APPENDIX O - V

SEPTIC TANK SYSTEM FAILURE

APRIL 1997

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Synopsis

It is well known fact that wastewater disposal, when done improperly, can pose a threat to the environment and public health. In order to protect people and environment, wastewater must be well disposed of in a manner that controls waterborne diseases and prevents contamination of surface water and underground water. It is the aim of this document to:

- Enhance public health protection, and
- Provide public health professionals, engineers, scientists, environmentalists, septic tank installers and pumpers, and others with first hand knowledge to make competent decisions whenever a septic tank system fails.

It must be noted that this document is not a panacea for all septic tank system problems. It is only an aid to solving some of the problems.

Acknowledgements

I would like to express my appreciation to LaTonya-Blount for her help in making this document possible. All county environmental health specialists in the State of Georgia are gratefully acknowledged for all their efforts, energy and self-motivation.

Disclaimer!!

Mention of trade names or commercial products do not constitute endorsement by the author. Moreover, the views expressed herein are entirely the author's and do not represent the official policy of the Georgia Department of Human Resources.

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PART I

INTRODUCTION

In the State of Georgia, over 30,000 new septic tank systems are installed each year for new housing, commercial and industrial development adding to over 600,000 systems that are already in use. These systems contribute over 75 million gallons of wastewater into the environment every day.

Most of these systems function satisfactorily, but approximately 10,000 systems are repaired each year because of failure. Accordingly, the system failures and installation of septic tank systems on unsuitable sites can create serious threats to public health and significant economic impact. Properly designed and located septic tank systems are now a permanent means of wastewater disposal that can function reliably with minimum maintenance and cost.

Why Use a Septic Tank System?

The septic tank system is an effective method for collecting, treating and disposing of sewage mostly from rural and suburban homes. In other words, whenever the municipal or community sewage treatment plants are inaccessible, the septic tank system is used. It is an on-site sewage management system designed to safely treat and dispose of wastewater from toilet, shower, bathtub, handwash sink, kitchen, and laundry. This wastewater usually contains disease-causing germs and pollutants that must be treated to protect human health and the environment.

How Does a Septic Tank System Work?

Wastewater from the home is collected in a water-tight tank called a septic tank. Bacterial action takes place in the septic tank where the end products are mainly water (mixed with some other components that are not readily consumed by bacterial action).
Gases and undigested material called sludge that sinks to the bottom of the tank and scum that floats to the top of the tank.

The septic tank contains a baffle that prevents any scum that floats to the surface and sludge that settles to the bottom from passing out of the tank. The gases that are generated vent to the atmosphere via the plumbing vent.

The segregated and relatively clear liquid in the tank will fill the outlet level, which is located on the opposite side of the tank from the inlet. As wastewater enters the tank, an equal volume of the liquid flows from the septic tank through the outlet into a small distribution box where it is then metered out to several perforated pipes or some other disposal system. These perforated pipes then deliver the liquid to a large subsurface area called the drainfield, nitrification field or soil absorption field.

The major function of the drainfield is to deliver the effluent to the soil. The soil purifies the effluent by removing the germs, solids and chemicals that may be carried along with the effluent before they reach the groundwater.

What Septic Tank System Design Practices Are Improper?

Many of the problems of septic tank system result from Improper design procedures which can be avoided. Some of these procedures include:

- relying solely on published soils information from the local county soil survey rather than performing actual field tests at the site.
- poor site evaluations, including failure to-assess impacts of surface runoff and internal groundwater movement,
- poor soil profile description made by nonqualified personnel who fail to detect seasonal high water tables and who fail to locate and properly describe restrictive features, e.g., slowly permeable layers and fractured rock,
- failure to design treatment units and absorption system for long-term performance. Systems are designed typically by using State Regulations and Codes as the sole basis of design; these guidelines are often only meant to serve as guidelines for establishing minimum requirements,
- failure to correlate soil characteristics with permeability test results,
- failure of designers to fully adapt a wastewater system to the site. Errors are made with mismatching absorption system geometry with site conditions which often result in localized overloading of the soil and possible groundwater mounding and flooding.
- improper installation of the system in an area not previously tested or with insufficient separation from water supplies such as wells, springs or other water ways,
- designers sometimes fail to understand the impact of soil characteristics relating to installation. Such potential problems during installation include:
    - installation at a less-preferred location than designed (e.g., a location with concave slopes).
    - excessive deep installation of any soil absorption system,
    - high soil moisture during installation,
    - backfilling causing damage to pipes, tanks, or other buried structure,
    - compaction of soil in and around the down slope area, once the pipes or tanks are in place,
    - not adhering to specifications such as placement of coarse material beneath pipes or tanks, or leveling of in-ground facilities,
    - site damage following preliminary evaluation and design (e.g., soil removal, compaction),
    - inadequate depths or protection to avoid freezing in-ground facilities,

