Code of practice – onsite wastewater management

Environment Protection Authority Victoria

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Guidelines for environmental management

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Chapter 1 — Overview of the Onsite Wastewater Framework

1.1 Purpose

This Code of Practice ("the Code") provides standards and guidance to ensure the management of onsite wastewater (up to 5000 L/day) protects public health and the environment, and uses our resources efficiently. It has been written to support the onsite wastewater industry, regulators and premise owners design, install and/or manage sustainable sanitation and re-use systems in accordance with the Environment Protection Act 1970 and the State environment protection policies Waters of Victoria (SEPP WoV) and Groundwaters of Victoria (GoV).

This Code applies to wastewater (containing sewage) generated by a single domestic household or by multi-dwelling residential, commercial, industrial or institutional facilities. It provides guidance on:

1. the selection, approval, management and maintenance of onsite wastewater management systems which treat up to 5,000 litres (L) of wastewater per day
2. systems which treat up to 5,000 L/day of greywater to a quality fit for toilet flushing and cold water supply to clothes washing machines and/or land application

   and
3. land capability assessment procedures and wastewater flow calculations for designing effluent recycling and disposal systems.

This Code is based on current State, national and international best practice principles in public health and environmental protection, wastewater treatment, land capability assessment and effluent minimisation, reuse, recycling and disposal.

This Code, EPA Publication 891.4, supersedes:

- EPA Publication 891.3: Code of Practice — Onsite wastewater management

EPA Publication 746.1 Land Capability Assessment is superseded by this Code together with the Victorian Land Capability Assessment (LCA) Framework (MAV et.al. 2014, as amended).

1.2 Legal status

This Code is the Victorian guideline for best practice management of onsite wastewater systems and associated land capability assessment. It is referred to in Clause 32 of the State Environment Protection Policy - Waters of Victoria (SEPP WoV 2003). SEPP WoV is subordinate legislation to the Environment Protection Act 1970 (“the Act”) and states that:

- occupiers of premises need to manage their onsite wastewater system in accordance with Council Permit conditions and this Code and
- Councils need to assess the suitability of land for onsite wastewater management and ensure that Permits are consistent with the guidance provided in this Code (as amended).

The Act sets out legal obligations for Councils and premise owners (53J-53O). Key obligations are:

- Council may only permit the installation of an onsite wastewater system that is a type approved by the EPA [53M(7)(a)].
- Council must refuse to issue a Permit if it considers that the site is unsuitable or the area available for the system is not sufficient [53M(6)].
- Council must refuse to issue a Permit for a treatment system (or systems) that does not treat all the sewage from the premises [53M(7)(c)].
- A person must not construct, install or alter an onsite wastewater system unless they have a Permit from Council to carry out the works (53L).
- A person must not use an onsite wastewater system until Council has inspected the system and issued a Certificate to Use. A penalty may be issued for non-compliance (53MB).
- The occupier of premises where an onsite wastewater system is installed must maintain it in accordance with the conditions in the Council Permit. A penalty may be issued for non-compliance (53N).

Where an onsite wastewater system has caused pollution, appropriate compliance and enforcement action must be undertaken by Councils in line with their powers and responsibilities under the Act.

The terms ‘must’ and ‘shall’ in this Code indicate established best practice, requirements under the Act or other legislation and regulatory requirements. The term ‘should’ refers to desirable or recommended procedures and methods.

More detail on the legal framework for onsite wastewater systems is provided in Section 1.7 and information on the roles and responsibilities of key stakeholders in Section 1.8 of this Code.

1.3 Audience

The target audience of this Code is the professionals in the onsite wastewater industry. It was developed in consultation with a diverse group of onsite wastewater professionals, including Council officers, wastewater consultants, developers, land capability assessors, land application designers, irrigation installers, plumbing and drainage practitioners, service technicians, Water Corporation staff, government agencies and wastewater treatment system manufacturers and suppliers. For the roles and responsibilities of the various stakeholders see Section 1.8.

1.4 Wastewater definitions

Onsite wastewater is divided into five categories:

- Blackwater - toilet waste (water flush, incineration, dry composting systems)
- Greywater – water from the shower, bath, basins, washing machine, laundry trough and kitchen (also called sullage)
- Sewage – wastewater which includes both greywater and blackwater.
- Yellow water – urine with or without flush water (i.e. from urine-diversion toilets) (see Appendix F)
- Brown water – sewage without urine (Otterpohl, 2002).

A glossary defining key terms is provided on page 60.

1.5 Scope

This Code applies to all types of onsite wastewater (sewerage) systems which treat up to a maximum peak daily flow (not average) of 5,000 L of toilet wastewater and/or greywater generated from domestic (including multi-dwellings) and/or commercial premises on a single land title in unsewered or sewered areas.

This Code includes guidance on:

1. wastewater treatment systems that may be permitted in new subdivisions and on single allotments or for upgrading or retrofitting existing premises
2. effluent recycling/disposal system options that may be permitted in new subdivisions and on single allotments or for upgrading or retrofitting existing onsite systems, including design requirements for land application systems
3. calculating the appropriate size of onsite systems

   and

4. the effective management of the systems.

In this context, commercial and multi-dwelling premises include, but are not limited to: schools, camping areas, food premises, wineries, government buildings, reception centres, housing complexes, conference centres, retail, business and public facilities which generate wastewater containing toilet water and/or greywater of human origin.

However, where a commercial premises, that is used intermittently, generates a peak load of more than 5,000 L/day, the wastewater may be stored in large balance tanks and piped to the onsite treatment system at a rate not exceeding 5,000 L/day. Onsite wastewater treatment systems and their associated effluent recycling systems are referred to as 'septic tank systems' in the Environment Protection Act, Part IXB, Clauses 53J-53O.

1.5.1 Exclusions

This Code does not include guidance for wastewater systems that treat more than 5,000 L/day, portable toilets, animal keeping premises or industrial wastewater that does not contain toilet wastewater or greywater of human origin. Refer to the EPA website for guidance on Works Approval applications for systems treating >5,000 L/day and to EPA Publication IWRG632: Industrial Waste Reuse Guidelines (2008) for industrial wastewater management.

This Code is not a design manual for onsite sewage treatment systems. The suitability of onsite treatment system designs is assessed and tested in accordance with Australian Standards by independent accredited bodies (see Section 1.7.4 of this Code.

1.5.2 Sewered and unsewered areas

This Code covers the requirements and procedures for site assessment, system selection, permitting, installation and sustainable management of onsite wastewater systems in unsewered and sewered areas. Greywater treatment systems, dry composting toilets and urine-diversion toilets may be installed and used in both sewered and unsewered areas.

The key differences between the guidance for sewered and unsewered areas are:

Sewered areas

- Land capability assessments are not required for irrigation systems in sewered areas because any water that is excess to plant requirements must be discharged to sewer.
- All-waste secondary treatment systems may only be installed in a sewered area where they are part of a sewerage system installed and managed by a Water Corporation, not by householders or premises owners (see Section 3.12.3).

- Water-based primary treatment systems (septic tanks and wet composting systems) are not permitted to be installed or used in sewered areas because the lower-quality primary treated effluent cannot be recycled. Therefore, the systems must be decommissioned when sewerage becomes available.
- The only onsite treatment systems permitted to be installed or used by premises owners in sewered areas are:
    - greywater treatment systems for single domestic households (see Table 2 for permitted uses)
    - greywater treatment systems for commercial and multi-dwellings establishments (see Table 2 for permitted uses)

      and
    - dry composting toilets (with all residual liquid discharged to sewer).

Unsewered areas

- Any current EPA-approved onsite wastewater treatment system (that is considered applicable by Council) may be installed in an unsewered area for:
    - a new development
    - upgrading an existing failed onsite system
    - converting an offsite discharge to an onsite treatment and recycling/dispersal system

      or
    - upgrading to a larger system where a premises is being extended to accommodate more people.

Installation is subject to Council issuing a Council Septic Tank Permit to Install/Alter.

1.6 Cumulative impacts

While this Code primarily refers to single allotments, the cumulative impact of all wastewaters within a subdivision, a commercial precinct or a township should be taken into account when assessing the capability of a lot to absorb treated effluent without negatively impacting its surroundings. This is particularly important in areas scheduled as open potable water supply catchments (DSE 2012).

To minimise the cumulative impact of wastewater, effluent must be contained onsite within the boundaries of the allotment. This aims to prevent the transport of nutrients, pathogens and other pollutants to surface waters and to prevent any negative impacts on 'groundwater beneficial uses' within the catchment (Clause 32, SEPP WoV 2003; SEPP GoV 1997).

For existing premises with an offsite discharge or a failing system on a small blocklot the wastewater management system should be upgraded to contain as much of the effluent as possible on the allotment (see Section 2.3.6). However, where an existing building on a small blocklot is intermittently used, such as community centre, a pump-out tank may be installed. Transporting the pump-out wastewater to a centralised sewerage plant will prevent further impact to the local environment as well as protect public health (see Section 2.3.7.

Note: a pump-out tank must not be permitted for a new, development, allotment or building.

1.7 Legal framework

1.7.1 Environment Protection Act 1970

An onsite wastewater management system is referred to as a 'septic tank system' in the Environment Protection Act 1970 (the Act). It includes both the onsite wastewater treatment system and the subsequent dispersal/recycling system, as well as the associated components (e.g. pipes, fittings, land area, etc.). This means both the treatment system and the dispersal/recycling system are defined by the legislation as a 'septic tank system'. However, the term 'septic tank', as commonly used in the water industry, only refers to a basic primary treatment tank which uses anaerobic microbes and physical settling processes to treat and clarify wastewater. Therefore, in any communication it is important to clearly distinguish which of the two meanings is intended.

The Act sets out a two-tier approval process for onsite wastewater treatment systems which treat up to 5,000 L/day:

- EPA defines and approves onsite wastewater management system *types.*
- EPA defines and approves system types in line with the classification structure adopted by the Australian Standards (1546.1 to 1546.4) for onsite sewage and greywater treatment systems which treat up to 5,000 L/day (see section 1.7.4). Council issues permits to property owners for the installation, use, maintenance and monitoring of site-specific treatment systems treating up to 5,000 L/day and the associated recycling/disposal systems:
    - A Septic Tank Permit to Install/Alter is issued once Council is satisfied an application nominating a preferred system meets the requirements of this Code and the relevant Australian Standard (certificate of conformity), a system type approved by EPA and any Council requirements.
    - A Septic Tank Certificate to Use is issued once Council is satisfied the treatment unit and recycling/disposal system have been installed in accordance with the Council Permit to Install/Alter and the manufacturer's installation manual.

Councils have the power under the Environment Protection Act (sections 53L, 53MA, 53MB, 53N, 59(3) and Schedule A) to:

- enforce compliance with:
    - Council Permit conditions

  and

- issue Penalty Infringement Notices to premises owners who:
    - use their onsite treatment system before being issued a Council Certificate to Use

      or

    - do not have their system regularly maintained by a professional service technician.

1.7.2 State environment protection policies

The Environment Protection Act provides for the formulation and adoption of State Environment Protection Policies (SEPPs) by the Victorian Government. SEPPs identify beneficial uses of the environment that need to be protected, environmental objectives appropriate to those uses, and plans and programs for achieving these objectives. SEPPs are statements of Government policy and bind State Government agencies, local government, the private sector and individuals.

This Code describes the steps that regulators and other stakeholders should follow to meet the requirements of the State Environment Protection Policies Waters of Victoria [SEPP (WoV)] and Groundwaters of Victoria [SEPP (GoV)] with regard to onsite wastewater management.

Clause 32 of SEPP (WoV) sets out the management controls for onsite wastewater and requires Councils to use this Code when assessing Septic Tank Permit and planning applications. SEPP WoV also requires householders to manage onsite wastewater systems in accordance with this Code.

SEPP WoV and SEPP GoV require that surface waters and groundwater are protected from nutrients, pathogens and other pollutants and that waste discharges do not harm the designated beneficial uses of groundwater and surface waters. Councils should therefore consider the cumulative effect of onsite wastewater treatment systems when assessing permit and planning applications and planning amendments to ensure that groundwater quality is protected and contamination is kept at least to background levels (see Section 1.6).

1.7.3 Planning legislation and policies

The key legislation relating to land development in Victoria is the Planning and Environment Act 1987 (the P&E Act). Paragraphs (c) and (d) of Section 4(2) of the P&E Act set out the Act's environmental objectives:

> '(c) to enable land use and development planning and policy to be easily integrated with environmental, social, economic, conservation and resource management policies at State, regional and municipal levels;
>
> (d) to ensure that the effects on the environment are considered and provide explicit consideration of social and economic effects when decisions are made about the use and development of land.'

The P&E Act requires each Council to ensure all land use and development occurs in accordance with the Planning Scheme for its municipal district. Each Planning Scheme refers to State policies for the environment and requires that any development not connected to reticulated sewerage be designed to ensure that wastewater can be contained on an individual allotment in accordance with this Code (SEPP WoV 2003). The ability of proposed developments to meet this requirement should be assessed at the rezoning, subdivision and development stages.

The P&E Act requires Councils to consider the following environmental issues and documents when assessing land development proposals in unsewered areas:

- 'any significant effects which the responsible authority considers the use or development may have on the environment or which the responsible authority considers the environment may have on the use or development' [s60(1)(iii)]
- 'any strategic plan, policy statement, code or guideline which has been adopted by a Minister, government department, public authority or municipal Council' [s60(b)(ii)].

Under Clause 65.02 of the Victorian Planning Provisions, Councils are responsible for issuing Planning Permits with a requirement that reticulated sewerage is provided at the time of subdivision where allotments are not capable of containing wastewater within their property boundaries. A land capability assessment addressing onsite wastewater management should be conducted as early as possible in the planning phase. All stakeholders should be aware that, as development densities increase, there may be a risk to the environment and beneficial uses from cumulative detrimental effects. There must be no surface flow or seepage of effluent (out of the ground) from an allotment on to adjoining properties.

When assessing planning applications for unsewered sub-divisions or other developments, or when preparing amendments to planning schemes to allow rural residential type or low-density development, Councils must consider (where applicable) Department of Sustainability and Environment Guidelines Planning permit applications in open, potable water supply catchment areas (November 2012) (as amended). Where there are concerns a proposed subdivision, development or rezoning may cause environmental degradation or negative impacts on beneficial uses, or that certain parts of an assessment report raise unresolved questions, it may be necessary for Council to seek advice from the relevant Water Corporation (if sewer is nearby) or for the proponent to engage the same or a different consultant to provide more detailed land capability information.

1.7.4 Australian Standards

Onsite wastewater treatment systems and associated recycling/disposal systems should be designed, accredited and managed in accordance with the following relevant Australian Standards. For onsite wastewater stakeholders the most recent version of the following Standards are considered 'tools of the trade' or recommended reading. Standards No. 1 to 5 below are required by onsite wastewater treatment system manufacturers. Most plumbers may require Standards No. 6 to 8, while other professional onsite wastewater stakeholders will only need to refer to the eighth Standard:

1. Australian Standard AS/NZS 1546.1: On-site domestic wastewater treatment units — Part 1: Septic Tanks
2. Australian Standard AS/NZS 1546.2: On-site domestic wastewater treatment units — Part 2: Waterless composting toilets.
3. Australian Standard AS/NZS 1546.3: On-site domestic wastewater treatment units — Part 3: Aerated wastewater treatment systems.
4. Australian Standard AS/NZS 1546.4 – Greywater Treatment Systems (noting that this standard is yet to be ratified)
5. Australian Standard AS/NZS 4130: Polyethylene (PE) pipes for pressure applications.
6. Australian Standard AS/NZS 1319: Safety signs for the occupational environment.
7. Australian Standard AS/NZS 3500 [set]: Plumbing and Drainage.
8. Australian Standard AS/NZS 1547: On-site domestic-wastewater management.

If there is an inconsistency between an Australian Standard and this Code, this Code takes precedence. Where this Code does not cover a topic, the relevant Australian Standard should be followed. Until such time as the Australian Standard for greywater treatment systems is published, greywater treatment systems are required to have a current certificate of conformity with the most recent version of the NSW Health Accreditation Guidelines for Greywater Treatment Systems.

1.8 Roles and responsibilities

The following stakeholders have key roles and responsibilities in the sustainable management of onsite wastewater systems:

- EPA Victoria
- Councils (Local Government)
- Land capability assessors
- Water Corporations
- Department of Health and Human Services
- Victorian Building Authority (formerly the Plumbing Industry Commission)
- Plumbing and drainage practitioners
- Building surveyors
- Onsite treatment system manufacturers, importers and suppliers
- Onsite treatment system installers
- Service technicians
- Property owners.

1.8.1 EPA Victoria

EPA administers the EP Act, SEPP GoV and SEPP WoV and is responsible for:

- producing guidance documents for:
  - onsite wastewater management
- providing advice on and interpretation of the guidance
- providing information on approval requirements for wastewater treatment system types to be installed in Victoria
- keeping a web-based list of systems which have a certificate of conformity issued by Conformity Assessment Body (CAB)in accordance with the relevant Australian Standard. (see www.epa.vic.gov.au/your-environment/water/onsite-wastewater)

1.8.2 Local government

Council is responsible for:

- issuing planning permits with a requirement that reticulated sewerage is provided at the time of sub-division where wastewater cannot be contained within the boundaries of every allotment
- assessing land development applications to determine the suitability of a site for an onsite wastewater management system

- assessing onsite wastewater management permit applications
- issuing Permits to Install/Alter and Certificates to Use onsite wastewater management systems
- refusing to issue a Planning Permit or Septic Tank Permit for a proposed development where Council considers wastewater cannot be contained within the boundaries of the site and reticulated sewerage is not available or will not be provided at the time of sub-division
- ensuring systems are installed in accordance with the conditions on any Planning or Septic Tank Permit issued for a site and the relevant Australian Standard
- ensuring systems are managed in accordance with the Septic Tank Permit, this Code, the Public Health and Wellbeing Act (2007) and, where applicable, the most recent version of AS/NZS1547 through relevant compliance and enforcement programs

  and
- developing Domestic Wastewater Management Plans (see Section 1.8.2.1).

Council assesses applications for Permits to Install or Alter and operate onsite wastewater management systems under the Act (s. 53J-O). Permits are issued with conditions. Council must refuse to issue a permit if:

- the proposed onsite wastewater treatment system and associated disposal/recycling system is contrary to any State Environment Protection Policy
- the application and/or land capability assessment report does not satisfy Council that wastewater cannot be sustainably managed on that site

  or
- the proposed onsite wastewater treatment system does not hold a current certificate of conformity with the relevant Australian Standard or standard specified in this Code (see section 1.7.4).Systems that hold a current certificate of conformity are listed online at www.epa.vic.gov.au/your-environment/water/onsite-wastewater.

Council must ensure that the proposed disposal/recycling system is assessed against and complies with this Code, holds a current certificate of conformity against the relevant Australian Standard or standard specifiedin this Code, and any land capability assessment for the site and/or catchment that has been conducted to Council's satisfaction. If no relevant State regulation exists that addresses a specific issue, the most recent version of AS/NZS1547: On-site domestic wastewater management must be followed. Once systems are installed and operating, Council must assess the service reports submitted by the service technicians to ensure that inspections, maintenance and the effluent quality testing results (if applicable) of each installed system is in accordance with the relevant Council Permit.

This Code cannot anticipate every potential environmental impact that may be associated with a development using onsite wastewater management systems. Council therefore needs to have a high degree of confidence and certainty about the investigation and conclusions made by land capability assessors (see Sections 1.8.3 and 4.4.3).

1.8.2.1 Domestic Wastewater Management Plans

Councils need to develop municipal Domestic Wastewater Management Plans (DWMP) in accordance with SEPP WoV, Clause 32(2)(e) to meet their responsibility of regulating onsite wastewater management. A DWMP is a planning and management document that provides a mechanism for the development, implementation and review of programs to protect public health, the environment and local amenity. The DWMP should articulate Council's policy on and commitment to sustainable ongoing wastewater management and their programs for compliance and enforcement. It should be developed in conjunction with Water Corporations and the local community.

A DWMP should establish processes to ensure early and comprehensive consideration of wastewater management in the planning cycle and Council's responsibility for the monitoring and compliance of the systems. The Municipal Association of Victoria (MAV) and EPA have developed a model DWMP based on trials conducted by a number of Councils across Victoria, representing urban fringe, provincial city and remote rural municipalities. The model plan, available from the MAV (www.mav.asn.au), assesses key issues including costs, impacts and barriers confronted when developing a Domestic Wastewater Management Plan.

1.8.3 Land capability assessors

Developers or individual landowners (not EPA or Councils) are responsible for engaging a suitably qualified soil science professional to undertake an assessment of the capability of the site, land and development proposal (a land capability assessment) to sustainably contain and manage wastewater on their property. The assessment must be sufficiently rigorous and provide sufficient information to allow Council to be fully informed when assessing the report and considering issuing a Permit for the development (see Sections 3.3 to 3.10). The assessment of a particular site must be more than an audit of the provisions and recommendations set out in this Code. It must demonstrate, to Council's satisfaction, the suitability or otherwise of the site and include all the technical data gathered by the assessor.

Land capability assessors may need to provide Councils with verification of the following requirements:

Qualifications

The assessor must have suitable professional training and experience. Personnel undertaking or supervising data gathering and assessment should have a relevant and acceptable tertiary-level scientific qualification from a reputable training institution in a discipline such as civil or geotechnical engineering, soil science, agricultural science, environmental science, chemistry or physical geography. The qualifications should include specific knowledge of soil, soil hydrological and soil chemical processes.

Experience

Knowledge of similar work having been undertaken or references from Councils and other bodies may allow Council officers, developers or individual landholders to judge the competency and capacity of individuals and organisations to carry out land assessments.

Professional membership

The assessor should be an accredited member of an appropriate professional body. In some instances, professional bodies will certify the competence of members to undertake particular works.

Professional indemnity

Individuals should hold relevant indemnity insurance to a level that will offer protection to Council if problems arise in the future due to inadequate assessment. Land assessors should not undertake assessments in areas where they do not hold insurance. Council may wish to verify the status of the policy with the insurance underwriter or actually see the relevant parts of the indemnity policy.

Independence

Assessors need to fully appreciate the consequences of their advice over the long term and follow professional Code of Ethics and Rules of Conduct. Engineers Australia advise their members that 'Consultants should place their responsibility for the welfare, health and safety of the community and environment before their responsibility to sectional or private interests' (Engineers Australia 2010). Assessors need to satisfy themselves that their recommended type of effluent recycling/disposal system and associated management program are the most appropriate in the circumstances and are suited to the proponent. It is recommended that land capability assessors familiarise themselves with the expectations of individual Councils through consultation with the relevant staff before conducting a land capability assessment.

1.8.4 Building surveyors

Building Permits are issued by registered building surveyors in accordance with the Building Regulations 2006 (as amended). Where an unsewered allotment requires the installation of an onsite wastewater management system and/or the erection or alteration of a building with an existing onsite system, building surveyors must obtain a 'Report and Consent' from the relevant Council before issuing a Building Permit [Building Regulations 801 (1)(2)].

A Report and Consent or a Septic Tank Certificate to Use is required from Council before a building surveyor issues a Certificate of Occupancy or a Certificate of Final Inspection [Building Regulations 1003 (2)(3), Planning Minister's Guideline 97/02].

These requirements ensure that:

- a Building Permit is only issued for an unsewered property where suitable wastewater management arrangements have been made and
- a Certificate of Occupancy or a Certificate of Final Inspection is issued only when Council has issued a Certificate to Use the onsite wastewater management system.

1.8.5 Onsite wastewater management system installers

Onsite wastewater treatment tanks can be installed on or in the ground by any suitable competent professional contractor.

However, the pipework from the premises to the treatment tank the treatment tank to the land application system, and the pipework for indoor effluent recycling and for the land application systems must be installed in compliance with the requirements of the Victorian Plumbing Regulations by appropriately licensed and registered plumbing/drainage practitioners.

