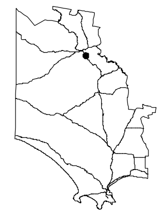
SANDFORD
TOWN REPORT

March 2009



INTRODUCTORY COMMENTS

Sandford is a very small town in the north of the Shire, 5 km (5 minutes) south of Casterton, 62km (50mins) west of Hamilton, and 91km (1 hr 10mins) north of Portland. There is reticulated town water and electricity, but no sewerage or gas. There are no shops or services. There is a football ground and public hall, both with public toilets. Sandford is too small to be documented as a town by the ABS, so no census statistics are available. Perusal at air photos reveals that much of the town is undeveloped so if the drivers that might make Sandford attractive to outsiders were to emerge, there is potential for much development in this town.

The terrain around Sandford is made up of an elevated alluvial terrace (Qra2 / AS/NZS category 2b-3a soils) and a floodplain bounded by hillslopes. The alluvial terrace is not prone to inundation and all development is located there. The floodplain is used entirely for agricultural purposes. The soils of the alluvial terrace consist of silt loams and sandy loams of excellent permeability. There are watercourses in close proximity.

Sandford's planning zones are shown in map 2. There are 44 properties (107 parcels) in the township zone. Given in the Township zone there are 107 parcels, there is the potential for an additional 63 allotments in the town (a more than two-fold increase in dwellings). Properties in the town are typically large, but there are a number of parcels that would be considered small.

Considering the density of development in Sandford, it is our opinion that there are no immediate wastewater problems there that would stem from the ability of the local soils to receive wastewater. However, it is likely that the majority of wastewater systems there are old. Sandford is probably dominated by systems that treat blackwater only and dispose of greywater to a ditch or gutter. There may also be some all-waste systems in the town. Where such systems have been maintained they are likely to continue working effectively for many years to come.

WASTEWATER MAPPING

In the following text we relate the AS/NZS and Septic Tank Code Of Practice to Sandford. Map 3 through map 10 (present for the towns of Allestree / Dutton Way, Cape Bridgewater Nelson and Narrawong) were not produced for Sandford.

Table 1: The implications of the disposal area requirements for Sandford's soils. Only Qra2 / 2a-3b soils are relevant to this study. The area within the township zone mapped as Qra1 is on a lower terrace and would be subject to flooding. Comments relate to the shading in map 11 and map 12.

Soil and technology	Loading rate (l / pp / day)	(a) Impervious surface allowance	(b) Required disposal area (3br home)	(c) Required reserve area	(a+b+c) Minimum block size required	In map 11 and map 12, closer scrutiny is required on blocks shaded:
2b and 3a: Trench (existing)	180	450	532	532	1514	Pink, orange and light green
2b and 3a: Trench (new)	115	450	336	336	1122	Pink and orange
2b Irrigation	115	450	185	0	635	Pink
3a Irrigation	115	450	217	0	667	Pink

The category ranges in map 11 and map 12 were formulated to reflect the capability of the local soils to deal with domestic wastewaters onsite and do not consider setbacks. In order to gain a strategic understanding of the implications of existing and future development in

Sandford, table 1 has been formulated to compliment map 11 and map 12. The table incorporates an allowance of $450m^2$ for impervious surfaces and a reserve area for trench systems.

For each technology (trench and irrigation), the map showing properties (map 11) and table 1 can be used to represent the ability of the local soils to deal with wastewater onsite if no further development were to ever occur in the town. In contrast, the map showing parcels (map 12) and table 1 can be used to represent the ability of the local soils to deal with wastewater onsite if the town were to be fully developed at some point in the future.

Trench performance

When read in conjunction with table 1, map 11 and map 12 illustrate where trench technologies would be sustainable in the long term, and the extent of problems that might arise should Council continue to approve trench systems. The maps give some indication how existing systems might be performing in terms of surface runoff potential but do not account for impacts on groundwater. Concerns for properties that seem to have minimal ability to adequately deal with their wastewater onsite need to be tempered by comments relating to blackwater-only systems in the report introduction.

Existing trench systems: There are a number of existing developments that are unsustainable, particularly with the increased disposal area requirements that go with higher wastewater of 180 litres / person / day. These are shaded pink, orange and light green in Map 11.

New trench systems: There are many parcels less than the 1122 m^2 required to support a new 3 bedroom house using trench systems (map 12). Problems might emerge if Sandford's present subdivision pattern on its category 2b-3a soils were to be fully developed using traditional trench technologies.