    - lack of field testing following installation but prior to the contractor leaving the site (e.g., pressure testing pumps and siphons or water testing a level distribution box), or
    - insufficient diversion of runoff to avoid infiltration and possible hydraulic overloading.
- failure of designers to consider techniques which can be implemented in the field to make gravity-feed systems perform better (e.g., specifying discharge hole diameters and spacing for wastewater distribution network),
- improper siting (e.g., up slope of a water supply well or within poorly drained soil), or
- failure to project flow inputs for the life of the proposed facility.

What are the Signs of a Failing Septic Tank System?

Unfortunately, it is not uncommon to find a septic tank system that is failing. In most cases, the failure starts as a small problem and continues growing until the problem is too large to ignore. The signs of a failing system include:

- Surfacing or ponding of the septic tank effluent on the ground surface. This effluent may contain many disease-causing bacteria, viruses, and dysentery, hepatitis, giardiasis, cryptosporidosis, hookworm, tapeworm and other diseases that have plagued mankind for years. Children are most likely to play in the pools or wet soil, but adults may have to walk through or work in the area, and once the effluent gets on a person, the germs can spread to the mouth or nose where they are swallowed or inhaled.

- Slow drains or sewage backing up into the house. The cause could be from failure or any part of the system.

- Smell of sewage odor outside the house where drainfield is not saturated and there is no back-up. This may cause fly infestations and isolated outbreaks of water-borne diseases.

PART II

Rehabilitating a Failing Septic Tank System

Source: State of North Carolina On-Site Wastewater Management Guidance Manual

A. Problem Identification

Whenever a septic tank system fails, the key to rehabilitation of the system is to use a systematic approach to identify the problem. The basic idea is to check the easy things first and then go to the more difficult items. The following steps are used to determine why a septic system is failing.

1. Determine the type of failure

The type of failure can indicate, to a large extent, what is causing the problem. To properly determine they type of failure, a field inspection must be done.

- ❑ Surface discharges can indicate which part of the system is failing. Note where the discharge is and appears to be coming from. Is the discharge:
    - over the septic tank?
    - over the pump tank?
    - over the distribution box?
    - over the treatment of disposal field? What part of the field?
- ❑ Are drains backing up into the house?
- ❑ Do fixtures in the house drain slowly?
- ❑ Is the problem occurring only in the wet season, after heavy rains, or throughout the year?
- ❑ Does the problem occur only on weekends, or every day?
- ❑ Is the effluent flowing at the failure site or is it a small wet spot that soaks back into the ground?

- Has the system operated well for a number of years and failed just recently, or his it been failing for a long time?

2. Check the easy things first

   The cause of the septic tank system failure often can be determined easily without complicated tests. Some failures may mean that complicated tests must be done, but many problems can be solved by checking the easy things.

   - If the water is backing up into the house or the toilets are flushing slowly, check for clogged plumbing first. A clog in the drain or house sewer going to the septic tank may be the problem.

   - Plugged plumbing vents, located on the roof of the house, also cause slow drains. Once the vent pipes are cleared, it may be helpful to put a screen over the vent pipe to keep out insects, rodents and birds.

   - If the house drains and roof vents are not plugged, check the septic tank. Uncover the access hatches and check for a clogged inlet or outlet.

   - If the inlet is clogged with solids, the house sewer coming into the tank may need a larger pipe, or may have collapsed and need replacing.

   - A clogged outlet may mean that the outlet has broken or that the solids need to be pumped out.

   - If the tank is completely full of solids and scum, it must be pumped. The residents must be informed that septic tanks should be pumped on a regular schedule. Pumping the tank keeps it from plugging and protects the treatment and disposal field from clogging with solids.

   - Distribution boxes can also be easily checked. Uncover the distribution box and check for clogs and excessive solids in the box and for unequal distribution of flow to the outlets.

