Troubleshooting Septic Tanks

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Presentation Topic Overview

- Process of troubleshooting tanks
- Odors
- Tank start-up with new systems
- Leaks and clean water
- Toxics
- Problem sources/sites

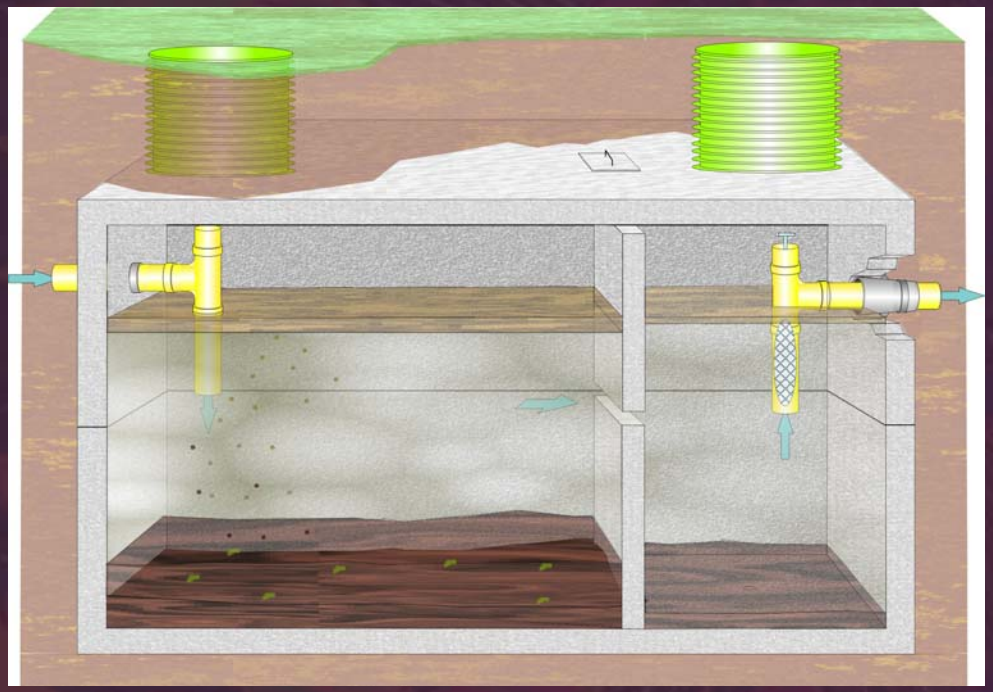
Process of Troubleshooting Tanks

- Off look or smell to tank?
- Effluent filter plugging up routinely?
- Get list of medicines/cleaners
- Get lab analysis to determine how "sick" the tank is
  - BOD and TSS
  - FOG only if commercial or a lot of FOG visible
- Determine last date of tank pumping and amount of sludge and scum

Sludge Levels

- Indicates amount of settling in tank
- Use sampling probe
  - Sludge judge or dip stick
- Should be three distinct layers if functioning properly
- Heavy accumulation means excess inputs or lack of

Scum in Tank



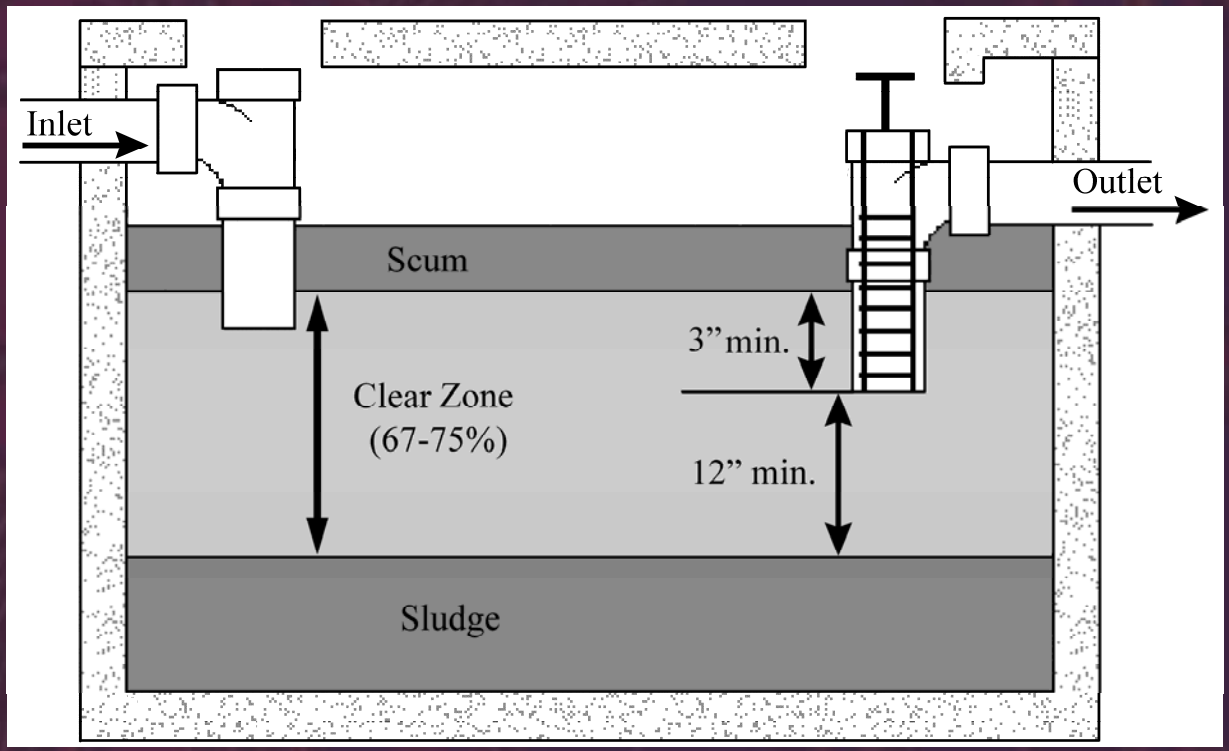
- Thick accumulation may mean excess fat oil & grease (FOG) input
- Need to maintain 2 day hydraulic retention time (HRT) between solids layers

