# E. Beeac Locality Report

## 1e. Introduction

Beeac is a rural town located on the northern side of Lake Beeac, approximately 19km north of Colac. The landform features undulating agricultural land on the Western Volcanic Plains.

There are approximately 603 and 269 unsewered properties/parcels located within the Beeac locality and town, respectively, with 80 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 Beeac locality are summarised as follows:

- 11 AWTS (3 subsurface, 1 trench, 5 drip irrigation, 2 unknown);
- 2 sand filters (1 subsurface irrigation and 1 unknown);
- 43 septic tanks (11 trenches, 1 irrigation and 31 unknown); and
- 24 unknown (6 trenches, 1 subsurface irrigation, and 17 unknown).

No field investigations were conducted within Beeac locality as part of the 2014 field assessments; however, soil investigations were conducted to confirm the soil type. There have been noted issues with the earthen stormwater drains; particularly with regards to odour and amenity with standing water which could also contain wastewater in the form of greywater or combined wastewater. These earthen stormwater drains flow into Lake Beeac.

## 2e. Background Documentation

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

- Urban Design Framework Plans for Beeac (2006/2007);
- Lake Beeac Catchment Plan (1998);
- Beeac Cemetery and Grasslands Land Management Plan (February, 2012);
- Colac Otway Domestic Wastewater Management Plan (2007);
- COS Planning Scheme; and
- Rural Living Strategy (2011).

## 3e. Summary of Constraints to DWM

| Characteristic | Description |
|---|---|
| **Climate Zone** | Zone 2. |
| **Surface waterways & catchments** | The locality has an extensive coverage of lakes, with Lake Beeac forming the largest waterbody to the southwest of the town. Other waterbodies include: Lake Cunadare to the northwest, Thomas Lake, Cemetery Lake, Butchers Lake, Calvert Lough and constructed drainage network to the east of the town. |
| **Groundwater** | Proximity to groundwater bores: primarily located within the western half of the locality. |

| Characteristic | Description |
|---|---|
| | Groundwater is seasonally high at some sites but depth hasn't been ascertained. |
| **Land subject to inundation** | Extensive, particularly to the east of the town and around Lake Beeac. |
| **Useable Lot Area**<br>**Town (Locality)** | High: 198 (236)<br>Moderate: 58 (80)<br>Low: 12 (275)<br>Compliant: 1 (12) |
| **Minimum lot size compliance with Planning Scheme Zoning** | The locality is predominantly zoned Farming Zone, with some land around the lakes in the Public Conservation and Resource Zone. The town is zoned as Township Zone.<br>Compliancy is variable throughout the locality; the Farming Zoned properties/parcels are generally non-compliant to the east of the town and the town is compliant.<br>Compliant: 263 (283)<br>Non-compliant: 6 (320) |
| **Slope**<br>**Town (Locality)** | High: 0 (0)<br>Moderate: 0 (0)<br>Low: 269 (603) |
| **Geology** | Beeac is underlain by unnamed stony rises and hummocky lava flows of Newer Volcanic Group and unnamed non-marine sediments comprising swamp, lake deposits of clay, silt, sand and humic soil that is moderately sorted and unconsolidated. Northeast section have hills with gentle crests and flat plains located on lunette, lake and beach deposits of clay, quartz sand, coxiella shells and minor swamp deposits. |
| **Soil suitability**<br>**Town (Locality)** | Soil has moderate to poor drainage and consists predominantly of shallow silty loam or sandy grey silt topsoil, followed by moist dark grey to brown silty clay, over moist grey or grey/yellow clay. Soil permeability 0.08-0.06m/day<br>High: 269 (561)<br>Moderate: 0 (42)<br>Low: 0 (0)<br>The town and majority of the locality consists of soil landscape unit '148' which forms on the gently undulating plains with low rises and lunettes, swamps and lakes and consists of texture contrast soils to |

