Guidance Notes for Wastewater Management

NORTHERN TERRITORY GOVERNMENT

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Disclaimer

The information provided in the Guidance Notes for Wastewater Management (the Guidance Notes) is general only and is based upon requirements for the design, installation and management of wastewater management systems in the Northern Territory.

The Guidance Notes and the information herein does not in any part act as an approval to install a wastewater management system.

The Northern Territory Government accepts no liability for costs or damages to any person or property resulting from the application of the Guidance Notes.

Contents

Acronyms

Acronyms	Full form
AEP	Annual exceedance probability
AS/NZS	Australia/New Zealand Standards
AWTS	Aerated wastewater treatment system
BOD	Biochemical oxygen demand
CEDS	Common effluent drainage system
CFU	Colony forming unit
COD	Chemical oxygen demand
CWMS	Community wastewater management system
DCMC	Department of Chief Minister and Cabinet*
DEPWS	Department of Environment, Parks and Water Security*
DGTS	Domestic greywater treatment system
DIPL-BAS	Department of Infrastructure, Planning and Logistics – Building Advisory Services*
DIR	Design irrigation rate
DLR	Design loading rate
DoH	Department of Health*
DRP	Dissolved reactive phosphorous
EP	Equivalent persons
ETA	Evapotranspiration-absorption
FOG	Fats, oils and grease
GDD	Greywater diverter device
Ksat	Saturated soil permeability measure (expressed in mm/day)
LPED	Low pressure effluent distribution
MBBR	Moving bed biofilm bioreactor
MBR	Membrane bioreactor
N	Nitrogen
NH_4	Ammonia
NH_4-N	Ammoniacal nitrogen
Nitrate	NO_3

Acronyms	Full form
NT	Northern Territory
NTU	Nephelometric turbidity unit
OWMS	On-site Wastewater Management System
P	Phosphorous
PCA	Plumbing Code of Australia
PWC	Power and Water Corporation*
RV	Recreational Vehicle
STEDS	Septic tank effluent drainage scheme
STS	Secondary treatment system
SSE	Site-and-soil evaluation
TDS	Total dissolved solids
TN	Total nitrogen
TOC	Total organic carbon
TP	Total phosphorus
TSS	Total suspended solids
UV	Ultraviolet
VIP	Ventilated improvement pit
WC	Water closet
WELS	Water Efficiency Labelling Scheme
WPZ	Wellhead protection zone (managed by PWC)
WMS	Wastewater management system

* These titles may change from time to time

Definitions

Definitions	Full form
Absorption	Uptake of sewage effluent or sullage or both into the soil by infiltration or capillary action.
Absorption trench/area	A system that uses the principle of absorption, which is limited to soil with good but not excessive permeability, i.e. between 2 mm/hour to 100 mm/hr or 0.05 metres/day (m/d) and 0.6 m/d.
Activated sludge process	A biological wastewater treatment process by which biologically active sludge (concentrated biomass) is agitated and aerated with incoming wastewater. The activated sludge is subsequently separated from the treated wastewater (mixed liquor) by settlement, and most of it is returned to the process. The treated effluent is then discharged to a land application area.
Adsorption	Physical or chemical attachment of substances to the surface of soil particles.
Advanced secondary treatment	Aerobic biological treatment process, including settling and/or filtering of wastewater. Advanced secondary treated wastewater is expected to be equal to or better than 15 g/m^3 5-day biochemical oxygen demand and 15 g/m^3 suspended solids. Higher quality (such as 10 g/m^3 and 10 g/m^3 respectively or better), may be required as a risk reduction measure in situations where a higher level of environmental protection is required. Wastewater treatment units that can provide advanced secondary treatment are predominantly sand filters, advanced textile filters and packed bed reactors. Some high performing, stabilised and closely monitored aerobic treatment plants (refer AWTS) can also achieve the same discharge quality.
Advanced tertiary treatment	Further treatment of secondary effluent by nutrient reduction and disinfection.
Aerated wastewater treatment system (AWTS)	A wastewater system that uses the processes of aeration following clarification to achieve secondary (biological) treatment of wastewater.
Aerobic	Having molecular oxygen as part of the environment, or growing/occurring only in the presence of molecular oxygen (as in "aerobic organisms").
Anaerobic	Characterised by the absence of molecular oxygen, or growing in the absence of molecular oxygen (as in "anaerobic bacteria").
Backflow	The undesirable reversal of water flow from private plumbing back into the public water supply system.
Biomass	A film of biological matter on the contact surface of the soil in a soakage system.
Blackwater	Liquid or solid human body waste and the carriage waters generated through toilet usage.
Biochemical Oxygen Demand	The Biochemical Oxygen Demand of sewage and other polluted waters which is a measure of the organic content in terms of oxygen required for bacterial oxidation. The standard test measures oxygen used in 5 days at 20°C (BOD_5)

Definitions	Full form
Chlorination	The addition of chlorine releasing compounds to the treated effluent for the purpose of disinfection.
Combined chlorine	Chlorine that is combined with ammonia and other organic compounds containing nitrogen to form chloramines thus reducing its effectiveness as a disinfectant.
Community wastewater management system	A decentralised system for the collection and management of wastewater generated in a town, regional area or other community, but does not include Power and Water Corporation sewerage infrastructure. CWMS may include common effluent drainage system (Refer AS3500.2, Section 3.19) or septic tank effluent disposal scheme.
Composting toilet	A treatment unit that employs the process of biological degradation in which organic material is converted into humus like material through the action of microorganisms and invertebrates.
Contaminated land	Land with hazardous substances in or on it that are reasonably likely to have significant adverse effects on the environment and potentially, human health. Hazardous substances can seep through the soil and contaminate the groundwater, which can affect nearby land or waterways.
Daily flow/daily inflow	The volume in litres of sewage and liquid wastes flowing into a septic tank during a 24 hour period. Also refer to 'hydraulic loading'.
Design irrigation rate	The loading rate that applies to the irrigation of a land application area with effluent of a secondary quality. It is expressed in L/m2/day or mm/day.
Design loading rate (DLR)	The long term acceptance rate (LTAR) reduced by a factor of safety as detailed in AS/NZS 1547:2012.
Desludging	Removal of accumulated sludge and scum from the septic tank.
Disinfection	A process which destroys, inactivates or removes pathogenic microorganisms.
Dispersive soil	Soil that has the ability in water to form a cloudy suspension that will not settle.
Distribution box	A device which is designed to distribute filtered effluent evenly to separate land application areas. These devices are typically sized to accommodate the expected hydraulic load and should be mounted on a concrete plinth (min 100 mm thickness) to maintain the device level so as to ensure even distribution to irrigation fields. There should be no vehicle or animal stock traffic over the device.
DN100	The nominal pipe diameter in millimetres.
Domestic greywater treatment system (DGTS)	System or device that collects, treats and disinfects domestic greywater for reuse.
Domestic residential premises	A Class 1 building as specified under the classification of the Building Standard of Australia and includes single domestic dwellings, town houses and villa units.
Domestic wastewater	Wastewater originating from households or personal activities including water closets, urinals, kitchens, bathrooms and laundries. Includes wastewater flows from facilities serving staff/employees/residents in institutional, commercial and industrial establishments, but excluding commercial and industrial wastes, large-scale laundry activities and any stormwater flows.

