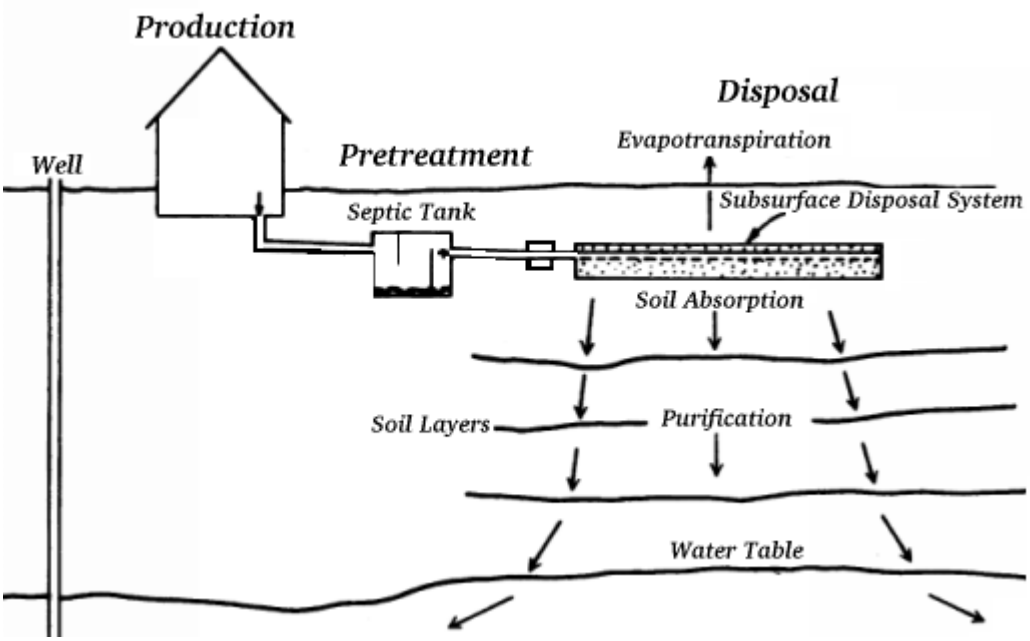
A Manual for Conducting Proper Inspections of Onsite Sewage Disposal Systems for Property Transfers in Maryland



MARYLAND ONSITE WASTEWATER PROFESSIONALS ASSOCIATION

A Manual for Conducting Proper Inspections of Onsite Sewage Disposal Systems for Property Transfers in Maryland

Sponsored by

The Maryland Onsite Wastewater Professionals Association
P.O. Box 2570
Ellicott City, MD 21041-2570
Telephone: 443-570-2029
Email: info@mowpa.org
Website: mowpa.org

Revised December 2019

Contents

Chapter 1 Introduction

Maryland law (Annotated Code 9-217.1) reads:

§ 9-217.1. Persons inspecting sewage disposal systems for transfer of property; proof of completion of course of instruction; regulations.

(a) *Verification of sewage disposal system inspection qualifications.* After July 1, 1999, every person engaged in the business of inspecting an on-site sewage disposal system for a transfer of property must certify to the Department of the Environment that the person has completed a course of instruction, approved by the Department, in the proper inspection of on-site sewage disposal systems.

(b) *Proof of inspection course completion.* Every person engaged in the business of inspecting an on-site sewage disposal system for a transfer of property shall make available to persons contracting for the inspection service evidence of completion of the course of instruction.

(c) *Regulations.* The Department shall adopt regulations to implement the provisions of this section.

Onsite sewage disposal systems (OSDS), often referred to as "septic systems" are generally inspected by septic system installers, pumpers, plumbers, some home inspectors and government regulators. In Maryland prior to 1999, property transfer "inspections" often comprised of a cursory assessment of the superficial parts of these systems (what can be easily seen) if an inspection was done at all. This casual approach occurred due to the lack of education and training on OSDS and because in most minds, septic systems were considered as temporary, and not a more permanent and important part of the home's value. The results were that many of the critical components of the system were not properly evaluated and thus contributed to the problem of reduced system longevity, "failing systems" and related water quality issues. In addition, certain buyers were faced with expensive repairs that they did not expect which, on occasion, has resulted in civil lawsuits.

Today, these types of cursory inspections are no longer acceptable. The OSDS is now considered an importamt part of the property's infrastructure. This principle is reinforced by the U.S. EPA who in 1997 stated that "*...onsite [sewage disposal] systems are a viable wastewater treatment alternatives in rural areas and for small communities.*" With an increasing number of states passing legislation and regulation requiring disclosure and inspection at the time of real estate transfer, this procedure is even more critical. Even in the financial community, many mortgage companies require a statement addressing the condition of the existing OSDS. In 2005, the U.S. EPA further issued voluntary guidelines to states addressing the need for management of onsite wastewater treatment and decentralized systems, again stating the need for inspections. According to the U.S. EPA, "All systems need to be inspected, at an interval defined by the technological complexity of system components, the receiving environment, and the relative risk posed to public health and valued water resources." In June 2013, the U.S. EPA published "A

Model Program for Onsite Management in the Chesapeake Bay Watershed" which again stressed the need for routine inspections.

The culmination of these events also means that the need for inspections of existing and new systems is becoming a standard practice. As a result, individuals working within the service industry need specific procedures and ongoing training to guide them in this process. The purpose of this document is to establish standardization in the service provider industry for this work to occur and to clearly define what constitutes a proper inspection for property transfer.

At the same time, with increased and proper inspections there is a corresponding increase in liability. However, it is believed that with well-defined procedures, this liability can be limited and greatly minimized so that local and state agencies and financial institutions can have confidence in the quality of the system inspection process as well as securing the financial security of the owner's investment.

This manual was developed to educate and assist inspectors on how to evaluate OSDS for property transfers in Maryland. The key elements of a proper inspection are also summarized in the **Recommended Onsite Sewage Disposal System (OSDS) Inspection Form** provided along with this manual. This manual provides specific inspection procedures beginning with conducting a file search, interviewing the homeowner or current occupant, completing the field inspection and documenting the findings in an inspection form**. It is important to recognize that not every situation can be described in this manual /course or be covered by a standard format.** Therefore, other observations unique to the site or property must be considered and documented in any final determination related to system operation. Considerable field experience in working with OSDS is necessary to perform these inspections properly and individuals taking this course should recognize their limitations based upon their experience, skills and abilities.

Over the years, several different types of OSDS inspections have emerged. It is important to recognize and communicate the differences in the levels of work from both a business profitability and liability standpoint. Examples of the inspection levels include:

- The infamous "drive by" or cursory inspection, (including a sole dye test) is really NOT considered a valid inspection by MOWPA.

- The "*compliance*" inspection procedure that examines whether the current system meets all elements of current state or local codes.

- The "*operating*" inspection examines each component of the existing system and determines its operating performance at the time of inspection.

- The "*warrant*y" inspection offers a guarantee to the owner that the system will work for a definite time into the future.

Many owners selling property might request the "*cursory"* inspection that gives them and the buyer extremely limited information at minimal cost. However, these limited inspections usually

do not reflect a true picture of how the system is operating or what the system is capable of handling.

A mortgage company may be interested in a "*compliance"* inspection but this type of inspection is of limited use. While pointing out compliance issues is an important part of evaluating an OSDS, stating a system is "in" or "out" of compliance does not necessarily indicate whether the system functioning properly or whether it is a human health or environmental concern.

An*" operating"* inspection is a comprehensive inspection of the entire OSDS that is accomplished by following defined procedures that realistically evaluates the system as it exists to determine whether each of its parts are functioning properly at the time of inspection.

A property purchaser may desire the "*warranty"* inspection. However, offering a warranty is not recommended since it is difficult to predict or control how the users will treat a system in the future. Past performance is not necessarily a guarantee for future performance.

For property transfers it is recommended that OSDS inspections consist of an "operating" inspection. An "operating" inspection results in a record of each component of the system's current condition and leads to one of four possible outcomes: "acceptable," "acceptable with concerns," "unacceptable" and "needs further evaluation." Compliance issues should also be documented, but as pointed out above, they may not accurately reflect the systems acceptability. The "**acceptable**" rating documents that the existing component is operating properly. It does not, however, address the life expectancy of the system or the ability to completely comply with all of the standards established by state or local codes. The "**acceptable with concerns**" rating could be used to rate a component that is operational but shows signs of a serious concern. The determination as to when and how to use this rating will vary from site to site and should factor in other aspects of the system, its current and future usage, and site constraints.

The "**unacceptable**" rating may be unwelcomed news for the buyer/seller, and unfortunately, some systems will inevitably fall into this category. But remember: a failing system is not the fault of the inspector. Inspectors are required to honestly and accurately complete a thorough investigation and the document the results. Some systems are unacceptable or failing in such a way that they present an imminent public health threat. Other systems may be unacceptable for different reasons.

In some instances, for a variety of reasons, an inspector may not be able to determine a particular components' acceptability. In these situations, it is recommended that those components be rated as **"needs further evaluation."** For example, if a system component is not located and inspected, the inspector cannot honestly report that it is acceptable or unacceptable. Unless the inspector is authorized to conduct the necessary work to verify the location and functionality of that component, the report should indicate that assessment of that component "needs further evaluation." Reporting that a component is "acceptable" or "unacceptable" when it was not properly inspected is misleading and may result in liability for the inspector.

Chapter 2 - Inspection Scope & Services

It is important that the inspector provide a scope of services document that outlines for the client the services that will be performed during the inspection. This document should be tailored to fit each inspection situation with wording that is very clear about what steps will be followed, and what will not be done. Clearly defining what is "acceptable" and "unacceptable" is very important. As addressed above, an operating inspection is a different than a compliance inspection.

For the purposes of a property transfer, MDE has stated that a proper OSDS inspection should include the following steps:

- **File Search –** Obtaining records from local health or environmental health department.
- **Homeowner/Occupant Interview –** Obtaining information about the OSDS from the current occupant.
- **Site Inspection –** Physical inspection of OSDS.
- **Final Report -** Documentation of observations, and findings.

Not performing (or not attempting to perform) any one of these steps during a property transfer inspection is considered by MDE to be an incomplete inspection as does not adhere to the inspection criteria established in this course.

Step 1 - File Search

Gather all available data and details about the design and location of the OSDS. This is most easily accomplished by requesting the information from homeowner and the local environmental health department or permitting agency. By law, this information must be provided by the government within 30 days. However, some jurisdictions will provide this information within 24-48 hours, and others may also require that the records be picked up in person. This information will be very important and helpful in assessing the location, age and design of the OSDS. It will also provide important information about historic or ongoing problems with the system and any repairs that have been made. If you are unable to get the as-built records prior to completing your inspection, document the date of the request and the reason why the records were unavailable.

Step 2 - Homeowner/Occupant Interview to obtain the OSDS History

The homeowner, or tenant, should be interviewed (even if they are not the client) to provide information on the OSDS and how it has been utilized. This step is even more important when no public records are available. If you are not provided with this information or were prevented from contacting the owner, document the request and any reasons.

Start by asking the age of the system, description of the system and whether or not there have been any repairs to the system. The local environmental health department or permitting agency records should reflect any repairs to the system if a permit was issued. Find out if there has been

any history of problems with the system either backing up or overflowing onto the surface. Also be sure to ask when the system was last pumped and how often it has been pumped in the past. A history of frequent pump-outs may be an indication of a problem. Also discuss how many people are living in the house and what the general daily water usage is like. Note if they are running any type of business or hosting regular functions at their house that would increase the demand on the OSDS. If the house has been vacant, note how long-- this could be an important factor in assessing the system.

