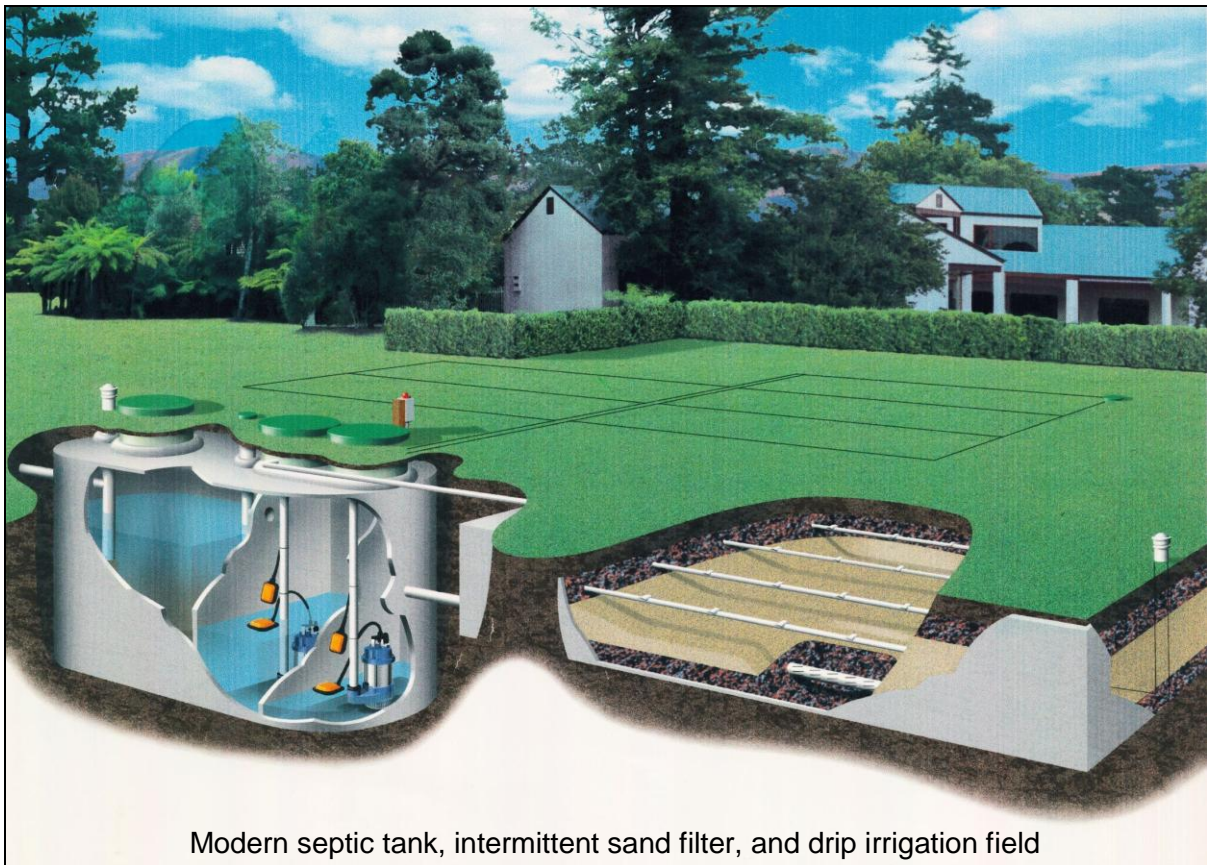


ON-SITE WASTEWATER SYSTEMS

Information Booklet For Homeowners



Modern septic tank, intermittent sand filter, and drip irrigation field

SELECTING A SYSTEM FOR YOUR PROPERTY

PRODUCED BY: SWANS-SIG
The Small Wastewater And Natural Systems Special Interest Group of Water
New Zealand

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SO, YOU ARE MOVING TO THE COUNTRYSIDE?

If you are moving to a property in a rural area or holiday resort, you may find there are no sewerage services. In such situations, dwellings have to be serviced by an “on-site domestic wastewater system” to treat all household wastewater flows from toilet, bathroom, kitchen and laundry.

WHEN DO I NEED AN ON-SITE SYSTEM?

