



ROSEWOOD ENVIRONMENTAL SERVICES PTY LTD

PO Box 129
WAUCHOPE NSW 2446

ON-SITE DOMESTIC-WASTEWATER MANAGEMENT REPORT

DATE: 2.10.2024

REPORT #: E3977

CLIENT DETAILS:

- **NAME:** D & M Calgaro Pty Ltd
- **POSTAL ADDRESS:** 327 Burraneer Road
Coomba Park
NSW 2428
- **PROJECT ADDRESS:** Lot 50 DP25366
327 Burraneer Road
Coomba Park NSW

Dear Mr & Mrs Calgaro,

At your request, Rosewood Environmental Services Pty Ltd carried out a site and soil evaluation at 327 Burraneer Road, Coomba Park, on the 2nd October, 2024. This information has been assessed to determine the suitability of the property to sustain a replacement on-site wastewater treatment system.

The existing residence after alterations and additions will have 5 bedrooms (8 persons/day). The water supply is tank water. The existing Septic tank & trench are to be decommissioned.

The Wastewater Treatment Unit options for the dwelling, based on the site & soil assessments and client preferences are:

- ☐ An Aerated Wastewater Treatment System (AWTS) serving a subsurface irrigation area;
- ☐ OR a Rosewood Reedbed serving a subsurface irrigation area.

The guidelines and Standards used for this report are:

- AS/NZS 1547:2000 & 2012 On-site Domestic-Wastewater Management.
- AS 1547: 1994 Disposal Systems for Effluent from Domestic Premises.
- Environment & Health Protection Guidelines: On-site Sewerage Management for Single Households.
- Local Council Code.

Thank you for using Rosewood Environmental Services Pty Ltd and if we can be of further assistance, please feel free to call and discuss any of the following results that you may have queries about.

Yours Sincerely

Lyn Richardson

LYN RICHARDSON

ROSEWOOD ENVIRONMENTAL SERVICES PTY LTD

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SECTION 1 **GENERAL INFORMATION**

1.1 LOCATION DETAILS

1.1.1 Locality.

The property is located at Coomba Park, south of Forster, on the NSW Mid North Coast.

1.1.2 Owner.

David & Mirella Calgaro are the owners of the property and residents of the dwelling.

1.1.3 Project Address.

Lot 50 DP253666, 327 Burraneer Road, Coomba Park

1.1.4 Phone number.

0439464020

1.1.5 Local Government.

Mid Coast Council

1.2 DAILY FLOW RATE

1.2.1 Intended Water Supply

The water supply to the residence is tank water.

1.2.2 Source of Wastewater

Source is from all waste (Black & Grey water combined).

1.2.3 Typical wastewater flow allowance. (AS1547:2012 APPENDIX H)

(120L/person/day) Standard water reduction fixtures

1.2.4 Total capacity of dwelling.

5 bedrooms = 8 persons/day

1.2.5 Total Daily Wastewater Flow Rate.

8 persons = 960L/day (Standard water reduction fixtures)

1.3 CLIMATE INFORMATION

SOURCE: BOM

Location of Precipitation data: Forster

Location of Evaporation data: Taree

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SECTION 2 SITE & SOIL EVALUATION

2.1 SITE EVALUATION

2.1.1 Site Plan (As per AS/NZS 1547:2012 Figure D1)

See APPENDIX A

2.1.2 Site Evaluator(s) (As per AS/NZS 1547:2012)

The principal evaluator: Lyn Richardson

2.1.3 Site Assessment Table

(As per AS/NZS 1547:2012-Table D1 /E & HP Guidelines Table 4/Local Council Code)

FEATURES	DESCRIPTION	LIMITATION CATEGORY (Minor/ Moderate/Major)
Flood Potential	NA	Minor
Aspect (Compass)	West	Minor
Exposure	Full sun/prevailing winds	Minor
Slope (° / %)	~12%	Minor
Landform	Hill slope	Minor
Upslope Seepage	Possible	Moderate
Run-on	Possible	
Erosion Potential	High	
Site Drainage	Good	Minor
Fill	Not detected	Minor
Groundwater	Not detected	Minor
Buffer Distances	See below	Minor
Sufficient Land	Yes	Minor
Surface Rocks	<10%	Minor

DESCRIPTION	ALLOWABLE MINIMUM (m)		AVAILABLE DISTANCE (m)
	Septic system	2 nd Treated	
Boundaries - up slope	6	3	3
- down slope	12	6	6
Waterways - Permanent	100		100
- Seasonal	40		40
Well / bores	250		250
Embankment / gully /dam	40		40
Buildings - up slope	6	3	3
- down slope	12	6	6
Driveways - up slope	6	3	3
- down slope	12	6	6
Swimming pool - up slope	6	3	3
- down slope	12	6	6
Other – Electricity easement	5	5	5

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2.1.4 Site Limitations

(As per AS/NZS1547:2012/E & HP Guidelines Table 4/Local Council Code)

There are no major site limitations

The moderate site limitations are:

- Run on & seepage is present
- Erosion potential high if not vegetated

2.1.5 Site Remediations

(As per AS/NZS 1547:2012/E & HP Guidelines Table 4)

- 1) All land application systems should be constructed on the contour so area of disposal system is level.
- 2) A diversion mound is required above the disposal area to reduce the risk of seepage and run-on from higher ground.
- 3) The area must be vegetated immediately after installation to avoid erosion.
- 4) The existing Septic tank & trench are to be decommissioned.