Irrigation performance

Most of the blocks that are constrained when trench systems are used, are not constrained when irrigation technologies are used. However, some blocks in Sandford are small for onsite wastewater systems (map 12).

In the long term boundary realignment would be required for many blocks to be developable. Effluent fields should be confined to Qra2 geology in order to avoid flood-prone land.

RECOMMENDATIONS AND CONCLUSIONS FOR IMPROVING SUSTAINABILITY

Failing or inappropriate onsite wastewater systems create concerns for human health and the health of the environment.

Towns of Sandford's age tend to use trench systems. Where these are all-waste systems, in some areas there is potential for surface runoff, and where they are blackwater only, grey-water is being disposed of as street drainage. Neither situation is acceptable either from a health or an environmental perspective. Nobody knows for sure the extent of the various types of wastewater systems being used in Sandford, whether they have been appropriately maintained, or how they are performing. The establishment of baseline information in order to understand this issue should be a high priority for council.

There are a number of properties that are unsustainable with the 180 litre / pp /day loading rate associated with the use of town water and non water saving fixtures. These are shaded pink, orange and light green in map 11. Blocks shaded light green become sustainable when lower flow rates associated with the use of standard water reduction fixtures are incorporated.

Map 12 and table 1 illustrate that Sandford's development potential would be constrained if onsite systems were to be used within the present pattern of subdivision. Many parcels are likely to be too small to deal with wastewaters onsite, even using irrigation technology. Many of these parcels would benefit from a process of boundary realignment.

Recommendation: Continue with onsite wastewater treatment. The following actions should be adopted.

- Do not allow the installation of new trench systems on blocks shaded red or orange in Map 11 or Map 12.
- Subdivision should occur in the context of a town plan. A number of small undeveloped parcels (shaded pink in Map 12) could be developed sustainably if they were made larger through a process of boundary re-alignment.
- Permit approval should be used as a trigger for onsite system review
    - Trench systems on blocks shaded light green would become sustainable through the use of water reduction fixtures.
    - Blocks shaded pink or orange in Map 11 or Map 12 should use irrigation systems.
- Manage remaining problems.

Problems to manage

- Audit of existing systems in areas shaded pink, orange or light green in map 11.
    - Document onsite technology being used
    - Initial desludging of all tanks
    - Establish system to monitor future desludging
- Begin a community awareness campaign to encourage:
    - The use of water saving devices and practices. The motivation for this is wastewater reduction rather than reduced water consumption.
    - The maintenance and care of septic tanks.
    - Effective operation of trenches through the installation of dosing pumps.
- Full Land Capability Assessment to be undertaken for development proposals that deviate from the wastewater technologies discussed in this document, or are shown to be unsustainable in Map 11 or Map 12.
- Ensure the regular maintenance of AWTS in accordance with certificate of approval.
- Where bores exist, the water could become contaminated from wastewater and health problems result.
    - Observe setback distances between disposal fields and bores that are set out in the Code Of Practice.
    - Discourage use of bore water for potable supply.
    - Promote secondary treatment and disinfection

Notes on upgrading existing septic tank systems

- Irrigation technology is the preferred option and implies the installation of AWTS. Wastewater should be treated to a 20/30 standard.
- A professionally designed and constructed sand filter would be an acceptable alternative technology.
- A dosing pump provides intermittent loading and uniform distribution of effluent. It is a relatively inexpensive option that would give immediate benefit to most blocks. It will not make a trench system more sustainable, but rather will ensure that it is performing the best it possibly can. A dosing pump might be connected to existing trenches or extended trenches.
- Aerated Wastewater Treatment System (AWTS) in combination with extended trenches and a dosing pump would be another option

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

EPA Victoria, State Environment Protection Policy (Waters of Victoria), 2003

ACKNOWLEDGEMENT

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

SANDFORD 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 Sandford, as it is so close to Casterton, the Casterton rainfall data are applicable. 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 whole of the urban area of Sandford is located on an alluvial river terrace that is above the flood level of the Wannon River. One small cluster of houses is situated on the foot slope of hills to the west of the terrace, immediately adjacent to the railway embankment. All of the lower and current flood plain is in agricultural use. It has been mapped geologically as Qra (River alluvium, including swam deposits) and as Wannon Alluvium land system in the Glenelg Soil Health Strategy. However, in this report the higher alluvial terrace is shown as Qra2 and the current flood plain as Qra1. The hilly land to the west is mapped as Kls (Mudstone, arkosic sandstone,siltstone) and is mapped also as Casterton land system. At the junction between the hill slope and the terrace there may be wet spots. Qra1 is flood prone and has no residential development.

