

GRAYWATER



FOR CALIFORNIA NATIVE GARDENS



What is graywater?

- Water from sinks, showers, and laundry tub
- No water from toilets (black water)
- No water from kitchen sinks (food particles)
- No water from laundry if used to clean diapers
- No water containing any harmful chemicals, including bleach

California code identifies 3 systems

- Clothes Washer System
- Single Fixture and Simple Systems
- Complex Systems

CA Code Highlights

- No permit required for washing machine system (Don't alter house plumbing & follow guidelines)
- Discharge depth raised to 2 inches from 9 inches
- Mulch basins allowed for distribution
- Edibles okay- no touching edible portion of crop
- Two tiers of systems "simple" (under 250 gpd) and "complex" (over 250 gpd)
- Location of irrigation zone rules:
 - 2 feet from building
 - 1.5 feet from property line

Don't confuse graywater with rainwater



Graywater

- Produced all year long
- Small tanks, if any
- Only hold < 24 hours
- Not for some vegetables
- Salts can build up from soaps unless flushed
- 29,000 gallons / six months for four people and all hookups
- Permits required for larger systems

Rainwater

- Produced in wet season and held until dry season for landscapes
- Large tanks
- Pure, great for all vegetables
- 25,000 gallons for 1500 sf house and 18" of rain per year
- No permits required except for electrical & grading



Where can you use graywater in the landscape?

- Fruit trees & vines
- Veggies-edible part can't touch GW
- Perennials, shrubs, groundcovers, and lawns (complex systems)
- Not on root vegetables
- Not on seasonally planted annuals
- Not in the house, yet

The simplest system is the best

Fewer parts
Least maintenance

This is the only system that
doesn't require a permit

Laundry
to
Landscape

“Laundry To Landscape”

- No permit needed
- Your washing machine has a pump!
- How much water can I get?
- What kinds of plants can I irrigate?
- What kinds of soaps can I use?

Follow these simple
graywater guidelines

“Do’s”

- Be able to easily switch back to sewer
- Discharge under 2" mulch/rock/cover
- Direct water to irrigation field (no storing more than 24 hours)
- Label your system
- Have a maintenance manual
- Minimize contact with humans and pets

“Don’ts”

- Have ponding, spray or runoff
- Discharge into neighbor’s yard
- Connect to potable water supply
- Include a pump (more room for error)
- Violate other codes/laws
- Damage building
- Use diaper wash water or hazardous chemicals (oily rags, etc.)

Before you put graywater into
your landscape, test your
drainage.

Percolation Test



Dig a hole and prefill it if the soil is dry

Fill your hole with water





Measure how fast it drains. This soil drained 2 ½" per hour.

This is what it looks like





Stacking washer - inside

Air gap at highest point - outside



Tighten all connections

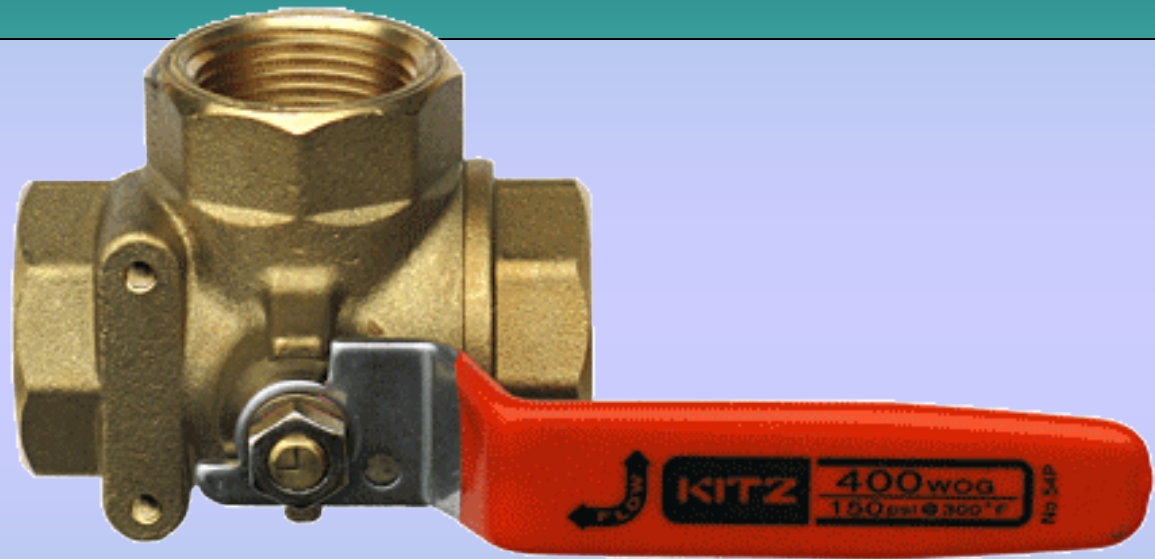


Leaks are not good.

Decide where the 3-way goes



3-way valve



Easily switch from the sewer to the garden.

Inlet is always in the middle.