Definitions	Full form
Domestic water supply	The source and infrastructure that provides water to households. A domestic water supply may include a stream, a spring, a bore, a rainwater collection system, or water vendors. It excludes a public water supply.
Drain	An underground pipe for conveying sewage and liquid wastes to the septic tank.
Durable aggregate	Aggregate, metal or stones which are graded to AS 2758.1 for single size coarse aggregate for nominal sizes, usually ranging from 20mm to 50mm.
Effluent	Sewage, water, or other liquid, partially or completely treated or in its natural state, flowing out of a wastewater treatment unit, or out of a component of a WMS.
E.coli	*Escherichia coli* which is a member of the faecal coliform group of bacteria, and indicative of faecal contamination.
Effluent disposal system	A constructed system utilising various methods and materials to effectively dispose of effluent.
Evaporation	The transfer of water from a liquid to a gas.
Evapotranspiration	Sum of evaporation and plant transpiration from the land and water surface to the atmosphere. Evaporation accounts for the movement of water to the air from sources such as soil, canopy interception and water bodies. Transpiration accounts for the movement of water within a plant and the subsequent loss of water as vapour through stomata in its leaves.
Evapotranspiration -Absorption (ETA) trench or bed	A land application area that uses the principles of evaporation, transpiration and absorption.
Faecal coliforms	Thermo-tolerant coliform organisms that indicate faecal pollution. *Escherichia coli* are generally the dominant species.
Filtration	Process of removing particulate matter from water by passing it through a porous medium, such as sand.
Flout	Technology that provides a low pressure dose of effluent similar to a pump, without requiring a power supply.
Free residual chlorine	Chlorine that is not combined with ammonia and is available for disinfection (Also known as free available chlorine).
Friable soil	Soil that is easily crumbled and consists predominantly of sand and loam.
Geotextile	A non-woven needle punched continuous filament polyester fabric 1.4 mm nominal thickness with a flow rate capacity of 500 litres/m^2/sec to AS 3705.
Greywater	Domestic wastewater drained from sinks, tubs, showers, baths, dishwashers, clothes washers and other non-toilet sources. (Greywater does not include waste from garbage grinders.)
Groundwater flow	The movement of water through the saturated zone below the water table and is a function of permeability. Groundwater flow encompasses the flow of water underground or the flow of water from saturated zones into a body of water.
Holding tank	A tank used for holding effluent or domestic wastewater prior to removal or direct discharge to a land application system or sewer. Also referred to as a collection well.
Hydraulic conductivity	Saturated hydraulic conductivity (Ksat) in m/day is the measure of soil permeability used in onsite wastewater management.

Definitions	Full form
Hydraulic consultant	For wastewater management systems installed outside a building control area: Certifying Engineer (Hydraulic) or Certifying Plumber and Drainer (Design) with experience in wastewater management.
Hydraulic loading	Liquid flow required to be handled by the treatment process. Also refer to 'daily flow'.
Indexing valve	Allows for a number of separate land application areas to be irrigated.
Infiltration rate	Rate at which water (or treated effluent) enters into the soil expressed as mm/day or L/m^2/day. The infiltration rate depends on soil texture (the size of the soil particles) and soil structure (the arrangement of the soil particles).
Land application system	The type of land application (dripper irrigation, trench, bed, mound etc.) sized to the daily wastewater flow and wastewater loading rate for discharge/distribution of treated wastewater into the ground for final treatment.
Land application area	The area of land used to disperse/dispose of treated wastewater. Provides further treatment within the soils and through plant uptake.
Long term acceptance rate (LTAR)	The long-term acceptance rate (LTAR) at which effluent can be absorbed into the soil of a disposal system, expressed in litres per square metre per day. The LTAR is dependent on the effluent quality, method of effluent dosing and soil permeability.
Low pressure effluent distribution (LPED)	Subsurface irrigation of secondary treated effluent into topsoil through low pressure effluent distribution (LPED) lines.
Non-potable water	Water which is not considered to be safe to drink.
Nutrients	The foods of microbial and plant life; mainly compounds of nitrogen and phosphorous.
On-site wastewater management system	The entire on-site management system including treatment and discharge of effluent, typically with a maximum hydraulic flow less than 2,000 L/day.
Outlet filter	An effluent filter placed in the outlet inspection opening of a septic tank to reduce the level of solids entering the land application system. Outlet filters do not provide secondary treatment.
Pan evaporation	The loss of water by evaporation measured in a Class A pan under controlled conditions.
Pathogens	Micro-organisms that are potentially disease causing; these include, but are not limited to bacteria, protozoa and viruses.
Percolation	The process by which water travels, primarily downwards, through an unsaturated soil matrix in a land application area.
Perforated pipe	A subsurface soakage system using perforated pipes to disperse effluent along a trench.
Permeability	A calculated value derived from the rate at which a head of liquid infiltrates a particular soil, usually measured in m/d and often referred to as saturated hydraulic conductivity (Ksat).

Definitions	Full form
Plastic tunnel trench	A subsurface absorption system using sections of slotted plastic tunnel to disperse effluent. Self-supporting durable arching, 500 mm wide, shall have a perforated water opening area of not less than 10,000 mm^2/m length and conform to AS 2041 and AS 2042.
Potable water	Water which is considered safe for drinking purposes. This is usually provided by a public water supply, but can be sourced from rainwater tanks in areas where there is no public water supply available.
Primary treatment	The separation of suspended material from wastewater by settlement and/or flotation in septic tanks, primary settlement chambers etc. prior to effluent discharge to either secondary treatment process or to a land application system.
Process water	Process water is derived from industrial plants, industrial processes and production facilities.
Public water supply	A reticulated supply of potable water operated by the water utility.
Reserve area	An area set aside for future use as a land application area to replace or extend the original land application area.
Runoff	The movement of water above the ground (overland flow processes) and may include stormwater, but also water from exfiltration (such as seepage or groundwater surfacing).
Sand	Shall be obtained from naturally occurring deposits or be washed quarry material and shall be free from clay lumps, organic material or other debris. It shall have an effective size between 0.4 mm and 1.0 mm and contain no more than 5% by volume of clay and fine silt.
Sanitary fixtures	The plumbing fixtures connected to the system including a bath, basin, clothes and dishwashing machines, food waste disposal unit, kitchen sink, laundry trough, spa bath, toilet and other sanitary fixtures as permitted by AS 3500-2.
Scum	Material floating on the surface of the septic tank. Scum usually contains fats, oils and greases.
Secondary treatment	Aerobic biological treatment process, including settlement and/or filtering of wastewater. Secondary treated wastewater is expected to be equal to or better than 20 g/m^3 5-day biochemical oxygen demand and 30 g/m^3 suspended solids. Wastewater units that can provide secondary treatment include well designed and operated stabilised aerated treatment plants.
Septic tank	A single or multiple chambered tank through which wastewater is allowed to flow slowly to allow suspended matter to settle and be retained, so that organic matter contained therein can decomposed (digested) by anaerobic bacterial action in the liquid. The term covers the tanks that are used to treat all wastewaters, greywater and blackwater.
Setback	The separation distance that a wastewater management system must be situated from any facility boundary, water body or other limiting factor.
Sewer	Pipe used to transfer sewage from location to another.
Sewered area	Land where sewer pipes have been laid adjacent to allotments.

Definitions	Full form
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.
Site-and-soil evaluator	A soil scientist or environmental engineer with appropriate training, competence and experience with site-and-soil evaluation for the design and installation of WMS. Also known as a land capability assessor.
Slope	Slope is the rise or fall of the land surface. In this document, slope is expressed in degrees accompanied by the equivalent % grade (see slope conversion table in AS/NZS 1547:2012
Sludge	The semi-liquid solids settled from wastewater.
Soil permeability	A calculated value derived from the rate at which a head of liquid infiltrates a particular soil, usually measured in m/day and often referred to as Ksat.
Subsurface	This is the depth from 100 mm to 150 mm below surface level.
Subsurface irrigation	Pressurised irrigation system requiring secondary treated effluent. Irrigation lines are situated approximately 150 mm below the ground surface.
Sullage	Domestic wastes from baths, showers, laundries and kitchens, including floor wastes from these sources.
Surface irrigation disposal area	A dedicated area of land suitably landscaped for the disposal of reclaimed water by means of surface irrigation onto a suitable medium and plants capable of affecting a high rate of evapotranspiration.
Suspended solids	Solid particles held in suspension including both settleable and non-filterable residues.
Tertiary treatment	Further treatment of secondary effluent by disinfection.
Transpiration	Transfer of liquid through plants to the atmosphere.
Treated effluent	Effluent that has undergone (wholly or partly) secondary treatment including aeration and or clarification but has not been subject to disinfection.
Water table	This is the level below which the ground is saturated with water. It is the surface where water pressure head is equal to atmospheric pressure.
Wastewater	The contaminated water produced from domestic activities in dwellings, institutions or commercial or public facilities, consisting of all waste, greywater or blackwater.
Wastewater management system	A wastewater management system (WMS) is a physical collection of pipes and chambers that receives, treats, and applies domestic wastewater to a land application system or a holding tank. A WMS may comprise an on-site wastewater management system (OWMS) or a community wastewater management system (CWMS).
Wastewater treatment unit	The unit that provides treatment of the effluent prior to discharge/distribution to land application area/s.
Waterway	Refer Part 1, section 4 Interpretation of *Water Act 1992*.
Wetted areas	The areas assumed for calculation purposes are as follows: • Absorption trenches and beds – basal width of trench or bed. • Surface Irrigation – the designated subsurface area to which effluent is applied.

