

ON-LOT SEWAGE SYSTEMS

“An Owner’s Manual”

*Chester County Health Department
Bureau of Environmental Health Protection*



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WHAT IS AN ON-LOT SEWAGE SYSTEM?

If you have recently moved from an urban environment, you are probably unfamiliar with the on-lot sewage system. In highly developed areas the usual method of sewage disposal is a public sewage system. The wastes from your home move through a pipe out of your house to a common sewer line which ultimately is treated at a municipal sewage treatment plant. In most cases, the treated waste is then discharged into a nearby creek or river. In Chester County, less than 40% of the residents are served by such public sewerage facilities. The other 60% are served by on-lot sewage systems.

On-lot sewage systems are composed of two primary parts: (1) septic tanks or an aerobic tank, and (2) an absorption area. The septic tanks remove the settleable and floatable solids from the wastewater. The aerobic tank acting in place of the septic tanks utilizes air pumped into the tank in addition to the settling action of the septic tank. The absorption area then utilizes the ability of the soil to filter and treat the remaining effluent before it reaches the water table. By removing the solids, the septic tanks and the aerobic tank protect the absorption area from becoming clogged. Proper maintenance of the septic tanks or the aerobic tank will prevent more costly problems with the absorption area.

Household sewage is a combination of wastewater from toilets, showers, tubs, sinks, washing machines, dishwashers, water softeners and garbage disposals (see Figure 1). The conventional 7-8 gallon flush toilet is the largest source of wastewater in most households.

SOURCES OF HOUSEHOLD SEWAGE



Figure 1.

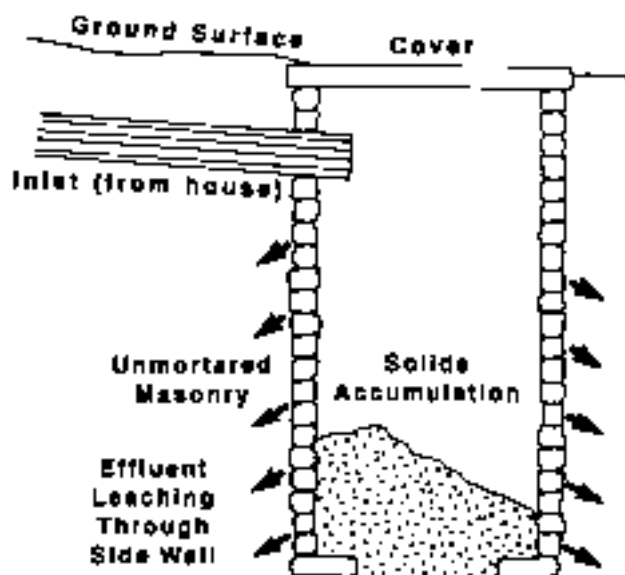
TYPES OF ON-LOT SYSTEMS

Every homeowner should be aware of what type of sewage disposal system they have. The type of maintenance and care may vary depending on the type of system serving the home. The basic types of on-lot systems in Chester County are: cesspool, septic tanks with seepage pit, septic tanks or aerobic tank with seepage bed, septic tanks or aerobic tank with standard trenches, septic tanks or aerobic tank with elevated sand mound. (Other technologies not listed here are used in special circumstances.)

Cesspools and Septic Tanks with Seepage Pits

Cesspools and septic tanks with seepage pits are no longer permitted for new installations or as corrective measures for malfunctioning systems. However, many older homes with systems installed prior to 1970 may have these systems presently in use. Cesspools are constructed of open-jointed walls (concrete block or stone) and open bottoms (see Figure 2). The solids in the wastewater settle to the bottom of the cesspool, while the effluent seeps through the jointed walls and bottom. If the cesspool is not properly cared for, the sidewalls and bottom tend to plug up with solids. This may result in sewage backing up into the house or being discharged to the ground surface.

The sewage system with a septic tank and seepage pit partially reduces the clogging problems inherent in cesspools. The septic tank provides for the separation of solids from the liquid while storing the accumulated solids. The seepage pit allows the effluent from the septic tank to infiltrate into the soil. The seepage pit is constructed similarly to a cesspool, except that there is a layer of rock or aggregate placed around the concrete blocks or stone and the open bottom.



CESSPOOL
Figure 2.