Baffles

- Plugging of baffles indicates use issues or construction problems
- Designed to only let water in clear zone to pass
- Indicates system upsets
- Three distinct zones in septic tank should be present

When to Pump Tank

- 25 – 33% of working volume of tank
- High risk pump more often

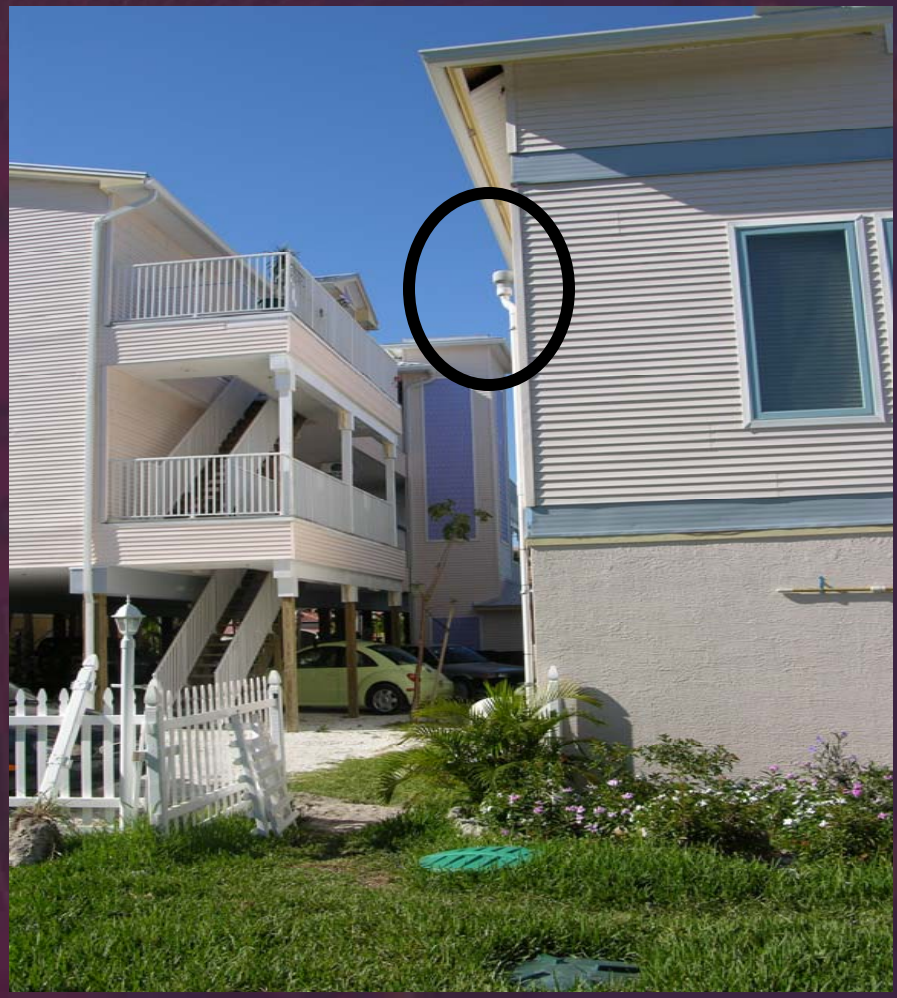


Effluent Screen

- Placed in outlet of septic tank for additional filtration
- Remove solids
- Requires periodic cleaning
- The need for frequent cleaning is an indication of organic or hydraulic overloading

Odors

- Inside
  - Venting
- Outside
  - Seals
  - Filters
  - Toxics



Outdoor Odor Problems

- Odors near septic tank
  - Manholes and riser secure?
    - Cover with soil or mulch
    - Seal with weather stripping
  - Sick septic tank?
    - Excessive chemical use in tank or lack of maintenance can effect odor
    - Pump tanks, reduce chemical usage

