CASTERTON
TOWN REPORT

March 2009

CASTERTON PREFERRED MANAGEMENT OPTIONS

Table 2: Climatic Regime (mm) – Meteorological Stations: Casterton for rainfall, Mount Gambier and Hamilton for evaporation.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Mean Rainfall	30.2	24.6	36.4	43.3	61.8	68.7	84.9	84.9	73.9	59	46.8	39.4	651.3
Mean Pan Evap'n	208.9	187.5	150.5	87.9	52.2	35.8	42.3	58.5	77.7	110.0	135.6	176.6	1322.4
Crop Factor	0.70	0.70	0.70	0.60	0.50	0.45	0.40	0.45	0.55	0.65	0.70	0.70	
Mean Pot'l Evapotrans'n	146.2	131.2	105.4	61.5	36.5	25.1	29.6	41.0	54.4	77.0	94.9	123.6	926.2
Water Deficit	116.0	106.6	69.0	18.2	-	-	-	-	-	18.0	48.1	84.2	460.1
Water Excess	-	-	-	-	25.3	43.6	55.3	44.0	19.5	-	-	-	187.7
90-Percentile Rainfall	50	47	79.4	82.2	110.3	106.4	128.1	128.8	108.9	100.6	73.9	69.9	824

The 90-Percentile annual rainfall[1] is the total yearly higher than normal rainfall that on average occurs only once in ten years, and it is made up by some parts of the year having sufficiently higher than average rainfall. It is based on a long historical period of rainfall measurements. This index is used in EPA publications on irrigation of large scale industrial and municipal wastewater and also for grey water re-use schemes. In Casterton the 90-percentile high rainfall is about 27% higher than the mean annual rainfall.

During an average rainfall and evaporation year, there will be six months that have more rainfall than will be transpired by a grassed surface. The excess rainfall in these months is about 190 mm. The excess rainfall water will infiltrate into the soil and some of it will be stored in the soil profile, becoming available for use during the six drier summer months when the total deficit amounts to approximately 460 mm. However, sandy soils have a low water holding capacity and very high permeability and therefore much of the excess will be lost to deep drainage. The potential for irrigated vegetation to use up water and hence take up nutrients is significant only in the period from November to March.

The urban land is almost wholly restricted to the more gently sloping plateau spurs and very gently sloping alluvial fan, with very little development on alluvial flood plains. The township of Casterton extends over a large area with variable underlying geology exposed at the surface, creating a complex pattern of soil types. Four main terrain units are distinguished.

[1] The 90-Percentile annual rainfall is very much less than the sum of the 90-Percentile monthly rainfalls because the chance of having twelve months in succession each with the 90-Percentile high rainfall is vanishingly small. The chance of any one month having a 1 in 10 month high rainfall is 1:10 or 0.1 per definition. This is true for each month in the year. The chance that in one year two months will each have a 1 in 10 high rainfall therefore is 1:100, or 0.01 or 1 in 10^2. Thus for all twelve months in the year to have a 1 in 10 high rainfall is 1 in 10^{12} or 1 in a trillion years.

- Remnant of an ancient plateau mapped geologically as Tpd (Dundas land system in Glenelg Soil Health Strategy(GSHS)). It has scattered remnants of sand dunes on it. It includes also the moderately gently sloping plateau spurs, mapped geologically as Klp (Casterton land system in GSHS); Soil Categories 5a and 5b
- Moderately steeply and steeply sloping dissection slopes mapped geologically as Klp (Casterton land system in GSHS); Soil Category 5a.
- Flood plains mapped geologically as Qra (Wannon Alluvial land system in GSHS). Soil Category 6b, mostly without urban development and remnant high alluvial terraces which have been developed, e.g. the relatively level, north-eastern part of Henty Street, with Soil Category 5a.
- Narrow, linear windblown sand deposits, probably derived from the flood plains and deposited against the east-facing steep slopes of the uplands, mapped geologically as Qrd and similar to the scattered sandy soils in the Dundas land system; Soil Category 2a.