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2.2 SOIL EVALUATION

2.2.1 Soil Profile Information (As per AS/NZS 1547:2012)

Test Pit	Soil Horizon Depths (mm)	Texture	Colour	Organic Matter (OM) Fill (F) Natural Ground (NG)	Gravel/Cobbles	Moisture Content	Structure	Consistency
			(P) = Pale (D) = Dark (/) = Mottled (-) = combination		Low (L) <10%> Moderate (M) <25%> High (H)	Dry (D) Moist (M) Wet (W)	Strong (St) Moderate (M) Weak (W) Massive (MA) Structureless (SL)	See Below
1	0-150	Topsoil	(D)Brown	OM/NG	L	M	St	S
	150-600	Heavy CLAY	Brown-grey	NG	L	M	St	VSt
	600-700	Heavy CLAY	Brown-grey	NG	M	M	St	VSt
	700	Refusal Gravelbed						
2	0-150	Topsoil	(D)Brown	OM/NG	L	M	St	S
	150-300	Light CLAY	Brown-grey	NG	L	M	St	St
	300-600	Heavy CLAY	Grey/Red	NG	L	M	St	VSt
	600-700	Heavy CLAY	Orange/grey	NG	M	D-M	St	VSt
3	0-100	Topsoil	(D)Brown	OM/NG	L	D-M	St	S
	100-600	Light CLAY	Orange	NG	M	D-M	St	VSt
	600	Refusal Gravelbed						
4	0-100	Topsoil	(D)Brown	OM/NG	L	D-M	St	S
	100-400	Light CLAY	(P)Brown/Orange	NG	M	D	St	VSt
	400	Refusal Gravelbed						

NOTE: CONSISTENCY TERMS.

COHESIVE SOILS	Very Soft (VS) ≤12 kPa	Soft (S) >12 ≤25 kPa	Firm (F) >25 ≤50 kPa	Stiff (St) >50 ≤100 kPa	Very Stiff (VSt) >100 ≤200 kPa	Hard (H) >200 kPa
NON-COHESIVE SOILS	Very Loose (VL) ≤15 kPa	Loose (L) >15 ≤35 kPa	Medium Dense (MD) >35 ≤65 kPa	Dense (D) >65 ≤85 kPa	Very Dense (VD) >85 kPa	-

2.2.2 Soil Profile Information

TESTPIT 1:



TESTPIT 3:



TESTPIT 2:



TESTPIT 4:



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2.2.3 Soil Assessment Table (As per AS/NZS 1547:2012/E & HP Guidelines Table 6/Local Council Code)

TESTPITS	1-4	Limitation Category ¹ (Minor/Moderate/Major)
Soil Structure ²	Strong	Minor
Soil Texture ³	Heavy CLAY	Major for trenches
Soil Permeability Category ⁴	6	
Indicative Permeability (K_{sat}) (m/day) ⁴	<0.06	
Recommended DLR (mm/day) ⁵ Mound	NA	
Recommended DIR (Irrigation area) (mm/week) ⁶	15	Minor
Course Fragments (%>2mm) ⁷	0-20	Minor
Depth to bedrock/hardpan (mm)	<1m(400-700mm) <1m(600-700mm)	Major for trenches (TP4 Major) Moderate for subsurface irrigation
Depth to Episodic/seasonal watertable	>1m	Minor
pH (1:5 water)	4.6	Moderate
Electrical Conductivity (dS/m)	<4	Minor
Dispersiveness (Modified Emerson Class) ⁸	3/6	Minor

SOURCES:

- 1) "Environmental & Health Protection Guidelines" Section 4-Table 6 page 68 & AS/NZS 1547-2012
- 2) AS/NZS 1547-2012 (Table E4 – Assessment of Soil Structure)
- 3) AS/NZS 1547-2012 (Table E1 – Assessment of Soil Texture)
- 4) AS/NZS 1547-2012 (Table E1) – Based on soil texture result.
- 5) AS/NZS 1547-2012 (Table L1– trenches and beds) or Table N1- Mound).
- 6) AS/NZS 1547-2012 (Table M1 – Irrigation systems) & Auckland Regional Council Technical Publication #58 (TP58)^{3rd} Ed. 2004
- 7) AS/NZS 1547-2012 (Table E.2 –Abundance of Course Fragments) & (Table E3 –Size of Course Fragments)
- 8) "Environmental & Health Protection Guidelines" Section 4-Table 6 page 68 Modified Emerson Aggregate Test Classifications are incorrect and the classification used is as per AS 1289.3.8.1 and AS/NZS 1547-2012-Clause E7.