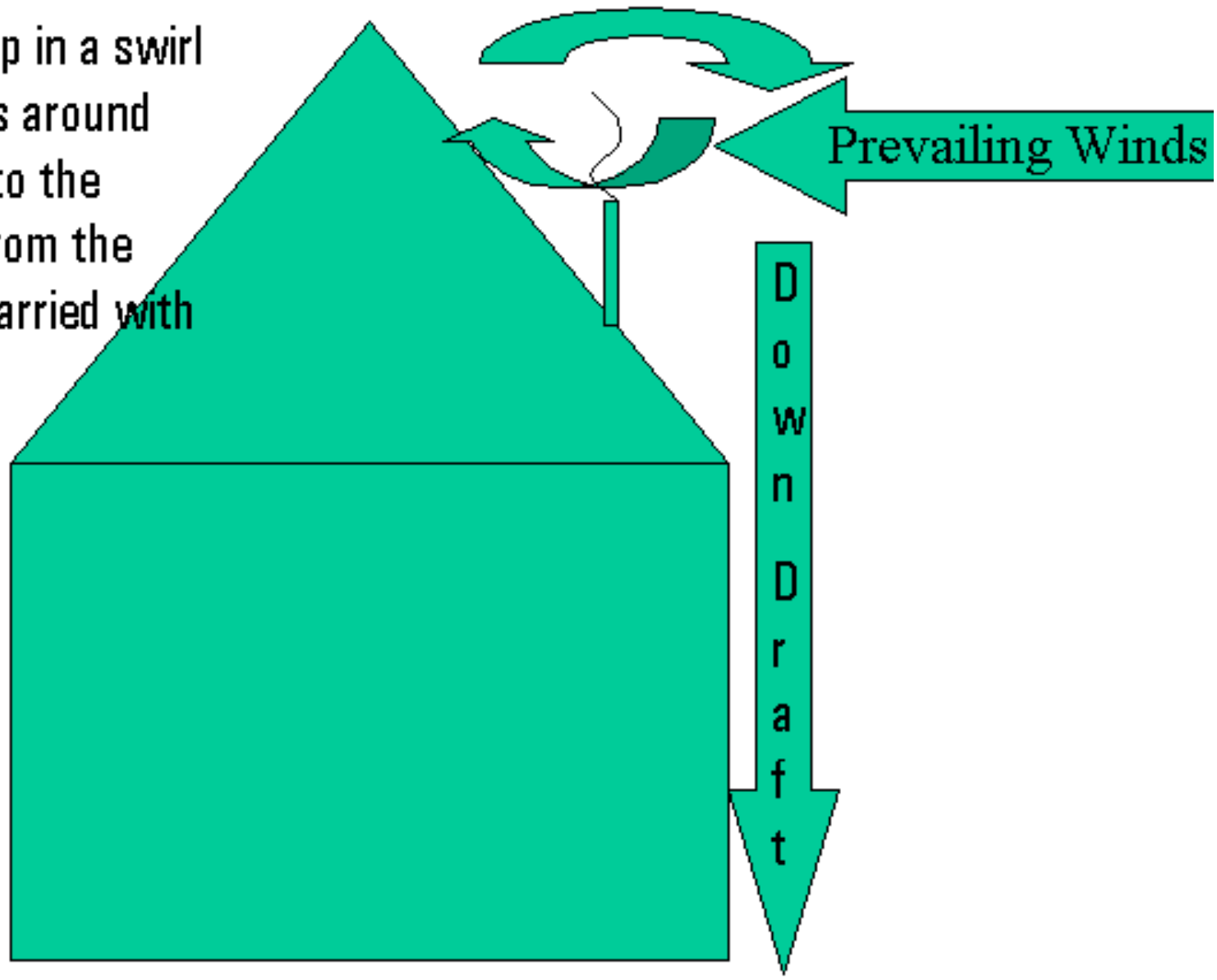
Odors Continued

- Odors near pump tank
  - Tank lid secure
  - Electrical conduit sealed?
- Odors near soil treatment units
  - Surfacing effluent
  - Vent pipe open

Odors in Yard

- Can get caught under roof over hangs
- Wind patterns can limit odor traveling away from home
  - Valleys, forested areas, low areas, etc
- Vent can be extended
- Carbon filters can be added on end
  - Be careful of winter use
  - Last 1-5 years

Prevailing winds hit the roof and curve up in a swirl which then loops around and goes down to the ground. Gases from the vent stack are carried with it.



Tank Start-Up with New Systems

Pump in the first 1-3 months

- Toxic tank
- Cleaning chemicals
- Construction chemicals
- Other outcomes
  - Education opportunity: use, 1st time owners, etc
  - Understanding the need for maintenance

Leaks & Clean Water into Tanks

- Leaks
  - In home
    - Drips
    - A ½ gallon per minute leak results in 700 gpd!
  - In system
    - Leaks into tank/risers
- Extras
  - Footing drains
    - Sump pumps
  - Roof leaders
  - Treated water
    - Pools
    - Hot tubs
  - Water treatment devices
    - Water softener
    - Iron filter
    - Reverse osmosis, etc

Mixing of Tank

- Reasons
  - Leaks/clean water
  - Peak use
    - Multiple shower heads
  - Pumping to tank
  - Elevation difference
    - Upstairs laundry or large bath tub
- Solutions
  - Control usage
  - Controlling loading
    - Timer
  - Increased tank capacity
  - Effluent screen

Water Treatment Devices

- Water Softener
  - Salt- concrete
  - Scum- separation
  - Additional water
    - On demand regeneration better
  - Softener misuse and malfunctions
- Iron Filters
  - Change iron from dissolved to solid
  - Results in iron accumulation in tank
  - More pumping needed
  - Unknown impacts to system
  - Large amount of back wash

Extra Water and Waste Producers

- Garbage disposal including many dishwashers
  - More food
  - More water
  - Slower to breakdown
  - Slower to settle
- Grinder pumps in the basement
- Jacuzzis, large tubes, showers with multiple heads

