ecoEng
Technical sheet: HT1809

Humus Trench

Canterbury Region Compliance

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1 Introduction

For

- Raw greywater
- Septic tank effluent
- Secondary effluent

> **Humus defined**: From Wikipedia http://en.wikipedia.org/wiki/Humus (2 January 2014)
> *In soil science, **humus** (coined 1790–1800; < Latin: earth, ground) refers to any organic matter that has reached a point of stability, where it will break down no further and might, if conditions do not change, remain as it is for centuries, if not millennia. Humus significantly influences the bulk density of soil and contributes to moisture and nutrient retention.*
>
> *In agriculture, humus is sometimes also used to describe mature, or natural compost extracted from a forest or other spontaneous source for use to amend soil. It is also used to describe a topsoil horizon that contains organic matter (humus type, humus form, humus profile).*

The humus trench is designed to:

- Receive raw wastewater
- Establish a humus ecology of decomposers (bacteria, fungi and worms)
- To be well aerated

The humus trench is a nuisance free, affordable facility for managing wastewater safely. The only servicing required will be to monthly cleaning of the screen and check the flout and chamber for blockages

2 Design

Loading rate to the trench to be no more than :

- Raw greywater: 150 L/m^2/day
- Septic tank effluent: 100 L/m^2/day
- Secondary effluent: <200 L/m^2/day

For seasonal loading (holiday dwelling) it is acceptable increase above loading rates by factor 1.3.

For 3 to 4 bedroom dwellings it is recommended to dose loading using a flout if there is sufficient fall to the humus trench distribution manifold inlet (at least 600mm fall) otherwise it will be necessary to pump. A simple greywater screen upstream of the flout or pump is essential. This screen must be accessible and easy to clean (stainless steel with at about 5mm screen aperture).

Table 1 provides daily wastewater and greywater volumes for different occupancies (expressed as p.e. population equivalents) based on Table H3, AS/NZS1547:2012. **Table 2** provides suggested p.e values for dwellings with a specific number of bedrooms. For example the design daily greywater volume for a 3 bedroom dwelling (5 p.e) with stand water saving and unrestricted water supply is 450L/day. A dwelling on rainwater supply is considered a restricted water supply.

Table 1. Wastewater/greywater volumes based on AS/NZS1547:2012 Table H3.

Daily design of wastewater and greywater						
Restricted water supply	Occupancy as Population Equivalents p.e.					
All wastewater	2	4	5	7	8	10
Standard fixtures	360	720	900	1260	1440	1800
Standard water saving fixtures	290	580	725	1015	1160	1450
Full water saving fixtures	240	480	600	840	960	1200
Greywater only	180	360	450	630	720	900
Unrestricted water supply	Occupancy as Population Equivalents p.e.					
All wastewater	2	4	5	7	8	10
Standard fixtures	400	800	1000	1400	1600	2000
Standard water saving fixtures	330	660	825	1155	1320	1650
Full water saving fixtures	290	580	725	1015	1160	1450
Greywater only	240	480	600	840	960	1200

Table 2 are the recommended p.e/bedroom based on ECan and TP58 recommendations

Number of bedrooms	ECan	TP58
	p.e	
1	2	2
2	4	4
3	5	5
4	7	6
5	8	8
6	10	9

Description of standard fixtures, standard water saving and full water saving follows:

- **Standard fixtures** (no water saving) with normal water use fixtures. (**Note**: if there are additional wastewater sources such as spa baths and/or multi-headed shower and luxury shower cabinets it will be necessary to increase daily wastewater volume to an appropriate value greater than 200L (at least 220 L).
- **Standard water saving** means dual flush toilets, shower flow restrictors, aerator faucets (taps), and water conserving automatic washing machines.
- **Full water reduction** means reduced flush 6/3L toilets, shower flow restrictors, aerator faucets (taps), front-load washing machines and flow/pressure control valves on all water water-use outlets (9L/min maximum). Baths should be discouraged.

For 2 bedroom or less, dosing may not be necessary. There will be sufficient dose effect from the discharge point (sink, shower, washing machine.....) however a covered chamber up stream of the humus trench and with an accessible and easily cleaned (5mm aperture) screen is strongly recommended.

Collected underdrainage can be irrigated through dripperlines provided a there is a 120-130 filter is fitted upstream of irrigation field.

Refer to **Figure 1** as an example for of a humus trench for up to 600L/day of greywater where free draining soils at the base of the humus trench. **Figure 3** illustrates cross-section detail of the humus trench.

