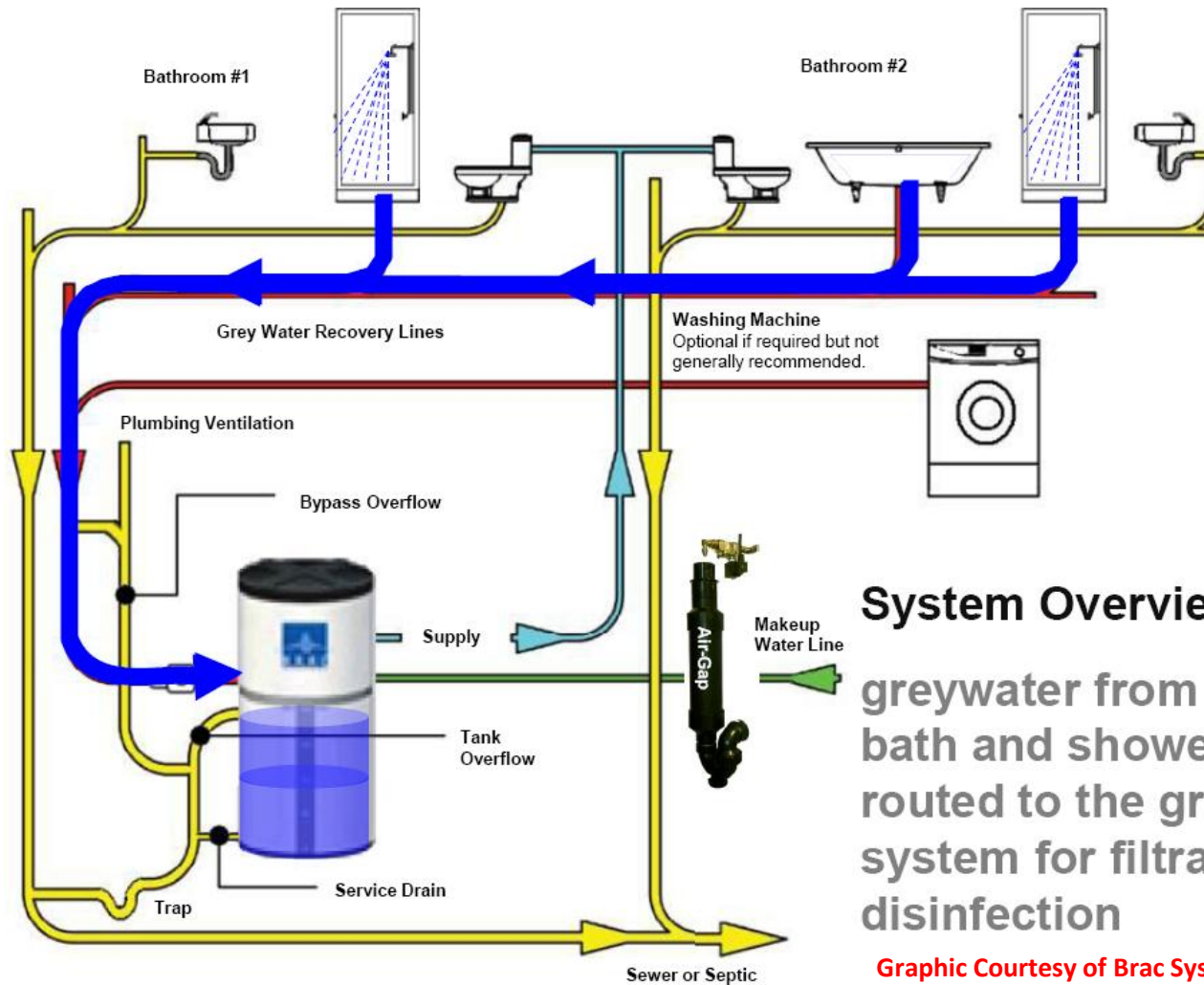




Field Test Background

- 2009 WCESU forecasted saturation of common place DM programs beyond 10 year forecast.
- Greywater Reuse/Rainwater Harvesting gained great public and political support through WCESU Consultation Process.
- Significant Savings Anticipated (approx 25 -30%) as a results of system use.
- Best match of Water Quality to Task to be completed

