# ON-SITE SEWAGE MANAGEMENT REPORT

394 Gooda Creek Road
Lot 4 DP 1247034
MURRUMBATEMAN NSW 2582

**16 December 2024 (V01)**


**FRANKLIN CONSULTING AUSTRALIA PTY LTD**
**GPO Box 837 Canberra ACT 2601**
www.soilandwater.net.au

Franklin Consulting Australia Pty Limited, trading as Soil and Water, offers expert advice and services to the agriculture, development and environmental conservation sectors. We provide soil and water management advice, undertake land capability and soil assessment, erosion and sediment control, and soil conservation, catchment and property management planning. We have extensive experience in both government and private sectors in senior management and consulting roles.

We provide our services to individual land holders, sub-division developers, surveyors, commercial business owners, and land development and regulatory agencies.

*Principal Consultant*
*John Franklin M App Sc, BSc, EIANZ*

John Franklin has over 30 years' experience in natural resource management in the ACT, the Upper Murrumbidgee region in New South Wales and the tropical farming regions in North Queensland. This experience includes providing extensive soil and water management advice to land holders, businesses, State and Local Governments and the urban / rural residential development sector across the region.

Contact details: GPO Box 837
Canberra ACT 2601
P 02 6179 3491
M 0490 393 234
soil.land.water@gmail.com

*Limitations*

*This report is based on the information provided by the client prior to this report, and from site investigation as undertaken. Franklin Consulting Australia does not take responsibility for subsequent development design changes by the client or third parties, or for the installation or operation of effluent management systems. This document may only be used for the purpose for which it was commissioned. Franklin Consulting Australia Pty Ltd accepts no liability or responsibility for or in respect of any use of or reliance upon this report and its supporting material by any party. Information provided is not intended to be a substitute for site specific assessment or legal advice in relation to any matter. Unauthorised use of this report in any form is prohibited.*

## CONTENTS

## SUMMARY RECOMMENDATIONS

**Development**

This site and soil assessment informs the appropriate on-site management of domestic effluent associated with the construction of a wedding venue and five farm stay accommodation cabins (see below). A new main dwelling will be the subject of a separate development application.

**Address**

Lot 2 DP 1247034
314 Gooda Creek Road,
Murrumbateman NSW

**Wedding venue:** 120 pax seated dining room, 250 pax total capacity, commercial kitchen.

| ***Peak Daily load*** | ***Weekly Load (3 peak load days)*** |
|---|---|
| 5,320 L | 16,240 L |

***Average Daily load***
2,320 L

***Recommended pre-treatment system:***
Grease trap with minimum capacity of **1,500 L** and in-floor and in-sink bucket traps.

***Recommended effluent dosing system:***
Buffer tank with **10,000 L** capacity and fitted with macerator pump and timer to dose treatment system at **2,500L/day.** The pump / tank will be fitted with a pump failure/high level alarm.

***Recommended treatment system:***
Advanced NSW Health accredited secondary treatment system (AWTS) with daily treatment capacity greater than **2,500 L/day**.

***Recommended Dispersal system:***
Dispersal of treated and disinfected effluent through fixed surface sprays to a minimum area of **1,600m$^2$** including 4 irrigation fields of **200m$^2$** upslope of 4 nutrient assimilation areas of **200m$^2$** with treated effluent delivered to each irrigation field by a 4-port sequencing valve in accordance with the prescriptions contained in this report.

**Cabins:** 5 cabins (doubles)

| ***Peak Daily load*** | ***Weekly Load (7 peak load days)*** |
|---|---|
| 590 L | 4,130 L |

***Average Daily load***
590 L

***Recommended treatment system***
Gravity main to pick up all 5 cabins running to a NSW Health accredited secondary treatment system (AWTS) with daily treatment capacity greater than **1,500 L/day**.

***Recommended Dispersal system:***
Dispersal of treated and disinfected effluent through moveable surface sprinkler line to a minimum area of **400m²** in accordance with the prescriptions contained in this report.

**Existing & proposed dwelling:**

***System not assessed:***
Owner advises that the On-site Sewage Management System installed on the cottage was designed to have adequate capacity to manage the estimated load from the proposed additional main dwelling, therefore no additional assessment was required.

**Constraints**

The main site constraints include buffer distances from proposed buildings and farm dams. Large load to be disposed of from venue and accommodation cabins and dwellings, which are spread out over the property.

***Refer to Figure 1-3 for Site layout and prescriptions***.

**TECHNICAL REFERENCES**

- *On-site Sewage Management for Single Households* (The Silver Book) NSW Govt, 1998.
- *ANZ Standard 1547:2012 On-site Domestic Wastewater Management*
- *Soil Landscapes of the Canberra 1:100,000 Sheet*. Jenkins B.R. (2000) Department of Land and Water Conservation, New South Wales
- *Yass Valley Local Environment Plan 2013*.

**REPORT SCOPE**

The report assesses land in the vicinity of the proposed dwelling to identify land suited to effluent application. This involves excluding land with major physical constraints, such as rock outcrop and poor drainage, and areas within buffer distances of proposed buildings.

Information required by council is contained in the report, including management prescriptions, site plan and photographs, with supporting information in this report including nutrient balance, water balance and limitation tables.