If the OSDS includes an advanced pre-treatment unit (such as a BAT), recirculating sand filter, sand or at grade mound, drip or other "nonconventional" OSDS technology, ask if the system is being (or has been) regularly maintained by another contractor, and note the name of the contractor. Document whether the system has a valid service contract.

More detail on the relevancy of the Homeowner/Occupant Interview is discussed below the section entitled "**General System Information**"

Step 3 - Site Inspection

After a file search and homeowner interview is completed, the field inspection can take place. Before proceeding directly to the field, fill out the general information and OSDS history sections of the form as completely as possible. Make sure you have all necessary paperwork, essential equipment, and are familiar with the state and local rules and regulations.

It is also a good idea to make sure that property lines are located and clearly marked before any field investigation is begun. It is possible that some components or all of the OSDS is located on another property. The inspection may require some digging so you should know the locations of buried pipes and cables. **In Maryland, call Miss Utility at 1-800-257-7777 prior to doing any excavation work.** This may take up to four days to arrange but is important from the perspective of both liability and personal safety.

Details for conducting the field inspection are discussed in the section entitled "**Site Inspection Procedures.**" If you are unable to get as-built records and are not able to get information of the OSDS history from the owner, the field inspection should be very comprehensive.

Step 4 - Inspection Report

It is recommended that the inspection observations and findings be documented on the **Recommended Onsite Sewage Disposal System (OSDS) Inspection Form** provided as part of this course. Use of this form or a similar form containing this information is strongly encouraged. Completing each section of the form insures that observations are well documented and recorded. If a question about the system arises in the future, the information captured on the form should be of sufficient detail and completeness, so accuracy can be verified. The inspection methods used at each site will vary, but the general procedure should be the same.

Chapter 3 - Site Inspection Procedures

Essential Tools

After conducting the homeowner (occupant) interview and obtaining pertinent records from the local environmental health department regarding the OSDS, the next step is the actual site inspection of the system. To perform a proper OSDS inspection it is important that you have the necessary tools with you during the field inspection.

The following tools and items are suggested to conduct a proper inspection.

Essential Tools and Equipment	
• Inspection Forms / Clipboard / Writing Utensil • Property Records (from Environmental Health Dept.) • State/County Codes / OSDS Inspection Manual • Digital Camera / Video Inspection Camera • Hand Tools (Channel locks, Pipe Wrenches, Screwdrivers etc.) • Shovel /Digging Bar	• Flashlight / Adjustable Mirror • 100’ garden hose • Stop Watch and 5 Gallon Graduated Bucket • Metal /fiberglass soil probe / T - Probe • Crowbar / Manhole Puller • Tape Measure (25’ and 100’) • Sludge Judge • Screw Gun and Stainless Steel Screws

Other Helpful Tools and Equipment	
• Plumbing Snake • Speed Levelers • Pump Truck • Mini-Excavator* • Materials to Repair/Replace Baffles • Hydraulic Cement • Flushable Transmitters/Remote Locating Equipment • D-Box Covers	

*Unless you are willing to dig by hand to whatever depth is necessary to expose necessary components

Safety

A properly designed and functioning OSDS should minimize any direct human exposure to sewage. However, anyone working on, or inspecting OSDS should be aware of the various physical and human health hazards associated with these systems.

The most serious health hazard to OSDS inspectors is the potential for direct contact with sewage which may contain pathogenic bacteria, viruses and parasites. The most common illnesses associated with this type of exposure are relatively mild cases of gastroenteritis. However, there have also been reported cases of more serious diseases from exposure to sewage including Weil's disease and hepatitis. Consequently, care should be taken to wear personal protective gear such as rubber gloves, and covering all exposed wounds with waterproof dressing. Do not touch your face, eat, drink or smoke until after you have washed your face and hand thoroughly with soap and water.

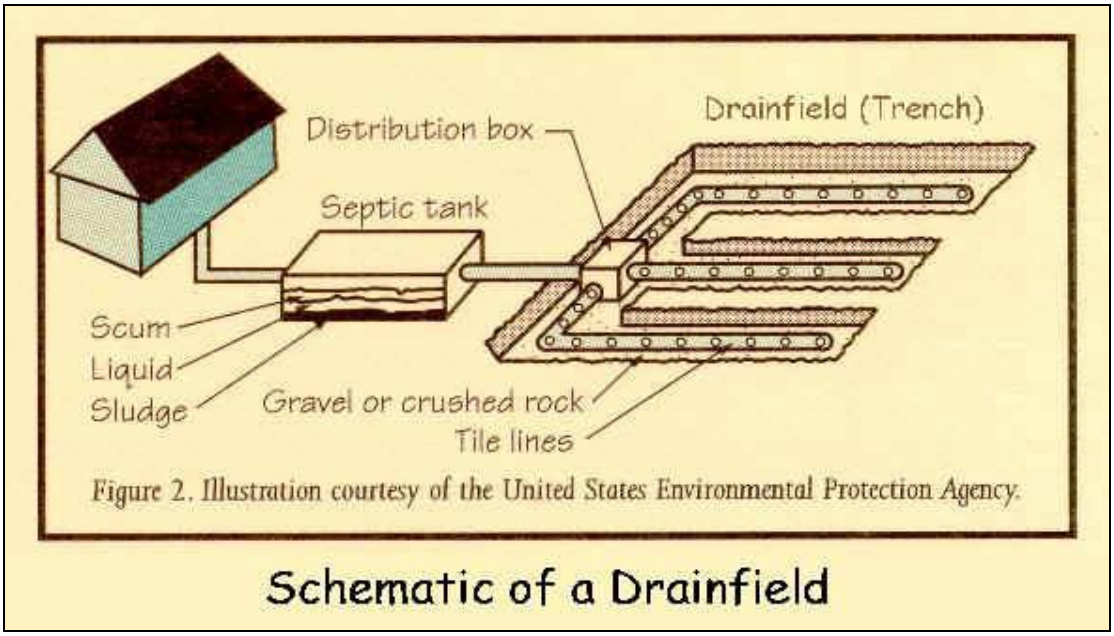
Septic tanks are enclosed vessels designed for accumulation of decomposed domestic wastewater. Natural decomposition and mixture of sewage leads to production of sewage gases. These gases can be toxic if inhaled in high concentrations or for a prolonged period of time. Septic tank gases contain methane, hydrogen sulphide (H_2S), carbon dioxide, sulphur dioxide, ammonia, nitrogen dioxide and traces of carbon monoxide. Hydrogen sulphide has a characteristic smell of rotten eggs, which is easily identifiable by human olfactory organs and serving as a warning signal for sewer gas leakage. Hydrogen sulphide can be poisonous even in small concentrations in the form of irritation of the eyes, shortness of breath and incessant cough. Exposure to higher concentrations can be rapidly fatal. For these reasons, no one should ever enter a septic tank or pump chamber unless they have been specifically trained in OSHA procedures for confined space entry and properly equipped. For most OSDS inspections, entering the tank should not be necessary.

Locating and uncovering the septic tank and other OSDS components may require excavation. To avoid damaging underground utilities (electrical, gas, water, sewer), inspectors should always have the utilities located in advance by calling Miss Utility and if possible, talk to the property owner about where lines or underground tanks may be located.

Lifting of concrete manhole covers that may weigh 100 lbs. or more. Use of proper lifting techniques and equipment should minimize physical injuries (especially to the lower back). If an inspector encounters a collapsed or partially collapsed septic tank or drywell, extreme care should be taken to avoid walking near the collapsed area. Leather gloves and steel toed boots can also be used to avoid physical injuries.

Identifying and Evaluating the OSDS Components

A proper OSDS inspection should include identifying the location, size and construction of each OSDS component along with an assessment of its current condition and functionality. It is generally recommended to start by finding where the sewer line exits the building and then work your way downstream. As detailed in the **Recommended Onsite Sewage Disposal System (OSDS) Inspection Form** (provided as part of this course), there are a wide variety of components and technologies that might be incorporated into a given OSDS. However, most systems will be comprised of a septic tank, a distribution box and seepage pits or gravity trenches. **Once all the system components are identified and located, it is important to draw a diagram as part of the inspection report that shows the location of each OSDS component** relative to the buildings being served, property lines, decks, driveways, etc. Include key distances, such as the distance from the house to the septic tank, from the septic tank to the distribution box, and the length of trenches. The various types of OSDS components that an inspector is likely to come across are discussed below.



Schematic of a Drainfield

The Conveyance System

The conveyance system is the network of pipes that conveys sewage from the various plumbing fixtures to the septic tank and from the tank to the field system. Ideally, the interior plumbing should be inspected (to the extent possible) to verify that all the plumbing fixtures in the dwelling are all discharging to the OSDS. It is common in some areas to have separate "gray water systems" for the laundry and/or kitchen waste that discharge to the surface or into a trench separate from the OSDS---the presence of a gray water system often means that the existing OSDS is hydraulically unable to handle this additional load. **The discharge of gray water to the surface is not an acceptable practice in Maryland and should be noted as "unacceptable."**

The type of plumbing material used for the wastewater system should be noted during the inspection. Cast iron pipe corrodes slowly from the inside out and over time can restrict the flow of wastes leading to more frequent clogging and sewage back-ups. Orangeburg pipe (or fiber conduit) is bituminized fiber pipe made from layers of wood pulp and pitch pressed together. It was used from the 1860s to the 1970s when it was replaced by PVC. Orangeburg pipe is no longer an acceptable conduit to use for plumbing since it is relatively brittle and susceptible to collapsing. Similarly, presence of terra cotta pipe indicates a very old system that is susceptible to leakage and collapse.

Clean-Outs, Inspection or Observation Pipes

During the site inspection it is likely that the location of portions of the OSDS will be evident at the surface by 6-inch inspection ports over the tanks, or 4 inch inspection/observation pipes in the drainfield. Clean-outs will typically be located between the house and the septic tank, or where the conveyance line change direction. The inspection pipes are often located over septic tanks or seepage pits in older systems. In some instances the trenches may be constructed with an observation pipe extending to the bottom of the trench at the terminal end. Some counties require these observation pipes in trenches for new construction and or repairs. As discussed in the "Drainfield" section, the observation pipes can be very helpful in assessing the drainfield's functionality.

The Septic Tank

The main purpose of the septic tank is to separate solids (sludge), scum (fats, oils, and grease), and non-biodegradable materials from the wastewater **effluent** that will be discharged to the soil treatment system. There are also important chemical and biological actions that occur in the septic tank aiding in the ultimate treatment of the wastewater. Studies have shown that properly functioning septic tanks alone are effective in reducing nitrogen levels by 10-20%.

Finding the tank can be difficult for some properties. The tank will typically be downgradient from the house. If not immediately evident, going inside the house and locating where the sewer line leaves the house will give you a general direction of the tank location. Then look for other clues: manhole covers, 6 inch inspection ports or, a low spot, lush grass, early snow melt. It will generally be between 10 and 20 feet from the house. Sometimes, owner will use landscaping to hide OSDS components. At the end of the inspection you will want to return the yard to close to its original condition, so if you have to do any digging, you should take care to save the sod and soils on a tarp or piece of plastic.

Prior to digging and/or uncovering the tank make note of any sewage odors in the vicinity of the septic tank. A properly designed and installed onsite sewage disposal system should be vented through the vent stack with the rest of the house plumbing. If odors are present, it could mean a clogged vent pipe.

