POLICY NAME: ON-SITE SEWAGE & WASTEWATER MANAGEMENT STRATEGY

POLICY REF: O01

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Part A: Introduction

1.0 INTRODUCTION

This document outlines the strategic direction of Council in relation to On-site Sewage and Wastewater management, setting aims, objectives and goals in this area.

It refers to Council's on-site sewage management inspection program, and the outcomes it seeks to achieve.

In addition it provides guidance for owners, applicants, installers, consultants and developers on all aspects of on-site sewage and wastewater management systems for single domestic households, from planning through to implementation and maintenance.

1.1 Aims

This Strategy aims:

- to provide a framework to manage and regulate the impact of on-site sewage management (OSSM) systems in the Ballina Shire Council (BSC) area, and to ensure user accountability;
- to provide appropriate information to the general community, plumbers and consultants to improve OSSM; and
- to assist in the assessment of proposed OSSM system design.

1.2 Objectives

The general objectives are:

- to ensure the protection of the surrounding environment including groundwater, surface water; land and vegetation through the selection of a system suitable for the specific site;
- to prevent public health risk from on-site sewage disposal;
- to maintain and improve community amenity;
- to ensure maximum re-use of resources;
- to ensure ecologically sustainable development;
- to update these guidelines as new knowledge and technology is developed;
- to recognize the value of wastewater as a reuse resource;
- to aid public recognition of on-site sewage treatment systems;
- to ensure on-going maintenance and monitoring programs involving both the land owner/resident and BSC; and
- to create a framework for improved management of OSSM systems.

1.3 Goals

To achieve these objectives BSC has set the following goals:

- create and maintain a database of all existing OSSM systems;
- ensure that all OSSM systems and land application areas comply with environment and health protection guidelines and Council operating requirements;
- reduce the frequency of system failure due to householder misuse;
- ensure that all OSSM systems are inspected at regular intervals and are de-sludged and maintained as required;
- ensure that residents with Aerated Wastewater Treatment Systems (AWTS) consult with service agents and submit quarterly maintenance reports;
- certify that land application areas comply with site requirements and are not failing; and
- review BSC development standards and approval criteria for subdivisions, development and buildings, to ensure that appropriate provision is made for sustainable effective OSSM when residential development occurs in non-sewered areas.

1.4 Citation

This Strategy, is referred to in "Chapter (TO BE ADDED ON FINALISATION OF DCP)",Ballina Shire Combined Development Control Plan". The Strategy which may be cited as "Ballina Shire Council On-Site Sewage and Wastewater Management Strategy" has been adopted by BSC and should be read in conjunction with the Ballina Shire Combined Development Control Plan.

1.5 Commencement

This Strategy applies from the date of adoption to all development consents, construction certificates and applications under s68 of the Act relating to or affected by the matters contained in the Strategy.

1.6 Relationship

This Strategy applies to all land within the local government area of BSC and supersedes all previous information issued by BSC with respect to OSSM treatment and disposal. In the event of any inconsistency between this Strategy and previous Development Control Plans, policies or codes, this Strategy shall prevail. However, it may be defined more specifically in future plans relating to specific areas.

1.7 Scope

The OSSM regulations and guidelines provide a framework for implementation of ecologically sustainable on-site sewage management practices. Management of *existing* as well as all new sewage management installations is a major focus of this Strategy. The regulations will be achieved by implementing appropriate guidelines for site evaluation criteria, maintenance requirements and operating requirements for all OSSM systems. Community and user education is also to be undertaken to complement the Strategy in a manner sensitive to local circumstances.

Council's 7(c) (water catchment) zones, are subject to requirements, that may be more stringent than those elsewhere, for both new and existing installations. If a property is located within these zonings, On-site Wastewater Guidelines prepared by the Rous Water Authority (June 2008) are applicable and are to be read in conjunction with this document.

This Strategy encompasses all domestic single dwellings/dual occupancies OSSM systems within the BSC area and is divided into three main sections with appendices;

- **Part A:** *"Introduction".* This part includes information on the scope of the Strategy, legislation, aims, objectives, guiding principles and definitions.
- **Part B:** *"On Site Management Systems Design Document"* provides step-by-step guidance in completing reports and planning systems.
- **Part C:** *"Calculating the Land Application Area"* Tables to be used in sizing Land Application Areas (LAA), and septic tank capacity.
- **Appendix A:** *"Treatment Systems"*. Supporting information
- **Appendix B:** *"Land Application Areas and Design".* Supporting information
- **Appendix C:** *"Native plants (local) suitable for Land Application Areas"*
- **Appendix D:** *"Related Forms*
- **Appendix E:** *"Frequently Asked Questions""*

The Strategy is designed to complement the NSW *Environment & Health Protection Guidelines: On-site Sewage management for Single Households* (1998), but highlights certain features of the Ballina Shire area which are not typical of NSW as a whole, such as the exceptionally high seasonal rainfall and volcanic soils. It recognises terrain comprising undulating, or steep escarpments, interspersed with drainage channels and watercourses, the coastal plain, and proximity of wetlands and an estuarine environment. This presents certain challenges that call for specialised solutions to wastewater disposal.

There are rural areas within the shire that do not have access to centralised sewage, such as the villages of Rous Mill and Newrybar. Many of the older septic systems are failing in these areas and creating risks that could compromise human health and the environment. This Strategy seeks to provide ecologically sustainable solutions to address these issues.

Additional information relevant to NSW as a whole may be obtained from:

- NSW Department of Local Government at www.dlg.nsw.gov.au which covers the Department's sewage and wastewater management programs. See Septic Safe Program;
- NSW Department of Health at www.health.nsw.gov.au/public-health/ehb/general; and
- NSW Department of Water & Energy. http://www.dwe.nsw.gov.au/.

1.8 Legislative Background

In March 1998 the NSW Government introduced changes to its on-site sewage management regulations in response to the need for improved health and environmental outcomes. These changes have been embraced by Ballina Shire Council, enhancing its capacity to monitor, manage and regulate sewage pollution. This On-Site Sewage and Wastewater Management Strategy (Strategy) addresses these reforms. The Strategy aims to assist in:

- the design of on-site sewage management systems (OSSMS); and
- the on-going operation of OSSMS.

The amendments, in the Local Government (General) Regulation 2005, do not alter the existing powers and duties of the Council to regulate the installation of and operation of on-site sewage management systems under Section 68 and 124 of the Local Government Act 1993 (the Act). However, the regulation stipulates:

- Council's responsibilities and powers to regulate the installation and ongoing operation of OSSM systems;
- performance standards for OSSM, including protection of public health and prevention of environmental damage;
- responsibilities of owners to seek a renewable approval to operate the facility; and
- Council's responsibilities to develop a strategy for OSSM within its area (of which this document is a part).

1.9 Legislation and Guidelines

- AS1546:1998 - On Site Domestic Wastewater Treatment Units
- AS/NZS1547:2000 - the Australian/New Zealand Standard: *On-site domestic- wastewater management*
- Local Government Act 1993
- Local Government (General) Regulation 2005
- Protection of the Environment Operations Act (POEO) 1997
- Public Health Act 1991
- Council Local Environmental Plan
- Environment & Health Protection Guidelines: *On-site Sewage management for Single Households* (1998)
- NSW Code of Practice: Plumbing & Drainage, 3rd Edition 2006
- Onsite Wastewater Management Guidelines, June 2008 Rous Water Authority
- NSW Guidelines for Greywater Reuse in Sewered, Single Household Residential Premises May 2008

1.10 Response to Revised Legislative Framework

Council circularized affected landowners informing them of the changes and requesting information about existing on-site sewage management systems.

A desktop study was undertaken utilizing the Council's Geographic information System (GIS) and overlays of multi-attribute data supplied by the then Department of Land and Water Conservation (DLWC) and water catchment zones designated under the Ballina Shire Local Environmental Plan (LEP) to define the areas of the Shire where if defective, on-site sewage systems posed the greatest risk to public health or the environment.

As examples the exercise identified areas near to the estuary, within water catchments, and where there were concentrations of population as situations where defective on site sewage management systems posed greater risk to both public health and the environment.

This has provided direction to an inspection program which commenced in 2002 and is on-going.

Inspections are also carried out where development applications potentially affect existing systems of on-site sewage management, where complaint is made regarding faulty systems and where inquiry is made at time of conveyancing.

Council officers provide advice to owners and to the trade on a regular basis. Officers attend training, conferences and field days to keep abreast of the latest developments so this information can be in turn related to others.

The program includes the use of regulatory provisions under State law to have the people responsible correct defective systems. Where necessary, penalty notices and court actions are taken to ensure that required outcomes are achieved.

1.11 Applications to Install/Alter/Operate an OSSMS

Applications to BSC for the installation of an on-site sewage and wastewater management system or an upgrade to an existing system on or after April 6th 1998 are subject to two separate approvals, being:

- An approval to install, construct or alter a sewage and wastewater management system; and
- An approval to operate an on-site sewage and wastewater management system.

The *Approval to Install, Construct or Alter a Sewage and Wastewater Management System* relates to the installation of a new OSSMS or the upgrade/alteration of an existing system. This application is made under s68 of the Act and is required to be submitted to Council with the appropriate fees for Council approval prior to any work commencing (refer BSC web page for application form).

An Approval to Install will not automatically result in an Approval to Operate being issued to the property owner. It is an offence under the Act to undertake work to install or alter an OSSMS without prior written approval from Council.

The *Approval to Operate a Sewage Management System* will only be issued to the owner of the property when either:-

- a new on-site sewage management system has been installed and a final inspection undertaken;
- an upgrade of an existing system results in a change to the type of system installed i.e. a failing septic tank and absorption system is upgraded by installing a reed bed. In this case, the Approval to Operate would be re-issued to include the reed bed;
- all new owners of properties that are serviced by an OSSM system are required to register their OSSM system with Council and pay the appropriate fee. This process is also required at the time of transfer of title to a new owner where properties change hands; and
- at the time an existing approval lapses (maximum ten years).

It is an offence to operate an OSSMS without a current Approval to Operate.

1.12 Offences and Penalties

There is an onus of responsibility on the owner of a premise where an OSSMS is installed, to ensure that Council has approved the installation and the operation of the system and that it is maintained and does not compromise public health or the environment.

Failure to obtain approval from council for the installation of an OSSMS, as well as failure to obtain approval to operate an OSSMS, are offences under s626 (3) of the Act.

Council can issue an on the spot fine for operating an OSSMS without approval. Failure to comply with the conditions of approval issued by Council is also an offence under s627 (3) of the LG Act 1993. Council can issue an on the spot fine for failing to comply with the conditions of approval for operating an OSSMS.

2.0 Introduction to Land Application (Disposal) Systems

Land application systems can be divided into the following categories:

- *Soil Absorption Systems (including disposal trenches and conventional absorption beds)* - commonly used for disposal of primary treated effluent. This system relies on absorption only with limited nitrogen uptake by planting.

  These systems may have limited application under the strategy where site constraints exist including where the possibility of groundwater contamination from pathogens and nutrients exists. Their use in some clay soils found in the local area is limited due to the soil's inability to accept effluent over the long term. Effluent is to be evenly distributed throughout disposal beds, which must be large in area to achieve adequate treatment.

- *Evapo-transpiration/Absorption Beds* - used for the application of primary or secondary treated effluent. The designs are based on the principle of maximising water and nutrient uptake via plantings. Effluent is to be evenly distributed throughout the beds. ETA beds are the preferred option due to their passive nature, low energy need and maintenance requirements.

- *Sub-Surface Drip Irrigation* - used for secondary treated effluent where disinfection may be required. Effluent is applied to the root zone of plants to increase nutrient uptake, treatment and evapo-transpiration. The effluent is to be evenly distributed throughout the sub-surface irrigation area, being physically separated from human contact, thereby reducing public health concerns. The irrigation system is to be designed and installed by a person with suitable expertise and experience. Suitable signage should be in place, warning persons of the presence of the irrigation field.

2.1 Design Considerations

The design must consider items, such as, the level of treatment required, site constraints, block size, nitrogen and phosphorus loads, buffer distances and a maximum runoff of nitrogen of 15 kg/N/ha. A set of tables have been developed as a tool for sizing Land Application Areas (LAA) and septic tank capacity. These tables are located in Part C of this Strategy.

2.2 Guiding Principles

The following principles should be applied in the design and operation of land application systems:

- selection of a treatment system and land application area: first consider low-tech passive design gravity fed systems i.e. a septic tank and ETA beds, compost toilet with greywater tank and ETA beds;

- maximise the opportunity for nutrient and water re-use through vegetation uptake. Re-use by evapo-transpiration is preferred but an alternative disposal is acceptable in particular circumstances given the environmental sensitivity of an area and the individual circumstances of the case;

- evenly distribute effluent throughout the effluent application area;

- reduce the amount of natural resources utilised in construction from off site;

- irrigation effluent is required to be of at least secondary standard; and

- systems must minimise the risk of runoff of wastewater including during rain/storm events.

- systems must minimise the risk, to householders and the public, of spread of pathogens/micro-organisms;

- intermittent dosing is desirable where possible;

- the minimum number of persons in a household is set out in the Part C of this Strategy (note: nominated study areas/offices etc may be regarded as capable of being used as a bedroom). If it is known that number of persons will be greater than this value, then the calculation will be the actual number of persons;

- irrigation systems (see definitions of *Irrigation system*) are to be hydraulically designed by a person with suitable expertise and experience.

- irrigation systems are to be installed by a person with suitable expertise and qualifications. A “works as executed” plan from the installer may be required to be submitted to BSC after installation; and

- Irrigation systems are to be provided with a maintenance schedule for approval by BSC and be maintained on a regular basis. BSC maintains a register of all OSSM irrigation systems and maintenance regimes.

3.0 DEFINITIONS

“Absorption” absorption and/or uptake of effluent into soil by capillary action

“Absorption area/trench/bed” a land application system which uses the principle of absorption

“Absorption Rate” rate of discharge of water into soil.

“Adsorption” physical or chemical attachment of substances to the surface of soil particles

“Aerated Wastewater Treatment System (AWTS)” a wastewater treatment process typically involving: settling of solids and flotation of scum; oxidation and consumption of organic matter through aeration; clarification - secondary settling of solids, and disinfection of wastewater before irrigation

“Batch System” a composting toilet system involving two or more alternating chambers.

“Biochemical Oxygen Demand (BOD)” the amount of oxygen required for the biological decomposition of organic matter, measured over a period of 5 days (BOD_5).

"Boulder" a rock with middle dimension greater than 600mm.

"Compost Toilet" treatment units which employ the process of biological degradation in which organic material is converted into humus like material through the action of micro-organisms and invertebrates. See AS/NZS1547,2000.

"Continuous System" a composting toilet using a single chamber

"Design Loading Rate" the Long Term Acceptance Rate (LTAR) (see definition below), reduced by a factor of safety.

"Dispersive soil" a soil that has the ability in water to form a cloudy suspension that will not settle.

"Distribution box" *a device which is designed to distribute filtered effluent evenly to separate irrigation areas. These devices are typically sized to accommodate the expected hydraulic loadings and should be mounted on a concrete plinth (min 100mm thickness) to maintain the device level so as to ensure even distribution to irrigation fields. There should be no vehicle or animal stock traffic over the device.*

"Domestic" *up to and including ten (10) persons in a non commercial situation.*

"Durable aggregate" aggregate, metal or stones which are graded to AS 2758.1 for single size coarse aggregate for nominal sizes, usually ranging from 20mm to 50mm,

"Effluent filter" placed in the outlet of septic or greywater tanks to reduce the level of solids entering the effluent disposal area. Effluent filters do not provide secondary treatment.

"Effluent Water" treated water which has passed through a treatment system,

"Evaporation" the transfer of water from a liquid to a gas

"Evapo-transpiration" removing water from soil by evaporation and from plants by transpiration

"Evapo-transpiration/absorption (ETA) bed" a prepared bed or area which embodies the principals of evaporation, transpiration and absorption. For the purposes of this strategy it represents the ETA trench (hydraulic) and the 300mm lateral seepage width strip.

"***Evapo-transpiration/absorption (ETA) trench*"** for the purposes of this strategy the ETA trench represents the actual hydraulic area and does not include the lateral seepage width of 300mm.

"Faecal Coliforms" a type of bacteria that live only in the gut of warm-blooded animals. Can be detected in the general environment if that environment is contaminated with human excreta, and therefore can act as an indicator of recent faecal contamination

"Geotextile" a water permeable material used in foundation stabilisation, soil particles moved by water erosion are designed not to pass thorough the geotextile fabric, (care should be taken as there are different fabric spacing sizes and qualities,)

"Greywater" the component of domestic wastewater which excludes water closet, kitchen and urinal wastes.