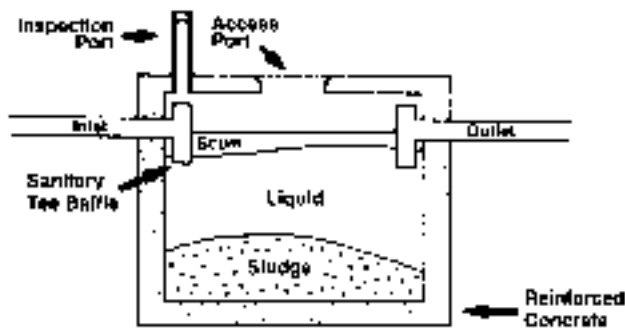
Current state regulations require better treatment of the effluent than either the cesspool or septic tank with a seepage pit can provide. These older types of systems frequently lead to the contamination of groundwater due to the improper renovation of the sewage effluent prior to reaching the water table.

Current methods of sewage disposal have been designed to provide for more effective renovation of the effluent. They utilize more soil area to absorb the effluent and provide for aerobic (oxygenated) conditions in the soil which are more efficient in treating the waste materials.

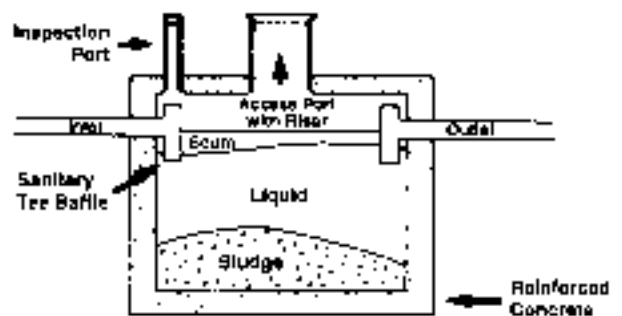
Septic Tank - Soil Absorption Systems

Septic Tanks

The septic tank is a watertight chamber constructed of a durable material which is not subject to corrosion or decay. Most septic tanks used in Chester County have one compartment, but some are designed with two compartments (see Figures 3 and 4). The two compartment tanks, or two single compartment tanks in series is now required and provides better settling of the solids. One of the most important components of the septic tank is the baffle. The inlet baffle forces the wastewater from the building sewer line down into the tank instead of across the surface of the tank and into the outlet pipe leading to the absorption area. The outlet baffle prevents the scum layer from moving into the soil absorption area. Each septic tank has an inspection port for checking the condition of each baffle as well as a manhole access port for cleaning the tank. State law requires that the manhole cover be no deeper than 12 inches below grade. Older homes may need access risers placed on the tanks to bring the manhole opening closer to the surface to allow for proper maintenance (see Figure 4).



**SINGLE COMPARTMENT
SEPTIC TANK**
Figure 3.

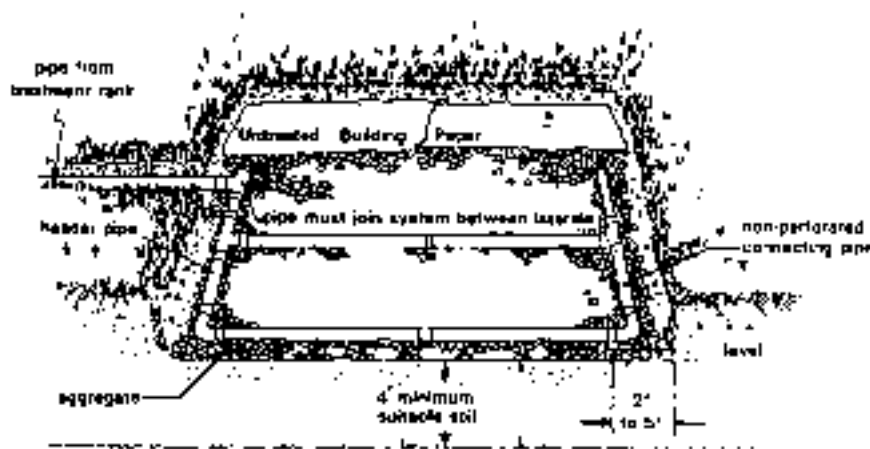


**SINGLE COMPARTMENT
SEPTIC TANK WITH ACCESS RISER**
Figure 4.

In-Ground Soil Absorption Areas

The soil absorption area receives the liquid effluent from the septic tanks and distributes it over a specific area. The effluent then filters through the soil under the pipes and is treated chemically and bacterially by the components of the soil. The size of the soil absorption area is based on the size of the house and the percolation rate of the soil. State law requires that there be at least four feet of usable soil for the effluent to percolate through before it reaches the water table.

