INDIVIDUAL SEWAGE TREATMENT SYSTEMS FACT SHEET SERIES

WATER METERS

BIOSYSTEMS AND AGRICULTURAL ENGINEERING AND WATER RESOURCES CENTER
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A water meter can help ensure successful septic system operation. Septic systems are becoming more expensive, both to install and to repair, so one goal is to design them to treat the actual flow, rather than an estimate that may be high or low. Another goal is to extend the effective life of existing systems. In order to achieve these goals, it's helpful to know actual flow rates, which the water meter provides. To keep track of the amount of water entering the septic system, include a water meter in the design of the system, or add one to an existing system.

Water meters come in many different shapes and sizes. Most water meters are designed to deal with clean water, which means that they may not function properly if they are used to measure the flow of sewage. For example, many water meters have small paddles or wheels that move around to measure flow. These moving parts can be easily plugged by solids in sewage. One way to avoid this problem is to measure the flow of clean water before it is used in the house.

Figure 1. A typical water meter.

Clean-Water Meter

These meters should measure the water used inside the house, but not the water used outside for watering lawns and gardens, filling swimming pools, or washing cars, since this water does not enter the septic system. If it's difficult to install a water meter so that it doesn't include the water to be used outdoors, try to estimate outside use, or use only data from December to March, when there is typically no outdoor use of water.

Water meters measure flow in either gallons per minute, gallons per hour, or cubic feet per second. Before doing

any calculations using data from the meter, check to be sure of the units of measurement. Designs for septic systems typically use gallons per day. If the meter measures gallons per minute, multiply by 1,440 minutes per day. If it measures gallons per hour, multiply by 24 to get the gallons per day. If it measures cubic feet per second, multiply by 276,480 to convert to gallons per day.

The water meter should be installed by a plumber to make sure it's put in properly. Although it is installed directly into the water system, it won't affect water pressure.

Another type of clean water meter often found in houses is an on-demand water softener. These water softeners measure flow and recycle at certain set flow amounts. This system may also be used to calculate water flow. These calculations are not as straightforward as simply reading a meter and multiplying by a factor of 24 or 1,440, but this is a valid method of measuring clean water flow.

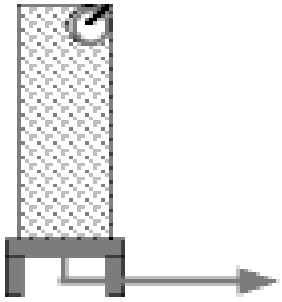

Figure 2. Water Softener

Dirty Water Measurements

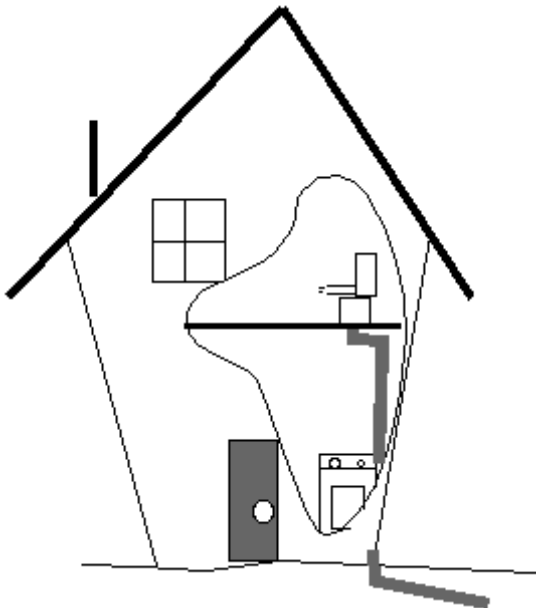

Figure 3. A home

Instead of measuring water use in the house, you could measure wastewater going to the septic system. To do this, the water entering the meter would need to be free of solids.

The use of a pump as a wastewater meter is more common. All pumps run at a constant rate, so water flow can be calculated and calibrated from the pump system. This calibration is very straightforward in that you measure the level in the tank, you run the pump for a certain amount of time, measure the amount of water that has left, divide that by the amount of time that the pump was running, and come up with a pumping rate in gallons per minute. Using this rate, you can calculate how much water has been pumped, based on how long the pump has been running.

For example, you know that a tank contains 100 gallons per foot of water depth, and the depth of wastewater is three feet. You run a pump for two minutes, and now the wastewater is two feet deep. 100 gallons have been pumped in two minutes, so the rate was 50 gallons per minute. Now find out how many minutes the pump runs in the course of a day. If the same pump ran for 10 minutes, then during that day it pumped 10 times 50 or 500 gallons. This is a quick way to use a pump and a clock to calculate how much water is being used.

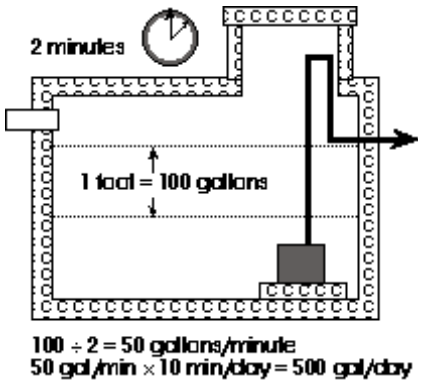

Figure 4. Using a pump to estimate flow

Once you know the pump's rate, check it regularly. It may slow down to the point where it is not evenly distributing wastewater to the soil treatment system. Or it may be failing, and it's good to know before it actually stops working that there's a problem.

Another way to use a pump as a measurement device is to use an "event counter." An event counter is a meter that records every time the pump turns on. You know from the septic system design how many gallons are to be pumped each time the pump turns on, so by counting the number of times it turns on during a day you can measure the flow of wastewater going out to the system. This is not as accurate as a running time clock because the floats that turn the pump on have some variability. That is, the pump may turn on at 6 inches the first time and then 6-l/2 inches the second time. That can be a 15 to 20 gallon discrepancy each time. If the event counter is turning five times a day, at a 20-gallon per time discrepancy, you may be off by 100 gallons of water that day.

However it is measured, flow is critical data that will allow the best design and operation of the septic system. Average flows for Minnesota homes are listed below.

Estimated flow is a great design tool. It allows for a safety factor and peace of mind. Measured flow is used to verify performance. By using both flow figures appropriately, you give the system the best chance of effective long-term performance.

Estimated Sewage Flows in Gallons per Day				
number of bedrooms	Class I	Class II	Class III	Class IV
2	300	225	180	60%
3	450	300	218	of the
4	600	375	256	values
5	750	450	294	in
6	900	525	332	Class I,
7	1050	600	370	II, or III
8	1200	675	408	

Class I: The total floor area of the residence is over 800 square feet per bedroom **or** more than two of the following water-using appliances are installed: dishwasher, automatic clothes washer, water softener, garbage disposal, self-cleaning furnace.
Class II: The total floor area of the residence is between 500 and 800 square feet per bedroom, and no more than two water-using appliances are installed.
Class III: The total floor area of the residence is less than 500 square feet per bedroom and no more than two water-using appliances are installed.
Class IV: Class I, II, or III home, but with no toilet wastes discharged into the system.

Figure 5. Estimated sewage flows