2.2.4 Soil Limitations (As per AS/NZS 1547:2012/E & HP Guidelines Table 6/Local Council Code)

The major soil limitations are:

- The shallow, low permeable clays are not suitable for the Septic tank & trench option.
- Test pit 4 area is too shallow for all options

The moderate soil limitations are:

- The soils are acidic
- The soil depth is too shallow for the subsurface irrigation in TP1-3.

2.2.5 Soil Remediations (As per AS/NZS 1547:2012 /E & HP Guidelines Table 6)

- 1) Based on the above limitations, the proposed systems for this property are considered suitable.
- 2) The septic tank & trench option has not been included within this report due to the shallow, low permeable clays.
- 3) Test pit 4 area is to be avoided due to shallow (400mm) soil depth.
- 4) The shallow soil depths in TP1-3 (600-700mm) requires additional topsoil (>300-200mm respectively) to increase the depth of soil to be >600mm below the application depth of 300mm for the non-disinfected Reedbed system.
- 5) The shallow soil depths in TP3 (600mm) requires additional topsoil (>100mm) to increase the depth of soil to be >600mm below the application depth of 100mm for the disinfected AWTs system.
- 6) The ground is to be lightly ripped along the contour to aerate the ground and improve absorption. At the same time the following soil additives are to be ripped into the soil:
 - Due to acidic soils, the addition of agricultural lime is required. As a guide, in clay, the approximate amount of lime required to raise the pH by 1 unit = 250g (~1 cup) ag lime/m²/150mm soil depth.

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SECTION 3 **DESIGN REPORT**

3.1 WASTEWATER TREATMENT UNIT & LAND APPLICATION SYSTEM

3.1.1 Options suitable for site. (As per AS/NZS 1547:2012)

OPTIONS	WASTEWATER TREATMENT UNIT	APPLICATION METHOD	LAND APPLICATION
1	AWTS	SUBSURFACE IRRIGATION	Natural ground Additional topsoil TP3
2	ROSEWOOD REEDBED		Natural ground Additional topsoil TP1-3

3.1.2 Size of area required

(Calculations as per AS1547:2012, E & HP guidelines, AS 1547:1994)

OPTIONS	Dimensions	5 Bedroom House
1-2	Subsurface irrigation Area	370m ²

3.1.3 Siting of system

The area to the northwest of the house has been assessed for the land application area. The land application area can be located anywhere within the assessed area.

3.2 WASTEWATER TREATMENT UNIT

3.2.1 Capacity of Unit Options

(As per Manufacturers recommendations)

OPTION 1

- AWTS = To manufacturer's instructions. 10 person max.

OPTION 2

- "ROSEWOOD REEDBED" (Vertical Flow)
16m³ (2m x 8m) x 1m deep
- SEPTIC TANK CAPACITY = **4000L**
- An outlet filter be installed into the septic tank outlet is also recommended.
- A pump well with a high-water alarm with a submersible pump suitable for transferring secondary treated wastewater to pressurised subsurface irrigation.

3.2.2 Effluent Quality (As per AS/NZS 1547:2012)

The quality of the wastewater from Options 1-2 will be to a secondary treatment level. Option 1 is disinfected.

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SECTION 4 **CONSTRUCTION & INSTALLATION** (AS PER AS/NZS 1547:2012)

4.1 CONSTRUCTION REQUIREMENTS

4.1.1 *Subsurface irrigation.*

- ❑ A diversion mound/drain above the application area to divert surface and seepage water away is required.
- ❑ As per AS/NZS 1547-2012 for clay soil/sloping site.
- ❑ Should be installed by a qualified person.
- ❑ Irrigation products should be suitable for pressurised wastewater distribution (eg Geoflow or Netafim).
- ❑ For all irrigations areas >400m², the irrigation area is to be split into 2 even sections and evenly distributed via a Distribution Valve eg K-Rain.