Septic tanks for residential use are generally 1,000 to 1,500 gallons, and should be sized such that the wastewater has a retention time in the tank of at least 1-2 days. Most tanks are

constructed of concrete, but some may be plastic or fiberglass. Prior to 1970 some septic tanks were steel or cinderblock**. If you encounter a steel tank it should be considered "unacceptable" due to its age and high likelihood of not being water tight or structurally sound. If you encounter a cinder block tank, it should be considered "unacceptable" unless it can be certified by a licensed engineer to be watertight and structurally sound.** The tanks should be equipped with baffles or "T" fittings to slow the movement of wastewater from the inlet to the outlet and prevent scum from entering the field system. The tank may also have two compartments to further aid in the separation of the wastewater.

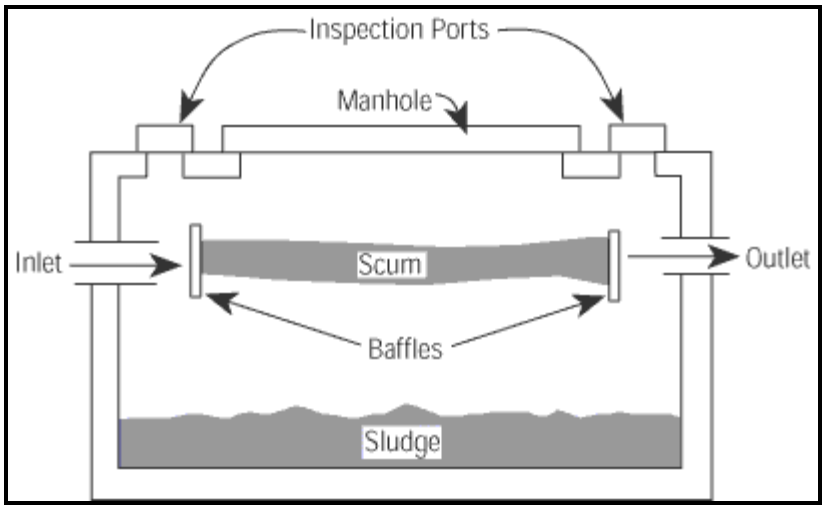
For a proper inspection of the septic tank, the inspector needs to either gain access through the manhole or uncover the inspection ports over each of the baffles. Excavation may be necessary. Looking at the tank through a 6-inch inspection pipe even with a mirror will typically not be sufficient. Most septic tanks will have a manhole access at both ends of the tank. In some cases, there will be a manhole in the center with smaller access lids on either end to access the inlet and outlet pipes.

While it is recommended that both inspection ports be uncovered to observe the condition of the tank baffles, verifying the presence of the outlet baffle is arguably the most important. The outlet baffle is a key design feature of the septic tank that prevents solids and scum from moving out to the fields system. A front baffle helps to slow the flow of wastewater coming from the facility and is especially important in a one-compartment tank.

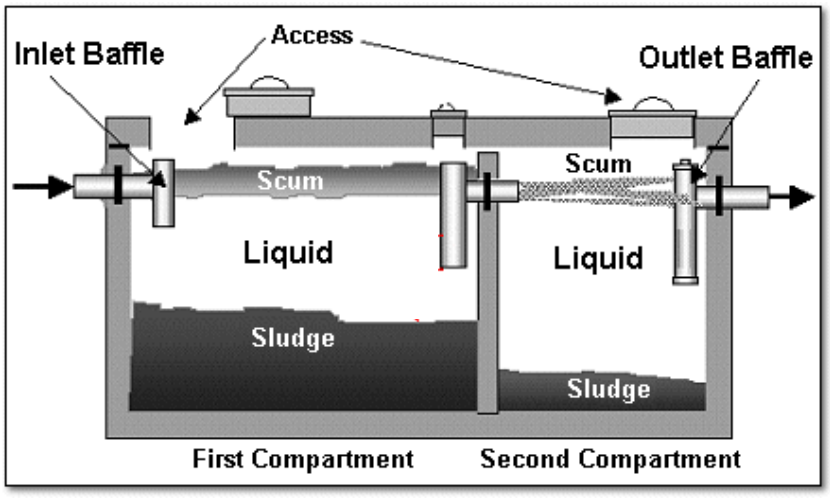
The lack of an outlet baffle or failure to properly maintain a septic tank by removing the sludge, scum, and other non-biodegradable waste may lead to early failure of the soil treatment system.

If there is a wall baffle verify that there should be at least 4 inches between the inlet pipe and the baffle to allow the free flow of both water and solids in the water. Note the depths of the baffles: the inlet baffle should be at least six inches deep. The outlet baffle should be drawing from the clear portion of the septic tank, typically about 40% of the depth. If the tank's function is to handle excessive suds or grease, the depth of the outlet baffle may be lowered so that the tank functions as a grease trap.

Examples of a one-compartment, and two-compartment septic tank are shown below.



Example Cross-Section of a One-Compartment Septic Tank with Wall Baffles



Example Cross Section of a Two-Compartment Septic Tank with "T" Baffles

It should be noted if the lid, risers, or inspection ports have evidence of above the normal operating levels such as residual scum or toilet paper above the normal effluent level. If present, this is a clear sign of periodic hydraulic overloading of the system.

The septic tank inspection ports manhole covers, risers and lid should be also carefully inspected to verify that they are structurally sound and watertight to the extent practical. Covers on inspection ports should be tight-fitting and preferably threaded. Watertight means that water is not allowed to flow in or out of the tank other than through the designed penetrations (inlet and outlet pipes). Water tightness is critical to septic tank and field system performance. Excess water entering the tank from surface runoff can result in inadequately treated effluent entering the soil treatment system and may cause premature failure. Untreated wastewater entering the soil from a leaky septic tank presents risks to human health and the environment.

The size construction of the septic tank should be noted in the inspection report. If the tank size is unknown or uncertain, the approximate capacity can be calculated by using a soil probe to determine the tank length and width and measuring the depth of sewage from the bottom of the tank. The tank volume in gallons can then be calculated by multiplying the width x length x the depth of sewage to the nearest tenth of a foot and then multiplying by 7.5 gal/ft^3. To be more accurate, you should take into account that the tank walls are typically 4 inches thick.

Example: If a tank is measured to have a liquid depth of 5 ft., and has width of 4 ft. and a length of 7 ft., the tank volume is calculated as: 5 ft. x 4 ft. x 7 ft. = 140 ft^3. Then multiplying 140 ft^3 x 7.5 gal/ft^3 = 1050 gallons. It should be noted that most tanks have 5-10% more capacity than what they are marketed as. So the tank in this example would be referred to as a 1,000 gallon tank even though the actual capacity is slightly more than 1,000 gallons.

The inspector should take note of the landscape position of the septic tank. The ground around the tank should be sloping away from the tank manholes and observation ports so that storm water is not directed onto the tank or the ground graded in such a way that water ponds on top of the tank.

The inspector should also note the depth of cover over the tank. Tanks with excess of 3 feet of cover may not be designed to handle the weight of the soil. They are also more difficult to service and inspect. Tanks installed in driveways (or parking areas) should be rated for traffic and fitted with traffic-bearing lids and covers. Determining if a tank is rated for traffic may be difficult for an inspector but any obvious deficiencies or concerns should be noted. Traffic rated tanks should have lids greater than 4 inches.

If there is no manhole access to grade, it is a good idea to recommend that one is installed for future access and for proper cleaning. **If the manhole access to the tank is buried greater than 36 inches, the tank should be marked as unacceptable due to the impracticality of being able to properly service the tank.** The installation of the manhole riser to the tank must be done properly so it is also watertight. In some cases, these types of modifications will require a permit.

SAFETY NOTE: Inspection of a septic tank, pre-treatment unit or pumping chamber should never involve actually getting inside the tank unless the person has been trained in confined space entry procedures and is equipped with the necessary breathing apparatus and safety harness. Breathing in the fumes from inside the tank could be fatal! With proper access to the tank, and the use of mirrors, and/or a flashlight, you should be able to perform a proper inspection of the tank without having to get inside the tank.

Evaluating Septic Tank Performance and Maintenance

Once the inspector has gained access to septic tank, the operating level of the tank should be noted. **Normal operating level should be just below the bottom of the tank outlet pipe.** If the water level is above this, it indicates that there is some type of backup in the field system. This can be the result of a clogged pipe or an indication that the entire system itself is hydraulically

overloaded. If the operating level is significantly below the tank outlet, this is an indication that the septic tank is leaking and is not watertight (or that the tank has been recently pumped).

Look to see if there is evidence of floating material that doesn't belong in the tank, such as dental floss, excessive hair, feminine hygiene products such as tampons, condoms, cigarette butts, or baby wipes. The presence of these items indicates that the users have not properly cared for the system and could be a potential cause of premature system failure.

Prior to pumping the tank, it is recommended that a Sludge Judge or similar device be used to retrieve a cross-section of the tank from the bottom to the operating water level. In a properly functioning system, the tank should develop three separate layers—*a scum layer* on top, a relatively clear section in the middle, and a *sludge layer* on the bottom. If these three separate layers are not present then the system is not operating the way it should. When wastewater doesn't form these layers it is often because some type of chemical had been added that has killed the bacteria or possibly because the outlet baffle is missing or hydraulic loading has occurred.

The Scum Layer

The scum layer should not be excessively thick and should be at least 3 inches from the bottom of the outlet baffle to ensure that scum is not leaving the tank. The scum layer should also not be higher than the outlet baffle. Excessive scum in the tank may mean that the tank needs to be pumped, or that the wastewater has high levels of grease or soap. For systems serving commercial establishments such as restaurants, it is recommended, and in some cases required, that a **grease trap** is installed ahead of the septic tank.

The Sludge Layer

The top of the sludge should not be within 12 inches of the bottom of the outlet. Allow time for the sludge to settle in the Sludge Judge sample before measuring this distance. Verify that the sludge is settling well and that there is not excessive movement of sludge out of the tank. Sludge will not settle properly if the water in the tank is turbulent. Turbulent conditions could be from a pump in the basement adding high volumes of water, "stirring up" the wastewater or there may simply be too much water entering the tank over a given time. If the wastewater flow from the house to the tank has increased since the tank was designed and constructed, the tank may not be large enough to handle the amount of wastewater entering it. Users of the system may be able to reduce their water use to improve the performance of the system.

A general rule of thumb is that if the combined thickness of the scum layer and sludge layer is greater than 30% of the total operating depth than the tank needs to be pumped. An example for how to calculate whether the tank should be pumped is shown below.

