

WASTE WATER MANAGEMENT PROPOSAL FOR STELLE

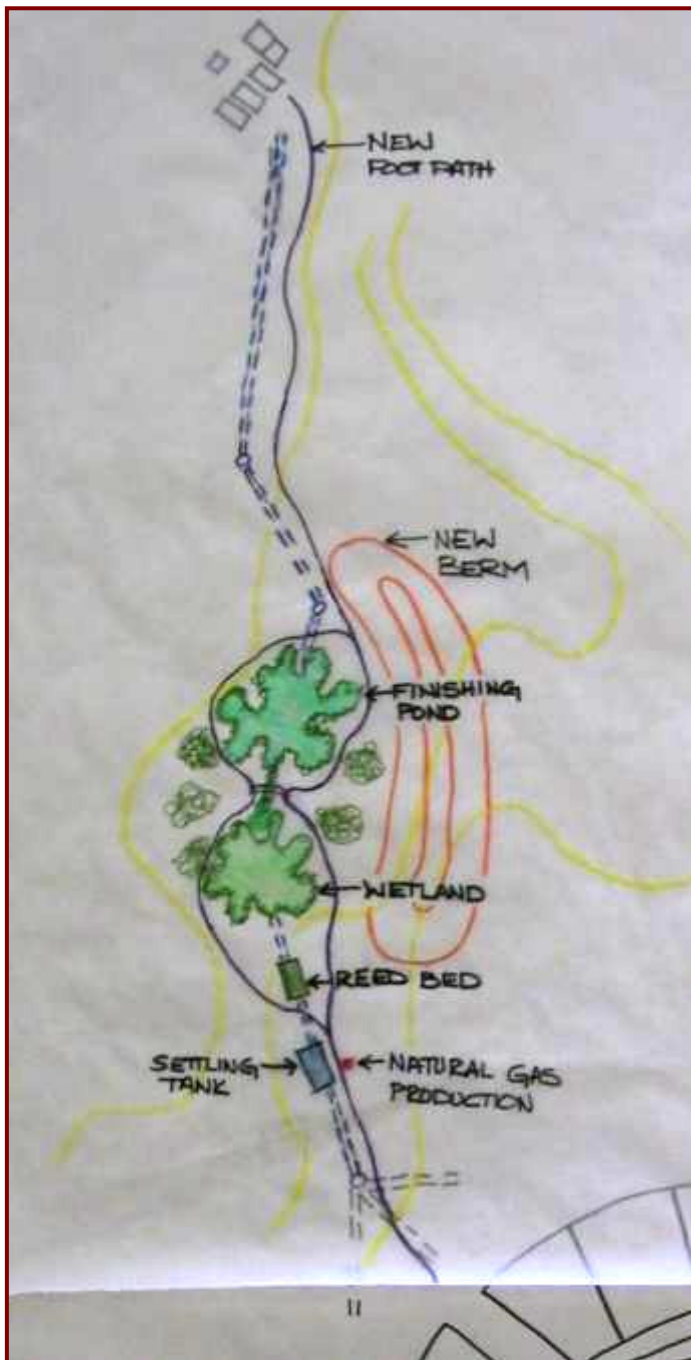
November 2007 – Permaculture Design Certification Design Plan

To the Stelle Community:

In reviewing the current system in operation and the proposed future goals for the community of Stelle we have proposed a phased or succession approach to wastewater management.

We have decided that the option of separating grey water and sewage and switching to the use of composting toilets for each house is not the best approach. Such a decentralized approach is not recommended.

We recommend a system of constructed wetlands (see drawing below) to be located at the south west corner of the community, where the current treatment site exists.



Phase 1: Our Immediate proposal is for the construction of a wetland system designed to store and filter all gray water and waste water from all households and buildings. This system would include:

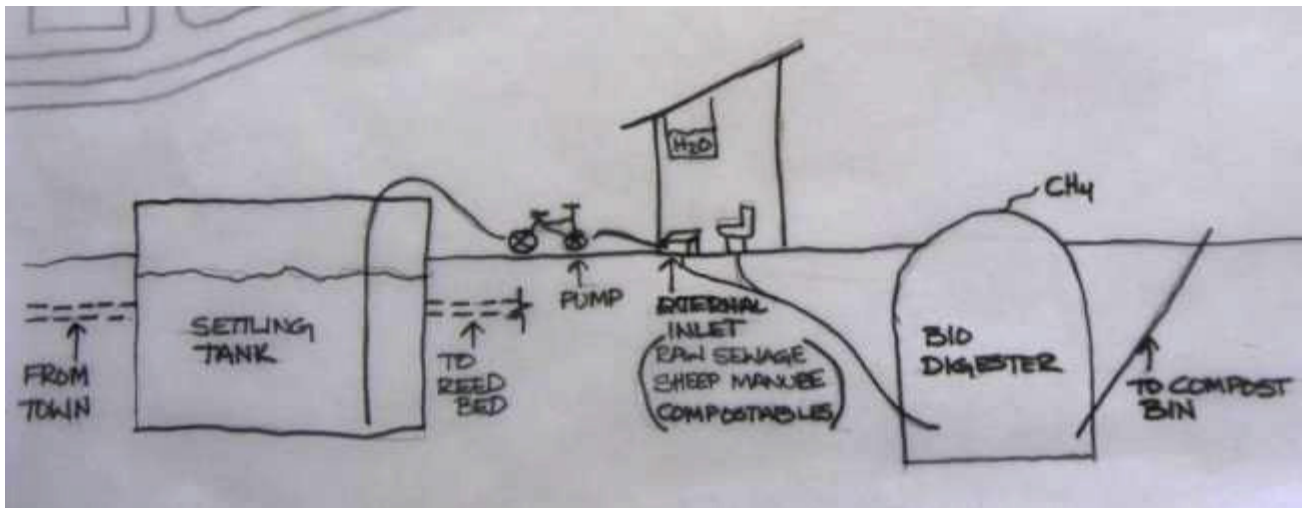
- Underground settling tank – constructed on site or purchased-complete system (from concrete) – solids will need to be pumped approx twice a year as is currently done.
- Reed bed, fed by materials from the settling tank, consists of cattails and other specific aquatic plants for filtering and purifying. There are many municipalities currently using this system. The cattails can be cut and harvested for composting. They naturally regenerate, eliminating the need for future re-planting.
- The reed bed feeds a catchment pond containing a variety of native plants to attract wildlife and create diversity. This reed bed is the main filtering component of the system.
- A flowform would lead the water from the catchment pond to a finishing pond. The flowform feature creates an essential terraced water channel that further purifies and aerates the water. This feature eliminates the need for energy intensive blowers currently in use.
- The now clean water from the final finishing pond could be fed into the current treatment system if it was deemed necessary to fulfill current EPA requirements to run it through an approved plant system. Otherwise, the final drainage into the drain tiles that lead to Kelley creek would not change.