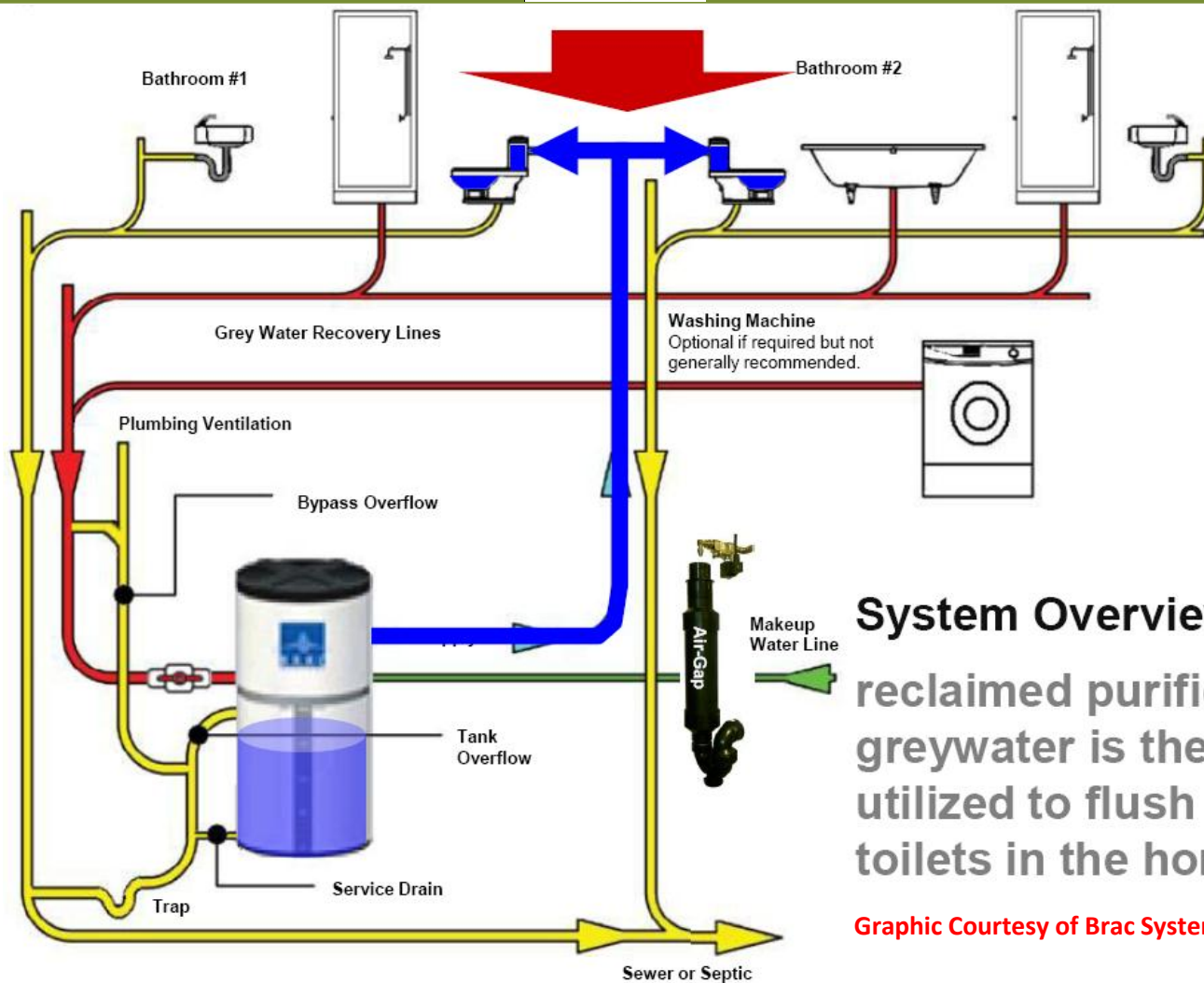




System Overview

greywater from your bath and shower is routed to the greywater system for filtration and disinfection

Graphic Courtesy of Brac Systems



System Overview
reclaimed purified
greywater is then
utilized to flush
toilets in the home.