Cut the PVC pipe



Cut a hole in the exterior wall

Seal it with silicone later



Because this is the highest point, put the air gap assembly here.

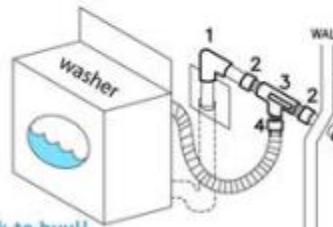
Run a PVC line out of the house



This is from the 2nd story

Diagram of system

Laundry to Landscape Greywater System Kit *Blu-Lock fittings*

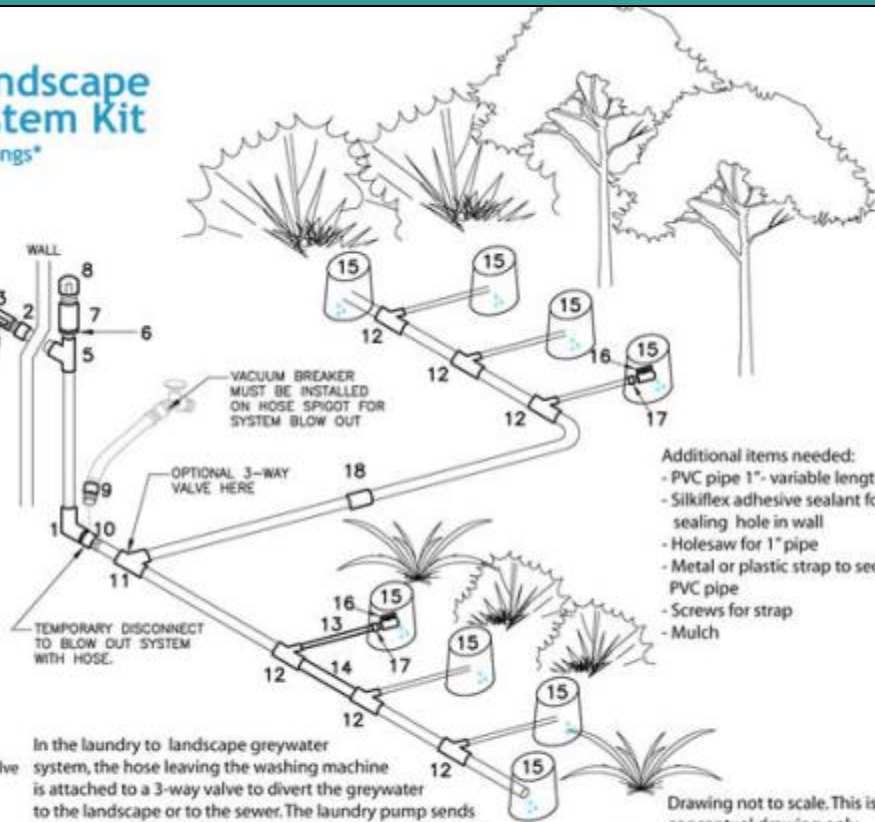


Click to buy!!

- (1) 2- PVC 1" 90 Elbow
- (2) 2- PVC 1" Male Adapter (S x MPT)
- (3) 1- Brass 1" 3-way valve
- (4) 1- Barbed 1" Male Adapter (MPT)
- (5) 1- PVC 1" Tee
- (6) 1- PVC 1.5" x 1" Reducing Bushing (5x5)
- (7) 1- PVC 1.5" Female Adapter (FPT x Slip)
- (8) 1- Auto-vent or Air Admittance Valve 1.5"
- (9) 1- Barbed 1" Female Hose Thread Adaptor
- (10) 1- Barbed 1" Adapter (BxS)
- (11) 1- Blu-Lock 1" Tee
- (12) 6- Blu-Lock 1" x 1/2" Reducing Tee
- (13) 10 ft- Blu-Lock 1/2" Tubing
- (14) 50 ft- Blu-Lock 1" Tubing
- (15) 8- Underground Emitter Box
- (16) 2- Blu-Lock Compatible 1/2" Threaded Ball Valve
- (17) 2- Blu-Lock 1/2" Male Adaptor
- (18) 1- Blu-Lock 1" Coupling

Included in kit but not shown:
20- U-shaped wire hold-downs (stakes)
1- PVC Cement - Gorilla 4 ounce
1- Teflon tape 1/2"

www.cleanwatercomponents.com



In the laundry to landscape greywater system, the hose leaving the washing machine is attached to a 3-way valve to divert the greywater to the landscape or to the sewer. The laundry pump sends greywater to valve box outlets in the landscape where adjacent plants are watered. This system is low cost, easy to install, and gives great flexibility for irrigation. In most situations this is the number one place to start when choosing a greywater system! Read more here.

Additional items needed:

- PVC pipe 1"- variable length
- Silkfiflex adhesive sealant for sealing hole in wall
- Holesaw for 1" pipe
- Metal or plastic strap to secure PVC pipe
- Screws for strap
- Mulch

Drawing not to scale. This is a conceptual drawing only and not to be used for construction

 clean water components
YOUR SOURCE FOR WATER-WISE SUPPLIES

Courtesy of Clean Water Components

PVC 1" Male Adapter



Thread into the 3-way valve ends using teflon tape.

