CODE OF PRACTICE FOR SMALL ON-SITE SEWAGE AND SULLAGE TREATMENT SYSTEMS AND THE DISPOSAL OR REUSE OF SEWAGE EFFLUENT

REFERRED TO IN THE PUBLIC AND ENVIRONMENTAL HEALTH REGULATIONS AS

CODE OF PRACTICE FOR ON-SITE WASTEWATER MANAGEMENT

IMPORTANT

CODE OF PRACTICE

for On-site Wastewater Management – July 2014

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CODE OF PRACTICE

for On-site Wastewater Management – July 2014

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PO Box 40596
CASUARINA NT 0811

CODE OF PRACTICE FOR SMALL ON-SITE SEWAGE AND SULLAGE TREATMENT SYSTEMS AND THE DISPOSAL OR REUSE OF SEWAGE EFFLUENT
NOVEMBER 1996

REFERRED TO IN THE PUBLIC AND ENVIRONMENTAL HEALTH REGULATIONS AS

CODE OF PRACTICE FOR ON-SITE WASTEWATER MANAGEMENT

Developed by the Environmental Health Program Directorate
Territory Health Services 1996
87 Mitchell Street Darwin NT
PO Box 40596
CASUARINA NT 0811

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AND SULLAGE TREATMENT SYSTEMS AND
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xsepcop

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NSW Health Department

Queensland Department of Primary Industries

South Australian Health Commission

Supertreat Sewage Treatment Systems

Tasmanian Department of Health

Territory Construction Association

Territory Health Services Environmental Health Officers

NT Department of Housing and Local Government

NT Department of Lands, Planning and Environment

NT Department of Transport and Works

NT Power and Water Authority

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GLOSSARY OF TERMS

Absorption:	Uptake of sewage effluent or sullage or both into the soil.
Absorption Trench or Area:	A system that uses the principle of absorption, which is limited to soil with good but not excessive permeability, ie between 2 mm/hour to 100 mm/hr or 0.05 metres/day (m/d) and 0.6 m/d.
Aerobic Bacteria:	Bacteria that grow in the presence of oxygen.
Aerated Wastewater Treatment System (AWTS):	An "alternative septic system" that treats effluent by biological processes in the presence of oxygen.
Aggregate(s):	Clean crushed rock, river/creek gravel, scoria or other stable inert granular material which will not break down under normal use and which is free from clay, dust and organic material. The aggregate shall be within the range specified within this document.
Alternative Septic System:	See septic tank definition.
Anaerobic Bacteria:	Bacteria that grow in the absence of oxygen.
Approve/Approved/Approval:	Includes a written endorsement, authorisation or consent issued by the Chief Medical Officer which may be subject to conditions.
AS:	Australian Standard (latest version).
Biomass:	A film of biological matter on the contact surface of the soil in a soakage system.
BOD:	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 degrees C (BOD_5).
Building:	A building as classified under the Building Code of Australia.
Building Practitioner:	Means a person defined under the Building Act as a building certifier, certifying plumber and drainer or certifying engineer (hydraulic).
Chlorination:	The addition of chlorine releasing compounds to the treated effluent for the purpose of disinfection.
Combined Chlorine:	Chlorine which is combined with ammonia and other organic compounds containing nitrogen to form chloramines thus reducing its effectiveness as a disinfectant.
Daily Flow/Daily inflow:	The volume in litres of sewage and liquid wastes flowing into a septic tank during a 24 hours period, see also Hydraulic Loading.
Desludging:	Removal of the accumulated sludge and scum from the septic tank or Aerated Wastewater Treatment System.
Disinfection:	A process which destroys, inactivates or removes pathogenic micro-organisms.
DN100:	Is the nominal pipe diameter in millimetres.

Domestic Residential Premises:	Is a Class 1 building as specified under the classification of the Building Code of Australia and Includes single domestic dwellings, row houses, terrace houses, town houses and villa units.
Drain:	An underground pipe for conveying sewage and liquid wastes to the septic tank.
Effluent:	The treated liquid leaving a septic tank, sullage treatment system or Aerated Wastewater Treatment System.
Effluent Disposal System:	A constructed system utilising various methods and materials to effectively dispose of effluent. It falls within the definition of a 'septic tank' under the Public Health Act.
Effluent Drainage Pipe:	Plastic effluent pipes shall comply with the requirements of AS2439 - Perforated Plastic Effluent Pipe and Fittings, and have a water opening area of not less than 8000mm^2/m length of pipe. Perforations for smooth wall or corrugated plastic pipe shall have 5mm slots or 10mm diameter holes.
EHO:	Environmental Health Officer.
Evaporation:	Direct transfer of a liquid from a liquid state to a vapour.
Evapotranspiration-absorption (ETA) Area or Trench:	A system that uses the principles of evaporation, transpiration and absorption.
Geotextile:	A non woven needle punched continuous filament polyester fabric 1.4mm nominal thickness with a flow rate capacity of 500 litres/m^2/sec to AS 3705.
Faecal Coliforms:	Thermotolerant coliform organisms that indicate faecal pollution. Escherichia coli (E.Coli) is generally the dominant species.
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.
Hydraulic Loading:	Liquid flow required to be handled by the treatment process, see also Daily Flow.
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.
Nutrients:	The foods of microbial and plant life; mainly compounds of nitrogen and phosphorous.
PAWA:	NT Power and Water.
Percolation:	Movement of water through the soil.
Perforated Pipe:	A subsurface soakage system using perforated pipe to disperse effluent along a trench.

Plastic (PVC) Sheeting: Shall be not less than 0.25mm thick and conform with AS 2324.

Plastic Tunnel Trench: A subsurface absorption system using sections of slotted plastic tunnel to disperse effluent. Self-supporting durable arching, 500mm wide, shall have a perforated water opening area of not less than 10000mm^2/m length and conform with AS 2041 & 2042.

Pooling: Water from any source that collects to form a pool or puddle which persists longer than the period between irrigation pump cycles.

Primary Treatment: Is the treatment of sewage that occurs in a traditional septic tank.

Reclaimed Water: Wastewater treated to a standard which is satisfactory for its intended use.

Reticulated Water: Any reticulated potable water supply from a bore, river or dam.

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 0.4mm and 1.0mm and contain not 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: The process of effluent aeration followed by clarification and disinfection prior to it reaching the effluent disposal system.

Septic Tank: Under the Public Health Act, a septic tank means any tank or series of tanks through which sewage is passed, and in which it is detained for the purposes of sedimentation, disintegration or digestion and includes:
(a) any associated effluent disposal system,
(b) any apparatus or device for the reuse of effluent, and
(c) any apparatus or device for the storage treatment, disposal or reuse of sullage.

The 'septic tank' definition includes such systems as Aerated Wastewater Treatment Systems, Aerobic Sand Filters, Composting Toilets and Sullage systems. When the term septic tank is used throughout this document, it will refer to all of the above types of systems. However, for clarity purposes, differentiation of specific types of septic tanks will be made by reference to Traditional Septic Tanks and "Alternative septic systems".

A **Traditional Septic Tank** means:

- a septic tank that is prefabricated and conforms with AS1546-1990 and which bears a manufacturer's stamp to this effect,
- rectangular cast in situ steel reinforced concrete septic tank,
- rectangular built on site brick and steel reinforced concrete septic tank.

An **Alternative Septic System** means:

a system that although falling within the legal definition of a septic tank under the Public Health Act, is distinguished from a traditional septic tank for the purposes of clarity in this Code of Practice. They are referred to in part 2 of this code and include:

- Aerated Wastewater Treatment Systems (AWTS),
- Aerobic Sand Filters,
- Composting Toilets, Incinerating Toilets and similar types,
- Effluent Disposal Systems other than those outlined in this Code.

Sludge: Solids which have settled to the bottom of the septic tank.

Soil Permeability: Capability of a soil to allow water to percolate through it.

Subsurface Soakage: A trench, bed, well or pipe system from which effluent percolates into the soil (ground absorption).

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 effecting a high rate of evapo-transpiration.

Suspended Solids: Solid particles held in suspension including both settleable and non-filterable residues.

Sullage: Domestic wastes from baths, showers, laundries and kitchens, including floor wastes from these sources.

THS: Territory Health Services (formerly Department of Health and Community Services).

Transpiration: Transfer of liquid through plants to the atmosphere.

Treated Effluent: Effluent which has undergone (wholly or partly) secondary treatment including aeration and or clarification but has not been subject to disinfection.

Wastewater: Water which is collected and transported through waste pipes and sewers. Wastewater can include water from domestic, commercial and industrial sources.

Wetted Areas: The areas assumed for calculation purposes are as follows:

a)Trenches - includes the floor area plus an allowance for the depth of wetted wall, usually the depth of aggregate in the trench,

b)Surface Irrigation - the designated surface area to which effluent is applied.

INTRODUCTION

The effective treatment and disposal of wastewater ie. sewage and sullage, is essential in safeguarding the health of the community and protection of water supplies and the environment from contamination . Septic tanks have traditionally been used in the Northern Territory to treat and dispose of sewage, with varying degrees of success; due largely to variations in topography, climatic and site conditions. While septic tanks remain a satisfactory sewage treatment device (in situations where a sewerage scheme is not available for connection) the use of alternative septic systems to treat and dispose of wastewater within either domestic or non-domestic allotments may be acceptable, providing they satisfy certain conditions.

Territory Health Services has developed the following Code of Practice in order to assist the community and particularly industry, in ensuring that safe and effective septic tanks are installed and maintained throughout the life of the system.

Details of the legal requirements for approval of types of systems for use in the Territory and their installation, are contained in Section 3.0 and the *Administrative Procedures* available from the relevant Environmental Health Office for the locality in which the works are to be carried out.

Information on certification within building areas can also be obtained from the Building Certification Guide available through the Building Advisory Services Branch of the Department of Lands, Planning and Environment.

NOTES

1.0 INSTALLATION INFORMATION & ENQUIRIES

Enquiries and applications should be directed to the Environmental Health Office for the locality in which the works are to be carried out (See map at Appendix H).

Darwin Urban
Shop 4, Ground Floor
Casuarina Plaza
PO Box 40596
CASUARINA NT 0811
Telephone: (08) 8922 7377
Facsimile: (08) 8922 7036

Darwin Rural
Building 4
Royal Darwin Hospital
PO Box 40596
CASUARINA NT 0811
Telephone: (08) 8922 8292
Facsimile: (08) 8922 8940

East Arnhem
Arnhem House
Endeavour Square
PO Box 421
NHULUNBUY NT 0881
Telephone: (08) 8987 0353
Facsimile: (08) 8987 0333

Katherine
NT Government Centre
PMB 73
KATHERINE NT 0851
Telephone: (08) 8973 8655
Facsimile: (08) 8973 8620

Barkly
Community Care
Tennant Creek Hospital
PO Box 346
TENNANT CREEK NT
Telephone: (08) 8962 4302
Facsimile: (08) 8962 4407

Alice Springs Rural
Population Health Unit
Stuart Terrace
PO Box 721
ALICE SPRINGS NT 0871
Telephone: (08) 8951 7808
Facsimile: (08) 8951 7811

Alice Springs Urban
Alice Springs Town Council
Environmental Services
PO Box 1071
ALICE SPRINGS NT 0871
Telephone: (08) 8950 0500
Facsimile: (08) 8953 0558

1.1 TYPE APPROVAL ENQUIRIES & APPLICATIONS

Type approval enquiries & applications should be directed to:

Program Director
Environmental Health
87 Mitchell Street
DARWIN NT 0800
PO Box 40596
CASUARINA NT 0811
Telephone: (08) 8999 2939
Facsimile: (08) 8999 2700

2.0 SCOPE OF CODE OF PRACTICE

This Code specifies standards for the correct design, construction, installation, certification and maintenance of:

- **traditional septic tanks for the reception, treatment and disposal of sewage and sullage servicing all classes of buildings throughout the Northern Territory, and**
- **alternative septic systems servicing all classes of buildings, including Aerated Wastewater Treatment Systems (AWTS), aerobic sand filters and composting toilets etc.**

NOTES

1. **All type approved domestic septic tank installations within a Building Area are bound by the Building Act 1993 and accordingly must be certified by a registered self certifying plumber and drainer. Further details of the administrative procedure to be followed are contained in Section 9 of the NT Building Certification Guide.**
2. **All septic tanks proposed to be installed in the Territory must comply with the relevant provisions of this Code in its entirety.**
3. **The terms septic tank, traditional septic tanks and alternative septic systems are specifically defined for the purposes of this document in the Glossary of Terms.**
4. **This Code takes precedence over relevant Australian Standards, except in circumstances specifically referred to in the document.**

2.1 REFERENCED DOCUMENTS

The latest versions of the following *Australian Standards* are referenced in this Code.

AS1319	Safety signs for the occupational environment
AS1546	Small Septic Tanks
AS1547	Disposal systems for effluent from domestic premises
AS1650	Hot dipped galvanised coatings on ferrous articles
AS1726	Site Investigation Code
AS2041	Corrugated steel pipes, pipe arches and arches
AS2042	Corrugated steel pipes, pipe arches and arches - design and installation
AS2324	PVC film and sheeting
AS2439.2	Perforated effluent pipe and associated fittings for sewerage applications
AS2698	Plastic pipes and fittings for irrigation and rural applications
AS2865	Safe working in a confined space
AS3500	National Plumbing and Drainage Code
AS3600	Concrete structures
AS3705	Geotextiles
AS3735	Concrete structures for retaining liquids.

3.0 LEGAL REQUIREMENTS

3.1 APPROVAL REQUIREMENTS UNDER PUBLIC HEALTH REGULATIONS

The Chief Health Officer (CHO) of the Territory Health Services (formerly Department of Health and Community Services) has the responsibility under the *Public Health Act* for approving the types of septic tanks that can be used in the Territory and approving the installation of septic tanks in the Northern Territory.

The CHO has delegated the installation approval to certain staff in the Territory Health Services operational regions and "type approval" to the Program Director, Environmental Health Program Directorate.

All septic tank installations servicing buildings both within and outside of building areas, apart from installations subject to the Building Act, must be approved by the CHO's delegate for the area in which the works are to be carried out. Further information may be obtained from the relevant Environmental Health Officer in whose area the works are to be located (See Section 1.0 for details).

NOTE:
For installation advice and further details, refer to the *Administrative Procedures for the Approval and Installation of Small On-site Sewage and Sullage Treatment Systems and the Disposal or Reuse of Sewage Effluent.* A copy of this document can be obtained from any Environmental Health Office listed in Section 1.0

3.2 TYPE APPROVAL

All septic tanks, including Aerated Wastewater Treatment Systems, aerobic sand filters and composting toilets require "type" approval from Territory Health Services before being able to be sold and installed in the Northern Territory. Type approval provides authorisation for the installation of that type of septic tank anywhere in the Northern Territory, subject to compliance with any conditions placed on the approval.

An application for type approval for a septic tank must be submitted to the Program Director, Environmental Health Program Directorate. (Refer to Section 1.1 and the *Administrative Procedures*).

3.3 SEPTIC TANK INSTALLATION APPLICATION PROCESS

All septic tank installations, apart from those subject to self-certification within building areas under the *Building Act*, are subject to regulations made under the *Public Health Act*.

For further details refer to the *Administrative Procedures.*

3.4 CERTIFICATION BY BUILDING PRACTITIONER

Certification of septic tank installations servicing all classes of buildings within building areas

All septic tank installations to Class 1 and 10 buildings within building areas must be certified by self certifying plumbers and drainers under the *Building Act*. See also Part 9 - *Plumbing and Draining Self Certification* of the *Building Certification Guide* for further details.

Septic tank installations to Class 2 - 9 buildings within building areas are also able to be certified, subject to compliance with all of the conditions required by the Chief Health Officer.

For further details refer to the *Administrative Procedures.*

4.0 PLUMBING AND DRAINAGE

The essentials of proper planning and effective drainage are simple design, sound materials and good workmanship. All materials, fittings and fixtures used must be of a standard approved for sanitary plumbing and drainage.

The sanitary plumbing and drainage work including the installation of fixtures and connection to the septic tank via traps, waste pipes and drains shall be carried out in accordance with:

(1) National Plumbing and Drainage Code, AS 3500 Part 2, Sanitary Plumbing and Sanitary Drainage, and

(2) Any NT amendment to the above including exclusions or modifications prescribed by regulation.

PART 1 - THE TRADITIONAL SEPTIC TANK

5.0 INTRODUCTION

A septic tank may include:

- sanitary plumbing fixtures connected to drain pipes that enable sewage and sullage wastes to be conveyed from the fixtures to the tank,
- a pumping sump,
- a sewage treatment tank,
- a distribution box,
- an effluent disposal system,
- a surface and subsurface effluent irrigation or disposal system.

The proposed installation site must be adequate to allow subsurface disposal within the allotment boundaries, otherwise an alternative system will be required. This may entail collection of the effluent in an impervious sump for subsequent removal from the property or the installation of an alternative form of effluent/sullage disposal.

NOTE: COMPLIANCE WITH SECTION 7.2 IS MANDATORY PRIOR TO A DECISION BEING MADE TO INSTALL A TRADITIONAL SEPTIC TANK

5.1 PRINCIPLES OF OPERATION

Owners of septic tanks should note the following.

A septic tank relies on natural biological processes to break down raw sewage (from toilets) and sullage (from kitchens, bathrooms and laundries). Three distinct zones exist within a septic tank namely the scum, detention and sludge zones **(See Figure 1).**

It is important to maintain an effective, undisturbed sludge and scum for biological processing of the effluent and therefore the inlet and outlet of a septic tank must be baffled to prevent disturbance of the scum. The minimum period in the detention zone should be 24 hours to ensure 60 to 70% of the suspended solids are removed and that the Biological Oxygen Demand (BOD5) is reduced by at least 30%. Therefore, the septic tank must be of sufficient capacity to ideally provide for a minimum 24 hour retention of the daily flow into the tank.

The owner should arrange for the septic tank to be desludged regularly in order to extend the life of the disposal system. Desludging should be carried out according to the desludging frequency stated in Section 5.4.3.

The septic tank shall be filled with clean water and remain full when installation is complete.

The septic tank may be seeded with sludge from another correctly functioning septic tank to assist in the establishment of bacteria necessary for processing of sewage.

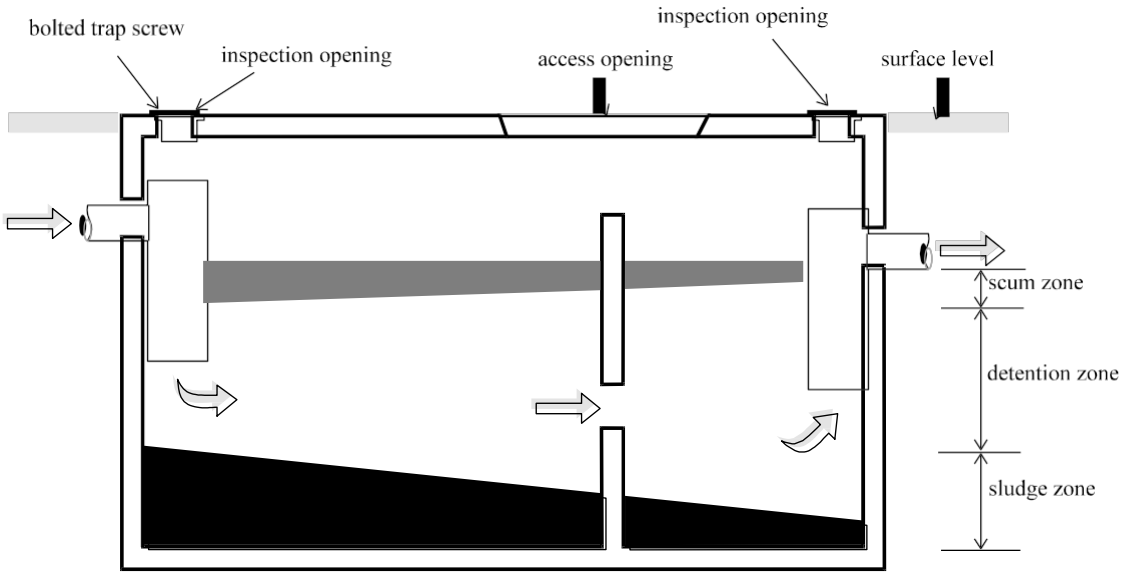


FIGURE 1: SEPTIC TANK ZONES

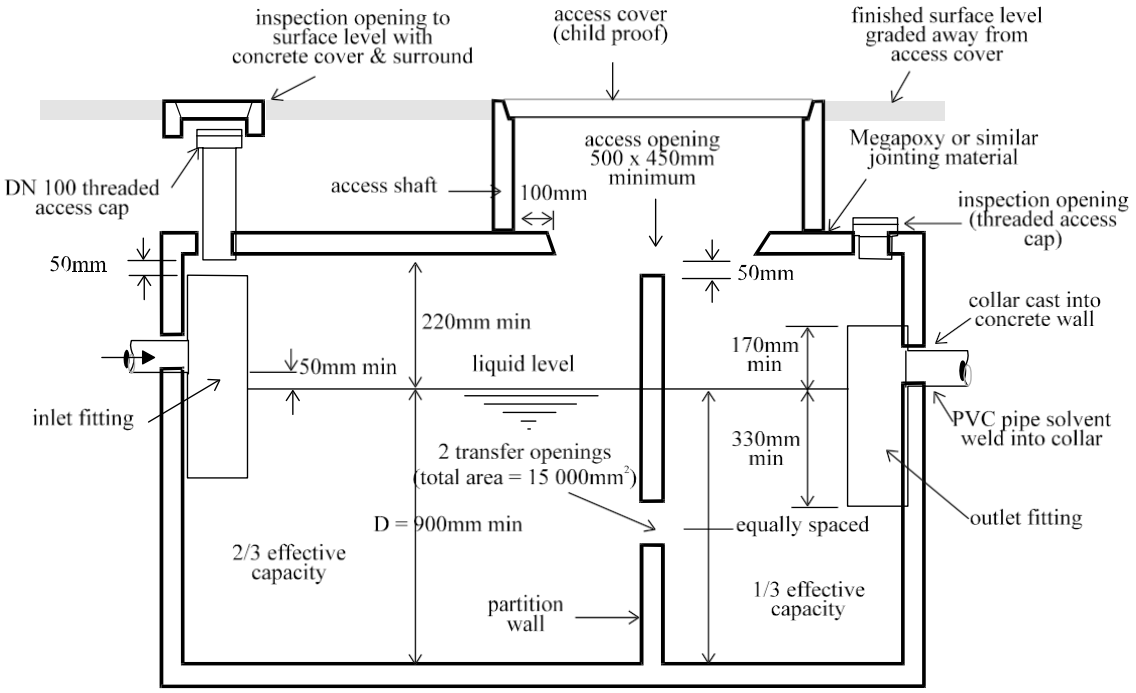


FIGURE 2: TYPICAL SEPTIC TANK DESIGN

5.2 APPLICATION OF THE CODE

5.2.1 Septic Tank Design

Traditional septic tanks shall comply with AS1546 as it applies to:

- cylindrical precast steel reinforced concrete septic tanks,
- cylindrical precast steel fibre reinforced concrete septic tanks,
- rectangular precast steel reinforced concrete septic tanks,
- glass fibre septic tanks,
- reinforced plastic septic tanks, or
- minor variations to the above types of septic tanks that have been approved by the Chief Medical Officer of Territory Health Services.

OR Section 6 of this *Code* as it applies to:

- rectangular cast in situ steel reinforced concrete septic tanks,
- rectangular built on site brick & steel reinforced concrete septic tanks,
- tanks of larger capacity than those covered by AS1546,

Alternative septic systems shall comply with:

- Section 8 as it applies to Aerated Wastewater Treatment Systems,
- Section 9 as it applies to Aerobic Sand Filters,
- Section 10 as it applies to Composting Toilets.

5.2.2 Effluent Disposal Systems Design

Effluent Disposal Systems shall generally comply with ***Section 7*** and either parts ***2, 3 or 4*** of the Code, whichever is applicable to the following installation type:

(a) **Ground Absorption Systems**

- perforated plastic tunnel is preferred in the installation of an absorption trench for areas where rainfall exceeds 800mm/yr. However perforated plastic pipe may be used where it is certified as a suitable alternative by a certifying plumber and drainer

or EHO,

- perforated plastic pipe or tunnel can be used in an absorption trench or an absorption bed for areas where rainfall is less than 800mm/yr (See Appendix C)

(b) **Evapo-Transpiration Systems**

- perforated plastic pipe or tunnel is preferred in a transpiration trench for areas where rainfall is less than 800mm/yr only (See Appendix C)
- perforated plastic pipe or tunnel is preferred in a transpiration bed for areas where rainfall is less than 800mm/yr only (See Appendix C)

(c) **On-site stabilisation ponds**

- NT government and non-government installations must be designed and certified by a qualified engineer or building practitioner. Non-government systems must be approved by THS prior to installation.

5.2.3 Effluent Disposal to non-potable water sources eg rivers, streams etc.

Disposal of sewage effluent to non-potable water courses, such as rivers, streams etc is subject to the Water Act 1992 and any conditions imposed by the Power and Water Authority. Applications for this form of effluent disposal shall be made to the Power and Water Authority.

5.2.4 Alternative Off Site Effluent Disposal Systems

Off site effluent disposal systems are not contained in this code and will require the specific approval from Territory Health Services prior to installation.

These forms may include common effluent drainage systems (CEDS) and off site effluent ponds. These systems must be designed and certified by a qualified hydraulic engineer, building practitioner or relevant NT government authority and must be approved by THS prior to installation.

5.3 DISCHARGES LIKELY TO DECREASE A SEPTIC TANK'S OPERATIONAL EFFECTIVENESS

No person should permit or cause any of the following substances to be discharged into a septic tank, as it may harm, impair or decrease its effective operation:

- any storm water, including roof and rainwater tank overflow, and surface drainage waters,
- any backflush waters from a swimming pool or water softener,
- any discharge or backflush from a spa bath/pool in excess of 680 litres,
- any sanitary napkin, clothing or plastic material or liner,
- any petrol or other flammable or explosive substance whether solid, liquid or gas,
- any disinfectant or deodorant, antiseptic or germicide powder or fluid, unless specifically stated by the manufacturer to be suitable for use with septic tanks and only in quantities necessary for normal household cleaning,
- any trade waste likely to be detrimental to the natural flora and fauna within a septic tank,
- any matter or substance which in the opinion of the EHO is likely to impair the effective working of a septic tank.

5.4 SEPTIC TANK CAPACITIES

5.4.1 Septic tank capacities for residential domestic premises Class 1 and Class 10 buildings

In all calculations on domestic premises, the following rates and information shall be used:

- a minimum daily inflow allowance (hydraulic loading) of;
  150 litres per person per day in Urban and Rural Living Areas
  300 litres per person per day for Aboriginal Housing in Remote Area Communities,
- a minimum sludge/scum accumulation rate of 80 litres per person per year,
- in the NT a nominal capacity of two persons per bedroom is used for daily flow calculations ie 300 litres per bedroom in Urban and Rural Living Areas and 600 litres per bedroom for Aboriginal Housing in Remote Area Communities,
- Food Waste Disposal Unit's (FWDU'S) are not recommended in residential premises served by a septic tank,
- spa baths in excess of 680 litres are considered to be spa pools and are not permitted to be connected to a septic tank. Spa baths ie installations having less than 680 litres capacity must conform with Section 5.5.1.

FOR URBAN AND RURAL LIVING ZONES			
No. of Bedrooms	Minimum Capacity (litres) of		
	All Waste Systems	Split Systems	
	Septic Tank	Sewage Tank	Sullage Tank
3 or less	2 500	1 000	1 500
4	3 000	1 350	1 800
5	3 500	1 700	2 200
6	4 000	2 000	2 500
FOR ABORIGINAL HOUSING ON REMOTE AREA COMMUNITIES			
No of Bedrooms	All Waste Systems	Split Systems	
	Septic Tank	Sewage Tank	Sullage Tank
2 or less	N/A	2 000	3 000
3	N/A	3 000	4 000
4	N/A	4 000	5000
5	N/A	5 000	6 000

1 Aboriginal Housing on Remote Area Communities - All waste systems are not approved, except where connected to a CEDS, in which case, the all waste capacities for Urban & Rural Living Zones may be used.
2 Tank capacity given above must be increased by 1 000 litres if receiving waste from FWDU's.
3 Tank capacity should be increased by 250 or 500 litres if receiving waste from spa-bath.

TABLE 1: MINIMUM CAPACITIES OF SEPTIC TANKS FOR CLASS 1 AND 10 BUILDINGS

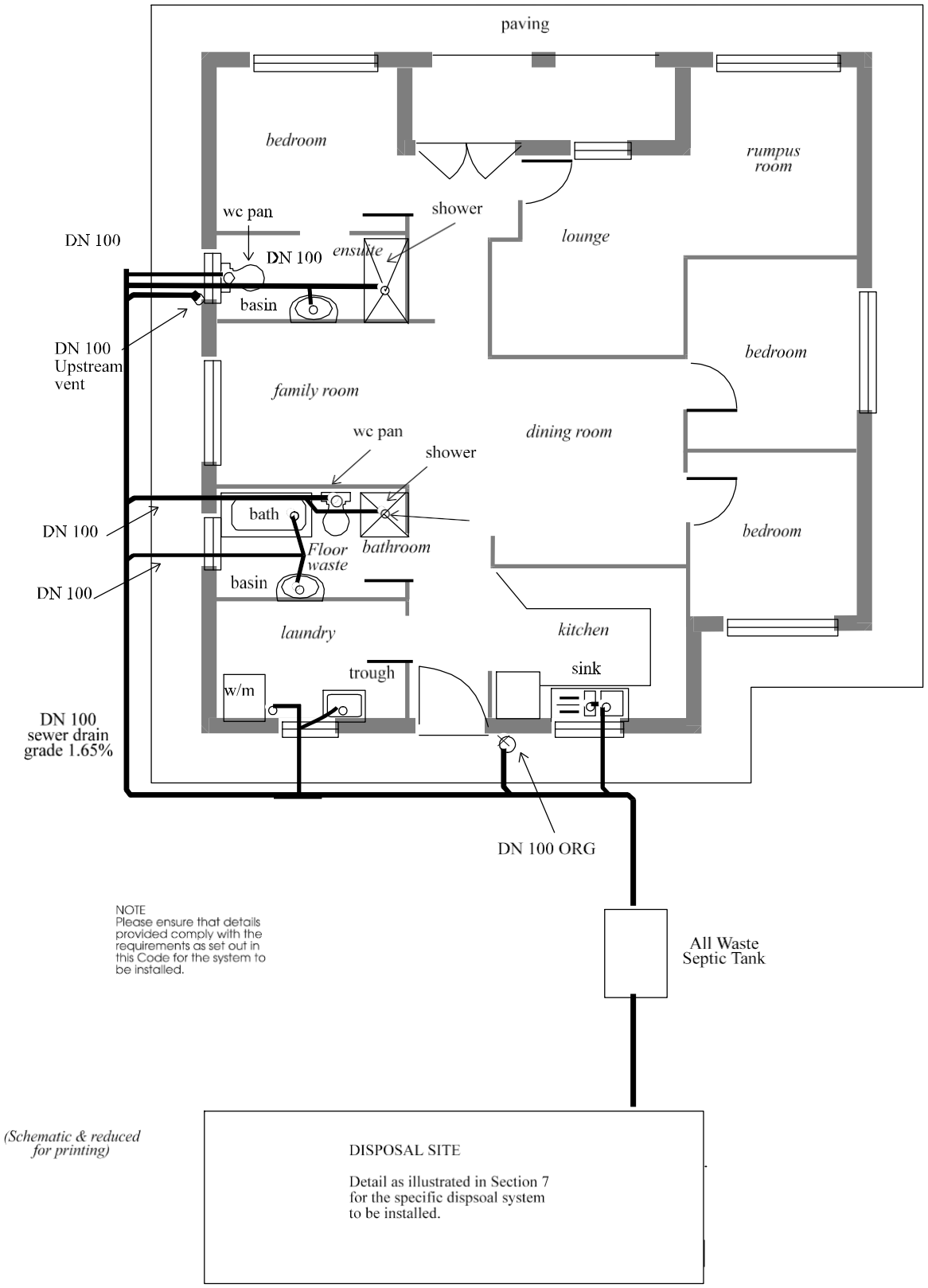


FIGURE 3: SITE PLAN & FLOOR PLAN FOR ALL WASTE SYSTEMS

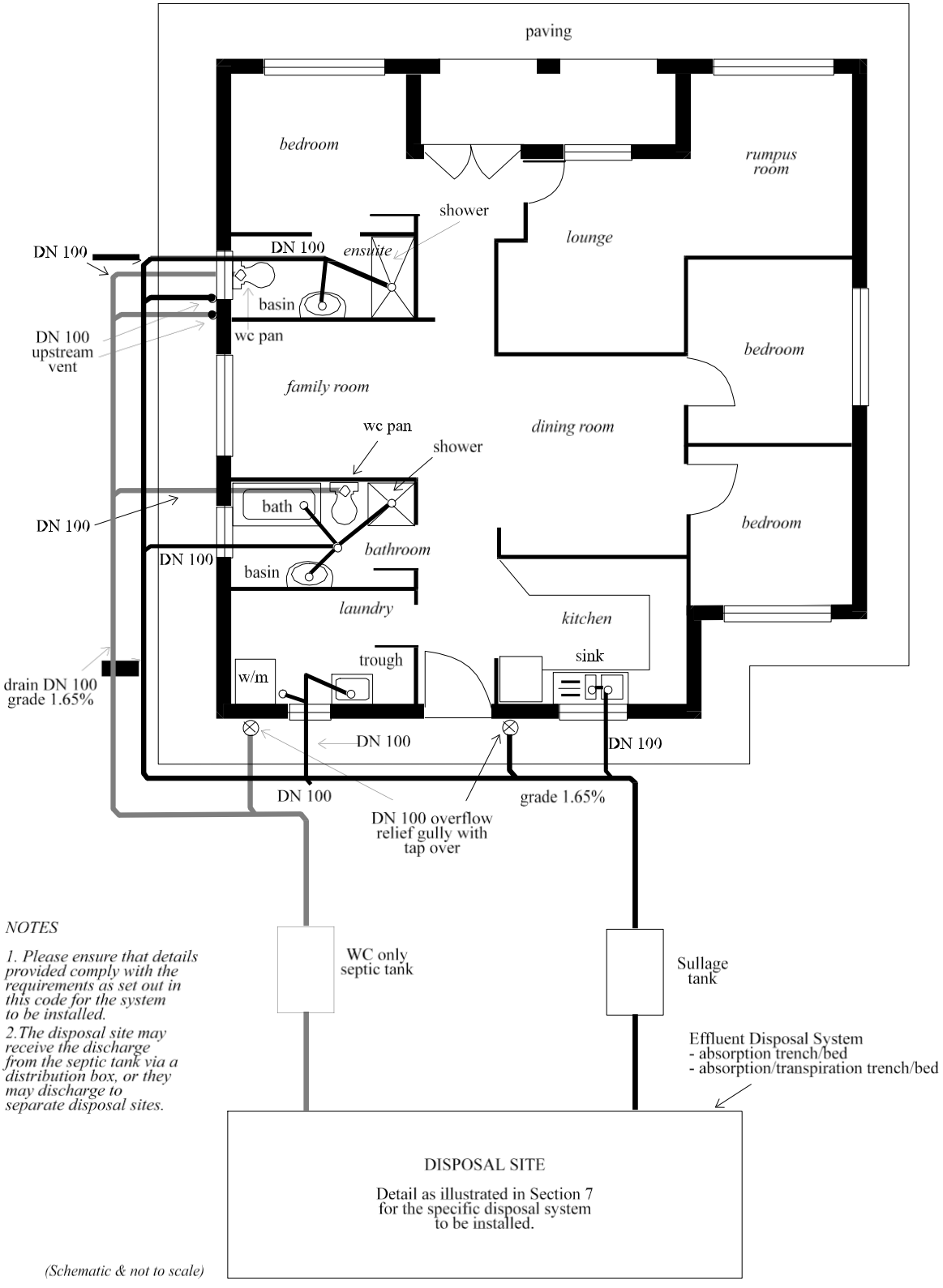


FIGURE 4: SITE PLAN & FLOOR PLAN FOR SPLIT SYSTEMS

5.4.2 Septic tank capacities for non-residential premises (ie Class 2-10 Buildings)

eg Factories, schools, offices, hotels, restaurants etc.

(Refer to Table 2 and Appendix D)

Appendix D provides a scale of load factors (S, P1, P2 and DF) to assist in determining the capacity of a septic tank based on use conditions and associated loadings. Where the specific use is not listed it may be necessary to select a like use to determine the capacity. Except where actual rates have been determined from appropriate monitoring of the sludge scum accumulation rate and water readings that exclude non-septic tank discharge, the rates as shown must be used.

Note: The term "highest daily number" over a 7 day period refers to the busiest period of operation in any 12 month period ie busiest period of the year.

Example 1. Restaurant - The average daily number over 7 days may be 45 people, while the highest daily number over 7 days, say at Christmas time, may be 70.

Example 2. Church - The average daily number over 7 days may be 50 people, while the highest daily number over 7 days, say at Easter time, may be 150.

Example 3. Shopping centre (Public Toilets) - The average daily number over 7 days may be 200 people, while the highest daily number over 7 days, say at end of year sale time, may be 450.

The word "shift" refers to a discrete period of time which involves a turnover of a majority of staff. For example a 24 hour hospital, supermarket or factory may utilise three (3) eight hour shifts, with a complete staff turnover on each shift. Alternatively, a hotel may operate continually and utilise eight 3 hour shifts, while an office may only have a single eight hour shift.

It is a requirement for the installation of a food waste disposal unit in a commercial or non-domestic residential premises for the septic tank capacity to be increased by 50% of the total sludge/scum and 10% of the hydraulic load capacity.

Where the system load varies from day to day, an average load figure is used to calculate capacity for sludge/scum accumulation. Calculation of the daily inflow shall always be made using the maximum daily load.

Determining the appropriate size of a septic tank requires the determination of two factors, namely:

1. volume for accumulation of sludge/scum (S x P1 x Y),
2. volume of daily flow into the septic tank (P2 x DF).

The effective capacity is obtained by calculating:

$$\mathbf{(S \times P1 \times Y) + (P2 \times DF)}$$

Where:
S = Rate of sludge/scum accumulation per person per year
P1 = Number of persons using the system
Y = Desludging frequency required and upon which the tank capacity depends (Refer to 5.4.3)
P2 = Number of persons using the system
DF = Daily inflow in litres per person per day.

TABLE 2 CALCULATING THE TOTAL CAPACITY REQUIRED FOR A NON-DOMESTIC SEPTIC TANK

The minimum capacity of any non-domestic septic tank shall be 1800 litres or the effective capacityas calculated using Table 2 in conjunction with Appendix D, whichever is greater.

It should be noted that the table only makes allowance for human waste. It does not allow for industrial wastes. In situations where the septic tank will also be servicing the waste generated from industrial activities, separate certification will be required by a plumbing designer/hydraulic engineer stating appropriate septic tank sizing based on anticipated waste generated from the premises. Also

note that certain discharges to a septic tank are not recommended as they could impair its effective operation (See Section 5.3 for further details).

5.4.3 Desludging Requirements

The capacity of smaller septic tanks must be of sufficient volume to accommodate the build up of sludge/scum over a minimum of four years.

It is however recognised that providing a four (4) year sludge/scum capacity, may result in impracticable sizes for septic tanks servicing industrial and commercial premises. Subsequently, the **desludging frequency (Y) required** may be increased in accordance with the following table to reduce the size of the septic tank required.

Sludge/scum capacity required for a 1 year period	**(Y) Desludging frequency**
less than 5 000 litres	4 yearly
greater than 5 000 litres and less than 10 000 litres	2 yearly
greater than 10 000 litres	1 yearly

TABLE 3 DESLUDGING FREQUENCY FOR VARIOUS TANK CAPACITIES

The value of **"Y"** is used in the equation **(S x P1 x Y) + (P2 x DF)** and can be calculated by **multiplying S and P1 together first (See Table 2 for definitions).**

If the result of (S x P1) is less than 5000 litres then Y = 4, between 5000 -10 000 litres than Y= 2 and above 10 000 litres Y=1.

Alternatively, where the owner of a septic tank provides a guarantee in writing to the relevant EHO or building practitioner of his/her intention to desludge the septic tank on an annual basis, then a desludging frequency of **Y = 1** can also be used when **S x P1 is less than 10,000 litres**.