Before installing and commissioning an onsite treatment system anywhere in Victoria (including on government land), the installer must ensure that the relevant Council has issued a Planning Permit (if required) and/or Septic Tank Permit to Install/Alter. The installer(s) must ensure the pipework from the house to the onsite wastewater management system, the treatment tank(s), any indoor effluent recycling system, the pipework to the land application system and the effluent disposal/recycling system complies with the following (where applicable):

- the most recent version of the Victorian Plumbing Regulations
- the manufacturer's specifications
- this Code
- Council Septic Tank Permit to Install/Alter conditions and the site land capability assessment recommendations
- AS/NZS 1547 (construction, installation and commissioning requirements)
- AS/NZS 1546.1, 1546.2, 1546.3 and 1546.4 (as amended) (see Section 1.7.4).

On completion of the installation, testing and commissioning of the treatment system, the licensed and registered plumbing/drainage practitioner(s) must issue and lodge up to three Plumbing Compliance Certificates with the Victorian Building Authority. The number of certificates issued depends on the number of plumbing/drainage practitioners doing the work. The three areas of work which require a Plumbing Compliance Certificate are:

1. the internal plumbing for effluent recycling using purple pipes and back-flow prevention devices
2. the plumbing from the treatment system to the house

and

3. the plumbing from the treatment tanks to the land application system and the installation of the land application (i.e. effluent recycling or disposal) system.

The installer must also provide a number of documents to Council and/or the property owner/occupier including, but not limited to:

- a commissioning report in accordance with AS/NZS 1547 Part 6 (as amended)
- a 'work-as-built' plan and report of the plumbing, treatment and/or land application systems in relation to the house, driveway and allotment boundaries etc., in accordance with AS/NZS 1547 (as amended)
- statement of service life and warranty of parts
- manufacturer or distributor's warranty that the treatment system installed for a commercial or community premises is appropriate for the intended use
- owner's manual
- maintenance/service manual including a service report template
- a copy of the Plumbing Compliance Certificate.

Land disposal systems (e.g. soil absorption trenches) and land recycling systems (e.g. sub-surface and surface irrigation) must be designed in accordance with this Code and the most recent version of AS/NZS1547: On-site domestic wastewater management. Indoor recycling systems (i.e. for toilet flushing and cold water supply to clothes washing machines) must be designed and installed in accordance with the most recent version of the Victorian Plumbing Regulations and AS/NZS 3500 (set): Plumbing and Drainage.

1.8.6 Service technicians

Council Septic Tank Permits state the frequency of maintenance that is required for each treatment system, as well as the reporting requirements to Council. Professional service technicians must be suitably trained in the installation, operation and service requirements of the system. Service technicians should be accredited in writing by the system manufacturer or authorised distributor. The prescribed servicing must occur at the frequency nominated in the Council Permit to maintain system performance. The service technician must complete a service report detailing the operating condition of the system, the maintenance that was performed, the percentage of scum and sludge in the primary settlement tank (as required) and any remedial work the owner has not been willing to authorise. A copy of the maintenance report must be forwarded to Council and the property owner after each service.

Property owners or occupiers must not service their own treatment system, unless they:

1. are a registered (or retired) plumbing practitioner or wastewater engineer

   and

2. have been trained and certified as competent by the manufacturer or distributor of their specific treatment system

   and

3. have shown written evidence of their qualifications and certification to Council and satisfied Council of points 1 and 2.

1.8.7 Property owners and occupiers

Before installing an onsite wastewater management system (treatment unit and land application and/or indoor recycling), a property owner must obtain the relevant application forms from their Council, arrange for a site assessment to be completed by a suitably qualified consultant (see Section 1.8.3) and apply to Council for a Planning Permit (where required) and Permit to Install the treatment and disposal/recycling system. Applications for Council Permits must contain sufficient information to enable Council to properly assess the application. The application must prove to the satisfaction of Council that the proposed system will meet design, installation, performance and maintenance requirements for the proposed wastewater flow, site and soil characteristics and the land available for wastewater disposal/irrigation.

Before making any alterations to a wastewater system, the property owner must apply for a Permit to Alter their existing system. The property owner must also contact Council before undertaking any house alterations, as a new Permit may be required for an extension to a house. Property owners should satisfy themselves that contractors and consultants are qualified to undertake works on their property.

Council has up to 42 days to assess an application and issue a Permit. However, if the application is considered deficient, Council may suspend the time period ('stop the clock') and require the property owner to provide further information. The Permit to Install/Alter will include conditions to ensure the system is installed, managed and operated in accordance with this Code, the LCA and the relevant Australian Standards. If Council refuses to issue a permit, the system must not be installed. Under Clause 53L and Schedule A of the Act Council may issue a Penalty Infringement Notice if the system is installed without a Permit.

After inspecting the installation, Council will issue a Certificate to Use if the installation is in accordance with the conditions in the Permit to Install/Alter, the manufacturer's installation instructions and this Code. It is an offence under the Act to commission and use a treatment system before a Certificate to Use is issued. This may result in Council issuing a Penalty Infringement Notice (PIN) to the landowner or occupier under section 53MB and Schedule A of the Act.

Property owners or occupiers must ensure the onsite wastewater management system is operated, maintained and monitored in accordance with the Council Permit requirements. A Council Permit may require a property owner to pay for regular sampling of treated wastewater to demonstrate system compliance, unless a remote monitoring system transmits relevant data to the service technician and regulatory authority (i.e. Council and/or Water Corporation). If a person other than the property owner will be using the system, the property owner must ensure the person is aware of any responsibilities they have in relation to the system, especially the mandatory requirement for ongoing regular servicing of secondary treatment systems. A person who fails to comply with permit conditions could be subject to Council enforcement action and penalties under sections 53MA and/or 53N of the Act. Property owners may need to review their household public liability insurance policy to ensure the onsite wastewater management system is included. Anyone who becomes responsible for the operation and maintenance of an onsite system (such as new property owners) must make themselves aware of the responsibilities they are acquiring. Therefore, they must familiarise themselves with the type of system in place, the system's location, its performance, the potential relevance of existing garden plants (in regard to evapo-transpiration) and the ongoing management program required by the Council Permit. Specific conditions regarding each system can be obtained from Council.

Householders should check the stated service life of their prospective onsite wastewater treatment system and anticipate replacing it with a new system at that time. Onsite systems must have a manufacturer's statement of service life of at least 15 years, though individual parts will generally have a warranty of 1 to 5 years. It is recommended that householders research and compare the likely cost of spare parts throughout the expected life of the onsite wastewater treatment systems they are interested in purchasing (see Appendix C). Where the system is not working satisfactorily at the end of its service life, the treatment plant should be repaired. Where the treatment system is not able to achieve secondary standard effluent after servicing, desludging and the replacement of parts, it may need to be decommissioned and replaced with a new approved treatment system.

Note: Under Schedule A of the Environment Protection Act the penalties for infringement of sections 53L, 53MA, 53MB and 53N are 10 penalty units for body corporates and 5 penalty units for all other premises.

1.8.8 Water Corporations

Water Corporations (also called Water Businesses) have a major interest in the correct functioning of onsite systems under the Water Act 1989 (as amended), the Water Industry Act 1994 (as amended) (for Melbourne metropolitan water retailers), the Planning and Environment Act 1987 and the Catchment and Land Protection Act 1994. The key area of concern is failing onsite systems which may:

1. impact water quality in waterways, channels and reservoirs especially in Special Water Supply Catchments (This may result in increased health risks to customers and increased operational costs to manage the problems associated with additional treatment of that water.)
2. lead to providing reticulated sewerage and enforcing connection to the sewer mains within the sewerage district. (This involves major works and a significant capital cost that is ultimately passed on to the community.)

Section 65 of the Water Industry Act gives the Melbourne metropolitan retail water companies the power to require a property to connect to sewer. Regional Water Corporations have the same power under section 147 of the Water Act.

Due to their responsibilities to a range of beneficial users, Water Corporations in rural and regional Victoria are Referral Authorities for Planning Permit applications within their areas of operation. The referral powers are set out in section 55 of the Planning and Environment Act and permit a Referral Authority to:

1. object to the proposal, in which case the responsible planning authority must refuse to issue a Permit

   or

2. consent with conditions, in which case the planning authority must include these conditions on any permit, if granted.

Under section 52 of the Planning and Environment Act, Water Corporations have the option to comment on or object to any development application in their area of operation, even where they are not a Referral Authority. Under the Water Act, Water Corporations with a sewerage district may also comment on Septic Tanks Permit applications and undertake enforcement action.

The Water Corporation's role is to assess all applications referred to it by Council (or which it becomes aware of) and respond to Council with the reasons for any objection and/or provide the exact wording of any condition it requires to be placed on the Planning Permit. In unsewered areas, especially in Special Water Supply Catchments, the Water Corporation may formally object where it considers onsite sewerage systems cannot be installed in compliance with the requirements of this Code, may fail due to poor land capability, require an unreasonable high level of management or where the density of development poses a high risk to ground and/or surface waters.

Water Corporations also have responsibilities under SEPP WoV, Clause 32(e) to support Councils in developing and implementing Domestic Wastewater Management Plans.

1.9 Onsite wastewater treatment system approval processes

The approval process for onsite wastewater treatment systems is two tiered:

1. Manufacturers/importers of onsite wastewater treatment systems must obtain a current certificate of conformity against the relevant Australian Standard or standard specified in the code from a Conformity Assessment Body. A list of systems with a current certificate of conformity and system types approved for use in Victoria can be found on the EPA website. www.epa.vic.gov.au/for-community/environmental-information/water/about-wastewater/onsite-wastewater-systems.
2. Premises owners must obtain a Council Septic Tank Permit to Install/Alter before installation of the treatment system and the indoor recycling and/or land application system. Following inspection of the installation of both the treatment system and the recycling/land application system, the Council Delegated Officer (CDO) will issue a Certificate to Use when they are satisfied that the systems have been installed and commissioned correctly.

> Note: Not all EPA-approved treatment system types are applicable for every site. It is important that the most appropriate type is selected to suit the characteristics of the site, the climatic conditions, the needs of the householders and the neighbouring land uses. The use of the system must comply with this Code, the conditions of the Council Permits, AS/NZS 1547, Council rules and the objectives of SEPP WoV and SEPP GoV.

1.9.1 Manufacturers' Approval process

Manufacturers and importers of onsite wastewater treatment systems who wish to sell and install their individual treatment system brands and models in Victoria, must have each system certified as conforming to the relevant Australian Standard (listed below) by a JAS – ANZ accredited Conformity Assessment Body (CAB). Manufacturers and importers of onsite wastewater treatment systems will need to provide EPA with a copy of current certificates of conformity, to demonstrate that the relevant standards have been certified against.

1. Australian Standard AS/NZS 1546.1: On-site domestic wastewater treatment units - Septic Tanks
2. Australian Standard AS/NZS 1546.2: On-site domestic wastewater treatment units — Waterless composting toilets.
3. Australian Standard AS/NZS 1546.3: On-site domestic wastewater treatment units — Aerated wastewater treatment systems.

4. Australian Standard AS/NZS 1546.4 – Greywater Treatment Systems (noting that this standard is yet to be ratified)

EPA will collate and publish a list of individual treatment system brands and models that hold current certificates of conformity. The list can be found on EPA website. www.epa.vic.gov.au/your-environment/water/onsite-wastewater.

Greywater Treatment Systems - Until an Australian Standard for greywater treatment systems is published and accepted by EPA (AS 1546.4), greywater treatment systems are required to have a current certificate of conformity with the most recent version of the NSW Health Accreditation Guidelines for Greywater Treatment Systems.

Vermiculture systems - Vermiculture systems are required to have a current certificate of conformity certified against AS 1546.1

Reed bed treatment systems - Reed bed treatment systems are required to have a current certificate of conformity certified against AS 1546.3

Sand filter - For premise owners who wish to install a sand filter treatment system, they must submit to Council, as part of their application to obtain a Council Septic Tank Permit to Install/Alter, detailed system design specifications that demonstrate compliance with the relevant specifications in Appendix G Sand filters. Council will then assess the system design specifications for compliance as part of the Council Septic Tank Permit to Install/Alter process.

1.9.2 Property owners' Permit process

The first step for the land owner is to contact their local Council and determine whether a Planning Permit is required or if planning controls apply. Where a Planning Permit is required or the planning controls require the owner to demonstrate that wastewater can be treated and retained onsite, the owner should obtain an application form for a Planning Permit and for a Septic Tank Permit (see Appendix B) and discuss any requirements and expectations with the relevant Council officer(s), including the requirement for a land capability assessment.

The landowner may need to engage a wastewater consultant and/or a land capability assessor in an unsewered area, or an irrigation designer and/or a plumber in a sewered area, to assist in the process of gathering and supplying Council with all the required information to apply for a Septic Tank Permit to Install/Alter (see Sections 1.8.2, 1.8.3, 1.8.7 and 3.1). Property owners and consultants can review the list of EPA-approved onsite wastewater treatment system *types* with a current certificate of conformity against the relevant Australian Standard or standard specified in this code are listed on the EPA website: www.epa.vic.gov.au/for-community/environmental-information/water/about-wastewater/onsite-wastewater-systems. To aid in the investigation and selection of onsite treatment systems, the list of systems is categorised under the headings of:

- 'Greywater Treatment Systems',
- 'Wastewater Secondary Commercial Treatment Systems'
- 'Wastewater Secondary Domestic Treatment Systems' and
- 'Wastewater Primary Treatment Systems'.

When Council is satisfied that the specified treatment and land application systems are suitable for the property, Council will issue a Septic Tank Permit to Install/Alter. After inspecting the installed (but not buried) systems, where Council is satisfied the installations are in accordance with this Code and the manufacturer's installation manual, Council will issue the property owner with a Septic Tank Certificate to Use.

Chapter 2 — Introduction to Onsite Wastewater Management

2.1 Sewage management options

In sewered areas, sewage is generated by toilets, bathrooms, kitchens and laundries and piped away to a centralised treatment plant, usually managed by the local Water Corporation. Stormwater is not part of the sewerage system in Australia, as it has a separate network of pipes. Stormwater must be directed away from effluent dispersal areas, usually via stormwater cut-off drains. In unsewered areas, it is the responsibility of the landholder to provide an onsite sewage treatment and disposal/recycling solution which can contain all the wastewater the household generates within the perimeter of the allotment. In Victoria, all newly installed onsite wastewater treatment systems must have a current certificate of conformity against the relevant Australian Standard or standard specified in this code at the time Council approves the householder's 'Septic Tank Permit to Install/Alter' (see EPA website for the current list of systems with a certificate of conformity).

2.1.1 Unsewered areas

When applying for a Planning Permit and/or a Septic Tank Permit to Install/Alter an onsite wastewater management system for a new building in an unsewered area, the property owner must propose a treatment system(s) and recycling/disposal system for all of the premise's wastewater which will prevent the treated effluent from flowing or seeping onto adjoining properties. The wastewater system may treat all wastewater streams in one treatment plant or have two separate systems for toilet water and greywater, or three systems for toilet, kitchen and greywater (see Tables 1 and 2). It is not permissible to install a treatment system for only the toilet wastewater and divert the raw greywater to land or the stormwater drain.

The treatment and recycling/dispersal system must be designed and managed to prevent any effluent flowing onto neighbouring properties, to prevent the transport of nutrients, pathogens and other contaminants to surface and groundwaters and to avoid any negative impacts on the beneficial uses of surface and groundwater. It is not possible or desirable to prevent all water from seeping into the watertable, but the wastewater contaminants must either be retained and utilised in the soil (preferably the topsoil) or reduced to a level that is less than the background level in the groundwater. Water seeping into the ground and the watertable provides the benefits of increased soil moisture available for plants and increased water flowing into the base of streams through groundwater recharge.

2.1.2 Sewered areas

In Victoria and other States, failing onsite wastewater management systems have jeopardised the health of householders, communities and the environment. As property owners in sewered areas already have a complete sewerage solution via the centralised sewerage system, the motivation to install an onsite sewerage system is to utilise the resources in the wastewater – the water, the nutrients and/or the organic matter. Therefore, to protect public health and the environment in areas which have an existing reticulated sewerage system, it is considered prudent to only allow greywater treatment and recycling systems and/or dry composting toilets to be retrofitted to homes or installed in new homes (see Table 1). It is of no concern that allotments in sewered areas are generally smaller than in unsewered areas, because only the amount of treated greywater required to sustain the garden in dry weather is utilised and the excess is discharged to sewer. As the organic matter in a dry composting toilet desiccates and matures during a specified time period, the pathogens die off and the resultant humus is considered suitable for burial in the garden following a set of safety precautions specified in the owner's manual. Any liquid discharge from the dry composting toilet must be piped to sewer (unlike in an unsewered area where it is piped to a small trench).

Onsite sewerage systems which treat wastewater that includes toilet water must not be installed (retrofitted) and managed by property owners or occupants in sewered areas. However, all-waste onsite sewerage and recycling systems can be installed by regional or metropolitan Water Corporations (not rural Water Corporations) as part of:

- a new reticulated sewerage system in a previously unsewered area
- a program to upgrade existing onsite systems in a declared sewerage district (or a backlog sewerage area)

  or
- as part of an upgrade to failing assets in a sewered area.

These onsite systems are then managed by the Water Corporation or another approved entity, not the householder (see Section 3.12.3).

Table 1: Treatment systems allowed in sewered and unsewered areas

Treatment Type and Effluent End Use	Sewered Area (Yes/No)	Unsewered Area (Yes/No)
Advanced secondary greywater system (10/10/10) with indoor recycling for toilet flushing and/or use in washing machine	Yes[1]	Yes[1]
Advanced secondary greywater system (10/10/10) for watering gardens and lawn via a dedicated purple tap and purple hose	Yes[2]	No
Advanced secondary greywater system (10/10/10) for surface irrigation	Yes[2]	Yes[2, 3]
Secondary greywater system (20/30 or 20/30/10) for sub-surface irrigation or other below-ground dispersal system	Yes	Yes
Secondary greywater system (20/30/10) for surface spray, trickle or drip irrigation	Yes[2]	Yes[2, 3]
All-waste secondary sewage treatment system (20/30/10, 20/30) with sub-surface irrigation	No[4,5]	Yes
All-waste secondary sewage treatment system (20/30/10) with surface spray, trickle or drip irrigation	No[4,5]	Yes
Dry composting toilet	Yes[6,7]	Yes[6,7]
Incineration toilet	No	Yes
Wet composting system (primary treatment) and land application	No	Yes
Septic tank (anaerobic primary treatment) and land application system	No	Yes

1. Single households only (internal re-use of greywater is not permitted at any multi-dwelling, business, commercial or school premises).

2. Single households only.

3. The exception to footnote 2 is a commercial premises with an end use (for non-sensitive populations) that is best suited to surface irrigation with 20/30/10 or 10/10/10 effluent and has a service contract with an accredited service technician e.g. a vineyard that requires drip irrigation; an existing golf course with pop-up sprinklers and a 4-hour withholding period management plan.

4. Although property owners/occupiers must not retrofit all-waste secondary sewage treatment systems in sewered areas, Water Corporations may elect to install/upgrade and manage onsite all-waste systems as part of a sewerage system whether or not reticulated sewerage is being installed into an unsewered area or as part of an asset management upgrade in a sewered area (see Section 3.12.3).

5. The exception is an existing well-functioning all-waste secondary treatment system that has a service contract and a sustainable land application system which may be retained after notification a reticulated sewerage system has been provided (see Section 3.12.4).

6. Mature compost from an approved dry composting toilet must be buried in a hole at least 300 mm deep in the 'ornamental' section of the garden (i.e. away from food crops) and covered with loamy topsoil.

7. The liquid discharge from a dry composting toilet system must be piped to sewer or piped to a suitably sized trench in an unsewered area.

2.1.3 Onsite and cluster scale options for new and existing developments

Many different treatment methods and combinations of treatment systems (scenarios) have been developed to treat and manage domestic and commercial sewage in new developments or when upgrading existing unsewered communities. These scenarios range from fully-contained onsite treatment and recycling systems to various combinations of onsite and offsite treatment and recycling, to all wastewater reticulated offsite and treated at a central location. Scenarios 1 to 9 require Council Septic Tank Permits for installation and use. Scenarios 10 to 13 only require a Septic Tank Permit where a community-scale system treats less than 5,000 L/day, otherwise the proponents of scenarios 10 to 14 must obtain an EPA Works Approval before installation. Any of these sewerage scenarios may be used for new developments or to improve the management of wastewater in unsewered townships:

1. All effluent generated onsite is treated and disposed/recycled within the boundaries of the property.
2. Single household dual onsite system – separate treatment for:
   a. toilet and kitchen wastewater (and possibly laundry trough water) treated in a septic tank or wet composting system and disposed of onsite
   b. greywater treated to advanced secondary standard (10/10/10 – see Section 2.2.3) and used for toilet flushing, washing machine use and garden irrigation.
3. Single household dual onsite system – separate treatment for:
   a. toilet waste treated in a dry composting toilet with mature compost buried onsite

      and

   b. greywater including kitchen wastewater treated to secondary standard (20/30 or better – see Section 2.2.2) for garden irrigation.
4. Single household triple onsite system – separate treatment for:
   c. toilet waste treated in a dry composting toilet with mature compost buried onsite
   d. septic tank and trench for kitchen wastewater, and urine (where applicable)

      and

   e. greywater (excluding kitchen wastewater) treated to secondary standard (20/30 or better – see Section 2.2.2) for garden irrigation.
5. Onsite secondary sewage treatment and recycling, with excess effluent pumped/gravitated offsite for community-scale secondary treatment and recycling.
6. Onsite secondary sewage treatment and recycling with excess effluent reticulated offsite for community-scale recycling.
7. Onsite primary treatment and disposal of toilet and kitchen wastewater (and possibly laundry trough water), with greywater reticulated offsite for community-scale secondary treatment and recycling.
8. Onsite dry composting toilet, with all greywater reticulated offsite for community-scale secondary treatment and recycling.
9. Onsite advanced secondary greywater treatment (10/10/10) and recycling, with toilet and kitchen wastewater (and possibly laundry trough water) and excess greywater reticulated offsite for community-scale treatment and recycling.
10. Onsite primary treatment in a wet composting system with all effluent pumped offsite through a reticulated sewer to a community-scale secondary treatment system.
11. Onsite primary treatment in a septic tank with all effluent reticulated offsite to a community-scale secondary treatment system (i.e. STEP/STEG – a Septic Tank Effluent Pumped or Gravity system).
12. Toilet and kitchen wastewater discharged to centralised sewerage and greywater reticulated offsite for decentralised, cluster or community-scale secondary treatment and recycling.
13. All wastewater reticulated offsite to multiple decentralised, cluster or community-scale treatment and recycling systems (possibly at the sub-catchment scale).
14. All wastewater reticulated offsite and treated at a central location.

Note: Any of these onsite treatment options can incorporate urine-diversion toilets. Urine-diversion toilets do not require EPA approval because they are not a treatment system. However, a centralised management entity should develop a strategy to manage, collect and beneficially reuse the urine from these toilets.

2.2 Effluent quality standards

2.2.1 Primary effluent standard

Primary treatment systems (such as septic tanks and wet composting systems) use physical methods such as screening, flocculation, sedimentation, flotation and composting to remove the gross solids from the wastewater, plus biological anaerobic and aerobic microbial digestion to treat the wastewater and the biosolids. Unlike secondary standard effluent, primary treated effluent does not have a specific water quality standard. It can range from 150 to 250 mg/L BOD_5 and 40 to 140 mg/L TSS without an outlet filter, and from 100 to 140 mg/L BOD_5 and 20 to 55 mg/L TSS with an outlet filter (Crites & Tchobanoglous 1998, p. 83). The pathogen indicator, E. coli, can be in the hundreds of thousands to millions of organisms per 100 mL of septic tank effluent. Consequently, primary treated effluent can only be dispersed to land via below-ground applications (see Table 1). However, where the septic tank or wet composting system is the first element in a secondary treatment train or is part of an effluent sewer, the primary effluent is treated to secondary quality before being recycled via an irrigation system.

