

D. Barwon Downs Locality Report

1d. Introduction

The Barwon Downs locality is located on the northern slopes of the Otway Ranges, with the town located on the northern foothills. The landform consists of dissected hills abutting rivers and streams, and alluvial terraces with relatively flat topography. The majority (approximately 80%) of the region is located within a DWSC, with the town located within the Upper Barwon DWSC. The region to the northeast of the town also falls within the Gosling Creek DWSC.

There are approximately 267 and 89 unsewered properties/parcels located within the Barwon Downs locality and town, respectively, with 62 DWM system permits that have been inspected to date by COS. The current DWM permits and their associated treatment system and LAA method within the Barwon Downs region are summarised as follows:

- 8 AWTS (4 subsurface irrigation, 1 trench and 3 unknown);
- 1 composting toilet (1 unknown);
- 10 sand filters (10 subsurface irrigation);
- 30 septic tank (6 trenches and 24 unknown);
- 4 worm farms (3 trenches and 1 unknown); and
- 9 unknown (3 trenches and 6 unknown).

2d. Background Documentation

Refer to the following documents for additional detail regarding the locality:

- Barwon Downs Township Master Plan Report (June, 2006);
- COS Planning Scheme; and
- Rural Living Strategy (2011).

3d. Site Assessment Results

The following table summarises the results from the representative audits conducted by Consultant staff in September 2014.

Characteristic	Description
Land use	Barwon Downs comprises a range of land uses, including dairy, forestry, rural living and tourism.
Occupancy rates	2.3 (Barwon Downs State Suburb, ABS Census, 2011).
Typical soils	Yellow mottled duplex soil with very deep (60 cm) silt loam grading to silty clay loam surface and subsurface over strongly mottled clay subsoil; between 25-60 cm the subsurface was saturated (25 July 2014). Drainage is generally poor and permeability is generally low.
AS/NZS 1547:2012 soil categories	5 (Light Clays) and 6 (Medium to Heavy Clays)

Characteristic	Description
Existing Systems	<p>Separate Blackwater and Greywater</p> <p>Of the eight systems inspected during field investigations, seven systems (88%) comprised separate blackwater treatment in a septic tank or composting toilet, with direct greywater diversion to an adjacent paddock, street drain, trench or AWTS. Where discharged to paddocks or neighbouring vacant properties/parcels, greywater was typically ponded near the diversion outlet pipe, and often in areas trampled by livestock (cattle and sheep).</p> <p>The blackwater septic tanks were typically 40+ years old and the time since last pump-out was unknown for the majority (due to owners not being home to ascertain). Septic effluent discharged to one or more conventional absorption trenches (or was assumed to if trenches could not be identified). The trench dimensions were generally unclear, and it is likely that most trenches were undersized for the number of bedrooms. The majority of trenches or/and available LAAs were located on land of less than 4% slope and appeared to be parallel with contours.</p> <p>One greywater diversion system was pumped with a home-made pump-well, with moveable sprinklers around fruit trees. The AWTS had not been serviced since installation approximately 4 years ago and the sprinkler heads periodically become blocked. Setback distances from boundaries were inadequate for this system.</p> <p>Combined Blackwater and Greywater</p> <p>One of the eight systems (13%) inspected was assumed to have a combined wastewater treatment system, based on layout of pipework and age of dwelling. Septic effluent discharged to a series of conventional absorption trenches which appeared to be working well and were adequately sized.</p>

4d. Summary of Constraints to DWM

Characteristic	Description
Climate Zone	Majority within Zone 3.
Surface waterways & catchments	The locality consists of an extensive drainage network. It is located within the DWSCs of Upper Barwon, Gosling Creek and a small part of Matthew Creek in the northeast. The locality is predominantly located within a DWSC, except for approximately 1km north of the most northern extent of the town. The major waterways include: Denn Creek to the east of the town, Callahan Creek North and South Branches and Barwon River East Branch to the west and south of the town, Dewing Creek, Seymour Creek, Kind Creek, and Mackie Creek.