4.1.2 Wastewater treatment units.

- ❑ AS/NZS 1546.1 & AS/NZS1547-2012.
- ❑ AWTS Manufacturers Guidelines.
- ❑ “Rosewood Reedbed” - Rosewood Environmental Services Pty Ltd for preferred installers

4.2 Installation Requirements (As per AS/NZS 1547:2012)

4.2.1 Installation Instructions (As per AS/NZS 1547:2012)

4.2.1.1 Instructions (As per AS/NZS 1547:2012)

4.2.1.2 Repairs (As per AS/NZS 1547:2012)

4.3 COMMISSION & INSPECTION (As per AS/NZS 1547:2012)

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SECTION 5 **CONCLUSION**

5.1 REPORT SUMMARY

- The site where the proposed and reserve land application areas are to be located has 2 main system design option available, under the guidelines and client request:-
 - ❑ An AWTs and subsurface irrigation
 - ❑ OR a Rosewood Reedbed System and subsurface irrigation
- Site and soil remediation involves:-
 - ❑ The septic tank & trench are to be decommissioned.
 - ❑ The area must be vegetated immediately after installation to avoid erosion.
 - ❑ A diversion mound is required above the disposal area to reduce the risk of seepage and run-on from higher ground.
 - ❑ The septic tank & trench option has not been included within this report due to the shallow, low permeable clays.
 - ❑ Test pit 4 area is to be avoided due to shallow (400mm) soil depth.
 - ❑ The shallow soil depths in TP1-3 (600-700mm) requires additional topsoil (>300-200mm respectively) to increase the depth of soil to be >600mm below the application depth of 300mm for the non-disinfected Reedbed system.
 - ❑ The shallow soil depths in TP3 (600mm) requires additional topsoil (>100mm) to increase the depth of soil to be >600mm below the application depth of 100mm for the disinfected AWTs system.
 - ❑ The ground is to be lightly ripped along the contour to aerate the ground, key in additional topsoil and improve absorption. At the same time the following soil additives are to be ripped into the soil:
 - Due to acidic soils, the addition of agricultural lime is required. As a guide, in clay, the approximate amount of lime required to raise the pH by 1 unit = 250g (~1 cup) ag lime/m²/150mm soil depth.
 - ❑ Subsurface irrigation lines to be constructed along contour.
 - ❑ Standard AAA Water saving devices are to be installed.
 - ❑ A final plan should be completed by the installer at the conclusion of the project for Council's and client's reference.
 - ❑ The long-term sustainability of the system relies on the occupier of the dwelling caring for their system. Appendix C provides information regarding the operation and maintenance of the system, which will greatly assist in prolonged performance.

5.2 DISCLAIMER

Results and recommendations in this report are based on the information supplied by the client and conditions present at the time of testing. Any changes affecting the proposed land application area or alternate land application area will require a review of this report.

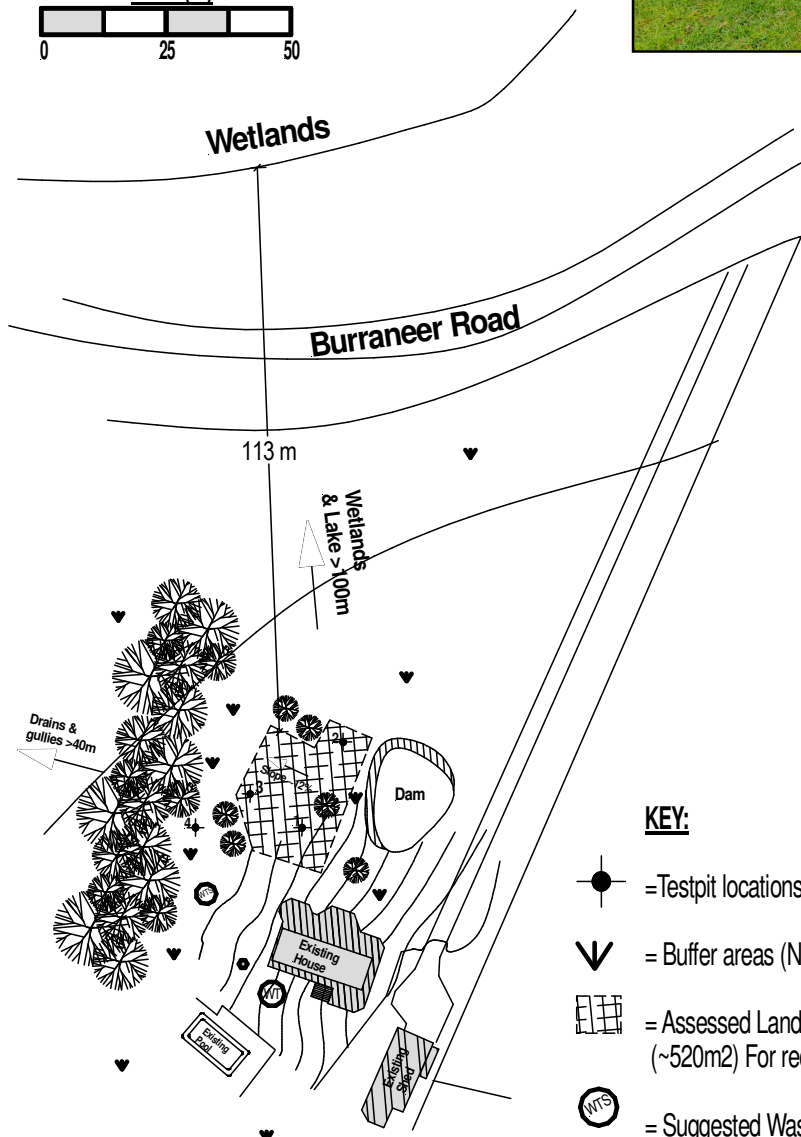
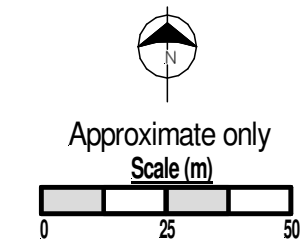
5.3 REPORT CONDITIONS

