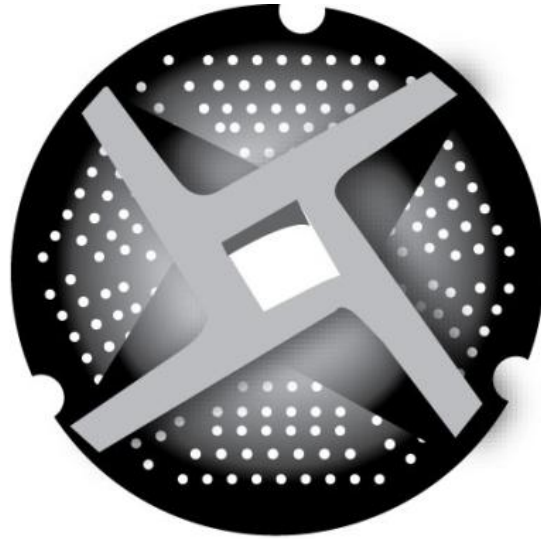


Innovations in Wastewater Management for Small Meat Processors



NICHE MEAT PROCESSOR

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July 23, 2013 Webinar

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RECIRCULATING VERTICAL FLOW CONSTRUCTED WETLANDS AT GUNTHORP FARMS, LAGRANGE COUNTY, INDIANA

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** Gunthorp Farms. www.gunthorpfarms.com/

JULY 2013

***Solving problems by focusing on
solutions***

Background

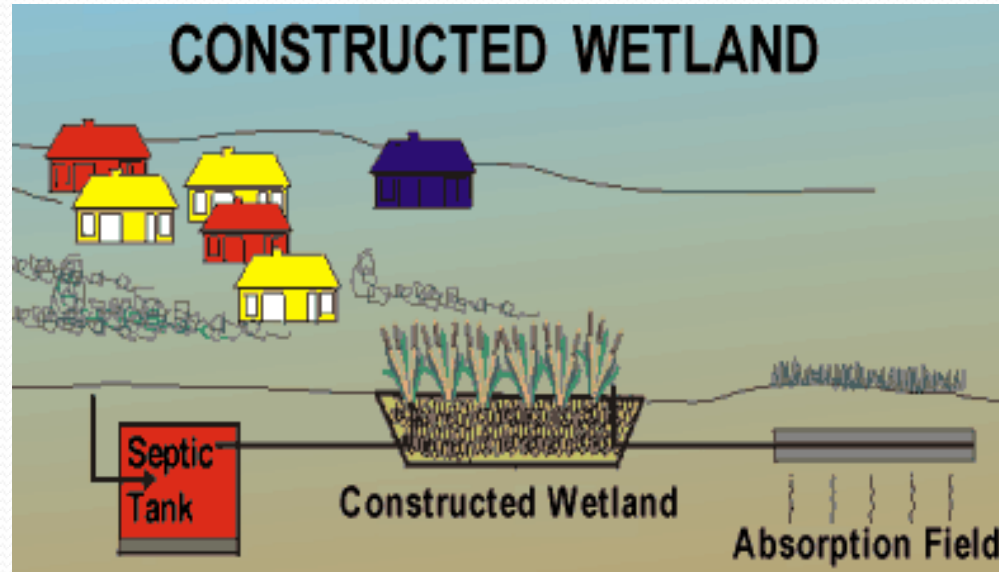
- CWs have been used to treat wastewater in EU & US for several decades
 - Last 25 years residential & commercial sewage treatment uses in LaGrange County, NE Indiana
- Newer designs based on a more understanding of science and underlying mechanisms of the wetlands
 - **RVFCW: Recirculating Vertical Flow Constructed Wetland**
- Application of technology expanding to new areas: Mines discharge; landfills; CAFO, aquaculture; etc.

What are Constructed Wetlands To Treat Sewage On-Site?

- Man made design systems
- Built specifically to remove contaminants in wastewaters that flow through them
- Involve physic, chemical and biological removal processes
- Not designed to fully recreate natural wetlands: many CWs to treat sewage on site look “dried” environments.