1. Introduction

1.1. Purpose

The Guidance Notes for Wastewater Management (the Guidance notes) provides additional information to the Code of Practice for Wastewater Management (the Code) on the technical requirements for the selection, design, installation, and management of wastewater management systems (WMS) in the Northern Territory.

The Guidance Notes is not a prescribed Code, however is considered to be 'best practice' for wastewater management.

1.2. Performance statements

The Guidance Notes have been developed to establish and achieve the following performance statements for any WMS:

- To protect public health.
- To maintain and enhance the quality of the environment.
- To maintain and enhance community amenity.
- To protect resources.

2. Wastewater quality

2.1. Wastewater constituents

The characteristics of wastewater generated by various establishments (e.g. residential dwellings or non-residential institutions, etc.) can be distinguished by their physical, chemical and biological composition.

There is currently limited data on non-residential wastewater composition, which creates uncertainty when determining the organic loading rates for treatment units. In this case, it is essential for the designers to use site-specific (monitored) data, or allow adequate safety factors in their design, to accommodate the potential variation of wastewater mass loading.

The constituent mass loading figures are important for operation and design of treatment processes. Typical parameters are presented in Table 1.

Table 1: Parameters to be considered during design and selection of WMS

Wastewater constituents	Analyte
Particulate matter	• Total suspended solids (TSS) [Note 1] • Turbidity (NTU) [Note 2].
Organic matter	• Biochemical oxygen demand (BOD_5) [Note 1] • Chemical oxygen demand (COD) • Total organic carbon (TOC).
Nutrients	• Total nitrogen (total nitrogen (TN) • Ammoniacal nitrogen (NH_4-N) • Total kjeldahl nitrogen (TKN) • Nitrate (NO_3) • Dissolved reactive phosphorus (DRP) • Total phosphorus (TP).
Faecal indicator microorganisms [Note 3]	• Enterococci spp. • Faecal coliforms • Total coliforms • *Escherichia coli.*

Notes:

1. Although waste disposal units (garbage grinders) are not recommended for use in residential properties serviced by WMS, some owners will against advice insist on their installation. In these instances, higher loadings of TSS, BOD_5 (and flow) need to be allowed for in design loading rates for both the wastewater treatment unit and land application system.
2. Turbidity assessment is important for secondary treated effluent, if followed by a chlorination or UV disinfection process. In the case of chlorination, excessive chlorine is consumed in oxidising organic material in turbid effluent to the extent that there may be insufficient chlorine left for disinfection.
3. Faecal indicator organisms are an important indicator of disinfection system efficacy for secondary treated effluent.

3. Principles of sustainable water resource management

3.1. Waste hierarchy

The principles of the waste hierarchy 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.

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 the Lanfax Laboratories website.

Different WMS 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 treat wastewater to a certain standard, i.e. reduce or remove nutrients, salts and sludge.
- Need for and ability to remove sludge and other solid wastes from the system.

Some of these details may be provided on the manufacturer's marketing material and owner's manual or by contacting the manufacturer or supplier.

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 WMS, 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 WMS is also a waste of a valuable nutritious organic (fertiliser) resource, because they are contaminated by pathogens and not returned to biologically-active soil.

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. 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 WMS.

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.

3.5. Small lots

The principles of efficient resource use should also be applied when considering the options for all on-site wastewater management. This is especially the case for dwellings on small lots of land (<4,000 m^2) in unsewered areas which, to contain (recycle) all wastewater on-site, must minimise the amount of wastewater generated.

The provision of a reserve area for the land application system should be considered as part of the risk management process for expansion, upgrade or replacement of the land application system. This is not always possible on small lots but the designer should assess options available for the site to select an appropriate design that will provide security in case of unexpected failure.

The feasibility of providing reticulated sewerage 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 on-site.

Treating greywater and blackwater separately 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.

3.6. 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 on-site.

- Avoid generating excess wastewater by:
  - not installing a spa.
  - not installing a bath (low flow rate shower only).
  - not installing a kitchen food waste grinder.
- Reduce the volume of wastewater generated by installing High 'Water Efficiency Labelling Scheme' (WELS)-rated water-efficient fittings (minimum '3 Stars' for appliances and minimum '4 Stars' for all fittings and fixtures):
  - water-efficient clothes washing machines (front or top loading).
  - dual-flush (6.5/3.5 L or less) toilets.
  - water-efficient shower roses.
  - water-efficient dishwashers.
  - aerated taps.
  - hot and cold water mixer taps (especially for the shower).
  - flow restrictors.
  - 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.
- Reuse (another use without any treatment) wastewater by:
  - 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.
  - 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.
- Recycle wastewater after treatment by using it to:
  - water gardens and lawn areas.
  - flush toilets with effluent from a product approved 10/10/10 greywater treatment system in accordance with AS/NZS 3500.1 Section 9.

3.7. No off-site discharge of wastewater

In unsewered areas, all wastewater generated on a property must be treated and the effluent sustainably recycled/dispersed within the property boundaries, unless the property is serviced by a CWMS.

4. Design of wastewater management systems

4.1. Alternative data

While water allowances for different facilities are provided in the Code, it is not an exhaustive list. Actual measured flow data can provide more certainty of site-specific water usage and is a good means of verifying the proposed design flow volume, however where alternative data is used then conservative values should be assumed.

Flow meter readings and occupancy numbers need to be recorded on a daily basis at the same time each day for a representative period (at least 6 to 8 weeks) for the existing activity and then extrapolated to represent predicted peak flows under the future maximum occupancy/usage conditions.

4.2. Minimum flow rates and organic loading

The volume of wastewater treated and recycled/dispersed on-site 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 the Code are conservative rates and take variable flows into account. However, where there is an increase in water use at a premises, this 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 a WMS.

4.3. Increasing flow rates

Daily 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, granny flat, 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 premises or the water supply (such as installing a bore) owners must consider whether the WMS needs to be or can be adapted to an increased flow rate and if there is sufficient area to enlarge the land application area. The property owner should engage a hydraulic consultant to consider these issues and design a solution.

Where the WMS is not adapted to accommodate a greater volume, the system owner should observe the WMS to monitor its performance and contact the service technician at any sign of the WMS being overloaded (e.g. noxious smells, or surface discharge from the disposal area flooding).

Swimming pool water must never be discharged to the WMS or applied to the land application area because the additional chlorine / salt water will disrupt the functioning of the treatment system and/or land application area.

4.4. Irregular, intermittent and surge flows

The WMS and the land application system must be designed to deal with irregular and surge flows without untreated or partly-treated wastewater being discharged into the land application system. Irregular and surge flows may occur during social gatherings, or from intermittent 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 WMS.

Surges have the potential to force untreated solids through the treatment plant into the effluent storage tank. When discharged these solids can clog filters, soil absorption trenches and effluent irrigation pipes. Manufacturers and suppliers of WMS should educate system owners to minimise surge flows. If high surge flows are likely, the system must be designed to adequately deal with this, such as incorporating an additional septic tank, a larger balance tank or a larger model of WMS.

Where the premises will be used as a holiday home or intermittently for social, business or educational purposes, consideration needs to be given to the potential effects of possible peak flows and whether the proposed WMS can handle the variable flows and operate effectively under stop/start conditions. The proponent may need to engage a hydraulic consultant to increase the design flow rate and use the weekend peak loads as the regular flow rates. A larger 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.

WMS 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.

Secondary treatment systems (STS) 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 STS 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 power being switched off for more than 48 hours, most aerobic microbes in an STS will die. 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). 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.

4.5. Design of wastewater treatment units

The design parameters of a wastewater treatment unit include the following:

- Providing an adequate level of treatment, while accommodating high fluctuations of flow rate and wastewater concentrations.
- Site-specific constraints.
- Safe design.
- Operation, access and maintenance needs.

New subdivisions may require special consideration such as, ensuring higher effluent quality and consideration of the fate of nutrients and any necessary disinfection.

Parameters that may be considered during the early design of the wastewater treatment unit are provided in Table 2.