Although the desludging period may reduce the capital cost of installation, maintenance costs will be increased and the installation of a reduced sized septic tank is conditional upon it being desludged at the frequency used in calculating the tank size.

An owner of a septic tank or maintenance contractor should have each septic tank inspected for sludge and scum build-up at least once a year. If the depth of sludge and scum exceeds two thirds of the total depth, the operational effectiveness of the septic tank may be reduced and subsequently the contents of the tank should be pumped out by a licensed commercial operator or suitably skilled operator on communities. The tank should not be cleaned after it is emptied and it shall be immediately filled with clean water and returned to service.

For personal safety reasons, all Work Health Authority (WHA) requirements for confined spaces shall be satisfied prior to septic tank entry for any maintenance or repairs. See WHA and refer to AS2865 for further details.

Septic tanks shall not be abandoned, except where approved and under the direction of the relevant Environmental Health Officer in which area the septic tank is situated.

5.5 NON STANDARD FIXTURES

5.5.1 Food Waste Disposal Units (FWDU's)

Food waste disposal units are not recommended for connection to a septic tank. However where they are installed:

- in kitchens of residential buildings, the effective capacity of the septic tank shall be increased by *50% of the sludge scum capacity* to allow for the additional accumulation of solids in the tank,
- in commercial or non-domestic residential premises eg hospitals, the septic tank capacity shall be increased by *50% of the sludge scum capacity* and *10% of the hydraulic load capacity.*

NOTE: Additional capacity and area for the effluent disposal system of a domestic premises is not normally required by the addition of a FWDU. However excessive use of the FWDU may necessitate more frequent desludging of the septic tank and extension to the effluent disposal field if it is overloaded through increased hydraulic loading.

5.5.2 Spa baths

A spa bath is a fixture having a capacity of less than 680 litres which incorporates facilities for injecting air bubbles or jets of turbulent water and connects to the septic tank in the same manner as a standard bath.

Units greater than 680 litres are considered to be spa pools and connection to the septic tank is prohibited.

See Section 7.8.2 for appropriate increases in effluent disposal area for various spa bath capacities.

5.5.3 Grease traps

Grease traps are important in arresting discharged fats and oils which could effect the efficient operation of a septic tank.

Grease traps with a capacity between 100-400 litres, should be considered for connection to the sullage line of a premises whenever high occupancy rates of dwellings and high levels of fats and oils discharged from other premises are anticipated.

The discharge from any kitchen sink in a commercial kitchen should be connected to an appropriately sized grease trap or arrester. The minimum capacity for any grease arrester shall be 500 litres. Contact the Power and Water for details on approved types of grease traps and the sizing of grease traps.

The grease trap must be insect and rodent proof and shall not be located in a food preparation or storage area. The grease trap must be constructed, installed, operated and maintained so as to not cause a nuisance. Grease traps should be checked and cleaned on a frequent basis or when directed to do so by an Environmental Health Officer.

6.0 SEPTIC TANK CONSTRUCTION

6.1 INTRODUCTION

The following types of septic tanks may be installed in the Northern Territory:

- prefabricated,
- cast in situ,
- manufactured or constructed in accordance with either AS 1546 or Section 6.2 of this Code.

All prefabricated septic tanks manufactured for sale and installation in the Northern Territory must be approved by Territory Health Services. A list of type approved septic tanks is available from a regional Environmental Health Office. See Section 1.0 and Appendix H for details of the address of each office. Refer to the *Administrative Procedures* for details on "type" approval requirements.

All septic tanks larger than 5000 litres or not conforming with the construction details in AS 1546-1990 shall be designed and constructed in accordance with the details contained in this document. Septic tanks in excess of 10,000 litres capacity shall be designed and certified by an engineer and will require installation approval from Territory Health Services.

6.2 GENERAL DESIGN PROVISIONS (Refer to Figures 5 and 6 for further details)

6.2.1 Capacity

The capacity of a septic tank shall be calculated using the depth (D) measured below the invert of the outlet.

6.2.2 Operating Depth

The internal design depth (D) of the liquids and solids in a septic tank, measured below the invert of the outlet of the tank, shall be not less than 900mm.

6.2.3 Shape

Septic tanks shall be generally either cylindrical or rectangular, although other type approved shapes may be used.

Cylindrical precast concrete reinforced septic tanks may be manufactured as either vertical or horizontal tanks in accordance with AS1546.

Septic tanks shall not be constructed by the use of multiple precast concrete rings or precast concrete sections unless it can be demonstrated that they are structurally integral with the septic tank and waterproof.

6.2.4 Inlet Fitting

The inlet to a septic tank shall have a minimum grade of 1.65% (1:60).

The inlet fitting shall be of durable material and not less than 100mm internal diameter or 100 x 120mm internal cross section complying with AS1260.2, AS1415.2 or AS1741 as appropriate for the installation. The vertical leg of the inlet fitting or baffle shall extend downwards for a distance of not less than 155mm below the invert of the outlet fitting **(See Figures 5 and 6).**

The top of the inlet fitting or baffle shall be not less than 170mm above the invert of the outlet pipe. The clearance between the top of the vertical leg of the inlet fitting or baffle and the underside of the roof of the septic tank shall be not less than 50mm. A watertight seal must be provided where a fitting is affixed to the wall of a tank.

Connections for the inlet, outlet and the inspection openings are to be integrally cast for concrete constructed septic tanks and for plastic type materials the connections are to be mechanically and/or

chemically sealed or bonded so as to be watertight and have a strength equal to that of the parent material.

Inlet fittings for plastic type septic tanks may be either fitted as part of the manufacturing process or as part of the installation of the septic tank. They shall be provided with fixing mechanisms and clear instructions to prevent incorrect installation with respect to grade and reversal of the inlet and outlet fittings.

6.2.5 Outlet fitting

The invert of the outlet fitting shall be not less than 50mm below the invert of the inlet fitting.

The vertical leg of the outlet fitting shall extend downward for a distance of not less than 330mm below the invert of the outlet pipe. The top of the outlet fitting or baffle shall be not less than 170mm above the invert of the outlet pipe.

Where fittings are cast in the walls of tanks, such fittings shall be installed in such manner as to provide a permanent watertight seal.

6.2.6 Provision for Scum

The top of any inlet or outlet fitting or baffle shall be not less than 170mm above the invert of the outlet pipe.

6.2.7 Air Gap

The minimum air gap when measured from the underside of the lid or roof of a septic tank to the invert of the outlet shall be:

- 220mm for septic tanks less than or equal to 5000 litres capacity,
- 300mm for septic tanks between 5000 - 10000 litres capacity,
- 400mm for septic tanks greater than 10000 litres capacity.

6.2.8 Access Openings

A septic tank shall be provided with a rectangular access opening measuring at least 900mm x 500mm or a circular opening not less than 500mm in diameter.

Where the removable lid of a glass fibre reinforced septic tank, plastic septic tank or an injection moulded structural foam polypropylene septic tank is to be completely buried, a separate access opening capable of being extended to ground level shall be provided in the lid.

Where any septic tank is to be completely buried the access opening shall be extended to ground level. Such extension shall be so constructed as to provide a watertight seal so as to prevent ingress of ground water or stormwater into the septic tank.

6.2.9 Access Opening Covers

Covers to access openings other than for glass fibre reinforced, plastic, injection moulded structural foam polypropylene or ferro cement septic tanks shall be of steel reinforced concrete not less than 65mm thick. A cover shall incorporate a durable lifting device and when in place after installation of the septic tank shall neatly fit and be sealed to prevent the ingress of water. Fixing covers on glass fibre reinforced septic tanks, plastic tanks or injection moulded structural foam polypropylene septic tanks, shall comply with the requirements of AS1546.

6.2.10 Inspection Openings

An inspection opening not less than 100mm diameter or 100mm x 100mm area shall be provided vertically above the inlet fitting of the septic tank. The opening shall be so designed as to be capable of being extended to ground level. Where septic tanks are completely buried the inspection openings shall be extended to ground level by a 100mm nominal diameter UPVC pipe complying with AS1415.2 which extends into the tank wall or top a distance of at least one -third but not more than two-thirds, of the corresponding wall or top thickness. Such UPVC extension pipe shall be sealed into the wall or top of the tank so as to provide a watertight joint.

6.2.11 Inspection Covers

Inspection openings shall have covers of concrete, cast iron, non-ferrous metal or other durable material capable which should be either made childproof or lockable, so as to prevent ready removal by children or vandalism. When installed the inspection opening covers shall fit neatly and be sealed to prevent ingress of water or mosquitoes.

6.2.12 Partition Walls/baffles

Where the capacity of the septic tank exceeds 2500 litres, the tank shall be divided into two chambers by means of a fixed durable partition, so that the effective capacity of the first chamber is twice that of the second chamber. The partition in all septic tanks shall be installed prior to the septic tank leaving the manufacturers premises. Partition walls shall have slots or openings with a total area of not less than 15000 mm^2 and shall be provided in the partition at approximately half the operating depth of the tank. For vertical cylindrical tanks the slots or openings shall be adjacent to the wall of tank to ensure the maximum length of flow through the tank. The clearance between the top of the partition and the underside top of the tank shall be not less than 50mm.

6.2.13 Septic Tank Venting

All septic tanks shall be vented in accordance with AS1546 and AS3500.2.

6.2.14 Multiple Unit Connection

Where, to achieve a required capacity, it is proposed to link two septic tanks in series then two septic tanks with their partition walls removed shall be used. The capacity of the first septic tank shall be at least two thirds (2/3) of the total required capacity and the second septic tank shall be at least one third (1/3) of the total required capacity, and

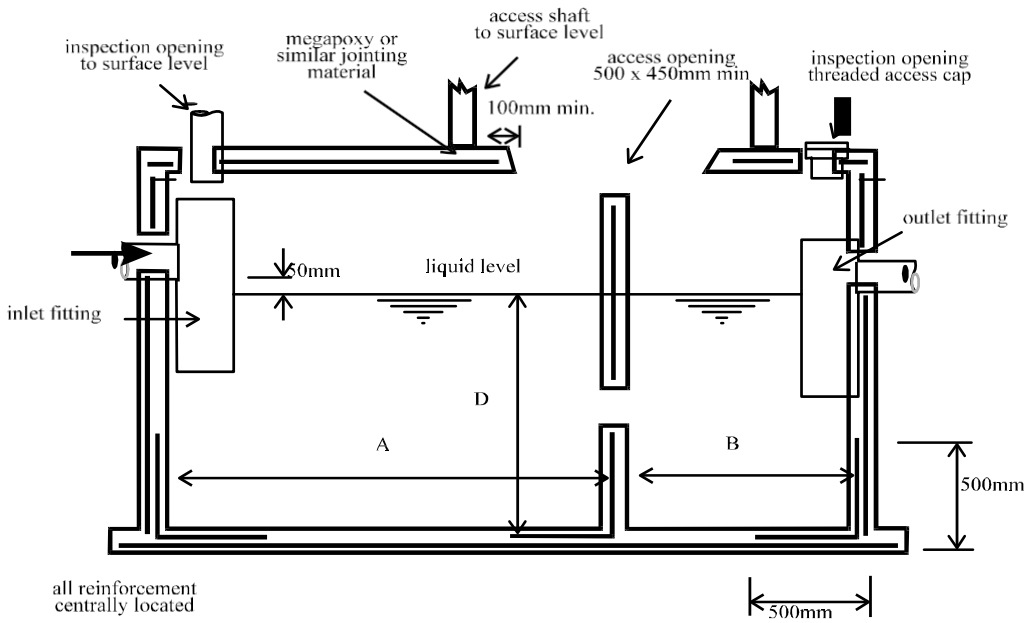
(a) both septic tanks shall be fitted with inlet and outlet fittings conforming with the requirements of 6.2.4 and 6.2.5 of this document,
(b) fitted with inspection and access openings and covers conforming with the requirements of 6.2.8, 6.2.9, 6.2.10 and 6.2.11 of this document,
(c) shall be bedded in a 100mm compacted sand base or on a common concrete slab, to ensure that there is minimal differential movement,
(d) connected so as to provide a watertight seal.

6.2.15 Handling Loads/Defects

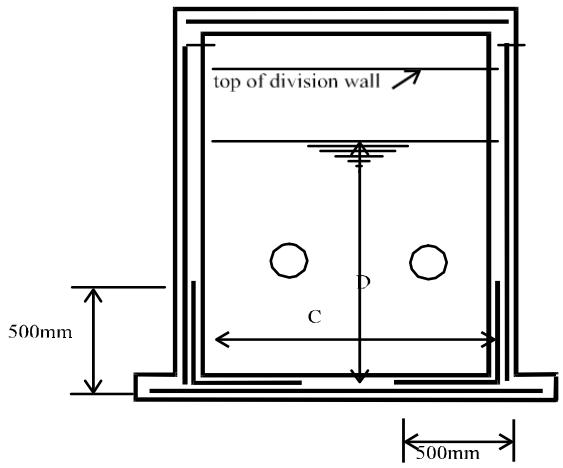
There shall be no structural failure, visible cracking or other significant defects when glass fibre reinforced, plastic, injection moulded structural foam polypropylene or ferro cement septic tanks are stripped from their mould at the time of manufacture.

There shall be no structural failure, visible cracking or other significant defects when the tank is lifted in accordance with the manufacturers instructions. If holes are specifically provided for lifting, they shall be made waterproof once the septic tank is lifted into position.

Defective septic tanks shall not be installed at any time.



LONGITUDINAL SECTION



CROSS SECTION

FIGURE 5: CAST IN SITU CONCRETE SEPTIC TANK

6.2.16 Markings on Septic Tanks

All septic tanks, except for those constructed on site shall have the following information permanently and legibly marked on each tank and lid, before leaving the manufacturers premises:

- the manufacturers name or registered trade mark and contact telephone number,
- the day, month and year of manufacture eg 5/12/95,
- the capacity of the tank in litres.

Furthermore, all glass fibre reinforced, plastic and injection moulded structural foam polypropylene septic tanks shall have permanent labels attached to each tank detailing the following information:

- the mass of the fully cured tank (excluding tank cover) in kilograms,
- detailed installation instructions,
- a durable and permanent warning label must be affixed to the lid of each tank advising of the precaution that the tank is never to be completely emptied while in the ground to prevent flotation.

6.2.17 Drains

Drains shall be tested in accordance with the National Plumbing Code AS 3500 and repaired as necessary to achieve compliance.

6.2.18 Mosquito Control

All vents shall be fitted with mosquito proof cowls. All access openings and inspection openings shall be securely fitted to prevent access by mosquitoes.

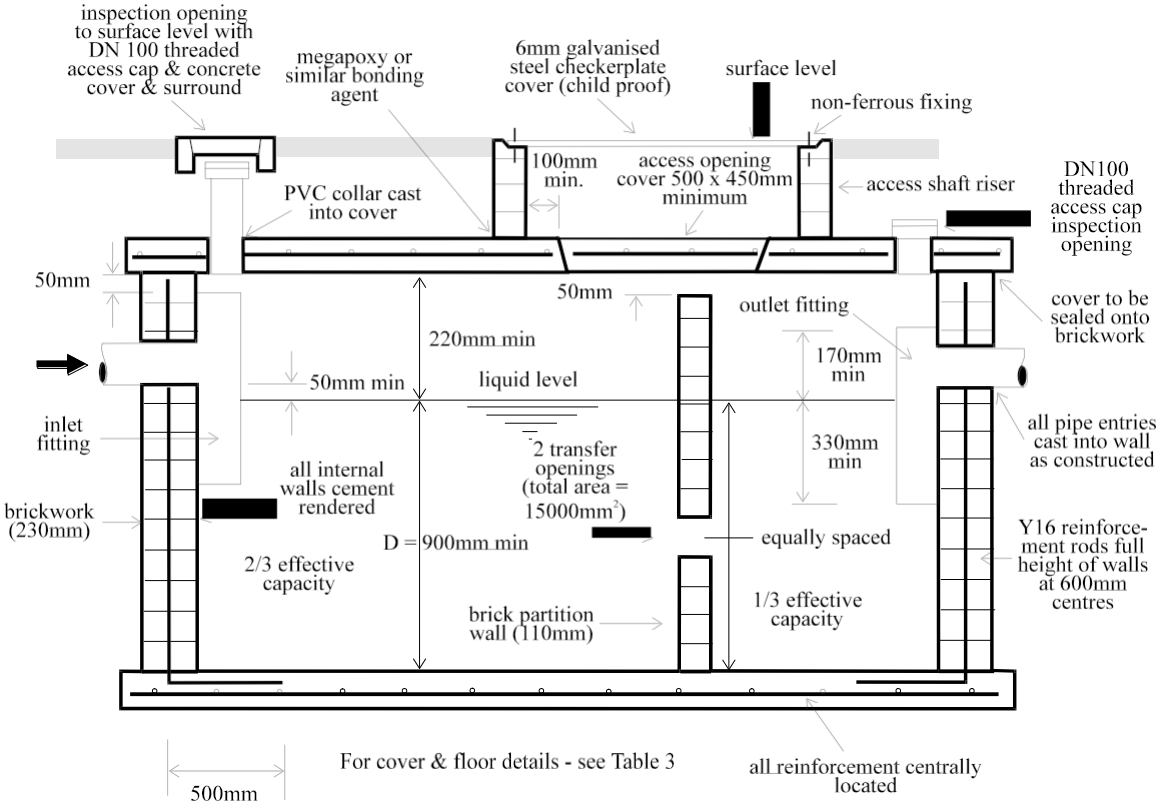


FIGURE 6: RECTANGULAR BRICK SEPTIC TANK

6.3 SEPTIC TANK INSTALLATION

Septic tanks shall be:

- installed in firm ground and/or on a uniform layer of 'sand' 100mm minimum thickness,
- installed on a level base,
- installed with the invert of the inlet measured at the septic tank not less than 475mm below the lowest floor level of the house served, or not less than is required to enable fixtures, fittings and drains to be installed in accordance with AS 3500-2 National Plumbing & Drainage Code,
- surrounded by sand or compacted soil by watering or tamping to the firmness of the surrounding soil,
- with the influent pipe being installed at a minimum grade of 1.65% ie 1 in 60.

Septic tanks and their associated effluent drains shall be adequately protected from vehicle access in all unfenced allotments or areas, particularly on remote area communities, by placing large stones, bollards, star pickets, chain fencing, heavy duty fences or similar means around the system.

Fibreglass or plastic septic tanks servicing buildings in urban areas and Aboriginal Housing in Remote Area Communities shall be fitted with concrete lids or collars as a minimum requirement.

Trafficable covers shall be provided to septic tanks when they are located in driveways.

6.4 PRE CAST CONCRETE SEPTIC TANKS

A pre cast concrete septic tank having a capacity:

- less than 5000 litres shall be constructed in accordance with AS1546,
- between 5000 and 10,000 litres shall be designed and certified by a certifying engineer and should generally conform with Section 6.2 as well as Figures 5 and 6 and Table 4,
- above 10,000 litres shall be designed and certified by a certifying engineer .

6.5 CAST IN SITU CONCRETE SEPTIC TANKS AND BUILT IN SITU RECTANGULAR BRICK SEPTIC TANKS (See Figures 5 and 6 and Table 4)Error! Bookmark not defined.

Cast in situ septic tanks and built in situ rectangular brick septic tanks:

- less than 5000 litres shall comply with the relevant provisions in AS1546 or the provisions contained in this document,
- having capacities between 5000 -10000 litres shall be constructed in accordance with Figures 5 and 6 and Table 4 and comply with the provisions contained within Section 6.2,
- having a capacity greater than 10,000 litres shall be certified by a plumbing designer and supported with detailed drawings, engineering calculations, material and construction specifications and comply with Section 6.2 "General Design Provisions",
- shall be installed in accordance with the provisions contained within this document.

These septic tanks are generally used when a capacity of more than 5000 litres is required. The tank shall be structurally sound, smooth internally, watertight and the concrete used shall comply with the requirements of AS 3600 Concrete Structures and AS 3735 Concrete Structures for Retaining Liquids, and shall have a compressive strength of not less than 25 MPa at 28 days.

These types of septic tanks must also comply with the following provisions:

- the depth of soil cover over the septic tank shall be not greater than 1.0 metre,
- the air space between the liquid level in the septic tank and the underside of the cover shall be as detailed in Section 6.2.7,
- all reinforcement shall be placed centrally, except where otherwise certified by an engineer,
- not be subject to vehicle loadings.

Where the required capacity does not exceed 10,000 litres and the capacity of the septic tank does not coincide with that shown in Table 4, it shall be constructed to the specifications of the next largest size.

6.6 SEPTIC TANKS MANUFACTURED FROM PLASTIC OR SIMILAR MATERIALS

Glass fibre reinforced and plastic septic tanks shall be constructed in accordance with AS1546. Minor variations from the above standard are acceptable, subject to approval from Territory Health Services.

All plastic type septic tanks:

- shall also comply where appropriate, with the general requirements of Section 6.2,
- shall be bedded in a compacted sand base and backfilled with sand unless otherwise recommended by the manufacturers specifications,
- shall be designed and be subject to certification by a structural engineer against buoyancy,
- having a capacity of over 5000 litres shall be subject to certification by a structural engineer for structural requirements such as load bearing capabilities, structural adequacy, wall thicknesses, lid thickness, reinforcement etc.

6.7 TESTING

It is a condition of type approval that all manufacturers of prefabricated septic tanks are required to have their tanks randomly tested and assessed in accordance with AS1546 by an independent structural engineer. The results are to be forwarded to the Environmental Health Program Directorate of Territory Health Services. (See Section 1.0 for address).

6.7.1 Tanks - Constructed in Situ -

All septic tanks constructed on site shall be tested by the plumber/installer in the following manner:

(i) Fill the septic tank with clean water to the level of the outlet drain,
(ii) Allow to stand for 24 hours,
(iii) Top up again with water and then measure the drop in water level in a one-hour period thereafter,
(iv) If a drop in the water level is observed, then the septic tank shall be emptied and the sealing of all joints and cracked or defective sections repaired and the tank re-tested.

CAPACITY LITRES	DIMENSIONS				STEEL REINFORCEMENT				CONCRETE THICKNESS		
					Walls		Slabs		Walls	Cover	Floor
	A	B	C	D	Vert	Horiz	Floor	Roof			
2000	2000	-	1000	1000	R10	Y12	R10	Y16	100	130	130
3000	2000	1000	1000	1000	R10	Y12	R10	Y16	100	130	130
4000	2200	1100	1100	1100	Y16	Y16	Y12	Y12	130	130	140
5000	2400	1200	1200	1200	Y16	Y16	Y16	Y12	140	130	150
6000	2800	1400	1200	1200	Y16	Y16	Y16	Y16	140	130	150
7000	3000	1500	1300	1200	Y16	Y16	Y16	Y16	140	140	150
8000	3000	1500	1400	1300	Y16	Y16	Y16	Y16	150	150	150
9000	3000	1500	1400	1450	Y16	Y16	Y16	Y16	150	150	150
10000	3000	1500	1500	1500	Y16	Y16	Y16	Y16	150	150	150

TABLE 4: IN SITU SEPTIC TANKS

Note: 1. To be read in conjunction with Figures 5 and 6.
2. An alternative reinforcement may be used subject to certification by a structural engineer.

7.0 THE EFFLUENT DISPOSAL SYSTEM

7.1 INTRODUCTION

Consideration must be given to an effluent disposal system that is suitable for the individual site, prior to a decision being made on the type of sewage treatment system to be installed.

An alternative type of effluent disposal to ground absorption shall be required when one or more of the site conditions described in Section 7.2 are not satisfied. Alternative types include above ground evapo-transpiration trenches or beds, aerated wastewater treatment systems, aerobic sand filters, CEDS etc.

7.2 SITE ASSESSMENT CRITERIA SUMMARY

Septic tank effluent may only be disposed of within an allotment if the site is both large enough and able to absorb the effluent discharged and without causing a health hazard or damage to the environment.

All the relevant tests as set out in this Code must be carried out to determine the size and type of installation required.

The following criteria must be considered prior to a decision being made to dispose of effluent by traditional ground absorption (sub-surface) means.

Each site *should* not be subject to stormwater inundation more frequently than an average of once in 100 years ie. within the Q100 line, as defined by Flood Plain Maps published by the PAWA.

Each site *shall* satisfy the following minimum standards in order for effluent disposal by ground absorption within individual allotments to be permitted.

1. **The disposal site shall not :**
   - **be within a water course,**
   - **be within a flood plain as indicated by the contour of the terrain or type of vegetation,**
   - **must have a consistent soil horizon to a depth of 1.2 metres.**
2. **The nearest point of discharge from the septic tank's effluent disposal system shall be not less than 100 metres from a bore or well.**
3. **For effective operation, the soil's Long Term Acceptance Rate (LTAR) should be between 10-25 litres/m^2/day. An LTAR outside the 10-25 litres/m^2/day range shall necessitate further site investigation and certification by a plumbing designer that effluent disposal by ground absorption under these circumstances, will operate effectively.**
4. **Ground slope must not exceed 1 in 4 (25%).**
5. **Unfragmented or impervious rock shall be not closer than 1.0m to the ground surface.**
6. **Ground water during all seasonal conditions shall be not less than 1.0m to the ground surface.**
7. **The septic tank's effluent disposal system shall satisfy the 'proximity to site features' criteria of Section 7.5 of this document.**
8. **No structure shall be built over the proposed septic tank site.**

MINIMUM CRITERIA FOR EFFLUENT DISPOSAL BY GROUND ABSORPTION

OTHER FACTORS AFFECTING CHOICE OF EFFLUENT DISPOSAL SYSTEM

Other factors that need to be taken into consideration before deciding on an appropriate means of effluent disposal include the following:

- The location of existing development on the site or adjoining sites (including upslope from the proposed effluent disposal location) needs to be considered to ensure that it does not adversely impact on the proposed system,
- The location of the disposal area and the need to protect it against vehicle traffic,
- The number of persons, the nature of the facilities to be installed and the type of land, will impact on and affect the ability of the site to absorb the effluent generated,
- The number of days that the system is used will affect the capacity of the disposal system,
- Some premises are dependent on rainwater storage which will limit the potential volume of effluent for disposal.

7.3 SOIL ABSORPTION CAPACITY

7.3.1 Introduction

One of the most important and dependent factors, in effectively disposing of septic effluent by subsurface soakage, is the rate at which the effluent percolates into the soil. The rate of percolation is influenced by the biological solids accumulation (biomass) from the septic tank, and soil permeability. The biomass operates quite independently of the soil type in limiting the rate of percolation. Once percolation through the biomass is achieved, the surrounding soil becomes the next barrier.

The percolation rate of the site soil shall preferably be determined by:

Soil classification as assessed by a suitably qualified geotechnical consultant. Initial advice on this matter can be obtained from the Resource Management Division of the Department of Lands, Planning and Environment (See Section 7.4), although

Percolation tests as described in Appendix A are also currently permissible, however seasonal conditions may often affect the reliability of the results.

7.3.2 Soil Characteristics

Other soil features that should be examined include the following:

- Soil colour - Mottling is invariably caused by a fluctuating water table or seasonal zones of saturation. It may also be evidence of high ground water or poor drainage,

- Soil texture - an examination of the depth and thickness of the various soil layers should be undertaken and any impervious layers noted. The assessment should include the determination of the proportions of silt, clay, sand and gravel and be determined in accordance with AS1547,

- Soil structure - the structure of the soil is important in assessing its porosity. Porosity or void space is particularly significant as it facilitates percolation of the effluent into the soil. The more cohesive the soil, the slower the percolation rate,

- Rock - Where rock is encountered, an examination of its structure should be carried out to determine its suitability for adequate percolation. The examination should identify fissures, joints and bedding planes that may influence percolation,

- Potential may exist for adverse impacts on sensitive environmental resources situated below or downstream from the site. Sensitive environmental resources include land form, marine environs, stream, surface and subsurface water bodies. "Setback distances", as detailed in Section 7.5, imposes buffer distances as a means of protecting sensitive resources.

7.3.3 Determining Absorption Area Required

After determining the soil type and/or carrying out percolation tests, the Long Term Acceptance Rate (LTAR) is to be identified by using Figure 7. The absorption disposal area required is then determined by using the method in Section 7.8.

7.3.4 Impervious Soil Conditions

If the soil percolation rate, as determined by reference to Figure 7, indicates that the soil is practically impermeable, a percolation test is essential if effluent disposal by ground absorption is to be further considered. If the percolation rate established by this test is less than 2mm per hour, then:

- site soil conditions must be improved as described in Section 7.3.5, or
- an alternative method of effluent disposal must be used.

7.3.5 Site Improvement

Where the soil has a percolation rate of less than 2mm per hour, it may be possible to improve the absorption rate by:

- digging out the impermeable soil to a depth of at least 500mm below the bottom of the proposed absorption trench/bed and replacing it with a more permeable imported soil,
- adding in gypsum and mixing into the soil to produce a more granular texture,
- adding organic matter and mixing into the soil to produce a more permeable soil matrix.

If any of these methods are employed to improve the site, then the permeability should be subsequently re-assessed.

Textural classification Refer to Appendix A	Permeability in millimetres per hour (mm/hr), or Permeability in metres / day (m/d) Typical range (P)	Representative values for Figure 7	Representative LTAR
Sand	25 to 250 mm/hr 0.6 to 6 m/d	50 1.2	**25**
Sandy Loam	12.5 to 75 mm/hr 0.3 to 1.8 m/d	25 0.6	**25**
Loam	8.3 to 21 mm/hr 0.2 to 0.5 m/d	12.5 0.3	**20**
Clay Loam	2.5 to 15 mm/hr 0.06 to 0.36 m/d	7.5 0.18	**15**
Silty Clay	0.3 to 5 mm/hr 0.007 to 0.12 m/d	2.5 0.06	**10**
Clay	0.1 to 1 mm/hr 0.0024 to 0.024 m/d	0.5 0.012	**5**

Notes:
1. Soil permeability can also be greatly influenced by soil structure.
2. Soil with a high silt content generally has a lower permeability than a clay soil. The clay content of a soil can be an aid to the formation of good soil structure.
3. The above table is based on Table 3.1 of AS1547.

TABLE 5 REPRESENTATIVE SOIL PERMEABILITY FOR VARIOUS SOIL CLASSIFICATIONS

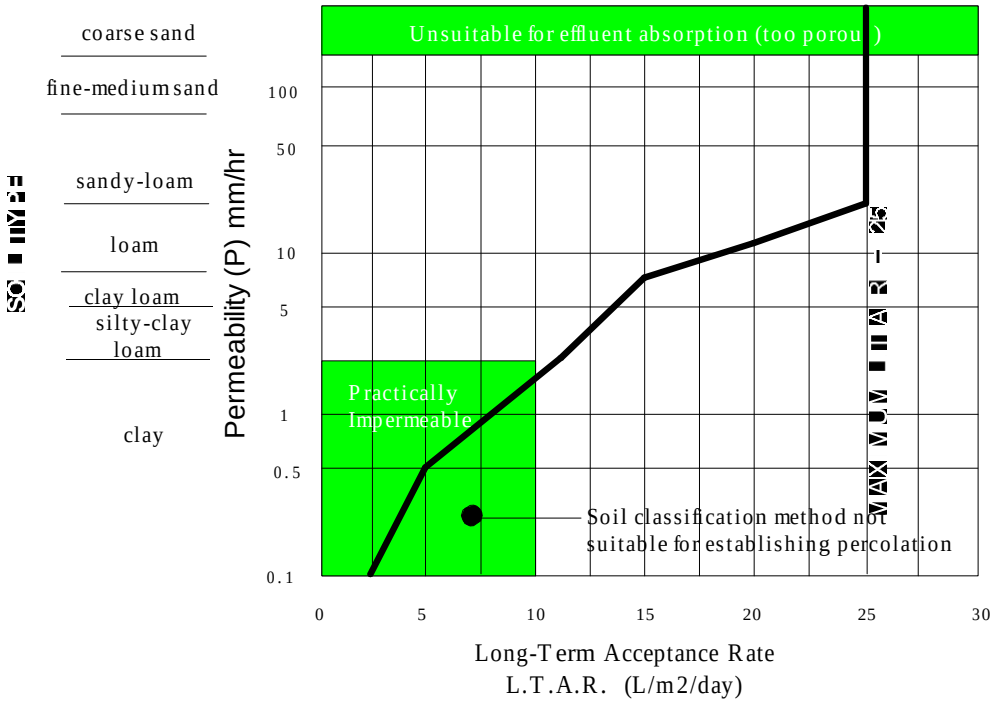


FIGURE 7: LONG TERM ACCEPTANCE RATE

7.4 SOIL CLASSIFICATION ASSESSMENT

The purpose of carrying out a soil classification assessment is to determine the sustained ability of the soil to absorb effluent from a septic tank. The soil type derived is then used to identify a representative LTAR value (from Table 5 and Figure 7), which is used in calculating the size of the effluent disposal area and the length of absorption trench required See Appendices F and G.

7.4.1 Responsibility of soil classification assessment by developers of sub-divisions

Developers of new land sub-divisions may have already provided much of the soil information required by the plumbing installer, as it may be a condition of Planning Authority approval, that determination of soil types across the sub-division be undertaken. *Currently it is a condition in the Litchfield area plan.*

When a proposed residential or rural/residential subdivision undergoes assessment by the Planning Authority, the following conditions relating to sewage treatment and effluent disposal are applied.

1. The developer shall indicate the exact position of the Q100 line on a plan at a scale of not less than 1 in 10,000.

2. The developer shall determine, and plot on the above plan, the soil types throughout the proposed sub-division.

3. Where the soil type classified in the *Code of Practice for Small On-site Sewage and Sullage Treatment Systems and the Disposal or Reuse of Sewage Effluent* indicates that soil percolation tests are required, these tests shall be carried out and the results noted on the above plan.

4. A copy of the completed plan shall be provided to Territory Health Services.

5. Where it is determined that, in accordance with the above *Code of Practice*, a traditional septic tank and associated effluent disposal system by ground absorption can not be installed, an appropriate alternative septic system shall be provided to the satisfaction of Territory Health Services. An alternative septic system includes aerated wastewater treatment systems, aerobic sand filters, composting toilets and sullage disposal systems.

6. Where it is indicated that a traditional septic tank would not be suitable for a particular lot, this information shall be provided to all potential purchasers.

FIGURE 8: CONDITIONS OF SUB-DIVISION

NOTE:

The above conditions are not required to be fulfilled for the following developments:

1. *Division of a single lot into 2 or 3 lots where there is already at least one existing approved traditional septic tank*
2. *Subdivisions into lots of greater than 20 hectares where at least 2 hectares are located above the Q100 line*
3. *Consolidation of a number of lots where there is already at least one existing approved traditional septic tank.*

7.4.2 Responsibility of soil classification assessment by Plumbing Designers

Where a septic system has been designed by a plumbing designer, it is the responsibility of that person to obtain/provide the soil classification information or soil percolation test results in order to determine a corresponding LTAR value from Table 5 and Figure 7 for use in effluent disposal field calculations.

Where the soil information required is not available to design a system for a particular site the person designing and/or installing the system shall be responsible for obtaining the necessary information and designing and/or installing the system in accordance with the information obtained. Further information on soil characteristics and soil types can be obtained from the Resource Management Division of the NT Department of Lands, Planning and Environment as well as AS1547. Local knowledge and experience by plumbing installers may assist in soil classification, however confirmation should be sought from the Resource Management Division as to the suitability / accuracy of this classification.

Where soil information does not provide conclusive evidence of the soil's absorptive characteristics, a soil classification or an effluent percolation test as specified in Appendix A will be required.

NOTE:

The Resource Management Division of the NT Department of Lands, Planning and Environment has extensive soil maps and seasonally waterlogged soils maps of key land areas across the Territory. This information will have a major impact on the type of septic system to be installed. ***Compliance with Section 7.2 is compulsory, prior to making application for the installation of a septic tank.***

7.5 PROXIMITY OF SEPTIC TANK AND DISPOSAL AREA TO SITE FEATURES

Site Feature	Minimum distance required in metres (m) from the closest point of effluent discharge to that site feature	
	1. Upslope from site feature	2. Downslope from site feature
Building	6.0	3.0
Allotment boundary	4.5	2.5
Swimming pool	6.0	3.0
Underground water tank	15	15
Bore or well	100	100
Cutting	15	No restriction
Watercourse	50	30
Lake, swamp, etc	50	30
Watercourse from which water supplies extracted	200	100
Water supply reservoir	200	100
Sub-surface disposal bed or trench	2.5	2.5
Septic tank	2.5	2.5

TABLE 6 SETBACK DISTANCES TO SURFACE FEATURE

NOTE. 1. For flat sites use column 2
2. Refer to Section 8.9 for exceptions to setback distances from site features for Aerated Wastewater Treatment Systems.

7.6. TYPE AND APPLICATION OF GROUND ABSORPTION DISPOSAL SYSTEMS

7.6.1 Introduction

There are four ground absorption effluent disposal systems covered by this Code which are appropriate for use where effluent is to be disposed of within both residential and non-residential allotments. These are:

- Absorption Trenches - refer Section 7.6.2,
- Absorption Beds - refer Section 7.6.3,
- Absorption and evapo-transpiration trenches or beds - refer Section 7.6.4,
- Absorption Wells - refer Section 7.6.5.

Other systems such as "surface irrigation" or "common effluent" drainage systems may be more feasible where site conditions are unsuitable for the disposal of effluent by Absorption or Transpiration within a single allotment, as assessed in this section. See Part 2.

7.6.2 The Absorption Trench

(See Figures 9, 10 and 11)

The absorption trench has the most universal application. An absorption trench utilising the perforated plastic pipe or tunnel may be used in all applications, although standard or jumbo perforated plastic tunnel for the distribution of effluent is preferred in:

- areas where the average annual rainfall exceeds 800mm per year (see Appendix C),
- Aboriginal Housing in Remote Area Communities and other areas where large fluctuations in the rate of effluent to be disposed of can occur.

Where tunnel sections are used, in areas where annual average rainfall exceeds 800mm, it is permissible for the inlet pipe from the septic tank to enter immediately below the highest point of the tunnel, rather than through the top of the tunnel as shown in Figure 9.

Particular regard should be given to the width of the trench which importantly, will determine the length of absorption trench tunnel required. Please note that a 600mm trench width will invariably result in a 30-40-% increase in the length of absorption trench tunnel required, compared to a trench width of 1200mm. See Section 7.9 for calculations (Refer to Appendices F & G for determination of the length of absorption trench required).

Figure 12 provides various septic tank and effluent disposal field configurations with particular regard given to details contained in this section including land contours, diversion drains and pertinent distances between fixtures and surface features.

- Absorption trenches may be raised above the surface level in areas where the annual rainfall exceeds 800 mm/year or where ground water is within a metre of the ground surface. This will require the need for a pump out pit and pump to raise the effluent sufficiently to be disposed of to this type of mound trench. However, plastic arch tunnel slots shall be installed as to remain sub-surface and a suitable surface mound shall be constructed in such a manner to prevent effluent escaping from the mound or causing other nuisances. Suitable vegetation shall be planted on top of the mound and suitable surface drains shall be constructed.

Note: The effluent disposal area for a split system may be common as shown in Figure 4.