Characteristic	Description
Groundwater	Proximity to groundwater bores: primarily located around the town and north-western region of the locality.
Land subject to inundation	Along Barwon River East Branch and Callahan Creek.
Useable lot area Town (Locality)	High: 43 (77) Moderate: 23 (29) Low: 23 (154) Compliant: 0 (7)
Minimum lot size compliance with Planning Scheme Zoning	The locality is predominantly zoned Farming Zone to the north and Public Conservation and Resource Zone to the south. The town is zoned as Township Zone. Compliance is variable throughout the locality, with the town predominantly compliant. Compliant: 84 (123) Non-compliant: 5 (144)
Slope Town (Locality)	High: 0 (50) (in southern region) Moderate: 1 (22) Low: 88 (195)
Geology	Eumeralla Formation of the Otway Group is predominant in the east, intertwined with the Dilwyn Formation of the Wangeripp Group (Eocene age) which consists of shallow marine, coastal barrier and back beach lagoonal deposits. Intertwined with Demons Bluff formation of the Niranda Group which consists of shallow marine and minor lagoonal deposits, with some unnamed alluvium flood plain deposits along waterways. The northwest corner is underlain by Gellibrand Marl from the Heytesbury Group continental shelf deposit.
Soil suitability	High: 0 (20) Moderate: 89 (247) Low: 0 (0) Variable soil throughout the locality (7 different units); however, it is noted that the locality is spatially expansive. The town consists of soil landscape units '78' and '73' which form on the undulating plain inland of Otway Range and steep rolling hills on the northern periphery of the Otway Range and consists of texture contrast soils with ironstone to 2m depth. The soils consist of weakly structured sandy loam over strongly structured medium to heavy clay.

Characteristic	Description
	<p>Limitations include low fertility, low p-sorb, sodic, dispersive, restricted drainage and coarse fragments.</p> <p>The central west region consists of soil landscape unit '76' which form on the undulating plains and consist of grey sand soils to more than 2m depth. The soils consist of weakly structured loamy sand over apedal sand. Limitations include low fertility.</p> <p>The northeast to southwest transversing region consists of soil landscape unit '63' which forms on deeply dissected hills of the Otway Ranges and consists of brown texture contrast soils to 0.9m depth. The soils consist of weakly structured loam over strongly structured heavy clay. Limitations include sodicity and very acidic.</p> <p>The southern region consists of soil landscape unit '61' which also form on the deeply dissected hills of the Otway Ranges and consist of brown gradational soils to 1.2m depth. The soils consist of moderately structured silty loam over clay loam. Limitations include acidity and restricted drainage.</p> <p>The regions adjacent to the river consist of soil landscape unit '95' which forms on the alluvial floodplain of the Barwon River and its tributaries with numerous cut-off meanders. The soil consists of a moderately structured fine sandy clay loam over medium clay to more than 2m depth. Limitations include restricted drainage and dispersive.</p>
<p>Sensitivity Overlay</p>	<p>Depth to Groundwater Compliance: predominantly compliant, except to the north and west of the town along Barwon River East Branch.</p> <p>Landslip: some to the south</p> <p>Vegetation: Great Otway National, Otway Forest Park, and Barwon Downs bushland reserve.</p>
<p>Sensitivity Analysis Rating Town (Locality)</p>	<p>Very High: 0 (1)</p> <p>High: 0 (27)</p> <p>Moderate: 89 (232)</p> <p>Low: 0 (7)</p>

5d. Sensitivity Analysis (Maps)