Graphic Courtesy of Brac Systems





Challenges

- Systems expensive to install (\$3500 - \$4500) & price of Water/Wastewater servicing inexpensive
- Limited End Uses for treated greywater
- Lack of objective field data or 3rd party performance testing for technologies
- Homeowner Maintenance Requirements & ongoing Sustainability of Municipal Investment
- Public Awareness of Technologies
- Potential Health Risks



Opportunities

- Facilitating Growth in a Groundwater Based Community
- Current Community Momentum
- Community and Political Support
- Community Conservation Ethic
- Building Industry Support
- Current Capacity/Expertise

Take water conservation to the next level

Install a rainwater harvesting or greywater reuse system in your home and you may be eligible for a rebate of \$1,000 or \$2,000 from the City of Guelph.



Greywater Reuse Rebate Program

Greywater is wastewater produced from washing dishes, doing laundry and bathing. A greywater reuse system collects the greywater from daily showers and purifies it, so it can be reused for household toilet flushing.



Rainwater Harvesting System Rebate Program

Rainwater harvesting is the collection and underground storage of rainwater for use in and around the home. A rainwater harvesting system purifies rainwater and uses it for toilet flushing and outdoor activities that require water but not drinking quality water.

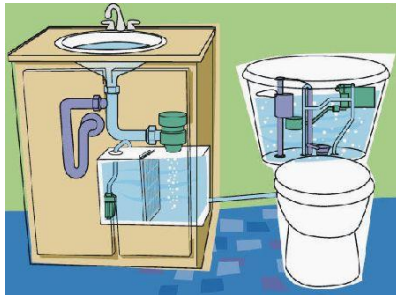
Installing either system can reduce the total average household water use by as much as 30% or 69,000 litres of water per year.

For more information call 519-822-1260 x 2106
or visit guelph.ca/rebates.