Teflon tape



Wrap every pipe threaded fitting, 3-4 turns clockwise.

Barbed 1" Male Adapter (MPT)



Threads into the 3-way valve and inserts into the washer hose.

PVC & couplings



Gorilla glue alternative to PVC glue and primer is a more ecological choice.

Auto-vent



Place at the highest point of the system (above the “flood rim of clothes washer”).

Connect the adapter and reducing bushing



+



+



Simple way to test the system



Always use a hose spigot vacuum breaker to avoid mixing greywater with domestic water when testing or blowing out system



Attach barbed 1" female hose thread adapter to your garden hose, to test or clean your greywater system

Barbed 1" adapter (BxS)



Attach the PVC to the Blu-lok pipe

1" Blu-lok pipe & fittings



Blu-lok pipe can be used with barbed fittings or locking Blu-lok fittings (which don't come off).



Connect the 1" pipe and reducing tee to the 1/2" pipe



1" pipe

+



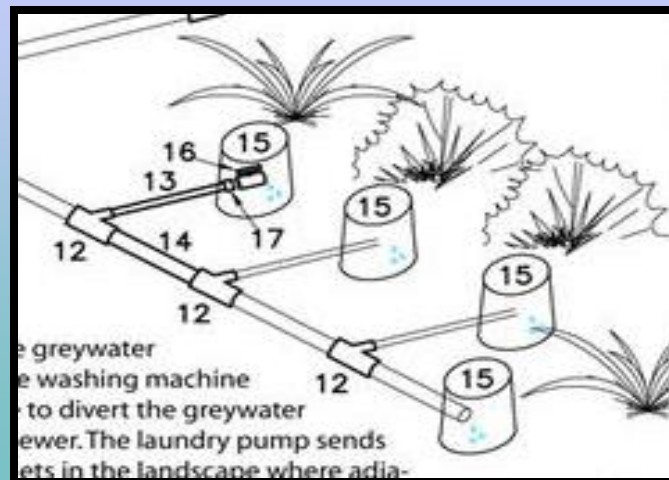
Reducing tee

+



1/2" pipe

Place a tee wherever you want water to come out. You can add 1/2" tubing to send water to a mulch basin off the 1" line



Barbed 1/2" Green-back valve



Adjust the flow of first few 1/2" outlets. Check here for potential clogs.

Connect the PVC to 1" black poly tubing



Flexible polyethylene irrigation tubing is a better environmental choice.

Dig trenches for the pipes



They don't have to be deep; you just don't want anyone to trip over them.

Dig mulch basins about 12" deep.
If your soil percolates slowly, make them wider.

This is a basin to hold the surge of water and sink it into the ground.



Laying pipe

Ornamental bed
With mulch basin
shields



Use 1" x 1/2" barbed tee emitters.
Don't cap the end.



This prevents clogging by lint . . .or pennies

Send emitters to mulch basins



Check the flow rates. Add little ball valves on some emitters to adjust the rates.

You can also use Blu-lock pipe and fittings



It works!



Mulch basins

Flow splitter register

empty 1 gal plastic pot covered with stepping stones allows access to double ell for cleaning without knocking dirt or leaves in (the most common way to disturb the flow)

