

Gary Beatty received a B.S. degree in professional chemistry from Eastern New Mexico University and is a Level 4 Certified Wastewater System Operator. He worked for more than 18 years for the City of Roswell as the City Chemist. Currently, Gary is the Liquid Waste Specialist for the New Mexico Environment Department, District 4.



GRAYWATER USE IN NEW MEXICO

Gary Beatty
New Mexico Environment Department
1914 W. 2nd Street
Roswell, NM 88201

Good morning. In the summer of 2003, New Mexico adopted regulations concerning graywater reuse for domestic systems. Our guiding principles to conserve water include: save fresh water; irrigate with graywater or wash water; relieve the strain on septic systems; and achieve the highest level treatment with little or no energy and chemicals.

What is graywater? Defined by New Mexico, it is any wastewater used in the home except water from toilets, kitchen sinks, and dishwashers. Shower, sink, and laundry water comprise 50 to 80 percent of the residential wastewater. This water may be used for other purposes, especially landscape irrigation. Let us be clear when we talk about wash water: wash water that has a large amount of fecal material, for

example, if you were washing baby diapers, is not acceptable. That water is considered to be black water, not graywater.

Why use graywater? We are used to irrigating with large quantities of drinking water when plants thrive on water that is used containing the micronutrients that naturally end up in the graywater. The benefits of graywater include:

- Lower fresh water use; could be used in some areas, like Ruidoso, with real water problems in the not so distant future.
- Less strain on liquid waste systems. You can extend the life of your disposal field by not putting so much water in it, lessening the hydraulic load.

- Highly effective purification and natural attenuation through the top layer of the soil.
- Less energy and chemical use; although there are some ways of using graywater that actually use more energy.
- Groundwater recharge. Eventually everything we put into the subsurface system, whether it is through the disposal field or as graywater, is going to end up back in the groundwater.
- Plant growth. Plants love this type of water. It helps their growth. If you have ever used graywater from your washing machine on part of your yard, you will notice that it will be the greenest area in your yard.
- Reclamation of otherwise wasted nutrients that end up in your drain field. The nutrients are not taken up by the plants because of the deeper dispersal.
- Just because it feels good to use graywater.

Examples of wastewater amounts of an average family of four per week:

Washer	160 gallons
Showering	450 gallons
A tub	60 gallons
Bathroom sink	60 gallons
R.O. unit	56 gallons
Total	800 gallons

Here are some sample residential irrigation needs on a weekly basis. You can see that you could do quite a bit of landscape watering with a typical flow from a 4-bedroom house.

Three large trees	345 gallons
Smaller trees	100 gallons
Hedges	230 gallons
Flower bed	130 gallons
Total	805 gallons

The following study reports on overland treatment of wastewater by the bacteria present on the surface of the soil. This presumably would be indicative of the treatment level graywater would receive if ran over the surface. The studies deal primarily with Texas and Arizona. You can see the BOD reduction is very high, phosphate removal is high, and nutrient removal is pretty high. In the case of Texas, they did not perform a coliform analysis, but in Arizona, data show virtually all the coliform was removed.

Removal rate studies:

	Texas	Arizona
BOD	99.1%	98%
Phosphorus	90.0%	87%
Total nitrogen	91.5%	40-80%
Coliform	N/A	100%

Keep in mind that graywater may contain infectious organisms. Therefore, there is a health risk associated with graywater. You want to keep contact to a minimum. Regulations do not directly prohibit it, but it is not a good idea to run it directly on the ground where you can come into contact with it, or kids can play in it, or dogs drink it. You must understand that this is the water you just bathed in and used to wash your clothes. You would not consider it dangerous, but it can contain pathogens.

Some safety guidelines are not directly addressed in the regulations. The graywater must pass slowly through healthy top soil for natural purification to occur. Graywater systems should be designed so that no contact takes place before purification, which means it should be applied to a mulch bed type situation or to a bit in the subsurface in a (dome) type system to keep direct contact away. I have seen trailer houses that have their sink water running out onto the ground and forming puddles in the yard. That is not acceptable.

The current liquid waste regulations are as follows. These regulations cover discharges under 2000 gallons a day of domestic wastewater.

