M E R I N O
T O W N R E P O R T

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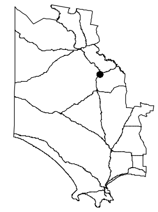

INTRODUCTORY COMMENTS

Merino is a small town (~200 people) located on the Merino and Palmer creeks. Hamilton is 47km (37 mins) to the east, Casterton 27km (21 mins) to the north and Portland 77km (58 mins) to the south. Services include town water (from an off-site bore) and electricity but no sewerage. There is a primary school, swimming pool, police station, bush nursing centre and basic retail and sporting facilities.

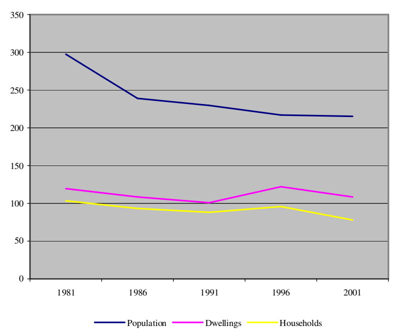

Figure 1: Population and housing trends between 1981 and 2001

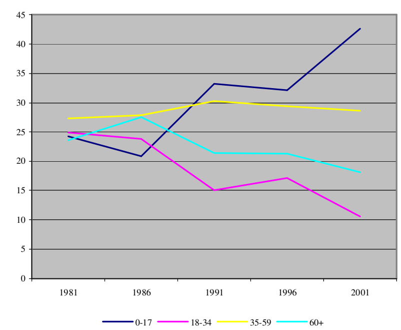

Figure 2: Population trends for four age groups between 1981 and 2001.

Figure 1 shows that in 2001 there were 108 dwellings in Merino, 30 of which were vacant. The vacancy rate of 28% is high (Portland's is 11% and the overall Victoria figure is 10.4%). Perusal at air photos reveals a number of vacant parcels, so there is some potential for additional dwellings in Merino. Considering the high vacancy rate, it is unlikely that there will be demand for this in the short term. In Figure 2 Merino's total 2001 population of 215(in steady decline between 1981-2001) is broken into four age groups. Over the period there has been an increase in the 0-17 age group and a stable 35-59 age group. The decline of the 18-34 age group might be explained by the lack of local opportunities for tertiary education and employment. In exception to other country towns, the 60+ age group is also in decline. As with all demographic statistics, local knowledge should be incorporated in order to confirm these assumptions.[1]

[1] This commentary is a measure of net population change based on the Department of Sustainability and Environment's census derived Towns-In-Time dataset. It should be interpreted with caution because in the absence of custom census tables and local knowledge, it is impossible to say whether the change relates to the same population in each census period. The data should also be interpreted with an understanding of drivers for change and their relevance for different groups (eg homemakers versus retirees). For example, housing affordability is a driver that might motivate some to seek housing in small towns, but for others, barriers such as the lack of education or employment opportunities might be too great. Barriers can also change in response to new regional employment or education opportunities, or technologies such as high speed internet.

The terrain around Merino is made up of moderate to gentle sloped leading down to the Merino Creek to the west, and underlain by sedimentary rock. The soils are black heavy clays (AsNZs Category 6b) and in low lying areas may suffer from seasonal waterlogging and a shallow water table.

Merino's planning zones are shown in map 2. There are 136 properties (220 parcels) in the township zone. Given that in 2001 there were 108 dwellings in the town, and that in the Township zone there are 220 parcels, there is the potential for an additional 84 dwellings in the town (a 78% increase in the number of dwellings). There are a number of small properties and parcels in the town.

Figure 1 shows that between aside from the 1990s when a number of new dwellings were built, there are probably 100 or so dwellings that were constructed prior to the 1980s, so it is likely that the majority of wastewater systems are old. Merino 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 Merino. Map 3 through map 10 (present for the towns of Allestree / Dutton Way, Cape Bridgewater, Narrawong and Nelson) were not produced for Merino.

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 Merino, table 1 has been formulated to compliment map 11 and map 12. The table incorporates and allowance of 450m^2 for impervious surfaces and a reserve field where appropriate.

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.

Table 1: The implications of different loading rates and onsite technologies for Merino. The higher loading rate for existing trench systems reflects the possibility that water saving devices are not installed in existing premises. For new systems Council can require water saving fixtures be installed. Hence the lower loading rate and consequent smaller disposal area requirement.