Leaks out of Tanks

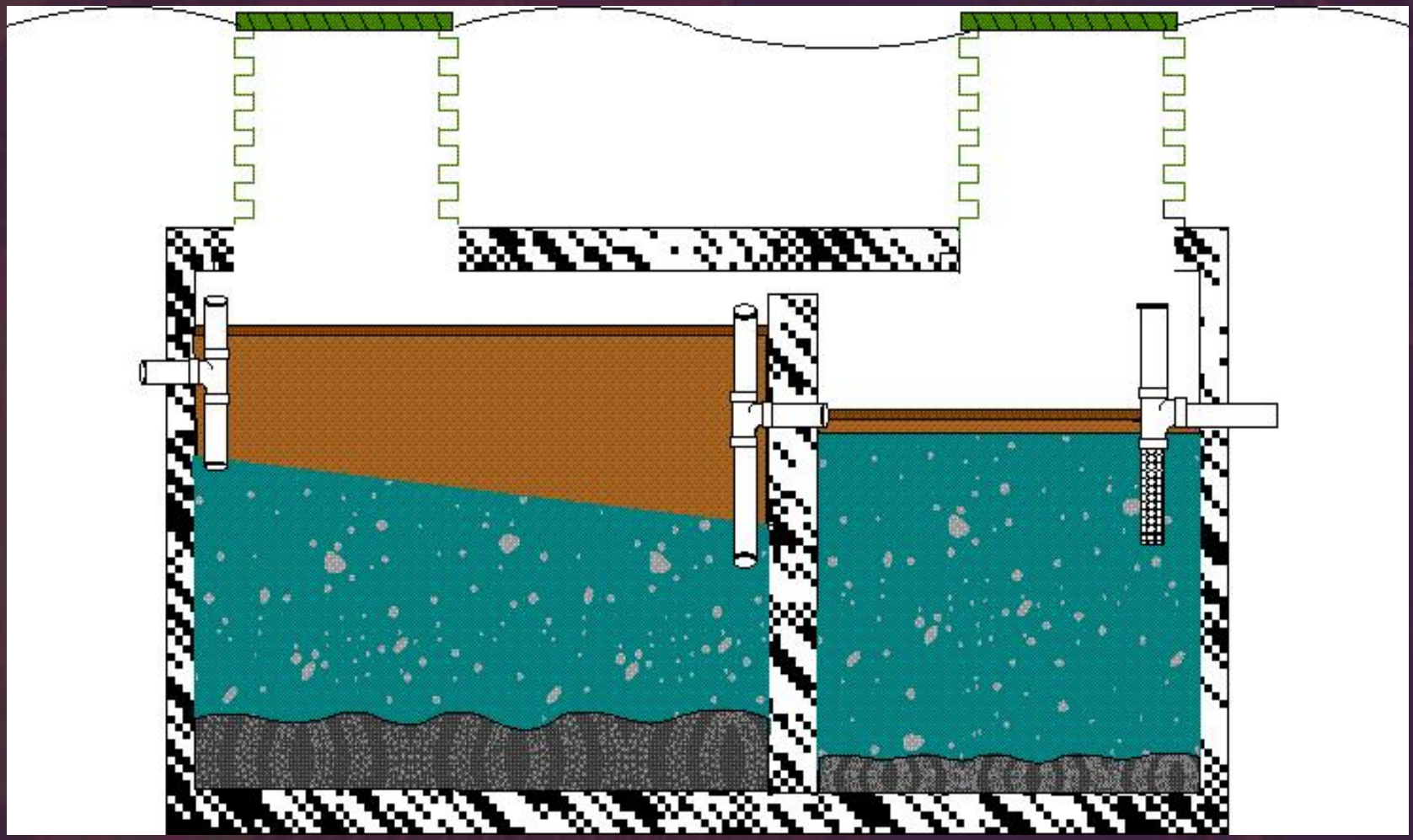
- Sends untreated wastewater into environment
- Can cause structural issues with the tank
- Safety issues

