

# Welcome

# Graywater Irrigation

- High Flow Rate (2.0 GPH) / Low Filtration (40 Mesh / 400 Micron) graywater dripperline
- Design and installation considerations
  - Paul James  
Just Water Savers USA Inc.  
Just Water Savers (Australia) Pty Ltd  
1,000+ Installations; 5,000+ systems sold

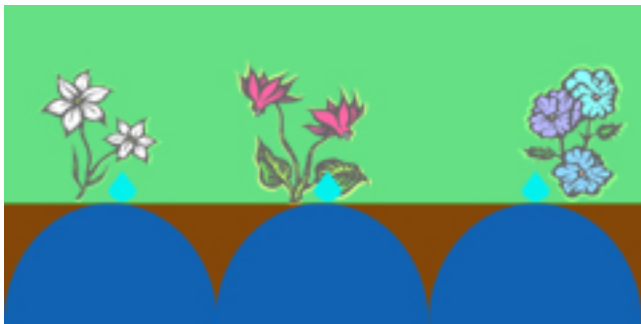
# Introduction to Graywater

- Graywater / Greywater / Gray water / Grey water
  - All household waste water with exception of Toilet water (Blackwater)
  - Kitchen water (legally and practically) requires treatment for re-use
- Greywater treatment / Non treatment
  - 25+ Gallons per person per day (750 gpmmonth)
  - Treated = Re-use for laundry / toilet, & garden
  - Diverted = Re-use for garden only

# Daily / Capillary Irrigation

## Twice per week irrigation

- Wet / dry / wet / dry



- 12" line spacing (typical)
- Watering plants, not soil
- Mulch preferred

## Daily irrigation

- Capillary action



- 36" (24" sand / 48" clay) spacing
- Watering soil, not plants
- Mulch required

# Daily / Capillary Irrigation (cont.)

## Twice per week irrigation

- 0.7 GPH emitters  
slow to avoid surf. runoff
- 150 Mesh filtration
- 1' dripperline / sq ft (avg)
- 2,000 GPMonth area x

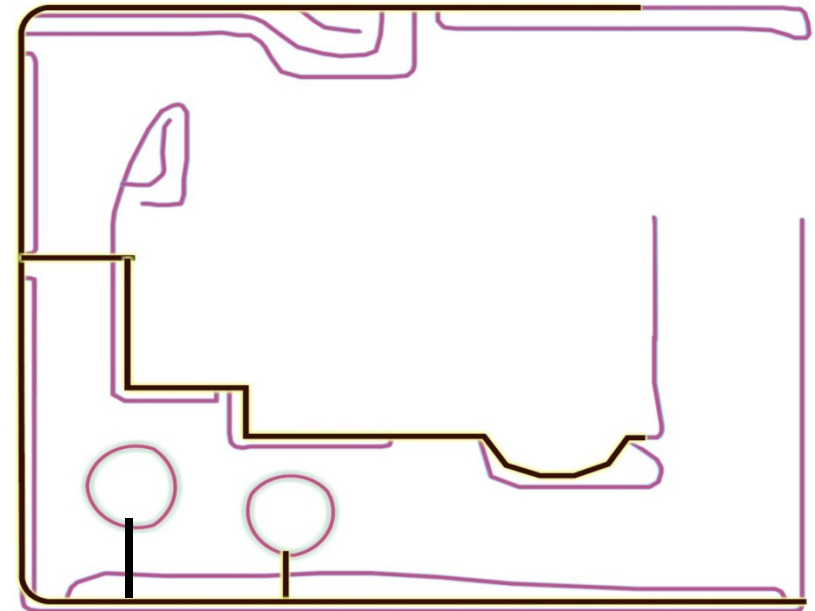
## Daily irrigation

- 2.0 GPH emitters  
soil receptive to water
- 40 Mesh filtration
- 0.3' dripperline / sq ft (avg)
- 3,000 GPMonth area x

# Irrigation Layout



— Supply Tube  
— Dripperline



— Supply Tube  
— Dripperline

- Supply tube vs. Dripperline
- 600' (1,800 sq ft approx.) maximum drip in one zone\*

# Capillary Implications

- Watering soil, not plants
  - Micro irrigation zones with own drip rate not applicable
  - Soil moist (cool to touch), not wet
  - Moisture in top 6" of soil, where 50% roots are located
- Wicking effect
  - Strip between curb & sidewalk irrigated solely by wicking under sidewalk
- Plant moisture transferral

# Evapo Transpiration

- Reversed calculation process
  - Known volume of water per month available
  - Calculate optimum irrigation area, **NOT disposal area**
- Factors include
  - ETo                      - Rainfall                      - Efficiency
  - Plant type              - Graywater volume              - No bare soil

