C. Barongarook Locality Report

1c. Introduction

Barongarook is located in the centre of COS approximately 9km south of Colac. The landform consists of dissected low hills and alluvial terraces abutting a stream on the northern foothills of the Otway Ranges. Notably, the entire settlement and surrounding locality is located within a DWSC, predominantly Barwon Downs Wellfield Intake DWSC and Gellibrand River DWSC in the southwest, as indicated by the surface water informative map, Appendix A.

There are approximately 265 and 101 unsewered properties/parcels located within the Barongarook locality and settlements, respectively, with 121 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 Barongarook locality are summarised as follows:

- 15 AWTS (5 subsurface irrigation,, 4 drip irrigation, 1 irrigation and 4 unknown);
- 2 sand filters (1 subsurface irrigation and 1 drip irrigation);
- 64 septic tanks (11 trenches, 1 subsurface irrigation and 52 unknown); and
- 40 unknown (12 trenches, 3 subsurface irrigation, 3 irrigation, and 22 unknown).

No field investigations were conducted in the Barongarook locality as part of the 2014 field assessments; however, soil investigations were conducted to confirm the soil type.

2c. Background Documentation

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

- Barongarook Covenant Reserve Land Management Plan (February, 2012);
- COS Planning Scheme; and
- Rural Living Strategy (2011).