   - Check to see if the distribution box is out of level. Re-level as needed.

   - Distribution boxes can help determine which part of the system is having the problem.

- Clear water flowing through the distribution box may indicate leaking fixtures and excessive water use.
- Solids in the distribution box mean that the septic tank outlet is not keeping the solids in the tank or that the tank is too full of solids and needs to be pumped.
- If no effluent is flowing to the distribution box, then there is a clog in the conveyance pipe to the distribution box, in the septic tank, or in the house plumbing.
- If the box is flooded, the effluent is not flowing out of the box to the drainfield, indicating the problem is either in the conveyance pipes going to the drainfield or in the drainfield.

❑ In systems that pump to drainfield, check to see if the pump is working.

If these quick checks do not indicate what the problem is, then the following may help determine why the septic tank system is failing.

3. Determine the sewage volume

The volume or total daily flow of sewage going to a system can cause it to fail if the system was designed for a smaller flow.

❑ Find the original design flow or expected daily flow of sewage. This information should be on the permit or other approval forms.

❑ There are several ways to find the actual flow into the septic tank system. An easy way is to check the water bills for records of water used. This is a good indication of how much water is going into the septic tank system unless there is a leak that drains somewhere else, such as under the house.

❑ If the water bills do not help, keep a record of the water meter reading over a period of time, say a month or two. If you are keeping records of the water meter reading, be sure that the plumbing is not leaking into the ground outside the house. Water from a leak outside the house will not go into the septic tank system.

❑ The water meter should be checked as frequently as possible; once each day may be necessary. If the water meter is a dial or pointer that indicates small volumes, see if it turns when no water is being used. This is a sure sign of a leak.

- ❑ Study the records of water use to find if there has been an increase in flow to the system. Leaking faucets and toilets can add large amounts of water to the daily flow of sewage, causing the septic system to fail.

- ❑ Has a water-using appliance be installed or added to the household recently? A system that was not designed for high flows may fail when a washing machine or dishwater is added.

- ❑ Has the water use habits in the home changed? A new baby can greatly increase the amount of water used in washing clothes, or teenagers can spend long amounts of time in-showers, which increases the total sewage flow.

- ❑ Have the residents changed the use of the washing machine? Are they washing clothes once per day when they used to wash once per week? Sometimes a septic system fails if the residents take in additional washing or if they wash all of their laundry on one day of the week. The residents can try washing one load each day, as opposed to all loads in one day.

- ❑ Has the use of the home changed? For instance, has a business that uses large quantities of water been started? Businesses such as day care centers, beauty shops and hobbies such as photography processing can cause problems.

- ❑ Has water been added to the daily sewage flow in other ways? Examples are:

  - Sump pump installation which discharges into sanitary drain,
  - Roof runoff from downspouts connected to sanitary drains,
  - Foundation drainage flowing into sanitary drain,
  - Heat pump discharging ground water into sanitary drain,
  - Water softener recharge brine flows into septic tank,
  - Swimming pool filter backwash water discharged into septic tank,
  - Ice machine adds to daily sewage flow,
  - Industrial wastewater added to domestic wastewater flow, and
  - Floor drains adding water to daily sewage flow.

4. Check topographic and landscape factors

A number of features of the land can cause a septic tank system to fail.

- ❑ Study the topographic position of the failing system. Is it at the base of a hill where surface drainage from the hill could flow onto the drainfield area? On long slopes, water can flow several hundred feet through the soil and flood the drainfield area.

- ❑ Is the drainfield downstream from a large drainage area where water drains onto it?
- ❑ Do roadside ditches, swales, or other channels drain water onto the drainfield?
- ❑ Does ground water flow into the drainfield or does the water table rise in wet weather, causing a failure?

5. Investigate the septic tank

   Determine if the septic tank is causing the problem.

   - ❑ Inspect the septic tank inlet. Check the inlet to see if it is clogged and make sure sewage is flowing to the septic tank. A clogged inlet or crushed inlet pipe will cause sewage to back up into the house.
   - ❑ Inspect the septic tank outlet. Is the outlet broken or clogged?
   - ❑ Is the outlet working properly, holding back the solids, grease, and scum? Measure the depth of the scum layer and the solids to see if either is flowing into the outlet.
   - ❑ If the outlet is full of solids and grease because too many solids and too much grease have accumulated in the tank, then the tank must be pumped out.
   - ❑ Check the depth to the top of the tank. If the tank is too deep, the effluent may have to flow uphill to reach the drainfield, causing the sewage to back up in the septic tank. This problem occurs only in new systems; if the system has worked for a number of years, this condition should not be present.

