



---

# Laundry-to-Landscape (L2L) Graywater Systems

Presented by:

Kat Sawyer, Tap the Sky

Jeff Parker, The Urban Farmer Store

San Francisco Public Utilities Commission

*Developed by: Laura Allen of Graywater Action*



# Welcome!

---

- Video from “Ask This Old House”
- Graywater overview
- Laundry-to-Landscape (L2L) overview
- Step-by-step how to build a L2L systems (SFPUC manual has all this info)
- Collect parts - start building!
- Sign-up for a free on-site consultation

## Natural Watershed



## Urban Watershed



We live in a watershed, we just don't know it.



# Being water conscious starts with **WATER CONSERVATION**

---

## 3 most water intensive activities in our homes:

- **Toilet flushing** – get low-flow toilet (SFPUC rebate)
- **Laundry** – front loading washers use half the water of top loaders
- **Landscaping** – watering outdoor plants is 1/3 of residential water use
- **Re-using water in the garden is important!**



# What is Graywater?

---

## It's water from...

- Showers and baths
- **Clothes washing machines**
- Bathroom sinks
- *Water from kitchen sinks is not considered graywater in CA*

## It's NOT from...

- Toilets or diaper wash water



# Graywater Can...

---

- Reduce water use by 16-40%
- Save energy used to transport, clean, and treat water
- Reduce strain on **SF's combined sewer system**
- Encourage healthy product choices
- Connect people to their backyards and show the benefits of re-using water
- Facilitate local food production



# Graywater Basics

---

- Graywater systems are not meant to be installed and then forgotten.
- They should be connected to your water use and plant needs.
- No ponding or runoff
- Cannot be stored more than 24 hours
- No spray
- Minimize contact
- Outlets must be 2” below surface

# Other Graywater Systems

---

Graywater systems that require a PERMIT:

- Graywater systems that collect graywater from showers, sinks and baths
- Plumbing is altered (cut into to drainage plumbing to access graywater)
- System includes a pump
- Building is larger than 1-2 units
- **L2L systems do NOT require a permit!**



# Down to Earth - Your Soil

---

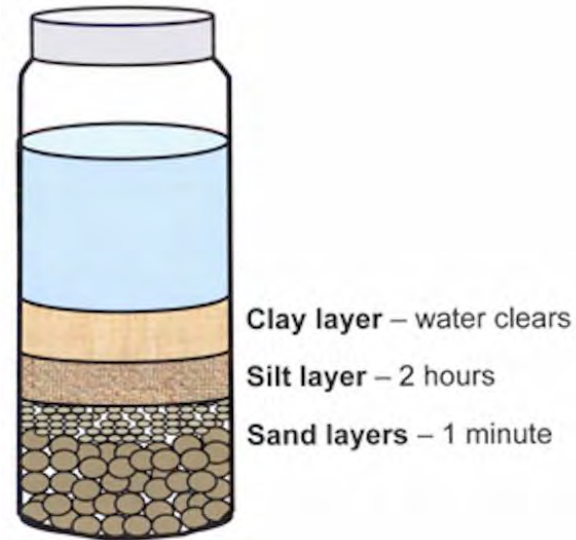
How quickly will water infiltrate your soil?

- Dig a 1 foot hole to see if groundwater seeps in
- Fill hole with water and measure how much will drain in 1 hour (must drain 1” per hour)
- Percolation test done after soil is saturated
- Protect groundwater – graywater should happen 3 feet above water table

# Analyze Your Soil Type

Soil can vary in different parts of your yard

- Jar Test



# Estimate Graywater flow

---

## Top Loading washing machine

- 30 – 50 gallons per load

## Front Loading washing machine

- 15 – 25 gallons per load

How many loads per week?

Laundry habits - all at once on the weekends or spaced throughout the week?

# Soaps and Products

---

## Things to avoid for happy plants

- Salt (sodium compounds)
- Boron (borate)
- Chlorine bleach (hydrogen peroxide bleach okay)

## Recommended products (salt and boron free)

- Liquid laundry detergent - Oasis, ECOS, soap nuts
- No powdered detergents!

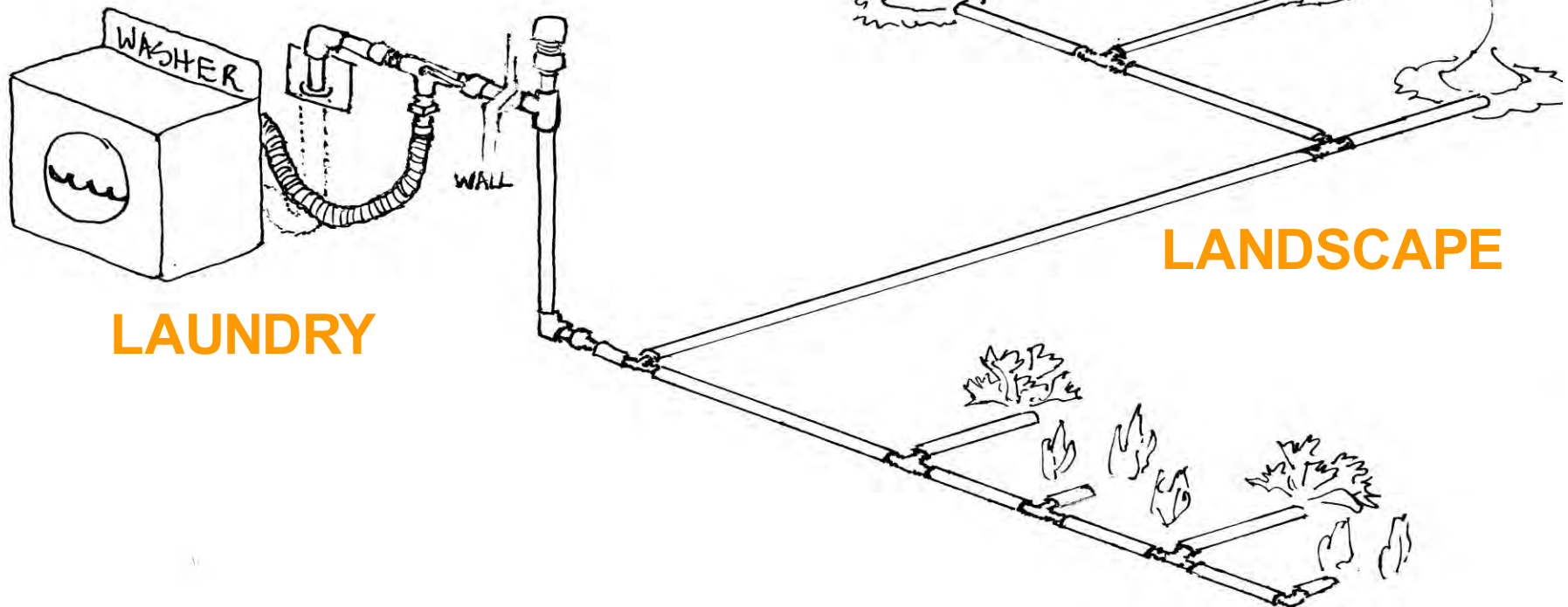
# Guiding Questions for your Design



- How can you maximize water savings with your graywater system?
- How can you increase the ecological productivity of your landscape?
- What do you want to irrigate?