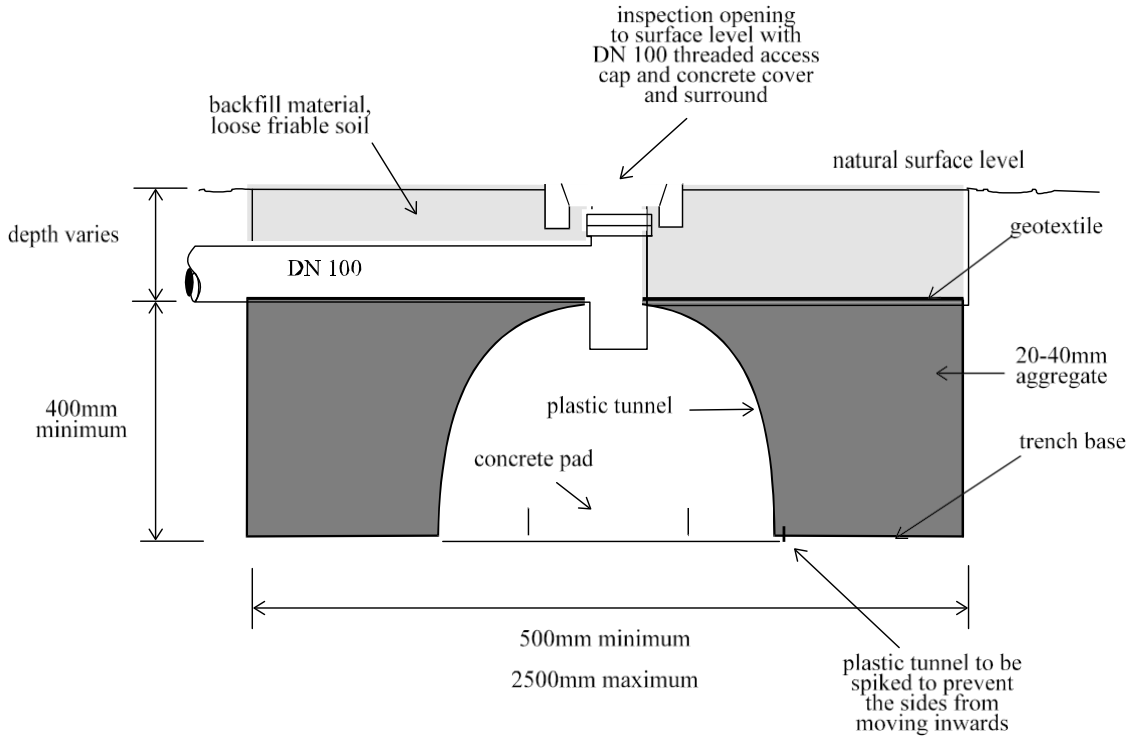


FIGURE 9: TYPICAL ABSORPTION TRENCH TUNNEL

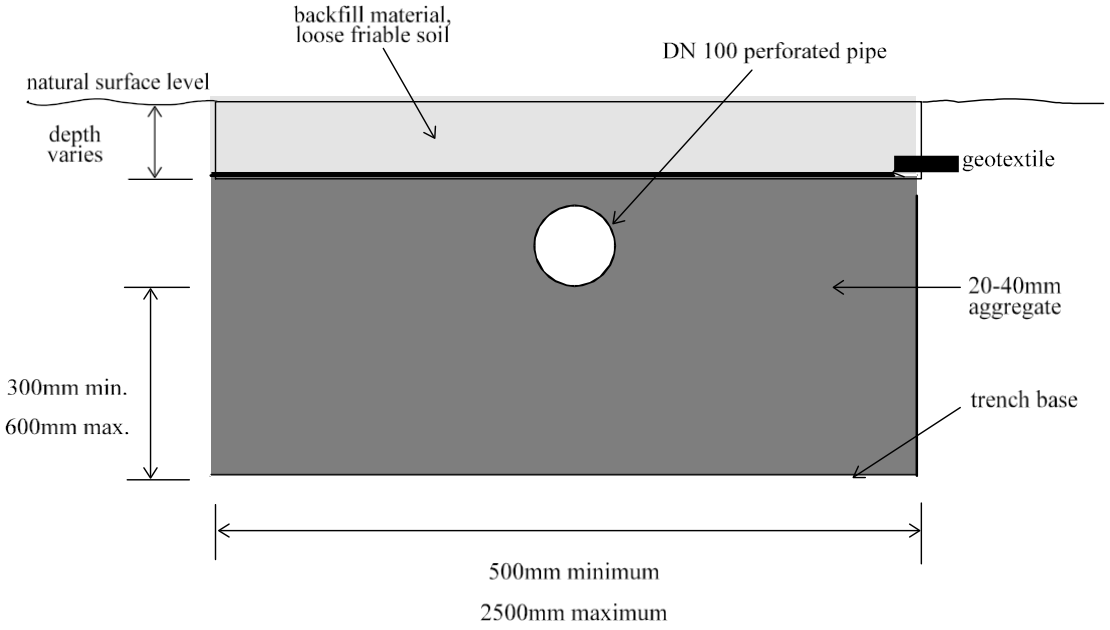


**FIGURE 10: ABSORPTION TRENCH TYPES -
PERFORATED (SLOTTED) PIPE SYSTEM**

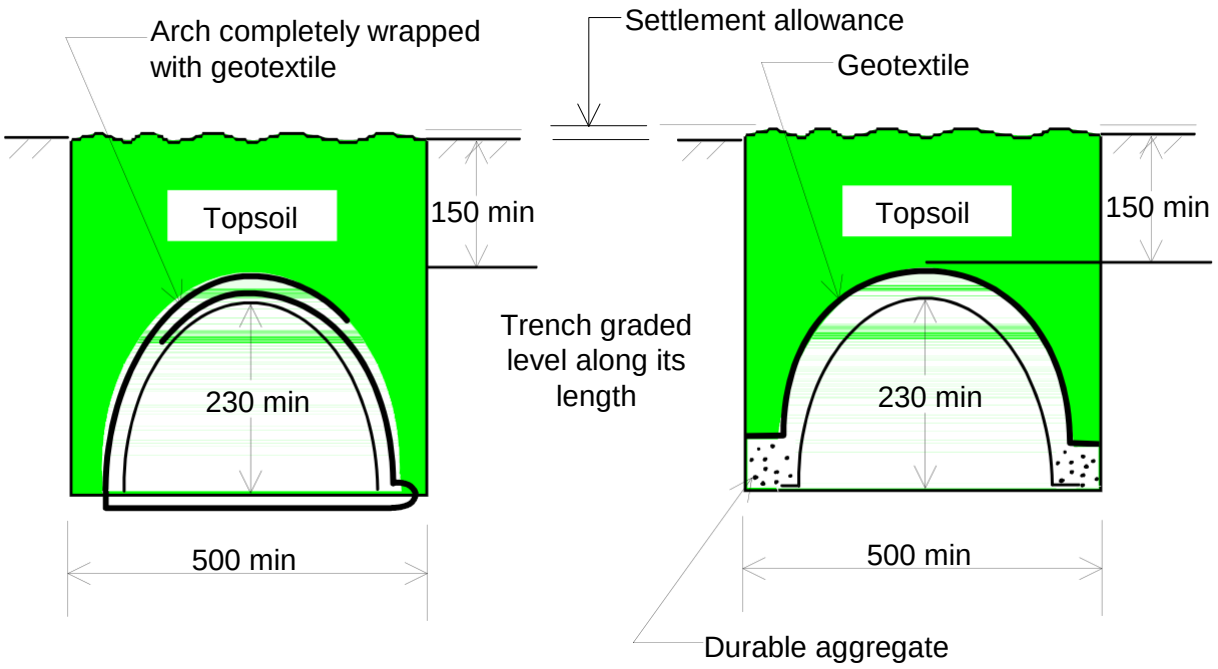


FIGURE 11: DURABLE SELF-SUPPORTING ARCH TRENCH

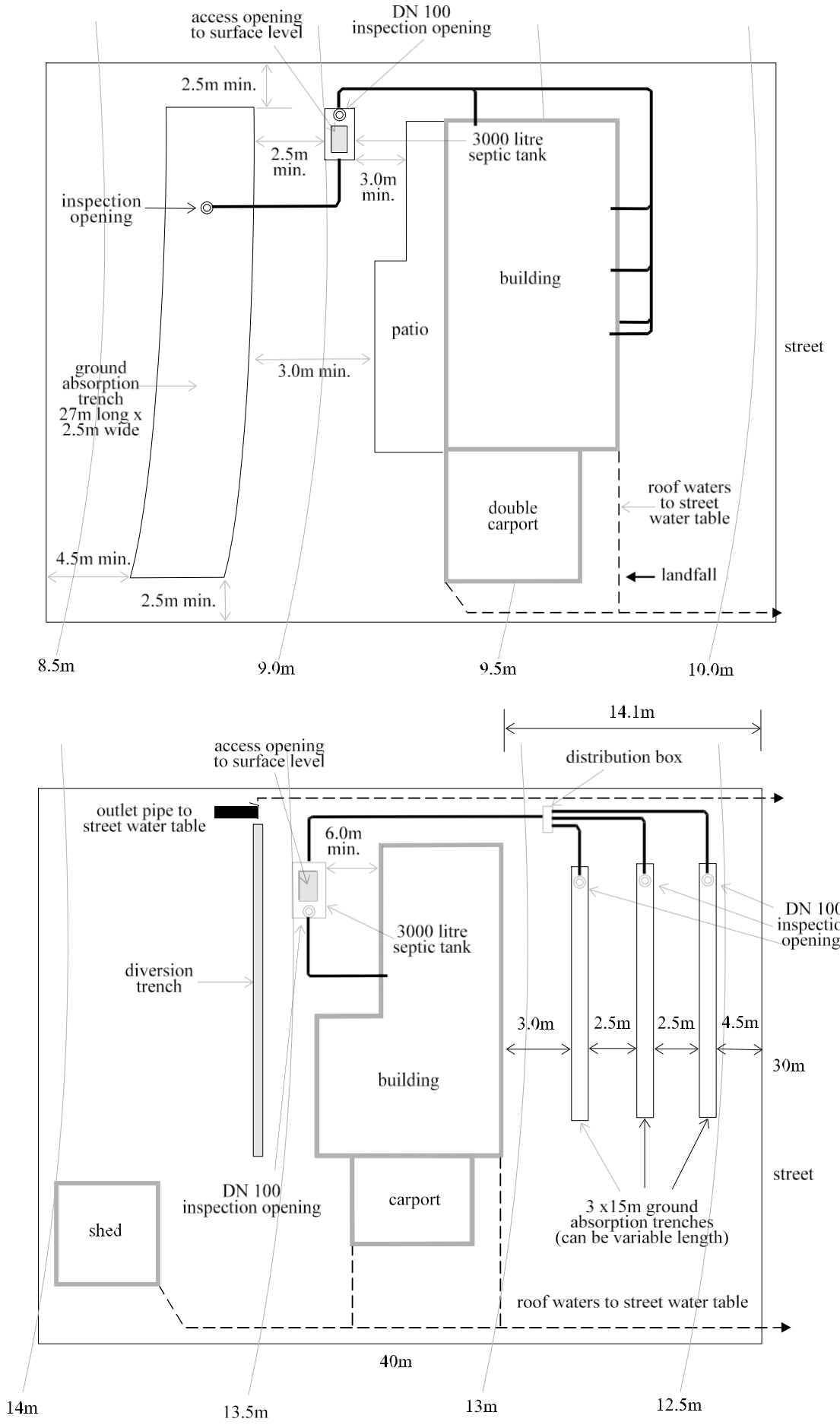


FIGURE 12: TYPICAL GROUND ABSORPTION SYSTEM LAYOUTS

7.6.3 Absorption Beds

These are similar to trenches but consolidated in one continuous area of aggregate bed as shown in Figures 13, 14 and 15.

Absorption beds are an acceptable alternative system to absorption trenches where the:

- use is on urban and rural living sites and suitable commercial/industrial sites,
- site is level,
- land available for disposal is limited in area.

7.6.4 Evapotranspiration- Absorption Trenches or Beds (ETA's)

They are of the same design and selected on the same basis as for absorption trenches and beds.

These types of systems may be used where:

- the average annual rainfall is less than 800mm per year,
- appropriate grasses and plant cover are established and maintained over disposal site; refer Appendix B - Schedule of Plants,
- usage of the effluent disposal system is not likely to be intermittent, as may possibly occur in remote out stations,
- where they are raised above the known level of flooding for that area. Confirmation of suitability of area and soil absorption capability will need to be obtained either by soil classification or soil percolation tests or as confirmed by the Resource Management Division Assessment Branch of the Department of Lands, Planning and Environment.

Note: The total area may be reduced by the factor detailed in **Figure 17** corresponding to the annual average rainfall shown in **Appendix C**, to provide for the increase in effluent disposal rate associated with transpiration of plants, shrubs and trees.

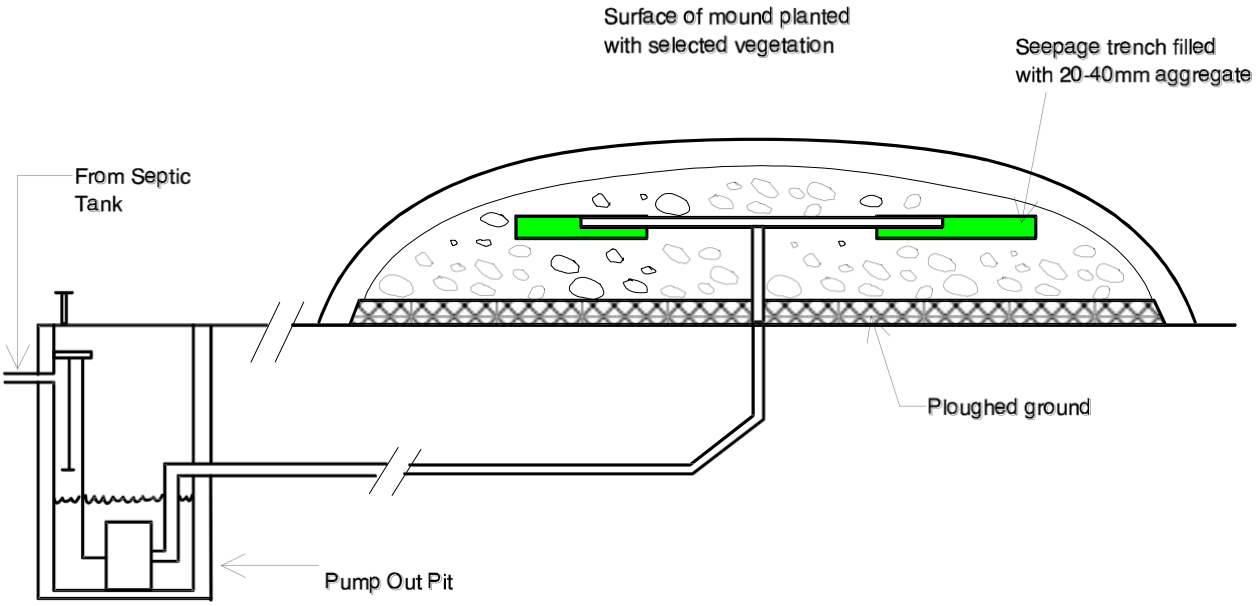


FIGURE 13: TYPICAL ABSORPTION MOUND

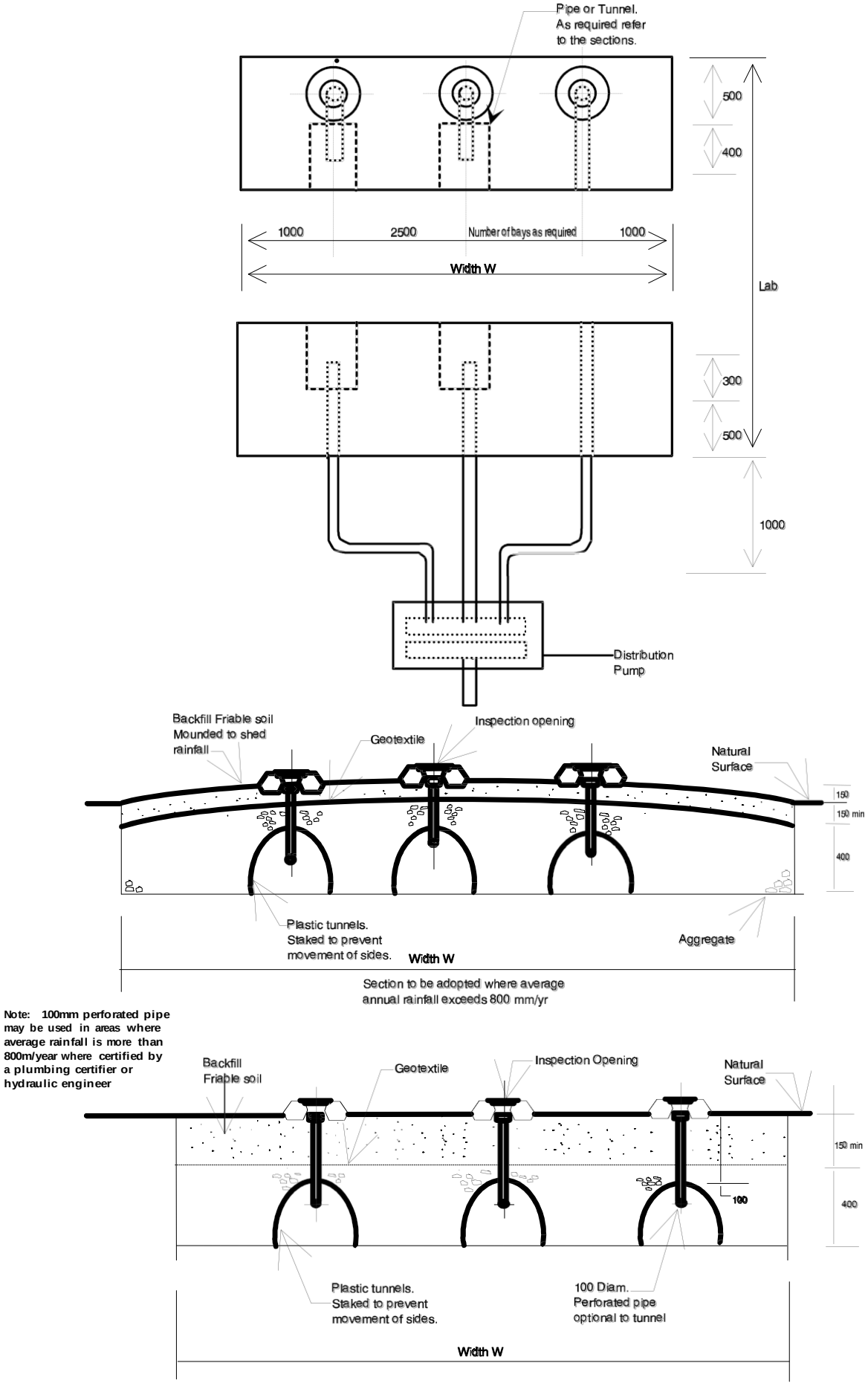
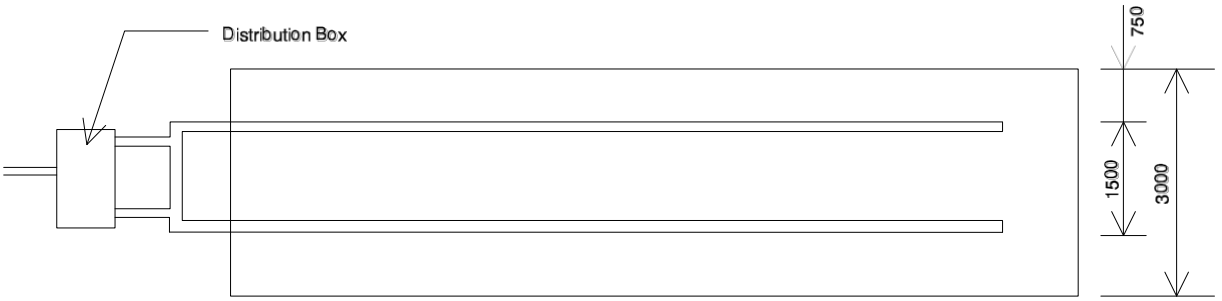
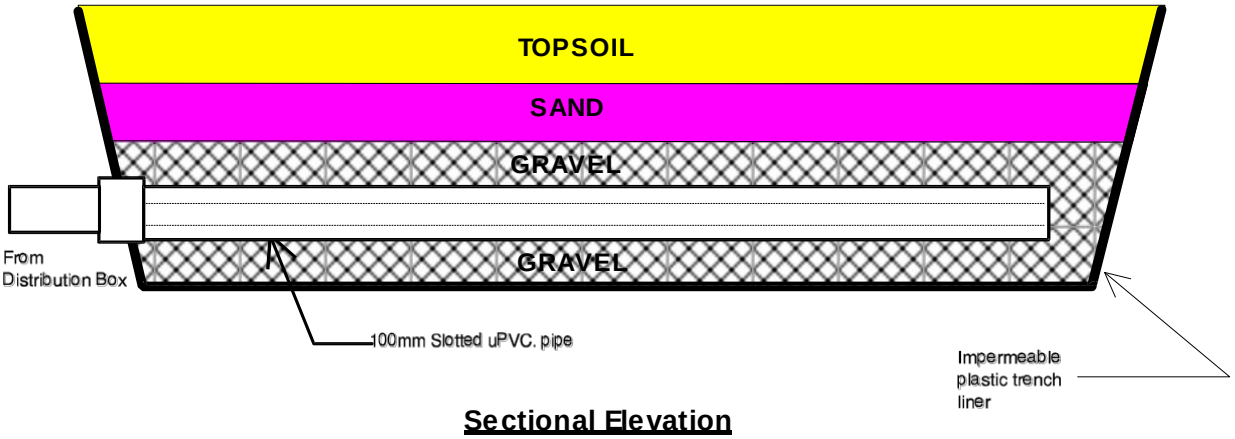


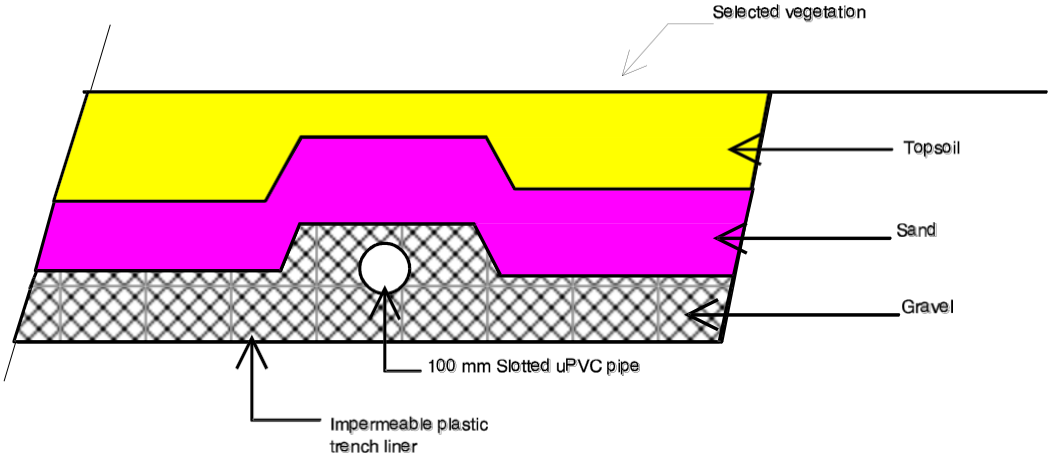
FIGURE 14: TYPICAL ABSORPTION TRENCHES



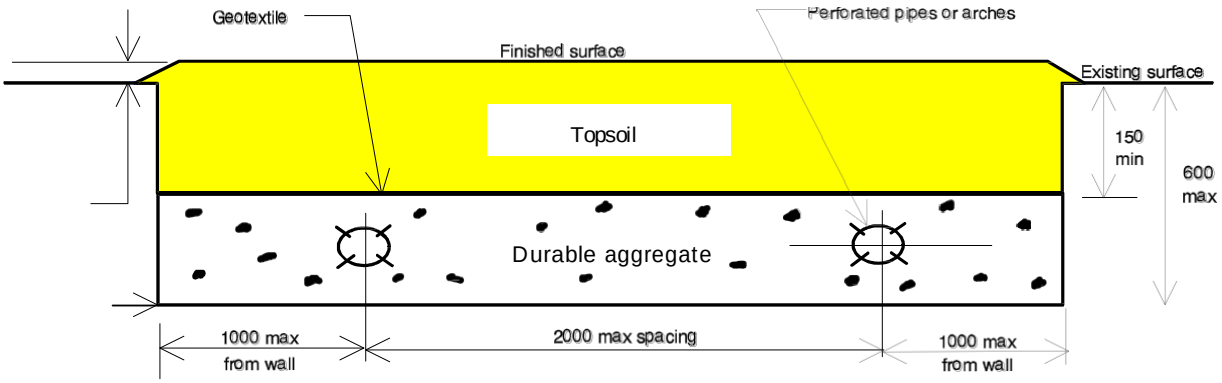
PLAN



Sectional Elevation

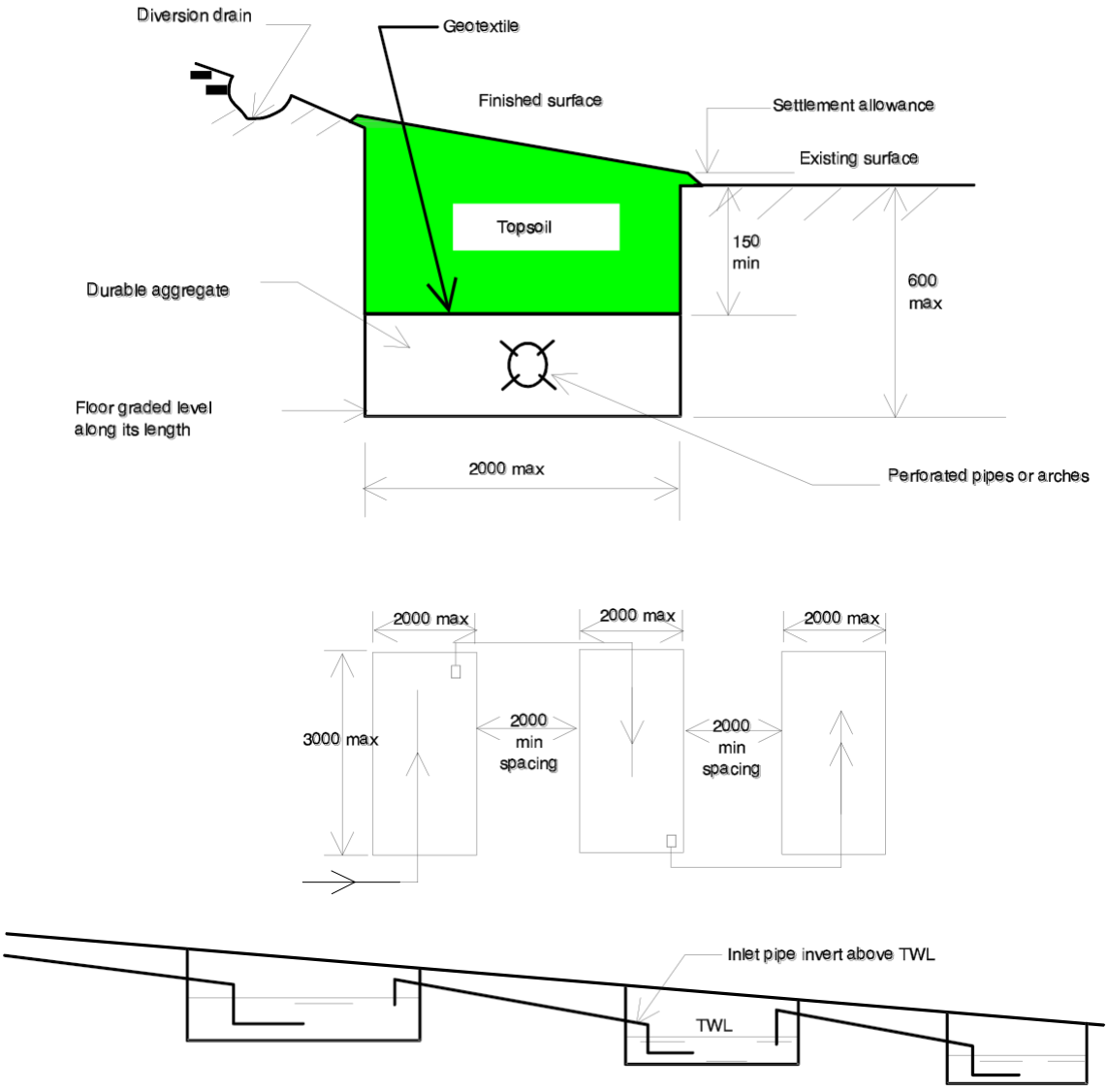


Section



Level site - slope less than 5%

FIGURE 15: TYPICAL ABSORPTION BED



Mild slope - equal to and greater than 5% but less than 15%

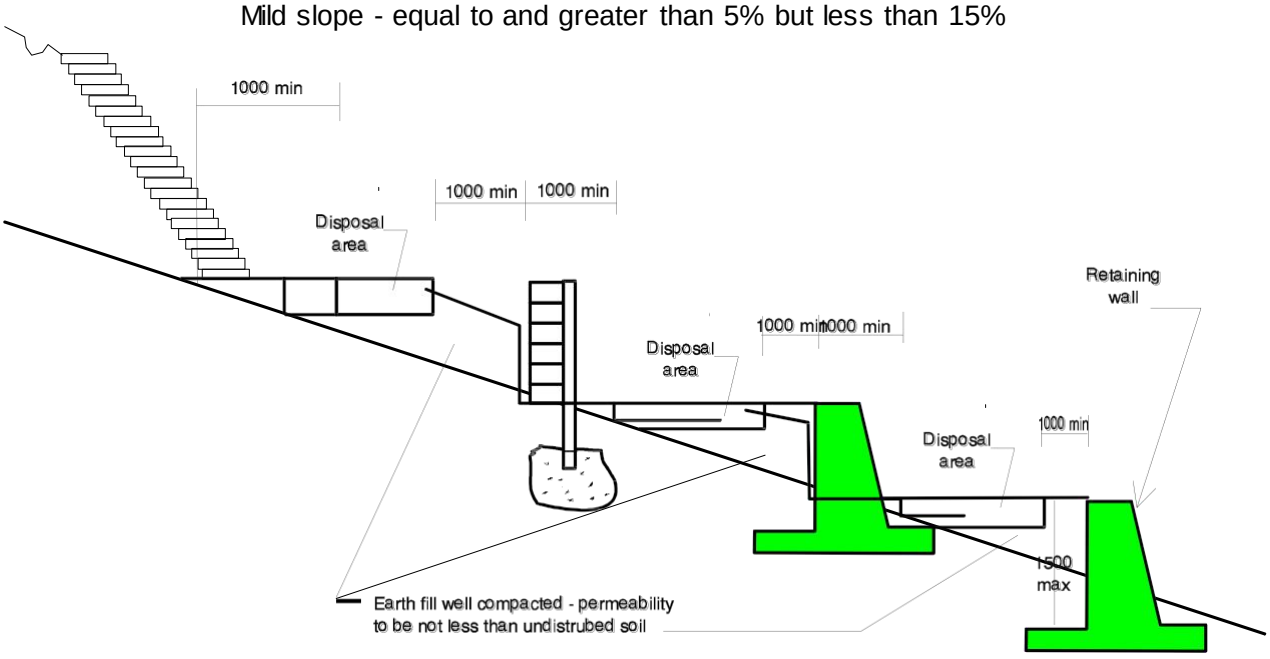


FIGURE 16: TYPICAL EVAPOTRANSPIRATION - ABSORPTION BEDS

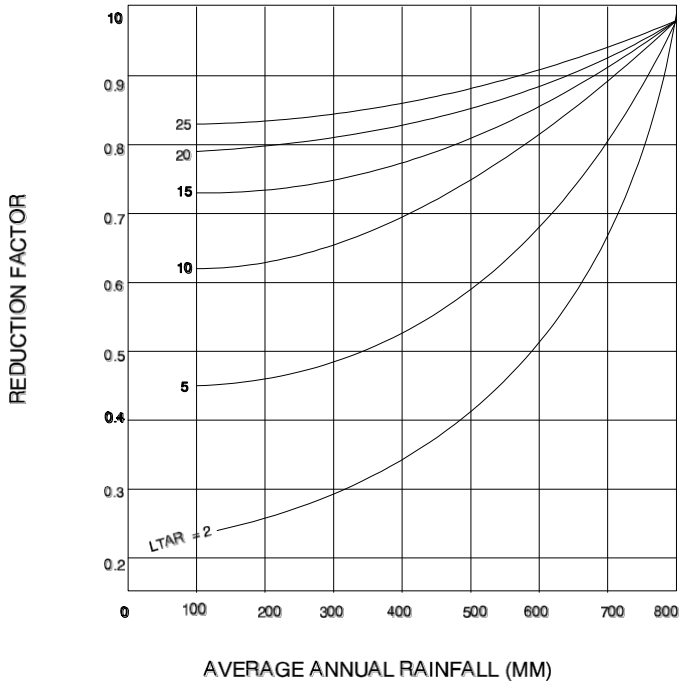


FIGURE 17: ABSORPTION/TRANSPIRATION ABSORPTION AREA REDUCTION FACTOR

7.6.5 Absorption Well (See Figures 18 and 19)

Absorption wells may be used where:

- deeper pervious soil layers occur, ie. up to 2.5m,
- area available is limited,
- the groundwater table does not rise within 3.0m of the natural surface.

The Absorption Area (AA) for an absorption well is the area of pervious soil in contact with the sides of the well eg. for a well 2m diameter and 2.5m in depth in which 1.5m depth of the sides and below the inlet is within pervious soil.

Therefore AA = (pervious floor area) + (pervious wall area) = $\pi r^2 + 2 \times \pi r \times \text{depth}$

= 3.142 x $1m^2$ (radius) + 3.142 x 2 x 1(x radius) x 1.5 (depth) = 12.57 m^2

The floor area must not be included if the well is bedded on impervious clay or rock.

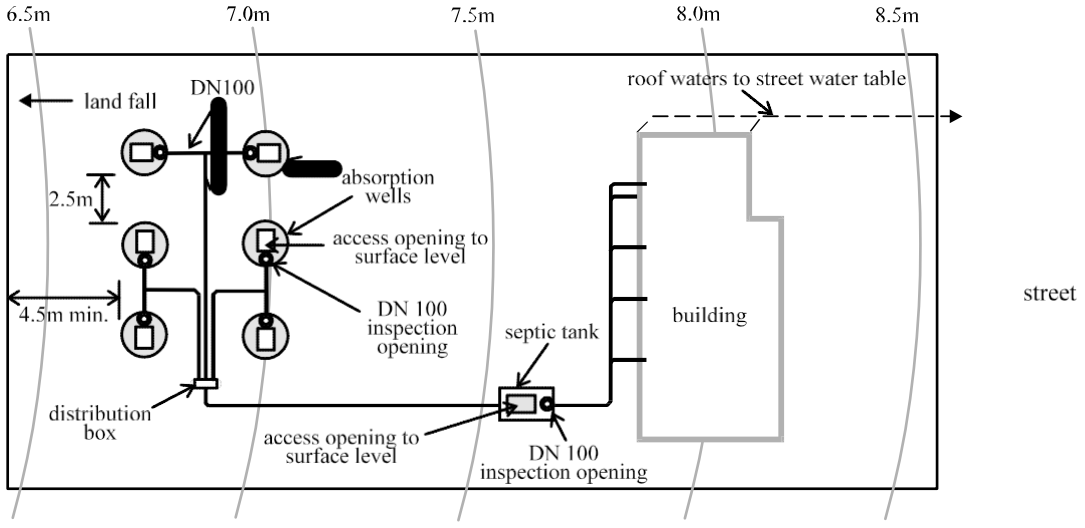


FIGURE 18: TYPICAL ABSORPTION WELL SYSTEM LAYOUT

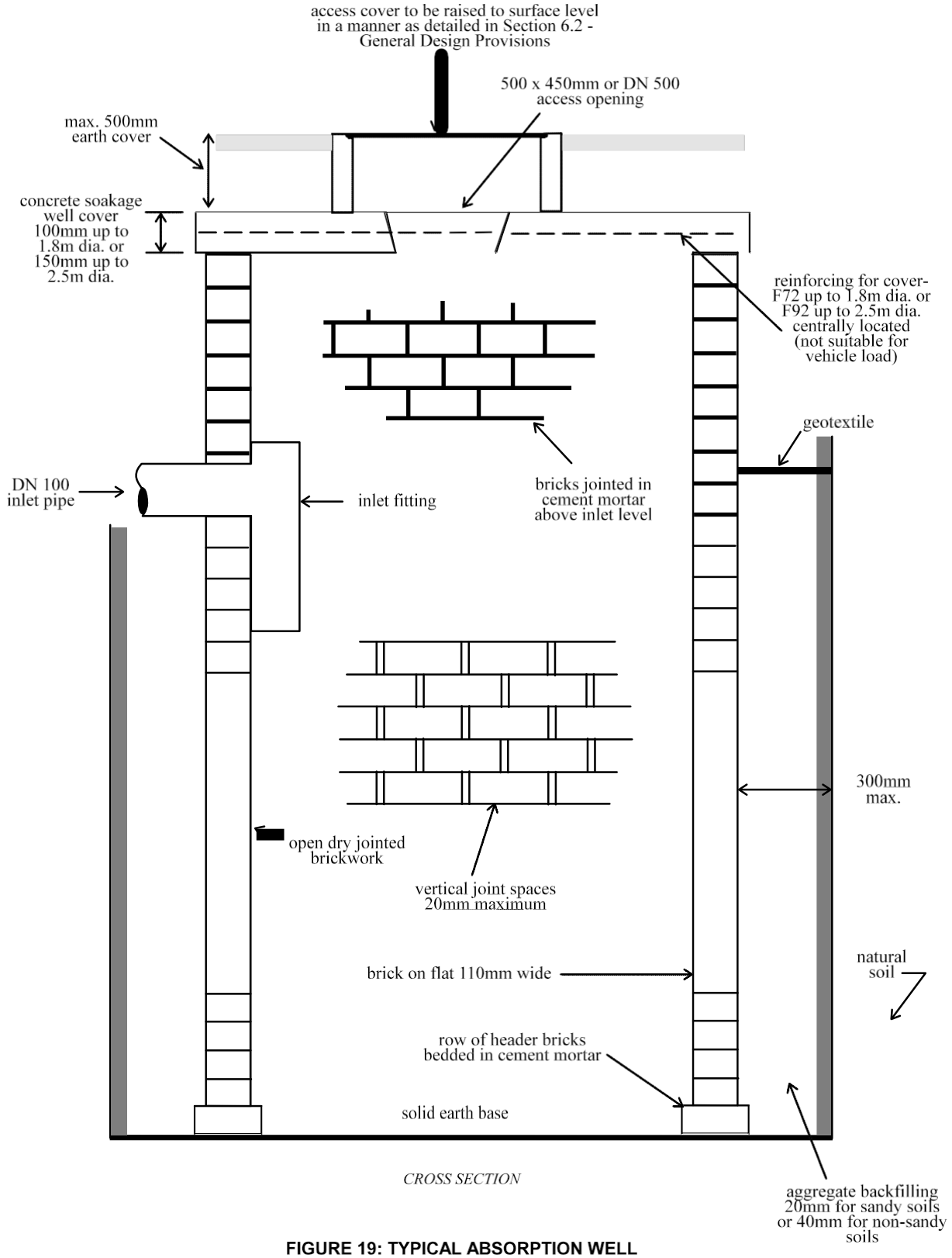


FIGURE 19: TYPICAL ABSORPTION WELL

7.7 DAILY EFFLUENT FLOW - CALCULATIONS

7.7.1 General

In order to determine the size of a subsurface effluent disposal system it is necessary to calculate the daily effluent flow and hence the required contact area, in square metres. The method for calculating the volume of effluent to be disposed of daily by ground absorption or absorption/transpiration differs in respect to residential and non-residential premises as outlined in Sections 7.7.2, 7.7.3 and 7.7.4.

7.7.2 Daily flow generated within Urban or Rural Living Allotments

From Section 5.4.1 an Equivalent Person (E.P) is equal to 150 Litres/person/day (L/p/d). A bedroom is rated at a nominal 2 persons per bedroom

a) COMBINED SYSTEM
Daily Flow litres/day = Number of bedrooms x 2 persons x 150 L/p/d

b) SPLIT SYSTEM
sewage effluent litres/day = number of bedrooms x 100 L/p/d
sullage effluent litres/day = number of bedrooms x 200 L/p/d

7.7.3 Daily flow allowances for Aboriginal Housing in Remote Area Communities

From Section 5.4.1 an Equivalent Person (E.P) is equal to 300 Litres/person/day (L/p/d). A bedroom is rated at a nominal 2 persons per bedroom

SPLIT SYSTEM
sewage effluent litres/day = number of bedrooms x 250 L/p/d
sullage effluent litres/day = number of bedrooms x 350 L/p/d

Note: Combined systems are no longer permissible for Aboriginal Housing in Remote Area Communities

7.7.4 Daily flow generated from non-residential premises ie. Class 2-9 buildings

(Refer to Appendix D for specific types of premises for calculation examples)

Use the following equation to calculate the total daily flow required.