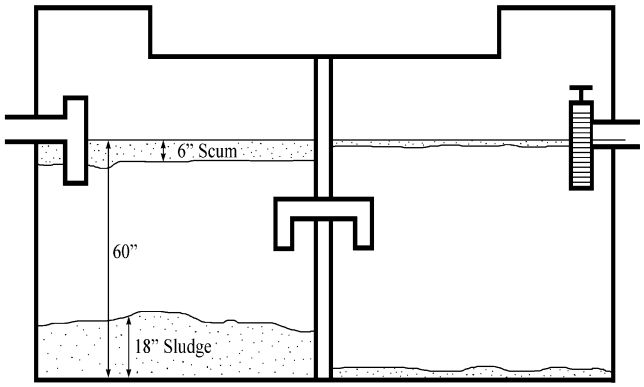
Calculating Whether a Septic Tank Should Be Pumped

The septic tank illustrated to the right has a liquid depth of 60 inches, a scum depth of 6” and a sludge depth of 18”

The percentage of scum and sludge in the tank is calculated as follows:

(18” + 6”) ÷ 60 x 100 = 40%

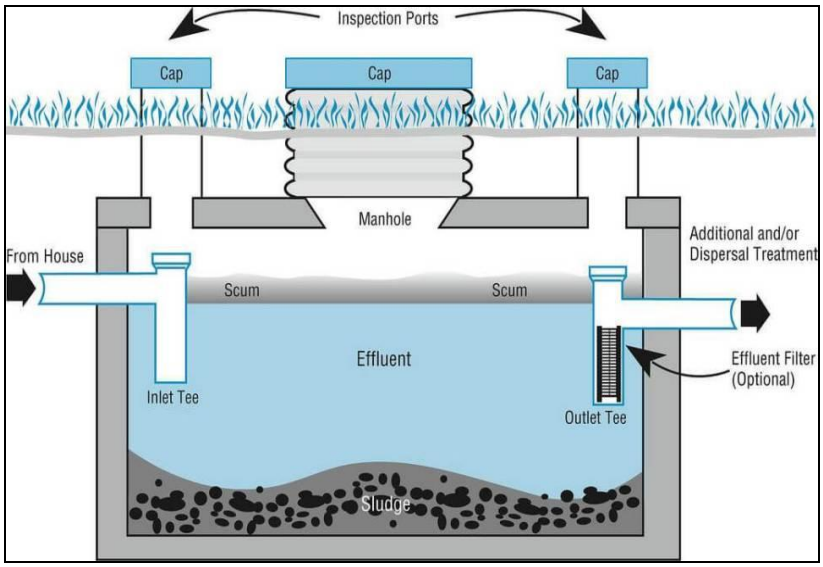
Therefore, this tank should be pumped.



Effluent Filters

An effluent filter is a slotted cylindrical piece of plastic that is fitted into a vertical pipe that is attached to the outlet of a septic tank. It is designed to prevent solids in your septic tank from exiting into your drainfield. While the majority of the material exiting the tank is liquid, there will also be solids moving through the outlet pipe. The effluent filter is an inexpensive option to prevent excessive amounts of solids and non-biodegradable objects from exiting the system.

Effluent filters typically require cleaning every 6 month to a year. More frequent cleaning may be required depending on the type of wastewater entering the septic tank. Cleaning the effluent filter involves pulling the filter out from the vertical pipe, and washing it off with a garden hose. Cleaning the filter should be done with the effluent filter directly over the inlet side of the septic tank.



Pumping the Septic Tank

To properly inspect the tank integrity and to clearly see the baffles, the septic tank needs to be pumped during the inspection unless there is clear evidence that the system is unacceptable and pumping the tank will only be an additional expense on top of what it will eventually take to correct the problem. If the tank is brand new and only has been in use a short period of time, pumping may not be necessary but this is a rare occurrence.

Once the tank is pumped, look to verify that there is no water entering the tank from the outlet pipe. **If water is flowing back into the tank, this would be strong evidence that the system is hydraulically overloaded or at a minimum that the conveyance line to the drainfield is clogged.** Also, look to verify that the concrete walls of the tank are watertight. Pay particular attention to seams in the walls. Tanks with mid-wall seams have a high probability of leaking at the joint. These joints should have a tongue-and-groove connection and a mastic sealer on them. Also check the tank bottom. This may seem pretty straightforward, but many older tanks may have floors that were not properly constructed and are not watertight.

Next, inspect all of the penetrations, including inlet, outlet, manhole riser, lid of the manhole, and inspection pipes. All of these should be watertight. Roots growing in the tank are strong evidence that that the tank is not watertight. Another sign of a tank that is not water-tight would be water trickling into the tank through the tank seams or sides. If water is flowing in from the inlet pipe, and you confirm no one was using water inside the house, this may be an indication of a leaking fixture inside the house or infiltration from ground water. To assess whether the manhole risers are watertight, run a garden house around the outside of the manhole for several minutes and see if any water leaks into the tank around the manhole.

Check the structural integrity of the tank. The lid should be strong enough to support the weight of a 250-lb. person. Walls must be strong enough to maintain a saturated soil overburden. Refer back to the original design of the tank for verification if necessary. If the tank is installed deeper than it is designed to handle, (usually maximum of 3’ in Maryland) this condition should be noted. Check for settling of soil around the tank. Depressions in the soil at the edges of the tank may cause ponding of storm water and may indicate the tank is leaking.

Pump Tanks (a.k.a. Pump Chambers)

If the field system of the OSDS is pressurized, or if it is located at a higher elevation than the septic tank, there will typically be a pump tank (also called a lift station) immediately following the septic tank or advanced treatment unit. The diagram below depicts a standard pump tank design.

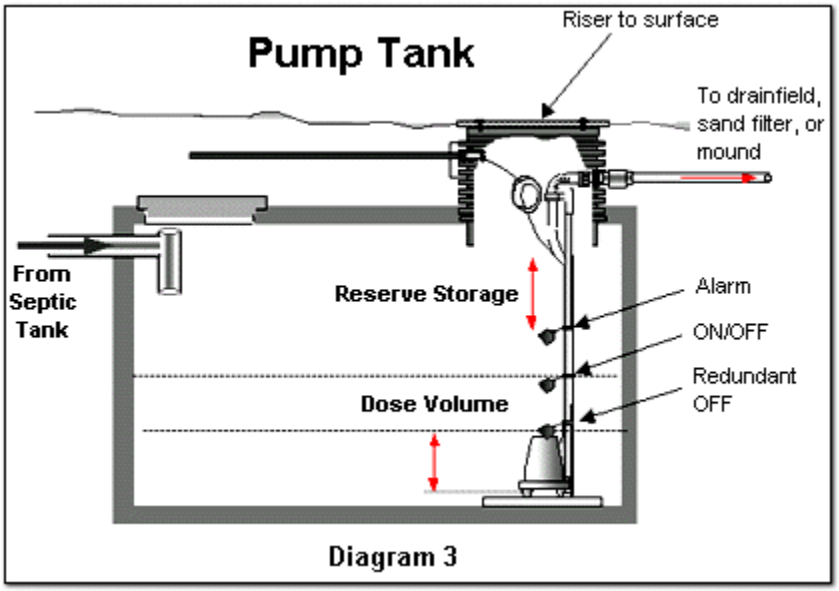


Diagram of a Typical Pump Chamber

The pump tank should be located and inspected in much the same way as the septic tank. First, evaluate how wastewater is moving through the pump tank—effluent should be entering the tank by gravity and there should be an inlet baffle in place. Check to see that the tank is watertight, and structurally sound. You should be able to access the pump without having to enter the system**. A pump tank without a manhole riser to grade should be listed as "unacceptable."**

The pump should be installed on a 6-inch block at a safe distance from the bottom of the tank so that it does not take in solids that may accumulate on the bottom of the tank, and will be activated by a series of floats or sensors when the water level in the pump tank reaches those elevations. There should be little or no sludge in the bottom of the pump tank. If there's excessive sludge in the pump tank or the first section of the trenches, there are probably turbulent conditions in the septic tank, resulting in poor settling. There should also be a high water alarm installed on a separate circuit than the pump to alert the owner/occupant when the pump fails or is unable to keep up with the volume of wastewater coming from the septic tank. Alarms and pumps should be checked manually to ensure that they turn on and off and are positioned correctly. The alarm should be on a separate electrical circuit from the pump, so that if the pump trips the circuit breaker, the alarm should still function. If the system is designed for effluent to drain back after pumping to a pressure distribution system, make sure that the drainage does not turn on the pump. This could cause serious damage to the pump.

Electrical connections should be watertight and free of corrosion and there should be a remote shut off for the pump. Control panels should be accessible (3' above grade and free from obstruction). All outdoor wiring should be protected from damage due to mowers, weed eaters, foot traffic, or any other activity. All wiring should located inside of conduits, junction boxes or other approved means. No outlets or switches should be located inside of septic tank or pump chamber risers. Only direct bury rated connections should be permitted inside of risers. Only proper weather rated connectors should penetrate risers or other tank barriers. Make sure to document any inadequate or questionable conditions and consult a licensed electrician and/or

certified OSDS service provider for direction. If an inspector encounters a pump chamber and he/she is not familiar with the design and specific techniques used to evaluate the pump chamber, the inspector should report that the pump tank "needs further evaluation" by a qualified professional.

Distribution Box or Serial Distribution

In Maryland, gravity-fed onsite sewage disposal systems typically utilize two means of wastewater distribution: parallel distribution; and serial distribution. A distribution box (commonly called the "D-box") is used in parallel distribution to evenly distribute effluent that comes from the septic tank to the drainfield. Trenches should be of equal length if a distribution box was used. Crossover pipes are typically used to achieve serial distribution where septic tank effluent is loaded into one trench and fills that trench to a predetermined level before passing through a relief line to the succeeding trench.