"Greywater Diversion Device (GDD)" – a GDD is a watermarked approved hand activated switch that diverts untreated Greywater by gravity or pump directly to sub surface irrigation system. GDD's are not permitted to be installed in unsewered areas in BSC.

"***Greywater Treatment System (GTS)"*** a system that collects, stores, treats, and may disinfect, greywater to the standards specified in the NSW Health ***Domestic Greywater Treatment Systems***

Accreditation Guidelines (February 2005) to provide treated greywater for reuse for irrigation, toilet flushing and washing machine use (see Section 2.10). A GTS must be installed, and operated in accordance with NSW Guidelines for Greywater Reuse in Sewered, Single Household Residential Premises May 2008.

"Groundwater" the body of water in the soil, all the pores of which is saturated with water; includes water below the water table and seepage from springs etc.

"Indexing Valve" allows for up to 6 separate land application areas to be irrigated.

"Irrigation Systems" pressurised sub-surface irrigation systems with pressure compensating emitters, (i.e. effluent disposal). These such as *Wasteflow* or *Netafim* systems and may incorporate an indexing valve (i.e. K-rain valve). These all require secondary treated effluent with disinfection, and are installed as *"sub-surface irrigation"* (300mm to 100mm depth) in accordance with the NSW Department of Health requirements.

"Infiltration" the passage of water into the soil.

"Land Application Area (LAA)" the area over which treated wastewater is applied i.e. disposal area.

"Long Term Acceptance Rate (LTAR)" the long term average rate effluent water can be absorbed into the natural soil at a selected disposal site, expressed in litres per square metre per day ($L/m^2/day$). This rate is influenced by effluent water quality, method of dosing, the soil permeability and the slime layer interface equilibrium of the receiving soil,

"Pan Evaporation" the loss of water by evaporation measured in a Class A pan under controlled conditions

***"Pathogens*"** micro-organisms that are potentially disease causing; these include, but are not limited to bacteria, protozoa and viruses

"Percolation" a general term describing the rate of water movement through a soil or through a biological mat within an effluent disposal area.

"Permeability" a calculated value derived from the rate at which a head of liquid is absorbed into soil, usually measured in m/d as Saturated Hydraulic Conductivity (K_{sat}).

"Primary Treatment" the separation of suspended material from wastewater by settlement and/or floatation in septic tanks, primary settling chambers etc., prior to effluent discharge to either a secondary-treatment process, or to a land-application system.

***"Scum*"** the floatable material which accumulates on the liquid during primary wastewater treatment. Material includes oils, grease, soaps and plastics.

"Secondary Treatment" aerobic biological processing and settling or filtering of effluent received from a primary treatment unit. Effluent quality following secondary treatment is expected to be equal to or better than than 20 mg/L BOD_5 and 30mg/L suspended solids.

"Secondary Treatment with disinfection" *Effluent quality following disinfection shall meet the NSW Department of Health requirement and is expected to be equal to or better than 20mg/L BOD5, 30mg/L Suspended Solids, and 30mg/L T.coli.*

***"Septic Tank*"** wastewater treatment device that provides a preliminary form of treatment for wastewater, comprising sedimentation of suspended solids, flotation of oils and fats, and anaerobic digestion of sludge

"Sewage Management" any activity carried out for the purpose of holding or processing, or reusing or otherwise disposing of, sewage or by-products of sewage

"Sludge" mainly organic semi-solid product produced by wastewater treatment processes found at the bottom of all primary treatment chambers in OSSMS.

"Soil Absorption" (includes leach drains, drain fields, absorption trenches, seepage beds and seepage pits) subsurface land application systems that rely on the capacity of the soil to accept and transmit the applied hydraulic load.

"Sub-soil" this is the depth below surface level from 300mm downwards i.e. for disposal of primary treated wastewater.

"Sub-surface" this is the depth from 100mm – 300mm below surface level.

"Sub-surface Irrigation (SSI)" pressurised irrigation system requiring tertiary and/or secondary treated effluent. Irrigation lines are situated approximately 150mm below the ground surface.

"Transpiration" the transfer of water to the atmosphere through plants

"Wastewater" Water discharges from a dwelling or other activity which are of a lower quality than the Sensitive Water Standard as defined by the EPA.

Part B: OSSMS Designs

1.0 STEPS REQUIRED FOR DESIGN AND INSTALLATION OF OSSM

A significant number of OSSM systems in NSW are failing to meet environmental and health protection standards (NDLG, 2000). To improve the performance of new systems in the BSC area, this design section of the Strategy provides supporting information to ensure sites are adequately assessed and risks to human health and the environment are minimised.

BSC has created a specific set of tables (outlined in Part C of this Strategy) that an applicant should reference when designing a new or making alterations to an OSSMS.

1.1 Reports to Accompany Applications

Whilst installations of an OSSM may only be undertaken by NSW licensed plumbers/drainers, design of systems may be prepared by either suitably credentialed waste water consultants or licensed plumbers/drainers.

In all cases a report is to be submitted in conjunction with the proposed plans for the OSSM.

1.2 Plumbers Reports

Plumber's applications and reports need to undertake the following steps in preparing the application:

Step 1: Consult with client about suitable treatment systems and land application systems.

Step 2: Conduct a site inspection.

Step 3: Undertake desktop research to determine Deposited Plan (DP) and Lot numbers, flooding depths and frequency (if applicable), acid sulphate soil presence (if applicable), whether the site is within a water catchment 7(c) zone, consider potential contaminated lands etc, geology and soils of the area (see Table 1) using *Soil Landscapes of the Lismore-Ballina 1:100,000 Sheet* by Morand (1994) (Located at Part C Table F), noting that this step does not preclude a proper site and soil assessment.

Step 4: Calculate the LAA using Part C – 'Calculation of the LAA'

Step 5: Peg and identify effluent disposal areas. All land application areas for effluent disposal are to be pegged out on-site for Council's site inspection, in order to delineate the nominated disposal area (not required to be surveyed). Pegs need only be sufficient to locate the land application area. If less than 4 pegs, dimensions in metres from the pegs in place need to be stated.

Step 6: Write a detailed report and complete OSSM Approval to Install Form (See Appendix G)

Step 7: Submit 3 copies of report to Council with the following documents attached:
- Plans of proposed works
- Application to Install or Alter a Sewage Management Facility
- S68 Application

1.3 Consultants Reports

BSC may require the submission of a specialist consultant's report under particular circumstances where critical site constraints or other environmental concerns exist. The details required in consultant's reports are described as follows. Sections 2.0 to 5.0 below will assist in steps 3, 4, 5 and 6 listed above. In deciding upon treatment and land application solutions it may be helpful to start from the site and soil constraints and work backwards through the treatment train.

Details required in consultant reports

- *Proposed system*: An outline of the proposed system components is to be stated on the first page of the report so that it is clear to BSC assessment staff, owners and installers regarding the type and size of system to be installed.

- *Site Specific*: Reports are to be specific, succinct and with information relevant to the site under review. Justification of the type of system nominated is to be included in the report. Consultants must state the date/s that they conducted site inspections. If any departures from the strategy are proposed, cogent argument and all necessary documentation must be provided. Any proposal for greywater diversion must be addressed in the report.

- *Site Constraints*: Reports are to accurately indicate the distances (metres) from the proposed wastewater irrigation field to any existing dry gullies, watercourses or any other environmental features on-site in relation to the land application area. Should a proposal be designed with less than the relevant buffer distance (Part C – Table F) or have environmental constraints, **upfront** acknowledgement of the limitation is to be reported. This must be accompanied by an explanation as to how it is proposed to manage the limitation eg. maximising the buffer distance, installing a secondary treatment device or installing an AWTS, etc. It is unacceptable that important relevant issues are hidden within the sub-text of a report or not commented upon.

- *Owners Acknowledgement*: Submitted effluent disposal reports are to include a statement by the owner that they are aware of the type of system being nominated in the report and of the maintenance schedule required to be carried out for the nominated system.

- *Irrigation Reports*: Subsurface drip irrigation, or subsurface irrigation-under-mulch designs are to be produced by a person with suitable experience in irrigation design.

- *Site Plans*:
  All reports are to include two site plans as follows,
  1) a small scale plan extending to surrounding areas, usually using a 1:25,000 topographic map, showing contours; and
  2) a large scale plan showing the location of: the proposed sewage management system and any existing OSSM components (for alteration);effluent disposal field areas including soil analysis bore logs; wells/bores; buildings and facilities; environmentally sensitive areas including permanent or seasonal waterways within 100m of the treatment or disposal areas; bunds, berms, drains or swales for the diversion of run-off around effluent application areas; and buffers surrounding the effluent application areas.

- *Plan of land application areas:* This is to be a detailed design plan suitable for use for construction purposes by the plumber and others including BSC assessment officers.

- *Full specifications and engineering details:*
  Submission of full details of the chosen treatment systems (including composting toilets) which are to include copies of all NSW Health accreditation documents is required, along with justification for the choice, including calculations, to allow BSC assessment staff to review all individual components of the OSSM system. These are to include construction, installation, operation and maintenance aspects.

- *Complete site and soil assessment*

- *Number of residents*: Is determined by using Table F in Part C of this Strategy.

- *Plans of management*: A plan of management should include operation, maintenance and service requirements of all components of the proposed sewage management system. This information must be specific to the particular system proposed, and provide all necessary instructions for the occupier/owner or service personnel including an emergency action plan in the event of a breakdown or power outage.

Generic reports irrelevant to the site or type of system installed will be rejected. The schedule is to stipulate the type of system, the person responsible for maintaining the various components of the system including treatment device and disposal area (i.e. owner or servicing agent) and specific time frames or conditions for servicing the various components. It will be a condition of approval that this information be displayed in an appropriate place for the benefit of future occupiers, owners and service personnel. A final inspection and Occupation Certificate may not be granted unless this service schedule is displayed.

1.4 Installers Requirements

- *Plumbers requirements:* All plumbers conducting work on OSSM systems within BSC must be suitably (NSW) licensed. For each OSSM installation, plumbers must obtain a copy of the relevant BSC Approval to Install an OSSM system and any conditions contained therein. Council is to be contacted to enable an inspection of the OSSM system prior to any backfilling of drainage lines and LAA (irrigation fields).

- *Plumbing & Drainage Work:* All plumbing work is to be carried out by the licensed plumber in accordance with the provisions of AS/NZS 3500 and the NSW Code of Practice for Plumbing & Drainage, 3rd Edition, 2006.

- *Certification*: Certification of the OSSMS including LAA details shall be submitted by the installer **and** the designer to Council in accordance with the approved design. The certification is to be submitted to BSC together with a “works as executed” diagram once the system has been completed. The final/interim inspection will not be approved until such certification is submitted to BSC.

- *Irrigation Installations:* subsurface irrigation designs are to be installed by a person with suitable experience & qualifications in irrigation installation.

- *Irrigation Maintenance Reports*: All effluent irrigation including subsurface irrigation are to be maintained on a regular basis as per the condition of approval for the installation. This maintenance is to be done during the quarterly inspection, and details submitted to BSC within 7 days of servicing the irrigation area and OSSMS.

- *Inspections:* Land application areas are to be planted out in accordance with the approval and/or effluent report prior to occupation of the dwelling. Permission to occupy will be generally refused should the nominated disposal area and planting schedule not be completed.

  - It is requested that a minimum 24 hours notice be given for a required BSC inspection.

  - Inspections of internal and external drainage lines, including the entire effluent disposal system can only be carried out by BSC assessment officers. Private certifiers or designers do not have the authority to inspect any aspect of an OSSM system and associated drainage.

  - It is a requirement for sub-surface irrigation systems that the installer contacts BSC prior to the backfilling of the treatment or irrigation field area so that the system can be inspected and tested.

  - It is a requirement for absorption or evapo-transpiration bed systems that a BSC inspection is carried out prior to the backfilling of the effluent field bed.

***Failure** to obtain an inspection* by BSC staff is an offence under the Local Government Act 1993. Persons breaching this legislation are liable to prosecution or infringement notices which may result in a monetary penalty.

Final Occupation certificates will not be issued unless BSC is satisfied that all required inspections have been carried out and the plumbing works completed satisfactorily.

1.5 Requirements for Plumber's Reports (Building Additions/Alterations)

BSC regularly receives development applications (DA's) from people wishing to undertake building renovations or additions to their dwellings in rural non-sewered areas. In many cases this may involve an extra hydraulic wastewater load entering their OSSM system. It is therefore necessary for the contracted plumber to prepare a small report/statement (e.g.1 page) and a plan of the existing system. This report is to be submitted with the correct paperwork (S68 application) and fees to Council at DA lodgement stage.

If there is no extra hydraulic wastewater load placed on the existing system with the additions, the system may not be required to be upgraded, providing such system is performing effectively.

Plumbers reports shall include the following:-

- An accurately dimensioned plan of the existing OSSM system.
- Details of the existing OSSM system (i.e. type and capacity of the tank, bed/trench length, greywater diversions) and its current condition (i.e. is it showing signs of deterioration, is effluent pooling).
- Buffer distances to environmentally sensitive areas i.e. waterways, dams, drinking bores, gullies etc
- State whether the proposed additions/alterations will result in any extra hydraulic loading upon the existing OSSM system.
- If there is a load increase, what is the ability of the existing system to cope with the additional load?
- If there is a load increase and the on-site system needs upgrading details of the proposed upgrade of the OSSM system are to be provided to Council.
- If the upgrade is on a constrained site, Council may request that an effluent report from a suitably qualified and experienced wastewater consultant be submitted.
- All upgrades are to meet the requirements of BSC's Revised On-site Sewage and Wastewater Management Strategy as amended.

2.0 CHOOSING A TREATMENT SYSTEM

On-site sewage and wastewater management is summarised in the following diagram:

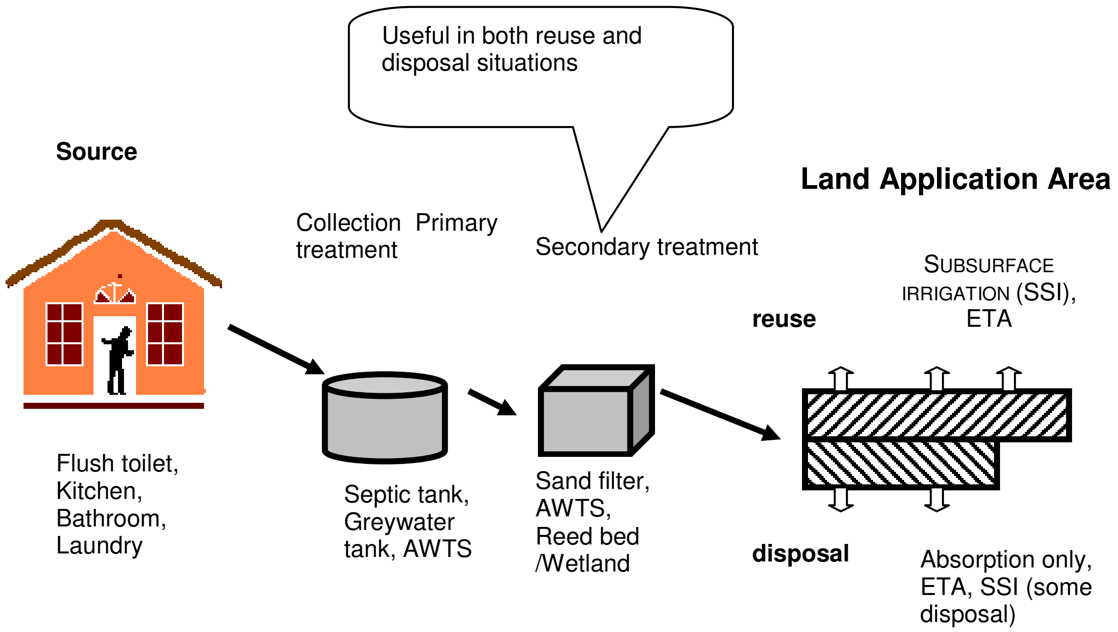

Figure 1: The Treatment Train

Various OSSM treatment systems will be described following the sequence within this diagram. **Expanded details of treatment systems may be found in Appendix A.**

2.1 Source Control

2.1.1 Waterless Compost Toilets

Compost toilets reduce the amount of treatment required for wastewater by removing faeces and urine at the source. They also significantly reduce household water usage, by up to 30%.