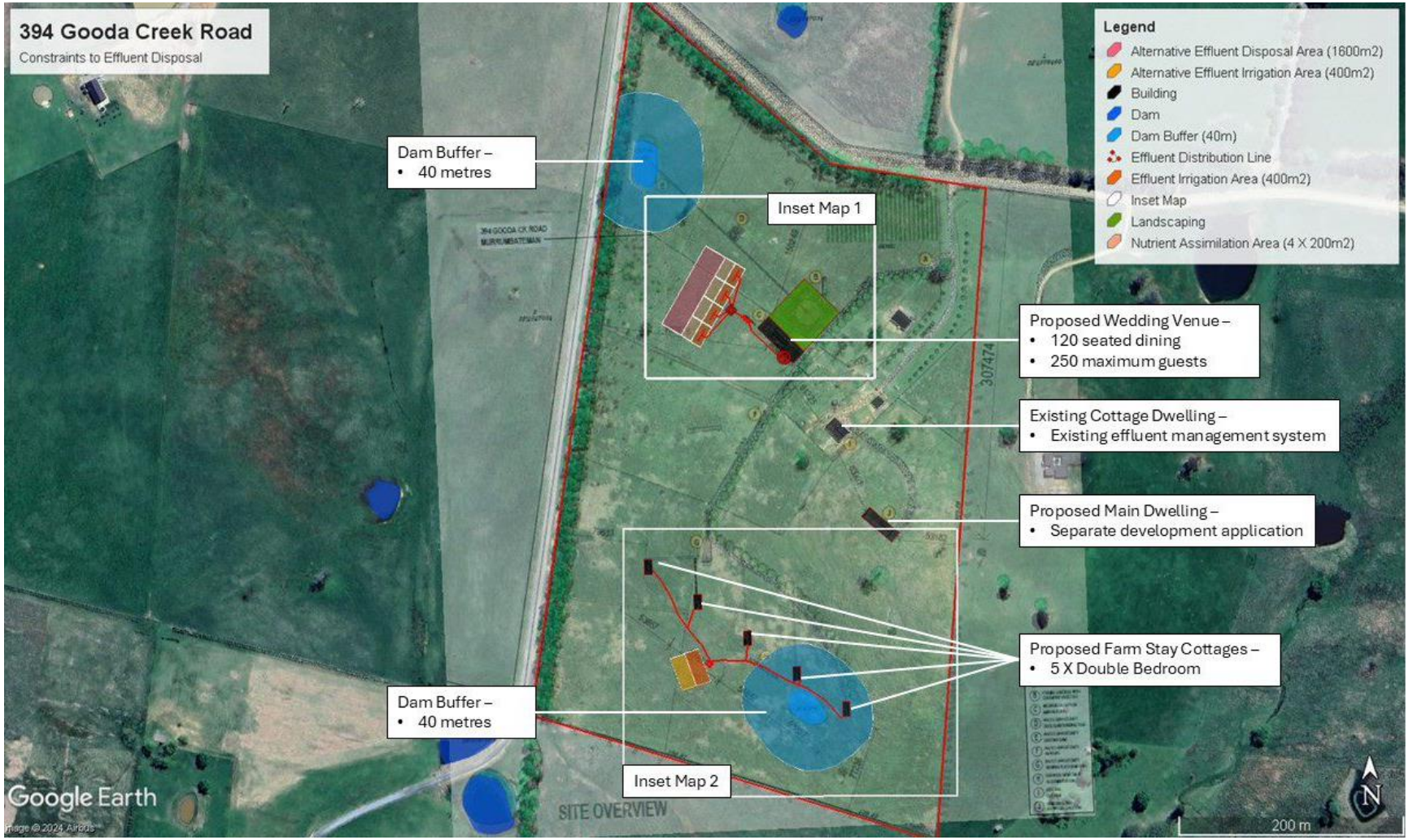



**Figure 1: Site layout and constraints to effluent disposal**

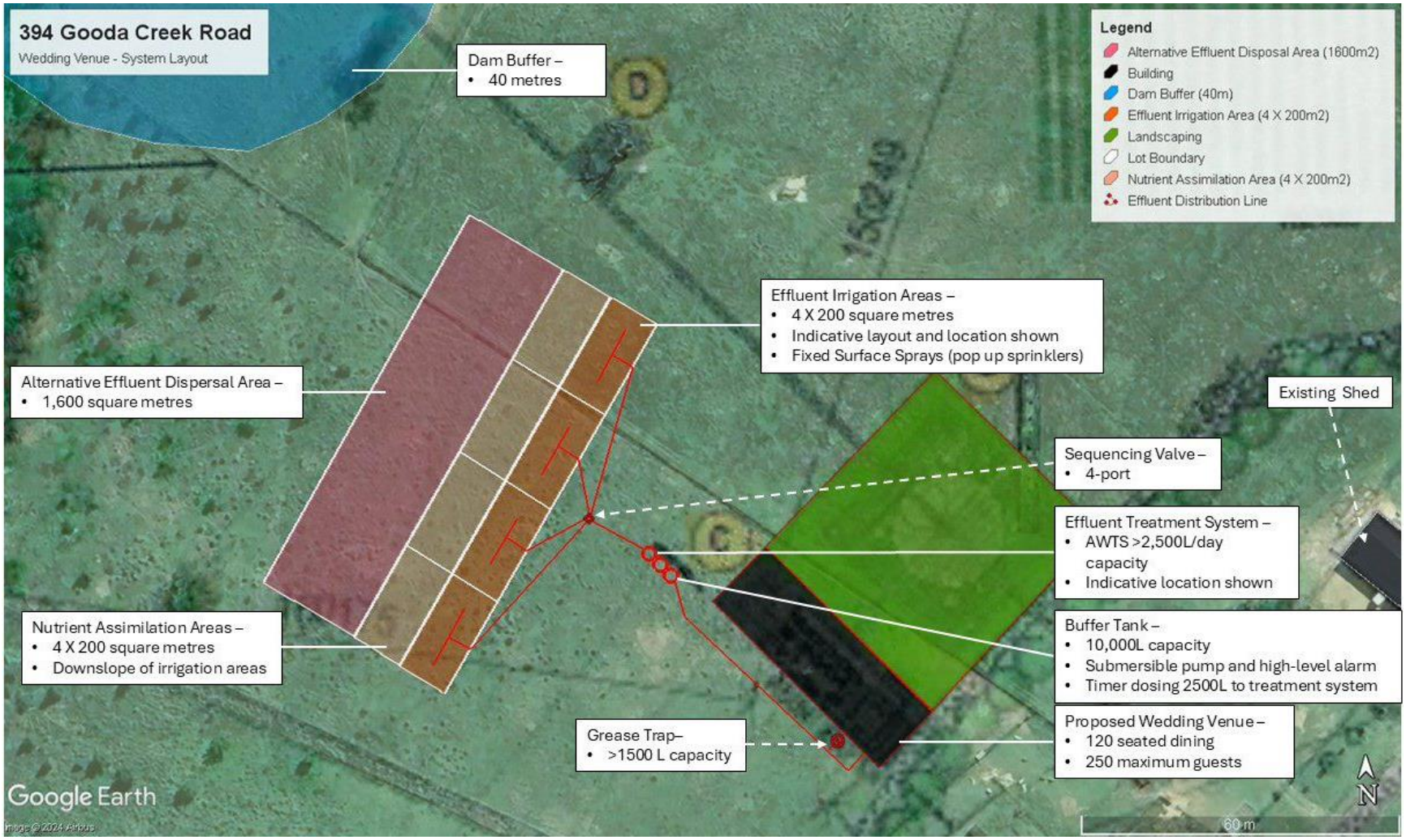



**Figure 2: Inset Map 1 – Wedding Venue system layout**

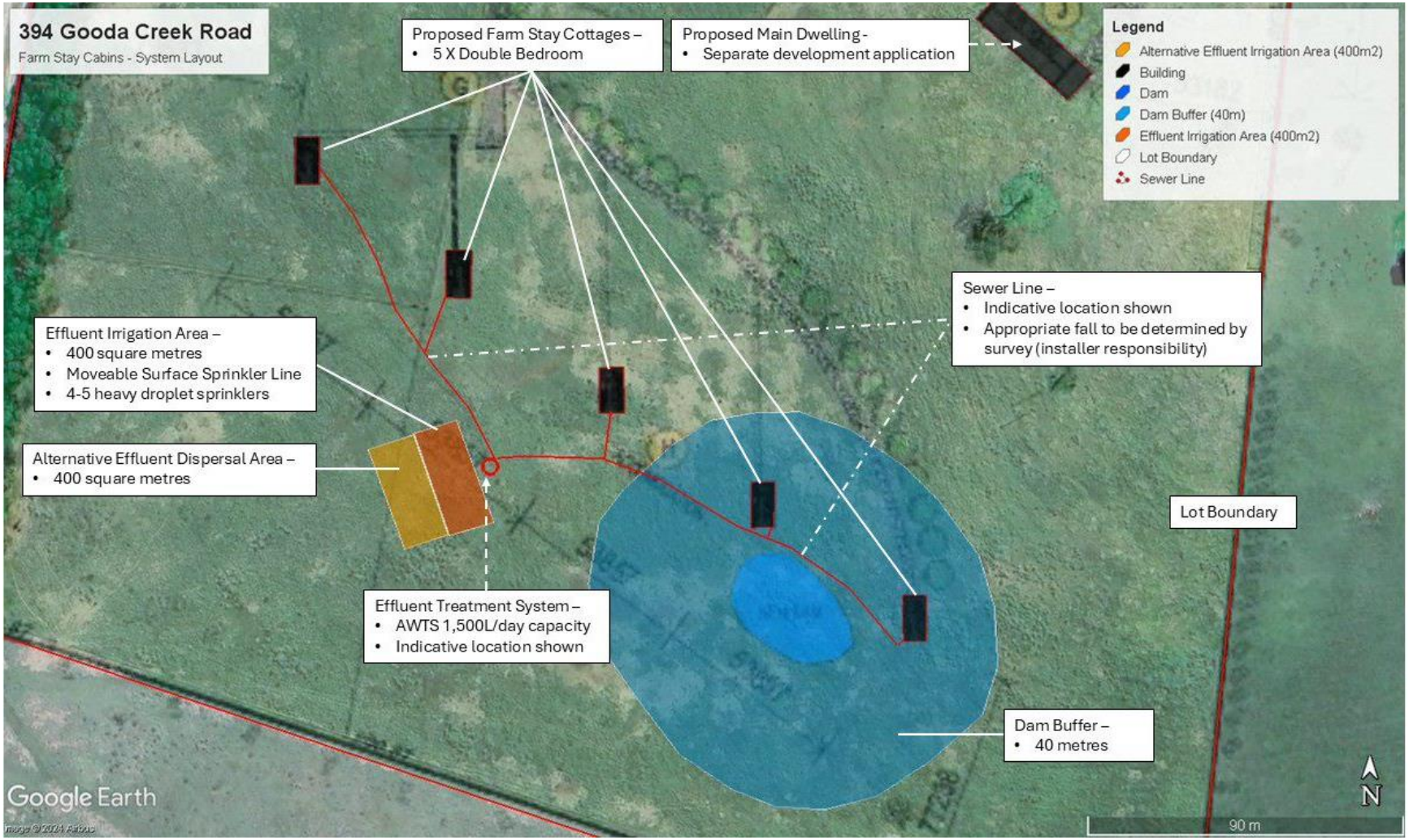



**Figure 3: Inset Map 2 – Farm Stay Cottages system layout**

## EFFLUENT MANAGEMENT PRESCRIPTIONS – WEDDING VENUE

**Effluent treatment**

Effluent will be treated by a NSW Health accredited system capable of achieving secondary standard treatment, see below:

Table 1: NSW Health accredited secondary treatment systems
http://www.health.nsw.gov.au/environment/domesticwastewater/Pages/default.aspx

The following specific recommendations are made in respect of the AWTS:

1. The model of AWTS should be selected by consultation between the installer and client and considering which model best suits the expected loading and usage patterns and the specific conditions.
2. The AWTS will have a daily treatment capacity greater than **2,500L/day.**
3. The treatment system will be dosed at **2,500L/day** from a **10,000L** capacity buffer tank.
4. The final location for the AWTS units should be chosen by the installer, in consultation with the client, and provide a minimum 3 m buffer from the dwelling or other buildings, an indicative location is shown in **Figures 1 & 2.**
5. The tank(s) should be installed so that the lid remains at least 100 mm above final ground level to avoid stormwater entering the tank
6. AWTS tanks should be installed in compliance with the manufacturer's recommendations, 'AS/NZS 3500.2:2003 Plumbing and Drainage Part 2 Sanitary Plumbing and Drainage' and Council requirements.

**Effluent Dosing**

Effluent will be dosed to the AWTS from a buffer tank fitted with a timer and pump, see below:

1. The buffer tank will receive all wastes from the wedding venue and will pump dose to the inlet of the AWTS.
2. The buffer tank will have a minimum capacity of **10,000L.**
3. The buffer tank will be fitted with a macerator pump (grinder pump) which is controlled by a timer.
4. The timer/pump will dose **2,500L/day** to the inlet of the AWTS
5. The buffer tank will be fitted with a pump failure/high level alarm.
6. The tank(s) should be installed so that the lid remains at least 100 mm above final ground level to avoid stormwater entering the tank
7. Tanks should be installed in compliance with the manufacturer's recommendations, 'AS/NZS 3500.2:2003 Plumbing and Drainage Part 2 Sanitary Plumbing and Drainage' and Council requirements.

**Pre-Treatment**

A commercial grease trap is to be installed on the waste lines coming from commercial kitchen including sinks, dishwasher and glasswashers. Any other sinks used for food preparation or cleaning of equipment used in food preparation and/or serving should also be plumbed to the grease trap.

1. The grease trap should have a **minimum capacity of 1,500 litres** or as specified by Yass Valley Council, refer **Appendix 3** for system sizing information
2. It is recommended that the grease trap be a make and model listed on Sydney Waters list of approved pre-treatment systems, available at:
3. http://www.sydneywater.com.au/SW/your-business/managing-trade-wastewater/grease-traps-and-treatment-equipment/listed-pre-treatment/index.htm
4. The grease trap must be installed according to the manufacturer's instructions and the plumbing and drainage must comply with the Plumbing Code of Australia, 2012.
5. The grease trap should be located where it is easily accessible by vacuum tanker
6. The invert of the outlet pipe must be set to provide the correct capacity for the system and the invert of the outlet pipe must be 150mm lower than the invert of the inlet pipe
7. All pipework must be installed according to *AS/NZS 3500*
8. It is recommended that an inground system be installed to limit the possibility of structural damage to the unit
9. The inlet and outlet lines from the grease trap should incorporate an elevated vent pipe
10. The outlet of the grease trap will discharge to the inlet line for the buffer tank / Aerated Wastewater Treatment System AWTS.
11. Basket traps are recommended for all floor and sink wastes in the commercial kitchen.

**Effluent dispersal**

An effluent dispersal area of **1,600 m²** is required to assimilate the hydraulic load and nutrients associated with the daily load of treated effluent. Areas suitable for effluent irrigation are identified in **Figures 1 & 2**.

A reserve effluent dispersal area of equivalent size (**1,600 m²**) is also identified for the future use if required in **Figures 1 & 2**.

Within the designated irrigation area effluent can be dispersed by fixed surface spray irrigation. Surface sprays are effective for dispersing effluent on grassed areas as currently exist on the property.

The following specific recommendations are made in respect of effluent dispersal:

1. The effluent dispersal area of **1,600 m²** should be divided into two sections, with the upslope half being the irrigation area and the downslope half the nutrient assimilation area.
2. The effluent irrigation area of **800m²** should be divided into 4 irrigation fields of **200m²**.

3. The 4 irrigation fields should be serviced sequentially through a 4-port sequencing valve fitted on the outlet line of the AWTS.
4. Surface spray irrigation should consist of a fixed buried irrigation laterals fitted with heavy droplet sprinklers with throw radius and spacing suitable to evenly distribute across the **200m²** area required.
5. The installer shall nominate the sprinkler heads, throw radius and final sprinkler spacing consistent with guidelines for the on-site disposal of effluent and Council requirements. Pop-up sprinklers are considered suitable for this application.
6. All components are to be installed according to 'PCA 2004 Plumbing Code of Australia' and the conditions of consent
7. Treated effluent must be applied to growing vegetation and not bare ground.
8. Effluent needs to be applied to perennial vegetative groundcover within the area identified in **Figures 1 & 2.**
9. Suitable grass/pasture cover will need to be maintained across the 4 irrigation fields totaling **800 m²** .
10. Grass/pasture should be slashed when it is >10 cm long
11. Species suitable for landscaping around the effluent irrigation areas include Callistemon pallidus, C. palludosis, Kunzea ericoides, K. parvifolia, K. phyllicoides (burgen), Leptospermum continentale (prickly ti tree), L. multicaule, L. flavescens, L. squarrosum, Melaleuca armillaris (honey myrtle), M. decussata, M. squamea, M. thymifolia, M. ericifolia, M. hypericifolia, M. linariifolia.
12. Effluent is not suitable for vegetables or lawns regularly used for play and foot traffic.
13. Adequate signage should be installed to indicate that the area is being irrigated with treated effluent.
14. The effluent irrigation area should be protected by fencing or by planting suitable shrubs around the outside boundary.
15. The aerated wastewater treatment system must be serviced regularly to provide adequate treatment and ensure that the irrigation system does not become clogged with suspended solids or organic material.

**General**

1. Stock and vehicular access must be excluded from the irrigation area as they compact the soil, thereby reducing the infiltration rate and water holding capacity.
2. Water conservation measures should be adopted to the greatest extent possible in the house, particularly in relation to the high water use activities of showering, clothes washing and toilet flushing. AAA+ plumbing appliances and fittings should be used. Measures including use of front loading washing machines, low volume shower roses and dual flush toilets reduce water usage by 30 to 40%.

3. Detergents low in phosphorous and sodium should be used as much as possible (see details in appendix) in order to protect the soil's capacity to absorb water.

## EFFLUENT MANAGEMENT PRESCRIPTIONS – FARM STAY COTTAGES

**Effluent treatment**

Effluent will be treated by a NSW Health accredited system capable of achieving secondary standard treatment, see below:

Table 1: NSW Health accredited secondary treatment systems
http://www.health.nsw.gov.au/environment/domesticwastewater/Pages/default.aspx

The following specific recommendations are made in respect of the AWTS:

1. The model of AWTS should be selected by consultation between the installer and client and considering which model best suits the expected loading and usage patterns and the specific conditions.
2. The AWTS will have a daily treatment capacity of **1,500L/day**.
3. The final location for the AWTS units should be chosen by the installer, in consultation with the client, and provide a minimum 3 m buffer from the dwelling or other buildings, an indicative location is shown in **Figures 1 & 3**.
4. The tank(s) should be installed so that the lid remains at least 100 mm above final ground level to avoid stormwater entering the tank
5. AWTS tanks should be installed in compliance with the manufacturer's recommendations, 'AS/NZS 3500.2:2003 Plumbing and Drainage Part 2 Sanitary Plumbing and Drainage' and Council requirements.