Table 2: Parameters to be considered during design and selection of the wastewater treatment unit

Parameters	Description
Aesthetics concern	• Odour control (e.g. gas tight lids, carbon filters, vents). • Visual aesthetics including above-ground components (e.g. tank cover, number of pumps, control panels). • Noise (e.g. pumps, aerators). • Dimensions of treatment plant. • Size of tanks. • Access for installation.
Costs	• Capital and installation costs.
Flow rate variability	• Acceptable variability in flow and constituent loading.
Maintenance needs	• Design for access for maintenance needs. • Frequency (e.g. solid removal frequency, outlet filter cleaning, media replacement, cleaning emitters and spray nozzles). • Responsible party (e.g. manufacture, third party, ownership changes). • Costs and fees associated with maintenance. • Time and skill associated with maintenance.
Monitoring	• Capacity for remote monitoring (e.g. pump on/off cycles, pump run-time, tank liquid levels, alarm conditions, constituent concentrations, UV lamp status). • Capacity for remote control (e.g. pump setting, alarm reset).
Performance and reliability	• Overall performance and reliability (e.g. pathogens, nutrient reduction) in relation to the sensitivity of the receiving environment. • Effluent quality. • Performance during power outage (e.g. a short period, one longer than 24 hours or an extended period over 48 hours). • Performance following extended periods of no flow (e.g. family vacation). • Performance following shock load. • Performance after exposure of slug dosing of toxic chemicals (e.g. chlorine bleach). • Start-up time required (e.g. hours, days, week). • Whether a WMS has DoH Product Approval. • Desludging frequency.
Power usage	• Power required for pumping, disinfection, control systems, monitoring and telemetry equipment
Quality of water supply	• Many remote areas utilise bore water which may have relatively high levels of calcium carbonate causing scale build-up in pipes and fittings affecting the performance of WMS. However, higher levels of calcium may mitigate the impact of soil structure due to the sodium content of wastewater increasing the ESP of the receiving soil

Parameters	Description
Remoteness	• Ability to procure qualified staff to service/maintain WMS in remote areas. • Secondary treatment systems provide improved effluent quality than primary treatment systems but require higher levels of maintenance, which is problematic when where seasonal access for repairs and maintenance is limited and where power supplies may be intermittent.
Scalability and retrofitting	• Ability to expand or upgrade process to accommodate higher hydraulic and mass loading.
Service life	• Warranties for process components. • Life-span for pumps, electrical components, tankage, media, etc.
Ownership	• WMS leased to building owner. • WMS owned by building owner.
Tank construction requirements and risks	• Non-corrosive, lids watertight, lids lockable, above-ground UV resistance material.
Volume	• Hydraulic retention time. • Emergency storage in case of power failure or clogging.

5. Outlet filters

Outlet or effluent filters are effective and low-cost items that are fitted to the outlet of septic tanks, providing a considerable improvement in the performance of the wastewater treatment unit. Their purpose is to capture the larger suspended solids that have not settled or have been re- suspended by hydraulic turbulence. They ensure that solids approximately 3 mm or greater are retained within the septic tank, rather than being discharged into the secondary treatment unit and/or to the land application system.

Different outlet filters are available including multiple mesh or slotted tubes or a plate disc module.

Mesh tube models can achieve a suspended solid concentration in effluent of 30 g/m^3 TSS, compared to 80 g/m^3 from a well-performing conventional septic tank, with only an outlet tee. Mesh outlet filters can enhance both the suspended solids and organic matter (e.g. BOD_5) removal performance of the septic tank.

It is recommended that all septic tanks should be fitted with effluent outlet filters and allow for external access for maintenance.

6. Greywater reuse

6.1. Greywater composition

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

Notwithstanding, 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. Raw 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 a DoH product approved DGTS, the resulting effluent can be applied to land by following the guidance in the Code and AS 1546:4.

Typical greywater constituents are summarised in Table 3, in comparison to the typical blackwater constituents.

Table 3: Typical raw greywater composition

Parameter	Greywater range from greywater fixtures	Greywater typical	Blackwater typical
BOD_5 (g/m^3)	250 to 550	360	267
COD (g/m^3)	400 to 700	535	533
TSS (g/m^3)	30 to 180	40	200
TN (g/m^3)	10 to 17	13	67
TP (g/m^3)	3 to 8	5.4	15
Total coliform (CFU/100 mL)	10^2 to 10^6	10^5	10^4 to 10^7
E.coli (CFU/100 mL)	10^2 to 10^6	10^4	10^4 to 10^7

6.2. Greywater system use

Greywater reuse is permitted in sewered and non-sewered areas using the following methods:

6.2.1. Permanent reuse

- Greywater diversion device (See Code)
- Domestic greywater treatment system (See Code).

6.2.2. Temporary reuse

6.2.2.1. Manual bucketing or using a temporary hose

Manual bucketing or using a temporary hose means simply collecting water in a bucket from the washing machine or shower or connecting a temporary hose to the washing machine and using it to water the lawn or garden.

Permission is not required to do this, but do not store or keep the collected greywater for more than one day. This avoids the risk of spills and bad odours. To prevent greywater running into neighbouring properties, don't use this method when it's raining or when the soil is already saturated.

6.2.3. Managing greywater

Follow these guidelines for managing greywater sensibly:

- Don't use greywater if other people in the house are sick.
- Don't use greywater from washing clothes covered in vomit or faeces - this includes nappies.
- Don't keep untreated greywater for more than 24 hours.
- Don't use kitchen wastewater - it must be treated before use.
- Try not to splash greywater.
- Keep children away from areas where greywater is used until it has soaked into the ground.
- Don't let greywater form puddles or run off onto other properties, watercourses and drains.
- Don't keep watering in one spot - salts and other contaminants will build up.
- Rotate greywater use with mains and rain water - this will help flush salts from the soil.
- Don't overwater your plants.
- Be careful when watering acid-loving plants such as azaleas and camellias - greywater tends to be slightly alkaline.
- If plants are damaged, reduce the amount of water used or try a bigger irrigation area.
- Wash your hands before eating, drinking or smoking.

7. Reserve land application area

A reserve land application area is an area set aside for future use as a land application area to replace or extend the original land application system as contingency.

Guidelines for reserve area allocations are provided in Table 4 and AS/NZS 1547:2012 – Section 5.5.3.4.

It should be noted that:

- The lower reserve areas should be applied where:
  - o Conservative higher wastewater production rates have been used in the design flow assessment.
  - o Lower irrigation rates have been used for determining the land application area requirements.
- The reserve area may be reduced where secondary effluent is discharged in WMS normally designed for primary effluent.
- In all cases, 100% reserve area should be provided for primary effluent WMS.
- The design should consider factors such as density of development, slope of land application area, potential for further site development and exposure to wind and sun.
- An additional reserve area should be allocated where there is doubt concerning the actual water usage and/or there is a possible lack of conservatism in the establishment of the design flow volume.
- Additional design requirements, such as additional planting or cut-off drains, may be required to ensure the integrity of the reserve area.
- The reserve area is a design contingency that should be proportionate to the degree of risk. As the scale of the WMS increases beyond that of a typical house, (i.e. any WMS with a flow greater than 5 m^3/day), then greater reserve areas should be used to mitigate any design, and/or on-going maintenance uncertainties, or uncertainties in the owner meeting their long-term responsibilities. An additional reserve allocation is important to provide an additional factor of safety in proportion to the greater scale of potential effects in the event of a significant failure.

Table 4: Reserve area allocations

Land application method	Reserve area allocation
Subsurface drip irrigation (pressure compensating)	33% - 100%
Surface drip and spray irrigation (pressure compensating)	50% - 100%
Absorption trenches and beds (with primary treated effluent)	100%
Absorption trenches and beds (with secondary treated effluent)	50% - 100%
Evapotranspiration beds	100%
Shallow trenches (with secondary treated effluent)	50% - 100%
No discharge systems	100%
Mound systems	100%

In cases where the design flow is based on greywater only with all toilet wastewater discharged to a compost toilet, the reserve allocation should be 140% to 150%.

8. Management of WMS in proximity to public drinking water supply bores managed by Power and Water Corporation

8.1. Overview

Power and Water Corporation (PWC) is the only water utility in the NT, managing drinking water supply systems for over 90 urban and remote communities.

Guidance with regards to the management of WMS in proximity to public drinking water supply bores managed by the PWC is provided in the PWC 'Wellhead Protection Zone Management Standard' (the Management Standard).

The Management Standard references 'wellhead protection zones' (WPZs) which define areas of concern in proximity to public drinking water supply bores, within which some developments (including WMS) may have to be managed or potentially excluded, to protect water sources and public health.

The Management Standard differentiates and defines WPZs as appropriate to different situations, and risk management expectations appropriate to each. A key principle of the Management Standard is that where potentially harmful development or activities are proposed to be undertaken with WPZs, it is the responsibility of the proponent of that activity to demonstrate that there will not be an unacceptable risk to the water source and community water supply.