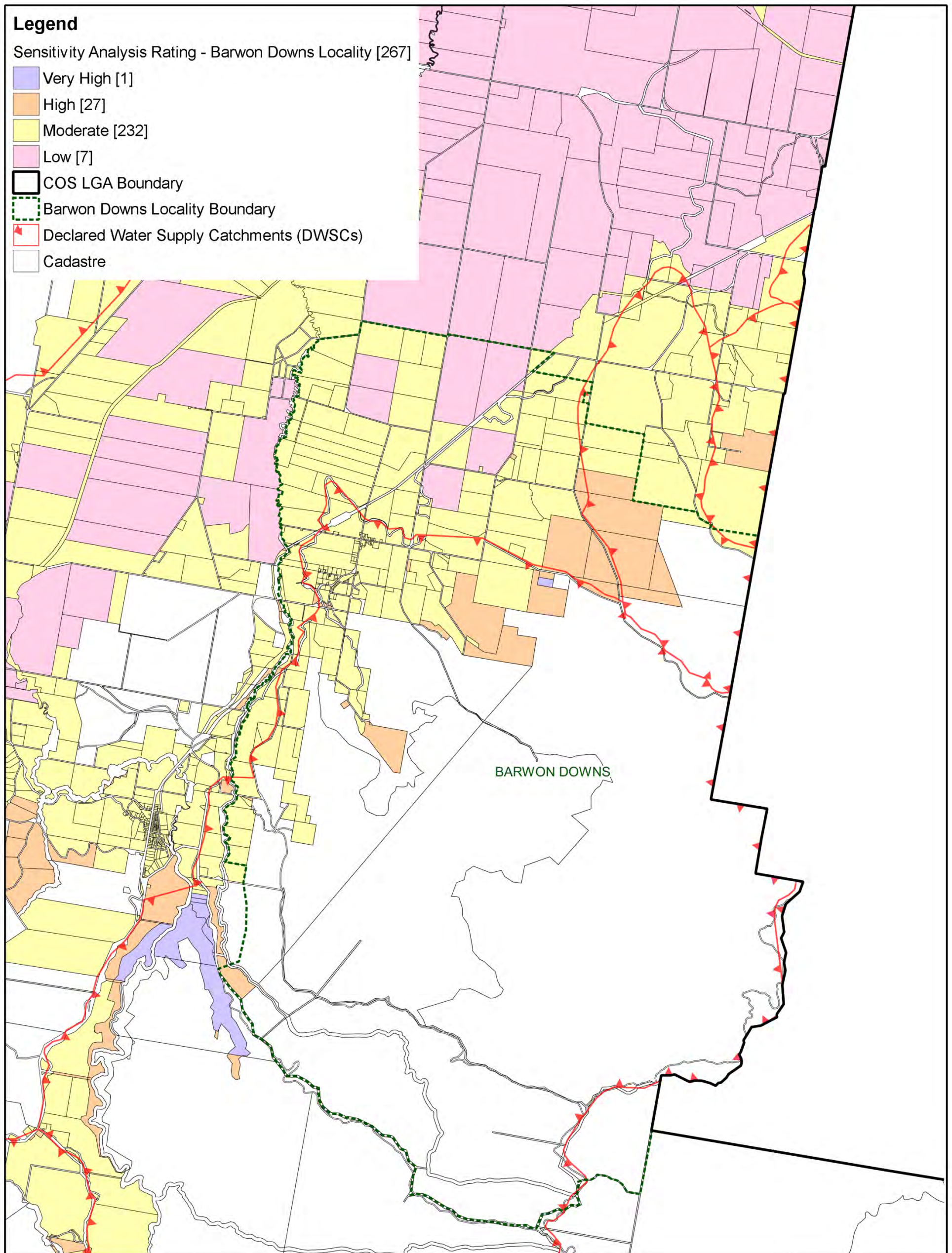


Figure c: Sensitivity Analysis - Barwon Downs Locality

Colac Otway Shire DWMP Review



W Whitehead & Associates
Environmental Consultants



Revision	3
Drawn	JK
Approved	MS

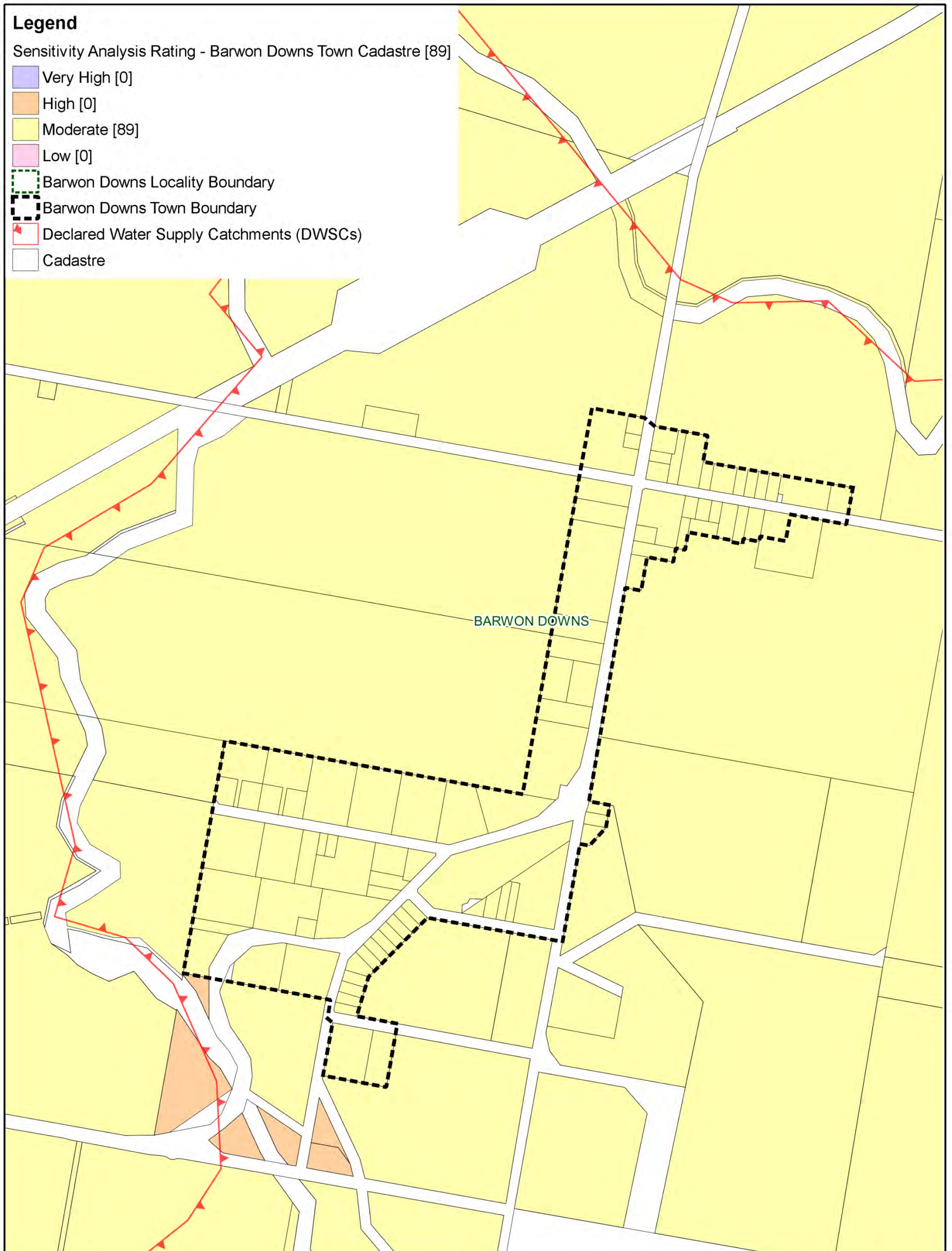


Figure d2: Sensitivity Assessment - Barwon Downs Town

Colac Otway Shire DWMP Review



Revision	3
Drawn	JK
Approved	MS

6d. System Selection

Due to the dominance of heavy-textured soils in the Barwon Downs locality, conventional absorption trenches and beds are not likely to be feasible and are discouraged. Appendix A of the EPA Code of Practice (2013) prohibits LPED systems on Category 5 and 6 soils (medium to heavy clays). Current best-practice is for effluent to be treated to a secondary standard or better, particularly within the DWSCs. Any variations to this must be provided with detailed evidence and explanations to demonstrate its suitability.

The System Sizing Tables (below) indicate which systems are likely to be the most appropriate for the locality.

7d. System Sizing Tables

Sizing Tables for each system type were created using conservative monthly water balances, following methods described in the MAV Model LCA, 2014. Monthly 70th percentile rainfall and average evapotranspiration data for Barwon Downs was sourced from SILO (Scientific Information for Land Owners) climate databases, which are managed by the Queensland Government. The SILO databases use accurate meteorological data collected throughout Australia over long time periods.

The Design Loading Rates (DLRs) and Design Irrigation Rates (DIRs) were taken from the current EPA Code of Practice. Where the Code of Practice has precluded use of a particular type of system on a certain soil type, it is shown as 'Not Applicable' for that soil type in the Sizing Tables. Where the evapotranspiration deficit requires unrealistically large land application areas for a particular system on a certain soil type, it is also shown as 'Not Applicable' for that soil type in the Sizing Tables. Detailed, site-specific LCAs and system designs would be required to further investigate the feasibility of systems deemed 'Not Applicable' in the sizing tables. Mitigation measures (such as importation of topsoil to appropriate depths in the land application area), may be required to sustainably achieve land application of effluent on constrained properties/parcels.

Sizing Tables for the Barwon Downs locality are provided below.

