Branchville Community Septic Systems

TO: Francisco Gomes

FROM: Joe Canas

COPY: John Block

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1 Introduction

Tighe & Bond has been asked to review potential treatment options as part of the Branchville Transit Oriented Development study. We have already reviewed connection to area wastewater treatment plants and package treatment plants. At the last review meeting, we were asked about community-type septic systems as opposed to a package treatment plant option due to initial capital costs and operational costs. A preferable option may be to initially start with a community type system and expand to a package treatment option in the future.

A community type system is one where each building or parcel has its own septic tank, but is piped to a centralized subsurface leaching field, which accepts effluent from a number of individual properties. All community systems are regulated by the Connecticut Department of Energy and Environmental Protection.

The steps involved would be to evaluate the soil's capacity to accept the flow and its capacity to renovate flow and remove nutrients, such as nitrogen and phosphorous, and also the removal of pathogens. Depending on these soil capacity factors, additional pretreatment and/or devices to provide uniform flow distribution may be required. More specifically, the system constraints will be dictated by the soil type, loading rate, effects of seasonal high groundwater, vertical separation, groundwater mounding, and horizontal separation from existing features such as structures, slopes and adjoining property lines.

1.1 Potential Additional Requirements

1.1.1 Pretreatment

Additional (enhanced) pretreatment, other than by a septic tank, can provide some additional attenuation of pathogens above that provided by a septic tank. Additional pretreatment is often used for reduction of the organic and solids concentrations in the pretreated effluent discharged to the system. Investigators have shown that additional pretreatment beyond that provided by a septic tank will substantially increase the rate of infiltration into the soil surrounding the system by reducing the clogging effect of the biomat. It can also help to maintain aerobic conditions in the unsaturated zone by reducing the oxygen demand caused by the metabolic processes of soil microorganisms that utilize the organic matter as a source of food and energy. This will result in fostering the growth of aerobic soil microflora that will have antagonistic effects on viruses. If disinfection is provided following the additional pretreatment, pathogens can be greatly attenuated. The requirements for pretreatment can only be known after the soil capacities are evaluated, and effluent totals are known.

Additional pretreatment may include flocculation, clarification, and disinfection, and may be chemical, biological, or ultraviolet in nature.

1.1.2 Flow Distribution

The basic objective of flow distribution is to uniformly distribute the septic tank effluent to the infiltrative surfaces of the leaching system so as to maximize the volumetric renovative capacity of the soil. However, there is considerable debate as to whether the distribution should be by means of gravity flow to the various units of the leaching system or by means of a pressure distribution system (PDS). In the latter case, this would require the use of septic tank effluent pumping stations or dosing siphons. The arguments on both sides of this issue appear persuasive. The use of pressure distribution for individual residential subsurface soil absorption systems is arguable because of problems resulting from probable lack of maintenance by individual residence property owners. However, for large systems where the system is extensive and system maintenance is required as part of the permit issued for such systems, pressure distribution may be warranted. The extent of the need for uniform flow can only be known after the soil capacities are evaluated, and effluent totals are known.

It is also important to know the source of the flow that will be generated, and the volume of effluent that will be generated by the sources. In many cases the wastewater flows determined for individual buildings are normally based on metered water use, rather than on measured wastewater flows, because of the difficulty in accurately metering small wastewater flow rates. It is normally assumed that almost all of the metered water use inside the building is converted to wastewater discharged from the building because very little of the water used is consumed. Generally, it is not overly conservative to consider indoor domestic water use as equivalent to domestic wastewater discharge, absent any significant use of water for cooling or other purposes where the water is not discharged to the building sanitary drains.

1.2 Characteristics of Wastewater

1.2.1 Restaurants

It should be noted that on-site subsurface wastewater absorption systems (SWAS) serving restaurants and other food processing and serving establishments often fail within a short time after being installed. Failure has been evidenced by severe clogging of the infiltrative surface of the SWAS, resulting in backup of wastewater into the building sewers and/or surfacing of inadequately treated wastewater to the ground above the SWAS. These problems generally resulted from failure to take the wastewater characteristics into account when sizing the on-site facilities such as grease trap(s), septic tank(s) and SWAS.

Restaurants are by far the most common food processing and serving establishments that experience problems with an on-site SWAS. Restaurant wastewater typically has a higher organic strength (BOD5) and TSS, and a much higher content of fats, oils and grease (FOG) than residential wastewater. The high FOG content compounds the effect of the high organic strength of restaurant wastewater. At the high temperatures used for many food-processing operations, animal fats, such as butter and lard, and oils from cooked meat are in liquid form. Such fats and oils tend to solidify as the temperature drops and thus a major portion (60-80%) can be separated from the wastewater by cooling under quiescent conditions in properly designed grease traps. However, in recent times, many restaurants have increased their use of vegetable oils in lieu of solid fats. Vegetable oils are harder to separate, as they are in liquid form at much lower temperatures than animal fats and oils. In some instances, specially designed grease interceptors and other grease recovery devices must be used to remove these oils. Many restaurants have ineffective means for removing FOG, with the result that relatively high concentrations of FOG can pass through the septic tank serving the restaurant and reach the biomat that forms on the infiltrative surfaces of the SWAS. When this happens, the FOG can clog the biomat and thereby prevent passage of the wastewater through the infiltrative surfaces. In addition, the high oxygen demand exerted by restaurant wastewater can cause anaerobic conditions to exist below the biomat if the infiltrative surfaces of the SWAS have been sized on the basis of typical residential wastewater infiltrative surface hydraulic loading rates. When such conditions occur, the results will be a reduced ability of the unsaturated soil beneath the SWAS to remove contaminants from the wastewater and degradation of the ground water quality. Where enhanced pretreatment will not be provided to reduce the strength of the restaurant wastewater to or below that of residential wastewater, it is necessary to provide adequate pretreatment for removal of FOG, and reduce the infiltrative surface hydraulic loading rate to account for the high strength of such wastewaters.

1.2.2 Offices

Wastewater from office buildings is generated in office restrooms, public restrooms, and, in some instances retail shops, restaurants and snack bars. While similar in many respects to residential wastewater, office wastewater is apt to have higher nitrogen concentrations because of the lack of dilution from bath and shower wastewater and other low strength wastewater components found in residential wastewater.

1.3 Location

The system must be located where groundwater and bedrock is relatively deep, soils are generally gravelly and permeable, and a sufficient distance away from wetlands and watercourses such that transport of pollutants is minimized and minimum travel times are achieved. Therefore, the criteria for locating a community system is similar to that of a package treatment plant.

1.4 Regulatory Requirements

A Permit Application for Wastewater Discharges from Subsurface Sewage Treatment and Disposal Systems is required from CTDEEP. The application includes a fee and public notice requirements, and basic background information on the applicant. The source and volume of effluent must be identifies, and potential storage of toxic and hazardous substances must be inventoried. Additionally, pollutant loading and groundwater mounding analysis must be provided to determine compliance with effluent limitations.

Permit conditions will also include monitoring and maintenance requirements, scaled to the size and scope of the system.

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