Pump Tank and Pretreatment Inspection & Troubleshooting

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Evaluate Presence of Odor

- Odors are improper venting
- Check seals
  - Lid
  - Conduit

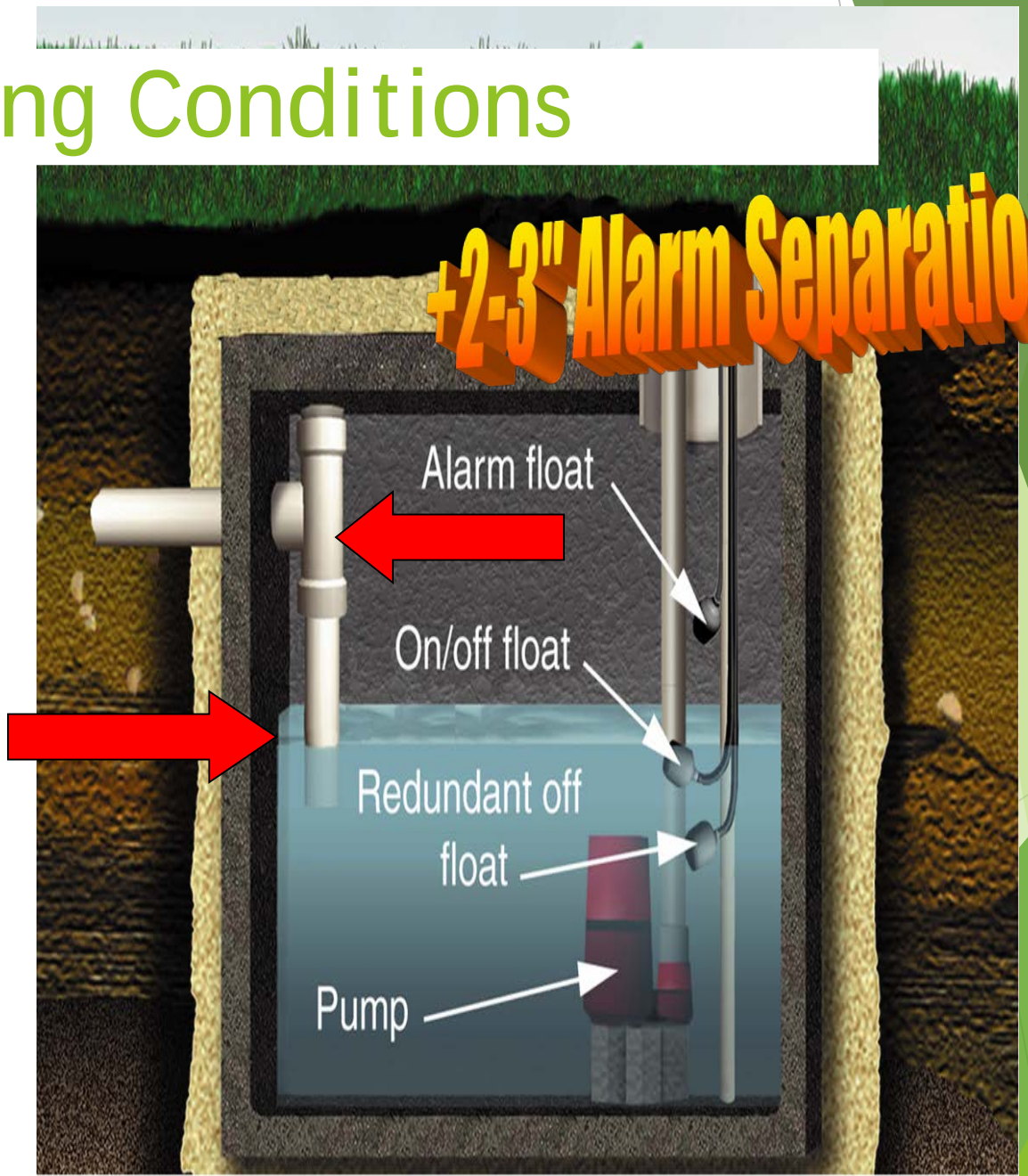
Tank Access

a. Access location:
b. Located at grade?
c. If ‘No’, how deep is lid buried?
d. Risers on tank?
e. Evidence of infiltration in risers?
f. Lids securely fastened?
g. Lid in operable condition?

Current Tank Operating Conditions

a. Liquid level relative to inlet

b. Maximum depth



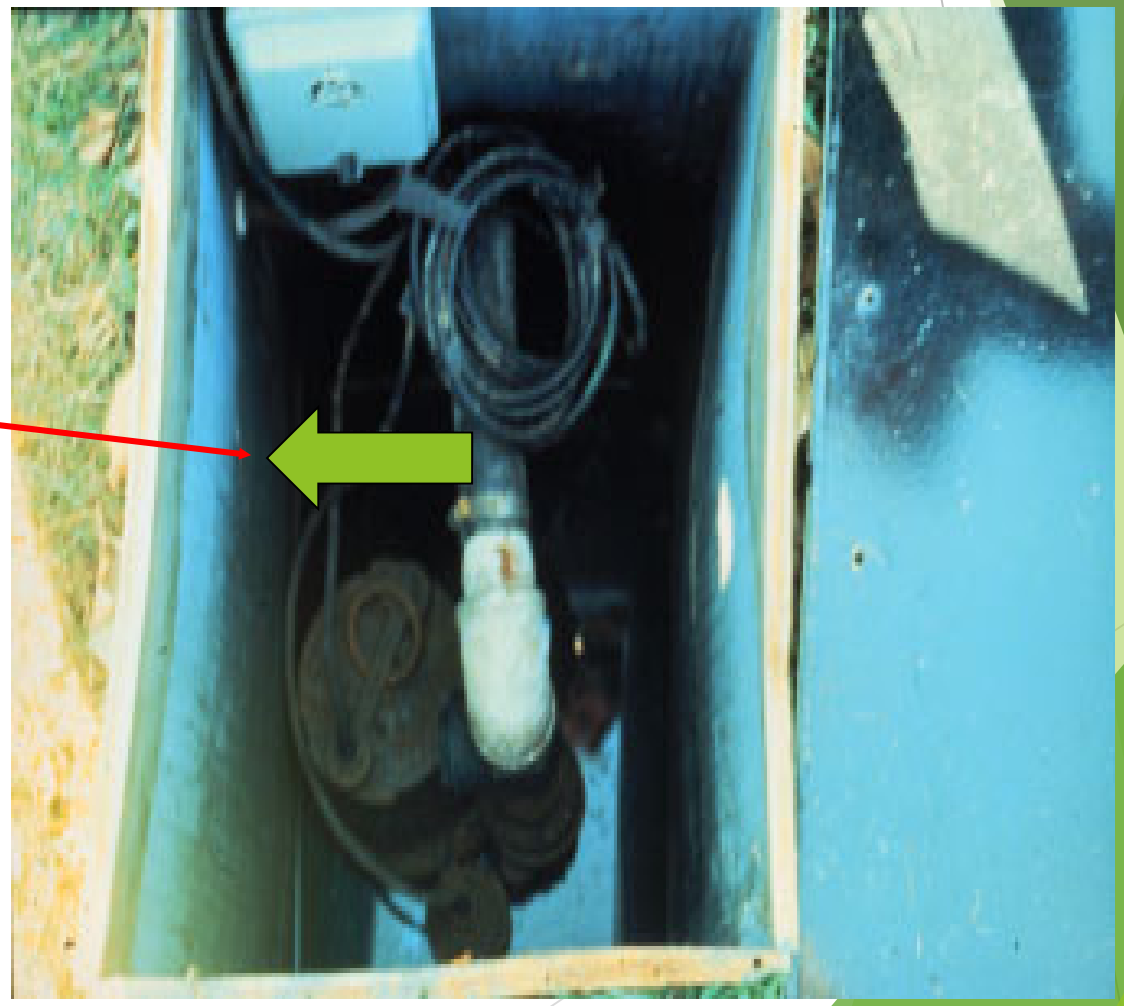
Current Tank Operating Conditions

c. Height with respect to alarm (inches):

d. Evidence liquid level has been higher:

- Stains
- Material hanging on the lid

e. Evidence liquid level dropped without pumping?