9. Water balance and nutrient balances

9.1. Overview

Refer AS/NZS 1547:2012 - Appendix Q – Water balance and land application systems (Informative).

Water and nutrient balances should be used for land application system sizing and wet weather storage to ensure a sound design for wastewater management. Rainfall and evapotranspiration rates vary across the NT. An important part of the system design is ensuring that rainfall and effluent loads do not exceed the transpiration rate and absorptive capacity of the soil, and ensuring that the vegetation and soil can readily assimilate the nutrients in the treated wastewater.

It is important that the land application area is designed to overcome or mitigate the most limiting factor identified during the SSE process. More specifically, the size of the land application area should be determined by the most limiting soil constraint (water or nutrient assimilative capacity).

Typically, the Standard Designs in AS/NZS 1547:2012 can be used to determine the minimum dimensions for the following system types:

- Absorption trenches and evaporation beds.
- Mounds.
- Irrigation systems.

However, these designs have been sized using conservative design inputs, and it may be in the interest of the property owner if site-specific designs are undertaken using water and nutrient balance calculations.

Details of commonly used methodologies for water and nutrient balances are provided in:

- AS/NZS 1547:2012: Appendix Q – Water balance and land application systems.
- AS/NZS 1547:2012: Appendix S – Nutrients.
- NSW Department of Local Government, 'Environment & Health Protection Guidelines: On-site Sewage Management for Single Households – Appendix 6' – Water Balances.

These methods are offered as a guide on possible methods only; there is no single accepted methodology for water and nutrient balances.

All water and nutrient balance calculations are simply estimates as they are not exact replications of what actually happens on a land application area. Small variations in the inputs to water and nutrient balances can result in large differences in estimated land application area. A conservative approach should be used when undertaking water and nutrient balances, to ensure the performance objectives of this are met.

9.2. Guidance about conducting a water balance

A monthly water balance using at a minimum the average long term monthly rainfall and evaporation for the official recording station nearest the site will be used. Assumptions of runoff coefficients, crop factors and long term absorption rates must be stated. Median rainfall data are not acceptable.

Rainfall and evaporation values may be obtained from the Bureau of Meteorology's website.

9.3. Guidance about conducting a nutrient balance

At a minimum, nutrient balances will be required for total nitrogen and total phosphorus using values for plant uptake and other soil processes. Nitrogen uptake by plants may be up to 250 kg/ha, while plant uptake of phosphorus of 30 kg/ha may be used. Some allowance may be used for degradation of total nitrogen in the soil. Values higher than the above will require justification.

Nutrient balance calculations should be performed using load values (kg/person/year) rather than concentrations (mg/L) and daily wastewater generation (L/day) as it is well known that higher water use does not necessarily equate to higher nutrient load.

Soil phosphorus absorption capacity may be measured and used to account for phosphorus removal. Such calculations must be supported by laboratory analysis of the phosphorus adsorption capacity of the B horizon.

10. Examples of sizing land application areas

10.1. Absorption trenches

10.1.1. Example 1: Absorption trenches for a 3 bedroom dwelling in an urban & rural living zone

- Soil testing identified that the soil is a weakly structured sandy loam with an indicative permeability (Ksat) of > 3.0 m/d.
- A maximum design loading rate (DLR) of 30 mm/day is assigned to the distribution of primary treated effluent to the basal area of the absorption trench.
- Drainage cell comprises large (jumbo) plastic arch tunnel (540 mm wide & 400 mm high).
- Maximum absorption trench width is 600 mm.
- Spacing between trenches is 1 m.
- The depth of aggregate is 400 mm.
- Individual trench or bed lengths shall be limited to approximately 20 m. (refer Clause L6.1.1 of AS/NZS 1547:2012).
- Daily flow for Equivalent Person (EP) for an urban or rural living zone is based on 150 L/person/day.
- 3 bedroom house in an urban or rural living zones is rated as 5 EP based on number of bedrooms plus 2.

Calculate the length of absorption trenches for a 3 bedroom dwelling in an urban or rural living zone
Determine trench surface area: A = Q/DLR
(Q) = 5 persons x 150 L/p/d = 750 L/day
(DLR) = 30 mm/d
(A) = 750/30 = 25 m^2
Determine trench length: L = A/W
(W) = 0.6 m
(L) = 25/0.6 = 41.6 m
Determine number of connected trenches: N = L/20 m maximum length rounded up to nearest integer (N) = 41.6 m/20 m (N) = 2.08; therefore 41.6/2 = 21 m (approximately 20 m) **= 2 No x 21 m trenches** Total LAA allowing 1 m spacing (As per AS/NZS 1547:2012) between adjacent trenches is (2 No trenches x 21 m long x 0.6 m wide) + (1 No space x 1 m spacing x 21 m long) = 46 m^2

10.1.2. Example 2: Absorption trenches for a 3 bedroom dwelling in an Aboriginal community

- Soil testing identified that the soil is a high/moderate structure loam with an indicative permeability (Ksat) of 1.8 m/d.
- A maximum design loading rate (DLR) of 25 mm/day is assigned to the distribution of primary treated effluent to the basal area of the absorption trench.
- Drainage cell comprises modular drain (400 mm wide x 400 mm high).
- Maximum absorption trench width is 600 mm.
- Spacing between trenches is 1 m.
- The depth of aggregate is 400 mm.
- Maximum absorption trench length is approximately 20 m (refer Clause L6.1.1 of AS/NZS 1547:2012).
- Daily flow for Equivalent Person (EP) for an Aboriginal residential premises in an Aboriginal community is based on 150 L/person/day.
- 3 bedroom dwelling in an Aboriginal community is rated as 7.5 EP based on 2.5 people per bedroom.

Calculate the length of absorption trenches for a 3 bedroom Aboriginal residential premises in an Aboriginal community
Determine trench surface area: A = Q/DLR
(Q) = 7.5 persons x 150 L/p/d = 1,125 L/day
(DLR) = 25 mm/d
(A) = 1,125/25 = 45 m^2
Determine trench length: L = A/W
(W) = 0.6 m
(L) = 45/0.6 = 75 m
Determine number of connected trenches: N = L/20 m maximum length rounded up to nearest integer (N) = 75 m/20 m (N) = 3.8 rounded up to 4 No.; therefore 75/4 = 19 m **= 4 No x 19 m trenches** Total LAA allowing 1 m spacing between adjacent trenches is (4 No trenches x 19 m long x 0.6 m wide) + (3 No spaces x 1 m spacing x 19 m long) = 103 m^2

10.2. Absorption beds

10.2.1. Example 1: Absorption bed for a 3 bedroom dwelling in an urban or rural area living zone

- Soil testing identified that the soil is a high/moderate structured loam with an indicative permeability (Ksat) of 2.0 m/d.
- A maximum design loading rate (DLR) of 25 mm/day is assigned to the distribution of primary treated effluent to the basal area of the absorption bed.
- Drainage cell comprises large (jumbo) plastic arch tunnel.
- Maximum absorption bed width is approximately 4 m.
- The depth of aggregate is 400 mm.
- Maximum absorption bed length is approximately 20 m (refer Clause L6.1.1 of AS/NZS 1547:2012).
- Daily flow for Equivalent Person (EP) for an urban or rural living zone is based on 150 L/person/day.
- 3 bedroom house in an urban or rural living zone is rated as 5 EP based on number of bedrooms plus 2.

Calculate the size of an absorption bed for a 3 bedroom dwelling in an urban or rural living zone
Determine bed surface area: A = Q/DLR
(Q) = 5 persons x 150 L/p/d = 750 L
(DLR) = 25 mm/d
(A) = 750/20 = 30 m^2
Determine bed width: W = $\sqrt{A}/R$
(R) = Length width ratio = 4
(W) = 30/4 = 7.5, therefore the square root of 7.5 = 2.74
(L) = 2.74 x 4 = 10.96 m
Allow 2 rows of drainage cell
1 bed = 11 m long x 3 m wide = 33 m^2

10.2.2. Example 2: Absorption bed for a 3 bedroom dwelling in an Aboriginal community

- Soil testing identified that the soil is a weakly structured or massive loam with an indicative permeability (Ksat) of 1.5 m/d.
- A maximum design loading rate (DLR) of 15 mm/day is applied to the distribution of primary treated effluent to the design area of the absorption bed.
- Absorption bed comprises flatbed modular drainage cell incorporating two distribution channels, with the entire absorption bed covered with filter fabric in accordance with manufacturer's specification.
- Maximum absorption bed width is 4.2 m which is governed by the width of the flatbed modular drainage cell.
- The maximum depth of fill is 600 mm measured from top of the modular drainage cell.
- Maximum absorption bed length is approximately 20 m (refer Clause L6.1.1 of AS/NZS 1547:2012).
- Daily flow for Equivalent Person (EP) for a dwelling in an Aboriginal community is based upon 150 L/person/day.
- 3 bedroom dwelling in an Aboriginal community is rated as 7.5 EP based on 2.5 people per bedroom.

