SEPTIC SYSTEM ALTERNATIVES

DEFINITION

The cumulative impact of on-site sewage disposal systems (OSDS), mostly septic systems, in the Inland Bays watershed has become a major concern as the pace of development increases along with the population. Many residential developments appear outside the service area of central sewage collection and treatment systems.

At present, approximately 20,000 homes in the watershed are served by on-site-systems. Despite the development of central collection and treatment systems in the watershed, the number of OSDS continues to grow. Of those 20,000 systems, 78% (15,486) are conventional gravity systems; 19% are pressure systems like mounds and low pressure pipe (LPP), designed to operate in shallow water table soils; 2% are permanent holding tanks, which are not treatment systems but must be emptied on a regular basis; and 1% are designed specifically to reduce nutrients migration to the groundwater.

WATER QUALITY IMPACTS & TYPICAL LOADINGS

4,447 pounds of nitrogen (N) enters the bays *each day* from nonpoint sources of pollution. Approximately 1,643 pounds enters the groundwater from septic systems—much of it reaching the bays. A *total* of 1,393 pounds per day—*from all sources*—is permitted under the TMDL.

163 pounds of phosphorous enters the *bay each day* from non point sources of pollution. 119 pounds could enter the groundwater from OSDS sources. A *total* 78 pounds per day—from all sources—is permitted to enter the bays under the current TMDL.

MANAGEMENT TECHNIQUES & TYPICAL REDUCTIONS

ADVANCED TREATMENT UNITS

Alternative on-site wastewater treatment and disposal systems are used to overcome site limitations or to provide additional treatment that cannot be achieved using a standard septic tank and drain field system. They are or can be equipped with components that remove nitrogen from the wastewater before being discharged into a drainfield. Some of these alternative/advanced treatment systems are listed below. Mentioning a commercial system is not an indication of DNREC's endorsement of the product.

BIOCLERE*

The Bioclere is a modified trickling filter designed for the secondary treatment of wastewater as well as the conversion and reduction of nitrogen. The self-contained unit is designed to work with both gravity flow and pressurized systems.

CLEARSTREAM WASTEWATER TREATMENT SYSTEM*

The Clearstream Wastewater Treatment System is an "extended aeration" sewage treatment plant. Designed to provide a proper environment for aerobic bacteria and other microorganisms, the aerobic unit is compact and easily installed. The unit requires additional accessories to reduce nitrogen.

KLARGESTER*

The Klargester uses a rotating biological contactor for biological treatment. The physical package plant includes a primary settlement tank, a two-stage biozone with rotating biological rotor, and a final settlement tank. Units designed specifically for nitrogen reduction are available.

FAST WASTEWATER TREATMENT SYSTEM*

FAST is a fixed film, aerated system utilizing a combination of attached and suspended growth capable of nitrification/denitrification in a single tank. The unit is designed to mount into a septic tank. FAST needs no other filters or pumps.

PURAFLO PEAT BIOFILTER*

Puraflo uses fibrous peat to treat effluent from septic tanks. Liquid from a septic tank is sent to a pump tank and then delivered to four biofibrous peat-containing modules. The liquid is evenly distributed over the peat where it is treated by the microorganisms that naturally exist in the effluent and percolates down through the modules into the surrounding soil.

** Descriptions of units taken from manufacturer's literature.*

SEPTIC SYSTEM PUMPING & MAINTENANCE

Through regularly having septic systems pumped out (for example, every 3 years) the annual rate of nitrogen influx will be decreased. Septic systems discharge water with 59mg/l of nitrogen while wastewater treatment facilities discharge nitrogen at 10 mg/l. Regular septic system pumping would reduce nitrogen loading by 1.6 pounds per system per year—over 812 pounds per day for the bays.

Other measures that homeowners could take to reduce nitrogen would be to use low flow fixtures, reducing the amount of water being put into the septic system (but increasing the nitrogen concentration of the effluent in the system).

CONNECT TO A CENTRAL SEWER SYSTEM

The potential nitrogen reduction from switching septic systems to sewer systems is the difference in the nitrogen concentration of the septic effluent (approximately 59mg/l) and of spray irrigation of the sewer discharge. This change would result in a 95-100% reduction in nitrogen load.