Pump

- Pump under access
  - Reachable from surface
  - Removable
  - Note if not

Pump Should Be

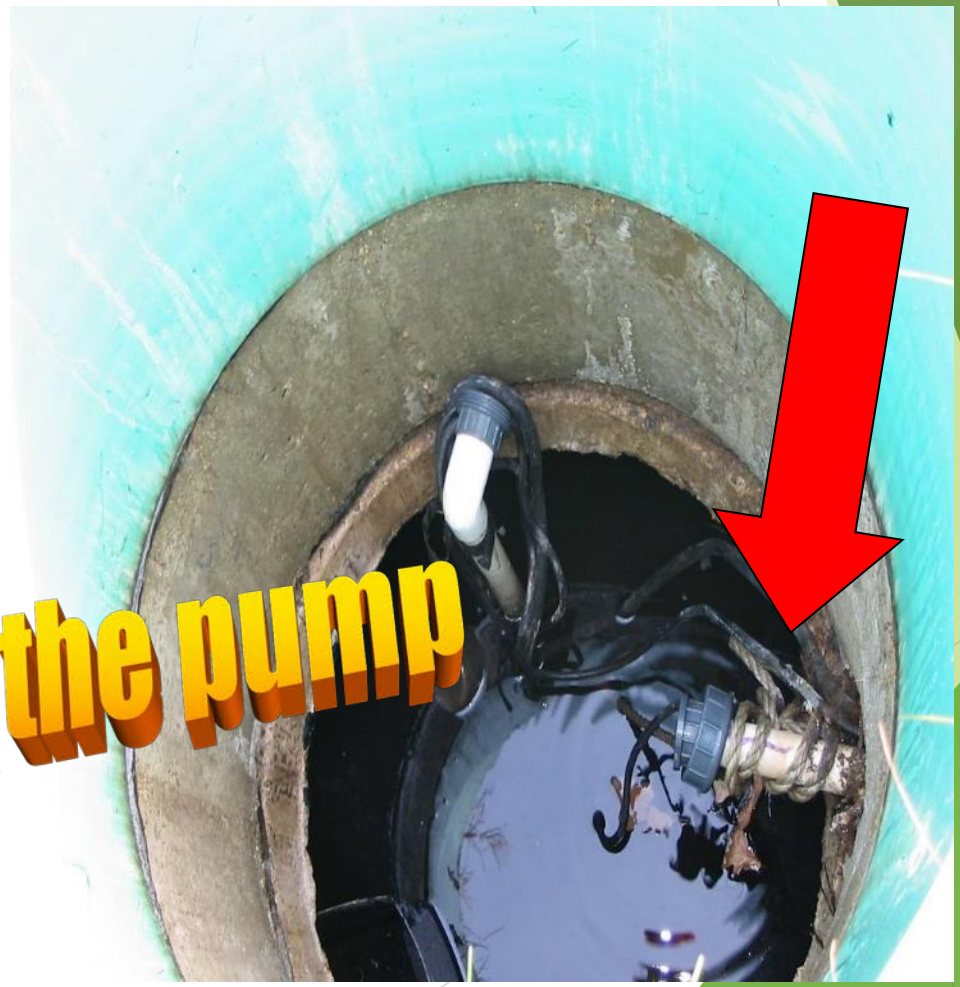
- Elevated off bottom
  - Storage
- Covered with effluent
  - Protection

Pump Placement

- Pump must be up out of the solids layer
  - unless it is a grinder pump
- A block is common
  - but not recommended
    - hard to find when tank is full of sewage
    - pump torque will move pump
    - no screen

Pump Removal?

- Pull chain or rope present
- Make sure it is secure when leaving the site
- Loose ropes sink pumps



Snake Removal?

Discharge Assembly

Quick disconnect present?

Fernco is not a quick disconnect!

Electrical Components Sealed and Watertight?

Electrical Conduit Sealed?

How is the Pump Operated?

- Float - Piggy back
- Control panel
  - Float - Demand
  - Panel functions
    - Running time clock
    - Event counter
- Timer panel

Does the Pump Work?

- On/ Off
- Alarm

How to Check?

- Lift the float
- Fill the tank to operate
- Run a dose
  - Check gpm {flow rate}
  - Gallons per inch x inches ÷ time = gpm

Drain Back?

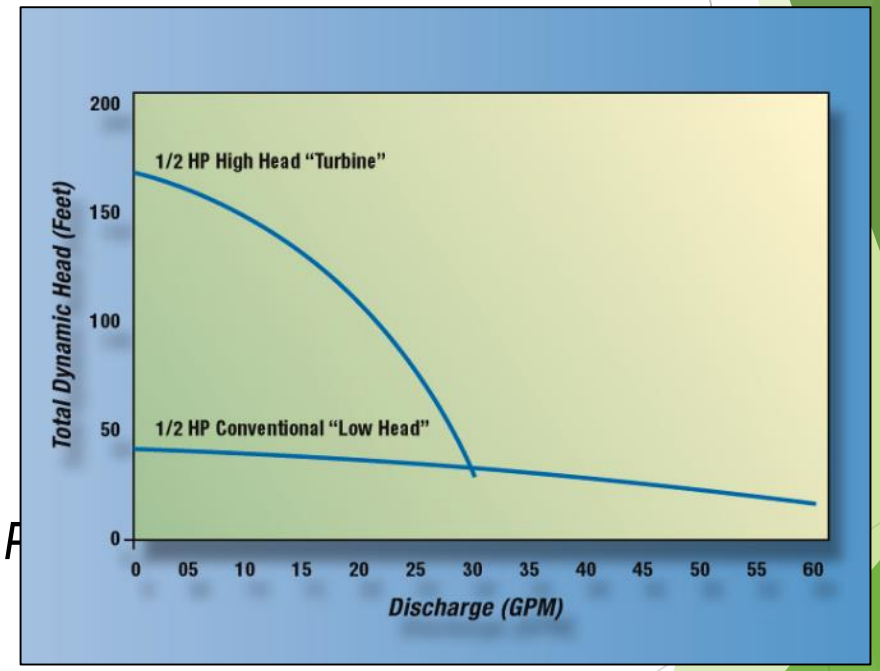
- Weep hole
- Check valve
  - Freezing

Is the Pump the Right Size?