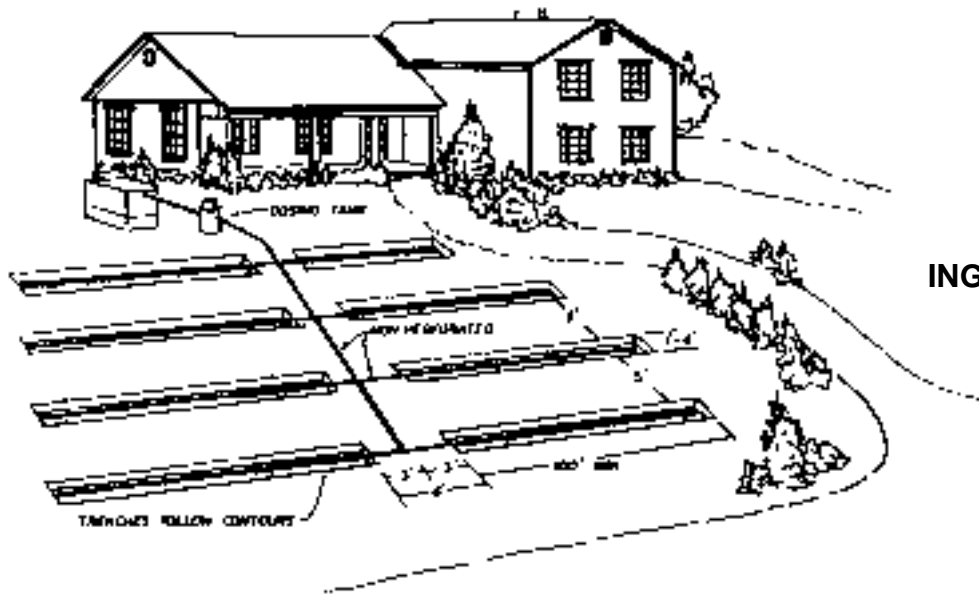
The soil absorption area may be an inground seepage bed (Figure 5), a set of trenches (Figure 6), or an elevated sand mound (Figure 7). The type of system installed will depend on the slope of the property, the depth of usable soil and the percolation rate.



INGROUND SEEPAGE BED
Figure 5.

A standard trench absorption area consists of two or more excavated trenches in which perforated pipes or laterals distribute effluent into a layer of crushed stone under the pipes (see Figure 6). The effluent is then absorbed into the soil where it is renovated. Seepage beds are different from trenches in that the entire absorption area is excavated and lined with crushed stone. The pipes (laterals) are then placed over the stone and the entire bed area serves as an absorption area for the effluent (see Figure 5). Leaching chambers may be used in place of gravel.

Equal distribution of the effluent is very important to the proper functioning of the system. Uneven distribution of the effluent could result on one of the areas being overloaded, leading to a failure of the system. Most trenches and in-ground bed systems utilize gravity distribution to the absorption area from the septic tanks, In all trench systems and in some beds a distribution box is used to split the flow equally to the individual laterals (pipes or leaching chambers) in the absorption area. It is important that this box remain level and that the pipes leaving the box be properly installed so that effluent flows equally out each pipe. In most bed systems, a piping loop is used instead of a distribution box. In this type of system, the perforated laterals are connected at either end by a section of unperforated pipe.



INGROUND TRENCHES
Figure 6.