P2 x DF = Total daily flow (Refer to Appendix D)

Where: **P2** **=** Number of people using the system. P2 shall be not less than 6 people

DF **=** Daily Flow or hydraulic loading, in litres per person per day

7.8 ABSORPTION DISPOSAL AREA (AA) REQUIRED

7.8.1 Absorption Trench/Bed Area required to dispose of daily flow as calculated from Section 7.7, Figure 7, Table 1 & Appendix D.

Use the following equation for calculating the absorption trench/absorption bed area (wetted area) required.

$$\text{Absorption Area (AA)} = \frac{\text{Calculated Daily Flow (which was obtained from Section 7.7)}}{\text{Long Term Acceptance Rate (LTAR)}}$$

LTAR determined from percolation rate (Appendix A) or assessed using the soil classification method as outlined in Section 7.4

7.8.2 Spa Baths

Sizing of the absorption area is also dependent upon the capacity of each spa and must be added to the area calculated from 7.8.1 as follows.

Capacity of Spa Bath	Septic Tank	Effluent Disposal System
less than 120 litres	No change	No change
> 121 to 370 litres	Increase by 250 litres	Increase absorption area by at least 25 square metres
> 371 to 680 litres	Increase by 500 litres	Increase absorption area by at least 50 square metres.

7.9 ABSORPTION TRENCH - LENGTH REQUIRED

Refer to **Figures 9 & 10** and to **Appendices F and G** for determination of absorption trench length for domestic dwellings in Urban or Rural Living Allotments and Aboriginal Housing in Remote Area Communities.

To calculate the Absorption Trench Length in metres required, use the following equation

$$\text{Trench Length} = \frac{\text{Absorption Area (AA)}}{\text{Effective Absorption Width } W_e}$$ (obtained from Section 7.8.1)

The length of absorption trench required is dependent on the Long Term Acceptance Rate (LTAR). The LTAR is determined from Figure 7 and is used in the following two sections for determining the effective absorption width W_e.

7.9.1 Effective Absorption Width " W_e" trench in metres where soil has LTAR > 10 Litres/m²/day

Effective Absorption Width, W_e = Trench Width W_t + 2 x Depth of aggregate D_a

Where a soil is identified as having an LTAR greater than 10 litres/m^2/day, the provisions contained in AS1547 are suitable for use in determining the effective absorption width **W_e** under the following conditions:

- standard plastic arch tunnel can only be used where the minimum absorption trench width W_t is 500mm and the minimum depth of aggregate in the trench is 300mm,
- large or jumbo plastic arch tunnel can only be used where the minimum absorption trench width W_t is 600mm and the minimum depth of aggregate in the trench is 400mm.

Note: ***Twice the depth of aggregate can only be used in calculations*** where the trench is filled with aggregate and covers the top of the trench tunnel as detailed as above and in Figures 9 and 10. If the top of the trench tunnel is not covered, then only half the depth will be allowed for the purposes of the equation (as in Section 7.9.2) which will subsequently increase the length of trench required.

7.9.2 Effective Absorption Width " W_e" trench in metres where soil has LTAR < 10 Litres/m²/day

W_e = Trench Width W_t + Depth of aggregate in the trench (D_a)

Soils having an LTAR less than 10 Litres/m^2/day invariably contain a large proportion of clay, and are subsequently more impervious and less effective in dispersing effluent than soils with higher LTAR's. Where a a thorough site assessment carried out in accordance with Section 7.2 does not rule out the use of effluent disposal by ground absorption, then standard and large/jumbo plastic arch tunnel shall be used where the minimum absorption trench width **W_t is 900mm.**

Under no circumstances are absorption trench width of **less than 900mm** to be used where the soil has been identified of having an LTAR < 10 Litres/m^2/day

EXAMPLE

Calculate the length of Absorption Trench required for a 3 Bedroom House constructed in an Urban or Rural Living Zone

Background Information:

- The soil has a percolation rate of **10 mm/hour** or the soil has been classified as being **loam** and thus has a corresponding Long Term Acceptance Rate **(LTAR) of 20 \Litres/m2/day** (Refer to Figure 7),
- large (jumbo) plastic arch tunnel is to be used in a trench that has a width of **600mm**,
- the **depth of aggregate is 400mm**,
- From Section 5.4.1 an Equivalent Person (E.P) for an ***Urban or Rural Living Zone*** is equal to **150 Litres/person/day (L/p/d)**, while a bedroom is rated at a nominal 2 persons per bedroom.

Method of Calculation Number 1:

1. Combined System = Daily Flow in litres/day
   = Number of bedrooms x 300 litres
   = 3 x 300
   = 900 litres/day

2. Absorption Disposal Area required (Refer to Section 7.8.1)

   Absorption area (AA) = $\frac{\text{Calculated Daily Flow}}{\text{LTAR}}$
   = 900/20
   = 45 m^2

3. Effective Absorption Width W_e (Refer to Section 7.9.1)

   Effective Absorption Width = Trench Width W_t + 2 x depth of aggregate
   = 0.6m + 0.8m
   W_e = 1.4 metres

4. Length of Absorption Trench Required (Refer to Section 7.9)

   Absorption trench length = $\frac{\text{Absorption Area (AA)}}{\text{Effective Absorption Width } W_e}$
   = $\frac{45\ m^2}{1.4}$
   = 32 metres long for single trench,
   OR
   2 x 16 metre long for two parallel trenches with distribution box.

Method of Calculation Number 2:

Using the background information, refer to Appendix F and simply read off the length of absorption trench required.

EXAMPLE

Calculate the length of Absorption Trench required for a 3 bedroom house used for Aboriginal Housing in Remote Area Communities.

Background Information:

Use the same information from the previous example and the following from Section 5.4.1:

- An Equivalent Person (E.P) in ***Aboriginal Housing in Remote Area Communities*** is equal to **300 Litres/person/day (L/p/d)**, while a bedroom is rated at a nominal 2 persons per bedroom ie. 3 BR House = 6 people = 1800 litres,
- As split systems are required, the ratio of sewage and sullage loadings is as follows **sewage** EP = No.bedrooms x **250 litres** ie 250 litres of the total 600 litres per room while **sullage** EP = No. bedrooms x **350 litres** ie 350 litres of the total 600 litres per room.

Method of Calculation:

1. Split System
   Sewage effluent litres/day = No. bedrooms x 250 litres = 3 x 250 litres = 750 l/d
   Sullage effluent litres/day = No. bedrooms x 350 litres = 3 x 350 litres = 1050 l/d

2. Absorption Disposal Area required (Refer to Section 7.8.1)

   Sewage Absorption area (AA) = $\frac{\text{Calculated Daily Flow}}{\text{LTAR}}$ = 750/20
   = 37.5 m^2

   Sullage Absorption Area = $\frac{\text{Calculated Daily Flow}}{\text{LTAR}}$ = 1050/20
   = 52.5 m^2

3. Effective Absorption Width W_e (Refer to Section 7.9.1)

   Effective Absorption Width = Trench Width W_t + 2 x depth of aggregate
   = 0.6 + (2 x 0.4)
   W_e = 1.4 metres

4. Length of Absorption Trench Required (Refer to Section 7.9)

   Sewage Absorption trench length = $\frac{\text{Sewage Absorption Area (AA)}}{\text{Effective Absorption Width } W_e} = \frac{37.5\ m^2}{1.4\ m}$

   = **27** metres long for single trench, or **2 x 14** m parallel trenches with distribution box

   Sullage Absorption trench length = $\frac{\text{Sullage Absorption Area (AA)}}{\text{Effective Absorption Width } W_e} = \frac{52.5\ m^2}{1.4\ m}$

   = **37** metres long for single trench, or **2 x 18.5** m parallel trenches with distribution box

   64 metres combined length or 4 x 16m trenches in parallel with distribution box

EXAMPLE:

Calculate the length of absorption trench required for a restaurant (with a liquor licence) that has a maximum capacity of sixty diners on a Saturday night.

Method of calculation:

1. Refer Section 7.7.4
   combined system Daily flow in litres/day
   = P2 x DF (refer to Appendix D for daily flow rates)
   = 60 people x 20 l/p/d
   = 1200 litres/day

2. Soil Absorption Capacity determined by classifying soil types?
   Soil Type observed to be silty loam after soil tests taken by the plumber and type confirmed by a suitably qualified geotechnical consultant.

   From Figure 7, the Long Term Acceptance Rate (LTAR) for silty loam is **20 Litres/m^2/day**.

3. Absorption Disposal Area required? Refer to Section 7.8

   Absorption Area, $Aa = \frac{\text{calculated daily flow}}{\text{LTAR}}$

   $= \frac{1200}{20}$

   = 60 m^2

4. Length of Absorption trench required? Refer to Section 7.9

   Using standard plastic arch tunnel and trench width of 600 mm wide and 400mm minimum depth of aggregate-

   Effective absorption width, W_e = Trench Width + 2 x depth of aggregate
   = 0.6 + 2 x 0.4m
   = 1.4 m

   Absorption Trench length required = $\frac{\text{Absorption Area Aa}}{\text{Effective Absorption Width, } W_e}$

   $= \frac{60\ m^2}{1.4\ m}$

   = approximately **42 metres long** for single trench
   or
   2 x 21 metre long parallel trenches
   with distribution box.

7.10 ABSORPTION BED - AREA REQUIRED (Refer to Figures 15 & 16)

Absorption beds as referred to in Section 7.6.3 are useful and acceptable in areas where both the amount of area available for effluent disposal by ground absorption is limited and is level. The beds are composed of a continuous area of aggregate, which allows for greater holding capacity and dispersal of the effluent.

7.10.1 Method for calculating area of Absorption Bed required to dispose of daily flow as calculated from Section 7.7, Figure 7, Table 1 & Appendix D.

Use the following equation for calculating the absorption trench/absorption bed area required.

$$\text{Area } (AA^2) = \frac{\text{Calculated Daily Flow}}{\text{Long Term Acceptance Rate (LTAR)}}$$

LTAR determined from percolation rate (Appendix A) or assessed using the soil classification method as outlined in Section 7.4

7.10.2 Length of Absorption Bed (LAB) Refer to Figure 15

$$\textbf{LAB} = \frac{\text{Absorption Area}}{\text{Width "}W_A\text{"}}$$

(Calculated from Section 7.10.1)
(Selected from Figure 15)

Where W_A = **Trench Width W_t + 2 x Depth of Bed**

The length of the Absorption Bed shall not be less than the width and no longer than three (3) times the width.

The preferable length to width ratio of **L**AB and W_A is 2:1.

EXAMPLE

Calculate the length of Absorption Bed required for a 3 Bedroom House constructed in an Urban or Rural Living Zone that has a limited area of 50m^2 designated for effluent disposal (Using the same background information in the previous example).

Method of Calculation:

1. Absorption area (AA) = $\frac{\text{Daily Flow}}{\text{LTAR}} = \frac{900 \text{ litres/day}}{20 \text{ litres/m}^2\text{/day}} = 45 \text{ m}^2$

2. Say two (2) tunnels are proposed for use in the bed, then width (See Figure 15)
   Then width by dimensions in diagram is 1m + 2.0m + 1m = 4.0m

   Effective Absorption Width W_A = Trench Width W_t + 2 x Depth of Trench D_t
   = 4.0 + (2 x 0.4)
   W_A = 4.8

3. Length of Absorption Bed (**L**AB) = $\frac{\text{Absorption Area}}{\text{Width "}W_A\text{"}} = \frac{45 \text{ m}^2}{4.8\text{m}}$ = approx. 9.4 metres

7.11 EVAPOTRANSPIRATION - ABSORPTION (ETA) / TRENCH OR BED - AREA REQUIRED

7.11.1 AREA - Evapotranspiration- Absorption /Trench or Bed

As outlined in Section 7.6.4, the use of an ETA trench or bed should be restricted to those areas that receive less than 800 mm average annual rainfall.

The area required for Absorption/ Transpiration trenches shall be as determined for an Absorption Trench (Section 7.9) or for Absorption Beds (Section 7.10) but reduced by the factor found from Figure 17, using the appropriate rainfall (see Appendix C) and LTAR.

EXAMPLE
Calculate the area required for an ETA trench or bed in a location that receives 650 mm average annual rainfall, using the information contained in the previous example.

Method of Calculation:

1. Absorption area (AA) = 45 m^2

2 Refer to Figure 17 and find the intersection of the LTAR = 20 litres/m^2/day and Annual Rainfall of 650mm. The "Absorption Area Reduction Factor" is approximately = 0.9

3. Multiply AA by Absorption Area Reduction Factor = 45 m^2 x 0.9 = **40.5 m^2 .**

7.12 Pump Out Pits / Collection Wells

Where the site characteristics are unsuitable for the installation of a ground absorption effluent disposal system, particularly in areas where rain exceeds 800mm per year, a pump out pit may be used in the Territory for the containment of effluent for suitable off site disposal. Pump out pits may be installed in the Territory subject to the following conditions.

1. to	The pump out pit shall have an effective capacity equal to at least four (4) days daily inflow the septic tank and shall be constructed of reinforced sulphate resisting cement concrete or other material as approved by THS.
2.	There shall be no structural failure or undue distortion of the pump out pit, empty or full, due to hydrostatic or other pressure when placed in situ.
3.	The reinforced concrete cement pump out pit shall be constructed in accordance with AS3600 and AS3735.
4.	There shall be no structural failure or cracking when a prefabricated pump out pit is transported and lifted into the excavation.
5.	Be designed to withstand any loading imposed by vehicles, adjoining structures or surrounding soils.
6.	It shall be installed on a solid base and be level.
7.	Be provided with a cover that is fitted so as to be watertight and have an access opening and cover of at least 500 x 450mm or DN500 terminating at surface level.
8.	Where it is not practical to terminate the top cover at surface level the access opening shall be shafted to the surface level as detailed in Section 6.2.
9.	Be provided with a DN100 inspection opening/pump out opening fitted with a threaded access cap and concrete block and cover. Where the sump cover is not at ground level, the inspection opening/pump out opening shall be shafted to surface level.
10.	Be provided with an audible and visible alarm with muting facilities and be located in a conspicuous position to warn that the pit requires pumping out within 24 hours.
11.	Be provided with an automatic system that shuts down the water supply to the premises whenever the liquid level is within 100mm of the invert of the inlet pipe.
12.	Fitted with a DN100 induct vent either located on the inlet pipe to the pump out pit or to the pit's cover.
13	All pipework/connections shall be made using PVC collars into the wall and the lid of the pump out pit.
14.	The pit's connections and appurtenances shall be waterproof.
15.	Be suitably located so as to permit access for the pump out vehicle.
16.	Setback distances for containment sumps are the same as for septic tanks.
17. provide	Where a pump out pit is approved it will require the owner/occupier of the premises to signed documents, - confirming agreement that the effluent will only be disposed of at the approved site. - confirming arrangements between the owner/occupier and an effluent removal contractor for removal of the effluent and disposal at the approved site. - ensuring the removal contractor will provide copies of cartnotes of such removals and notification to THS.
18.	That the area, in which the pump out pit is installed, is operated by a collection agency and the system is guaranteed to be serviced at least twice a week.

NOTE

The ongoing cost of having effluent carted away to an approved disposal site is expensive and should be carefully considered before proceeding with the option. All owners of premises, serviced by on-site containment for off site disposal by tanker to an approved disposal site, are required to inform all users of the premises of the requirements. All owners must in the event of sale of the premises, advise would be purchasers of the requirements and obligations, to ensure the system does not overflow or discharge any of the sewage or treated effluent or reclaimed water onto the site or elsewhere except as approved.

7.13 THE EFFLUENT DISPOSAL SYSTEM - ANCILLARY STRUCTURES

7.13.1 Distribution Box (Sump) (refer Figures 20 & 21)

Where multiple trenches, wells or bed systems are used to dispose of effluent it is necessary to install a "distribution box". The distribution box has two purposes; firstly to provide a means of distributing the effluent evenly to the entire soakage system, secondly to provide a means of alternating flow to sections of the soakage system.

Alternating the flow to each trench or well allows resting of sections of the ground absorption system. Should the option of alternating the flows to the various sections of the disposal system be utilised, it will be necessary to closely monitor the duration of flow that the section can function without backflow or surcharge. When the inflow exceeds the capacity of soil to handle the hydraulic load it will be necessary to isolate the section and re-direct the effluent to another section. Seasonal conditions may impact on the duration of the operation of the respective sections.

The distribution box shall:

- be constructed from sulphate resisting reinforced cement concrete or an approved material,
- utilise all pipework connections made of PVC collars cast into the walls of the sump,
- be installed on a level solid base and not be subjected to vehicle loads,
- be waterproof and be finished at ground surface level with a removable cover to permit diversion control,
- have the level of the outlet pipes at least 50mm below that of the inlet pipe,
- contain an inlet stilling chamber and weir or other means of regulating the flow of effluent the overflow level of the weir shall be below the inlet level and the weir and the outlets shall be in a parallel plane and installed level,
- be installed with a setback distance of one (1) metre from the septic tank and effluent disposal system and 2.5 metres from buildings and boundaries.

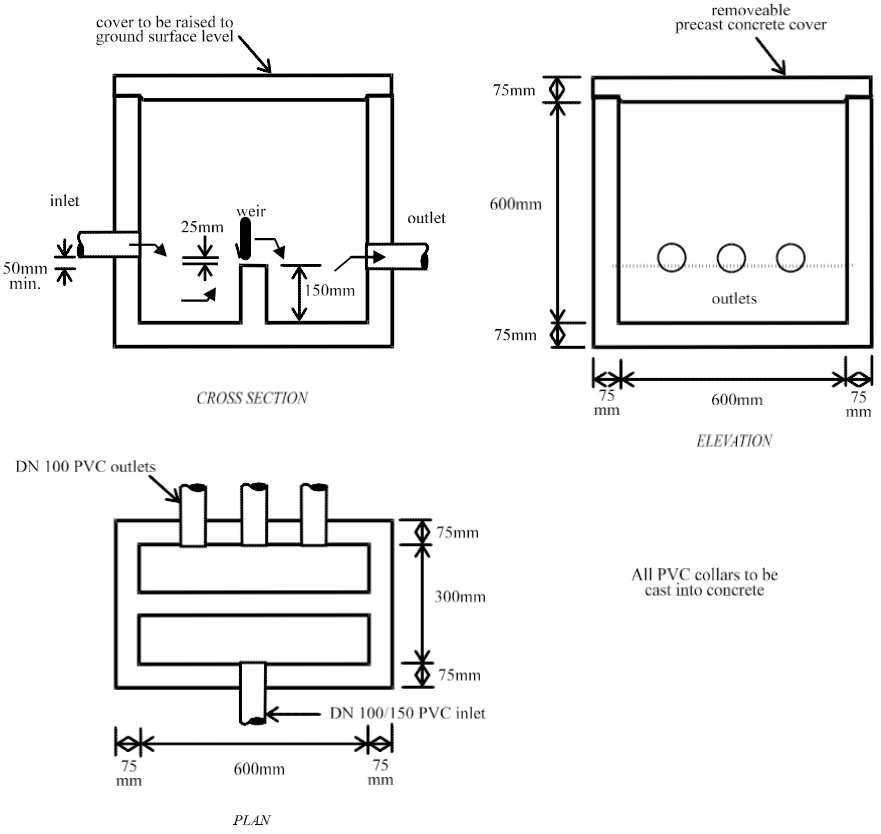


FIGURE 20: TYPICAL DISTRIBUTION BOX

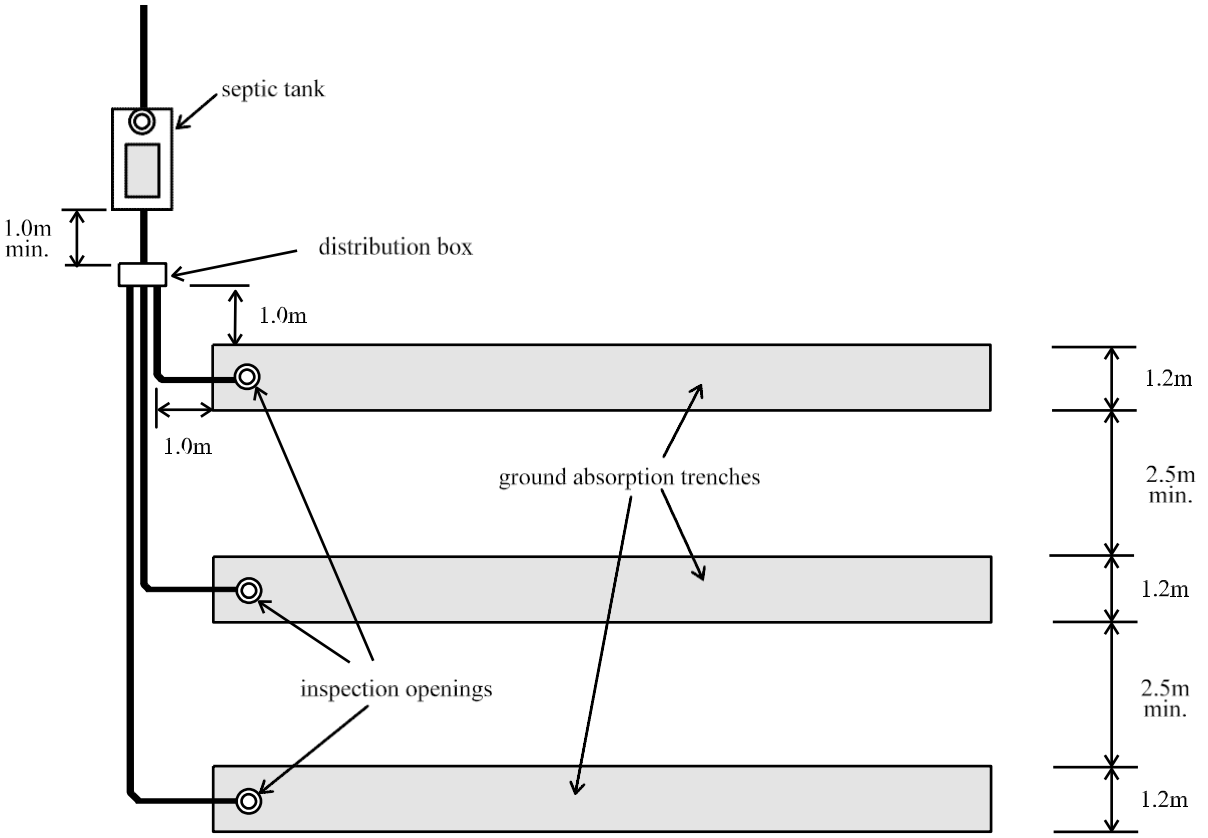


FIGURE 21: DISTRIBUTION BOX/GROUND ABSORPTION TRENCH LAYOUT

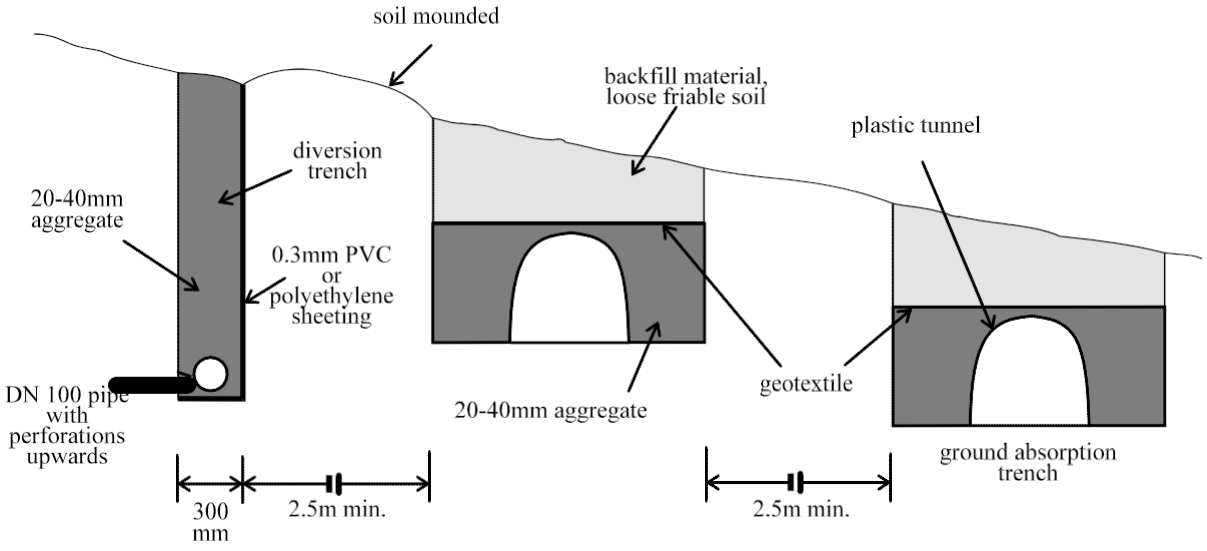


FIGURE 22: DIVERSION & GROUND ABSORPTION TRENCH SECTION

7.13.2 Diversion Trench

Migrating surface and subsurface water can affect the ability of the ground absorption system to dispose of the effluent.

A diversion trench will be required where soil maps, soil classification results or site assessment indicates ground water movement and shall be installed so that the surface and subsurface water is diverted away from the disposal area.

It is not practical to install a diversion trench when the site is flat. On some sites the diversion trench may need to be situated upslope from the building and to a depth to arrest migrating subsurface flow that may impact on the disposal system **(See Figure 22).** In this case it is unlikely that the depth will be below the base of the ground absorption trench.

The diversion trench shall comply with the following requirements:

- the base of the diversion trench should be deeper than the effluent disposal system base,
- the diversion trench shall be lined with 0.3mm PVC or polyethylene placed on the trench bottom and the side nearest to the effluent disposal system,
- the PVC or polyethylene sheeting shall be extended to the ground surface level,
- a DN 100 or other approved perforated pipe with the perforations facing upward shall be placed on the PVC or polyethylene sheeting,
- the trench shall be filled with 20 - 40mm aggregate to the surface level,
- the soil shall be mounded between the diversion and the soakage trench,
- the outlet from the perforated pipe shall be extended to discharge at ground surface level at a point downslope from the subsurface soakage system,
- the diversion trench width shall be 300mm minimum.

7.13.3 Roof Waters

All roof waters shall be diverted away from the effluent disposal area. Where practical, roof waters should be diverted to the street water table or to a point beyond the disposal area, so that it has no impact on the operation of the disposal system (**See Figures 23 & 24).**

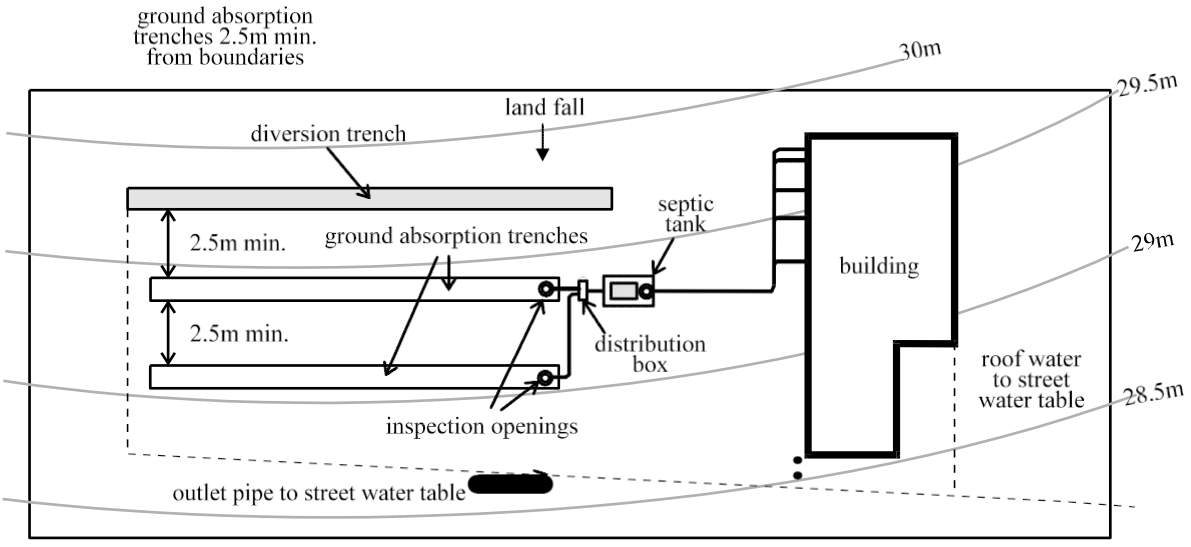


FIGURE 23: DIVERSION / ROOF WATER DISPOSAL LAYOUT

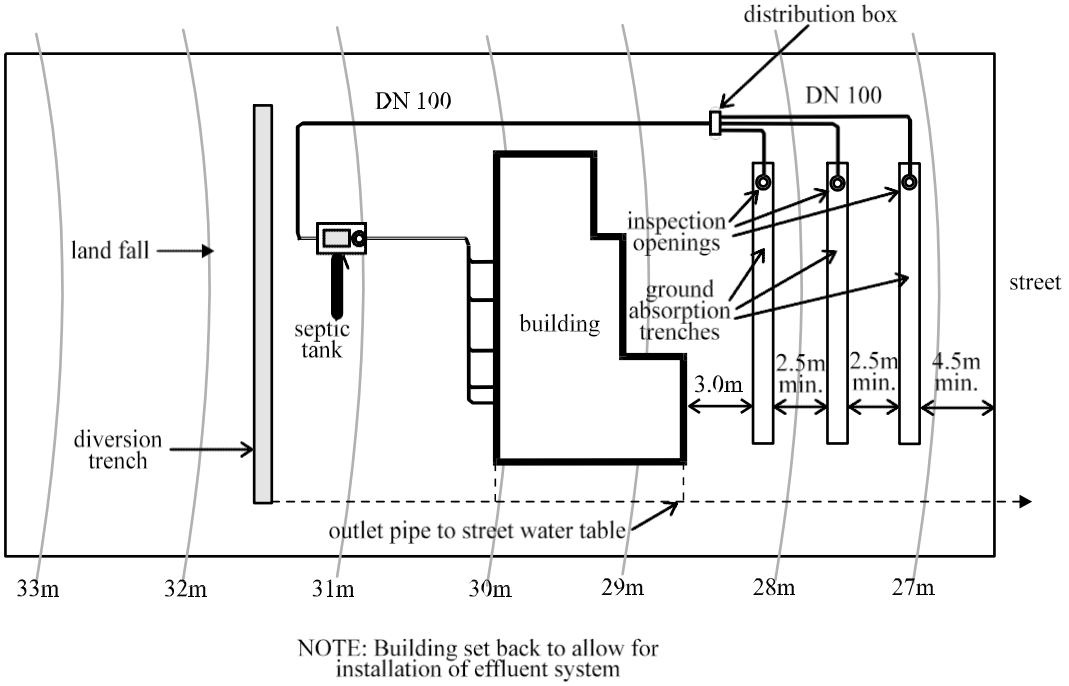


FIGURE 24: DIVERSION / ROOF WATER DISPOSAL LAYOUT

7.13.4 Pump Chamber (refer to Figure 25)

A pump chamber and pumping system may be required where:

- the discharge level of the septic tank is below the level of the soakage drain,
- geotechnical evidence indicates optimum soil permeability at a level higher than the septic tank outlet.

The pump chamber and pump system shall comply with the following provisions:

- there shall be no structural failure or undue distortion of the pump chamber, empty or full, due to hydrostatic or other pressure when placed in situ,
- the sulphate resistant cement, reinforced concrete pump chamber shall be constructed in accordance with AS3600 and AS3735,
- there shall be no structural failure or cracking when a prefabricated pump out chamber is transported and lifted into the excavation,
- be designed to withstand any loading imposed by vehicles, adjoining structures or surrounding soils,
- it shall be installed on a solid base and be level,
- be provided with a cover that is fitted so as to be watertight and have an access opening and cover of at least 500 x 450mm or DN500 terminating at surface level,
- where it is not practical to terminate the top cover at surface level the access opening shall be shafted to the surface level in a manner as detailed in Section 6.2,
- be provided with a DN100 inspection opening fitted out with a threaded access cap, concrete block and cover. Where the pump chamber cover is not at ground level, the inspection opening shall be shafted to surface level,
- fitted with a DN100 induct vent either located in the inlet pipe to the pump chamber or on the pump chambers cover,
- all pipework/connections shall be made using PVC collars into the wall and the lid of the pump out pit,
- the pump chambers connections and appurtenances shall be waterproof,
- setback distances for containment sumps are the same as for septic tanks,
- a minimum liquid capacity of 500 litres or 50% of the daily inflow, whichever is the greater shall be provided as an emergency storage provision.

7.13.5 Pump System (refer to Figure 25)

The pump system shall:

- be constructed from materials (including pipework) suitable for pumping septic tank effluent and may be an above ground or submersible type,
- have a capacity to discharge the maximum average daily flow against any physical or imposed head eg 900 litres for a 3 BR urban/rural house,
- be statically mounted and protected from the elements and be wired to operate automatically,
- be installed so as the electrical work complies with the requirements of AS3000 SAA Wiring Rules,
- be provided with an audible and visible alarm with muting facilities for the audible component and be located in a conspicuous location within the confines of the premises to warn of pump failure and highwater level.

The mechanism of operation must satisfy the size and design of the pump well and effluent flow.

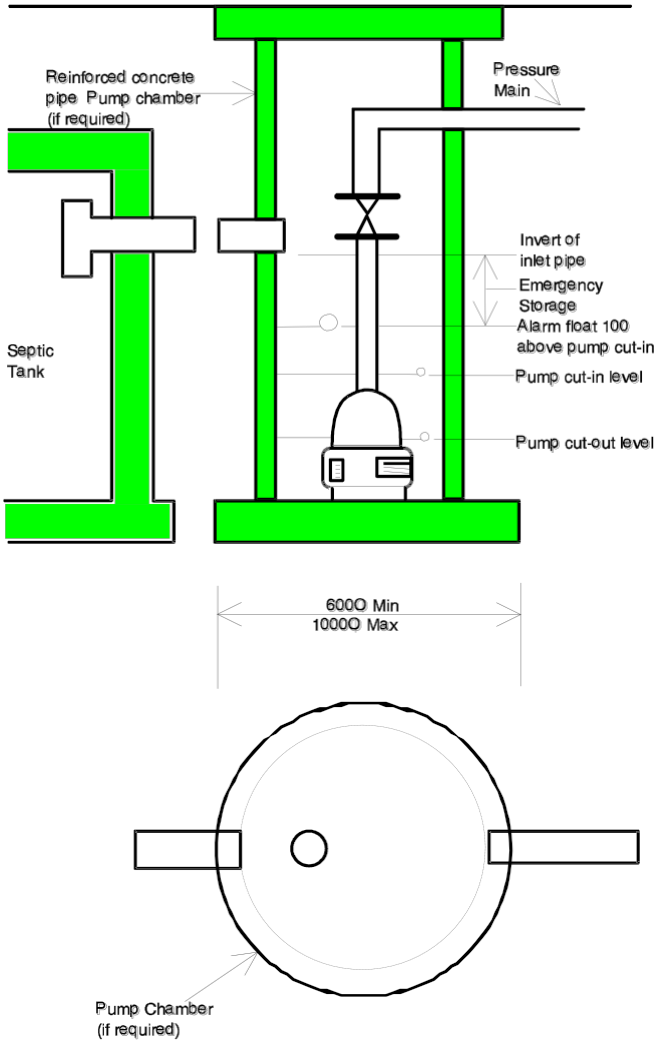


FIGURE 25: TYPICAL PUMP CHAMBER

7.13.6 Inspection Opening (Figure 26) for Absorption & Absorption/Transpiration Trenches & Beds

Inspection openings shall be installed at the inflow end of each Absorption, Absorption/Transpiration trench to enable performance of the trench or bed to be monitored and pumped out if necessary.

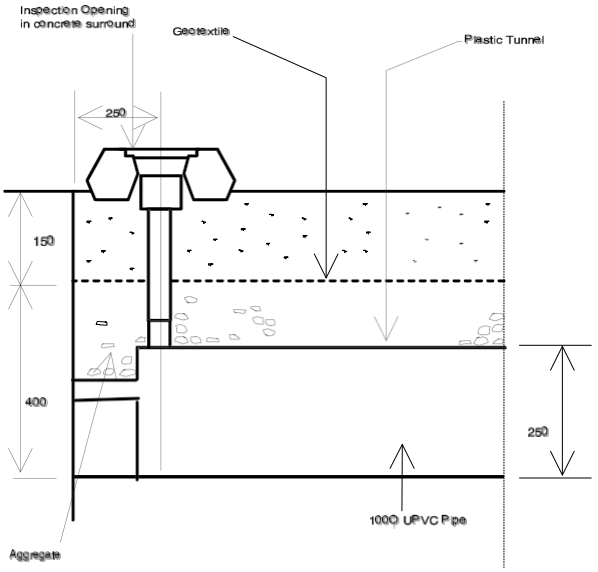


FIGURE 26: INSPECTION OPENING

7.13.7 Other Systems

Where the absorption systems covered by this section of the Code are found to be uneconomic or unsuitable because of site conditions, other systems described in this document may be feasible. Other sewage treatment and effluent disposal systems not covered in this document will require separate approval and advice from Territory Health Services before proceeding.

Irrigation

Irrigation requires a high quality effluent to reduce hazard to health and is more appropriate in low rainfall areas, ie. less than 800mm per year. Alternative septic systems can improve effluent quality by aeration and disinfection, although specific precautions are required (Refer to Sections 8 and 11).

Off-Site Disposal

Effluent can be disposed of to a water course if it is of suitable high quality and the water course is adequate for dilution. PAWA must be consulted before pursuing this option (Refer to Section 11).

Evaporation

Evaporative ponds or basins are most appropriate where adequate land is available and average annual rainfall is less than 800mm. They require a detailed study to establish their feasibility. This system is outside the scope of the Code and will need to be designed by a qualified hydraulic engineer.

Common Effluent Drainage Schemes

A Common Effluent Drainage Scheme involves the collection of effluent from septic tanks servicing individual lots and conveying the effluent to a common secondary treatment and/or disposal site remote from the community. Effluent is usually treated in oxidation lagoons. The purpose of septic tanks in these systems is generally limited to the trapping of gross solids in order to enable smaller and flatter graded collection sewers and hence septic tanks do not necessarily need to be in accordance with this Code Of Practice. These systems are subsequently beyond the scope of this Code of Practice and an application for approval must be directed to the relevant Environmental Health Office in which locality the works are to be carried out.

NOTES

PART 2 - Aerated Wastewater Treatment Systems (AWTS)

8.0 INTRODUCTION

The safe disposal of sewage and household wastewater is necessary to protect the health of the community and the environment.

In many parts of the Northern Territory, development is occurring on sites where conventional methods of subsurface effluent disposal are not suitable, and alternative methods are required. Subsequently, where connection to a reticulated sewerage system or a septic tank is not possible and where the soil is unsuitable, the installation of aerated wastewater (sewage) treatment systems (AWTS) using on-site disposal/reuse may be a satisfactory alternative. However, much consideration needs to be given to the installation of these types of systems in areas where frequent system maintenance cannot be guaranteed.

Although AWTS are more expensive to install and have higher operational and maintenance costs than conventional subsurface disposal system, they are still less expensive than removing effluent by tankerage. Additional benefits accrue through the conservation of water, provided on-site reuse can be used to displace potable water use.

A correctly operated and maintained AWTS can be an acceptable alternative method for treating domestic sewage to a level enabling a variety of sewage reuse options. These systems also can reduce the public health risks associated with other less effective treatment and disposal methods.

The demand for use of individual AWTS has occurred through changes in wastewater technology, increased costs associated with the installation of deep drainage; development within areas where conventional subsurface effluent disposal methods are ineffective and the need to conserve water resources while protecting the environment.

Some units require a separate primary treatment tank (septic tank) and secondary treatment tank while others comprise of a larger single tank incorporating primary treatment, aeration, clarification, settling, disinfection and storage chambers. The resultant effluent is discharged by pumping to a dedicated surface or shallow sub-surface irrigation disposal area. Larger systems may include two or more tanks configured to achieve the required level of treatment. Whilst some units incorporate a trickling or rotating biological filter the more commonly installed systems utilize variations of the extended aeration process.

8.1 APPLICATION FOR AWTS TYPE APPROVAL

AWTS require "type" approval from Territory Health Services before being able to be sold and installed in the Northern Territory. Type approval provides authorisation for the installation of that type of AWTS (alternative septic system) anywhere in the Northern Territory, subject to compliance with any conditions placed on the approval.

A manufacturer must apply for type approval for each AWTS model to the Program Director, Environmental Health Program Directorate (See Section 1.0 for address details).