- Flow
  - rate that water needs to be moved
- Pressure (or head)
  - the pressure required to generate the required flow
  - calculated by knowing
    - elevation difference
    - friction in pipes and fittings
    - required pressure at distal end

Using a Pump Curve

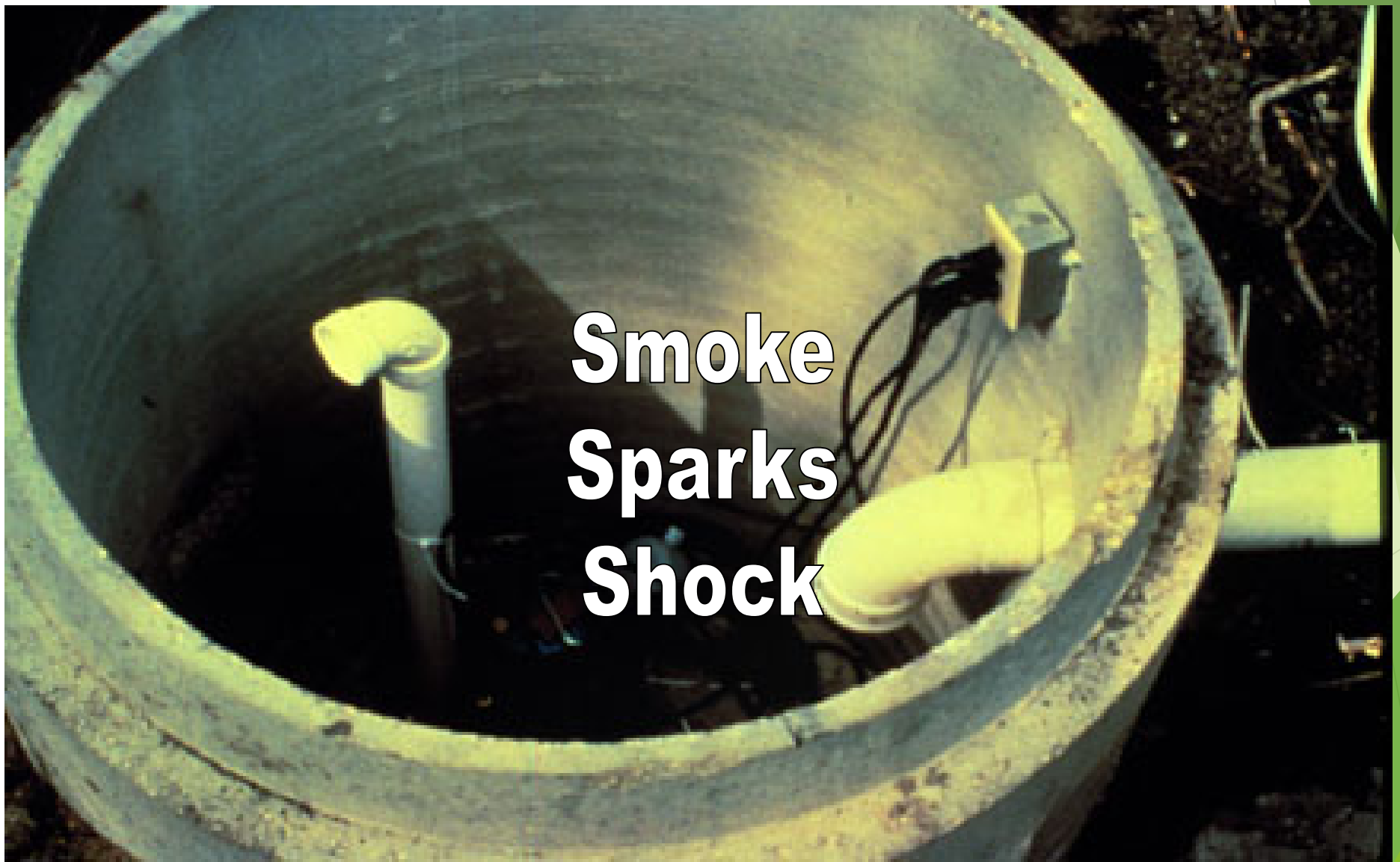
- One-half horsepower
  - the turbine pump can produce high head at low flows
  - the other pump cannot produce much head but has high flow
  - notice the curve shape



Alarm?

- Separate circuits?
  - Shut off circuit in basement for alarm
    - Pump still operational?
- Only lift it up if you can silence @ panel
- Be careful as lifting to not damage

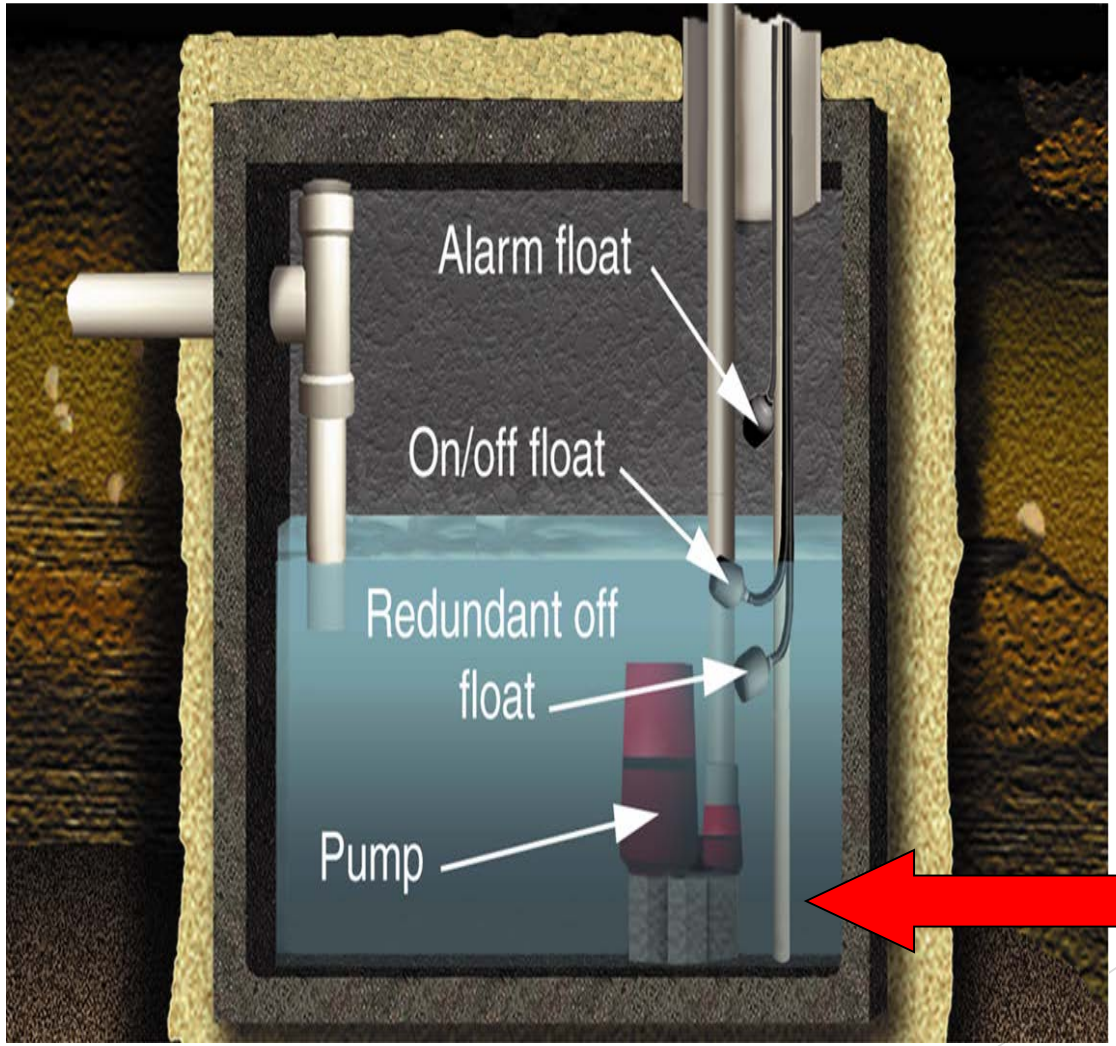
Electrical?



Electrical Components Sealed and Watertight?

Electrical Conduit Sealed?

Tank Pumping Recommended?