Sustainable Communities Conference and Trade Show



Conférence et salon professionnel sur les collectivités durables



Sloan Aqus System



Brac System



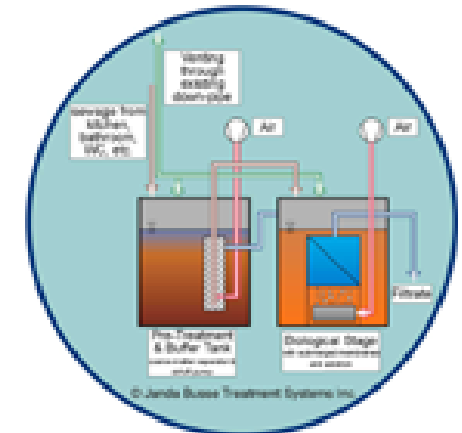
Pontos AquaCycle



Gaiam Toilet Lid Sink



ConservePump System



Jande Busse Treatment System



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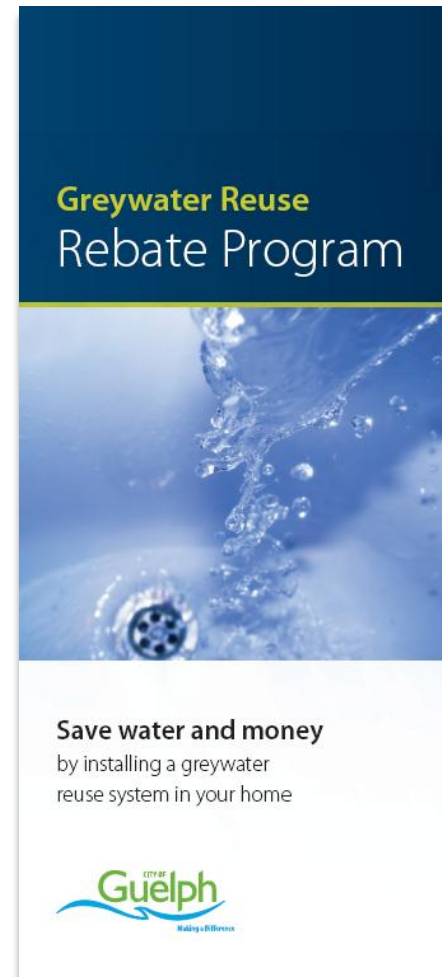
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Making a Difference

Field Test Background

- Introduction May 2009
- Goal: 30 Homes (New/Existing)
- \$1500 Incentive to homeowners
- Participant Requirements:
 - Social Feedback Forums
 - Site Access for System Monitoring





Project Team

- **University of Guelph School of Engineering**
- **Fusion Homes**
- **Reid's Heritage Homes**
- **Evolve Builders Group**
- **Veritec Consulting**
- **Federation of Canadian Municipalities**
- **City of Guelph**





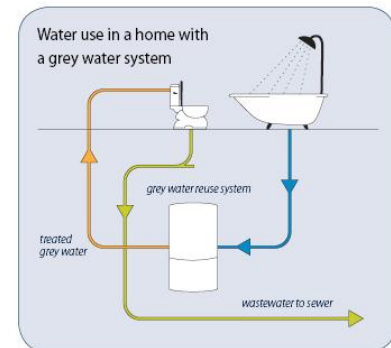
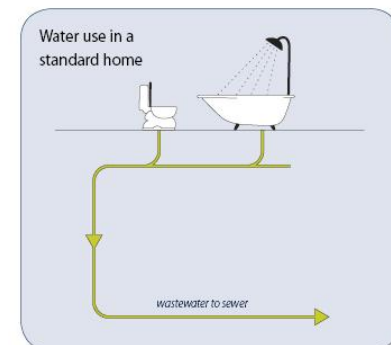
Greywater System Eligibility Criteria

- Available in Canada with local tech support
- Generally cost effective*
- Maintain Chlorine Residual
- Remove particulate matter
- 150L of storage capacity (min)
- Achievable maintenance program
- Install in accordance with OBC



Background: Core Areas of Focus

- System Operation and Performance
- Social Acceptance of Technology
- Water Use Reductions
- Environment Footprint vs. status quo
- Required Support Networks
- Municipal Management Framework
- Premise Isolation Device Requirements



Health Canada Domestic Reuse Guidelines

Water Quality Criteria

Parameter	Units	Water quality parameters	
		Median	Maximum
BOD ₅	mg/L	≤10	≤20
TSS ^b	mg/L	≤10	≤20
Turbidity ^b	NTU	≤2 (alternative to TSS)	≤5 (alternative to TSS)
<i>Escherichia coli</i> ^c	CFU/100 mL	Not detected	≤200
Thermotolerant coliforms ^c	CFU/100 mL	Not detected	≤200
Total Chlorine residual ^d	mg/L	≥0.5	

^a Unless otherwise noted, recommended quality limits apply to the reclaimed water at the point of discharge from the treatment facility or treatment unit. BOD₅ = five-day biochemical oxygen demand; TSS = total suspended solids; NTU = nephelometric turbidity unit; CFU = colony-forming unit.

^b Measured prior to disinfection point.

^c Only one of either *Escherichia coli* or thermotolerant coliforms needs to be monitored in a given system. Further information is provided in Box 1.

^d Measured at the point where the treated effluent enters the distribution/plumbing system.



