APPENDIX 0-II

Inspecting and Troubleshooting Wisconsin Mounds

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The Wisconsin mounds system was developed in the 1970s to overcome some soil site limitations for on-site disposal of septic tank effluent. A recent survey of Wisconsin counties found the mound system to be performing very well. However, the owner or inspector must identify potential problems early and diagnose them correctly, with a minimum of time and expense. This publication outlines potential problems, their symptoms, and solutions. It also presents a systematic method of inspecting and evaluating the system.

Figure 1 is a cross-section view of an entire system. To analyze problems, you must know the location of each portion of your system. Keep a scale drawing of your system handy.

The septic tank and dose chamber of the on-site system must be pumped periodically to remove accumulated solids. The tank and chamber should be pumped at least every 3 years in year-round residences. Seasonally used systems, e.g. in summer cottages and camps, require less frequent pumping.

Heavily used systems, e.g. in restaurants, require more frequent pumping. If you use one of these systems, work closely with an experienced hauler to establish a long-term pumping frequency to help minimize carry-over of solids to the soil absorption unit.

Conserve water when using a soil absorption system. Low-flow toilets, low-volume shower heads, front-loading washers, elimination of garbage grinders, and other techniques can reduce waste water with minimal inconvenience.

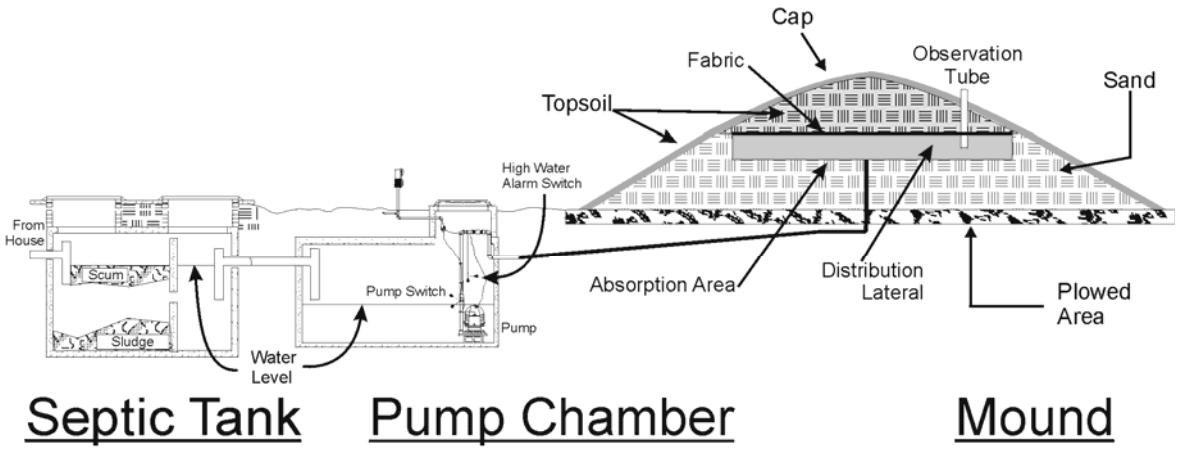


Figure 1. Cross-section of a Wisconsin mound system

When you have completed inspecting and troubleshooting your Wisconsin mounds, all questions in Table 1 should have been answered.

Table 1. Questions to be answered when inspecting a mound system.

Yes	No	1. Is the alarm system operating properly?
Yes	No	2. Does waste water ever back up into the house?
Yes	No	3. Do the toilets ever flush slowly?
Yes	No	4. Does the liquid level in the septic tank appear abnormal?
Yes	No	5. Is there a thick scum mat on the surface in the septic tank?
Yes	No	6. Is the liquid level in the dose chamber within operating range?
Yes	No	7. Are there a lot of solids in the bottom of the dose chamber?
Yes	No	8. Is there standing water in the observation tubes in the mound?
Yes	No	9. Are there spongy spots on the top or side areas of the mound?
Yes	No	10. Is there seepage on the side slopes of the mound?
Yes	No	11. Are there spongy spots in the toe area of the mound?
Yes	No	12. Is there leakage at the toe of the mound?

If you answered no to all of the questions, your mound system should be operating properly. If you answered yes to any of the questions, refer to the text for explanations, causes, and solutions.

> ***WARNING: DO NOT ENTER THE TANK OR CHAMBER!!!***
>
> **NEVER ENTER A SEPTIC TANK OR DOSE CHAMBER WITHOUT SPECIAL EQUIPMENT. PEOPLE HAVE DIED IN SEPTIC TANKS AND DOSE CHAMBERS. THEY CONTAIN TOXIC GASSES AND LITTLE OR NO OXYGEN. HOMEOWNERS DO NOT HAVE THE NECESSISARY EQUIPMENT OR THE EXPERIENCE TO SAFELY ENTER TANKS.**

Following is a list of symptoms, followed by an explanation of the problem, probable causes, and possible solutions. Make sure you investigate all possible causes before you attempt a repair.