**Effluent sewer line**

A sewer line will be installed as shown in **Figures 1 & 3.** The following specific recommendations are made in respect of the sewer line:

1. The installer will survey the proposed sewer line location to ensure suitable grade can be achieved along the line to the proposed location of the treatment system.
2. Should suitable grade not be achievable along the sewer line then the design may be amended to incorporate septic tanks at each cabin site to remove solids from the waste stream and enable a liquid only sewer line to be installed. Alternatively pump wells fitted with grinder pumps may be installed at each cabin to enable a pressure sewer main to be installed. *Installer should contact the designer to discuss suitable alternative design measures.*
3. *Installer should contact the designer to discuss suitable alternative design measures.*

**Effluent dispersal**

An effluent dispersal area of **400 m²** is required to assimilate the hydraulic load and nutrients associated with the daily load of treated effluent. Areas suitable for effluent irrigation are identified in **Figures 1 & 3**.

A reserve effluent dispersal area of equivalent size (**400 m²**) is also identified for the future use if required in **Figures 1 & 3**.

Within the designated irrigation area effluent can be dispersed by surface spray irrigation. Surface sprays are effective for dispersing effluent on grassed areas as currently exist on the property.

The following specific recommendations are made in respect of effluent dispersal:

1. The effluent dispersal area of **400 m²** should be managed in two sections, with only half being used during summer months when vegetation is actively growing and both halves being used during cooler months when vegetation growth is slower.
2. The irrigation field can be serviced by a moveable sprinkler line of adequate length to reach the entire irrigation area, 30 -40 metres is usually adequate.
3. The sprinkler line should be dedicated effluent sprinkler line (lilac in colour).
4. The sprinkler line should be fitted with 4-5 heavy droplet effluent sprinklers (lilac in colour).
5. Sprinkler heads should be installed at 5 metres spacings.
6. All components are to be installed according to 'PCA 2004 Plumbing Code of Australia' and the conditions of consent
7. Treated effluent must be applied to growing vegetation and not bare ground.
8. Effluent needs to be applied to perennial vegetative groundcover within the area identified in **Figures 1 & 3.**
9. Suitable grass/pasture cover will need to be maintained across the 4 irrigation fields totaling **400 m²**.
10. Grass/pasture should be slashed when it is >10 cm long
11. Species suitable for landscaping around the effluent irrigation areas include Callistemon pallidus, C. palludosis, Kunzea ericoides, K. parvifolia, K. phyllicoides (burgen), Leptospermum continentale (prickly ti tree), L. multicaule, L. flavescens, L. squarrosum, Melaleuca armillaris (honey myrtle), M. decussata, M. squamea, M. thymifolia, M. ericifolia, M. hypericifolia, M. linariifolia.
12. Effluent is not suitable for vegetables or lawns regularly used for play and foot traffic.
13. Adequate signage should be installed to indicate that the area is being irrigated with treated effluent.
14. The effluent irrigation area should be protected by fencing or by planting suitable shrubs around the outside boundary.
15. The aerated wastewater treatment system must be serviced regularly to provide adequate treatment and ensure that the irrigation system does not become clogged with suspended solids or organic material.

**General**

1. Stock and vehicular access must be excluded from the irrigation area as they compact the soil, thereby reducing the infiltration rate and water holding capacity.
2. Water conservation measures should be adopted to the greatest extent possible in the house, particularly in relation to the high water use activities of showering, clothes washing and toilet flushing. AAA+ plumbing appliances and fittings should be used. Measures including use of front loading washing machines, low volume shower roses and dual flush toilets reduce water usage by 30 to 40%.
3. Detergents low in phosphorous and sodium should be used as much as possible (see details in appendix) in order to protect the soil's capacity to absorb water.

**SITE LOCATION**


**Figure 4: Lot 4 DP 1247034, 394 Gooda Creek Road, Murrumbateman**

**LANDSCAPE**

Undulating rises, fans, valley flats and depressions on Silurian Volcanics of the Canberra Lowlands. Slopes generally between 5-7%. Local relief is between 5-50m with elevations ranging 550- 650m. Drainage form is convergent.

Extensively cleared woodland vegetation communities with highly modified pasture grazing the dominant landuse.

The local landscape is dominated by small rural properties with a number of rural small acreage holdings.

**SOILS**

Soils in this landscape include Deep Red and Brown Chromosol on crests and side slopes with poorer drained Yellow Chromosols in drainage depressions.

The soils in the areas mapped as suitable for effluent dispersal are Brown Chromosols formed in situ from Duoro Volcanics parent material.

They comprise a weakly structured silty loam upper layer overlying a bleached massive sandy loam which overlays a moderately structured silty light clay loam subsoil. Total depth is variable from 50 - >100cm.

Extrapolating from the soil survey of the Canberra 1:100,000 sheet (Jenkins 2000), the soils on the gently sloping side slopes fit the Williamsdale soil landscape. The representative analytical data in the survey report shows a

moderate phosphorous sorption level, non-saline subsoils and low exchangeable sodium. As such the soils are free of any significant chemical limitations to effluent dispersal.

## SITE INFORMATION

| | |
|---|---|
| **Local Government Area** | Yass Valley Council |
| **Address/locality** | Lot 4 DP 1247034, 394 Gooda Creek Road, Murrumbateman. |
| **Owner / Developer** | C/- Heywood Lance Architects, Dickson ACT |

**Block configuration:**
plans attached
photo attached

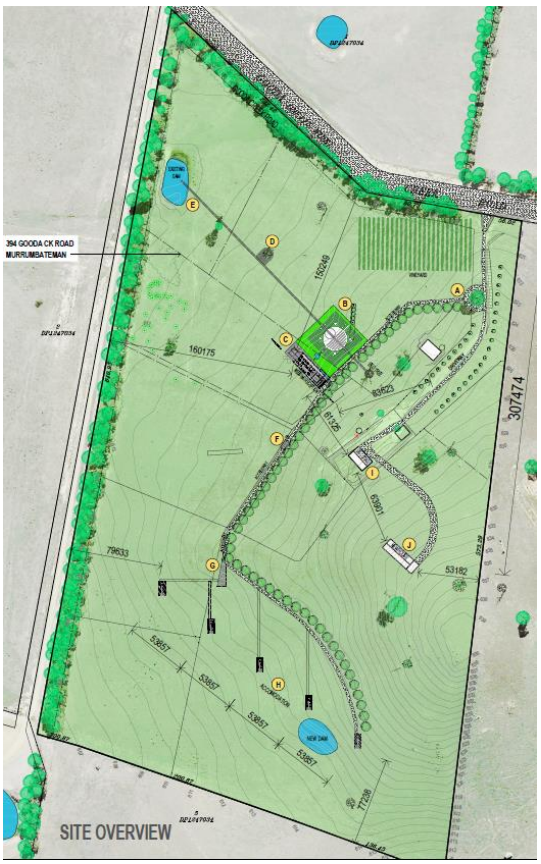



**Figure 5: Lot layout extract (refer to client plans).**

| | |
|---|---|
| **Intended water supply** | Potable water to be supplied by roof catchment with tank storage. |

| | |
|---|---|
| **Daily wastewater load** (litres/day) (*AS 1547:2012*) | **Wedding Venue**<br>120 seated dining @28L/pp/day[1]<br>130 non-dining/bar patrons @ 14L/pp/day[2]<br>10 staff @14L/pp/day<br><br>**Peak Daily Wastewater Load (3 days) = 5320 L/day**<br>**Off-peak Daily Wastewater Load (4 days) = 70 L/day**<br>[based on 5 staff @ 14l/pp/day]<br>**Total Weekly Wastewater Load = 16,240 L**<br>**Average Daily Wastewater Load = 2,320 L**<br><br>**Farm Stay Cottages**<br>5 double bedroom cottages @59L/pp/day[3]<br><br>**Peak Daily Wastewater Load (7 days) = 590 L/day**<br>**Total Weekly Wastewater Load = 4,130 L**<br>**Average Daily Wastewater Load = 590 L** |
| **Local experience** | Most secondary treatment and surface irrigation systems work adequately in the area provided they are on appropriate soil and site conditions. Systems commonly malfunction due to lack of ongoing maintenance. System to be maintained regularly, in accordance with council regulations and prescriptions in this report. |