TYPICAL COSTS

Sussex County System Costs and Nutrient Reductions

SYSTEM	Starting Prices	% NH_4 Reduction of influent	% N Reduction of influent	% P Reduction of influent
Standard Gravity	$2,900	94	50	90
Capping Fill Gravity	$3,100	94	50	90
Elevated Sand Mound	$7,500	30	38	90
Standard Pressure Dosed	$4,900	94	43	90
Capping Fill Pressure Dosed	$5,300	94	43	90
Low Pressure Pipe (LPP)	$5,200	94	66	90
Wisconsin At-Grade	$6,900	30	38	90

These are the systems currently being used in the Inland Bays. Existing systems contribute to nutrient pollution due to the lack of maintenance, faulty systems, and using systems in inappropriate soils.

Advanced System Costs and Nutrient Reductions

Additional Costs (plus maintenance)	*Additional Nitrogen Reduction*	*Effluent N Concentration w/o Advanced Treatment*	*Effluent N Concentration w/ Advanced Treatment*
$4000 -6000	*50 - 60%*	*45 mg/L*	*18 – 22 mg/L*

Advanced treatment units cost an additional $4,000 to $6,000. Since some of these advanced treatment systems require additional equipment for nitrogen removal, costs will be even higher. Additionally, maintenance costs should be considered. These units can provide additional nutrient reduction of 50-60% (Whitmyer, Apfel, Otis & Meyer 1991).

Septic Pumping

Assuming pumping costs are $175, and pumping occurred every 3 years, then it would cost an average of $58 per year to pump a septic system.

Connecting to Central Sewer Systems

Based on a 1996 USEPA cost curve for the provision of sewer service to populations less than 3500, a sewer system could cost from $3.2 million for a community of 500 to $7 million for a community of 3500. This would result in an average cost of $6400 to $2000 per person.

For example, the Ocean View sewer system project cost $11,400 per existing house or $8100 per connection provided to each property or $3300 per potential home (accounts for undeveloped subdivisions).

IMPLEMENTATION ISSUES

- The resident area population is generally ***seasonal***. Many property owners use their homes during the summer and some just on weekends. This poses a problem for the advanced treatment units that require a constant food source for microorganisms to survive. It is possible that at the time ***when the food supply is adequate for biological treatment, many of these systems would be shut down*** for the winter as the occupants vacate for the off-season.

- Systems left unattended and allowed to discharge without benefit of maintenance would be defeating the purpose. ***Sampling of the effluent would be needed*** to provide evidence that nutrient reduction is taking place. In some instances, adding carbon or alcohol may be needed to maintain the system.

- ***The permit is issued today and the property is sold tomorrow***. The Delaware Real Estate Commission requires notice be given to buyers about the septic system used. However, this provision is difficult to enforce. If advanced treatment becomes required, full disclosure to the buyer would be necessary for operation and maintenance purposes.

- There are many existing communities close to the Bays; some along the waterfront use only ***cesspools***. *(Cesspools are permitted under a grandfather provision until such time that they fail, or are disconnected. It is illegal to re-connect a cesspool.)* These particular communities should be upgraded from cesspools before requiring the retrofitting of existing systems.

- A program relying on the pumping of septic tanks for nitrogen reduction should be concerned about how this program would operate. Would it be voluntary or mandatory? How could you ensure that voluntary measures were taken? How could you fund a program regulating the operation of the 20,000 septic systems in the watershed?

- ***Sewer systems are costly endeavors***. If we need to provide the infrastructure for sewer in an area prior to development, who should pay for it?

- When providing sewer, ***septic system removal costs should be considered, along with monthly sewer fees.*** While most systems are abandoned in place, *removal costs* may be as much as $1,000 to $2,500. (Tanks can be pumped, filled, or crushed; elevated sand mounds can be dismantled, with pipes going to a landfill; and stone can be dried out and re-used.)

- When financing sewer systems consider grants and loans from various government bodies, tax revenue, and/or septic impact fees. Current owners of septic systems could pay into a trust for the future construction of sewer systems. This payment would be an "impact fee," a fee for their adding nutrients into the ground and surface water system.

INLAND BAYS WATERSHED

This fact sheet was prepared by the Delaware Department of Natural Resources and Environmental Control's Whole Basin Team, at the request of the Inland Bays Tributary Action Teams, for citizens and stakeholders interested in one of Delaware's most environmentally and economically attractive areas—the Inland Bays and its surrounding lands, surface and ground waters.

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