

## L. Kawarren Locality Report

### 1I. Introduction

Kawarren is located approximately 16km south of Colac. It is located on rolling hills or dissected hills abutting rivers and streams or large flood plains with undulating agricultural land. Notably, approximately 90% of the locality is located within a DWSC; predominantly Gellibrand River DWSC and a small portion in the northeast corner located within Barwon Downs Wellfield Intake DWSC.

There are approximately 215 and 72 unsewered properties/parcels located within the Kawarren locality and settlement, 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 Kawarren locality are summarised as follows:

- 6 AWTS (1 drip irrigation, 1 trench, 1 irrigation and 2 unknown);
- 1 composting toilet (1 trench);
- 3 sand filter (1 irrigation and 2 subsurface irrigation);
- 36 septic tank (12 trenches and 24 unknown); and
- 16 unknown (10 trenches and 6 unknown).

### 2I. Background Documentation

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

- COS Planning Scheme; and
- Rural Living Strategy (2011).

### 3I. Site Assessment Results

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

Characteristic	Description
Land use	Comprises of a range of land uses, including dairy, forestry, rural living and tourism.
Occupancy rates	2.3 persons (Part of the Gellibrand State Suburb ABS Census, 2011) <sup>5</sup> .
Typical soils	Grey brown fine sandy loam to fine sandy clay loam becoming mottled at 15cm, abrupt change at 30cm to mottled light yellow brown and grey brown silty clay loam, grading to increasing mottling with depth to bright dark yellow brown, strong brown silty clay loam with some black small concretions below 80cm depth. Drainage and permeability are variable depending on slope and position.

---

<sup>5</sup> No separate data for individual small townships and localities.

<b>Characteristic</b>	<b>Description</b>
<b>AS/NZS 1547:2012 soil categories</b>	4 (Clay Loams) to 5 (Light Clays)
<b>Existing Systems</b>	<p><b>Separate Blackwater and Greywater</b></p> <p>Of the 8 systems inspected during field investigations, 75% of systems comprised separate blackwater treatment in a septic tank, with direct greywater diversion to an adjacent paddock (not to street drains, due to blocks generally sloping away from the street frontage). 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 approximately half had been pumped out within the last ten years. Septic effluent discharged to one or more conventional absorption trenches, some of which could not be identified without the owner present. The majority of trenches were located on land of less than 8% slope and appeared to be parallel with contours (i.e. running across slope, not down it). There was no evidence of blackwater effluent surcharging to the surface; however soils were typically soft or boggy, mainly due to recent high rainfall.</p> <p><b>Combined Blackwater and Greywater</b></p> <p>25% of systems inspected had combined wastewater treatment systems or were assumed to have combined systems, based on layout of pipework. It is likely that the proportion of combined systems in Kawayren is less than this; however, this should be confirmed by ongoing inspections by Council.</p> <p>Septic effluent discharged to one or more conventional absorption trenches, which were all undersized for the number of bedrooms, and/or located in inadequately sized available land application areas (LAAs).</p>

#### 4I. Summary of Constraints to DWM

<b>Characteristic</b>	<b>Description</b>
<b>Climate Zone</b>	Zones 2 and 3.
<b>Surface waterways &amp; catchments</b>	The locality is located within the Gellibrand River and Barwon Downs Wellfield Intake DWSCs. The waterways include: Love Creek to the north of the settlement, Yahoo Creek, Ten Mile Creek, and Porcupine Creek which contains an extensive waterbody.
<b>Groundwater</b>	Proximity to groundwater bores: significantly dense distribution throughout the settlement and along the river, similar to Gellibrand.