- This report remains the property of "Rosewood Environmental Services Pty Ltd" and we reserve the right to withdraw this report at any stage until all payments have been received in full.
- This report is not to be copied except in full (exempting Appendices relating to general Maintenance/operations and Plantings).
- This report is not to be used for any property or persons other than those specified within the report, otherwise this may lead to a breach of copyright.
- NOTE: The information contained within this report is for wastewater purposes only and must not be used for any other purpose (especially Construction, Footing Designs, etc) as it is not considered relevant.






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APPENDIX A Site Plan

NTS in pdf



KEY:

-  = Testpit locations
-  = Buffer areas (Not to be used for wastewater application)
-  = Assessed Land Application Area for wastewater application (~520m²) For required area refer to Section 3.1.2
-  = Suggested Wastewater Treatment Tank (TBC)
-  = Existing septic tank to be decommissioned
Trench not located

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APPENDIX B CALCULATIONS

Minimum Area Method Water Balance and Wet Weather Storage Calculations Forster

Assumption

* L/person/day
* persons = 8
* Soil Texture (No): 7
Design Wastewater Flow:
(l/day) 960

Table 1.1(International Permeability Standards)

Texture:	Permeability (m/d):	D.I.R.
1.Sand	>3.0	35
2.Sandy Loam	>3.0	35
3.Silty Loam	3	28
4.Clay Loam	0.5	25
5.Silty Clay	0.12	20
6.Clay	0.06	20
7.Heavy Clay	<0.06	15

Options 1-2 – Subsurface irrigation

Minimum Area Method Water Balance and Wet Weather Storage Calculations (Forster)

Design Wastewater Flow (Q):	l/day	960
Design Percolation Rate (R):	mm/wk	15

Subsurface Irrigation Area

Parameters					Outputs			Inputs					
Month	Days (D)	Precipitation (P)	Evaporation (E)	Crop factor (C)	Evapotranspiration (ET)	Percolation (B)	Total Outputs (ET+B)	Retained Precipitation (P) 75%	Possible Effluent Irrigation (W)	Actual Effluent Production (I)	Inputs	Storage (S)	Cumulative Storage (M)
	days	mm/month	mm/month	-	mm/month	mm/month	mm/month	mm/month	mm/month	mm/month	mm/month	mm/month	mm
Jan	31	111	177	0.75	132.75	66.43	199.18	83	115.93	78.24	161.49	-37.69	0.00
Feb	28	116	146	0.75	109.5	60.00	169.50	87	82.50	78.24	165.24	-4.26	0.00
Mar	31	150	133	0.75	99.75	66.43	166.18	113	53.68	78.24	190.74	24.56	24.56
Apr	30	129	99	0.75	74.25	64.29	138.54	97	41.79	78.24	174.99	36.46	61.02
May	31	116	65	0.75	48.75	66.43	115.18	87	28.18	78.24	165.24	50.06	111.08
Jun	30	119	54	0.75	40.5	64.29	104.79	89	15.54	78.24	167.49	62.71	173.79
Jul	31	86	62	0.75	46.5	66.43	112.93	65	48.43	78.24	142.74	29.81	203.60
Aug	31	72	84	0.75	63	66.43	129.43	54	75.43	78.24	132.24	2.81	206.41
Sep	30	68	114	0.75	85.5	64.29	149.79	51	98.79	78.24	129.24	-20.54	185.87
Oct	31	78	146	0.75	109.5	66.43	175.93	59	117.43	78.24	136.74	-39.19	146.68
Nov	30	77	159	0.75	119.25	64.29	183.54	58	125.79	78.24	135.99	-47.54	99.13
Dec	31	94	186	0.75	139.5	66.43	205.93	71	135.43	78.24	148.74	-57.19	41.95
Total	365	1216	1425	0.75	1068.75	782.14	1850.89	912	938.89	938.89	1850.89	-	-

Irrigation Area (L) m2 368.09

Storage (V) largest M mm 206.41
(VxL)/1000 m3 75.98

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APPENDIX C **OPERATION & MAINTENANCE INFORMATION** **(As per AS/NZS 1547:2000 APPENDIX 3A)**

➤ **General.**

Long-term sustainability of the on-site wastewater system will depend on the Operation and Maintenance (O & M) management procedures that the user undertakes. Regular O & M in the form of understanding the basic mechanics of the system, so that the system can function properly through the correct use and care by the user, is essential. A systematic monitoring program is also required to reduce the risk of failure and inefficiency.