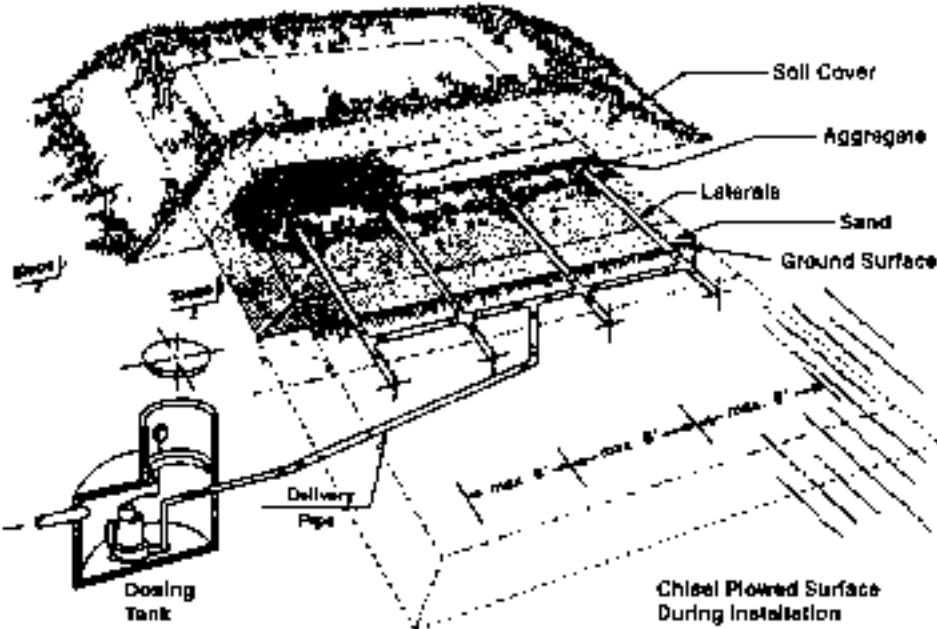
Pressure Dosed Systems

Some systems may require pressure distribution due to the permeability characteristics of the soil. In this type of system, the effluent from the septic tanks flows by gravity into a dosing tank. Depending on the size of the dose volume for that absorption area, effluent may be pumped to the absorption area at least once a day. The dosing tank forces effluent through the distribution lines in a controlled dose so that all pipes discharge effluent at the same rate throughout the absorption area. The pressure distribution system has two distinct advantages: (1) the entire length of the lateral is utilized and, (2) the soil absorption area is allowed to rest between doses. The disadvantage of this system is the additional maintenance requirements of the mechanical parts of the pump and alarm system.

Elevated Sand Mounds

The elevated sand mound system is used in areas of the County with reduced permeability, shallow soils and poor drainage characteristics. Soils in these areas require the addition of sand above the ground to provide for adequate renovation of the sewage prior to reaching the water table. The absorption area is constructed similarly to a standard seepage bed or trench, except that the system is required to use pressure distribution and a layer of sand must be placed between the crushed stone and the natural soil cover. A soil berm is placed around the mound to protect it and to provide a suitable base for the establishment of a vegetative cover (see Figure 7).

The mound is preceded by a dosing tank which must be equipped with an audible and visual alarm system to alert the homeowner when a pump failure occurs. It is very important that the homeowner make the necessary repairs to the pump system as soon as the problem is detected or significant damage could be done to the mound. This type of damage could result in very expensive repairs.



ELEVATED SAND MOUND
Figure 7.

Aerobic Treatment Tanks

An alternative to the septic tank is an aerobic treatment tank. This type of tank is utilized in some systems. These systems utilize an air compressor or a churning propeller to maintain an aerobic environment for the growth of aerobic microorganisms. These microorganisms break down the sewage like the anaerobic bacteria found in the septic tank.

Proper functioning of this type of treatment tank is highly dependent upon the diligent maintenance of the mechanical components of the aerobic system.

LANDSCAPING THE ABSORPTION AREA

After the absorption area has been installed, inspected by the Health Department and covered by the contractor, there should not be any major changes in the grade of the property. The system was installed at a specific depth due to soil conditions, and any changes in the contours of the property could cause problems for the system. Grass should be planted immediately on the absorption area to prevent erosion. Large trees and shrubs must not be planted on or near the absorption area because roots could clog the absorption area. Roof gutters must be diverted so that they do not discharge over the absorption area. The soil must be able to accept all the wastewater from the house. Any additional surface water on the absorption area could put a disastrous load on the system and the soils under the system.



MAINTENANCE OF THE ON-LOT SEWAGE SYSTEM

To insure that an on-lot system will function properly, it is important that the homeowner have regular maintenance performed to the system.

Septic Tank Maintenance

The septic tank is designed to remove solids from the wastewater by holding the materials in the tank for at least 24 hours. This provides time for the solids to settle and the scum and grease to rise to the top. Up to 50% of the solids retained in the tank decompose, with the remainder accumulating in the bottom of the tank. Biological or chemical additives are not needed to aid or accelerate the decomposition of this material.

