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INTRODUCTION

How to Use This Manual

The purpose of this manual update is threefold. The first objective of the writing team was to improve the usability of this massive text. To this end, the sections are organized primarily to follow the flow of water, from wastewater source to soil-based treatment, with subheadings providing direction for specific tasks associated with each component (design, installation, care, and inspection). Section 13 - Forms provides some guidance for system designers, installers, maintainers, and service providers. Visit septic.umn.edu/ssts-professionals/forms-worksheets to access the most up-to-date forms for system design, installation, maintenance, and inspection. This manual is completely available in a searchable format online at septic.umn.edu.

The second purpose of this manual revision was to make the manual more specific to the requirements and conditions found in Minnesota. This manual has been updated at the time of rule changes since its original development in 1974. It was originally meant to be an educational manual for extension educators focusing on sewage treatment and had a national research focus. The development of Minnesota Rules Chapter 7080-83 and the manual were directly connected. Earlier versions of the manual did not directly reference MN Rules and correlations were cited in later revisions. This version of the manual directly quotes MN Rules Chapter 7080-83 and offers explanations, discussion points, and other related suggestions. Rule language is highlighted with **bold text** (green online), while related discussion and commentary can be read in the standard black font.

Lastly, the third purpose of this manual revision was to improve the organizational framework and accessibility of this text so desired content could be easily found in different manners. Readers may use the online resource to find specific topics using the search tool available in the latest version of Adobe Reader or Adobe Acrobat, which is available as a free download at the University of Minnesota's Onsite Sewage Treatment Program (U of MN OSTP) web page (septic.umn.edu). Others may find it more convenient to use the table of contents or newly developed detailed directory (Section 14). Information can also be retrieved using the labeled tabs that separate chapters.

Ultimately, this manual is meant to provide guidance for the onsite professional. Whether you are an installer, designer, inspector, maintainer, or service provider, it is important that this manual meets your needs. If you believe that material is missing or incorrect, please contact us so we can fix any errors before the next publication.

Understanding Septic Systems

Why Are Septic Systems Necessary?

Over 25 percent of the nation's and Minnesota's households use subsurface sewage treatment systems (SSTS), commonly referred to as septic systems, to treat their wastewater. Since 1997, the US EPA has considered the use of septic systems to be a permanent part of our nation's wastewater treatment infrastructure. In their 1997 letter to

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Congress, they emphasized, “. . . adequately managed decentralized wastewater systems are a cost-effective and long-term option for meeting public health and water quality goals, particularly in less densely populated areas” (US EPA, 1997). While septic systems in Minnesota are designed and installed by licensed professionals to meet the needs of individual sites, homeowners are usually responsible for their system’s operation and maintenance. Often septic systems fail because owners do not maintain them after installation.

This section provides basic information for septic system professionals and homeowners about:

- What septic systems are, how they work, and where to learn more in this manual
- How septic systems fail and what to do in the event of a problem
- Operation and maintenance tips
- Minnesota’s system of local program administration
- Important information to communicate between SSTS professionals and owners

What Do Septic Systems Do?

Septic systems protect human health and the environment by safely recycling wastewater back into the natural environment. Septic systems treat wastewater as well as, or better than, municipal treatment systems at a reasonable cost when properly designed, installed, operated, and maintained.

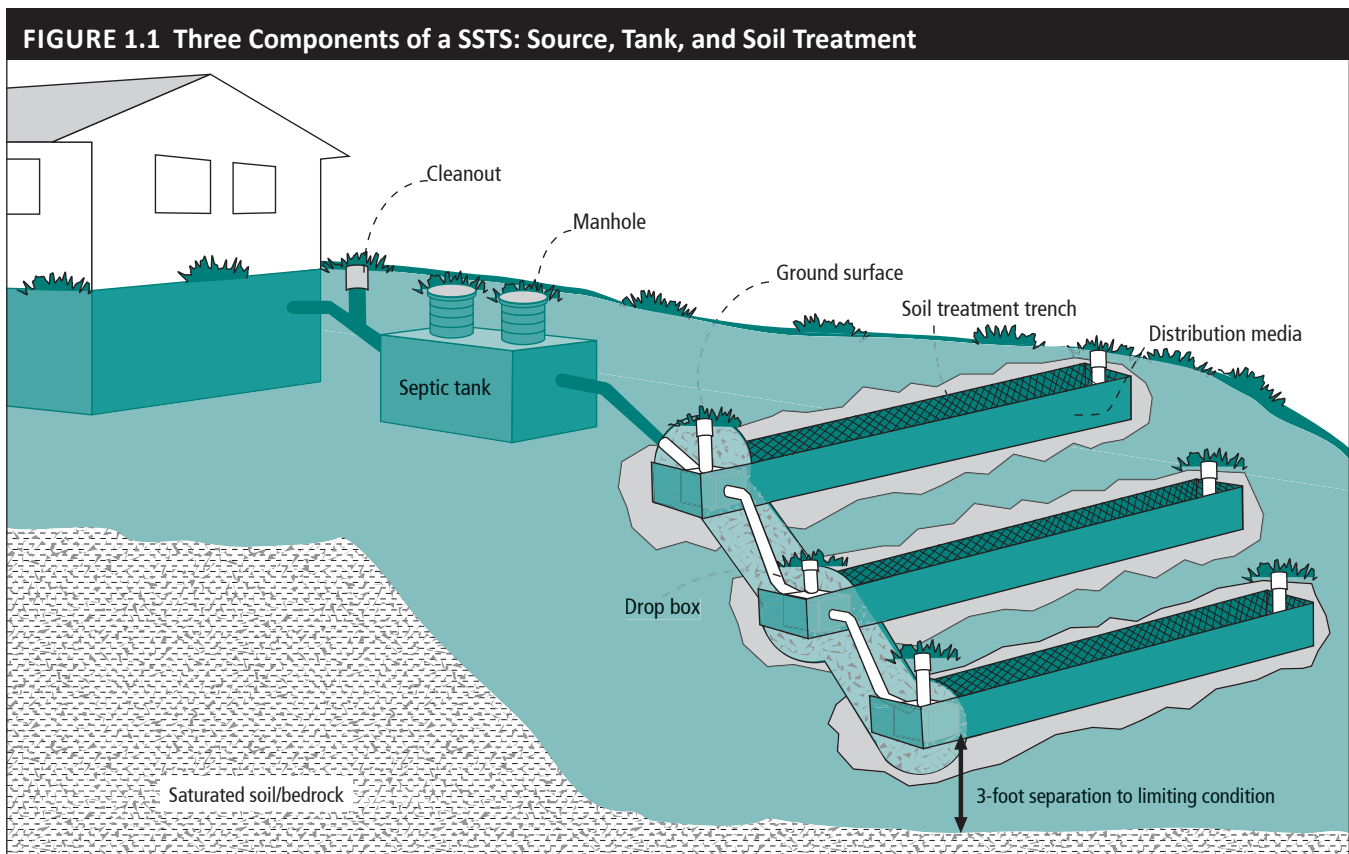
Federal, state, and local regulation of onsite systems focuses on proper treatment of sewage to protect citizens, communities, and the environment.