6. Find the drainfield trenches and determine the amount of ponding.

   Many septic tank systems failures occur because the drainfield is not handling the effluent properly.

   - ❑ Do not dig an open hole in a trench and leave it open. Open holes can spread bacteria and disease.

- ❑ Observation tubes can be installed to check the water level in the trenches. These tubes are vertical, open-ended pipes with one end in the trench and the other end sticking above the ground and covered by a removable cap. By removing the cap and looking or measuring down the observation tube, the water level in the trench can be easily observed and measured. By measuring the depth of water and how long the water stays in the trench, you can get and idea of whether the trenches are clogged.

- ❑ If the water level in the trench rises quickly and drops rapidly, the trenches are not clogged. The drainfield is being overdosed with effluent and some of the effluent is ponding.

- ❑ If the water level rises quickly and drops very slowly or continues to rise, then the trenches are clogged and will need to be repaired or replaced.

- ❑ Use the observation tubes to determine if the trenches are flooded permanently or only temporarily.

- ❑ If effluent is ponding on the ground surface, find out if the ponding is permanent or if it only happens during wet periods, after heavy use, during certain days of the week, etc.

- ❑ Is one part of the drainfield being overloaded? A distribution box that has shifted may direct all the effluent to one trench.

- ❑ Look for changes in the soil across the drainfield especially for soil types that cannot absorb much effluent.

- ❑ Are the trenches too deep? Have the trenches been installed below the seasonal high water table? Is there a perched water table under the drainfield that may restrict the flow of effluent away from the trenches?

- ❑ Have the trenches been installed so that they run up a hill or are not on the contour? Is there too much fall on the trenches so that the effluent runs to the end of the trenches?

- ❑ In areas with very uneven ground, be sure that the trenches have been placed deep enough so that the trench is not too shallow in low spots.

- ❑ If effluent is surfacing somewhere other than over the drainfield, it may mean that an utility trench has been cut across the drainfield.

Effluent flows through the loose backfill in underground electrical, cable TV, telephone or water lines, and surfaces in a low spot along utility trenches. The utility trench should be moved so that it does not cross the drainfield.

7. Determine the rate of absorption of wastewater by the soil.

   A method to determine the absorption rate of the soil in the trenches is presented below. This technique is useful because it fives a value of the treatment and disposal rate for the trenches as they really are. Once the treatment and disposal rate has been found, you can better understand why the system is failing.

   A. Determine the daily usage of water by reading the water meter. Take readings for at least a week or longer to be sure that you have a good idea of the amount of water being used.

   B. Install observation tubes in the trenches.

   C. To begin the test, mark the level of water in the trenches as seen through the observation tubes.

   D. Use no water in the house for at least eight hours. The water at the meter should be turned off so that the residents will not use the water.

   E. Read the water meter after it has been turned off. This reading will be used to find how much water can be absorbed by the system over the eight hour period.

   F. Watch the water level in the trenches drop over the eight hour period. At the end of the eight hour period, measure the level of water in the trenches.

   G. Turn the water on and let the water flow so that the trenches fill to the same level as at the beginning of the eight-hour period. When the trenches have filled to the level at the beginning of the test, turn off the water at the faucet and read the water meter.

   H. Subtract the water meter reading at the beginning of the eight hour test from the meter reading at the end of the test to find the total volume of water used to fill the trench back to the water level at the beginning of the test. This volume of water is also the volume of water absorbed in eight hours.

I. Take the volume of water absorbed in eight hours and multiply it by three to get the volume of wastewater absorbed in one day.

J. If the rate of wastewater treatment and disposal per day, through the soil, is less than the amount of water used per day, then the system is being overloaded. Determine the percentage that the system is overloaded using the following equation:

$$\textbf{Percent overloaded} = \frac{\textbf{GPD use} - \textbf{GPD Wastewater absorbed} \times 100}{\textbf{GPD Wastewater absorbed}}$$

- ❑ If the system is less than 35% overloaded, then the residents may be able to correct the system failure by water conservation. Water conservation includes using low-flow showerheads, low-flush toilets, flow restrictors on all faucets, and other methods to reduce the volume of water flowing to the septic tank system. Installation of these devices is much cheaper than rebuilding a septic tank system.

