Advisory Note 4 - January 2017

Recommended Final Uses of Effluent based on the Type of Treatment

The local council is the regulator for the installation and operation of Sewage Management Facilities (SMF), such as septic tanks and aerated wastewater treatment systems, and their related land application systems and/or household reuse applications. The local council should have a local approvals policy or a strategy for household wastewater management in un-sewered areas to assist in delivering considered and consistent regulatory decisions.

However, before a council may grant approval to install certain types of Sewage Management Facilities (SMF) the SMF must firstly be accredited by the NSW Ministry of Health under the provisions of Clause 41 *Local Government (General) Regulation 2005*. NSW Health applies different final use accreditation criteria and conditions depending on the level of treatment and infection risk.

This Advisory Note 4 considers the public health aspects of single household wastewater management based on the level of treatment by SMF and recommends appropriate effluent applications. For environmental aspects the "Environment & Health Protection Guideline: On-site Sewage Management for Single Households" by the Office of Local Government should be consulted (see link to "Septic Safe"). The Australian /New Zealand Standard AS/NZS 1547:2012 “On-site Domestic Wastewater Management” should also be consulted.

All types of domestic waste water are potentially highly infectious and pollutant and therefore a health risk. Even after treatment and disinfection there is a health risk even though it is considered to be very low. The bacterial numbers in septic tank effluent, for example, are roughly ten times that found in raw sewage. Sewage treatment in septic tanks or greywater treatment tanks (known as primary treatment) merely reduces the solids content of the waste water and increases the bacterial numbers in the final effluent. Typical sewage has about 1 million E. coli bacteria per millilitre while septic tank effluent has about 10 million E. coli per millilitre.

Single domestic on-site wastewater systems receive wastewater from a maximum of 10 people (commonly 4 or 5 people) who are usually related. The wastewater undergoes some form of treatment and then must be reused within the confines of the premises. The diversity of micro-organisms and diseases which can be transmitted is relatively small in comparison to reticulated community effluent re-use schemes, generally being limited to one premises and contained with the exposure of the occupants. With community based reticulated effluent reuse schemes wastewater could be drawn from many thousands of people with a large variety and diversity of diseases and micro-organisms and be reused by many thousands of people. The propensity, risk and scale of disease transmission are therefore much larger and not limited to the confines of single premises.

In order to protect public health the barrier system is used to separate occupants from their wastewater usually by containing the effluent. That is, people, their pets or other objects to which the occupants and their visitors may be exposed must not come into contact with wastewater including greywater. Pipes, tanks, soil and exclusion zones are used as protective barriers. To relax some of these barriers the effluent should be treated to such an extent where the treated effluent may be applied to a designated land area as spray or drip irrigation; or treated greywater may even be re-used inside the house as washing machine water or for toilet flushing.

All wastewater, also known as effluent, must be treated to some extent. Treatment processes includes primary, secondary, advanced, nutrient reduction and disinfection.

Primary treatment is a process where the household effluent, sewage or greywater enters a large tank, usually a septic tank or greywater tank, and is kept under quiescent or calm conditions. Larger solids sink to the bottom of the tank, gradually decompose, accumulate and collectively are called sludge. The sludge often needs to be removed every few years. The floating materials such as grease float to the top

and are called scum and also decompose and accumulate. The settled effluent from the middle layer flows out of the tank and is disposed in sub-soil facilities such as in trenches, transpiration beds or mounds at a soil depth of greater than 300 mm because the effluent is offensive, highly odorous, infectious and very pollutant. Because primary treated greywater has less inherent health risk it may be applied to a sub-surface system within the root zone at no less than 100 mm below ground level. In general primary treatment is one of solids separation. There are other methods not discussed here.

Wastewater which has not received primary treatment will quickly clog subsoil systems of management causing a highly infectious and offensive surface discharge. This is a serious health risk and must be avoided.