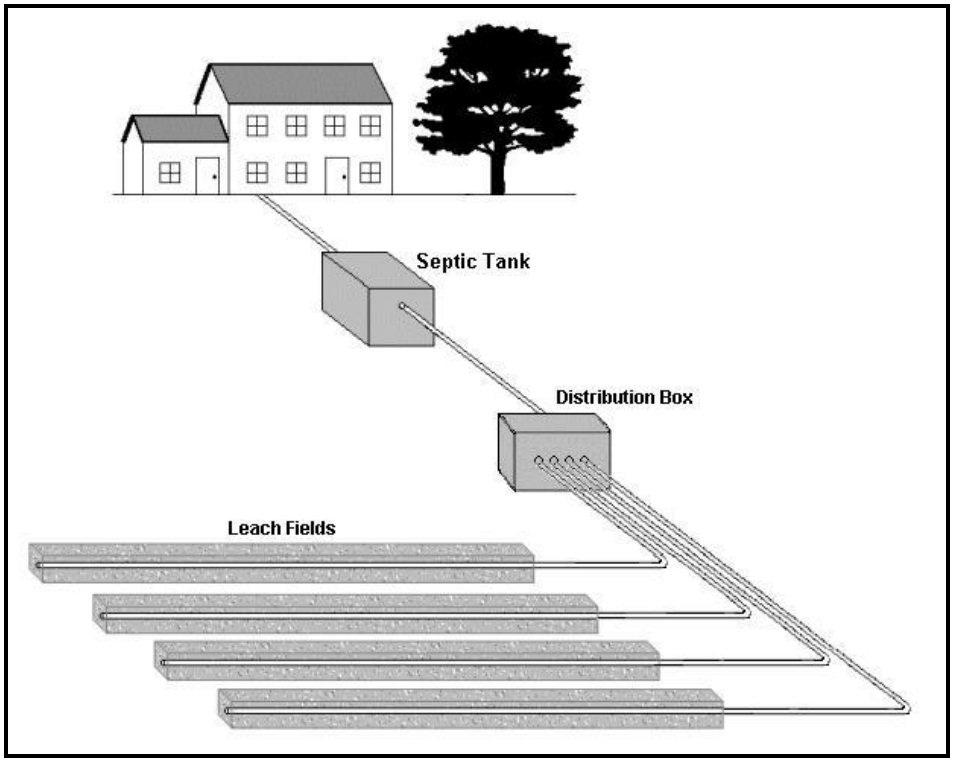


Diagram of Parallel Distribution Using a Distribution Box and Trenches

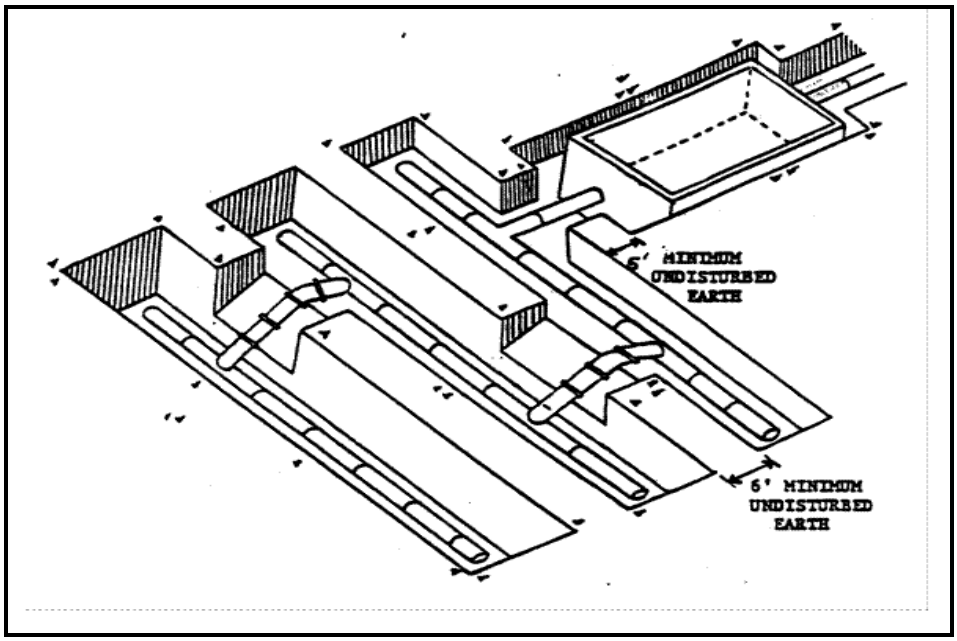


Diagram of Cross-Over Pipes and Trenches

A common problem with D- boxes is that they may become out-of-level over time assuming they are level when installed, thereby, causing all or most of the effluent to be directed to one of the field components. These boxes can also become deteriorated over time and susceptible to water and root infiltration. Therefore, they should be located and inspected. Some counties require an inspection port or locator pipe attached to the D-box. D-boxes are typically square or rectangular concrete boxes that are 15-18 inches wide. Verify that D-boxes have solid walls and bottoms. Although D-boxes need not be absolutely watertight, they should be constructed in such a way as to minimize infiltration. If the D-box is flooded or there is evidence of sewage sludge at the bottom, this is another indication that the system has not been properly maintained.

If you cannot /do not locate these components as part of the inspection, be sure to specifically note this and discuss the potential problems with the client. **It is highly recommended that every inspector have a device that can be used to find buried OSDS components and help assess the integrity and functioning of the OSDS (e.g. probe, sewer pipe video camera).** If the component can not be found and inspected, it should be rated in the final report as "needs further evaluation."

If a hydraulic loading test is conducted where water is added to the system in a gravity distribution system, the distribution box or trenches should be opened to observe that water freely moves from one part of the system to another. See section on Hydraulic Load Testing below.

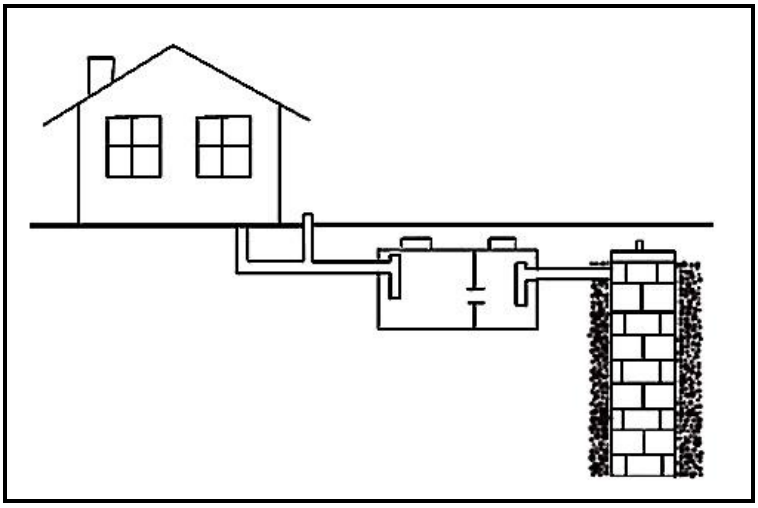
To assess the distribution of effluent to the drainfield, the distribution box needs to be located and uncovered. The physical integrity of the box should be noted along with any evidence of solids, water or root infiltration. Special care should be taken to determine if the lines leaving the D-box are level or whether certain lines are receiving most or all of the waste. **Any distribution**

box found to be out-of-level should be rated as "unacceptable." Correction of this situation is typically straight forward and relatively inexpensive.

In some cases, individual lines may be purposefully blocked off to "rest" that field component. If this situation is encountered, try to ascertain when/why that field component was blocked off. Theoretically, failed field components that are allowed to "rest" for several years may be put back into use, however, it is generally believed that the life of that field component will never return to its original capacity.

The Drainfield

The drainfield (also called the leachfield, or field system) is a general term used to describe the soil absorption system where the sewage effluent is introduced into the subsurface. There are several different designs used to discharge wastewater to the soils. In most homes constructed from the 1950s to the 1980s, wastewater effluent leaving the septic tank was directed by gravity to one or more seepage pits (also called drywells). See diagram below. Alternatively, and more commonly installed today, effluent leaving the septic tank is directed by gravity to a series of lateral perforated pipes that discharge the effluent horizontally over a larger area. See diagrams showing distribution with lateral drainfields above. It is important to note that many seepage pits (drywells) were installed deeper into rockier soils that in many cases today would be considered unacceptable for new construction. Some counties may require modification for continued use of existing seepage pits.[1]



Cross Section of a Septic Tank and Seepage Pit (Drywell)

[1] Howard County requires seepage pits to be filled with stone surrounding a vertical perforated pipe. Specific details and questions regarding this issue should be referred to the local environmental health office.

Evaluating the Drainfield

If the field components or soil treatment system is overloaded, effluent may come to the surface, or may back up into the house. **If the effluent is surfacing, the field system should be reported as "unacceptable."** When looking for evidence of a surface failure, keep in mind that people can be creative at hiding it. Odor is one good indicator, and so is spongy ground around the drainfield. Check for water loving plants or a change in vegetation or other landscaping that may be hiding surfacing effluent. If an OSDS is located in close proximity to a stream, or in a remote area, look down gradient from the system for overflow pipes to the surface.

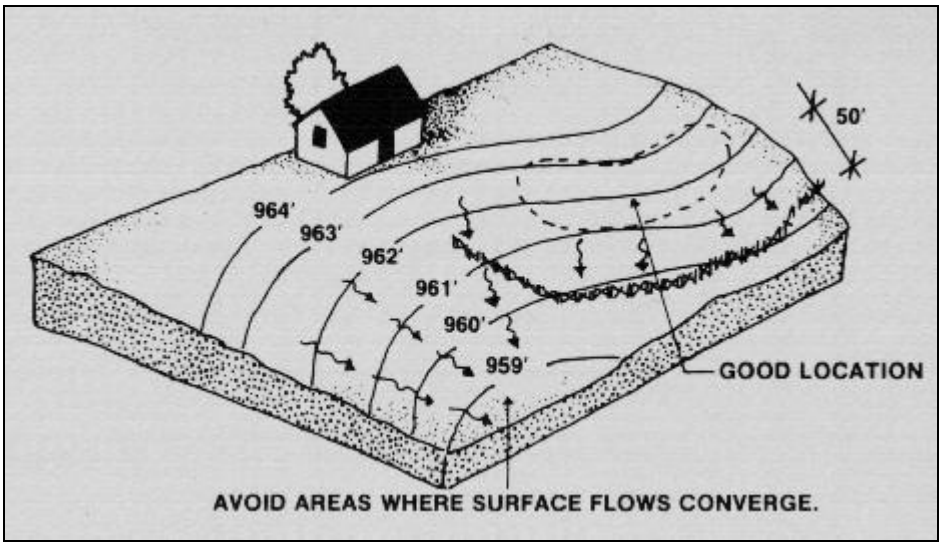
Dye testing is a tool to possibly identify a failing system, but dye testing is only recommended if the site inspection indicates an unacceptable discharge location (i.e., visible pipe discharge to the surface or surface water body). Dye will generally not be effective if the effluent must travel through the soil system before surfacing since the dye itself may adsorb to the soil and/or may take a long time to migrate to the surface.

If observation pipes are present, the liquid level in gravity fed trenches and seepage pits should be checked to ascertain what percentage of the system is being used. The level of effluent in observation pipes indicates how well the system is performing under current flow conditions and gives an indication of the ability of the system to handle additional flow. It can also be of value from a troubleshooting standpoint. For example, if only part of the system is receiving effluent and it is overloaded, it means that the distribution box is out of level or there is a blockage in the conveyance line.

When evaluating the sewage level in a seepage pit (drywell), it is important to note the level of the sewage relative to the inlet pipe elevation. For instance, if a drywell is 12 feet deep and the sewage level is measured to be 4 feet from the surface, one might conclude that the drywell is "acceptable" but if the inlet pipe is 3 feet 10 inches feet below surface, there is really only 2 inches of available capacity in the drywell and an increase in daily water usage might quickly result in a sewage back-up for a new homeowner. Another potential concern is a drywell that is constructed into bedrock (i.e., sewage is being discharged directly into bedrock with little or no treatment of the soils). This situation may be difficult to identify if you do not have knowledge of how the depth and type of soils on the property. Consult the local environmental health department should this question arise.

Landscape Position

Field system should not be located in excessively steep slopes (>25% for subsurface trenches, and >12% for sand mounds). If system is on a steep slope, inspect the area at the lowest portion of the system for seepage or break-out of sewage from the ground surface. If there is evidence of sinkholes or rock outcroppings around the field system, sewage could be discharging to ground water with little or no treatment. If the field system is located in a swale or concave landscape position, the system may be susceptible to seasonal high water tables which may result in periodic back-ups or failure of the OSDS.



Conducting a Hydraulic Loading Test

Another method to help determine if the OSDS is operating properly is to conduct a hydraulic loading test. The primary purpose of this test is to determine whether the effluent is flowing freely from the tank, to the distribution box and to the field system, and that the receiving soil can accept an expected peak load without backing up. Nationally, there are various philosophies and methodologies on how to conduct a hydraulic loading test. Depending on the situation, there are three general approaches recommended by this course:

1. House is Occupied – In this scenario, one can assume that the OSDS is receiving daily sewage flows, but depending on the actual number of people in the house, the system may or may not be receiving daily flows that approximate the original capacity of the system. To test the system, use the following formula as a rule of thumb: Total Hydraulic Load = Total Design Flow (number of bedrooms x 150 gallons/day) – (number of occupants x 150 gallons/day). So, for a 4 bedroom home with two occupants, the Total Hydraulic Load would be 600 gpd (4 x 150 gpd) – 300 (2 x 150) = 300 gallons. If the same house was occupied by 4 people a nominal amount of water should be used just to verify that the effluent is flowing freely through the system.

2. House is Vacant – if the house is vacant for more than a week, it is recommended that a more robust evaluation of the hydraulic performance of the system be performed. Ideally, you should charge the system with the peak design flow (number of bedrooms x 150 gpd). However, it may also be reasonable to load the system with an amount of water that will approximate that projected future usage. So if it is a 5 bedroom house with 3 people moving in, a 450 gallon hydraulic load test may sufficient. If there are other known issues with a site (documented problems with the system that were never repaired), a sufficient hydraulic loading test might require multiple days of testing.