Many SSTS owners incorrectly assume that as long as their used water “goes away,” their system must be working properly. Septic systems are machines that are designed to utilize physical, chemical, and biological processes to treat sewage and effluent. Disposal systems, though popular in the past, are just that—relics of a time when treatment of sewage was not considered the priority it is today. As the population grows and the demand for natural resources continues to increase, society’s expectations that sewage be responsibly treated and returned to the environment will also increase. This means that many local programs will be focusing on identifying and addressing problematic disposal systems in the years to come. According to 2006 local program reporting to the Minnesota Pollution Control Agency (MPCA), approximately 1/3 of all systems in Minnesota either pose a threat to public health or are failing to protect groundwater resources (MPCA, 2007).

How Does a Septic System Work?

In typical onsite treatment systems, all wastewater is co-mingled, treated, and dispersed by one system. There are a few separation systems in which toilet wastes or grease from restaurants are treated separately from other wastewater.

Common septic systems all have three basic components: plumbing, septic tank, and a soil treatment area (see Figure 1.1). Individual systems may have variations of each of these components.



Plumbing

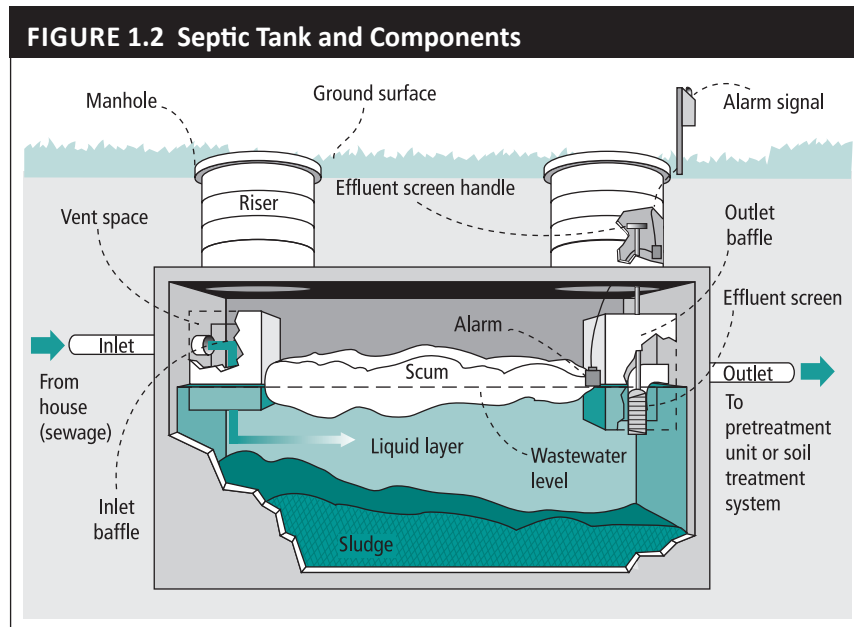
The wastewater side of household plumbing collects used water from fixtures and appliances and delivers it to the treatment system(s). Reducing the waste that enters this plumbing is an easy way to reduce the management necessary to ensure safe wastewater treatment. Determining the quantity and strength of wastewater generated on a site is the topic of Section 5. Wastewater collection specifications are highlighted in Section 6.

Septic tank - Treatment Level C

The septic tank is a solid, watertight tank, or series of tanks, that receives waste water. It separates the solids from the liquids and stores the solids until they are decomposed or removed. The liquid, called effluent, is delivered to the soil treatment system.

Inlet and outlet baffles trap the floating solids (scum) in the tank. Inspection pipes allow monitoring of the tank, and maintenance holes facilitate cleaning. Certain systems are required to add filtration to the outlet end of the tank. Effluent screens are a practical means of reducing the loading of solids to the soil treatment area and are now required in many instances. A septic tank and its components are shown in Figure 1.2. Septic tanks are the focus of Section 7 of this manual. The management of septic tanks and land application of tank septage are discussed in detail in Section 8.

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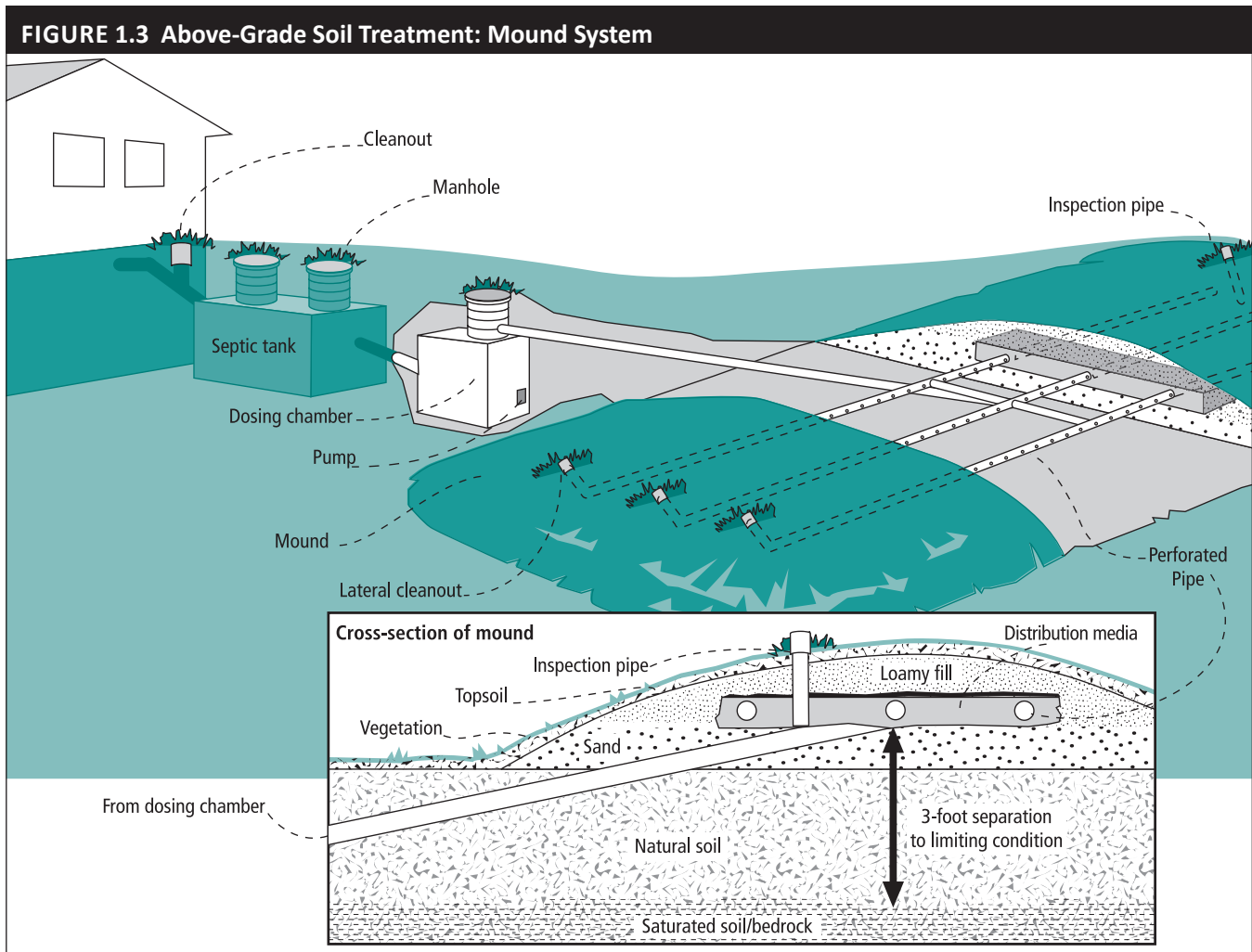
The size of the septic tank is based on the home's potential water use volume and the type of appliances used. In aerobic tank systems, pumps and other mechanisms are necessary to deliver air to the tank.