Toxic Waste

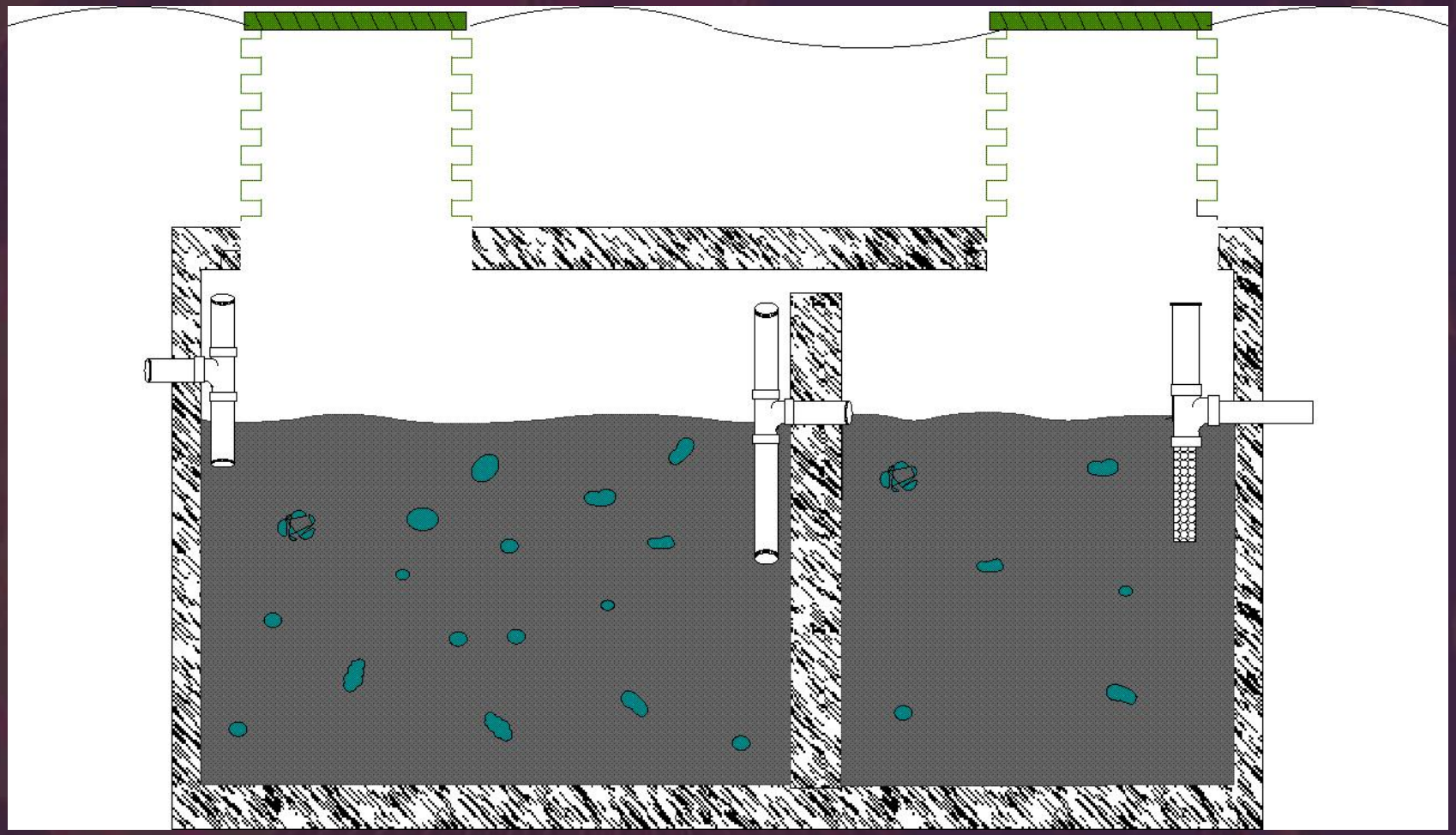
- Chemicals
  - Antibacterial
- Medicines
- Additives
  - Safe
  - Effective

Chemical Impact?

- Different types of chemicals
  - Ones that kill or upset microbes may not cause the floating mat and sludge to move through the septic tank
  - Ones cause the floating mat and sludge to move through the septic tank may not kill or upset the microbes