3. OSDS is Pressurized – Pressurized field systems are typically installed on sites that have limiting site conditions (see discussion below). Special care should be taken to determine

if a hydraulic loading test is necessary and if so, what the appropriate volume should be. Do not perform a hydraulic loading test on a pressurized system unless you are experienced and understand how the system was designed. Typically, running the system through one complete pump cycle should be sufficient for evaluating a pressurized system.

Regardless of which approach is employed, it is important to discuss your plans for conducting a hydraulic loading test with the property owner. You should ascertain if the well onsite is a low-yielding well. If there are concerns that the hydraulic loading test will put too much strain on the well, arrangements for hauling water in may be necessary. Water used in the hydraulic loading should be non-chlorinated water, free from contaminants—septage from another site should NOT be used for this purpose.

The water can be introduced into the tank outlet pipe, at a clean out after the tank, or in the distribution box with a hose with dedicated backflow prevention. A hydraulic load test should NOT be conducted by running water through the septic tank unless the tank has been pumped and thoroughly cleaned immediately beforehand. Otherwise, the test could introduce a slug of suspended solids to the field system. Before running the test, note if there is any ponding in the observation pipes in the trenches (if present), and measure the depth to ponding.

During the course of the test, look for evidence of back up in the distribution box, septic tank, observation pipes or overflows to the surface. If the system incorporates a pump, make sure to run the water until the pump runs completely through its cycle of one dose volume. If the septic tank has been recently pumped, the water will need to be added into the effluent line leaving the septic tank. The results of the test should be evaluated in consideration with the type of trench distribution design and any recent heavy water use. A hydraulic load test is not recommended if the field system is already observed to be failing to the surface.

Pressurized OSDS

In areas where the soil is more restrictive (i.e., slowly permeable), or has other site limitations, the field system may be pressurized. Commonly used pressurized designs include sand mounds, at grade mounds, low-pressure dosing in trenches, or drip dispersal. These types of OSDS almost always incorporate the use of a pump chamber or an advanced treatment unit (ATUs) to aerate the wastewater to further reduce the levels of total suspended solids (TSS), biochemical oxygen demand (BOD). For these more complex systems, it is likely that the local environmental health department or permitting agency has plans showing the layout and design of the system**.** The diagram below is a cross section of a sand mound soil absorption system incorporating a septic tank and pump chamber.

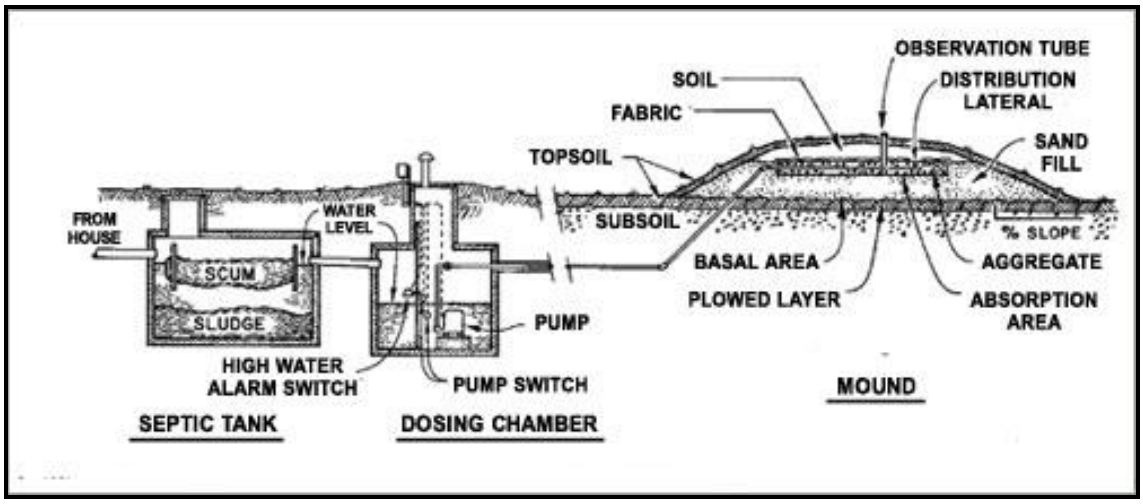
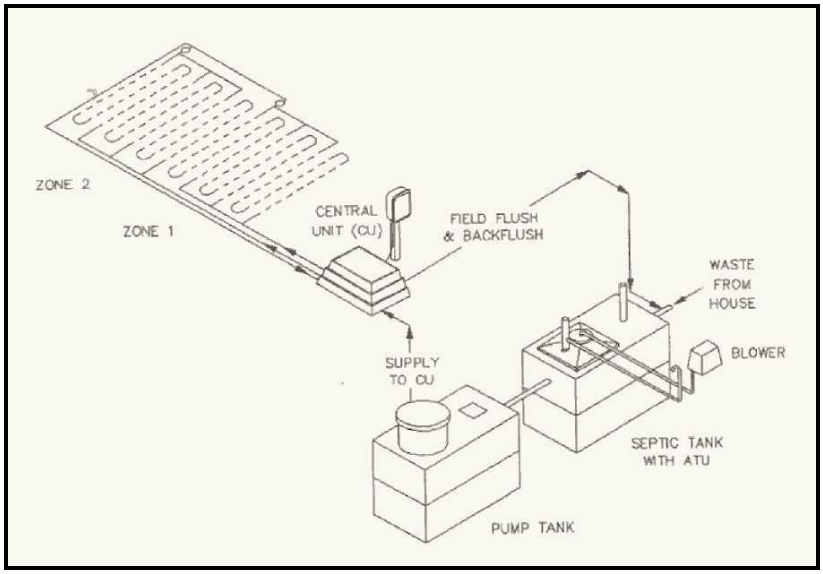


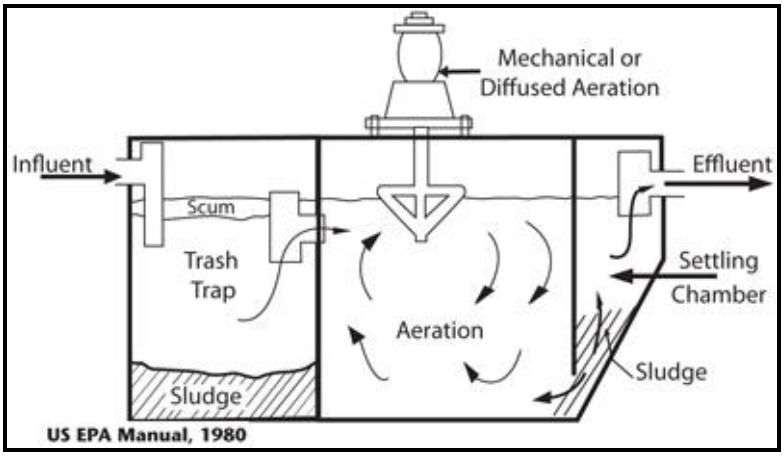
Diagram of Sand Mound OSDS

If you are familiar with pressure distribution systems, the ends of the laterals should be identified and uncovered. The squirt height (distal head pressure) can be checked with effluent being pumped to the system. Squirt height will indicate whether the pump continues to deliver effluent at the rate needed or as and may serve as an indicator of perforation or lateral plugging (i.e., head levels higher than called for in the original design). There should usually be a minimum of 2 ft. of vertical distal head as measured from the lateral elevation turn-up furthest uphill from the pump. This test is not recommended if you are not trained to do so. **If an inspector encounters a pressurized system and he/she is not familiar with the design and specific techniques used to evaluate the system, the inspector should report that the system "needs further evaluation" by a qualified professional.** Be advised that probing in the area of a field system with drip tubing should never be done as this may damage the system components.



Aerobic Treatment Units

Since the mid 1990's, the use of aerobic treatment units (ATUs) have been increasingly incorporated into the design of onsite sewage disposal systems in Maryland and throughout the country. An ATU is a device that incorporates the use of oxygen (air) in the wastewater treatment process to enhance the decomposition of the wastes beyond what would typically take place using a standard septic tank. Other commonly used names for these types of systems include: advanced treatment units, sewage pre-treatment units, and package wastewater treatment plants. Unlike a typical gravity septic system, ATUs general require a power source, and air supply, and some may also have pumps associated with them (see generic design below).



Typical Aerobic Treatment Unit Design

Beginning with the creation of the Bay Restoration Fund (BRF) in 2004, Maryland initiated a state-wide effort to reduce the nitrogen discharges associated with municipal wastewater treatment plants as well as onsite sewage disposal systems. Since many ATUs are also effective in reducing nitrogen in wastewater, BRF money was made available to upgrade existing septic systems with MDE approved ATUs. The ATUs that were approved by MDE were designated as BATs which stands for: "**Best Available Technology**" for removing nitrogen from an onsite sewage disposal system.

There are over a dozen manufacturers that have approved BAT units for installation in Maryland. From 2013-2016, state regulations required that all new construction to be served by an onsite sewage disposal system must incorporate a BAT unit in the system design. Currently BATs are required for all new construction and repairs in the Chesapeake Bay critical area and Atlantic Coastal Bay critical area. This manual will not review all the types or configurations available. Some will be discussed in class. MDE's webpage has the current BAT technologies listed:

https://mde.state.md.us/programs/Water/BayRestorationFund/OnsiteDisposalSystems/Pages/index.aspx

The state regulations also require that all BAT units installed shall be maintained and operated for the life of the system by a certified maintenance provider. In areas of the state where property owners' are responsible for maintaining their own BAT unit (most areas), the regulations require that the property owner ensure that each BAT system is inspected and has necessary operation and maintenance performed by an MDE and vendor certified service provider at a minimum of once per year.

What is important for an inspector to understand is how to identify when a BAT (or ATU) is being used and how to address such a system in the inspection report.

In general, the manufacturers and vendors of proprietary BATs do not want inspectors to evaluate the BAT units unless the inspector is both an MDE and vendor approved certified O/M service provider. The inspector should be able to determine the manufacturer make and model by asking the property owner, requesting records from the county, and/or by product identification tags or insignia located on the control panel or other system components. It is recommended that at a minimum your inspection report should include the following language:

"The OSDS serving this property includes the use of an ATU or BAT. State regulations require that the owner shall ensure that each BAT system is inspected and has necessary operation and maintenance performed by an MDE and vendor certified O/M service provider at a minimum of once per year."

The seller may have a copy of the current service contract and last service inspection report. Otherwise, the vendor or certified person responsible for doing the service should be able to send you the most recent service inspection report and or verify the unit has been serviced properly at the necessary frequency. An OSDS that includes a BAT that has not been serviced within the last year and listed as "acceptable" by a certified service provider should be reported as "unacceptable" in the final report.

This next part is for general information only, as far as the formal inspection is required, the instructions above are sufficient.

There should be power to it the control panel, and no alarms going off. (Sometimes homeowners will turn off the power to these units.) All units have some sort of air supply. **All units have a trash trap which should be sludge judged only by an MDE and vendor certified O/M provider to see if pumping is needed. If pumping is needed, it must be done by a vendor certified and properly trained pumper.** Care must be taken when pumping these units, as the instructions are specific to the manufacturer, and if the pumper is not knowledgeable about the unit, they can actually damage internal components. The aerobic portion of the unit should not have a septic smell. It should be odorless or musty smelling and be a shade of brown, like coffee with cream. If this portion of the unit is black and smelly, the microbes have died indicating that the system is not operating as designed. The effluent stream after the clarifier should be clear and odorless, occasionally it may be stained "tea" colored but there should be no visible sediment.

The number of different ATU manufacturers will make it unlikely for any one inspector to be knowledgeable in all the systems on the market. OSDS Inspectors should become familiar with BATs to some degree, but rely on the MDE and vendor certified O/M service provider to give final OK as to the functioning of the unit.