- A. "graywater" means untreated household waste that has not come into contact with toilet waste and it includes wastewater from bathtubs, showers, wash basins, clothes washing machines, laundry tubs, but does not include wastewater from kitchen sinks, dishwashers, or laundry water from washing material soiled with human excreta such as diapers.
- L. shall not require a permit for applying less than 250 gallons a day of private residential graywater originating from a residence for the resident's household gardening, composting or landscape irrigation if:
 - (1) a constructed graywater distribution system provides for overflow into the sewage collection or on-site wastewater treatment and disposal system;
 - (2) a graywater storage tank is covered to restrict access and to eliminate habitat for mosquitoes or other vectors;
 - (3) a graywater system is sited outside of a floodway;

- (4) graywater is vertically separated at least five feet above the groundwater table;
- (5) graywater pressure piping is clearly identified as a nonpotable water conduit;
- (6) graywater is used on the site where it is generated and does not run off the property lines;
- (7) ponding is prohibited, application of graywater is managed to minimize standing water on the surface and standing water does not remain for more than twenty-four hours;
- (8) graywater is not sprayed; and
- (9) graywater used within municipalities or counties complies with all applicable municipal or county ordinances enacted pursuant to Chapter 3, Article 53 NMSA 1978

Graywater can be used for gardening, composting, and landscaping. Construction of a graywater distribution system provides for overflow into the sewage collection or on-site wastewater treatment and disposal system. This means if you design a system for graywater, you still must have the connection that runs back to your septic system or into the domestic sewer, if you live in a municipality. That is a requirement. Setting up a graywater system will not reduce the size of the drainfield as required in the regulations. If you have a tank, your graywater must be covered to restrict access, primarily for vector control.

A graywater system is sited outside of a floodway. Graywater is vertically separated at least five feet above the groundwater table. I am not sure why they instituted that requirement. For three-quarter acre lots, the liquid waste system and disposal field must be separated by four feet.

Graywater pressure piping must be clearly identified as a non-potable conduit. You must make sure it is clearly marked either with spray paint, colored differently, different type of faucets on it, or similar.

Graywater is generally used on the site and does not run off the property lines; it cannot run down the hill into your neighbor's yard. Ponding is prohibited. Application of graywater is managed to minimize standing water on the surface and standing water cannot remain for more than twenty-four hours. As I mentioned before, the regulations do not specifically say that you cannot have graywater on the surface, but it is not a good health practice. It is recommended to run the graywater under a mulch or subsurface. Graywater is not to be sprayed. Graywater use within

municipalities or counties must comply with all applicable municipal or county ordinances. These regulations do not supersede any other entities', whether county, city, or state.

How can we use graywater? A number of different ways are acceptable. The lower cost systems are branched drains to mulch basins; drain directly to a mulch basin; mini leachfield, a subsurface discharge; and gravity drum. More costly systems include a drum with pump and filter, which will require filtration and additional maintenance. One potential problem with domestic systems is that maintenance can be challenging. Since homeowners do not see what is going on with the system, they tend to forget about it.

Figure 1 is a picture of a typical mulch basin with a pit around a tree that is being watered. The picture includes a subsurface addition to that pit with a mulch entering the fixture.

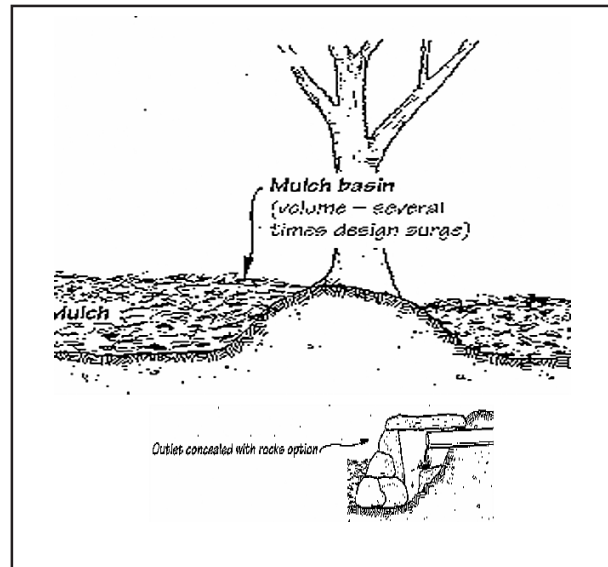


Figure 1.

Figure 2 depicts a direct system where you have one connection, in this case a sink, going to a mulch basin outside the house. No tank is required. The minimum set back from the building is five feet. A P-trap is used to keep insects and other vermin from entering the fixture. watered.