Most of these solutions require an experienced plumber, installer or electrician. Most homeowners don't have the tools or expertise for this work. Untrained do-it-yourselfers may cause further damage and expense.

SYMPTOM 1: WASTE WATER BACKING UP AT THE HOUSE OR SOURCE

Explanation: Toilets may flush very slowly; waste water may back up in the floor drain.

Causes: If the toilet flushes slowly, the roof vent may be frosted over.

If waste water backs up in the floor drain and slowly seeps away, tree roots or accumulated solids may be clogging the sewer line to the septic tank. The restriction is often at the inlet to the septic tank. Over time, the blockage prevents waste-water flow from the house. The outlet from the septic tank to the dose chamber may be plugged; or the pump or controls may have failed, causing water to back up into the house.

Solution: Check the water level in the septic tank and dose chamber. If the dose chamber is full, the problem is a faulty control unit or pump or a blockage in the force main or mound. The alarm should have sounded. If not, check the alarm system. Inspect the circuit breaker. It may have tripped. If the liquid level is normal in the dose chamber, but higher than normal in the septic tank, the pipe connecting the septic tank and the dose chamber is plugged. Call a septic tank hauler or plumber to unplug the pipe and check the septic-tank baffles.

If the septic tank level is normal, the inlet to the septic tank or the pipe between the house and the septic tank is plugged. Take care when unplugging the inlet or the pipe. ***DO NOT ENTER THE TANK WITHOUT PROPER SAFETY PRECAUTIONS***.

SYMPTOM 2: ALARM FROM DOSE CHAMBER

Explanation: When the liquid level in the dose chamber reaches a set height above the waste-water level normally needed to activate the pump, it trips an audible alarm or light in the house.

Causes: Faulty pump or pump controls, or a malfunctioning alarm. Blockage in the force main or distribution system of the mound keeps the pump from moving water to the mound.

Solution: If the problem appears to be a faulty pump or controls, see Symptom 1.

If the pump runs but the water level doesn't drop, then the force main or distribution laterals are plugged. See Symptom 10.

SYMPTOM 3: EXCESSIVE SOLIDS ACCUMULATING IN THE DOSE CHAMBER

Explanation: Settled solids should be removed in the septic tank. Solids carried to the dose chamber will be pumped to the mound and may plug the distribution system or the mound infiltrative surface.

Causes: Not pumping the septic tank often enough.

Broken baffles in septic tank.

Excessive solids introduced into the system.

Solutions: Pump the septic tank on a regular basis and have baffles checked after each pumping. ***DO NOT ENTER THE TANK WITHOUT PROPER SAFETY PRECAUTIONS***. Don't use in-sink garbage grinders. They add too many solids to the septic tank.

SYMPTOM 4: PONDING IN THE ABSORPTION AREA OF THE MOUND

Explanation: If you see waste water in the observation tubes (Fig. 2), you have ponding at the sand/aggregate interface. It may be 1) ponding during dosing, 2) seasonal ponding, or 3) permanent ponding.

Ponding during dosing is very temporary and usually disappears shortly after the pump stops.

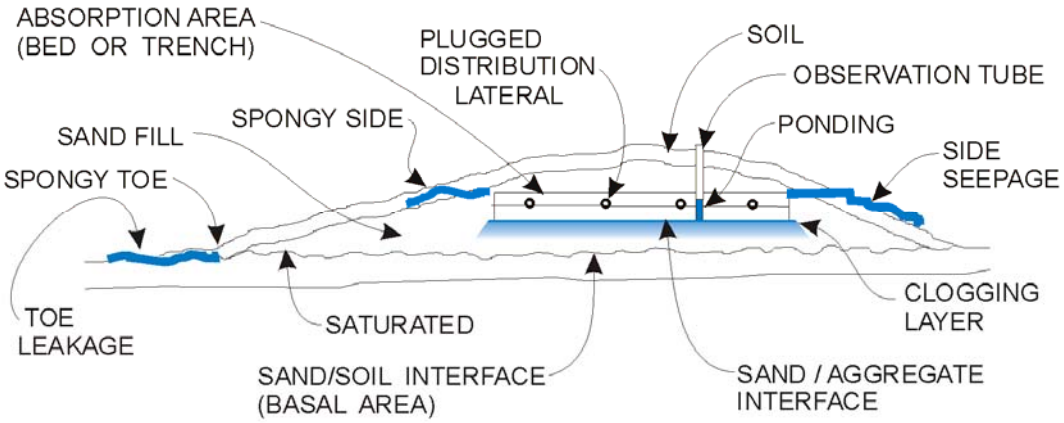
Seasonal ponding occurs over the winter but usually disappears by early summer. Low bacterial activity allows a clogging layer to develop at the sand/aggregate interface, which reduces the infiltration rate across the

interface. As the weather warms, bacterial activity increases, reducing the clogging mat and increasing the infiltration rate. Seasonal ponding rarely causes problems.