[1] Restaurant patrons - Septic Tank and Collection Well Accreditation Guidelines, NSW Health, December 2001
[2] Bar Patrons - Septic Tank and Collection Well Accreditation Guidelines, NSW Health, December 2001
[3] Caravan Parks - Septic Tank and Collection Well Accreditation Guidelines, NSW Health, December 2001


**Figure 6: Looking south from the Wedding Venue effluent disposal area.**


**Figure 7: Looking east from the Wedding Venue effluent disposal area.**


**Figure 8: Looking north from the Wedding Venue effluent disposal area.**


**Figure 9: Looking west from the Wedding Venue effluent disposal area.**


**Figure 10: Looking north towards the bore**


**Figure 11: Looking west from the Farm Stay Cottages effluent disposal area.**


**Figure 12: Looking south from the Farm Stay Cottages effluent disposal area.**


**Figure 13: Looking east from the Farm Stay Cottages effluent disposal area.**


**Figure 14: Looking north from the Farm Stay Cottages effluent disposal area.**

## SITE ASSESSMENT – Wedding Venue and Farm Stay Cottages

**Climate**

The climate is typically a cool and moderately dry climate. Average rainfall for the area is 600 – 800 mm.

Median annual rainfall is 620mm, annual pan evaporation is 1200mm. Warm summers have a large evaporative deficit (evaporation exceeds precipitation), whereas cool winters have a slight evaporative deficit. Median summer monthly rainfall for Canberra airport 49 mm; median monthly winter rainfall 38 mm; mean monthly summer evaporation is 177 mm, mean monthly winter evaporation is 60 mm.

***The local climate is therefore well suited to the dispersal of secondary treated, disinfected effluent by surface irrigation.***

| | |
|---|---|
| **Rainfall water balance attached** | Yes |
| **Land application area calculated** | Yes |
| **Wet weather storage calculation attached** | NA |

**Flood potential**

| | |
|---|---|
| land application area above 1:20 year flood: | Yes |
| land application area above 1:100 year flood: | Yes |
| electrical components above 1:100 year flood: | Yes |

**Exposure**

Cleared grazing grassland.

**Slope**

Effluent disposal sites 4-7 degrees downwards towards west and southwest.

**Landform / Run-on**

Slope form of the effluent disposal areas is divergent to flat.

***Upslope diversion bank required for the wedding venue effluent dispersal area.***

**Seepage**

No evidence of seepage was observed at any of the proposed effluent disposal areas during the site inspection.

**Erosion potential**

Limited potential due to good pasture groundcover and low to moderate slope.

***The effluent irrigation areas will be protected from erosion by the maintenance of good levels of vegetative groundcover.***

**Site drainage**

Drainage on the lot is through overland flow with numerous small farm dams including a proposed dam near the proposed cottages.

***A 40m dam buffer will be required from the existing and proposed dams and the proposed effluent irrigation areas.***

**Fill**

***There is no imported fill on-site at time of inspection.***

**Groundwater**

Horizontal distance to groundwater well used for domestic supply:

No domestic groundwater wells are known in the vicinity.

**Groundwater vulnerability map category:**

The area is mapped as moderate vulnerability on NSW Groundwater Vulnerability Map.

**Bores in area and purpose:**

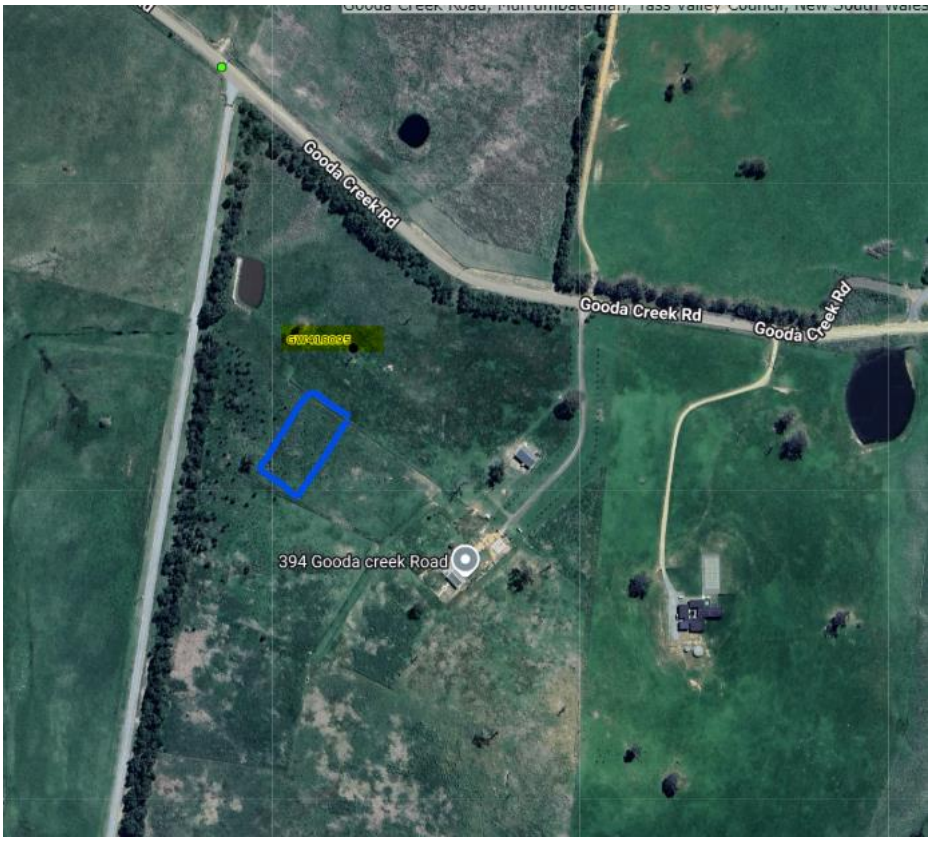



**Figure 15: Wedding Venue irrigation area and local bore**


**Figure 16: Farm Stay irrigation area and local bore**

There is a bore on the property. The bore is GW 418095 located 50m northeast of the Wedding Venue effluent dispersal site and 500m north of the Farm Stay Cottages effluent dispersal site. The bore has a depth of 60m, with water bearing zones at 24-25/41-42/50-52m and a yield of 0.46L/sec.

***The effluent management practices recommended in this report will not impact surrounding bores of the groundwater aquifer due to:***

- ***spatial separation (buffer distance) of >50m[4],***
- ***depth to water bearing zone of >24m,***
- ***low transmissivity of fractured rock aquifers***
- ***depth of low permeability clay subsoil,***
- ***low application rate of secondary treated effluent to surface.***

**Buffer distance from treatment system to**

| | |
|---|---|
| Perennial rivers and creeks: | NA |
| Drainage depressions: | NA |

[4] A reduced bore buffer of 50m is considered appropriate for the site given the use of secondary treated and disinfected effluent, depth to water bearing zones of >24m and location of bore upslope of effluent dispersal areas.

| | |
|---|---|
| Other sensitive environments: | 40m (dam) |
| Boundary of premises: | 6m |
| Swimming pools: | NA |
| Buildings: | 15m (from dwellings) |

*[Buffers distances as per Silver Book and AS 1547:2012]*

| | |
|---|---|
| **Is there sufficient land area for** | Yes |
| Application system including buffers: | Yes |
| Reserve application system: | An irrigation area of 1600m$^2$ is required for the wedding venue irrigation system and 400m$^2$ for the farm stay cabins, refer **Figures 1-3.** |

**Surface rock and outcrop** ***None***

## SOIL ASSESSMENT

| | |
|---|---|
| **Depth to bedrock or hardpan** | >1 m |
| **Depth to high soil water table** | >1.5 m |