Operation & Maintenance

- After each visit add some carbonaceous bulking agent. i.e. Wood shavings.
- Poke/flatten the compost pile to reduce height if a large "cone" of material forms.
- Manually clean the pedestal and do not use bleach or dispose of cleaning agents into the toilet.
- Remove compost when it builds up near the door at the back of the unit.
- Bury compost for three months before use.
- Use compost only on trees etc, and not on vegetable gardens.

2.1.2 Detergents

The use of low phosphorus and low sodium detergents is recommended in households with OSSM systems. Detergents can affect the ability of the soil to absorb effluent and generally degrade the land application area. High strength sterilising agents should be avoided in the household OSSM system as they can kill off the bacteria within the system and hinder the breakdown of solid waste material.

2.2 Collection / Primary Treatment

Collection tanks (i.e. septic or greywater tanks) for raw effluent provide some primary treatment. The level of primary treatment depends on the residence time of the wastewater in the tank.

2.2.1 Septic Tanks

The septic tank is a small anaerobic digester. The anaerobic bacteria which perform the treatment are kept sealed from the atmosphere by a scum layer on the surface. The resulting effluent is low in suspended solids but high in Biochemical Oxygen Demand (BOD) and requires further biological treatment in the soil, preferably after secondary treatment.

Operation & Maintenance

- It is recommended that the contents of the septic tank be pumped out every 3 to 5 years.
- Do not flush tampons, condoms and other indigestible material into septic tanks. Avoid introducing bleach and chemicals harmful to the anaerobic micro-organisms.
- Do not smoke near the septic tank when undertaking maintenance work due to a possible build up of gases i.e. flammable methane.

2.2.2 Greywater tanks

Some OSSM systems incorporate separate greywater tanks, including those premises utilising composting toilets. The average greywater collection system consists of a tank (minimum size 1800 litres) where some primary treatment occurs. As greywater tends to be nutrient-poor for purposes such as promoting growth in reed beds, leachate from compost toilets is sometimes included in the effluent wastewater stream.

2.2.3 Effluent Filters

To reduce Total Suspended Solids (TSS), effluent filters are required on the outlets of greywater or septic tanks. Effluent filters are not to be regarded as secondary treatment devices and simply filter the effluent prior to discharge to the effluent field area. These devices are useful in minimising any blockages within the effluent irrigation area and the filters need to be cleaned on a regular basis to maintain performance.

2.3 Secondary Treatment

In order to qualify as “secondary treated”, effluent must contain no more than 20mg/L BOD and 30mg/L Total Suspended Solids. The choice of a treatment system to achieve this level of water quality may involve balancing the strengths and weaknesses of the available systems, as summarised in Table1.

Land application areas within stated buffer distances (Section 4; Table 8) and on unsuitable soils or steep slopes may require the installation of OSSM secondary treatment systems.

2.3.1 Aerated Wastewater Treatment Systems (AWTS)

AWTS's depend on reliable electrical supply, mechanical and electronic components to be in good working order. Failure in any part of the system, especially as a result of power interruptions, can lead to a definite health risk. This is why BSC will usually only approve sub-surface irrigation as the land application method for receiving treated effluent from an AWTS. The high up-front and regular quarterly maintenance costs must be considered when choosing an AWTS.

Maintenance

- AWTS's require regular *quarterly* maintenance and servicing by a *qualified service contractor* (usually the firm that supplied the unit).
- An owner-funded contract must exist between the Council-authorised service provider and the owner.

2.3.2 Sand Filters

Sand filters are of two types: a) intermittent (single-pass) and b) recirculating. Intermittent sand filters are either operated under gravity or by a pump. One of the main disadvantages of the single pass filter is its poor nitrogen-removing performance (though good nitrifying capacity). BSC only allows the use of a sand filter if the sand filter is dosed by a pump or dosing siphon. NO gravity feed sand filters are permitted.

The recirculating sand filter has good Nitrogen removing capability, indeed, good performance overall, providing the system is maintained on a regular basis. Sand filters as with any secondary treatment system, can be expensive to construct when compared to other primary treatment systems. They also require electrical power and regular maintenance checks.

Operation & Maintenance

- Check pumps and other mechanical parts.
- Check for slime or algae build up in intermittent (single pass) sand filters and remove if necessary.

2.3.3 Reed Beds / Wetlands

Reed beds remove nitrogen better than an AWTS or single pass sand filter, and are less costly to construct. They are also passive devices not reliant upon power or pumps.

Operation & Maintenance

- Check inlets/outlets for root blockages.
- Harvest the reeds at least once per year.
- Remove any weeds.
- Divert surface storm waters from entering system.

For more information on Reed Beds/Artificial Wetlands for Domestic Households you are advised to access Council's reed bed document titled '*The Use of Reed Beds for the Treatment of Sewage and Wastewater from Domestic Households*'. Reed Bed containment structures must be made of durable robust material. The use of liners is not permitted for reed bed construction (See Appendix A: Section 5).

The strengths and weaknesses of common OSSM system components are presented below in Table 1.

Table 1. Strengths and weaknesses of secondary treatment systems. Source: Davison (2003)

Performance criterion	AWTS	Single pass sand filter	Recirculating sand filter	Reed bed (horizontal flow wetland)	Vertical flow wetland
Power required?	yes	pump needed on flat ground	yes	no	pump needed on flat ground
Fall of site	any	1m fall if no pump	any	flat to moderate slope	1m per stage if no pump
Surface area	small	~3m^2 /EP	<3m^2 /EP	4-6m^2 /EP	~3m^2 /EP
Maintenance	high- contract or required	owner can do	owner can do	owner can do	owner can do
Construction cost	high	high	high	moderate	high
Nitrification	good	good	good	poor to moderate	good
Nitrogen removal	low	low	good	moderate to good	poor
Intermittent dosing needed?	no	preferable	yes	no	preferable
Tolerance to peak loads	low	low	moderate	very good	low for high loads
Tolerance to low loads (holidays)	low	OK	OK	OK	OK
Visual impact	low unless above ground	can be hidden	can be hidden	can be landscaped	can be landscaped
Awareness? Does the device invite user participation & hence awareness/commitment?	no	no	no	yes	yes

2.4 Tertiary Treatment

2.4.1 Disinfection

There are a number of options for effective long-term disinfection for some tertiary treatment OSSM systems. Chlorination is used with AWTS's. Other agents include bromine, UV light & membrane filtration technology. For dripper-under-mulch or sub-surface (subject to assessment) irrigation systems, the effluent *must* be disinfected after secondary treatment prior to discharge to the irrigation field.

2.4.2 Phosphorus Removal

Those land application areas located on sandy soils may need suitable imported soils into the land application area to aid in phosphorus removal. Soils higher in clay particle content generally have a greater propensity to accept and retain phosphorous as opposed to porous sands. Ideally, phosphorous should be retained within the irrigation field to prevent the travel of nutrients into waterways, contributing to algal blooms.

2.5 Other considerations

Separate Vs Combined Systems

Opinion differs on whether components of the wastewater stream should be treated separately or together. When treatment is separated, the usual split is between black- and greywater, though the split may also separate (for example) kitchen wastewater from other wastewater. There are many possible combinations. The use of compost toilets presupposes a separate greywater system because the blackwater system is eliminated altogether (although compost toilet leachate may be incorporated into greywater systems, as noted above). Whilst a combined system is less costly there are situations where site or dwelling characteristics may dictate separated systems.

Reuse

Council will consider applications for the re-use of wastewater and these applications will be assessed based on their merits. All applications for re-use will have to meet BSC and NSW Department of Health guidelines. Any devices or systems used with effluent re-use may have to be accredited with the NSW Department of Health.

2.6 Small Blocks

There are instances of failing OSSM systems on smaller rural residential lots within the BSC local area. In many of these cases it is impossible to meet nutrient requirements and in some cases the hydraulic load is too large for the available irrigation area.

The first priority with these difficult sites is to protect public health and deal with the hydraulic loading appropriately. This may involve the requirement for secondary & tertiary treatment of the wastewater and in some cases the installation of a compost toilet to reduce the hydraulic load to protect public health and the environment.

With OSSM system upgrades on smaller blocks, it is sometimes necessary to locate the land irrigation area inside buffers. In these cases it is usual practice if the required buffers cannot be satisfied that secondary treatment or tertiary treatment will be required.

2.7 The Upgrade of OSSMS in BSC LGA

BSC has an audit program that is working towards inspecting all the existing OSSM systems within the local area.

Causes of failed systems include: inadequate sizing of systems, age, poor design, poor location of effluent fields, abuse of system, incompatibility of system with the site characteristics and with AWTS, poor construction of effluent irrigation areas.

2.7.1 Upgrade of Failing Septic Tank System

Many OSSM system failures relate to defective septic tank absorption trenches usually associated with the age of the system and/or damage from livestock and vehicles.

The majority of failing septic tank systems require the installation of a new land application area e.g. ETA Beds and the addition of an effluent filter (See Section 2.2.3).

In cases where these failing septic tanks are located on poor soils (from light to heavy clays), are within buffer distances to environmentally sensitive areas or are located on a constrained site, upgrade to secondary treatment of the wastewater may be required. This is usually achieved by either installing a tertiary treatment system or additional device that holds a NSW Department of Health accreditation for secondary treatment e.g. AWTS, biological treatment system etc.

2.7.2 Upgrade of Pit or Pan Toilets

Ballina has minimal instances of pit toilets. Such systems can be inundated with ground water during times of wet weather. Inspections of pan toilets reveal the pan is usually open to the environment and the contents are not disposed of in a suitable manner. Therefore, due to the risk these types of toilets pose to human health and the environment, they are now being replaced & upgraded to more suitable systems such as those mentioned previously.

2.7.3 Upgrade of AWTS's Land Application Area's

Historically in the BSC area AWTS's were installed with a minimum 200-400m2 of spray irrigation area and installed under the approval of the NSW Department of Health. The spray irrigation was usually installed by the owner or the builder. Resulting in numerous problems that have led to system failure.

Examples of failure include the uneven distribution of the treated wastewater over the land irrigation area resulting in pooling of wastewater in the bottom corner of the irrigation area and lack of maintenance. There are instances where the land irrigation area has never been established. Fine mist sprinklers used blocked easily and it is possible for spray drift to reach neighbouring properties.
Due to these problems, Council has been requiring that the majority of failing sprinkler systems be replaced with ETA beds or sub-surface drip irrigation. All new AWTS irrigation is to be via drip feed subsurface irrigation.

Please note that BSC may allow the sprinkler system to remain if the sprinkler system does not represent a public health threat and meets buffer requirements (see Section 4.2), however the owners should ensure they understand the risks of human contact with the effluent.

To retain an existing above ground sprinkler system, the upgrade of the sprinkler system will need to comply with the following:

- the installation of a 4 or 6 way indexing valve;
- the installation of a 120micron, 50mm (2 inch) inline filter;
- the use of heavy droplet sprinklers on hard risers;
- delivery lines to be buried a minimum of 100mm;
- a suitably sized pump to drive the indexing valve;
- the land disposal area will need to be sized according to Council's Tables for sizing of LAA in Part C; and
- on completion of the works, the sprinklers will need to be tested by the plumber in the company of a BSC assessment officer.

2.8 Vegetative Buffer

The use of a vegetative buffer will reduce surface runoff of pathogens and improve infiltration. In some upgrades the land application area is closer to an environmental constraint such as a waterway than preferred. In some cases the wastewater can be treated to a secondary level and a vegetative buffer planted between the land application area & waterway. See Appendix C for plant details.

2.9 Greywater Diversion Devices (GDD)

The NSW Guidelines for Greywater Reuse in Sewered, Single Household Residential Premises (May 2008) allow the installation of approved propriety devices in sewered residential areas.
BSC will not permit these devices to be installed in non-sewered areas or within areas with dual reticulation. Where installed a GDD must be a specifically approved product and can not be constructed by the property owner or plumber.

It does NOT include:-

- the manual collection and re-use of greywater;
- greywater treatment systems;
- AWTS's;
- any other system which treats sewage to a standard suitable for re-use i.e. septic tank with a reed bed or sand filter.

3.0 GREYWATER TREATMENT SYSTEMS (GTS)

Please refer Part C Section 4 of NSW Guidelines for Greywater Reuse in Sewered, Single Household Residential Premises May 2008

3.1 On-site Systems Accredited for Toilet Flushing/Re-use

Those people considering installing an OSSMS or Greywater Treatment System (GTS) that re-uses the wastewater for toilet flushing, or clothes washing etc are advised to go to NSW Health's webpage, http://www.health.nsw.gov.au/, to determine those OSSM systems that are accredited for these purposes.

Advice from NSW Health is that for toilet flushing, and in some cases clothes washing, only effluents that have been treated via approved domestic greywater treatment systems (GTS) are to be used for this purpose.
Any submission to Council for such uses would need to be supported with an effluent report, including accreditation details of the proposed on-site sewage management system, details on the separate pipe work (including the back-flow prevention device) that would supply the treated wastewater for toilet flushing and details of the black water system.

Warranties for washing machines and toilet cisterns etc may be void if greywater is used in these facilities. Instances of staining have been reported. BSC recommends that people check with the manufacturers.

NOTE. BSC takes no responsibility for any damage or warranty issues relating to greywater use.

3.2 Approvals for Installation and Operation of an OSSM System

An application to install an OSSM system must be accompanied by the correct fee and three (3) copies of plans for the proposed work. (Refer web page for forms). Work to install the OSSMS shall not commence until the owner has received written approval from Council to undertake the proposed work. The approval to install will have numerous conditions applied, specific to the proposed work that need to be read and followed carefully by the Licensed Plumber and owner. Once the required final inspection of completed work and certification process is completed BSC may issue an approval to operate the facility. This process is required for all new developments and major upgrades of existing systems.

Under no circumstances shall upgrades, or new installations be undertaken without written approval from Council.

All work must be undertaken by a NSW Licensed plumber.

3.3 Pump Wells

Pump wells are to be sized according to the NSW Code of Practice: Plumbing & Drainage, July 2006 (Part 2: NSW 3.20.2 - Holding Well or Wet Well Capacity). Two pumps are required for systems with one day's storage. Single pump systems are acceptable where storage capacity is equivalent to 3 times the daily flow. **Note:** Alarm systems are recommended for ongoing maintenance management of pump well systems.

Pump wells are to have an overflow trench in case of pump failure. The minimum size of this trench shall be 1.5metres long by 500mm wide by 400mm deep and shall utilise one length of arch trenching (i.e. half round, hoop).

3.4 Electrical components

All electrical components associated with any OSSMS shall be installed a minimum of 300mm above the 1:50 yr flood level applicable to the property.

4.0 CHOOSING A LAND APPLICATION SYSTEM

Site and soil-specific parameters largely determine the appropriate system for any given situation. But cost and maintenance requirements also play a part in choosing a system. The strengths and weaknesses of various land application systems are summarised in Table 2. Please refer to the tables in Part C - 'Calculating the Land Application Area'.

Greater detail of each system may be found in Appendix A. Common to all systems are the following maintenance principles, to protect land application areas:

Generic maintenance principles

- Do not drive over beds, except with ride-on mowers.
- Keep the grass short and trim the vegetation when necessary to let sunlight in, promote plant uptake and remove nutrients from the land application area.
- Keep vehicles & stock i.e. cattle, away from the beds.
- Fence effluent irrigation areas where necessary.

4.1 Disposal systems (Absorption Trenches)

A conventional septic tank and the LAA (trench) is classified as a primary treatment system. Septic tanks have been in existence for many years and some limitations exist with their usage, The system largely depends on the absorption of the liquid effluent into the existing soil below ground over the LAA. BSC does permit the installation of these systems where the particular site is appropriate for their use.

4.2 Evapo-transpiration/absorption (ETA) Trenches

Owners of ETA trenches should establish appropriate vegetation. In addition to grassing the beds themselves, BSC recommends shrubs to be planted no closer than one (1) metre from the sidewall of the ETA bed or trench and small trees (<5m) no closer than five (5) metres. Large trees, such as, eucalypts, figs or mangoes should be planted no closer than 20metres from the beds. A good rule of thumb is to plant the shrub/tree a little more distance away from the bed than it would grow in height i.e. a shrub that will grow 3m in height, is planted 3m plus away.

Operation & Maintenance

- Apply the generic maintenance principles outlined above.
- If using a septic tank, it is recommended the tank be inspected regularly and pumped out every 3-5 years depending on usage to avoid stressing/over-loading the land application system.

4.3 Subsurface Irrigation

Sub-surface irrigation is particularly appropriate where there are major site or soil limitations or constraints, such as steep slopes and heavy impermeable (e.g. pug) soils, or highly permeable sandy soils. These systems must be designed and installed by suitably qualified persons. Waste waters managed through a sub-surface irrigation system will generally be required to be disinfected after secondary treatment.