Typical locations where on-site domestic wastewater systems are used to service properties and dwellings in unsewered areas include:

- Rural residential subdivisions
- Lifestyle blocks
- Coastal or lakeside holiday areas
- High country cabins/huts

If you are buying a property which already has a dwelling then you should ensure that the seller arranges for the existing on-site wastewater system to have a WOF (warrant of fitness) inspection before you complete your purchase. If you are modifying a dwelling or building a new one you will need to upgrade any existing on-site wastewater system or install a new system.

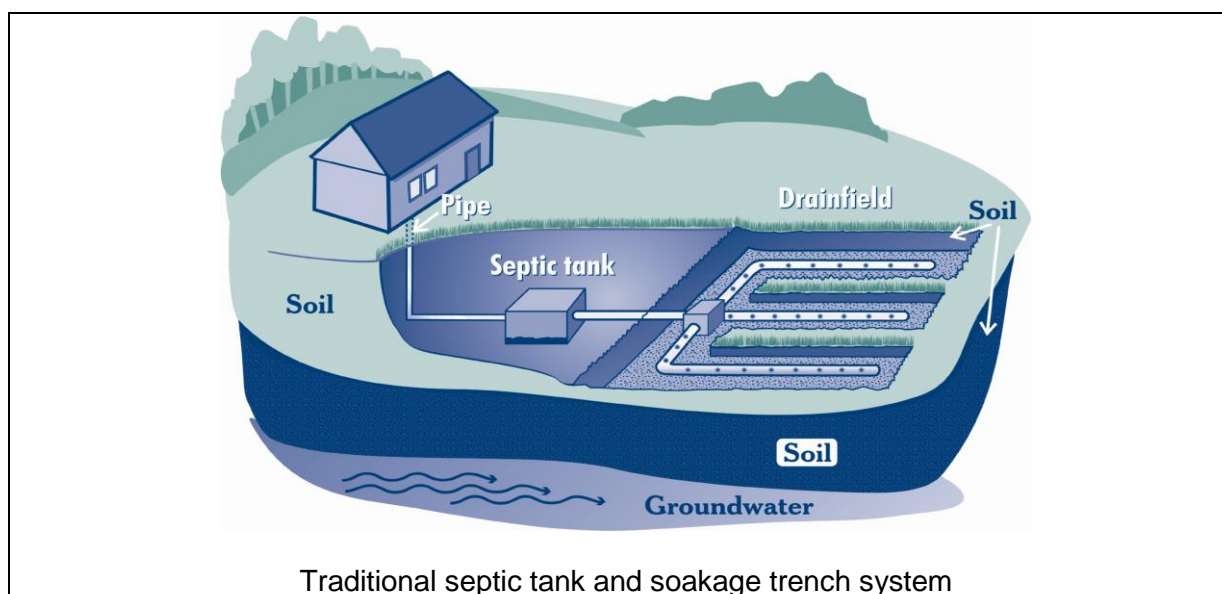
WHAT IS AN ON-SITE DOMESTIC WASTEWATER SYSTEM?

Any domestic wastewater treatment unit serving a residential dwelling or commercial building where the final effluent is discharged to a land-application area within the property boundary is known as an “on-site wastewater system”.

ON-SITE WASTEWATER SYSTEMS – TRADITIONAL APPROACHES

The most common systems used through to the 1970s were:

- Pit privies (outdoor toilets) and soakaways (for kitchen, bathroom and laundry wastes)
- Traditional septic tanks and soakage trenches or beds (for all household wastewaters).



Traditional septic tank and soakage trench systems worked well for large lots (1/4 acre or more), but had limitations in clay soils (poor soakage conditions) or gravelly soils (too rapid soakage resulting in pollution of wells). For small lot subdivisions, septic tank effluent resulted in groundwater contamination in some locations. Un-maintained septic tanks exacerbated these problems.

ON-SITE WASTEWATER SYSTEMS – MODERN APPROACHES

On-site wastewater treatment has made rapid progress in the last 20 to 30 years due to advances in design methods, manufacturing techniques, and materials for enhancing and supporting small-scale wastewater treatment processes. There is also a greater understanding of the role of soils and soil bacteria in adsorbing and treating waste nutrient material in on-site land-application areas. This has resulted in much wider choices in providing pre-treatment of domestic wastewaters and then subsequent discharge to a land treatment area on-site.