Once type approval is granted the installation of an AWTS may either be:

- installed by a certifying plumber and drainer who certifies that the system has been installed in accordance with this Code of Practice and provides this certification to the relevant Environmental Health Officer for the locality in which the works are to be installed, or
- approved by the relevant Environmental Health Officer for the locality in which the works are to be installed. This will necessitate contacting the relevant Environmental Health Office and making an application for installation approval, adequately in advance of any installation work being commenced **(Refer to the *Administrative Procedures*)**.

8.2 APPROVAL TO INSTALL AN AERATED WASTEWATER TREATMENT SYSTEM

8.2.1 Information to be Provided with the Installation Application

The installation approval process for AWTS is detailed in the *Administrative Procedures*.

Further enquiries regarding conditions of AWTS installation can be directed to the relevant Environmental Health Office for the locality in which the AWTS is to be installed (See Section 1.0).

8.3 PRIMARY COMPONENTS OF AERATED WASTEWATER TREATMENT SYSTEMS

8.3.1 Aeration Chamber

The design of the aeration chamber takes into consideration the uneven nature of waste flow, especially for domestic premises where shock loading is severe. Air is usually supplied by a small blower or compressor and distributed throughout the chamber by air diffusers. Alternatively air may be supplied by means of a fan, venturi or mechanical agitation. Media may be installed in the aeration chamber to facilitate contact aeration. The use of media may vary but should have a discrete flow pattern with a large contact surface area and a self cleansing action. Media provides a surface area that will entrap air, impede the flow of the effluent and allows air to be taken up into the effluent to promote microbial growth.

8.3.2 Clarification Chamber

After aeration the partly treated effluent flows into the clarifier which provides still conditions necessary for the settling of suspended solids. A sludge scum return system operating continuously or intermittently returns the solids to either the primary (septic tank) compartments or the first aeration compartment.

8.3.3 Disinfection / Pump Chamber

The clarified effluent then passes through a disinfection chamber (usually a tablet chlorination) into the chlorination compartment with a retention time sufficient to ensure a free residual chlorine level of at least 0.5 mg/litre at the first discharge point in the surface irrigation disposal area. Depending on the type of chlorine compounds used, retention times may vary from 30 minutes to two hours at peakflow.

After disinfection the reclaimed water is stored in a sump and then pumped to a dedicated, landscaped surface irrigation or sub-surface disposal area for final disposal by absorption and evapo-transpiration.

As AWTS rely on aeration, chlorination and electricity for effective effluent treatment:

- the owner of the system is required to arrange for regular maintenance, monitoring and testing of the system to manufacturer's specifications,
- Maintenance is required in order to ensure satisfactory performance and that effluent quality satisfies the Chief Medical Officer's conditions of type approval for that type of system.

NOTE: Failure by the owner to operate and/or maintain the AWTS in accordance with the manufacturer's specifications and the type approval conditions for that type of AWTS may result in revocation of approval for the use of the system and may require the owner to take immediate steps to rectify the system's problem(s) to the satisfaction of the EHO.

8.4 SYSTEM LOADING AND DESCRIPTION

8.4.1 Sizing of the Primary Treatment Compartment in an Aerated Wastewater Treatment System

The capacity of the primary treatment (septic tank) compartments shall be determined in accordance with the criteria detailed in Section 5.4 of this document for residential premises and Appendix D for non-residential premises.

8.4.2 Sizing of the Secondary, Clarification and Chlorination Treatment Compartments in an AWTS

The capacity of the aeration, clarification, chlorination, effluent storage and pump chamber are determined according to manufacturers design criteria based on recognised engineering standards. The sizing takes into account factors relating to hydraulic, organic, surge and peak loadings, detention times, treatment process and process residues, volumetric requirements for diffusers, media, pipework, pumps and other appurtenances.

An aerated wastewater treatment system receiving all waste discharges from a residential dwelling must be designed to handle:

- hydraulic load
  - 150 litres per person per day in urban and rural living zones and
  - 300 litres per person in Aboriginal Housing in Remote Area Communities
- organic load
  - 50 grams BOD_5 per person per day ex the primary treatment compartments (septic tank) in both Urban/Rural Living Zones and Aboriginal Housing in Remote Area Communities.

Based on a 3 bedroom (2 persons per bedroom) dwelling the system will have a:-

- 900 litres per day (6 x 150 l/p/d) hydraulic load and 300 grams per day BOD5 organic load in urban and rural living zones.
- 1800 litres per day hydraulic load and 300 grams per day BOD5 organic load in Aboriginal Housing in Remote Area Communities.

This assumes standard sanitary fixtures, no spa bath in excess of 120 litres and no food waste disposal unit. Non standard fixtures are permitted with the following modifications to the secondary treatment compartments of the AWTS.

8.4.3 Spa Baths

Sizing of the secondary treatment capacity and the irrigation area is dependent on the capacity of the spa bath, although there is no alteration to BOD5 loading (See Section 5.5.2).

Example:
A system designed for a 3 bedroom residential premises located in an urban/rural living area (all waste) with a spa bath of 300 litres capacity requires an AWTS designed for a hydraulic loading of 1150 litres per day:

ie.	3 bedroom = 6 people x 150 litres/day	= 900 litres/day
	Spa bath	= 250 litres/day
	TOTAL	= 1150 litres/day

8.4.4 Food Waste Disposal Units (FWDU)

The installation of a FWDU in a domestic premises is not recommended. The installation of a FWDU requires the installation of a system having a larger primary and secondary treatment capacity and may require a larger disposal area depending on use conditions.

Details of the primary treatment capacities are detailed in Sections 5.4 and 5.5 of this document.

The increased loadings imposed on the secondary treatment unit for the use of a FWDU are as follows:

- hydraulic loading increase by 10%
- organic loading increase by
  - non domestic/residential premises 33%
  - restaurants/dining/meals areas 50%

Example

A restaurant (no liquor licence) catering for a maximum of 100 meals per day requires an aerated wastewater treatment system which is designed to handle a hydraulic and organic load, including a food waste disposal unit (FWDU), as follows:

- Loading Requirements - Organic (See Appendix E)

  10 grams BOD5 per meal (assume I meal = l person)
  20 grams BOD5 per employee (See Appendix D)
  -sludge scum rate (S) "
  35 litres/person "
  - hydraulic (DF) "
  15 litres/person

- System Requirements
  Use formula (P1 x S x Y) + (P2 x DF) from Appendix D
  - primary treatment (septic tank)
  P1 = 100 persons + 4 staff = 104 persons (patrons & staff)
  S = *sludge scum (SC)* = 35 litres/person/year

  Patrons/Staff = 104 x 35 = 3640 litres
  FWDU = 104 x 17.5 = 1820 "

  TOTAL = 5460 litres

As greater than 5 000 litres for I year, desludging frequency can be every 2 years

Using Appendix D and (P1 x S x Y)
5 460 x 2 = 10 920 (SC)
daily inflow rate (H) = P2 x DF
104 x (15 + *1.5)* total capacity = 1 716 litres includes 10% H for FWDU
total capacity = 12 636 litres

- hydraulic H (secondary treatment unit)
100 persons + 4 staff = 104 persons
104 x (15 litres + *1.5)* **= 1 716 litres** includes 10% H for FWDU

- organic (O) (secondary treatment unit)
100 persons x (10 + 5) = 1500 grams includes 50% O for FWDU
4 staff x 20 = 80 grams
total organic = 1580 grams

8.4.5 Multiple Occupancy Residential Premises (in urban/rural living zones)

For *multiple occupancy residential premises* such as units, townhouses and flats the sizing of *the secondary treatment* requirements for the aerated wastewater treatment system is based on the total number of bedroom plus one bedroom with 2 persons per bedroom.

Example :

Four by two bedroom units (no spa baths or food waste disposal units)

4 units x 2 bedroom	=	8 bedrooms
8 bedroom plus I bedroom	=	9 bedrooms
9 bedroom x 2 person/bedroom	=	18 persons

System Capacity

18 x 150 litres	=	2 700 litres
and 18 x 50 grams	=	900 grams (from Appendix E)

However, if the same units each had a *370 litre spa bath and a Food Waste Disposal Unit* (FWDU) the system including primary capacity would be sized as follows:

primary capacity (based on 4 year desludging frequency)

- *sludge l scum*

18 person x 80 litres/person/year x 4 year desludging period	=	5760 litres
+ 18 person x 40 litres (50% for FWDU) x 4 year desludging period	=	2880 litres
TOTAL	=	8640 litres

hydraulic

18 person x 150 litres	=	2700 litres
4 spa baths x 250 litres (See Section 5.5.2)	=	1000 litres
Total primary tank capacity	=	12 340 litres

secondary hydraulic capacity

- 18 person x 150 litres/person/day	=	2 700 litres
- 4 spa baths x 250 litres	=	1000 litres
Total secondary hydraulic load	=	3 700 litres

secondary organic capacity

18 person x 50 grams	=	900 grams
+ 18 x 16.5 (33% of 50 grams for FWDU)	=	297 grams
TOTAL	=	1 200 grams (rounded)

Therefore system capacity would be

- primary (sludge scum & hydraulic) 12 340 litres
- secondary hydraulic 3 700 litres
- secondary organic 1 200 grams
- irrigation area = 3700 Litres ÷ 4.5Litres/m^2 = 822m^2

For non-domestic (commercial) applications, the size of the AWTS is dependent on the:

- hydraulic loading,
- organic loading,
- flow balance or surge control.

Refer to Appendix D for details of the various hydraulic flow requirements by use or activity.

It may be necessary to add the various amounts to arrive at the total hydraulic and organic loading. Where Appendix D does not specifically list the type of premises or activity, it may be necessary to select a like use/activity and use that figure and adjust accordingly. The CMO reserves the right to require additional data to substantiate the nominated loadings and/or vary such loadings.

8.4.6 Flow Balancing or Surge Control

Larger capacity AWTS may be required where the hydraulic system loading is highly variable and where systems do not incorporate flow balancing.

All AWTS approved for use in the Northern Territory are rated on a maximum hydraulic and organic loading.

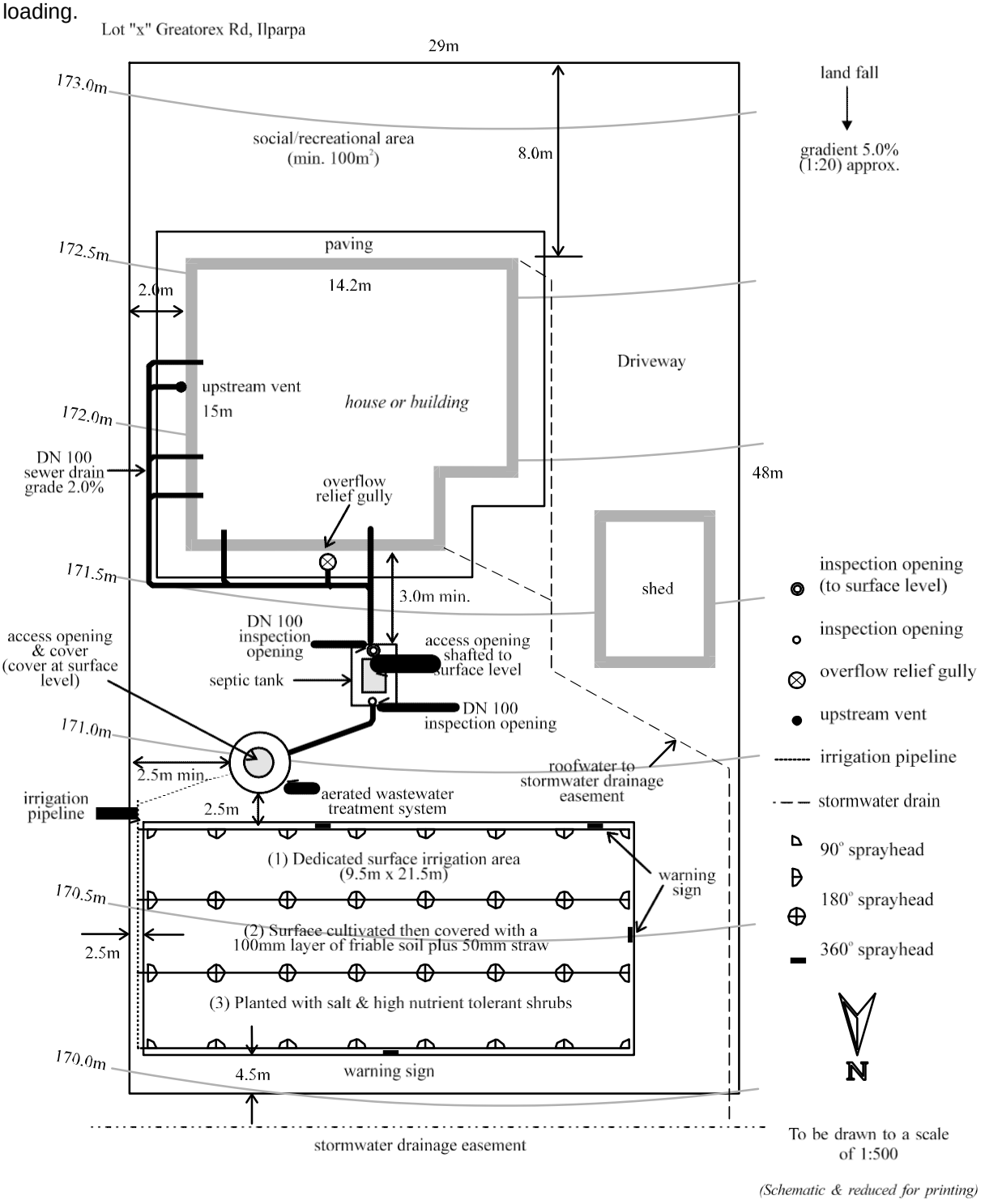
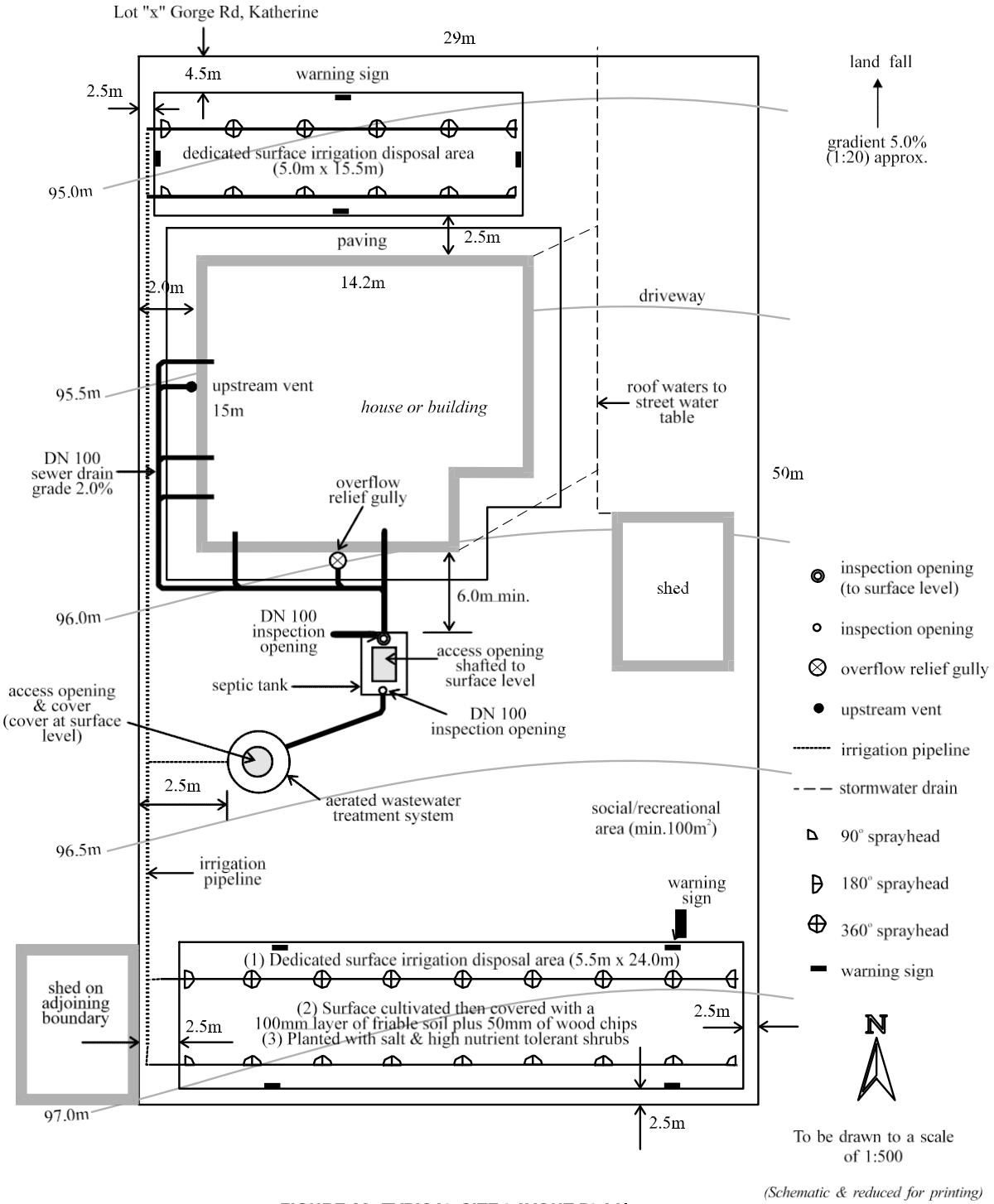


**FIGURE 27: TYPICAL SITE LAYOUT PLAN -
TWO TANK SYSTEM - SINGLE IRRIGATION AREA**



(Schematic & reduced for printing)

**FIGURE 28: TYPICAL SITE LAYOUT PLAN -
TWO TANK SYSTEM - SPLIT IRRIGATION AREA**

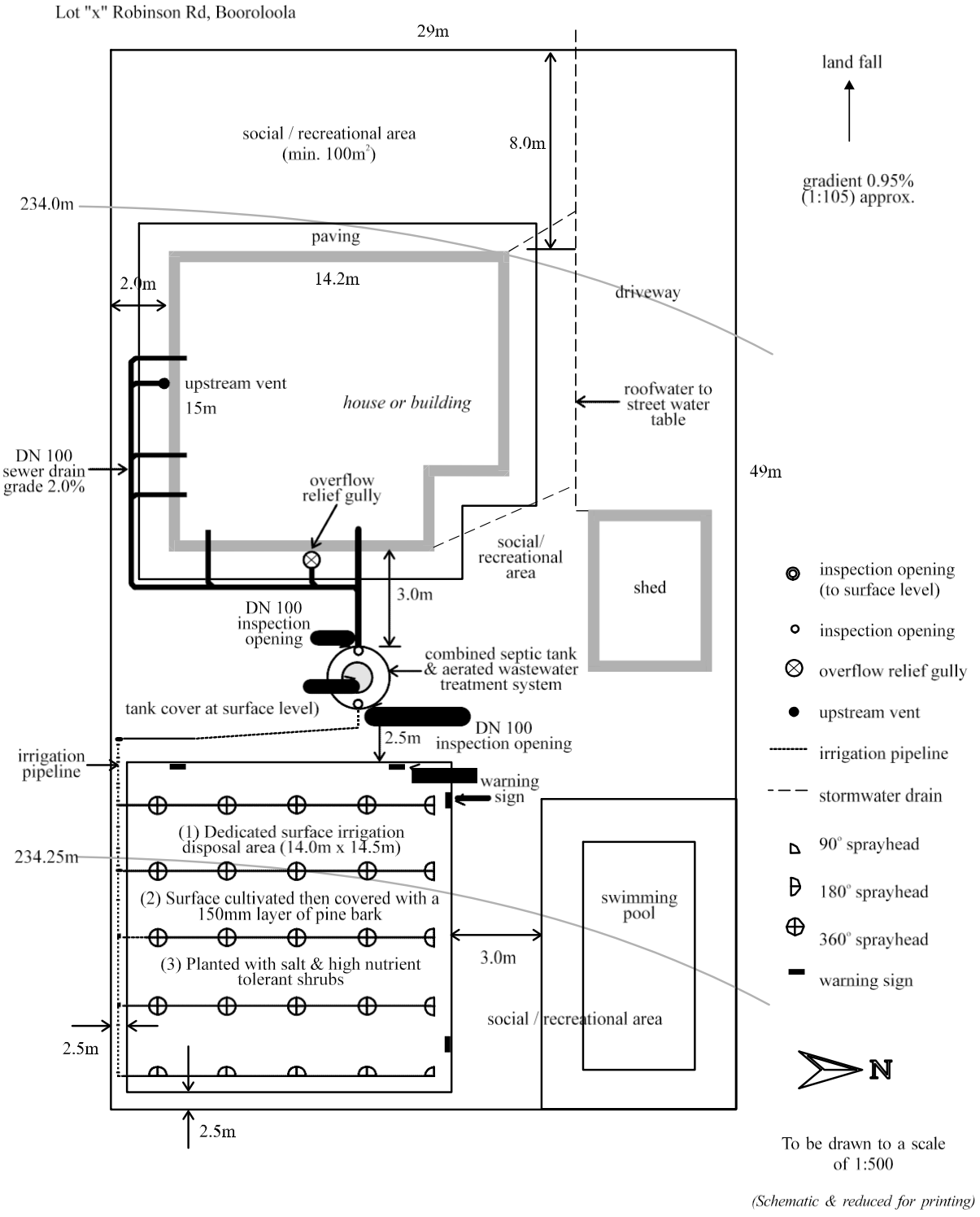


FIGURE 29: TYPICAL SITE LAYOUT PLAN - SINGLE TANK SYSTEM

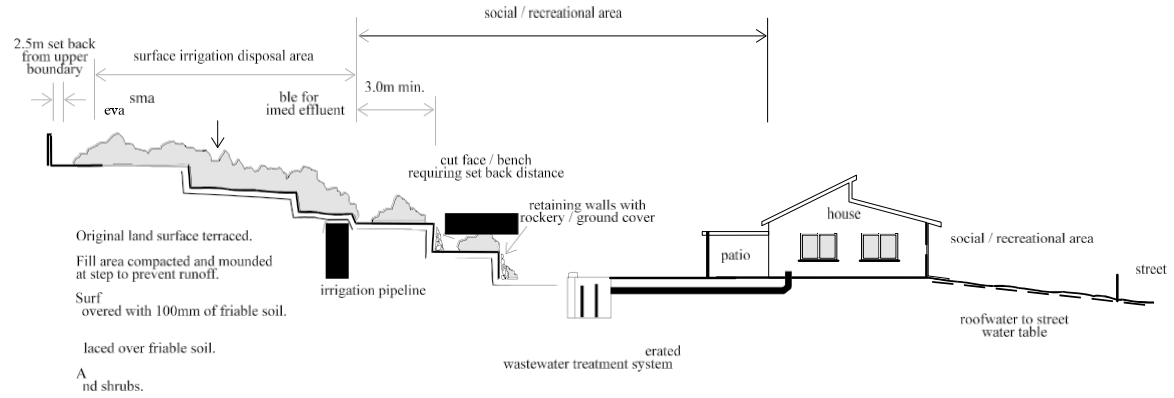


FIGURE 30: TYPICAL SECTION THROUGH CUT / BENCHED SITE

8.5 AERATED WASTEWATER TREATMENT SYSTEM INSTALLATION

8.5.1 Installation Requirements

The AWTS must be installed so that the cover and access openings are at least 100-150mm above the finished ground level.

All junctions between the wall of the tank, shaft/riser/ring and cover must be sealed water-tight. The first junction must be at least 300mm above the usual working level of the tank. A shaft/riser/ring used to raise the cover and access openings to the surface must be constructed of the same material, diameter, and thickness as the walls of the tank.

Where separate primary and secondary treatment tanks are used, they must be installed on a level compacted/solid base. The tanks must be spaced so that ground movement will not result in structural damage or loss of integrity of the base support of the shallower tank. No part of either tank must be closer than 2 metres to the other except where both tanks are installed on undisturbed bedrock or on a reinforced concrete base.

The backfill around the deeper tank must be sufficiently compacted to prevent movement or collapse of the ground below or around the shallower tank.

Connecting pipes between the two tanks must be laid in accordance with the National Plumbing Code AS 3500, Part 2, Sanitary Plumbing and Sanitary Drainage.

Landscaping of the finished ground surface must be graded down and away from the cover of the AWTS to prevent the ingress of surface water through the access openings.

A notice in the form prescribed by the Chief Medical Officer and containing such information about the system as required by the CMO, shall be permanently affixed to the inside door surface of the meter box of the building being serviced by the system.

8.5.2 Electrical Components

Electrical controls, blowers, compressors and non-submersible pumps must be located above ground in non-traffic areas and be firmly secured using anti-vibration mountings in a well ventilated weather-proof housing. Electrical devices should be housed to minimise noise emissions. All wiring must be installed by an appropriately licensed electrical worker and all electrical connections shall comply with the requirements of the Power and Water and AS 3000, SAA Wiring Rules.

8.5.3 Alarm Systems

All AWTS must be provided with an alarm to indicate an electrical or mechanical malfunction. The alarm must comprise audible and visible (indicator light) components, with muting facilities for the audible component For domestic systems the alarm indicators must be positioned inside the building, preferably in the kitchen or laundry.

For multiple occupancy residential premises, an indicator light and audible alarm, with muting facilities for the audible component, must be provided in the kitchen or laundry of each residence, with an external flashing visible alarm in a suitable location to indicate a system malfunction.

For commercial and industrial premises, an indicator light and audible alarm, with muting facilities for the audible component, must be provided in a prominent location inside the building with an external flashing visible alarm provided in a suitable location to indicate a system malfunction.

8.6 SURFACE IRRIGATION DISPOSAL AREA

The surface irrigation disposal area must be dedicated to the sole use of receiving reclaimed effluent. The area must be landscaped, preferably with shrubs and trees and should be designed to discourage pedestrian and vehicle access. The surface irrigation disposal area must be correctly maintained at all times to maximise its evapo-transpiration and absorption capability.

See Section 11 for specific conditions of effluent reuse and further information

NOTE

(1) Where the only source of water is rainwater or carted water the minimum area required will be based on a hydraulic flow of 125 litres/person/day.

(2) Where the land gradient is greater than 10% (1:10) and it is practicable, the surface irrigation disposal area may need to be modified by benching or bunding etc. or increased in size to enable satisfactory disposal of the reclaimed effluent.

(3) Drip irrigation OR subsurface disposal will be mandatory if the land gradient is greater than 20% (1:5). See Section 11 for further details.

(4) On some sites it may be necessary to require tertiary treatment of the effluent to control the quality of the effluent. It may also incorporate backflushing devices to maintain the subsurface disposal system.

8.6.1 Sizing of the Disposal Area

The size of the irrigation disposal area is dependent on the type of irrigation proposed. For spray irrigation, the size of the area required is generally found by dividing the total daily inflow by 4.5 litres per square metre per day (4.5 L/m^2/d). See Section 7.7 and Appendix D for calculations.

The only exceptions to the above disposal area requirement is when either an evapotranspiration system (see below) or sub-surface/sub-strata dripper irrigation system is the proposed method of disposal (Section 8.7.1).

Therefore a typical AWTS sized to service a 3 bedroom (6 person) dwelling provided with standard plumbing fixtures requires the allotment to have *at least 200 m^2* of land ie (6 persons x 150L/p/d) ÷ 4.5 L/m^2/d. This 200 m^2 irrigation area is in addition to 100m^2 required for social and recreational purposes. These systems are not therefore considered appropriate for individual use on small allotments. The 300 m^2 required does not include the area required for the dwelling, sheds, carport, driveways, access paving, setback distances and the AWTS.

8.6.2 Evapotranspiration

Disposal of effluent by evapotranspiration is permitted when the evaporation rate exceeds the amount of precipitation and total hydraulic inflow. It will be necessary to obtain long term monthly average rainfall and pan evaporation rates from the Bureau of Meteorology. When effective evapotranspiration for any month of the year is not a positive value, absorption of effluent must be the means of disposal. For further information see the water equation detailed in AS1547.

A greater irrigation application rate may be applied for this method of disposal subject to the above calculations being made and appropriate landscaping of the surface irrigation area to prevent effluent runoff eg 6 L/m^2/d.

8.7 SURFACE EFFLUENT IRRIGATION / DISPOSAL OPTIONS

There are a number of surface effluent irrigation/disposal options available which are dependent on the
effluent quality achieved, proximity to dwellings, public access and potential exposure to effluent etc.

The various surface effluent irrigation / disposal options are as follows:

- **unrestricted surface irrigation subject to maintaining the effluent quality standards listed in Section 11.5 and conditions listed in Section 11.6.1 and 11.6.2,**
- **disposal or reuse in accordance with Section 11.7, depending on effluent quality,**
- **deep sub-surface disposal in accordance with Section 7,**
- **shallow sub strata/sub-surface disposal (dripper irrigation) of effluent from AWTS servicing dwellings in accordance with Section 8.8.**

8.8 SUB STRATA/SHALLOW SUB SURFACE DISPOSAL

The following standards are specific to the use of dripper irrigation effluent disposal systems servicing *single domestic premises*.

Standards for industrial and commercial premises shall be as detailed below except that the disposal areas shall be calculated by dividing the total daily inflow by 4.5 litres/m^2/day

The two dripper systems permitted are sub-strata and sub-surface dripper systems. Exposed above ground dripper systems are not permitted.

A ***sub-strata dripper irrigation system*** involves the placement of the irrigation pipework on top of the ground surface and then covered by a minimum of 100mm of scoria, pine bark, woodchips, hay, mulch or other similar absorbent materials. See **Figure 31** which details the installation requirements for various soil types.

A ***sub-surface dripper irrigation system*** involves the burial of the irrigation pipework to a minimum depth of 150mm below the ground surface. See **Figure 32** which details the installation requirements for various soil types.

8.8.1 Sub Strata/Shallow Sub Surface Disposal Area

The disposal area requirements for sub strata/shallow sub surface dripper irrigation systems in urban and rural living zones, shall comply with the following:

Sandy Soils *****

1 - 2 bedrooms	60 m^2
3 bedrooms	80 m^2
4 bedrooms	90 m^2
5 bedrooms	100m^2

All other soils *****

Up to 3 bedrooms	150m^2
4 - 5 bedrooms	200m^2

***** These areas shall be doubled for aboriginal housing in remote area communities.

8.8.2 Sub Strata/Shallow Sub Surface Disposal Area - Installation Conditions

1. The disposal area shall not be located in a flood prone area.

2. The disposal area shall be maintained as a permanent dedicated area for the purposes of effluent disposal. The disposal area shall be a passive area (not subject to human traffic).

3. Ground water during all seasonal conditions must be not less than 0.5m from the ground surface.

4. All storm or surface waters must be diverted away from the disposal area and cut off drains shall be installed where seepage of the disposal area is likely to occur.

5. Where the proposed irrigation area has a slope greater than 1 in 20, the area shall be terraced and designed to prevent run-off from the disposal area.

6. Effluent disposed by dripper irrigation shall be chlorinated to prevent organic growth in the distribution pipework and fittings.

7. The sub-strata dripper irrigation area shall be planted out prior to use with suitable plants or shrubs (See Appendix B).

8. A 100mm cover of scoria, pine bark, woodchips, hay, mulch or other similar absorbent material shall be maintained over a sub-strata irrigation area at all times.

9. No part of the disposal area shall be paved or built over. The disposal area must be maintained in such a manner to provide access for maintenance.

10. Vegetables shall not be grown in any part of the disposal area.

11. All polyethylene pipework and fittings used in the irrigation area shall comply with AS2698.

12. There shall be at least 2 signs erected in the surface irrigation disposal area in accordance with AS 1319, warning that effluent is being used and that it is not suitable for human contact / consumption. Alternatively, the signs shall be on a white background with red lettering at least 20mm high. The sign shall state "RECLAIMED EFFLUENT, DO NOT DRINK, AVOID CONTACT".

13. No part of the disposal area shall be altered by any person without the approval of the Chief Medical Officer.

14. The minimum width of a landscaped area designated to accommodate a sub strata or shallow sub surface drip irrigation area shall be 2 metres.

15. Establishing a sub strata or shallow sub surface drip irrigation area upslope (i.e. gradient greater than 1:100) of a building may have implications for the structural integrity of the building. This issue is beyond the scope of this section and should be examined by a building professional on a site-by-site basis.

16. The applicant must demonstrate to the Department of Health compliance of the sub strata or shallow sub surface drip irrigation area with the setbacks in 8.9 and that the irrigation area is of sufficient size to accommodate the effluent discharged from the Aerated Wastewater Treatment System (AWTS) without causing a public health or environmental nuisance. These details must be documented on a scaled site plan included with the site-specific design approval application showing setbacks to all site features, irrigation layout, and method of sizing the irrigation. Failure to provide these may negate the Department of Health's assessment of the site specific design approval.

17. For the purposes of sizing the substrata or shallow subsurface drip irrigation area, the minimum flow rate from any commercial or industrial development shall be 450 litres per day. Daily flow rates exceeding 450 litres daily flow require the sizing of the irrigation area to be calculated using Appendix D of the Code.

18. Each drip irrigation line shall have a maximum nominal width of infiltration of 1 metre, i.e. 500 mm each side of the drip irrigation line. Therefore a 50 metre length of drip irrigation line shall be calculated as having a 50m^2 irrigation area.

19. All irrigation pipes and fittings should comply with AS/NZS 4130 and AS/NZS 4129 or with AS/NZS 1477.

20. The use of garden hoses and fittings is not permitted. Drip irrigation lines should be of purple colour to indicate sewage.

21. To avoid effluent pooling, drip irrigation lines should be laid level and must be spaced a minimum 1 metre apart.

22. Sub strata or shallow sub surface drip irrigation (including any supply or return header lines connected to the AWTS) must be designated for the sole use of the land application of effluent and must not connect to the reticulated water supply. These components must be fully exposed to the elements and be clear of any structures (including shade cloth structures), paving, bitumen, concrete slabs, storage facilities, etc.

23. Irrigation areas must be landscaped with appropriate nutrient reducing plants and maintained accordingly.

24. All AWTS treated effluent must be contained within the property boundaries and must not cause a public health or environmental nuisance.

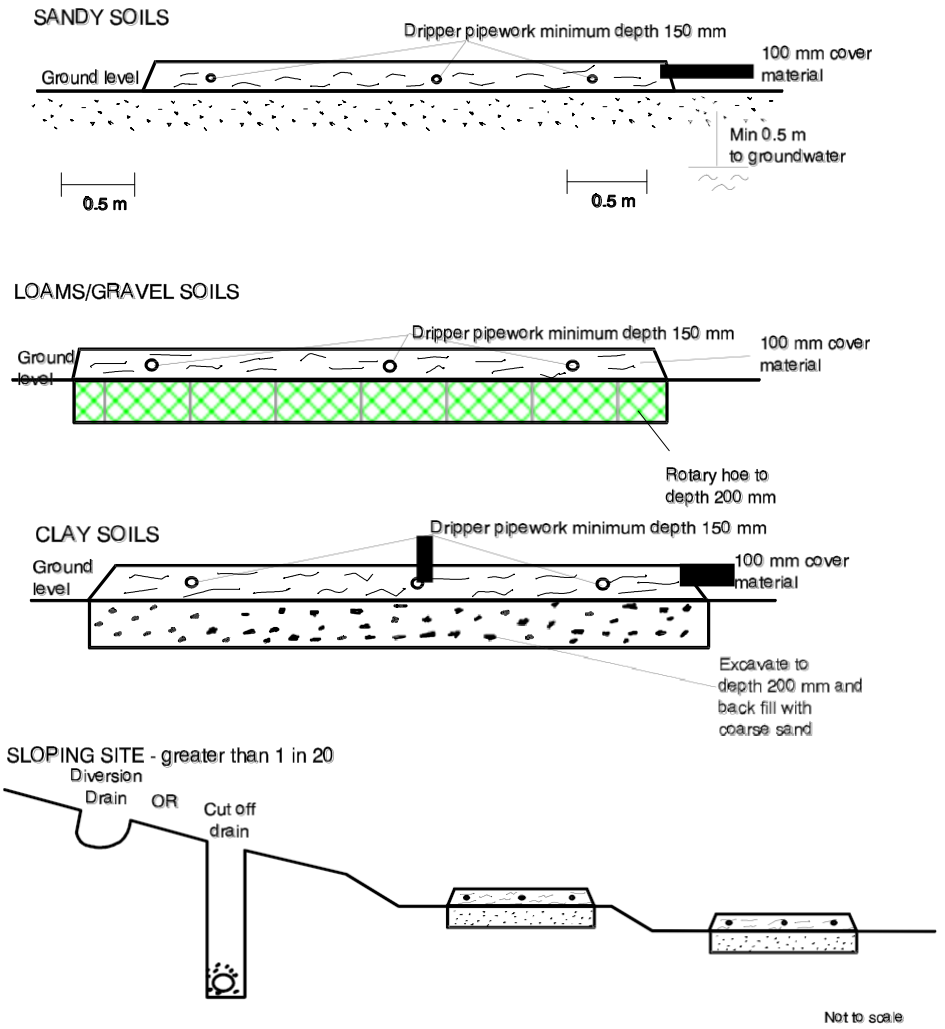


FIGURE 31: SUB-STRATA DRIPPER IRRIGATION SYSTEM

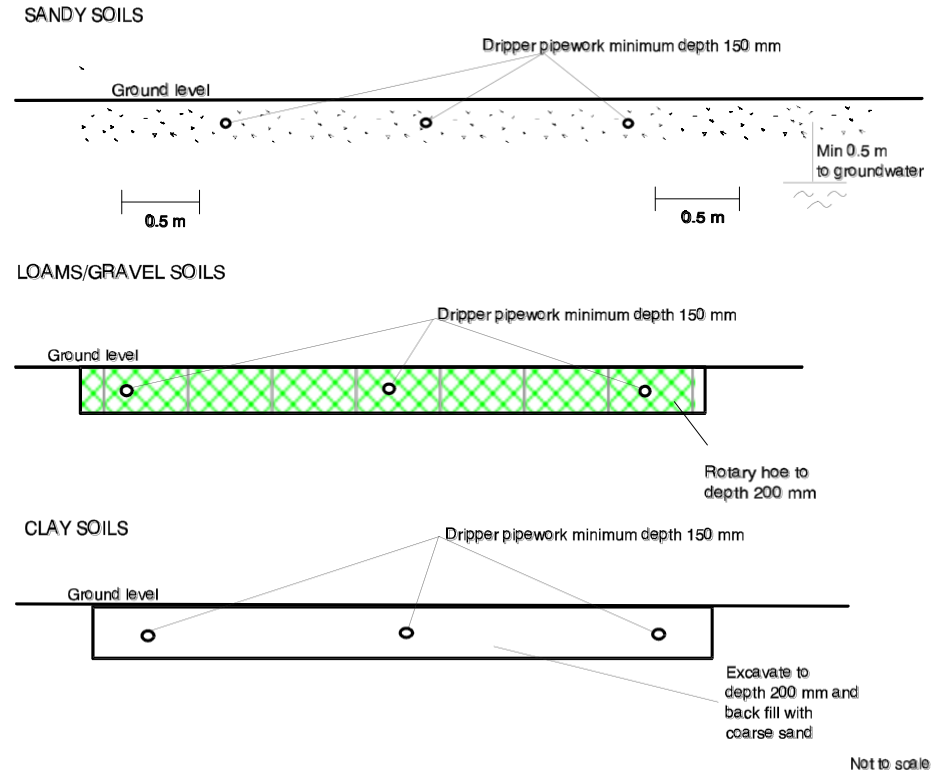


FIGURE 32: SUB-SURFACE DRIPPER IRRIGATION SYSTEM

8.9 SITING AND SETBACK DISTANCES FOR AERATED WASTEWATER TREATMENT SYSTEMS

8.9.1 Siting of AWTS

Establishing a surface or sub strata/shallow sub surface drip irrigation area upslope (i.e. gradient greater than 1:100) of a building may have implications for the structural integrity of the building. This issue is beyond the scope of this section and should be examined by a building professional on a site-by-site basis.

The AWTS and associated irrigation area should not be sited on land subject to flooding.

8.9.2 Surface Irrigation

A range of minimum setback distances for AWTS are necessary in order to protect buildings, structures and adjoining properties. See Figures 27-30 and Section 7.5, for general setback distances from the closest point of the surface effluent irrigation area to the surface features.