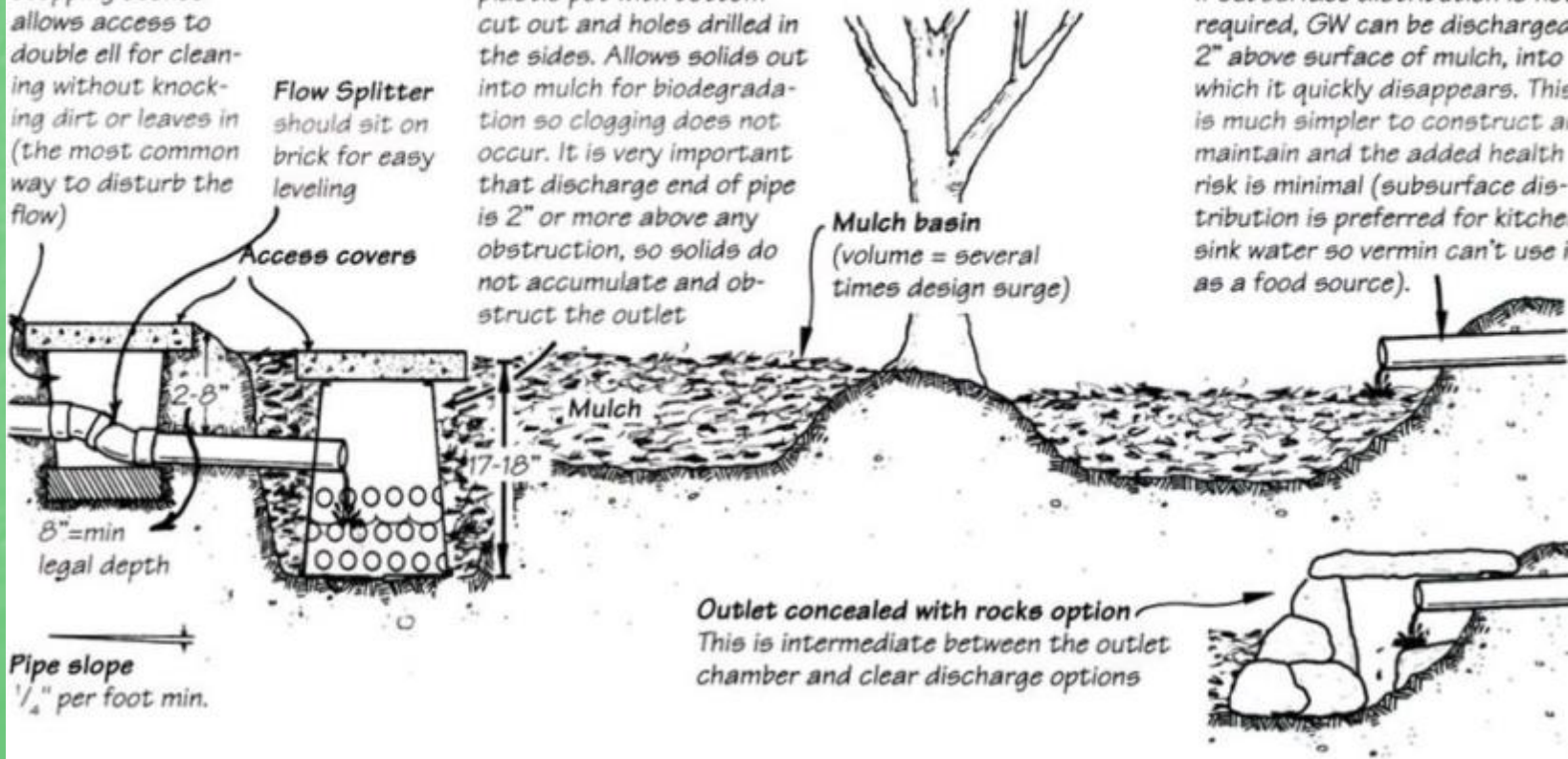
Flow Splitter should sit on brick for easy leveling

Outlet chamber option

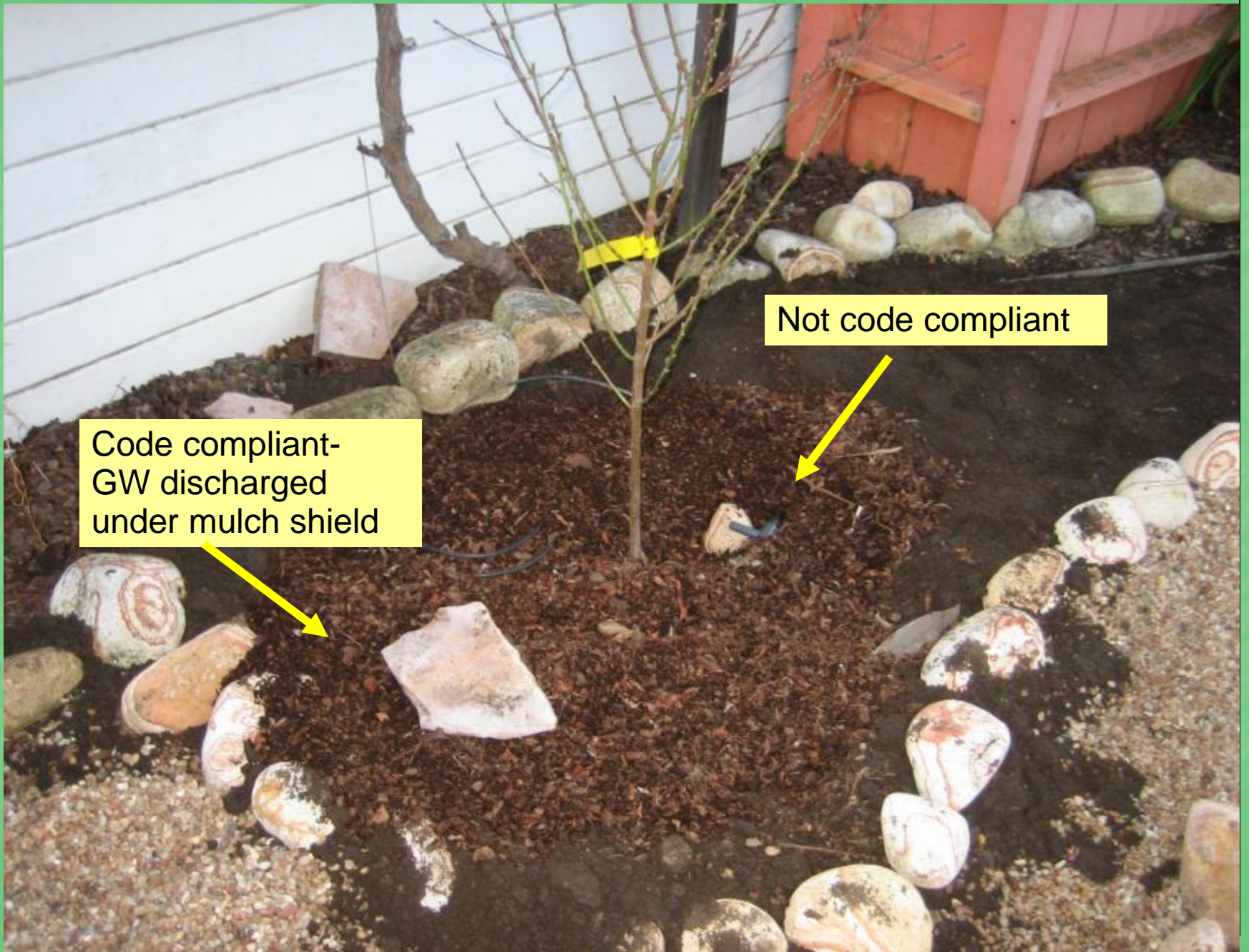
upside-down, empty 5 gal plastic pot with bottom cut out and holes drilled in the sides. Allows solids out into mulch for biodegradation so clogging does not occur. It is very important that discharge end of pipe is 2" or more above any obstruction, so solids do not accumulate and obstruct the outlet