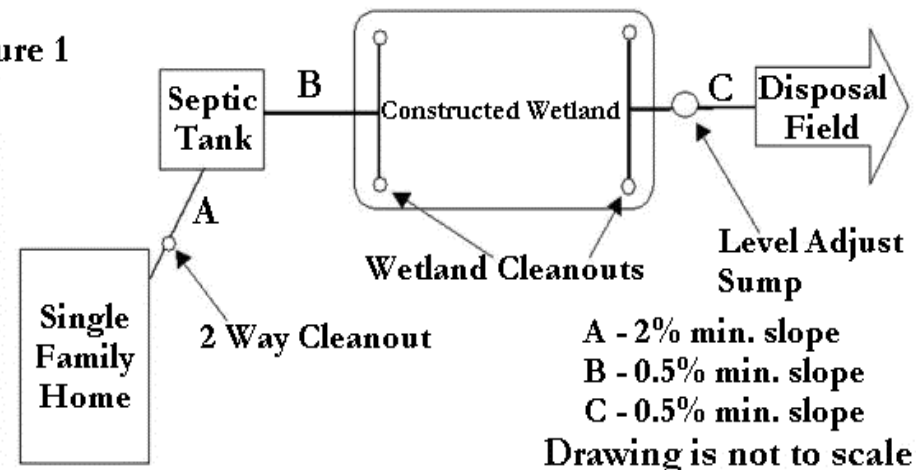


Where Are Constructed Wetlands Installed?