Subsurface Irrigation (SSI) Designs

Council requires details of sub-surface irrigation design. Designs submitted to Council are to address details, such as, design criteria spreadsheet, contours, buffer distances, use of: 50 mm 120 micron inline filters, Trifluralin (TECH) filter (if required), vacuum breakers, indexing valve, unions, support bracket, and pump well capacity (if required).

Other Design Considerations

- A Trifluralin (TECH) filter is required if herbicide is not impregnated in dripper pipe.
- BSC expects that the design submitted for approval shall be able to be read easily by a plumber and be able to be used and referred to during installation. If a poor design is submitted to BSC it is likely to be refused and returned to the consultant for amendment.
- Manufacturers of drip line irrigation systems require that wastewater is treated to a secondary level. Therefore, SSI designs are to meet the following water quality requirements: 20/30 BOD/TSS. Disinfection may be required subject to system accreditation, irrigation area constraints, and Council's discretion.
- The discharge of greywater to SSI without first undergoing secondary treatment will not be permitted.
- The ability of the proposed pump to deliver effluent and to flush (scour) the lines must be addressed.
- Potential disinfection requirements of wastewater.

Small Irrigation Area Sizes

Please note BSC does not recommend SSI areas under 300m2. However, if it is proposed to utilise a very small irrigation areas i.e. less than 300m2, then the design will need to consider such detail as:-

- N.B. effluent to be applied at a slow rate & in small doses with consideration given to the wastewater load entering the irrigation chamber/pump well triggering the alarm.
- Laterals to be spaced closely i.e. 600mm apart.
- Consider emitters at 400mm spacing.
- Drippers to emit 1.3 or 1.6 lt/hr.

Operation & Maintenance

- Apply the generic maintenance principles outlined above.
- Systems must be serviced by a suitably qualified person quarterly or half-yearly depending on the designer's requirements.

4.4 Components Used in Land Application Areas

Indexing Valves

Indexing valves allow for up to six (6) separate land application areas (beds or irrigation areas), to be used. The indexing valve will apply a set volume of effluent to the first application area after which the pump turns off and the valve automatically switches to the second application area where the process is repeated. Indexing valves are used in sub-surface drip irrigation and ETA beds LAA's. This creates a dry/wet effect in the beds allowing for greater treatment of the wastewater.

Dosing Siphons

Gravity-driven dosing siphons are becoming more popular. Siphons are located after the collection tank (greywater or septic tank) and can be used to dose reed beds, sand filters or ETA beds. Siphons ensure that effluent reaches the ends of ETA beds thus providing more even distribution and allowance for the intermittent dosing of sand filters.

Dosing siphons are passive devices that deliver a set quantity of water in discrete doses. They are used in sloping sites where a fall of over 2 or more metres exists between system elements (eg. Between the septic tank and sand filter or reed bed and ETA bed).

Distribution boxes

These are concrete boxes used when installing two or more ETA beds and allow for the even distribution of wastewater between the individual beds. Distribution boxes are to be installed level to ensure an even delivery of wastewater to each bed and they must be structurally secured to prevent movement overtime. The box shall be bedded in concrete and level to allow even distribution of the effluent to the LAA.

5.0 SITE AND SOIL ASSESSMENT

When designing systems the site assessment task is critical to the overall successful operation of an environmentally sustainable system. The depth of information required differs depending on the circumstances of the site. This section concentrates on site assessment for new wastewater land application systems but also has applicability to existing systems.

Existing systems

The 'Approval to Operate' arrangements introduced in 1998 and, enforced under the Local Government (General) Regulation (2005). This requires Council to inspect existing systems and to issue a certificate of approval on the basis on the performance of the system. Improvements to failing existing systems may be required at any time and if necessary changes to the conditions of the approval may result. Any building additions that are carried out may require an upgrade to the system to meet any new demands on the existing system.

Existing systems need to be re-evaluated under the following circumstances:

- proposed extension to an existing dwelling;
- change of use;

- increase in the generation of wastewater for a development, e.g. a dual occupancy is added to the development; and
- where existing on-site system has failed.

Failing Systems

Should an OSSM system be failing, the following steps should be undertaken to rectify the problem:

1. Seek advice from a qualified plumber or consultant to determine the source of the failure.
2. Contact officers of Council's Environmental Health Unit for advice on what upgrades are needed.
3. Complete and submit all required documentation to Council (See Part B – Section 1.0 of this Strategy).

New systems on land previously zoned

Any site requiring on-site wastewater disposal should be examined in accordance with the Site and Soil Evaluation Parameters described in the next section. This assessment can then be used to determine the appropriate location for on-site land application. There may be situations where the wastewater siting may have to take priority over the house siting, because of environmental constraints. In water catchment areas zoned 7 (c) Environmental Protection assessment will be required to have regard to the Rous Water Guidelines and those of BSC noting that BSC remains the final approving authority.

Rezoning and Subdivision Applications

This document provides a framework for the implementation of ecologically sustainable OSSM systems on single dwelling/dual occupancy sites as identified in Section 1.2 "Scope". In this respect it provides the framework and requirements for the design and installation of single systems on land where it is already zoned for residential development and where a residential subdivision has been approved.

For rezoning and subdivision applications within non-sewered areas, a thorough investigation will be expected to fully characterise the site suitability for on-site sewage management. This is likely to require a laboratory analysis of soils (not normally required for single site assessment). Guidance on detailed investigation is provided in other documents including the State Government "Environment and Health Protection Guidelines - On Site Sewage Management for Singe Households" and Australian Standard 1547:2000.

Additional factors required to be addressed when preparing rezoning and subdivision applications include:

- the desirability for "low-tech gravity fed " treatment systems i.e. septic tank and ETA beds, compost toilet with greywater tank and ETA beds, septic tank, reedbed and ETA beds;
- provision for buffers to watercourses and drainage lines strictly in accordance with Part C Table F of this Strategy. The determination of whether a watercourse is "perennial", "intermittent" or a "gully" must be clearly justified by carrying out a detailed site assessment;
- assessment of characteristics of the upstream and receiving catchment, including land uses and physical constraints;
- assessment of groundwater flows and patterns;
- determination of phosphorous sorption rates for soils;
- nutrient balance calculations for the catchments involved; and
- evidence of high water tables and subsurface bedrock.

5.1 Site Evaluation Parameters

This section explains in detail the various parameters required for site assessment.

5.1.1 Site Evaluation

Most of the following information is drawn from the Australian Standard (AS/NZS1547, 2000). The information will assist in the completion of the required *OSSMS Approval to Install Assessment Form.*

a) Slope Angle (AS/NZS1547, 2000)
The slope of the site should be determined in the field, through the use of such instruments as an inclinometer, or through a formal survey of the site. BSC generally considers landslopes of less than 20% to be suitable for land irrigation disposal.

b) Slope shape (AS/NZS1547, 2000)
The shape of the slope may either assist or hinder drainage as shown in the following diagrams

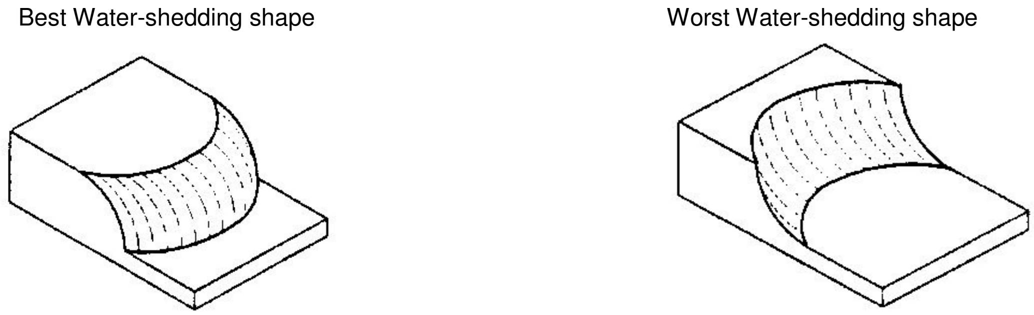

Figure 2: Slope Configuration in relation to surface drainage: AS/NZS1547:2000)

Cut-off drains and bunds may be used to ameliorate poor drainage likely to result from poor shape. The reader is referred to the Australian Standard for more detailed diagrams of these various types of slope shape. A minimum distance of 20 metres will be required to measure and determine the degree of slope. It is strongly recommended that the site be surveyed to aid slope assessment.

c) Aspect (AS/NZS1547, 2000)
Use a compass to ascertain the direction of the slope. North and North East facing slopes are recommended positions due to greater exposure to sunlight, hence higher evapo-transpiration. Shaded irrigation areas should be avoided.

d) Exposure (AS/NZS1547, 2000)
The exposure to sunlight and prevailing winds aids the uptake of water vapour through transpiration and evaporation, depending on the disposal system selected. It is noteworthy that meteorological stations, which supply climate information, are always fully exposed to sun and wind. Thus the daily water balance model used in this document, based on Alstonville climate records, would not be representative of a damp shaded area. Any such areas should be marked on the site plan.

e) Boulders/Floaters/Rock Outcrops (AS/NZS1547, 2000)
Boulders/floaters or rock outcrops may allow wastewater to short circuit the disposal field and enter water supplies. Therefore the site should be traversed on foot, and the presence of any boulders/floaters or rock outcrops should be recorded in the site plan. Note: A boulder's middle dimension is at least 600mm (see Definitions).

f) Buffer Distance
An accurate distance must be recorded to watercourses, gullies and other environmental features in relation to the land application area. In the event a proposal cannot achieve the relevant buffer distance or have environmental constraints, upfront acknowledgement of the limitation is to be clearly reported and explanation of how it will be managed for the limitation eg. maximising the buffer distance, installing secondary treatment etc, is to be stated. This provides the potential for some level of flexibility subject to a merit based assessment for single lots with an existing dwelling entitlement. This level of flexibility is not afforded to rezoning and subdivision applications as buffer distances are treated as absolute minimums.

The following buffer distances apply to disposal areas situated near watercourses:

- 100m buffer. Watercourse: comprise two types of systems
  1. Perennial: Those watercourses that essentially flow all year-round and consist of baseflow during dry periods.

  2. Intermittent: Those watercourses that flow for only certain times of the year, when they receive water from surface runoff, springs or ground water. During dry years they may be reduced to a series of separate pools or may even cease to flow entirely. However these pools are still connected to the water table/ground water.

- 40m buffer. Gully or Ephemeral Stream:
  These watercourses have channels which are above the water table at all times and therefore do not receive spring or groundwater flows. They carry water only during and immediately after rain. They may be dry for extended periods but subjected to flash flooding during high intensity storms.

- 250m Domestic Groundwater wells/bores.

The following buffer distances apply to disposal areas situated near property:

- 12m up-gradient of property boundaries, and 6m from swimming pools, driveways and buildings
- 3m down-gradient of property boundaries, swimming pools, driveways and buildings
- 12m up-gradient of property boundaries for ETA beds (though 6m for swimming pools, driveways and buildings)
- 6m down-gradient of property boundaries for ETA beds (though 3m for swimming pools, driveways and buildings)

g) **Run-on and Upslope Seepage** (AS/NZS1547, 2000)
Any run-on or upslope seepage must be recorded on the site plan. If uncontrollable by the construction of a catch drain above the disposal field, then an alternative location must be chosen. The presence of flood debris and silt deposits may assist in identifying run-on.

h) **Flooding Potential**
The flooding potential of the site must be determined, especially for low-lying areas of Richmond River. All disposal areas should be above the 1 in 20 year flood height, and treatment systems should be above the 1 in 50 year flood level. BSC or the NSW Department of Public Works may be able to supply flood height records. Alternatively the property owner may have to engage a surveyor to ascertain accurate levels.

i) **Site Drainage** (AS/NZS1547, 2000)
The frequency and duration of seasonal shallow waterlogging should be noted. Signs of poor drainage include hard packed soils, vegetation growth characteristics of damp sites, and pooling of water. It is not recommended that land application areas be installed within sites with poor drainage. The location of channelled (concentrated) runoff on site, as well as any runoff likely to move onto neighbouring properties, should be noted on the site plan.

j) **Vegetation Indicating Waterlogging**
While wetland species such as bullrushes etc are obvious signs of frequent waterlogging, other less obvious species such as sedges and buffalo grass indicate seasonal waterlogging in this region. These species should be noted in the site plan.

k) **Surface Condition** (AS/NZS1547, 2000)
Note cracks, hardness, previous compaction, dampness and the location of seepage areas.

l) **Fill** (AS/NZS1547, 2000)

The location, depth and type of any fill should be noted on the site plan (AS/NZS1547, 2000). Clean fill free of contaminants & consisting of soil, which has settled and is on a stable site, may be considered for use for wastewater disposal. However other types of fill with coarse fragments etc, and located on steep sites, are unsuitable for wastewater disposal. An analysis of any fill to be introduced to a site is required by BSC prior to the fill entering the site in order to assess its suitability and identify any contaminants.

m) **Erosion/Mass Movement** (AS/NZS1547, 2000)
The location and details of existing mass movement and erosion, such as gullies, slips and rills should be recorded on the site plan. To protect against future erosion, adequate drainage controls must be undertaken to ensure that wastewater is not concentrated within one location, and upslope runoff is diverted around the disposal area.

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Part C: Calculating the Land Application Area

1.0 INTRODUCTION

The following set of tables have been designed in conjunction with; *AS/NZS 1547;2000 On-Site domestic wastewater management*, *NSW Code of Practise Plumbing and Drainage 2006,* and *Lismore City Council's On-Site Sewage and Wastwater Management Strategy (amendment 2007).* The past performance and suitability of various types of OSSMS's used in the shire have also been taken into consideration.

These tables must be used to size an applicant's minimum land application area (LAA) and septic tank capacity in domestic situations. Variations to the minimum LAA sizing in the tables may be considered by Council under certain circumstances. In these instances, and when soil types are not provided for in these tables the applicant shall provide a detailed wastewater report by a competent and qualified wastewater consultant with the application.

The object of the tables is to provide a consistent and simplistic method of determining the minimum size of an applicant's Land Application Area. BSC has determined to provide the following tables to address the shires diverse range of landscapes. In doing so the tables have been created using P-sorption as the basis for sizing the LAA's for domestic situations, up to and including ten (10) persons.

Typically P-sorption is the most constraining factor in determining LAA's. By conservatively sizing LAA's by P-sorption, hydraulic, & Nitrogen requirements are deemed to be met by Council. The applicant will need to know their basic soil type, number of bedrooms in the dwelling and the type of treatment system proposed. Table 'I' provides a list of areas and their soil types as a guide to soils within BSC. In 7 (c) Environmental Protection (water catchment) Zones, *Rous Water's Onsite Wastewater Management Guidelines 2007* shall be read in conjunction with this strategy.

The diagram below shows the steps to be taken when designing an OSSM, and should be read in conjunction with Part C of this Strategy.