Clear discharge outlet option

If subsurface distribution is not required, GW can be discharged 2" above surface of mulch, into which it quickly disappears. This is much simpler to construct and maintain and the added health risk is minimal (subsurface distribution is preferred for kitchen sink water so vermin can't use it as a food source).



Pipe slope
1/4" per foot min.



Code compliant-
GW discharged
under mulch shield

Not code compliant

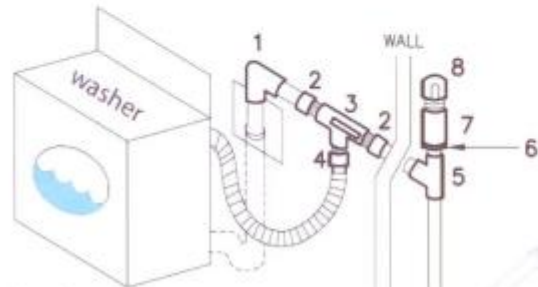
Where do you get the parts?

- www.cleanwatercomponents.com
- www.oasisdesign.net
- Plumbing, irrigation and hardware stores carry *some* of the parts, but not all

You can purchase all parts online
from cleanwatercomponents.com

Laundry to Landscape Greywater System Kit

barbed fittings

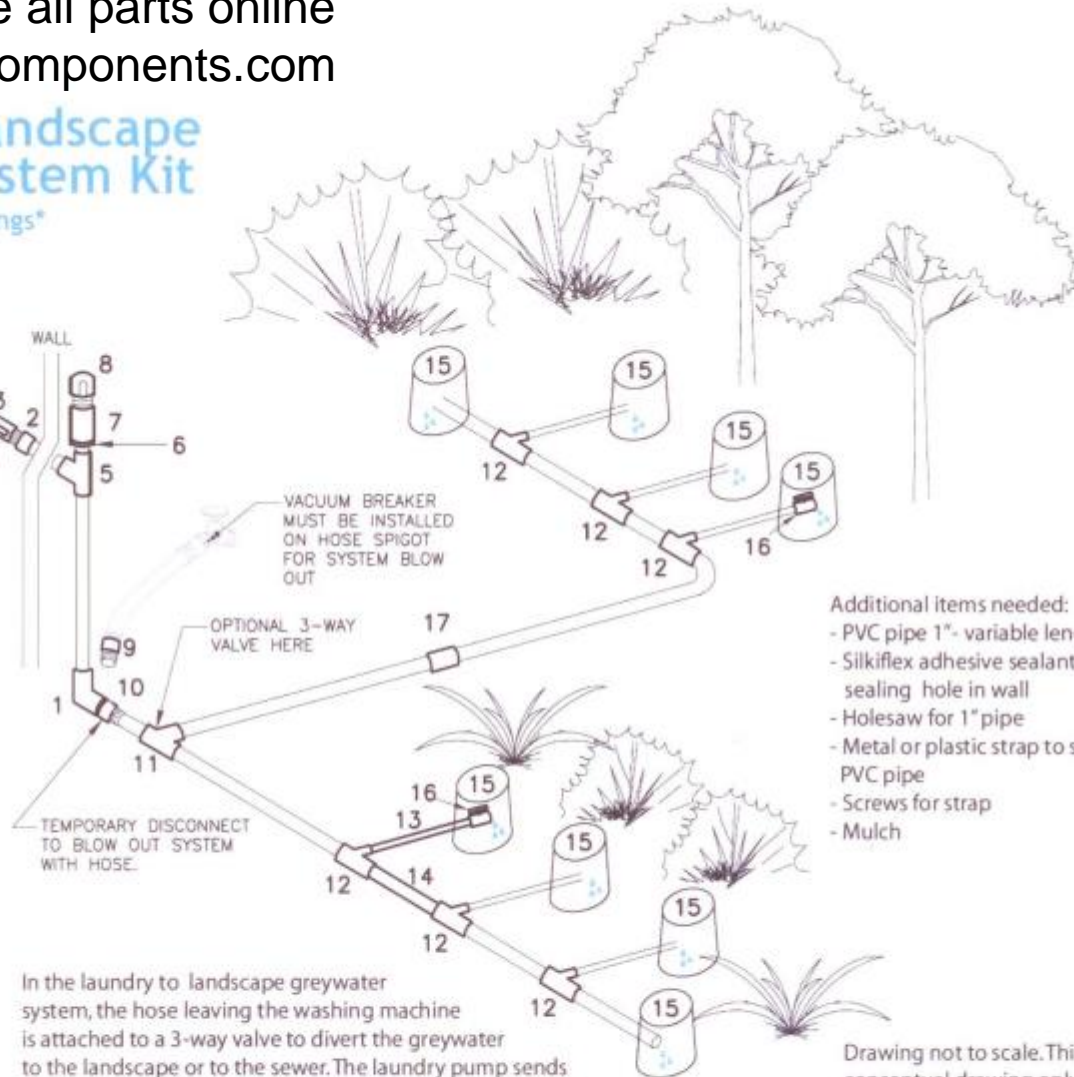


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 **clean water components**
YOUR SOURCE FOR WATER-WISE SUPPLIES



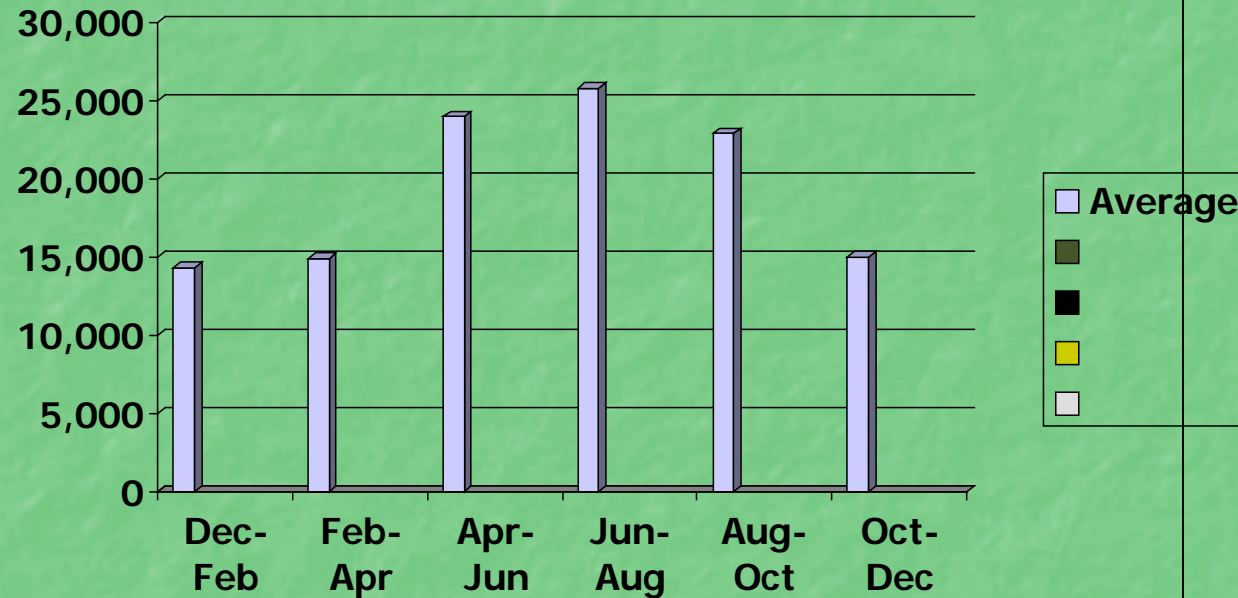
How much GW do you have?

- Compare your winter and summer water bills – the difference is your outdoor water use.
- Analyze your use:
 - Amount of showers and length
 - Low flow shower head – 2.5 gal/min 10 minute shower = 25 gallons
 - Type of washer and # of loads
 - Top loaders: 40 gal, front loaders: 10-20 gallons each time