➤ **O & M Guidelines.**

The O & M guidelines for the wastewater treatment system should be supplied by the manufacturers of the system in question.

A copy of these guidelines should be kept in an accessible location and made available to any person that is involved with the specific system ie. Home owners, tenants/occupiers, and on change of ownership or tenancy.

➤ **Monitoring.**

- All systems should be monitored to ensure they are complying with regulations.
- Frequency should take into consideration:
 - Age of system;
 - Experience with other on-site system performances;
 - Recent history of poor maintenance on site or similar site;
 - Approval conditions;
 - Type of system.
- A regular schedule for maintenance checks on individual on-site wastewater systems should be organised. These checks should be carried out by an accredited organisation and a "Maintenance Certificate" should be issued.
- Record sheets should be filled out for every maintenance check or action carried out on the system. They should be available to any agency or local regulatory authority who need to certify that the system is being operated and maintained properly. The report sheets should be kept for at least 10 years.
- "Maintenance Certificates" should be kept for at least 10 years. The owner and/or occupier are responsible for commissioning the maintenance check and carrying out any remedial works as recommended by the "Maintenance Certificate", and paying any costs involved. The "Maintenance Certificate" should include:
 - Certification by a qualified and experienced person that the wastewater system is operating and performing effectively.
 - Specific O & M attention due.
 - Identification of any O & M problems, their likely cause and recommended remedial action.
 - Any evidence of system capacity being exceeded.
 - Results of effluent quality testing where secondary treatment is being used.
 - Actions and results, achieved following recommendations for remedial work after previous routine inspections, are noted.
 - Desludging time frame recommended.
 - Other relevant matters.
- Maintaining records, certificates and guidelines are the responsibility of the home owner or occupier.
- Registration of on-site wastewater system is to keep track of change of ownership, change in size and use of premises or demolition of premises.
- All persons carrying out O & M activities should ensure that, at all times, precautions are taken to protect their own health and the health of all other people at risk from the activity.

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OPERATION & MAINTENANCE INFORMATION

(As per AS/NZS 1547:2000 APPENDIX 3A)

➤ **O & M Requirements. (AS/NZS 1547:2000 APPENDIX 3A5)**

- **Advice on use of the system.**

- Reduce sludge build up in tank:
 - 1) Scrape all dishes to remove fats, grease, etc. before washing.
 - 2) Keep all possible solids out of the system.
 - 3) Don't use a garbage grinder unless system has been specially designed to carry the extra load. Note: Conventional septic tanks are not designed for this purpose and this report has not been designed for one.
 - 4) Don't put sanitary napkins and other hygiene products into the system.
- Keep bacteria active in tank and land application area:
 - 1) Use biodegradable, low phosphorous soaps and detergents.
 - 2) Use a low-sodium detergent in dispersive soil areas.
 - 3) Use detergents in recommended quantities.
 - 4) Use liquid detergents in preference to powders.
 - 5) Don't use powerful bleaches, whiteners, nappy soakers, spot removers and disinfectants.
 - 6) Don't put chemicals or paint down the drain.
- Water conservation measures to promote sustainability and performance:
 - 1) Install water saving devices such as shower roses.
 - 2) Take showers rather than baths.
 - 3) Wash clothes only when there is a full load.
 - 4) Only use dishwasher when there is a full load.
- Avoid overloading the system by spacing out water use as evenly as possible.
 - 1) Don't do washing all on one day.
 - 2) Don't run dishwasher and washing machine at the same time.

- **Advice on maintenance.**

- Primary wastewater-treatment unit (septic tank)
 - 1) Desludge regularly ie every 3-5 years or when scum and sludge occupy 1/3 of the volume of the tank (or first stage of a two-stage system).
 - 2) Protect from vehicles.
 - 3) Clean grease trap, if any, out regularly.
 - 4) The vent and/or access cover of tank kept exposed.
 - 5) Have any outlet filter inspected and cleaned.
- The land-application area needs protection as follows:
 - 1) Land application areas are not play areas for children and access should be restricted.
 - 2) No vehicles or stock allowed on land application areas.
 - 3) Deep rooting plants should not be grown near absorption trenches or pipes.
 - 4) The diversion drains above the area should be kept clean.
 - 5) Baffles and valves in distribution box should be periodically (monthly or seasonally) changed to direct effluent into alternative trenches or beds, as required by the design.