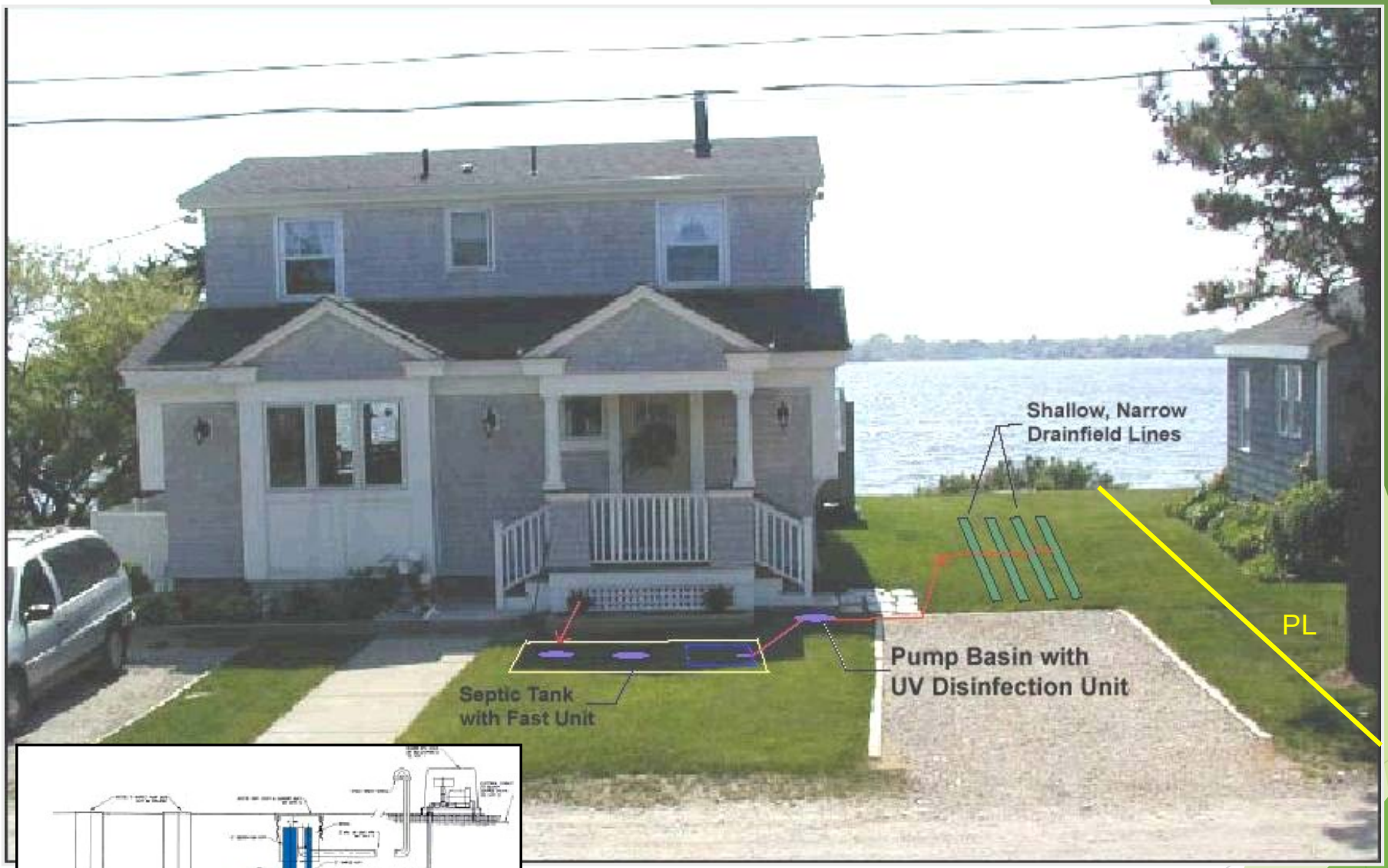


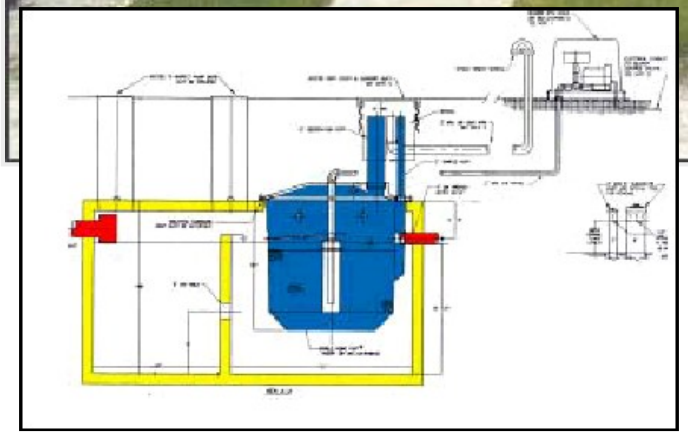
>25%

Pretreatment Units

Why Aerate?

- Aerobic environment
  - Has dissolved oxygen
  - Aerobic microbes break down waste
    - Faster than anaerobic treatment
    - Little odor





Fixed Activated Sludge System

Types of Aeration Devices

- Aerobic Treatment Units (ATUs)
  - Saturated units – bubble air through water
- Media Filters
  - Unsaturated units – diffuse air through pore space

Aerobic Treatment Unit

- Aerobic tank
  - Saturated environment (liquid)
  - Incorporates dissolved oxygen (2 mg/L)
    - Organisms break down organic matter into
      - CO_2
      - H_2O
      - Produce new organisms/cells
  - Higher quality effluent than septic tank
    - Less TSS
    - Less BOD
  - Bacterial cells accumulate, must be dealt with

Comparisons of Domestic WW Effluent

Constituent	Septic tank	ATU
BOD (mg/L)	140-220	5-50
TSS (mg/L)	50-100	5-100
Total (N mgN/L)	40-100	25-60
Total P (mgP/L)	5-15	4-10
Fecal col/100ml	1 million to 100 million	1,000 – 10,000