Step 1: Determine your soil type, site specifics, and limitations
If a 7(c) zone refer to Rous Water Guidelines 2007

↓

Step 2: Determine what type of treatment system is required for the property. e.g AWTS, Reed Bed, Septic etc based on site specifics and limitations

↓

Step 3: Determine what type of LAA is required for the property. SSI, ETA beds, Trenches etc

↓

Step 4: Find the table that is relevant to your system and LAA configuration located in Part C

↓

Step 5: Based on the number of bedrooms of the dwelling and the soil type, a minimum LAA size can be determined

Figure 3: Determination of Treatment System and LAA

2.0 TABLES

Table A
Minimum SSI areas in square metres for Secondary Treated Effluent
(AWTS, REED BEDS, ETC) *See Note

Soil Types	3 Bedrooms (4 EP 560L/d)	4 Bedrooms (6 EP 840L/d)	5 Bedrooms (8 EP 1120L/d)	6 Bedrooms (10 EP 1400L/d)
Alluvial **ep**	300m^2	450m^2	600m^2	750m^2
Dark Basaltic	300m^2	450m^2	600m^2	750m^2
Red Basaltic **bg, el, ew, ro, wo**	300m^2	450m^2	600m^2	750m^2
Duplex **ba,**	300m^2	450m^2	600m^2	750m^2
Podzol **ty, wa, ab, eb,**	500m^2	800m^2	1000m^2	1400m^2
Humic Gleys **bp, tu, xx**	Report Required	Report Required	Report Required	Report Required

Table B
Minimum ETA Dimensions for Secondary Treated Effluent
(AWTS, REED BEDS, ETC) *See Note

Soil Types	3 Bedrooms (4 EP 560L/d)	4 Bedrooms (6 EP 840L/d)	5 Bedrooms (8 EP 1120L/d)	6 Bedrooms (10 EP 1400L/d)
Alluvial **ep**	1 x (15.0Lx2.0W)	2 x (10.0Lx2.0W)	3 x (10.0Lx2.0W)	4 x (20.0Lx2.0W)
Dark Basaltic	1 x (15.0Lx2.0W)	2 x (10.0Lx2.0W)	3 x (10.0Lx2.0W)	4 x (20.0Lx2.0W)
Red Basaltic **bg, el, ew, ro, wo**	1 x (15.0Lx2.0W)	2 x (10.0Lx2.0W)	3 x (10.0Lx2.0W)	4 x (20.0Lx2.0W)
Duplex **ba,**	1 x (15.0Lx2.0W)	2 x (10.0Lx2.0W)	3 x (10.0Lx2.0W)	4 x (20.0Lx2.0W)
Podzol **ty, wa, ab, eb,**	Report Required	Report Required	Report Required	Report Required
Humic Gleys **bp, tu, xx**	Report Required	Report Required	Report Required	Report Required

Table C
Trenches for Secondary Treatment
Minimum Absorption Trench Dimensions for Secondary Treated Effluent
(AWTS, REED BEDS, ETC) *See Note

Soil Types	3 Bedrooms (4 EP 560L/d)	4 Bedrooms (6 EP 840L/d)	5 Bedrooms (8 EP 1120L/d)	6 Bedrooms (10 EP 1400L/d)
Alluvial **ep**	2 x (15.0Lx1.0W)	2 x (20.0Lx1.0W)	3 x (20.0Lx1.0W)	4 x (20.0Lx1.0W)
Dark Basaltic	2 x (15.0Lx1.0W)	2 x (20.0Lx1.0W)	3 x (20.0Lx1.0W)	4 x (20.0Lx1.0W)
Red Basaltic **bg, el, ew, ro, wo**	2 x (15.0Lx1.0W)	2 x (20.0Lx1.0W)	3 x (20.0Lx1.0W)	4 x (20.0Lx1.0W)
Duplex **ba,**	2 x (15.0Lx1.0W)	2 x (20.0Lx1.0W)	3 x (20.0Lx1.0W)	4 x (20.0Lx1.0W)
Podzol **ty, wa, ab, eb,**	Report Required	Report Required	Report Required	Report Required
Humic Gleys **bp, tu, xx**	Report Required	Report Required	Report Required	Report Required

Table D
Minimum Absorption Trench Dimensions for Primary Treated Effluent
(SEPTIC TANKS, GREYWATER ETC) *See Note

Soil Types	**3 Bedrooms (4 EP 560L/d)**	**4 Bedrooms (6 EP 840L/d)**	**5 Bedrooms (8 EP 1120L/d)**	**6 Bedrooms (10 EP 1400L/d)**
Alluvial **ep**	2 x (20.0Lx1.0W)	3 x (20.0Lx1.0W)	4 x (20.0Lx1.0W)	5 x (20.0Lx1.0W)
Dark Basaltic	2 x (20.0Lx1.0W)	3 x (20.0Lx1.0W)	4 x (20.0Lx1.0W)	5 x (20.0Lx1.0W)
Red Basaltic **bg, el, ew, ro, wo**	2 x (20.0Lx1.0W)	3 x (20.0Lx1.0W)	4 x (20.0Lx1.0W)	5 x (20.0Lx1.0W)
Duplex **ba,**	2 x (20.0Lx1.0W)	3 x (20.0Lx1.0W)	4 x (20.0Lx1.0W)	5 x (20.0Lx1.0W)
Podzol **ty, wa, ab, eb,**	Report Required	Report Required	Report Required	Report Required
Humic Gleys **bp, tu, xx**	Report Required	Report Required	Report Required	Report Required

Table E
Minimum ETA Dimensions for Primary Treated Effluent
(SEPTIC TANKS, GREYWATER ETC) *See Note

Soil Types	**3 Bedrooms (4 EP 560L/d)**	**4 Bedrooms (6 EP 840L/d)**	**5 Bedrooms (8 EP 1120L/d)**	**6 Bedrooms (10 EP 1400L/d)**
Alluvial **ep**	2 x (10.0Lx2.0W)	3 x (10.0Lx2.0W)	2 x (20.0Lx2.0W)	3 x (20.0Lx2.0W)
Dark Basaltic	2 x (20.0Lx2.0W)	3 x (10.0Lx2.0W)	2 x (20.0Lx2.0W)	3 x (20.0Lx2.0W)
Red Basaltic **bg, el, ew, ro, wo**	2 x (20.0Lx2.0W)	3 x (10.0Lx2.0W)	2 x (20.0Lx2.0W)	3 x (20.0Lx2.0W)
Duplex **ba,**	2 x (20.0Lx2.0W)	3 x (10.0Lx2.0W)	2 x (20.0Lx2.0W)	3 x (20.0Lx2.0W)
Podzol **ty, wa, ab, eb,**	Report Required	Report Required	Report Required	Report Required
Humic Gleys **bp, tu, xx**	Report Required	Report Required	Report Required	Report Required

Table F
Minimum Mound Dimensions for Secondary Treated Effluent
(AWTS, REED BEDS, ETC) *See Note

Soil Types	**3 Bedrooms (4 EP 560L/d)**	**4 Bedrooms (6 EP 840L/d)**	**5 Bedrooms (8 EP 1120L/d)**	**6 Bedrooms (10 EP 1400L/d)**
Alluvial **ep**	1 x (10.0Lx6.0W)	1 x (12.0Lx8.0W)	1 x (14.0Lx8.0W)	1 x (16.0Lx9.0W)
Dark Basaltic	1 x (10.0Lx6.0W)	1 x (12.0Lx8.0W)	1 x (14.0Lx8.0W)	1 x (16.0Lx9.0W)
Red Basaltic **bg, el, ew, ro, wo**	1 x (10.0Lx6.0W)	1 x (12.0Lx8.0W)	1 x (14.0Lx8.0W)	1 x (16.0Lx9.0W)
Duplex **ba,**	1 x (10.0Lx6.0W)	1 x (12.0Lx8.0W)	1 x (14.0Lx8.0W)	1 x (16.0Lx9.0W)
Podzol **ty, wa, ab, eb,**	1 x (10.0Lx6.0W)	1 x (12.0Lx8.0W)	1 x (14.0Lx8.0W)	1 x (16.0Lx9.0W)
Humic Gleys **bp, tu, xx**	Report Required	Report Required	Report Required	Report Required

Note 1: A typical site has the following site characteristics for this exercise:
Note 2:

Table A Figures are based on a typical site able to meet minimum buffer distances, using the *LCC Computer Model 07*.

Table B Figures are based on a typical site able to meet minimum buffer distances, using *AS/NZS 1547:2000, Using a DLR of 20*

Table C Figures are based on a typical site able to meet minimum buffer distances, using *AS/NZS 1547:2000, Using a DLR of 20*

Table D Figures are based on a typical site able to meet minimum buffer distances, using *AS/NZS 1547:2000, Using a DLR of 14*

Table E Figures are based on a typical site able to meet minimum buffer distances, using *AS/NZS 1547:2000, Using a DLR of 14*

Table F Figures are based on a typical site able to meet minimum buffer distances, using *AS/NZS 1547:2000, Using a DLR of 10*

Note 3: All tables are based on a standard on-site roof water tank supply (140l/p/d), & Reticulated community or bore water supply (145Lp/d) with standard water reduction fixtures.

Note 4: BSC Standard water reduction fixtures include; dual flush 6/3 litre water closet, shower flow restrictors, aerator faucets (taps and water conserving automatic washing machines.)

Table G
Recommended Buffer Distances for On-site Systems Table

System	Recommended Buffer Distances
All land application systems	• 100 meters to permanent surface waters (eg rivers, streams, lakes etc) • 250 meters to domestic groundwater well • 40 meters to other waters (eg farm dams, intermittent waterways and drainage channels etc)
Surface spray irrigation (not permitted in BSC for new/upgrade installations)	• 6 meters if area up-gradient and 3 meters if area down-gradient of driveways and property boundaries • 15 meter dwellings • 3 meters to paths and walkways • 6 meters to swimming pools
Surface drip and trickle irrigation (not permitted in BSC for new/upgrade installations)	• 6 meters if area up-gradient and 3 meters if area down gradient of swimming pools, property boundaries, driveways and buildings
Subsurface irrigation	• 6 meters if area up-gradient and 3 meters if area down-gradient of swimming pools, property boundaries, driveways and buildings
Absorption system	• 12 meters if area up-gradient and 6 meters if area down-gradient of property boundary • 6 meters if area up-gradient and 3 meters down-gradient of swimming pools, driveways and buildings.

Table H
Minimum Septic tank capacity
(ALL WASTE SEPTIC TANKS, ETC)

Population equivalent persons	Number of bedrooms	Daily average flow (L)	Tank capacity (L)
1-4	3	Up to 560	3000
5-6	4	560-840	5000
7-8	5	840-1120	5000
9-10	6	1120-1400	5000

Table I
Soil Landscapes in and Around Ballina Shire
Source: A guideline to soil types in BSC area showing likely limitations for effluent disposal, and phosphorous sorption. Sources: Morand (1994), OSWMS (1999), P-sorption analyses by EAL, Southern Cross University 1998, L.C.C. 2007 Strategy.

Soil Unit	Code	Broad Soil Type	Likely limitations	P-sorption kg/ha/m
Angels Beach	**ab**	Podzols/ Siliceous / Calcareous Sands	**non-cohesive, highly permeable/ low available waterholding capacity**	1,000
Bagotville	**ba**	Sandy Duplex	**Flood prone footslopes.**	8,000
Bangalow	**bg**	Red Basaltic	**Steep, shallow*.**	10,000
Burns Point	**bp**	Alluvial / Humic Gleys	**Unsuitable for effluent disposal, high watertables**	0
Eltham	**el**	Red Basaltic	**Locally waterlogged, flood hazard, proximity to streams.**	10,000
Empire Vale	**ep**	Alluvial (highly reactive)	**Dispersive, waterlogged subsoils, high watertables.**	10,000
Ewingsdale	**ew**	Red Basaltic	**High permeability, but mass movement hazard near drainage lines, waterlogging on lower slopes.**	10,000
Rosebank	**ro**	Red Basaltic	**Steep slopes, mass movement**	10,000
Tuckean	**tu**	Humic Gley	**Unsuitable for effluent disposal.**	0
Tyagara	**ty**	Podzolic	**high watertables**	1,000
Wardell	**Wa**	Podzols	**highly permeable, highly acid soils**	1,000
Wollongbar	**Wo**	Red Basaltic (Kraznozem)	**high aluminium toxicity potential and low available waterholding capacity.**	10,000

Appendix A: Treatment Systems

1.0 INTRODUCTION

There are a number of different treatment systems available in the Ballina Council area and the performance of these can vary due to climatic conditions, population characteristics, loading cycles, human dietary habits, and influent quality.

In regards to the maintenance of these systems it should be pointed out that these systems are “living” systems that rely on micro-organisms to treat the effluent to varying degrees. The heavy use of chemicals in these systems will lead to a reduction in the systems treatment performance.

The types of on-site disposal systems are listed below:

2.0 SEPTIC TANKS

The septic tank used for single houses is a small anaerobic oxidation plant, which removes suspended solids from the wastewater and breaks them down anaerobically. The resultant effluent is low in settled solids but high in biological oxygen demand (BOD) and requires biological treatment before release to the environment. The septic tank to be installed must have at least one internal buffer.

Other solids settle to the bottom of the tank, whilst most fats, oils and greases float, and the middle zone of wastewater within the tank overflows to the disposal beds. No enzymes are to be added to the system but natural bacteria are permitted. These bacteria can be added to the system, reducing the amount of sludge and therefore increasing the time between the pumping out of the tank, and reducing the smell of the tank.

Induct vents are no longer required on septic tanks due to these structures allowing flies and mosquitoes to breed in the tank (E&HPGuidelines, 1998). Due to the larger septic tank size, (>3000L) grease traps are no longer required. The smaller tanks were found to be too small to trap grease effectively. With the larger tanks the kitchen wastes can be connected directly into the septic tank with a baffle installed (E&HPGuidelines, 1998).

All new septic tanks and those requiring upgrading are now required to have an effluent filter installed on the outlet of the septic tank (Section 5.9). It is advised that the effluent filter is fitted to the outside of the septic tank to allow ease of maintenance. Also, the owner does not have to put their hands in the system.

The location of the septic tank must be at a greater distance than 3 metres from any building. Allowances must be made for easy access to the tank in order for the pumping contractor to get a truck near the septic tank so that the contents of the tank can be pumped out (de-sludge the tank).

All septic tanks need to be manufactured in accordance with Standards Australia, and have an appropriate AS Standards Mark. Lists of the currently approved tanks are available at the BSC office. While alternate tank shapes are mentioned in the standard, in the Tweed Richmond region there are only cylindrical tanks available “off the shelf”. Cast-in-situ tanks are specified in Section 7 of AS1546. The NSW Health Department Register certifies manufacturers of the septic tanks and collection wells.

The Australian Standard for septic tanks is AS1546 (1998). Septic tank sizes are nominated for domestic flows of up to 14,000 L per week or daily flows of 2000 L. AS1546 states that the function of a septic tank is to provide a relatively still zone of adequate size for all domestic flows. Scum and solids are separated from the wastewater flow and must be periodically removed.

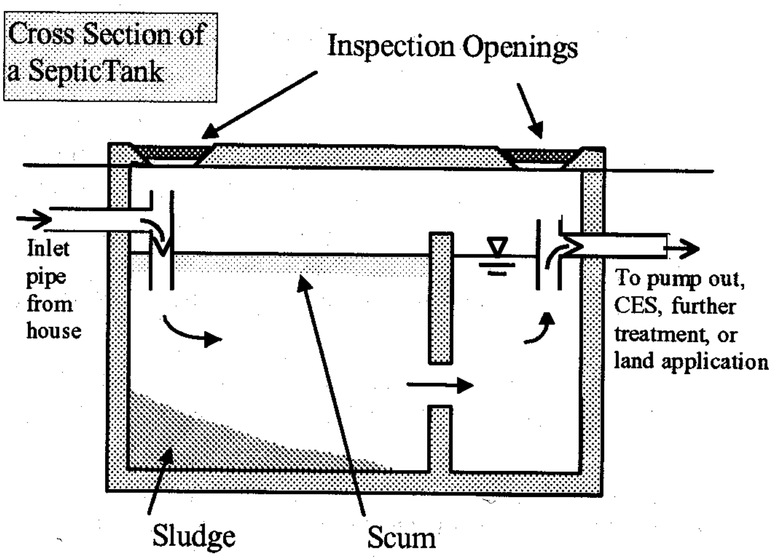


Figure 4: Cross Section of a Septic Tank

2.1 Maintenance for Septic Tanks and Trenches/ETA Beds

For longevity of the on-site sewage management system the following maintenance regime should be employed by the owner/occupier of the dwelling:

- bleach, bleach-based products, whiteners, nappy soakers and spot removers shall not be disposed of into the on-site system. They shall be disposed of on a disused area of a garden, well away from the disposal area;
- the effluent filter is to be checked monthly and regularly cleaned;
- it will be necessary to have the contents of the septic tank pumped out on average every three (3) to five (5) years. Generally speaking households of meat eaters would need to pump out their septic every 3 to 5 years and vegetarians every 4 to 6years;
- ensure that the septic tank is mosquito and fly proof; Hygiene products, condoms, tampons, sanitary napkins, disposable nappies and cotton buds and the like shall not be disposed of via the on-site disposal system. They should be disposed of into garbage bins in sealed plastic bags;
- only the recommended amounts of disinfectants should be used. Biodegradable products for septic systems are recommended;
- the septic tank should be serviced annually including the assessment of sludge and scum levels, and checked for blockages of the outlet and inlet square junctions on a regular basis, at least annually;
- runoff diversion banks to be inspected annually and maintenance as required undertaken to ensure that surface runoff is diverted around each of the disposal areas;
- no vehicular, stock or pedestrian access should be made across the disposal field;
- vegetation from the irrigation area needs to be harvested to promote young growth and the area may need to be replanted with new plants every five years, depending on plant condition. This work should be undertaken during dry season (August to October);
- effluent from disposal system should not be discharged to the stormwater system or over the ground;
- the effluent distribution pipes and aggregate are to be inspected for blockage etc. and flushed clean or replaced as required.