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:
6b: Trench (existing)	180	450	1806	1806	4062	Pink, orange, light green
6b: Trench (new)	115	450	1169	1169	2788	Pink, orange
6b: Irrigation	115	450	357	0	807	Pink

Trench performance

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 the discussion of blackwater-only systems above.

The major concern for trench systems relates to the clustering of blocks in the south-west corner of the town. This area drains towards Merino Creek.

- Present sustainability (no water saving fixtures): Most of the properties of concern (shaded pink, orange and light green) are already developed. These shades indicate a block is less than the 4062 m^2 required to support a 3 bedroom house using trench systems (map 11).
- Potential sustainability (with water saving fixtures): Only a few properties change their status when lower flow rates are considered. However, many additional blocks emerge as causing concern (shaded pink and orange) if Merino's 6b soils were to be fully developed using traditional trench technologies (map 12).

Irrigation performance

Most of the blocks identified as being constrained when trench systems are used, cease to be a concern when irrigation technologies are used. However, some blocks in Merino are small for onsite wastewater systems (Map 12).

In the long term, if irrigation technology was to be adopted for all developments in Merino, there is no reason why onsite wastewater systems would not be a long term sustainable option for development throughout the town.

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 Merino'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 Merino, whether they have been appropriately maintained, or how they are performing. The establishment and maintenance of baseline information in order to understand this issue should be a high priority for council.

Table 1 and map 11 indicate that septic systems with trench disposal are unsustainable in Merino. If at some point in the future Merino were to be fully developed using onsite wastewater systems, irrigation systems would be required. For those blocks shaded red in map 11 or map 12 (too small to contain wastewaters onsite), the high quality wastewater produced by AWTS / irrigation systems would do much to improve their sustainability. For some sites where trench systems are being replaced, it may be necessary to re-use existing trenches for AWTS treated water, or to install irrigation lines within existing trench areas.

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

- Blocks shaded pink in the south west corner of the town should be upgraded to irrigation systems.
- Do not allow the installation of new trench systems on blocks shaded pink or orange in Map 11 or Map 12.
- Permit approval should be used as a trigger to upgrade blocks shaded pink and orange to be 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.

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.

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 891.2, December 2008

ACKNOWLEDGEMENT

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

MERINO PREFERRED MANAGEMENT OPTIONS

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Mean Rainfall	31.4	29.9	37.7	54	71.7	81.7	89.6	90.5	79.6	69.8	51.3	41.6	728
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	0.7	0.7	0.7	0.6	0.5	0.45	0.4	0.45	0.55	0.65	0.7	0.7	
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					35.2	56.6	60.0	49.6	25.2				226.6
Water Excess	114.8	101.3	67.7	7.5						7.2	43.6	82.0	424.1
90-Percentile Rainfall	58.5	66.2	70.3	99.1	121.9	135.7	138.8	139	121.5	117	86.6	75.4	900.4

The 90-Percentile annual rainfall[2] 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 Merino the 90-percentile high rainfall is about 24% 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 230 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 420 mm. Gypsum applied to the soil may improve permeability and water holding capacity. 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 a very gently sloping alluvial fan, with very little development on alluvial flood plains. One main terrain unit is distinguished.

- Gently undulating slopes on mudstones, arkosic[3] sandstones, and siltstone mapped geologically as Klp (Casterton land system in Glenelg Soil Health Strategy(GSHS)). Soil Category 6b.

Local topography affects the natural drainage of the land. Higher lying and more steeply sloping areas may not suffer from seasonal waterlogging because of more effective runoff, whereas lower concave slopes and flatter low lying areas can suffer by receiving runoff and shedding it more slowly.