Soil treatment area

The soil treatment area for the typical septic system is a network of perforated pipes or tubes typically surrounded by small rock and soil. Some designs use large plastic tubes or chambers instead of rock to disperse effluent from the tank into the surrounding soil. Section 11 focuses on the delivery of effluent to the soil treatment area, while Section 12 provides detail about the design, installation and care of various types of soil treatment areas.

The design of the treatment area (trench, mound, etc.) is based on the depth of the limiting condition, such as saturated soil or bedrock. The soil in the treatment area must not be saturated with water for extended periods of time during the year. Three feet of unsaturated soil below the system is necessary to complete the treatment process. This is not possible in many instances in Minnesota, in which case, the system must be built at-grade or above the natural ground surface to artificially create an unsaturated treatment zone. A mound system and its components are illustrated in Figure 1.3 (next page). Details about the connection between soil science and onsite wastewater treatment are provided in Section 3 of this manual.

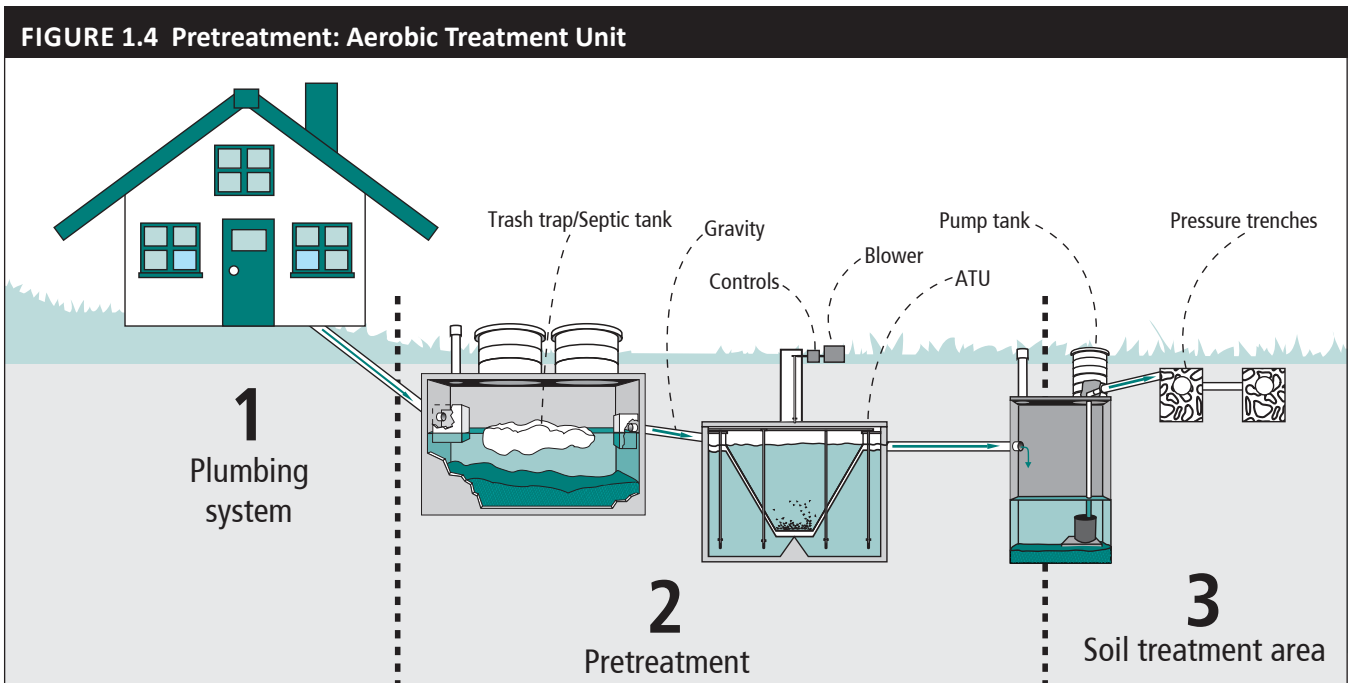
The size of the soil treatment area needed depends on the volume of water to be treated and the infiltration capacity of the soil on the site. For example, a much larger soil area is needed for a large home or a home on clay soil than for a small home or one on sandy soil.



Pumps and a lift station may be components of a system where gravity flow is not possible. For example, in systems above grade and those using advanced technologies, a pump is required to provide pressurized flow for the distribution of effluent. Section 4 provides information about conducting legal and accurate site evaluations to determine the appropriate design for a given site.

Enhancements - Treatment Levels A and B

Sometimes enhancements, known as pretreatment units, are added to septic systems. Some of the options are aerobic tanks, single pass or recirculating media filters, and constructed (lined) wetlands. These are located between the septic tank and the soil treatment area to improve the performance of the system or provide treatment in difficult soil conditions (for example, shallow bedrock or high water tables). These systems typically require additional pumps, control devices and a higher level of management. Section 10 provides information and specifications on many pretreatment devices used in Minnesota. A septic system utilizing an aerobic treatment unit is shown in Figure 1.4 on the next page.



Separation technology systems may require containers in the home that collect and compost solid organic wastes. Other devices may collect and store wastewater for delivery to a soil treatment or dispersal unit.

How Is The Sewage Treated?

In the typical system, raw sewage is collected by the plumbing in the home and delivered to the septic tank. There the light solids float to the top, forming a scum layer, and the heavy solids sink to the bottom, forming sludge.

In the tank, organic solids such as food particles and human waste are decomposed by millions of naturally occurring bacteria. In regular septic tanks, the bacteria are anaerobic, that is, they live without air in the liquid of the septic tank. In aerobic tanks, the bacteria are aerobic and require air to live.

The septic tank delivers the partially treated liquids, or effluent, to the soil treatment area. Effluent contains pathogens (disease-causing organisms), nutrients, chemicals, and some fine solids. In order to both treat the effluent and disperse the water, the soil treatment area must be appropriately sized. The size of the soil treatment area is based on two major variables: the potential size of the home, and thus, potential water use, and the type of soils on the site, which vary significantly in conductivity, or the ability to transmit water. A thin layer of fine solids, dead bacteria, and soil bacteria, called a biomat, forms naturally where the effluent enters the soil. The biomat restricts the flow sufficiently to keep the soil beneath unsaturated. Pressurized systems dose effluent periodically to ensure unsaturated flow.

The unsaturated soil contains oxygen, which allows aerobic bacteria to live and destroy pathogenic organisms. Aerobic bacteria also consume the ever-forming biomat, creating a balance between formation (thickening) and consumption (thinning). These

air spaces also force nutrients such as phosphorus to come in direct contact with soil particles to which they become attached. A portion of the nitrogen contained in the effluent passes through into the groundwater. After passing through the unsaturated soil, the effluent—now treated—returns to the soil and groundwater system. Some treated effluent does evaporate into the atmosphere, the amount of which depends on various factors such as system depth, climate, and weather.

Why Do Septic Systems Fail?

Failure of a septic system means that wastewater may come in contact with people or enter the natural environment without complete treatment of all harmful contents. Indicators of problems or a failing system include the following:

- Sewage backup into the house or surfacing in the yard
- System alarms sounding
- Frozen pipes or frozen soil treatment areas
- Algal blooms and excessive plant growth in nearby ponds or lakes
- High levels of nitrates or coliform bacteria in well water tests

System failure is most commonly the result of lack of proper maintenance, overuse of water in the home, or improper system design or installation.