<b>Characteristic</b>	<b>Description</b>
<b>Land subject to inundation</b>	Nil.
<b>Useable lot area</b> <b>Settlement (Locality)</b>	High: 37 (72) Moderate: 6 (16) Low: 29 (121) Compliant: 0 (6)
<b>Minimum lot size compliance with Planning Scheme Zoning</b>	<p>The locality is predominantly zoned Farming Zone and Public Conservation and Resource Zone. The settlement is zoned Rural Living Zone.</p> <p>The majority of properties/parcels are non-compliant, particularly within the settlement.</p> <p>Compliant: 2 (29)</p> <p>Non-compliant: 70 (186)</p>
<b>Slope</b> <b>Settlement (Locality)</b>	High: 6 (58) Moderate: 29 (74) Low: 37 (83)
<b>Geology</b>	Gellibrand Marl of Heytesbury Group (continental shelf deposits) is dominant with Older Volcanic Group to the west and north of settlement. The Clifton Formation of Heytesbury Group straddles the Older Volcanic Group and alluvial flood plain deposits. Demons Bluff Formation of the Nirranda Group is to the north of locality.
<b>Soil suitability</b> <b>Settlement (Locality)</b>	<p>High: 0 (13)</p> <p>Moderate: 72 (202)</p> <p>Low: 0 (0)</p> <p>Variable soil landscapes throughout locality (5 in total).</p> <p>The settlement and the majority 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.</p> <p>The settlement and to the east of the locality consists of soil landscape unit '76' which forms on undulating plains. The soil consists of grey sand soils to more than 2m depth with weak loamy sand overlying apedal sand. Limitations include low fertility.</p>

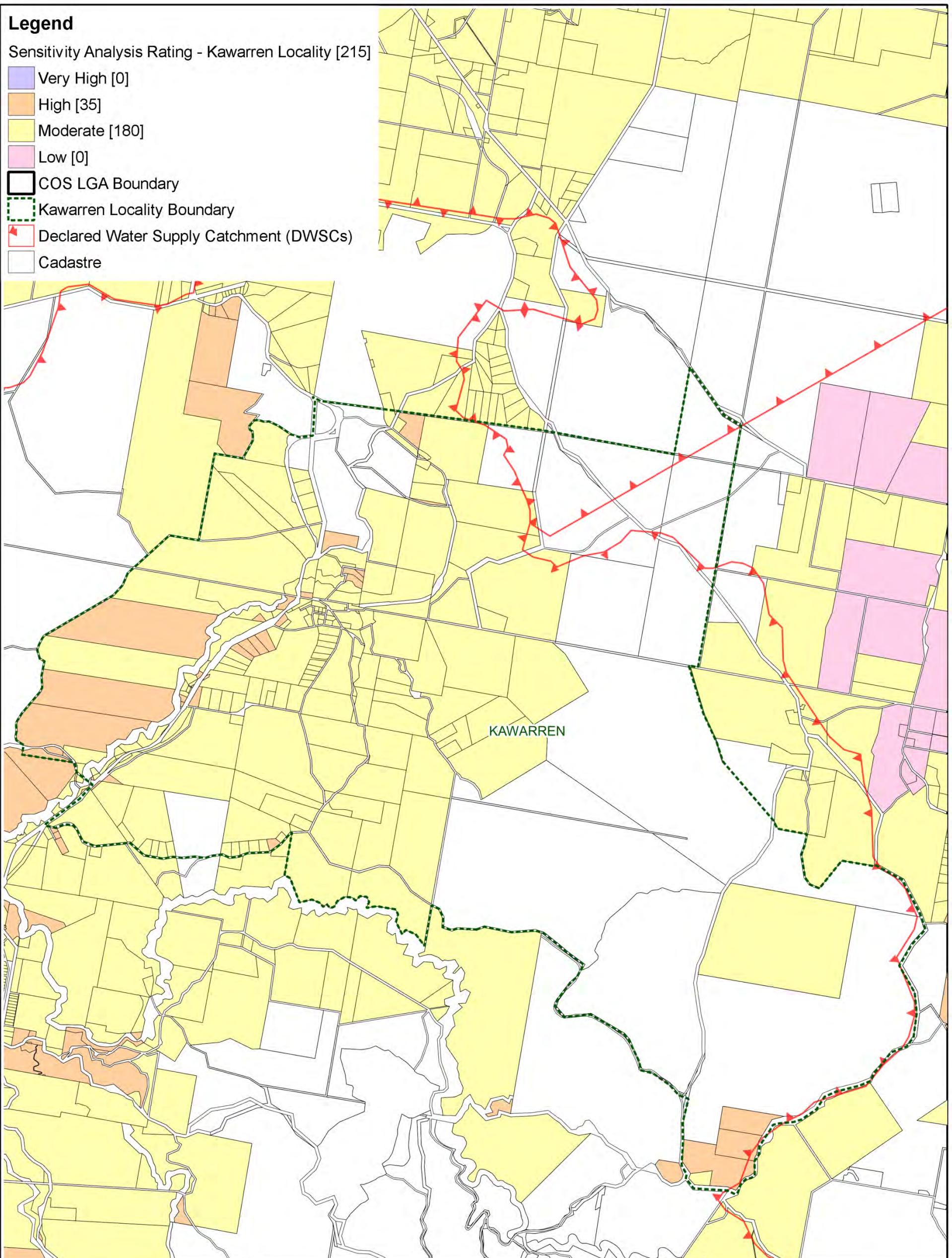
Characteristic	Description
<b>Sensitivity Overlay</b>	Depth to Groundwater Compliance: predominantly compliant, except for along Love Creek which transverses northeast to southwest around the settlement. Landslip: minimal, with a few large regions to the east of the settlement. Vegetation: eastern half of locality consists of Otway Forest Park and Great Otway National Park.
<b>Sensitivity Analysis Rating</b> <b>Settlement (Locality)</b>	Very High: 0 (0) High: 12 (35) Moderate: 60 (180) Low: 0 (0)