# Laundry-to-Landscape (L2L)

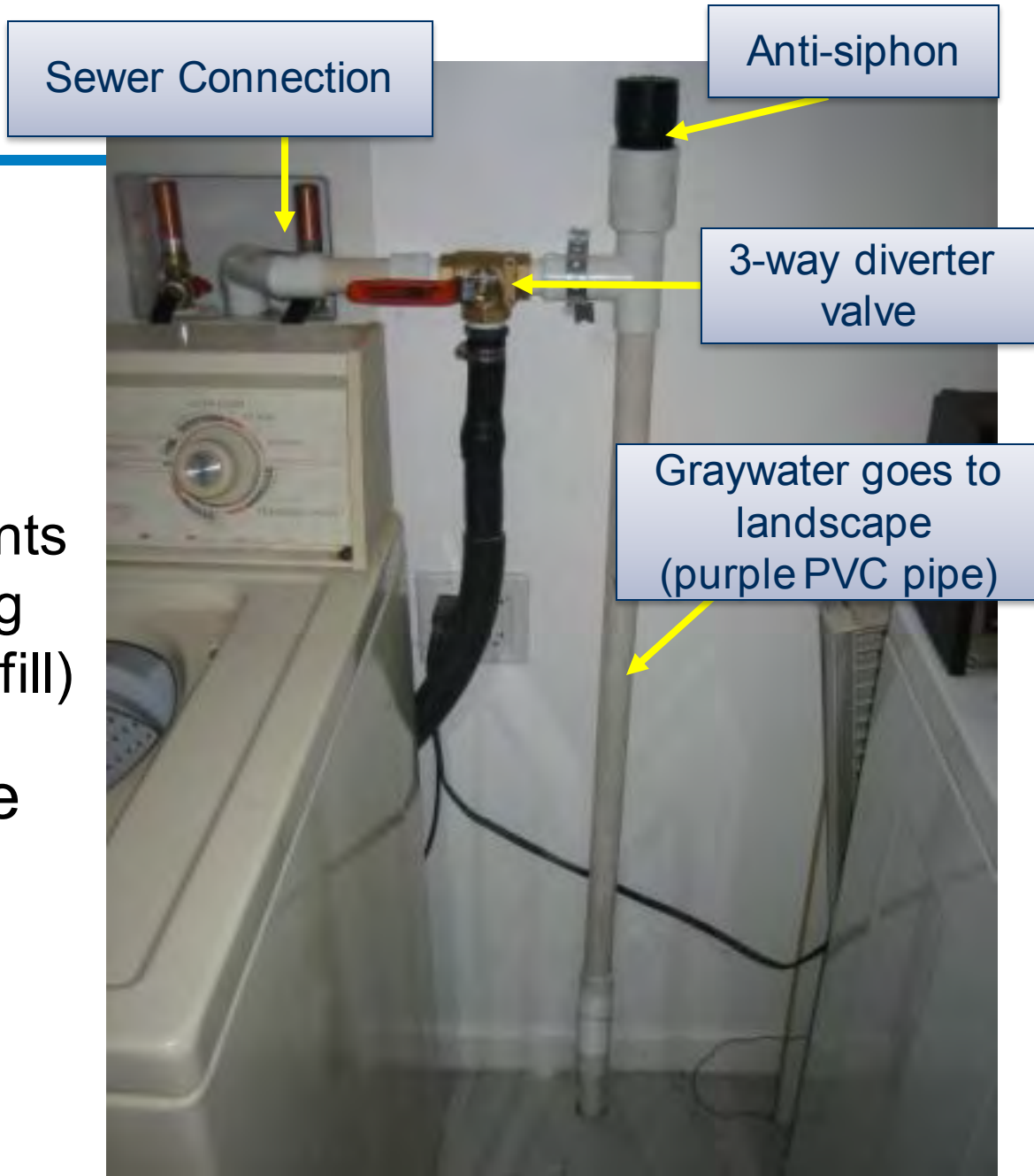
A L2L graywater system uses clothes washer water for **subsurface** irrigation and does not require a permit if guidelines are followed





- **3-Way Diverter Valve**

- “Auto” Vent (Prevents a siphon from draining machine as it tries to fill)
- 1” purple PVC pipe for conveyance to landscape

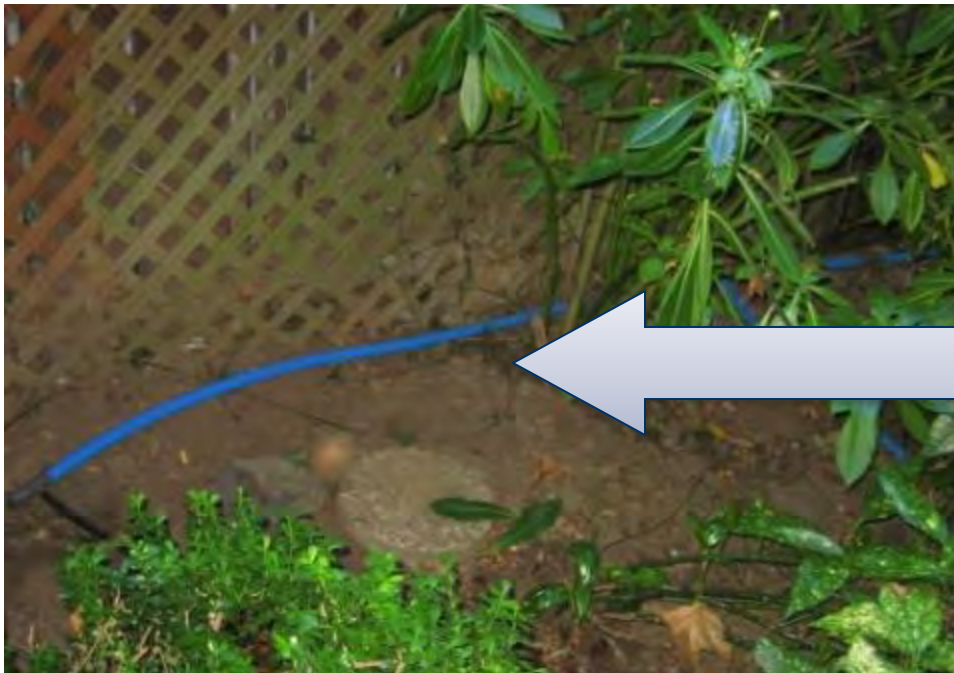


# In the Landscape

Trench, stake and bury  
tubing



or run tubing along  
walls or fences.  
Try to keep out of sun.