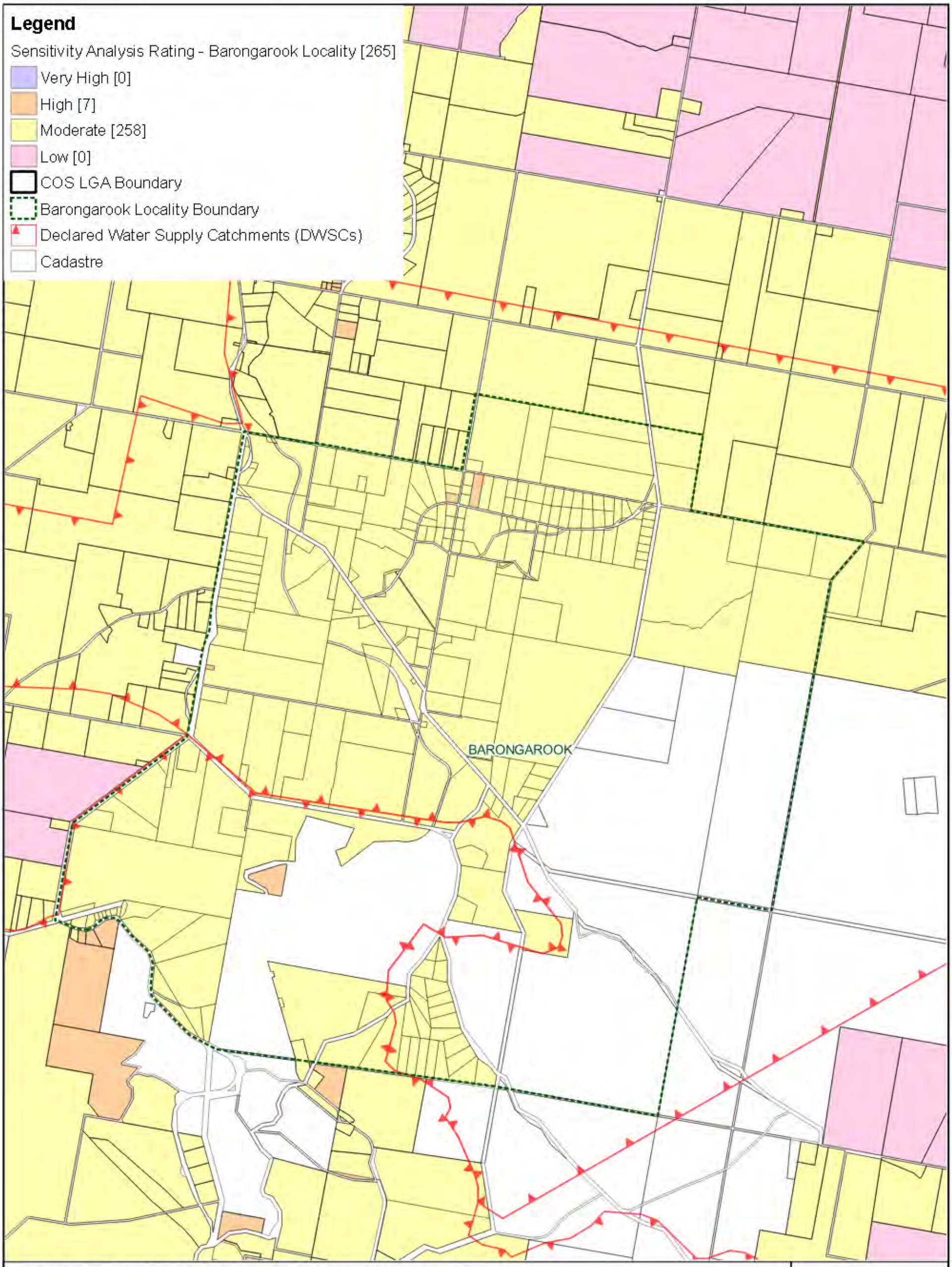
3c. Summary of Constraints to DWM

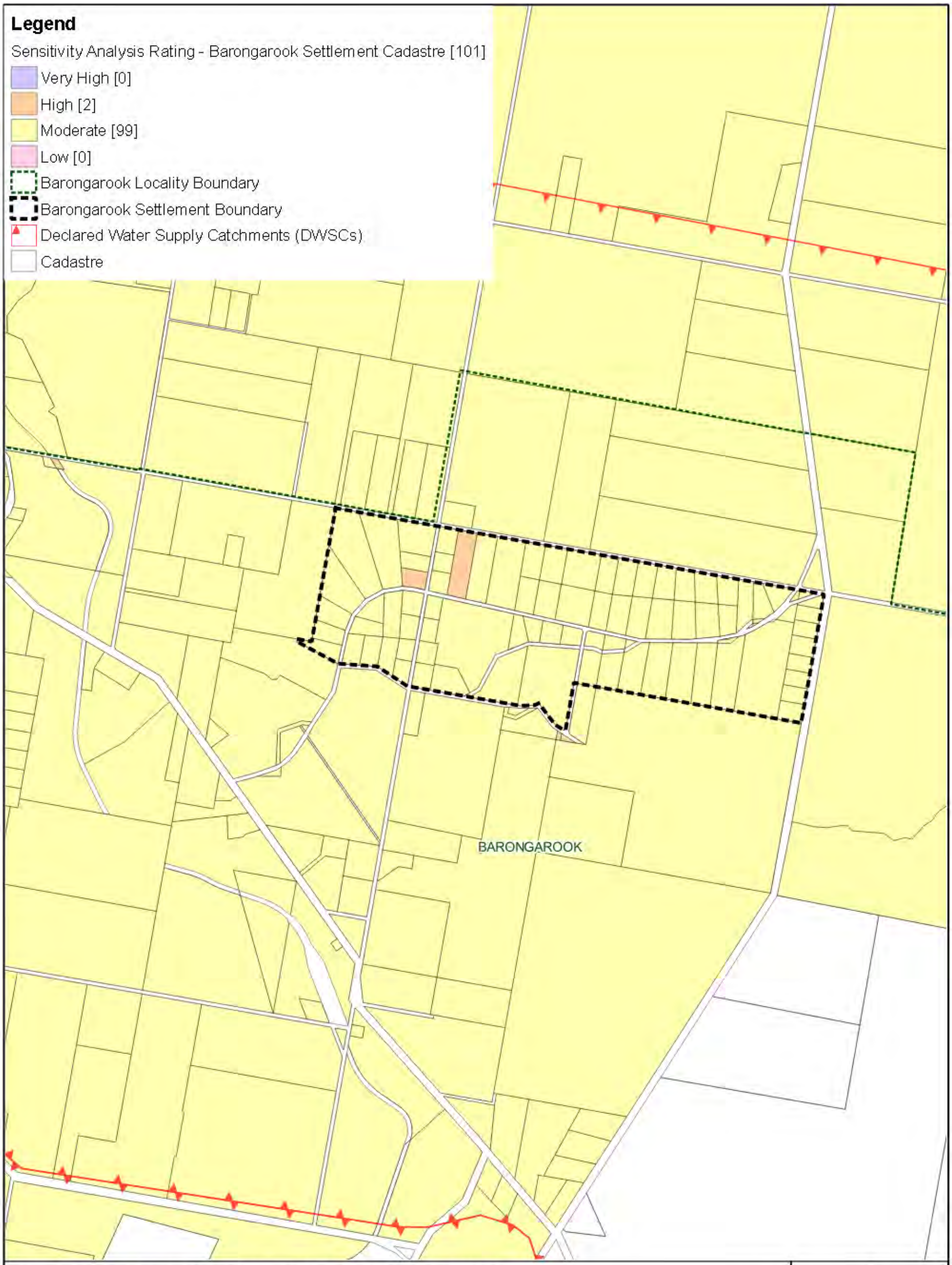
Characteristic	Description
Climate Zone	Zone 3.
Surface waterways & catchments	The locality is located entirely within the Barwon Downs Wellfield Intake (Geelong) DWSC and Gellibrand River DWSC in the south. Boundary Creek is located to the south of the settlement, traversing southwest-northeast. Ten Mile Creek and Dividing Creek are also located to the south of the settlement. Tributaries of the Barongarook Creek West Branch flow into the surrounding region from the north into the settlement.
Groundwater	Proximity to groundwater bores: distributed throughout.
Land subject to inundation	Nil

