Are Boat Pumpouts Compatible with Onsite Sewage Systems?

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AGENDA

- Characteristics of Boat Pump Outs
- Comparison of Boat Pump Out (BPO) Waste to Domestic Sewage
- Options for Treating BPO Waste
- Limitations of Onsite Sewage Systems

Characteristics of Boat Sewage

DATE	BOD Mg/l	COD mg/l	NO2,3 mg/l	TKN mg/l	TP mg/l	FECAL COLIFORM # / 100ml	ENTERO COCCUS # / 100ml	GAL PUMPED Gallons	Calls	REMARKS
6/8/07								75	1	
6/9/07								13	3	
6/10/07	2,890	5,000	0.20	2,290	113	29,000,000	>24,200	5	1	See note 1
6/29/07								0	0	
6/30/07								20	1	
7/1/07*	1,360	2,910	0.20	623	46	37,000	>24,200	60	3	See notes 1,2
7/6/07								0	0	
7/7/07								3	1	
7/8/07	3,740	8,660	0.44	1,670	141	46,000	>24,200	37	2	
7/13/07								75	1	
7/14/07	2,320	5,690	0.20	1,140	115	350,000	>24,200	68	1	See notes 1
7/15/07								15	1	
7/20/07	5,590	15,800	1.00	2,700	313	2,800,000	2,420,000	34	2	See note 3,4
7/21/07								8	2	
7/22/07	3,120	7,030	1.00	1,490	56	42,000,000	2,420,000	70	2	See note 3,5
7/27/07	1,850	4,590	1.00	1,230	118	42,000	1,200,000	25	2	See note 3
7/28/07	1,070	3,160	1700.00	2,860	56	10,800	166,000	25	2	
7/29/07								0	0	
8/3/07	2,880	6,260	1.00	1,320	84	1,310,000	308,000	90	3	See note 3
8/4/07	5,240	53,200	3.79	721	98	1,000	78,400	25	2	See notes 6,7
8/5/07								15	1	
8/10/07								0	0	
8/11/07								20	2	
08/12/07	2,940	6,410	40.00	1,360	50	230,000	687,000	50	3	See note 8
08/17/07								0	0	
08/18/07								0	0	
08/19/07	3,250	6,700	40.00	1,500	146	100,000	2,420,000	25	1	See note 9
Avg	3,172	11,136	163	1,662	117	7,578,980	1,212,425			
Total								758	37	
								20.5		Avg Gals/boat

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Summary

BOD, mg/l	COD, mg/l	NO2,NO3, mg/l	TKN, mg/l	TP, mg/l
3,172	11,136	163	1,662	117
1,700-3,500*				
Fecal Coliform, Col/100 ml	**Enterococcus Col/100 ml**	**Total gallons pumped**	**Calls**	**Number of Samples**
7,578,980	1,212,425	758	37	12

*Florida DEP

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Microbial Contamination

- **EPA: The most frequent sources of disease-causing microorganisms in water are: -**
  - sewage overflows
  - polluted storm water runoff
  - sewage treatment plant malfunctions
  - **boating wastes**
  - malfunctioning septic systems

Pathogens in Sewage cause Recreational Water Illnesses

- **Bacteria**
  - Gastroenteritis (diarrhea, nausea, abdominal pain), Salmonellosis (food poisoning), cholera.
- **Viruses**
  - Fever, common colds, gastroenteritis, diarrhea, respiratory infections, hepatitis.
- **Protozoa**
  - Gastroenteritis, cryptosporidiosis and giardiasis (diarrhea, abdominal cramps), dysentery.
- **Worms**
  - Digestive disturbances, vomiting, restlessness, coughing, chest pain, fever, diarrhea.

Effects Associated with the Discharge of Raw & Partially Treated Sanitary Waste From Vessels

Public Health Concerns

- Transmit diseases like hepatitis, typhoid, and cholera to swimmers.
- Contaminate shellfish beds so shellfish become unsafe for human consumption.
- Make water visually repulsive and decreases the use of waterbodies for recreation.