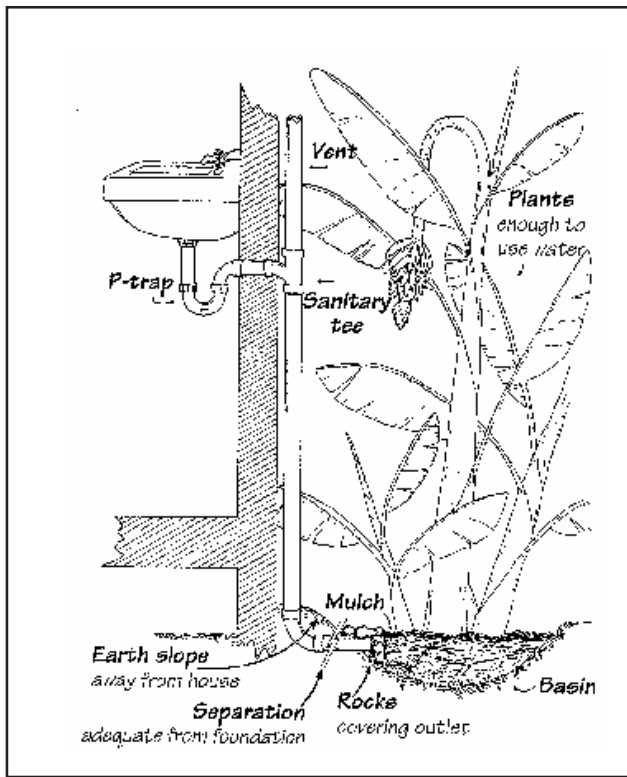


Figure 2.

Figure 3 depicts another drain to mulch basin system, in this case, a washing machine. The system is designed with an anti-siphon valve to deal with “pull-back” when the washing machine cycles, something

you definitely do not want. As you can see, graywater is discharging via the subsurface to a mulch area around the tree.

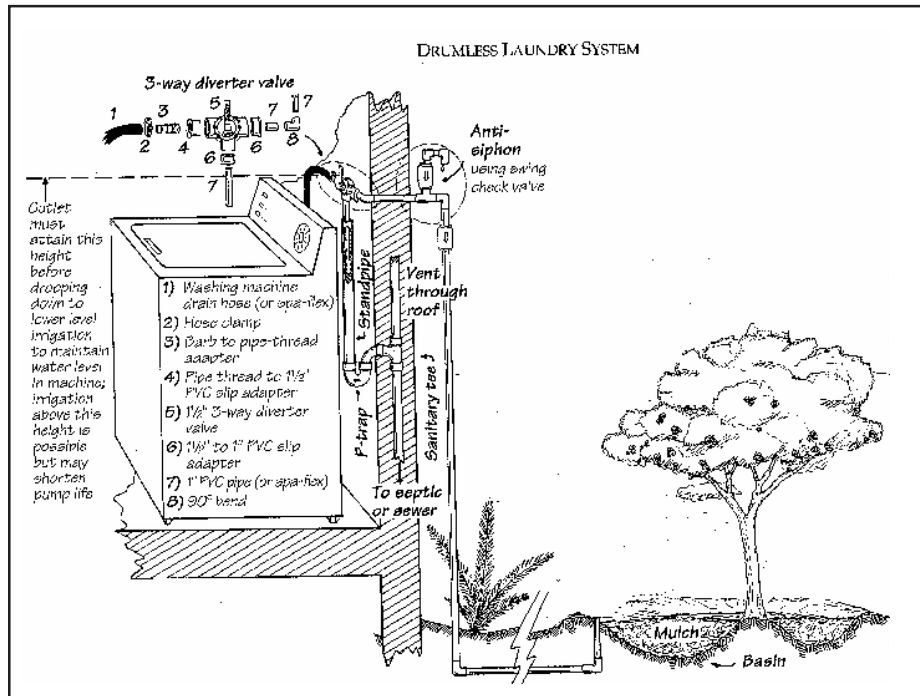


Figure 3.

The next Figure (4) shows two examples of branched drains to mulch basins. Again, no tank is required. Graywater flows are split by using tees or double ells. The mulch basins are down gradient from

the source, although in some cases, this is not possible. Basins around plants are filled with wood chips or other mulch in order to avoid contact with the graywater.