Although not itself a failure, permanent ponding (waste water always visible in the observation tubes) may lead to failure.

Causes: Permanent ponding is the result of a clogging mat at the sand/aggregate interface. It may be caused by overloading of septic tank effluent and/or too fine a sand fill.

Solutions: Check the observation tubes every 3 months to see if permanent ponding is occurring in the mound's absorption area. If the ponding appears to be permanent, reduce water use in your home to reduce the load to the system. This often reduces permanent ponding.



SYMPTOM 5: SEEPAGE OUT THE SIDE OF THE MOUND

Explanation: Seepage out the side of the mound is usually black and smelly. It is primarily septic tank effluent that has been pumped into the mound. The breakout normally occurs around an observation tube or at other locations near the top of the mound. The effluent flows down the side of the mound (Fig. 2).

Causes: A clogging mat prevents effluent from infiltrating into the sand as quickly as it's pumped into the mound. Effluent is then forced to the surface of the mound. The clogging mat appears as a black layer at the sand/aggregate interface. The sand several inches below the interface is usually dry and clean.

Temporary or continuous overloading also causes seepage out the side of the mound, even though a clogging mat may not be causing permanent ponding.

Solutions: Estimate the effluent entering the system. Look for 1) excessive water use in the home, and 2) groundwater entering the dose chamber. Reduce the loading to the mound by conserving water in the home and/or eliminating infiltration through joints in the riser into the dose chamber. To eliminate infiltration, re-caulk all the joints on the outside of the riser including the joint between the riser and the tank cover.

Determine the quality of fill. Sample the sand at several locations and have it analyzed for particle size. (Some experienced people can

estimate sand texture in the field.) If the sand beneath the absorption area is fine sand, medium sand with a lot of fines in it, or course sand containing a lot of fine and very fine sand plus silt and clay, the mound may have to be partially rebuilt.

To partially rebuild the mound:
1) remove the soil above the absorption area,
2) remove the distribution system and aggregate,
3) remove the sand beneath the absorption area down to the natural soil,
4) replace it with an approved sand fill,
5) replace the distribution system,
6) cover with a synthetic fabric,
7) replace, seed and mulch the topsoil.

Another approach may be to lengthen the mound, if you have the space:
1) remove the topsoil on the end slope,
2) till the natural soil,
3) place the proper-quality sand fill,
4) place the aggregate in the absorption area and extend the laterals,
5) place fabric on the aggregate,
6) place topsoil on the mound extension,
7) seed and mulch.

Note that making the absorption area wider may cause leakage, especially on slowly permeable soils. Prior to extending the mound, determine if pump or siphon will provide sufficient head at the end of the distribution laterals.

SYMPTOM 6: SPONGY AREA ON THE SIDE OR TOP OF MOUND

Explanation: A small amount of effluent seepage from the absorption area may cause soft spongy areas on the side or top of the mound.

Causes: Spongy areas indicate ponding in the absorption area—the result of nearly saturated soil materials.

Solutions: See Symptom 5. Spongy areas usually precede seepage.

SYMPTOM 7: LEAKAGE AT THE TOE OF THE MOUND

Explanation: Effluent leakage at the toe of the mound (Fig. 2) may be seasonal or permanent. Extremely wet weather can saturate the toe area, causing leakage. Leakage usually stops a few days after the wet period. In extreme cases the toe may leak continuously, even during dry weather. Research has shown that the water is of high quality with no odor and few if any fecal bacteria. This leakage is often indistinguishable from natural surface water.

Causes: Leakage at the toe may be caused by 1) overloading of the mound due to excessive water use or groundwater infiltration, 2) overestimating the infiltration rate and hydraulic conductivity of the natural soil during design, 3) hydrophobic soils that do not readily accept water, and 4) soil compaction during construction.

Solutions: Conserve water to add less waste water to the system.
If the soil accepts the waste water, but more slowly than anticipated, extending the toe sometimes eliminates the leakage.

To extend the toe:
1) remove the existing toe, 2) allow the soil to dry, 3) till downslope soil area, 4) place sand on the tilled area, 5) place topsoil over the sand, 6) seed and mulch the topsoil.

If the natural soil beneath the mound is dry even though the sand fill above is saturated, the natural soil is hydrophobic, compacted or accepts the waste water very slowly. The waste water is moving horizontally at the sand/soil interface, rather than downward.

Extending the basal area downslope may help. You may also have to increase the length of the mound. This reduces the linear loading rate and reduces the loading at the toe. A combination of both may be required.