Characteristic	Description
Useable lot area **Settlement (Locality)**	High: 18 (26) Moderate: 6 (16) Low: 77 (216) Compliant: 0 (7)
Minimum lot size compliance with Planning Scheme Zoning	The locality is predominately in the Farming Zone with some Public Conservation and Resource Zone to the southeast. The settlements (one in the south and the other in the north) are zoned Rural Living. Properties/parcels are predominantly non-compliant, including both settlement areas. Compliant: 0 (15) Non-compliant: 101 (250)
Slope **Settlement (Locality)**	High: 1 (16) Moderate: 16 (48) Low: 84 (37)
Geology	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 alluvial and fluvial deposits associated with the Eumeralla Formation.
Soil suitability **Settlement (Locality)**	High: 0 (0) Moderate: 101 (265) Low: 0 (0) Variable soil landscapes (four). The majority of the locality and southern region of the northern settlement area consists of soil landscape unit ‘88’ which forms along the rolling plains in the western part of the Barwon catchment and northern parts of the Gellibrand catchment and consists of grey sand soils to more than 2m depth. The soils consist of apedal sandy loam to sand over weakly structured sandy clay. Limitations include low fertility and coarse fragments. The northwest region of the locality consists of soil landscape unit ‘92’ (moderate rating) which forms in the undulating plain in the north part of the Gellibrand River Catchment and consist of mottled yellow and red gradational soil to more than 2m depth. The soils consist of moderately structured sandy loam over light clay. Limitations include low fertility and low p-sorb.

Characteristic	Description
	Around Bushbys Road in the northwest consists of soil landscape unit '93' (moderate rating) which forms in the gently undulating plain in the western parts of Barwon Catchment and consist of mottled gradational soil to more than 2m depth. The soils consist of weakly structured loam over moderately structured medium clay. Limitations include low fertility, p-sorb and coarse fragments. The southwest region of the locality consists of soil landscape unit '90' which forms on the rolling hills in the northern upper reaches of the Gellibrand catchment and consists of mottled gradational soil to more than 2m depth. The soil consists of apedal fine sandy loam over weakly structured silty clay loam. Limitations include low p-sorb, low fertility and restricted drainage.
Sensitivity Overlay	Depth to Groundwater Compliance: variable compliancy; predominantly compliant, except for the middle of the locality and a few properties/parcels in the northern settlement. Landslip: minimal. Vegetation: Otway Forest Park and Great Otway National Park to the south to southeast.
Sensitivity Analysis Rating **Settlement (Locality)**	Very High: 0 (0) High: 2 (7) Moderate: 99 (258) Low: 0 (0)