- ❑ If the plumbing system has a pressure-regulating valve, the pressure in the house can be reduced somewhat, which will help lower water usage. On drinking water well systems, the pressure switch for the well pump can be set to operate over a cycle of 30 to 50 psi rather than the usual 40 to 60 psi setting.

- ❑ The residents can lower their water use by a number of simple actions. Shutting off the water while shaving or brushing teeth, taking short showers, and taking laundry to a Laundromat are all ways to decrease water use.

- ❑ For large overloads, the system may have to be expanded or a replacement system installed.

8. Evaluate site and soil properties.

Information from a proper soil evaluation can determine if the site can be used to repair a drainfield that has failed.

- ❑ Determine the types of soil present. Use soil borings, textural determination, and other techniques to determine the type of soil. Complete a soil evaluation and fill out an evaluation sheet.

- ❑ Determine the appropriate loading rate, or acceptance rate, for the soil. This is the volume of effluent the soil can absorb in a day. Check the following items:

- Soil depth,
- Soil wetness,
- Soil characteristics or morphology, restrictive horizons, changes in soil characteristics either with depth or over the drainfield area,
- Loading rate for the trench bottoms, loading rate for the entire area of the drainfield, which is the volume of effluent per square foot of the field, and
- Loading rate along trench length, volume of effluent per foot of trench.

❑ Determine which type of on-site system will fit the site and soil conditions and the available area.

9. Note cut or excavated areas.

If topsoil has been removed in an area, the septic tank system will not operate properly. Usually, these areas have much less capacity to absorb and treat the effluent once the topsoil is gone.

❑ Try to find out is the system was placed in an area that had been excavated and the soil removed. Subsoils and saprolite are not the best soils for septic tank systems.

❑ Check for cut or excavated areas downslope from the system. Effluent may be coming to the surface in the cut area after it flows downhill from the drainfield.

❑ Old farming terraces upslope can trap rainwater causing the soil downslope to become saturated.

10. Interpret information gathered.

At this stage, you should have most of the information that can be obtained. The information must be interpreted to determine the cause of the problem and whether the problem can be corrected. Some failing systems cannot be corrected.

❑ See if the information points to the cause of the problem. Keep well organized files of the information you have gathered. This information may help decide what is causing the problem.

❑ Discuss the situation and the information you have with your county environmentalists. Environmental health professionals have experience with septic tank systems.

B. Taking Corrective Action

If the problem has been identified, then it is time for corrective action. The following list contains actions that will correct many problems.

- The best thing to do in any system failure is to start a schedule of regular maintenance and operation checks. Homeowners rarely maintain their septic tank systems properly and maintenance can easily make the difference between a system with problems and one that functions well.

- If the plumbing or conveyance pipes are clogged, clean them out.

- If water leaks are overloading the septic tank system, then repair the leaking plumbing fixtures or pipes.

- If seasonal high water table saturates the soil around the drainfield, use subsurface tile drainage to lower the water table.

- If the system is being flooded by runoff from roof downspouts, change the downspouts to direct the runoff away from the drainfield.

- In situations where the tank is plugged with solids or the inlet or outlet is clogged because of solids in the tank, pumping the septic tank will help the system to function properly again.

- If mechanical or electrical parts have broken, replace the parts.

- If pipes have collapsed or trenches have filled in, then the pipes should be replaced and reinstalled.

- Broken conveyance pipes or laterals on pumped systems must be replaced.

- Leaking septic tanks and pump tanks must be repaired or replaced.

- In some cases, nothing can be done to correct the existing septic tank system, which means that the homeowner is in for big changes and probably high costs. Here are some alternative to consider when whole systems must be repaired.

- The owner may be able to obtain an easement for use of a neighbor's property for an expanded or additional drainfield. This option depends greatly on the type of neighborhood and how close the houses are to each other.

- ❑ Be certain that smaller corrections will not fix the system before you go to larger system repairs. For instance, if there is only a small failure where water is ponding on the surface, then adding one or two trenches of the same size as the original trenches may be enough.

- ❑ If there is a large failure over most of the drainfield, the entire field will have to be replaced. Sometimes the old field will recover if it is not used for six months or a year, and is then put back into service.