Calculate the size of an absorption bed for a 3 bedroom Aboriginal residential premises in an Aboriginal community
Determine bed surface area: A = Q/DLR
(Q) = 7.5 persons x 150 L/p/d = 1,125 L/day
(DLR) = 15 mm/d
(A) = 1,125/15 = 75 m^2
(W) = 4.2 m
(L) = 75 m^2/4.2 = 18 m
Allow 2 absorption beds at 1 metre apart
2 beds = 9 m long x 4.2 m wide = 76 m^2 Total LAA allowing 1 m spacing (As per AS/NZS 1547:2012) between adjacent beds is (2 No beds x 9 m long x 4.2 m wide) + (1 No space x 1 m spacing x 9 m long) = 85 m2

10.3. Shallow subsurface drip irrigation

10.3.1. Example 1: Shallow subsurface drip irrigation for a 3 bedroom residential premises in an urban or rural area living zone

- Soil testing identified that the soil is a weakly structured or massive loam with an indicative permeability (Ksat) of 0.5 to 1.5 m/d. A maximum design irrigation rate (DIR) of 4 mm/day is applied to the distribution of secondary treated effluent to the design area of the shallow subsurface drip irrigation area.
- Drainage cell comprises micro trench containing drip irrigation line.
- Equivalent Person (EP) for an urban or rural living zone is equal to 150 L/person/day.
- 3 bedroom house in an urban or rural living zone is rated as 5 EP based on number of bedrooms plus 2.

Calculate the size of shallow subsurface drip irrigation for a 3 bedroom dwelling in an urban or rural living zone
Determine irrigation area: A = Q/DIR
(Q) = 5 persons x 150 L/p/d = 750 L
(DLR) = 4 mm/d
(A) = 750/4 = 187.5 m^2
Determine irrigation field width along contour: W = $\sqrt{AR}$
(R) = Length width ratio = typically 1.0 to 2.0
(W) = 187.5 x 1.5 = 281.25, therefore the square root of 281.25 = 16.77)
Determine irrigation field distance down slope: W = $\sqrt{A}/R$
(D) = 187.5/1.5 = 125, therefore the square root of 125 = 11.18)
Determine irrigation lateral length: L = W-S = $\sqrt{AR} - S$
(S) = Irrigation drip line spacing = typically 1.0 m
(L) = 16.77 m – 1.0 m = 15.77 m
Determine number of irrigation laterals: N = A/WS
(N) = 187.5 m^2/16.77 m x 1.0 m = 12 *(rounded up to next integer)*
Determine minimum pump flow rate in field: P = FLN/3600B. Noting that head pump will be dependent on length of line and static head pumping requirements
(F) = Dripper flow rate = typically 4.5 L/hour
(B) = Dripper outlet spacing = typically 0.5 m
(P) = 4.5 Litres per hour x 15.77 m x 12 laterals/3600 x 0.5 m
(P) = 851.58/1800 = 0.47 L/s

10.3.2. Example 2: Shallow subsurface drip irrigation for a 3 bedroom dwelling in an Aboriginal community

- Soil testing identified that the soil is a weakly structured or massive loam with an indicative permeability (Ksat) of 0.5 to 1.5 m/d. A maximum design irrigation rate (DIR) of 4 mm/day is applied to the distribution of secondary treated effluent to the design area of the shallow subsurface drip irrigation area.
- Drainage cell comprises micro trench containing drip irrigation line.
- Equivalent Person (EP) for a dwelling in an Aboriginal community is equal to 150 L/person/day.
- 3 bedroom dwelling in an Aboriginal community is rated as 7.5 EP based on 2.5 people per bedroom.

Calculate the size of shallow subsurface drip irrigation for a 3 bedroom dwelling in an Aboriginal community
Determine irrigation area: A = Q/DIR
(Q) = 7.5 persons x 150 L/p/d = 1,125 L
(DLR) = 4 mm/d
(A) = 1,125/4 = 281.25 m^2
Determine irrigation field width along contour: W = $\sqrt{AR}$
(R) = Length width ratio = typically 1.0 to 2.0
(W) = 281.25 x 1.5 = 421.88, therefore the square root of 421.88 = 20.54
Determine irrigation field distance down slope: W = $\sqrt{A/R}$
(D) = 281.25/1.5 = 187.5, therefore the square root of 187.5 = 13.7)
Determine irrigation lateral length: L = W-S = $\sqrt{AR} - S$
(S) = Irrigation drip line spacing = typically 1.0 m
(L) = 22.50m – 1.0m = 21.50 m
Determine number of irrigation laterals: N = A/WS
(N) = 281.25 m^2/20.54 m x 1.0 m = 14 (rounded up to next integer)
Determine minimum pump flow rate in field: P = FLN/3600B. Noting that head pump will be dependent on length of line and static head pumping requirements
(F) = Dripper flow rate = typically 4.5 L/hour
(B) = Dripper outlet spacing = typically 0.5 m
(P) = 4.5 Litres per hour x 21 5 m x 14 laterals/3600 x 0.5 m
(P) = 1,354.5/1,800 = 0.75 L/s

10.4. Surface spray irrigation

10.4.1. Example 1: Surface spray irrigation for a 3 bedroom residential premises in an urban or rural area living zone

- Soil testing identified that the soil is a weakly structured or massive loam with an indicative permeability (Ksat) of 0.5 to 1.5 m/d. A maximum design irrigation rate (DIR) of 4 mm/day is applied to the distribution of secondary treated effluent to the design area of the surface spray irrigation area via sprinklers.
- Equivalent Person (EP) for an urban or rural living zone is equal to 150 L/person/day.
- 3 bedroom house is rated as 5 EP based on number of bedrooms plus 2.

Calculate the size of surface spray irrigation for a 3 bedroom residential premises in an urban or rural living zone
Determine irrigation area: A = Q/DIR
(Q) = 5 persons x 150 L/p/d = 750 L
(DLR) = 4 mm/d
(A) = 750/4 = 187.5 m^2
Determine the number of sprinklers (N)
(R) = Sprinkler throw radius = 1 m
(Os) = Design sprinkler overlap fraction (generally 0.1 to 0.3) = 0.2
(N) = $A/(2R)^2(1 - Os)$
(N) = $187.5m^2/(2 \times 1m)^2 \times (1 – 0.2)$ -= $187.5m^2/4 \times 0.8$ = 59 (rounded up to next integer)
Determine approximate sprinkler spacing (D)
(D) = 2R(I – Os)
(D) = 2 x 1 m x (1 – 0.2) = 1.6 m

10.5. Mound system

10.5.1. Example 1: Mound system for a 3 bedroom residential premises in an urban or rural area living zone

- Soil testing identified that the soil is a weakly structured or massive loam with an indicative permeability (Ksat) of 0.5 to 1.5 m/d. A maximum design loading rate (DLR) of 16 mm/day is applied to the distribution of primary treated effluent to the design area of the mound.
- Distribution bed loading rate (BLR, mm/d) shall not exceed 40 mm/d.
- Ground slope is 1^{o} (8.5^{o} is typical maximum) and drainage will be vertical. If flat ground then use 0^{o} which overrides 'tan' and ensures I = J.
- Bed length to width ratio (R) is 6 (typically 6 to 8).
- Fill batters are 1 in 3 (minimum b = 3).
- Distribution bed thickness (T1, minimum 225 mm).
- Sand cover over distribution bed (T2, minimum 300 mm).
- Top soil cover over mound (T3, minimum 150 mm).
- Sand depth below distribution bed (T4, minimum 600 mm).
- Equivalent Person (EP) for an urban or rural living zone is equal to 150 Litres/person/day.
- 4 bedroom house in an urban or rural living zones is rated as 6EP based on number of bedrooms plus 2.