The structural integrity of the tank that houses the primary treatment system must comply with the most recent version of AS/NZS 1546.1. After installation or desludging, and before use, a septic tank must be filled with clean water to provide ballast to prevent groundwater forcing the empty tank up out of the ground (AS/NZS 1546.1and to reduce odours.

2.2.2 Secondary effluent standard (20/30/10 and 20/30)

The water quality of secondary standard effluent in Victoria is <20 mg/L BOD_5, <30 mg/L TSS and, where disinfected, E. coli <10 cfu /100 mL. Due to the high risk to human health and the environment from unserviced and failing treatment systems which disperse poorly treated and undisinfected effluent onto the ground, sub-surface irrigation from all-waste treatment systems is the best practice land application system for secondary quality effluent (except for commercial applications such as non-contact sports fields, golf courses or vineyards in unsewered areas – see Tables 1 and 2). Effluent must be applied to land using one of the methods listed in Table 2 and detailed in the latest version of AS/NZS 1547 or Appendix E. However, sub-surface pressure-compensating irrigation (which ensures even distribution of effluent) with a disc or screen filter and scour and vacuum release valves is the default land application system for secondary treated all-waste sewage effluent. Sub-surface irrigation provides the most sustainable use of recycled water because the water is applied directly to the plant roots and is not dissipated by sun or wind, as it is when applied by spray irrigation.

In most cases, secondary treatment does not reduce the salinity and sodium levels or nutrients in wastewater. The sustainability of the land application system should take into account the long-term impact of the sodium in the effluent on the soil (see Section 2.2.4). For environmentally sensitive sites such as sandy soils adjacent to waterways, a nutrient balance may need to be calculated to determine the size of the sustainable irrigation area to limit the impact of nitrates and phosphorus on groundwater [see Victorian LCA Framework, MAV et. al. 2014 (as amended)].

Where Council considers there may be a risk of pathogen contamination of groundwater supplies in a sandy area (in Soil Categories 1 or 2a), the Council Delegated Officer (CDO) may require disinfected secondary treated effluent (<10 E. coli cfu/100mL) to be applied to the sub-surface land application system, especially where there are bores in the vicinity (see Table 5 for setback distances from bores). A nutrient balance may also be required for Category 1 to 3a soils where nutrients may cause a risk to environmentally sensitive areas such as freshwater lakes.

Note: Sub-surface irrigation of secondary treated effluent is mandatory in New Zealand, Germany and most of the USA.

2.2.3 Advanced secondary effluent standard (10/10/10)

Onsite wastewater management systems that are capable of producing a higher quality effluent are greywater systems that have been tested and accredited to a 10/10/10 standard [i.e. <10mg/L Biochemical Oxygen Demand (BOD_5), <10mg/L Total Suspended Solids (TSS), <10 Escherichia coli cfu/100mL] in accordance with the NSW Health Domestic Greywater Treatment Systems Accreditation Guidelines (2005). However, the salt and nutrient levels in the water may not have been reduced by the treatment process.

In unsewered areas 10/10/10 greywater effluent may be applied via low trajectory, coarse droplet, surface irrigation to:

- horticultural crops such as grape vines where drip irrigation is common practice and the effluent does not come in contact with the edible parts of the herbs, vegetable or fruit,
- sporting fields with existing sub-surface irrigation systems and where the sport does not involve players' bodies coming in contact with the grass on the field (such as golf courses).

In addition, there must be a 4-hour withholding period between the application of the effluent and use of the sporting field. The property owner must also have a service contract with a service technician and regularly send the reports to Council.

Only greywater treatment systems that have been accredited to 10/10/10 effluent quality and have a current certificate of conformity against the NSW Health Domestic Greywater Treatment Systems Accreditation Guidelines (Feb. 2005) or AS 1546.4 – Greywater Treatment Systems (once ratified) are permitted to recycle effluent indoors for toilet flushing and for use as cold water supply to the washing machine in single households. Back-flow prevention devices must be installed to prevent greywater entering the drinking water supply. Garden irrigation is permitted at single households using sub-surface and surface pressure-compensating irrigation systems and hand-held purple hoses attached to child-proof purple standpipes (see Section 4.4.3). Indoor greywater recycling is not permitted in multi-dwelling, commercial and business premises (see Table 1) due to:

- the health risks of viruses and other pathogens not being adequately treated at the level of 10 E. coli cfu/100 mL
- the risk of failing treatment systems and inadequate disinfection due to lack of servicing, and
- the risk of cross-connection between potable water and effluent supply pipes.

2.2.4 Secondary effluent standard with nutrient reduction

Several secondary quality onsite treatment systems have been tested and approved for their nutrient-reduction capabilities (total nitrogen, nitrates and total phosphorus). Only manufactured treatment units that have been tested for nutrient reduction during accreditation testing in accordance with AS/NZS 1546.3 or the NSW Health Domestic Greywater Treatment Systems Accreditation Guidelines (Feb. 2005) or AS 1546.4 – Greywater Treatment Systems (once ratified) can claim nutrient-reduction capabilities for the purposes of land application sizing. Systems with nutrient-reduction capabilities may be the most applicable option in environmentally-sensitive areas, such as sandy areas with high water tables and in sensitive lake districts where the receiving waters may be at risk of algal blooms from high nutrient levels. However, the impact of salt (which may not have been reduced by the treatment process) should be taken into consideration in the land capability assessment.

All onsite wastewater treatment systems with a current certificate of conformity against the relevant Australian standard or standard specified in this code

Sand filter - For premise owners who wish to install a sand filter treatment system, they must submit to Council, as part of their application to obtain a Council Septic Tank Permit to Install/Alter, detailed system design specifications that demonstrate compliance with the relevant specifications in Appendix G Sand filters. Council will then assess the system design specifications for compliance as part of the Council Septic Tank Permit to Install/Alter process.

at
www.epa.vic.gov.au/for-community/environmental-information/water/about-wastewater/onsite-wastewater-systems. If a brand or model of treatment system does not have a current certificate of conformity against the relevant Australian standard or standard specified in this code, it cannot be installed in Victoria. However, when a certificate of conformity expires or is rescinded and is removed from the EPA website, units that have been installed can continue to be used in accordance with the Council Permit conditions.

Note: Onsite treatment systems are not tested to the Victorian Class A Recycled Water Standard. ‘Class A’ is the quality of recycled water required for high exposure uses including those in residential developments (e.g. ‘dual pipe’ systems for toilet flushing and garden use) and only applies to sewage treatment systems that have a design capacity and flow rate greater than 5,000 L/day. As onsite treatment systems are not tested to Class A standard, they must not be marketed using that term in Victoria. (Refer to EPA Publications 1015 and 464.2 for information on Class A requirements and recycled water schemes.)

Table 2: Onsite wastewater management options for sewered and unsewered areas

<table>
<tr><th colspan="2">Onsite Wastewater Treatment Systems [1, 7]</th><th>For sewered or unsewered areas</th><th>Effluent recycling options [2, 3, 6, 7]</th><th>Effluent dispersal options</th></tr>
<tr><td rowspan="2">DRY</td><td>Primary Treatment
Dry Composting Toilets</td><td>All areas</td><td rowspan="2">N/A</td><td rowspan="2">Excess liquid discharged to sewer, or to a soil Absorption Trench in unsewered areas</td></tr>
<tr><td>Incineration Toilets</td><td>Unsewered only</td></tr>
<tr><td rowspan="4">WATER-BASED</td><td>Primary Treatment
Anaerobic (Septic Tank),
Aerobic Biological Filter (wet composting, vermiculture)</td><td>Unsewered areas only</td><td>N/A</td><td>Absorption Trenches/Beds
Evapo-Transpiration Absorption (ETA) Beds
Low Pressure Effluent Distribution (LPED)
Mounds
Wick Trench & Beds</td></tr>
<tr><td rowspan="3">Secondary Treatment
Sewage and Greywater
AWTS (Aerated Wastewater Treatment Systems)
Biological Filters (wet composting, vermiculture)
Membrane Filtration
Ozonation
Reed beds
Sand Filters
Textile Filters
Trickling Aerobic Filters:
(foam, plastic, mixture of media)</td><td>All-waste sewage treatment systems in unsewered areas only [10]</td><td>Sub-surface irrigation
Surface irrigation [11]</td><td rowspan="3">Absorption Trenches/Beds
Evapo-Transpiration
Absorption (ETA) beds
Low Pressure Effluent Distribution (LPED)
Mounds
Wick Trench & Beds</td></tr>
<tr><td rowspan="2">Greywater systems in all areas</td><td>Single domestic households [5, 8, 9]
10/10/10:
Toilet flushing
Cold water supply to washing machines
Surface irrigation
Sub-surface irrigation
Hand-held purple hose [12]
10/10, 20/30/10, 20/30:
Sub-surface
Surface irrigation</td></tr>
<tr><td>Multi-dwelling residential, business and community [4]
10/10, 10/10/10
20/30/10, 20/30:
Sub-surface irrigation [13]</td></tr>
</table>

1. It is recommended that onsite sewerage systems used by patients with transplants or on dialysis or chemotherapy are more frequently serviced and/or pumped-out as the drugs are likely to kill the beneficial microbes in the treatment system.
2. Sub-surface irrigation is the dispersal of water from pipes laid 100 mm to 150 mm below the ground surface (i.e. in the unsaturated biologically-active topsoil layer) (see AS/NZS 1547). The minimum water quality required is 20/30 standard.
3. Treated sewage or greywater must not come in contact with the edible parts of herbs, fruit or vegetables.
4. Treated greywater from multi-dwellings, schools, business or commercial premises must not be used for toilet flushing or used in the washing machine (see Section 2.2.3).
5. The use of treated greywater for clothes washing may not always result in the desired outcome, especially when washing light-coloured clothes. Householders should discuss the risks with the system manufacturer or supplier and be careful of the colours of cleaning and personal care products used.

6. No uses other than those stated are permitted.
7. See the relevant product owner's manual and Council Permit for information on installation, performance and management.
8. Only a purple-coloured hose with a left-hand thread which screws into the recycled greywater tap (coloured purple) is permitted to be used. The tap must have a removable child-proof handle and clear signage with words and symbols which indicate 'Recycled Water – Do Not Drink' (see Section 4.4.3).
9. Recycled water pipes must not be connected to the drinking water supply pipes. All recycled water plumbing works must be undertaken in accordance with the most recent version of AS/NZS 3500 [set]: Plumbing and Drainage.
10. The exception is a water business which may install all-waste sewage treatment systems as part of a new reticulated sewerage system or an upgrade to existing onsite wastewater systems within a sewerage district or as an asset management retrofit to an existing reticulated sewerage system.
11. The exceptions are multi-dwelling residences, schools, child care centres, medical centres, hospitals, nursing homes and premises for other sensitive populations which must use sub-surface irrigation.
12. Only permitted in sewered areas, where the excess greywater is discharged to sewer.
13. The exception is a commercial premises (other than multi-dwelling residences or a school, medical centre, hospital, child care centre, nursing home or premises for other sensitive populations) in an unsewered area which has a technical requirement for surface irrigation with 20/30/20 or 10/10/10 effluent (e.g. a vineyard using drip irrigation; an existing golf course with pop-up sprinklers provided it has a 4-hour withholding period after each irrigation event and a service contract with a professional service technician).

2.3 Principles of sustainable water resource management

Fresh, clean groundwater and surface waters are very valuable resources that are increasingly scarce in Victoria. Potable (drinking quality) water is used to flush wastes away in all sectors of our community. However, by conserving our water resources for drinking and bathing and for the beneficial uses of environmental flows (aquatic habitat, riparian health, wetland vitality, recreation and a sense of wellbeing) our water security can be increased.

2.3.1 Waste hierarchy

The principles of the waste hierarchy (EP Act Section 1I) (or resource use) can be utilised to value-add to our water resources and to extend 'the life' of water by reusing it. The hierarchy of resource use for wastewater generation is:

- avoid generating wastewater
- reduce wastewater volume (by minimising water use)
- reuse untreated greywater (for temporary purposes in dry weather)
- recycle treated wastewater.

2.3.2 Environmental sustainability

The environmentally-sound management of wastewater involves more than the sustainable use and management of water. Salts (especially sodium), pathogens and excess nutrients can have a detrimental impact on soils, vegetation, groundwater and/or surface waters. Excess sodium applied over a period of several years may affect the soil's ability to 'breathe' (utilise air) and absorb more effluent. The volume of nutrients, salts and sludge generated by each household depends on the types of food eaten, the cleaning products used and household and personal cleaning behaviours. Research on and lists of low sodium and low phosphorus cleaning products can be found at www.lanfaxlabs.com.au.

Different sewage treatment system types, brands and models vary in their:

- use of electricity
- use of consumables (such as chlorine)
- frequency of servicing
- number and cost of parts that require replacing
- generation of greenhouse gases
- ability to reduce nutrients, salts and sludge.

Some of these details may be provided on the manufacturer's marketing material and owner's manual or by contacting the manufacturer or supplier (see Appendix C for a checklist guide).

2.3.3 Organic matter and nutrients

Organic matter and nutrients in wastewater are a combination of toilet excrement and paper as well as hair and skin particles from basins and showers, lint from the laundry, personal care and household cleaning products, and fats, oils and food particles from the kitchen. Fats, oils, milk, tea leaves, coffee grounds and other kitchen food liquids, particles and scraps should be composted in a garden compost bin. These organic wastes should not be disposed of into domestic secondary onsite wastewater treatment systems, because as these systems have been designed to treat sewage, any additional organic matter is likely to overload them and cause the system to malfunction, only partially treat the wastewater and/or require more frequent desludging. Putting food scraps into a secondary wastewater treatment system is also a waste of a valuable nutritious organic (fertiliser) resource, because they are contaminated by pathogens and not returned to biologically-active soil.

2.3.4 Salts

To protect the health, productivity and longevity of the soils receiving treated effluent, cleaning products (especially laundry detergents) which contain minimal salt (sodium) are recommended (see www.lanfaxlabs.com.au). The high salt content of many cleaning products can eventually cause the soil aggregates in the irrigation/disposal area to disperse and lose their structure resulting in reduced permeability to water or air. This limits the ability of the salts to move through the soil and increases the likelihood of salts accumulating to levels that are potentially toxic to plants. Soil microbes and plants subsequently die and the soil is rendered unproductive. This can be a high risk when untreated laundry water is continuously used to water gardens, but is also an important consideration for treated effluent. Reducing salts in the wastewater also reduces the risk of surface waters and groundwater being impacted by failing onsite systems.

To monitor the potential impact of salts, effluent should be tested at least annually for Electrical Conductivity (EC) and Sodium Absorption Ratio (SAR). Effluent with EC levels exceeding 0.75 dS/cm [500 mg/L of Total Dissolved Salts (TDS)] and/or a SAR level of 18 should be discharged to sewer (where applicable) and/or the use of household and personal cleaning products with high salt contents discontinued (Richards 1954) (see Appendix G).

2.3.5 Small lots

The principles of efficient resource use should also be applied when considering the options for all onsite wastewater management. This is especially the case for homes on small lots of land (<4000 m^2) in unsewered areas which, to contain (recycle) all wastewater onsite, must minimise the amount of wastewater generated. The feasibility of providing a reticulated sewerage system should be seriously considered for the development of individual lots and for subdivision proposals that would result in allotments smaller than 10,000 m^2 (1 hectare). This area should not be seen as a minimum lot size but as a risk threshold, as lots smaller than 10,000 m^2 may be unable to retain all wastewater onsite. (See Section 3.6.1 for key risk factors such as proximity to waterways.)

Treating greywater and 'blackwater' separately (see Section 2.1.3 for options) and recycling a portion of the greywater effluent indoors for approved household uses is one way of reducing the volume of wastewater discharged to the land even though the nutrient and salt loads applied to the dispersal area remain the same. Wick Trenches (see Appendix E), which have been designed to facilitate dispersal of effluent to the atmosphere through evaporation and transpiration, and mound systems, may be suitable for some small lots.

2.3.5.1 Reducing wastewater

In accordance with the principles of the waste hierarchy, the following steps are recommended to limit the amount of wastewater generated and beneficially use the resultant water resource onsite.

I. Avoid generating excess wastewater by:

1. constructing a house with fewer bedrooms
2. installing a dry composting toilet
3. not installing a spa
4. not installing a bath (low flow rate shower only)
5. not installing a kitchen food waste grinder.

II. Reduce the volume of wastewater generated by installing:

6. High 'Water Efficiency Labelling Scheme' (WELS)-rated water-efficient fittings (minimum '3 Stars' for appliances and minimum '4 Stars' for all fittings and fixtures):
    a. water-efficient clothes washing machines (front or top loading)
    b. dual-flush (6.5/3.5L or less) toilets
    c. water-efficient shower roses
    d. water-efficient dishwashers
    e. aerated taps
    f. hot and cold water mixer taps (especially for the shower)
    g. flow restrictors
    h. hot water system fitted with a 'cold water diverter' which recirculates the initial flow of cold water until it is hot enough for a shower.

III. Reuse (another use without any treatment) wastewater by:

7. washing fruit and vegetables in tap water in a container and reusing the water for another purpose in the house such as watering pot plants
8. collecting the initial cold water from showers in buckets and using it for another purpose such as soaking feet, hand washing clothes or washing the car on the lawn.

IV. Recycle wastewater after treatment by using it to:

9. water gardens and lawn areas
10. flush toilets with effluent from an EPA-approved 10/10/10 greywater system
11. supply effluent to the cold water tap of the washing machine from an EPA-approved 10/10/10 greywater treatment system (see Section 4.4).

2.3.6 No offsite discharge of wastewater

The State Environment Protection Policy, Waters of Victoria (SEPP WoV, 2003) (Clause 32) and the Victorian Planning Provisions (https://planning-schemes.delwp.vic.gov.au/schemes/vpps) prohibit offsite discharge of wastewater from onsite wastewater management systems to adjacent land, stormwater drains, waterways or beaches for all new developments.

The Victorian Planning Provisions require that, in Township Zones (Clause 32.03-2), Rural Living Zones (Clause 32.05-2), Farming Zones (Clause 35.03-2), Rural Activity Zones (Clause 35.07-2) and Low Density Residential Zones (Clause 35.08-2):

> 'Each dwelling must be connected to reticulated sewerage, if available. If reticulated sewerage is not available, all wastewater from each

dwelling must be treated and retained within the lot in accordance with the State Environment Protection Policy (Waters of Victoria) under the Environment Protection Act 1970.'

Therefore, new premises may only be built if it will be connected to a reticulated sewerage scheme or where the wastewater can be treated and contained on the lot in a Township, Rural Living, Farming, Rural Activity or Low Density Residential Zone.

2.3.6.1 Existing offsite discharges of wastewater

Premises with an existing offsite discharge of wastewater (untreated greywater or treated sewage) to a waterway or stormwater drain should connect to reticulated sewerage where it is available. Eliminating offsite flows of wastewater and raw greywater to stormwater drains will improve the health and quality of our waterways and the local amenity of suburbs and towns.

For existing offsite discharges in unsewered areas, it is recommended that wastewater management systems are upgraded and the effluent utilised in a land application system onsite. Where a land capability assessment indicates that a property which has an existing offsite discharge is too small to contain all the effluent onsite throughout the year, it is preferable to find a practicable solution [as per Clause 12 of SEPP (WoV)] that reduces the impact or risk e.g.:

- discharge a smaller quantity of higher quality effluent to a stormwater drain in wet weather than continue to discharge all untreated greywater or treated sewage offsite all year round (see section 2.1.3 for treatment options)

  or

- install a pump-out tank and periodically transport the excess wastewater to a centralised sewage treatment plant.

This will prevent further impact to the local environment and waterways as well as protect public health.

2.3.6.2 Existing discharge of primary treated effluent in sandy soils

In areas with sandy soils, instead of offsite discharge, many existing premises discharge primary treated effluent or untreated greywater to "soak-away pits" or short trenches that would be considered inadequate to protect groundwater from pathogens or nutrients by current design requirements. The best environmental outcome in sandy soils with a high groundwater table may be achieved by upgrading septic tanks to secondary treatment systems with disinfection and nutrient reduction.

To ensure that the effluent is contained within the boundary of the property Council need to be satisfied that the upgraded system will provide an improved environmental and public health outcome.

2.3.6.3 Upgrade of existing onsite wastewater systems to 'best environmental outcome'

In some situations where an existing onsite wastewater system is discharging effluent overland or off-site and needs to be upgraded to protect public health and the environment, site constraints may not allow the proposed system to achieve full compliance with the requirements of this Code. In such situations Council may permit the upgrade if Council is satisfied that the new system will result in an improved environmental and public health outcome.

2.3.7 Pump-out tanks

Pump-out tanks are large septic holding tanks designed to contain effluent from premises usually for 1 week to 3 months. The tanks must be certified in accordance with AS/NZS 1546.1 and suitably sized for the application in accordance with AS/NZS 1547 (as amended).

A pump-out tank is an option of 'last resort', but may be installed on an existing lot which cannot be connected to sewer or contain all of its wastewater onsite. The contents of the tank are pumped into a sewage-sludge truck and transported and discharged to an approved sewer main access hatch or centralised sewage treatment plant. This is often not a sustainable option for sewage management, because of the economic and environmental costs associated with pump-out, transport and licences to discharge septic sewage effluent into a centralised sewerage system.

Pump-out tanks are best suited to premises with low or intermittent use. The most sustainable practice is to irrigate the maximum amount onsite and accumulate the residual wastewater in the pump-out tank.

Where a pump-out tank is considered suitable it should only be issued with a Septic Tank Permit where Council is satisfied the property owner has a suitable management program. Best practice should include:

- water conservation fittings and fixtures, including dual-flush toilets and spring-loaded taps to prevent excess water filling the tank
- a suitably sized tank, generally a minimum storage capacity of 15,000 L for a residential premises where the effluent is pumped out on a fortnightly basis
- a water meter on the water supply to the premises
- a water meter on the effluent irrigation or disposal system
- an audio/visual or telemetric alarm system which alerts the premises occupier when the tank is three-quarters full and requires pumping out, in the event the tank fills more quickly than the pump-out schedule
- extra ballast to weigh down the tank to prevent groundwater lifting it out of the soil after the tank has been pumped out
- a contract with a sewage/sludge pump-out operator to regularly educt the wastewater, and
- a strategy for sending a copy of the receipt and volume of wastewater educted for each pump-out to Council.

Pump-out tanks may be installed without a Septic Tank Permit for public toilet blocks on Crown Land, provided the responsible government entity (such as Councils, Parks Victoria, Water Corporations or the Department of Environment, Land, Water and Planning) has a suitable risk management plan and procedures for the management of the wastewater and the pump-out tank.

Although the effluent from a pump-out tank is not technically contained within the boundaries of the site, a pump-out tank does fulfil the intent of SEPP (WoV) and the Environment Protection Act. This is because effluent is transported and managed at a centralised sewage treatment plant and cannot impact neighbouring properties, public health or the local environment.

2.4 Effluent dispersal and recycling systems

An effluent disposal/recycling system must be selected from the following list of land application systems and designed and installed in accordance with the most recent version of Australian Standard AS/NZS 1547 and this Code:

- Sub-surface drip irrigation
- Surface spray, drip or trickle irrigation
- Evapo-Transpiration Absorption (ETA) trenches/beds
- Low Pressure Effluent Distribution (LPED) system
- Mounds
- Absorption trenches/beds
- Wick Trench and Bed system (see Appendix E).

(See Section 3.7 and Appendix E for information on each land application system).

The maximum design loading rates (DLR) and design irrigation rate (DIR) should be in accordance with the recommended maximums in Tables 3 and 9 of this Code. All pipework must be installed in accordance with the most recent version of the Victorian Plumbing Regulations.

Where this Code does not address an issue or a technology, the most recent version of AS/NZS 1547: On-site Domestic Wastewater Management must be used. However, where this Code does provide guidance on an issue or technology, it has precedence over any Australian Standard.