Exceptions to Section 7.5 include an AWTS's surface effluent irrigation area being a minimum of:

- thirty (30) or fifty (50) metres from a bore, well or water courses used for human or animal consumption for chlorinated and unchlorinated effluent respectively
- fifteen (15) metres from rainwater tanks
- 2.5 metres from any boundaries or buildings.

8.9.3 Sub Strata/Shallow Sub Surface Irrigation

Shallow sub strata or shallow sub surface drip irrigation areas (i.e. drip irrigation lines) must not be located within:
thirty (30) or fifty (50) metres from a bore, well or water courses used for human or animal consumption for chlorinated and unchlorinated effluent respectively

- 1.5 metres from rainwater tanks
- 1.5 metres of a building
- 0.5 metres of property boundary
- 0.5 metres of a driveway or paved surface
- 3.0 metres of an open drain
- 1.0 metre of a swimming pool.

8.10SYSTEM OPERATION & MAINTENANCE

AWTS are not generally suited for intermittent use and consequently, type and installation approval will only be granted for a system designed to be operated in accordance with the manufacturer's recommendations.

The use and discharge of strong alkalis, oils, acids, bleaches, disinfectants, chemical detergents, pesticides and herbicides to the primary and secondary treatment compartments should be avoided in order to ensure that system operation is efficient and trouble-free. Where biodegradable cleansers are used, the manufacturers recommendations should be followed (See Section 5.3).

The maximum daily flow should not be exceeded nor the system subjected to shock loads eg by using the shower or bath and washing machine at the same time. Wherever possible, large loads should be minimised, preferably by washing smaller loads at more frequent intervals. Should surge loading become a problem it may be necessary for a balancing compartment to be added to the AWTS. As an alternative, effluent can be pumped from the AWTS to a holding/storage tank before distribution to the surface irrigation disposal area or other disposal as approved. Sufficient chlorine must be added to the effluent to ensure at least 0.5 mg/litre free residual chlorine in the holding/storage tank.

If the biological activity of the system is affected, by surge loading and/or chemicals, then there will be a reduction in the quality of the effluent, requiring the system to be re-balanced by the manufacturer's service agent.

8.10.1 Free Residual Chlorine

The effluent must have at least *0.5 mg/ litre of free residual chlorine* at the first point of discharge on the surface irrigation disposal area ie. first spray head or dripper.

An Environmental Health Officer reserves the right to inspect individual systems and to conduct any tests to confirm compliance with regulatory and/or approval requirements.

8.10.2 Unit Maintenance

It is an offence under the Public Health Act to discharge untreated or treated effluent to the environment without the consent of the Chief Medical Officer. Legal action may be taken against persons discharging or allowing the discharge of untreated or treated effluent above the ground surface without the consent of the Chief Medical Officer.

The AWTS must be maintained at all times by the owner to ensure that the following requirements are satisfied:

- effluent from the system must comply with the discharge criteria,
- irrigated effluent must be suitably disinfected or chlorinated to the minimum "residual free chlorine" standard as measured at the first point of discharge within the irrigation area,
- the irrigation system is maintained in such a manner that it does not create environmental nuisance and or risk to public health. Maintenance is required to prevent the occurrence of spray drift, misting, pooling and run-off from the surface irrigation disposal area.

The septic tank compartment of an AWTS must be desludged in accordance with Section 5.4.3 Some manufacturers of AWTS recommend desludging more frequently.

An existing septic tank connected to an AWTS must be desludged prior to the commissioning of the system.

In the event of the owner failing to operate the AWTS and irrigation system in accordance with the above conditions, or allowing the system to operate in a manner prejudicial to public health, an Environmental Health Officer may:

- impose sampling of the effluent with the user (owner or occupier) bearing all sampling costs,
- require modification of the system,
- require replacement of the AWTS,
- require the removal of the effluent from the site by tankerage for final disposal in an approved manner and location,
- institute legal proceedings under the Public Health Act.

The installer/supplier of the aerated wastewater treatment system is required to supply the owner/occupier with an *operating and maintenance manual.* The manual is to clearly detail the operation and maintenance procedures to be followed to ensure that the effluent conforms with the discharge criteria and provisions of this Code. The manual is to detail the procedures to be followed in the event of system malfunction.

8.10.3 Maintaining the Surface Irrigation Disposal Area

To prevent runoff and ensure that the surface irrigation disposal area operates at its maximum efficiency, a consistent 100mm minimum cover of friable soil, pine bark, wood chips, scoria must be maintained at all times as well as suitable plants capable of effecting a high evapo-transpiration rate.

PART- 3 AEROBIC SAND FILTERS

9.0 AEROBIC SAND FILTER APPLICATIONS AND APPROVALS

The administrative processes involved in the approval of individual aerobic sand filters and the requirements for installation approval are the same as for aerated wastewater treatment systems (AWTS) and are contained in the *Administrative Procedures.*

9.1 PRIMARY TREATMENT

All inflow effluent to the sand filter must be pre-treated through a septic tank of an approved capacity. The minimum size septic tank for a residential dwelling for up to 6 persons with standard plumbing fixtures is 2500 litres in urban and rural living zones **(See Table 1).**

Septic tanks discharging to the sand filter must be desludged in accordance with the sand filter manufacturer's operating instructions and type approval conditions. The normal desludging frequency is every four years for a dwelling serving up to 6 persons, although some sand filter manufacturers recommend that the septic tank be desludged more frequently. An existing septic tank connected to a sand filter must be desludged prior to commissioning of the system.

9.2 SIZING OF THE SAND FILTER

A sand filter is sized according to the hydraulic ***or*** organic load and must not exceed 50 litres hydraulic and 25 gram BOD5 per square metre of top surface area of the filter bed over 24 hours.

The sizing criteria for a sand filter receiving the discharge from an all waste septic tank servicing a domestic premises in an urban or rural living zone is:

150 litres hydraulic load per person per day,
50 grams BOD5 organic load per person per day,
25 grams BOD5 organic load per I m^2 top surface area,
50 litres hydraulic load per I m^2 top surface area.

The actual surface area is based on the higher of the two surface irrigation areas obtained from the organic and hydraulic load calculations.

Note: These figures may vary for other use conditions.

Example

The size of a sand filter receiving the discharge from an all waste septic tank sized for up to 6 persons, in an urban or rural living zone, is calculated as follows:

hydraulic load
6 persons x 150 litres per person = 900 litres / 50 litres per m^2 = 18m^2 top surface area
organic load
6 persons x 50 grams per person = 300 grams / 25 grams per m^2 = 12m^2 top surface area

As the hydraulic load is the greater amount, the sand filter size is 18m^2 top surface area.

9.3 NON STANDARD FIXTURES

Non standard fixtures such as spa baths and Food Waste Disposal Units (FWDU) are not recommended, although their use will result in modification of the sand filter size to take into account increased organic and hydraulic loadings.

Spa Baths

The sizing of the sand filter and the irrigation area is dependent on the capacity of the spa bath. Refer to Sections 5.5.2 and 8.4.3 for further information.

Example:

A system designed for a residential premises for up to six persons (all waste) ,with a spa bath of 300 litres capacity requires an aerobic sand filter system designed for a hydraulic loading of 1150 litres per day ((6 persons x 150 litres/person/day) + 250 litres) and provision of an irrigation area, calculated from Section 7.7.

Food Waste Disposal Units

Refer to Sections 5.5.1 and 8.4.4.

Details of the primary treatment capacities are found in Section 5.4, Table 1 and Appendix D.

The increased loadings resulting from the addition of a FWDU are as follows:

- hydraulic loading Increase by 10%
- organic loading increase by
  - domestic residential premises 33%
  - non- domestic residential premises 33%
  - restaurants/dining/meals areas 50%

NOTE: No increase required for the hydraulic flow where the food waste disposal unit is installed in domestic residential premises.

The following examples indicate the changes required for the following sanitary fixtures.

Example:

A residential premises for up to 6 persons (all waste) including a food waste disposal unit discharging into a sand filter system would require a capacity, when the absorption rate is rated at 4.5 Litres/m^2 as follows:

- 900 litres hydraulic (6 persons x 150 litres/day),
- organic loading of 400 grams BOD5 ((6 persons x 50 g/BOD) + 33%),
- 200m^2 irrigation area (900 litres/4.5 litres per m^2),
- Approx. 4000 litre primary (septic tank), (2500 + 50% sludge/scum allowance. See Section 5.5.1)
- sand filter size

Hydraulic $\frac{900 \text{ litres}}{50} = 18m^2$ Organic $\frac{400 \text{ grams}}{25} = 16m^2$

As the hydraulic flow has the greater area requirement, the sand filter size = 18m^2 top surface area.

Example:

A restaurant with no liquor licence catering for a maximum of 100 meals per day and for employees requires a sand filter system designed for the hydraulic and organic load including a food waste disposal unit (FWDU) as follows:

- loading requirements

  - organic
    10 grams BOD5 per meal (assume I meal per person),
    20 grams BOD5 per employee
  - sludge scum
    35 litres/person
  - hydraulic
    15 litres/person
  - absorption rate = 4.5 litres per m^2

- *system requirements*

primary (septic tank)

100 persons + 4 staff	= 104 persons
sludge scum	
104 x (35 + 17.5 litres)	= 5 460 litres (includes 50% for sludge scum)
As greater than 5 000 litres for 1 year, desludging frequency is 2 yearly	
5 460 x 2	= 10 920 litres sludge scum capacity
hydraulic	
104 x (15 + 1.5 litres)	= 1716 litres (includes 10% hydraulic)
Total primary capacity	= 12 636 litres

hydraulic (sand filter)

100 persons + 4 staff	= 104 persons
104 (15 + 1.5 litres)	= 1716 litres (includes 10% for FWDU)

organic (sand filter)

100 persons x (10 + 5 grams)	= 1500 grams (includes 50% for FWDU)
4 staff at 20 grams	= 80 grams
Total organic	= 1580 grams

sand filter size

hydraulic 1716 / 50 litres	= 34.3m^2
organic 1580 / 25 grams	= 63.2m^2

As the organic load has the greater area requirement the sand filter size = 63m^2 top surface area.

Additional data on hydraulic loadings of various use conditions are contained in Section 5.4, Table 1 and Appendix D. It may be necessary to add the various amounts to arrive at the total hydraulic and organic loadings. Where Appendix D does not specifically list the type of premises or activity, it may be necessary to adjust accordingly and select a like use/activity and use that figure.

9.4 FILTER SAND SPECIFICATION

Only filter sand conforming with the following criteria must be used:

- the effective sand particle size must not be less than 0.25 mm and not greater than 0.6mm,
- the sand must have a uniformity co-efficient of less than 4,
- the sand must contain less than 5% volume of clay and fine silts as determined by the test method in Section 33 of AS 1141.

Where the,

Effective Size = maximum particle size of the smallest 10% (D 10) by mass of the sample,

Uniformity Co-efficient (UC) = the ratio of the maximum particle size of the smallest 60%(D 60) by mass of the sample to the maximum particle size of the smallest 10% (D 10) by mass of the sample,

$$\frac{D60}{D10} = UC$$

9.4.1 Filter Sand Certification

A guarantee must be provided by the supplier of the filter sand to the owner or installer, stating that the quantity supplied was adequate for the required sand filter size and that the sand supplied will satisfy the required filter sand specifications. This guarantee must be submitted to the relevant Environmental Health Office, in any application for installation approval or to a self certifying plumber and drainer who intends certifying the installation of the sand filter.

9.5 CONSTRUCTION REQUIREMENTS

9.5.1 The Distribution Pipes

The distribution pipes are required to evenly distribute the effluent over the entire sand filter bed and must comply with the following:

- the distribution pipes are to be DN90 smooth bore UPVC slotted storm water pipe (AS 1254),
- the slots in the distribution pipes are to be 6mm wide by 80mm long and be equally spaced at 120 degrees around the pipe with one slot located at the top of the pipe and the other slots at 30 degrees below the horizontal (see **Figure 34** for details),
- the slots within the distribution pipe are to be longitudinally positioned along the pipe axis at 200mm centres and terminate 100mm from the pipe ends,
- the total area of the slot openings is to be 4 800mm^2 for each metre length of pipe,
- the fittings used are to be solvent welded and must not be slotted,
- the pipes are to be laid level and are to be capped at the terminal end,
- slotted distribution pipes are positioned no closer than 500mm from the sand filter side and end walls,
- the distance between multiple runs of distribution pipes must not exceed one (1) metre centre to centre,
- the distribution pipes must be installed along the longitudinal axis of the pipe and across the horizontal axis of the slots and be hydraulically tested during installation to ensure a uniform discharge from each and all of the discharge slots,
- they are to be installed as required by this Standard and positioned as indicated in the detailed drawings (see **Figure 33**) and/or as shown on the approved plan.

9.5.2 Collection Pipes

The collection pipes are designed and installed to collect and transport the treated effluent from the sand filter bed to the collection / pump sump.

The design and installation of the collection pipes must comply with the following:

- the collection pipes are to be DN100 UPVC sewer grade pipe (AS 1415),
- multiple collection pipes are required at the ratio of one collection pipe for every two distribution pipes, except where three distribution pipes are used, then one collection pipe will suffice,
- slots in the collection pipe are to be 10mm wide through 180 degrees across the pipe and spaced at 200mm centres along the pipe and terminate 100mm from the pipe ends **(see Figure 34)**,
- the total area of the slot openings is 9000 mm^2 for each metre length of pipe and be faced downwards,
- the fittings used are to be solvent welded and are not to be slotted,
- the capped ends of the collection pipes must terminate 500mm from the inlet and end trench wall,
- pipes must be laid on a grade of 0.50%, except in the case of the interconnecting pipes,
- the base of the sand filter must be graded to discharge to a collection pipe. Where multiple pipes are utilised, these are to be connected to a common outlet,
- the collection pipes are to be installed as required by this Standard and positioned as indicated on the detailed drawings **(see Figure 33)** and/or as shown on the approved plan.

9.5.3 Plastic Liner

The plastic liner used in the construction of the sand filter must comply with the following:

- the plastic liner from the filter bed must be 0.5mm PVC sheeting and be suitable for use with effluent from primary treated sewage,
- all PVC sheeting must have the brand name and sheet thickness marked thereon and be installed with the name and thickness facing upwards and inwards,
- all joints shall be lapped and joined by high frequency welding in accordance with the manufacturer's requirements,
- the liner must be assembled prior to placement in the excavation and all corners must be formed by high frequency welding,
- all pipe/fitting penetrations through the liner must be sealed by taping on both sides in a manner recommended by the manufacturer of the liner material and be watertight,
- the liner must extend up to the finished ground surface,
- where the sand filter is to be installed on material such as rock or shale type soils the liner must be placed over a 75mm layer of clean sand suitable for concrete or bricklaying work,
- where the liner is damaged during installation it must be patched with a layer of parent material extending at least 150mm beyond the damaged area. The repair is to be sealed as for jointing and be watertight,
- the liner is not to be folded back over the top of the sand filter.

9.5.4 Distribution Box

A distribution box is required on the inlet to the sand filter and must be constructed of impervious materials as detailed in Section 7.13.

The base of the distribution box and the invert levels of the distribution pipe outlets must be constructed so as to be level within a tolerance of 0.5mm and ensure an even flow from the weir to each distribution pipe outlet. The distribution box shall terminate at least 100mm above the final finished ground surface level and be provided with a baffle as shown in Figure 36.

9.5.5 Collection / Pump Chamber (sump)

A collection/pump chamber (pump out pit) is required for the collection, chlorination and storage of the treated effluent prior to irrigation of a dedicated area. The sump must comply with the following:

- the chamber must be of a capacity to ensure adequate disinfection of the treated effluent at peak flow,
- where the collection pipe discharges into the chamber positioned adjacent to the sand filter bed a DN 100 inspection opening is to be provided on the collection pipe just prior to its discharge from the filter bed **(see Figure 35).** The inspection opening must be shafted to the surface level and be finished in accordance with the requirements as detailed in AS 3500-2 National Plumbing Code - Sanitary Plumbing and Sanitary Drainage,
- the chamber must be constructed of impervious materials so as to prevent the egress/ingress of treated effluent/water and be constructed of materials as outlined in Section 7.13 of this Code,
- the top of the pump out chamber must terminate at least 100mm above the ground surface level,
- the chamber must be emptied by an automatic electrically operated submersible pump of sufficient capacity to discharge the reclaimed effluent from the spray heads in the irrigation area. The top level of the treated effluent must be at least 100mm below the invert of the collection pipe where it discharges into the chamber with the alarm level being set 75mm below the invert level of the collection pipe **(see Figure 35)**,
- all electrical connections shall comply with the requirements of the AS 3000 SAA Wiring Rules,
- the chamber must be vented with a DN100 screened induct vent or similar alternative.

9.5.6 The Aggregate

All aggregates are to be clean hard quartz stone or other approved stone, be of the specified size range and be free of dust, dirt, loam, soft particles, organic matter or other foreign material and be suitable for use with septic tank effluent.

The aggregates and sand must be placed within the lined sand filter bed in such manner as not to damage the liner, collection and distribution pipes, inlet and outlet structures, distribution box and pump chamber.

9.5.7 Other General Requirements

The sand filter bed can be constructed on a 2:1 to a 10: 1 length to width ratio.

The minimum depth of the approved filter sand must be 750mm.

The inlet and outlet pipe trenches to and from the sand filter must be sealed to the trench wall and base for the full height of the trench using 100mm concrete keyed at least 75mm into the trench walls and base.

Where it is not possible to discharge by gravity to the sand filter within the limits of 25mm minimum to 825mm maximum from the top of the distribution pipes to the underside of the top layer of the 5-10mm aggregate then it will be necessary for the effluent to be pumped to the sand filter. This permits the sand filter to be installed to a maximum depth of 1165mm from the distribution pipe invert to the finished ground level (that is, top layer of 20-25mm aggregate can vary from a minimum of 200mm to 1000mm depth).

The top 50mm layer of 5-10mm aggregate of the sand filter must be covered with a *geotextile* having a minimum mass of 100g/m^2 prior to placement of the sandy loam layer.

A DN100 screened induct vent is required to be provided on the outlet pipe from the septic tank to the sand filter. Where a distribution box (sump) has ventilation provisions, it must be screened to prevent the ingress or egress of mosquitoes.

The sand filter must be protected from migrating surface and subsurface waters and be provided with mounds or cut-off drains to deflect water to an area beyond the sand filter. Sand filters are not recommended on sites having land gradients greater than 20% (1:5) unless designed and certified by a certifying design engineer.

The area over the sand filter can be planted with lawn or be covered with scoria, woodchips or pinebark, provided that there is no interference with the aerobic operation of the sand filter (only light watering should be provided for flora planted over the sand filter).

The top soil covering over the sand filter must be sandy loam only and be graded at 3.35% (1:30) across the top of the sand filter as shown on the drawings, see Figure 33.

The maximum depth of the sandy loam at the exterior edges of the sand filter bed must not exceed 200mm.

9.6 SAND FILTER PERFORMANCE AND DISCHARGE CRITERIA

The sand filter is to be constructed and operated to ensure the discharge of treated effluent to the collection/pump sump complies with the effluent quality parameters detailed in Section 11.5.

See also Section 11 " Reuse of Sewage Effluent" for further details.

9.6.1 Disinfection

All treated effluent collected and stored within the collection/pump sump must be disinfected with chlorine so as to provide a microbial standard of not greater than 10 faecal coliforms per 100ml (for surface discharge) and ensure a minimum of 0.5mg/litre free residual chlorine in the effluent at the first discharge point within the dedicated irrigation area; that is, the first spray head or dripper in the disposal area. Depending on the type of chlorine compounds used, retention times may vary from 30 minutes to 120 minutes at peak flow.

See also Section 11 " Reuse of Sewage Effluent" for further details.

9.7 ALARM SYSTEMS

An audible and visible alarm (indicator light) must be provided to warn of pump failure. The alarm must be positioned within the premises and be provided with muting facilities for the audible alarm. A suggested location for the alarm is either the kitchen or laundry.

For multiple occupancy residential premises, an indicator light and audible alarm, with muting facilities for the audible component, must be provided in the kitchen or laundry of each residence, with an external flashing visible alarm in a suitable location to indicate a system malfunction.

For commercial and non-domestic residential premises, an indicator light and audible alarm, with muting facilities for the audible component, must be provided in a prominent location inside the building with an external flashing visible alarm provided in a suitable location to indicate a system malfunction.

9.8 SURFACE IRRIGATION /DISPOSAL REQUIREMENTS

The requirements for aerobic sand filters are the same as those for aerated wastewater treatment systems (AWTS). See Sections 8.6 to 8.9 for specific requirements for:

- **surface irrigation /disposal options,**
- **sub strata/shallow sub surface disposal,**
- **sizing of the disposal area,**
- **setback distances.**

9.9 OPERATING REQUIREMENTS

See also Section 11 "Reuse of Sewage Effluent" for further details.

The system must be operated at all times to ensure that the following requirements are satisfied:

- the effluent from the sand filter complies with the discharge criteria detailed in Section 11.5. The irrigated effluent must be chlorinated to the minimum "residual free chlorine" standard as measured at the first point of discharge within the irrigation area,
- the irrigation system must be operated in such manner that it does not create environmental nuisance and/or risk to public health. Such operation must prevent the occurrence of spray drift, misting, pooling and run-off from the surface irrigation disposal area.

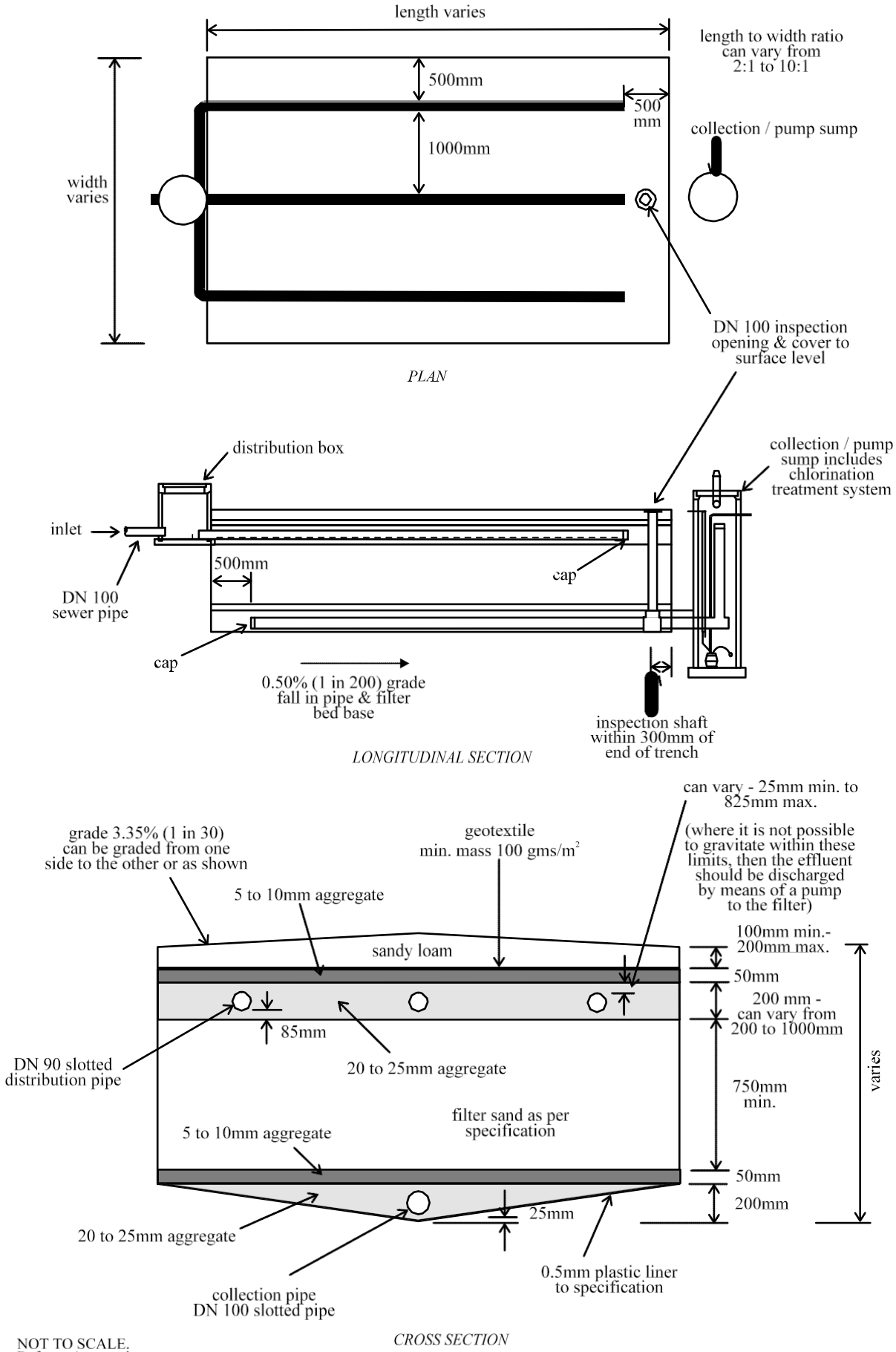
To ensure that the operation of the septic tank and sand filter system is efficient and trouble free, the use and discharge of strong alkalis, oils, acids, bleaches, disinfectants, chemical detergents, pesticides and herbicides to the system should be avoided. Where biodegradable cleansers are used, the manufacturer's recommendations should be followed.

In the event of failure to operate the sand filter system, septic tank and irrigation system in accordance with the above conditions, or operating the system in a manner prejudicial to public health, an Environmental Health Officer may:

- require modification of the system,
- impose sampling of the effluent with the user (owner or occupier) bearing all sampling costs,
- require replacement of the sand filter system, or require the removal of the effluent, treated effluent or effluent from the site by tankerage for final disposal in an approved manner and location,
- institute legal proceedings under the Public Health Act.

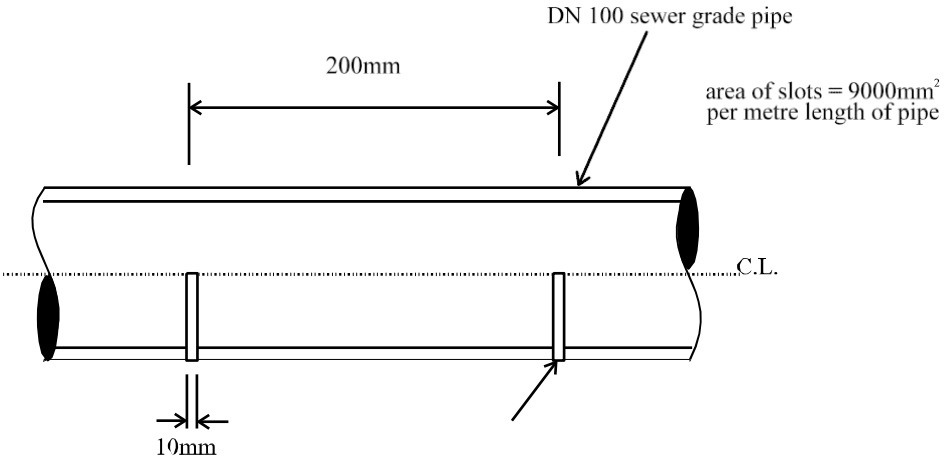
The installer/supplier of the sand filter system is required to supply the owner/occupier with an operating and maintenance manual. The manual is required to clearly detail how the system operates and the necessary maintenance procedures to be followed to ensure the inspection/distribution sump, sand filter, pump sump, chlorination, pump, pump high liquid level alarm, irrigation reticulation system and the dedicated irrigation area is operated to maintain the effluent at the required standard and to present the discharge of effluent beyond the designated irrigation disposal area. The manual is also required to indicate the procedures to be followed by the system user in the event of system malfunction.

NOTE: The relevant Environmental Health Office may impose additional requirements with respect to the installation of the sandfilter or its operation, depending on specific site conditions.

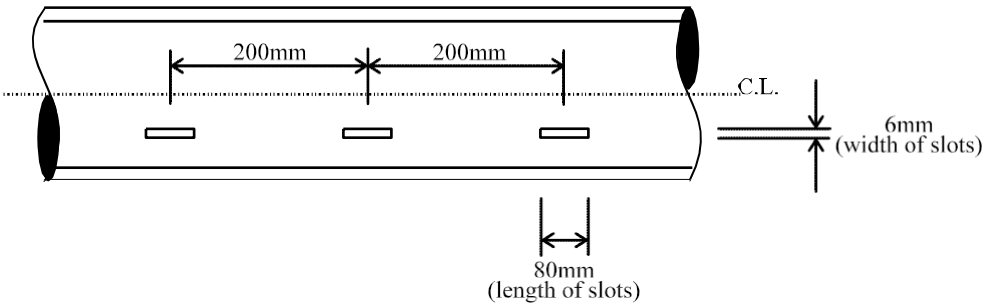


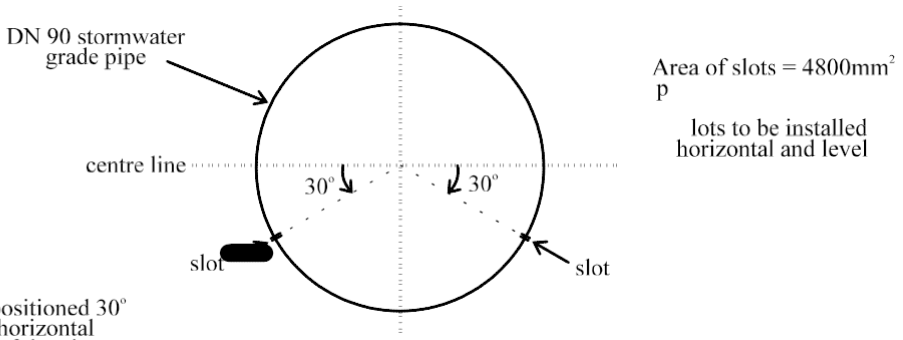
NOT TO SCALE.
Refer to Approval Conditions & Guidelines for specific details

FIGURE 33: SAND FILTER CONSTRUCTION LAYOUT



DETAIL OF SLOTS ON COLLECTION PIPE





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DETAIL OF SLOTS ON DISTRIBUTION PIPE

FIGURE 34: COLLECTION / DISTRIBUTION PIPE DETAILS

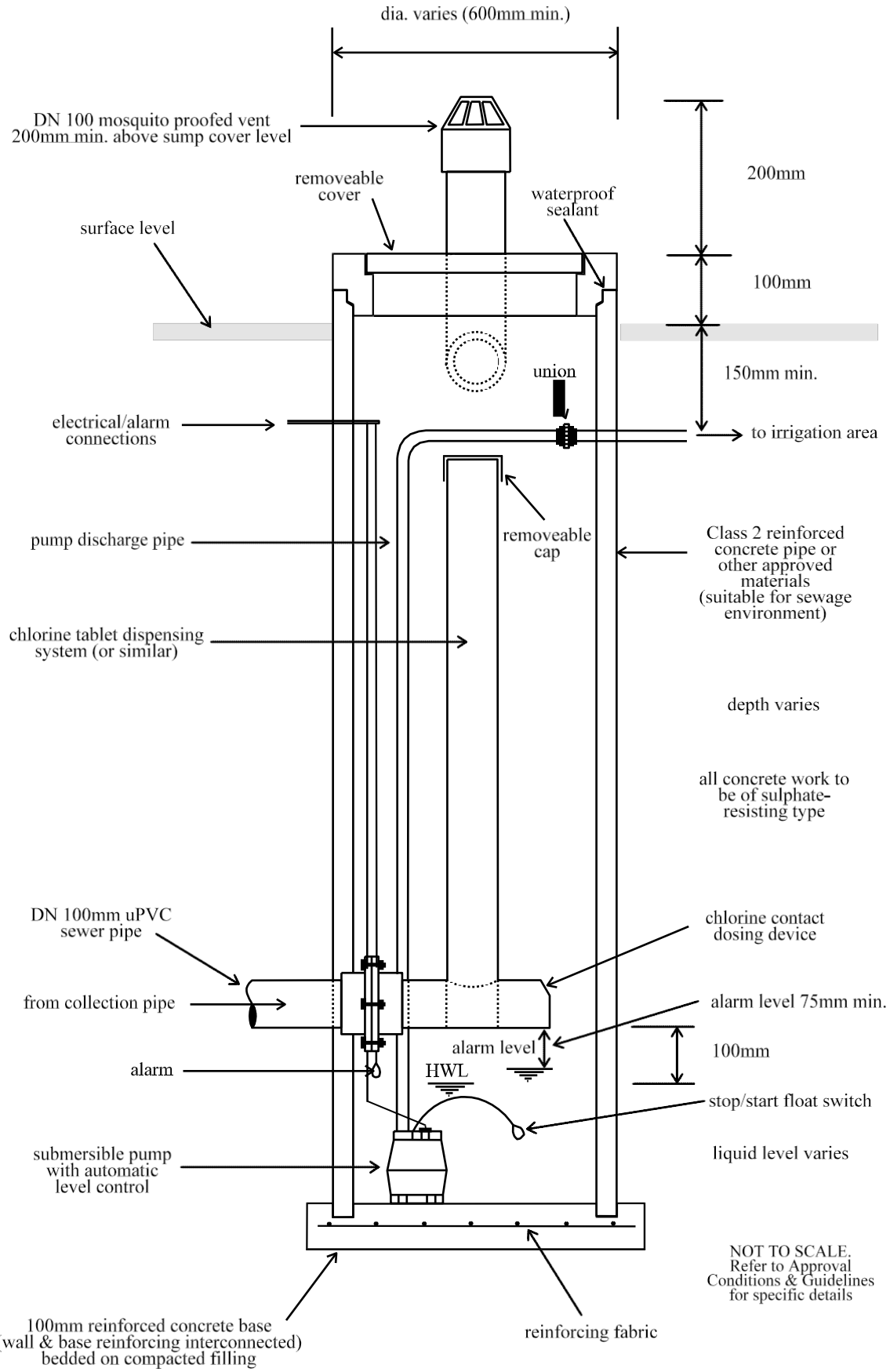


FIGURE 35: COLLECTION / PUMP CHAMBER (SUMP)

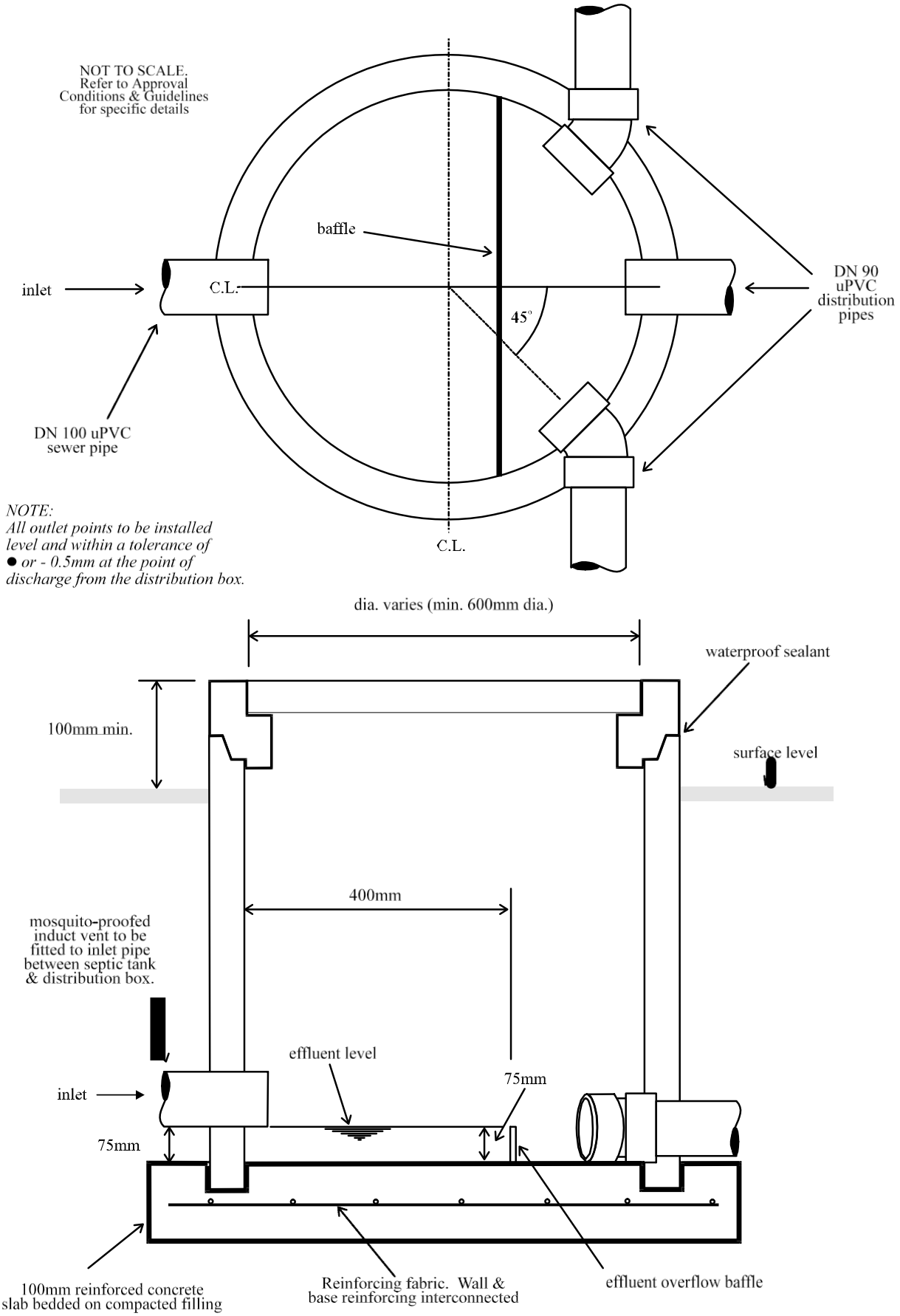


FIGURE 36: DISTRIBUTION BOX

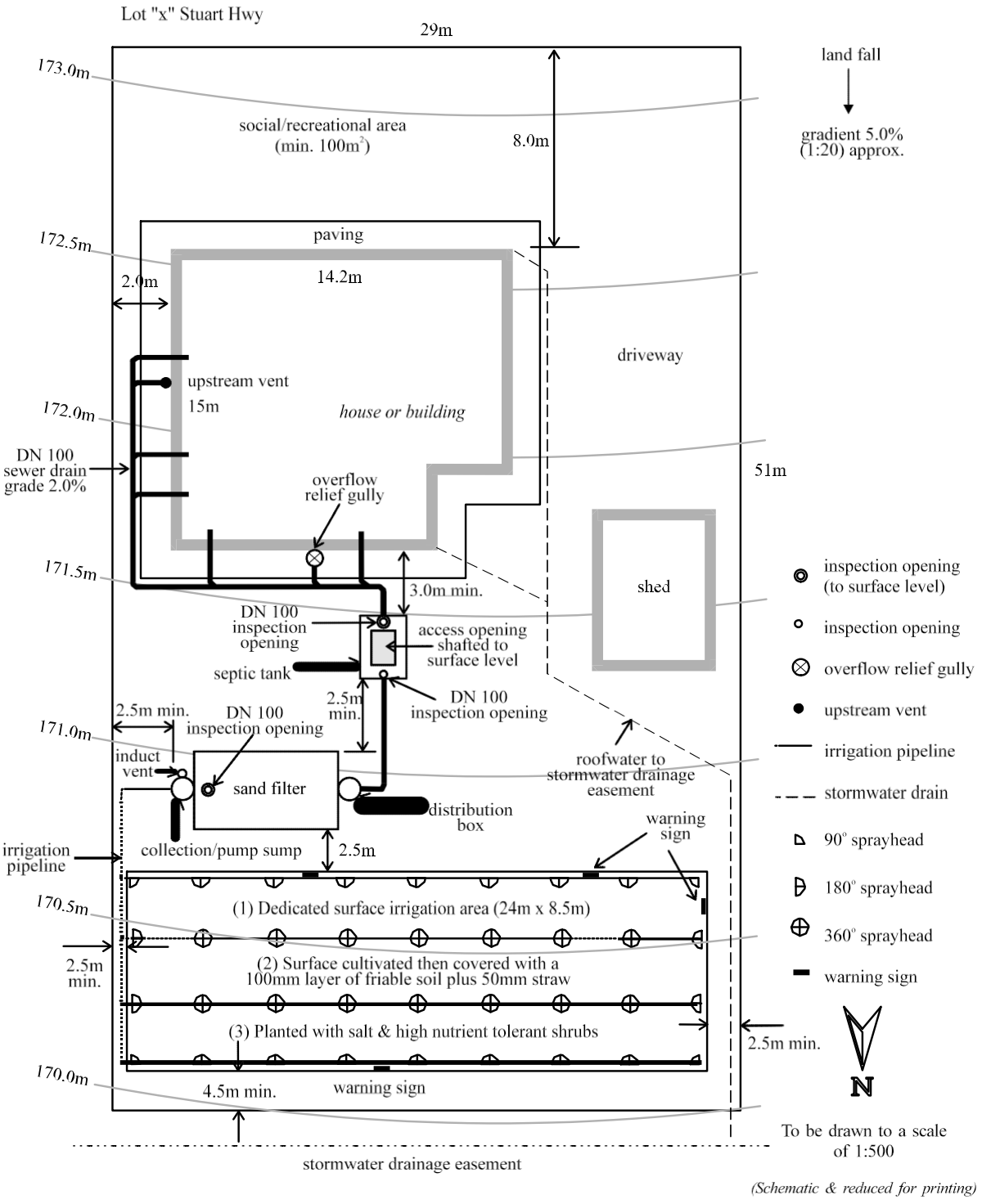


FIGURE 37: TYPICAL SITE LAYOUT PLAN

NOTES

PART- 4 COMPOSTING TOILETS & OTHER DEVICES

10.0 INTRODUCTION

A composting toilet generally consists of a large chamber, into which human wastes, along with organic bulking agents are deposited, for biological and physical breakdown into 'humus' material by aerobic decomposition.