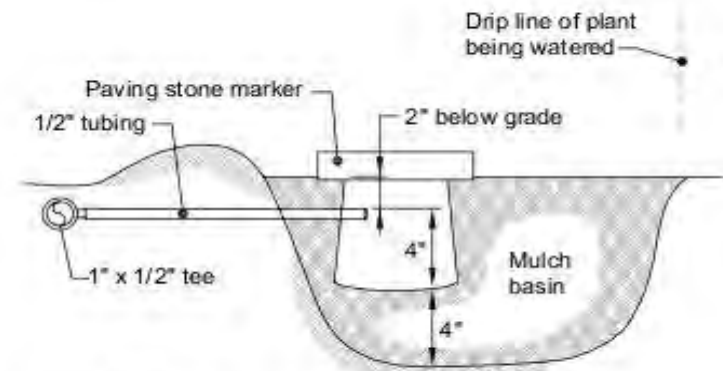




# Distribution Points



Code requires that you discharge graywater under 2 inches of mulch

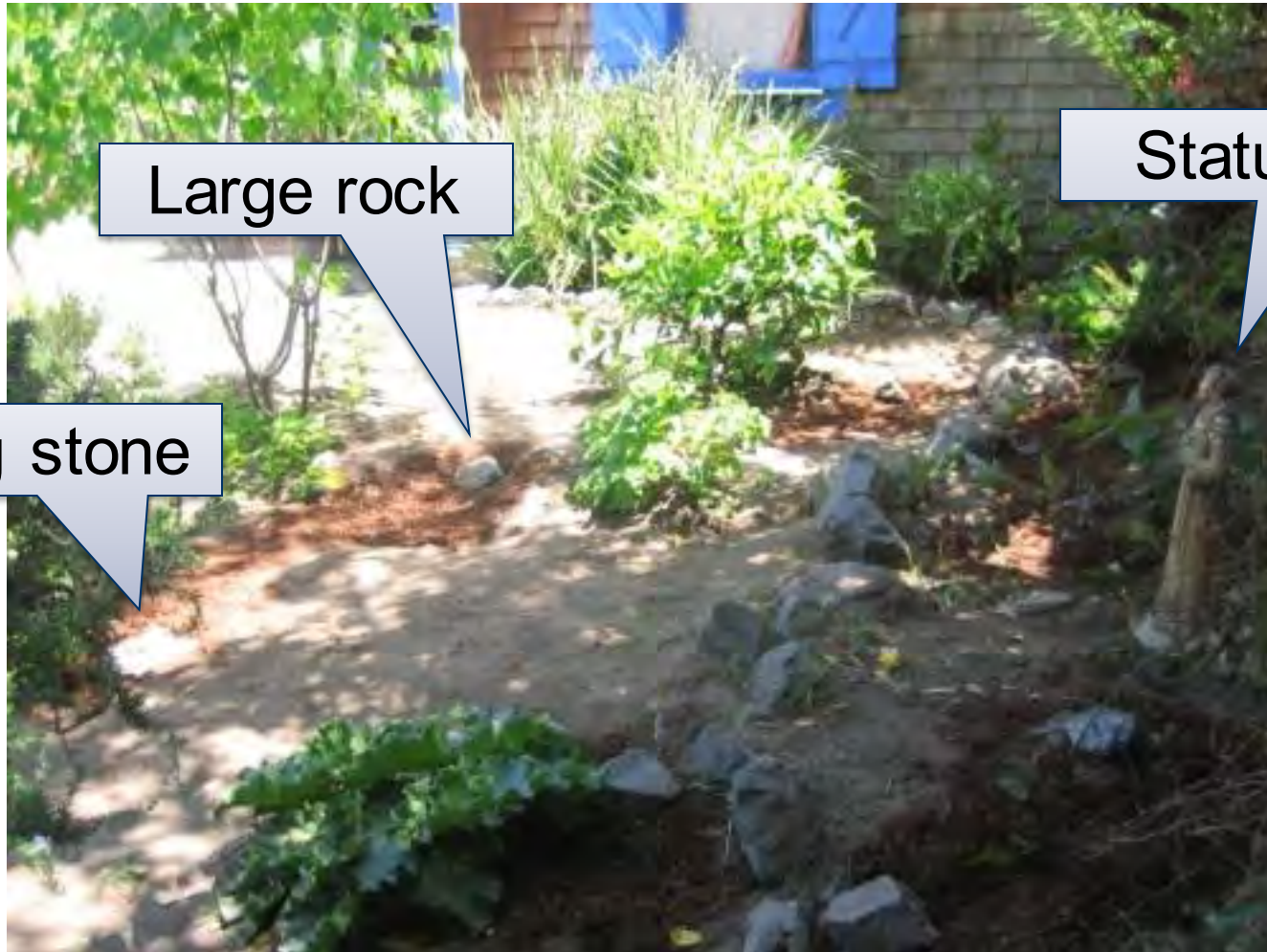


*Figure 4. Mulch shield placement.*



1/2 inch lines irrigate from the 1-inch mainline

# Hidden Outlets



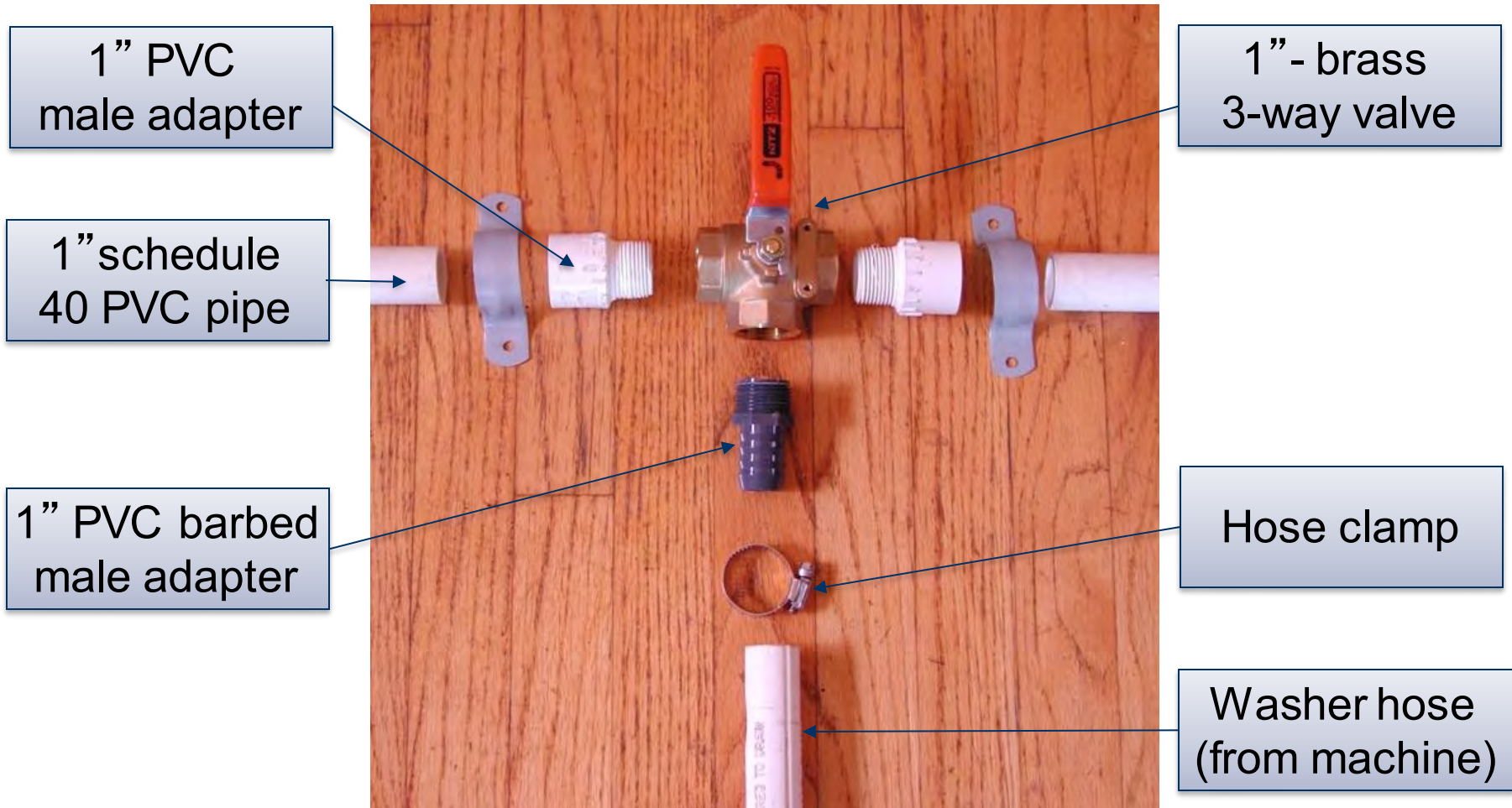
Large rock

Paving stone

Statue



# Step 1: Connecting the 3-way valve



# Teflon tape threaded fittings

Teflon tape helps prevent leaks.

- Wrap tape **CLOCKWISE** around threads.
- Wrap several times over threads.
- Don't “cross-thread” when screwing fitting into 3-way valve.
- Tighten with channel locks.



# 3-way Valve Configurations



1. 3-way Valve must be above “**flood rim**” of machine
2. Washer hose must connect to middle port
3. Use teflon tape on threads and glue on slip connections to make water-tight connections





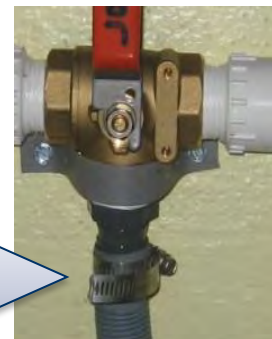