| Characteristic | Description |
|---|---|
| | less than 2m depth. The soil consists of strongly structured medium clay over heavy clay. Limitations include restricted drainage, dispersive, very acidic, coarse fragments and sodic.<br><br>Surrounding soil landscape '148' and to the east consists of soil landscape unit '153' which forms on gently undulating plains with swamps, lunettes and lakes and consists of textured contrast soils to less than 2m depth. The soils consist of strongly structured fine sandy clay loam over light to heavy clay. Limitations include restricted drainage, dispersive, very acidic, sodic and coarse fragments.<br><br>The land to the west of the town consists of soil landscape unit '114' which forms on undulating basalt plains and stony rises. The soil consists of strongly structured clay loam to medium clay to less than 1.5m depth. Limitations include restricted drainage and coarse fragments. |
| **Sensitivity Overlay** | Depth to Groundwater Compliance: all compliant.<br><br>Landslip: Nil.<br><br>Vegetation: Lake Beeac to the south/southwest of town is an internationally important habitat for waterbirds, Lough Calvert Drainage Scheme (central), Lake Cundare, Cockatoo and Cemetery to the north of Lake Beeac. |
| **Sensitivity Analysis Rating**<br><br>**Town (Locality)** | Very High: 0 (0)<br><br>High: 198 (235)<br><br>Moderate: 70 (321)<br><br>Low: 1 (47) |