Typical Modern Pre-treatment Systems

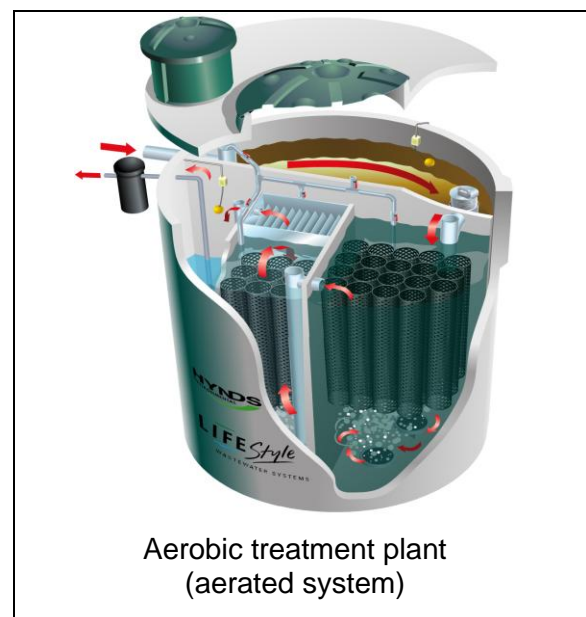
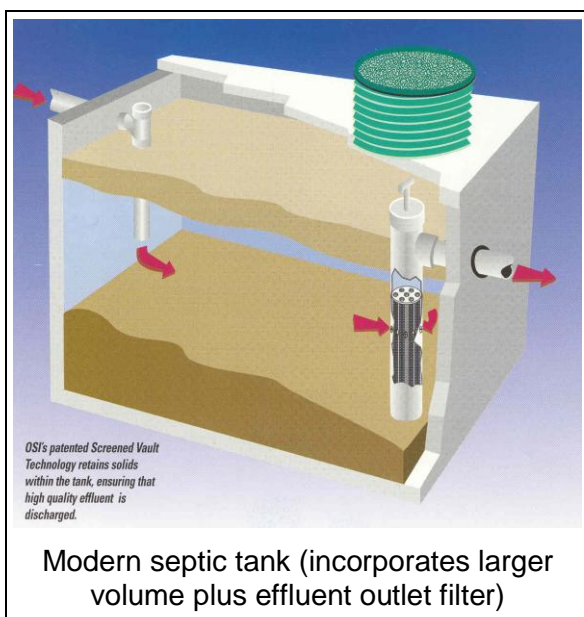
A “pre-treatment” system is the first stage in handling household wastewater flows before discharge to land. Modern non-flush toilet systems for dwellings without conventional water closets include:

- VIP toilets (ventilated improved pit)
- Composting toilets
- Dehydrating toilets

Non-flush toilet systems require a “greywater” septic tank and soakage system to handle kitchen, bathroom and laundry wastewaters.

Modern pre-treatment systems for full waterborne wastewater servicing (flush toilet “blackwater” plus kitchen, bathroom and laundry “greywater” flows) include:

- Modern septic tanks (larger tanks with special effluent outlet filters in place of an outlet tee)
- Modern septic tank and packed bed (sand or textile) filter systems
- Aerobic treatment plants (aerated systems and bio-filter systems)
- Aerobic treatment plant and membrane bioreactor (MBR) systems