# For Tricky Sewer Connection



Clothes washer hose used to make connection into sewer standpipe

# Tips for Connecting Washer Hose

1. Select correct size adapter to fit the washer's hose (usually 1" but sometimes 3/4" and very rarely 1.25")
2. If difficult to slip hose over barb, heat hose with hair dryer or hot water, then forcefully push on
3. Secure with hose clamp



## Troubleshooting Tips for Connecting Washer Hose

If washer hose connection leaks (rigid hose)

- Connect with piece of vinyl tubing
- Tighten hose clamp, add 2<sup>nd</sup> hose clamp





## Step 2: Strap Pipe / 3-way Valve

- Use 2-hole straps or plumbers tape
- Add wood blocking as necessary (**screw into studs**)
- Strap so 3-way valve is secure



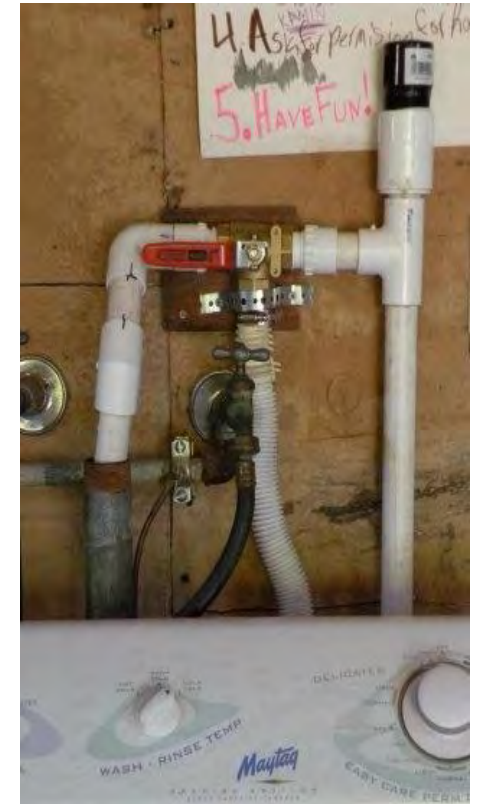
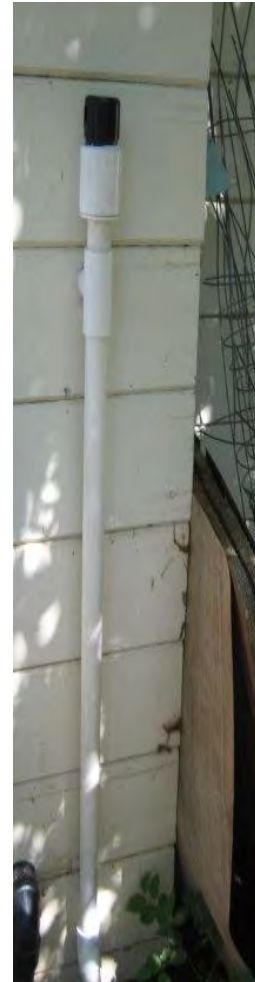
## Step 3: Drilling Hole for PVC Pipe to Exit (through the wall / floor)