## 4e. Sensitivity Analysis (Maps)

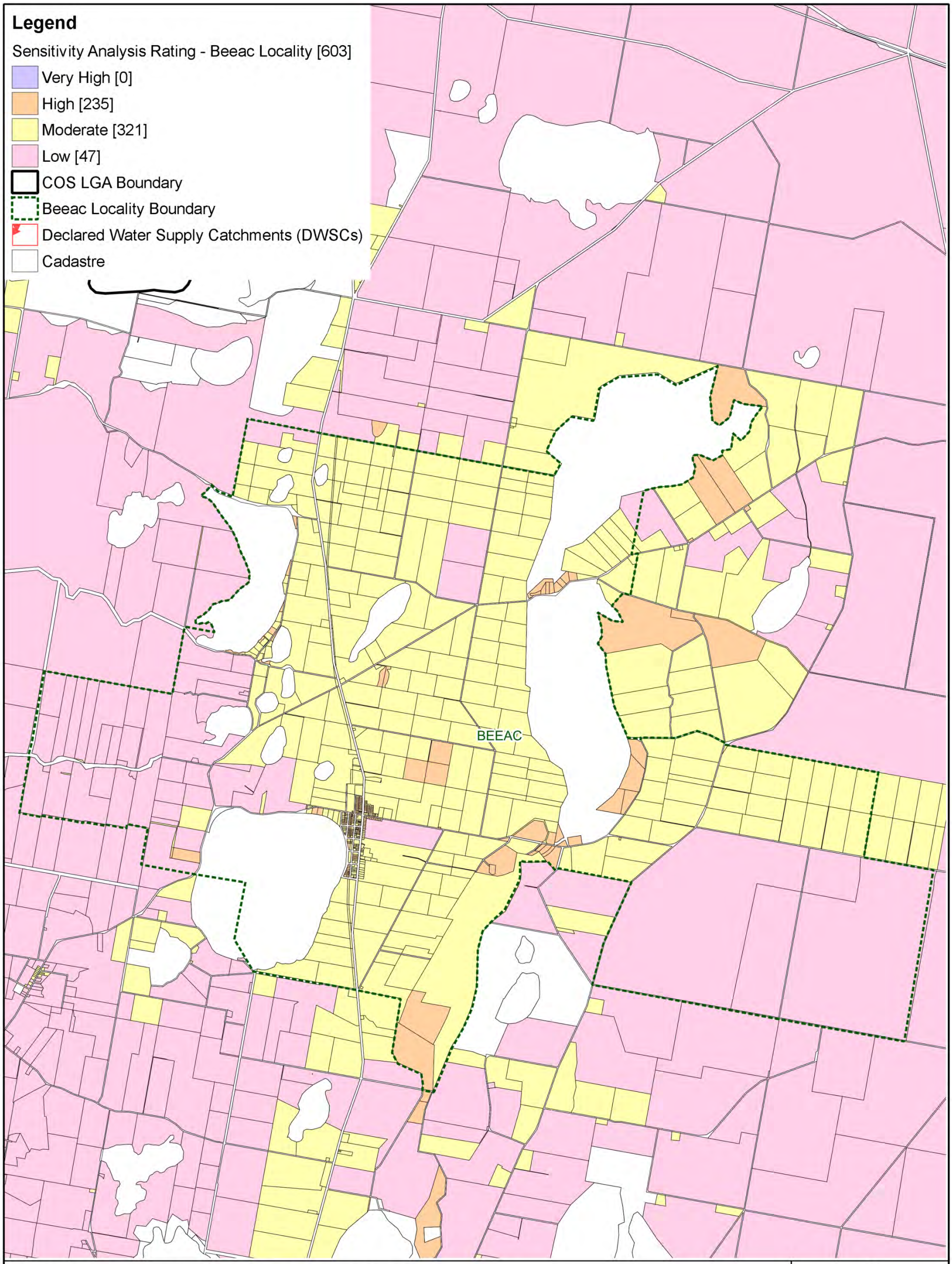


**Figure e1: Sensitivity Analysis - Beeac Locality**

Colac Otway Shire DWMP Review

Whitehead & Associates Environmental Consultants

0 1.5 3 4.5 6 7.5 km

(Approx Scale)