The soils of the river terrace are mainly brown silt loams to sandy loams, and may contain some river gravel at depth. They are permeable, and there will be a ground water table within a few metres from the surface. Ground water quality is likely to be good.

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[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.

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
2b & 3a	Loamy sand to sandy loams (Qra2) Deep sandy loam to loamy soils with river gravels at depth common Near level topography	1.4 – 3.0 m/day	Absorption trenches & beds Standard 0.5 m wide; unit length 10 m; spacing 2 m + 2 m envelope	15 L/m^2.day Trenches not desirable due to high permeability unless dosed	1 br: 230 L/day – 31m, 189 m^2 2 br: 345 L/day – 46m, 287 m^2 3 br: 460 L/day – 61m, 336 m^2 4 br: 575 L/day – 77m, 434 m^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.	Not desirable due to high permeability unless dosed	n/a
			Mounds AS/NZS 1547:2000	Not desirable due to high permeability unless dosed	n/a
			Irrigation Systems AS/NZS 1547:2000 Secondary treated effluent only	Irrig'n area DIR = 5 (2b) to 4 (3a) L/m^2.day;	1 br: 230 L/day – (2b) 120 to (3a) 137 m^2 2 br: 345 L/day – (2b) 153 to (3a) 177 m^2 3 br: 460 L/day – (2b) 185 to (3a) 217 m^2 4 br: 575 L/day – (2b) 217 to (3a) 257 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

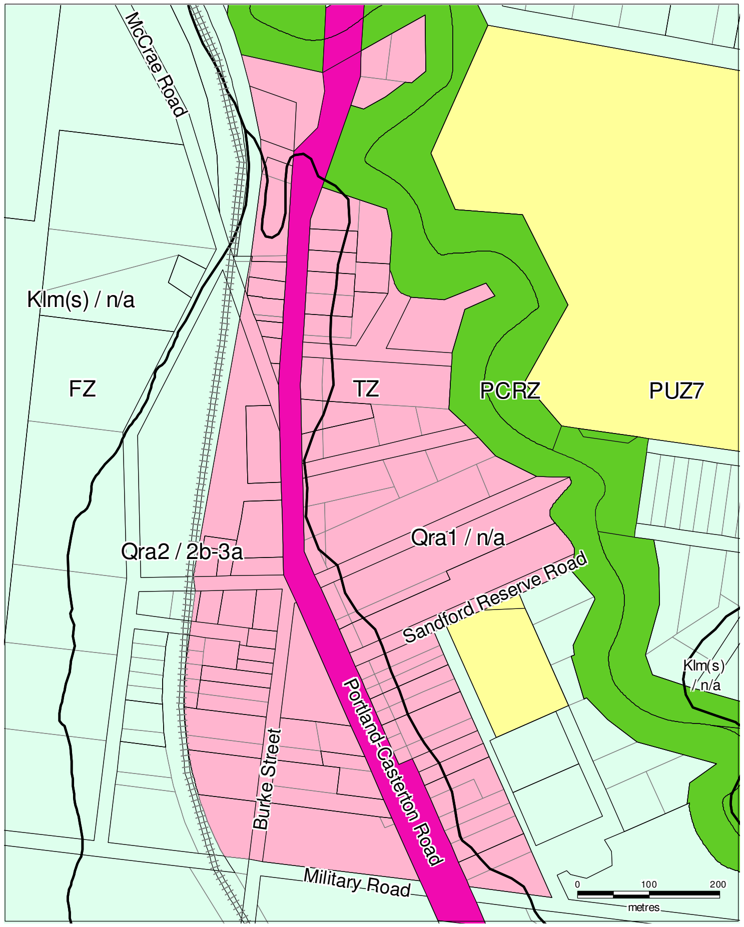
Comments – Soil and other terrain features:

Table 3.2 Management for existing premises

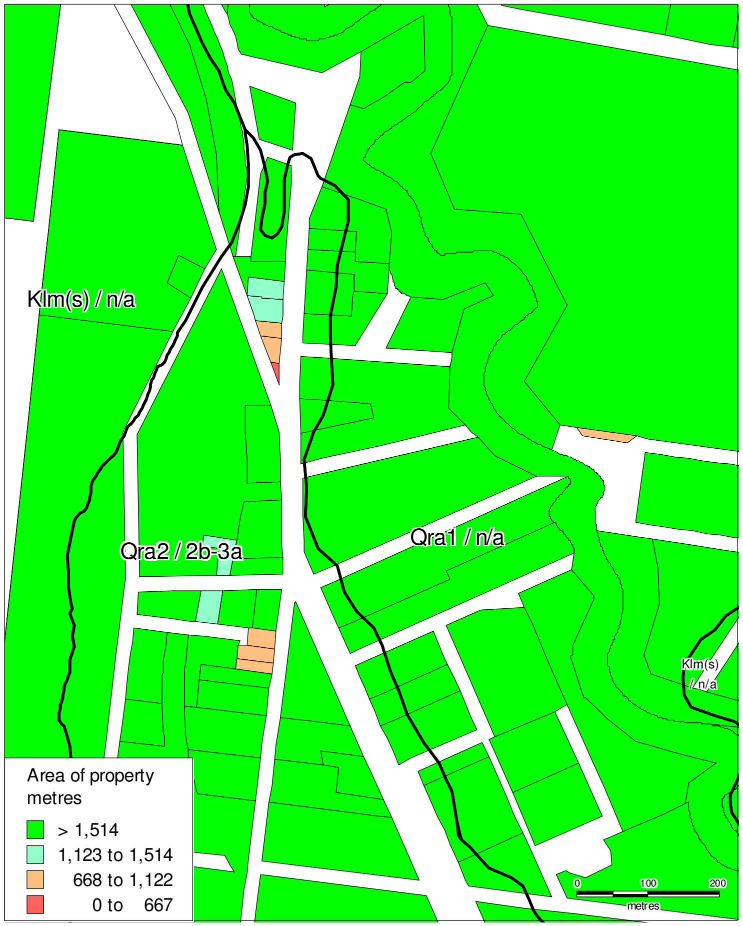
Soil Category	Soil, Geology & Topography	Indicative permeability (Ksat)	Waste water management system	Design Loading rate	Area required for waste water management system
2b & 3a	Loamy sand to sandy loams (Qra2) Deep sandy loam to loamy soils with river gravels at depth common Near level topography	1.4 – 3.0 m/day	Absorption trenches & beds Standard 0.5 m wide; unit length 10 m; spacing 2 m + 2 m envelope	15 L/m^2.day Not desirable due to high permeability unless dosed	Upgrade by installing an AWTS, and extend trenches to maximum possible, install pressurised dose loading and install water saving appliances
			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 desirable due to high permeability unless dosed	Upgrade by installing an AWTS, and extend trenches to maximum possible, install pressurised dose loading and install water saving appliances
			Mounds AS/NZS 1547:2000	Not desirable due to high permeability unless dosed	Upgrade by installing an AWTS, and extend trenches to maximum possible, install pressurised dose loading and install water saving appliances
			Irrigation Systems AS/NZS 1547:2000 Secondary treated effluent only	Irrig'n area DIR = 4 L/m^2.day but preferably less	Extend irrigation area where possible and reduce loading rate; install water saving appliances
			Irrigation Systems MAV Model for Sensitive Sites Secondary treated effluent only		

Comments – Soil and other terrain features:

Map 1: Overview of Sandford showing soils overlaid with 5m contours. Only Qra2 / 2a-3b soils are relevant to this study. The area within the township zone mapped as Qra1 is on a lower terrace and would be subject to flooding. Soils are expressed in terms in terms of AS/NZS 1547:2000 categories for on-site domestic wastewater management.



Map 2: Planning zones in the area are the Farming Zone (FZ), Township Zone (TZ), Public Conservation and Resource Zone (PCRZ), and Public Use Zone (PUZ7).



Map 11: Legend classes are sensitive to soil category area requirements for a 3 br home.

Soil and technology	In map 11 and map 12, closer scrutiny is required on blocks shaded:
2b and 3a: Trench (existing)	Pink, orange and light green
2b and 3a: Trench (new)	Pink and orange

Map 12: Legend classes are sensitive to soil category area requirements for a 3 br home.

Soil and technology	In map 11 and map 12, closer scrutiny is required on blocks shaded:
2b Irrigation	Pink
3a Irrigation	Pink