**Hydraulic loading rate**

| | |
|---|---|
| Soil texture: | Sandy loam topsoil over clay loam subsoil, moderate structure |
| Soil structure: | Moderate |
| ***Surface Irrigation*** | |
| Permeability *(from table M1 of AS1547:2012)*: | 1.5-3.0 |
| Recommended design irrigation rate for disposal system (mm/day): | 3.5 |

*(from table M1 of AS1547:2012)*

| | |
|---|---|
| **Coarse fragments** | None |
| **Bulk density (g/cm$^3$)** | 1.6 topsoil, 1.5 subsoil |
| **pH field (1)** | 5.4 topsoil, 6.0 subsoil |
| **Electrical conductivity Ds/M (1)** | 0.10 topsoil, 0.11 subsoil |
| **Exchangeable sodium %(1)** | 0.10 topsoil, 4.2 subsoil |
| **Cation exchange capacity (mequiv/100g) (1)** | 5.5 topsoil, 11.4 subsoil |
| **Phosphorous sorption capacity mg/kg (1)** | 122 (1,952kg/ha) topsoil, 447 subsoil (6,705kg/ha) |
| **Geological feature** | |
| Discontinuities: | None |
| Fractured rock: | None |
| **Soil landscape reference (1)** | Canberra 1:100,000 (2000), Williamsdale Units |
| **Dispersiveness EAT class (1):** | 3(2) topsoil, 2(1) subsoil |

1 extrapolated from Jenkins (2000) Soil Landscapes of the Canberra 1:100,000 Sheet. DLWC

## SYSTEM SELECTION

**Consideration of connection to centralized sewerage system**

| | |
|---|---|
| Distance: | >5 kilometres |
| Potential for future connection: | None |
| Potential for reticulated water: | None |

| | |
|---|---|
| **Type of land application system best suited** | Surface spray irrigation to semi improved perennial pasture/grass &/or landscaped areas. |
| Justification: | Suited to site and soil conditions. Enables beneficial reuse of effluent in a water constrained environment |

| | |
|---|---|
| **Type of treatment system best suited** | NSW Health accredited secondary treatment system. Reliable system with high quality disinfected effluent then available for beneficial reuse. |
| Justification: | |

## SIZING EFFLUENT DISPOSAL AREA – Wedding Venue System

**Water balance**

Using the DIR for irrigation on clay loam soils of 3.5 mm/day and adopting the design loading of 2500 L/day, the following land application areas are required to manage additional hydraulic loading, nitrogen and phosphorous generated:

- **Sizing based on hydraulic loading:**

A = Q (l/day)/DIR (mm/day)
where A = area; Q = 2500 l/day; DIR = 3.5 mm/day
A = 2500/3.5 = 714 $m^2$
**Area required = 750 $m^2$**

**Nitrogen balance**

- **Sizing based on nitrogen balance:**

A = Q(l/day) X TN (mg/l)/$L_n$ (critical loading of TN, mg/$m^2$/day)
where A = area; Q = 2500 l/day; TN = 25mg/l (from Silver Book)
Assume 20% loss by denitrification; 25mg/l – (25 X .2) = 20mg/l
$L_n$ = 15,000mg/$m^2$/yr (ie 150kg/ha/yr, for semi improved pastures)
A = 2500 X 20 X 365/15,000 = 1216.67$m^2$
**Area required = 1250 $m^2$**

**Phosphorous balance**

- **Sizing based on phosphorous balance**

A = $P_{gen}$/( $P_{uptake}$ + $P_{sorb}$) [P sorption capacity in upper 50cm & 50 year design period]
$P_{gen}$ = 10mg/l X 2500 X 365 X 50 = 456.25kg
$P_{uptake}$ = 4.4mg/$m^2$/day X 365 X 50 = .080kg/$m^2$
$P_{sorb}$ = 2,164kg/ha = .216kg/$m^2$
A = 456.25/(.08+ .216) = 1541.38 $m^2$
**Area required = 1600 $m^2$**

**Design effluent disposal area**

Therefore, a land application area of **1600 $m^2$** will account for phosphorous, nitrogen and water applied based on estimated connections and usage patterns associated with the construction and connection of a wedding function facility including commercial kitchen and 120 seated dining capacity and peak capacity of 250 people.

An allowance of a reserve land application area will double this area to **3,200$m^2$**.

## SIZING EFFLUENT DISPOSAL AREA – 5 Farm Stay Cabins

**Water balance**

Using the DIR for irrigation on clay loam soils of 3.5 mm/day and adopting the design loading of 480 L/day, the following land application areas are required to manage additional hydraulic loading, nitrogen and phosphorous generated:

- **Sizing based on hydraulic loading:**

A = Q (l/day)/DIR (mm/day)
where A = area; Q = 590 l/day; DIR = 3.5 mm/day
A = 590/3.5 = 168.57 $m^2$
**Area required = 200 $m^2$**

**Nitrogen balance**

- **Sizing based on nitrogen balance:**

A = Q(l/day) X TN (mg/l)/$L_n$ (critical loading of TN, mg/$m^2$/day)
where A = area; Q = 590 l/day; TN = 25mg/l (from Silver Book)
Assume 20% loss by denitrification; 25mg/l – (25 X .2) = 20mg/l
$L_n$ = 15,000mg/$m^2$/yr (ie 150kg/ha/yr, for semi improved pastures)
A = 590 X 20 X 365/15,000 = 287.13$m^2$
**Area required = 300 $m^2$**

**Phosphorous balance**

- **Sizing based on phosphorous balance**

A = $P_{gen}$/( $P_{uptake}$ + $P_{sorb}$) [P sorption capacity in upper 50cm & 50 year design period]
$P_{gen}$ = 10mg/l X 590 X 365 X 50 = 107.67kg
$P_{uptake}$ = 4.4mg/$m^2$/day X 365 X 50 = .080kg/$m^2$
$P_{sorb}$ = 2,164kg/ha = .216kg/$m^2$
A = 107.6/(.08+ .216) = 363.51 $m^2$
**Area required = 400 $m^2$**

**Design effluent disposal area**

Therefore, a land application area of **400 $m^2$** will account for phosphorous, nitrogen and water applied based on estimated connections and usage patterns associated with the construction and connection of 5 double bedroom cottages.

An allowance of a reserve land application area will double this area to **800$m^2$**.

## SITE AND SOIL LIMITATION ASSESSMENT

The following two limitation tables are a standardised guide to the site and soil characteristics which may limit the suitability of the site for effluent disposal and which would require attention through specific management practices. The tables have been reproduced from *On-site Sewage Management for Single Households* (tables 4 and 6, Anon, 1998). The highlighted categories represent site and soil conditions of the land covered in this report. The tables show that the land designated for effluent application has slight to moderate limitations, but no severe limitations.

**Site limitation assessment**

| Site feature | Relevant system | Minor limitation | Moderate limitation | Major limitation | Restrictive feature |
|---|---|---|---|---|---|
| **Flood potential** | All land application systems | > 1 in 20 yrs. | | Frequent, below 1 in 20 yrs | Transport in wastewater off site |
| | All treatment systems | components above 1 in 100 yrs. | | Components below 1 in 100 yrs. | Transport in wastewater off site, system failure |
| **Exposure** | All land application systems | High sun and wind exposure | | Low sun and wind exposure | Poor evapo-transpiration |
| **Slope %** | Surface irrigation | 0-6 | 6-12 | >12 | Runoff, erosion potential |
| | Sub-surface irrigation | 0-10 | 10-20 | >20 | Runoff, erosion potential |
| | Absorption | 0-10 | 10-20 | >20 | Runoff, erosion potential |
| **Landform** | All systems | Hillcrests, convex side slopes and plains | Concave side slopes | Drainage plains and incised channels | Groundwater pollution hazard, |

| Site feature | Relevant system | Minor limitation | Moderate limitation | Major limitation | Restrictive feature |
|---|---|---|---|---|---|
| | | | and foot slopes | | resurfacing hazard |
| **Run-on and seepage** | All land application systems | None-low | Moderate | High, diversion not practical | Transport of wastewater off site |
| **Erosion potential** | All land application systems | No sign of erosion potential | | Indications of erosion e.g. rills, mass failure | Soil degradation and off-site impact |
| **Site drainage** | All land application systems | No visible signs of surface dampness | | Visible signs of surface dampness | Groundwater pollution hazard, resurfacing hazard |
| **Fill (effluent dispersal area)** | All systems | No fill | Fill present | | Subsidence |
| **Land area** | All systems | Area available | | Area not available | Health and pollution risk |
| **Rock and rock outcrop** | All land application systems | <10%-in effluent dispersal area | 10-20% | >20% | Limits system performance |
| **Geology** | All land application systems | None | | Major geological discontinuities, fractured or highly porous regolith | Groundwater pollution hazard |