Wetland Schematic

Figure 1



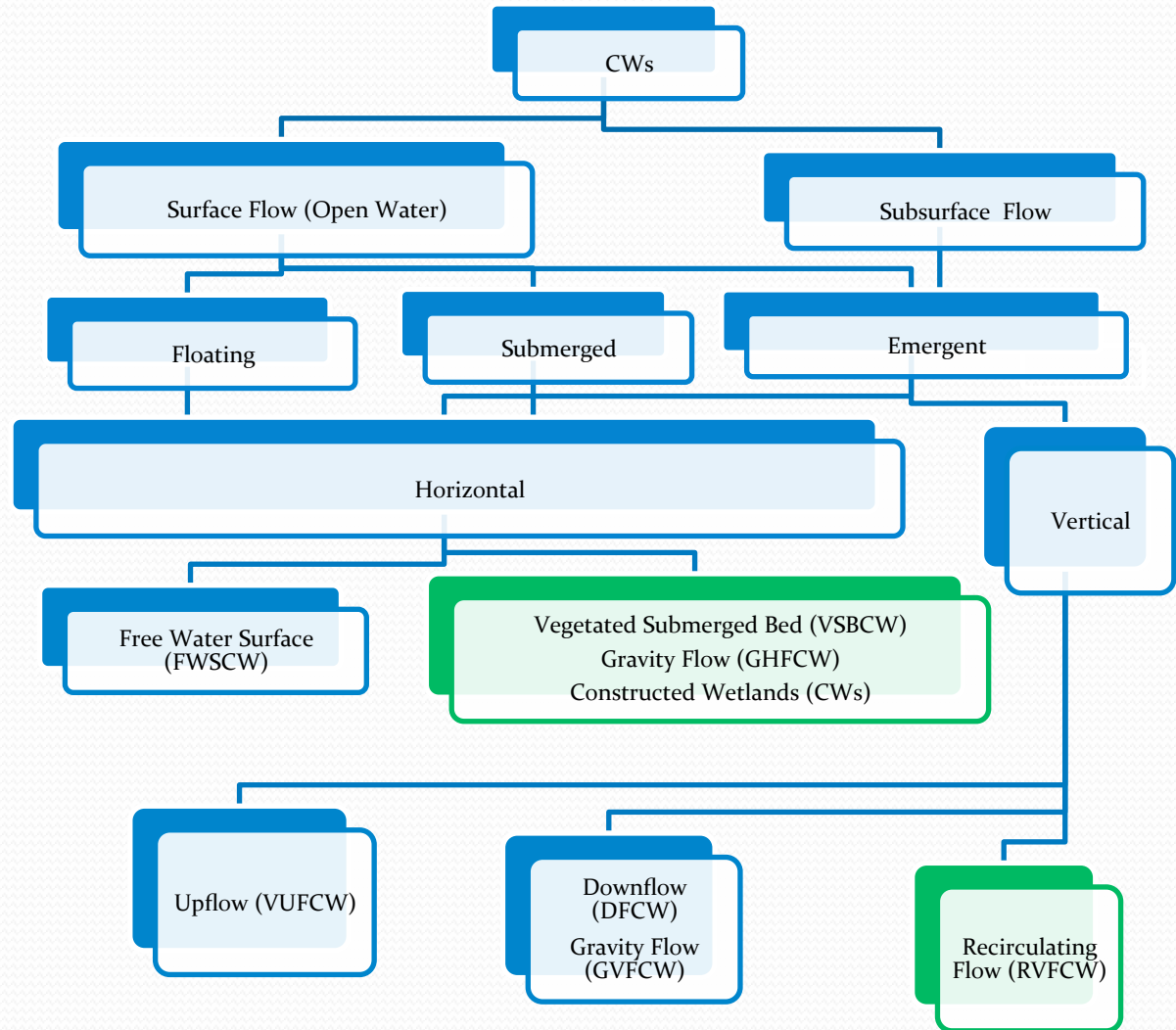
Types of Constructed Wetland Systems*

Hydrology

Vegetation

Flow Path

Design

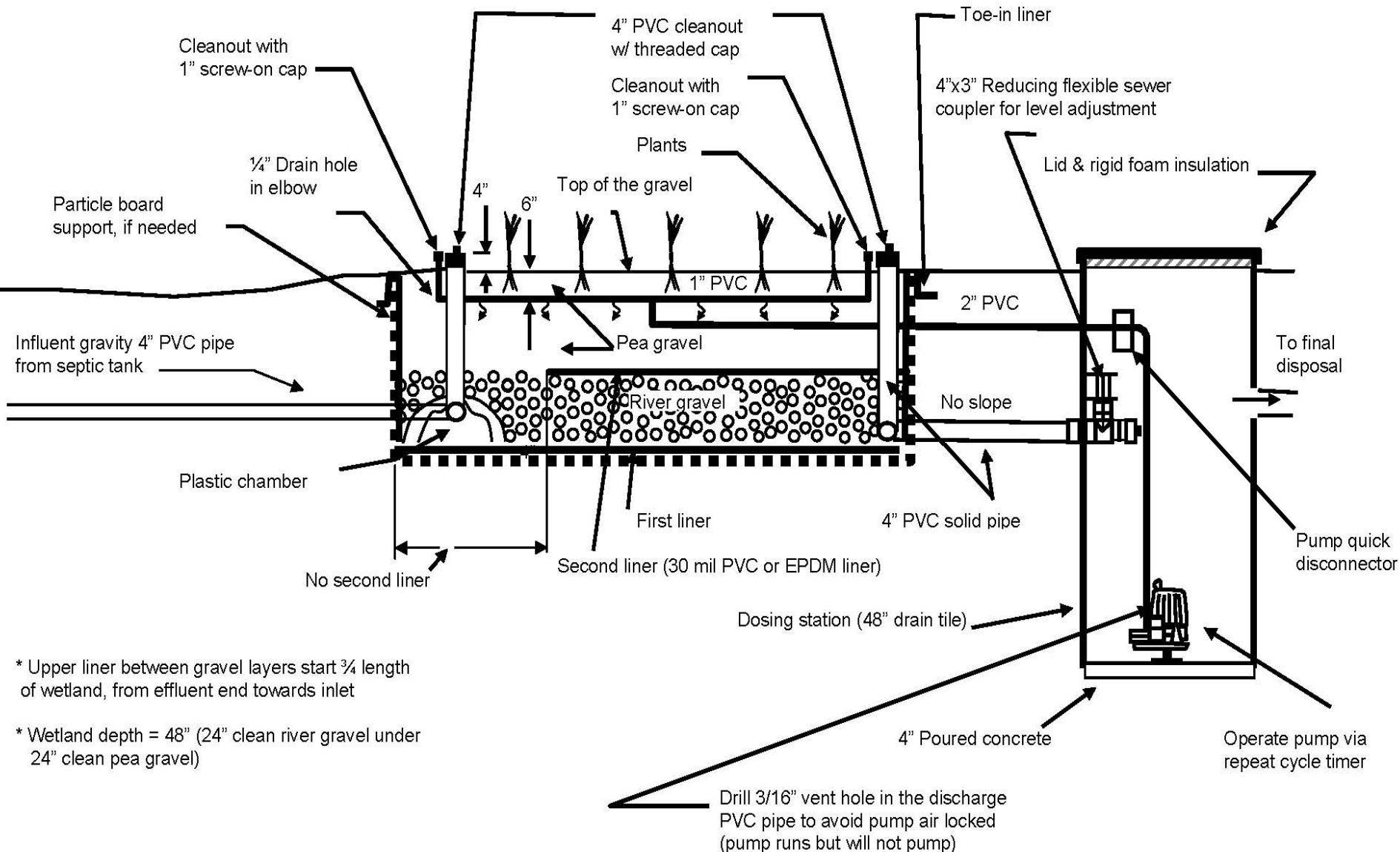


* Modified after Wallace and Knight, 2006

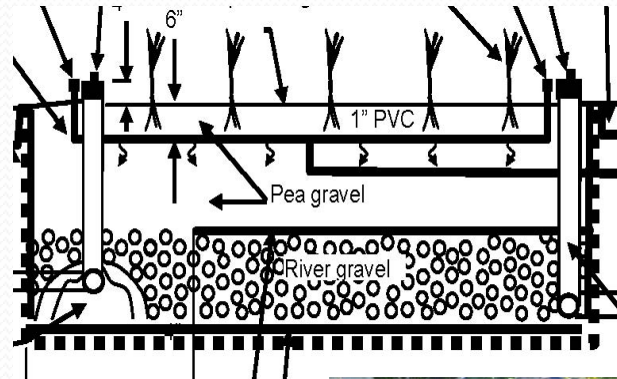
Why Constructed Wetland (CW)?

- Classic example of **passive treatment**
 - Natural processes to remove contaminants
 - Designed to be low energy input requirements, and **low maintenance** to operate indefinitely