Water Use in Typical Bay Area Home

Water use in dry summers almost twice that of wet winter months

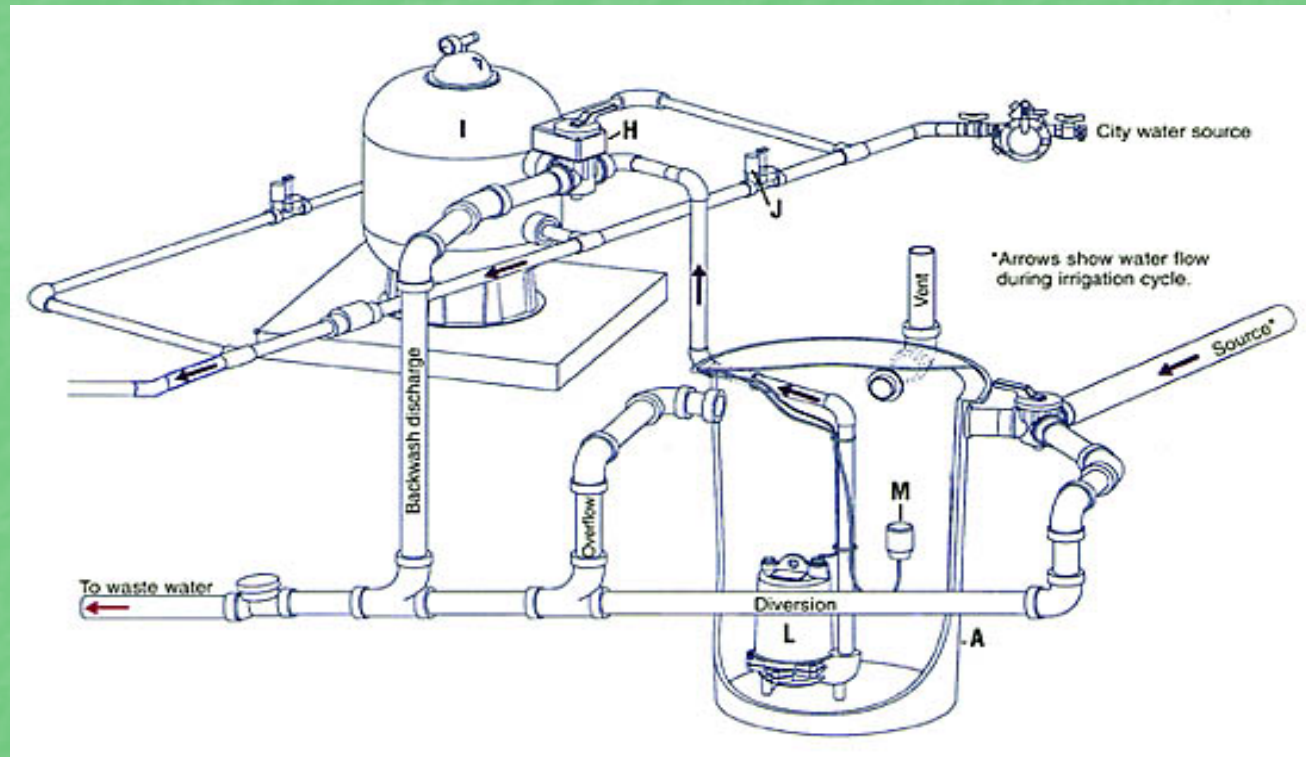
- Estimate of 40 gallons of gray water produced per day per person
- Family of four can produce about 9,600 gallons per two month water billing period
- Just about the water required for "typical" Bay Area landscape



Graywater costs

- Laundry to landscape
 - \$100-\$200 materials only
 - \$700-\$2,000 full installation
- Single fixture branched drain system
 - \$200-\$400 materials only
 - \$800-\$3,000 full installation
- Complex systems with tanks & pumps
 - \$400-\$600 materials only
 - \$2,000-\$6,000 full installation

More complex systems

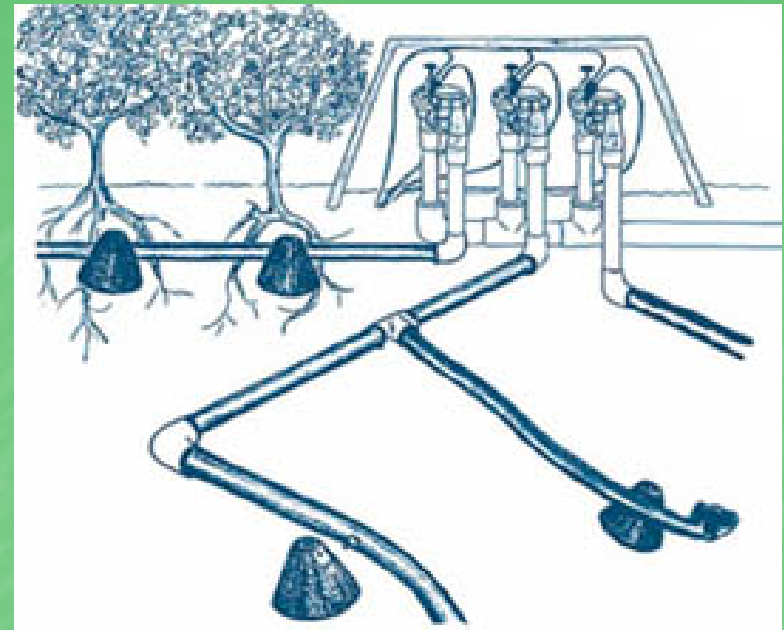


Surge tank, pump, and filter

Source: ReWater, Inc.