Note: The following land applications systems cited in AS/NZS 1547: 2012 (as amended) are not allowed in Victoria due to the high loading rate of wastewater, nutrients, pathogens and salts deep in the soil profile, which could impact on groundwater:

1. Box trenches with impermeable side walls (AS/NZS 1547, Figure 4.5A3, p. 149)
2. Discharge control trenches with impermeable side walls (AS/NZS 1547, Figure 4.5A4, p. 150)
3. Secondary treated effluent to reduced-length absorption trenches and beds (AS/NZS, Table 5.2 and L1)

However, reduced-length Wick Trench and Bed Systems may be installed using secondary quality effluent (see Table 9 for the recommended loading rates and Appendix E). Secondary treated effluent is a valuable resource which should be utilised in the biologically active topsoil layer, not discharged at high rates to sub-soil layers. Research has shown that secondary effluent discharged to absorption trenches can have a greater negative impact on groundwater than primary effluent, due to the lack of biomat build-up in the secondary trenches (Gill et al 2009). The Wick Trench and Bed System provides a substrate for the biomat to grow and facilitates the distribution of the wastewater into the biologically active topsoil layer.

Table 3: Recommended maximum design irrigation rates for secondary effluent irrigation systems in sewered and unsewered areas

Soil type	Irrigation rates [1, 2] (L/m^2.day)
Sands and gravels	5
Sandy loams	5
Loams	4
Clay loams	3.5
Light clays	3
Medium to heavy clays	2

1. From AS/NZS 1547: 2012
2. Lower application rates may be required to make allowance for reduced soil permeability in sodic and dispersive soils, and sandy soils with seasonally high water tables.

Note: The international colour-coded for plumbing installations for recycled water is lilac, but it is generally referred to as purple in Victoria (i.e. ‘purple pipe’). The pipework connecting the treatment unit and irrigation area, the pipes in a new irrigation field and the pipes supplying treated greywater (10/10/10 standard) to fixtures within the house must be colour-coded ‘purple’ and have appropriate signage in accordance with the most recent version of AS/NZS 1319: Safety Signs for the Occupational Environment. Where a treatment system is retrofitted to existing irrigation pipes that are not purple-coloured, the above-ground fixtures such as taps, pumps and hatches, must be covered with purple paint or tape.

Chapter 3 — Onsite wastewater management in unsewered areas

In unsewered areas, all wastewater generated on a property must be treated and the effluent sustainably recycled/dispersed (see Table 1) within the property boundaries (unless a portion is reticulated off-site for further treatment or recycling via an effluent sewer – see Section 2.1.3).

3.1 Onsite wastewater planning process

When a property developer, potential buyer or land holder considers subdividing land or building one or more premises, they must first determine whether wastewater can be sustainably managed and absorbed by the land within the property boundaries without negatively impacting the beneficial uses of surface waters and groundwater. It is the responsibility of the property owner to prove to Council that the proposed onsite wastewater treatment and recycling system will operate sustainably on the property without adverse impacts on public health or the environment.

Developers must demonstrate that each lot within a proposed subdivision is capable of meeting this requirement. This may result in larger lots in those sections of the subdivision where soils with poorer effluent absorption characteristics cannot be ameliorated, or delaying the development until sewer becomes available.

In many unsewered areas, a Planning Permit is required for new developments in addition to a Septic Tank Permit. It is recommended that applicants contact their Council's Environmental Health Department, and in regional areas their local Water Corporation as well, to discuss wastewater requirements before applying for a Planning Permit. The local planning scheme mandates connection to sewer where it is practicably available.

Owners or potential buyers planning to apply for a Council Permit to Install an onsite wastewater management system in an unsewered area should follow these steps to have the best possible sustainable onsite system designed:

1. Decide on the proposed design criteria for the property (the 'wish list'):
   - location of the dwelling and outdoor paved areas (patio, sheds)
   - location of infrastructure (easements, sheds, driveway, paths, paddocks)
   - size of the buildings (the building envelope, including the footprint of the house or premises, sheds and all other hard non-absorbing surfaces in square metres)
   - number of bedrooms in the dwelling
   - maximum occupancy of the dwelling (i.e. will the premises accommodate large numbers of people at weekends and holiday periods and/or remain vacant for extended periods of time?)
   - is recycled greywater effluent required for toilet flushing or the clothes washing machine?
   - any extra water-generating fixtures such as spa baths?
   - use of high WELS-rated fixtures and fittings.
2. Arrange for a suitably qualified and experienced land capability assessor (see Section 1.8.3) to carry out a land capability and risk assessment (LCA) (see Section 3.6.1) on the lot, unless the relevant Council advises it is not required.

Note: an LCA is always required in a Special Water Supply Catchment.

3. Whether an LCA is required or not, the proponent should engage a suitably qualified consultant experienced in onsite wastewater land capability and/or irrigation systems to design an onsite wastewater recycling/dispersal system. This system should best fit the features of the land, the needs of the proponent and address the risks of the site with sustainable solutions. Designing the land application system is the role of an independent consultant, not Council. Council's role is to assess the land capability and risk assessment report, flow rates, land application calculations and trench, bed, mound or irrigation design, not do the calculations or design the land application system for the property owner.

3.2 Onsite treatment system options

In Victoria, all newly installed onsite wastewater treatment systems must have a current certificate of conformity against the relevant Australian Standard or standard specified in this code as listed on the EPA website. www.epa.vic.gov.au/for-community/environmental-information/water/about-wastewater/onsite-wastewater-systems. If a brand or model of treatment system does not have a current certificate of conformity against the relevant Australian Standard or standard specified in this code as listed on the EPA website, it cannot be installed in Victoria. Any onsite treatment system listed on the EPA website can be installed in an unsewered area, if the treatment system and the design loading rate of the effluent dispersal system are appropriate for the site.

The most common types of treatment systems and their associated recycling/land dispersal options are listed in Table 2. Different treatment trains or combinations of systems which are possible to treat all the wastewater streams onsite include:

- dry/wet composting for toilet waste plus a greywater treatment system which treats kitchen waterdry composting for toilet waste, a small septic tank for kitchen water, plus a greywater treatment system
- septic tank (see Appendix D) or wet composting system for toilet and kitchen water, plus a greywater treatment system

- all-waste secondary treatment system
- septic tank or wet composting system for all wastewater.

For details of these options see Section 2.1.3.

3.3 Wastewater generation

Minimum daily wastewater flow rates from domestic and commercial premises are set out in Table 4. However, a range of factors can increase or decrease these flow rates.

When calculating the daily wastewater flow rates for an existing commercial premise or an alteration/extension to an existing commercial premise, the metered flow rates should be used instead of the flow rates in Table 4. For a new commercial premise the flow rates in Table 4 are to be used unless metered flow rates are available from an equivalent type of premises.

Increased variations to these flows such as surges, peaks or intermittent flows should also be taken into consideration when calculating the wastewater volume generated.

3.3.1 Minimum flow rates and organic loading

The volume of wastewater treated and recycled/dispersed onsite can vary considerably. It depends on the type of premises, the occupancy throughout the year, water availability, the use of water saving fixtures and fittings, occupants' habits and how efficiently water is used. The minimum flow rates listed in Table 4 are conservative rates and take variable flows into account. However, where an increase in water use at premises may lead to system failure and an increased risk to human health and the environment, the system may need to be altered or enlarged, or water reduction fixtures and fittings installed.

For systems other than a single domestic residence, the organic loading must also be considered when designing an onsite wastewater management system (see Table 4). Due to water restrictions and water conservation practices, it is increasingly important to select a treatment system based on the appropriate organic loading, as well as the water flow rate.

3.3.2 Increasing flow rates

Household flow rates can increase with a change of ownership, a higher number of occupants, connection to reticulated water supply and/or the addition of a bedroom, bathroom, spa or other water-using fixture. Where the wastewater treatment and/or land application system are not large enough to cope with the increase in flow the system may fail, causing a risk to public health and the environment.

Before making any additions or renovations to a house or the water supply (such as installing a bore) owners must contact the Environmental Health Unit of their local Council. Council will need to determine whether the onsite wastewater management system needs to be or can be adapted to an increased flow rate and if there is sufficient room on the lot to enlarge the land application area. Council may direct the property owner to engage a consultant to consider these issues, design a solution and submit a report to Council.

Where there is not enough land to increase the size of the land application area, the house extensions cannot be approved. If the existing system can be altered, the owner must apply to Council for a Septic Tank Permit to Alter the wastewater management system before the house alterations begin. The treatment system and land application area must be protected and not impacted by any building works or vehicular access.

Where the wastewater treatment system is not enlarged to accommodate a greater volume, the householders should observe the onsite treatment system to monitor its performance and contact the service technician at any sign of the system being overloaded (e.g. noxious smells, the disposal area flooding especially in winter).

Swimming pool water must never be discharged to the onsite wastewater treatment system or applied to the onsite wastewater land dispersal area, because the additional water, chlorine and/or salt will disrupt the functioning of the treatment system and/or effluent dispersal area.

3.3.3 High flow rates and organic loadings

Where the proposed wastewater flow rate from a residential dwelling is expected to exceed 2,000 L a day, it is recommended that Council critically review the reason for the high flow rate and the concurrent organic load (see Section 3.3.6). Regular discharges exceeding 2,000 L a day may indicate a usage that is not purely domestic and may require additional equipment (i.e. septic or surge tanks) added to the treatment train. Procedures for estimating potential peak hydraulic loads (e.g. spa draining) and potential peak organic loads from commercial premises (e.g. from wine making, cheese making, home businesses) are not addressed in this Code. The wastewater system designer must calculate the hydraulic and organic loadings from commercial premises in accordance with EPA Publication 500: Small Wastewater Treatment Systems and justify these calculations to the satisfaction of Council on a case-by-case basis.

3.3.4 Irregular, intermittent and surge flows

The onsite wastewater treatment system and the recycling/disposal system must be designed so they can deal with irregular and surge flows without untreated or partly-treated wastewater being discharged into the land application system or the indoor water recycling system. Irregular and surge flows may occur when social gatherings take place, from fittings such as spa baths or when a bath and washing machine are discharging at the same time. These flows may be greater than the design capacity of the treatment system. Surges have the potential to force untreated solids through the treatment plant into the effluent storage tank which when discharged can clog filters, soil absorption trenches and effluent irrigation pipes. Manufacturers and suppliers of onsite treatment systems should educate system owners to minimise surge flows. However, if high surge flows are likely, the system must be designed to adequately deal with them, such as by incorporating an additional septic tank, a larger balance tank or a larger model of treatment system.

Where the dwelling will be used as a holiday home or intermittently for social, business or educational purposes, Land Capability Assessors and Council should consider the potential effects of possible peak flows and whether the proposed wastewater treatment and recycling system can handle the variable flows and operate effectively under stop/start conditions. Council may require the proponent to engage a wastewater consultant to increase the design flow rate and use the weekend peak loads as the regular flow rates. Consequently, a larger than normal pre-treatment balance tank, treatment plant and/or effluent storage tank may need to be installed to ensure that effluent is dispersed to land over a longer time period than the weekend or holiday period.

Treatment systems powered by electricity that must run continuously may not be suitable for sites with irregular or intermittent flows such as holiday homes, public toilets, community halls or sporting facilities which are subject to irregular peak hydraulic and organic loads.

Aerated wastewater treatment systems must not be switched off when not in use, otherwise the aerobic microbiological ecosystem in the tank will die and the water becomes anaerobic. Some aerated systems have a low-flow switch that recirculates effluent during periods of non-occupancy to ensure the aerobic microbes are provided with oxygen and can stay alive. After a power outage or being switched off for more than 48 hours, most aerobic microbes in an AWTS will die. However, the microbiological ecosystem will gradually regenerate after the treatment system is turned back on. To give the aerobic microbes time to recolonise, water use should be restricted for several days (i.e. use water only for bathing, toilet flushing and kitchen activities and not for clothes washing). The system may take 2 to 3 weeks to be fully functional again. Trickling filters can cope with intermittent flows or no electricity for several days or weeks because the aerobic microbes that are attached to the media (sand, gravel, foam, glass, peat, plastic, textile etc.) continue to live in the moist air environment.

3.3.5 Reduced water flows

Wastewater flow rates based on water-reduction fixtures and fittings should only be accepted when Council is satisfied the fixtures were installed at the time the treatment system was commissioned and operational and they are unlikely to be replaced by higher-flow fittings in the future (because of already planned renovations, change of ownership, etc.). This may be implemented through the use of a section 173 agreement under the Planning and Environment Act. Sections 181 and 182 of this Act enable these agreements to be recorded on the land title at the time they are registered, thus binding future owners.

Where Council is satisfied a household or premises is unlikely to be provided with a reliable water supply (e.g. a rural farming property where groundwater or surface water is unavailable), the design flow rates for Onsite Roof Water Tank Supply listed in the most current version of AS/NZS 1547 may be used instead of the flow rates in Table 4.

3.3.6 Organic loads

With more water efficient appliances and fixtures being used in domestic and commercial premises the organic concentration and BOD of wastewater is increasing. Therefore, the organic load from a premise must be appropriately matched with the capabilities of the treatment system (see the EPA CA for the maximum organic load).

Wastewater consultants and Council officers must consider the organic load of the wastewater as the primary design component when selecting a treatment system for toilet blocks and for food premises such as cafes, restaurants, food factories and function centres etc. Otherwise, treatment systems which are overloaded with organic matter will fail to achieve the required effluent quality and may produce noxious odours and pose a risk to public health and the environment.

3.4 Daily wastewater flow rates

Daily household wastewater generation is estimated by multiplying the potential occupancy, which is based on the number of bedrooms (plus one person), by the Minimum Wastewater Flow Rates in Table 4. The table shows the minimum water usage per person for a range of different activities. There is no differentiation between the various sources of water supply because, over time, most households and commercial premises will be supplied with a reticulated water supply or have access to bore water, surface water or tankered water, usually before reticulated sewerage is available (also see Table 4, footnote 5).

3.4.1 Calculations for minimum daily domestic flow rates

Using the formula 'number of bedrooms plus one' takes into consideration the potential future occupancy, not just the (possibly smaller) number of people who may be intending to live in the house. Assessors should include any additional room(s) shown on the house plan such as a study, library or sunroom that could be closed off with a door, as a bedroom for the purposes of the following calculations. However, Council may choose to reduce the number of potential bedrooms based on evidence (from the floor plan or building layout etc.) that the room is unlikely to be used as a bedroom.

Calculations for household wastewater generation:

a. Water-reduction fixtures

i. For a 4-bedroom house with water reduction fixtures and fittings, the daily minimum wastewater generated is:

Daily Wastewater Volume = (Number of bedrooms + 1) x L/person.day
= (4 + 1) x 150
= 5 x 150
= 750 L/day.

ii. For a 2-bedroom house with water reduction fixtures and fittings, the daily minimum wastewater generated is:

Daily Wastewater Volume = (2 bedrooms + 1) x L/person.day
= 3 x 150
= 450 L/day.

b. Standard water fixtures

i. For a 4-bedroom house with standard water fixtures and fittings, the daily typical wastewater generated is:

Daily Wastewater Volume = (Number of bedrooms + 1) x L/person.day
= (4 + 1) x 180
= 5 x 180
= 900 L/day.

ii. For a 2-bedroom house with standard water fixtures and fittings, the daily typical wastewater generated is:

Daily Wastewater Volume = (2 bedrooms + 1) x L/person.day
= 3 x 180
= 540 L/day.

3.5 Commercial premises

3.5.1 Organic loads from commercial premises

Commercial premises dealing with food or other organic matter in the wastewater stream (with peak daily flows into the treatment system of less than 5,000 L/day) will need to consider not only the hydraulic aspects of the design but also the capacity of the system to deal with high and irregular organic loadings (see Table 4). Premises in this category include (but are not limited to) hotels, motels, guesthouses, bed and breakfast establishments, restaurants, cafes, wineries, poultry farms, mushroom farms, cheese factories, take-away food premises, shops, schools, toilet amenity blocks, childcare centres, reception centres, conference centres, nursing homes, hospitals, environment centres, sport centres, community halls and public recreational areas.

The provision of an additional septic tank, a larger balance tank or larger model of treatment system may provide the additional capability for the higher organic loading. Any proposed premises with a commercial kitchen should consider installing a suitably-sized additional septic tank at the start of the treatment train to cope with the high organic load. Best practice may be two septic tanks in sequence followed by a secondary treatment system of appropriate organic and hydraulic load capacity. Two complete treatment systems such as a primary wet composting system and a secondary treatment system, may also be coupled together to treat commercial wastewater with high BOD to a 20/30 or 20/30/10 standard.

All treatment systems installed on commercial premises should have a flow meter fitted to the discharge pipe to measure the daily volumes of effluent in litres (not megalitres).

Note: Two or more complete treatment systems may be installed in series at a commercial site to produce the required effluent quality. All the elements in both treatment trains must be installed.

3.5.2 Daily flow rates for community and commercial premises

Use the 'Minimum daily wastewater flow rates' in Table 4 or data collected from a water meter at the site. The organic loading from any commercial kitchen or trade waste facility must be calculated using the values in Table 4 as a minimum.

Table 4: Minimum daily wastewater flow rates and organic loading rates [1, 10]

Source	Design hydraulic flow rates for all water supplies [2, 4, 5] (L/person.day)	Organic material loading design rates (g BOD/person.day) [7]
Households with extra wastewater producing facilities [6]	220	60
Households with standard water fixtures	180	60
Households with full water-reduction fixtures [3]	150	60
Motels/hotels/guesthouse		
- per bar attendant	1000	120
- bar meals per diner	10	10
- per resident guest and staff with in-house laundry	150	80
- per resident guest and staff with out-sourced laundry	100	80
Restaurants (per potential diner) [9]		
- premises <50 seats	40	50
- premises >50 seats	30	40
- tearooms, cafés per seat	10	10
- conference facilities per seat	25	30
- function centre per seat	30	35
- take-away food shop per customer	10	40
Public areas (with toilet, but no showers and no café) [8]		
- public toilets	6	3
- theatres, art galleries, museum	3	2
- meeting halls with kitchenette	10	5
Premises with showers and toilets - golf clubs, gyms, pools etc. (per person)	50	10
Hospitals - per bed	350	150
Shops/shopping centres		
- per employee	15	10
- public access	5	3
School – child care	20	20
- per day pupil and staff	20	20
- resident staff and boarders	150	80
Factories, offices, day training centres, medical centres	20	15
Camping grounds		
- fully serviced	150	60
- recreation areas with showers and toilets	100	40

1. Based on EPA Code of Practice for Small Wastewater Treatment Plants, Publication 500 (1997).
2. When calculating the flow rate for an existing commercial premise, use this table or metered water usage data from the premise's actual or pro-rata indoor use.
3. WELS-rated water-reduction fixtures and fittings - minimum 4 Stars for dual-flush toilets, shower-flow restrictors, aerator taps, flow/pressure control valves and minimum 3 Stars for all appliances (e.g. water-conserving automatic clothes washing machines).
4. These flow rates take into consideration the likelihood of a reliable water supply being currently provided to a premises or in the future (e.g. from groundwater, surface water or reticulated water supply, or a tankered water supply).
5. Where Council is satisfied a household or premises is unlikely to be provided with a reliable water supply (e.g. a rural farming property where groundwater or surface water is unavailable or used only for stock) the design flow rates for Onsite Roof Water Tank Supply listed in the most current version of AS/NZS 1547 may be used.
6. Extra water producing fixtures include, but are not limited to, spa baths.
7. Based on Crites & Tchobanoglous (1998) and EPA Publication 500 (1997).
8. For premises such as public areas, factories or offices that have showers and toilets, use the flow rates for 'Premises with showers and toilets' in the calculations.
9. Number of seats multiplied by the number of seatings i.e., may include multiple seatings for breakfast, morning and afternoon teas, lunch and/or dinner.
10. The organic loading rate must be considered as well as the hydraulic flow rate when selecting the most suitable treatment system.

3.6 Land capability assessment

In unsewered areas, a land capability assessment (LCA) should be undertaken for each site that requires the installation of an onsite wastewater treatment system, unless Council is satisfied the site is low risk or sufficient information (e.g. soil permeability rates, soil types, depths to watertable, fractured rock and other limiting factors) has already been gathered about the site. The information may have been obtained through previous Council investigations such as a regional, catchment or township-based land capability assessments. However, a large area LCA is only a general guide because soils and landscapes can be highly variable within an allotment and between neighbouring properties. A 'best practice' regional or catchment-scale LCA will identify high, medium and low risk areas and can recommend minimum lot sizes as well as the most appropriate management solutions.

An LCA is mandatory for any allotment within a Special Water Supply Catchment Area. In potable water supply catchments, a greater density of rural lifestyle allotments not only involves potential pathogen contamination risks from onsite wastewater management systems, but also added risks factors such as domestic animals, horses, chemical sprays and increased traffic.

It is very important an LCA is performed early in the planning phase of land developments. An LCA should be conducted before rezoning, or subdivision if the land does not require rezoning. The information gathered through the LCA process is used to determine the areas most and least capable of managing wastewater onsite and the required size of the lots to ensure sustainable onsite wastewater management.

Land capability assessments should only be conducted, or overseen and signed-off, by suitably qualified, experienced and independent soil scientists and/or hydro-geologist (with suitable professional indemnity insurance) who can analyse the capacity of the land to sustainably absorb treated wastewater onsite without negatively impacting householder and public health and local environmental health [e.g. land, vegetation, surface waters and groundwater (see Section 1.7.3)]. On the basis of the information collected, the land capability assessor will recommend the required effluent quality and design the land application system. The Council officer's role is to assess land capability assessment reports and applications for Planning and Septic Tank Permits, not do the LCAs or design the land application areas. Unsewered residential developments and new buildings should only proceed on land the local Council has determined, after review of the LCA report and from consideration of local knowledge, has an acceptable capability for sustainable onsite wastewater management.

The objectives of the land capability assessment process are to:

- assess the capability of the site to sustainably utilise and manage wastewater within the allotment boundaries
- assess the capability of catchments to sustainably utilise and manage wastewater within sub-catchments or specific regions
- determine high risk and sensitive areas within allotments and within catchments
- gather the relevant geographical and social information to adequately inform the process of designing the best practicable and most sustainable type of onsite wastewater treatment and effluent recycling/disposal system that should protect the health of the householders and the community and protect the local environment from pollution
- formulate a sustainable management plan (in accordance with this Code and the conditions in the Council Permit) that:
    a. must be carried out by the property owner to ensure that impacts on the environment or public health do not occur or are minimised

       and

    b. will ensure the beneficial reuse of the treated water, organic matter and nutrients (where applicable).

3.6.1 LCA procedure

Land capability assessors should follow the conservative and 'best practice' Victorian LCA Framework [MAV el. al., 2014 (as amended)] procedures for carrying out land and soil assessments and hydrological calculations for designing land application areas. Either the constant-head Soil Permeability method or site-and-soil evaluation procedures detailed in Part 5.2 of AS/NZS 1547:2012 (as amended) are to be employed to analyse and estimate the permeability of the soil.

> Note: The soil percolation (falling-head) test method is no longer allowed as it is not based on valid scientific evidence and it tends to produce data that results in the land application area being undersized.

Soil permeability testing conducted in situ using the constant head well permeameter method (AS/NZS 1547) to determine the likely rate of flow of wastewater through the soil of the dispersal area is best practice. In situ permeability testing must be conducted on the limiting soil layer (frequently the B horizon) unless soil saturation or high swelling clays or cracked low-to-moderate swelling clays are present. The visual or tactile estimation of indicative permeability based on the latest version of AS/NZS 1547 'Site-and-Soil Evaluation' procedures, which includes soil texture, structure and swell potential tests, may be used as a substitute for actual measurements of soil permeability.

