

Onsite Non-Potable Water Uses: Economics and Embedded Energy

Southern California Water Dialogue

Prepared by

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This talk is dedicated to my grandmother.





Presentation Outline

Residential Homes

- Water demand
- Non-potable source options
- Potable water augmentation
- Infrastructure requirements and costs
- Non-Residential Buildings
 - Typical commercial water demand profiles
 - Non-potable water recycling: considerations
 - Case Studies
- Summary





Residential Water Use Demand



Zita L.T. Yu, J.R. DeShazo, Michael K. Stenstrom, Yoram Cohen, 2015. Cost-Benefit Analysis of Onsite Residential Graywater Recycling Case Study: the City of Los Angeles. Journal of American Water Works Association, 107 (9).



Zita L.T. Yu, 2015. Feasibility of Onsite Residential Graywater Recycling Using a Semi-Batch Vertical Flow Wetland for Nonpotable Water Reuse. Doctoral Dissertation. University of California.

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Potable Water Augmentation by Graywater



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Zita L.T. Yu, J.R. DeShazo, Michael K. Stenstrom, Yoram Cohen, 2015. Cost-Benefit Analysis of Onsite Residential Graywater Recycling. A Case Study: the City of Los Angeles. Journal of American Water Works Association, 107 (9).

Geosyntec Graywater Collection and Distribution Costs (Residential)



Zita L.T. Yu, J.R. DeShazo, Michael K. Stenstrom, Yoram Cohen, 2015. Cost-Benefit Analysis of Onsite Residential Graywater Recycling Case Study: the City of Los Angeles. Journal of American Water Works Association, 107 (9).



Onsite Non-Potable Water Recycling in Non-Residential Buildings





Water Demand



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Source: http://www.epa.gov/greeningepa/water/lab_vs_office.htm



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Non-Potable Water Recycling: Considerations

		Surface		
	Roof runoff	Runoff	Graywater	Blackwater
Organic contaminant concentration				
Treatment capital cost				
Treatment O&M				
Daily supply stability and reliability				
Storage requirements				
Energy demand & carbon footprint				
Onsite technical labor				
Reuse for irrigation purpose				
Good	ł			
Fai	r			
Роо	r			

Note: The above matrix was developed specifically for the sites presented in the Case Studies section. The site is a private commercial property located in the Bay Area, CA. The above matrix is intended to be used as an example.

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Case Study Project Location: Bay Area, CA

Hotel



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Non-Potable Water Supply and Demand

Design Details					
Capacity, employees	600				
Function	Hotel with 200 rooms, with green roof				
Status	Planning				
Project Location	Bay Area, CA				



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Cost Estimates



Note: Cost calculations excluded the costs required for storage and salaries for onsite operators. The costs presented above include capital, O&M, routine monitoring and reporting. It was assumed that treated effluent water quality and monitoring requirements met the San Francisco On-site Non-Potable Water Use Guide

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Embedded Carbon Footprints



Note: Carbon footprints calculations assumed no onsite renewable energy supply as the worst case scenario. Also, embedded carbon footprint calculation is location specific and depends highly on local water supply portfolio.

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Case Study Project Location: Bay Area, CA

Office Building





Non-Potable Water Supply and Demand

					NAME AND POST OFFICE ADDRESS OF TAXABLE PARTY.
Capacit	ty, employees			3,600	
Functio	on		Office building with event space with green roof		
Status			Design		
Project	Location		Bay Area, CA		
Green I	Building Certif	fication		LEED	
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nual		Graywater	Wastewater	Blowdown water	Roof runoff
An	Demand		Su	pply	
	Water closet	U	rinals	Cooling	tower
	Irrigation	R	ainwater	Dry-we	ather runoff
	Graywater	■ W	/astewater	Blowdo	own water



Cost Estimate



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- Bottom-up approach to water supply will help increase our water reliability and make individual properties more drought prepared
- Residential homes:
 - Having graywater ready homes will help lower the implementation costs of graywater recycling
- For non-residential buildings:
 - A water budget analysis will be a useful tool to help make sound decisions.
 - In addition to quantity, the quality of non-potable water sources should also be considered.
 - Graywater could be a great non-potable resource for hotels.
 - Office buildings typically do not have enough non-potable water demand to consume all recycled water; thus offsite distribution of surplus to meet other offsite non-potable demand could be beneficial.





Thank You!

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