**Soil limitation assessment**

| Soil feature | Relevant system | Minor limitation | Moderate limitation | Major limitation | Restrictive feature |
|---|---|---|---|---|---|
| **Depth to bedrock** | Surface and sub surface irrigation | > 1.0 | .5-1.0 | < 0.5 | Restricts plant growth |
| **or hardpan (m)** | Absorption | > 1.5 | 1.0-1.5 | < 1.0 | Groundwater pollution hazard |
| **Depth to seasonal water table (m)** | Surface and sub surface irrigation | > 1.0 | 0.5-1.0 | < 0.5 | Groundwater pollution hazard |
| | Absorption | > 1.5 | 1.0-1.5 | < 1.0 | Groundwater pollution hazard |
| **Permeability** | Surface and sub surface irrigation | 2b, 3 and 4 | 2a, 5 | 1 and 6 | Excessive runoff and waterlogging |
| **Class** | Absorption | 3, 4 | | 1, 2, 5, 6 | Percolation |
| **Coarse fragments %** | All systems | 0-20 | 20-45 | >40 | Restricts plant growth, affects trench installation |
| **Bulk density (g/cc)**<br>**SL**<br>**L, CL**<br>**C** | All land application systems | <br><br>< 1.8<br>< 1.6<br>< 1.4 | | <br><br>> 1.8<br>> 1.6<br>>1.4 | restricts plant growth, indicator of permeability |
| **pH** | All land application systems | > 6.0 | 4.5-6.0 | - | Reduces plant growth |
| **Electrical conductivity (dS/m)** | All land application systems | <4 | 4-8 | >8 | Restricts plant growth |

| Soil feature | Relevant system | Minor limitation | Moderate limitation | Major limitation | Restrictive feature |
|---|---|---|---|---|---|
| **Sodicity (ESP)** | Irrigation 0-40cm; absorption 0-1.2mtr | 0-5 | 5-10 | > 10 | Potential for structural degradation |
| **CEC mequiv/100g** | Irrigation systems | > 15 | 5-15 | < 5 | Nutrient leaching |
| **P sorption kg/ha** | All land application systems | > 6000 | 2000-6000 | < 2000 | Capacity to immobilise P |
| **Aggregate stability** | All land application systems | Classes 3-8 | class 2 | class1 | Erosion hazard |

# APPENDIX 1: SOIL PROFILE DESCRIPTIONS

**Soil Profile 1: Effluent dispersal area – Wedding venue system #1**

| Soil classification | Depth (cm) | Properties |
|---|---|---|
| Brown Chromosol | 0-10 | A1 Light brown silty loam, massive to weak structure, dry and friable, no coarse fragments |
| | 10-45 | A2 Bleached grey silty loam, massive to weak structure, dry and friable, no coarse |
| | 45->90 | B Orange/grey, clay loam, no coarse, moderate, dry and firm.no coarse. |

**Figure 17: Soil profile augered at representative site in the building envelope.**

NB: Soil profile is presented as an expanded profile (expansion factor approximately X2)

**Soil Profile 2: Effluent Dispersal – 5 cabins**

| Soil classification | Depth (cm) | Properties |
|---|---|---|
| Brown Chromosol | 0-10<br><br>10-40<br><br>40-65 | A1 Light brown silty loam, weak structure, dry and friable, no coarse<br><br>A2 Grey silty loam, weak structure, dry and friable, no coarse…<br><br>B Orange/grey, clay loam, no coarse, moderate, dry and friable, no coarse.<br><br>. |


**Figure 18: Soil profile augered at site suitable for effluent disposal.**

NB: Soil profile is presented as an expanded profile (expansion factor approximately X2)

# APPENDIX 2: SUPPORTING INFORMATION

## Powder Laundry Detergents

### *What did we test?*

***Lanfax Laboratories*** purchased laundry detergents powders from supermarkets in Armidale, NSW (during late 2008) and a few samples were supplied, without charge, by various individuals to total 71 powders.

Samples of each of these products were mixed at two rates: one specifically for front loading washing machines (25 L); and one for top loading washing machines (60 L) to simulate the wash cycle of a normal wash program.

The rates of detergent were calculated from weighed samples of a known volume from a freshly opened packet and mixed at the manufacturer's recommended dose for a normal wash.

The samples were mixed with rainwater at the chosen dose and agitated for 30 minutes to replicate washing action. Samples were tested within one hour for pH and salinity. Other tests followed normal good laboratory practice.

### *Why carry out the tests?*

The quality of greywater from domestic dwellings is a cocktail from the numerous chemicals used in the home for personal and general cleaning. Perhaps the greatest use of chemicals is in the laundry where modern detergents are used at rates from a teaspoonful per wash to 1½ cups per wash. Manufacturers have their formulations and marketing strategies that mostly fail to address the problem of potentially hazardous chemicals. The impacts of pH, salinity, sodium, phosphorus and sulphur are not addressed in advertising. Most product labels don't state the ingredients, so astute purchasers can never be sure what is actually in the product. More importantly, very few even let you know how many washes in a packet. This research set out to address some of those shortcomings.

These data are not an endorsement of any product. ***Lanfax Labs*** has a policy of not endorsing or degrading any product.

No "safe in septic" standards or acceptable guidelines exit, and no laundry product can be "environmentally friendly".

The term "biodegradability" can only apply to the organic components of a powder detergent. When the detergent has a positive reading for Electrical Conductivity, you know immediately that inorganic components are included so the product cannot be "100% biodegradable".


## *Lanfax Laboratories*

ABN 72 212 385 096
493 Old Inverell Road
(PO Box 4690)
Armidale NSW 2350

Phone: +[61] 2 6775 1157
Fax:+[61] 2 6775 1043
Website: www.lanfaxlabs.com.au
Email:
lanfaxlabs@bigpond.com.au


***Commercial and Research Laboratories with special expertise in analysis for:***

Domestic On-site Sewage Treatment
Laundry product testing
Greywater reuse
Effluent irrigation
Wastewater treatment
Environmental Monitoring
Soil and Landscape Assessments
Environmental Engineering

***Principal Scientist:***

Dr Robert Patterson FIEAust, CPSS, CPAg



NOTE: Product formulations may have changed since this research was undertaken. Lanfax Labs has no way of knowing which products may have changed and manufacturers have no requirement to advertise formulation changes to the public.

Lanfax Laboratories

ABN 72 212 385 096

## *Laundry Detergents*


***Research Results - 2009***

***Front Loading & Top Loading Powders***

## How to interpret the results

The graphs shown on these pages are examples of the numerous graphs available on the website.

### *Greywater pH*

pH is a measure of the acid or alkaline status of the liquid. Acids have a pH <7, while alkaline solutions have a pH>7. Natural systems prefer pH between 6 and 8.

High pH causes soil to disperse and where greywater is used for landscaping, a high pH may be detrimental to both the plants, soil microbes and the soil structural stability.

### *Phosphorus (symbol P)*

Phosphorus is an essential biological element and a non-renewable resource. It is an excellent component of modern detergents, but detrimental when discharged into waterways as it encourages growth of algae and bacteria ("blue-green algae"). When greywater is used for landscaping, plants can uptake the P and so reduce the need for P from other fertilisers. On sandy soils P may leach into groundwater. With care on heavy clay soils much of the P may be locked up in the soil and not be an environmental problem.

If your greywater system may impinge on a sensitive environment, you need to choose a product with a very low P. The "P" symbol on the packet is not a good indicator as some products marked "P" have relatively high levels of P. The "NP" symbol is a good indicator of extremely low (almost absent) P. See Figure F1 and T1 for P ratings.