2.2 Warning Signs of Possible Troubles

If any of the following signs of system failure occur contact the plumber who installed the system:

- surface ponding and run-off of treated wastewater;
- degradation of soil structure - e.g. sheet and rill erosion, surface crusts, or hard surfaces are evident;
- poor vegetation growth;
- unusual odours;
- wastewater is backing back up into the house; and
- drain pipes that gurgle or make noises when the air bubbles are forced back through the system.

3.0 EFFLUENT FILTERS

An effluent filter is a plastic tube type filter used to reduce suspended solids to a level of about 30 parts per million or less and reduce the potential for carry over of suspended solids into the disposal area. This will help prevent the voids in the disposal bed from clogging. There are advanced filters available on the market through most plumbing suppliers. It should be noted that an effluent filter does not provide secondary treatment of the effluent, simply filtering the effluent prior to discharge to the irrigation field.

It is recommended that the effluent filter is fitted to the outside of the tank so that owners do not have to place their hands in the tank, and for ease of maintenance. This can be used by fitting a “P” trap on the outlet. The regular cleaning or hosing of filters is important to ensure they are operating effectively.

4.0 AERATED WASTEWATER TREATMENT SYSTEMS

Aerated wastewater treatment systems (AWTS) are becoming more common following NSW Health Department certification in 1983. These systems employ anaerobic and aerobic processes. They have multi-chambered tanks, which provide primary treatment through settling and an aeration process. They typically settle solids and float scum in an anaerobic chamber, much like a septic tank, then aerate in a second chamber. The aerobic process consists of injecting compressed air into the effluent for secondary treatment. Disinfection usually consists of chlorination in the collection chamber. Failure in any part of the system could lead to a definite health risk (Office of Local Government, 1987).

Some AWTS include an activated sludge process that enables the breakdown of sludge and a theoretically better effluent quality without the need for periodic de-sludging. The aerated section of the AWTS oxidises the wastewater and organic matter is consumed. A clarification process is carried out through secondary settling of solids.

There are a number of brands which are certified by the NSW Health Department pursuant to Clause 95B Local Government regulations 1993. The minimum size for AWTS tanks would be in accordance with accreditation from NSW Department of Health. The AWTS to be installed will be approved by the NSW Health Department.

It should be noted that AWTS’s are accredited with disinfection i.e. chlorine tablets or UV and that this disinfection device cannot be removed because the disinfection is part of the system's accreditation requirements. Also in the case of chlorine, the chlorine helps control algal growth in the pipe work.

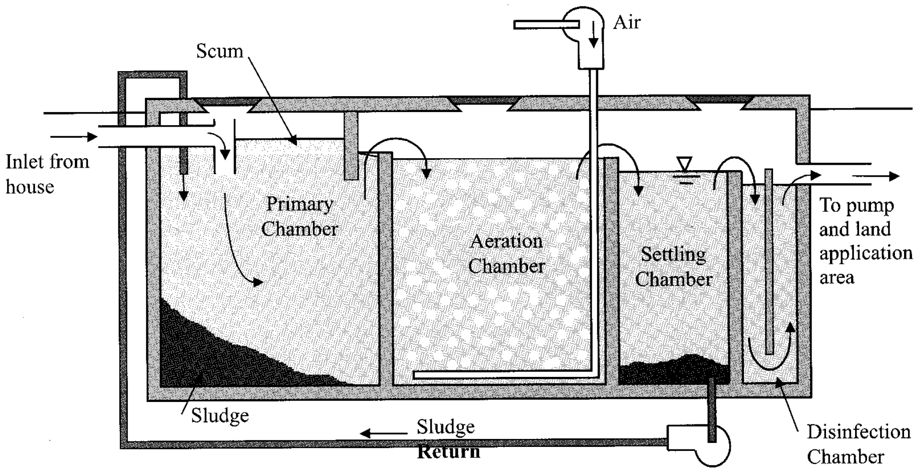


Figure 5: Cross Section of an AWTS

4.1 Maintenance of the Aerated Wastewater & Other Treatment Systems

Regular servicing and maintenance is often required, commonly on a quarterly basis. The owner therefore must enter a service contract with a service agent authorised by the Local Council. The cost of each service is borne by the owner. A copy of the service report is forwarded to Council for appropriate action.

The service agent must be able to provide service within 24 hours of being notified of a system malfunction. At each service, all mechanical, electrical and functioning parts of the treatment system should be checked, including:

- all pumps;
- the air blower, fan or air venturi;
- the alarm system;
- the operation of the sludge return system, where installed;
- pH from a sample taken from the irrigation chamber;
- check on sludge accumulation in the septic tank (primary treatment chamber) and the clarifier where appropriate;
- a thorough inspection, testing, & flushing (if appropriate) of the effluent disposal field and all fixtures to ensure operation is in accordance with the approved design;
- a sludge bulking test is required annually if activated sludge or contact aeration is used; and
- at the completion of the service a report submitted.

5.0 SAND FILTERS-SINGLE PASS SAND FILTERS

Sand filtration systems typically consist of one or more layers of sand or fine gravel contained within an impermeable structure. Wastewater is applied evenly to the surface of the sand, through which it percolates vertically to a collection system at the base of the filter. Media is usually at least 60 cm deep.

There are two types of sand filter, (1) intermittent (single pass) or (2) recirculating. Intermittent sand filters are single pass with the effluent entering the sand filter passively under gravity (i.e. whenever wastewater is generated in the dwelling) or dosed by a pump or siphon. Because they provide a largely aerobic environment single pass, passive sand filters produce excellent TSS and BOD removal and a highly nitrified effluent. However there is little or no removal of total nitrogen because of the scarcity of anoxic sites and organic carbon necessary for denitrification.

In order to remove nutrients a recirculating sand filter with a collection tank and pump is required. Of utmost importance is the type of media used.

The media used in filters is described through its effective size (ES) and uniformity coefficient (UC) (Equations 1 and 2).

$$ES = d_{10} \quad (1)$$

$$UC = d_{60}/d_{10} \quad (2)$$

where; ES = effective size of sand
UC = uniformity coefficient of sand
d_{10} = screen size through which no more than 10% by weight of the sand passes
d_{60} = screen size through which no more than 60% by weight of the sand passes

An optimal media in sand filtration systems is one in which abundant surface area for microbial growth is combined with adequate pore space to facilitate the movement of water and oxygen through the filter. If the sand filter media is too coarse, wastewater percolates rapidly through the system without allowing sufficient time for the pollutants to undergo treatment. On the other hand, if the filter media is too fine, pore spaces between the particles easily clog, reducing hydraulic conductivity and oxygen transfer rates.

US EPA (1999) recommends that media have ES >0.25mm and <0.75mm, and UC <4.0. Lienard *et al.* (2000) concur with these specifications for media and add that fines (< 80 µm) should not exceed 3% by weight.

For those without access to the sieves which are necessary to measure the above mentioned media parameters, Grant and Griggs (2001) describe a simple falling head test for determining suitability of sand for intermittent sand filters. Figure 4 shows the apparatus. A 300 mm length of 103 mm ID PVC pipe (ie nominal 100 mm sewer pipe) is placed on a bed of free draining pea gravel. A representative sample of damp (but not wet) sand is placed in the pipe to a depth of 200 mm. A nylon scouring pad or similar item can be used to protect the sand surface. Tap the side of the pipe to settle the sand then slowly pour two litres of clean water into the pipe to saturate the sand. As soon as surface ponded water has fully disappeared pour another 0.5 L of clean water into the tube, starting a stopwatch at the beginning of the pour. This should take about five seconds. Measure the time taken for the applied water to disappear from the surface. Repeat the operation four times in quick succession, restarting the test as soon as ponded water has fully drained. The "Grant time", t_g is the average of the five times. Grant and Griggs (2001) suggest that sand with a Grant time in the range 15 seconds < t_g < 100 seconds should be suitable for sand filter substrate.

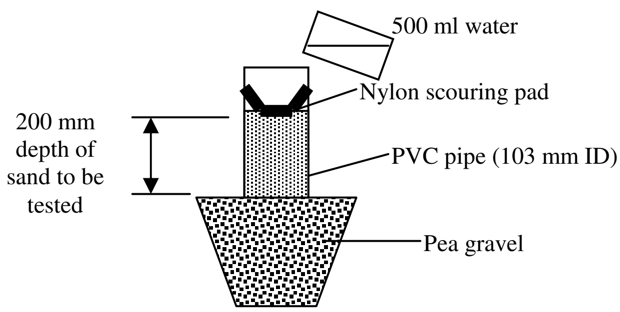


Figure 6: Apparatus for falling head sand test (Source: grant and Griggs, 2001)

Containment of the substrate can be achieved using a variety of materials, with Council preferring the use of polyethylene troughs.

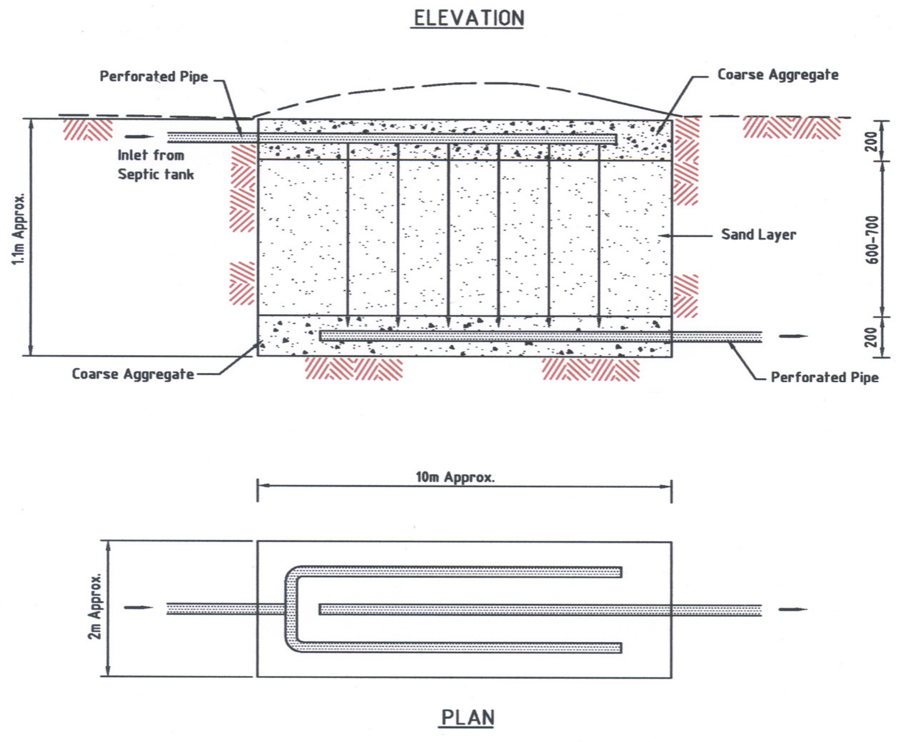


Figure 7: Cross Section and Plan View of a Standard Sand Filter Design

BSC only allows the use of a sand filter, if the sand filter is dosed by a pump or dosing siphon. No gravity feed sand filters are permitted. Council currently has a draft sand filter guideline that consultants must meet when proposing a sand filter. The use of a liner in the construction of the sand filter is not permitted (See Appendix A: Section 5).

6.0 REED BEDS (ARTIFICIAL WETLANDS)

Surface area

Council will accept a reed bed with a 7 day residence time as a secondary treatment device (ie achieving BOD < 20mg/L, TSS < 30 mg/L). A reed bed with a 5 day residence time will be also be assumed to remove 50% of the total nitrogen loading from applied effluent. For example, a reed bed with a 7 day residence time can be installed at sites within 100metres of a waterway on existing subdivided land and utilizing sub-surface drip irrigation.

As a rule of thumb, Council requires that a reed bed will have a surface area of at least 4 m^2 for blackwater and $3m^2$ for greywater with a minimum 500mm water depth in the reed bed per person. Reed beds for non-standard effluent types (e.g. laundry water only) should be designed by a qualified person.

Reed Bed Construction

There are essentially five functional elements to a reed bed as shown in Figure 6-13. These are:

- the containment or outer structure;
- the substrate or porous medium;
- the macrophytes or aquatic plants;
- the inlet structure; and
- the outlet structure.

1) Inlet from primary treatment tank	6) Gravel media (10 x 20mm), maximum fine material <5%
2) Inspection & delivery chamber (225mm diameter)	7) Operating water level, 100mm below to of gravel
3) Inspection push on cap	8) Outlet manifold & inspection chambers (225mm diameter)
4) Reln trench fitted with end caps	9) Wetland species
5) Medium rocks/ coarse aggregate (50 x 70mm)	10) Approved lining

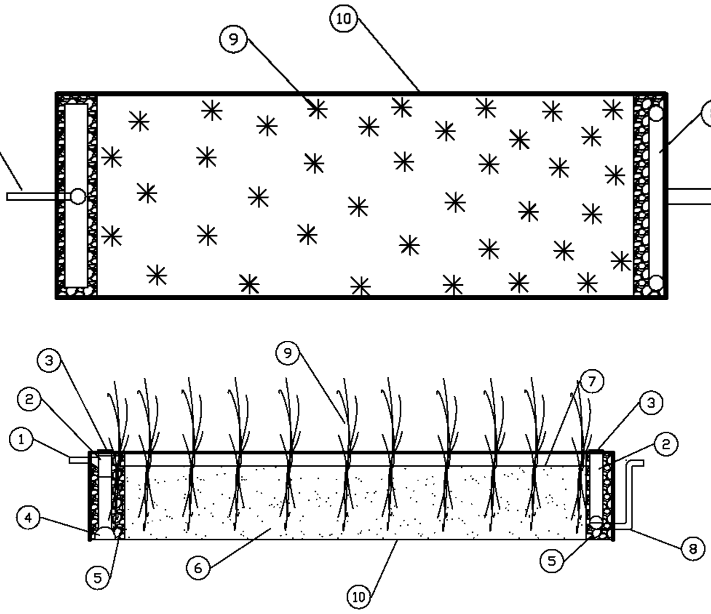


Figure 8: Reed Bed / Wetland Treatment System

This section describes some of the constraints and possibilities in relation to each of these elements.

Outer Structure or containment

The purpose of the reed bed skin is to prevent the escape of partially treated wastewater and the spread of macrophytes from the bed while excluding surface water, groundwater, adjacent soil and weeds. It therefore needs to be impermeable, durable and be able to resist penetration by macrophyte roots. Materials that have been used on the NSW North Coast include fabricated reinforced concrete slabs, ferro-cement, stainless steel, polyethylene cattle troughs, fibreglass troughs, sealed concrete blocks laid on concrete slab, and in the past flexible liner membranes.

The use of a liner membrane is not allowed in the Ballina Shire Council area due to limited margin for error in workmanship, indications that the liner will not last 15years (as required by the Local Government Act 1993) and evidence that voids behind the liner can provide penetration sites for macrophyte rhizomes. *Pharagmites australis* has a particularly penetrative rhizome and has caused problems in this respect with at least two flexible liners in NSW reed beds having been penetrated by Phragmites roots.

The edge/lip of the reed bed needs to be structurally sound, durable and a minimum of 150mm above finished ground level, and must be constructed in such a way that overland flow is diverted around the bed. In some cases gravel drains/trenches are placed around the reed bed or swales constructed above the reed bed to divert stormwater away from the reed bed.

Substrate

The choice of wetland substrate will depend on the type and quality of influent and the desired quality of effluent. Gravel of 10 or 20 mm diameter is commonly used for domestic wastewater. As a rule, media consisting of larger particles will have higher hydraulic conductivities and be less prone to clogging. It is advisable to place larger stones/rocks, >50mm, around the inlet and outlet pipes to allow for ease of checking for root intrusion and in the case of 10mm gravel to limit the possibility of clogging.

Ideally 10mm gravel should be placed away from the inlet pipe. For example, if using moulded tubs, the 10mm gravel should be placed in the second and following tubs to reduce the possibility of clogging.

Macrophytes

While there is general consensus in the literature regarding the benefits of macrophyte presence in a bed, there is no agreement on which is the most suitable species. Various macrophytes have been used in reed beds throughout the world with species from the genera *Phragmites, Schoenoplectus* and *Typha* being the most commonly used. Macrophytes that have been used in this region are *Schoenoplectus validus* (river club rush), *Typha orientalis* (bull rush), *Bolboschoenus fluviatilis* (marsh clubrush), *Lomandra hystrix* and *Baumea articulata* (jointed twigrush). Certain reed beds are planted with *Melaleuca quinquenervia*.

Tube stock for most wetland plant species may be purchased from nurseries that specialise in wetland plants. These plants can also be propagated vegetatively by dividing root clumps obtained from existing constructed wetlands.