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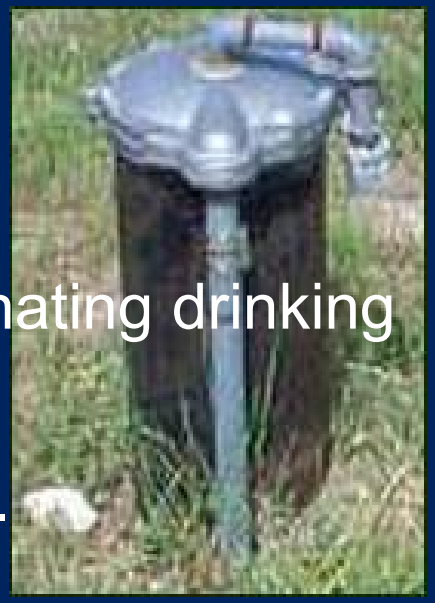
Environmental Concerns



- Seep into groundwater—potentially contaminating drinking water.
- Harmful to wildlife and may result in fish kills.
  - nutrients can fertilize algae which results in the reduction of light penetration thereby killing grasses which provide nursery areas for young fish
  - Organic matter is decomposed by bacteria resulting in oxygen depleteion, which is then not available to fish and other aquatic animals that need oxygen to survive
  - coral reef communities particularly sensitive to untreated sewage.

Main Impacts

- Pathogens → Disease
- High BOD → Oxygen Demand → Reduced DO
- Nutrients (N&P) → Eutrophication

Types of Marine Sanitation Devices

Device	Vessel Length	Standard
Type I- Flow-through device (maceration and disinfection)	equal to or less than 65 feet in length	fecal coliform bacteria count < 1000 per 100 milliliters and have no visible floating solids.
Type II- Flow-through device (maceration and disinfection)	greater than 65 feet in length	fecal coliform bacteria count < 200 per 100 milliliters and suspended solids not greater than 150 milligrams per liter .
Type III- Holding tank	any length	No overboard discharge of treated or untreated sewage.

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Boat Waste vs Domestic Sewage

	BOD mg/l	COD mg/l	TN mg/l	TP mg/l	Fecal Col/100ml
Boat Waste	3,172	11,136	1,662	117	7,500,000
Raw Sewage	242 110-400	463	38	5.7	NA
Ratio Boat Waste: Raw Sewage	13.11	24.05	43.74	20.53	NA

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Options to Treat?

- Haul to large central sewage facility
- Haul to a land based onsite sewage treatment system

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Central Sewage Facility

Sewage treatment plants typically have excess capacity and are treating hundreds of thousands if not millions of gallons a day.

>Highly regulated
>Operators on site
>Remote monitoring

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- 500,000 gpd
- 80% of capacity (400,000 gpd)
- Excess capacity = 100,000 gpd

BOD

- 1 gallon boat waste= 13 gallon raw sewage

Nitrogen

- 1 gallon boat waste = 43 gallons raw sewage

Phosphorus

- 1 gallon boat waste = 20 gallons raw sewage

Boat Waste to Central STP

	BOD	Nitrogen	Phosphorus
Boat Waste: Raw Sewage	13	43	20

Excess capacity (domestic sewage) 100,000 gpd

Capacity for Boat Waste in Gallons		
BOD	Nitrogen	Phosphorus
7,692	2,326	5,000

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Gallons of STP Capacity Required for 2,000 gallons of Boat Waste		
BOD	Nitrogen	Phosphorus
26,000	86,000	40,000

Gallons of STP Capacity Required for 4,000 gallons of Boat Waste		
BOD	Nitrogen	Phosphorus
52,000	172,000	80,000

Onsite Sewage Treatment Plants

- Final dispersal is to soil
- Volumes treated are much lower
- Operators on site intermittently
- Remote monitoring rare
- Excess capacity may be there, but not as much

- 20,000 gpd
- 80% of capacity (16,000 gpd)
- Excess capacity = 4,000 gpd

BOD

- 1 gallon boat waste= 13 gallon raw sewage

Nitrogen

- 1 gallon boat waste = 43 gallons raw sewage

Phosphorus

- 1 gallon boat waste = 20 gallons raw sewage

Boat Waste to Onsite STP

	BOD	Nitrogen	Phosphorus
Boat Waste: Raw Sewage	13	43	20

Excess capacity (domestic sewage) 4,000 gpd

Capacity for Boat Waste in Gallons		
BOD	Nitrogen	Phosphorus
308	93	200

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Options to Make it Work

- The daily load must be reduced so that it operates within the available capacity
  - Pretreat the boat waste
  - Feed the boat waste to the treatment unit over multiple days
- Design for it