As the septic system is used, the solids (sludge) accumulate on the bottom of the septic tanks. Properly designed tanks have enough space for up to three years accumulation of sludge. When the sludge level increases beyond the normal three years accumulation, sewage has less time to settle properly before leaving the tank through the outlet pipe. As the sludge level increases, more solids escape into the absorption area. If sludge accumulates too long, no settling of the solids will occur, and the solids will be able to directly enter the absorption area. These solids will clog the distribution lines and cause serious and expensive problems for the homeowner. To prevent this, the tank must be pumped out every two to three years. The frequency of pumping depends on several factors:

- (1) capacity of septic tanks
- (2) amount of wastewater generated
- (3) volume of solids in wastewater (more solids if garbage disposal used)

The more people per household, the more frequently the tanks will have to be pumped. In addition, the use of a garbage disposal will require more frequent pumping of the tank.

When you have septic tanks pumped, you should hire a local septage contractor who is licensed to operate in Chester County. The Health Department maintains a licensing program for all sewage pumpers who operate in the County. You may ask to see their up-to-date license. These pumpers are aware of proper maintenance procedures and should be equipped to provide you with adequate service. However, it is advisable that the homeowner be present during the cleaning of the septic tanks. There are several things the contractor should be expected to do. First, he should locate the manhole access cover of each tank (Figure 8). This may mean digging in your yard if the manhole cover is not at grade. If this is the case you should consider having risers put on the manhole of the tanks to provide easier access for future maintenance visits. The contractor should never pump sewage from the small inspection port. Chester County regulations require that the tanks be pumped out through the center manhole. Forcing the hose through the smaller opening will probably damage the baffles in your tank causing serious and possibly expensive problems in the future not only to the tank but to the absorption area.

Figure 8.



To extract all the material from the tank, the scum and grease layer must be broken up and the sludge later stirred up into the liquid portion of the tank. This is usually done by alternately siphoning liquid from the tank and reinjecting it into the bottom of the tank. All material in the tank should be removed, not just the liquid. The contractor will normally backflush the materials into the septic tank to mix them thoroughly and then repump. After the septic tank is empty, the baffles and walls should be checked for cracks and leaks. A toilet should be flushed before closing the tank to make certain that the pipes leading to the tanks from the house are not plugged. Finally, allow the contractor to set the manhole access cover back on the septic tank. The hole can then be filled in and the grass replaced.

The waste removed from the tanks will be taken to a sewage treatment plant where it will be properly treated and disposed. The last page of this booklet provides a place for you to keep track of your maintenance on the septic tanks. Record the dates the tanks were pumped and make note to have the tanks pumped every two to three years, unless the sewage contractor has advised you to pump more frequently. Cesspools should also be inspected and pumped at least every two to three years. A licensed septage hauler can also clean and maintain cesspools. A list of sewage haulers can be found in the yellow pages of your telephone directory. Be sure to ask the sewage hauler if he has a valid Chester County Health Department License to Transport and Pump Liquid Waste prior to hiring him. Any problems you have with a liquid waste pumper should be reported to the Chester County Health Department.

Chemical or bacterial additives are not necessary for the proper functioning of your sewage system. Nor are these a substitute for proper pumping of the septic tanks.

Aerobic Tank Maintenance

The mechanical portion of the aerobic tank requires routine maintenance and supervised operation.

The aerobic tank must be pumped out at least every two years to remove the accumulated solids. This must be done by a Chester County licensed sewage hauler. In addition, all mechanical parts, electrical controls and alarms must be checked periodically by someone who is familiar with the proper operation of these parts. The homeowner must continually check to see that the motor for the aeration device is running properly. If it is not, the tank will not function as it was designed. Instead of an aerobic environment for the breakdown of sewage, an anaerobic environment will be created.