---

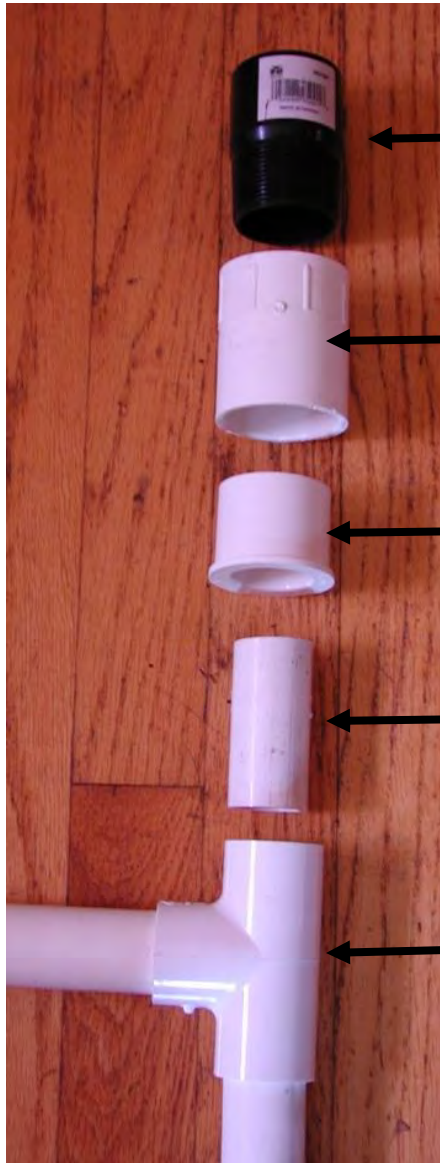
- Look for potential issues (electrical lines, gas pipes, etc.)
- Drill a 1/4" pilot hole
- If no obstructions, drill hole for 1" PVC with 1½" holesaw (drill from outside in and inside out for a clean looking hole)
- Use proper bit for your wall / floor (wood bit, stucco bit, etc.)

## Step 3: Anti-siphon Component

- An **anti-siphon** is used to prevent a potential siphon from forming and draining the machine as it tries to refill.
- Must be at **high point** of system **on pipe going to landscape**
- Must be accessible in case of leaks and for replacement
- Auto-vent is included in your L2L kit



# Assembling the Anti-siphon Component (purple PVC pipe)



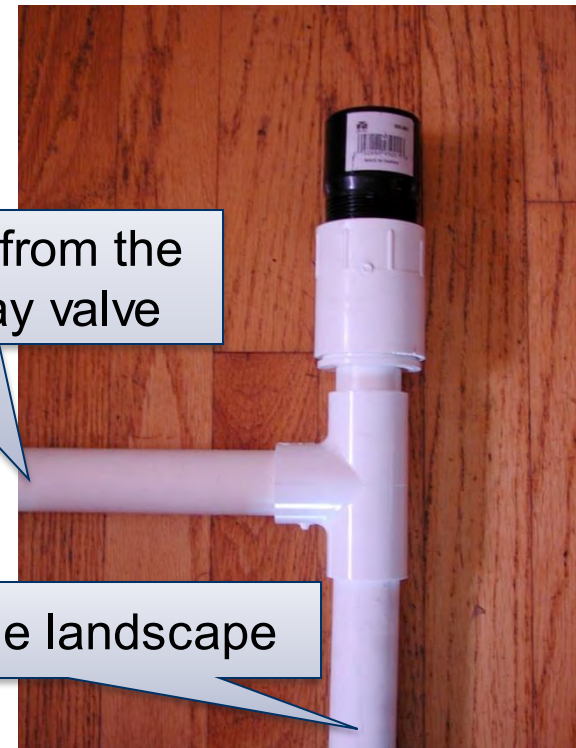
← Autovent (1 ½" threads)

← 1 ½" FPT (female pipe threads) by slip coupling

← Reducing bushing 1 ½" x 1" slip

← 1" schedule 40 PVC pipe

← 1" PVC tee



Flow from the 3-way valve

Going to the landscape

# Placement of Anti-siphon Valve

- High point
- Accessible / visible (not behind a wall)





## Step 4: Plumb to Hole

---

### Cutting PVC pipe:

- Use PVC cutters or handsaw
- Remember to calculate the length of pipe that will “slip” into the fitting when figuring your measurements
- Use as few fittings as possible to minimize friction
- Use **purple pipe** to indicate graywater

## Step 5: Plumb to Sewer Connection

### Gluing PVC pipe:

- Clean and dry pipe
- Apply glue to the inside of the fitting “hub” first
- Then apply glue to the outside of the pipe
- Push together quickly, inserting all the way. Twist and hold a second as it will try to push out



## Step 7: Label Pipe and 3-way Valve

- **Label pipe:** “Caution: Non-potable water, do not drink” (*UFS kit comes with 10’ purple pipe*)
- **Label valve:** show/diagram direction of graywater





## A tight fit!

- Stacked washer in closet - limited space



# Tricky Exits...





# Draw Your L2L System

---

Any questions about the inside portion of your system?

5 min break



# Outside Portion of a L2L System

---

- Determine graywater production
- Calculate plant water requirements
- Identify which plants you want to irrigate
- Plan the path of travel
- Prepare the landscape
- Comply with the code



# Estimate Graywater Production

1. Number of loads of laundry done each week?
2. Number of gallons per load?
  - Top loading machine uses  $\approx 40$  gallons/load
  - Front loading machine uses  $\approx 20$  gallons/load
3. Future changes?
  - New machine? Change in usage? Change in landscape?

***Weekly graywater produced = loads per week x gallons per load***

# Plant Water Requirements

---

## In San Francisco...

- A small-medium sized **tree needs about 10-20 gallons per week**
- A small-medium sized **shrub needs about 5-10 gallons per week**
- A drought tolerant shrub needs about 2-4 gallons per week

These are very rough estimates. Plant water requirements are affected by microclimate, sun and wind exposure, size and type of plant, ground water depth, etc. Get to know your plants!

