

F. Beech Forest Locality Report

1f. Introduction

Beech Forest is located approximately 43km south of Colac on the northern edge of the Otway Ranges. The landform consists of rolling hills and crests of the Otway Ranges. Approximately half of the locality is located within a DWSC; with the northern region located within Gellibrand River DWSC and the southeast region located within Barham River DWSC. The main road through the town runs along a ridgeline that forms the DWSC boundary as indicated by the surface water informative map A1, Appendix A.

There are approximately 354 and 150 unsewered properties/parcels located within the Beech Forest locality and town, respectively, with 34 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 Beech Forest locality are summarised as follows:

- 7 AWTs (1 irrigation, 3 drip irrigation, 2 trenches, and 1 unknown);
- 1 sand filter (1 drip irrigation);
- 12 septic tanks (4 trenches, 8 unknown);
- 1 worm farm (1 trench); and
- 13 unknown (6 trenches, 1 subsurface irrigation and 6 unknown).

2f. Background Documentation

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

- Beech Forest Township Master Plan Report (May, 2004);
- COS Planning Scheme; and
- Rural Living Strategy (2011).

3f. Site Assessment Results

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

Characteristic	Description
Land use	Beech Forest comprises a range of land uses, including dairy, forestry, rural living and tourism.
Occupancy rates	2.3 (Beech Forest State Suburb, ABS Census, 2011).
Typical soils	Gradational profile of dark grey brown sandy clay loam grading to dark brown silty clay loam between 10-25cm, grading to dark brown to dark reddish brown sandy clay loam with excellent structure and fairly common small rock fragments. Drainage and permeability are variable depending on slope and position.
AS/NZS 1547:2012	4 (Clay Loams) and 5 (Light Clays)

Characteristic	Description
soil categories	
Existing Systems	<p>Separate Blackwater and Greywater</p> <p>Of the six systems inspected during field investigations, just one (17%) comprised separate blackwater treatment in a septic tank, with direct greywater diversion to the ground surface within the property/parcel boundary.</p> <p>The blackwater septic tank was 40+ years old and had been pumped out more than 15 years ago. Septic effluent discharged to one conventional absorption trench of approximately 3m length, on land of less than 4% slope and parallel with contours. There was no evidence of blackwater effluent surcharging to the surface. Soils were typically soft or boggy, mainly due to recent high rainfall.</p> <p>Combined Blackwater and Greywater</p> <p>Five of the six systems (83%) inspected had combined wastewater treatment systems or were assumed to have combined systems, based on layout of pipework and/or age of dwelling. One of these five systems is an Aerated Wastewater Treatment System (AWTS), for a commercial property. It is likely that the proportion of combined systems in Beech Forest is likely to be less than this; however, this should be confirmed by ongoing inspections by Council.</p> <p>Septic tank effluent discharged to one or more conventional absorption trenches, or was assumed to when the LAA could not be identified. Generally trenches were undersized for the number of bedrooms or there was inadequate suitable space for an appropriately sized LAA.</p> <p>The AWTS effluent discharged to a subsurface irrigation system of approximately 480m².</p>

4f. Summary of Constraints to DWM

Characteristic	Description
Climate Zone	The town is included within Zone 4 and part of the surrounding locality is located within Zone 3.
Surface waterways & catchments	<p>The northern half and the south-eastern corner of the locality are located within the Gellibrand River DWSC and Barham River DWSC, respectively. The DWSC boundary runs along the ridgeline, which forms the major road running through the middle of the town. The drainage network is extensive, with West Gellibrand Dam located in the northeast of the locality along the Gellibrand River.</p> <p>Waterways located within the DWSC are: Asplin Creek, Larder Creek East and West Branches, Little Larder Creek, McDonald Creek, Charleys Creek, Barham River East Branch, Falls Creek, and Seaview</p>