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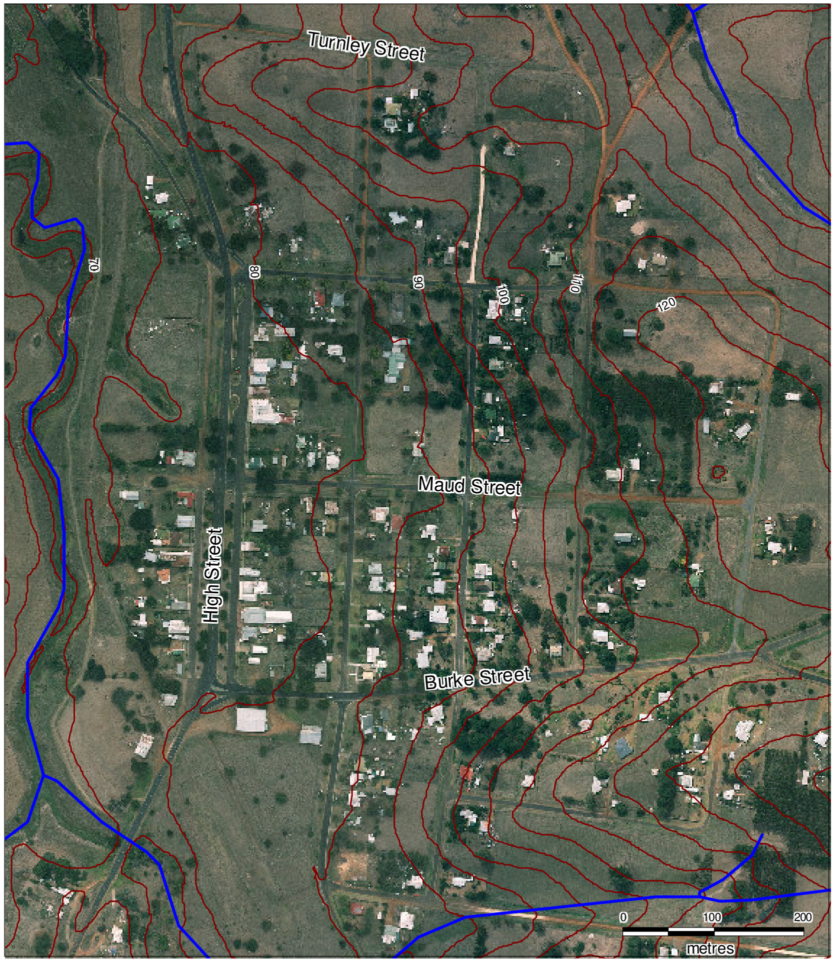
[2] The 90-Percentile annual rainfall is very much less than the sum of the 90-Percentile monthly rainfalls because the chance of having twelve months in succession each with the 90-Percentile high rainfall is vanishingly small. The chance of any one month having a 1 in 10 month high rainfall is 1:10 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.

[3] Sandstones rich in minerals that form clay upon weathering.

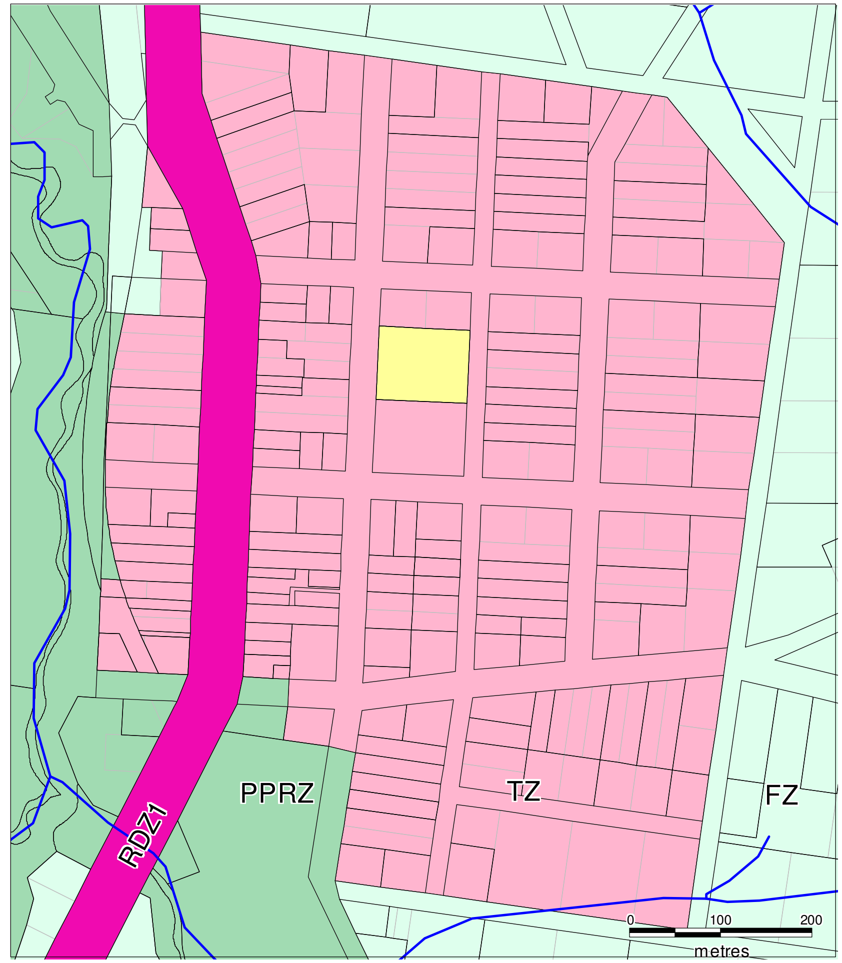
Table 3.1 Management for vacant allotments