## 5I. Sensitivity Analysis (Maps)

**Legend**

Sensitivity Analysis Rating - Kawarren Locality [215]

- Very High [0]
- High [35]
- Moderate [180]
- Low [0]
- COS LGA Boundary
- Kawarren Locality Boundary
- ◆ Declared Water Supply Catchment (DWSCs)
- Cadastre

**Figure I1: Sensitivity Analysis - Kawarren Locality**

Colac Otway Shire DWMP Review



**W** Whitehead & Associates  
Environmental Consultants

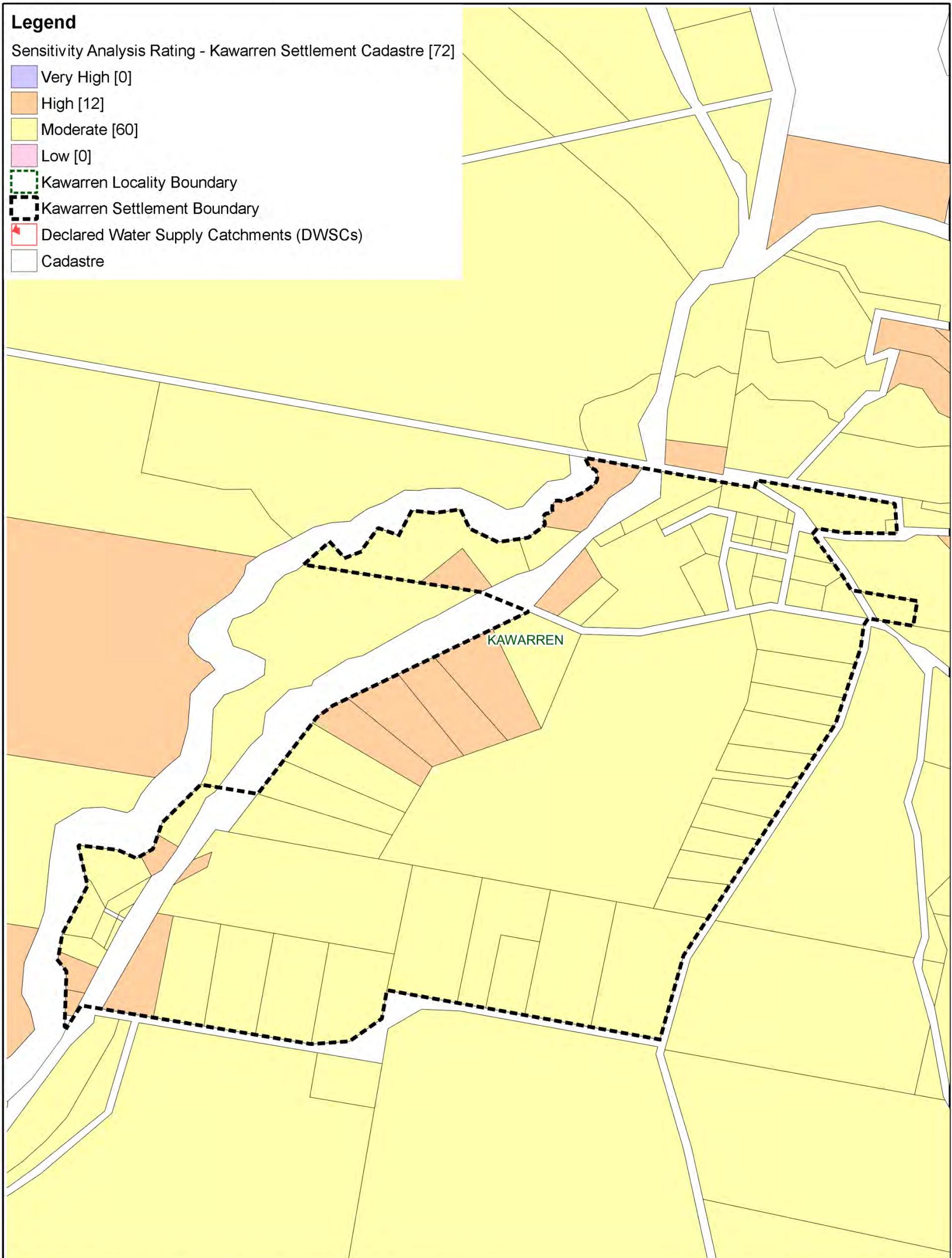
0 1 2 3 4 5 km  
(Approx Scale)