### *Sulphur (symbol S)*

Sodium sulphate is often used as a "manufacturing" agent, in other words a "filler". Detergents high in sulphur are more likely to have ingredients that may not be essential to a clean wash. Usually there is no indication on the packet to suggest high proportions of "filler" other than a big bulky box. Choose a concentrate and one with a small dose.

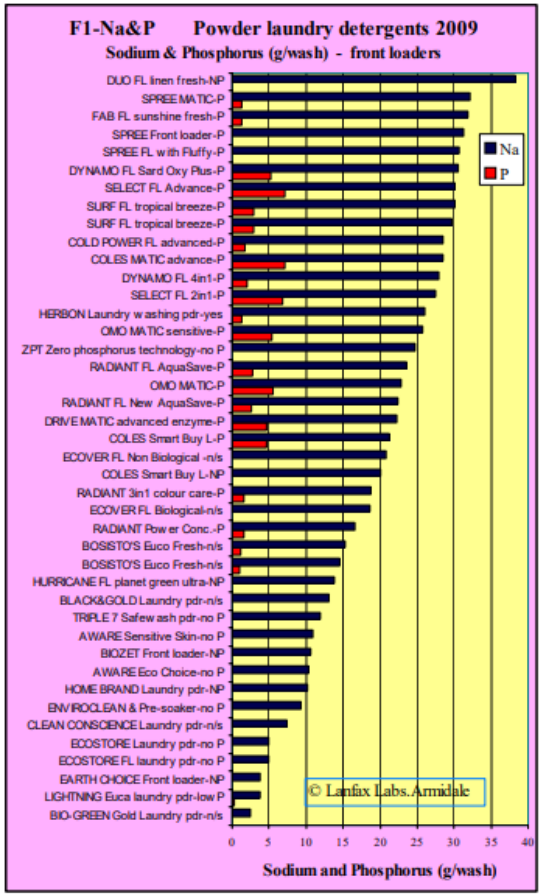
### *How much detergent to use.*

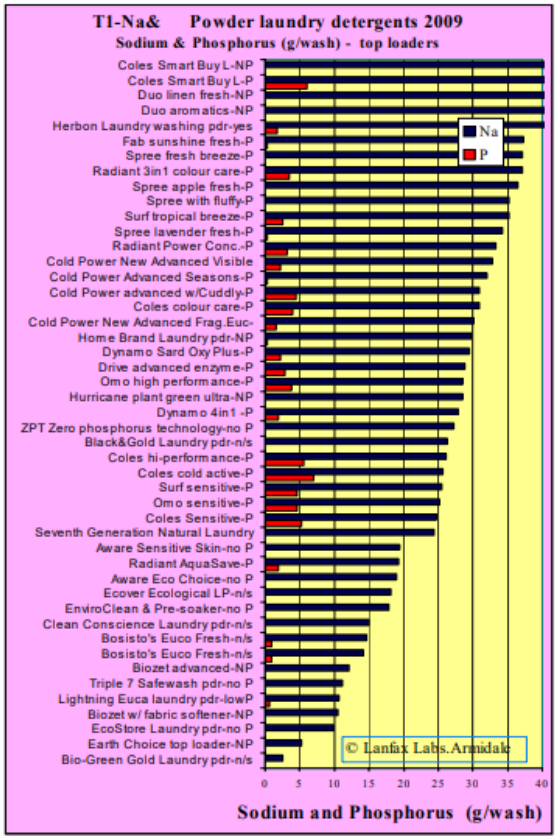
The "builder" in detergents (often sodium tripolyphosphate, or zeolite as a replacement) has to immobilise the "hardness" in water. Hardness is caused by calcium and magnesium in the water. Rainwater has almost none of these two elements and is "soft" water. Use less detergent than recommended in "soft" water. You may need to use more detergent in "very hard" water. How do you know if water is soft or hard?Hard water leaves a scum with soap.

### *Sodium (symbol Na)*

Sodium is an element essential for all life, however, in elevated concentrations leads to serious plant water stress and potential soil structural instability. Laundry detergents that contain more than 20 g sodium per wash may be detrimental to plants and soil structure. In the figures F1 and T1, the lower the sodium the better. Take care with products over 20 g Na/wash by spreading greywater over a larger area, or dilute with the rinse water.

When in doubt, choose low sodium and no phosphorus.




### *WASH and RINSE efficiency*

Whether you have a front loader or a top loader, the efficiency of the wash and rinse cycles are more important than the quantity of water used. Some powders are slow to fully dissolve so the particles will be difficult to wash from the clothes. Always try your own experiment and see how much detergent you need to a wash to your satisfaction. Be aware of great cleaning claims. Remember, the performance of your wash will depend upon the washing machine action, the hardness of your water, the temperature of the wash, and the quality of the detergent. They all go together for a clean wash.

**DO**

- ✓ Learn how your sewage management system works and its operational and maintenance requirements.
- ✓ Learn the location and layout of your sewage management system.
- ✓ Have your AWTS (if installed) inspected and serviced four times per year by an approved contractor. Other systems should be inspected at least once every year. Assessment should be applicable to the system design.
- ✓ Keep a record of desludgings, inspections, and other maintenance.
- ✓ Have your septic tank or AWTS desludged every three years to prevent sludge build up, which may 'clog' the pipes.
- ✓ Conserve water. Conservative water use around the house will reduce the amount of wastewater which is produced and needs to be treated.
- ✓ Discuss with your local council the adequacy of your existing sewage management system if you are considering house extensions for increased occupancy.

**DON'T**

- ✗ Don't let children or pets play on land application areas.
- ✗ Don't water fruit and vegetables with effluent.
- ✗ Don't extract untreated groundwater for cooking and drinking.
- ✗ Don't put large quantities of bleaches, disinfectants, whiteners, nappy soakers and spot removers into your system via the sink, washing machine or toilet.
- ✗ Don't allow any foreign materials such as nappies, sanitary napkins, condoms and other hygiene products to enter the system.
- ✗ Don't put fats and oils down the drain and keep food waste out of your system.
- ✗ Don't install or use a garbage grinder or spa bath if your system is not designed for it.

**Reducing water usage**

Reducing water usage will lessen the likelihood of problems such as overloading with your septic system. Overloading may result in wastewater backing up into your house, contamination of your yard with improperly treated effluent, and effluent from your system contaminating groundwater or a nearby waterway.

Your sewage management system is also unable to cope with large volumes of water such as several showers or loads of washing over a short period of time. You should try to avoid these 'shock loads' by ensuring water use is spread more evenly throughout the day and week.

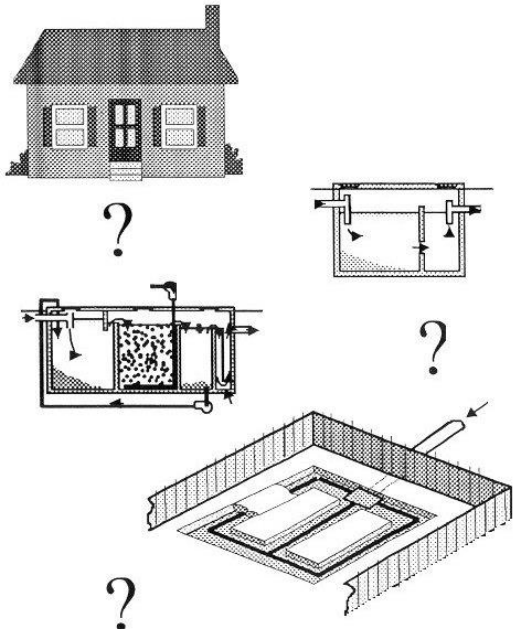
**HELP PROTECT YOUR HEALTH AND THE ENVIRONMENT**

Poorly maintained sewage management systems are a serious source of water pollution and may present health risks, cause odours and attract vermin and insects.

By looking after your management system you can do your part in helping to protect the environment and the health of you and your community.

For more information please contact:

# Managing Wastewater In Your Backyard



SOILANDWATER

www.soilandwater.net.au