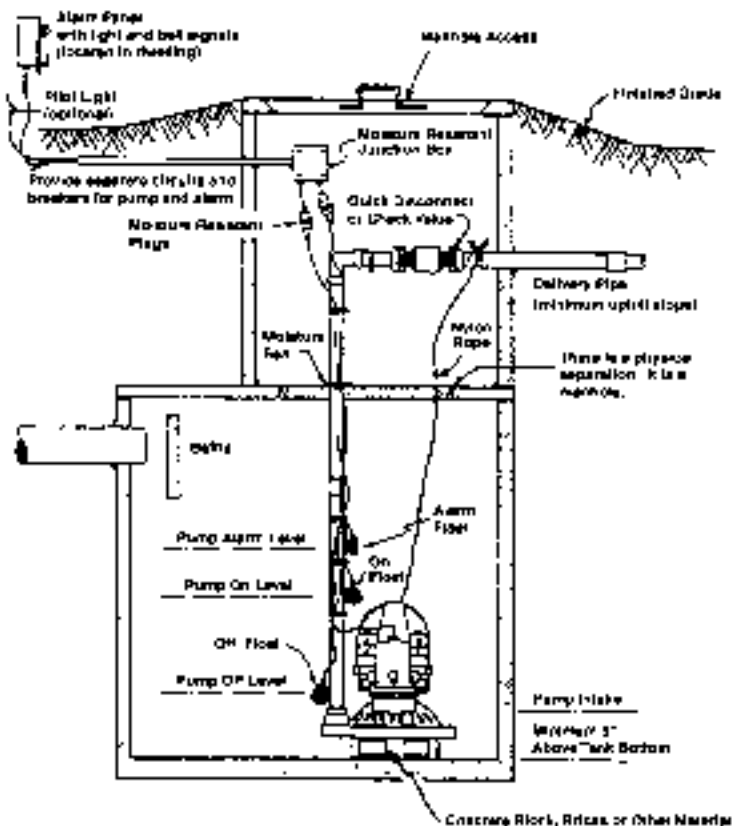
****For safety reasons always use a qualified electrician to check the electrical controls and parts of the system. The electrical circuit must be disconnected prior to working on any part of the aerobic tank.****

Dosing Chamber Maintenance

A dosing chamber (Figure 9), equipped with either an electrical pump or siphon, stores effluent from the septic tank or aerobic tank and periodically discharges it, under pressure, into the absorption area. Dosing chambers are used with all elevated sand mounds, in systems where the absorption area is at a higher elevation than the septic or aerobic tank and in other situations where pressurized distribution is desired. The manhole access port of a dosing chamber is always at or slightly above grade.

Proper maintenance of a dosing chamber includes:

- Periodically removing solids that accumulate on the floor of the chamber (this can be done at the same time the septic tank is pumped);
- Checking for proper operation of the electrical pump, controls and alarms;
 - ** For safety reasons always use a qualified electrician to check the electrical controls and parts of the system. The electrical circuit must be disconnected prior to working on any part of the pump, controls and alarms. ****
- Cleaning the vent tube in siphon dosing chambers, if the effluent level doesn't fluctuate properly;
- Checking for leaks and cracks that may develop in the chamber walls, bottom, or access cover.



DOSING TANK
Figure 9.

Absorption Area Maintenance

The absorption area (trenches, seepage bed, elevated sand mounds, etc.) requires very little in the way of maintenance as long as the effluent being discharged to it is nearly free of solids. Solids entering the absorption area can cause considerable damage to the system by clogging the openings in the pipes or by forming an impermeable sludge layer over the stones. To insure that solids do not enter the absorption area it is essential that the treatment tanks are properly pumped and maintained.

To further insure that the absorption area continues to function properly, the following actions are suggested:

1. Prevent heavy vehicles from entering the area in which the on-site system is located to avoid breakage of pipes in the distribution system and the compaction of the soil;
2. Do not plant trees and shrubs in the area of the on-site system to avoid damage from root penetration;
3. Do not use drain cleaners or other additives containing chemicals that might destroy biological activity in the septic or aerobic tank;
4. Do not build any structures (including swimming pools) on or near the absorption area;
5. Check plumbing fixtures frequently for leaks that might add substantial amounts of water to the on-site system;
6. Direct rainwater away from absorption area to avoid placing an additional water burden on the system;
7. Do not regrade the area in such a manner that rain water runoff pools over the absorption area.



MALFUNCTIONING ON-SITE SEWAGE SYSTEMS

Occasionally, on-site systems malfunction and require some type of repair. The malfunction may appear as a seasonal growth of lush vegetation, a chronic surfacing of effluent in the area of the system, the backing up of sewage into the home, and/or the contamination of the groundwater supply with untreated effluent. These problems may be due to the natural aging of the individual components of the system, improper installation, improper operation and maintenance, adverse site conditions, or a combination of these.