Inlet pipe work

The inlet structure for small reed beds, shall consist of a 225mm diameter PVC vertical tower connected by a minimum of 225mm prefabricated spreader pipe, & should extend almost the full width of the reed bed and should be kept above the gravel surface with large stones placed around it. The large stones/rocks (>50mm) allow easy access for maintenance.

Outlet structure

A simple outlet structure design incorporates a PVC pipe spanning the reed bed width randomly drilled with holes of approximately 15 mm diameter and surrounded by larger stones (up to 100 mm). Figure 1 shows an outlet structure consisting of a series of 225 mm diameter, capped, vertical towers spaced evenly across the width of the bed. Effluent enters the towers via 15-25 mm diameter holes surrounded by stones > 50 mm diameter. Hand access to the towers is available should clogging of the holes occur.

Reed bed shape

Having determined the total area of the bed or beds the next step is to decide on its actual shape. Rectangular plans, while not always the most aesthetically pleasing, will be more hydraulically efficient (less likely to have dead zones) than curved configurations. Aspect ratios (length to width) for rectangular beds of 3:1 down to 1:1 are generally favoured in the literature. The wider the bed, the less likely it is to clog. On sloping ground a long thin bed may be desirable for structural reasons. In such cases a longer section of large stones should be installed at the front end of the bed.

Operation and Maintenance

Providing reed beds are properly designed and constructed, they require minimal maintenance. Harvesting of reeds, while not necessary, does promote fresh green growth and thus enhance a reed bed's aesthetic appeal while resulting in increased nutrient removal. This job is easily performed using a sharp knife, sickle or whipper snipper. January (after the spring/summer growth flush) and May (prior to dormancy) are probably the optimum harvest times from the perspective of both nutrient removal and aesthetics.

The reeds are cut back to approximately 20cm in height. The cut material can be used as mulch or left on the bed to break down and ultimately contribute to the pool of reactive organic carbon necessary for effective denitrification. In the case of *Melaleuca quinquenervia* the trees should be cut when approximately 2.5metre high and cut to chest level (1.5metres). This will allow them to bush out.

During macrophyte establishment, bed weeding may be necessary. Weeds can be pulled out very easily from the wet gravel. Flooding may be used to drown out terrestrial weeds. Because substrate blockage is the primary failure mode of reed beds steps should be taken to minimize carryover of solids from the primary treatment device. The septic tank should have an effective outlet filter fitted. This filter should be cleaned regularly, sludge and scum levels checked and, when necessary, tank pump-out conducted. Where blockage has already occurred, lowering of the water level has been found to lead to recovery.

7.0 WATERLESS COMPOST TOILETS

Compost is a mixture of decomposing vegetable refuse, manure etc for fertilising and conditioning soils. Dry compost produced from a compost toilet is normally composted again with garden compost before it is used as a soil conditioner in the planted garden. Jenkins (1994) states that the complete elimination of pathogens occurs after both these composting processes are complete. A local study demonstrated the complete destruction of parasites and commensals in the humus of seven composting toilets (Safton, 1996).

All compost toilets in NSW must meet the *NSW Health Department Waterless Composting Toilet Approval Guideline 1997*.

Dry composting toilets require a bulking agent such as wood shavings, which needs to be applied after each use of the toilet. This bulking agent also covers the faecal material and aids in reducing any odours from the compost. The toilets are vented and some have mechanical ventilation to ensure good air flow in difficult situations around the compost heap. After a period of time compost is produced from the toilet, and removed from a door at the base of the toilet.

The subtropical climate of the Tweed Richmond region is suitable for compost toilets all year round. The process is biological and involves micro-organisms attacking the faecal heap and gradually composting the material to humus. The time taken to reduce the material to humus is variable, and the operator of a compost toilet must recognise that the compost heap is a living thing and needs to be cultivated and protected. There are texts available for those wishing to use a compost toilet and these should be read and understood so that the compost process is encouraged by the household activities.

The use of a compost toilet will remove the toilet component from the wastewater flow of a dwelling or development. The greywater will still need to be collected and treated in an appropriate manner. Greywater may be treated in conventional septic tanks or AWTS or in tanks specifically designed for that purpose (GTS).

Leachate from the compost toilet must be directed to the greywater system if appropriate or its own designated trench. This can actually help the biological process in the greywater tank by adding valuable bacteria. If a reed-bed is used the nutrients in the leachate help promote reed growth. Leachate management must be included in any treatment design. Reference should also be made to the Australian Standard titled “On-site Domestic Wastewater Treatment Units - Waterless Composting Toilets (AS/NZS1546.2, 2001)”.

7.1 Maintenance for Composting Toilets

Operation & Maintenance

It is intended that the householder should:

- record the commissioning date of each chamber for multi chamber systems;
- ensure that the toilet lid is closed when the toilet is not in use to control fly breeding;
- ensure that the material is spread evenly over the compost heap;
- ensure that the material is clear of the chute;
- clean the pedestal by hand, with minimal use of water and no use of disinfectants;
- consult the service agent in case of vermin and excessive odour;
- **SAWDUST SHOULD NOT BE USED AS THE SOLE BULKING AGENT.** This will lead to clogging. Wood shavings are preferred over sawdust as they allow for greater aeration of the compost pile;
- annual servicing of the toilet, including a check of the fan operation and check of the amount and spreading of the compost within the compost chamber;

- the compost will need to be removed periodically. The frequency of removal depends on the type of compost toilet, E.g. a "*Clivus Multrum/Minimus*" being used by a family of 5 would need to have the first batch of compost removed after 12-18months and then every 6 months;
- compost is only to be disposed of after the minimum composting period has lapsed, as stated by the NSW Public Health Certificate. The minimum composting period is twelve months;
- compost should be buried on site under clean friable soil to a depth of no less than 100mm, and in a position which is not subject to erosion or flooding; and
- compost must not be buried in an area used for cultivation of crops for human consumption, unless:
  - compost is placed in a separate lidded compost bin providing aeration, for at least three months, with no further addition; and
  - compost has seasoned underground for at least three months.

Checking of the composting toilet should be undertaken periodically and weekly for continuous batch systems.

Compost, including partially composted material must not be removed from the premises unless written consent from the council is obtained. The council may specify removal and disposal requirements.

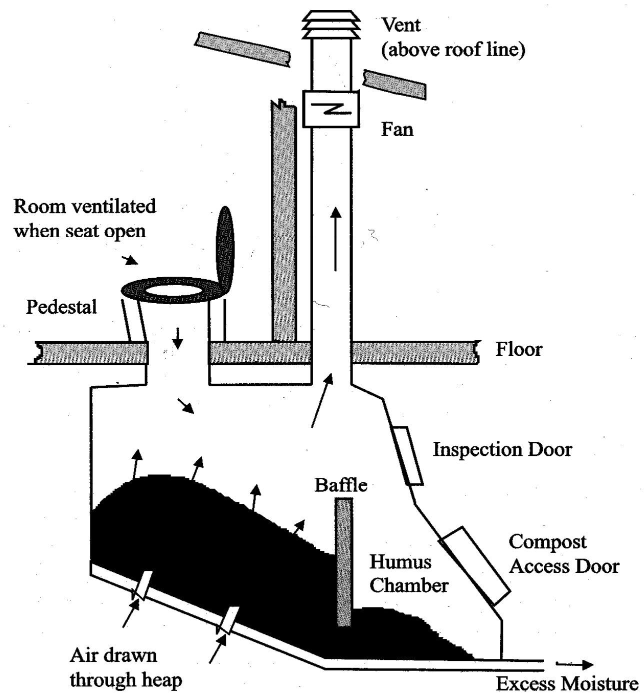


Figure 9: Cross Section of a Compost Toilet

8.0 SEPARATE SYSTEMS VERSUS COMBINED SYSTEMS

There are differing views on the desirability of separate or combined on-site wastewater treatment and disposal systems. The usual split separates greywater from blackwater. Some experts advocate an all waste system in preference to separately treated greywater and blackwater, because of the increased clogging which occurs with greywater alone, due to its higher C/N ratio generating polysaccharides (Laak, 1986 cited in Patterson, 1994).

The use of compost toilets presupposes a separate greywater system. There are situations where the design of the structure and the characteristics of the land require two systems which may or may not be split along strict greywater /black water lines. A combined system is less costly due to the need to purchase only one tank and install one disposal field, particularly if an AWTS is used.

9.0 DISINFECTION

There are a number of options for effective long-term disinfection for on-site systems. Chlorination & U.V. disinfection is used with AWTS installations. Methods for disinfection include chlorine, bromine and UV radiation. Subsurface irrigation systems require disinfection of wastewaters following secondary treatment. It should be noted that AWTS's and other secondary treatment devices are accredited with disinfection e.g. chlorine tablets or UV and that this disinfection device cannot be removed because the disinfection is part of the system's accreditation requirements.

Appendix B: Land Application Areas & Designs

1.0 INTRODUCTION

The E&HP Guidelines (1998) and AS/NZS1547 (2000) describe the various systems that are available for land application areas in some detail. The intention of this strategy is not to reproduce information that is readily available but to highlight points that are relevant to the Ballina Council area. The Council area has local climatic variation and as such different systems will be more appropriate in different localities. The final land application system selection is most dependent on the site conditions but is still a combination of a number of parameters.

Subsurface land application systems for treating effluent are socially acceptable as they are out of sight (Stewart et al., 1983). Many residents of this region have selected planted (grass) beds utilising evapo-transpiration as part of the disposal method, because of the ability of the plants to enhance the beauty of the locality. The subtropical climate allows a large range of plants to be selected for this purpose compared to other parts of NSW.

Wherever possible a reserve land application area should be provided for. In existing subdivisions if there is available area, a reserve area should be nominated and retained for this purpose. Generic sketches are provided for most of these land application options incorporating the design requirements for the Ballina Council area.

2.0 ABSORPTION BEDS

Absorption trenches will be considered in the Ballina Shire Council area for effluent disposal where appropriate based on site specifics.

These beds generally rely only on absorption of effluent water into the ground. Historically this was the only wastewater disposal method used in the Richmond Region, irrespective of the soil type.

All beds are to be centrally fed via a distribution box. The central inlet to each trench shall be comprised of a 100mm swept junction into the trench, with a cast iron concreted surround inspection opening on the surface. The maximium length for any trench gravity fed shall not exceed 20.0m.

3.0 MOUND SYSTEMS

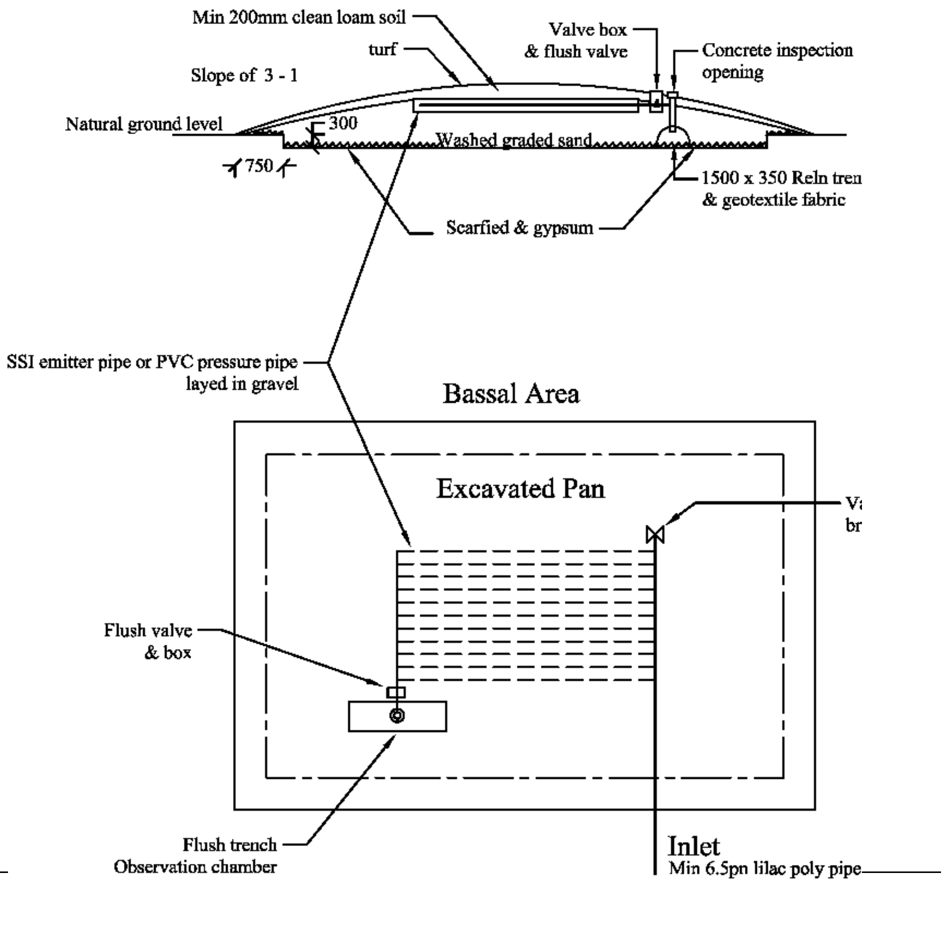


Figure 10: Mound System

Mounded systems are effluent drain fields constructed on the surface of the soil from imported fill material, usually sand.

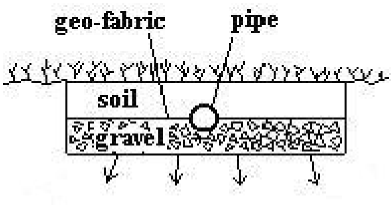
The main use of the mounded bed system is in situations where drainage of the natural soil is a problem. Other uses are in locations where low height flooding may occur or when area onsite is limited. They are used as an alternative to below ground drainage fields. Water disposal is by evaporation and some low level of soil absorption. Denitrification can be carried out within this system with intermittent loading. The mound will need to be turfed to prevent erosion.

4.0 EVAPO-TRANSPIRATION/ABSORPTION BEDS (ETA)

These beds are a combination of evaporation beds with a permeable base. Ballina Shire Council encourages the use of mowed grass on the top of ETA beds due to its ease of maintenance, evaporation of effluent reaching the surface and the fact that the vegetation is regularly removed. Shrubs are recommended to be planted no closer than one (1) metre from the sidewall of the ETA bed or trench and small trees no closer than five (5) metres. Large trees, such as, eucalypts, figs or mangoes should be planted a minimum of 20metres from the beds. Nutrients and wastewater will be taken up by evapo-transpiration and plant uptake. Overshadowing of the ETA's should not occur.

Distribution of the effluent water through the beds is critical as the grass and plants need to be well watered to survive. The soils in the bed may need to be conditioned by the addition of coarse granular sand like material, to improve water movement through the bed.

Figure 11 – Evapo-transpiration and Absorption (ETA) Bed



To encourage the even movement of water, distribution pipes consisting of 90-100mm agricultural pipe or slotted PVC pipe are placed in the bed, usually 500mm in from the sidewalls of the bed. The distribution pipes are centrally fed into the beds and are **NOT** to have geotextile socks fitted to them as this may lead to the pipes clogging.

5.0 IRRIGATION DISPOSAL SYSTEMS

Sub surface irrigation, designs submitted to Council for approval are to be designed by a competent person with suitable experience in irrigation design.

All effluent disposal by irrigation shall be maintained on a regular basis as per the condition of approval for the installation. The Irrigation Maintenance Report is to be submitted to Council within 7 days of servicing the irrigation area.

The irrigation area is to be planted with mown grass or other nutrient and water-scavenging plants. The soils in the irrigation area may be conditioned prior to installation with rotary hoeing and the addition of sands and gypsum to break down the soil structure. The amount of conditioning depends on the soil type.