- ❑ Another alternative is to install dual alternating drainfields, alternating the flow between the old field and the new field. The old field may recover in a few months and be ready for use when the flow is turned on again.

- ❑ Another piece of land may be purchased to install another or an expanded drainfield.

- ❑ Alternative wastewater disposal methods that might work on the property can be investigated.

After the system has been rehabilitated, follow-up on how the repaired system is functioning is necessary. Here are a few ideas for follow-up.

- ❑ Inspect the repaired system and review the operation and maintenance of the system. If the system is not being maintained or operated properly, it will fail again.
- ❑ Try to educate the owner and users of the system so that the system is not abused. Education can prevent another failed system.

- ❑ Be sure that the owners and users know what maintenance is necessary for the system. Try to find out if the maintenance is being done.

- ❑ Inspect the system periodically to check for recurring problems.

- ❑ Continue keeping records on the system for future needs. Keep well-organized files of all information. These files may help you or someone else in another situation with a failing system.

PART III

REFERENCES

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Onsite Sewage Management System Trouble-Shooting Repair Guide

Instructions: Read and mark each item in the list and follow the go to guide for each. Always presume multiple contributors to system failure. Mark all of the contributors implicated.

1) <u>System type</u>
- a) Gravity flow without D-Box **{go to 4}**
- b) Gravity flow with D-Box **{go to 3}**
- c) Pump system **{next}**

2) <u>Pump system evaluation</u>
- a) Location of discharge
  - i) Drain field area **{go to 3}**
  - ii) Septic or pump tanks
    - (1) Pump malfunction
      - **(a)** Yes – <u>failed pump is contributor</u> **{go to 2)a)ii)(2)}**
      - (b) No **{next}**
    - (2) Does water flow freely from septic tank
      - (a) No
        - (i) Check:
          1. water level above outlet
          2. filter condition
          3. broken pipe
          4. inlet and outlet levels (backwards tank or not level)
          5. outlet fall from tank

        <u>any of the above found are contributors</u>
        - (ii) repair water flow problem **{go to 2)a)ii)(2)}**
      - (b) yes **{next}**
    - (3) Dose volume and frequency OK?
      - (a) Yes **{go to 3}**
      - (b) No – <u>float or timer are contributors</u> **{repair and go to 2)a)ii)(2)}**
  - iii) Inside building
    - (1) Drain from building blocked
      - (a) Yes – <u>blockage is contributor</u> **{repair and go to 1}**
      - (b) No **{go to 1}**

3) <u>D-Box system evaluation</u>
- a) Failure over D-Box?
  - i) Yes
    - (1) Is it associated with pump cycle
      - (a) Yes **{go to 2)a)ii)(2)}**
      - (b) No
        - (i) All lines out level
          1. no – <u>D-Box or lines out off level are contributor</u> **{repair and go to1)}**
          2. yes **{go to 4}**
  - ii) No **{next}**

4) <u>Gravity flow system evaluation</u>
- a) Continuous discharge **{go to 6}**
- b) Periodic discharge **{go to 5}**

5) <u>Periodic discharge</u>
- a) Malfunction on weekends
  - i) Yes
    - (1) Weekend visitors or weekend laundry
      - (a) Yes – <u>peak or surge sewage flows are contributors</u> **{go to 5)a)ii)(2)}**
      - (b) No
        - (i) Does the number of people exceed system design
          1. yes - <u>peak or surge sewage flows and excessive water use are contributors</u>
          2. no **{next}**
  - ii) No
    - (1) Do you take in children or laundry
      - (a) Yes - <u>peak or surge sewage flows and excessive water use are contributors</u> **{go to 5)b) }**
      - (b) No **{next}**
- b) Malfunction after rainfall
  - i) Yes
    - (1) Does surface water or drainage run across the drain line area
      - (a) Yes – <u>surface water entering system is contributor</u> **{go to 7}**
      - (b) No **{go to 7}**

6) <u>Continuous discharge evaluation</u>
- a) Is water use 80% of design or greater
  - i) Yes – <u>excessive water is contributor</u>
  - ii) No
    - (1) Is there a heat pump or sump pump draining into system
      - (a) Yes – <u>excessive water is contributor</u>
      - (b) No **{go to 8}**