Improper maintenance

The solids that accumulate in the septic tank must be removed regularly. If excessive scum or sludge builds up, it will begin to enter the soil treatment area and over time will prematurely plug it. It is required that a septic tank be cleaned (pumped) through the manhole, removing all solids, at least every three years. Cleaning frequency depends on several factors, including the number of people in the home, the size of the tank, and the use of a garbage disposal. The preferred method of completely removing solids from the tank requires flushing and back-flushing between the tank and truck several times. Another method is to agitate the contents of the tank to the extent that it becomes a “slurry” that can be completely evacuated by the vacuum truck.

Overuse of water

The typical Minnesota resident (man, woman, or child) uses about 60-70 gallons of water per day (Mayer et al., 1999). Systems are sized for typical water use, but abnormally high usage or accidental overuse (such as from leaky fixtures or tanks) can quickly overload the system. A system partially damaged from improper maintenance may not be able to accept even typical volumes of water. When ownership changes, high water use patterns by the new tenants can result in the flushing of solids to the drainfield, soil plugging, and/or system surfacing. Section 5 discusses Wastewater Sources and Flows.

Improper design or installation

This may be the result of mistakes made by the designer or installer. It is also possible that the wrong system was chosen for the site and soil conditions (for example, high water table, shallow bedrock). It is also possible that the site was compacted by construction equipment or other mistakes were made during the installation. Often times, though, the residence has been modified to house more people or to use fixtures or appliances that the system was not designed for or sized to handle.

Cleaning up a Sewage Back-up

Adapted with permission from KING COUNTY, WA Environmental Health; kingcounty.gov

Thorough cleaning of indoor sewage spills is necessary to protect people -- especially small children -- from harmful bacteria and viruses. Clean-up should begin as soon as possible to reduce the risk of exposure to sewage. The following tips are a guide to proper spill clean up.

Clean up tips:

- Keep children and pets out of the area until clean-up has been completed.
- Wear rubber gloves and boots.
- Wash your hands thoroughly and launder clothes separately after completing the clean-up.
- Remove all furniture, loose rugs, and so on from the area.
- Saturated wall-to-wall carpeting (and the pad) usually cannot be adequately cleaned. They should be removed, wrapped in plastic, and taken to a transfer station or sanitary landfill. If you decide to keep the carpeting, hire a licensed carpet cleaning company to steam clean and disinfect the carpet.
- All hard surfaces, such as linoleum, hardwood floors, concrete, wood moldings, wood, and metal furniture, and so on, should be thoroughly cleaned with hot water and a mild detergent (dish detergent), and then rinsed with a bleach solution by mixing one tablespoon of liquid household bleach to one gallon of water. Let the surface air dry.
- Upholstered furniture, loose rugs, drapery, and so on, should be professionally cleaned or discarded. Notify the cleaner of the problem.
- Remove and replace plaster, drywall, and lath that have been saturated and are soft to the touch. If the surface has been wetted, clean as you would a hard surface, but do not saturate the plaster.
- Clean sinks, dishwashers, and other plumbing fixtures that have had sewage back-up with detergent, and then rinse with bleach solution.
- Disinfect clean-up mops, brooms, and brushes with bleach solution.
- Increase air circulation to reduce odors and mold growth - open all windows and doors. The use of fans and heaters may speed this process.

Compliance Inspections

Septic systems are evaluated during a compliance inspection to assure nothing is causing back-up of sewage into the dwelling or in the yard. Systems are further evaluated to ensure the tank is watertight, and the soil treatment area is properly sited to provide treatment.

Abandonment

Septic systems must be properly abandoned when they are replaced or disconnected. The piping can remain in place or be removed and properly disposed of. Guidelines for proper tank abandonment are found in Section 7.

Operation and maintenance tips

Proper operation and maintenance will prevent costly repairs and replacement in the future.

Control water use

- Repair all leaky faucets, fixtures, and appliances immediately.
- Install low water use fixtures (especially toilets and shower heads) and appliances, such as front-loading washing machines and low-flow dishwashers.
- Do not connect roof drains and sump pump water into the septic system.
- Wash only full loads of clothing and dishes.
- Reduce length of showers and number of toilet flushings.
- Reroute water softener discharge water out of the septic system.
- Spread water use, such as laundry, evenly throughout the day and week.

Eliminate harmful products from the system

- Reduce or eliminate use of harsh cleaners, disinfectants, detergents, and bleach.
- Dispose of solvents, paints, and unwanted medications through other means.
- Keep grease, lint, food particles, cigarette butts, paper towels, disposable diapers, coffee grounds, feminine hygiene products, plastics, and other solid products out of the system.
- Use only necessary amounts of liquid non-phosphorus detergents and cleaners.

Do not use additives

It is not necessary to use additives to enhance the performance of a properly operating system. If the level of bacterial activity is low, it is because disinfectants and other products are killing the bacteria. Reduce or eliminate the use or disposal of these products in the system to allow the bacteria to re-establish. Some additives cause solids to become suspended in the liquids. These solids will move on to the soil treatment area and cause excessive plugging of the soil pores.

Regularly clean/pump and inspect the septic tank

The septic tank must be cleaned or pumped regularly to remove all solids. **Never go into the septic tank. It lacks oxygen and contains dangerous gases, creating a life-threatening environment.**

- Always clean the tank through the maintenance hole (20- to 24-inch opening).
- Always use a licensed and certified professional.
- Be sure all solids are removed (flush and back-flush).
- Inspect the baffles to be sure they are in place and functioning properly.

Maintain pumps and filters properly

- All pumps and motors should be routinely checked for proper operation.
- Replace weak or faulty pumps and motors.
- Install and clean lint filters on laundry equipment.
- Clean or replace effluent filters regularly.
- Attend to alarms on pumps and filters immediately.

Protect the soil treatment area

- Mow but do not fertilize or water turf grasses.
- Keep heavy vehicles (cars, tractors, snowmobiles, etc.) off soil treatment area.
- Do not place gardens, swing sets, or sand boxes over this area.
- Do not plant trees and shrubs on or close to this area.
- Maintain stands of appropriate plants on constructed wetland sites.

Items to Keep Out of a Septic System

It is a best practice to keep solid and liquid wastes separate. Certain materials should never be put into a septic system, and the proper disposal of solids in a garbage can will extend the life of a septic system. Coffee grounds, cat litter, cooking fats, and cigarette butts do not decompose in the septic tank and can cause rapid accumulation of solids. Paints, paint chips, solvents, some drain cleaners, and house and yard chemicals are not digested in the tank. They may actually disrupt bacterial digestion and they may pass from the tank and contaminate groundwater. Items that are non biodegradable may cause rapid accumulation of solids in the tank. Even paper products such as paper towels, facial tissues, sanitary wipes, etc., add to solids build up in the tank. In the absence of an effluent screen, some of these may exit the tank, posing a danger of plugging the outlet pipe, an effluent pump, dispersal system orifices or part of the soil absorption system. Items that should not be put into the tank include:

- Greases/fats/cooking oils
- Coffee grounds
- Cat litter
- Paints and chemicals
- Disinfectants
- Inorganic material (kitty litter, etc.)
- Disposable diapers
- Paper towels
- Female hygiene products
- Condoms
- Toilet wipes and similar materials
- Cigarette butts

There has been some debate about which type of toilet paper works best with septic tanks. Some arguments claim that if the paper doesn't decompose, it causes excessive solids accumulation. Others claim that if paper *does* break down in the tank, non biodegradable cellulose fibers can flow into the soil absorption field or next treatment component and cause clogging; still others argue that colored toilet paper causes more clogging problems than white paper. The subject certainly warrants further research. In any case, it is best to exercise moderation in the use of toilet paper and to avoid disposing of excessive amounts of "non-contaminated" paper and facial tissue (e.g., tissue used in removing makeup, etc.) in the toilet.