Complex Systems parts

- Special Emitters
- Complex controllers
- Automatic filter backwash
- Fresh water supplementation (when out of town)



ReWater, Inc. Cone drip emitters



Techline purple for recycled water



ReWater's Complete Control
irrigation controller

Complex systems

- Are pumped and filtered
- Have small surge tanks
- Advantages
 - Most flexible
 - Good for most types of vegetation
 - Similar to modern irrigation systems
 - Good for most topographies
 - Good for multi-unit and commercial sites
- Disadvantages
 - Most expensive – about \$6,000 extra
 - Most complicated – must be installed by professionals

Lawn irrigation installation



Photos from ReWater, Inc.



Lawn five years after installation

Sunnyvale Home – Installed 2006

Sand filter from ReWater



Surge tank in vault



Lawn with subsurface drip tubing from Netafim, installed by EarthCare Landscaping, plumbing by Hal Branges

What soaps to use?

Not all biodegradable products
are good for plants. . .

. . .think biocompatible!

Ingredients to avoid

Read the labels

- Salt, sodium compounds
damages soil
- Boron, borax (Bon Ami)
micronutrient turns into a microtoxin
- Chlorine
kills bacteria/life (hydrogen peroxide better)

Use these laundry products

- Oasis
- ECOS (available at Costco and Whole Foods)
- Bio pac liquid detergent
- Wonder balls or Soap nuts



- **No** powdered detergents, salt, borax, bleach, water softener

Shower and sink products

- Aubrey Organics shampoo and conditioner
- Dr. Bronner's
- Oasis all purpose cleaner



- **No** bleach, hair dye, harsh cleaners, salt baths, epon salts

Cleaning products

- Vinegar based cleaners
 - Liquid soap based cleaners
 - Dr. Bronner's
-
- **No** high salt products, bleach, harsh cleaners





What plants don't like Graywater?

- **Acid loving plants**

Madrones, Huckleberries, Blueberries, Azaleas, Rhododendrons

- **Saline intolerant plants**

Redwood trees, Giant Sequoia

- **Phosphorus intolerant plants**

Protea family (Australian)

Best Natives for Greywater

Irrigate with mulch basins:

- Plants that have a moderate or high water requirement
- Plants that do not favor acidic soil

- “California Native Plants that tolerate moist habitats”

Adapted from “California Native Plants for the Garden”
(Bornstein, Fross, & O’Brien, Cachuma Press)

- Annuals, vegetables, and drought tolerant plants are best irrigated by drip irrigation

Perennials

- | | |
|---------------------------|--|
| •Western Columbine | <i>Aquilegia formosa</i> |
| •Mugwort | <i>Artemisia douglasiana</i> |
| •Wild Ginger | <i>Asarum caudatum</i> |
| •Sedge | <i>Carex</i> (all) |
| •Stream Orchid | <i>Epipactis gigantea</i> |
| •Horsetail | <i>Equisetum</i> |
| •Wire Grass, Rush | <i>Juncus</i> (all) |
| •Scarlet Monkeyflower | <i>Mimulus cardinalis</i> |
| •Seep Monkeyflower | <i>Mimulus guttatus</i> |
| •Hooker Evening Primrose | <i>Oenothera elata</i> |
| •Redwood Sorrel | <i>Oxalis oregana</i> |
| •Monkeyflower Savory | <i>Satureja mimuloides</i> |
| •Point Reyes Checkerbloom | <i>Sidalcea calycosa</i> ssp. <i>rhizomata</i> |
| •Golden-eyed Grass | <i>Sisyrinchium californicum</i> |
| •Goldenrod | <i>Solidago</i> (all except <i>californica</i>) |

Grasses

- Pacific Reedgrass *Calamagrostis nutkaensis*
- Red Fescue *Festuca rubra*
- Deer Grass *Muhlenbergia rigens*
- Alkali Sacaton *Sporobolus airoides*

Trees

- Alder *Alnus* (all),
- California sycamore *Platanus racemosa*
- Cottonwood, Quaking Aspen *Populus* (all)
- Western Red Cedar *Thuja plicata*
- California Bay *Umbellularia californica*
- California Fan Palm *Washingtonia filifera*

Shrubs & Subshrubs

- Spicebush *Calycanthus occidentalis,*
- Creek Dogwood *Cornus sericea,*
- Poverty Weed *Iva hayesiana,*
- Pacific Wax Myrtle *Myrica californica,*
- Western Mock Orange *Philadelphus lewsi,*
- Golden Currant *Ribes aureum var.gracillimum,*
- Elderberry *Sambucus (all),*

**A VERY easy
graywater system:**

Sink Positive!



www.sinkpositive.com

Graywater references

- *Create an Oasis with Greywater* by Art Ludwig
<http://oasisdesign.net>
- Greywater Guerrillas, authors of *Dam Nation*
www.greywateraction.org
- Complete graywater system: Rewater, Inc.
www.rewater.com
- Several slides courtesy of Sherri Osaka --
Sustainable Landscape Designs

The end. . .



. . .or is it just the beginning?