Although the Victorian LCA Framework [MAV et. al., 2014 (as amended)] recommends digging pits to identify the soil profiles, the procedure of augering the soil to at least 2 m and laying the retrieved soil on the ground in sequence for description, identification (bore logging) and photographing is also valid. However, should there be a dispute or any doubt or uncertainty regarding the soil category derived by visual/tactile methods, in situ permeability testing must be undertaken.

When conducting LCAs assessors must take into consideration the following issues:

- Soil permeability testing is not appropriate when soils are waterlogged.
- Soil that is frequently or seasonally waterlogged is a good indication the land is not capable of dispersing wastewater and therefore

must not have wastewater applied to it.

- A distinction must be made between temporary perched water tables lying over a subsurface layer of lower permeability after a heavy rainfall and permanent shallow ground water tables.
- Soil permeability testing is not appropriate in any soils with low to moderate shrink/swell properties when there are desiccation cracks due to prolonged dry weather or in soils with high shrink/swell properties at any moisture content.
- Shrink/swell soils must be tested for soil permeability in moist condition when no drying cracks are visible.

A best practice procedure for land capability assessment is a 12-stage process:

1. List the relevant LCA criteria for the site in consultation with the developer or householder, Council Town Planners and the Environmental Health CDOs. This will determine whether a detailed or more basic land capability report is required by Council.
2. Gather and collate a land, surface water and groundwater inventory and climatic information (www.bom.gov.au – 'climate data' and 'design rainfalls for engineers') to develop water balances for the site. Particular attention must be given to features or factors that may impose a constraint on the application of treated wastewater to land, including constraints on adjacent land, such as bores used for domestic water supply, dams and/or waterways. For groundwater and bore water information consult: http://nremap-sc.nre.vic.gov.au/MapShare.v2/imf.jsp?site=water (also see Maps in this Code).
3. Gather any Council, Water Corporation, Catchment Management Authority and State Government requirements, including restrictions, caveats, planning/building/bushfire/flood zones, Environmental Significant Overlays, potable water supply and Special Water Supply Catchment information (including Special Area Plans) and maps. Overlay this information on a base map which shows all title boundaries, especially where the property is comprised of more than one title.
4. Visit the site and carry out a site inspection and field investigations including (but not limited to) soil profiling, soil texture classification and/or soil permeability tests. Where there is a risk of land slippage a geotechnical assessment may be needed to determine the extent, especially if the soil is likely to be saturated during winter.
5. Collate and analyse the information in relation to both the development site and any possible cumulative detrimental impacts that the development may have on beneficial uses of the surrounding land, surface water and groundwater.
6. Assess the capacity of the land to assimilate the treated wastewater based on the data collected and the total dissolved salts (TDS) in the potable water supply (see Section 2.3.4 and Appendix G) for both levels of effluent quality – primary and secondary.
7. Based on the LCA criteria, the data collected and the owner's requirements, calculate the size and design the layout of the most appropriate type of land application area (LAA) in accordance with this Code and the most recent version of Australian Standard AS/NZS 1547 and the Victorian LCA Framework [MAV et. al., 2014 (as amended)]. This determines the effluent quality that the treatment system must achieve.
8. On the basis of the effluent quality required for the land application system, the property owner selects an applicable onsite treatment system(s) (see the EPA website for the list of currently approved systems).
9. Create a site plan(s) to scale showing the dimensions and, where relevant, include the following details:
    a. the site address, including lot number and street number
    b. title boundaries
    c. Council zoning and Environmental Significant Overlays
    d. type of catchment (e.g. a potable or other special water supply catchment)
    e. direction of north
    f. location, depth and specified use of the groundwater bores on the site and adjacent properties from the register of the relevant Rural Water Corporation
    g. contour lines (at 1 to 10 m intervals), direction of slope and slope analysis
    h. location of soil profile test pits or auger holes
    i. location of other utilities i.e. electricity, gas, telecommunications (which must be located outside the land application area)
    j. depth to groundwater table in winter
    k. presence of soil/water features indicative of springs and prolonged surface ponding or topsoil waterlogging
    l. rock outcrops
    m. shallow bedrock and other impervious layers
    n. location of surface water onsite and on adjoining properties and applicable setback distances (Table 5)
    o. drainage lines and springs
    p. flood potential (1% and 5% Annual Exceedance Probability contour lines), location of floodways (see Maps for water resources)
    q. landslip potential and erosion potential
    r. location and types of trees and other vegetation cover
    s. relevant setback distances (see Table 5)
    t. proposed stormwater cut-off drains adjacent to land application area and treatment system

- u. location of actual and proposed buildings, sheds, driveways, paths and paddocks
- v. type and location of actual and proposed infrastructure, especially drains
- w. landuse, vegetation, bores and any constraints on adjoining properties
- x. the location and dimensions of the proposed wastewater treatment plant
- y. the location and dimensions of the proposed land application area, and
- z. the location and dimensions of the duplicate reserve area (see Section 3.10).

10. Develop a management plan that addresses any site or local constraints, risks and potential impacts, and procedures for the householder to carry out, to sustainably manage the treatment plant and the effluent recycling/disposal area.
11. Write a report which details the LCA objectives, process, findings and proposed onsite treatment, land application and management strategies. Clearly identify any assumptions and design requirements that should be included on the Council Permit (e.g. assumed water conservation fixtures and fittings or required surface water drainage diversions).
12. The site and land capability assessment report submitted to Council should include the following items:
    - a. location map
    - b. the site plan to scale (detailed in Stage 9)
    - c. Certificate of Title for the property, including property description and plan
    - d. building floor plans
    - e. design maximum peak daily hydraulic flow
    - f. design maximum daily organic load
    - g. water balance calculations
    - h. nutrient balance calculations (where applicable for sensitive sites)
    - i. a log of all soil test pits and auger holes
    - j. the site management plan including wastewater system design and installation plan
    - k. any other documentation supporting the risk management of the proposed onsite wastewater treatment and land application system.

When analysing the LCA report, Council will overlay and consider other relevant issues and determine the appropriateness, or otherwise, of the proposal. The practicality of the proposed land application system, the management plan in the larger context of the sustainability of the catchment and the community may also be considered. Council will refer the LCA report to the relevant Water Corporation for their consideration and decision as part of any Planning Permit application that requires referral under the planning scheme for that Council. The Water Corporation has the right to object to any planning proposals which may negatively impact the beneficial uses of groundwater or surface water within its catchments.

The onus of proof rests with the proponent to demonstrate that the proposal is environmentally sustainable. Council will not approve applications if the proponent's LCA report and supporting information is inadequate or if the proposed management plan is impracticable (that is beyond the capacity of those who would be responsible for managing the onsite wastewater system). Council and the Water Corporation (where relevant) must be satisfied that the treatment type, land application type and area, and the management plan are appropriate for the site and the residents and capable of protecting public health and the environment.

Note: Property owners must submit an application for a Planning Permit (where applicable) and an application for a Septic Tank Permit to Council and include a site plan detailing the relevant items listed in Stage 9 above with the LCA report. Where any items have been omitted, an explanation as to why those items are not relevant must be provided. All data collected and the calculations used should be provided to demonstrate the suitability or otherwise of the soils. If Council is not satisfied the Land Capability Assessor has conducted a full and thorough LCA, Council may return the LCA to the applicant detailing the deficiencies and refuse to issue a permit.

3.7 Onsite land dispersal and recycling options

3.7.1 Primary treated effluent land application systems

Land application systems for dispersing primary treated effluent onsite must be designed and installed in accordance with latest version of Australian Standard AS/NZS 1547, this Code and the latest version of the Victorian LCA Framework [MAV et. al. 2014 (as amended)]. The possible options are:

- Evapo-Transpiration Absorption (ETA) beds and trenches

- Mounds
- Low Pressure Effluent Distribution system (LPED)
- Soil absorption trenches
- Wick Trench and Bed system (see Appendix E).

For the recommended maximum Design Loading Rates and Design Irrigation Rates see Appendix A - Table 9 (adapted from AS/NZS 1547: 2012).

3.7.1.1 Soil absorption trenches

Absorption trenches for primary treated effluent should be designed for Soil Categories 2b to 5a (see Appendix A and AS/NZS 1547) in accordance with monthly water balances and the design loading rates (DLR) in Table 9. Even though effluent will infiltrate through the side walls of the trench, as well as the base, the DLRs only use the base of the trench to calculate the application area.

Absorption trenches should not be used in Soil Categories 1 and 2a [unless the soil does not have a high perched or seasonal (winter) watertable] due to the high infiltration rates of wastewater that can carry pathogens, salts and nutrients to the groundwater. It is not recommended that trenches are installed in Soil Categories 5b, 5c and 6. However, where an LCA has been conducted in accordance with the Victorian LCA Framework [MAV et. al. 2014 (as amended)] procedures and this Code, absorption trenches may be proposed for Soil Categories 5b, 5c and 6 if a sustainable management program is considered feasible.

Depending on the soil type, trench spacings from side wall to side wall will vary between 1 m (for sandy loams) and 2 m (for clayey soils), and may be greater where required. The minimum spacing of 1 m is in accordance with AS/NZS 1547 and other State regulations. The maximum trench length for a gravity-flow trench is 30 m and the base of all trenches must be level. Land must be allocated for a duplicate absorption trench area [known as the 'reserve area' (see Section 3.10)], which can be utilised if the initial land application area fails or more trenches are required when the house is extended or a groundwater spring is found in the vicinity which will impede the proper functioning of the trench.

3.7.1.2 Low Pressure Effluent Distribution (LPED) system

A Low Pressure Effluent Distribution (LPED) system is a series of narrow gravel-filled trenches with good quality friable, humus-rich topsoil between and above the trenches. Where the local soil is inadequate good topsoil must be imported to the site. This system was designed in the USA for difficult sites such as an impervious B horizon. The system utilises the permeable nature of friable humus-rich topsoil to spread effluent through the side walls into the 1 to 1.5 m trench spacings. The topsoil helps maximise evaporation and transpiration through the grass cover. Pump dosing is essential to evenly spread the effluent along the trenches (see Appendix A for application rates and AS/NZS 1547 for design information).

Limitations of the LPED system are the risk of distribution holes becoming blocked by biosolids and roots, and limited effluent storage capacity between the trench aggregate. Therefore, even distribution along the trench is crucial to utilise the land available and prevent failure of the system (ARC Technical Publication, No. 58, 2004).

3.7.1.3 Effluent dispersal in sands and gravels

Neither soil absorption trenches/beds nor primary treated effluent should be used in sands and gravels (i.e. Soil Categories 1 or 2a – see Appendix A) unless the soil does not have a high perched or a seasonal (winter) watertable. The best practice land application systems for sands and gravels are surface irrigation, sub-surface irrigation, mounds and Wick Trench and Bed Systems.

3.7.1.4 Rectification of a failed soil absorption trench system

If a trench system fails, the householder may investigate the installation of a secondary treatment unit and sub-surface irrigation system with suitable soil remediation techniques such as the application of gypsum in clayey soil (~1 kg/m^2) and good quality loamy topsoil with a high level of organic matter, preferably in conjunction with deep ripping. However, if it is found that the trenches were installed without a distribution box or with a faulty one, the installation of a new distribution box which will allow the soil in the trenches to be 'rested' between dosing, may solve the land degradation problem. Other installation problems include:

- trenches not installed parallel to the contour
- trenches installed too deep
- root infestation (e.g. cypress, eucalyptus and other water seeking trees and shrubs)
- the septic tank not level – sludge builds up at one end and may flow out of the tank and into the trenches or causes the tank to have to be desludged more frequently.

A root infestation problem can be rectified by installing a root barrier i.e. digging a 1 m deep narrow trench, 1 m to the side of the trench where the trees and shrubs are sending out their roots and lining it with plastic (Norm Sherar, Gippsland Septic Tank & Concrete Products Pty Ltd, pers. comm., 2009).

Note:

a. In Soil Categories 1 and 2a (AS/NZS 1547 and Appendix A) – gravels and sands – the disposal of primary treated effluent to land via soil absorption trenches / beds or LPEDs should not permitted because of the risk of pathogens and nutrients moving rapidly through the soil profile and negatively impacting the groundwater (unless the soil does not have a high perched or seasonal watertable). [The preferred methods of land application in Category 1 and 2a soils are Wick Trench/Bed Systems, irrigation systems and mounds for secondary quality effluent.]

b. Discharge Control Trenches and Boxed Trenches (AS/NZS 1547) are not allowed in Victoria due to the lack of side wall absorption and because the effluent is directed to groundwater.

c. The conservative Design Loading Rate in the most recent version of AS/NZS 1547 should be used for primary treated effluent applied to Soil Categories 2b to 6 via soil absorption trenches and beds (see Table 9).

3.7.2 Secondary treated effluent land application systems

The default land application system for sustainably recycling secondary treated sewage or greywater effluent to land is pressure-compensating sub-surface irrigation (with disc or mesh filters and scour and vacuum valves) which evenly distributes effluent throughout the irrigation area. The distribution pipes (drip-lines) fill up with effluent until a certain pressure is reached which opens the emitter valves. For a 450 m^2 irrigation field with 13 mm diameter pipes, at least 60 L may be required to be pumped into the pipes to reach the required pressure to open the emitters. More controlled pressure can be applied when the field is divided into two or more zones and these smaller areas are intermittently dosed using a sequencing valve.

A gravity-flow effluent irrigation system is not allowed, due to the lack of even distribution. Irrigation distribution pipes must not have dripper-holes drilled or cut into them after purchase because the effluent will flow out of the holes in the first few metres of pipe at a far higher rate than the system is designed for and higher than the soil is capable of sustainably absorbing.

Other land application systems suitable for secondary treated effluent are:

- Evapo-Transpiration Absorption (ETA) beds (AS/NZS 1547)
- Low Pressure Effluent Distribution (LPED) system (AS/NZS 1547)
- Mounds (AS/NZS 1547)
- Soil Absorption Trenches/Beds (AS/NZS 1547)
- Wick Trench and Bed system (Appendix E)

(see Table 9 for recommended application rates).

3.7.2.1 Secondary effluent irrigation designs

Secondary treated effluent should be applied using the design irrigation rates specified in Tables 3 and 9 as a maximum. Secondary quality effluent is a valuable water and nutrient resource and should be used beneficially to support vegetation growth, not be discharged deep in the soil profile where it provides very little beneficial use to the land or to the residents. The default for recycling secondary quality effluent is sub-surface irrigation because water is not wasted by evaporation or runoff, flexible garden designs are possible, water is delivered to the plants' roots in the topsoil layer and it provides the highest protection for environmental and public health.

Where secondary treated effluent from commercial premises will be irrigated, consideration should be given to the retention of surge loadings in a holding tank and timer-dosing the effluent to the irrigation field to evenly spread the dispersal over 24 hours. This will reduce the possibility of effluent surfacing during peak usage.

3.7.2.2 Advanced secondary treated greywater effluent (10/10/10) for outdoor uses

Approved greywater treatment systems producing a 10/10/10 standard of effluent may recycle effluent from single domestic households to land using either sub-surface or surface irrigation or dedicated hand-held (purple) hoses (see Tables 1 and 2) in accordance with the most recent version of the Victorian Plumbing Industry Commission's Technical Solutions Grey or Recycled Water (Non-drinking Water) and AS/NZS 1319 (for safety signs).

Multi-dwelling residential developments, hospitals, child care facilities and schools must only use sub-surface irrigation, not surface irrigation nor hoses for garden watering. Only in unsewered areas may advanced secondary greywater effluent be used for commercial applications via low trajectory, coarse droplet, surface irrigation to:

- horticultural crops such as grape vines where drip irrigation is common practice and the effluent does not come in contact with the edible parts of the herb, fruit, nut or vegetable
- sporting fields with existing surface irrigation systems and where the sport does not involve players' bodies coming in contact with the grass on the field (such as golf courses).

In addition, there must be a 4-hour withholding period between the application of the effluent and use of the sporting field. The property owner must also have a service contract with a service technician and regularly send the reports to Council.

3.8 Indoor uses for advanced secondary treated greywater effluent (10/10/10)

Only single domestic households are allowed to use treated greywater (10/10/10 quality or better) for toilet flushing and/or cold water supply to the clothes washing machine (see Section 4.4.2). The householder must arrange and pay for the recycled water to be annually tested by a NATA-accredited laboratory for Biochemical Oxygen Demand (BOD_5), Total Suspended Solids and E. coli, and where it is also used outdoors Electrical Conductivity (EC) and Sodium Absorption Ratio (SAR) is recommended as well (see Section 2.3.4 and Appendix G for guidance on EC and SAR). The test results are to be sent to the local Council and the service technician. Where the effluent quality results show the treatment system is not functioning at the advanced secondary quality standard, the treatment system must be serviced to achieve 10/10/10 or all the greywater must be dispersed to land via a sub-surface irrigation system.

Treated greywater must not be used indoors in multi-dwellings, hospitals, aged care centres, schools, commercial, community or business institutions for any purpose due to the higher risks to public health from plumbing cross-connections and potential failure of the treatment system from lack of servicing.

3.9 Setback distances

Even when onsite wastewater management systems are properly designed, installed and maintained, potential environmental and public health risks always exist. The consequences of failing onsite treatment and land application systems are diverse and depend on the type of treatment system, the characteristics of the site and the wastewater, the sensitivity of the surrounding environment and proximity of neighbouring households and landuse.

To minimise the potential risks, onsite wastewater management systems must be installed with a 'buffer' or 'setback distance' to the property structures and the surrounding environment. Setback distances from primary and secondary sewerage and greywater systems are listed in Table 5.

The setback distances in potable water catchments are based on the Sydney Catchment Authority's requirements for residential developments in drinking water catchments (SCA 2010). These setback distances are based on in-depth scientific investigations and assessments using groundwater dye and plume studies, in-ground viral die-off studies, surface water flow studies, sophisticated modelled and ground-truthing which have been carried out over more than a decade.

Using Council's local knowledge, a comprehensive LCA undertaken in accordance with this Code and the latest version of the Victorian LCA Framework [MAV et. al. 2014 (as amended)], Council may,

- increase these setback distances where it considers that there is an increased risk to public health and/or the environment
- orreduce the setback distances in non-potable water supply catchments where it considers that the risk to public health and the environment is negligible
    - reduce the setback distance to a waterway in a potable water supply catchment up to a maximum of 50% for a secondary treatment system where the conditions of footnotes 4 and 5 in Table 5 are met

Research (CRC WQ&T 2007) has shown that system failure usually occurs under wet conditions. Consequently, any consideration of a reduction to setback distances should consider the cumulative impacts of a number of systems failing during wet weather.

3.9.1 Treatment tanks

Onsite wastewater treatment tanks which are installed below ground must be designed, constructed and accredited in accordance with the latest version of AS/NZS 1546.1 'Onsite Wastewater Management: Part 1 Septic Tank'. The buffer distance required between in-ground onsite wastewater tanks and building footings or boundary fences is the appropriate 'angle of repose' (based on soil type, tank depth etc.). Above-ground and in-ground treatment systems must comply with the same setback distances as land application systems.

3.9.2 Flood-prone areas

Onsite wastewater management systems are generally not suitable for areas likely to flood more frequently than every 20 years (on average) unless the treatment system is watertight and has mechanisms in place which prohibit floodwaters or wastewater from the land application system from flowing into the tank and from the tank into the premises. Systems which are not watertight may only be installed in areas that have an 'annual exceedance probability' (AEP) of flooding of more than 20 years (i.e. are likely to flood less frequently than every 20 years).

3.9.3 Bores

Category 1 and 2a soils (see Appendix A and AS/NZS 1547) are highly porous and often have numerous bores where the water table is high, easily accessible and contains good quality water. Dispersing treated, but un-disinfected, sewage effluent into porous soils may pose a health risk where bore water is used to top-up rainwater tanks used for domestic purposes (i.e. to supplement potable water supplies). Therefore, primary treated effluent must not be applied to Category 1 and 2a soils near bores. Sub-surface land application systems which disperse un-disinfected secondary effluent (20/30) needs to be at least 50 m from a bore. However, where the secondary effluent is disinfected to $\leq$10 cfu / 100 mL the setback to a bore can be reduced to 20 m.

Table 5: Setback distances for primary and secondary treatment plants and effluent disposal/irrigation areas in sewered and unsewered areas (where applicable) [1, 2, 6, 10,]

Landscape feature or structure	Setback distances (m)		
	Primary sewage and greywater systems	Secondary sewage and greywater systems	Advanced secondary greywater systems [3]
Building			
Wastewater field up-slope of building [7]	6	3	3
Wastewater field down-slope of building	3	1.5	1.5
Wastewater up-slope of cutting/escarpment [12]	15	15	15
Allotment boundary			
Wastewater field up-slope of adjacent lot	6	3	1
Wastewater field down-slope of adjacent lot	3	1.5	0.5
Services			
Water supply pipe	3	1.5	1.5
Wastewater up-slope of potable supply channel	300	150	150
Wastewater field down-slope of potable supply channel	20	10	10
Gas supply pipe	3	1.5	1.5
In-ground water tank [14]	15	7.5	3
Stormwater drain	6	3	2
Recreational areas			
Children's grassed playground [15]	6	3 [16]	2 [16]
In-ground swimming pool	6	3 [16]	2 [16]
Surface waters (up-slope of:)			
Dam, lake or reservoir (potable water supply) [8, 13]	300	300 [4]	150
Waterways (potable water supply) [9, 13]	100	100 [4, 5, 17]	50
Waterways, wetlands (continuous or ephemeral, non-potable); estuaries, ocean beach at high-tide mark; dams, reservoirs or lakes (stock and domestic, non-potable) [8, 9]	60	30	30
Groundwater bores			
Category 1 and 2a soils	NA[11]	50[19,]	20
Category 2b to 6 soils	20	20	20
Watertable			
Vertical depth from base of trench to the highest seasonal water table [18]	1.5	1.5	1.5
Vertical depth from irrigation pipes to the highest seasonal water table [18]	NA	1.5	1.5

1. Distances must be measured horizontally from the external wall of the treatment system and the boundary of the disposal/irrigation area, except for the 'Watertable' category which is measured vertically through the soil profile. For surface waters, the measuring point shall be from the 'bank-full level'.
2. Primary water-based sewerage systems must only be installed in unsewered areas; secondary sewerage systems must only be installed and managed in sewered areas by Water Corporations; secondary greywater systems can be installed in sewered and unsewered areas (see Section 3.12.3).
3. Advanced secondary greywater systems treating effluent to ≤10/10/10 standard.
4. The setback distance in a Special Water Supply Catchment area may be reduced by up to a maximum of 50% conditional on the following requirements (otherwise the setback distances for primary treatment systems apply):
    - effluent is secondary treated to 20/30 standard as a minimum
    - a maintenance and service contract, with a service technician accredited by the manufacturer, is in place to ensure the system is regularly serviced in accordance with Council Septic Tank Permit conditions and
    - Council is satisfied the reduction in set-back distance is necessary to permit the appropriate development of the site and that risks to public health and the environment are minimised.
5. Effluent typically contains high levels of nutrients that may have a negative impact on native vegetation and promote the growth of weeds.

When determining setbacks, Council should consider not only the potential impact of nutrients from the proposed onsite wastewater management system, but the cumulative impact of the existing onsite wastewater management systems in the area.

