

## **WM Evans Engineering, LLC**

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June 1, 2010

To Whom It May Concern:

### **Introduction:**

The following discussion summarizes my experiences with the approval and use of Presby Environmental's Enviro-Septic technology in the State of New Hampshire. Presented below are my personal observations of the System's capabilities and field performance in the State of New Hampshire over the past fourteen (14) years.

As former administrator of the Subsurface Systems Bureau of the New Hampshire Department of Environmental Services (NH DES), I was directly involved in the approval process, permitting, plan review and inspection of Enviro-Septic systems from 1995 through 2009 (please refer to attached Curriculum Vitae for details of my credentials and experience). During this time period, there were approximately 80,000 Enviro-Septic systems installed in New Hampshire; in fact, about 9 out of 10 plans for onsite wastewater treatment systems that come to the NH Subsurface Systems Bureau for approval today are for Enviro-Septic system designs. It has been my experience that when properly installed, Enviro-Septic systems have an extremely low failure rate (less than 1%) and, even after as much as 14 years in service, these systems are continuing to work as expected with only minimal required maintenance. These systems have consistently performed with a very high degree of reliability and have demonstrated superior durability and longevity. Based on the results of third-party testing (Stokes, Canada and BNQ/NSF), NH DES determined that the treatment capabilities of the Enviro-Septic system were so far superior to other alternatives that the Enviro-Septic system was approved for use with a smaller required separation distance from restrictive features than what has been granted for any other product approved for use in New Hampshire.

In my opinion, Enviro-Septic® technology is an effective and practical innovation in the field of onsite wastewater treatment technology for two primary reasons: 1) the protected biomat surface area provides for highly effective, long-term treatment of effluent, and 2) the system's

hydraulic features maintain unsaturated flow conditions allowing treated wastewater to be safely dispersed into underlying native soils:

### **1. Effective Biomat Surface Area:**

The Enviro-Septic System allows for a greater effective biomat surface area. The pipe's design features allow for controlling and protecting the development of an effective treatment biomat surface area that remains oxygenated (aerobic) and permeable. Significant additional pretreatment of septic tank effluent occurs within the pipe, where suspended solids, oils, and greases (F.O.G.) not retained in the septic tank are allowed to settle, cool down and be retained inside the pipe. Additional physical and biological removal of solids and F.O.G. is accomplished as effluent passes through the layer of green plastic fibers. The excess solids and grease are never directly deposited on the protected biomat surface area, which forms on the inner surface of the outer fabric layer.

### **2. Unsaturated Flow Conditions are Maintained:**

The Enviro-Septic Design and Installation Manual submitted as part of Presby Environmental's application for approval in New Hampshire specifies the layout and configuration of the Enviro-Septic pipes, the amount of pipe required to provide the necessary effective biomat surface area, appropriate row spacing given slope and soil conditions, and minimum System Sand bed sizing parameters that will conservatively provide an unsaturated flow condition outside of the pipe, allowing treated wastewater to permeate gradually into the natural soil at a controlled rate that the in situ soil can accept.

This technology has been well tested in the field, having been used in the State of New Hampshire for more than 14 years. It has been my experience that with thousands of installed Enviro-Septic® onsite wastewater disposal systems, NH DES observed few if any problems when the System is installed and operated according to the Design Manual. In fact, Enviro-Septic technology has been used to replace numerous problematic onsite systems that have failed prematurely due to poor site conditions or because of high effluent mass loading rates (i.e., restaurants, laundromats, and food stores). I have personally inspected a significant number of these installations in order to monitor these systems' performance. The Enviro-Septic® systems have been observed to be functioning as intended, even on difficult sites and/or under heavier than usual wastewater strength or loading.