# Plant Water Requirements

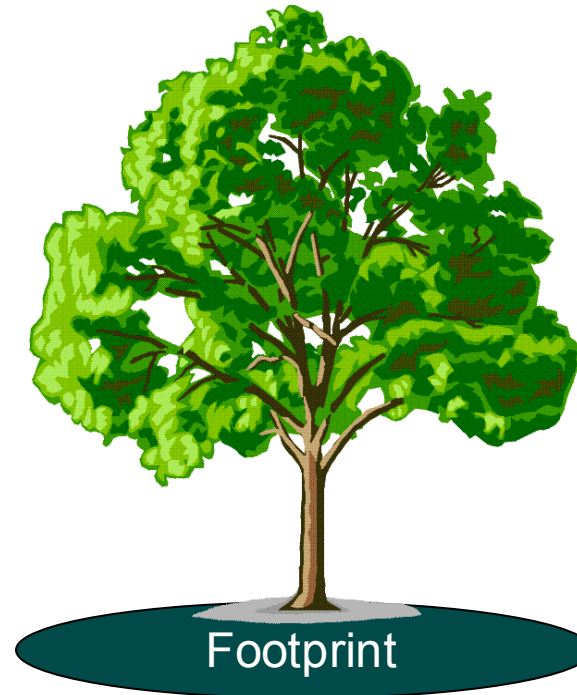
In San Francisco, a general rule of thumb:

- For each **square foot** of the plant's **footprint**; assume a weekly need of **1/4 gallon** water per week.

***This rule of thumb number is for peak irrigation time.***

*You don't need to irrigate this much most of the year.*

*Try and stay within 30% of this number.*



The footprint is the area beneath the canopy

# Finding Plant Water Requirements

How many gallons per week would a fruit tree need during peak irrigation season if it had a **4 foot radius**?

**Footprint = Area of a Circle**

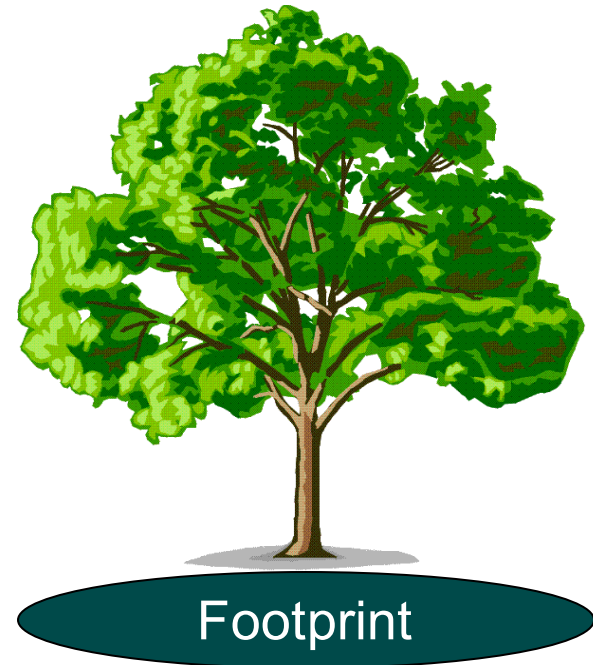
$$\pi r^2$$

$$3 \times 4 \times 4 = 48 \text{ square feet}$$

Divide by 4 (1/4 gallon of water per square foot of footprint)

$$48 / 4 = \mathbf{12 \text{ gallons per week}}$$
 during peak irrigation months

If it's a drought tolerant plant, divide by 2 again = 6 gallons per week





# Easiest and Hardest Plants to Water

## Easiest:

1. Trees (fruit trees are the best!)
2. Shrubs and bushes
3. Vines
4. Perennials
5. Large annuals

**Note about food crops:** *graywater can't touch the edible portion, so*  
***NO root crops***

## Hardest:

1. Lawns (no spray)
2. Drought established (eg. never irrigated)
3. Small plants
4. Sensitive plants (eg. ferns)
5. Raised beds

Plants with **larger root zones** do better with irrigation from the washer  
i.e. stay happy with laundry water use patterns

# Rank that plant

---



Good choice for a L2L system



Might be okay



Bad idea

# Potted Plants





# Pear Tree





# Meyer Lemon Tree





# Graywater to Vegetable Garden?



# Landscape Considerations

---

- Irrigate areas closest to the washer and **NOT uphill**
- Irrigate larger plants (trees, shrubs, perennials)
- Washer type:
  - Top-loading machines: up to 16 outlets possible (or less!)
  - Front-loading (or top high-efficiency) machines: 8 outlets possible (or less)
  - **You may only have 3 or 4 zones to irrigate**

# Setbacks for Irrigation Fields

---

- 2 ft from buildings
- 1.5 ft from property lines
- 100 ft from wells or creeks
- 5 ft from septic tank
- 4 ft from leach field
- 3 ft above groundwater table



# What Plants Will You Irrigate?

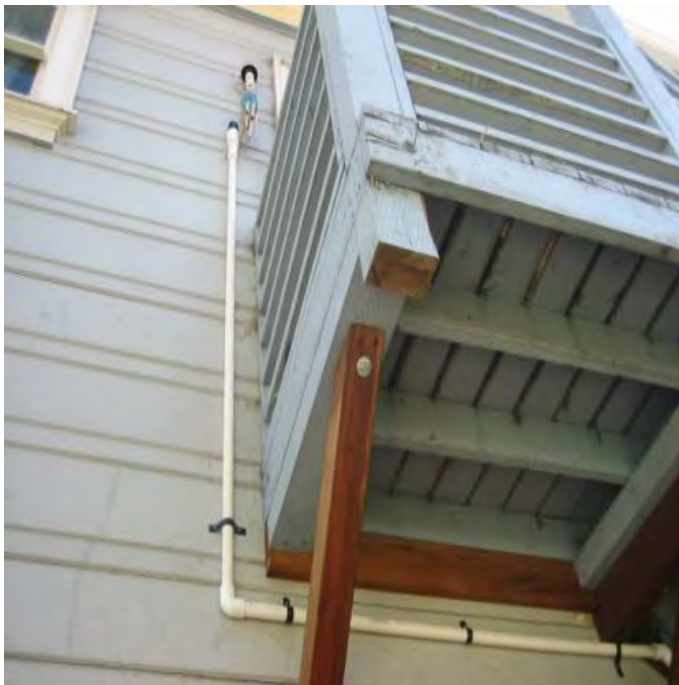
---

Consider:

- Gallons per week of graywater
- Plant water requirements
- Choose what plants you'll irrigate
- For those with existing irrigation systems, try and find a zone you can shut off and replace with graywater

# Piping to the Landscape

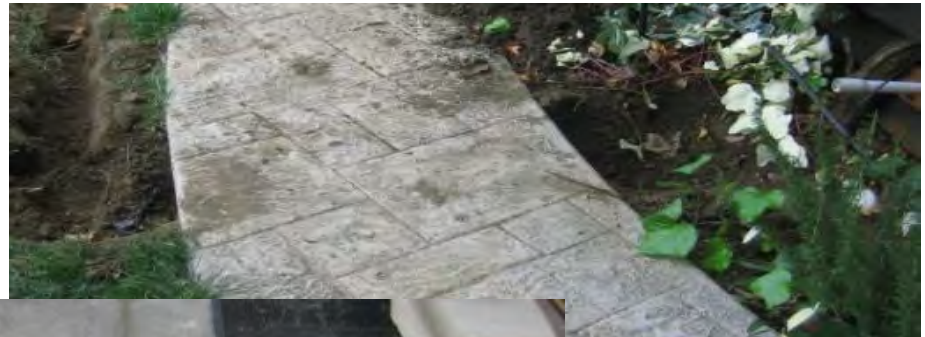
- Pipe around obstacles
- Try to maintain a downward slope whenever possible





# Hardscape

Go under it  
Go around it  
Remove it  
Cut a strip of it



# Slope Considerations

---

## Be mindful of the washing machine pump!

- In a **flat yard**, distribution should be within **50 feet**
- If site slopes downward to distribution points, no rule on distance
- Serpentine tubing to slow graywater flow on downhill slopes
- **Leave a 1” open end to protect the machine's pump**

*If the distribution points are uphill, a L2L graywater system is NOT recommended.*

# Dig Trench and Lay Tubing to Basins



Keep tubing out of the way, and out of sunlight. Stake down as needed



# Downward Slope

Serpentine the tubing on a downward slope, to slow water flow.

Irrigate on upper side of plant

Don't plug the end!





# Cut in 1½-inch Tees Add ½-inch Tubing as Needed



## Tips for working with tubing:

- \*No kinks (cut them out)
- \*Dip end of tube in hot water to soften plastic
- \*Minimize ½ inch tubing



# Mulch Basins

- Size basins so all graywater soaks in with **no ponding**.
- Dig in “**drip line**” of plant - where branches (& roots) end
- **Size depends on quantity of graywater and soil type**
- In **clay soil**, approximately **1 square foot of basin is needed per 1 gallon of graywater (daily)**
- In **sandy-loam** approximately **1/2 square foot of basin is needed per 1 gallon of graywater (daily)**



# Mulch Basins

---

- Basins can be any shape, typically they are:
  - circular (around tree)
  - semi-circle (around 1 side of plant)
  - trench (in front of plants)
  - star (radiate out from the middle)
- Clay soils require larger mulch basins
- Sandy soils can have smaller mulch basins
- Place them where it's convenient
- Put basins between plantings so plants can share irrigation water



# A Point of Clarification

---

- Use WEEKLY graywater production to decide how many plants to water.
- Use DAILY MAXIMUM FLOW and soil conditions to determine size of mulch basins.



# Mulch Basin Construction

*Example: Clay-rich soil, circular basin  
3 loads of laundry (on Saturdays)  
Lots of graywater in one day  
(clay soil needs 1 sq ft basin / gal)*

20 gallons per load to water 6 trees.  
3 loads x 20 gal / load = 60 gallons  
60 / 6 trees = 10 gallons per tree

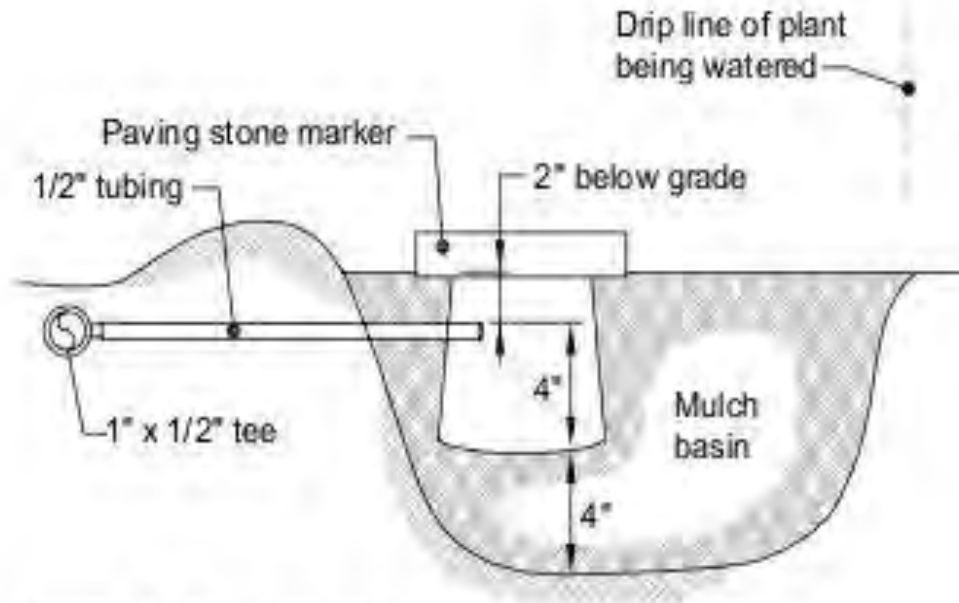
*Each tree needs at least 10 square feet of basin.*

**This example basin is BIG - 24 sq feet  
For clay soil with weekend laundry use**

**(circumference =  $2\pi r$ )  $2 \times 3 \times 4 = 24$  sq ft**



# Mulch Shield: Prevents Roots from Clogging Outlets



*Figure 4. Mulch shield placement.*

Image from SFPUC Graywater Design Manual



# Mulch Shields

Use small “valve box”

Drill hole for graywater  
tube 2” below top

Basin should be 3-4” deeper than  
mulch shield so graywater falls  
through air onto mulch



MULCH LAYER

Or ready-made round shield



# Test and “Tune” System

- Insert temporary *“female hose thread by barbed”* connection
- Connect to garden hose to test system (remove and connect to tubing after testing)
- **Or simply run a wash cycle and fine-tune tubing when washer is draining**



# Avoid Clogs

- **Use full port valves** (that have large orifice inside)
- Minimize use of ball valves
- Open outlet is best
- Check for clogs when valves are used





# Follow-up

---

- Bury tubing
- Check for leaks inside
- Paint exposed PVC pipe
- Caulk holes
- **Post sign / diagram**
- Post maintenance manual
- Get graywater friendly soap
- Finally, do laundry and water plants!