Outcome if Overloaded

Onsite STP

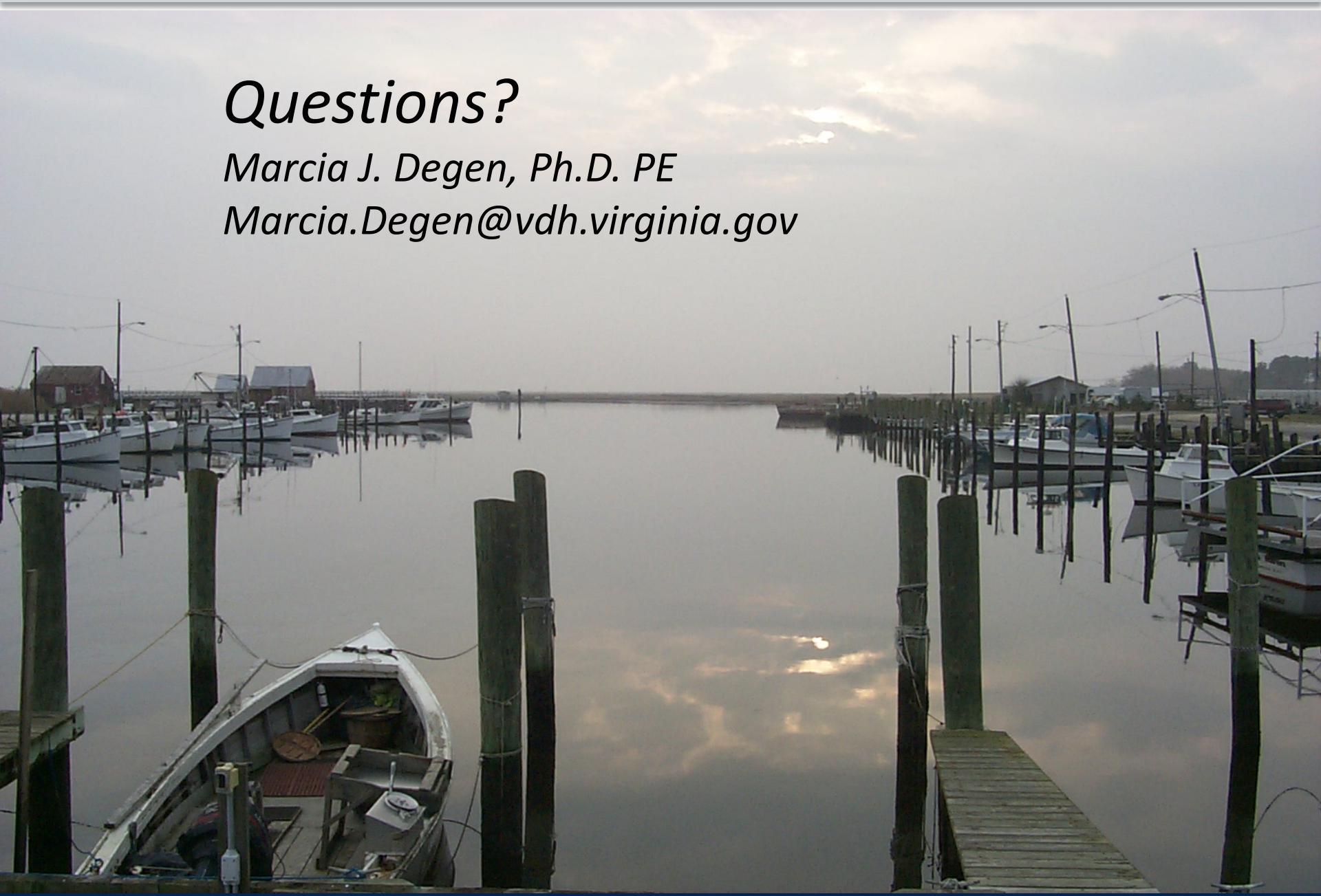
- Upset of sewage treatment process
- Under staffed to address
- Odors
- STP recovery in weeks
- Solids to drainfield
- Clogging of drainfield
- Potential to lose drainfield

Central STP

- Upset of sewage treatment process
- Staff onsite to manage
- Odors
- Recovery in days
- Solids to stream with aquatic impacts

Summary

- A large Central STP generally has more excess capacity and can absorb the extra load easier
- An onsite system is limited in excess capacity and the excess load can result in a catastrophic failure of the drainfield
- Options are available to mitigate the effects of the extra load, but it requires upfront design and more frequent onsite operation ($$)



Questions?

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