N

| | |
|---|---|
| Revision | 3 |
| Drawn | JK |
| Approved | MS |

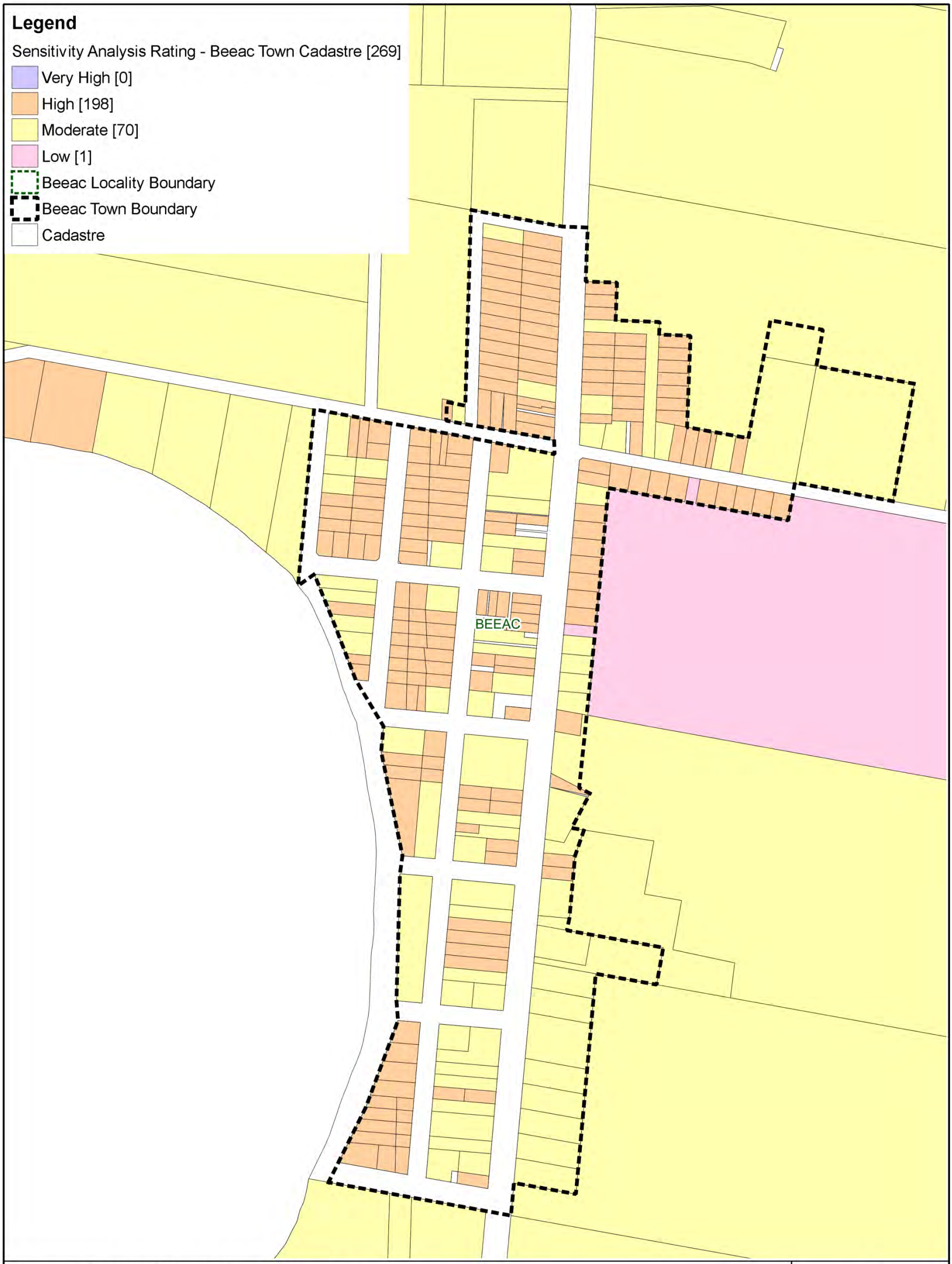


**Figure e2: Sensitivity Analysis - Beeac Town**

Colac Otway Shire DWMP Review

Whitehead & Associates Environmental Consultants

0 150 300 450 600 750 m

(Approx Scale)

N

| | |
|---|---|
| Revision | 3 |
| Drawn | JK |
| Approved | MS |

## 5e. System Selection

Due to the dominance of heavy-textured soils in the Beeac 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). The System Sizing Tables (below) indicate which systems are likely to be the most appropriate for the locality.

## 6e. 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. The water balances used monthly 70$^{th}$ percentile rainfall and average evapotranspiration data for Alvie, as it was compared with that of Beeac and found to be very similar, with very little size differences in water balance results. The climate data for Alvie 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 Beeac locality are provided below.

## 7e. General Conclusion

The Sensitivity Rating with regards to sustainable DWM varied throughout the Beeac locality. Council, Standard and Detailed LCAs will be required, with the use of the Sizing Tables deemed appropriate except for the Detailed LCA which requires site-specific design. Particular attention needs to be directed towards ensuring that systems are sized based on the most limiting soil horizon, that the amenity of the Lakes is maintained, that the minimum depth from the base of the land application area and the watertable are maintained, and that DWM system components and land application areas are constructed above the COS Planning Schemes land subject to inundation overlay.

**Alvie and Beeac**

| 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 ($m^2$) not including spacing and setbacks** | | | | | | |
| 5 + bedroom residence | 1,080 | 268 | | 356 | 426 | 530 | 1,039 | |
| 4 bedroom residence | 900 | 223 | | 297 | 355 | 442 | 866 | |
| 1-3 bedroom residence | 720 | 127 | | 237 | 284 | 353 | 693 | |

**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 or Secondary Treated Effluent | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Soil Category** | **Gravels & Sands (1)** | **Sandy Loams (2)** | **Loams (3)** | **Weak Loams & High/Mod Clay Loams (3 & 4)** | **Weak Clay Loams (4)** | **Massive Clay Loams (4)** | **Light Clays (5)** | **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 or Secondary 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 effluent storage ($m^2$) not including spacing and setbacks** | | | | | | | |
| 5 + bedroom residence | 1,080 | 58 | | 78 | 123 | 100 | 128 | 281 | |
| 4 bedroom residence | 900 | 48 | | 65 | 102 | 83 | 132 | 234 | |
| 1-3 bedroom residence | 720 | 39 | | 52 | 82 | 67 | 106 | 188 | |

**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** | **3** | **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 ($m^2$)†** | | | | | |
| 5 + bedroom residence | 1,080 | | 379 | 460 | 584 | | | |
| 4 bedroom residence | 900 | | 316 | 383 | 487 | | | |
| 1-3 bedroom residence | 720 | | 253 | 307 | 390 | | | |

**†** 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 effluent storage ($m^2$) not including spacing and setbacks** | | | | | | | |
| 5 + bedroom residence | 1,080 | 46 | 38 | 58 | 123 | 100 | 128 | | 281 |
| 4 bedroom residence | 900 | 38 | 32 | 48 | 102 | 83 | 132 | | 234 |
| 1-3 bedroom residence | 720 | 31 | 25 | 39 | 82 | 67 | 106 | | 188 |