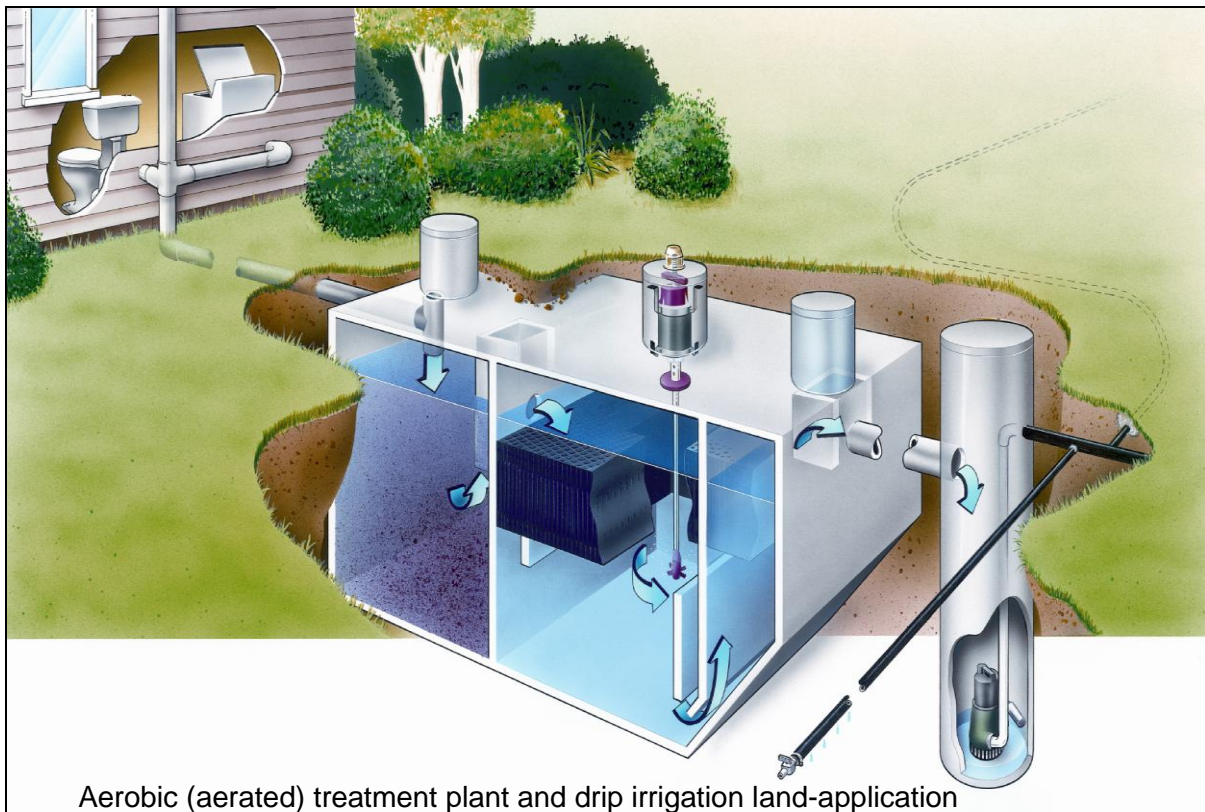


Typical Modern Land-application Systems

A range of soil treatment systems is now available in situations where trench systems are not suitable. These include:

- Dripline irrigation systems for spreading high quality effluent from aerobic treatment plants or from modern septic tank and packed bed (sand or textile) filter systems into landscaped grass or garden areas.
- LPED (low-pressure-effluent-distribution) irrigation of effluent from modern septic tank via pump or siphon dosing into well planted good topsoil areas.
- ETS beds (evapo-transpiration-seepage) using plants to assist in removing water by transpiration and thus reducing reliance on soil soakage.
- 'Wisconsin Mounds' for boggy areas or thin soils over rock or high groundwater.

ETS, LPED and Mounds use the soil to treat modern septic tank effluent in a far more effective way than traditional septic tank and trench systems. Dripline systems disperse high quality treated wastewater effluent into garden areas where advantage can be taken of the nutrient and water value to enhance landscaping.