As NH DES staff became more experienced with the capabilities of the technology, Enviro-Septic®'s approval has been modified over the years; the required separation distance from restrictive features has been reduced, and Enviro-Septic® is now approved for use in level, sloping, and even multi-level systems. The product's literature details the following specific functional advantages of the system that NH DES was able to verify in the field: 1) Pipe allows undesirable materials such as grease and oils to settle out and be retained inside the pipe, 2) The

coarse fiber mat traps solids and protects the biological mat which grows on the inside of the outer fabric, 3) System Sand remains compacted in place around the pipe regardless of system loading, so there is no silt transfer in the sand surrounding the system, 4) System provides ample storage capacity for peak flow times, and 5) A aerobic biological mat that is effective (highly efficient) and permeable develops on the inside of the fabric and fibers which surround the pipe.

### **Experience with Sloping Sites and Sloping Beds:**

Enviro-Septic technology also has other unique operational characteristics that have led it to be widely and successfully used in the State of New Hampshire. One of these characteristics is the use of this technology on sloping sites and in sloping bed configurations.

As a result of the soil forming processes that occurred since the last glaciation period, most of New Hampshire's present day soils are glacial till. Soil forming processes over the last 10,000 to 12,000 years have resulted in a predominance of soil that typically has hardpan (restrictive) layers between 24 and 30 inches below grade. NH DES considers this hard pan layer as the apparent seasonal high water table, or in the case of bedrock, to be the restrictive design feature from which required separation distances are measured. Because of this and the fact that most of New Hampshire's topography is to some degree sloping in nature (average slope is approximately 15%), a majority of the systems designed in this State must be installed at or above grade. Because conventional onsite wastewater treatment systems such as pipe and stone leachfields have to be installed in fill and constructed on level ground, this results in excessive fills to support the system fill extensions and the required 3:1 structural side slopes necessary to support the system on slopes. Therefore, because trees and natural vegetation have to be removed to allow for the placement of these structural fills, considerable impacts are necessary to the natural landscape that are significantly larger than the footprint of the required leaching field in order to construct a conventional leaching field system.

Furthermore, the design of raised stepped stone and pipe trenches is not a feasible solution because they cannot effectively be built and stabilized in fill on slopes. As a result, the introduction of Enviro-Septic technology throughout New Hampshire has been and continues to provide a practical and effective solution for sites with sloping terrain. Enviro-Septic systems can be installed on varying slopes (up to 35%) with minimal disturbance of existing natural onsite vegetation and down gradient receiving soils.

It has been my experience that constructing Enviro-Septic systems on slopes and in sloping bed configurations has allowed designers to use the more permeable/less compacted soils found on our sloping landscapes. Because structural fill extensions are not necessary, impact to the landscape is kept to a minimum. This also results in the ability to blend a system in with the natural topography resulting in an aesthetically more pleasing design. Designers can usually configure the system using gravity distribution, resulting in a passive, less expensive treatment

system for the consumer. Because Enviro-Septic systems can be constructed on sloping sites, they are less subject to flooding/ponding impacts from precipitation. Where site conditions dictate, up-slope interceptor trenches can also be constructed to make sure that surface and ground water can pass around the system. NH DES did not observe any failures due to sloping bed installations, provided they were constructed in accordance with the Design Manual and provisions were made to shed/divert up-gradient ground and surface water if necessary. Enviro-Septic Systems were not found to have problems with effluent pooling at the base of the system, nor did NH DES observe any tendency for effluent to surface or “blow out” at the base of sloping sites. This is due to the fact that the sand distributes the purified wastewater gradually and evenly, allowing it either to percolate vertically over the entire footprint of the system or to move into the preserved down gradient natural receiving soil layer.

### **Serial Distribution:**

NH DES approved and encouraged the use of serial distribution configurations for the Enviro-Septic® system in New Hampshire. One primary benefit of the use of serial distribution is that it eliminates the need for a distribution box. My experience has been that distribution boxes typically are found in the field to be out-of-level or not functioning as designed. The use of serial distribution also guarantees air flow and therefore aerobic conditions will be promoted throughout the entire system.