Control Panels

A control panel is associated with the design of all pressurized OSDS. The panel should be outside, in a weather proof enclosure and be located relatively close to the pump chamber at a minimum of 32-36 inches above finished grade, with a clear line of sight between the panel and the pump chamber as a safety precaution. The panel should be equipped with a pump event counter, an elapsed time meter and a high-water event counter to determine gallons pumped and to aid in trouble shooting if problems arise. The high water alarm float should be wired on a separate circuit from that of the pumps so that if the pump circuit fails, the alarm float circuit should still be operational. The alarm may be audible and/or visual.

Individuals not familiar with control panels should limit their inspection to noting obvious signs of a problem such as no power, loose wires, evidence of flooding, and damaged housing.

Cesspools (an OSDS without a Septic Tank)

A cesspool is essentially a seepage pit or drywell without the benefit of a septic tank ahead of it to separate the solids, scum and non-biodegradable material. The raw wastewater is discharged into a subsurface structure typically constructed of a porous masonry wall, through which the liquid seeps into the surrounding soil. This method of sewage disposal was generally not used after about 1950, so any cesspools still in use are very old. **When encountered, MOWPA recommends that cesspools be considered "unacceptable" as an OSDS as they do not provide primary treatment**. They were not designed or constructed to properly treat the wastewater, and are considered by the USEPA to be a threat to groundwater quality. If a property is served by a cesspool, the owner should be advised to contact the local county h environmental health department or permitting agency to determine an appropriate repair. .

Holding Tanks

In rare instances, dwellings may utilize a sewage holding tank for their wastewater. A holding tank is a watertight storage tank for the collection of sewage which must be regularly pumped and disposed by a licensed liquid waste hauler. A holding tank system is NOT a disposal system—i.e., the sewage is not disposed of onsite. Holding tanks must be permitted by the local environmental health department and a holding tank agreement must be recorded in land records for the property. Holding tanks are generally considered a "last resort" option for management of sewage, where an onsite repair has been determined to be not feasible. If a holding tank is encountered, it generally means that this site is extremely limited for onsite sewage disposal. Holding tanks should be inspected to verify they are watertight (to the extent practical), have not

been illegally modified, have a functioning high water alarm, and a current service contract with a licensed liquid waste hauler.

Supplemental OSDS Information

Age of the OSDS

Determining the age of the OSDS will give an indication as the likely design and construction of the system. The older the system, the more likely it is that problems will be encountered. The average expected life of a traditional conventional on-site system is 20-30 years. However, do not assume that because a system was recently installed, it is without flaws or problems. Also, older systems may have significantly different designs than are currently in use. In particular, the system capacity may be smaller and may not be suitable to handle modern family living or modern luxury appliances. At some sites, an older system may mean no system at all, and could be direct pipe discharging to the surface, subsurface or stream.

Water Supply

The water source to the home should be noted. Some properties served by an OSDS have public water as a water source instead of well water. Water meter readings may be a good reflection of actual water usage and should be used when present to assess average daily water usage. If the water supply is a well, the location and construction of the well should be documented and are important considerations pertaining to the OSDS. Some older properties served by an OSDS may have a spring or cistern as a water supply which are prone to contamination from substandard OSDS.

The well serving the property should be identified and the setback distances from the OSDS noted. In Maryland the setback distance from a well completed into an unconfined aquifer to any identifiable source of contamination (this includes all major components of an OSDS) is 100 feet. Wells drawing from a confined aquifer must be 50 feet from identifiable sources of contamination. The term “confined” essentially means that the aquifer is sealed from receiving water directly from the surface or near surface. Generally speaking for Maryland, areas west of I-95 are underlain by Piedmont bedrock aquifers that are unconfined aquifers, and areas east of I-95 are underlain by unconfined and confined aquifers. If there is doubt about whether the aquifer is confined or unconfined, consult with the local environmental health department.

Setback distances were not established until the late 1970s, so properties developed prior to this time may not always comply with the current setback standards. This may or may not be a problem depending on the location and construction of the well and OSDS. In general, wells should be at higher elevation that the OSDS. If wells are shallow (< 50 feet below ground surface), and in particular, if they are hand-dug wells, there is a higher likelihood of water quality concerns. If there is some concern about the location or construction of a well relative to the OSDS, it is recommended that the local environmental health department be consulted. A

variance may have been approved that allows the reduced setback condition to exist. If a variance was approved, this information should be available in the county records.

Water Usage

To assess whether the OSDS is sized appropriately, compare current water usage and anticipated water usage with the designed flow. Since the early 1970's residential systems in Maryland have been designed based on the number of bedrooms assuming maximum daily sewage flows of 150 gallons/bedroom/day or 75 gallons/person/day assuming 2 people per bedroom. We should remember though, that bedrooms don't generate wastewater**,** people do, and actual usage is estimated at 40-60 gallons/person/day. Compare the number of bedrooms, current number of residents and water use pattern with the anticipated future number of residents and water use pattern. For example, consider whether the people moving in are employed full-time and are not at home during the day, shower at a health club and eat out regularly, they may add very little water to the system, and the current system may be more than adequate. Differences in the flow should also be considered for a family with children. In particular, if there are a number of teenagers, the amount of bathing and laundry could increase dramatically. All families go through high and low wastewater flow periods as kids are growing up. Multiple families in homes also can affect wastewater flow as can families that home school their children. Two or more families sharing an OSDS typically use more water than a single large family, because there are more meal times and more loads of laundry. Also, compare the permitted number of bedrooms to the Real Estate Listing. This is may be a concern to be noted if these numbers do not match.

Occupancy/Vacant Properties

The number of people living or that recently lived at the house at the time of the inspection should be noted along with the number of bedrooms. If the house has been vacant for more than a week, it should be noted. The longer a property remains vacant, the more difficult it may be to assess the long-term hydraulic capacity of the associated septic system. Be very cautious with properties that are in foreclosure, as these OSDS may not have been properly maintained.

Leaking Fixtures

Make sure that all of the water-using devices in the house operate properly. If they do not, they should be fixed. This information can be obtained from the Home Inspection. Repair or replacement of leaky fixtures is a highly effective, low-cost protection of the septic system. No footing or roof drains (clean water) should be routed through the OSDS. Even if the current owner or real estate agent doesn't know whether leakage to the OSDS is occurring, there may be indications of this during the field inspection. A constant trickle of water into the septic tank when no in-house devices are being used is a good indicator of extra water being added to the system. However, depending on groundwater or weather conditions, this observation could also

mean that there is leakage of surface water or groundwater into the inlet pipe leading to the tank, or from around the tank itself.

Garbage Disposals

Use of a garbage disposal is generally **NOT RECOMMENDED** for use with onsite systems as it promotes the disposal of undigested food to the system which takes longer to decompose, and may not separate as readily in the septic tank. Septic tanks serving homes with garbage disposals may need to be pumped out more often to ensure that solids are not entering the soil treatment system. In addition, the use of an effluent filter on the outlet of the septic tank is a good preventative measure for protecting the soil absorption system.

Water Treatment Systems

The primary concern for water treatment devices is the potential for sending excess water to the OSDS. For example, a typical water softener may only backwash once a week, only adding an additional 50-70 gallons to the system (usually in the middle of the night). However, a whole-house reverse osmosis (R/O) system generates between 1 and 2 gallons of wastewater for every gallon of filtered water. So a whole-house R/O system could easily overload an onsite system that was not designed for that additional wastewater load.

A secondary concern is the chemical nature of the water discharged to the OSDS. Backwash from water softeners has high concentrations of salt which can be corrosive to concrete and metal. Excessive salt concentrations in the wastewater can lead to premature failure of the cast iron pipe, concrete (and metal) septic tanks, and/or tank baffles. While many studies indicate that typical salt levels found in wastewater with softening systems do not pose any concern for the biological activity in the tank or the soil treatment system, many manufacturers of pre-treatment units do not want/allow discharge of the backwash into the their units. **Where advanced pre-treatment units or BAT units are used in conjunction with a water softener, it is generally recommended that the backwash from the water softener be discharged on the downstream side of the pre-treatment unit or to a separate approved onsite sewage disposal system.**

If an inspector encounters a water treatment system that is discharging to the ground surface, this condition should be noted in the final report. However, if the surface discharge is not affecting the potential functionality of the OSDS, the condition should not be considered a deficiency or listed as “unacceptable.” The inspector should be aware that while the state regulations do not allow for discharge of backwash to the ground surface, there may be variations in local enforcement. Any concerns regarding discharge of backwash should be referred to the local environmental health or permitting office.

In general, older water treatment systems are less efficient and use more water than newer systems. It is important that all water treatment devices are regularly maintained to optimize their performance and minimize any negative impacts on the onsite sewage disposal system.

In Home Businesses

Depending on the type of in-home business, extra care may be necessary to properly evaluate an onsite system serving this usage. In general, the system design should be reviewed to make sure that the septic tank capacity is large enough to provide at least 1.5 times the daily flow volume, and that the soil treatment system is sized to handle the maximum daily design flow.

Day-care facilities and **bed and breakfasts** are relatively common in home businesses, which due to the nature of their usage can be problematic for an onsite system. A two-compartment septic tank, effluent filter, grease trap and more frequent pumping of the septic tank may be good recommendations for these types of uses.

Home businesses (or hobbies) involving **taxidermy, lawn care, painting and photography** may affect the operation of an onsite system due to the chemicals used onsite. These chemicals can impair the system's biological functions, and proper separation of the wastes, ultimately leading to premature failure of the soil treatment system. It should be noted how these chemicals are stored and disposed and whether the owner has a specific protocol of handling these wastes.

Home beauty shops, **dog kennels, and veterinarians** may cause two different problems for an onsite system. The first is excess hair entering the septic tank. Hair can generally be screened out with an effluent filter, but if one does not exist, the hair can quickly compromise the soil absorptions system. The second concern is chemicals that may be used such as bleach, dye, antibiotics, oils and other chemicals that may cause significant problems in the septic tank and ultimately the soil treatment system. It should also be noted how these chemicals are stored and disposed and whether the owner has a specific protocol of handling these wastes

Commercial Businesses

Onsite sewage disposal systems serving **food service facilities** (i.e., restaurants, bars, convenience stores, banquet halls, etc.) may be the most difficult to design and costly to maintain. This is generally due to the relatively high strength of the waste generated (high BOD, FOG and TSS), and the variability of the flow. If these systems are not designed, installed and maintained properly, the onsite system may fail quickly. Many of these types of businesses now incorporate the use of grease traps and advanced pre-treatment units to lower the strength of the waste (and nitrogen) prior to discharging to the soil treatment system. It is recommended, and in some cases required, that these systems have a current service contract with a qualified service provider.

A **commercial laundry** and/ or **dishwashing operation** also present special concerns for an onsite system, not only due to the volume of waste that might be generated from these activities, but also the temperature. Hot water keeps fats from congealing and rising to the top of a grease trap or septic tank, thereby enabling fats, oils and grease to pass through the septic tank and into soil treatment area. Grease traps must be properly sized and located in order to work effectively.

Medications

In general, unused medications should never be disposed of through a septic system (or municipal system for that matter). However, even when taken as prescribed, certain medications will pass through the patient and can affect the performance of an onsite sewage disposal system. In particular, antibiotics and drugs used in chemo-therapy can virtually sterilize the "good" bacteria in the septic tank and enter into the ground and surface water.