Siegrist, 2001

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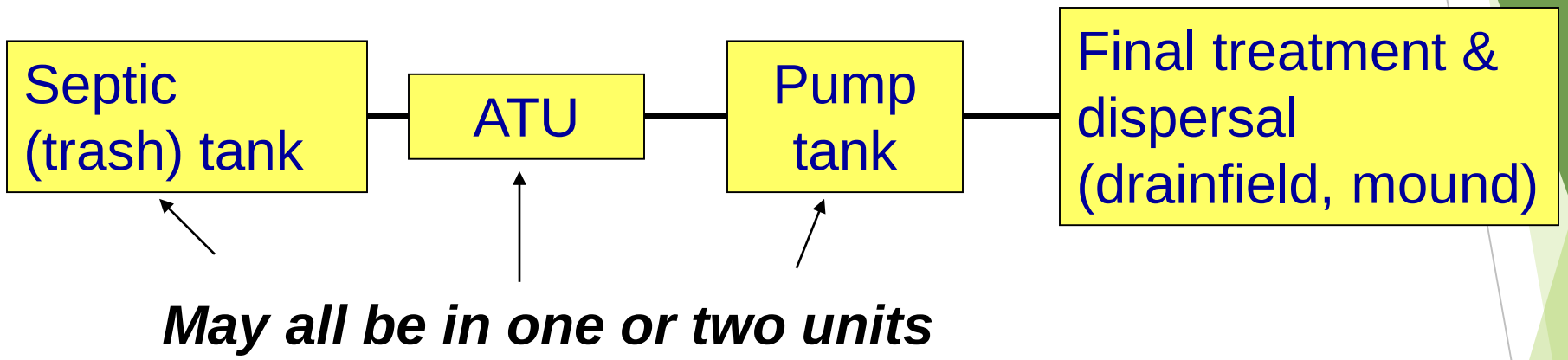
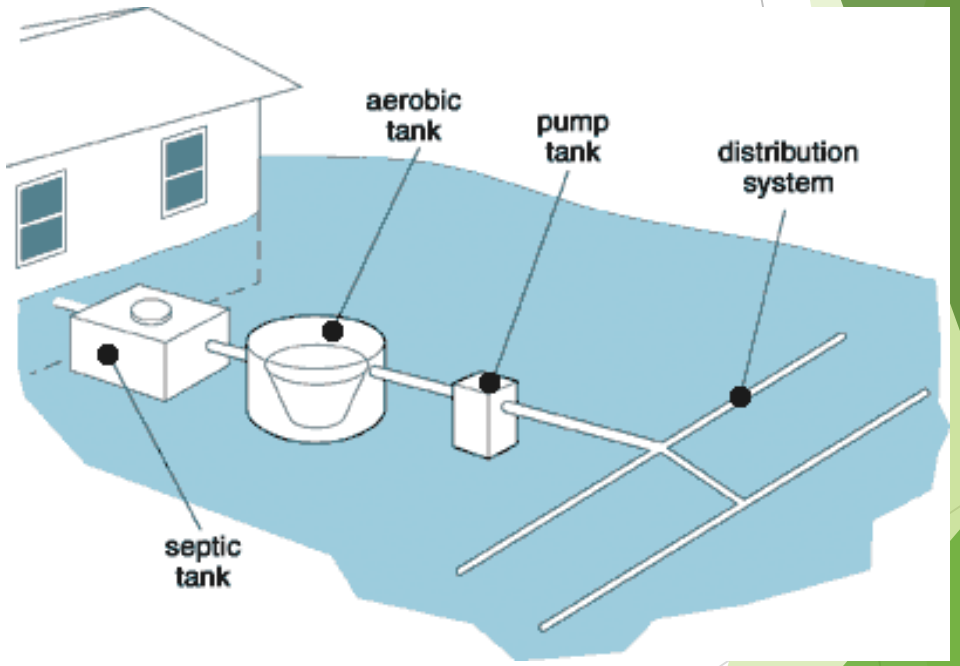
Treatment Train



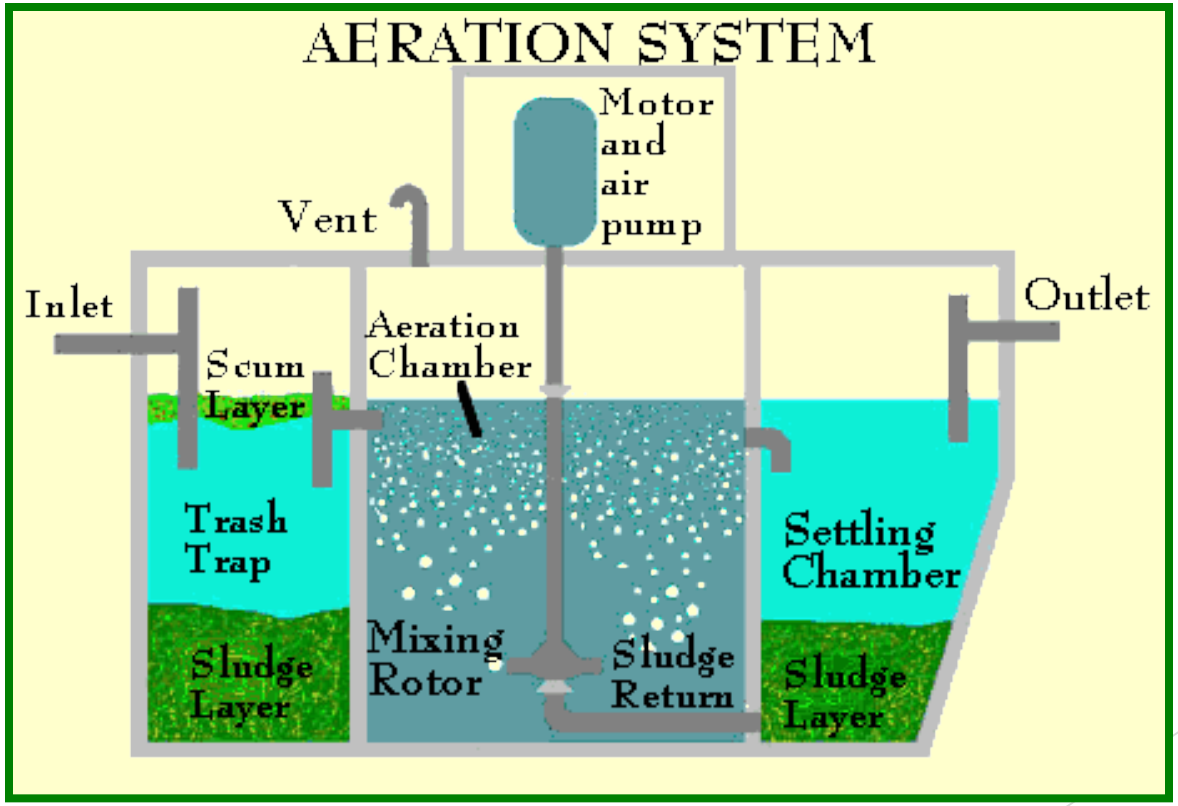
Layout

- ATU positioned after septic tank or trash tank
  - Reduces amount of solids entering ATU
  - Provides some flow equalization



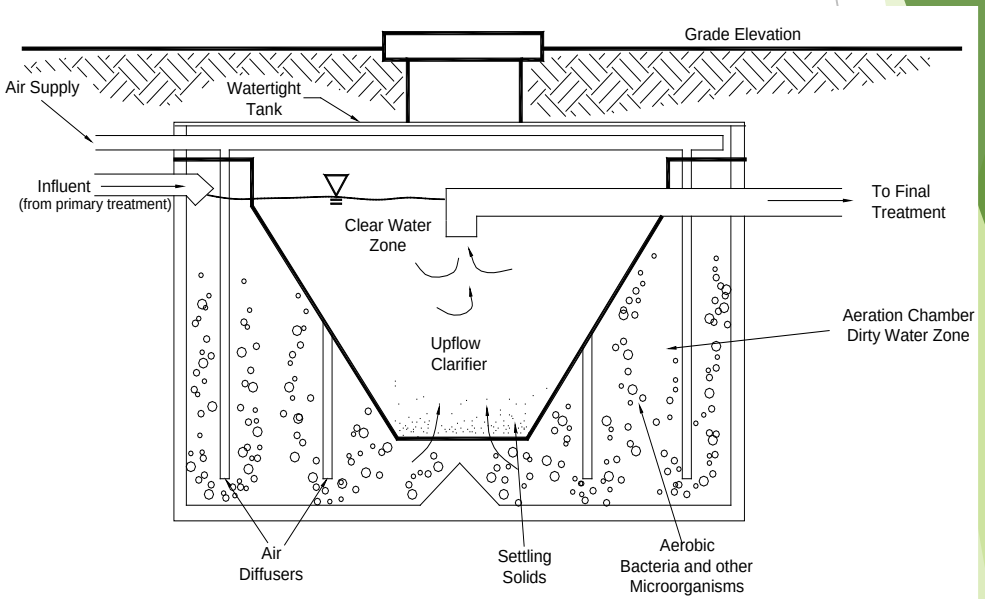
Aerobic Treatment Unit

- Typical components



ATUs: Miniature WWTP

- Biological processes are well understood
- Mix microbes, wastewater, and dissolved oxygen



Hydraulic and Organic Loading

- Two main design parameters
  - Hydraulic Loading
    - Rate that water will pass through the device
    - Must provide sufficient retention time
    - Wash-outs can occur on laundry day
  - Organic Loading
    - Organic matter is food for microbes
    - More food than microbes – poor quality effluent
    - More microbes than food – high quality effluent

What should it look like?