In the dry type composting toilet, decomposition of the wastes by micro organisms occurs naturally and does not use water as an agent to aid the decomposition of the wastes. The processes are achieved through aeration of the receptacle using air channels, baffles and in many cases by the use of a continuously operating fan. The organic bulking agents, as recommended by the manufacturer, provide a source of carbon for the bacteria and worms which treat the wastes and keep the sewage pile loose for proper air distribution. There are two types of dry composting toilet; continuous and batch types. In the continuous type, human wastes are continuously added to the pile within the receptacle and compost is removed from the bottom of the pile. In the batch type, different sectors of the receptacle are used for waste accumulation. When one sector is filled, it is isolated and another sector is used. The initial filled sector is left to decompose for a period of time, until such time as the humus is safe to use as compost.

The wet composting toilet as the name suggests works on the same principle as the dry composting toilet, but utilises sewage and sullage as well as bulking agents, micro organisms and worms to break down the continuously aerated large organic pile into humus. The resultant effluent is disposed into an absorption trench, earth mound or evapotranspiration bed. Alternatively, the effluent can be passed through a charcoal/sand/earth filter which may result in a high quality effluent, that may be reused subsequent to the conditions detailed in Section 11.

Chemical toilets are usually portable and are generally used on a temporary basis only. They are a suitable temporary means of sewage treatment and off site disposal, particularly where site assessment criteria identifies sewage disposal to the immediate environment to be unsuitable. The chemicals contained in the toilet (usually diluted glutaraldehyde) act to sterilise faecal deposits as well as neutralise odours. Chemical toilets will generally only be approved for short periods of time and will necessitate frequent pumpouts of the receptacle contents, depending on usage.

Pit toilets and cesspits are one of the most basic forms of sewage treatment and disposal. A pit toilet is comprised of a closet set above an earth pit. The pit acts as a receptacle and slowly decomposes the human wastes by naturally drying the waste pile. When the pit becomes full, lime is added to it and then covered with earth. Another pit is dug and the above ground closet is usually transported above the new pit. The most common and effective types of pit toilets are the ventilated pit toilets, which are constructed to include a fly wire covered vent pipe and darkened interior to minimise the presence of insects and odours.

10.1 SCOPE

This part of the Code provides details on the requirements for:

- **wet and dry composting toilets,**
- **incinerating toilets,**
- **chemical toilets,**
- **pit toilets, and**
- **cesspits / earth closets.**

An application to install any one of the above toilet types must be made to the relevant Environmental Health Office for the locality in which that type of toilet is proposed to be installed.

The proposed Australian Standard for Waterless Composting Toilets will be used as a basis for determining type approval conditions once finalised.

10.2 LEGISLATION

For legislative purposes, composting toilets and other toilet systems fall within the definition of a septic tank, chemical toilets or approved devices as detailed in the Public Health (General Sanitation, Mosquito Prevention, Rat Exclusion and Prevention) Regulations and are therefore subject to the Regulations and the provisions contained in this section.

Under the above Regulations, composting toilets, chemical toilet and approved devices must be 'type' approved by the Chief Medical Officer prior to their sale and installation in the Northern Territory (See Section 10.3).

10.3 TYPE APPROVAL

All Composting Toilets and other toilet systems will require "type" approval from Territory Health Services before being able to be used in the Northern Territory. 'Type approval' in this case, is approval granted by the Chief Medical Officer for the marketing, sale and use of a composting toilet or other toilet system in the Northern Territory. Type approval provides authorisation for the use of a septic tank or other toilet systems anywhere in the Northern Territory, subject to compliance with any type approval conditions.

An application for type approval for a composting toilet or other toilet system must be made in writing to the Program Director, Environmental Health Program Directorate. See the *Administrative Procedures* for both type approval and installation approval application details.

A current list of type approved composting toilets and other toilet systems can be obtained from an Environmental Health Office listed in Section 1.0.

10.4 COMPOSTING TOILET INSTALLATION APPLICATION PROCESS

Each composting toilet must have type approval granted by the Chief Medical Officer, prior to being installed in the Northern Territory.

The application for installation of a composting toilet (septic tank) process is detailed in *Administrative Procedures*.

10.5 REQUIREMENTS FOR COMPOSTING TOILETS

The following list of conditions are intended to be used as a guide only in an application for type approval. The conditions are not an exhaustive list of type approval conditions as they will vary according to the design, manufacture, method of installation for each individual system and degree of compliance with Australian Standards.

10.5.1 Wet and Dry Composting Toilets

- Composting toilet systems (hereinafter referred to as the 'system') may only be installed where connection to a sewer is not available.

- Regular usage capacity in the Northern Territory is assessed on the basis of the number of bedrooms in a dwelling, with a notional two persons per bedroom. A typical three bedroom dwelling would therefore require a system capable of servicing six (6) people minimum or less than six (6) people when specified by the manufacturer or where in the opinion of Territory Health Services the closet will be capable of providing satisfactory toilet accommodation.

- General approval is not given for use in non-residential situations. Any proposed non-residential use will require an application which provides adequate data on anticipated numbers and frequency of use and justification of the capability of the proposed installation to operate satisfactorily under those conditions.

- Where the system is to be installed within the dwelling, a separate room (not being a bathroom) shall be provided with an adjoining air-lock or enclosed hallway or room and built in accordance with the requirements of the Building Code of Australia.

- Where a system is to be installed beneath the surface or below the concrete slab of a dwelling, the system shall be designed by a structural engineer and certified by a building certifier.

- Each system must be used in conjunction with a method of effluent or sullage disposal that satisfies the requirements of Territory Health Services.

- A permanent notice with basic instruction shall be affixed to the unit in a prominent position. The permanent notice shall include provision for recording the date of commissioning of the chamber after the last time humus material was removed.

- When these systems are used as public facilities, they shall be regularly inspected and the waste chutes shall be cleansed when they become fouled with faecal matter.

- The manufacturer shall supply the owner of the premises on which the unit is installed, with a comprehensive maintenance manual with details of the procedures necessary to ensure the efficient and safe operation of the unit.

- Notwithstanding any other conditions, the system shall be installed and operated in accordance with the manufacturers instructions and detailed specifications.

- Where the system incorporates a fan fitted to the air vent, it must be installed in such a manner that it operates continuously. Access must be provided for repairs/replacement of the fan.

- The minimum composting period for all systems shall be not less than 12 months, unless otherwise stated by manufacturers specifications. The manufacturer must prove that the humus is safe to use under normal conditions for a composting period of less than twelve months and a statement to that effect must be included on any accompanying literature.

- Unless otherwise directed by an EHO, the composted humus is to be disposed of by burial within the confines of the premises in soil which is not intended to be used for the cultivation of food for human consumption. The minimum cover of soil over the deposited humus must be 300mm. It must also be ensured that humus is not buried within 100m of a potable water source and that there is no potential for sub-surface water contamination.

- Composted humus may only be removed from the closet through the access door provided for that purpose at or near the base of the closet.

- Unless otherwise approved of by the Chief Medical Officer, all effluent from a wet composting toilet shall only be disposed of by sub-surface means.

- Systems should not be located within such distance from neighbouring dwellings so as to cause a nuisance from odour or visual amenity.

- Each composting toilet shall be clearly and indelibly branded with the brand name and the model number.

- The manufacturer must provide a list of the type approval conditions to all prospective purchasers.

- Random checks of installations will be carried out by Environmental Health Officers to evaluate quality control measures and to ensure system performance to the design criteria.

- Non compliance with the above requirements may result in the creation of a nuisance necessitating remedial action by the relevant Environmental Health Officer.

- System approval may be revoked, suspended or otherwise varied by the Chief Medical Officer if he or she is of the opinion that it is necessary to do so.

10.5.2 Incinerating Toilets

The information required for an application for 'type approval' for an electric incinerating toilet system (hereinafter referred to as the system) is detailed in the *Administrative Procedures*. Type approval will generally be granted on the basis of compliance with the documentation submitted and the following conditions.

- Regular usage capacity in the Northern Territory is assessed on the basis of the number of bedrooms in a dwelling, with a notional two persons per bedroom, a typical three bedroom dwelling would therefore require a model capable of servicing six (6) people minimum. General approval is not given for use in non-residential situations. Any proposed non-residential use will require an application which provides adequate data on anticipated numbers and frequency of use and justification of the capability of the proposed installation to operate satisfactorily.

- The system may only be installed where connection to a sewer is not available.

- Where the system is to be installed internally within the dwelling, it shall be installed in a separate room (not a bathroom) with an adjoining air-lock or ventilated enclosed hallway or room and built in accordance with the requirements of the Building Code of Australia.

- Each system must be used in conjunction with a method of sullage disposal that satisfies the requirements of this Code of Practice.

- The manufacturer/importer/distributor shall supply the owner of the premises on which the unit is installed, with a comprehensive operation manual which includes installation data, operating instructions and maintenance procedures necessary to ensure the efficient and safe operation of the unit.

- The system shall be installed and operated in accordance with the manufacturers instructions.

- Young children using the system should be supervised by a responsible adult.

- The ash pan is to be emptied of ash residue at intervals not exceeding three days, or more often depending on the frequency of use or as detailed in the manufacturers specifications.

- Unless otherwise directed by an Environmental Health Officer, the innocuous ash residue may be disposed of into a suitable garbage container.

- The system should not be located within such distance from neighbouring dwellings so as to cause a nuisance from odour or visual amenity.

- A sufficient supply of plastic inserts or other suitable materials shall be supplied with the unit or ensure effective operation of the system.

- Each system shall be clearly and indelibly branded with the name and model number and a warning label shall be attached to the underside of the toilet cover indicating that the seat cover should be kept closed when not in use.

- Any changes to the design or the construction shall be submitted for assessment and approval to the Territory Health Services before being made commercially available in the Northern Territory and a list of type approval conditions must be provided to all prospective purchasers.

10.5.3 Chemical Toilets

A chemical toilet will generally only be type approved when the following conditions are satisfied.

- The system is only to be installed on a temporary basis up to a maximum of twelve months.

- The system must have adequate capacity to service the anticipated loadings.

- Where the system(s) are installed as temporary toilet facilities at public events, adequate toilets to the satisfaction of the relevant Environmental Health Officer shall be provided.
  It should also be ensured that no waiting time requirement is necessary between flushes that might cause a blockage, particularly at large events.

- When these systems are proposed to be installed at public events, an adequate supply of soap, running water and hand towels shall be provided.

- A pump out service has been negotiated with a suitable and professional carrier.

- The system(s) are directly ventilated by a ventilation pipe of at least 7.6cm in diameter and communicates directly with the outer air.

- The chemical used in the receptacle part of the toilet is able to destroy all pathogens and is preferably bio-degradable.

- The system is odour free so as not to attract insects.

- The system must not operate so as to allow waste to be exposed to the atmosphere.

- The system must only accept human waste and toilet paper.

10.5.4 **Pit Toilet** (includes an earth closet, pit latrine or privy).

A pit toilet, pit latrine, earth closet or privy will generally only be approved when the following legislative provisions regarding closet construction details are satisfied.

The closet shall not be constructed:

- Within 6 metres of any house or water storage tank or within 100 metres of any bore, water supply source etc.
- Within 15 metres of a milking shed, milk room or dairy.
- Unless walls are constructed of stone or brick or cement or other material approved by the Chief Medical Officer and the roof is constructed of corrugated iron or other impervious material.
- Unless there are at least two openings for ventilation.
- Unless the area of each opening is not less than 322cm^2.
- Unless the openings are on opposite walls and the lower edge of each opening is at least 1.8 m above the level of the floor.
- Unless the pan stand is constructed of not less than 24 gauge galvanised iron approximately 40cm in diameter and furnished with a seat hinged aperture cover.
- Unless the inside of the seat is at least 39cm above the floor.
- The closet must be protected from mosquitoes by placing a minimum of 33 gauge brass or bronze wire mesh (minimum 7 meshes to the cm) across each access opening, apart from the pan chute.

10.5.5 Specifications of closet with cesspit

A cesspit closet will generally only be approved when the following legislative provisions regarding closet construction details are satisfied.

1. The cesspit is constructed on an approved site.
2. No cesspit shall be constructed or maintained where it could pollute any well or other ground water.
3. A cesspit for use under one seat shall not be less than 194cm^2 and not less than 2.44m deep, and, where there is more than one seat, the size of the pit shall be increased as directed by an EHO.
4. A margin of 23cm of undisturbed ground shall be left between the pit and the ground plates of the closet building, which shall be set level on the ground over the cesspit.
5. The earth dug from the pit shall be placed around the closet for a distance of not less than 90cm in the form of a mound, having a slight fall away from the building.
6. Where the cesspit closet is built on land having a fall, a level site shall be excavated on which to erect the closet building and the earth dug from the pit used to form a parapet at least 30cm high on the slope above the closet in order to divert stormwater past the structure and prevent flooding the cesspit.
7. The parapet shall be banked in such manner as to prevent the earth being washed away.
8. The cabinet shall be constructed of flat iron, wood, or other approved material, and the walls of the cabinet shall be 39cm high.

9. The internal measurements of the cabinet shall be 40.6cm by 38cm; there shall be a seat and a flap cover, and the orifice in the closet seat shall not be less than 11.4cm from the front edge of the seat.

10. The whole cabinet unit including side, seat and flap cover shall be so constructed as to render the space beneath the seat fly proof.

11. The cabinet shall be so placed that deposit will fall clear of the walls of the cesspit.

12. The floor and cabinet shall be so constructed that rodents and flies are excluded from the cesspit.

13. Every closet used as a cesspit shall have internal dimensions of not less than 1.2 m wide, 1.5m long and 2.1m high.

14. The closet shall have an entrance of not less than 0.76m wide and shall be fitted with a door or effectively screened to the satisfaction of an EHO.

15. The closet shall be securely roofed, and ventilation openings of not less than 645cm^2 shall be provided in the upper part of the wall opposite the entrance and the cabinet shall have a fly trap opening to the exterior; and

16. The door shall be capable of being fastened from the inside.

NOTES

PART 5 - REUSE OF SEWAGE EFFLUENT

11.0 INTRODUCTION

All treated sewage effluent intended for disposal or reuse should be contained on site by means of efficient sub-surface ground absorption, evaporation, transpiration or surface irrigation. The requirements for effluent quality and maintenance for below ground discharge are not as stringent as when effluent is spray or drip irrigated on site. The choice of sewage effluent reuse method will determine the effluent quality standard and the operating and maintenance costs associated with the corresponding level of required treatment.

11.1 SCOPE

This section provides:

- **various on-site effluent reuse options for septic tanks servicing class 1-10 buildings,**
- **corresponding conditions imposed on each effluent reuse option, that must be satisfied for the following types of alternative septic systems:**

  - Aerated Wastewater Treatment Systems, aerobic sand filters and other alternative types of septic tank systems,
  - privately owned sewerage ponds.

Note The pertinent requirements for the reuse of effluent from PAWA sewerage ponds are subject to joint policy formulation between THS and PAWA. Applicants are directed to contact the Environmental Health Directorate or the Power and Water for further details regarding individual applications for the reuse of effluent from a PAWA installation. The NH&MRC "Guidelines for Sewerage Systems - Use of Reclaimed Water" will provide a general guide to prospective applicants on conditions to be satisfied for particular uses of sewage effluent.

11.2 REFERENCED DOCUMENTS

1996 Draft Guidelines for Sewerage Systems - Use of Reclaimed Water, NH&MRC, ANZECC & ARMCANZ
1992 Australian Water Quality Guidelines for Fresh & Marine Waters, ANZECC;
1993 NSW Guidelines for Urban & Residential Use of Effluent
1993 VIC EPA Guidelines for Domestic Wastewater Treatment Systems
1992 WA Standard for the Installation and Operation of Aerobic Treatment Units (ATU's) serving single Households
1995 SA Standard for the Construction, Installation and Operation of Septic Tank Systems in South Australia, Supplement A -Aerobic Sand Filters and Supplement B - Aerated Wastewater Treatment Systems.

11.3 POTENTIAL PROBLEMS WITH DISPOSAL AND REUSE

There are a number of problems associated with the disposal and reuse of treated sewage effluent, including public health issues, water pollution, salinity, corrosion and fouling and land availability for effluent reuse.

11.3.1 Public Health

Public health issues and risks of disease transmission are the most important aspects associated with sewage effluent reuse. Preventing disease associated with sewage effluent reuse involves preventing both an infective dose of pathogen from reaching the field and from reaching human beings, particularly young children and the immuno-compromised. Potential health issues and hazards associated with land disposal and effluent re-use include:

- dispersal in aerosol form of pathogenic micro-organisms and their possible ingestion or inhalation by persons in the vicinity; particularly young children,
- nutrient enrichment by nitrates and phosphates and the accumulation of toxic substances (such as heavy metals) which can cause contamination of underground water supplies, eutrophication and facilitate growth of blue-green algae,
- possible contamination of the person or clothing of persons operating the system,
- microbiological contamination of the surface of land used for recreation purposes, by home owners or members of the general community,
- contamination of native flora and food crops grown within residential allotments or communities,
- public health nuisances such as effluent pooling, breeding of insects and odours.

Effluent shall not be used for any of the following purposes:

- drinking, cooking or kitchen purposes,
- baths, showers or personal washing,
- clothes washing,
- swimming pools,
- water contact recreation,
- irrigation of crops for human consumption which are neither processed or cooked.

11.3.2 Water Pollution

Particular attention must be paid to the protection of surface and ground waters which may be at risk from pollution from nitrates and phosphorus, as a result of the effluent disposal process. Application rates need to be carefully calculated and assessed to prevent runoff beyond the land disposal area onto adjoining land or pollution of water bodies.

11.3.3 Salinity

High total dissolved solids in the effluent can cause salinity problems to crops, accumulation in the soil and the creation of problems with percolation to the ground water. Salt injury is often more severe under dry and hot weather conditions as salt accumulates in the soil faster, because of more frequent irrigation and greater plant water demand. The problem is more severe if irrigation is inadequate. The effect of sodium can be both direct (leaf burn and die-off) or indirect (nutritional imbalance and impairment of soil physical conditions).

11.3.4 Corrosion and Fouling

Chemical and biological matter present in the effluent can cause fouling of pipes. Fouling can reflect any combination of the following processes:

- corrosion accompanied by the production of metal oxide films,
- biological fouling by the metabolic activity of micro-organisms leading to the growth of slimes,
- precipitation or crystallisation, primarily due to calcium salts, and
- sedimentation and absorption of solid suspended matter.

11.3.5 Land Availability

The demand for housing, agricultural and horticultural development generally results in increased land prices and the rapid depletion of stocks of land suitable for conventional effluent disposal. Subsequently, the depletion of suitable land can lead to poorer quality or marginal land being made available for effluent disposal, which restricts the disposal options because of the more limiting soil properties and site characteristics. This is now particularly evident in the Darwin rural area and other parts of the Territory where rapid residential expansion has resulted in the encroachment on surrounding poorer quality land available for conventional effluent disposal.

11.4 SEWAGE EFFLUENT REUSE TYPES

Reuse of sewage effluent can take the form of sub-surface disposal, shallow sub-surface disposal or surface irrigation. In each case, there are a number of factors to be taken into consideration and a number of conditions satisfied before the system is installed. There are two major types of sewage effluent treatment, namely primary and secondary treatment of sewage effluent. Each type of treatment will result in various physical and microbiological quality parameters being achieved. For the purposes of this Code, these parameters will determine the type of disposal or reuse system allowed to be used.

11.4.1 Primary Sewage Treatment Disposal

Primary sewage treatment is initial wastewater treatment, which in on site applications generally occurs in a septic tank. It involves screening and sedimentation to remove gross and settleable solids from the wastewater. Generally up to 40% BOD_5 and 70% suspended solids reduction are achieved through primary treatment in a suitably sized septic tank.

Primary sewage treatment effluent cannot be reused and must be disposed of by sub-surface disposal or other suitable method as detailed in Section 7 of this document.

11.4.2 Secondary Sewage Treatment Disposal

Secondary sewage treatment is simply primary treated sewage effluent which has been further treated through a clarification or filtration chamber followed by disinfection, so that a high percentage of dissolved and suspended solids have been removed. The effluent quality is generally reflective of disinfected secondary sewage effluent from alternative septic systems including, AWTS, aerobic sand filters and disinfected effluent from stabilisation ponds.

Secondary sewage treatment effluent is considered suitable for on site:

- **unrestricted surface irrigation subject to maintaining the effluent quality standards listed in Section 11.5 and conditions listed in Section 11.6.1 and 11.6.2,**
- **deep sub-surface disposal in accordance with Section 7 of this Code,**
- **shallow sub strata/sub-surface disposal in accordance with Section 8 of this Code,**
- **disposal or reuse in accordance with Section 11.7, depending on effluent quality.**

11.5 EFFLUENT REUSE QUALITY STANDARDS

BOD^5	**Less than 20 mg/L**
Suspended Solids	**Less than 30 mg/L**
Free residual chlorine	**0.5 mg/L (minimum)** **2.0 mg/L (maximum)** **after 30 minutes detention time at peak flow**
Faecal coliforms	**10 cfu / 100 ml (median)** **with 4 / 5 samples containing less than 20 cfu / 100 ml**

Source: Based on AS 1547 Disposal systems for effluent from domestic premises

11.6. SURFACE IRRIGATION OF DISINFECTED SECONDARY TREATED SEWAGE EFFLUENT IN UNRESTRICTED PUBLIC ACCESS AREAS

eg residential backyards, dedicated landscaped areas directly accessible by the public, sports ovals, golf courses etc.

Failure to comply with any of the conditions listed below, particularly the effluent quality standards, may result in the owner having to modify the method of effluent disposal to a type detailed in Section 11.7. Continued non-compliance with effluent quality parameters may result in modification of the manufacturers type approval conditions and the instigation of legal proceedings should the system cause a nuisance or pose a risk to public health.

NOTE: The manufacturer, seller, installer and owner shall ensure that the pertinent septic tank or alternative septic system conditions detailed in parts 2-4 as well as the specific reuse and disposal conditions listed below are satisfied prior to the installation of an unrestricted surface irrigation area. The owner shall ensure that effective maintenance is carried over the lifetime of the overall system.

The following conditions must be satisfied in order for surface irrigation of disinfected secondary treated sewage effluent to occur in unrestricted public access areas.

1. Full compliance with the effluent quality standards listed in Section 11.5. The manufacturer or his agent shall be responsible for having the effluent analysed on a monthly basis for three months and thereafter on a quarterly basis during the first year of operation. The results of such analyses shall be forwarded to the pertinent Environmental Health Officer for the locality in which the system is installed (See Section 1.0 for the address details).

2. Notwithstanding the above, unrestricted surface irrigation is prohibited in areas where the incidence of hookworm disease is high or where its prevalence is endemic to an area. The disease, caused by *Necator americanus, Ancylostama duodenale and Ancylostama ceylanicum* is usually present in tropical areas where hygiene practices and the sanitary disposal of sewage is not consistently sustained. Spraying of sewage effluent may have adverse effects on efforts used to control the spread of hookworm infection in these areas. Under these circumstances, it is more appropriate to install a sub surface effluent disposal system.

3. The surface irrigation disposal area must not be located on land prone to waterlogging or subject to flood or surface water inundation unless the disposal area is significantly raised or where the plumbing designer or installer guarantees/certifies that the area will not cause a nuisance. Landscaping must be designed so that the effluent does not pool within, or run-off from the surface irrigation disposal area. Most sites are initially unsuitable for evapo-transpiration of reclaimed effluent. Where this is the case and there is surface rock or water, near surface ground water or rock; or heavy soils, the site must be modified.

4. The surface irrigation disposal area shall:

(a) be sized in accordance with the requirements of this Code,

(b) be dedicated to the sole use of receiving reclaimed effluent and be landscaped with shrubs and trees suitable for the transpiration of reclaimed effluent. If the existing vegetation is not suitable or adequate for evapo-transpiration, extra trees and shrubs must be planted, and additional landscaping may be necessary. Plants in the surface irrigation disposal area must be suitable for the transpiration of effluent and be salt and nutrient tolerant (See Appendix B),

(c) exclude pedestrian traffic as a precautionary measure, except for maintenance purposes or when in compliance with Section 11.6.2. The installation of bollards or other permanent means of protecting the system shall be installed in areas where the system is prone to vehicular traffic, particularly in remote communities,

(d) require at least 200 m^2 in an allotment for a typical alternative septic systems sized to service a 6 person dwelling provided with standard plumbing fixtures. This 200 m^2 is additional to that required for the dwelling, recreational areas, sheds, carport, driveways, access paving, setback distances and the treatment unit. Therefore, they are not considered appropriate for use on allotments smaller than 800m^2,

(e) be correctly maintained to maximise its evapo-transpiration and absorption capability,

(f) not be used during passive or active recreational purposes,

(g) not contain any picnic areas, children's play areas, barbecue facilities, drinking water fountains or other like structures,

(h) as a public health precaution where spray irrigation is used, vegetables or food plants, including fruit and nut trees, must not be grown in the surface irrigation disposal area. However, if drip irrigation is used, fruit and nut uses may be allowed in conjunction with a covering of at least 50mm of hay, mulch or other absorbent organic material,

(i) Provide landform modification prior to commissioning of the alternative septic systems including soil cultivation. This includes at least 150mm depth of friable soil and or other suitable material such as pinebark, woodchips, scoria etc. over the entire surface irrigation disposal area for example, 100mm layer of friable soil and a 50mm layer of pinebark. Hay, straw or mulch can be used, but must be frequently replaced. The surface irrigation area also needs to be planted with appropriate flora to ensure loss of the effluent from the irrigated area by transpiration as well as normal evaporation,

(j) not be located on land subject to water logging and/or subject to flooding, subject to satisfactory absorbing material being used in the landscaped area as indicated in 4 (i),

(k) be completed including landscaping and planting, prior to the occupation of the premises to ensure no pooling or run-off of irrigated effluent occurs,

(l) be provided with bunding, mounding and/or terracing to suit the proposed site, to prevent run-off from the disposal area and to prevent surface water entering the disposal area. This is particularly necessary where the surface irrigation disposal area is constructed over rock, or where there is a danger of effluent escaping to adjacent areas,

(m) require all roof waters to be diverted away from the surface irrigation disposal area. Where practicable, roof waters shall be diverted to the street water table or to a point beyond the surface irrigation disposal area,

(n) require all rainwater tanks and rainwater catchment areas to be designed, protected and maintained so as to prevent airborne contamination from spray irrigated reclaimed water.

5. There shall be at least 4 signs erected in the surface irrigation disposal area in accordance with AS 1319, warning that effluent is being used and that it is not suitable for human contact/ consumption. Alternatively, the signs shall be on a white background with red lettering at least 20mm high. The sign shall state 'RECLAIMED EFFLUENT, DO NOT DRINK, AVOID CONTACT'.

6. The surface irrigation system, including the spray irrigation equipment connected to the distribution lines, shall be a permanently fixed system. For commercial and/or industrial premises, a moveable system is permissible. However, any moveable system must be installed so as to confine the discharge or effluent solely within the surface irrigation disposal area and comply with setback distances. It must also be situated in such a manner so as to pose minimal health risk under the same conditions as if it were fixed.

7. Effluent pipelines and fittings must be clearly identified.The possibility of cross connection with water supply pipelines must be avoided through the use of backflow prevention devices, air gaps and similar means.Lockable valves or removable tap handles shall be used wherever there is public access. The distribution line shall not be connected to any standard household hose taps and garden fittings.

8. The minimum standard of all pipework to and within the surface irrigation disposal area must be polyethylene complying with AS 2698. Pipework must also be suitable for use with effluent and buried at least 150mm underground. UPVC potable water pipes are not permitted under any circumstances for use in the irrigation system.

9. The irrigation system including the pump, pressure lines and distribution points must be of sufficient capacity to ensure that the rate of discharge is at least 50% greater than the maximum volume delivered at any one time into the alternative septic systems to satisfy imposed pressures such as friction or static head.

10. Spray irrigation equipment shall be fitted with low pressure, low volume spray heads which are not capable of producing aerosols or fine mist. Spray drift into adjacent areas is not permitted and some sites may require drip irrigation due to adverse conditions (e.g. exposed sites subject to strong prevailing winds, no fencing or tree buffers provided, excessive land slope etc). Care must be taken in the selection of the type and placement of the spray heads to ensure the plume is contained totally within the surface disposal area. This may require the installation of 90^0 and or 180^0 sprays around the perimeter of the surface irrigation disposal area.

11. Sprays and Sprinklers used shall be suitable for use with reclaimed effluent, with a plume height not exceeding 500 millimetres above the finished level of the surface of the disposal area and a spray area diameter of less than 5.0m in residential areas.

12. A dripper system can be used as an alternative to spray irrigation, provided there is no pooling or run-off of the effluent within or from the surface irrigation disposal area. The number of outlets required is dependent on the type and capacity of the drippers, the alternative septic systems, pump and landscaping. A detailed plan is to be submitted with the notification showing the discharge quantity and the area to be served by each dripper, including details of trees, shrubs or plants to confirm uptake of the applied effluent.

13. The minimum horizontal setback distance from the perimeter of the disposal area to various features shall be in accordance with Section 7.5.

14. Irrigation systems shall be operated only by a suitably trained personnel. All employees and other people exposed to the effluent should be instructed in appropriate health and safety procedures. People should wash their hands before eating or smoking while at work and before leaving work each day.

15. Any alteration to the irrigation system or area shall require the written approval of the Chief Medical Officer.

16. Environmental Health Officers may inspect the installation at anytime and may carry out any tests considered necessary, at the owners expense, to ensure compliance with effluent quality standards.

17. The owner, installer or maintenance contractor shall carry out any necessary repairs or modifications to the treatment plant, irrigation system or disposal area when directed to do so by an EHO.

SPORTS OVALS, GOLF COURSES ETC.

On order to safeguard people from exposure to treated effluent during the day, it may be more appropriate to irrigate at night, which would require compliance with the following conditions:

18. A sufficiently sized holding tank(s)/ pond/ balance tank shall be installed to cater for the storage of at least 24 hours effluent generation,

19. The height of the plume and spray diameter may be increased for larger non-residential areas such as parks, sports ovals etc. A suitable number of sprays or sprinklers shall be installed to ensure that the total effluent irrigation area is evenly covered,

20. Timer switches shall be installed when the effluent is intended to be used for irrigating sports fields and public access areas. Electronic timer switches are not permitted for the operation of the surface irrigation disposal system unless they are connected and operated in conjunction with the irrigation pump.

21. Members of the public shall be excluded from the area while irrigation of recreational and sports areas is in progress.

22. Surface irrigation must be completed at least four (4) hours before being used by the public or dry to the touch.

11.7 EFFLUENT DISPOSAL OR REUSE SYSTEMS TO BE USED WHERE EFFLUENT QUALITY STANDARDS IN SECTION 11.5 ARE NOT ACHIEVED

Where an alternative septic system does not satisfy the effluent quality requirements of Section 11.5, then one of the following sewage effluent reuse or disposal systems shall be installed:

- **deep sub-surface disposal system, installed in accordance with relevant part of Section 7,**
- **sub-strata/sub-surface dripper irrigation system that is installed in accordance with Section 8.8,**
- **surface irrigation area with compulsory 1.5 metre high perimeter fencing,**
- **surface irrigation area involving holding tank(s) and an automatic timer system,**
- **dedicated landscaped areas not generally accessible by the public,**
- **disposal to a non-potable water source (such as river, stream), subject to compliance with the Water Act 1992 and conditions set down by the Power and Water.**

11.7.1 Deep sub-surface disposal system installed in accordance with Section 7

Where the effluent quality is not in accordance with the standards listed in Section 11.5, then sub-surface disposal is the next preferred means of effluent disposal, although other methods of effluent disposal are available as detailed above. Secondary treated effluent is of higher quality than primary treated effluent, and subsequently has less environmental and public health problems associated with its sub-surface disposal. Chlorination of secondary treated effluent is unnecessary if the effluent is disposed of in accordance with the provisions contained in Section 7.

11.7.2 Shallow sub strata/sub-surface disposal in accordance with Section 8.8

The sub strata/ sub-surface disposal systems detailed in Section 8.8 for Aerated Wastewater Treatment Systems may also be used as a means of disposal for secondary treated sewage effluent from other alternative septic systems.

Shallow sub-surface disposal or irrigation involves the installation of the effluent disposal pipe within the range of 100-300 mm of the surface (See AS1547).

The area must not be prone to flooding and diversion drains for stormwater runoff must be utilised. The system relies mainly on the transpiration of effluent, using plants described in Appendix 2.

The irrigation line must be surrounded by durable aggregate to allow for adequate percolation of the surrounding soil. Landform modification prior to commissioning of the alternative septic systems includes soil cultivation, with at least 150mm depth of friable soil and or other suitable material such as pinebark, woodchips, scoria etc. to the specified depth over the entire surface irrigation disposal area for example, 100mm layer of friable soil and a 50mm layer of pinebark. Hay, straw or mulch may be used, but must be frequently replaced. The surface irrigation area also needs to be planted with appropriate flora to ensure loss of the effluent from the irrigated area by transpiration as well as normal evaporation.

11.7.3 Surface irrigation area with compulsory 1.5 metre high perimeter fencing.

Where the dedicated disposal area <u>is</u> accessible by the public (particularly young children), and holding tanks and timer systems are not installed, the surface irrigation area shall be fenced to a height of 1.5 metres, so as to prevent access. The type of fencing should be such that children are unable to gain a firm foothold such as cyclone fencing, Australian Standard pool fencing, or solid barrier fencing.

The microbiological effluent quality criteria shall comply with the following:-

Faecal coliforms less than 1000 cfu / 100 ml (median)

The relevant requirements for effluent reuse under these circumstances are condition numbers 3 to 17 in Section 11.6 ie. Conditions 3,4,5,6,7.....17 inclusive.

11.7.4 Surface irrigation area involving holding tank(s) and an automatic timer system eg fenced golf courses and sports ovals etc.

Where the dedicated disposal area or landscaped irrigation area is used for recreational purposes and is accessible by the public during the day or is surrounded by perimeter security fencing, then holding tanks and timer systems shall be installed. This will allow for the irrigation of a lesser quality effluent (compared to the quality required in Section 11.5) to be used at times when the areas are not being utilised by the public.

1. The microbiological effluent quality criteria shall comply with the following:-

Faecal coliforms 1000 cfu / 100 ml (median)
with 4 / 5 samples containing less than 4000 cfu / 100 ml

2. The manufacturer or his agent shall be responsible for having the effluent analysed on a quarterly basis. Results greater than a median of 2000 cfu/100ml may result in the need for additional chlorine until such time as it is consistently shown that desirable effluent quality parameters are being maintained. The results of such analyses shall be forwarded to the pertinent Environmental Health Office for the locality in which the system is to be installed (See Section 1.0).

3. A sufficiently sized holding tank(s) shall be installed to cater for the storage of at least 24 hours effluent generation.

4. Timer switches shall be installed when the effluent is intended to be used for irrigating sports fields and public access areas. Timer switches used in the operation of the surface irrigation disposal system must be electrically operated in conjunction with the irrigation pump.

5. Irrigation of these areas will be confined to 10 pm - 5.00 am in the morning. Members of the public shall be excluded from the area while irrigation is in progress. The irrigation of sporting facilities by fresh water may occur at any time during the day. However, the irrigation pipes must be immediately and satisfactorily flushed with fresh water at the completion of nightly/early morning irrigation by treated sewage effluent, to ensure that initial irrigation of the course during the day will not affect the public's health. In the event that unsatisfactory conditions arise from irrigating the golf course during this period, the period of irrigation may be altered on public health grounds.

6. The area must be dry to the touch before use by the public eg golf courses etc.

7. A moveable system of surface irrigation may be installed as long as the discharge of reclaimed effluent is confined solely within the surface irrigation disposal area and complies with setback distances as detailed in Section 7.5 and 8.9. It must also be situated in such a manner so as to pose minimal health risk under the same conditions as if it were fixed.

8. Sewage treatment and irrigation systems should only be operated by suitably qualified personnel. All employees and others exposed to effluent should be instructed in appropriate health and safety procedures. Further information and clarification can be obtained from the Work Health Authority. People should wash their hands before eating or smoking while at work and before leaving work each day.

9. The provision of appropriate and adequate signs indicating that irrigation of the sporting facilities with treated sewage effluent is taking place and that the irrigation water is unfit for drinking.

10. Immediate and adequate remedial measures being taken to eliminate odour or other public health problems which may arise from irrigation of the sporting facilities with treated sewage effluent.

11. Effluent pipelines and fittings must be clearly identified. The possibility of cross connection with water supply pipelines must be avoided through the use of backflow prevention devices, air gaps and similar means. Lockable valves or removable tap handles shall be used wherever there is public access. The distribution line shall not be connected to any standard household hose taps and garden fittings.

12. The minimum standard of all pipework to and within the surface irrigation disposal area must be polyethylene complying with AS 2698. Pipework must also be suitable for use with effluent and buried at least 150mm underground. UPVC potable water pipes are not permitted under any circumstances for use in the irrigation system.

13. The irrigation system including the pump, pressure lines and distribution points must be of sufficient capacity to ensure that the rate of discharge is at least 50% greater than the maximum volume delivered at any one time into the aerated wastewater treatment system to satisfy imposed pressures such as friction or static head.

14. Spray irrigation equipment shall be fitted with low pressure; low volumes spray heads which are not capable of producing aerosols or fine mist. Spray drift into adjacent areas is not permitted and some sites may require drip irrigation due to adverse conditions (e.g. exposed sites subject to

    strong prevailing winds, no fencing or tree buffers provided, excessive land slope etc). Care must be taken in the selection of the type and placement of the spray heads to ensure the plume is contained totally within the surface disposal area. This may require the installation of 90^0 and or 180^0 sprays around the perimeter of the surface irrigation disposal area.

15. Sprays and Sprinklers used shall be suitable for use with reclaimed effluent. A suitable number of sprays or sprinklers shall be installed to ensure that the total effluent irrigation area is evenly covered.

16. Any alteration to the irrigation system or area shall require the written approval of the Chief Medical Officer.

17. EHO's may inspect the installation at anytime and may carry out any tests considered necessary, at the owners expense, to ensure compliance with effluent quality standards.

18. It is the responsibility of the owner to monitor and maintain the on-site system and arrange repair of leaks, broken pipes and repairs to the irrigation system or disposal area as they become apparent or when directed to do so by an EHO.

11.7.5 Dedicated landscaped areas not generally accessible by the public

These dedicated landscaped areas are defined as those areas, that because of their distance, construction and/or orientation are generally not accessible to the public, particularly small children. Examples of such areas include;

- raised rockeries or landscaped gardens which are not accessible to the public and which act to contain runoff through the use of bunding or diversion drains as well as utilising 100 mm minimum cover of absorbent materials such as mulch, hay etc,
- neighbouring properties which are appropriately bounded by the installation of permanent markers or rails and warning signs posted so that the disposal area is clearly defined. These can include paddocks, grazing fields, dedicated tree plantations etc,
- embankments which incorporate bunding and other runoff provisions.