Characteristic	Description
	<p>Creek.</p> <p>Waterways located outside of the DWSC are: Aire River, Little Aire Creek, Youngs Creek, Corgram Creek, Farrell Creek, Beech Creek, and Deppeler Creek.</p>
Groundwater	Proximity to groundwater bores: minimal (only 3).
Land subject to inundation	Nil.
Useable Lot Area Town (Locality)	<p>High: 98 (125)</p> <p>Moderate: 39 (67)</p> <p>Low: 13 (146)</p> <p>Compliant: 0 (16)</p>
Minimum lot size compliance with Planning Scheme Zoning	<p>The locality is predominantly zoned Farming Zone to the west and Public Conservation and Resource Zone to the east. The town is zoned as Township Zone.</p> <p>Compliance is variable throughout the locality, with the smaller town properties/parcels generally compliant and the larger rural properties/parcels non-compliant.</p> <p>Compliant: 147 (191)</p> <p>Non-compliant: 3 (163)</p>
Slope Town (Locality)	<p>High: 98 (229)</p> <p>Moderate: 26 (64)</p> <p>Low: 26 (61)</p>
Geology	Underlain by Eumeralla Formation of Otway Group which consist of fluvial and braided stream sedimentary deposits.
Soil suitability Town (Locality)	<p>High: 150 (302)</p> <p>Moderate: 0 (52)</p> <p>Low: 0 (0)</p> <p>The central region of the locality, including the town, consists of soil landscape unit '60' which form on rolling hills along the top of the Otway Ranges. The soil consists of brown friable gradational soils with weakly structured clay loam over light clay to 0.9m depth. Limitations include restricted drainage.</p> <p>The remainder of the locality consists of soil landscape unit '61' which forms on the deeply dissected hills of the Otway Ranges and consists of brown gradational soils to 1.2m depth. The soils consist of</p>

Characteristic	Description
	moderately structured silty loam over clay loam. Limitations include acidity and restricted drainage.
Sensitivity Overlay	No depth to groundwater data. Landslip: extensive around locality Vegetation: both sides of ridgeline.
Sensitivity Analysis Rating Town (Locality)	Very High: 103 (126) High: 44 (162) Moderate: 3 (66) Low: 0 (0)

5f. Sensitivity Analysis (Maps)