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- **Plants**

Evapo-transpiration and irrigation areas should have their grass mowed and plants maintained to ensure that these areas take up nutrients with maximum efficiency.

- **Signs**

Spray irrigation areas require appropriate warning signs that are always visible to persons undertaking activities near an irrigation area.

- **Equipment**

- 1) Follow the manufacturer's instructions for maintaining and cleaning pumps, siphons and septic tank filters.
- 2) Clean discs filters or filter screens on irrigation-dosing equipment periodically by rinsing back into the primary wastewater-treatment unit.
- 3) Flush drip irrigation lines periodically to scour out any accumulated sediment.

- **Advice on operating problems.**

- **Warning signs:**

- 1) Absorption field is wet or soggy with wastewater ponding on the surface of the ground.
- 2) Smells of "Sewage" near the septic tank or absorption area.
- 3) The drains and toilet run slowly.
- 4) The grease trap is full or blocked.

- **Advice on consequences of failure.**

- **Serious health and environmental hazards:**

- 1) Spread of infectious diseases.
- 2) Breeding of mosquitoes and attraction of flies and rodents.
- 3) Nuisance and unpleasantness.
- 4) Pollution and infection of waterways, beaches, streams and shellfish beds.
- 5) Contamination of bores, wells and groundwater.
- 6) Alteration of the local ecology.

- **Advice on home owner/occupier responsibilities.**

The homeowners and occupiers are *legally* responsible to keep their on-site wastewater system in good working order. If any warning signs (as described above) are evident, the homeowner or occupier must contact their council immediately.

- **Advice on alternate on-site wastewater systems.**

Specific O & M measures will be required for alternative on-site wastewater treatment units, equipment, facilities and land application system beyond what has been outline above.

These should be obtained from:

- The designer and installer
(i.e. Design basis; operating requirements; enhancement of factors of safety)
- Equipment suppliers
(i.e. Regular maintenance schedule; spare parts list; call-out contact details; operational instructions).
- Local government
(i.e. inspections schedule; reporting defects).
- The regional environmental control agency
(i.e. monitoring requirements; flow records; reporting environmental incidents).

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APPENDIX D

VEGETATION SUITABLE FOR LAND APPLICATION AREAS

(Source: Environment & Health Protection Guidelines-1998)

Botanical Name	Approximate Height	Common name or Variety
Grasses		
- Carex spp.		
- Lomandra longifolia **		
- Microlaena stipoides		
- Oplismenus imbecillis		
- Pennisetum alopecuroides	40-80cm	Available as lawn turf
- Poa lab		
- Stipa spp.		
Ground cover/climbers		
- Hibbertia scandens **		
- Hibbertia stellaris		Snake vine
- Isotoma fluviatilis		
- Kennedia rubicunda	Prostrate	
- Scaevola albida	Climber	Dusky Coral Pea
- Scaevola ramosissima		
- Veronica plebeia		
- Viola hederacea **		Native Violet
Sedges/grasses/small plants		
- Anigozanthus flavidus	2m	Kangaroo Paw
- Baumea acuta		
- Baumea articulata	Sedge	
- Baumea juncea	Sedge	
- Baumea nuda	Sedge	
- Baumea rubignosa	Sedge	
- Baumea teretifolia	Sedge	
- Blandfordia grandiflora	30-90cm	Christmas Bell
- Blandfordia nobilis	30-90cm	Christmas Bell
- Brachyscome diversifolia	Clump	Native Daisy
- Carex appressa	Sedge	
- Cotula coronopifolia	10-20cm	Waterbutton
- Crinum pedunculatum **	<2m	Swamp lily
- Cyperus polystachyos	Sedge	
- Dianella caerulea **	Low plant	Blue Flax Lily
- Epacris microphylla	50cm-1m	
- Ferns		
- Gahnia spp.	Tall grass	
- Juncus spp.	0.5m Rush	
- Lobelia trigonocaulis	5-10cm	
- Lomandra spp. **	Grass	
- Patersonia fragilis		Native Iris
- Patersonia glabrata		Native Iris
- Patersonia occidentalis		Native Iris
- Ranunculus graniticola	5cm	
- Restio australis	Reed	
- Restio tetraphyllus	1m	
- Sowerbaea juncea	Sedge	Rush Lily
- Tetratheca juncea	<30cm	
- Xyris operculata	<1m	Tall Yellow Eye