Calculate the size of a mound system for a 4 bedroom residential premises in an urban or rural living zone
Determine minimum distribution area: Ar = Q/BLR
(Q) = 6 persons x 150 L/p/d = 900L
(BLR) = 40 mm/d
(Ar) = 900/40 = 23 m^2 (Rounded up to next integer)
Determine distribution bed width (A, m)
(R) = 6 (bed length to width ratio)
(A) = $\sqrt{Ar}/R$
(A) = $\sqrt{23m2}$ /6 = 1.96 m
Determine distribution bed length (B, m)
(B) = AR
(B) = 1.96 m x 6 = 11.76 m
Determine minimum mound height at distribution bed (T, m)
(T) = (T1 + T2 + T3 + T4)
(T) = (0.225 m + 0.300 m + 0.150 m + 0.600 m) = 1.28 m

Determine mound extent upslope (I, m)
(α) = 1° (ground slope)
(b) = fill batter of 1 in 3
(I) = T/[(1 ÷ b) + tanα]
(I) = 1.28 m/[(1 ÷ 3) + tan 1] (on calculator press 1 then tan)
(I) = 1.28 m/(0.33 + tan 1)
(I)= 1.28/(0.33 + 0.035)
(I) = 1.28/0.368
(I) = 2.72 m
Determine mound extent downslope (J, m)
(α) = 1° (ground slope)
(b) = fill batter of 1 in 3
(J) = [T + (A x tan α)]/[(1 ÷ b) – tanα]
(J) = [1.28 m + (3.83 m x tan 1)]/[(1 ÷ 3) - tan 1)]
(J) = [1.28 m + (3.83 m x 0.017)]/(0.33 – 0.017)
(J) = (1.28 m + 0.067)/0.316
(J) = 4.26 m
Determine upper mound extent across slope (K1, m)
(K1) = Tb
(K1) = 1.28 m x 3 = 3.84 m
(K1) = 3.84 m
Determine lower mound extent across slope (K2, m)
(K2) = [T + (A x tanα)] x b
(K2) = [1.28 m + (3.83 x tan1)] x 3
(K2) = (1.28 m + 0.134) x 3
(K2) = 4.04 m
Check toe loading rate (TLR, l/lineal m of toe/d)
(TLR) = Q/[B + (2 x K1)]
(TLR) = 900/[11.76 + (2 x 3.84)]
(TLR) = 900/19.44
(TLR) = 46.30 L/m/d, which is OK (<125 L/m/d)
Check mound base loading rate does not exceed allowable maximum DLR of 16 mm/d
DLR_{Actual} = Q/[B + (2 x K1) x (A + J)]
DLR_{Actual} = 900/[11.76 m + (2 x 3.84 m)] x (1.96 m + 4.26 m)
DLR_{Actual} = 900/(11.76 m + 7.68 m) x (1.96 m + 4.26 m)
DLR_{Actual} = 900/(19.44 x 6.22)
DLR_{Actual} = 900/120.92
DLR_{Actual} = 7.44 mm/d, which is OK (<16 mm/d)

11. Construction, installation, operation, and maintenance

11.1. Overview

Refer to AS/NZS 1547:2012: Section 6 - Construction, installation, operation, and maintenance.

Refer to AS/NZS 1546:2012: Appendix T – Operation and maintenance guidelines which details what should be contained in any operation and maintenance guidelines for property owners or occupiers.

Correct installation and operation management (operation and maintenance) is vital to ensuring that the designed WMS meets its ultimate performance objectives. This part outlines the key steps recommended as ‘best practice’ for WMS installation, commissioning, operation and maintenance. In all instances, safe design processes should be in place.

Further information for home owners and householders about operation and maintenance of WMS is available on the Northern Territory Government website.

12. Risk management

12.1. Overview

Refer to AS/NZS 1547:2012: Clause 1.4 – Risk management framework and Section 2 Risk management process.

Refer to AS/NZS 1547:2012: Appendix A – Risk management process guidelines.

The risk management process involves identifying hazards (something that can cause harm), determining the risk (the chance that that hazard will actually cause harm) and mitigating or eliminating that risk.

Hazards, as they relate to WMS, can be broadly grouped into three types:

- Public health: Hazards to human health, such as contamination of potable water supplies and public exposure to seepage
- Environment: The impact of poorly treated wastewater on the surrounding environment. This includes the potential effects on soils, surface water, groundwater, air (odour) and noise
- System: The design and operation of the WMS and may include systems that do not treat to a sufficiently high standard, that may be wrongly sized (e.g. too small), or are not being maintained.

The first step in risk reduction (reducing the likelihood of hazard occurrence) is good design (prevention). A good design uses highly conservative factors of safety that design against future malfunction and failure for the life of the WMS. All elements of the design process should be directed towards eliminating or mitigating risks of inadequate or poor performance to the fullest extent possible.

13. Community wastewater management system

A community wastewater management system (CWMS) is a system for the collection and management of wastewater generated in a town, regional area or other community, but excludes PWC sewerage infrastructure. It is not uncommon for remote communities to use off-site wastewater management utilising a CWMS.

CWMS include septic tank effluent drainage schemes (STEDS), septic tank effluent pumping schemes (STEPS), sewage systems, pressure sewerage systems and vacuum sewage systems as well as any associated wastewater treatment facilities and recycled water reuse schemes.

As a guide, proponents of CWMS are should refer to the South Australia Department of Health - Community Wastewater Management Systems Code which provides information about:

- The technical requirements to be considered in the planning stages of a CWMS.
- The requirements for design, operation and management of the CWMS.

The SA Code is available on the SA Health website.

14. WMS for mining and construction camps

The recommended specifications for WMS serving mining and construction camps outside Building Control Areas:

- Proponents engage a hydraulic consultant to design and certify the WMS
- The wastewater treatment units should provide a minimum of secondary treatment, i.e. STS
- The wastewater treatment unit should be transportable, preferably mounded on ‘skids’
- Reticulate wastewater to a stock fenced, sign posted spray irrigation land application system
- Incorporate trade waste management system if the camp includes a commercial kitchen
- Ensure the entire WMS is removed from site at the completion of works, referring to Section 16 ‘destruction, removal and reuse of WMS’.
- Refer to Section 15 for information about the disposal of septage and sludge
- Refer to the ‘Administrative procedures for the installation of WMS outside building control areas’.

15. Disposal of septage and grease trap waste

15.1. Septage

Septage is the material pumped out from septic tanks during desludging. This can be made up of solids and liquids and can contain high levels of microorganisms such as *E.coli*.

15.1.1. 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.

15.1.2. 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.
- The 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, i.e. one that is not overloaded with liquid, organic matter or synthetic material, typically only needs to be desludged once every 3 to 7 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.

Septic tanks and grease traps in remote communities are typically pumped out by plumbers contracted by Regional Councils, Government agencies or property owners/business proprietors. The frequency of desludging will be determined by the septic tank size and the daily hydraulic flow going through the system.

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.

15.2. Grease solids

The preparation of food in commercial business can result in high levels of oils entering the septic tank. This fat can destroy the natural bacteria located within the septic tank, therefore preventing the anaerobic breakdown of waste solids. To prevent this occurring, a grease trap is installed to remove fats from the waste entering the septic tank. This fat builds up and is required to be disposed of regularly off-site. Like septage, this waste can have a strong smell and can contain a high level of microorganisms.

Grease traps servicing food businesses should be regularly inspected by the proprietors and pumped out on an 'as-required' basis. This will be dependent on the size of the grease trap and the amount of food preparation which involves the production of fats.

15.3. Transport of septage and grease trap waste

The transport operator must take all reasonable and practicable measures to prevent or minimise pollution or environmental harm resulting from the activity of collecting, storing and transporting septage and grease trap waste. As a minimum the equipment used must be fit for purpose; the operator must be trained in the appropriate operation of the equipment; and emergency spill response equipment and procedures appropriate to the scale of the activity must be accessible to the operator throughout the activity.

An operator engaged to desludge septage and grease trap waste may transfer the waste into a vacuum tanker for transport to an authorised disposal facility.

Where the operator is engaged on a commercial or fee for service basis, a Department of Environment and Natural Resources (DENR) - Environment Protection Licence (EPL) or authorisation to operate without EPL is required.

15.4. Disposal

The options for the disposal of septage and grease trap waste in remote areas are limited. Surface application of septage poses a public health and environmental risk and is not supported by the DoH or DENR.

Disposal of septage and grease trap waste on Crown Land is not permitted.