For poorly draining subsoils at the base of the humus trench it will be necessary to install an underdrain as shown in **Figure 2**. This will need to drain to an acceptable discharge point (soakhole, swale....., pump chamber for pumping to an irrigation field).

For a system with good subsoil drainage the design requires $1m^2$ of humus bed for every 100L of daily greywater. The loading rate can be used to design a humus trench for daily flows other then 600L.

For a system with poor subsoil drainage requiring an under-drain to a holding tank for additional management, the design requires $1m^2$ of humus bed for every 150L of daily greywater. Refer to **Figure 2**.

The above loading rates can be used to design a humus trench for daily flows other then 600L.

The humus trench is a popular method for managing greywater. It is preferable to have greywater distributed to land in a well aerated environment as quickly as is possible**. Stored greywater can become very odorous**. However it does contain solids; e.g. hair, lint, soaps, organics (if it contains kitchen wastewater) and can, from time to time, contain pathogens which are a health risk. As noted above a simple screen that can be easily and regularly cleaned is recommended prior to the dosing device.

Typical <u>daily</u> greywater volume (shower, laundry and kitchen) from a domestic dwelling is 90-120L/person.

Figure 1. Example of 5m greywater humus trench system with good subsoil drainage for up to 600L/day greywater

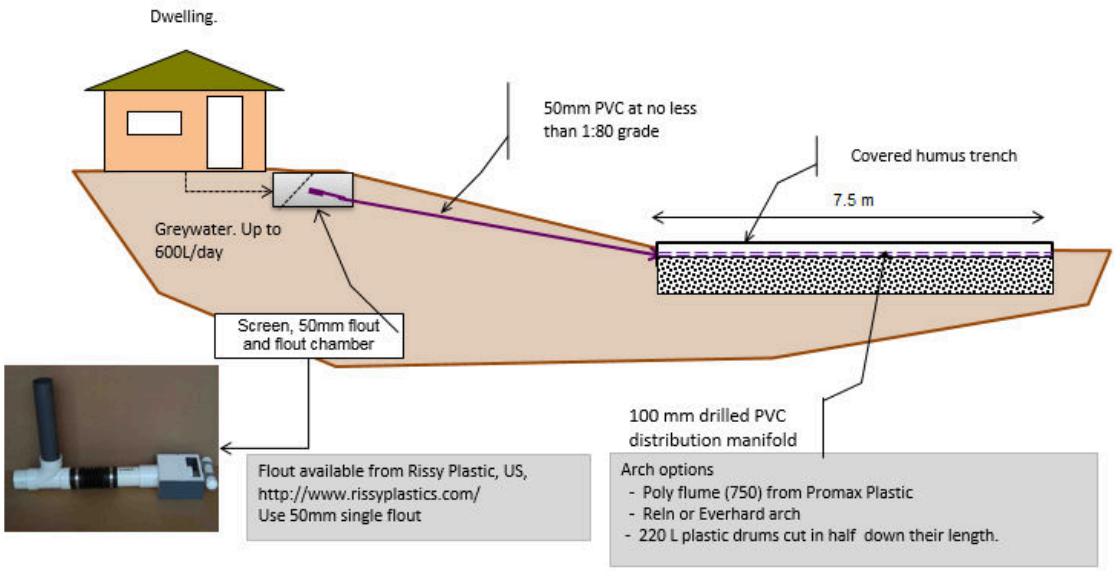


Figure 2. Example of 5m greywater humus trench system with poor subsoil drainage

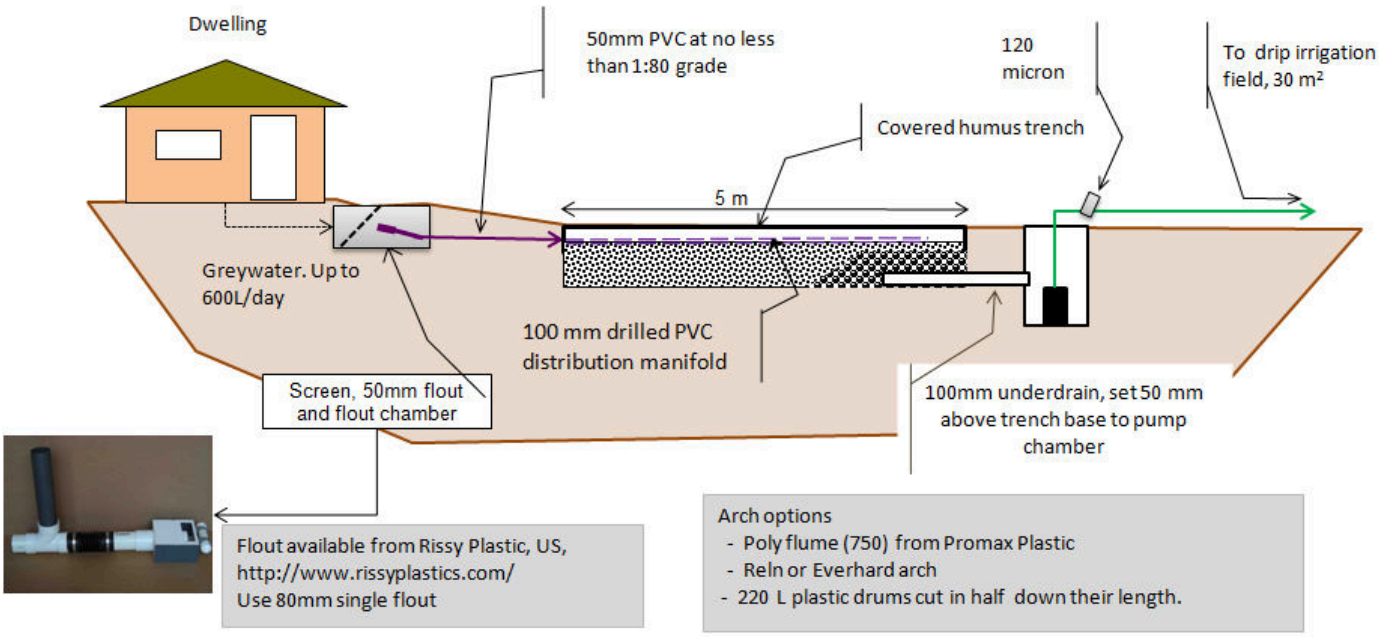


Figure 3. Flout and chamber for greywater

For details contact ecoEng.

Figure 4. Cross-section of a humus trench illustrated in Figure 2.

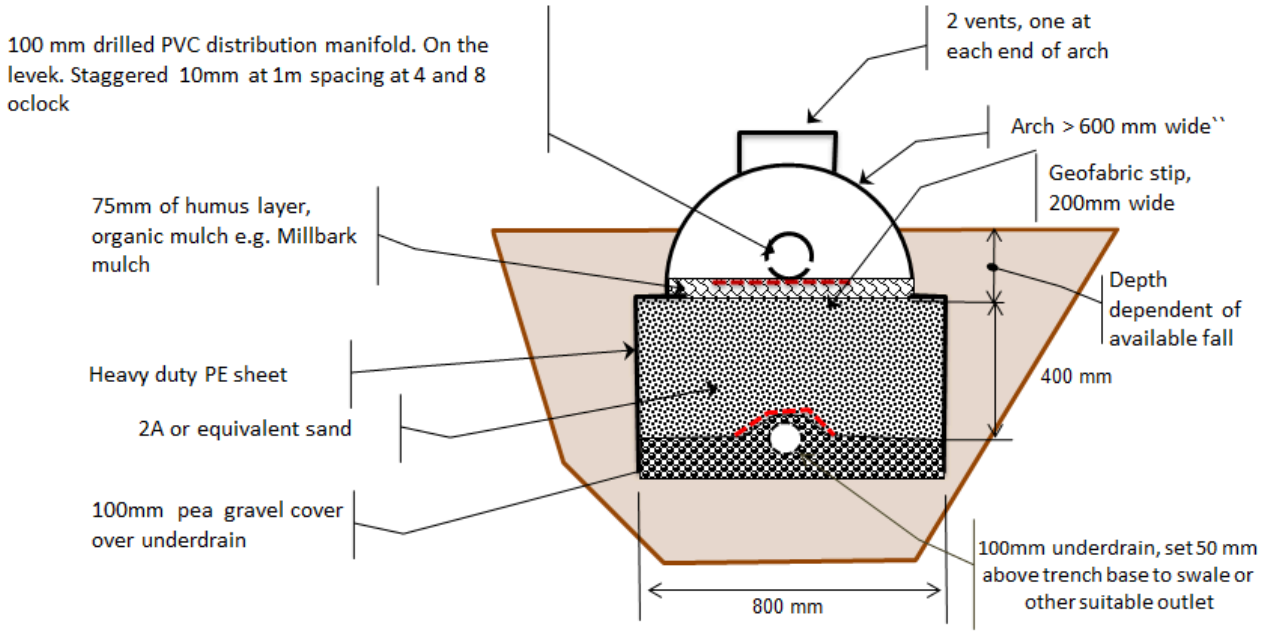
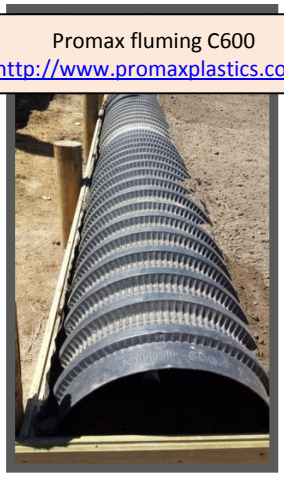