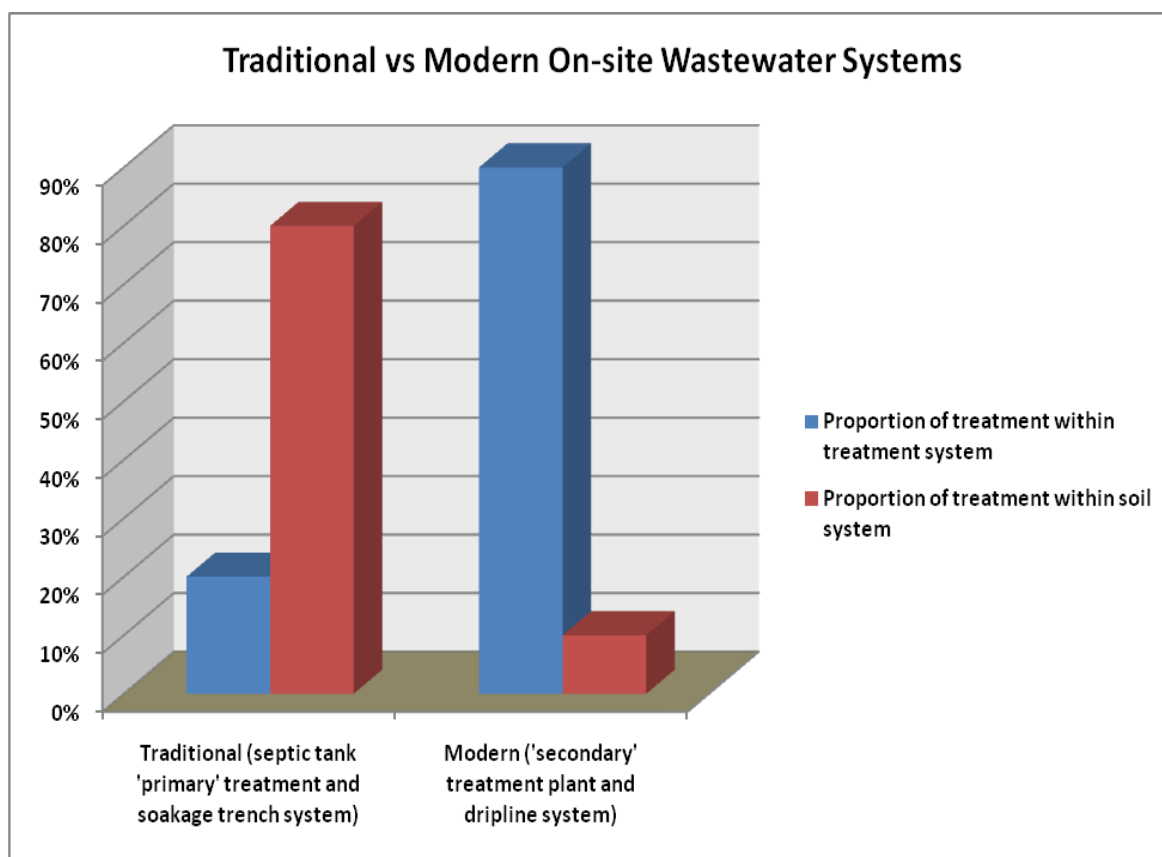


Aerobic (aerated) treatment plant and drip irrigation land-application

Modern Treatment versus Traditional Treatment

Traditional septic tank systems provide only 'primary' treatment and require ample topsoil and organic matter to enable bacteria to break down septic tank effluent and allow the water in the effluent to soak away effectively. The soil provides the majority of the treatment in a septic tank and soakage trench system. Poor soils can be a contributing factor to system failure.

The 'secondary' treatment process provided by modern treatment systems (aerated treatment or modern septic tank and packed bed filter systems) breaks down most of the waste matter and creates nutrients for plant growth. The soil is a less important part of the treatment process, but is still required to capture bacteria and viruses and enable them to die off with time.



Innovation and On-site Wastewater Servicing

New techniques and technologies for on-site wastewater servicing are constantly under development. In addition to the modern pre-treatment and land-application systems outlined above, there are a range of alternative technologies available. Examples include worm-based (vermiculture) pre-treatment units, hybrid toilet (non-flush) treatment tanks, and constructed wetland systems for individual household use.