- Air operating
- DO > 2 mg/l
- Musty odor
  - Rotten eggs
- Brown color-Chocolate
  - Black
  - Clear
- Settling
  - 50% in 15 min.
- Effluent quality

DO Testing

- Meter
- Kit

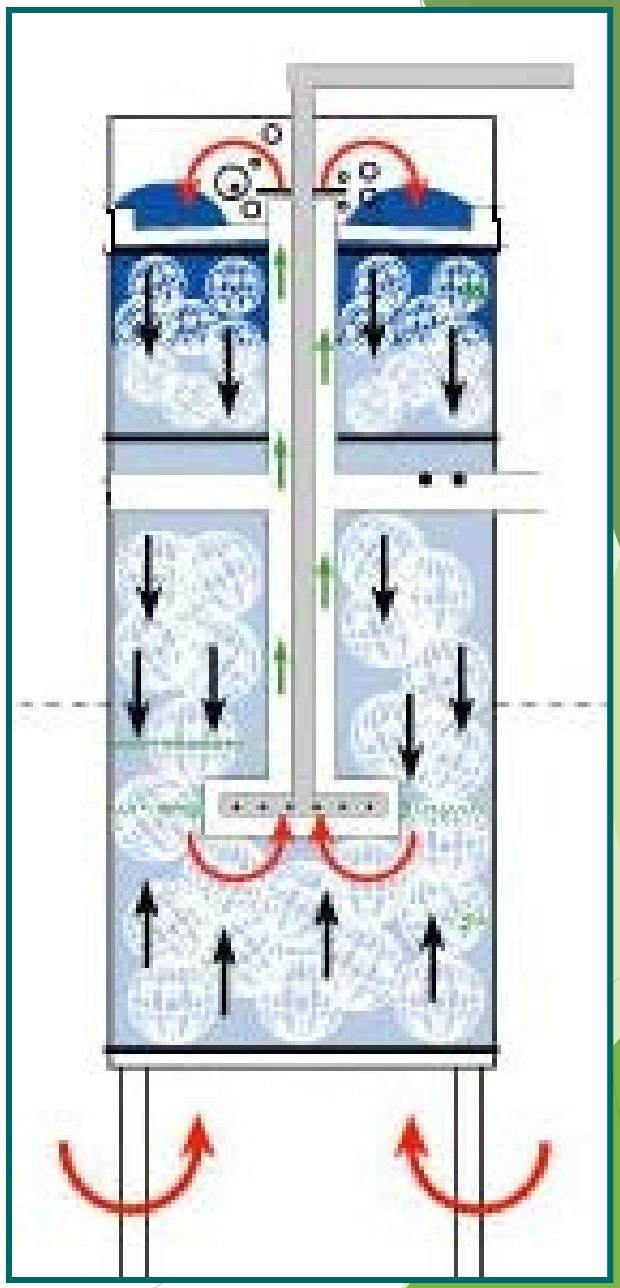

Color
Smell
Look

Foam

- Color
  - White & Soapy
  - Gray/ Black

Low DO

- Air problems
  - System
  - Owner
- High organic loading



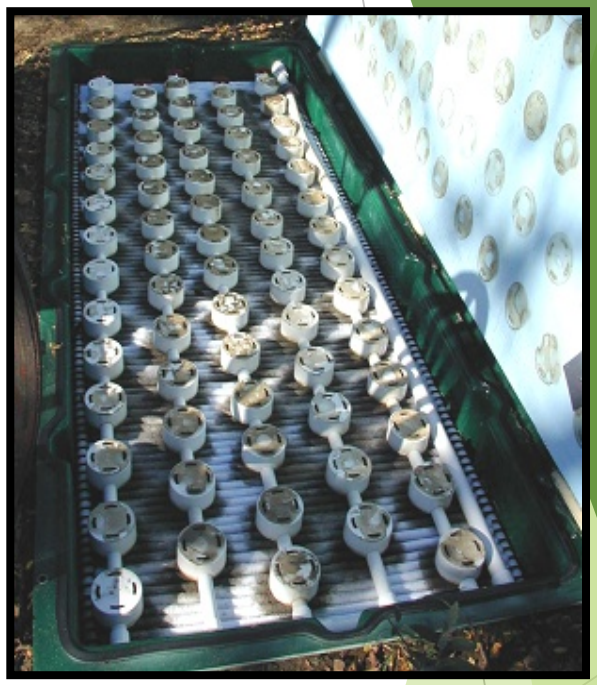
Microbial Biomass Management ~Wasting

- Sludge wasting is required to reduce the quantity of biomass in the system.
- Frequency depends on the waste load into the system. High organic loading requires larger microbial population to transform waste
- SG: 30 minute settle ability test is used to determine when system needs pumping.
- FF: Plugging of media {50%}

Media Filters

Description

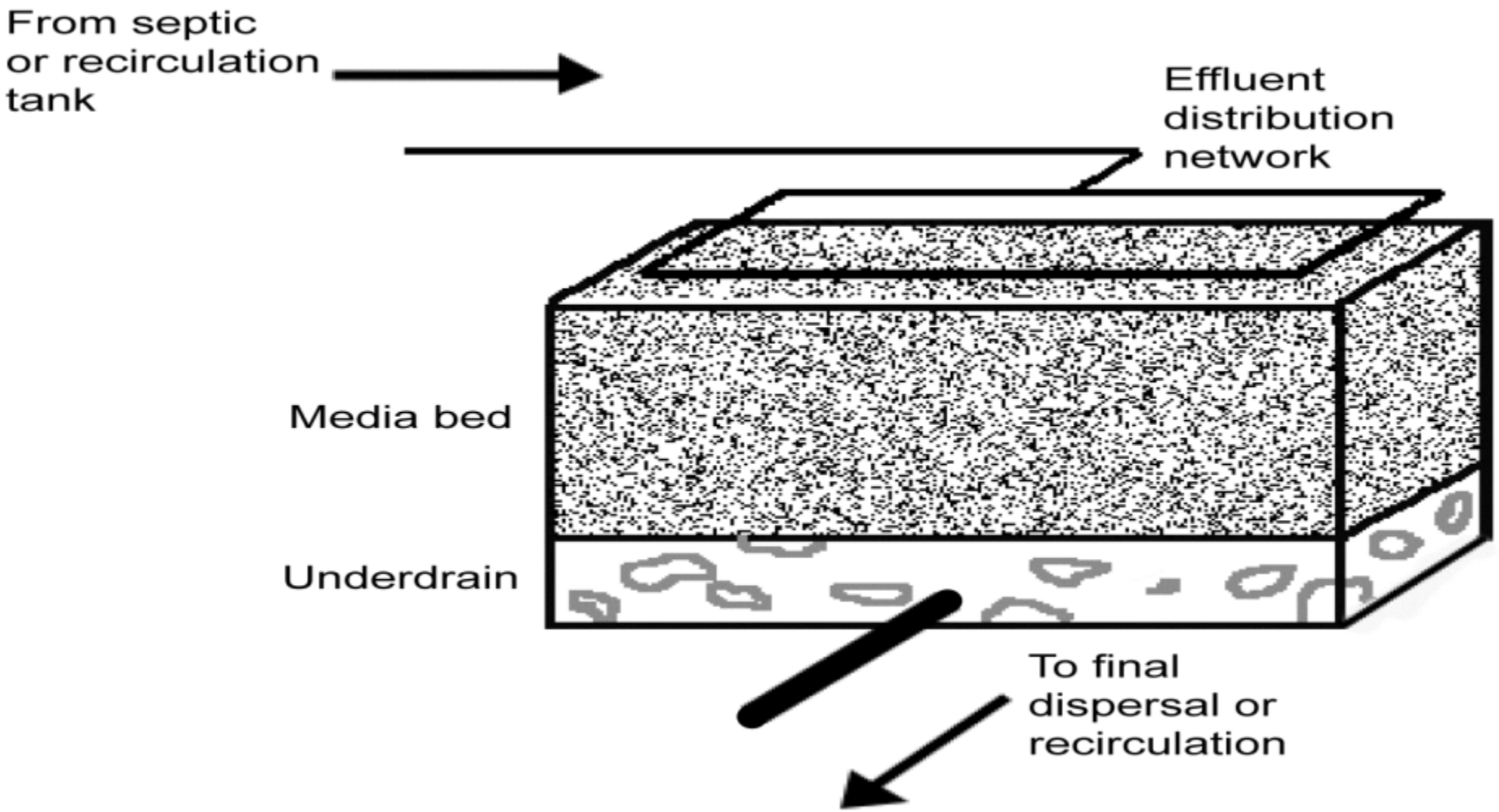
- Watertight structure with media of particular specifications
- After being collected in a processing tank, effluent is distributed (by pressure or gravity) over the surface of the media
- Media provides surface area for bacteria and other microorganisms to treat the effluent
- Aerobic treatment zone