The microbiological effluent quality criteria shall comply with the following:-

Faecal coliforms 1000 cfu / 100 ml (median) with
4 / 5 samples containing less than 4000 cfu / 100 ml

The installation of dedicated landscaped areas not generally accessible by the public, shall require compliance with the same conditions detailed in Section 11.7.3, except for the need to provide compulsory surface field perimeter fencing to a height of 1.5 m.

11.7.6 Disposal to a non-potable water sources eg rivers, streams etc.

Approval for the disposal of sewage effluent to non-potable water courses, such as rivers, streams etc is subject to the Water Act 1992 and the conditions imposed by the Power and Water Authority.

People wishing to utilise this form of effluent disposal shall seek further advice and make application to the Power and Water Authority.

11.8ALLOTMENT REQUIREMENTS

11.8.1 Recreational, Social and Domestic Use Areas

Sufficient space must be provided on the site for domestic, social and recreational use in addition to the area required for:

- building and perimeter paving,
- foot and vehicle access,
- vehicle parking, carports, garages and storage sheds, septic tank and aerated wastewater treatment system, surface irrigation disposal area.

For single occupancy residential premises, the area provided for domestic, social and recreational use must be at least 50% of the area required for the dedicated surface irrigation disposal area ie. 100 m^2 For multiple occupancy residential premises, this must be at least 25% of the area required for the dedicated irrigation disposal area and be evenly distributed amongst the residences. This includes lawns, patios, outdoor entertainment, children's play areas, clothes drying, garden area.

NOTE: Commercial and/or Industrial premises are exempted from recreational, social and domestic use requirements subject to adequate land being available for disposal of the irrigated effluent.

11.9 SETBACK DISTANCES

See Section 7.5 and Section 8.9.

NOTES

PART 6 - DISPOSAL AND REUSE OF SULLAGE

12.0 INTRODUCTION

The disposal and reuse of sullage water (grey water) is an important public health issue in the Northern Territory. While being a potentially valuable renewable resource, sullage can contain high levels of pathogenic microorganisms and therefore a level of caution is required in its use.

The Chief Medical Officer has the responsibility for the approval of sullage reuse schemes under the Public Health (General Sanitation, Mosquito Prevention, Rat Exclusion and Prevention) Regulations. Under these regulations, sullage is defined as domestic waste water from baths, showers, basins, laundries and kitchens, including floor wastes from these sources.

Sullage forms the bulk of the volume of the waste water passing through the household. It should also be recognised however that sullage originating in the kitchen would generally require additional treatment, such as a grease trap to bring it to a similar quality with the remainder of the sullage stream. Importantly, wastes originating from external gully drains are not considered to be part of the sullage stream because of the increased public health risks associated with these drains, as they are often used for wash down of equipment which may contain solvents, paints, biocides and herbicides.

The priority of Territory Health Services is to safeguard public health and it subsequently acts to control and minimise the public health risks associated with sullage reuse. THS in consultation with PAWA, which has funded and trialled a number of sullage reuse schemes across the Territory, have combined to address the issue of sullage reuse by providing the following information. It is anticipated that proposed national model guidelines for sullage reuse when finalised, will be adopted for use in the Territory.

The following information should therefore be taken into account before making application to the CMO for approval to reuse sullage.

12.1 SCOPE

The information contained in this part is specific only to on-site *domestic* sullage disposal or reuse in:

- non-sewered urban centres and rural living zones; and,
- Aboriginal Housing in Remote Area Communities.

12.2 SULLAGE DISPOSAL

The disposal of sullage from domestic dwellings shall be in accordance with the pertinent requirements relating to sullage in Section 7 and Table 1 of this document as well as the relevant provisions of AS 1547.

12.3 GENERAL PRINCIPLES OF SULLAGE REUSE

The following principles have been employed to state the position Territory Health Services (THS) in relation to sullage reuse.

1. The concept of treated and disinfected sullage reuse is potentially a valuable renewable resource, specifically in areas where potable water is a scarce commodity. Sullage reuse is recognised as providing a significant means of lowering waste discharges to treatment plants and reducing the demand for potable water.

2. Users should be aware that the initial set up costs associated with sullage reuse schemes are high and that return on investment is on average in excess of twenty five years.

3. Sullage can be as polluted as blackwater and as such is liable to form a public health risk. Sullage from domestic premises can significantly differ from sullage produced in commercial and industrial premises because of the quality and quantity of additions to the sullage stream, particularly solids, detergents and metals.

4. Territory Health Services will not endorse any treated or untreated patented sullage system(s) to be used in single dwellings, multiple-occupancy buildings or other private or commercial premises, until such time as there is sufficient Australian and overseas research to qualify that there is either no risk or minimal increased risk to public health and the environment.

12.4 TREATMENT OPTIONS

Various sullage treatment systems exist in the market place. However, none of these are currently approved by the Chief Medical Officer for use in the Northern Territory. The following systems provide options for sullage reuse.

12.4.1 By Pass Systems

These units involve by-passing laundry discharges from washing machines to surface irrigation systems. These units do not provide any treatment of the sullage. An example of one such unit is the "Suldi valve", which is designed to be fitted to a washing machine. In some other Australian States, the 'suldi valve' has been approved for direct garden watering use, on the specific condition that only sullage generated during a washing machine's rinse cycle is to be used.

12.4.2 Temporary Storage Systems

These systems generally involve a gross solids filter with a surge tank. The filtered sullage is then gravitated to a drip irrigation system. These systems do not permit for controlled irrigation and are more of a waste disposal system than a reuse system. Significant fungal growth and runoff can occur during humid and/or wet conditions.

12.4.3 Large Storage Systems

These systems involve some form of digestive treatment to reduce the oxygen demand and lower the amount of suspended solids. The tanks used are in many cases septic tanks, which provide for some sedimentation and settling of the solids in the sullage. The minimum capacity of such systems is 1500 litres as per AS1547 and Table 1. The effluent must be stored for an extended period to attain a reasonable quality.

More advanced aerated suspended media, fixed media digester or membrane based treatment systems exist. However due to the high cost and complexities of these systems, they may not be fully appropriate for use in domestic households.

12.5SULLAGE REUSE CONCLUSIONS

Trials conducted by PAWA in the Northern Territory as well as information gleaned from interstate and overseas sources have resulted in certain conclusions being drawn regarding sullage reuse.

It would appear that any form of sullage reuse, must be accompanied by an acceptance by users of the high initial set up costs involved. The costs include the initial capital outlay in purchasing and installing the system and the time and vigilance required in system maintenance. There are also some lifestyle adjustments involved, whereby users need to take greater caution in the types of household activities carried out that result in an addition of microorganisms, chemicals etc, to the sullage stream eg washing soiled nappies in laundry troughs etc.

12.6 RECOMMENDED SYSTEM SPECIFICATION

The following minimum treatment components shall be incorporated in any application for approval of a sullage reuse system.

- Gross screening (solids screening filter).
- Sedimentation (storage tank of at least 1500 litres capacity).
- Disinfection (If physical contact with sullage is possible during re-use)
  Where possible the disinfection unit should be based on minimum residual disinfectant levels eg chlorine 0.3 -0.5 mg/L etc. Disinfecting methods should not create measurable residuals. Faecal Coliforms, predominantly E.Coli should be adopted as an indicator of quality of disinfection.
- Sullage should be disposed of in accordance with Section 11 of this document, depending on effluent quality.

12.7INTERIM STANDARDS FOR SULLAGE REUSE

In light of the PAWA trials and conclusions drawn, the following standards have been developed concerning sullage reuse. These are provisional standards only and shall be used until such time as national standards or guidelines are developed and adopted (if applicable) for use in the Northern
Territory.

1. Application shall be made to the Chief Medical Officer for type approval for the use and installation of a sullage reuse system in the Northern Territory.

2. Any type approval for a sullage reuse system granted by the Chief Medical Officer, shall be accompanied by the manufacturer's endorsement of the approval conditions in all marketing literature, operational specifications and owners manuals accompanying the sale of this specific type of sullage reuse system in the Northern Territory.

3. The effluent quality for above surface irrigation shall be in accordance with those detailed in Section 11 of the Code.

4. The reuse of sullage in a sewered area is prohibited, as all domestic wastewater shall be discharged to the sewer.

5. The methods of sullage disposal employed must conform with the provisions contained herein and must not constitute a nuisance, including odours, runoff to neighbouring properties, watercourses and must not promote mosquito breeding.

6. Sullage must not be reused where direct contact by human beings is possible eg ingestion. Subsequently, the disposal of sullage through conventional fittings and fixtures such as unmarked internal or external taps, drink water tanks etc, is prohibited. Sullage systems which contain a potable water top-up facility, must be provided with backflow prevention devices on potable water supply pipes. An air gap method for protecting public health is preferable to the use of double check valve assemblies to prevent back syphoning or backflow of contaminants in cross connection with potable water supplies by bores or public reticulated water supply systems.

7. Sullage pipe fittings shall be incompatible with potable water systems and shall operate at pressures lower than the operating pressure expected in the potable supply mains. All surface connectors, including taps, quick couplers etc, shall be marked to reflect that the content is not suitable for ingestion.

8. Only disinfected treated sullage can be reused where secondary contact is inevitable during normal use. The most common form of secondary contact sullage reuse schemes involve surface irrigation, including toilet flushing and car washing. However results from NT greywater reuse tests conducted by PAWA suggest that aerosols generated through these types of schemes may still form a potential risk to public health. Treated sullage may still contain high levels of pathogenic bacteria, viruses and parasites. Disinfection of these flow streams shall be carried out and allow for sufficient contact or detention time to destroy these microorganisms.

9. Except during system maintenance operations, non-disinfected treated sullage shall not be re-used where secondary contact (skin contact) is inevitable.

10. The use of untreated sullage is discouraged due to the high bacterial, BOD and suspended solids content. Untreated sullage and non-disinfected treated sullage shall only be utilised for sub-surface irrigation of areas not intended for food production. Due to the significant loading of solids in sullage, maintainable filters shall be utilised to prevent blockages and soil clogging.

11. Disinfection of untreated sullage is impractical, due primarily to the high level of suspended solids.

12. Rainwater can be used to top-up large tank systems during times of high irrigation demand. A float valve shall be used to ensure at least one week's operating capacity, with a manual diversion valve on the stormwater drain. Rainwater should enter into the final clarification zone of the storage tank in a manner so as to prevent turbulence. Automatic by-pass systems will be necessary to ensure that surplus stormwater is diverted back to the stormwater system without being contaminated. The rainwater stream must be by-passed during the wet seasons.

13. Existing external gullies on dwellings shall not be connected to sullage reuse schemes.

14. Installation of sullage systems shall be accompanied by an undertaking from the owner to operate the system to a given specification. During the conveyance process in a house sale the new owners shall be made aware of any conditions placed on such systems on the property. It is advisable that an inspection by an Environmental Health Officer be carried out to ensure that the system is functioning correctly during the house sale process, although a fee for such service may be levied on the vendor. Houses rented would remain the owner's responsibility until the tenant assumes that responsibility contractually.

15. The installation of all sub-surface irrigation lines shall conform with the requirements of Section 7 of this document.

16. The minimum capacity of a sullage tank shall be 1500 litres.

APPENDIX A

SOIL PERCOLATION TESTS

Scope

A soil percolation test involves calculating the permeability (P) of the soil by using either of the following two methods:

1. Falling head method as detailed below, or
2. Constant head method as detailed in AS1547 -1994.

The Falling-Head Method

Step 1 Dig five (5) holes using a hand auger to the proposed depth of the absorption trench. The holes should be either 100mm or 150mm diameter or 300mm x 300mm square.

Space the holes evenly over the proposed disposal area.

Step 2 Remove any clay smears or loose soil and place 50mm depth of coarse sand over the bottom of the holes.

Step 3 Add water to the holes to about 250mm above the bottom and top up to maintain level for at least one hour.

Where the soil has a high potential for shrinkage or swelling or the test is carried out in summer or during the dry season the holes shall be continuously soaked until a uniform drop in water level is obtained.

Step 4 Top the water level up to 250mm again and then measure the drop in water level at 10 minute intervals until the drop is uniform.

If the rate of drop has not become uniform by the time the water level has fallen by approximately 50mm, repeat the test.

If the hole empties within the first one or two ten-minute increments, then further soaking may be required -repeat from Step 3.

Note: the time to establish a uniform drop in water level is dependent on the soil type and moisture content and could vary from 30 minutes to several days.

Step 5 When the rate of fall of water is uniform, add additional water to the test hole to a depth of 250mm and measure and record the time (t) in minutes for the water to fall 25mm.

CALCULATION

Falling head method

The permeability of the soil (m/d) is calculated from the following equation:

$P = 4.0 / t$ when a 100mm diameter test hole is used

or

$P = 5.5 / t$ when a 150mm diameter test hole is used

or

$P = 9.0 / t$ when a 300mm square test hole is used

Where P = permeability of the soil in metres per day

t = time for the fall of 25mm in the water depth from 250mm in minutes, which has been determined from step 5.

Note: To determine permeability of the soil (P) in mm/hr, simply multiply the above result by 1000 and divide by 24 and determine the corresponding soil type from Figure 7.

Constant head method

Refer to AS1547 - 1994

APPENDIX B

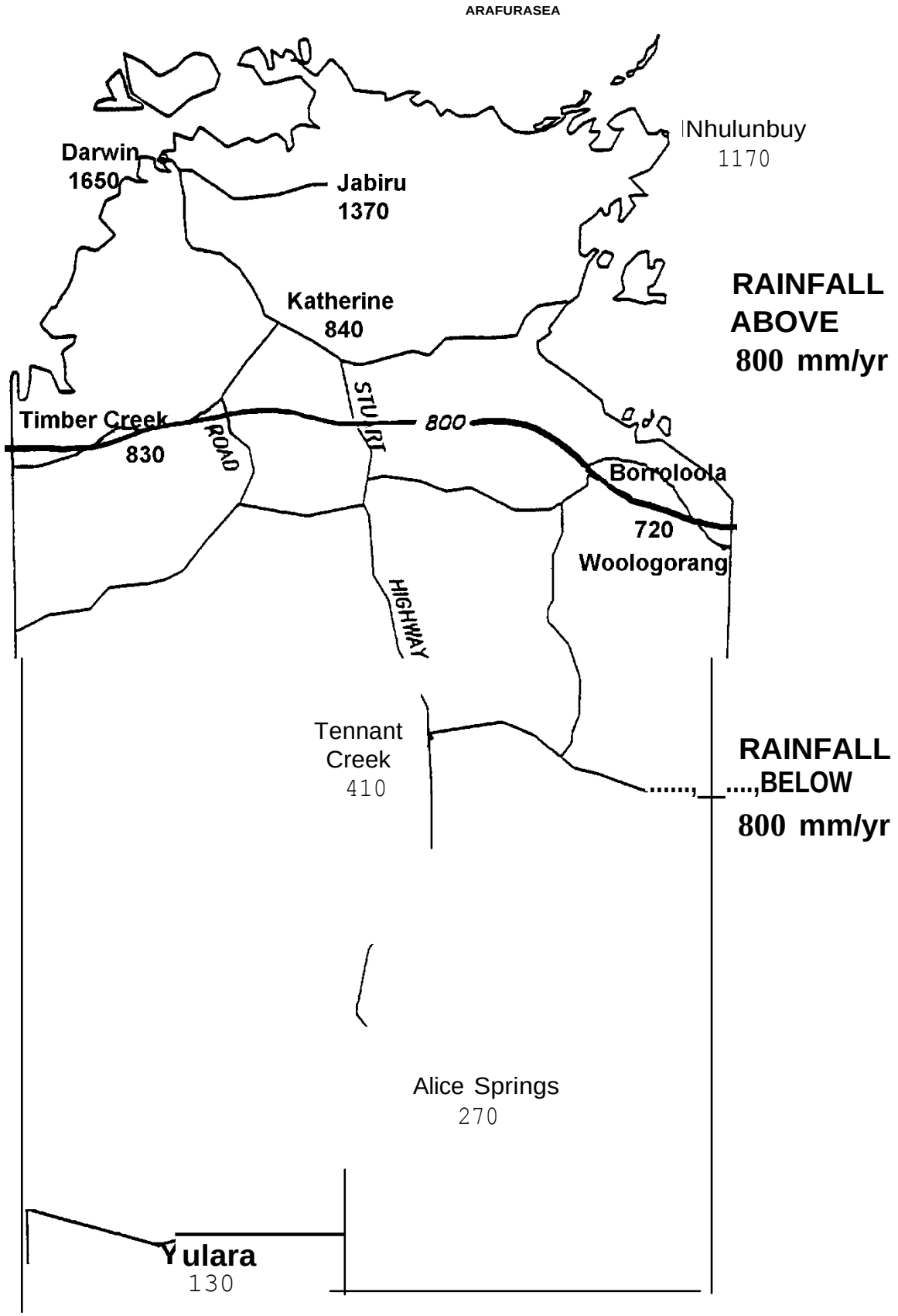
PLANT SCHEDULE

SUITABLE PLANTS			
BOTANICAL NAME	**NT COMMON NAME**	**REMARKS**	**HEIGHT**
Acacia stenophylla	River Cooba	*	4-5m
Atriplex nummularia	Oldman Saltbush	*(S)	1-3m
Eucalyptus camaldulensis *Eucalyptus microtheca* *Eucalyptus papuana*	River Red Gum Coolibah Ghost Gum	*	10-20m 15-20m 7/10-20m
Melaleuca bracteata *Melaleuca dissitiflora* *Melaleuca glomerata* *Melaleuca viridiflora*	Black Tea Tree Creek Tea Tree Inland Tea Tree Green Paperbark	* * * (N)	6m 5m 3m 3-10m
Myoporum acuminatum	Boobialla	*	hedge to 3m
PLANTS LIKELY TO BE SUITABLE			
Acacia aneura *Acacia kempeana* *Acacia victoriae*	Mulga Witchetty Bush Acacia Bush		5-8m 3-4m 4-8m
Atalaya hemiglauca *Atalaya vesicaria*	Whitewood Bladder Saltbush	 *(S)	4-12m 0.5-1m
Callitris glaucophylla	White Cypress Pine	*	3-8m
Clerodendrum floribundum	Smooth Spider Bush		2-3m
Dodonaea petiolaris *Dodonaea viscosa*	Balloon Hopbush Sticky Hopbush		1-3m 1-3m
Ehretia saligna	Coonta	(N)	7m approx
Enchylaena tomentosa	Ruby Saltbush	Groundcover (will climb fences)	
Eremophila latrobei *Eremophila longifolia* *Eremophila maculata*	Native Fuchsia Weeping Emu Bush Spotted Fuchsia	 *	1-2m 1-5m 0.5m
Erythrina vespertilio	Batwing Coral Tree	Deciduous when dry	5-10m
Eucalyptus chlorophylla *Eucalyptus cupularis* *Eucalyptus gamophylla* *Eucalyptus opaca*	Northern Grey Box Hall's Creek White Gum Blue Mallee Bloodwood	(N) (N)	10m 12m 3-5m 7/10-20m
Ficus platypoda	Native Fig		6-8m
Grevillea striata	Beefwood		9m
Halosarcia pergranulata	Blackseeded Samphire	*	30cm salt lakes
Ipomoea costata	Native Potato	(N) shrubs with twinging branches	
Maireana species *Malreana sediflora*	Bluebush or Saltbush Pearl Saltbush	* *(S)	1-3m 1m
Owenia acidula	Gruie	(N)	6-12m
Pittosporum phylliraeoides	Weeping Pittosporum	*	3-7m
Rhagodia parabolica *Rhagodia spinescens*	Berry Saltbush Spiny Salbush	* *	1.5-2m 1.5-2m
Santalum lanceolatum	Plum Bush	*	Shrub to 3m
Ventilago viminalis	Supplejack	*	3-10m

* - Salt Tolerant Plants
(S) - For Central Australia South of the Plenty Highway
(N) - For Central Australia North of the Plenty Highway

APPENDIX C

NT ANNUAL RAINFALL PATTERNS



APPENDIX D

DETERMINING THE CAPACITY OF A SEPTIC TANK USING THE EQUATION (S x P1 x Y) + (P2 x DF) BASED ON USE CONDITIONS FOR NON-RESIDENTIAL PREMISES.

The term average daily number over an "x" day period means the highest average number in any 12 month period eg Restaurant's average daily number in the busiest week of the year. The term highest daily number refers to the busiest day of the year eg fully booked restaurant, factory at peak production, fully booked hotel etc.

Example 1. **Restaurant - The average daily number over 7 days may be 45 people, while the highest daily number over 7 days, say at Christmas time, may be 70.**

Example 2 **Shopping centre (Public Toilets) - The average daily number over 7 days may be 200, while the highest daily number over 7 days, say at end of year sale time, may be 450.**

NOTE:
The table only makes allowance for human waste. It does not allow for industrial wastes. In situations where the septic tank will also be servicing the waste generated from industry activities, separate certification will be required by a plumbing designer/engineer stating appropriate septic tank sizing based on anticipated waste generated from the premises. It should also be noted that certain discharges to a septic tank are prohibited (See Section 5.3 for further details).

Premises	**Fixtures**	**Sludge /**	**Scum Rate**	**Daily Inflow**	**Rate**
		Number of Persons	Rate/ Litres/ Person/Year	Number of Persons	Rate Litres/ Person/Day
Note: Calculate each use and add to obtain total capacity		**P1**	**S**	**P2**	**DF**
CARAVAN PARKS					
Permanent Occupation	wc/urinal basin bath/shower laundry kitchen sink	Total number of sites x 3.5	**80**	Total number of sites x 3.5	**150**
Casual Occupation	wc/urinal basin bath/shower laundry kitchen sink	Average number of sites occupied per year x 3.5	**48**	Total number of sites x 3.5	**100**
CHILD DAY CARE CENTRES	wc/urinal basin bath/shower laundry kitchen sink	Total number of children and staff	**48**	Total number of children and staff	**50** if in house laundry service **35** if external laundry service

Premises	Fixtures	Sludge /	Scum Rate	Daily Inflow	Rate
		Number of Persons	Rate Litres/ Person/Year	Number of Persons	Rate Litres/ Person/Day
Note: Calculate each use and add to obtain total capacity		**P1**	**S**	**P2**	**DF**
CHURCHES, PUBLIC HALLS etc	wc/urinal basin bath/shower laundry kitchen sink	Average daily number over 7 day period	**25** up to 4 days use per week **40** over 4 days use per week	Highest daily number over 7 day period	**8**
Addition:	where kitchen area provided for catering		Add **10** to either of above		Add **5** to above
CLUBS					
Membership entry only. Members/guests & staff using facilities	wc/urinal basin bath/shower kitchen sink (tea service area only)	Average daily number over 7 day period	**35**	Highest daily number over 7 day period	**30**
Licensed area Bar trade only	wc/urinal basin bar sink glass washer	Average daily number over 7 day period	**5**	Highest daily number over 7 day period	**10**
Licensed bar & restaurant/ meals area	wc/urinal basin bar sink glass washer	Average daily number over 7 day period	**10**	Highest daily number over 7 day period	**15**
COFFEE/TEA SHOPS,KIOSKS					
	wc/urinal basin kitchen sink	Average daily number over 7 day period	**30**	Highest daily number over 7 day period	**10**
CONSTRUCTION CAMPS (TEMPORARY)					
	wc/urinal basin shower laundry kitchen sink dishwasher	Total number of persons using facilities	**80** x number of years to be used	Total number of persons using facilities	**150**

Premises	Fixtures	Sludge /	Scum Rate	Daily Inflow	Rate
		Number of Persons	Rate Litres/ Person/Year	Number of Persons	Rate Litres/ Person/Day
Note: Calculate each use and add to obtain total capacity		**P1**	**S**	**P2**	**DF**
HOLIDAY CAMPS					
eg. scout, youth and church centres with casual occupation	wc/urinal basin shower laundry kitchen sink dishwasher	Total number of beds (single equivalent)	**48**	Highest daily number using facilities	**100**
Staff &/or residential	caretaker data	to be added	where	applicable	
HOSPITALS & NURSING HOMES					
Accommodation and resident staff	wc/urinal basin bath/shower laundry kitchen sink dishwasher	Total number of beds plus resident staff	**80**	Total number of beds plus resident staff	**150**
Non - resident staff	wc/urinal basin kitchen sink (tea area only)	Number of employee's per x number of shifts	**25**	Number of employee's per x number of shifts	**30**
	with shower			as above	**10**
HOTELS / MOTELS CONFERENCE CENTRES					
Accommodation	wc/urinal basin bath/shower laundry kitchen sink dishwasher	Total number of beds (single equivalent)	**48**	Total number of beds (single equivalent)	**100**
Permanent residents staff etc.	wc/urinal basin bath/shower laundry kitchen sink	Total number of live in staff	**80**	Total number of live in staff	**150**
Bar trade	wc/urinal basin bar sink glass washer	Average daily number attending in 7 day period	**5**	Highest daily number over 7 day period	**10**

Premises	Fixtures	Sludge /	Scum Rate	Daily Inflow	Rate
		Number of Persons	Rate Litres/ Person/Year	Number of Persons	Rate Litres/ Person/Day
Note: Calculate each use and add to obtain total capacity		**P1**	**S**	**P2**	**DF**
Dining room lounge area non -resident use	wc/urinal basin kitchen sink dishwasher	Average daily number of diners per 7 day period	**10**	Highest daily number over 7 day period	**15**
Non-resident staff	wc/urinal/basin kitchen sink (tea service area only)	Number of employees per shift x no of shifts	**25**	Number of employees per shift x no of shifts.	**30**
	with shower			*as above*	**10**
MEDICAL CONSULTING ROOMS					
eg. doctors, dentists staff	wc/urinal basin kitchen sink (tea service area only)	Number of employees using system per shift x number of shifts	**45**	Number of employees using system per shift x number of shifts	**30**
	with shower			as above	**10**
Consulting rooms		Per consulting room	**80**		**100**
PUBLIC SWIMMING POOLS					
including kiosk eg. take away food	wc/urinal basin shower kitchen sink (tea area only)	Average daily number over 7 day period	**20**	Highest daily number over 7 day period	**20**
PUBLIC TOILETS					
	wc/urinal basin	Average daily number over 7 day period	**20**	Highest daily number over 7 day period	**5**
Addition:	where shower provided	as above	**5**	as above	**10**

Premises	Fixtures	Sludge /	Scum Rate	Daily Inflow	Rate

		Number of Persons	Rate Litres/ Person/Year	Number of Persons	Rate Litres/ Person/Day
Note: Calculate each use and add to obtain total capacity		**P1**	**S**	**P2**	**DF**
RESTAURANTS					
No liquor licence	wc/urinal basin kitchen sink dishwasher	Average daily number over 7 day period	**35**	Highest daily number over 7 day period	**15**
With Liquor	wc/urinal basin kitchen sink dishwasher glass washer	Average daily number over 7 day period	**35**	Highest daily number over 7 day period	**20**
REST HOME, BOARDING & LODGING HOUSES					
Accommodation & resident staff	wc/urinal basin bath/shower kitchen sink laundry	Total number of beds plus resident staff (single equivalents)	**80**	Total number of beds plus resident staff (single equivalents)	**150**
Non resident staff	wc/urinal basin kitchen sink (tea area only)	Number of employees per shift x number of shifts	**25**	Number of employee's per shift x number of shifts	**30**
	with shower			as above	**10**
ROADHOUSES/ SERVICE STNS					
Staff	wc/urinal basin kitchen sink (tea service area only)	Number of employee's per shift x number of shifts	**25**	Highest daily number over 7 day period	**30**
	with shower			as above	**10**

Premises	Fixtures	Sludge /	Scum Rate	Daily Inflow	Rate
		Number of Persons	Rate Litres/ Person/Year	Number of Persons	Rate Litres/ Person/Day
Note: Calculate each use and add to obtain total capacity		**P1**	**S**	**P2**	**DF**
Public toilets	wc/urinal basin	Average daily number over 7 day period	**20**	Highest daily number over 7 day period	**5**
	with shower		**5**	as above	**10**
Restaurant Take away and sit down meals	wc/urinal basin kitchen sink dishwasher	Average daily number over 7 day period	**10**	Highest daily number over 7 day period	**10**
SCHOOLS & KINDERGARTENS					
Including kiosk facilities eg take away foods	wc/urinal basin kitchen sink	Total numbers of students plus staff	**25**	Total numbers of students plus staff	**20**
Where canteen facilities provided eg plated hot and cold meals	kitchen sink dishwasher	as above	**10**	as above	**5**
	with shower			per 100 students	**100**
SEMINAR/ CONFERENCE ROOMS					
No meals	wc/urinal basin kitchen sink (tea service area only)	Total seating capacity plus staff	**25**	Total seating capacity plus staff	**30**
Meals No liquor licence	wc/urinal basin kitchen sink dishwasher	Total seating capacity plus staff	**35**	Total seating capacity plus staff	**35**

Premises	Fixtures	Sludge / Number of Persons	Scum Rate Rate Litres/ Person/Year	Daily Inflow Number of Persons	Rate Rate Litres/ Person/Day
Note: Calculate each use and add to obtain total capacity		**P1**	**S**	**P2**	**DF**
Meals with liquor licence	wc/urinal basin kitchen sink dishwasher glass washer	Total seating capacity plus staff	**35**	Total seating capacity plus staff	**40**
SHOPPING CENTRES					
Staff	wc/urinal basin kitchen sink (tea area only)	Number of employees per shift x number of shifts	**25**	Number of employee's per shift x number of shifts	**30**
Public	wc/urinal basin	average daily number over 7 day period	**20**	Highest daily number over 7 day period	**5**
Shop Facilities	double bowl sink basin	Per shop	**20**	Per shop	**40**
Supermarket	double bowl sink basin cleaners sink	**Per super-market**	**40**	Per super-market	**500**
SPORTS CENTRES					
eg. health and fitness clubs, squash courts, indoor cricket, basketball.	wc/urinal basin shower kitchen sink (tea area only)	average daily number over 7 day period	**25**	Highest daily number over 7 day period	**40**

Premises	Fixtures	Sludge / Number of Persons	Scum Rate Rate Litres/ Person/Year	Daily Inflow Number of Persons	Rate Rate Litres/ Person/Day
Note: Calculate each use and add to obtain total capacity		**P1**	**S**	**P2**	**DF**
STAFF ABLUTIONS & WORK PLACE INSTALLATIONS					
eg. factories, commercial office	wc/urinal basin kitchen sink (tea area only)	number of employee's per shift x number of shifts	**25**	Number of employees per shift x number of shifts	**30**
	with shower			as above	**10**
Where canteen facilities provided for kiosk meals eg. pies, pasties & sandwiches	kitchen sink			as above	**2**
Where plated meals provided eg. hot/cold meal: prepared on site	kitchen sink dishwasher	as above	**10**	as above	**5**
WINE TASTING	wc/urinal basin kitchen sink glass washer	average daily number over 7 day period	**5**	Highest daily number over 7 day period	**8**
	staff		**25**		**30**

APPENDIX E

AERATED WASTEWATER TREATMENT SYSTEMS - B.O.D. LOADINGS

AIRPORTS (highest daily number)

8 grams per passenger per day
20 grams per employee per day

CARAVAN PARKS, CAMPING SITES

160 grams per site - casual occupation
180 grams per site - permanent occupation
120 grams per site - camping site

CHILD DAY CARE CENTRES (highest daily number)

40 grams per person - including children and staff

CHURCHES, PUBLIC HALLS (highest daily number)

8 grams per person
plus *5* grams per person - where kitchen provided

CLUBS (highest daily number)

15 grams per person
plus *5* grams per person - licensed area, bar trade
plus *5* grams per person - restaurant, meals area
plus 20 grams per employee

COFFEE / TEA SHOPS (highest daily number)

10 grams per person
20 grams per employee

COIN OPERATED LAUNDRY

350 grams per machine
or 65 grams per load

CONSTRUCTION CAMPS (highest daily number)

50 grams per person

HOLIDAY CAMPS (highest daily number)

50 grams per person

HOSPITALS

200 grams per bed

HOTELS, MOTELS

80 grams per room/unit
plus 50 grams per person - permanent resident/staff
plus 10 grams per person - bar trade
plus 10 grams per person - dining room, lounge area
plus 20 grams per person - non-resident staff
or 25 grams per person - non-resident staff - shower provided

MEDICAL CONSULTING ROOMS

20 grams per person - staff
or 25 grams per person - staff - shower provided
plus 40 grams per consulting room

NURSING HOME

90 grams per bed

OFFICES

20 grams per employee
or 120 grams per 100 square metres

PUBLIC SWIMMING POOL (highest daily number)

10 grams per person
or 15 grams per person - shower provided
plus 20 grams per employee

PUBLIC TOILETS (highest daily number)

I0 grams per person
or 15 grams per person - shower provided

RESIDENTIAL PREMISES INCLUDING APARTMENTS, FLATS, TOWNHOUSES

50 grams per person

RESTAURANTS (highest daily number)

10 grams per meal - no liquor licence
or 15 grams per meal - with liquor licence
plus 20 grams per employee per shift

REST HOMES, BOARDING AND LODGING HOUSES

50 grams per person
plus 20 grams per non-resident employee
or 25 grams per non-resident - shower provided

ROADHOUSES, SERVICE STATIONS

20 grams per employee per shift
or 25 grams per employee per shift - shower provided
plus 10 grams per car
plus 200 grams per bus

SCHOOLS, KINDERGARTENS

15 grams per person - staff and students
or 20 grams per person - staff and students -shower provided
plus 5 grams per person - canteen facilities

SEMINAR, CONFERENCE ROOMS (maximum capacity)

20 grams per person
or 25 grams per person - meals provided - no liquor licence
or 30 grams per person - meals provided - liquor licence

SHOPPING CENTRES

150 grams per 100 square metres
or 20 grams per employee

SPORTS CENTRES (highest daily number)

30 grams per person
plus 20 grams per employee per shift

STAFF ABLUTIONS, WORK PLACE INSTALLATIONS

20 grams per employee per shift
or 25 grams per employee per shift - shower provided
plus 5 grams per employee per shift - canteen facilities
or 10 grams per employee per shift - hot meals provided

TAVERN

10 grams per person - bar trade
plus 15 grams per person - dining room
plus 20 grams per employee - non-resident staff

THEATRES

10 grams per seat

THEATRES - DRIVE-IN

10 grams per car space

WINERIES

8 grams per person - wine tasting
plus 15 grams per person - meals dining
plus 20 grains per employee - non-resident staff

Note: BOD_5 loading based on 50 grams per person ex the septic tank

APPENDIX F

DETERMINATION OF THE LENGTH OF ABSORPTION TRENCH REQUIRED IN METRES (USE FOR FIGURES 9 & 10)

Daily Flow of 900 Litres/Day (l/d) from a 3 bedroom house @ 300 litres/bedroom in an Urban or Rural living Zone
Daily Flow of 1800 l/d from a 3 bedroom house @ 600 litres/bedroom in Aboriginal Housing on Remote Communities

Note: Double the length of trench detailed below for Aboriginal Housing on Remote Communities & use sewage to sullage ratio of 2:3 (approx) for split systems eg 100m of trench = 40 m sewage and 60 m sullage.

LENGTH OF ABSORPTION TRENCH REQUIRED IN METRES

STANDARD PLASTIC ARCH TUNNEL (300mm depth of aggregate)

Using AS1547 where length of trench required = wetted area / width + 2 x depth of aggregate.

SOIL TYPE (classification)	CLAY	SILTY CLAY	CLAY LOAM	LOAM	SANDY LOAM	FINE-MEDIUM SAND
SOIL PERCOLATION RATE (mm/hr)	0.1 - 1	0.3 - 5	2.5 -15	8.3 -21	12.5 -75	25 - 250
L.T.A.R (average)	**5**	**10**	**15**	**20**	**25**	**25**
500 mm wide trench	164	82	55	41	33	33
600 mm wide trench	150	75	50	38	30	30
900 mm wide trench	120	60	40	30	24	24
1000 mm wide trench	112	56	38	28	23	23
1200 mm wide trench	100	50	33	25	20	20
2500 mm wide trench	58	29	19	15	12	12

LENGTH OF ABSORPTION TRENCH REQUIRED IN METRES

LARGE (JUMBO) PLASTIC ARCH TUNNEL (400mm depth of aggregate)

Using AS1547 where length of trench required = wetted area / width + 2 x depth of aggregate.

SOIL TYPE (classification)	CLAY	SILTY CLAY	CLAY LOAM	LOAM	SANDY LOAM	FINE-MEDIUM SAND
SOIL PERCOLATION RATE (mm/hr)	0.1 - 1	0.3 - 5	2.5 -15	8.3 -21	12.5 -75	25 - 250
L.T.A.R (average)	**5**	**10**	**15**	**20**	**25**	**25**
600 mm wide trench	129	64	43	32	26	26
900 mm wide trench	106	53	35	26	21	21
1000 mm wide trench	100	50	33	25	20	20
1200 mm wide trench	90	45	30	23	18	18
2500 mm wide trench	55	27	18	14	11	11

APPENDIX F (Continued)

LENGTH OF SLOTTED PIPE REQUIRED IN METRES

Aggregate filled trench at depth of 300mm

Using AS1547 where length of trench required = wetted area / width + 2 x depth of aggregate.

SOIL TYPE (classification)	CLAY	SILTY CLAY	CLAY LOAM	LOAM	SANDY LOAM	FINE-MEDIUM SAND
SOIL PERCOLATION RATE (mm/hr)	0.1 - 1	0.3 - 5	2.5 -15	8.3 -21	12.5 -75	25 - 250
L.T.A.R (average)	**5**	**10**	**15**	**20**	**25**	**25**
300 mm wide trench	200	100	67	50	40	40
450 mm wide trench	170	85	57	42	34	34
600 mm wide trench	150	75	50	38	30	30
900 mm wide trench	120	60	40	30	24	24
1200 mm wide trench	100	50	33	25	20	20

APPENDIX G

DETERMINATION OF THE LENGTH OF ABSORPTION TRENCH REQUIRED IN METRES (USE FOR FIGURE 11)

Daily Flow of 900 Litres/Day (l/d) from a 3 bedroom house @ 300 litres/bedroom in an Urban or Rural living Zone
Daily Flow of 1800 l/d from a 3 bedroom house @ 600 litres/bedroom in Aboriginal Housing on Remote Communities

Note: Double the length of trench detailed below for Aboriginal Housing on Remote Communities & use sewage to sullage ratio of 2:3 (approx) for split systems eg 100m of trench = 40 m sewage and 60 m sullage.

STANDARD PLASTIC ARCH TUNNEL (WRAPPED IN GEOTEXTILE OR MINIMAL AGGREGATE)

using AS1547 where trench length required = wetted area / trench width + depth plastic arch tunnel (230mm)

SOIL TYPE (classification)_	CLAY	SILTY CLAY	CLAY LOAM	LOAM	SANDY LOAM	FINE-MED SAND
SOIL PERCOLATION RATE (mm/hr)	0.1 - 1	0.3 - 5	2.5 -15	8.3 -21	12.5 -75	25 - 250
L.T.A.R (average)	**5**	**10**	**15**	**20**	**25**	**25**
500 mm wide trench	247	123	82	62	49	49
600 mm wide trench	219	108	72	54	43	43
900 mm wide trench	160	80	53	40	32	32
1000 mm wide trench	146	73	49	37	29	29
1200 mm wide trench	126	63	42	31	25	25
2500 mm wide trench	66	33	22	17	13	13

LARGE (JUMBO) PLASTIC ARCH TUNNEL (WRAPPED IN GEOTEXTILE OR MINIMAL AGGREGATE)

using AS1547 where trench length required = wetted area / trench width + depth plastic arch tunnel (350mm)

SOIL TYPE (classification)_	CLAY	SILTY CLAY	CLAY LOAM	LOAM	SANDY LOAM	FINE-MEDIUM SAND
SOIL PERCOLATION RATE (mm/hr)	0.1 - 1	0.3 - 5	2.5 -15	8.3 -21	12.5 -75	25 - 250
L.T.A.R (average)	**5**	**10**	**15**	**20**	**25**	**25**
600 mm wide trench	190	95	63	47	38	38
900 mm wide trench	144	72	48	36	29	29
1000 mm wide trench	134	67	44	33	27	27
1200 mm wide trench	116	58	39	29	23	23
2500 mm wide trench	64	32	21	16	13	13

APPENDIX H

MAP OF ENVIRONMENTAL HEALTH AREAS

NOTES