

How expensive is fecal coliform testing?

It costs \$50 to send a compost sample in for a fecal coliform count at Alexin Analytical Laboratories

How many compost processors would we need?

We are two adults, and we intend to be the two people living there, so we will do calculations for two.

$$2 \text{ people} * 180.5 \frac{\text{gal}}{\text{person}} = 361 \frac{\text{gal}}{\text{year}}$$

If we, as two adults, each produce the world average (mean) of 180.5 gallons of excreta and carbon matter per person per year, then together we will produce 361 gallons in a year.

$$\frac{361 \frac{\text{gal}}{\text{year}}}{65 \frac{\text{gal}}{\text{bin}}} = 5.55 \frac{\text{bins}}{\text{year}}$$

Per the Portland Sewer Catastrophe Companion, we will use standard 65 gallon wheelie bins. Given that we will produce ~361 gallons in a year, and that the bins will hold 65 gallons, we can expect to fill 5.55 bins in one year.

$$\frac{365 \frac{\text{days}}{\text{year}}}{5.55 \frac{\text{bins}}{\text{year}}} = 65.72 \frac{\text{days}}{\text{bin}}$$

Assuming a constant rate of deposits into the bins, the first bin will be full around two months into the first year.

$$65.72 \text{ days}_{\text{filling}} + 365 \text{ days}_{\text{maturing}} + 31 \text{ days}_{\text{testing}} = 461.72 \text{ days until the bin can be reused}$$

Thus, the compost will be ready 14 months after we start using the first bin. We will then send this compost to the lab for testing. Conservatively, assuming sending the test to the lab and getting the results back takes a month, this means 15 months total time until we can reuse the first bin. Thus, we need enough bins to last 15 months assuming all goes well.

$$\frac{461.72 \text{ days}}{65.72 \frac{\text{days}}{\text{bin}}} + 1 \text{ emergency bin} = 8.02 \text{ bins}$$

One additional bin should be provided in case of emergency (eg., a composting process takes longer than expected). Given this information, we will need 8 bins for two people.

Note: This is a conservative estimate of the number of bins needed, since excreta & carbon matter will shrink due to evaporation and composting even while the bin is being filled.

Contingency plan in case compost spills?

In the unlikely event of a spill during transfer, clean-up should be performed with the same care as clean-up for an overflowing flush toilet, though the excreta-and-sawdust mix will be easier to contain. If it's an indoor spill, use rags and soapy water. Wash the rags as you would wash a dirty diaper. If it's an outdoor spill, use a shovel to remove any soil, bark mulch, or chips that were exposed to the spill.

Follow normal bucket-washing procedure for washing the shovel. Let this be a lesson and secure your lid better next time.

Contingency plan for too much leachate?

Add dry carbon matter and give the leachate time to evaporate, switching to a new bin if needed. It is for this reason that we have added an emergency bin to our bin quantity calculations.

Create brief visual manual (consider airline safety brochure for inspiration).

[see attached slideshow]

What is the expected capacity of the system?

There are two factors that can limit capacity – area to spread finished compost and area to store compost processors.

The Humanure Handbook states that a family of four produces about a cubic meter of finished compost per year. So we can assume that one person would produce ¼ cubic meter, or 9 cubic feet, of finished compost each year.

Common recommended application depths for compost generally range from 1 to 3 inches per year. For these calculations, we will assume a conservative 1 inch application depth, though we could spread it thicker.

So if we apply two peoples’ worth of compost 1 inch deep, we would cover 216 square feet per year:

$$\frac{2 \text{ people} * 9 \frac{\text{ft}^3}{\text{person}}}{1 \text{ in} * \frac{1 \text{ ft}}{12 \text{ in}}} = 216 \text{ ft}^2$$

We currently have 275 square feet planted with trees and ornamental shrubs under which we would want to spread compost:

Ornamental shrubs in landscape barrier = 7 shrubs x ~5'/shrub x 5' deep = 175

Other space under the madrone tree = ~5x10' = 50

Ornamental shrubs and walnut trees along alley = 5x30' = 150

= 275 square feet

So there is easily enough area to support two people. The attached site plan shows placement of the eight compost processors (see above) that we would need to accommodate two people.

If we really crammed them in, we could probably fit around 66 bins (396 ft²), which would accommodate about 13 people. The resulting compost, applied 1” deep, would cover 1404 square feet.

$$\frac{13 \text{ people} * 9 \frac{\text{ft}^3}{\text{person}}}{1 \text{ in} * \frac{1 \text{ ft}}{12 \text{ in}}} = 1404 \text{ ft}^2$$

The absolute maximum area we would be able to spread compost on given our site plan is:

$12*61.28 + 48.74*50$ (total area of site) - $22*26$ (house + 2' clear perimeter) - $19*11$ (accessory structure + paved area) - $10*8$ (covered patio) - $7*5*5$ (7 edible shrubs in 5' deep "landscape barrier" @ 5' spacing) = 2136 square feet

So there is technically enough room to support 13 people on the site, but that's a lot of bins and a lot of compost.

That would be a whole lot of compost processors, though, so we'd expect our actual maximum to be around 6 people:

$$\frac{6 \text{ users} * 9 \frac{\text{ft}^3}{\text{user}}}{\frac{1 \text{ ft}}{12 \text{ in}} * 1 \text{ in}} = 648 \text{ ft}^2 \text{ of application area at 1 inch depth}$$

and 20 bins.

We can easily accommodate the expected 2 residents and technically we could handle as many as 13. Our suggested maximum for this site is 6 people, and that gives plenty of application area for finished compost and a reasonable number of compost processors. If, after using the system and collecting data, we wish to increase that number, we would presumably apply to the appeals board again.

Add dimensions to drawings, especially commode height.

Commode seat is 17" above the floor. [see updated drawings]

Specify type & material of bucket.

We will use Letica 5DM buckets (see <http://www.letica.com/catalog/product/49-5DM>) made from HDPE with matching removable lids. There are many other similar 5-gallon buckets that could work as well: we could imagine people wanting to use stainless steel, for example, or whatever slightly different bucket is locally available.

Clearly label buckets and lids so they aren't used for something else.

[see updated manual]

Clearly label compost processors with their purpose and the date they were filled.

[see updated manual and sample label]

Specify typical quantity of carbon cover.

Carbon cover should be applied after every use of the toilet to cover the most recent deposit.

The Humanure Handbook says, "Make sure that enough cover material is applied so there is neither excess liquid build-up in the toilet nor offensive odors escaping either the toilet or the compost pile. The trick to using cover material is quite simple: if it smells bad or looks bad, cover it until it does neither." and also mentions that it should take one 5-gallon bucket of cover material per 5-gallon bucket filled in the toilet system.