6. Establishing an effluent disposal/irrigation area upslope of a building may have implications for the structural integrity of the building. This issue is beyond the scope of this Code and should be examined by a building professional on a site-by-site basis.
7. Does not apply to dams, lakes and reservoirs located above ground-level which cannot receive run-off.
8. Means a waterway as defined in the Water Act 1989.
9. The setback distances for flat land are equivalent to 'down-slope' setback distances.
10. See Table 9 for other land application options for Category 1 and 2a soils.
11. A cutting or escarpment from which water is likely to emanate.
12. Applies to land, adjacent to a dam, lake, reservoir or waterway that provides water for a public potable water supply, which is:
    a. subject to a Planning Scheme Environmental Significant Overlay (ESO) that designates maintenance of water quality as the environmental objective to be achieved (contact the relevant Water Authority to determine whether the ESO is in a potable water supply catchment)
    and/or
    b. within a Special Water Supply Catchment Area listed in Schedule 5 of the Catchment and Land Protection Act 1994.
14. It is recommended that any primary or secondary treatment system and its associated land application system are installed downslope of an in-ground water tank.
15. Means a school, council, community or other children's grassed playground managed by an organisation which may contain play equipment (but does not mean a sports field).
16. Sub-surface irrigation only.
17. Where an intermittent stream on a topographic or orthographic map is found through ground-truthing to be a drainage line (drainage depression) with no defined banks and the bed is not incised, the setback distance is 40 m (SCA 2010). The topography of the drainage line must be visually inspected and photographed during the LCA site inspection and reported upon in writing and photographs in the LCA report.
18. The highest seasonal watertable occurs when the watertable has risen up through the soil profile and is closest to the ground surface. This usually occurs in the wettest months of the year.
19. The setback distance to a groundwater bore in Category 1 and 2a soils can be reduced to 20 m where treated and disinfected greywater or sewage (20/30/10 or better standard) is applied and the property owner has a service contract with an appropriately qualified technician to regularly maintain the treatment system.
20. See Section 3.9 for more details on setback distances from treatment tanks and land application areas.

3.10 Reserve areas

3.10.1 Absorption trench systems

A reserve area is a (duplicate) land area of equal size to the designated land application area (LAA) which may be used as the LAA in the event that the original area fails or is inadequate or needs to be rested. A reserve area is required for all primary and secondary effluent trench and bed systems (including LPED systems) unless Council is satisfied that based on local knowledge and evidence from a comprehensive LCA (see Section 3.6.1), there is a low risk of negative impact on the environment or public health. However, an LCA and a duplicate reserve area are mandatory in all Special Water Supply Catchment areas. The reserve area should be identified on the site plan as an area of land separate to the LAA.

Absorption trench systems and their duplicate reserve area must be designed, installed and maintained in accordance with the latest version of AS/NZS 1547. The spacing between the trench side walls must be a minimum of 1 m and although the spacing typically ranges from 1 m in sandy loams to 2 m in clayey soils in Australia and internationally, the spacing may be larger. The maximum length of a trench is 30 m. A root guard installed to a depth of 1 m on either side of the absorption field is a best practice method to protect the trench system from infestation, damage and blockage from plant roots.

Note:
The primary cause of trench failure (75% of cases) in the Gippsland area over the last 25 years has been plant root infiltration. Other causes

include:

- trenches not installed on the contour
- the slope of the trench is too steep across the contour (a grade of <1:20 is required for gravity flow systems i.e. a drop of 2 mm every 3 m is best practice)
- no distribution box
- the concrete in the distribution box disintegrated making the box inoperable
- Plastic arch collapsed after approximately 20 years.

All these problems were not dependent on climate or location and were rectified without utilising the reserve area (Norm Sherar, Gippsland Septic Tanks & Concrete Products Pty Ltd, pers. comm. 2010).

However, in the Ballarat area the primary cause of trench failure has been poor installation, overloading the system and impact by vehicles. In all but one instance, a new trench system was installed in the reserve area.

3.10.2 Irrigation systems

A reserve area is not required for a surface or sub-surface pressure-compensating irrigation system where the size of the system has been calculated and designed using the latest version of the Model LCA Report and the recommended Design Irrigation Rates in Tables 3 and 9, unless Council considers the site maybe subject to environmental or operational risks. The low application rates are designed to create irrigation systems that are sustainable over the life of the system. If a fault occurs with a pressure-compensating irrigation system it is an equipment fault which needs maintenance, it is not a soil degradation problem. Pumps and disc/mesh filters will fail before the soil is overloaded.

3.11 System installation, use and maintenance

A Council Permit to Install is required before the installation of any treatment system and the associated effluent recycling/disposal system. Once installed, the onsite wastewater management system may not be used until Council has issued a Certificate to Use. Before commissioning, Council must be given suitable notice (the required timeframe will vary between Councils) that the treatment and irrigation systems have been installed (but not buried) and are ready for Council inspection. The Certificate to Use is issued after Council has received the Plumbing Compliance Certificate and is satisfied the treatment and irrigation systems were installed in accordance with the Permit to Install and this Code. Council may fine a property owner under section 53MB and Schedule A of the Act for using an onsite wastewater management system before a Council officer has inspected the installation and issued a Certificate to Use.

3.11.1 Service contracts

The treatment and irrigation/disposal systems must be operated and maintained in accordance with the conditions in the Council Permit to Install/Alter and this Code to ensure that human health and the environment are protected.
Where a property is served by a treatment system other than a gravity-flow primary treatment and land application system, it is mandatory that the property owner has a service contract with an accredited and trained service technician who will routinely service and maintain the treatment unit and land application system in accordance with the Permit conditions. Council may fine a property owner under section 53N and Schedule A of the Act for failing to have the treatment system regularly serviced on an ongoing basis in accordance with the conditions on the Council Septic Tank Permit.

3.11.2 Maintaining land application area (LAA)

To ensure that a LAA functions efficiently long-term, all the following actions should be undertaken by the land application designer and/or property owner:

- Realistic estimates of water, salt and sodium balances should be made to ensure that sufficient leaching occurs and no salts or sodium can accumulate in the root zone of vegetation. Sufficient gypsum should be applied to the garden to displace sodium from the soil particles and replace lost calcium (see Appendix G).
- New land application areas should be vegetated immediately after installation (see manufacturer's or Council's list of suitable plants).
- Care should be taken to protect the vegetation growing across soil absorption trenches because plants, together with sunlight and wind, play a vital role in supporting the utilisation and dispersal of wastewater.
- Effluent recycling/disposal areas should be isolated as much as possible from other domestic facilities and activities to protect people and pets from potential contamination with wastewater and to protect the land from disturbance.
- Signs should be erected to inform householders and visitors of the proximity of the LAA and to limit their access and impact on the area.
- Paving, driveways, patios, fences, building extensions, sheds, children's playgrounds, utility service trenching must not be built over or encroach on the disposal/recycling area.
- The long-term functionality of the LAA will depend on the actual (as distinct from the proposed) hydraulic loading, the composition of the wastewater and the ongoing maintenance of the treatment plant and LAA system (see the Council Septic Tank Permit/Alter for management and maintenance conditions and recommendations).

3.12 Connection to sewer

For new developments, SEPP WoV (Clause 32.2.b) requires Councils to issue Planning Permits with a requirement that reticulated sewerage is provided at the time of subdivision, where the use of onsite wastewater management would result in wastewater being discharged offsite or negatively impacting groundwater beneficial uses.

SEPP WoV (Clause 34) requires that premises connect to sewer where it is available, unless the wastewater is being recycled in accordance with this Code and is retained with the allotment boundaries. Consequently any premises with an offsite discharge or a primary treatment and disposal system must connect to sewer. However, a secondary treatment system can continue to be used if it can be shown that it is beneficially recycling effluent within the boundaries of the allotment in accordance with Section 3.12.4.

3.12.1 Split systems

Property owners with a 'split system', where toilet wastewater is treated by a septic tank and absorption trench system and greywater is discharged offsite to the stormwater system, should connect both the blackwater and greywater to the reticulated sewerage when it is available.

3.12.2 Primary treatment systems

Primary treatment anaerobic septic tanks and aerobic wet composting systems must not be used after reticulated sewerage has been provided to an allotment, unless all the effluent from the tanks is piped to the reticulated sewer system i.e. to an effluent sewer system (also known as a STED, STEP or STEG system). Otherwise, home owners with primary treatment systems should decommission the tanks to the satisfaction of the Council (see Appendix D) and connect to the sewer when it is available. Dry composting toilets, however, may continue to be used provided any residual liquid is piped to sewer.

3.12.3 Retrofitting secondary treatment systems

As an alternative to the effluent sewer scenario in Section 3.12.2 a Water Business may choose to install and manage onsite secondary treatment systems where:

a. the treatment system has an EPA approval for the production of secondary quality effluent (20/30) or better
b. the treatment system continues to treat to 20/30 standard or better
c. a remote monitoring device is installed to continuously monitor electrical components and the alarm signals and relay the information to the service technician and the Water Business, and
d. the annual effluent quality results (e.g. BOD, SS, EC and SAR) of each onsite wastewater treatment system are reviewed by the Water Business to determine whether the minimum secondary effluent quality standard is being maintained. (Where a treatment system is not achieving secondary quality effluent it may either be fixed and brought up to standard or decommissioned and the premises connected to the sewer, or replaced with another secondary treatment system.)

3.12.4 Existing secondary treatment systems

Where a property has an existing EPA approved secondary treatment system that was installed before the property owners were formally notified by the Water Corporation that a reticulated sewerage system is available, the treatment system may be retained under the following conditions:

- the effluent quality is verified, via independent effluent sampling and analysis at a NATA-registered laboratory, to be 20/30 secondary standard or better
- the premises owner has demonstrated to the satisfaction of the relevant Council that the effluent is being sustainably recycled and contained onsite in all weather conditions
- service reports which verify that the premises owner/occupier has had an on-going service history with a professional service technician have been provided to Council at regular intervals in accordance with the conditions in the Council Septic Tank Permit
- the treatment and recycling system is managed and serviced in accordance with the conditions on the Council Septic Tank Permit to Install/Alter.

Householders with well-functioning secondary treatment systems which meet the above conditions may elect to:

- connect their onsite treatment plant to the reticulated sewer and discharge treated effluent or raw wastewater to sewer during wet weather

  or

- where there is no or insignificant impact, continue to irrigate all-year round.

Where a well-functioning onsite secondary treatment system continues to be used after reticulated sewerage is available, the householder should arrange and pay for the effluent to be analysed by a NATA-accredited laboratory for Biochemical Oxygen Demand (BOD_5), Total Suspended Solids, Electrical Conductivity, Sodium Absorption Ratio and, if applicable E. coli on an annual basis. The results should be sent to the relevant Council and Water Corporation each year. Where the effluent quality results show that the treatment system is no longer functioning at the secondary quality standard, the treatment system should be serviced to achieve secondary standard or the house connected to the reticulated sewerage.

Chapter 4 — Onsite wastewater management in sewered areas

4.1 Onsite systems allowed and not allowed in sewered areas:

Systems allowed:

- Greywater treatment and recycling systems are allowed to be installed in new or existing homes.
- Dry composting toilets are allowed to be installed in new or existing homes provided the liquid discharge is piped to sewer.
- Urine separating toilets (a collection system not a treatment system – see Appendix F) may be installed provided a centralised entity, such as a Water Corporation manages the collection and beneficial reuse of the urine.
- An existing secondary treatment system installed before reticulated sewerage became available may be retained, provided it is regularly serviced, is achieving secondary standard and is sustainably recycling effluent to the garden (see Section 3.12.4).
- A secondary treatment system may be installed, maintained and monitored by a Water Corporation as part of a reticulated sewerage system (see Section 3.12.3).

Systems not allowed:

- Primary treatment sewerage systems (anaerobic or aerobic) are not allowed in sewered areas, unless managed by a Water Corporation as part of an effluent sewer system (i.e. a STEP and/or STEG system).
- All-waste secondary sewage treatment and recycling systems are not allowed to be installed where reticulated sewerage is already available (see the exceptions immediately above).
- Greywater treatment systems used in multi-dwelling or commercial buildings must not recycle effluent for any indoor purposes such as toilet flushing.

4.1.1 Greywater overview

It is a common misconception that greywater does not contain pathogens and that it is only sewage and blackwater that require treatment before disposal or recycling. Treated greywater can contain pathogens, and if poorly managed, can present a risk to human health and the environment. Both raw and treated greywater contain salts, especially sodium from powdered detergents, which can have a detrimental effect on soil structure and health. Raw kitchen wastewater which contains fats, oils and grease (FOG) should not be diverted to gardens because the FOG can reduce the availability of air to plants and harm micro-organisms. However, when greywater is treated using an EPA-approved wastewater treatment system the resultant effluent can be applied to land by following the guidelines in this Code and the most recent version of AS/NZS 1547: On-site Domestic Wastewater Management.

4.2 Onsite sewerage options in sewered areas

All currently approved dry composting toilets and greywater treatment systems are listed on the EPA website www.epa.vic.gov.au/for-community/environmental-information/water/about-wastewater/onsite-wastewater-systems. The range of onsite wastewater scenarios that are possible in sewered areas are listed in Tables 2 and 6. All greywater in excess of a treatment system's daily maximum hydraulic capacity and the garden's needs (i.e. in wet weather) must be discharged to sewer.

Due to the difficulty of treating fats, oils, grease and high loads of organic matter in kitchen wastewater, most greywater treatment systems exclude kitchen water from the waste stream. Kitchen wastewater must, therefore, be diverted to sewer (or to a septic tank in unsewered areas) unless the treatment system is specifically designed for treating kitchen wastewater. Most greywater treatment manufacturers instruct householders to exclude greywater from the laundry trough when it is polluted with contaminants such as dirty nappies, soiled clothing or cleaning chemicals etc. A greywater treatment system's ability to treat kitchen or laundry trough wastewater is detailed in the owner's manual.

Most dry composting toilets have a liquid waste stream, consisting mainly of urine. A plumbing practitioner must connect pipe-work to the dry composting toilet to discharge this liquid waste to the sewer, not to a greywater treatment system or to a land application system. The mature composted material from a dry composting toilet must be buried in a 300 mm deep hole in the ornamental section of a garden and covered with loamy topsoil in accordance with the compost handling and safety procedures in the manufacturer's written instructions.

Table 6: Onsite wastewater collection and treatment options in sewered areas

Toilet waste	Kitchen wastewater	Other household greywater (with excess to sewer)

Dry composting toilet	To sewer	
Dry composting toilet	To sewer	Onsite treatment
Dry composting toilet	All greywater treated onsite	
To sewer	To sewer	Onsite treatment
To sewer	All greywater treated onsite	

4.3 Greywater treatment system installation, use and maintenance

A Council Permit to Install is required before a greywater treatment system is installed. A greywater treatment system must be operated and maintained in accordance with the conditions in the Council Permit to ensure that human health and the environment are protected. It is mandatory that the householder has a service contract with an accredited and trained service technician to service and maintain the treatment unit and irrigation system in accordance with Council Permit conditions and the manufacturer's Service Manual.

4.3.1 Soil type assessment and site plan

In sewered areas, the soil type assessment for an irrigation system can be undertaken in accordance with the 'Site and Soil Properties' procedures in Appendix E of AS/NZS 1547: 2012 (as amended) or another method approved by the relevant Council before the site investigations begin. The irrigation designer, land capability assessor, wastewater consultant or other suitable professional undertaking the soil type assessment and designing the irrigation system must prepare a site plan, incorporating the relevant features and information listed in Section 3.6.1 (9) and the applicable setbacks lists in Table 5, to accompany the application for a Septic Tank Permit to Install/Alter. The design irrigation rates for surface or sub-surface irrigation should be equal to, or less than, those listed in Tables 3 and 9 for the relevant soil type.

4.4 Treated greywater recycling and reuse

Climate change and population growth have resulted in increasing pressure on drinking water supplies. Greywater is a resource that can be recycled for indoor and/or outdoor purposes (see Tables 1, 2 and 7). Replacing the use of potable water for toilet flushing, cold water supply to the clothes washing machine and/or garden irrigation with greywater will reduce the demand on drinking water supplies and the amount of sewage effluent discharged to the environment. By using treated greywater instead of drinking quality water for these purposes, more water is available in potable supply dams providing greater water security for cities and towns.

Greywater treatment systems provide a permanent supply of treated effluent. The use of treated greywater inside the house requires more stringent conditions for the installation and performance of the treatment system than is required for garden irrigation only. The greywater treatment and storage system must be designed so the volume of greywater collected matches the household recycled water needs (e.g. for toilet flushing, washing machine use and garden irrigation). Large effluent storage tanks may be installed to ensure a ready supply of water for indoor uses, garden irrigation and/or fire fighting. The requirement for 24-hour maximum storage time only applies to untreated greywater, not to treated, disinfected greywater. Where there may be insufficient effluent for continuous supply to the toilets and/or washing machine, the system can be supplemented with potable quality water, provided that a suitable backflow prevention device is installed in accordance with AS/NZS 3500.

Table 7: Options for treated greywater recycling in sewered areas [1]

Secondary[1] Treated Greywater Effluent Quality BOD / SS / *E. coli*	Single domestic household				Multi-dwellings, schools, hospitals, commercial and business premises			
	Surface[2, 5] Irrigation – spray, drip	Sub-surface [2, 3] Irrigation	Toilet Flushing	Clothes Washing Machine Coldwater Supply [4]	Surface Irrigation – spray or drip only	Sub-surface [2, 3] irrigation	Toilet Flushing	Clothes Washing Machine Coldwater Supply
10/10/10	Yes [6, 7]	Yes	Yes	Yes	No	Yes	No	No
10/10	No	Yes	No	No	No	Yes	No	No
20/30/10	Yes	Yes	No	No	No	Yes	No	No
20/30	No	Yes	No	No	No	Yes	No	No

1. In sewered areas, excess treated greywater and water polluted with dyes or nappy faeces must be diverted to sewer.
2. Treated greywater must not come in contact with the edible parts of herbs, fruits or vegetables.
3. For sustainable garden irrigation, liquid laundry detergents should be used, because powdered laundry detergents can contain a high level of salts which may degrade soil health over time (see www.lanfaxlabs.com.au).
4. Greywater recycling for clothes washing may not always result in the desired outcome, especially when washing light-coloured clothes. A carbon filter may need to be added to the treatment train to remove colour from greywater effluent.
5. Surface irrigation of treated greywater must be in accordance with Section 4.4.3.
6. Advanced secondary greywater may be dispersed via a hand-held purple hose that is connected to a purple tap with a left-hand thread in sewered areas where the excess treated greywater is discharged to sewer. The recycled greywater can be used to water lawns and gardens, but not hard surfaces such as paths and driveways because the nutrients and pathogens in the greywater would flow through the stormwater drains and could negatively impact the local waterways.
7. Recycled greywater may be used for fire-fighting.

4.4.1 Prohibited uses of greywater

Treated greywater effluent must NOT be:

- consumed by humans or animals
- used for food preparation or washing dishes or kitchen appliances
- used for bathing or showering
- used to fill or top-up swimming pools or spas
- used for car washing
- used for hosing pavements and other hard surfaces that will result in greywater flowing into stormwater drains
- used for irrigating in a way that the greywater will come in contact with edible parts of herbs, fruit or vegetables
- used in evaporative coolers
- piped to hot water services
- stored in rainwater tanks
- discharged off the property and beyond the allotment boundary.

4.4.2 Indoor use of treated greywater in single domestic households

The indoor use of treated greywater is only permitted in single domestic households, not in any commercial, business, community, school, child care, hospital or multi-dwelling residential premises.

The internal plumbing of pipes to the toilet cistern and/or clothes washing machine for greywater recycling must be undertaken by the licensed plumber in accordance with the most recent version of AS/NZ 3500: Plumbing and Drainage and the Plumbing Industry Commission's Technical Solution Grey and Recycled Water (Non-drinking Water) which specifies the use of management controls such as back-flow prevention devices and purple colour-coded pipes.

Greywater recycling systems for indoor use (see Tables 1, 2 and 7) must include:

- back-flow prevention devices
- purple colour-coded pipework for internal recycled water plumbing
- an appropriate back-up supply of potable water in the event that the supply of recycled greywater fails
- an automatic valve to divert effluent to sewer if the system fails as a result of a malfunction or power failure or if the effluent storage tank is full
- a manual valve to divert wastewater contaminated with chemicals, dyes or faecal matter from any sink, bath or shower to the sewer.

Note: Treated greywater pipes must not be cross-connected to the potable water supply pipes. Appropriate back-flow prevention devices must be installed on any potable water backup to the treated greywater supply in accordance with the most recent version of AS/NZS 3500, after consultation with the relevant Water Corporation where reticulated drinking water is supplied. Back-flow prevention devices must be tested annually by a licensed plumbing practitioner and the results submitted to the relevant Water Corporation.

Flow estimates for the proportion of greywater that can be used for designing household greywater recycling systems are provided in Table 8. The Permit applicant can propose alternative flow volumes based on local or site specific data or relevant literature.

Table 8: Recommended estimates for greywater flows [1]

Household flow estimates [2]	
Source	% of Total Household Wastewater
Household showers, baths, basins	40%
Household laundry	30%
Toilet wastewater	30%

1. Adapted from AS/NZS 1547: On-site domestic wastewater management.
2. Flows from the kitchen sink and laundry troughs are considered insignificant in this context and are not differentiated in these general estimates.

4.4.3 Outdoor use of treated greywater

Greywater recycling for garden irrigation (see Table 7) must be designed, installed and maintained in accordance with this Code and the most recent versions of AS/NZS 1547: Onsite domestic wastewater management, AS/NZS 1319: Safety Signs for the Occupational Environment and the Victorian Technical Solution Grey and Recycled Water (Non-drinking Water) (PIC, 2008a) and ensure that:

a. Greywater is treated to the required effluent quality for the intended uses (see options in Tables 1, 2 and 7).

b. New irrigation systems use purple coloured pipes and fittings, or if an existing irrigation system is being used, the external connection to the greywater supply is retro-fitted with purple coloured tape or painted purple (Note: lilac (purple) is the international colour code for secondary effluent quality recycling).

c. Disc or mesh filters are installed to protect the irrigation system from solids being carried over from the treatment system

d. Flush/scour valves or an equivalent system are installed to enable periodic flushing to clean the pipes in the irrigation system.

e. Vacuum breakers are installed to stop soil and other particles being sucking into and clogging the drippers.

f. Failsafe diversion valves divert greywater to sewer (or to blackwater systems in unsewered areas):
   i. during wet weather
   ii. in the event of a power outage or system malfunction
   iii. when greywater production exceeds demand and the storage capacity limit is reached.

g. Prohibition and safety signs with the symbols and/or words indicating 'Recycled Water — Do Not Drink' are clearly displayed on the treatment unit and adjacent to any dedicated recycled greywater hose tap in accordance with the most recent version of AS/NZS 1319.

h. Recycled water hose tap outlets:
   i. are coloured purple
   ii. are located at least 300 mm from any drinking water tap
   iii. have a non-standard "five-eighths of an inch" connecting thread, and

    iv. have a removable “child-proof” handle.

i. Recycled water hoses are purple and have a non-standard left-hand thread which screws into the recycled water taps (the opposite of drinking water taps).

j. Effluent is contained within allotment boundaries and not discharged to drains, waterways and does not negatively impact the beneficial uses of groundwater (see Table 5 for setback distances).

k. The effluent is dispersed throughout the land application area via a pressure-compensating drip irrigation system in accordance with the Design Irrigation Rates in Tables 3 and 9 after the irrigation designer has determined the soil type on the property (see Appendix A)

l. The irrigation rate and volume of effluent applied to the irrigation area does not exceed the plant or soil requirements.

m. The irrigation area contains good quality loamy topsoil (native or imported soil) with substantial organic matter to support the growth of healthy plants and soil microbes.

n. Soil moisture sensors and/or rain sensors are integrated into the irrigation system to automatically divert treated effluent to sewer before the soil becomes saturated in sewered areas (consult the soil moisture or rain sensor manufacturer for advice on installation to ensure the location is representative).

o. Treated effluent does not come in contact with the edible parts of herbs, fruit or vegetables.

p. Any evidence of effluent pooling, odours or increase in noise receives the attention of the service technician.

q. Householders monitor their gardens and use information about plant type, soil type and soil profile to ensure the irrigation rate meets the plants’ water requirements and is at a level suitable for the hydraulic capacity of the soil.