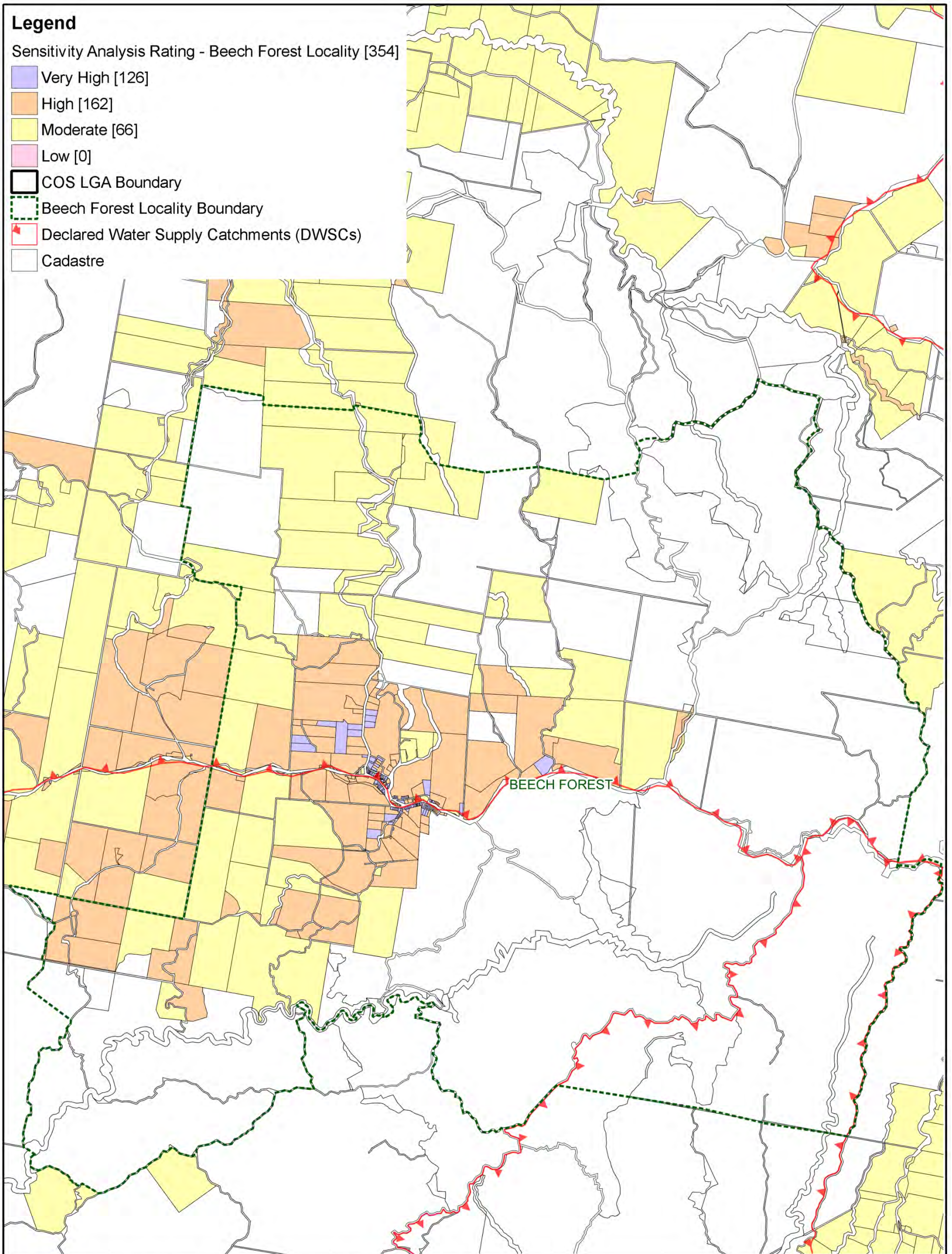


Figure f1: Sensitivity Analysis - Beech Forest Locality

Colac Otway Shire DWMP Review

	<p>(Approx Scale)</p>		Revision	3
			Drawn	JK
			Approved	MS

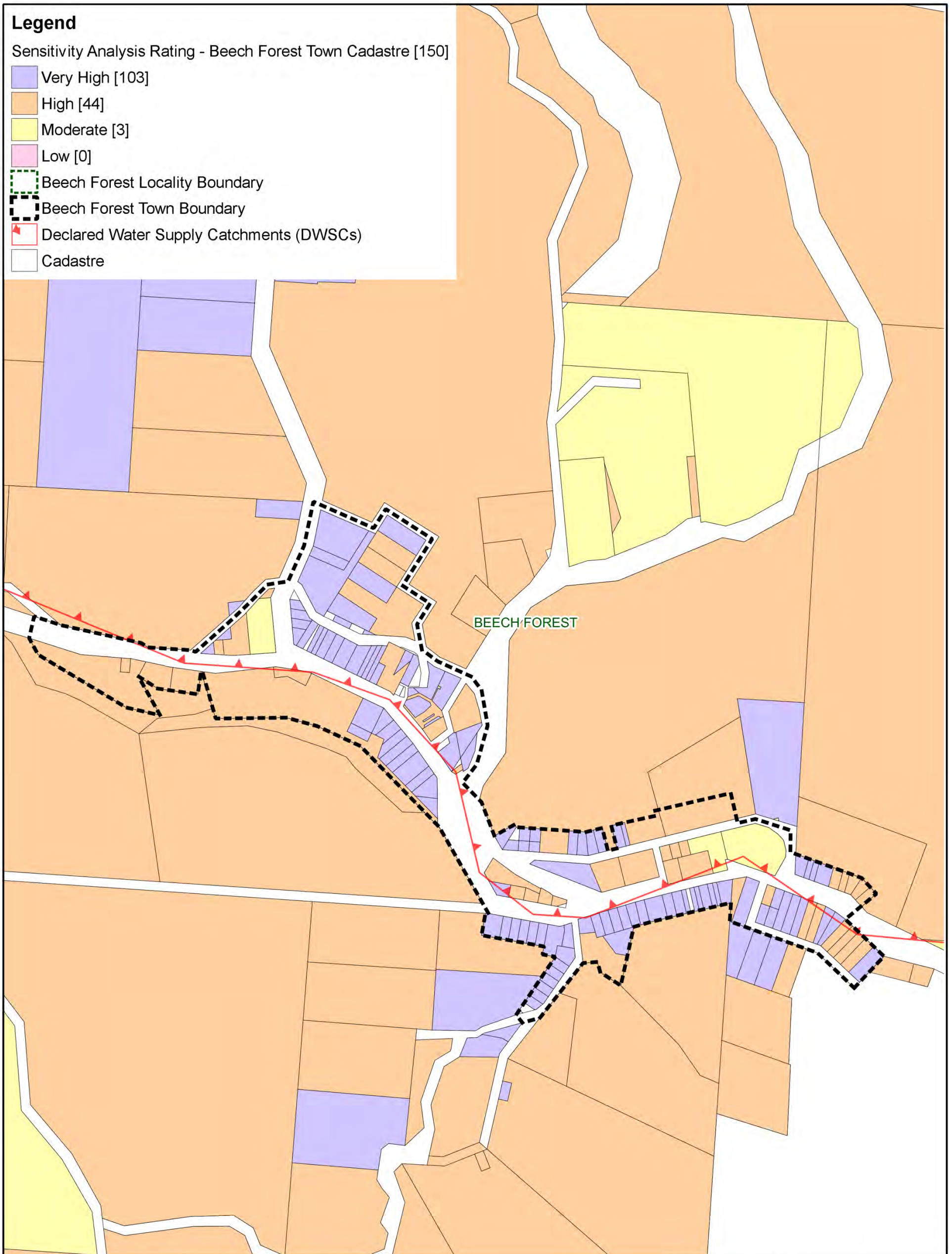


Figure f2: Sensitivity Analysis - Beech Forest Town

Colac Otway Shire DWMP Review

	<p>(Approx Scale)</p>	
	Revision	3
	Drawn	JK
Approved	MS	

6f. System Selection

Due to the shallow soils and localised steep slopes in the Beech Forest locality, conventional absorption trenches and beds are not likely to be feasible and are discouraged.

The wet climate of the Beech Forest area makes it a high risk for DWM and site-specific, detailed land capability assessment and design will be required for unsewered properties/parcels in this area. 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.

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.

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

7f. 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 was sourced from the Beech Forest BoM station (090006) and average evapotranspiration data for Beech Forest 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.

Design Loading Rates (DLRs) and Design Irrigation Rates (DIRs) were taken from the EPA Code of Practice. Where the Code 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’ (N/A) for that soil type in the Sizing Tables. Detailed, site-specific LCAs and system designs would be required to justify the feasibility of these systems.

Sizing Tables for the Beech Forest locality are provided below.

8f. General Conclusion

The majority of properties/parcels within the locality have been assigned a Very High or High Sensitivity Rating to sustainable DWM. Predominantly, Detailed and Comprehensive LCAs will be required; however, all levels of LCA will require site-specific design due to the higher rainfall associated with this region (Climate Zone 4), as per Figure 3 of the DWMP Technical Document. Particular attention needs to be directed towards ensuring that DWM systems are sized based on the limiting soil horizon and that the systems selected are appropriate for steeper slopes with correct construction. The locality is also extensively considered to be prone to landslip; a geotechnical report by a suitably qualified person will need to be conducted to address this constraint.