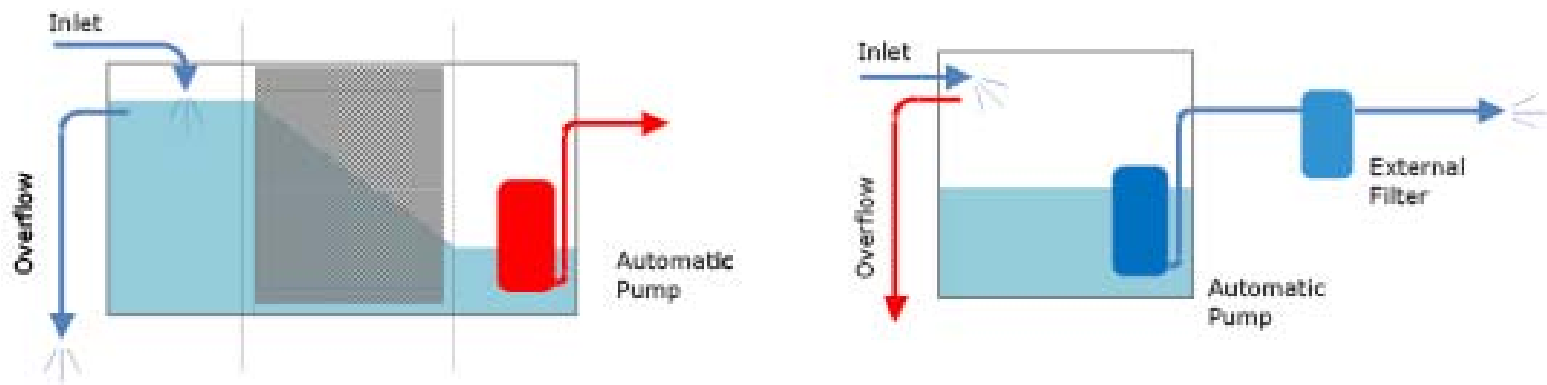
<b>ETo value (inches) for your area</b>	<b>6</b>	Inches	
<b>Rainfall (inches)</b>	<b>0</b>		
<b>Plant Coefficient</b>	<b>0.26</b>	Coefficient	
<b>Number of people in house</b>	<b>2</b>		
<b>Graywater, gallons per person, per day</b>	<b>25</b>	Gallons	
<b>Optimized Irrigation Area (sq ft)</b>	<b>1410</b>	Square Feet	

## 2.0 GPH flow / Pumping Design

- Typical minimum dripperline total = 150'
  - Irrigate 4 gallons per minute (20' pressure)
  - Irrigate 1 gallon per minute (1' pressure)
- Average dripperline total = 300'
  - Irrigate 8 gallons per minute (20' pressure)
- 20 gallon collection / pumping vessel large enough to avoid overflow loss
  - Filtration biggest cause of overflow

# 40 Mesh Filter / Pumping Design

- 40 Mesh (400 Micron) filtration
  - 3D filter cleaning period 1 – 6 months
    - Subject to graywater volume
    - (75 Micron would require cleaning almost every day)
  - Graywater loss from filtration



# Graywater ROI / Payback

## Santa Barbara

### Purchase

Pumping Unit (eg GRAYBarrel)	\$	585.00
IrrigRAY Dripperline Kit (eg IrrigRAY)	\$	425.00

### Installation

Dripperline Installation	\$	400.00
Plumbing retro fit or new home	\$	850.00

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**TOTAL INSTALLED COST** **\$ 2,260.00**

### Graywater potential

Number of residents		3
Water use per person per day (gpd)		60
<i>source AWWA (excl 9 g leak loss)</i>		
Graywater % of total water use		70%
Total graywater per day (g)		126
<i>Total graywater per month (g)</i>		<i>3780</i>

### Potable water irrigation saving

Assumed graywater dripperline efficiency		90%
Assumed potable water efficiency (deep watering)		60%
Irrigation efficiency increase factor		1.5
Equivalent potable water saved (gpm)		5670
Gallons per HCF		748.5
Total domestic water use (inside house)		5400
Equivalent HCF		7.21
Water Supply (after 4 HCF) charge, per HCF	\$	4.76
Service sewer rate, per HCF	\$	2.09
Potable water saving (gpm)		5670
Equivalent HCF		7.58
<i>Water &amp; Sewer saving (per month)</i>	<i>\$</i>	<i>51.89</i>

### Running costs

Assumed flow rate (1/2 full filter) (gpm)		6
Total water pumped, per month		3780
Run time, per month (hr)		10.5
Power Consumption (660w pump, uses 450w) (watts)		4725
Cost per Kilowatt Hour		\$0.11
<i>Monthly electricity cost</i>		<i>\$0.52</i>

### Economic Summary years

	<b>5</b>
Pump replacement (\$300 each 5 years)	0
Assumed operating months per year	9
Installation	\$ 2,260.00
Running costs (electricity)	\$23.39
Total cost	\$ 2,283.39
<u>Water &amp; Sewer Saving</u>	<u>\$ 2,554.67</u>
<i>Net Benefit</i>	<i>\$ 271.28</i>

### Economic Summary years

	<b>10</b>
Pump replacement (\$300 each 5 years)	\$300
Assumed operating months per year	9
Installation	\$ 2,260.00
Running costs (electricity)	\$46.78
Total cost	\$ 2,306.78
<u>Water &amp; Sewer Saving</u>	<u>\$ 5,815.14</u>
<i>Net Benefit</i>	<i>\$ 3,508.36</i>

### Note – Above table includes 5% pa rate increase:

New Home, subtract \$600 cost for irrigation system savings. Payback <3.5 years

- IRR 17% over 5 years, assume 5% annual rate increase. 29% IRR over 10 years
- Existing Home, subtract \$400 for dripperline installation (DIY). Payback 5 years.
- IRR 4% over 5 years, assume 5% annual rate increase. 12% IRR if DIY drip installed

# Further Information

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2.0 GPH / 40 Mesh Graywater Dripperline technical information

[www.irrigray.com](http://www.irrigray.com)

Graywater pumping systems

[www.graybarrel.com](http://www.graybarrel.com)

Graywater gardening concepts (beginner to advanced)

[www.graywatergardening.com](http://www.graywatergardening.com)