REFERENCES

Australian / New Zealand Standard, On-site domestic-wastewater management – AS/NZS 1547:2000, 2000

EPA, Guidelines for Environmental Management – Septic Tanks Code of Practice, Publication 891, March 2003

van de Graaff & Associates Pty Ltd, Geocode Mapping & Analysis Pty Ltd and Patterson Rural Business Management Pty Ltd, 2006, Glenelg Hopkins Catchment Regional Soil Health Action Plan

ACKNOWLEDGEMENT

Extensive use has been made of an earlier wastewater report produced by Mr Larry White.

Table 3.1 Management for vacant allotments					
Soil Category	Soil, Geology & Topography	Indicative permeability (Ksat)	Waste water management system	Design Loading rate	Area required for waste water management system
5b	Ferruginous sandstone, sand, grit, clays and ironstone, (Tpd) [Dundas land system] Duplex soils with relatively deep sandy topsoil (400-800 mm) over layer of buckshot or hard ironstone, overlying yellow brown clay subsoil Gently sloping plateau surface	0.06 – 0.12 m/day	Absorption trenches & beds Standard 0.5 m wide; unit length 10 m; spacing 3 m + 2 m envelope	4 L/m^2.day Special design Water balance	1 br: 230 L/day – 115 m trench, 630 m^2 2 br: 345 L/day – 173 m trench, 875 m^2 3 br: 460 L/day – 230 m trench, 1169 m^2 4 br: 575 L/day – 288 m trench, 1463m^2
			Evapo-Transpiration Absorption – Seepage Trenches & Beds EPA CA 01.2/3 for annual rainfall 650 mm AS/NZS 1547:2000 Annual rainfall is not a factor for sizing in AS/NZS.	5 L/m^2.day Special design Water balance	Customise to local conditions
			Mounds AS/NZS 1547:2000	5 L/m^2.day on mound basal area	Customise to local conditions
			Irrigation Systems AS/NZS 1547:2000 Secondary treated effluent only 2 m envelope	Irrig'n area DIR = 2.86 L/m^2.day but preferably less	1 br: 230 L/day – 169 m^2 2 br: 345 L/day – 225 m^2 3 br: 460 L/day – 281 m^2 4 br: 575 L/day – 337 m^2
			Irrigation Systems MAV Model for Sensitive Sites Secondary treated effluent only		MAV Spreadsheet; Parameters: Crop N Uptake 150 kg/ha; Crop P Uptake 40 kg/ha; P sorption 400 mg/kg soil; Bulk Density 1.5 c/cm^3; Depth of soil allowing for rock 2.0 m