- EU has systems working for more than 100 years
- LaGrange County systems already reached “adult” age:
 - * 1st residential GHFCW installed around 1990 (24 years of service)
 - * 1st commercial GHFCW installed in 1993 (20 years of service): 50K GPD
 - * 1st residential RVFCW installed in 2001 (12 years of service)
 - * 1st commercial RVFCW installed in 2004 (10 years of service): 1,600 GPD **Gunthorp's Farm**

RVFCW Longitudinal Sectional View



RVFCW Installation

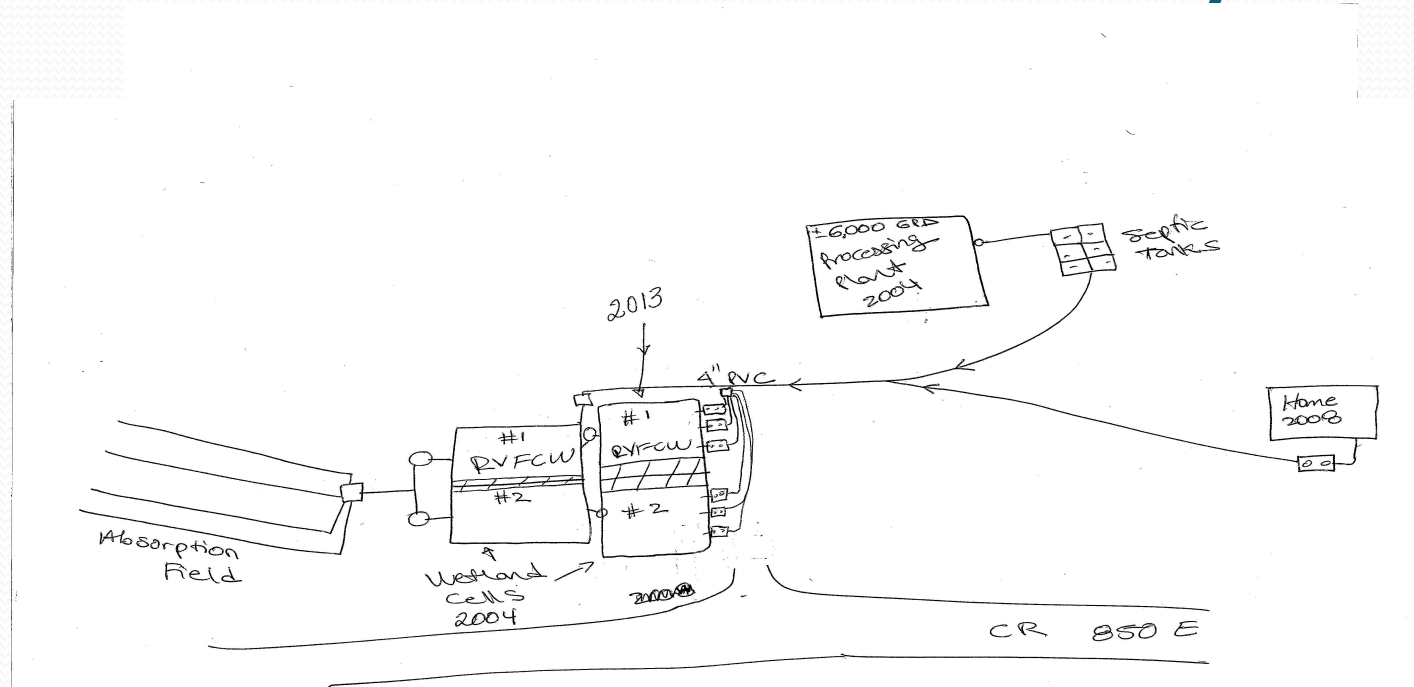


Materials and Methods:

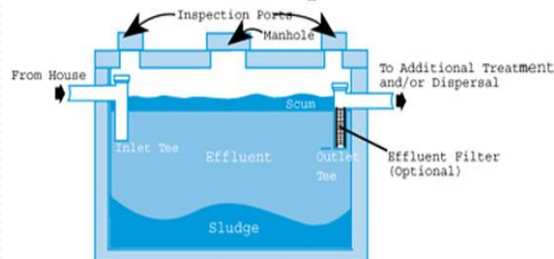
Gunthorp Farms

- Preliminary Information
 - Flow:
 - 1600 GPD (2004)
 - 600 GPD (2008)
 - 6000 GPD (2013)
- Design of the system (ISDH):
 - Septic Tanks & Outlet filter
 - Subsurface Constructed Wetland:
 - Type: RVFCW
 - Dimensions:
 - 20' X20' X4' (2004)
 - 25' X25' X4' (2013)
 - Final Effluent Disposal:
 - Absorption field

General Sketch of the System



Conventional Septic Tank



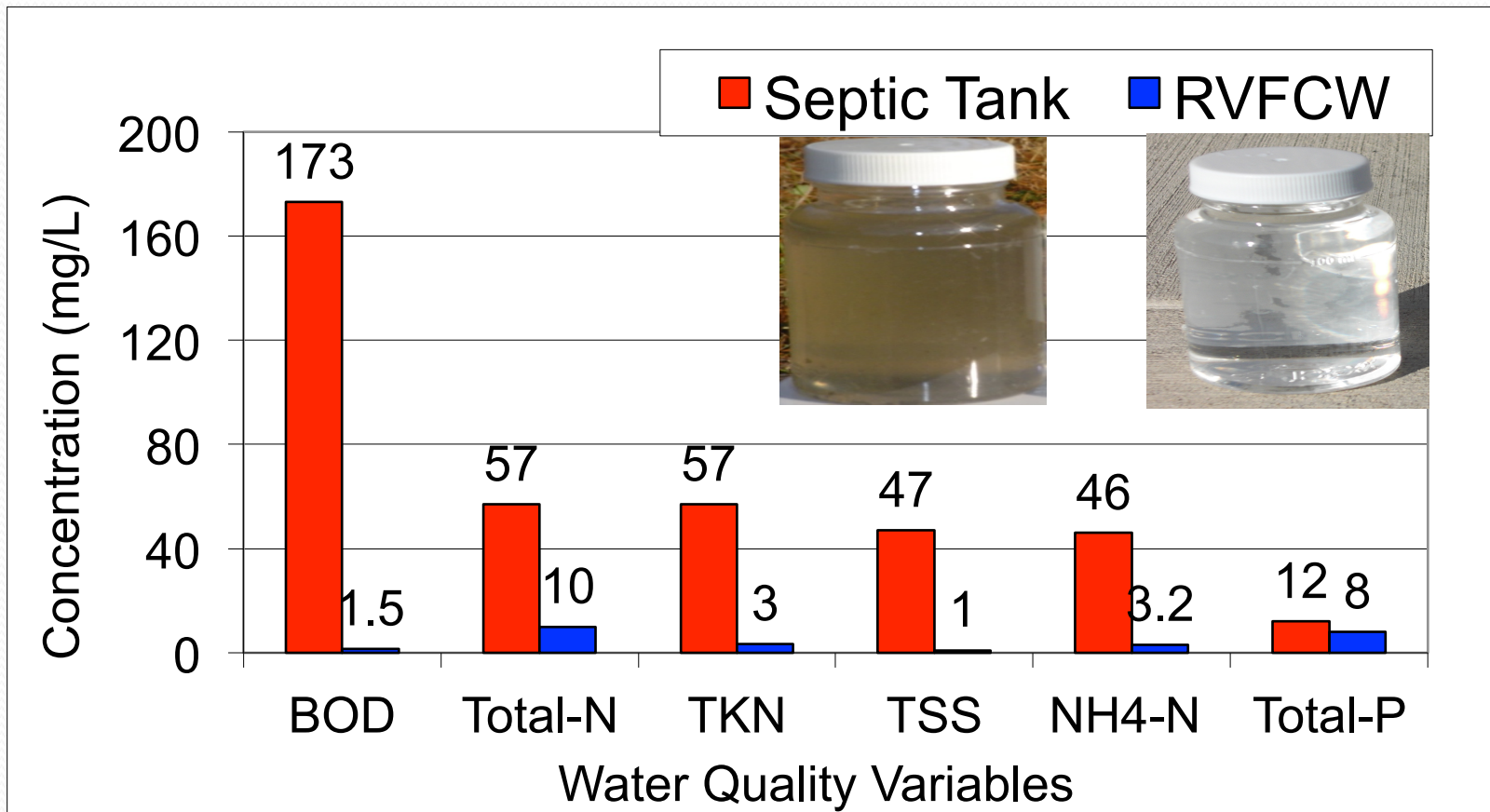
Single Compartment Septic Tank



Laboratory Testing:

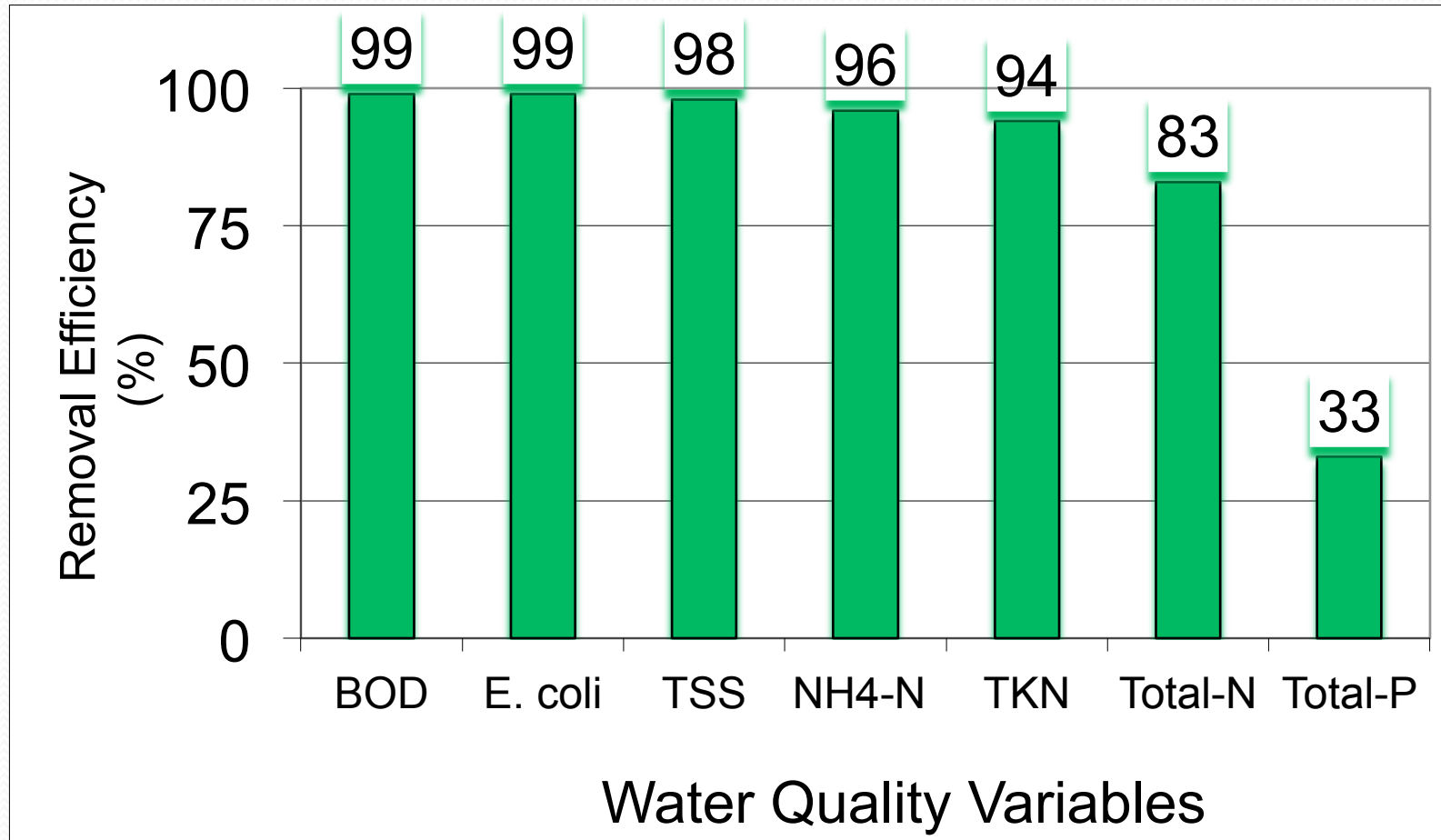
- Certified US EPA Laboratory
- Samples effluent: septic tank versus RVFCW
- Analysis Effluent for:
 - BOD₅: Biological Oxygen Demand
 - TSS: Total Suspended Solid
 - Nitrogenous compounds:
 - Ammonia-nitrogen (NH_4^+ -N)
 - Total Kjeldhal Nitrogen ($\text{TKN} = \text{NH}_4^+$ -N + Organic N: urea and uric acid)
 - Nitrate (NO_3^- -N)
 - TN (TKN + Nitrate)
 - Total phosphorus (TP)
 - Fecal coliform bacteria (*E. coli*)
 - On-site: T°C (air and water), DO, ORP and pH