Beech Forest (including Ferguson and Weeaprounah)										
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)	Not supported (Alternative Land Application System or Extensive/Modified Design Required)								
Development Type	Daily (L/day)									
5 + bedroom residence	1,080									
4 bedroom residence	900									
1-3 bedroom residence	720									
Notes: * 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 or 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 3a to 5a) only										
	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	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' required for water balance (m²) not including spacing & setbacks								
5 + bedroom residence	1,080	Not Supported (not considered best-practice)		131	332	206	862**			
4 bedroom residence	900			110	277	172	719**			
1-3 bedroom residence	720			88	222	138	575**			
Notes: * Gravels, Sands and Sandy loams are generally unsuitable for ETA 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. ** Will require specialist advice regarding engineering and construction detail for installation.										
† will require detailed hydraulic design for effluent distribution system.										
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)	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									
Wick Trench† - 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	N/A (Alternative Land Application System Required)	
Development Type	Daily (L/day)	Total min. basal or 'wetted area' required for water balance (m²) not including spacing & setbacks								
5 + bedroom residence	1,080	Not Supported (not considered best-practice)		81	311	198	734**			
4 bedroom residence	900			67	260	165	611**			
1-3 bedroom residence	720			54	208	132	489**			
Notes: ** Will require specialist advice regarding engineering and construction detail for installation.										
† will require detailed hydraulic design for effluent distribution system.										