When serial distribution is employed, the first row of the system quickly develops an active aerobic biomat on the inside of the fabric and fibers. The liquid level in the first row can only reach a depth of approximately 0.58’ or 7” before it will overflow into the next line, and so on if necessary. Aerobic conditions are continuously maintained in an Enviro-Septic System due to the fact that oxygen continues to circulate through the head space remaining in the pipe and then into the specified sand that surrounds the pipe. Because the sand acts like the respiratory system of the AES System, the developed high rate biomat formed on the inside of the fabric surrounding the pipe stays permeable and operating in an aerobic manner. Once the LTAR (Long Term Acceptance Rate) of the biomat has been reached additional sewage flow will then travel to the next line in series. This is a key operational factor that separates the Enviro-Septic system from other conventional leaching systems and is another reason the system has been used so successfully in the State of New Hampshire.

### **Purpose of System Sand:**

As mentioned in the discussion of serial distribution above, the use of specified sand that surrounds the pipes on all sides is essential to the proper functioning of the system. It is crucial to providing the required oxygen/gas exchange necessary to provide aerobic conditions that support the biomat that develops on the inside of the fabric that surrounds the pipes. The sand is the conduit for oxygen that travels in the head space of the pipe due to air flow (draft) from the

low vent at the end of the system, through the system, and out the building plumbing vent (roof vent). System sand also provides storage capacity for treated wastewater as it infiltrates into the underlying soils.

The specified sand also provides a capillary effect which helps to move treated wastewater away from the pipes. While the majority of treatment and contaminant reduction occurs as a result of passing through the developed biofilm found on the inside of the fabric, some additional polishing of purified wastewater released from the Enviro-Septic pipes occurs in the sand. Specifically phosphorus can be adsorbed and some additional bacteria and virus removal has been found to occur. Presby Environmental provided reports of third-party testing which proved that Enviro-Septic technology was consistently able to produce effluent quality that meets if not exceeds EPA Tertiary guidelines. In other words, the aerobic biofilm located on the inside of the pipe has been found to be consistently doing what it was designed to accomplish. Furthermore, after observing dozens of actively functioning Enviro-Septic systems, there is no visible evidence of any type of secondary biofilm (which would indicate additional treatment occurring) being developed in the sand or at the sand/soil interface.

### **Conclusion:**

Presby Environmental, Inc. has become an industry leader in the State of New Hampshire, providing an unprecedented level of quality control, technical support, training for industry professionals and customer assistance. Their products (Enviro-Septic and the new Advanced Enviro-Septic) provide a cost-effective alternative onsite system with unique design features that adapt to a site's terrain. These systems are more protective of the environment due to the high level of treatment provided. Presby Environmental has also shown a commitment to ongoing research and product development in an effort to make an effective product even better.

In my opinion, Enviro-Septic's superficial resemblance to leaching system products which only provide dispersal of septic tank effluent and rely on the soil to provide treatment has been misleading to some regulators, industry professionals and consumers. Enviro-Septic has been proven to provide exceptional treatment (consistently meeting US EPA Tertiary standards or better) while also providing efficient dispersal via non-mechanical processes. The fact that the system is releasing highly treated wastewater from the pipes means that the system is not subject to progressive failure; the underlying soils are preserved, maintaining their ability to accept treated wastewater. This eliminates the need for a replacement area with the AES / ES system, extends system longevity, and reduces any possibility of discharge or surfacing of inadequately treated wastewater. The system's simplicity means there is little to go wrong; no replacement parts or media are ever needed, and since there is virtually no maintenance other than pumping the septic tank, the system is not compromised by non-compliance with maintenance procedures. Once the system is properly installed, there is minimal expense to the owner to operate and maintain it in order to ensure proper functioning.

In conclusion, I feel Enviro-Septic® technology is an effective and practical innovation in the field of onsite wastewater treatment technology; it has provided a superior onsite wastewater treatment alternative which has greatly benefited the State of New Hampshire, its citizens and its environment. As a former regulator, I can attest to the fact that the availability of a smaller, less expensive, longer-lasting onsite wastewater treatment system has encouraged the replacement of failed or failing systems that jeopardize the soils, surface waters and ground waters in their vicinity.

Sincerely,

*William E. Evans*

William Evans, P.E.