Hair (particularly long hair) can cause thickening and matting of the scum in the tank by entangling other solids. It may also contribute to premature clogging of effluent screens. Using drain strainers on sinks, tubs, and showers and cleaning them frequently can minimize hair in the tank.

Laundry wastewater raises another set of concerns, particularly because modern households do much more laundry than households of several decades ago. Laundry lint, which often has a high proportion of non biodegradable fibers, has been suggested to cause problems by matting the scum layer in septic tanks and by exiting the tank and clogging absorption systems. Several screens for intercepting laundry lint in the house plumbing are currently on the market. They are relatively inexpensive and are a simple way of avoiding a costly problem. Powdered laundry and dishwasher detergents may contain fillers and bulking agents that can add solids to the tank and can clog soil absorption fields. Washing numerous consecutive loads of laundry in a short period of time can cause turbulence that may wash solids out of the tank and cause hydraulic overloading of the soil absorption system.

As stated previously, plumbing water softener backwash water into a system is a subject of much discussion. The effects of doing so are not well understood and more study is needed in order to provide accurate guidance to practitioners and homeowners. In the interim, careful monitoring of systems receiving backwash water is warranted.

Odor Issues and Onsite Sewage Treatment Systems

Occasionally homeowners complain about odors from their onsite sewage treatment system. Although most people understand that sewage has a particular odor, steps can be taken to limit these odors in the home and yard. Gases from an onsite system that can be a problem include hydrogen sulfide, carbon dioxide and methane. Within a home these gases can be irritating, toxic and explosive. In a yard they are not typically found in high enough concentrations to be dangerous, but are still a nuisance.

There are several locations within an onsite system where odor can be an issue.

1. In the home
2. Near the septic tank
3. Near a pretreatment unit
4. Near the soil treatment area
5. In the yard

1. Odors in the home

Septic odors inside the house are both annoying and can be a health problem. Odors in a home are typically an indication of a plumbing problem. A very common problem is the drying out of a trap in a basement floor drain allowing gases from the septic tank to vent back into the home. This can be corrected by making sure all floor drain traps are periodically filled with water. Also, the cleanout access plug inside a drain may be loose and could allow for sewer gas to escape. A plumber or ISTS professional that provides line cleaning could check this out.

A second common problem is the plumbing vent located on the roof. The vent is necessary to allow the pressure in the drainpipes to equalize as wastewater flows through them. Without this vent, sinks, tubs, and toilets would gurgle, traps dry out and odors come into the home. These plumbing vents can freeze closed during prolonged cold periods or get clogged with leaves or other debris. A warm day or two will thaw out the frozen pipe but leaves will need to be removed. The pipe can be unfrozen using a jetter or warm water. Always take special precautions when working on a slippery or steep roof.

Plumbing Odors:

1. Dry trap
2. Missing P-trap
3. Damaged toilet wax ring
4. Punctured plumbing (recent picture or trim installation)

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A third common plumbing problem is an improperly sealed cover on an ejector sump pump basket in the basement. The cover should be checked and a new seal applied to prevent leaks.

2. Odors near the septic tank

An occasional weak odor near the septic tank may be quite normal but if there is a particularly strong odor around the septic tank(s) the first step should be to make sure all maintenance holes and inspection pipes are securely covered. Typically a concrete lid covers the maintenance hole, although other materials such as plastic and metal lids are used. The septic tank maintenance hole can be covered with a maximum of 12" of soil for older systems. New designs require the maintenance hole to come to the surface. All tanks with a pump must come to surface to allow for repair or replacement of the pump. The newer plastic lids have a rubber seal which helps keep odors in the tank. They must also be properly secured in place with lag screws or other fasteners. If a concrete lid is leaking odors out of the maintenance hole, weather stripping or other materials can be used to create a temporary seal that will contain odors but still allow for proper maintenance of the tank. This seal will need to be replaced after maintenance.

3. Odors near a pretreatment unit

There is a growing use of pretreatment units in onsite sewage treatment systems. The most common pretreatment devices are aerobic treatment units, constructed wetlands and peat, recirculating, sand and textile filters. If an odor is persistent around one of these pretreatment units a licensed onsite professional trained to maintain the specific type of unit should be called.

4. Odors near the soil treatment area

If there are strong odors in the soil treatment area (around a below grade or above grade system), it can indicate a problem with that part of the system. All inspection pipes should be checked to make sure the pipes are not broken and they are covered. A visual inspection of the entire area should be performed to determine if there are any wet or spongy soil areas indicating that sewage is coming to the surface. If any of these conditions are found, humans and animals can come in contact with sewage. This is considered an "imminent health threat" and must be corrected immediately.

5. Odors in the yard

If the yard in general smells of septic gas, it may be that the plumbing vent pipe (described in # 1 above) on your house or a neighbor's house needs to be extended to diffuse the odors. Homes located in valleys, forested areas or low areas may not have appropriate wind patterns to carry the odors away from the living areas and the yard. As the wind blows over the house, the air currents that are supposed to carry the gases up and away can instead carry the sewer gas down into the yard. Extending the vent pipe can help diffuse the odors carrying them away from the yard. Carbon filters can also be placed on the top of the vent to help control odor. The filters do need to be changed regularly (every 1 to 5 years) to be effective. According to the Minnesota Plumbing Code a device, such as a filter, cannot obstruct the flow of air, therefore the filter must be chosen in accordance with these regulations. Check with the local unit of government if clarification is needed.

Designer Responsibilities: Providing Information to the Homeowner

As the septic designer, it is your responsibility that the homeowner clearly understands their responsibilities in maintaining their new system. This will increase the longevity of the system (and thereby be cost effective), improve customer satisfaction, and protect our water quality. MN Rules Chapter 7083.0740 identifies the system designer as the one responsible for the development of a Management Plan for all new or replacement septic systems. The checklist and information in this section provides designers with a tool to guide discussions with the homeowner about the adherence to the Management Plan. Your task as you complete the design and oversee the installation is to help the customer understand that the long-term success or failure of an onsite sewage treatment system depends on:

1. Proper design of the system
2. Proper installation of the system
3. Proper use of the system by the homeowner and occupants
4. Proper maintenance of the system by maintainer/service provider
5. Proper maintenance of the system by the homeowner

I. Pre-Design Communication

A. Pre-design meeting with system owner

- Before designing the system, complete the homeowner survey available at septic.umn.edu. Assess the property with the property owner to identify possible sites for the system while avoiding sensitive areas such as favorite trees, flower beds, play areas, etc. It is important that the designer helps the homeowner understand that the system should be sited in a manner that meets all setbacks, takes future plans (decks, garages, etc.) into consideration, and allows for access for management activities.
- Discuss the potential for plan changes and the As-Built form that will be filled out by the installer and provided to the homeowner. Discuss the importance of the homeowner reviewing the As-Built form with the installer upon completion of the system. Stress the need for saving a copy of the As-Built form and the System Management Plan in the system owner's files.
- Determine with the homeowner and installer who will complete the landscaping and establishment of vegetative cover on the finished system. Advise the homeowner about landscaping that will not adversely affect the system.
- Discuss with the homeowner and installer how important it is that heavy equipment does not operate over the septic tank and soil absorption area. Little additional soil should be placed over the soil absorption unit other than the slight amounts necessary to fill depressions created by settling over trenches or septic or pump tank. Ensure that the top layer contains soil appropriate for establishing a good ground cover over the tank and drainfield area.