Soil Category	Soil, Geology & Topography	Indicative permeability (Ksat)	Waste water management system	Design Loading rate	Area required for waste water management system
6b	Mudstones,arkosic sandstones, and siltstone, Klp [Casterton land system] Heavy black or dark grey silt loam grading to structured black to dark yellow brown medium to heavy clay subsoil The more yellow brown and mottles occur in the subsoil, the more that the soil will be wet in winter.	< 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 – 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 730 mm AS/NZS 1547:2000 Annual rainfall is not a factor for sizing in AS/NZS.	4 L/m^2.day Special design Water balance	Customise to local conditions
			Mounds AS/NZS 1547:2000	4 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 = 2.14 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

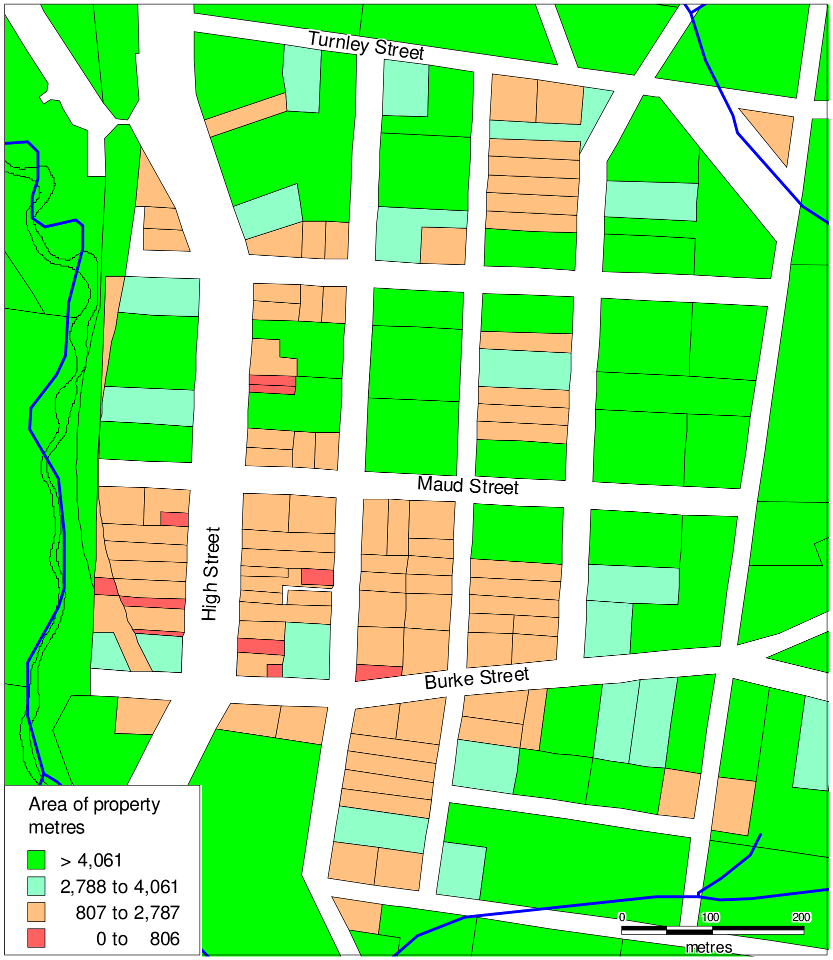
Table 3.2 Management for existing allotments					
Soil Category	Soil, Geology & Topography	Indicative permeability (Ksat)	Waste water management system	Design Loading rate	Area required for waste water management system
6b	Mudstones,arkosic sandstones, and siltstone, Klp [Casterton land system] Heavy black or dark grey silt loam grading to black to dark yellow brown medium to heavy clay subsoil The more yellow brown and mottles occur in the subsoil, the more that the soil will be wet in winter.	< 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	Reduce wastewater generation by water saving appliances and fixtures; consider installing pressurised effluent distribution and/or aerated wastewater treatment system
			Evapo-Transpiration Absorption – Seepage Trenches & Beds EPA CA 01.2/3 for annual rainfall 730 mm AS/NZS 1547:2000 Annual rainfall is not a factor for sizing in AS/NZS.	4 L/m^2.day Special design Water balance	As above
			Mounds AS/NZS 1547:2000	4 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 = 2.14 L/m^2.day but preferably less	Extend irrigation area where possible; reduce wastewater generation by water saving appliances and fixtures
			Irrigation Systems MAV Model for Sensitive Sites Secondary treated effluent only		