Results and Discussion



***Fecal coliform (*E. coli*) 2 to 4 log reduction from 10^6 to $10^{4/3}/10^2$**

CONCLUSIONS



FUTURE REPORTS

- Recirculating vertical flow constructed wetlands to enhance biological nitrogenous and phosphorus removal from sewage:
 - Engineered ecosystems for sustainable biomass crop production: Corn, sunflowers, soya-beans



- Tire chips as replacement of stone
- Recycling & Reuse: Water reclamation

Additional Information about CWs

http://www.lagrangecountyhealth.com/Pages/Constr... Constructed Wetlands

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Sugg... Los ... Get ... regi... Unti... LaGr... Bris... Curr... Ivy ... Life... TWC Inte... Indi... LaGr... Type... ifio... RYLM... dlgr... MUN... Prog... Outl... M Onli...

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On-Site Sewage Rule
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FAQ
Sanitary Sewer

BIO-ENHANCED TREATMENT SYSTEM (BETS)
(Constructed Wetlands To Treat Sewage On-Site)
Constructed Wetlands (Humedales Construidos)



1. Materials & Installation
[General Information](#) [Plastic Liner](#)
[Filter\(outlet septic Tank\)](#) [Wetland Dimensions](#)
[Wetland Plants & Guide to Selecting Plants](#)
[Operation and Maintenance Manual](#)
[General steps to install a gravity constructed wetland](#)

Recirculating Vertical Flow Constructed Wetland=**RVFCW**
[General steps to Install a RVFCW](#)
[Timer \(option 1\)](#) [Timer \(option 2\)](#)
[Pump Specifications & Orificies Shield/Diffusers](#)

2. Future Reports:
Recirculating vertical flow constructed wetlands to enhance biological nitrogenous and phosphorus removal from sewage: Engineered ecosystems for sustainable biomass crop production(**Research Project in Progress**).

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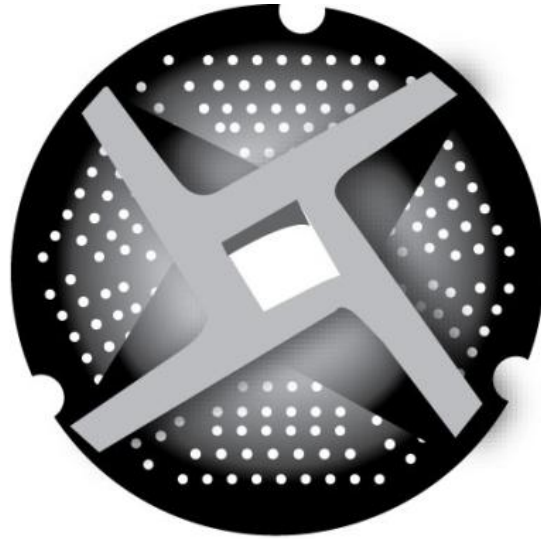


Thanks a lot for your time
and attention...!!!

Questions

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