4c. Sensitivity Analysis (Maps)


Legend
Sensitivity Analysis Rating - Barongarook Locality [265]
Very High [0]
High [7]
Moderate [258]
Low [0]
COS LGA Boundary
Barongarook Locality Boundary
Declared Water Supply Catchments (DWSCs)
Cadastre
BARONGAROOK
Figure c1: Sensitivity Analysis - Bargonarook Locality
Colac Otway Shire DWMP Review
Whitehead & Associates
Environmental Consultants
0 1 2 3 4 5 km
(Approx Scale)
N
Revision 3
Drawn JK
Approved MS


Legend
Sensitivity Analysis Rating - Barongarook Settlement Cadastre [101]
Very High [0]
High [2]
Moderate [99]
Low [0]
Barongarook Locality Boundary
Barongarook Settlement Boundary
Declared Water Supply Catchments (DWSCs)
Cadastre
BARONGAROOK
Figure c2: Sensitivity Analysis - Barongarook Settlement
Colac Otway Shire DWMP Review
Whitehead & Associates
Environmental Consultants
0 0.5 1 1.5 2 2.5 km
(Approx Scale)
N
Revision 3
Drawn JK
Approved MS

5c. System Selection

Due to the dominance of heavy-textured soils in the Barongarook 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).

EPA Code of Practice (2013) (Section 2.2.2) identifies secondary treatment standard (or better) followed by subsurface pressure-compensating irrigation as current best-practice in Victoria for substantially reducing the risk associated with unsewered development. Further, the Code describes a "Wick trench/bed" land application option that may be incorporated with secondary treatment for consideration on sites constrained by climate or lot 'useable area', particularly within the DWSCs. Any variation from this best-practice approach must be provided with detailed supporting information to demonstrate suitability.

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

6c. 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 Barongarook 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 Barongarook are provided below.

7c. General Conclusion

The properties/parcels within the locality have predominantly been assigned a Moderate Sensitivity to sustainable DWM, with some properties/parcels assigned a Low or High Sensitivity Rating. Predominantly, the Standard LCA will be required, with use of the 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 assessing cumulative impact of DWM systems on the environment to ensure that the DWSCs are protected and that groundwater resources are preserved.

Barongarook

Drip and Spray Irrigation Systems* - Secondary Treated Effluent only									
	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)†**					**N/A (Alternative Land Application System Required)**		
5 + bedroom residence	1,080	386		600	831	1,350			
4 bedroom residence	900	322		500	693	1,125			
1-3 bedroom residence	720	258		400	554	900			
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									
† not including spacing and setbacks									

Conventional Absorption Trenches and Beds - Primary Treated Effluent									
	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)									
	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 & setbacks**							
5 + bedroom residence	1,080	62		87	145	115	199	441	
4 bedroom residence	900	52		73	121	96	166	368	
1-3 bedroom residence	720	42		58	97	77	133	294	
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									
	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 (Alternative Land Application System Required)**	**4**	**3.5**	**N/A (Alternative Land Application System Required)**	**N/A (Alternative Land Application System Required)**	**N/A (Alternative Land Application System Required)**		
Development Type	**Daily (L/day)**		**Total min. basal or 'wetted area' (m^2)†**						
5 + bedroom residence	1,080		744	1,135					
4 bedroom residence	900		620	946					
1-3 bedroom residence	720		496	757					
† required for zero wet weather storage (m^2) not including spacing & setbacks									

Wick Trenches and Beds - Secondary Treated Effluent Only									
	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**	**5**
Development Type	**Daily (L/day)**	**Total min. basal or 'wetted area' required for zero wet weather storage (m^2) not including spacing & setbacks**							
5 + bedroom residence	1,080	49	40	62	145	115	199	441	
4 bedroom residence	900	41	33	52	121	96	166	368	
1-3 bedroom residence	720	33	27	42	97	77	133	294	