The options for waste disposal are:

15.4.1. Transport to a PWC regional trade waste management facility.

Power and Water Corporation (PWC) fees apply for the discharge of septage and grease trap waste to PWC facilities. PWC will accept septage and grease trap waste from waste contractors to the following regional trade waste facilities:

- Palmerston trade waste stabilisation ponds.
- Katherine, Alice Springs and Tennant Creek waste stabilisation ponds via a dedicated discharge area. The only exception is that Alice Springs does not accept grease trap waste which instead is disposed at the Alice Springs landfill.

PWC will not accept septage or grease trap waste to their waste stabilisation ponds in remote Aboriginal communities. The transport of septage and grease trap waste to regional waste stabilisation ponds is the preferred option for disposal, however it is acknowledged that it may be impractical to transport septage and grease trap waste from remote areas to the regional facilities.

15.4.2. Land application to a Regional Council landfill

This should only be done in agreement with the Regional Council in a specific area of the landfill that is authorised to dispose of septage and grease trap waste by burial.

15.4.3. Land application to a private property

In some cases it is not feasible to transport septage and grease trap waste from a remote area (e.g. mining sites, construction sites and pastoral leases) to a PWC regional trade waste management facility or a Regional Council landfill. In these cases there may be an option to dispose of septage and grease trap waste on private property providing conditions are met. This would require the waste handler/plumbing contractor to:

- Seek permission from the property owner (including land councils, traditional owners, etc).
- Advise the property owner of the source, type and quantity of waste.
- Advise the property owner of the proposed method of disposal and how the disposal area will be protected.
- Contact DENR to confirm if the land application to private property requires an authorisation.

Providing land application of the waste is permitted by the property owner then dedicated disposal trenches shall:

- Be of sufficient volume to contain the amount of septage requiring disposal. The minimum recommendations for the sizing of a trench to accommodate 4000 L of septage from a single septic tank is 4 m long x 1 m wide x 2 m deep with 1 m of cover. Septage trenches are generally single use.
- Be located so as to minimise access by humans and stock.
- Be recorded as a location using GPS coordinates or a Google map reference.
- Not cause a public health nuisance, environmental nuisance, or mosquito breeding.
- Be immediately covered with a minimum of 150 mm soil, though this depends on the extent of waste liquid (which should be as dry as possible).
- Meet the following setbacks:
    - 1,000 m minimum from a dam, well or bore, reservoir, public or domestic water supply.
    - 500 m minimum from a stream or water course.
    - 250 m minimum from a growing edible vegetable or flowering fruit tree.

16. Destruction, removal and reuse of WMS

16.1. Decommissioning treatment systems

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 NT 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 plumber must disconnect the tank from the premises and from the land application 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 plumber must disconnect it from the premises and the land application 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.

Existing WMS such as septic tanks, holding tanks and secondary treatment systems (STS) become redundant where reticulated sewerage progresses through an area and premises connect. These WMS may be demolished or reused on-site as a storm water storage vessel. The existing septic tank, where suitable, may also be used when the premises is upgraded to a STS.

Where it is feasible to reuse a septic tank, holding tank, or STS, there are several precautions that need to be observed to ensure that public health risk is minimised. The reuse and/or removal of a septic tank, collection well or STS shall only be carried out once the premises is connected to sewer or an alternate WMS.

Under no circumstances are WMS to be reused as vessels for holding water for drinking purposes, or for any internal household domestic purpose.

16.2. Septic tank/holding tank/land application system

16.2.1. Demolition on-site

The contents of the septic tank/holding tank/land application system are to be removed by either by tanker removal to an appropriate authorised site or pumped into the existing land application system if of sufficient capacity and which then should be sealed. The contents of a septic tank or collection well must not be broadcast or discharged above ground.

The sides, lid, baffle or partition (if fitted) and square junctions of the tank should be hosed down as the waste is being removed.

The tank is to be treated by liberally broadcasting builders' (hydrated) lime over the exposed surfaces. It is advisable to wear personal protective equipment.

Several holes should be punched or drilled into the base of the tank. The lid and those parts of the walls baffle and square junctions above the ground should be demolished and collapsed into the tank and the tank filled with clean soil or rubble and topped with clean soil. This should be performed to ensure that voids cannot develop which would allow collapse and injury in the future.

16.2.2. Reused on-site as a stormwater storage and irrigation tank

The water from such a stormwater or irrigation tank may be used for garden purposes but not for topping up swimming pools. Nor should the water be used for internal household purposes such as for toilet flushing, or in laundry tubs, washing machines, bathrooms or kitchen.

For reuse on-site as a non-domestic water containing vessel, the contents are to be removed either to an acceptable site or pumped into the existing land application system if of sufficient capacity which then should be sealed. The contents of a septic tank or collection well must not be broadcast or discharged above ground.

The sides, lid, baffle or partition (if fitted) and square junctions of the tank should be hosed down as the waste is being removed.

The tank should be filled with fresh water and disinfected to a minimum level of 5 mg/L of free residual chlorine with a half hour contact time. The chlorine should be allowed to dissipate naturally at least overnight and not be neutralised.

The inlet(s) and outlet(s) of the vessel should be sealed. Pumps and other accessories may then be installed and connected to an irrigation system. The tank is to be mosquito proofed and fitted with a strainer or first flush device to prevent the introduction of coarse particles and materials.

The tank is to be labelled as containing water unfit for human consumption.

Pipes, fittings or fixtures in accordance with the water utility requirements may only be used. No cross connection is to be made with any potable water supply, nor should the vessel be likely to contaminate any potable water supply. Backflow prevention devices may need to be installed in accordance with the water utility directions.

16.2.3. Upgrading to a secondary treatment system

An existing septic tank may be used in conjunction with a STS on the same site provided:

- The existing septic tank is of at least the same size and capacity of the septic tank of the accredited STS and the existing septic tank is not to be relocated elsewhere on the same site.
- The contents of the septic tank are to be removed either to an acceptable site or pumped into the existing land application system if of sufficient capacity which then should be sealed.
- The contents of a septic tank or collection well must not be broadcast or discharged above ground.
- The septic tank when inspected by a competent person such as the installer of the STS or a plumber/drainer is found to be in a suitable condition and in conformity with AS/NZS 1546.1:2008.

16.2.4. Removed and relocated

Septic tanks and collection wells may only be removed, relocated and reused as such where the septic tank or collection well is subject to product approval.

The contents of the septic tank and/or collection well are to be removed either to an acceptable site or pumped into the existing land application system if of sufficient capacity which then should be sealed. The contents of a septic tank or collection well must not be broadcast or discharged above ground.

The sides, lid, baffle or partition (if fitted) and square junctions of the tank should be hosed down as the waste is being removed.

The inlets and outlets should be plugged and the tank should then be filled with clean water and disinfected to a minimum level of 5 mg/L of free residual chlorine, with a minimum one half hour contact time. The lid should be exposed to the chlorine solution. The chlorine should be allowed to dissipate naturally at least overnight and not be neutralised.

The contents of the tank and/or well may be then emptied as stated above in and the land application system should be sealed. The septic tank and/or collection well may be removed if the structural integrity of the tank and/or well can be maintained.

16.3. Secondary treatment system

16.3.1. Demolition on-site

The contents of the STS are to be removed either to an acceptable site or pumped into the existing land application system (if one exists) and sealed. The liquid content of the STS is not to be irrigated using the land application system and is not to be discharged to the environment.

The sides, lid, baffles or partitions, components and square junctions of the STS should be hosed down as the waste is being removed.

The pumps, blowers and internal components of the STS may be either collapsed into the STS or selectively removed by the owner/occupier, an STS manufacturer or service agent for proper disposal to landfill. The owner/occupier, manufacturer or service agent must remove such parts in a manner which will not contaminate the environment or compromise the health and safety of themselves or others. Un-retrieved components must be left in the STS.

The STS and remaining components are to be disinfected by broadcasting builders' (hydrated) lime over the exposed surfaces. It is advisable to wear personal protective equipment.

Several holes should be punched or drilled into the base of the tank. The lid and those parts of the walls, baffle and square junctions above the ground should be demolished and also collapsed into the tank and the tank filled with clean soil or rubble and topped with clean soil.

All irrigation lines and spray head, sprinklers, drippers and the like are to be flushed with potable water for 5 minutes. If the irrigation lines are to be connected to the reticulated water supply the installation shall comply with the water utility requirements and a backflow prevention device installed.

17. References used in the development of the Code & Guidance notes

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