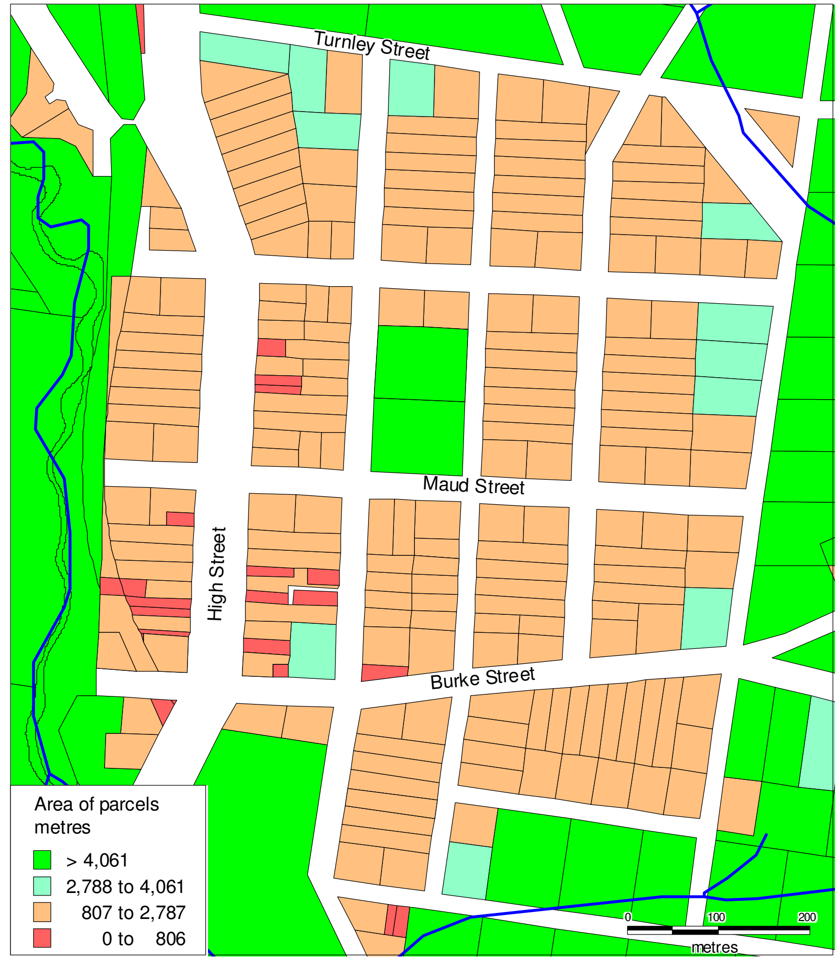
Map 1: **Overview of Merino showing 5m contours. All soils in Merino are AS/NZS 1547:2000 on-site domestic wastewater management category 6b.**



Map 2: Planning zones in the area are the Township Zone (TZ) and Public Park and Recreation Zone (PPRZ) and Farming Zone (FZ).



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



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

Soil and technology	In map 11 and map 12, closer scrutiny is required on blocks shaded:
6b: Trench (existing)	Pink, orange, light green
6b: Trench (new)	Pink, orange
6b: Irrigation	Pink