

APPENDIX 3

THE SUITABILITY OF THE SITE FOR ONSITE WASTEWATER DISPOSAL SYSTEMS

*The following is an excerpt from Chapter 2 of the Champaign County Department of Planning and Zoning staff report entitled *Locational Considerations and Issues for Rural Subdivisions in Champaign County, Illinois* dated November 19, 1998.*

In rural development there are no sanitary sewers to carry wastewater to a central treatment plant. Each development site must have its own onsite wastewater treatment and disposal system. The most common type of onsite wastewater disposal system is the subsurface soil absorption system.

The most common subsurface soil absorption system is the traditional septic tank leach field. In these systems the soil is a significant part of the treatment process and the final depository of the wastewater effluent. When the soil is not ideally suited for these systems, significant problems and system failures can and often do result. Determining soil suitability for these systems is absolutely necessary to insure a good system installation.

The suitability of Champaign County soils for subsurface soil absorption systems is well known. Often, however, the true costs of dealing with the unsuitability of most of those soils are avoided. System failure is not unusual and the typical replacement systems have significant operational requirements that are not usually fulfilled. Even when the "replacement" systems are used in the beginning as a way of bypassing the problems of soil suitability for subsurface soil absorption systems, the installations often lack adequate infrastructure to ensure nuisance free operation. Nuisance conditions can result.

Alternatives for Onsite Disposal of Wastewater. All onsite wastewater disposal systems fall into two broad categories. Subsurface soil absorption systems release wastewater into the ground below the ground surface. Surface discharge systems release wastewater onto the surface of the ground or onto a body of water. The traditional and most common type of onsite wastewater disposal for rural residential development is subsurface soil absorption by means of septic tank leach fields (trenches). Surface discharge systems (such as Multiflow and Jetflow) are increasingly common. All wastewater disposal systems in Illinois, however, regardless of the specific type, require some sort of approval by a government agency in order to safeguard the public health and safety.

Approval of Rural Onsite Wastewater Disposal Systems. In Champaign County, onsite wastewater disposal systems are now approved by the County Health Department (contracted to the Champaign-Urbana Public Health District). The County has adopted the requirements (with minor variation) of the Illinois Department of Public Health (IDPH) in the *Champaign County Health Ordinance*. IDPH requirements specify techniques for designing the wastewater disposal system including methods for determining the suitability of soils for subsurface soil absorption systems.

The *Subdivision Regulations* also require evidence to be submitted during the plat approval process that the soils are suitable for subsurface soil absorption systems. Percolation test data (one percolation test per lot) for all proposed lots is required on the subdivision plat. When the house is constructed on any of these lots later, the installation of the wastewater disposal system must still be approved by the Health Department. If a subsurface soil absorption system is proposed at that time, the *Health Ordinance* requires further proof that the soil is suitable for subsurface soil absorption systems.

Determining the Suitability of a Site for a Subsurface Soil Absorption Wastewater Disposal System. IDPH allows two techniques for determining soil suitability for subsurface systems. The most common method is the soil percolation test. Percolation tests are done in a standardized manner that is supposed to correct for things like dry soil conditions. This test involves digging holes into the land on the proposed site. The surrounding soil is saturated and the hole is filled with water. The time it takes for the water in the hole to drop six inches is then noted. Test results are described in terms of the average time it takes water to drop one inch. If it takes four hours (240 minutes) for a six inch drop, the percolation rate is 40 minutes per inch (a fair to poor rate). The maximum rate permitted under IDPH regulations is 60 minutes per inch.

Percolation tests can still be greatly effected by the moisture of the soil at the time of the test. Percolation tests are also not a good predictor of the long term performance of a subsurface soil absorption system and it is quite common to get variable results in the same type of soils with the same person doing the test.

The preferred technique is soil investigation. This technique consists of boring samples of soil on the proposed site (or excavating pits) and then having a qualified professional identify the specific soils that were found. The relevant soil drainage characteristics have already been determined for all soils in Champaign County and can be found in the *Soil Survey of Champaign County*. Thus, when the soils have been properly identified, a percolation test is not necessary. This approach is more dependable than percolation tests because it relies on positive identification of the soils on the proposed site. Percolation tests, in addition to soil investigation, are the best approach.

Suitability of Champaign County Soils for Subsurface Soil Absorption Systems. The *Soil Survey* indicates the limitations of County soils regarding their suitability for subsurface soil absorption systems. Once a soil is accurately identified, the limitations are well known. The following limitations are used in the *Soil Survey* to describe the degree to which the soils are not suitable for septic tank absorption fields:

- *Slight* if the soil characteristics are generally favorable and limitations are minor and easily overcome.
- *Moderate* if the soil characteristics are not favorable for subsurface soil absorption systems and special planning, design, or maintenance is needed to correct for the limitations.
- *Severe* if the soil characteristics require a greater degree of planning, design, or maintenance.

The *Soil Survey* gives only general guidance for overcoming these three classes of limitations. Also, the limitation ratings are actually national limitation ratings. They are meant to apply for all soils in the entire country and are consequently somewhat limited in their usefulness for Champaign County.¹ Consider that the soils on over 97% of the land in Champaign County are given a “severe” limitation rating by the *Soil Survey* for suitability for subsurface soil absorption systems. Only 1.7% of the land is rated as having “slight” (the best rating) limitations.