Revision	3
Drawn	JK
Approved	MS

**Legend**

Sensitivity Analysis Rating - Kawarren Settlement Cadastre [72]

- Very High [0]
- High [12]
- Moderate [60]
- Low [0]
- Kawarren Locality Boundary
- Kawarren Settlement Boundary
- Declared Water Supply Catchments (DWSCs)
- Cadastre

**Figure I2: Sensitivity Analysis - Kawarren Settlement**

Colac Otway Shire DWMP Review


**Whitehead & Associates**  
Environmental Consultants

0	0.25	0.5	0.75	1	1.25 km
(Approx Scale)					

Revision	3
Drawn	JK
Approved	MS

## **6I. System Selection**

Based on soil types and indicative depths, the Kawarren locality has the potential to sustainably accommodate a broad range of system types, depending on the influences of climate.

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.

## **7I. 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 70<sup>th</sup> percentile rainfall and average evapotranspiration data for Kawarren 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 Kawarren locality are provided below.

## **8I. General Conclusion**

The properties/parcels within the locality have predominantly been assigned a Moderate Sensitivity Rating to sustainable DWM; however, some properties/parcels, particularly in the settlement, have been assigned a High and Low Sensitivity Rating. 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 appropriate setbacks to surface waterways, groundwater bores and flood prone areas are maintained. It is imperative that there is sufficient useable area to sustainably manage wastewater on-site.

**Gellibrand & Kawarren**

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 <sup>2</sup> )†													
5 + bedroom residence	1,080	379	584	800	1,269	2,329									
4 bedroom residence	900	316	487	667	1,058	1,941									
1-3 bedroom residence	720	253	389	533	846	1,553									
<b>Note:</b> * 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)	Not supported (Alternative Land Application System Required)													
5 + bedroom residence	1,080	Not supported (Alternative Land Application System Required)													
4 bedroom residence	900	Not supported (Alternative Land Application System Required)													
1-3 bedroom residence	720	Not supported (Alternative Land Application System Required)													
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 <sup>2</sup> ) not including spacing & setbacks													
5 + bedroom residence	1,080	62	87	145	114	197	433								
4 bedroom residence	900	52	73	121	95	164	361								
1-3 bedroom residence	720	42	58	97	76	132	289								
<b>Note:</b> * 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)									
Development Type	Daily (L/day)		Total min. basal or 'wetted area'†												
5 + bedroom residence	1,080		723	1,086											
4 bedroom residence	900		603	905											
1-3 bedroom residence	720		482	724											
† required for zero wet weather storage (m <sup>2</sup> ) 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	N/A (Alternative Land Application System Required)						
Development Type	Daily (L/day)	Total min. basal or 'wetted area' required for zero wet weather storage (m <sup>2</sup> ) not including spacing & setbacks													
5 + bedroom residence	1,080	49	40	62	145	114	197								
4 bedroom residence	900	41	33	52	121	95	164								
1-3 bedroom residence	720	33	27	42	97	76	132								