Figure 5. Examples of humus trenches under construction (from Mike Copeland, Kiwi Pioneer, Westport)

Arch options

Trench arch	The arch could be Evertrench, Reln drain trenching, Farm Boss or Promax culvert (600mm) cut in half or 220 l plastic drums cut in half. The recommended size is to be at least 500-600mm width. If the arch material is not UV resistant it will need to be covered. **The arch must be tied down to avoid damage by wind.** EverTrench 350. Available from. Dunedin Stainless PO Box 5690. DUNEDIN  Reln and Framboss Arch available from Hynds  Promax fluming C600 . http://www.promaxplastics.co.nz/   Or 220 L drums cut in half
Humus layer - Bark chip, mulch and/or peat	The arch is to sit on a layer of about 75-100 mm of organic mulch material. The purpose of this layer is to provide a humus ecology to reduce the build-up of biofilm on top of the sand. The mulch material is available from a local nursery supply company.

3 Compliance (for Canterbury)

Refer to **Appendix A** for Canterbury Regional Council Rules (for Permitted Activity), for discharge of greywater. If all conditions of these rules cannot be met that a Resource Consent to discharge will be required .

4 Appendix A: ECan and Building Code Rules for Greywater discharges

4.1 Canterbury Regional Council Regional Rules

Consentability of greywater management is assessed in terms of the current Canterbury Regional Council Rules in the Land and Water Regional Plan (**LWRP**), Rule 5.12 (for greywater), **Table 2**.

It is ecoEng's assessment that this proposal is a permitted activity and a resource consent is not required.

Table 2. Permitted Activity Conditions. Greywater. Proposed LWRP, Rule 5.12.

The discharge of greywater onto or into land in circumstances where a contaminant may enter water is a permitted activity, provided the following conditions are met:			
Condition	**Criteria**	✓ ×	**Comments**
1	The discharge is only from a dwelling house and does not contain any waste from a toilet or any hazardous substances;		
2	The discharge is from a system authorized for use under the Building Act 2004		Refer to **Note 1**.
3	The discharge is:		
a	Via a land application system located beneath the ground surface; and		
b	As far as practicable, is evenly distributed and does not exceed an application rate of 50 mm per day		Refer to **Note 1**.
4	The discharge does not result in greywater flowing, seeping, or ponding on the surface of the ground for more than two hours;		
5	The system does not store greywater for more than 12 hours and incorporates a proprietary filter prior to discharge;		
6	The discharge does not result in water or contaminants flowing onto another site; and		
7			
a	20 m of a surface water body or the Coastal Marine Area;		
b	20 m of a bore used for water abstraction;		
c	To land that is contaminated or potentially contaminated;		
d	Onto or into land listed as an archaeological site.		
8	Where the discharge is located over an unconfined or semi-confined aquifer and the highest groundwater level is less than 2 m from the ground surface, there shall be at least 600 mm of soil or sand between the point of discharge and the seasonal high water table.		
Note 1. May be a problem with the humus trench. Will depend on interpretation by the TA.			

4.2 Building Act 2004 and regulations

Table 3 provides an assessment of a greywater system in terms of the Building Act 2004.

Table 3. Building Act 2004 Requirements

Code/clause	Requirements	Assessment
B1 Structural	The proposed structures are to be of such a standard to ensure public safety and protection of property.	There are no significant structural components that would trigger the structural requirements in B1.
B2 Durability	To ensure durability of the "building". The code implies durability of materials.	ecoEng is confident that all component materials for all options will, within reason, meet the durability requirements of B2, and in particular Table 1 requirements for plumbing and piping.
G13 Foul water	This code applies to above-ground non-pressure (gravity flow) sanitary plumbing for buildings having 3 levels or less and includes all pipe work for foul water within, or on the building, including any basements.	All conditions and requirements under G13 can be met.
E1 Surface water	(a) Safeguard people from injury or illness, and other property from damage, caused by surface water, and (b) Protect the outfalls of drainage systems	All stormwater is to be diverted away from the installed on-site wastewater system.

If proposing to do your own construction/installation, first check with your District Council Building Section. You may be required to engage a registered drain-layer to sign of the installation.