Preliminary Water Quality Results

Parameter	Maximum	Minimum	Average	Health Canada Target Value
E. Coli (CFU/100mL)	2000.00	0.00	189.39	0.00
BOD (mg/L)	280.00	0.00	56.11	20.00
Chlorine Residual (mg/L Cl-)	8.80	0.00	1.53	0.50
Turbidity (NTU)	180.00	0.39	29.59	5.00





Water Quality Results: **New** vs. **Retrofit**

Parameter	Maximum		Minimum		Average		Health Canada Target Value
	New	Retrofit	New	Retrofit	New	Retrofit	
E. Coli (CFU/100mL)	2000.00	2000.00	0.00	0.00	44.69	255.17	0.00
BOD (mg/L)	220.00	280.00	0.00	0.00	48.61	59.52	20.00
Chlorine Residual (mg/L Cl-)	8.80	8.80	0.00	0.00	2.18	1.23	0.50
Turbidity (NTU)	123.00	180.00	0.39	0.39	30.97	28.96	5.00





New Home Water Usage

Home Name	City of Guelph Avg Use per capita (m3/day)	Avg Use Post Install per capita (m3/day)	% Difference	Potable Water Fill Use (m3)
Home L	0.176	0.067	-61.93%	30.87
Home M	0.176	0.494	180.68%	0.051
Home N	0.176	0.115	-34.66%	0.015
Home O	0.176	0.082	-53.41%	0.021
Home P	0.176	0.099	-43.75%	0.027
Average	0.176	0.171	-2.84%	6.1968





Home Retrofit Water Usage

Home Name	Avg Use Pre Install per capita (m3/day)	Avg Use Post Install per capita (m3/day)	% Difference	Potable Water Fill Use (m3)
Home A	0.221	0.169	-23.53%	0.0007
Home B	0.114	0.092	-19.30%	0.0020
Home C	0.242	0.122	-49.59%	0.0004
Home D	0.108	0.069	-36.11%	0.0024
Home E	0.477	0.153	-67.92	0.0038
Home F	0.170	0.115	-32.35	0.0072
Home G	0.153	0.095	-37.91	1.0190
Home H	0.067	0.101	+50.75	0.0021
Home I	0.145	0.118	-18.62	6.8900
Home J	0.500	0.213	-57.40	0.0093
Home K	0.235	0.045	-80.85	0.0034
Average	0.221	0.117	-33.89	0.7218



Social Acceptance

Qualitative Research:

- Ongoing Homeowner Surveys
- Focus Groups
- Homeowner Interviews

Quantitative Research:

- Web Based Resident Survey

Get to know greywater



Did you know that recycling used bath and shower water to flush a home's toilets is called grey water reuse? Installing a greywater reuse system is a great way to conserve water in a home.

Tell us what you think

Have you heard of greywater? Would you use it in your home? Fill out a short survey and enter to win 1 of 10 Guelph Water stainless steel water bottles.

For more information including contest rules visit guelph.ca/greywater.



Social Technology Acceptance

Technology Users Group:

- System Lacking Self Sufficiency
- Initial Engagement Key to Success
- Concerns Present Regarding System
- Ongoing Educational Support Required
- Conservation Ideals driving uptake not POI
- Health Concerns generally non-issue

Technology/Practice Acceptance

General Public:

- Awareness minimal
- Terminology may be excluding
- Legitimacy/Self Applicability of Technology
- POI/ROI key in driving uptake
- Education should be based on touch/feel
- Support Practice Ideologically



Preliminary Observations

- Water Savings Encouraging
- Awareness vs. System performance
- WQ Goals: End Use Considerations
- Improving Technology
- System Footprint
- System Novelty vs. Sustainability....





Next Steps

- Quantitative Public Survey
- City Staff Stakeholder Consultations
- Continued Monitoring
- Life Cycle Analysis/Impact Analysis
- Development of management framework
- Service Delivery Format Assessment
- Anticipated Study Completion: April 2012





Questions/Comments

Thank you!

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