A note about community education: As a design team we make the following recommendations.

- Train 2-3 community members on the operation and maintenance of the current wastewater treatment system as soon as is practicably possible.
- If possible, arrange a meeting with an individual experienced in alternative wastewater treatment systems who could provide input in a site evaluation, review proposed plans, and speak to easing the transition from conventional wastewater treatment methods.
- Raise awareness in the wider community that it would be preferable to limit the amount of unnecessary solids entering the wastewater treatment system. This could be done by encouraging residents to use biodegradable toilet paper, and to install drain screens in household kitchen and bathrooms in order to significantly decrease the amount of hair introduced into the system.
- Education efforts could be directed towards the school age children in the community, about 25 individuals, this has proven to be an effective method of encouraging change.

Phase 2: Natural (Bio) Gas Production: Implement a biomass compost system to address future community goals to achieve sustainability and to produce zero waste.

Estimated System Cost: \$500-\$1000



The digester is a concrete container buried into the ground. The dimensions of the tank are 2m³ which produces 1m³ of biogas per day at optimal efficiency, which is enough to cook 3 meals a day for one household. The digester is surrounded by insulation lining the outside of the tank to keep a constant year round temperature. The digester creates methane gas as the waste decomposes. The methane gas can be tapped off for use by the community for cooking, as fuel for a vehicle or for heating.

The digester is fed via two input pipes. One pipe comes directly from the outhouse located next to the digester. The second pipe comes from a tank situated next to the outhouse. The tank is used to add sheep manure, compost, water, and human waste pumped from the settling tank.

The pump that feeds the tank is run via mechanical energy generated by riding a bike to turn the pump. The pump takes the sludge from the bottom of the settling tank and into the tank feeding the digester.

The plants surrounding the outhouse consist of Linden trees, comfrey, and mulberry. This plant combination provides a ready source of toilet paper in season, flowering plants for use by local wildlife (bees, hummingbirds...), and food from the mulberry. Planting plants next to the outhouse that sheep favor (kura clover?) may help concentrate sheep manure near the digester intake. This assumes that the sheep farm nearby could be utilized.

A rain catchment system on the outhouse roof can be utilized to provide the water necessary to create the digester slurry, for flushing (if necessary), and cleaning.

The used slurry from the digester outputs to a composting shed where carbaceous material can be added to create compost for garden use.

Optimal performance requires waste from 40 humans per day, or 25 sheep per day fed into the digester. Daily pumpings from the settling pond should provide the necessary input to the digester.

This system is intended to be a demonstration project that allows the community to explore this technology and evaluate its usefulness for use on a larger scale.

Constructed Wetlands Research

The Centre for Alternative Wastewater Treatment (CAWT) promotes constructed wetlands and other innovative forms of wastewater treatment through applied research, education, and demonstration projects. Located at Fleming College in Lindsay, Ontario, Canada.

<http://www.flemingcollege.com/cawt/pages/conwet/virtualtour.html>

From Wikipedia

"He found that subsurface flow wetlands were superior to surface flow wetlands for nitrate removal."

http://en.wikipedia.org/wiki/Constructed_wetland

Rose Acres Egg Farms

http://www.landandwater.com/features/vol50no1/vol50no1_2.php

*Location and design firm are in Indiana. And this is recent...!!! 2005
And the 'customer' did some of their own work.*

Freezing weather effectiveness

<http://www.esemag.com/0905/wetland.html>

Check out this article:

http://online.wsj.com/article/SB119498201350991670.html?mod=googlenews_wsj

Then check out the guys website:

<http://www.biolytix.com/detail.php?ID=129>

Constructed Wetlands . org

<http://www.constructedwetlands.org/cw/index.cfm>

North American Wetland Engineering (NAWE) is the leader in the decentralized water and wastewater industry, providing innovative and ecological solutions for [industrial](#), [residential](#) and [municipal](#) clients. Located in Minnesota.

<http://nawe-pa.com/>

This article was insightful although focused on single residential beds. Some good history. Gives some good contacts. Date: 2004

http://www.nesc.wvu.edu/nsfc/Articles/SFQ/SFQ_f04_PDF/Wetland_f04.pdf