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Botanical Name	Approximate Height	Common name or Variety
Shrubs		
- Agonis flexuosa nana		
- Baekea linifolia	1-2.5m	
- Baekea utilis	1-2.5m	
- Baekea virgata	<4m	
- Banksia aemula	1-7m	
- Banksia robur	0.5-2m	
- Bauera ruboides	0.5-1.5m	
- Callistemon	2-3m	Burgundy
- Callistemon	2-4m	Eureka
- Callistemon	3-4m	Harkness
- Callistemon	3-4.5m	Kings Park Special
- Callistemon	2-3m	Mauve Mist
- Callistemon	1-2.5m	Red Clusters
- Callistemon	2-3	Reeves Pink
- Callistemon citrinus	50-80cm	Austraflora Firebrand
- Callistemon citrinus	2-4m	Splendens
- Callistemon cirinus	60cm-1m	White Ice
- Callistemon linearis	1-3m	
- Callistemon macropunctatus	2-4m	
- Callistemon pachyphyllus	2-3m	
- Callistemon pallidus	1.5-4m	
- Callistemon paludosus	3-7m	
- Callistemon pinifolius	1-3m	
- Callistemon rigidus	1.5-2.5m	
- Callistemon salignus	3-10m	
- Callistemon shiresii	4-8m	
- Callistemon sieberi	1.5-2m	
- Callistemon sieberi	50-80cm	Austraflora Little Cobber
- Callistemon subulatus	1-2m	
- Callistemon viminalis	1-2m	Captain Cook
- Callistemon viminalis	5-10m	Dawson River
- Callistemon viminalis	3-5m	Hannah Ray
- Callistemon viminalis	50cm-1m	Little John
- Callistemon viminalis	1.5-2m	Rose Opal
- Callistemon viminalis	2-3m	Western Glory
- Goodenia ovata **	1-1.5m	
- Hibiscus diversifolius **	1-2m	Swamp Hibiscus
- Kunzea capitata	1-2m	
- Leptospermum flavescens	<2m	Tea-tree
- Leptospermum juniperinum	1m	Tea-tree
- Leptospermum lanigerum	1-2m	Woolly tea-tree
- Leptospermum squarrosum	<2m	Tea-tree
- Melaleuca alternifolia	4-7m	
- Melaleuca decussata	1-2m	Cross-leaved honey myrtle
- Melaleuca lanceolata	4-6m	
- Melaleuca squamea	1-2m	
- Melaleuca thymifolia		

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Botanical Name	Approximate Height	Common name or Variety
Trees		
- Acacia elongata	>2m	
- Acacia floribunda **	2-4m	Gossamer wattle
- Agonis flexuosa	5-6m	Willow myrtle
- Allocasuarina diminuta	1.5m	
- Allocasuarina paludosa	0.5-2m	
- Angophora floribunda	Large tree	
- Angophora subvelutina	Large tree	
- Callicoma serratifolia **	<4m	
- Casuarina cunninghamiana	10-30m	River she-oak
- Casuarina glauca	6-12m	Swamp oak
- Elaeocarpus reticulatis **	Large tree	Blueberry Ash
- Eucalyptus amplifolia	Large tree	
- Eucalyptus botryoides (coastal areas)*	10-30m	
- Eucalyptus camaldulensis (west of ranges)*	15-20m	River red gum
- Eucalyptus deanei	Large tree	Blue Mountains Blue gum
- Eucalyptus elata	Large tree	River Peppermint
- Eucalyptus grandis *	10-20m	Flooded gum
- Eucalyptus longifolia	20m	Woollybutt
- Eucalyptus pilularis *	30-40m	Blackbutt
- Eucalyptus punctata *	<35m	Grey gum
- Eucalyptus robusta	20-30m	Swamp Mahogany
- Eucalyptus saligna (coastal) *	30-50m	Sydney blue gum
- Eucalyptus tereticornis *	30-40m	Forest red gum
- Eucalyptus viminalis (ranges)	20-40m	Ribbon gum
- Acmena smithii **	10-20m	Lilli pilli
- Flindersia australis	<40m	Native teak
- Hymenosporum flavum **	3-6m	Native frangipani
- Melaleuca armillaris	3-4m	Bracelet Honey Myrtle
- Melaleuca decora	4-7m	
- Melaleuca ericifolia	6m	
- Melaleuca halmaturorum	4-6m	
- Melaleuca hypericifolia	2-3m	
- Melaleuca linariifolia	4-8m	Snow in Summer
- Melaleuca quinquenervia	5-7m	Broad paper bark
- Melaleuca squarrosa	6m	
- Melaleuca stypheloides	6-15m	
- Melia azedarach **	15-20m	White Cedar
- Pittosporum spp. **		
- Syzigium paniculatum **	8-10m	Bush cherry
- Tristania laurina **	5-15m	Kanuka (Water Gum)
- Viminaria juncea	2-3m	Golden spray

NOTE: - *Callistemon, Melaleuca & Leptospermum burn well due to their high oil content.*

- * = Banksia & Eucalyptus are fire hardy but generally do not retard fire.
Eucalypts with* are better because of their smooth bark.
- ** = Indicates plants that have fire resistance or are hard to burn properties and may assist in bushfire protection as well as suitability for wastewater uptake.