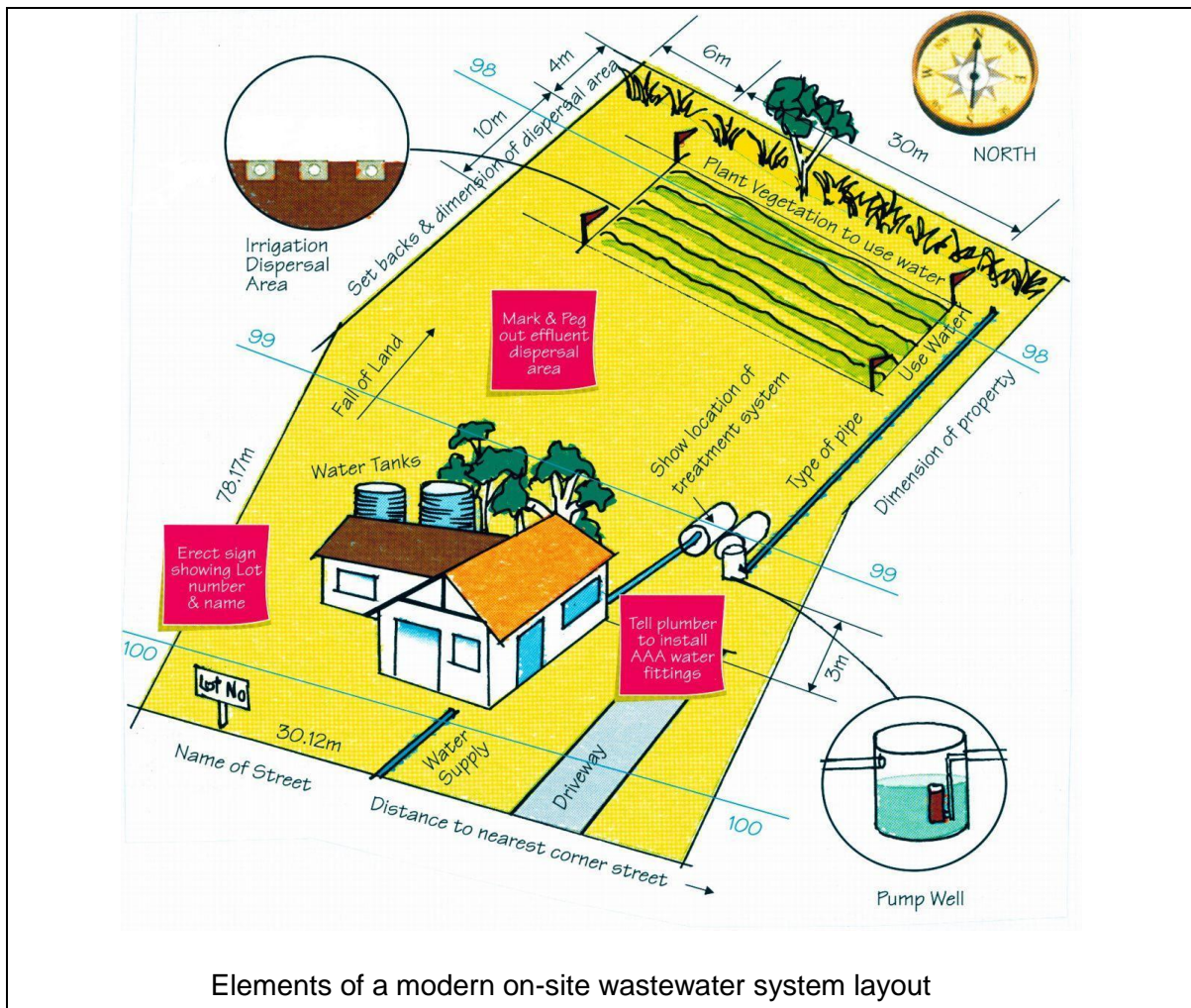
Which is the Best System?

Usually the most environmentally effective on-site wastewater system comprises either an aerobic treatment plant, or a modern septic tank and packed bed (sand or textile filter) treatment plant, both of which produce high quality effluent for use in supporting plant growth in landscaped areas via dripline irrigation. Aerobic treatment, packed bed and MBR units produce high quality reclaimed water which after disinfection may be acceptable for toilet flush recycling.

HOW DO I DECIDE WHICH SYSTEM IS MOST APPROPRIATE FOR MY PROPERTY?

You Need to Engage a Designer

A “designer” will arrange an investigation of your site, its soil conditions and natural drainage patterns, and then discuss with you where you would wish to locate your dwelling and other on-lot facilities. If you want to rely on using the soil as the main treatment medium, it is important that the best soils on the site are set aside for the modern septic tank and land-application system, together with a reserve area for extending the system. Check with your local Council as to “designers” operating in your locality.



Elements of a modern on-site wastewater system layout

The Benefits of Selecting a Treatment Plant and Dripline system

You may prefer to go for maximum environmental effectiveness and flexibility in locating a wastewater system on your property by using a modern pre-treatment plant and drip irrigation system. This simplifies the design process significantly, and allows your “designer” and architect or builder to work together to provide optimum locations for dwelling, treatment plant, and dripline landscaping. The high quality effluent provided by your pre-treatment plant enables you to recycle water for landscaping, and reduce the amount of drinking water supply you might have used for garden watering.

Applying for a Building Permit for Your On-site System

Your “designer” will also find out what your local District Council requirements are, and check if your Regional Council has set any special environmental requirements for on-site systems when installed in your locality.

Using an Alternative Technology System

If you decide to go with one of the alternative technology systems now available, check with your designer as to its suitability for your site. Make sure you ask about the system’s performance record, and if appropriate, ask the supplier or installer for a performance guarantee over the first three years of use.

WHO SHOULD I USE TO INSTALL MY SYSTEM?

The Installer

Once you or your “designer” have selected the system most suited to the soils on your property and which best meets your environmental objectives for siting your dwelling and landscaping layout, your “designer” will assist in choosing an installer experienced in the type of system proposed. Sometimes the “designer” also provides installation services as well as operation and maintenance services in a design-build-operate process.