Non-Sewage Water

Certain water generated from a household should not be directed into to the OSDS or onto the soil absorption system. One example is **swimming pool** water which can cause problems due to the volume of water as well as the chlorine content. **Drainage water from roof**s, or other storm water runoff, should not be directed into or onto the OSDS. **Sump pump** discharge should also be directed away from the field system and all interior plumbing should be inspected to make sure sump pump water is not directed into the OSDS. A good home inspection can also identify these issues.

OSDS Repairs /Maintenance

Owners and/or real estate agents should be asked about existing problems and/or OSDS repairs. These conditions include issues such as backups, slow drainage, freeze ups, odors, need for frequent pump outs and surface discharge. In addition, it should be noted if there were any repairs or system additions or modifications that have been done since the original installation. Knowing this information before starting the field inspection can speed up the process particularly, when you find something that was not part of the current system documentation. Every attempt should be made to get information from the owner on system history.

Previous Inspections/Pump Outs

In some instances, an inspector may be asked to give a "second opinion" on the adequacy of an OSDS. Again, the owner and/or real estate agent should be asked if there has been a previous inspection (or recent pump-out) and if the results of that inspection are available. In these cases, it is likely that a problem was noted and the parties involved are looking for confirmation. If a septic tank was recently pumped, it may have an impact on your observations. It is also an appropriate time to ask again if any modifications have been made since that former inspection in an attempt to improve performance. Sometimes people are "shopping" for the answer that they want to hear. The majority, though, are getting a second opinion because they want to be sure of the right answer before they proceed.

Service Contracts

The owner should also be asked if there is a regular service or maintenance contract for the OSDS, and if so, find out who the provider is and what type of services they are providing. Components of an OSDS that need regular service are: septic tanks, pump tanks, alternating (bull run) valves, pressure distribution networks in mounds and LPD systems, media filters, drip systems, holding tanks, advanced treatment units (ATUs, aka BATs) and other devices. Knowing that regular preventive maintenance has been done is an indicator that the system has been taken care of and is more than likely operating the way it should. Certainly, a prospective buyer would like to know this and the seller can use this as a selling point. Of course, sometimes this maintenance will have been done because there have been problems with the system. All of the previous information can be used to help interpret whether the current level of pumping is due to a problem or is preventive in nature. It is important to note that whether the homeowner is aware of it or not, BATs installed as of July 1, 2017 come with a limited 2-year warranty. The warranty includes of annual inspections by a certified service provider. BAT systems installed prior to July 1, 2017 included a 5-year warranty.

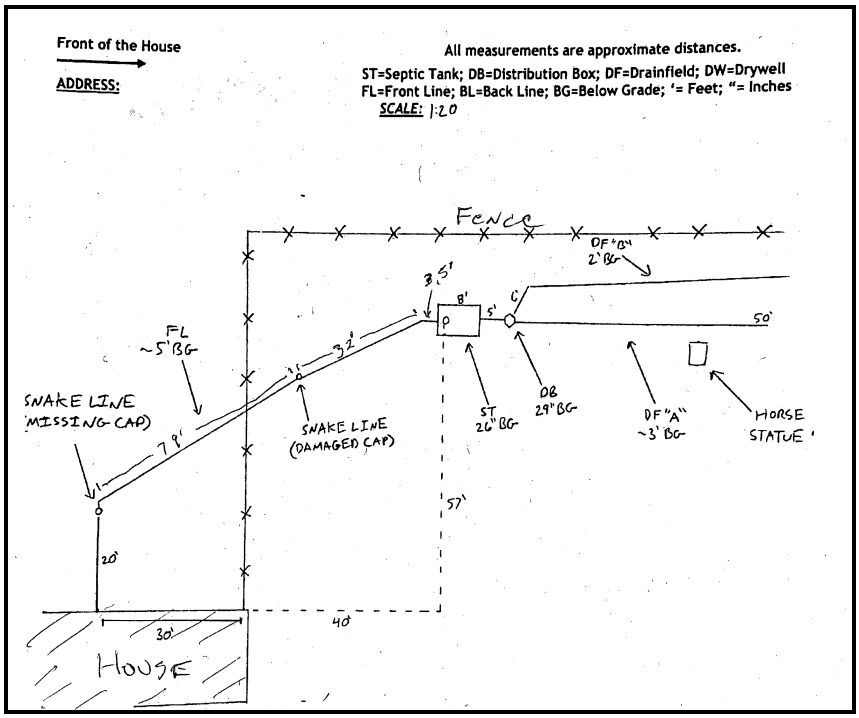
Chapter 4 - Final Report Preparation

A proper OSDS inspection for property transfer must include a final inspection report with the following information:

- Complete location and address of the property.
- Date of Site Inspection.
- Level of occupancy at the time of the inspection.
- Site plan showing the location of septic system components relative to the building(s) that it serves (including approximate distances).
- Summary of information regarding the file search, and homeowner interview and site inspection observations.
- Assessment of each component as to its functionality and conclusions as to whether any maintenance or repair to the OSDS is necessary or recommended.
- Notation to the effect that this inspection does not guarantee or certify the property functioning of the system for any period of time in the future.

The attached form has been created to ensure that these minimum criteria are met. Understanding that some systems may require different levels of inspection, the inspection form was not designed to be an "all inclusive" form but it should cover most types of OSDS.

An often omitted piece of information from older OSDS Inspection Reports is a site plan. Even the most rudimentary of plans can be useful but it is most helpful if approximate distances are shown relative to the house and other system components. Below is an example of a simple site plan that can be created by an inspector in just a few minutes:



The last page of the form includes the Inspection Conclusions and Comments. This part of the inspection report is dedicated to conclusions drawn on the condition of the septic tank, absorption system, and if applicable, the ATU and/or pump tank. As stated in the Introduction, it is recommended that OSDS inspections consist of an "operating" inspection for property transfers. An "operating" inspection results in a determination of each component's current condition and functionality, and leads to one of four possible outcomes:

- **Acceptable -**The existing component is operating properly. This conclusion does not address the life expectancy of the component or its compliance with current state and local codes. Compliance issues should be documented for the benefit of the buyer in the event they plan on any future additions or redevelopment of the site in which case, these issues may need to be addressed.

- **Acceptable With Concerns** – The existing component is operating satisfactorily but shows signs of potential concern. The determination as to when and how to use this rating will vary from site to site and should factor into other aspects of the system, its current and future usage and the site constraints. Examples of acceptable with concern include:

    - The home has more known bedrooms or greater square footage than what is indicated on the OSDS permit provided by the county.

    - A potable well is located less than 50 in confined aquifer (or 100 feet in a confined aquifer) downgradient from the absorption portion of the on-site system. Consider recommending a water test for total coliform, E. Coli, and nitrates.

    - When a separate subsurface gray water system is found. Secondary on-site systems are rarely permitted by the approving authority. Note: gray water discharge to grade should be marked as "unacceptable".

    - Indication that there has been a previous back up in the septic tank (i.e. toilet paper on wall above the outlet), but all other aspects of the inspection are acceptable.

    - Evidence of poor maintenance such as failure to pump the tank for more than five years. Solids greater than 1/3 of the tanks capacity is an indicator of poor maintenance.

    - Any discharge of water conditioning waste directly to an advanced treatment unit. Note that the maintenance provider should be contacted for assistance.

    - Any portion of the on-site system located under a non-enclosed or non-permanent structure such as a deck or a shed.

    - Any system that is identified as an innovative or alternative system. Be sure to refer the client to the I&A agreement on file at the local government or the Maryland Department of the Environment.

    - No observation port or manhole riser to grade over the septic or treatment tank.

- Missing inlet baffle.
- Inlet and outlet baffle are both present but there is no air gap between the top of the baffle and the top of the tank. This may cause accelerated corrosion by accumulating corrosive gases.
- Any pump tank not fitted with an alarm where not be required by the approving authority.
- One or more trench/drywells are saturated or not accepting effluent, but the remaining trench(s)/drywell(s) are functioning and passed the hydraulic load test.
- Roots observed in a trench or drywell but the system is accepting effluent.
- Orangeburg, cast iron, or terracotta pipe are found, but are not defective at the time of the inspection.
- Trenches known to be running downhill.
- Driveway, parking lots or other indication of traffic over any portion of the on-site system.
- Any disturbance of grade over a sand mound or drip irrigation system.

- **Unacceptable** – The existing component is not functioning properly or it presents a threat to human health or the environment. Recommendations for maintenance, repair, or replacement should be made. Examples of an unacceptable condition include:
  - Discharge from a sump pump or any discharge of surface or stormwater such rainspouts or basement stairwell floor drains;
  - Observed topography directing storm water, such as a drainage ditch or swale, into any portion of the on-site system;
  - Observed back-up of sewage into the house or ground surface;
  - Observed flow back of sewage to the septic tank or distribution box from the absorption system after pumping or hydraulic load testing;
  - Electrical components that are not functioning such as a control panel, aerobic blower, etc.
  - System is a cesspool or does not contain primary treatment prior the absorption of the system;
  - Effluent filter is damaged or removed. Check with advanced treatment unit maintenance providers regarding missing filters;
  - Gray water discharging to the surface;

- Continuous flow entering the tank from a broken fixture such leaking toilet or continuously dripping faucet. If the source of the flow cannot be determined the evaluation should be marked “need further evaluation;”
- Any defect in the sewer line such as breaks, separations, bellies, blockage, or negative slope;
- Collapsed or partially collapsed conveyance lines that carry solids;
- Missing or deteriorated outlet baffles;
- Any portion of the tank(s) or absorption area are located under an enclosed structure;
- Liquid level of septic tank above or below normal operating level;
- Damaged or cracked portions of the tank that lead to the instability of the tank or create a safety hazard. Crack on the lid of the of roof of the tank should always be marked as “unacceptable”;
- A treatment tank filled with woody roots;
- Any trees growing directly over the tank(s);
- Alarm for pump tank not functioning when it was required by the approving authority;
- Missing lid on the tank when the manhole riser lid is damaged or easily accessible;
- Manhole access is buried deeper than 36” below grade. Inhibits the ability to properly maintain the tank;
- Sludge level in pump tank is within one inch of pump intake;
- Septic tank is of metal or cinderblock construction
- No manhole access to grade for a pump tank;
- Distribution box is not level;
- Inadequate pump discharge or short cycling;
- All portions of the absorption area are saturated to the top of the aggregate;
- Standing effluent in the aggregate of a sand mound;
- Exposed aggregate or rodent holes that expose aggregate;

- A drinking water well located directly in the absorption area;
- Any pump suspended by a rope or cable in a pump tank (i.e., pump not set on a pedestal);
- Pumps or alarms are not working properly when required;
- A BAT unit that has not been serviced by a certified service provider within the last year.

- **Needs Further Evaluation -** The existing component could not be located or was not adequately assessed. This rating will depend on the authorization permitted by the property owner and/or contract purchaser, or the experience and qualifications of the inspector.

It is important to be knowledgeable of OSDS regulations and plumbing codes and to report if the OSDS does not conform to any state or local requirement.

Company Disclaimer

This portion of the report pertains to system performance at the time of inspection and under current conditions of use. Fill in the blanks provided for company name. This statement should help reduce liability if the inspection has been performed with these procedures and standards.

Identify Inspection Company

Complete the company information and sign as the individual who has taken the MDE approved training and certify that the inspection was conducted according to these standards. Include a copy of your certificate with report.

Deliver Final Report to the Client

Submit the form, together with any written report comments, other inspection materials, photos, and site maps to the client. Make sure you know your state and local requirements and responsibilities. In Maryland it is not required for the inspector to report a failed septic system. Make sure any comments made relate to only what was observed. For instance, if the soil absorption system couldn't be located, then it should be noted as "needs further evaluation."