Description

- Media is typically un-saturated
- The presence of air promotes establishment of favorable microorganisms
- Effluent percolates through media to under-drain system where it is collected for further treatment

General Wastewater Flow



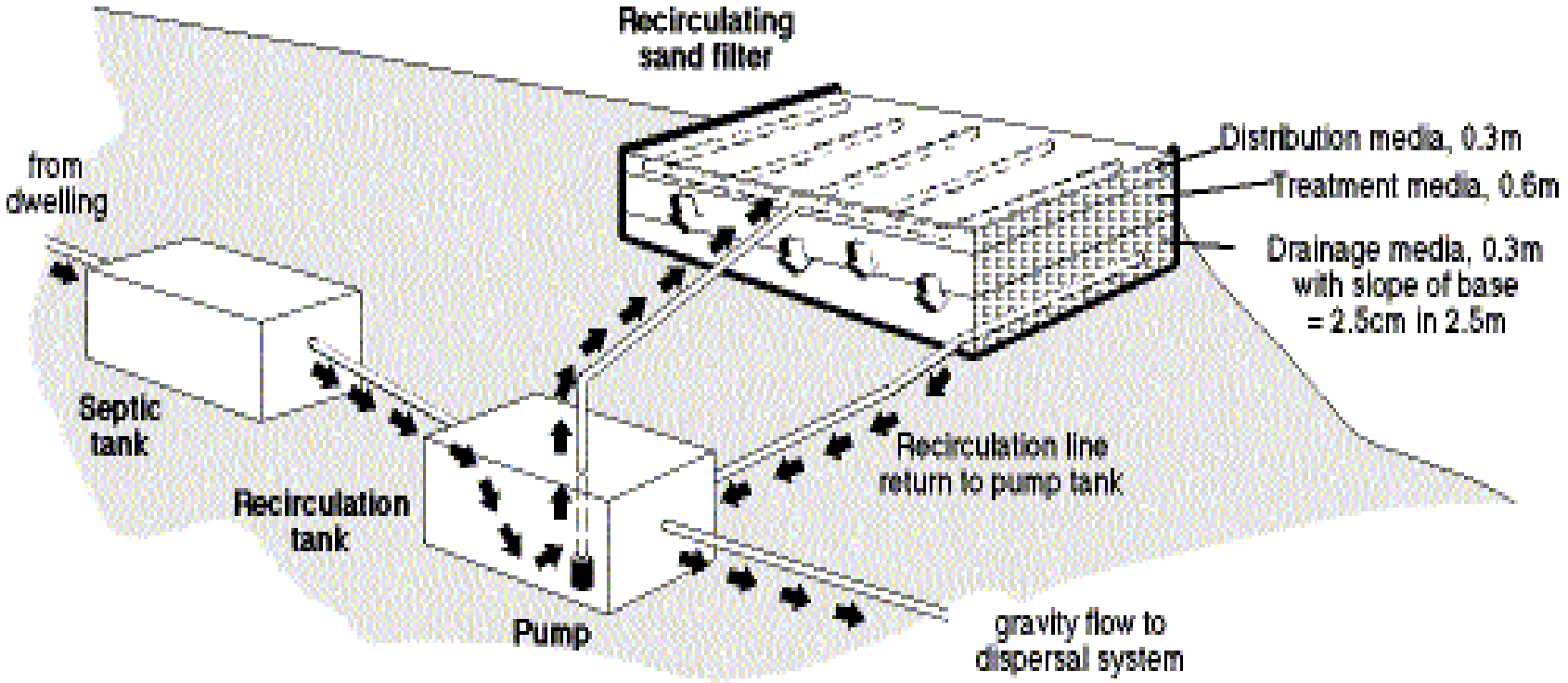
Single-Pass Media Filters (SPMF)

- Usually pressure dosed, but some are gravity fed
- Applied wastewater infiltrates the filter surface
- Percolates through the filter *only once,*
  then flows to the next treatment step
- Treated effluent then flows to STA
- Usually quite effective in removing BOD, TSS, and pathogens

Recirculating Media Filters (RMF)

- Multi-pass filters
- Wastewater is treated by mixing effluent that has passed through the media bed with raw septic tank effluent.
- Filtrate from the media filter is split
  - A portion returns to the recirculation tank for more processing and a portion goes out for final dispersal.
- Recirculating media filters are effective in reducing BOD, TSS, and total nitrogen.