II. Post-Design Communication

A. Final design review

- After completing the system design but before construction begins, conduct a final review and walk through with the property owner to identify where each component of the system will be placed as well as the location of a second site for a replacement system (if required). Provide the system owner with a map showing the location of all of the systems, components.
- Stress the need for avoiding damage to or use of the potential second drainfield site if one is required.

B. Management Plan

- Distribute the Septic System Management Plan (Management Plan) for system based upon design. This plan is required by Minnesota Rules Chapter 7082.0100 subp. 3, J before a permit for the system can be issued. Copies of the plans for below grade and above grade systems are available on the septic web site, septic.umn.edu.
- Discuss the Management Plan with system owner and have the system owner sign the plan after a thorough review before a permit for the system is issued.
- Provide the system owner with a signed and dated copy of the Management Plan. (For new home construction still held by the builder, provide a copy of the Management Plan to the builder and request that the Management Plan be provided to the buyer upon completion of the sale of the home.)
- Stress the need for protecting the system through water and product use. Sources for that information include the Extension Service publication “Septic System Owner’s Guide” and the OSTP website, septic.umn.edu (click on Information for Homeowners).
- For new home construction, discuss the need to remove sources of water that don’t need to be treated (e.g., water softener recharge, high efficiency furnace discharge, water filters) from the septic system.
- Homeowners should refer to the Management Plan at least annually to stay on track for management tasks. It is a resource to help manage the system by tracking and recording tank cleanings and other maintenance steps, changes, and other information. This plan, along with the “**Septic System Owner’s Guide,**” provides the homeowner with tracking tools for the system. When the home is sold, the new homeowner will have a good reference point to pick up the management tasks.
- Refer homeowners to the University of Minnesota Extension Service septic web site, septic.umn.edu, for additional information. You may contact the OSTP team via the web page or call 800-322-8642 to obtain other resources you think homeowners would find valuable. We strongly encourage installers to provide homeowners with a copy of the “**Septic System Owner’s Guide,**” if one was not provided with the permit in your county.

Installer Responsibilities: Providing Information to the Homeowner

As the septic professional, it is your responsibility to ensure that the homeowner clearly understands their responsibilities in maintaining their new system. This will increase the longevity of the system (and thereby be cost effective), improve customer satisfaction, and protect our water quality. The checklist and information in this section provide installers with a tool to guide discussions with the homeowner. Your task as you complete the installation is to help the customer understand that the long-term success or failure of an onsite sewage treatment system depends on:

1. Proper design of the system
2. Proper installation of the system
3. Proper use of the system by the homeowner and occupants
4. Proper maintenance of the system by maintainer/service provider
5. Proper maintenance of the system by the homeowner

I. Pre-Installation Tasks

A. Agree on establishing the vegetative cover and topsoil.

- The installer will do the final grading, add top soil suitable for vegetative cover, and plant the vegetative cover.
- The installer will do the final grading and add top soil suitable for vegetative cover. The homeowner will plant the vegetative cover.
- The homeowner will do the finishing work, adding topsoil and establishing vegetative cover. The installer will provide the final grade.
- Discussion with the homeowner:*** it is important that heavy equipment does not operate over the septic tank and soil absorption area. Little additional soil should be placed over the soil absorption area other than the slight amounts necessary to fill depressions created by the settling over trenches or septic or pump tank. Ensure that the top layer contains soil appropriate for establishing a good ground cover over the tank and drainfield area.

B. Septic System Management Plan (select one box)

- Yes, the homeowner received and discussed the completed Septic System Management Plan (referred to as the Management Plan from here forward) from the designer.
- The installer discussed the Management Plan with the homeowner.
 - If the designer does not have direct contact with the homeowner, the installer should review the plan with the homeowner.
 - A copy of the As-Built form has been added to the management plan.
 - Acquire signatures if still needed. Ensure the form, including all charts, is complete.

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- Be sure all who require copies, including the homeowner and permitting authority have them.

Copies of blank management plans are available on the septic web site, septic.umn.edu/ssts-professionals/forms-worksheets.

II. Post-Installation Tasks

A. Discuss ponding, run-off, and surfacing.

- Discuss what ponding caused by excessive rainfall or rapid snowmelt looks like and what to watch for. If ponding occurs after the job is completed, add adequate fill and landscape to divert runoff away from the system. This may require follow-up visit to the property, especially in spring during snowmelt. Distinguish between ponding and sewage surfacing.
- Offer the homeowner ideas on how to avoid runoff into the system from roofs and other impervious surfaces.

B. Explain and show the system to the homeowner.

(Check the boxes as each topic is discussed.)

- Review the As-Built form and Information on Your System, Management Plan, p. 2, with the homeowner.
 - Walk the system with the homeowner to be sure they understand all parts of the system and know the location of each component. Be sure to address all their questions and concerns. Discuss how their system was designed and built, including the type of soil treatment area installed. Remind them they are treating wastewater to protect our groundwater quality, and provide safe drinking water.
- Discuss the septic tank.
 - Discuss the role of the tank (to hold solid and scum layers).
 - Discuss how the anaerobic bacteria function.
 - Discuss pumping or cleaning the septic tank. Minnesota Chapter 7080 requires that the tank is inspected and cleaned, if needed, a minimum of every three years. Be familiar with local ordinance requirements for inspection and pumping, and share these with the homeowner.
 - Help the homeowner locate a maintainer/service provider.
 - Discuss the effluent screen. Who is responsible for cleaning and inspecting – the homeowner or the service provider? Does it have an alarm? If homeowner cleans, discuss procedure—hose over the manhole, never directly on the ground; wear protective clothing and glasses; wash hands thoroughly; secure lid tightly again.
 - Septic system additives: avoid adding any products to the tank; they can destroy helpful bacteria.
 - Discuss any pumps and their function.
 - Discuss any alarms: what to do when an alarm signals, what it means.
- Discuss the soil treatment area.

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- Discuss how it works. Include the role of the soil bacteria, removing some nutrients, and dispersing clear water back into the groundwater table.
- Vegetative cover: discuss ideas for cover. The Landscaping Septic Systems publication available from the University of Minnesota has advice on what to plant and how to care for the vegetative cover.
- Inspection pipes: explain that they can be cut to grade and re-capped when final grade is established.
- Automatic sprinkler system: if they have a sprinkler system, disconnect over the soil treatment area.
- Maintenance of the soil treatment area. Discuss these topics with the homeowner:
 - Mow grass regularly or care for native plantings to aid in nutrient and water uptake.
 - Prohibit vehicle traffic, including bicycles, four-wheelers, snowmobiles, and cars, across either an in-ground or a mound system at any time.
 - Protect all pipes from compaction.
 - Follow good practices, such as ending mowing early in the season to help prevent freezing.
 - If new construction, discuss the future soil treatment site. Help the homeowner mark it in some fashion so it remains protected. Be sure this is indicated on the design map in the Management Plan.
- Prevention of freezing: discuss vegetative cover, lack of winter protection, compaction, high efficiency furnace drip, and other issues that can cause freezing.
- Homeowner Management Tasks
 - Review p. 3 in the Management Plan with the homeowner.
 - Review the Professional Management Tasks on p. 4 of the Management Plan.
 - Encourage the homeowner to use the Maintenance Log on p. 6 of the Management Plan.
 - Discuss water and product use tips, such as how to prevent system over-loading by excessive water and inappropriate product use and other household topics (see next section for help on what to discuss).
 - Discuss Water-Use Appliances and Equipment in the Home, on p. 5 of the Management Plan, with the homeowner.
 - Discuss the impacts to the system of future changes in the homeowner's home or lifestyle, such as the birth of a child, older teens leaving home, adding water treatment devices or a garbage disposal, starting a day care, and other changes. Remind the homeowner to include these changes in their Management Plan.
 - Discuss how to prevent hydraulic overloading by repairing leaky faucets immediately and routing clear water sources such as water softener

recharge away from the system.

