Laundry-to-Landscape (L2L)
Graywater Systems Presentation
Slides
San Francisco Public Utilities Commission
Welcome!

This L2L training presentation has 3 sections that detail the following:

- Graywater Basics
- L2L indoor portion
- L2L outdoor portion
Natural Watershed  Urban Watershed

We live in a watershed, we just don’t know it.
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!
How quickly will water infiltrate your soil?

- Dig a 1-ft hole to see if groundwater seeps in
- Fill hole with water and measure how much will drain in 1 hour (must drain 1”/hr)
- Percolation test done after soil is saturated
- Protect groundwater – graywater should happen 3 ft above water table
- 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.
L2L System Essential Components

- **3-Way Diverter Valve**

- **Anti-Siphon valve**
  (Prevents a siphon from draining machine as it tries to fill)

- **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

½ inch lines irrigate from the 1-inch mainline
Hidden Outlets

- Large rock
- Paving stone
- Statue
Any Questions?

Review time for Section 1 - Graywater Basics

The next section will focus on the indoor portion of the L2L installation…
Step 1: Connecting the 3-way valve

1” PVC male adapter
1” schedule 40 PVC pipe
1” PVC barbed male adapter
1”- brass 3-way valve
Hose clamp
Washer hose (from machine)
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, but do not overtighten!
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\textsuperscript{nd} 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 4: 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)

1. **Autovent (1 ½” threads)**
2. **1 ½” FPT (female pipe threads) by slip coupling**
3. **Reducing bushing 1 ½” x 1” slip**
4. **1” schedule 40 PVC pipe**
5. **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 5: 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 6: 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”
- **Label valve**: show/diagram direction of graywater
A tight fit!

- Stacked washer in closet - limited space
Tricky Exits…
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 ≈ 40 gallons/load
   - Front loading machine uses ≈ 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!
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.*
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)

$$48 / 4 = \textbf{12 gallons per week}$$ 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
Best plants for GW?

Which of the following types of plants are best suited for graywater?
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
• 18-inches 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.
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

\( \text{circumference} = 2\pi r \) \( 2 \times 3 \times 4 = 24 \text{ sq ft} \)
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

Or ready-made round shield
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!
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't's

• 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 2nd 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 ½” 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

Indoor Assistance
• Free water-wise evaluation phone consultations
• Water-saving device distributions (showerheads, shower timers, aerators, hose nozzles, toilet parts, pre-rinse spray valves, etc.)
• Free toilet & urinal replacement program
• Commercial & resi clothes washer rebates
• Commercial equipment rebates

Outdoor Assistance
• Landscape plan review and certification
• Free irrigation & landscape phone consultation evaluations
• Rain barrel and cistern rebates
• Laundry-to-landscape rebates
• Large landscape tech assistance & grants
• Community garden irrigation grants

Education & Outreach
• School curriculum, presentations, field trips
• Gardening, plumbing and leak guidebooks
• Social media and regular outreach

Water Use Tools & Resources
• Check your water use - MyAccount Webpage
• Leak alerts
• Water waste alerts and follow up
• Expanded Leak alert program
  • Account holders, occupants and property owners of single family, multi-family, and irrigation customers now notified by email, text, robo call, and letter about constant water use over 7.48 gallons for 3 days or more.
• MyAccount online portal – hourly water use data now available!
• Customers can now apply online for some conservation programs, more coming soon!
Thank you for Participating!

For follow-up questions contact us at waterconservation@sfwater.org or by calling 415.551.4730

When you are ready to apply for your Laundry-to-Landscape Rebate, visit Save Water Outdoors | SFPUC