Appendix A:

Table 9: Soil Categories and Recommended Maximum Design Loading/Irrigation Rates (DLR/DIR) for Land Application Systems [1, 2, 5]

<table>
<tr><th rowspan="2">Soil texture</th><th rowspan="2">Soil structure</th><th rowspan="2">Soil category</th><th rowspan="2">Indicative permeability (Ksat) (m/d)</th><th colspan="6">Design Loading Rates and Design Irrigation Rates (DLR / DIR) (mm/day)</th></tr>
<tr><th>Absorption trenches/beds and Wick Trench & Bed Systems 6 for primary effluent (see Table L1 in AS/NZS 1547:2012)</th><th>(ETA) Evapo-transpiration absorption beds and trenches (see Table L1 in AS/NZS 1547: 2012)</th><th>Secondary treated effluent applied to Wick Trench & Bed System [4]</th><th>Sub-surface and surface irrigation (see Table M1 in AS/NZS 1547: 2012)</th><th>LPED
(see Table M1 in AS/NZS 1547: 2012)</th><th>Mounds (basal area) (see Table N1 in AS/NZS 1547: 2012)</th></tr>
<tr><td>Gravels and sands</td><td>Structureless (massive)</td><td>1</td><td>>3.0</td><td rowspan="2">NA [3]</td><td rowspan="2">NA [3]</td><td rowspan="2">25</td><td rowspan="3">5 [6]
(see Note 2 in Table M1)</td><td rowspan="2">NA [3]</td><td>24</td></tr>
<tr><td rowspan="2">Sandy loams</td><td>Weakly structured</td><td>2a</td><td>>3.0</td><td>24</td></tr>
<tr><td>Massive</td><td>2b</td><td>1.4 – 3.0</td><td>15</td><td>15</td><td>30</td><td>4</td><td>24</td></tr>
<tr><td rowspan="2">Loams</td><td>High / moderate structured</td><td>3a</td><td>1.5 – 3.0</td><td>15</td><td>15</td><td>30</td><td rowspan="2">4
(see Note 1 in Table M1)</td><td rowspan="2">3.5</td><td>24</td></tr>
<tr><td>Weakly structured or massive</td><td>3b</td><td>0.5 – 1.5</td><td>10</td><td>10</td><td>30</td><td>16</td></tr>
<tr><td rowspan="3">Clay loams</td><td>High / moderate structured</td><td>4a</td><td>0.5 – 1.5</td><td>10</td><td>12</td><td>30</td><td rowspan="3">3.5
(see Note 1 in Table M1)</td><td rowspan="3">3</td><td>16</td></tr>
<tr><td>Weakly structured</td><td>4b</td><td>0.12 – 0.5</td><td>6</td><td>8</td><td>20</td><td>8</td></tr>
<tr><td>Massive</td><td>4c</td><td>0.06 – 0.12</td><td>4</td><td>5</td><td>10</td><td>5
(see Note to Table N1)</td></tr>
<tr><td rowspan="3">Light clays</td><td>Strongly structured</td><td>5a</td><td>0.12 – 0.5</td><td>5</td><td>8</td><td>12</td><td rowspan="3">3
(see Note 1 in Table M1)</td><td rowspan="3">2.5
(see Note 4 in Table M1)</td><td>8</td></tr>
<tr><td>Moderately structured</td><td>5b</td><td>0.06 – 0.12</td><td rowspan="5">(see Notes 2 and 3 in Table L1)</td><td rowspan="5">5
(see Notes 2, 3 & 5 in Table L1)</td><td>10</td><td rowspan="5">5
(see Note to Table N1)</td></tr>
<tr><td>Weakly structured or massive</td><td>5c</td><td><0.06</td><td>8</td></tr>
<tr><td rowspan="3">Medium to heavy clays</td><td>Strongly structured</td><td>6a</td><td>0.06 – 0.5</td><td rowspan="3">5
(see Notes 2 and 3 in Table L1)</td><td rowspan="3">2
(see Note 2 in Table M1)</td><td rowspan="3">NA</td></tr>
<tr><td>Moderately structured</td><td>6b</td><td><0.06</td></tr>
<tr><td>Weakly structured or massive</td><td>6c</td><td><0.06</td></tr>
</table>

1. Adapted from Australian Standard AS/NZS 1547: 2012 – On-site domestic wastewater management.
2. The DIR and DLR are recommended maximum application rates for treated effluent. A water balance may indicate that a reduced application rate is required for a specific site.
3. The exception is where the soil does not have a high perched or high seasonal (winter) watertable (see AS/NZS 1547).
4. See Appendix E for design, installation and maintenance details.
5. Lower application rates may be required for reduced soil permeability in sodic and dispersive soils, soils with a perched or seasonally high watertable or soils with a limiting layer.

6. The application rate may be increased in sandy soils with a high watertable where an advanced secondary treatment system with disinfection replaces a primary treatment system on an existing lot that is too small to accommodate the maximum DIR for category 1 to 2b soils.

Appendix B: Council Septic Tank Permit Application Process

Overview of the main steps in applying for a Council Septic Tank Permit:

1. The property owner contacts the local Council Planning Department to determine whether a Planning Permit is required or planning conditions apply.
2. The property owner contacts the local Council Environmental Health Unit to collect a Septic Tank Permit application form, to determine which documents are required to accompany the application form and what level of detail is required for the land capability assessment (if applicable).
3. The property owner engages a land capability assessor, wastewater consultant and/or plumber to carry out the required investigations and write a report which will include maps and plans.
4. The property owner applies for their Planning Permit.
5. The property owner engages a land capability assessor (where applicable) to undertake the land capability assessment (LCA) and create a report for Council. The completed Septic Tank Permit, LCA report, any other required documents and the prescribed fee can be submitted to the Environmental Health Unit by the owner, builder or plumber.
6. The Planning Department refers the Planning Permit application to the relevant Water Corporations, the Environmental Health Unit and other agencies as required under the Planning and Environment Act.
7. Where the Planning Permit application is satisfactory the Planning Department issues the property owner with a Planning Permit, with the condition that the property owner must apply for a Septic Tank Permit.
8. The Planning Permit and LCA report are attached to the Septic Tank Permit application to ensure that all conditions on the Planning Permit are included in the Septic Tank Permit.
9. When the Environmental Health Unit is satisfied the application meets all requirements it issues a Septic Tank Permit to Install or Septic Tank Permit to Alter.
10. When the treatment system and indoor recycling and/or land application system are installed but not buried, the installer contacts Council to arrange an inspection of the installation.
11. When the Council Environmental Health Unit has received:
    a. the Plumbing Compliance Certificate
    b. the 'As Laid Plan'
    and
    c. the commissioning form from the plumber

    and is satisfied the system is installed correctly in accordance with the manufacturer's Installation Manual and the Council Permit to Install/Alter, Council issues a Certificate to Use to the property owner.

Appendix C: Useful factors to consider when selecting an EPA-Approved Onsite Wastewater Treatment System

Physical features	
Dimensions of the treatment plant	
Location of treatment unit – above-ground or below-ground	
Number and power of pumps, aerators and other electrical components	
Size of effluent storage tank	
Type of treatment processes	
Type of disinfection used if applicable	
Chemicals used	
Capital and installation costs	
Council Permits – e.g. Permit to Install, Permit to Alter and Certificate to Use	
Capital and delivery charge for the treatment system components including the septic tank, sump and sump pump (if applicable) and effluent storage tank	
Cost of manoeuvring the treatment unit into the back yard (i.e. is vehicular access or a crane required or can it be carried by several people?)	
Cost of digging the hole and removing the debris (if applicable)	
Concrete pad (if required)	
Cost of electrician's work to lay power cords to connect the treatment plant to the house, including a dedicated weather-proof power point and any modifications required to the switch board	
For greywater systems – cost of internal plumbing for toilet flushing, washing machine, backflow prevention device and automatic diversion valve to sewer	
Cost of the plumber/drainer digging trenches and laying pipes to connect the treatment system to the house	
Cost of land application/irrigation system including ancillary equipment (e.g. effluent pump, disc or mesh filter, vacuum breakers, scour valves, soil moisture sensors or rain gauges)	
Cost of the audio-visual alarm system and/or remote monitoring system	
Performance	
Minimum and maximum daily volumes that can be effectively treated	
Effluent quality (primary, secondary 10/10/10, 10/10, 20/30/10 or 20/30)	
Commissioning time to achieve approved effluent quality	
Total pump run time per day	
How does the system cope with:	large shock loads or surge flows? toxic substances like bleach, oil, paint thinners etc.? 24-hour power failure? 72-hour power failure? being switched off for 1 week, 1 month, 3 months? no inflow for 1 week, 1 month, 3 months?
kWh of electricity per kilogram of BOD removed	
Estimated lifetime of the treatment systems and its component parts	
Sustainability features of the treatment system	
Maintenance	
Desludging frequency or what is the fate of the biosolids?	
Number of service visits per year	
Number of hours of maintenance per year	
Expected maintenance tasks during each service call	
Qualifications and training of service technicians	
Ongoing costs	
Electricity usage per day; electricity cost per kL of wastewater; electricity cost per year	
Service fees per year (labour and travel costs)	
Annual cost of chemicals used	
Annual cost of replacing the UV lamp, membranes	
Annual cost of testing any backflow prevention devices	
Average annual cost of consumables, spare parts, pumps and desludging per year (annualised over 30 years)	
Annual effluent monitoring cost	
Cost of desludging the system every 3 to 5 years	
Total annual cost to run the treatment plant (including annualised spare parts and desludging)	

Appendix D: Septic Tanks

Commissioning

After installation or desludging, and before use, a septic tank must be two-thirds filled with clean water to:

- provide ballast in the tank to prevent groundwater lifting the tank out of the ground
- reduce odours
- enable any subsequent secondary treatment plant to be switched on, commissioned and used immediately.

When domestic wastewater from the dwelling flows into the septic tank it contains sufficient microbiological organisms to start and continue the treatment process. There is no need to 'feed' or dose a new or desludged septic tank with starter material or micro-organisms. If odour occurs after the commissioning of a system, a cup of garden lime can be flushed down the toilet each day until the odour disappears. If the odour persists, the property should seek professional advice from a plumber.

Sludge and scum

As organic matter from the wastewater and inert material, such as sand, settle to the bottom of the tank a layer of sludge forms. This layer contains an active ecosystem of mainly anaerobic micro-organisms which digest the organic matter and reduce the volume of sludge. Scum forms as a mixture of fats, oils, grease and other light material floats on top of the clarified liquid that has separated from the solids. When the clarified liquid flows out of the septic tank it is called 'primary treated effluent'.

It is not necessary or recommended that householders pour commercial products that are reputed to dissolve sludge build-up, down the toilet or sink. A teaspoon of granulated yeast flushed down the toilet once a fortnight may assist with microbial activity, though such a procedure is not an alternative to regular sludge and scum pump-out (Lord 1989).

Desludging septic tanks

Over time, the sludge and scum layers build up and need to be removed for the tank to function properly. The level of solids accumulation in the tank cannot be accurately predicted, and will depend on the waste load to the tank. Therefore, the sludge and scum depth should be checked annually by a contractor. If a septic tank is under a maintenance contract, regular assessment (every 1 to 3 years) of the sludge and scum layers must be part of the maintenance agreement.

The sludge and scum need to be pumped-out with a vacuum suction system when their combined thickness equals 50% of the operational depth of the tank. The frequency of pump-out depends on:

- whether the tank is an adequate size for the daily wastewater flow
- the composition of the household and personal care products
- the amount of organic matter, fat, oil and grease washed down the sinks
- the use of harsh chemicals such as degreasers
- overuse of disinfectants and bleaches
- the use of antibiotics and other drugs, especially dialysis and chemotherapy drugs
- whether any plastic or other non-organic items are flushed into the tank.

A well-functioning septic tank – one that is not overloaded with liquid, organic matter or synthetic material – typically only needs to be desludged once every 3 to 8 years (depending on the size of the tank). A septic tank connected to a home with a frequently used dishwasher will need to be pumped out more frequently (typically every 3 to 4 years) than a home with no dishwasher connected (typically every 5 to 6 years). A holiday home will need to be pumped out less frequently. Large (6,000 L) domestic septic tanks which are common in New Zealand and the USA and have started to be installed in Victoria, have been proven to require desludging only once every 10 to 15 years (Bounds, 1994).

After pump-out, tanks must not be washed out or disinfected. They should be refilled with water to reduce odours and ensure stability of plumbing fixtures. A small residue of sludge will always remain and will assist in the immediate re-establishment of bacterial action in the tank.

Householders should keep a record of their septic tank pump-outs and notify the local Council that a pump-out was undertaken in accordance with the Council Permit.

Septic tank failure

It is critical that a septic tank is not used as a rubbish receptacle. Septic tanks are designed solely for the treatment of water and organic materials. Items such as sanitary napkins, tampons, disposable nappies, cotton buds, condoms, plastic bags, stockings, clothing and plastic bottles will cause the septic tank to fail and require costly removal of these items. If a tank is contaminated or poisoned by household materials it should be pumped out immediately to enable the microbiological ecosystem to re-start.

Without the removal of the scum and sludge, sewage biosolids will increasingly be discharged into the soil absorption trenches and will eventually cause them to fail. This can force untreated sewage onto the ground surface and cause:

- noxious odours
- a boggy backyard
- a health hazard to the family, pets, visitors and neighbours from the pathogens in the sewage
- environmental degradation of the property, surrounding area and waterways from the nutrients, organic matter and other pollutants in the discoloured water

  and
- a public health risk to drinking water supplies in potable water supply catchments.

Positive actions a property owner can take to help a septic tank function well:

- Use soapy water (made from natural unscented soap), vinegar and water or bi-carbonate of soda and water to clean toilets and other water fixtures and fittings.
- Read labels to learn which bathroom and laundry products are suitable for septic tanks. Generally plain, non-coloured, unscented and unbleached products will contribute to a well-functioning septic tank.
- Use detergents with low levels of salts (e.g. liquid detergents), sodium absorption ratio, phosphorus and chlorine (see www.lanfaxlabs.com.au).
- Wipe oils and fats off plates and saucepans with a paper towel and dispose of in the kitchen compost bin.
- Use a sink strainer to restrict food scraps entering the septic system.
- Ensure no structures such as pavements, driveways, patios, sheds or playgrounds are constructed over the tank or absorption trench area.
- Ensure the absorption trench area is not disturbed by vehicles or machinery.
- Engage a service technician to check the sludge and scum levels, pumps and alarms annually.
- Keep a record of the location of the tank and the trenches and all maintenance reports (including the dates of tank pump-outs, tank inspections and access openings) and ensure the service technician sends a copy of the maintenance report to the local Council
- Have the tank desludged when the combined depth of the scum and sludge is equal to the depth of the middle clarified layer.

Indications of failing septic tanks and soil absorption trenches

- Seepage along effluent absorption trench lines in the soil
- Lush green growth down-slope of the soil absorption trench lines
- Lush green growth down-slope of the septic tank
- Inspection pits and/or the soil absorption trenches consistently exhibiting high water levels
- Soil absorption trench lines become waterlogged after storms
- General waterlogging around the land disposal area
- Presence of dead and dying vegetation (often native vegetation) around and down-slope of the land disposal areas
- A noxious odour near the tank and the land disposal area
- Blocked water fixtures inside the house, with sewage overflowing from the relief point
- High sludge levels within the primary tank (within about 150 mm of inlet pipe)
- Flow obstructed and not able to pass the baffle in the tank
- The scum layer blocking the effluent outflow.

Decommissioning treatment systems

Septic tanks

When a septic tank is no longer required it may be removed, rendered unusable or reused to store stormwater. The contents of the tank must first be pumped out by a sewage sludge contractor. The contractor must also hose down all inside surfaces of the tank and extract the resultant wastewater. Where the tank will no longer be used but will remain in the ground, the contractor must first disinfect the tank by spreading (broadcasting) hydrated lime over all internal surfaces in accordance with the WorkSafe safety precautions associated with using lime (i.e. wearing gloves, safety goggles and not using lime on a windy day).

Under no circumstances should anyone enter the tank to spread the lime or for any other reason, as vapours in confined spaces can be toxic.

A licensed plumbing practitioner must disconnect the tank from the premises and from the absorption trench system. The inlet and outlet pipes on the tank must be permanently sealed or plugged. To demolish a tank, the bottom of the tank is broken and then the lid and those parts of the walls that are above ground are collapsed into the tank. The tank is then filled with clean earth or sand.

Before a tank may be used to store stormwater a licensed plumbing practitioner must disconnect it from the premises and the trench system and connect an overflow pipe from the tank to the stormwater legal point of discharge. Before disinfecting the tank, it must be pumped out, the inside walls hosed down and then pumped out again. The tank is to be filled with fresh water and disinfected, generally with 100 mg/L of pool chlorine (calcium hypochlorite or sodium hypochlorite) to provide a resultant minimum 5 mg/L of free residual chlorine after a contact time of 30 minutes. However, advice should be obtained from a chemical supplier about safety precautions, dosage and concentrations to provide adequate disinfection for any tank. The chlorine is not to be neutralised, but be allowed to dissipate naturally for at least 1 week, during which time the water must not be used. Pumps may be installed to connect the tank to the irrigation system. The contents of the tank must not be used for any internal household purposes or to top-up a swimming pool. The water may only be used for garden irrigation. The tank and associated irrigation system must be labelled to indicate the water is unfit for human consumption in accordance with AS/NZS 3500: Plumbing and Drainage (Blue Mountains City Council 2008).

Secondary treatment systems

All treatment systems must be decommissioned by a licensed plumbing practitioner.

Appendix E: Wick Trench and Bed System

The Wick Trench and Bed land application system was developed by Kerry Flanagan of 'Kerry Flanagan Wastewater' for use in clay soils for primary and secondary effluent. The Wick System may also be used in other soil categories and on small lots (where applicable), as the system is designed to maximise the movement of effluent up through the soil to plant roots and the atmosphere.

The Wick System is a series of trenches with adjacent evapo-transpiration (EVT) beds that are underlain and joined by a layer of geotextile. The EVT bed may be installed on either side of the trench. The surface of the combined trench and EVT bed, which is approximately three times the width of a conventional trench, is planted with herbaceous vegetation to maximise the wicking effect over the large surface area. The geotextile acts as the 'wick' to continuously draw liquid upwards through capillary action. Plant roots and leaves, the sun and the wind act as 'pumps' to draw the liquid upwards out of the soil and into the atmosphere.

Design and Installation

Photographs of the Wick Trench and Bed System installation procedures can be found on pp. 137–141 of the Sydney Catchment Authority's manual *Designing and Installing On-Site Wastewater Systems* (SCA 2012). The manual can be downloaded at http://sca.clients.squiz.net/__data/assets/pdf_file/0020/39314/Designing-and-Installing-On-Site-Wastewater-Systems-complete-document.pdf . The design and installation procedures to be followed in Victoria, particularly in regard to the geotextile component of the system, are listed below.

Design

- The Wick Trench and Bed System must be installed on flat land. Where the available land is not flat, it must be terraced to provide a flat platform.
- The trench must have uniform depth to provide uniform performance along its length.
- For effective gravity flow from the septic tank to the Wick Trench the surface level of the Wick Trench must be at least 150 mm below the invert of the septic tank outlet (e.g. where the tank outlet invert is 400 mm below the top of the tank, the ground level of the Wick Trench must be at least 550 mm lower). On sites where it is not possible to have a 550 mm height difference between the septic tank outlet invert and the Wick Trench, a suitably-sized distribution pump must be used.

Sizing calculations:

Legend:

Q = Daily design flow rate in L/day

W = Width of trench and bed

DLR = Design Loading Rate in mm/day (see Table 9 for primary and secondary effluent loading rates)
F = factor of 1.2

Arch trench refers to a plastic self-supporting arch 410 mm wide x 1.5 m long.

EXAMPLE for Primary Treated Effluent:

Length of Wick Trench System for a standard 3-bedroom house on clay loam soil:

Length of Trench / Bed = Q / [DLR x (W / F)]

= [(3 bedrooms + 1) x 180 L/day] / [10 L/ m^2 x 1.6 m / 1.2]

= 720 L/ [10 L/m^2 x 1.6 m / 1.2]

= 720 L / 13.3 L/m

= 54 m

This would be built with two 27 m long Wick Trench/Beds or three 18 m long systems.

Area of the Wick Trench and Bed System = Length x Width

= 54 m x (600 mm + 1000 mm)

= 54 m x 1.6 m

= 86.4 m^2 (plus spacing between the Trench/Bed units)

EXAMPLE for Secondary Treated Effluent:

Length of Wick Trench System for a standard 3-bedroom house on clay loam soil:

Length of Trench / Bed = Q / [DLR x (W / F)]

= [(3 bedrooms + 1) x 180 L/day] / [30 L/ m^2 x 1.6 m / 1.2]

= 720 L/ [30 L/ m^2 x 1.6 m / 1.2]

= 720 L / 40 L/m

= 18 m

This would be built with one 18 m Wick Trench/Beds or two 9 m long systems.

Area of the Wick Trench and Bed System = Length x Width

= 18 m x (600 mm + 1000 mm)

= 18 m x 1.6 m

= 28.8 m^2 (plus spacing between the Trench/Bed units).

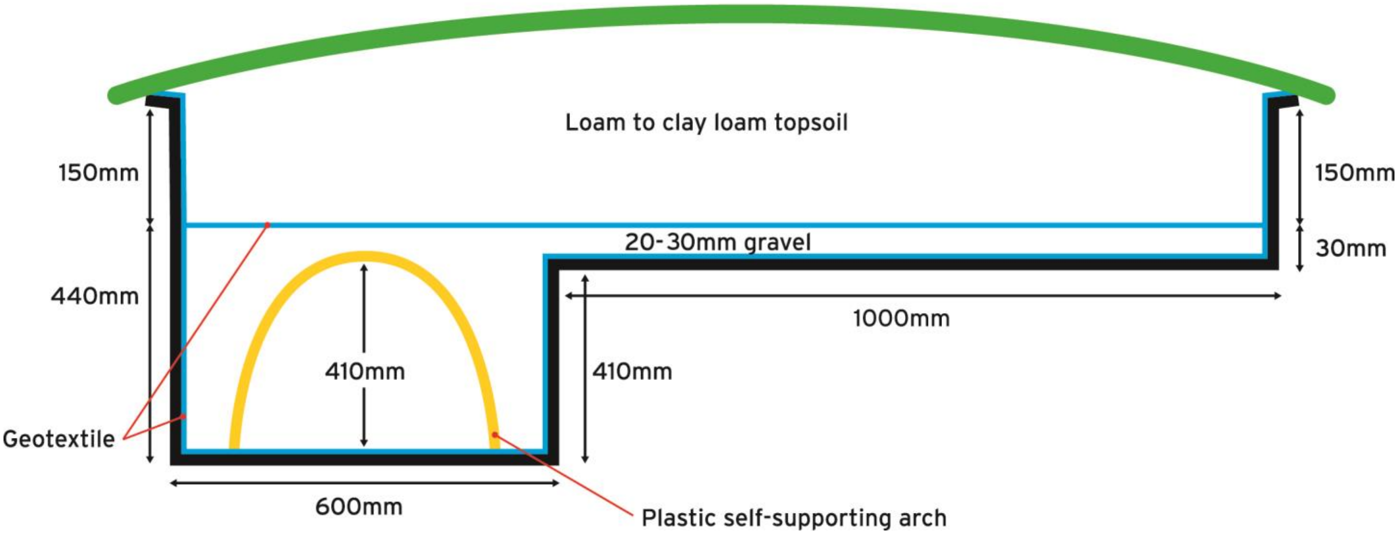
Installation

1. Peg out the trench and pan areas.
2. Remove the topsoil and stockpile. Where this is a friable, loamy soil it can be reused as the final layer of the Wick Trench and Bed. Otherwise neither the topsoil nor lower soil horizons are to be reused in the system, and suitable loamy soil must be imported.
3. Excavate the trench to a depth of 600 mm and the adjacent pan to 130 mm for secondary effluent and 180 mm for primary effluent systems.
4. Continuously check the level of the bed of the trench and the pan with a laser level to ensure they are flat.
5. Lay the 'A12 grade' geotextile fabric (with dry pore size 230 µm) in a continuous length across the trench and pan i.e. down the outer side wall of the trench, across the base of the trench, up the inner side wall of the trench, across the base of the pan and up the outer side wall of the pan.
6. Ensure the geotextile extends at least 50 mm further than the top of the side walls
7. Overlap the edges of the geotextile down the length of the trench and pan system until all bases and side walls are covered.
8. Place the plastic self-supporting arch in sections 410 mm wide and 1500 mm long, into the trench on top of the geotextile.
9. Install inspection ports at trench entry points and the connection points to other trenches.
10. Install a mica-flap vent at the end of the each trench to facilitate air being drawn into the trench, up the pipe line into the septic tank, through the pipe line into the house drainage system and up through the roof vent. The mica-flap acts as a marker for the end of the trench.
11. Spread clean 20 – 30 mm gravel over the arch in the trench and across the pan to a depth of 30 mm. Ensure the top of the gravel layer is level.
12. Lay overlapping lengths of geotextile across the top of the gravel layer, ensuring the geotextile extends at least 50 mm further than the side walls of the trench and pan.
13. Spread good quality friable and permeable loamy soil over the top of the geotextile to a depth of 100 mm for secondary effluent and 150 mm for primary effluent systems. Never use soil from lower soil horizons.
14. Slightly mound the surface of the topsoil across the trench and bed to help shed rainwater off the system (see the diagram below).
15. Plant the topsoil with a suitable grass or plants that thrive when their roots are continuously wet, especially those with large leaves as they will transpire more water than plants with small leaves.
16. Install stormwater diversion drains to direct stormwater away from the Wick System.