8d. General Conclusion

The properties/parcels within Barwon Downs, including the entire town, have predominantly been assigned a Moderate Sensitivity Rating to sustainable DWM. Predominantly, Standard LCAs will be required, with the use of System Sizing Tables deemed appropriate. The Low Sensitivity Rating properties/parcels within a DWSC are required to complete a Standard LCA as per the current EPA Code of Practice's requirements. Particular attention needs to be directed towards ensuring that the soil stability and appropriate setbacks to surface waterways and groundwater bores are maintained.

Barwon Downs

Drip and Spray Irrigation Systems* - Secondary Treated Effluent only									
Development Type	Soil Category	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)		
	DIR (mm)	5	5	4	3.5	3	2		
Development Type	Daily (L/day)	Total min. irrigation area required for zero wet weather effluent storage (m ²) not including spacing or setbacks							
5 + bedroom residence	1,080	419		684	1,000	1,863	2,556		
4 bedroom residence	900	349		570	834	1,552	2,130		
1-3 bedroom residence	720	280		456	667	1,242	1,704		

Note: * irrigation system sizes are based on the assumption that the land application area is less than 10% slope. Reductions in DIR apply for slopes above 10% according to Table M2 of AS1547:2012

Conventional Absorption Trenches and Beds - Primary Treated Effluent									
Development Type	Soil Category	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Weak Loams & High/Mod Clay Loams (3 & 4)	Weak Clay Loams (4)	Light Clays (5)	Massive Clay Loams (4)	Medium to Heavy Clays (6)
	DLR (mm)	Not supported (Alternative Land Application System Required)							
Development Type	Daily (L/day)								
5 + bedroom residence	1,080								
4 bedroom residence	900								
1-3 bedroom residence	720								

Evapotranspiration-Absorption Trenches and Beds - Primary Treated Effluent (Category 1 to 5) and Secondary Treated Effluent only (Category 6)									
Development Type	Soil Category	Gravels & Sands (1)	Sandy Loams (2)	Loams (3a)	Weak/Massive Loams (3b)	High/Mod Clay Loams (4a)	Weak Clay Loams (4b) & Strong Light Clays (5a)	Massive Clay Loams (4c) and Mod & Weak Light Clays (5b, 5c)	Medium to Heavy Clays (6) - Secondary Effluent Only
	DLR (mm)	20*	20*	15	10	12	8	5	5
Development Type	Daily (L/day)	Total min. basal or 'wetted area' required for zero wet weather storage (m ²) not including spacing or setbacks							
5 + bedroom residence	1,080	63		89	150	118	208		488
4 bedroom residence	900	53		74	125	98	173		407
1-3 bedroom residence	720	42		59	100	79	139		326

Note: * Gravels, Sands and sandy loams are unsuitable for conventional absorption trenches and beds if there is a high watertable, including seasonal and perched watertables. Value based on average of conservative rate and maximum rate for Category 2b and 3a soils in AS1547:2012

LPED Irrigation Systems - Primary or Secondary Treated Effluent									
Development Type	Soil Category	Gravels & Sands (1)	Sandy Loams (2)	Loams (3)	Clay Loams (4)	Light Clays (5)	Medium to Heavy Clays (6)		
	DIR (mm)	N/A	N/A	N/A	N/A	N/A	N/A		
Development Type	Daily (L/day)	(Alternative Land Application System Required)							
5 + bedroom residence	1,080								
4 bedroom residence	900								
1-3 bedroom residence	720								

† required for zero wet weather storage (m²) not including spacing or setbacks

Wick Trenches and Beds - Secondary Treated Effluent Only									
Development Type	Soil Category	Gravels & Sands (1)	Sandy Loams (2) Loams (3) & High/Mod Clay Loams (4a,b)	Weak Clay Loams (4)	Massive Clay Loams (4)	Strong Light Clays (5a)	Moderate Light Clays (5b)	Weak Light Clays (5c)	Medium to Heavy Clays (6)
	DLR (mm)	25	30	20	10	12	8	8	
Development Type	Daily (L/day)	Total min. basal or 'wetted area' required for zero wet weather storage (m ²) not including spacing or setbacks							
5 + bedroom residence	1,080	49	40	63	150	118		208	N/A (Alternative Land Application System Required)
4 bedroom residence	900	41	34	53	125	98		173	
1-3 bedroom residence	720	33	27	42	100	79		139	