Healthy septic tank—before chemicals



Bulking due to chemicals

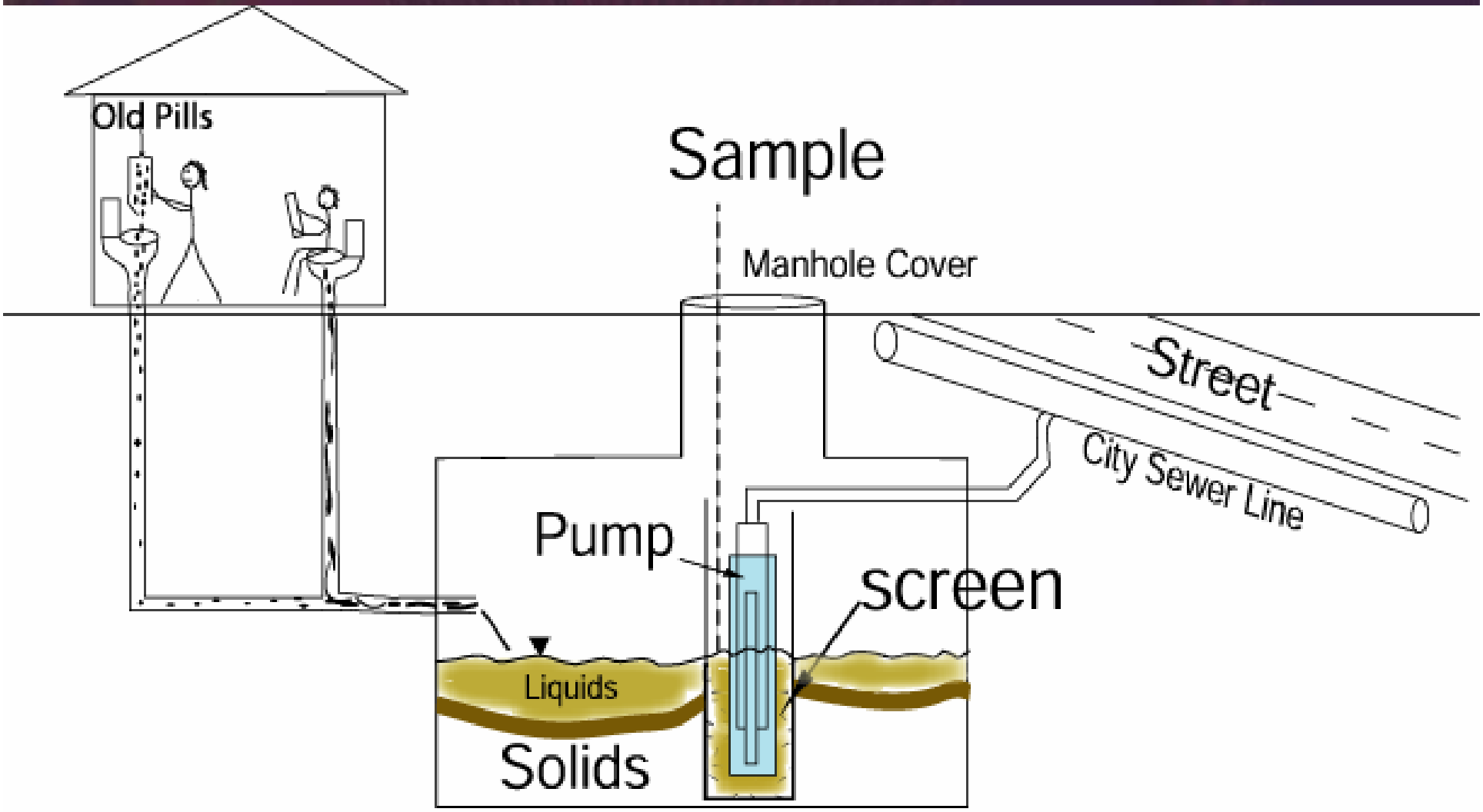
Problem Sites

- Some problem sites:
  - Dwellings with occasional or chronic prescription drug use
  - Dwelling with meth labs
  - Restaurants
  - Camps, hotels, churches and schools
  - Laundromat
  - Medical and dental facilities
  - Beauty salons
  - Car wash
  - Slaughter house
  - Dog kennels

Dwellings

- Very clean people
- Antibacterial soaps
- Antibiotic use (short and long term)
- Bulimia
- Chemotherapy
- Heart medicine, etc
- Water treatment devices
- Organic and hydraulic overloads

What NOT to do with Your Old Pills



Meth Labs and Septic Systems

Chemicals recovered from inside a meth lab
Fact sheet on our website

Chemicals Used in Meth Production

Type of Chemical	Chemical Name	Common Source
Solvents	Toluene	Paint thinner
	Methanol	Anti-freeze “Heet”
	Ethyl Ether	Starting fluid
	Benzene, Xylene, Acetone, Hexane	
Corrosives	Anhydrous Ammonia	On-farm nurse tanks
	Sodium Hydroxide	Lye, “Draino”
	Hydrochloric Acid	Hardware stores
Metals and Salts	Iodine	Iodine Crystals
	Mercury	Thermometers
	Red Phosphorus	Match books
	Lithium	Camera batteries
	Sodium Metal	
Over-the-counter medicine	Ephedrine Pseudoephedrine Phenyl-2-pronanone	Over the counter cold medicines and dietary supplements

Concerns for Wastewater Professionals

- Currently there are no guidelines related to meth lab waste for professionals in the onsite industry
- Generally toxic chemicals are diluted & not classified as hazardous

Signs of Meth Labs

- Houses or apartments with blocked-off windows or windows covered with foil
- Discoloration of structures and pavement
- Unmarked propane tanks with blue or green fittings
  - Anhydrous ammonia reacts with copper fittings
  - These tanks are dangerous!
- Unmarked trash bags may contain contaminated glassware or needles
  - Moving the bag could expose the contents to water or air and cause an explosion.