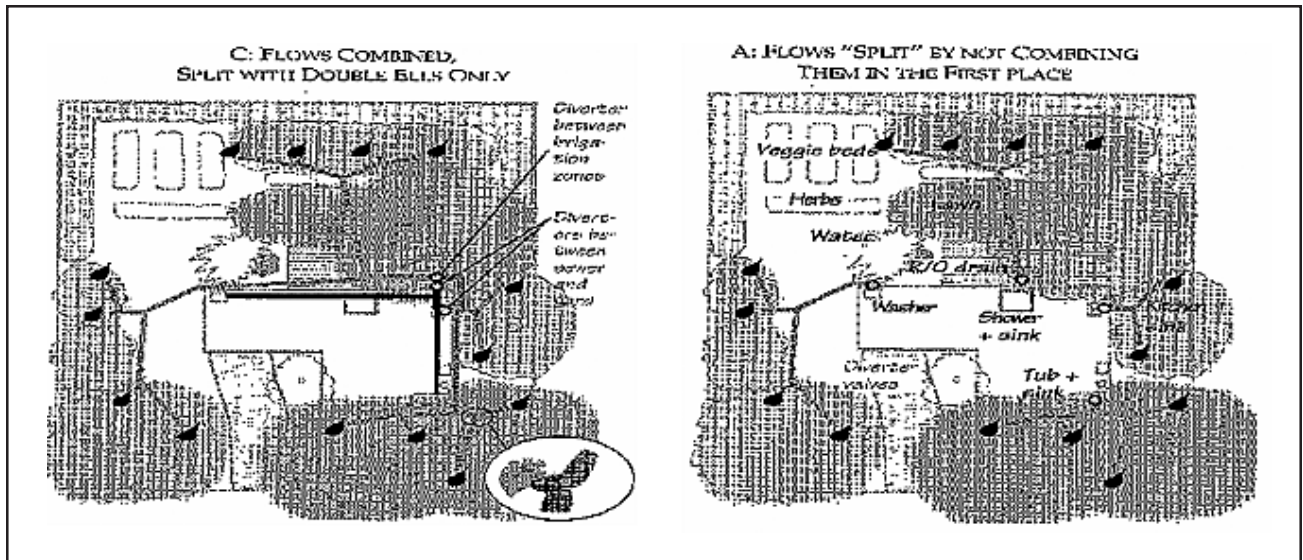


Figure 4.

Another system that uses mini leachfields is shown on Figure 5. Again, no tank is required. Pipe and gravel or gravelless chambers are used as in a standard system. The graywater could even be reverted to five gallon drums in some cases. Maintenance would be

the main consideration for this system especially to prolong its lifetime. Depicted in the figure are gravelless chambers; a couple around each of the plants or trees being watered.

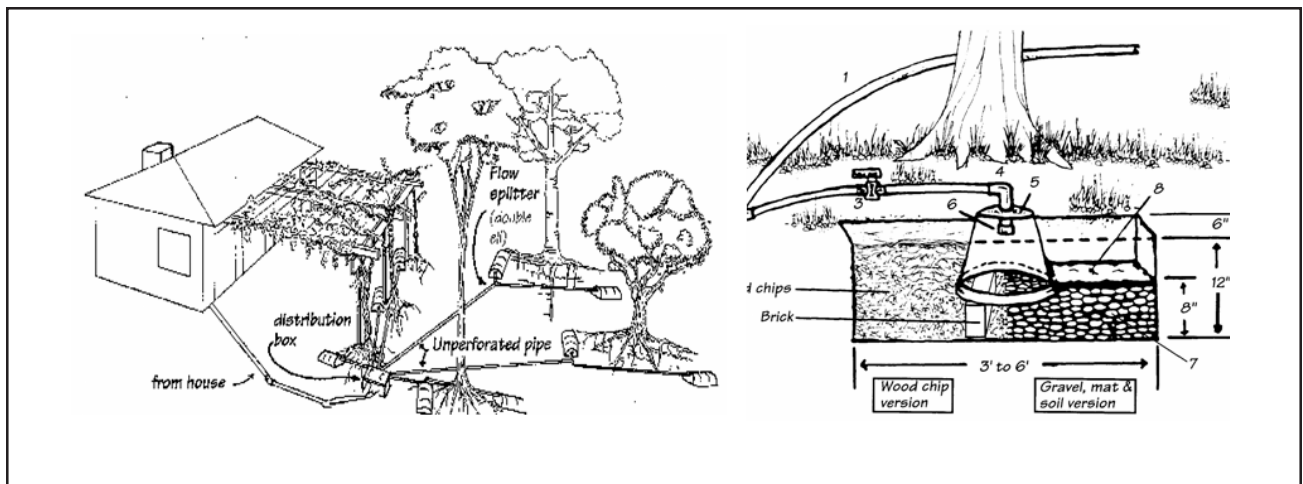


Figure 5.