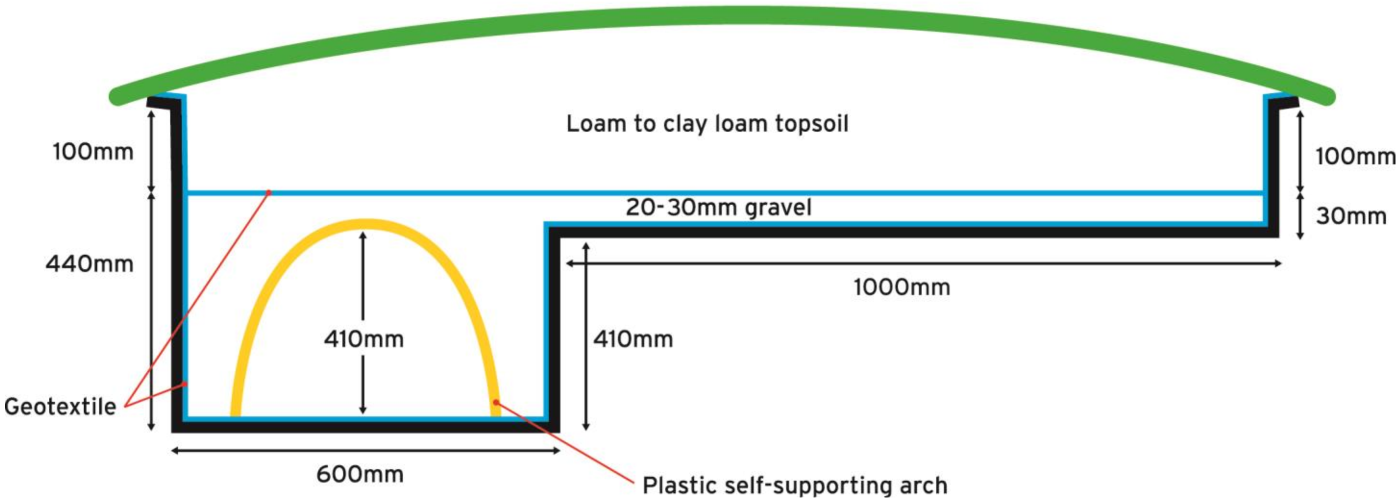
Maintenance

The septic tank must be periodically desludged to ensure proper functioning of the Wick Trench and Bed System.

Wick Trench & Bed System
For primary treated effluent



For secondary treated effluent



Appendix F: Urine-diversion toilets (UDT)

Urine-diversion toilets are common in Scandinavia, where they were created over 20 years ago with the aim of returning nutrients to agricultural land (i.e. to 'close the food loop'). However, they are now used in many northern European countries and to a lesser extent in North America and New Zealand. In Australia, several urine-diversion projects are underway which use a range of tanks and flexible rubberised 'bladders' to store the urine and a centralised management plan to beneficially reuse the urine for agricultural or horticultural purposes or turf growing (Hood et al. 2008; McDonald et al. 2008; Narangala et al. 2010).

Both water-flush and dry composting toilets can be designed with a urine-diversion system. The urine is piped to an onsite or cluster-scale sealed collection vessel which may be a tank or a soft 'bladder'. When the container is full the urine is stored for 6 months before it is tankered to farmland and used as a substitute for inorganic fertiliser. Based on pathogen die-off studies and the risk assessment of various projects, storing the urine for 6 months ensures sufficient die-off of pathogens to render the urine solution safe for fertilising all crops (WHO 2006; Schönning & Stenström 2004). Inactivation of bacteria, viruses and Ascaris spp. can occur in as little as 2 months where the average storage temperature is greater than 20 ºC (Nordin et al. 2009). Dilution rates and temperature are the major factors determining inactivation rates. Diurnal variation in temperature is not a concern; conversely it has the potential to produce more efficient inactivation (Niwagaba 2009).

Appendix G: Sand filters

- Sand Filters shall only be used to treat effluent that has been subject to either primary or secondary treatment.
- An alarm system with suitable visual and/or audio (with mute facility) must be installed in an appropriate location to indicate failure.
- The system must be installed with all inspection and access openings over all chambers brought up to ground-surface level.
- Sand filters design must comply with the following requirements:

Type of Wastewater Being Treated	Maximum Dosage Rate, L/m^2/day
Septic tank effluent	50
• Wastewater from intermittently used facilities, such as sporting pavilions	100
• 20/30 effluent (BOD/suspended solids) requiring polishing	200

Dosage rate, L/m^2/day	Clay and Fine Silt Content (by Volume)	Effective Size*, mm	Uniformity Coefficient**
Less than 50	Less than 5%	Between 0.25 and 0.60	Less than 4
50 or greater	Less than 5%	Between 0.4 and 1.0	Less than 4

* Effective size = maximum particle size of the smallest 10% (D10) by mass of the sand
** Uniformity coefficient = the ratio of the maximum particle size of the smallest 60% by mass of the sand to the maximum particle size of the smallest 10% by mass of the sand

Appendix H: Salinity criteria for Sustainable Wastewater Irrigation Schemes

The sustainability of an onsite wastewater irrigation system depends on the impact of the dissolved chemicals in the wastewater on the irrigated soil and the surrounding surface and groundwater. Land capability assessors should determine the Total Dissolved Solids (TDS) content of the water that will be supplied to the premises and estimate to what degree it may increase the salt content of the wastewater. The salt content of the wastewater can be altered by the household cleaning products used (see www.lanfaxlabs.com.au for sodium content of laundry detergents). Domestic wastewater will always contain more salts than the potable water used in the house because salts, especially sodium, are in food, laundry and dishwasher detergents and other cleaning products. Common salts include sodium chloride, as well as chlorides and sulphates of calcium, magnesium and potassium. To maintain a productive and healthy garden the treated wastewater should have a TDS of <500mg/L. EPA Publication 168 Guidelines for Wastewater Irrigation (1991) (Section 4.2.3 and Figure 3) provides details on the interaction between TDS and Sodium Absorption Ratio (SAR) and the effect of sodium ions adsorbing on to soil particles, leading to the dispersion of colloidal clay and subsequent blockage of soil pores.

The total concentration of the salts and the proportions of sodium, magnesium, calcium and potassium have an effect on irrigated soil where the soil contains clay. Irrigation water containing a low concentration of salts, but a high proportion of sodium compared to calcium and magnesium has a high SAR and will cause irrigated soil to become more dispersive and much less permeable to air and water. Over time this will damage the plants growing in the soil. Soils receiving effluent with a SAR level of >18 and/or a TDS level of >500 mg/L may need remedial action. A high SAR can be lowered by dissolving gypsum in it and soil affected by high SAR can be improved by adding gypsum to it.

Abbreviations

AS/NZS: Australian Standard/New Zealand Standard

AWA: Australian Water Association

AWTS: Aerated wastewater treatment system

BOD_5: Biochemical oxygen demand (5-day test)

CaLP: Catchment and Land Protection Act

CDO: Council delegated officer

CFU: Colony forming units

DIR: Design irrigation rate

DELWP Department of Environment, Land, Water and Planning

DLR: Design loading rate

DWMP: Domestic wastewater management plan

DSE: Department of Sustainability and Environment

EC: Electrical conductivity

EHO: Environmental health officer

EPA: Environment Protection Authority

EPAI: Environment Protection Agency, Ireland

ETA: Evapo-transpiration absorption (bed)

EVT: Evapo-transpiration

FOG: Fats, oils and grease

IWRG: Industrial Wastewater Resource Guidelines

LCA: Land capability assessment

LAA: Land application area

LPED: Low-pressure effluent distribution system

MAV: Municipal Association of Victoria

NA: Not allowed/Not applicable

PIA: Planning Institute of Australia

PIC: Plumbing Industry Commission

SAR: Sodium absorption ratio

SEPP (GoV): State Environment Protection Policy (Groundwaters of Victoria)

SEPP (WoV): State Environment Protection Policy (Waters of Victoria)

SS: Suspended solids

STED: Septic tank effluent drainage

STEG: Septic tank effluent gravity

STEP: Septic tank effluent pump

TDS: Total dissolved salts

TSS: Total suspended solids

UDT: Urine-diversion toilets

UV: Ultraviolet

VBA: Victorian Building Authority

WELS: Water Efficiency Labelling and Standards

Glossary

10/10 standard: water quality standard indicating an effluent quality of $\leq$10 mg/L BOD_5 and $\leq$10 mg/L suspended solids. Greywater of this quality may only be recycled via subsurface irrigation.

10/10/10 standard: water quality standard indicating an effluent quality of $\leq$10 mg/L BOD_5, $\leq$10 mg/L suspended solids and E. coli $\leq$10 cfu/100 mL. Greywater of this quality may be recycled indoors for toilet flushing or cold-water supply to clothes washing machines. It may also be recycled outdoors via surface and subsurface irrigation systems.

20/30 standard: water quality standard indicating an effluent quality of $\leq$20 mg/L BOD_5 and $\leq$30 mg/L suspended solids. Wastewater, including greywater, of this quality may be recycled outdoors via subsurface irrigation.

20/30/10 standard: water quality standard indicating an effluent quality of $\leq$20 mg/L BOD_5, $\leq$30 mg/L suspended solids and E. coli $\leq$10 cfu/100 mL. Effluent may only be recycled via sub-surface irrigation.

Absorption: the disappearance of a liquid through its incorporation into solid material i.e. the uptake of effluent into the soil by capillary action.

Absorption trench system: the area of land utilised for the disposal of partially treated sewage to ground via a soil absorption trench. The base of the trench is typically dug 400 mm below the ground surface. The trench is built or filled in to a height of 250 mm and then a layer of 150 mm of native soil is backfilled on top to bring the soil up to the original ground level. The trench location and design will include setback distances from existing and proposed buildings, patios, drains, driveways, fences etc.

Accredited service technician: a person suitably trained by the system manufacturer in the installation, operation and service requirements of the system who is accredited by the system manufacturer in writing to undertake the servicing and maintenance.

Aerobic: organisms and processes that require oxygen (i.e. microbiological digestion and assimilation of organic matter through the use of oxygen).

Aerated Wastewater Treatment System (AWTS): air bubbled through wastewater in a tank provides oxygen to micro-organisms to facilitate aerobic biological digestion of the organic matter in the wastewater.

All-waste treatment system: a system that treats all the wastewater from a premises.

Anaerobic: living or occurring without oxygen (i.e. microbiological digestion and assimilation of organic matter in the absence of oxygen).

Alteration to a Septic Tank System: any physical alteration to the design or construction of an onsite wastewater system, or any alteration to the premises serviced by the system which has the potential to increase the hydraulic flow or organic load to the treatment system.

Australia/New Zealand Standard: a document produced by Standards Australia and Standards New Zealand. A voluntary national standard, code or specification prepared under the auspices of Standards Australia and Standards New Zealand. Standards are mandatory when referred to in regulations and are enforceable in contracts when called up in contract documents.

Biochemical Oxygen Demand (BOD_5): the amount of oxygen consumed by chemical processes and micro-organisms to break down organic matter in water over a 5-day period, measured in milligrams per litre (mg/L).

Blackwater: wastewater from toilets containing faeces and urine.

Council: a municipal Council/local government body.

Declared Water Supply Protection Area: applicable to groundwater as defined in section 27 of the Water Act (as amended).

Design Loading Rate: the long term acceptance rate (LTAR) expressed in Litres/m²/day or mm/day as applied to a land-application area.

Desludging: see Pump-out

Dispersal field: the distribution of treated effluent through the biologically-active topsoil layer.

Disposal: to get rid of a waste product via air (an evaporation pond), land (soil absorption trench), fire (incineration, steam) or water (discharge to surface waters or to groundwater), with no intention of beneficial reuse.

Disposal field: the area of land utilised for the disposal of partially treated sewage to ground via a soil absorption trench. The base of the trench is typically dug 400 mm below the ground surface. The trench is built or filled in to a height of 250 mm and then a layer of 150 mm of native soil is backfilled on top to bring the soil up to the original ground level. The trench location and design will include setback distances from existing and proposed buildings, patios, driveways, fences etc.

Domestic wastewater: see Sewage

Drinking water: water suitable for human consumption or for purposes connected with human consumption, such as preparation of food or making ice for consumption or for the preservation of unpackaged food.

E. coli: Escherichia coli: a species of bacteria in the faecal coliform group found in large numbers in the intestines of animals and humans. Its presence in freshwater indicates recent faecal contamination and is measured in 'colony-forming units' (cfu) per 100 mL of water.

Effluent: liquid flowing out of a container.

Effluent sewer: reticulated sewerage system where wastewater solids are contained onsite in an interceptor tank and the primary or secondary treated effluent is discharged to a sewer.

Ephemeral stream or channel: a stream or channel that carries water for a period of time, but occasionally or seasonally ceases to flow.

Evapo-transpiration: transfer of water from the soil to the atmosphere through evaporation and plant transpiration.

Greywater: domestic wastewater from sources other than the toilet, urinal or bidet (e.g. from showers, baths, spas, hand basins, clothes washing machines, laundry troughs, dishwashers and kitchen sinks).

Groundwater: all underground water contained in the void spaces within and between the rocks and soil, excluding water travelling between the ground surface and the water table (Oxford Dictionary of Earth Sciences).

Infiltration: the gradual movement of water into the pore spaces between soil particles.

Influent: water flowing into a container.

Irrigation: the artificial supply of water to land and vegetation.

LPED irrigation: shallow sub-surface irrigation of primary or secondary effluent into high quality loamy topsoil through low pressure effluent distribution (LPED) lines. The pressurised line is a twin construction consisting of a perforated pipe with drilled squirt holes inside a rigid slotted PVC pipe or aggie pipe.

Micro-organism: an organism that is invisible or barely visible to the unaided eye (e.g. bacteria, viruses, protozoa).

Nutrients: organic and inorganic substances used in an organism's metabolism which must be taken in from the environment (e.g. carbohydrates, fats, such as proteins and vitamins). Nutrients are molecules that include elements such as carbon, nitrogen, phosphorus, potassium, calcium, magnesium and a range of trace elements.

Onsite domestic wastewater management system: see Onsite wastewater management system

Onsite wastewater disposal/recycling system: a system or method for the disposal/recycling of treated wastewater.

Onsite wastewater recycling: recycling wastewater sourced from, treated and used at a single residential site, premises or allotment.

Onsite wastewater management system: is the same as a ‘septic tank system’ as defined in the Environment Protection Act 1970. It includes an onsite wastewater treatment system (primary or secondary standard) plus the subsequent disposal/recycling system.

Onsite wastewater treatment system: a treatment system that treats up to 5,000 L/day of wastewater on the allotment where it was generated.

Pathogen: a disease-causing micro-organism.

Permeability: the ability of water to move, through soil which depends upon the soil particle sizes, pore space sizes, soil texture, soil structure and water content.

Pollution: any harmful or undesirable change in the physical, chemical or biological quality of air, water or soil as a result of the release of chemicals, heat, radioactivity or organic matter.

Perched watertable – the upper surface of a temporary water-saturated soil layer, supported by a small impermeable or slowly permeable soil unit, below which the soil is unsaturated. As the soil below the perched watertable is unsaturated, vertical drainage continues, even if slowly, until the water-saturated layer becomes sufficiently dry then drainage ceases.

Potable water: water suitable for human consumption (see Drinking water).

Potable water supply catchment: an area declared as a Special Water Supply Catchment under Schedule 5 of the Catchment and Land Protection Act 1994 and used as a source of drinking water by a Water Corporations.

Precautionary principle: a principle of the Environment Protection Act 1970: “Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.”

Primary treatment of wastewater: the physical processes of screening, filtration, sedimentation, flocculation and flotation to remove organic and inorganic matter from wastewater.

Pump-out: the removal of biological sludge and inert sediment from a septic tank, including the surface crust (scum) material. A pump-out should not drain tanks dry, because some residual sewage is needed to provide a seed source of digesting micro-organisms.

Qualified person: a person who holds relevant qualifications, or a person who is experienced and accepted by a professional body to practice in the pertinent area.

Recycling: using treated wastewater for an appropriate use (e.g. 10/10/10 greywater used for toilet flushing or 20/30 effluent used for sub-surface irrigation).

Reserve area: a duplicate land disposal area reserved for use when the original land disposal area needs to be rested.

Reuse: using a waste product in its present form for another purpose, e.g. diverting (reusing) untreated greywater to water the garden.

Reticulated water: water suitable for human consumption that is delivered to a dwelling through a network of pipes.

SAR: see Sodium Adsorption Ratio.

Scum: material that floats on top of the liquid in an anaerobic sewage treatment tank (i.e. septic tank).

Secondary treatment: biological and/or physical treatment following primary treatment of wastewater. Disinfection to kill pathogens may also occur.

Septic tank: a tank that temporarily holds wastewater. In a septic tank, wastewater is primarily treated through filtration, sedimentation, flocculation and flotation to remove organic and inorganic matter from wastewater in combination with anaerobic microbiological digestion.

Septic tank system: as defined within the Environment Protection Act 1970 (section 53J) "means a system for the bacterial, biological, chemical or physical treatment of sewage, and includes all tanks, beds, sewers, drains, pipes, fittings, appliances and land used in connection with the system". In essence this includes the wastewater treatment system (all types of onsite wastewater treatment systems, including septic tanks), as well as associated wastewater storage tanks, distribution pipes and the wastewater disposal/recycling system and area.

Service technician: see Accredited service technician

Sewage: as defined within the Environment Protection Act 1970 (section 53J) "means any waste containing human excreta or domestic wastewater".

Sewer: pipe used to transfer sewage from one location to another.

Sewered area: land where sewer pipes have been laid adjacent to allotments.

Sewerage: the pipework and ancillary equipment associated with the collection and transport of sewage, and the equipment and processes involved in treating and discharging the effluent.

Sludge: the material that rests on the bottom of a septic tank. It can include inert matter (such as sand, glass and plastics) and biosolids (organic material produced by biological processes).

Sodium Adsorption Ratio: describes the tendency of sodium cations to be adsorbed at cation-exchange sites at the expense of other cations. It is calculated as the ratio of sodium to calcium and magnesium. A low sodium content gives a low SAR.

Soil absorption trench: an infiltration or soak-away trench installed generally at a depth of 300 to 600 mm below ground level, which facilitates the disposal of primary treated sewage.

Special Water Supply Catchment: one of the areas listed in Schedule 5 of the Catchment and Land Protection Act 1994.

STEP/STEG: Septic Tank Effluent Pump/Septic Tank Effluent Gravity: an effluent sewer system utilising both gravity and pumps to discharge effluent from septic tanks to a reticulated sewer system.

Sub-surface irrigation: the dispersal of water through a network of pressure-compensating pipes and emitters at a depth of 100 mm to 150 mm below ground surface level (i.e. in the biologically active topsoil layer). The irrigation system also includes a disc or mesh filter, vacuum filters and scour valves. Minimum water quality required for sub-surface irrigation with treated sewage or greywater is 20/30 standard (20 mg/L BOD_5 and 30 mg/L TSS).

Sullage: household greywater that does not contain human excreta, but may still contain pathogens, nutrients and potentially harmful chemicals.

Suspended solids (SS): a measure of the solids in water, expressed in milligrams per litre (mg/L).

Surface irrigation: the irrigation of water to the ground surface. It includes the use of low-rise sprinklers, micro-sprayers, and drip systems under mulch, but excludes the use of hand-held hoses for treated sewage. Treated greywater can be connected to purple coloured child-proof taps that have a removable handle. Irrigation spray heads must not spray beyond the property boundary. Minimum water quality required for surface irrigation with treated sewage or greywater is 20/30/10 standard (20 mg/L BOD_5, 30 mg/L SS and 10 cfu E. coli 100 mL).

Sustainable: able to continue indefinitely without any significant negative impact on the environment or its inhabitants.

Treatment: a process or series of processes that remove contaminants from wastewater, whereby the physical, chemical and biological characteristics of wastewater are altered.

Topsoil: the top layer of the soil, typically containing plant roots, organic material and an active microbiological ecosystem, which is usually more fertile than the underlying layers.

Total suspended solids (TSS): a measure of the solids in water, expresses in milligrams per litre (mg/L).

Turbidity: the cloudy appearance of water that is an indication of fine solids suspended in the water, measured by a light penetration test and expressed in nephelometric turbidity units (NTU).

Unsewered area: land where no sewer pipes are adjacent to the allotment boundaries.

Urine-diversion toilet (UDT): a toilet bowl designed to separate urine from solid excrement. The UDT may be attached to a dry composting toilet chamber or a water-flush blackwater treatment system or sewer system. A 'dam' wall, which extends between the two side of the toilet bowl, creates a front and back well from which the excrement drains or is flushed away.

Watertable: the upper surface of groundwater or the level below which an unconfined aquifer is permanently saturated with water.

Waterway: as defined by the Water Act 1989 (as amended):

a. a river, creek, stream or watercourse; or

b. a natural channel in which water regularly flows, whether or not the flow is continuous; or

c. a channel formed wholly or partly by the alteration or relocation of a waterway as described in paragraph (a) or (b); or

d. a lake, lagoon, swamp or marsh, being –

e. a natural collection of water (other than water collected and contained in a private dam or a natural depression on private land) into or through or out of which a current that forms the whole or part of the flow of a river, creek, stream or watercourse passes, whether or not the flow is continuous; or

f. a collection of water (other than water collected and contained in a private dam or natural depression on private land) that the Governor in Council declares under section 4(1) to be a lake, lagoon, swamp or marsh; or

g. land on which, as a result of works constructed on a waterway as described in paragraph (a), (b) or (c), water collects regularly, whether or not the collection is continuous; or

h. land which is regularly covered by water from a waterway as described in paragraph (a), (b), (c), (d) or (e) but does not include any artificial channel or work which diverts water away from such a waterway; or

i. if any land described in paragraph (f) forms part of a slope rising from the waterway to a definite lip, the land up to that lip.

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Geology and aerial photography: http://www.energyandresources.vic.gov.au/earth-resources/maps-reports-and-data/geovic

Finding a property: http://services.land.vic.gov.au/landchannel/jsp/map/InteractiveMapIntro.jsp

Soils data: http://vro.depi.vic.gov.au/dpi/vro/vrosite.nsf/pages/vrohome

Useful contacts and websites

EPA Victoria
200 Victoria Street
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Tel: 1300 372 842
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Information about domestic wastewater treatment systems is available on EPA's website: www.epa.vic.gov.au

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Water Efficiency Labelling Scheme - WELS Rating
www.waterrating.gov.au