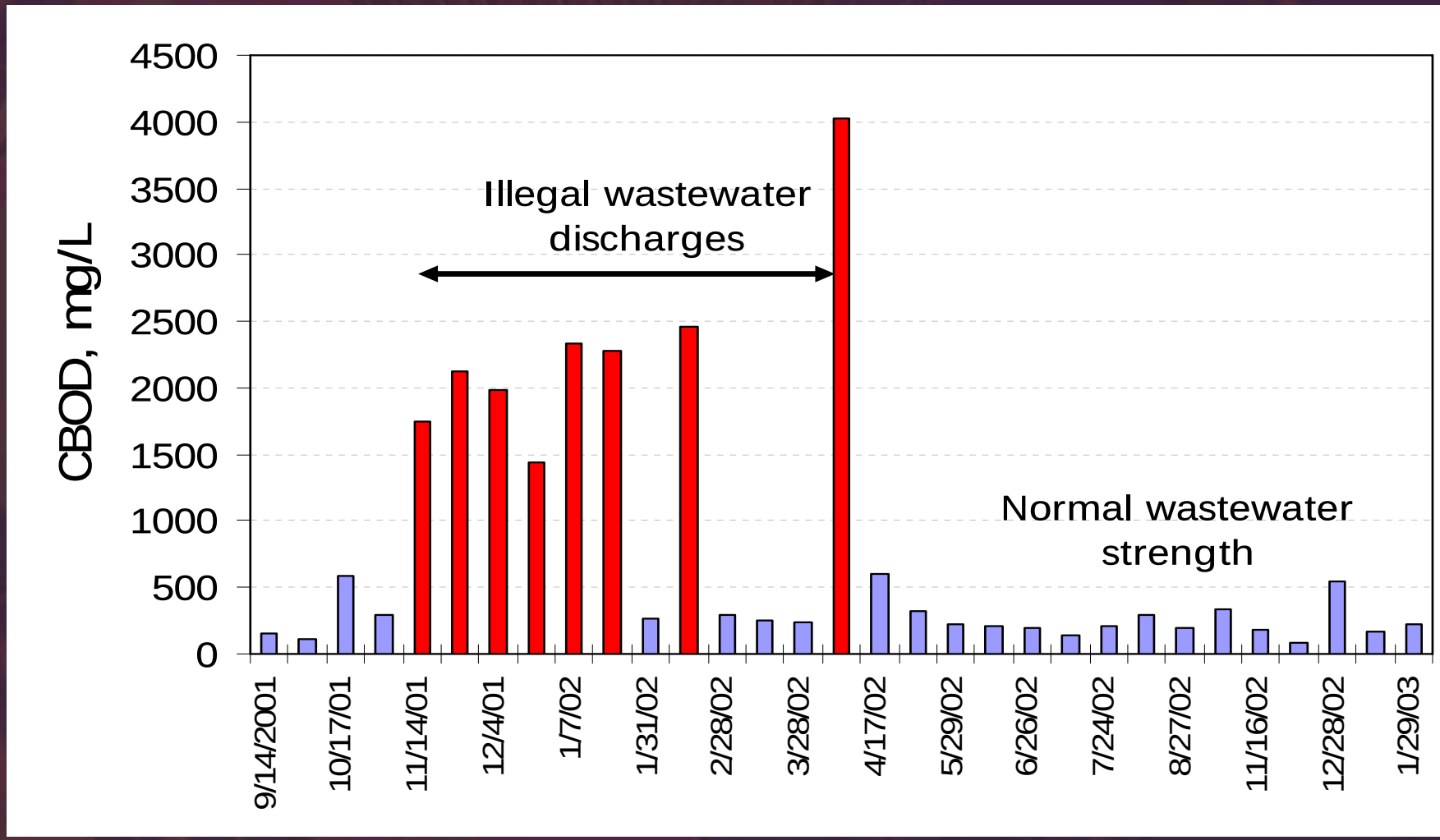
Signs of meth lab waste

- Strong or unusual odors
  - Solvents
  - Ammonia
  - Vinegar
- Abnormally high or low pH
- Abnormally high CBOD spikes
- Wastewater tests positive for Volatile Organic Chemicals (VOCs)

Case Study

- Cluster wastewater treatment system (domestic waste)
- CBOD spikes 10 times stronger than "normal" domestic waste
  - Average CBOD around 265 mg/L
  - Spikes as high as 4000 mg/L
- pH drops in influent wastewater coincide with CBOD spikes
  - Average pH 7.0 – 7.5
  - Drops around 4.0 – 5.0

Case Study - BOD spikes



Case Study – action taken

- Monitor influent CBOD, pH
  - Called local Deputy Sheriff
    - Sheriff ran background checks on residents
  - Called local Fire Department
    - Fire Department had equipment to scan for VOCs
    - Samples testing positive for VOCs were sent in for analytical tests

Case Study – action taken

- Called in the Drug Enforcement Administration for further assistance
- Some samples tested "positive" for VOCs.
- Positive Chemical Hits
  - Benzyl Alcohol (used in solvents and paint)
    - 12.9 ug/L
  - Phenol (fire hazard, found in urine, disinfectants and over the counter drugs)
    - 66.0 ug/L
  - 4-Methyl phenol
    - 1210 ug/L

Who to Contact

1. Local Law Enforcement Agency or 911

2. Duty Officer?

3. Department of Natural Resources or other agencies involved with clean up

Other Challenging "Toxic" Waste Streams

Class V

- Definition
  - Any septic system serving > 20 people per day
  - Non-domestic waste or non-domestic mixed with domestic
- EPA requirement – Class V inventory form
- State requirements

Flow and Waste Strength

- Flow measurement must be provided
- Estimated of measured
  - BOD
  - TSS
  - Oil and Grease
- Sufficient detention time and/or pretreatment
  - BOD < 200 mg/l
  - TSS < 65 mg/l
  - Oil and Grease < 30 mg/l

Wastewater Use in Home

Component	gpd/cap	% of total
Faucets	10.9	15.7
Dishwasher	1.0	1.4
Clothes	15.0	21.7
Showers	11.6	16.8
Bath	1.2	1.7
Toilet	18.5	26.7
Leaks and others	11.1	16.0
Total	69.3	100

EPA –2002 manual

High Strength Waste (HSW)

- Higher organic and inorganic load from facility
- Common parameters
  - Biochemical oxygen demand (BOD)
  - Total suspended solids (TSS)
  - Fats, oil and grease (FOG)
  - pH
  - Temperature

BOD

- Biochemical oxygen demand
- Organic
- Amount of oxygen used by bacteria to break down waste
- Higher levels increase biomat development
- Pretreatment
- Recoverable
- Pounds = Flow (gpd) x concentration (mg/L) X1,000,000

High BOD

- Causes
  - High Organic Loading
    - Number of people exceeds design
    - Poor kitchen practice
  - Low flow fixtures
  - Chemicals
    - Bleaches, detergents, cleaners, medication, etc.
  - Limited treatment
  - Reduced biological activity
- Effects
  - Greater biological load on downstream components
  - Biological clogging