Secondary treatment, which normally follows primary treatment, often uses some form of aeration, settlement and clarification to reduce the pollutant nature and microbial load but this is not enough to prevent the transmission of disease. The most commonly known secondary treatment SMF is the aerated wastewater treatment system, but there are other systems such as sand filters and reed beds.

Advanced secondary treatment is an even higher level of treatment further reducing the pollutant nature of the final treated effluent.

Nutrient reduction treatment is where a SMF is designed to reduce total nitrogen and total phosphorus and where testing has demonstrated the nutrient reduction capabilities. Local councils may require the use of SMF with nutrient reduction capabilities in environmentally sensitive areas.

Disinfection: Disinfection is the active destruction or removal of disease causing (pathogenic) micro-organisms. Disinfection efficiency is measured by the reduction of *E. coli* bacteria. Unfortunately there are pathogenic bacteria, viruses, parasites and other microbes which are resistant to disinfection. The absence of E. coli does not necessarily mean that the effluent is sterile or even fully disinfected. It is impossible to disinfect effluent which has not been treated at least to secondary standard.

When secondary treated effluent is disinfected the microbes are further reduced such that it is possible to reduce or remove the barriers of protection. Treated and disinfected effluent must not be used for drinking, ablution, car washing or topping up swimming pools.

When greywater is treated to a secondary treated and disinfected then this effluent may also be reused for toilet flushing and clothes washing.

Therefore, all effluent not treated to secondary standard and all un-disinfected (even if secondary treated) effluent must be managed using soil barrier techniques. However, where un-disinfected secondary treated effluent is utilised it is essential that the land application technique is health risk monitored by the local council and reported on by servicing personnel. This is because the occupier of the premises may unknowingly alter the land application system such that the occupants may be exposed to un-disinfected effluent which is still highly infectious.

The table on the following page will assist in determining the end use according to the SMF and treatment standard:

Table: Recommended Final Use of Treated Effluent based on Treatment

Treatment	Standard	Recommended Final Use / Application
Primary Treatment (sewage or greywater) e.g., septic tank, greywater tank, wet composting closet system, greywater diversion device	Solids separation and digestion– no effluent standard	Sub-soil at greater than 300mm depth below finished ground level e.g., absorption trenches, mounds, and evaporation-transpiration beds.
Secondary Treatment without Disinfection	• BOD < 20 mg/L • TSS < 30 mg/L • Service person performs compliance inspection and reports condition of land application system • Local council develops risk management monitoring strategy	• Sub-soil > 300mm depth • Sub-surface (300 mm to 150 mm) • * LPED • Shallow Sub-surface Drip Irrigation
Secondary Treatment with Disinfection	• BOD < 20 mg/L • TSS < 30 mg/L • *E. coli* <30 cfu/100mL	• Sub-soil > 300mm depth • Sub-surface (300 mm to 150 mm) • * LPED • ** Shallow sub-surface drip irrigation • Surface and spray irrigation (100 mm to above GL)
Advanced Secondary Treatment without Disinfection	• BOD < 10 mg/L • TSS < 10 mg/L • Service person performs compliance inspection and reports condition of land application system • Local council develops risk management monitoring strategy	• Sub-soil > 300mm depth • Sub-surface (300 mm to ground level (no spray) • * LPED • ** Shallow Sub-surface drip irrigation
Advanced Secondary Treatment with Disinfection	• BOD < 10 mg/L • TSS < 10 mg/L • *E. coli* <10 cfu / 100mL	• Sub-soil > 300mm depth • Sub-surface (300 mm to 150 mm) • * LPED • ** Shallow sub-surface drip irrigation • Surface and spray irrigation (100 mm to above GL) • Greywater may be used for toilet flushing and washing machines

* Low Pressure Effluent Distribution (LPED) Irrigation Lines if installed in accordance with AS/NZS 1547:2012 On-site domestic wastewater management; Appendix M

** Shallow sub-surface drip irrigation if installed in accordance with AS/NZS 1547:2012 On-site domestic wastewater management; Appendix M