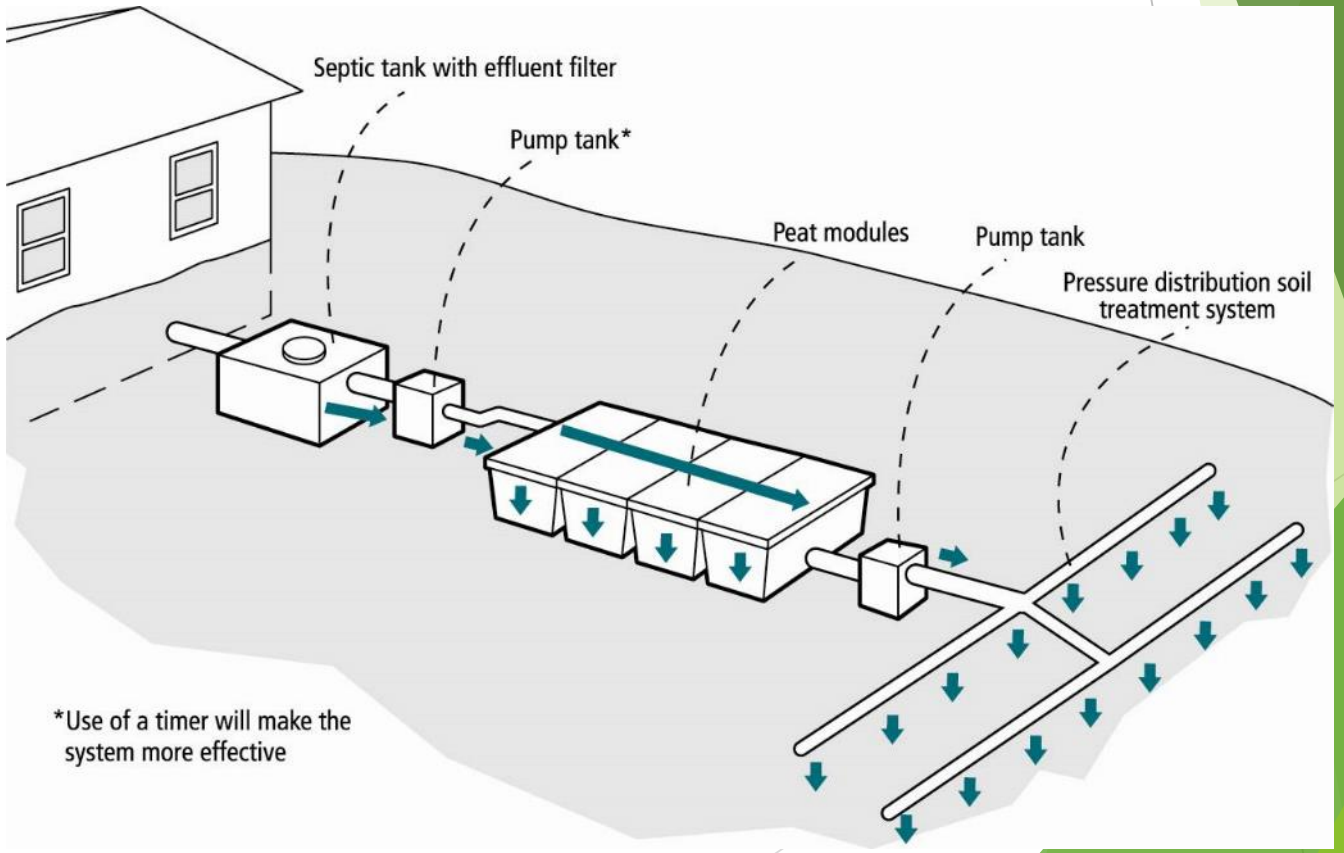
Flow Path in a RMF



Troubleshooting Media Filters

Problems in Filters

- Ponding
- Performance
  - Pathogens
  - Nutrients



Assess system

- Infiltrative surface
- Replacement activities
  - Peat
  - Plantings
- Distribution system
- Drainage system
- Effluent quality

Accessibility

- Operation
  - Surface of filter
  - Drainage operation
  - Effluent quality
- Maintenance
  - Distribution System
  - Media issues

Ponding

- Ponding is a problem
  - Single pass
  - Recirculating
- Media selection
  - Peat
    - Depth
  - Textile
  - Wetlands
    - Plants
- Loading rate
  - BOD
  - H_2O

Media

Ponding- O2 relationships

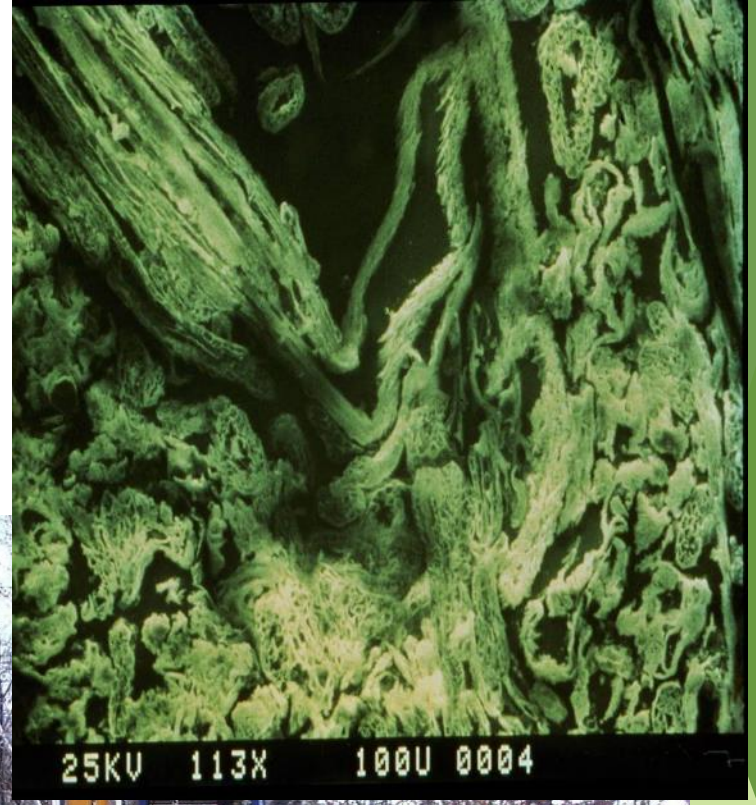
- Overloading
  - Water {Hydraulic}
  - Food {Organic}
- Oxygen flow

Media

- Media quality
  - Sand
  - Synthetic
- Wetland vegetation
- Quantity-
  - Depth
    - Peat
    - Synthetic

Media depth-

- 24” typical
- Organic
  - Dissolve
  - Compact
- Replace
  - < 25%
  - 6”
  - Rebuild



Constructed Wetland

- Vegetation
- Levels
- Sizing
- Distribution
  - Ponding

Drainage

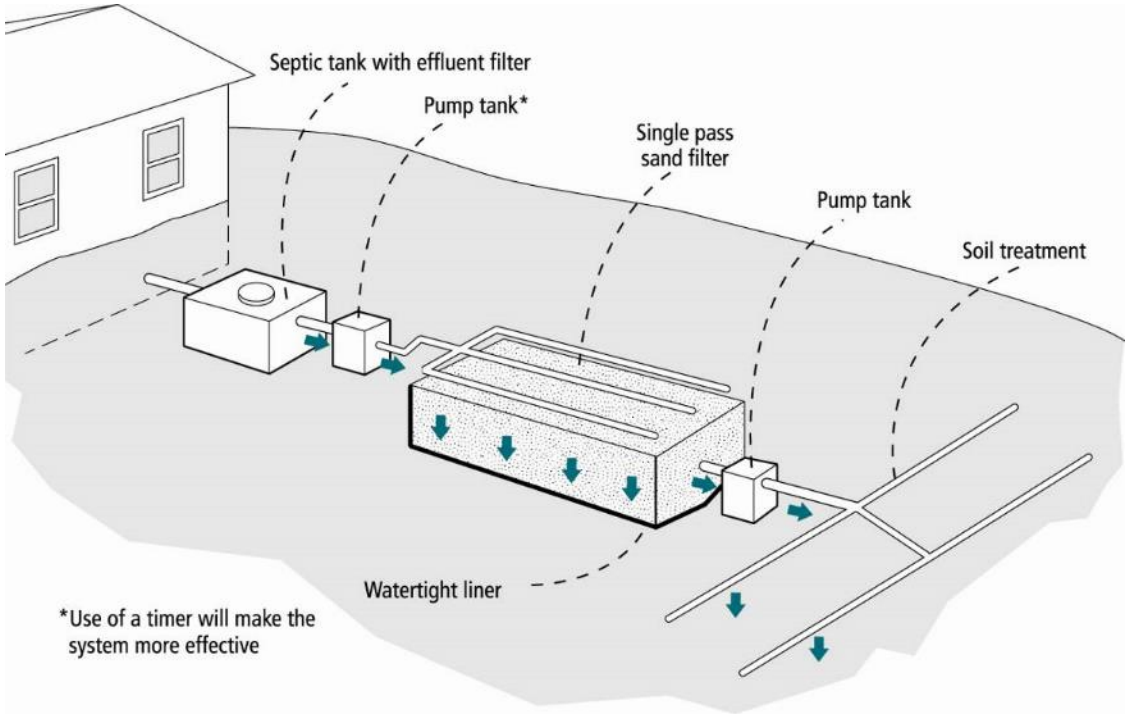
- Saturation- No air movement
- Design- [float sep.]
- Plugged drainage--- Ponding

Distribution in Filter

- Squirt height
- Uniform design
- Pattern
  - Listen

Media filters

- **Single pass**



Container integrity

- Water tight
- Lids/ Access
- Insulation

Questions?