## Follow-up (cont' d)

- Paint PVC pipe to protect from UV
- Seal hole with Sikaflex





## Do's

- Have a **3-way valve**
- **Label system**
- **Discharge under 2"**  
mulch/rock/cover
- Direct water to irrigation  
or disposal field
- Minimize contact
- Document set-up
- Create a maintenance  
manual

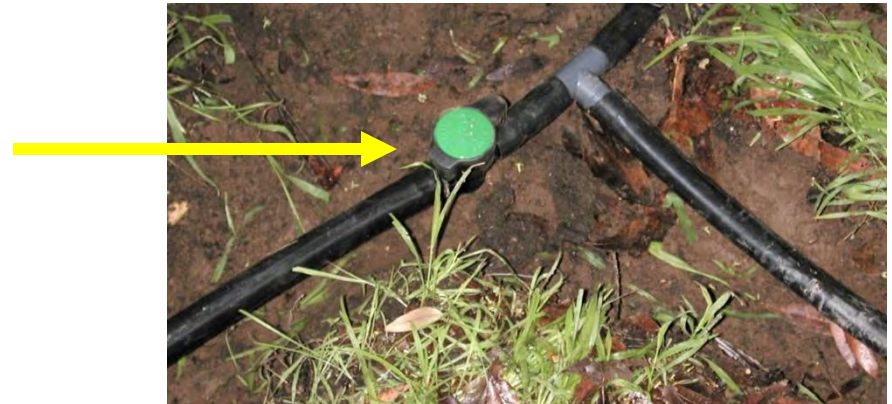
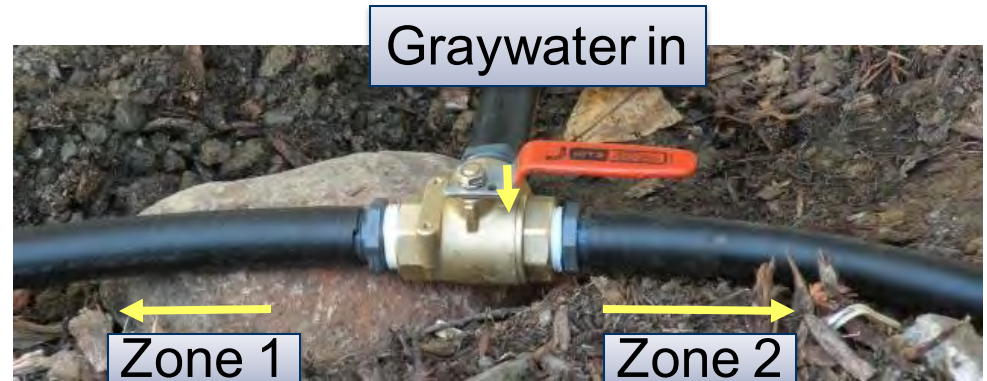
## Don'ts

- Ponding or runoff
- Discharge into neighbor's  
yard (follow setbacks)
- Connect to potable water  
supply
- Include a pump
- Alter existing plumbing
- Use diaper wash water or  
hazardous chemicals (oily  
rags, etc.)
- Violate codes/laws

# Two-zone Graywater System

**For a house that produces lots of graywater...**

- A 2<sup>nd</sup> 3-way valve in the landscape creates zones.
- Must be switched manually.
- Additional 1" line can be controlled with 1" ball valve to shut off or reduce flow.



# Key Points for L2L System

---

- From washing machine only
- 3-way valve installed above flood rim of washer
- Needs 1" PVC pipe (purple), 1" and 1/2" flex tube
- Anti-siphon used (auto-vent) at high point *on landscape side*
- No graywater storage
- Use large, chunky woodchips (mulch) in basins
- 1" open end in systems
- No additional pump



## Sketch the Outside Portion of your L2L System

---

Write down materials you'll need and lengths of pipe and tubing:

Will you need any extra 1" x 1" x 1" tees?

How many 1" x 1/2" tees will you need?

Remember, the end of the tubing will be fully open and located in a mulch basin to irrigate a plant





# Current Services & Incentives

- Free indoor/outdoor Water-Wise Evaluations
- Free showerheads, aerators, pre rinse spray valves, toilet leak detection tablets & repair parts
- Free residential toilet and urinal replacement program
- Commercial and residential clothes washer rebates
- Commercial equipment rebates and grants
- Rain barrel and cistern discounts
- Discounted laundry-to-landscape graywater kits
- Large landscape technical and grant assistance
- Community garden irrigation grant program
- Gardening classes and workshops
- “Our Water” curriculum, presentations and field trips for schools
- Free gardening and plumbing guidebooks



# Technology and Tools

- Expanded leak alert program
  - Account holders, occupants and property owners of single family homes now notified by email, text, robo call, and letter about constant water use over 7.48 gallons (1 cubic foot) for 3 or more days. Irrigation multi-family and commercial alerts under evaluation.
- MyAccount online portal – hourly water use data now available!
- Customers can now apply online for some conservation programs, more to be added.



SFPUC 1of4: \*\* SFPUC LEAK ALERT - NOTICE #1 \*\* Our data shows nonstop water use of at least 15 gal/hr at 221 3rd Av. This may mean you have a

2of4: plumbing leak. Log onto [MyAccount.sfwater.org/?ID=9710400580170802](https://myaccount.sfwater.org/?ID=9710400580170802) to check for unusual increases in water use and visit

3of4: [sfwater.org/homeleaks/?ID=9710400580170802](https://sfwater.org/homeleaks/?ID=9710400580170802) for tips. For questions call (415) 551-3000 weekdays 8-5 or email

4of4: [customerservice@sfwater.org](mailto:customerservice@sfwater.org). Thank you.

Wed 3:08 PM



# Thank you for Participating!

---

- Do you have additional questions specific to your installation? **Sign-up for a free in-home consultation!**
- Need tools? **Check out a tool kit**
- Share your L2L installation with us! We're interested in hearing about your experience with a L2L graywater system. Send feedback and photos to: **landscape@sfgwater.org**



# Thank you for Participating!

**For follow-up questions and scheduling home visits, contact Kat Sawyer at:**



[kat@tapthesky.org](mailto:kat@tapthesky.org) / (cell) 415.424.1120