A 1979 publication by the Soil Conservation Service (now the Natural Resources Conservation Service or NRCS) provides better information on overcoming the limitations of Champaign County soils for subsurface soil absorption systems. The booklet *Soil Potential Ratings for*

Septic Tank Absorption Fields Champaign County, Illinois contains ratings for all the soils in the County compared against a theoretical “standard” County soil. The ratings take into account the costs of overcoming the limitations discussed in the *Soil Survey*. Instead of three classes of limitations, there are five ratings of potentiality. The potentiality ratings are:

- *Very High Potential* was assigned to soils with characteristics that were above the local standard, which results in lower installation costs and no continuing limitations.
- *High Potential* was assigned to soils with characteristics that are at or above local standards. Costs to overcome the limitations were judged to be favorable and impacts on long term performance were not significant.
- *Medium Potential* was assigned to soils with characteristics somewhat below local standards. The costs for overcoming the limitations were judged to be high and long term problems were significant.
- *Low Potential* was assigned to soils with characteristics that are significantly below local standards. The costs to overcome the limitations are very high and continuing problems are quite significant.
- *Very Low Potential* was assigned to soils with characteristics that cannot be economically overcome. Soil characteristics pose continuing problems even after corrective measures are installed. For soils in this class and some soils in the ‘Low Potential’ class, alternative systems are advised for wastewater disposal. In some instances, even special engineering is advised.

Almost 15% of the land in the County is made up of soils that were assigned Very High or High Potential. A little more than 48% of the land in the County was rated as Medium or better. On the other hand, a little more than 50% of the land in the County was assigned potential ratings of Low and Very Low. Included in that was less than 5% of the land in the County for which alternative systems were recommended.²

The SCS report indicates that there should be little problem with subsurface soil absorption systems on at least 15% of the land (Very High and High ratings) in the County.

Almost all of the soils with a Medium rating have severe problems (problems that lead to system failure) with high groundwater. The corrective action required is to either bring in earth fill materials or install subsurface drainage.

For at least half of the land in the County (Very Low and Low ratings), however, subsurface soil absorption systems have real problems. The severe problems with these soils are seasonal flooding, high groundwater, and very slow permeability (a measure of how quickly the septic effluent is absorbed into the soil). The corrective actions for these soils include bringing earth fill onto the site to raise the subsurface system above the groundwater level or installing subsurface drainage. The slowly permeable soils require alternative systems.

Replacement of Failed Subsurface Soil Absorption Systems. When a subsurface soil absorption system is installed into soil without adequate corrective measures to overcome the soil limitations, failure will usually result. For example, most of the soils rated with a Medium Potential in the SCS report require a corrective measure (subsurface drainage or a curtain drain) that is not usually provided. The actual failure rate of subsurface soil absorption systems

in Champaign County is not known. However, the failure of subsurface soil absorption systems in Champaign County is quite common. Approximately half of the onsite wastewater permits that the IDPH approved in Champaign County in a recent year (the regional IDPH office inspected wastewater systems prior to the adoption of the *Health Ordinance*) were for replacement systems.³

Replacement systems are usually “Class A” Aerobic Treatment Plants (Jetflow or Multiflow) that discharge to the surface of the ground. The surface discharge is common because there is usually no water body to discharge to. A “common collector” (underground pipe or tile) is also usually available. Common collectors serving more than seven bedrooms (residential septic loading is regulated in terms of bedrooms) require an Environmental Protection Agency permit and are generally regarded as impractical. The surface discharge results in several hundred gallons of treated wastewater⁴ being released on the ground surface each and every day. This can create a nuisance situation if there is not adequate drainage for the discharge.

Determining Suitability of a Site for a Surface Discharge Wastewater Disposal System.

Site suitability for surface discharge is very simple to determine. When the discharge is to the surface of the ground, there is a limit of one surface discharge per acre and a requirement that the effluent does not pond or create a nuisance. When the discharge is to a body of water, there are limitations on the dilution (amount of receiving water versus amount of effluent) provided by that body of water and, when the discharge is to a lake or pond, there is a limit of two discharges to each acre of water.

Summary. The soil is suitable for the most common type of onsite wastewater disposal system in only about 15% of Champaign County. In the rest of the County, there are significant problems with subsurface soil absorption systems. There are also significant problems associated with the surface discharge systems that are typically used to replace failed subsurface systems. And, even when surface discharge systems are installed in the very beginning, they are usually not installed with adequate infrastructure to deal with the surface discharges. The following problems should be addressed to improve the provision of onsite wastewater disposal for future subdivisions:

- Current regulations allow the use of unreliable methods of predicting soil suitability for typical onsite wastewater systems.
- Current regulations allow the use of subsurface soil absorption wastewater disposal systems in areas where soils are not suitable and failure is almost guaranteed.
- Most alternative wastewater systems require a drainage outlet that is not usually available.

Appendix 2 Notes:

1. Classifying the soils found in Champaign County for septic limitations using a national scale is similar to classifying those soils for their productivity using a national scale. Just as nearly 95% of the soils are considered Prime Farmland almost 85% are considered to have worst than slight limitations for subsurface soil absorption systems. Neither classification is incorrect but neither is very useful for making land use decisions for Champaign County.
2. The Illinois State Geological Survey is preparing a large map of the soil potential ratings.
3. Telephone conversation.
4. IDPH requires that all surface discharge and discharges to bodies of water be disinfected with a chlorine solution.