What will a System Cost?

Costs vary around the country from area to area, and differ according to type of system to be installed, accessibility to the site, and distance from main supply locations. General cost ranges are:

- Traditional septic tank and trench systems \$6,000 to \$10,000
- Modern septic tank, LPED irrigation, ETS or Mounds \$7,000 to \$15,000
- Aerated treatment plant and driplines \$9,000 to \$12,000
- Modern septic tank, packed bed filter and driplines \$10,000 to \$15,000

Any system with mechanical equipment such as pumps and aerators will involve a running cost which includes power charges, and replacement parts from time to time as wear occurs and equipment ages. Generally aerated treatment units have higher power consumption than packed bed (sand or textile) filter systems.

WHAT TYPE of TREATMENT PLANT?

There are many manufacturers and installers providing proprietary treatment plants for pre-treatment prior to dripline irrigation. The main types of ‘secondary’ treatment plant include:

- Aerobic treatment systems (aerated treatment units; biological filter units; rotating disk or drum units; MBR units)
- Modern septic tank and packed bed filter systems (intermittent sand filters; recirculating sand filters; recirculating textile filters)
- Alternative treatment units (vermiculture units; wetland systems).

On-Site NewZ maintains a directory of domestic wastewater treatment plant manufacturers and/or suppliers in New Zealand. This can be downloaded from the Water New Zealand website at <http://waternz.org.nz/swans.html>.

SWANS-SIG (the Small Wastewater and Natural Systems Special Interest Group of Water New Zealand) initiated the setting up of a national testing facility in Rotorua in 2008 for such treatment units. The On-Site NewZ directory details those companies which have participated in the testing programme, and indicates which products (treatment units) have been tested. Environment Bay of Plenty provides details of testing results and power operating costs at www.envbop.govt.nz/Environment/Rotorua-Lakes-Catchment.aspx.

HOW DO I LOOK AFTER MY ON-SITE SYSTEM?

Keep within Your Loading Certificate

Your “designer” should have provided you with a Loading Certificate for your system. This will set out the design criteria and the limitations associated with use of the system and incorporate such matters as:

- (a) system capacity (number of persons and daily flow);
- (b) summary of design criteria;
- (c) the location of and use of the ‘reserve area’;

- (d) use of water efficient fittings, fixtures, or appliances;
- (e) allowable variation from design flows (peak loading events);
- (f) consequences of changes in loading (due to varying wastewater characteristics);
- (g) consequences of overloading the system;
- (h) consequences of underloading the system;
- (i) consequences of lack of operation, maintenance and monitoring attention; and
- (j) any other relevant considerations related to use of the system.

Operation, Maintenance and Performance Monitoring

You will need to check operation and maintenance requirements with your local Council to see if a Council managed scheme is in place for your locality. If not, you may have to do one of two things:

- **Either:** Manage operation and maintenance yourself. Your “designer” should have provided a set of Operation & Maintenance Guidelines appropriate to your system along with the Loading Certificate. These guidelines will include advice on what you should **NOT** be pouring down your drainage system.
- **Or:** Engage an on-site servicing specialist to undertake (for an annual fee) a regular WOF service and performance check. The WOF inspection report will advise when the septic tank or treatment plant compartments need de-sludging or pumpout, whether your land-application area needs attention, and how the overall system is performing.

All manufacturers and installers of treatment plants provide instruction manuals, and also will undertake routine servicing checks. Where a treatment plant is part of your system, your District or Regional Council will require you to enter into a “service contract” with the installer or with an experienced on-site wastewater servicing agency. A service contract provides at least a minimum of a six-monthly maintenance visit, cleaning any effluent filters, and inspecting the control systems. The contract will also provide for a callout service to deal with emergencies such as equipment failure or overload, and where required by the consent conditions, will carry out a periodic check of effluent quality.

Some developers of rural residential subdivisions are setting up “body corporate” structures to which all property owners are members. For an annual charge, your on-site system along with all your neighbours’ systems are fully maintained, and your wastewater service thus becomes just as “invisible” as your sewerage service when you lived in town.

Maintenance Guidelines for Homeowners

For further information on looking after your on-site wastewater system, see the SWANS-SIG booklet entitled “Maintenance Guidelines for Homeowners – Protecting your Health, your Environment, your Investment”, a companion publication to this information booklet, also available on the SWANS-SIG web-site.

Acknowledgements:

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