- Refer homeowners to the University of Minnesota septic web site (septic.umn.edu) for additional information. The septic professional or homeowner can contact the OSTP team via the web page or call 800-322-8642 to obtain other resources you think the homeowner would find valuable. We strongly encourage installers to provide homeowners with a copy of the “**Septic System Owner’s Guide**,” if one was not provided with the permit.

C. Discuss household water and product use tips with the homeowner.

Once an onsite sewage treatment system has been properly designed and installed, it becomes the responsibility of the homeowner to use and maintain the system to ensure long-term proper and safe wastewater treatment. The most common causes of system failure are:

1. Overuse of water in the home, including allowing clear water sources into the system (such as water softeners and filters, sump pumps) and leaky fixtures
2. Using products that contain ingredients harmful to septic systems
3. Improper, inadequate, or lack of maintenance

These three factors are controlled by the occupants of the home. The University of Minnesota Extension Service publication, “**Septic System Owner’s Guide**,” provides many “best management practices” for homeowners. Go to the University of Minnesota On-site Sewage Treatment Program web site (septic.umn.edu) for additional information. The Management Plan is the guideline for system care and maintenance. The installer should review the Homeowner Management Tasks in the plan with the homeowner in addition to the following list of household product and water use for homeowners. Direct them to the Homeowner section on maintenance at the OSTP web site (septic.umn.edu). A number of resources are available there, particularly “How Do I Conserve Water and Use Products Wisely to Protect my Septic System?” Installers may wish to provide copies to homeowners of resources available on the web site.

- Water use: Do not use more water than the average daily flow for which the sewage system was designed. A water meter may be used to monitor water use. Event counters can be used to measure how much is passing through the pumps.
- Product use and disposal: A growing concern is the increased use of strong cleansers, including bleaches, shower cleaners, toilet bowl cleaners, disposable toilet brushes, anti-bacterial soaps and cleaners, and other common products. Excessive use of these products can reduce or eliminate beneficial bacterial activity in the septic tank and soil treatment area. Eliminate use of anti-bacterial products and limit use of bleaches and other strong cleaners. Refer the homeowner to the web page, septic.umn.edu, and the “**Septic System Owner’s Guide**.”
- The disposal of old and unwanted medications, solvents, paints, antifreeze, and chemicals can be particularly troublesome for a system. Even the amounts of medications passing through the body of a person on heavy regimens of certain medications can cause problems for a system. UMN OSTP has a fact sheet on the proper handling of medications at: septic.umn.edu. Other hazardous wastes should be managed through local household hazardous waste programs,

usually housed in departments of solid waste.

- Clear water sources, including water softener and iron filter recharge, high efficiency furnace drip, sump pumps, floor drains, and whirlpool and hot tubs should be routed away from the system. Refer to the Management Plan chart on Water-Use Appliances and Equipment in the home. Discuss with the homeowner the differences between the plumbing codes and septic codes. Help them determine where their clear water sources are being discharged.
- Best practices include using liquid laundry detergents without bleach, using gel dishwashing detergents (read the label to determine phosphorus content – aim for 0%), spreading laundry and other water uses out throughout the day and the week, avoiding the use of anti-bacterial products and automatic toilet or shower cleansers, natural-based cleansers with less chemical content when a cleanser is necessary. Do not use the toilet as a trash can – only allow toilet paper and human waste to enter the system. Do not use a garbage disposal, re-route clear water sources, repair leaks immediately.
- Homeowners should refer to the Management Plan at least annually to stay on track for management tasks. It is a resource to help manage the system, by tracking and recording tank cleanings and other maintenance steps, changes, and other information. This plan, along with the “Septic System Owner’s Guide,” provides the homeowner with tracking tools for the system. When the home is sold, the new homeowner will have a good reference point to pick up the management tasks.

Maintainer & Service Provider Responsibilities: Providing Information to the Homeowner

As the septic professional, it is your responsibility to ensure that the homeowner clearly understands their responsibilities of maintaining their new system. This will increase the longevity of the system (and thereby being cost effective), improve customer satisfaction and protect our water quality. The checklist and information in this section provide installers with a tool to guide discussions with the homeowner. Your task as you complete the installation is to help the customer understand that the long-term success or failure of an onsite sewage treatment system depends on:

1. Proper design of the system
2. Proper installation of the system
3. Proper use of the system by the homeowner and occupants
4. Proper maintenance of the system by maintainer/service provider
5. Proper maintenance of the system by the homeowner

A. Septic system Management Plan

- At each service visit, review the Septic System Management Plan (referred to as the Management Plan from here forward) with the homeowner.

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- Review page 3, Homeowner Tasks, with homeowners.
- Use page 4, Professional Management Tasks, as your guideline for the service call.
- If no Management Plan is available, one of the following situations might apply:
 - Has a plan been completed and filed with the permitting authority? If so, ask the homeowner to request a copy. The plan may be lost, or the new homeowner may not have received the plan.
 - Many existing systems do not have Management Plans. To establish one with the homeowner, obtain a blank form at septic.umn.edu. Click on Forms and Worksheets.

B. During service call, accomplish these tasks and discuss these topics with a homeowner.

- The Receipt for System Maintenance (available at septic.umn.edu, click on Forms and Worksheets) provides a comprehensive checklist of all assessments that should be accomplished on a visit. Complete the checklist and leave it with homeowner. Copy the Septic Tank Maintenance fact sheet on the back of your invoice to provide use and care reminders to the homeowner.
 - Check tank level, scum depth, sludge depth, and record these on the invoice if using the UMN invoice template. Pump if needed.
 - Verify baffle integrity, record on the invoice.
 - Verify tank integrity, record on the invoice.
 - Verify manhole/riser integrity, record on the invoice.
 - Verify functioning of any alarms; verify the homeowner understands the alarms.
 - Check inspection pipes – all in place, good covers. Replace, or recommend replacement of any damaged parts.
 - Pumps. Check that all pumps, controls, the pump vault, and any alarms are operating properly. Clean the pump vault if needed. Check the drain-back. Check the event counter if there is one.
 - Walk the soil treatment area, preferably with the homeowner; check for any concerns. Watch for surfacing, odors, ponding, and other issues. If any cleanouts are necessary, flush and clean as needed.
 - Provide a system overview to the customer. If you notice any problems, discuss possible causes, and solutions. Discuss how the system works, how pathogens are destroyed, how clean water re-enters the groundwater. Check if the homeowner has any problems or concerns.
- If the home is in a county with a pumping requirement ordinance, determine with the homeowner who is responsible for filing the certificate.
- Maintenance Holes
 - If no risers—encourage homeowner to add them; be sure they are insulated, sealed, and tightly secured.
 - If no maintenance hole can be located—be sure to have homeowner sign

the waiver found at septic.umn.edu. Click on Forms and Worksheets.