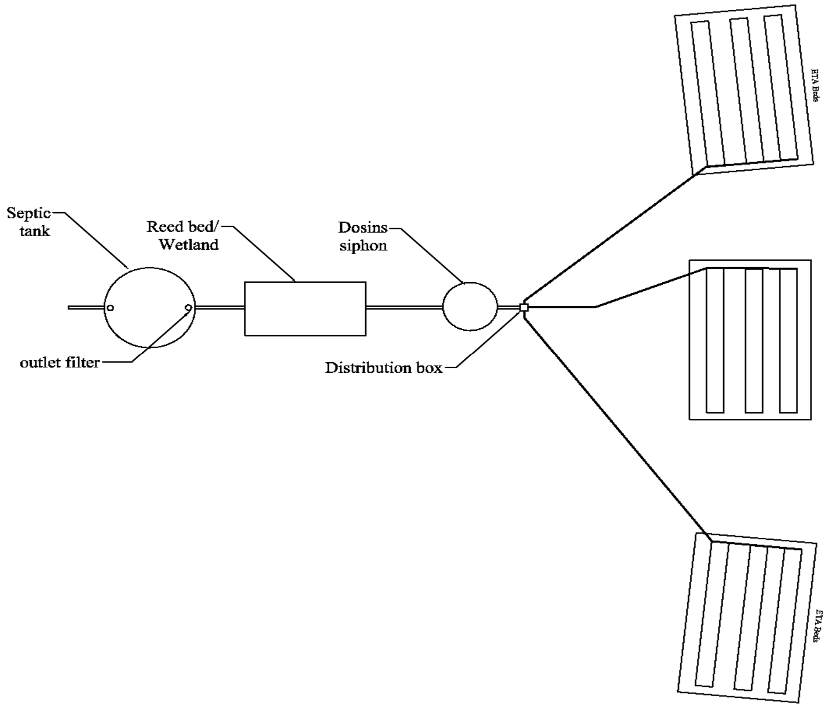


Figure 12 – Septic tank reed bed system

Appendix C: Native plants (local) suitable for Land Application Areas

1.0 PLANTS (LOCAL) SUITABLE FOR LAND APPLICATION AREAS

Scientific name	Height	Common name
Sedges/Rushes/Reeds		
Baumea articulata	1m	Jointed Twigrush
Baumea rubiginosa	1m	Rush
Bolboschoenus fluviatilis	2m	Club Rush
Carex appressa	1m	Sedges
Carex fasicularis	1m	Tassel Sedge
Carex gaudichaudiana	1m	Sedge
Cyperus exaltatus	1m	Sedge
Eleocharis equisetina	1m	Spike Rush
Fimbristylus spp.	50cm	
Gahnia clarkei, G. sieberiana	1.5m	Sawsedge
Juncus polyanthemos, J. usitatus	1m	Reed
Juncus krausii	1m	Salt Rush
Lepironia articulata	2m	Grey Sedge
Lomandra hystrix	1m	Creek Mat Rush
Lomandra longifolia	1m	Long Leaf Mat Rush
Scirpus mucronatus	50cm	Triangular Club Rush
Schoenoplectrus validus	1m	
Typha orientalis	1.5m	Bulrush
Grasses/Ground covers/climbers		
Bacopa monniera		
Centella asiatica	20cm	Pennywort
Oplismenus ameulus	30cm	Grass
Oplismenus imbecillis	30cm	Grass
Paspalum distichum	50cm	Water Couch
Pollia crispata	80cm	Pollia
Pseuderanthemum variable	50cm	Pastel Flower
Themeda triandra	80cm	Kangaroo Grass
Vetiveria filipes	1m	Native Vetiva
Viola betonicifolia	30cm	Arrow-leaved Violet
Viola hederaceae	30cm	Native Violet
Penniselum clandestinum* *(exotic)***	30cm	Kikuyu
Setaria spacelata* *(exotic)***	30cm	Setaria species
Forbs/Small plants		
Alocasia brisbaniensis	1m	Cunjevoi Lily
Alpinia caerulea	1.5m	Native Ginger
Callistemon pachyphyllus	1m	Wallum Bottlebrush
Cordyline rubra, C. petiolaris	3m	Palm Lilies
Crinum pedunculatum	1m	River Lily
Enydra fluctuans	50cm	
Helmholtzia glabbristylis	1m	Stream Lily
Melastoma affine	50cm	Blue Tongue
Persicaria spp.	50cm	Knotweeds
Philydrum lanuginosum	1m	Frogsmouth
Pipturua argenteus	50cm	White Nettle
Tetragonia tetragoniodes	50cm	Warrigal Greens

Scientific name	Height	Common name
Ferns		
Blechnum indicum	1m	Bungwall
Blechnum cartilagineum	1m	Gristle Fern
Christella dentata	1m	Binung
Cyathea australis	3-5m	Tree Fern
Cyclorus interruptus	80cm	
Shrubs/ Small trees		
Banksia ericifolia	3-5m	Heath Banksia
Banksia robur	1-3m	Swamp Banksia
Callistemon salignus	5m	White Bottlebrush
Callistemon viminalis	5m	Weeping Bottlebrush
Evodiella muelleri	3m	Little Evodia
Ficus coronata	5m	Creek Sandpaper Fig
Hibiscus diversifolius	1.5m	Swamp Hibscus
Leptospermum flavescens	3m	Common Ti Tree
Leptospermum liversidgeii	1m	Lemon Ti Tree
Melaleuca nodosa	3m	Paperbark
Melaleuca stypheloides	5m	Prickly-leaved Paperbark
Myoporum acuminatum	3-5m	Mangrove Boobialla
Omalanthus nutans	3-5m	Bleeding Heart
Trees		
Acacia melanoxylon	15-20m	Blackwood
Acmena smithii	5-10m	Lilly Pilly
Archontophoenix cunninghamiana	10-15m	Bangalow Palm
Casuarina glauca	10-15m	Swamp Oak
Commersonia bartramia	5-10m	Brown Kurrajong
Glochidion sumatranum	5-10m	Umbrella Cheese Tree
Hibiscus tiliaceus	5-10m	Cottonwood Hibiscus
Livistona australis	15-20m	Cabbage Palm
Lophostemon suaveolens	5-10m	Swamp Box
Melaleuca quinquenervia	10-15m	Broad-leaved Paperbark
Melicope elleryana	10-15m	Pink Euodia
Syzygium australe	5-10m	Scrub Cherry
Tristaniopsis laurina	10-15m	Water Gum
Waterhousea floribunda	5-10m	Weeping Lilly Pilly

* Exotic grass species. BSC does not promote the use of indigenous exotic grasses.

Appendix D: Related Forms

ON-SITE SEWAGE MANAGEMENT SYSTEM
APPROVAL TO INSTALL ASSESSMENT FORM

“Under construction”

List of Device Types (Circle the appropriate system and LAA number)

1	Septic Tank & Trenches
2	Septic Tank & Evapo-transpiration & Absorption Beds
3	Septic Tank & Sand Filter
4	Septic Tank & Mound
5	Aerated Wastewater Treatment System & Sub Surface Irrigation
6	Aerated Wastewater Treatment System & Micro Trenches
7	Aerated Wastewater Treatment System & Evapo-transpiration & Absorption Beds
8	Aerated Wastewater Treatment System & Trenches
9	Aerated Wastewater Treatment System & Mound
10	Aerated Wastewater Treatment System with UV & Sub Surface Irrigation
11	Aerated Wastewater Treatment System with UV & Micro Trenches
12	Aerated Wastewater Treatment System with UV & Evapo-transpiration & Absorption Beds
13	Aerated Wastewater Treatment System with UV & Trenches
14	Aerated Wastewater Treatment System with UV & Mound
15	Humus Composting Closet & Sub Surface Irrigation
16	Humus Composting Closet & Micro Trenches
17	Humus Composting Closet & Evapo-transpiration & Absorption Beds
18	Humus Composting Closet & Trenches
19	Humus Composting Closet & Mound
20	Biological Filter System with UV & Sub Surface Irrigation
21	Biological Filter System with UV & Micro Trenches
22	Biological Filter System with UV & Evapo-transpiration & Absorption Beds
23	Biological Filter System with UV & Trenches
24	Biological Filter System with UV & Mound
25	Constructed Wetland (Reed bed) & Sub Surface Irrigation
26	Constructed Wetland (Reed bed) & Micro Trenches
27	Constructed Wetland (Reed bed) & Evapo-transpiration & Absorption Beds
28	Constructed Wetland (Reed bed) & Trenches
29	Constructed Wetland (Reed bed) & Mound
30	Sand Filter & Sub Surface Irrigation
31	Sand Filter & Micro Trenches
32	Sand Filter & Evapo-transpiration & Absorption Beds
33	Sand Filter & Trenches
34	Sand Filter & Mound
35	Pump Out System
36	Alternate System

Appendix E: Frequently Asked Questions

1.0 OSSM QUESTIONS / ANSWERS

	GENERAL
Q	Who is responsible for OSSMS within Council?
A	The *Environmental and Public Health Section* in *Regulatory Services* has an *Onsite Sewage Management Officer* to handle all OSSM issues relating to managing aspects of **EXISTING** OSSMS. The *Building Services Section* handles OSSM issues that pertain to a new DA. The OSSM Officer will be asked to comment on new DA's from time to time, relating to such matters as boundary adjustments, subdivisions etc.
Q	Is there an annual OSSM charge for rural properties in non-sewered areas with improvements?
A	Yes, there is an annual fee that is charged out to all relevant properties on their annual rates notice.
Q	Does a property owner have to apply to Council to operate their OSSMS?
A	Yes, all property owners that have an OSSMS must apply to Council for an Approval to Operate each OSSMS on the property. When an application for Approval to Operate is made to Council the OSSM Officer will visit the property to inspect the OSSMS.
Q	Is there a fee for an *Approval to Operate*?
A	Yes. The cost is a one off fee. This fee is to cover administration costs & associated inspections etc.
Q	Do new property owners need to apply to Council for an *Approval to Operate*?
A	Yes, under The Local Government Act 1993 the new property owner has 2 months to make application to Council for an Approval to Operate. A check of Councils records will show if the current owners of a property have applied to Council. Approvals can not be transferred from owner to owner.
Q	How long does an owner have to make an application to Council for *Approval to Operate?*
A	Under the The Local Government Act 1993 the new property owner has 2 months to pay the fee & make application to Council for an Approval to Operate.
Q	Are there penalties for not applying for an *Approval to Operate?*
A	Yes, a property owner that has an OSSMS must apply for and obtain an Approval to Operate from Council. If the property owner refuses to comply, the The Local Government Act 1993 allows for a Penalty Infringement Notice (PIN).
Q	Will Council inspect all properties with an OSSMS?
A	Yes, Council will eventually be inspecting all properties in the Shire that have an OSSMS. Council has undertaken a GIS desk top study to identify and prioritize areas within the shire for inspection, based on allotment size, zoning, highly populated areas, soil type and proximity to environmentally sensitive areas such as watercourses etc.

Q	What happens after the property is inspected?
A	The OSSMS either passes or fails the inspection. If the OSSMS passes, a risk assessment is given of a Low, Medium, or High rating. Then an Approval to Operate is issued. These risk assessments have no bearing on the length of the Approval to Operate. They are purely for Council purposes in identifying systems at risk to the environment, and reporting purposes. If a OSSMS fails the following occurs: - Minor failure; a letter requesting works to be undertaken is sent. This letter include a list of works required, time frame to undertake works and the requirement to make a Sec 68 application (Approval to install or alter OSSMS) with applicable fee and three (3) copies of plans of proposed works. - Major failure, but not likely to pollute; a Notice of proposed Order under The Local Government Act 1993 would be sent to the property owner outlining Council requirements similar to above letter. If no action or representations are made back to Council, an Order would be issued. - Major failure polluting or likely to pollute; A Clean up Notice or a Prevention Notice would be served under the Protection of the Environment and Operations (POEO) Act. A $320.00 admin fee is applicable as well as Sec 68, Fee, and plan. - Major failure, polluting and public health risk/threat to life; An Emergency Order under the The Local Government Act 1993 could be issued. A Notice of Proposed Order is not required. This could be combined with a Clean up Notice to address individual polluting issues. Fines are applicable for non compliance with Notices and Orders, and non payment of administration fees. The requirement to pay an administration fee may be appealed to Council. Prosecution may be considered in serious circumstances.
	PRE – PURCHASE INSPECTION
Q	How does this work?
A	Council offers a pre-purchase inspection service for those people who, when purchasing a property wish to ascertain the condition of the OSSMS.
Q	What is the process?
A	Either the vendor's, or normally the purchasers' solicitor makes an application to Council on the *Application for Pre-Purchase Inspection* form available from Council. This form requires that the vendor sign the form providing Council with permission to inspect the OSSMS. The applicant must provide their details and contact numbers for the vendor and themselves. It is a requirement as stated on the application that all dogs be under effective control during the inspection.
Q	Are there costs involved?
A	Yes, a fee is charged for an inspection & written report.
Q	What do you get?
A	OSSM officer conducts an inspection and provides a written report to the applicant with a copy provided to the vendor. If the property is situated in or near an environmentally sensitive area a flouresceine dye test may be carried out.

Q	How long does Council take?
A	Normally the applicant is informed that Council requires a minimum of two weeks notice to undertake the inspection, and write the report. There is no urgency fee available.
Q	What happens if the inspection reveals a problem with the OSSMS?
A	If there is a problem with the OSSMS the items are outlined in the pre-purchase report. Formal correspondence advising of the situation is sent to the owner/vendor. This may either take the form of a letter or in the case of a pollution incident a Clean up Notice or Prevention Notice under the POEO Act. A Notice of Proposed Order under the The Local Government Act 1993 is issued if the situation is serious but not likely to pollute the environment. In the situation of a life/health threatening incident an Emergency Order under the The Local Government Act 1993 could be issued. (This does not require a Notice of Proposed Order). If a notice under the POEO Act is issued, Council is entitled to a $320.00 administration fee for issuing the Notice, and a charge is applicable under Section 68 of the The Local Government Act 1993 where an application to modify the system is required. A PIN for "pollute waters" under the POEO Act may be considered by Council in accordance with Council's *Infringement Protocol.*
Q	If the property is to settle soon and the vendor claims they can't undertake the works before settlement, what happens?
A	The purchaser inherits the problem and will be pursued by the Council to comply with any notices it has issued. Purchasers should seek legal advice.
Q	Can the vendor get Council out to undertake an inspection for an Approval to Operate?
A	Yes, any property owner can request the OSSM officer to inspect their system. A fee of $110.00/hr may be charged. A written report is not provided. The property owner/applicants are informed at the time of enquiry that if there are any problems they will be required to undertake works to rectify them in accordance with Council requirements, Sec 68, fee's, plans etc. If the OSSMS is satisfactory and they have submitted an application for Approval to Operate, and paid the associated fee, an Approval to Operate would be issued by Council.
Q	What happens if the inspection reveals a problem with the OSSMS?
A	A similar approach is taken to that outlined above for a pre-purchase inspection, (except that there is no pre-purchase report).
	INSTALLING OR ALTERING AN OSSMS
Q	What must an owner do?
A	If an existing system requires upgrading, altering or replacing, the owner of the property must: - Make an application to Council under Sec 68 of the The Local Government Act 1993 to undertake works. - The Sec 68 application must be signed by the property owner. - The requisite fee must accompany the application. - Three (3) copies of plans of the proposed works must accompany the application. COUNCIL WILL NOT ACCEPT APPLICATIONS UNLESS ALL OF THE ABOVE STEPS ARE COMPLETED.

Q	Are there costs involved?
A	Yes. - Domestic (Sec 68 application under 10 EP) includes a fee for an Approval to Operate and two (2) inspections. - Commercial (Sec 68 application over 10EP) includes a fee for an Approval to Operate and three (3) inspections.
Q	Can a property owner undertake the work themselves?
A	No, *the NSW Code of Practice Plumbing and Drainage* and other Regulations requires that a NSW licenced plumber undertake the works.
Q	How does Council determine the type and size of an OSSMS?
A	Every job is site specific. The applicant will need to know their basic soil type, number of bedrooms in the dwelling and the type of treatment system proposed. Table three (3) provides a list of areas and their soil types as a guide to soils within the Shire. *Tables to be used in sizing Land Application Areas (LAA), and septic tank capacity,* can be found in Part C of the Strategy. Council takes into consideration the geotechnical nature of the site, size, ability to meet all minimum buffer distances, & the load from the premises etc. It is strongly recommended that the upgrade/installation work takes into consideration any future development that may place an additional load on the OSSMS. It is generally far more economical to provide for any additional load that may arise from future alterations and additions at the time of initial installation rather than have to do an upgrade later.
Q	Will Council's OSSM Officer come out onsite to assess the property?
A	The OSSM Officer may come out on a site visit to meet with the owner and chosen plumber to advise and guide them as to what Council requires if required. Council is entitled to, and does normally charge for these visits at an hourly rate. Council does not design systems or recommend proprietary named systems.
	APPROVALS TO OPERATE
Q	Once issued how long is an Approval to Operate for?
A	Most Approvals to Operate are for a period of ten (10) years. Sometimes an Approval will be issued for a shorter time if circumstances warrant this and any approval can be called up for review at any time.
	What happens if an OSSMS that has a current Approval to Operate fails or is likely to fail or pollute?
A	If at any time any OSSMS fails, the Approval to Operate is no longer valid. Council would require that works be undertaken to rectify the failure.

Q	Can Council withdraw or terminate an Approval to Operate?
A	Yes, Council has the right to terminate an Approval to Operate with valid reasons.