

A comparative study on the treatment performance of a conventional septic tank system and reed bed-soil absorption system receiving domestic effluent

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ABSTRACT

In Ireland, the most prevalent domestic wastewater treatment application in unsewered areas is the conventional septic tank system comprising of septic tank and soil absorption system, the latter more commonly referred to as a percolation area in Ireland. Recent concern has been expressed over the discharge of on-site effluent to highly permeable soils which, although permitted in current Irish EPA guidelines, has generated debate as to whether an insufficient level of treatment in the subsoil’s vadose zone is being achieved. In situations where a septic tank installation is considered unsuitable according to a rigorous site assessment, a secondary treatment system such as a horizontal subsurface-flow reed bed can be installed to improve the effluent quality before discharge to the subsoil. On-site research was thus carried out to assess and compare the treatment capabilities of freely-draining subsoils receiving both septic tank and secondary effluents in tandem with a treatment assessment of a horizontal subsurface-flow reed bed. Results over an 18-month period have shown the HF reed bed to perform poorly with removal of only 52% of the organic load. An impressive 1.9 log-unit removal in *E. coli* was nevertheless achieved. The majority of nitrification is seen to occur in the first 0.35m of subsoil for all sets of percolation trenches and, while coupled with poor denitrification throughout the subsoil, has compromised groundwater quality in the form of nitrate infiltration. The research also shows that in general the septic tank effluent has received a comparable quality to the secondary effluent in terms of N-loading and *E. coli* occurrence by the time the point of potential discharge to groundwater is reached in the subsoil.

Keywords: On-site wastewater treatment (OWTS); Septic tank effluent (STE); Secondary effluent (SE); Percolation area; Freely draining; Horizontal subsurface flow (HF) reed bed

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