In extreme situations, place an interceptor drain at the downslope toe to move leakage away from the toe of the mound to a drainage ditch. Many states prohibit surface disposal of this water, so this approach may not be feasible.

If you know that groundwater is moving laterally downslope on sloping sites, place an interceptor drain on the upslope edge of the mound to intercept the groundwater. This allows the effluent to infiltrate into the soil and replace the intercepted groundwater.

SYMPTOM 8: SPONGY AREA AT THE TOE OF THE MOUND

Explanation: Saturated sand fill and nearly saturated cover soil at the toe makes it soft and spongy.

Causes: Causes are similar to those of Symptom 7, though not as extreme.

Solutions: Same as Symptom 7.

SYMPTOM 9: TOO MUCH EFFLUENT FLOWS BACK INTO THE DOSE CHAMBER AFTER THE PUMP SHUTS OFF.

Explanation: The pump pressurizes the absorption area by forcing effluent into the aggregate and soil above the distribution laterals. When the pump shuts off, the effluent flows back into the dose chamber until the effluent level in the absorption area is below the distribution laterals. Side seepage may or may not occur.

Causes: Permanent ponding fills the aggregate below the laterals. Verify this by checking for effluent in the observation wells. Rapidly overloading the system may also cause excessive flowback.

Solutions: Same as Symptom 5.

SYMPTOM 10: THE PUMP RUNS CONTINUOUSLY WITH NO DROP IN THE LIQUID LEVEL IN THE DOSE TANK.

Explanation: The observation tubes indicate that the absorption area is not ponded, but the mound does not accept waste water satisfactorily.

Causes: Solids plug the small-diameter holes in the distribution system, and effluent can’t flow into the absorption area. Items such as disposable

wash towelettes or sanitary napkins will not settle out in the septic tank and are carried over into the dose chamber and forced into the distribution pipes.

Solutions: Pump septic tank and dose chamber. (Every 3 years for residential units; more often for heavily used systems.)

Do not flush towelettes and similar materials down the toilets.

If system is plugged, remove the end caps to the distribution lateral sand flush out the solids using a high-volume, high-pressure pump. Recap the laterals and force water or air into the distribution system to unplug the holes. Septic tank pumpers, when pressurized, force water into the laterals to remove the accumulated solids and force water out the holes to unplug them.

Consider installing a 1/8-inch screen around the pump or siphon to keep larger solids out of the system. Other types of filters may also minimize the solids carried over to the dose tank.

SYMPTOM 11: OCCASIONAL SEPTIC ODORS

Explanation: Biological activity in the septic tank and dose chamber produces ammonia, hydrogen sulfide and other foul-smelling gases. These gases escape from the dose tank via the vent and possibly the house vent stack.

Causes: Odors generated in the septic tank and dose chamber can circulate to occupied areas under certain humidity and wind conditions.

Solution: There is no easy solution to this problem, because the odors are usually emitted through the vent of the dose chamber. Extending the dose chamber vent to roof level may minimize these unpleasant odors. If the dose chamber is vented back through the septic tank and house stack, you may be able to plug the dose thank vent during warm weather. Occasionally the odors may be caused by gases emitted through the house stack. In this case, nothing can be done.

REFERENCES:

Converse, J. C. and E. J. Tyler, 1986. *Wisconsin Mound Performance*, Small Scale Waste-Management Project, College of Agricultural and Life Sciences, 240 Agriculture Hall, University of Wisconsin-Madison.

Table 2. For quick reference: Symptoms, probable causes and solution index.

INSPECTION POINT	SYMPTOM	PROBABLE CAUSE	FOR SOLUTIONS, SEE THESE SYMPTOM NUMBERS IN THE TEXT
1. Alarm	sounding	pump failure alarm switch failure	2
	non-functioning	circuit breaker thrown faulty alarm	2
2. Floor drain	waste on floor	house sewer plugged septic tank inlet plugged septic tank outlet plugged pump failed distribution laterals plugged	1, 2, 10
3. Septic tank	liquid waste level above normal	outlet plugged pump failed distribution laterals plugged	2,10
	excess solids	excess solids added garbage disposal	3
4. Dose chamber	liquid level above high-water pump switch	pump failure control failure plugged laterals	9,10
	excess solids	solids carry-over septic tank baffle missing	3
	groundwater inflow	high groundwater leaky joints	5
	odors	pump chamber emitting odors	11
5. Mound	water in observation tubes	soil absorption area plugged excessive water use	4
	seepage of raw sewage on side or top of mound	soil absorption area plugged system overloaded sand fill too fine	5
	spongy on side and top of mound	same as seepage of raw sewage (above)	6
	leakage at toe	slowly permeable soil compaction during construction soil damaged during construction overloading of system	7
	spongy at toe	same as leakage at toe (above)	8

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