7) <u>Seasonal malfunction</u>
- a) Is failure in particular season
  - i) Yes **{go to 6)a)}**

ii) No **{next}**

8) <u>Soil and site evaluation</u>

a) Landscape position of drain field
   i) Poor drainage [depression, floodplain, head, toe, or foot slopes, concave slope, long linear slope, stair step graded lot, coastal plain] – poor landscape position is contributor {next}
   ii) Adequate surface drainage [ridge, shoulder or short linear slopes]
b) Level 3 soil report
   i) Perched or laterally moving water
      (1) Yes
         (a) Is there a functional subsurface drain system
            (i) No – <u>subsurface water is contributor</u> **{go to 9}**
            (ii) Yes **{go to 9}**
      (2) No **{go to 9}**

9) <u>Distribution type</u>

a) Serial **{go to 10}**
b) Level field or D-Box **{go to 12}**

10) <u>Serial distribution evaluation</u>

a) Locate:
   i) Trenches
   ii) Depth of trenches
   iii) Ponding levels
   iv) Stepdowns
b) Is failure in any trench before the last stepdown
   i) Yes **{go to 11}**
   ii) No **{next}**
c) Do ponding levels indicate short circuiting
   i) Yes – <u>short circuiting is contributor</u> **{go to 11}**
   ii) No **{next}**
d) Are soil conditions suitable under malfunctioning line
   i) No or don't know **{go to 8}**
   ii) Yes **{go to 13}**

11) <u>Stepdown evaluation</u>

a) Is level of stepdown correct
   i) No - <u>elevation of stepdown is contributor</u> **{go to 11)b)iii)}**
   ii) Yes {next}
b) Is stepdown damaged
   i) No - **{go to 11)c)}**
   ii) Yes – <u>damage to stepdown is contributor</u> **{next}**
   iii) Repair stepdown **{next}**
c) Check for short circuits between trenches such as:
   i) Roots
   ii) Rock crevices
   iii) Trash pits
   iv) Old drain line
   v) Other routes for water flow
d) Are short circuits available for water flow
   i) Yes - <u>short circuit is contributor</u>
   ii) No **{go to 8}**

12) <u>Level field distribution</u>

a) Locate:
   i) Trenches
   ii) Depth of trenches
   iii) Ponding levels
b) Are all trenches ponded evenly or to capacity
   i) Yes **{go to 8}**
   ii) No **{next}**
c) Is there any clogging or blockage
   i) No **{go to 8}**
   ii) Yes – <u>blockage is likely contributor</u> **{next}**
d) Does malfunction continue when blockage removed
   i) Yes **{go to 8}**
   ii) No **{go to Summary of Causes}**

13) <u>Biomat induced failure</u>

a) Is Biomat excessive
   i) Yes – <u>Biomat is contributor</u> **{go to 13)b)}**
   ii) No **{next}**
b) Does drainfield size match soil conditions and system flow
   i) No – <u>undersized drainfield is contributor</u>
   ii) Yes **{go to 8}**
c) Go to Summary of Causes

Summary of Causes

Note all contributors to malfunction by giving each a rating of how much it influenced the failure.

Rating Scale

1 – very little affect to 5 – main reason for failure

⓪ ① ② ③ ④ ⑤ Failed pump
⓪ ① ② ③ ④ ⑤ Water level above outlet
⓪ ① ② ③ ④ ⑤ Filter condition
⓪ ① ② ③ ④ ⑤ Broken pipe
⓪ ① ② ③ ④ ⑤ Inlet and outlet levels (backwards tank or not level)
⓪ ① ② ③ ④ ⑤ Outlet fall from tank
⓪ ① ② ③ ④ ⑤ Float or timer is not working properly
⓪ ① ② ③ ④ ⑤ System sewers are blocked
⓪ ① ② ③ ④ ⑤ D-Box or lines out off level
⓪ ① ② ③ ④ ⑤ Peak or surge sewage flows
⓪ ① ② ③ ④ ⑤ Surface water entering system
⓪ ① ② ③ ④ ⑤ Excessive water use
⓪ ① ② ③ ④ ⑤ Subsurface water entering system
⓪ ① ② ③ ④ ⑤ Short circuiting between trenches
⓪ ① ② ③ ④ ⑤ Elevation of stepdown above tank outlet
⓪ ① ② ③ ④ ⑤ Damage to stepdown
⓪ ① ② ③ ④ ⑤ Biomat is over grown
⓪ ① ② ③ ④ ⑤ Undersized drainfield for intended use