- If maintenance is not on risers and below grade—discuss with homeowner the need to expose the maintenance hole to ensure proper cleaning of the tank. Determine who will expose the maintenance hole and what, if any, additional excavating fees may apply if this is to be done by the professional.
- Effluent screen
 - If there is none, encourage the homeowner to consult a professional about adding a screen.
 - If it is pumper-maintained: clean, be sure it is functioning correctly. Check the alarm if there is one.
 - If it is homeowner-maintained: verify proper cleaning is occurring. If not, help homeowner with technique.
 - Discuss with the homeowner any product and water use issues evident from cleaning the screen.
- Discuss when the next visit should be and record on invoice.

C. Communication with the homeowner.

(Check the boxes as each topic is discussed)

- If not completed yet, licensed service providers should complete forms 1-1: System Description, and 1-2: System Evaluation. From the CIDWT O&M materials, available on the University of Minnesota web site: septic.umn.edu
- At each visit – discuss these forms with the homeowner. Communicate the difference between these forms and a full compliance inspection. Update as needed.
- Determine any questions the homeowner has and provide information as appropriate. Review any concerns that surfaced while pumping or inspecting; do any necessary trouble-shooting.
- Septic system additives: remind homeowner to avoid adding any products to the tank; they can destroy helpful bacteria.
- Freezing prevention tips: discuss vegetative cover, winter protection, compaction, high efficiency furnace drip, and other issues that can cause freezing.
- Water and product use tips: discuss how to prevent system over-loading by excessive water and inappropriate product use and other household topics (see next section for help on what to discuss).
- Discuss Water-Use Appliances and Equipment in the Home, on page 5 of the Management Plan, with the homeowner.
- Prevent hydraulic overloading: talk about preventing damage to the drainfield by repairing leaky faucets immediately and routing clear water sources, such as water softener recharge, away from the system.
- Refer homeowners to the University of Minnesota Extension Service septic web site for additional information: septic.umn.edu. You can contact the OSTP team via the web page or call 800-322-8642 to obtain other resources you think the

homeowner would find valuable. The “Septic System Owner’s Guide” is a good resource for homeowners. Help them obtain a copy if they don’t currently have one.

D. Discuss household water and product use tips with the homeowner.

Once an onsite sewage treatment system has been properly designed and installed, it becomes the responsibility of the homeowner to use and maintain the system to ensure long-term proper and safe wastewater treatment. The most common causes of system failure are:

1. Over-use of water in the home, including allowing clear water sources into the system (water softeners and filters, sump pumps) and leaky fixtures
2. Using products that contain ingredients harmful to septic systems
3. Improper, inadequate, or lack of maintenance

These three factors are controlled by the occupants of the home. The University of Minnesota Extension Service publication, “**Septic System Owner’s Guide,**” provides many “best management practices” for homeowners. Go to the University of Minnesota OSTP web site (septic.umn.edu) for additional information. The Management Plan is the guideline for system care and maintenance. Review the Homeowner Management Tasks in the plan with the homeowner in addition to the following household product and water use guidelines for homeowners. Direct homeowners to the Homeowner section on maintenance (on the OSTP web site, septic.umn.edu). A number of resources are available there, particularly “Septic Tank Maintenance,” a fact sheet for service providers to provide customers, and “How Do I Conserve Water and Use Products Wisely to Protect my Septic System?” Service providers may wish to provide copies of resources available on the web site.

Household Product and Water Use Guidelines for Homeowners

- Water use: Do not use more water than the average daily flow for which the sewage system was designed. A water meter may be used to monitor water use.
- Product use and disposal: A growing concern is the increased use of strong cleansers, including bleaches, shower cleaners, toilet bowl cleaners, disposable toilet brushes, anti-bacterial soaps and cleaners, and other common products. Excessive use of these products can reduce or eliminate beneficial bacterial activity in the septic tank and soil treatment area. Eliminate use of anti-bacterial products and limit use of bleaches and other strong cleaners. Refer the homeowner to the web page (septic.umn.edu) and the “**Septic System Owner’s Guide.**”
- The disposal of old and unwanted medications, solvents, paints, antifreeze, and chemicals can be particularly troublesome for a system. Even the amounts of medications passing through the body of a person on heavy regimens of certain medications can cause problems for a system.
- Clear water sources, including water softener and iron filter recharge, high efficiency furnace drip, sump pumps, floor drains, and whirlpool and hot tubs should be routed away from the system. Refer to the Management Plan chart on Water-Use Appliances and Equipment in the home. Discuss with the homeowner the differences between the plumbing codes and septic codes. Help them determine where their clear water sources are being discharged.

- Basic best practices include using liquid laundry detergents without bleach, using gel dishwashing detergents, spreading laundry and other water uses out throughout the day and the week, avoiding the use of anti-bacterial products, and automatic toilet or shower cleansers, and using natural cleansers when a cleanser is necessary. Do not use the toilet as a trash can – only allow toilet paper and human waste to enter the system. Do not use a garbage disposal, re-route clear water sources, and repair leaks immediately.
- Homeowners should refer to the Management Plan at least annually to stay on track for management tasks. It is a resource to help manage the system by recording tank cleanings and other maintenance steps, changes in the system and other information. This plan, along with the **“Septic System Owner’s Guide,”** provides the homeowner with tracking tools for the system. When the home is sold, the new homeowner will have a good reference point at which to pick up the management tasks.

More Information About Septic Systems

Local and Regional

City, Township, or County Offices of:

- Planning and Zoning
- Land Use Management
- Environmental Services
- Public Health
- Building Official
- Water Plan Coordinator
- Soil and Water Conservation District

State and National

University of Minnesota Onsite Sewage Treatment Program (OSTP)

septic.umn.edu

(800) 322-8642 - septic@umn.edu

Minnesota Pollution Control Agency (MPCA)

Search for “Subsurface Sewage Treatment” at: www.pca.state.mn.us

(651) 757-2201 or (800) 657-3659

Minnesota Department of Health (MDH)

health.state.mn.us/divs/eh/wells

(651) 201-4600 or (800) 383-9808 - health.wells@state.mn.us

National Small Flow Clearinghouse (NESC)

nesc.wvu.edu/wastewater.cfm

(304) 293-4191, ext. 3 - info@mail.nesc.wvu.edu

US Environmental Protection Agency (EPA)

<https://www.epa.gov>

Minnesota Onsite Wastewater Association (MOWA)

www.mowa-mn.com

Publications and DVDs

University of Minnesota Bookstore

bookstores.umn.edu

Find detailed descriptions at the University of Minnesota Bookstores. Search 'Septic' to find all of our publications and pay online by credit card. Bulk order pricing is available.

\$5.00 Septic System Owner's Guide

ISBN: 281000008407B, 33-page book

\$15.00 Septic Systems Revealed: Guide to Operation, Care, and Maintenance

ISBN: 281000008408B, DVD

ISBN: 281000008409B, DVD & Owner's Guide Set (\$19)

\$50.00 Manual for Septic System Professionals in Minnesota

ISBN: 281000008426B

For More Information

Please see our website at septic.umn.edu for more information about septic systems. You can also contact our staff by calling (800) 322-8642.

References

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MPCA. 2006 Annual LGU ISTS Program Questionnaire. Available by reaching MPCA SSTS Program at 1-800-657-3864

U.S. Environmental Protection Agency, 1997. Response to Congress on Use of Decentralized Wastewater Treatment Systems. EPA-832-R-97-001b. Washington, D.C.