Table 3.1 Management for vacant allotments - Continued					
Soil Category	Soil, Geology & Topography	Indicative permeability (Ksat)	Waste water management system	Design Loading rate	Area required for waste water management system
5a	Mudstone, arkosic sandstone, siltstone some thin coal seams, (Klm/Klp) [Casterton land system] Uniform dark to black clay soils strongly structured, may be calcareous Close to Tpd geology (Dundas land system) duplex soils may occur with relatively deep sandy topsoil (400-700 mm) over layer of buckshot or hard ironstone, overlying yellow brown clay subsoil (Category 5b). Gently to moderately steep sloping plateau spur surfaces	0.12 – 0.5 m/day	Absorption trenches & beds Standard 0.5 m wide; unit length 10 m; spacing 3 m + 2 m envelope	5 L/m^2.day Special design Water balance	1 br: 230 L/day – 92 m trench, 483m^2 2 br: 345 L/day – 138 m trench, 728 m^2 3 br: 460 L/day – 184 m trench, 973 m^2 4 br: 575 L/day – 230 m trench, 1169m^2
			Evapo-Transpiration Absorption – Seepage Trenches & Beds EPA CA 01.2/3 for annual rainfall 650 mm AS/NZS 1547:2000 Annual rainfall is not a factor for sizing in AS/NZS.	5 L/m^2.day Special design Water balance	Customise to local conditions
			Mounds AS/NZS 1547:2000	5 L/m^2.day on mound basal area	Customise to local conditions
			Irrigation Systems AS/NZS 1547:2000 Secondary treated effluent only 2 m envelope	Irrig'n area DIR = 2.86 L/m^2.day but preferably less	1 br: 230 L/day – 169 m^2 2 br: 345 L/day – 225 m^2 3 br: 460 L/day – 281 m^2 4 br: 575 L/day – 337 m^2
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Table 3.1 Management for vacant allotments - Continued					
Soil Category	Soil, Geology & Topography	Indicative permeability (Ksat)	Waste water management system	Design Loading rate	Area required for waste water management system
6b	Heavy textured flood plain soils (Qra) [Wannon Alluvial land system] Uniform dark to black clay soils, often with a shallow water table Near level flood plains	< 0.06 m/day	Absorption trenches & beds Standard 0.5 m wide; unit length 10 m; spacing 3 m + 2 m envelope	4 L/m^2.day Special design Water balance	1 br: 230 L/day – 115 m trench, 630 m^2 2 br: 345 L/day – 173 m trench, 875 m^2 3 br: 460 L/day – 230 m trench, 1169 m^2 4 br: 575 L/day – 288 m trench, 1463m^2
			Evapo-Transpiration Absorption – Seepage Trenches & Beds EPA CA 01.2/3 for annual rainfall 650 mm AS/NZS 1547:2000 Annual rainfall is not a factor for sizing in AS/NZS.	5 L/m^2.day Special design Water balance	Customise to local conditions
			Mounds AS/NZS 1547:2000	5 L/m^2.day on mound basal area	Customise to local conditions
			Irrigation Systems AS/NZS 1547:2000 Secondary treated effluent only 2 m envelope	Irrig'n area DIR = 2.86 L/m^2.day but preferably less	1 br: 230 L/day – 206 m^2 2 br: 345 L/day – 282 m^2 3 br: 460 L/day – 357 m^2 4 br: 575 L/day – 432 m^2
			Irrigation Systems MAV Model for Sensitive Sites Secondary treated effluent only		MAV Spreadsheet; Parameters: Crop N Uptake 150 kg/ha; Crop P Uptake 40 kg/ha; P sorption 400 mg/kg soil; Bulk Density 1.5 c/cm^3; Depth of soil allowing for rock 2.0 m

Table 3.1 Management for vacant allotments - Continued					
Soil Category	Soil, Geology & Topography	Indicative permeability (Ksat)	Waste water management system	Design Loading rate	Area required for waste water management system
2a	Colluvial slopes covered by accumulation of wind blown sand adjacent to flood plains (Qrd) [Wannon Alluvial land system] Deep grey to brown sand, structureless East facing slopes	>3.0 m/day	Absorption trenches & beds Standard 0.5 m wide; unit length 10 m; spacing 3 m + 2 m envelope	Not suited, too permeable	n/a
			Evapo-Transpiration Absorption – Seepage Trenches & Beds EPA CA 01.2/3 for annual rainfall 650 mm AS/NZS 1547:2000 Annual rainfall is not a factor for sizing in AS/NZS.	Not suited, too permeable	n/a
			Mounds AS/NZS 1547:2000	Not suited, too permeable	n/a
			Irrigation Systems AS/NZS 1547:2000 Secondary treated effluent only 2 m envelope	Irrig'n area DIR = 5 L/m^2.day but preferably less	1 br: 230 L/day – 120 m^2 2 br: 345 L/day – 153 m^2 3 br: 460 L/day – 185 m^2 4 br: 575 L/day – 217 m^2
			Irrigation Systems MAV Model for Sensitive Sites Secondary treated effluent only		MAV Spreadsheet; Parameters: Crop N Uptake 150 kg/ha; Crop P Uptake 40 kg/ha; P sorption 400 mg/kg soil; Bulk Density 1.5 c/cm^3; Depth of soil allowing for rock 2.0 m