Depending on the reason for the malfunction, some of the following suggestions may help in correcting the problem:

1. Installing water conservation devices in the home;
2. Pumping and inspecting the septic tanks or aerobic tank which could entail the repair of baffles, cracks in the tank or lid, or replacement of the tank;
3. Inspecting and leveling the distribution box in trench systems;
4. Replacing the building sewer line which may have been damaged during installation or by the natural effects of the settling of the house and tank over a period of time;
5. Diverting surface water from the absorption area;
6. Installing underground curtain drains to divert groundwater from the absorption area.

If the above suggestions do not properly rehabilitate the system, it may be necessary for the homeowner to install a new sewage disposal system. Any effort to remedy a malfunctioning on-site system should be done with assistance from the Sewage Enforcement Officers at the Chester County Health Department. Certified Sewage Enforcement Officers employed by the Department may be able to give the homeowner additional suggestions. They will also be able to provide the homeowner with information on how to proceed should a new system ultimately be required. **Note: No system may be repaired and no new system installed until a permit is issued by the Chester County Health Department. This is required by State law.**



SUGGESTED WATER CONSERVATION PRACTICES

Water conservation is an important factor in prolonging the life of any on-site disposal system. Reducing the amount of water used in the home decreases the volume of wastewater that must be renovated. In addition, water conservation reduces energy costs and protects the groundwater supply.

Suggestions for using water wisely are:

1. Install water saving plumbing fixtures in your home. These would include water dams for toilets, water saver aerators on faucets and water saving shower heads.
Most building codes require that all new construction have these water saving devices routinely installed.
2. Check your toilets periodically for leaks. This can be done quite easily. Place a few drops of food coloring in the toilet tank. Do not flush the toilet for several hours. If the colored water appears in the toilet bowl during this time, your toilet is leaking. Have it fixed immediately. Also check the water tank portion of your toilet to be sure no water is flowing out the overflow pipe.
3. Fix leaking faucets.
4. Wash dishes once a day using a dishpan or plugging sink. Do not let water run for washing.
5. Operate the dishwasher only when full. Do not prewash dishes for the automatic dishwasher unless absolutely necessary.
6. Refrigerate a bottle of water for drinking to avoid letting the water run to obtain a cold drink.
7. Select the proper load size or water level on your washing machine. Do not wash multiple loads of laundry one right after the other.
8. Take a shower instead of a tub bath. Also try to limit the length of your showers.
9. Do not allow the water to run while brushing teeth or shaving.
10. Do not use garbage disposals.



HAZARDS TO ON-LOT SEWAGE SYSTEMS

On-lot sewage systems are "alive" and contain a biological mat which is constantly decomposing and treating sewage. This biological mat is sensitive to several types of pollutants. As a homeowner, you should avoid placing the following materials into your sewage system:

1. Oils and grease
2. Harsh drain cleaners
3. Pesticides
4. Paints and paint thinners
5. Disposable products including sanitary napkins and diapers
6. Paper Towels
7. Plastic products (Children's toys, plastic bags, etc.)
8. Septic tank additives/cleaners. These products are not needed and may harm the system's plumbing and/or biological mat.
9. Bones, eggshells, coffee grounds

AVAILABLE PUBLICATIONS

The "Use Water Wisely" and "Water Saving Fixtures" brochures prepared by the Pennsylvania Department of Environmental Protection

Home Sewage Disposal, Circular 212*

Septic Tank Pumping, Engineering Fact Sheet SW-40*

Septic System Failure, Engineering Fact Sheet SW-41*

Mound System for Wastewater Treatment, Engineering Fact Sheet SW-43*

Septic Tank Soil Absorption Systems, Engineering Fact Sheet SW-44*

*The above brochures were prepared by Penn State University, College of Agriculture, Extension Service.

"Consumer's Guide to On-Lot Sewage Disposal System Operation and Maintenance", prepared by the Pennsylvania Department of Environmental Protection, Bureau of Water Quality Management.

For more information about the care and maintenance of your on-lot sewage system please contact

The Chester County Health Department
Main Office
Government Services Center
601 Westtown Road, Suite 295
P.O. Box 2747
West Chester, PA 19380-0990
(610) 344-6526 FAX: (610) 344-5934

South Branch Office
174 Kelton-Jennersville Road
West Grove, PA 19390-9430
(610) 869-0560 FAX: (610) 869-0525

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**“Working
toward a
Healthier
Environment”**