Figure 6 shows a gravity drum or tank. This requires a tank (drum) but no pump. Graywater exits the tank from the bottom of the tank, above the ground.

The tank must be covered. This system allows for batching of the water. You could switch fields and run a batch.

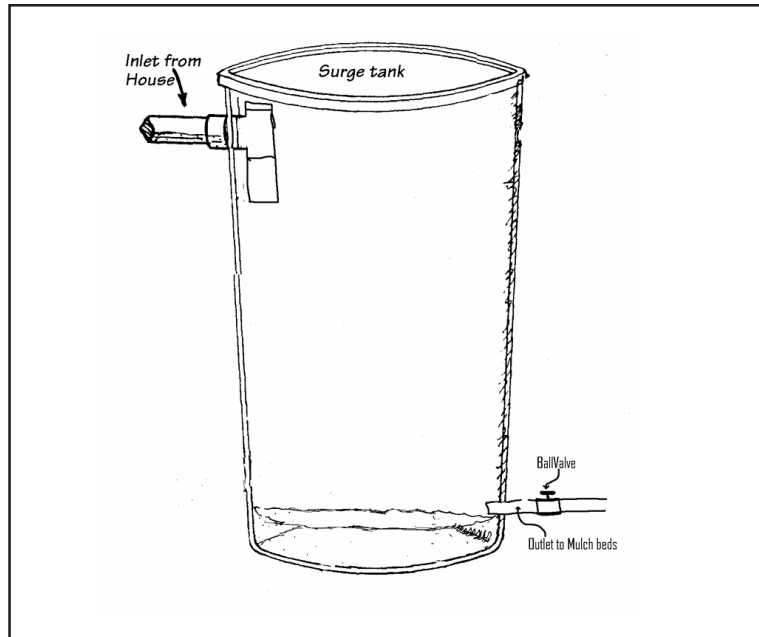


Figure 6.

A tank with pump and filter is shown on Figure 7. This is used when you want to discharge to two exits, both above gradient. Many situations call for this type

of system, especially in the mountains. This system requires continuous maintenance and that can prove difficult to get from property owners.

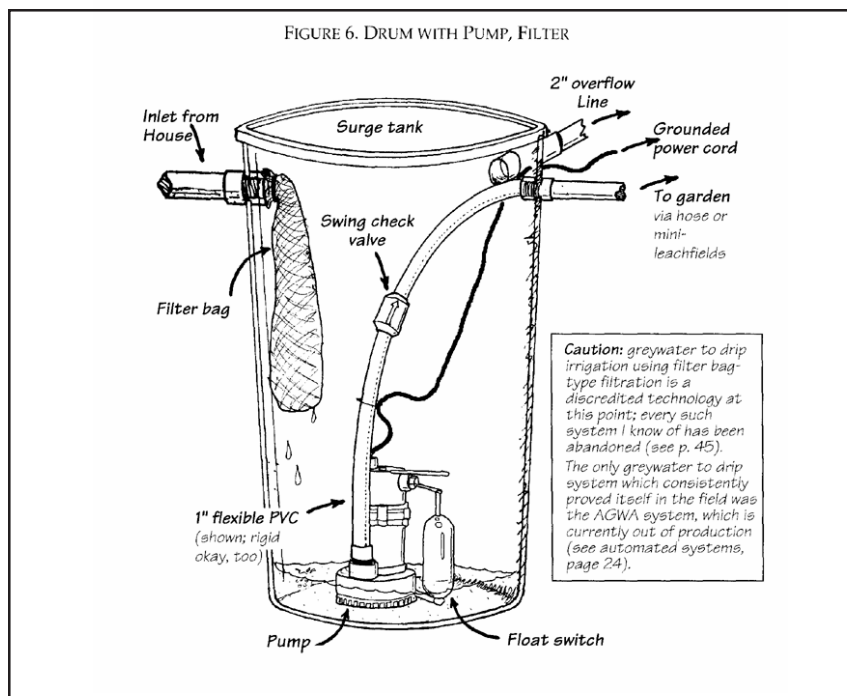


Figure 7.

An example of an infiltration bed is shown on Figure 8. Infiltration beds are nothing new and have been commonly used for septic systems drains. The bed does require a tank and must be pressurized. This

system would be used where you do not have suitable soil for attenuation. You supply the suitable soil and then apply water to that suitable soil.