Low BOD

- Cause
  - Water infiltration
  - Low organic loading
    - Over designed system
    - Meals not prepared in the facility
  - Higher than normal flows
    - Clean water addition
      - Condensate
      - Food defrosting
    - High water use appliances
- Effect
  - Indicator of how the system is working

TSS

- Total suspended solids
- Organic and inorganic
- Remaining unsettled food
- Paper, dirt, lint, etc
- Range: 44 - 155 mg/L
- Typical Value: 75 mg/L

- Causes physical plugging of soil voids
- Fix?
  - Avoid
  - Pretreatment
  - More tanks
  - Effluent filter
  - Maintenance

TSS

- What will cause a low reading?
  - Dilution; low inputs
- What harm will a low reading have on the system? - little
- What will cause a high reading?
  - Laundry lint, toilet tissue
- What harm will a high reading have on the system?
  - Neutral buoyancy solids do not settle, stay in suspension in the tank "clear zone"; may carry over

FOG

- Fats, oil and grease
- Fats
  - Animal
  - Solid at room temp
- Oils
  - Vegetable
  - Liquid at room temp
- Grease = petroleum

- Avoid FOG
- Limit degreasers
- Temperature is an issue with animal products
  - High temp dishwashers
- Pretreatment

High FOG

- What will cause a high reading?
  - Hair and body lotions, moisturizers
  - Food prep – high use of cooking oils
- What harm will a high reading have on the system?
  - Clog lines, coat media and biomat
  - Temperature sensitive – cooler temps help removals

pH

- Range: 6.5 – 7.2
- Typical Value: 7.0
- What will cause a low reading? (sour odor)
  - Inputs of sugars, flour, milk products, canning
- What will cause a high reading? (chemical odor)
  - Additions of chemicals
- Both low and high readings cause lethargic microorganisms.

Temperature

- Range 48- 70° F, typically around 60° F
- What will cause a low reading?
  - Low ambient air temp; use of cold water
  - What harm will a low reading have on the system? Low microbial activity – accumulate organics on surfaces / screens
- What causes a high reading?
  - High ambient air temp; use of hot water
  - What harm will a high reading have on the system? Poor FOG separation with hot effluents

MN Waste Restaurant Waste Strength Study

- 20 restaurants
- Sampled 4 times
- BOD
- TSS
- FOG

Restaurant Sampling Result

Type of Restaurant	Number of Restaurants	BOD mg/L	TSS mg/L	FOG mg/L
Fast Food	8	1286	202	282
Service	5	1130	213	219
Golf Club	4	1010	142	200
Bar	3	874	184	132

HSW Monitoring

- Sampling
  - Timing –after busy weekend
  - Mature tank
- Location
  - Average – Pump tank
  - Outlet baffle of last tank
- Test
  - Sludge and scum
  - BOD
  - TSS
  - FOG
  - Temperature
- Cost ~ $100 for BOD/TSS/FOG
- Time

Camp Grounds & RV Dump Stations

- Potential for users unfamiliar with onsites
  - Toilets sometimes used as garbage cans
- Peak flows very high
  - Consider extra tank capacity and timers
- RV waste
  - Harmful chemicals to control odor including:
    - Formaldehyde the organic strength is so high that the resulting mixture in a holding tank is fifteen to twenty times stronger
    - Quats are not biodegradable and deodorize by killing the microorganisms
    - Enzyme-based products employ natural organic chemicals, because less effective not used much
  - Consider advance treatment or operating as holding tank

Laundromats

- High soap/chemical use
  - Specify that only liquid soaps should be used because some cheap powders have fillers
  - Sell only liquid soaps which do not have a bleach additive
- High water usage/hot water
  - Consider doubling tank capacity
  - Low water use washing machines
- Lint
  - Specify lint filters in facility
  - Commercial size effluent filter on septic tank

Hotels, Motels, Schools and Churches

- High flows events common
  - Consider extra tanks, timers and dual fields so one can be rested
- Meal preparation?
- If more of a seasonal facility consider dual fields to rest
- Potential for users unfamiliar with onsites
  - Consider commercial size effluent filters

Medical Facilities

- Potential for users unfamiliar with onsites
  - Consider commercial size effluent filters
- Sharp/red bag waste must not go into system
- Prescriptions
  - Left over medicine should not be flushed
- Cleaning chemicals
  - The minimum amounts should used

Beauty Salons and Barbers

- Hair
  - Good catch basins in sinks
  - Commercial size effluent filter
- Chemicals
  - Have 1 sink for rinsing out perms/hair color which goes to holding tank
  - Separate tank for hair washing goes to onsite

Automotive and Car Wash

- No floor drains to onsite where vehicle maintenance is being performed
  - Sent to holding tank
- Flammable waste traps
  - Not required, but good idea in case of spill or misuse
- Hazardous waste
  - Not allowed to enter the system
  - If thick layer of oil/grease on top of tank, tests should be run to determine quality
- Sand
  - Can be thin spread or landfilled

Slaughter Facility

- No blood/particles down the drain
  - Must go to holding tank, can be sold to render
- Residual blood will make it down the drain
- Double tank capacity and commercial size effluent filter recommended

Dog Kennels

- Not a septic system
- Don't mix animal and human waste
- Hair
  - Good catch basins in sinks/drains
  - Commercial size effluent filter
- No feces going down the drain – dealt with as solid waste or land applies
- Limit chemical usage

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