Table 3.2 Management for existing allotments					
Soil Category	Soil, Geology & Topography	Indicative permeability (Ksat)	Waste water management system	Design Loading rate	Area required for waste water management system
5b	Ferruginous sandstone, sand, grit, clays and ironstone, (Tpd) [Dundas land system] Duplex soils with relatively deep sandy topsoil (400-800 mm) over layer of buckshot or hard ironstone, overlying yellow brown clay subsoil Gently sloping plateau surface	0.06 – 0.12 m/day	Absorption trenches & beds Standard 0.5 m wide; unit length 10 m; spacing 3 m + 2 m envelope	5 L/m^2.day Special design Water balance	Extend trench system where possible; reduce wastewater generation by water saving appliances and fixtures; consider installing aerated wastewater treatment system
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			Mounds AS/NZS 1547:2000	5 L/m^2.day on mound basal area	n/a
			Irrigation Systems AS/NZS 1547:2000 Secondary treated effluent only 2 m envelope	Irrig'n area DIR = 2.86 L/m^2.day but preferably less	Extend irrigation area where possible; reduce wastewater generation by water saving appliances and fixtures
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			Evapo-Transpiration Absorption – Seepage Trenches & Beds EPA CA 01.2/3 for annual rainfall 650 mm AS/NZS 1547:2000 Annual rainfall is not a factor for sizing in AS/NZS.	Not suited, too permeable	n/a
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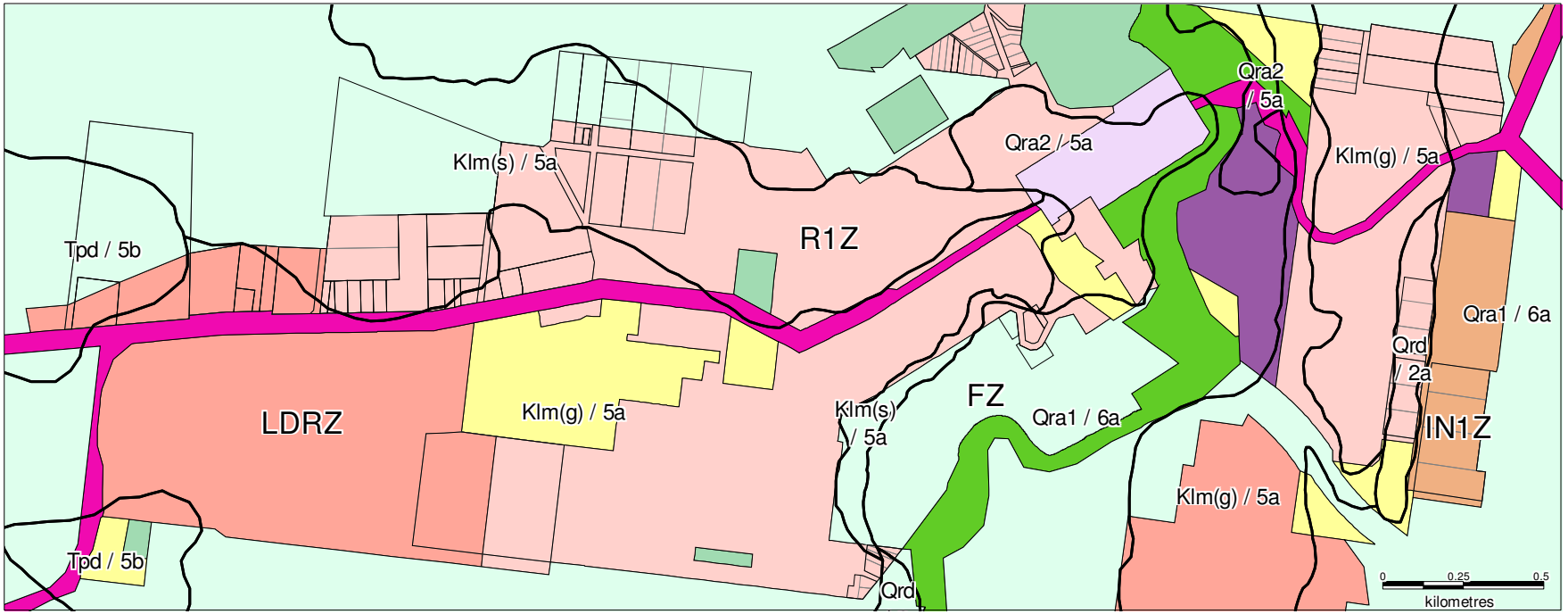
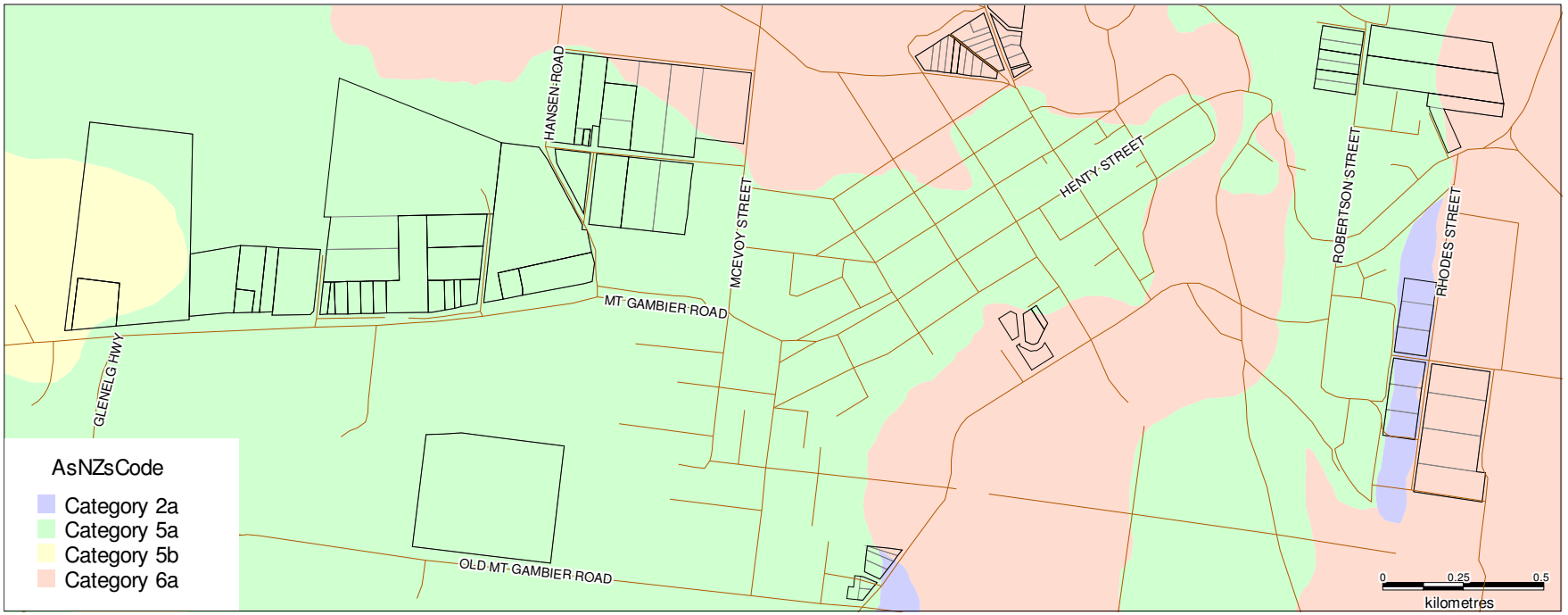
Map 1: Overview of Casterton showing soils overlaid with 5m contours. Soils are expressed in terms in terms of AS/NZS 1547:2000 categories for on-site domestic wastewater management.



Map 2: Relevant planning zones in the area are the Residential 1 Zone (R1Z) , Low Density Residential Zone (LDRZ), Industrial 1 Zone (IN1Z), and Farming Zone(FZ).



Map 13: Soils mapped in terms of AS / NZS code and overlayed with unsewered properties (black boundaries) and parcels (grey boundaries)