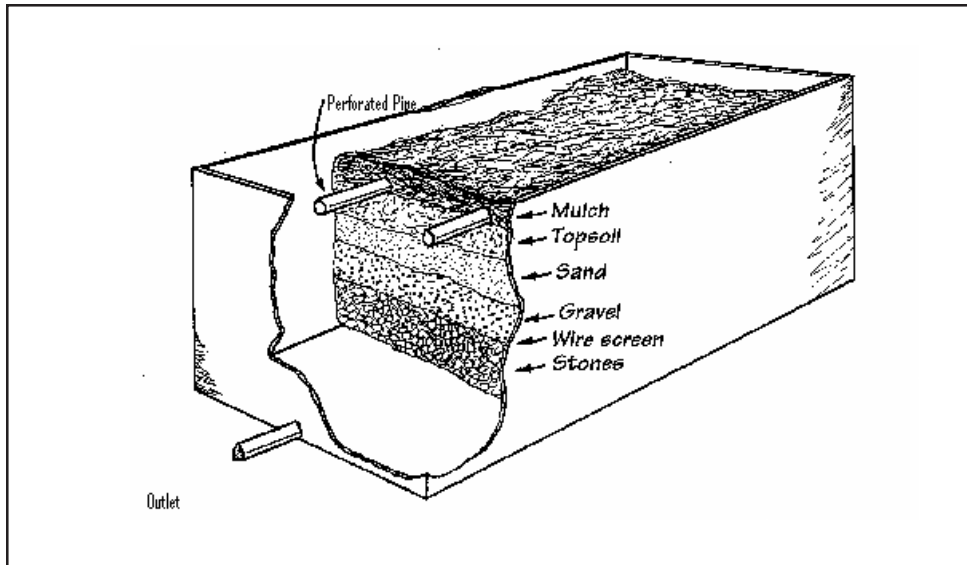


Figure 8.

The final figure (9) depicts plumbing connections and how to modify existing plumbing to run the graywater. Keep in mind that you must be able to run

your graywater back to your septic system or the collection system in the house.

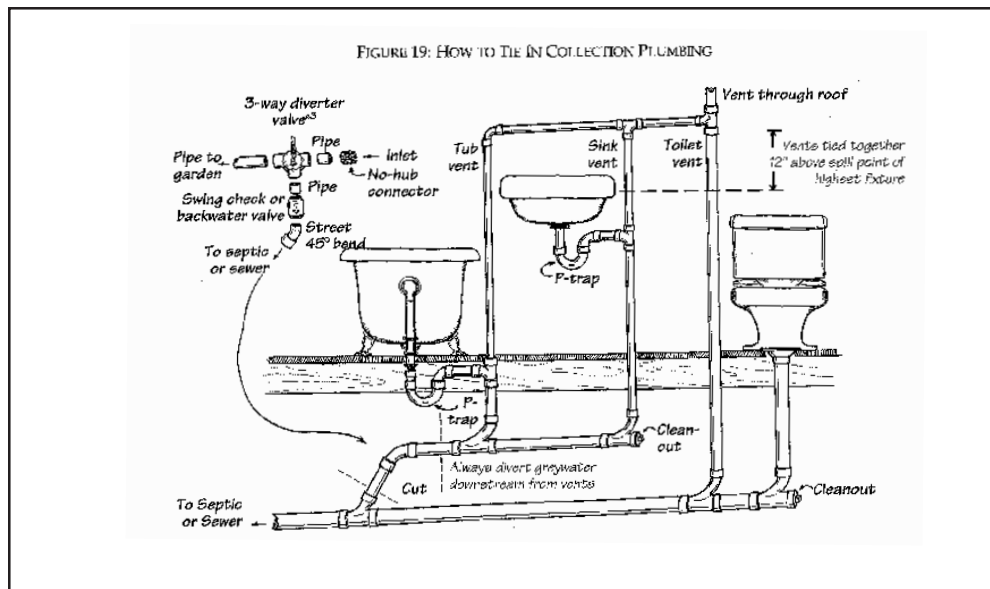


Figure 9.

In summary, graywater is safe to use. In New Mexico, I think it is one of the better ways that we have to cut down on our need for fresh water. Using graywater to irrigate will lessen the impact on the liquid

waste system, and will lessen the amount of water that you actually have to buy, provide, or pump for yourself.