LAND CAPABILITY ASSESSMENT (LCA)

Onsite Wastewater Management System (OWMS)

23 Maddens Lane, Gruyere

Council Property Number: 173520

A20

Prepared for: Andrew Vogt
Stage 1 - Residence upgrade
Stage 2 – Cabin and Cellar Door

Date: 10 November 2023
Revised: 24 May 2024 (New EPA Guidelines released 22 May 2024)

Reference: 230824

Prepared by:

ews | **EWS** Environmental | Water & Soil Consultants | Mobile: **0413 62 32 02**
ABN: 14 740 748 489 | Email: ews@bigpond.com | Web: www.ews.land

1. Introduction and Background

EWS Environmental has been engaged to undertake this Land Capability Assessment (LCA).

1.1 Consultant's brief

EWS Environmental has been engaged to develop a wastewater plan to support a Land Capability Assessment (LCA) for an application for a LGA Council permit, *Reg. 25, EP Regulations 2021*.

To further assess land features for long-term sustainable development and address the risk consequences using best practice (septic sewerage) management options.

The field investigation and report have been undertaken and prepared by a suitably experienced consultant in accordance with the *Victorian Land Capability Assessment Framework*, 2014, MAV [9]. EWS Environmental has appropriate professional indemnity insurance for this type of work.

1.2 Report Summary

This report will form part of the application to Council for a Permit to *Install /alter an Onsite Wastewater Management System (OWMS).*

This report provides information about the site features and soil characteristics. It also provides a risk assessment for the site including a conceptual design for a suitable onsite wastewater management system with recommendations for monitoring and management of the system.

A number of options have been assessed to provide for both the treatment and land application area (LAA) that represent *best practice*.

Risks to human health and the environment associated with this onsite wastewater management system have been addressed by adopting *reasonably practicable* measures as outlined in this report.

This assessment and the proposed system is consistent with the *Environmental Protection Act 2017, and the Environment Protection Regulations 2021.*

Note: The terms 'domestic wastewater' and 'sewage' are interchangeable for the purposes of *EP Act* 2017.

1.3 Site Overview

Location

Address:	**23 Maddens Lane, Gruyere** ("site")
Map Reference:	**MELWAY 283 A 5**
Nearest cross Road:	**Briarty Road**
Land area:	**40,518** m^2
LGA:	**Yarra Ranges**

Land features

Drainage: towards	**Trib. Log Crk..**
Slope of land:	**6**%
Distance to surface water:	> **100** m:
Flooding:	> **1 in 20 years**
Climate: Rainfall:	**882** mm
Evapo-transpiration 'A'	**1151** mm

Soil characteristics

Soil texture (limiting layer):	**Fine sandy CLAY**
Structure: Category:	**4 (b)**
Permeability (K_{sat})	**0.12** m/day.

Wastewater system sizing (AS/NZS 1547)

Water supply rate:	**3/4 star** (WELS)
Number of bedrooms:	**6**
Number of persons:	**7**
Daily contribution:	**180 & 150 Cabins** (Litres/day)
Maximum daily flow (L/day):	**1260 House 260 Cabins 320 Cellar**
Design Irrigation Rate(DIR)	**3.5** litres/m^2.day
Dispersal area (LAA):	**950** (m^2)

Authorised by:

John Lawrey, *MIE Aust*. Reg. 142295
Senior Environmental Engineer
EWS Environmental

Date: 10 November 2023
Revised 24 May 2024

On-site Wastewater Management Certificate CET-NZ, 2001.
Professional Indemnity Insurance:
DUAL Australia Pty Ltd on behalf of certain underwriters at Lloyds.
Policy: SOB/26785/000/23/N, Period 01/07/23 to 01/07/24.

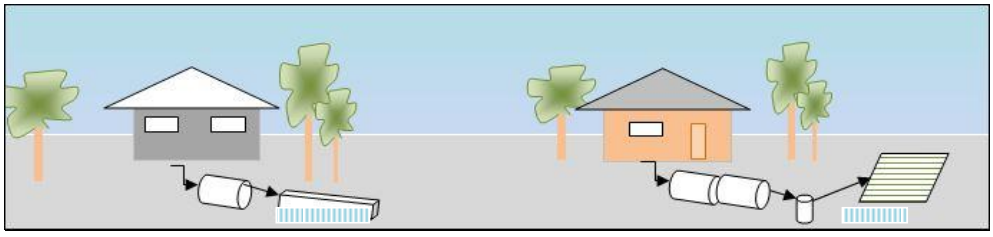
This report does not include a designer's certification and/or loading certificate under Section 3.4 -AS/NZS 1547:2012.

1.4 Client Summary

The nature of the site and the environmental constraints identified requires appropriate treatment by advanced septic tank or aerated treatment system. The treatment options listed below are deemed capable of achieving the desired level of performance.

The property owner has the responsibility for the final selection of the treatment system details of which may be included in the *Application to Install an Onsite Wastewater Management System*.

The pros & cons depend on site constraints and site characteristics listed in Table 5:



Options – basic primary or secondary treatment plant (two chamber) 20/30 standard

Primary (1^{O}) system -	Secondary (2^{O}) system -
AS/NSZ 1546.1 for Primary septic tanks and AS/NSZ 1546.3 for secondary systems	
Advantages	
Suitable for large properties	Suitable for small properties
Robust operation	Efficient pump distribution and minimum odour
Minimal maintenance	Minimal setback distances
	Best Practice –20/30 standard, for better water quality.
Disadvantages	
Short operating life	Higher installation & energy costs
Not suitable for some soil types	More frequent servicing
Greater setback distances	
Larger footprint for dispersal	

A comprehensive check list of factors to consider when selecting an onsite treatment system can be found in EPA's *Code of Practices /Guidelines May 2024.*

Following the wastewater treatment process the effluent must be distributed onto land in a safe manner for the environment and public health.

The dispersal options considered and available for use currently are:

1. Pressure compensating drip irrigation;
2. Low pressure effluent distribution systems (LPED); or
3. Wick trench or evapo-transpiration bed systems.

The suggested best option suited to your property is detailed in Section 7 – Conclusions and recommendations.

.

2. Description of development

Site Address:	23 Maddens Lane, Gruyere
Owner/Contractor:	Andrew Vogt
Postal Address/Email:	vogtandrew691@gmail.com
Contact:	Ph: 0418 144 896
Municipality Council (LGA):	Yarra Ranges
Allotment Size:	40,518m^2
Domestic Water Supply:	Onsite roof water collection, reticulated supply assumed
Forecast Wastewater Load:	A 6-bedroom residence with 3/4 star WELS rated fixtures @ 7 people per maximum occupancy. Wastewater generation = 180 L/d for House residents & 150L/d Cabins guests and 16 L/p Cellar Door visitors. (source EPA Guidelines May 2024).
Availability of Sewer:	The area is unsewered and highly unlikely to be sewered within the next 10 years, due to low development density in the area and the considerable distance from existing sewerage services.

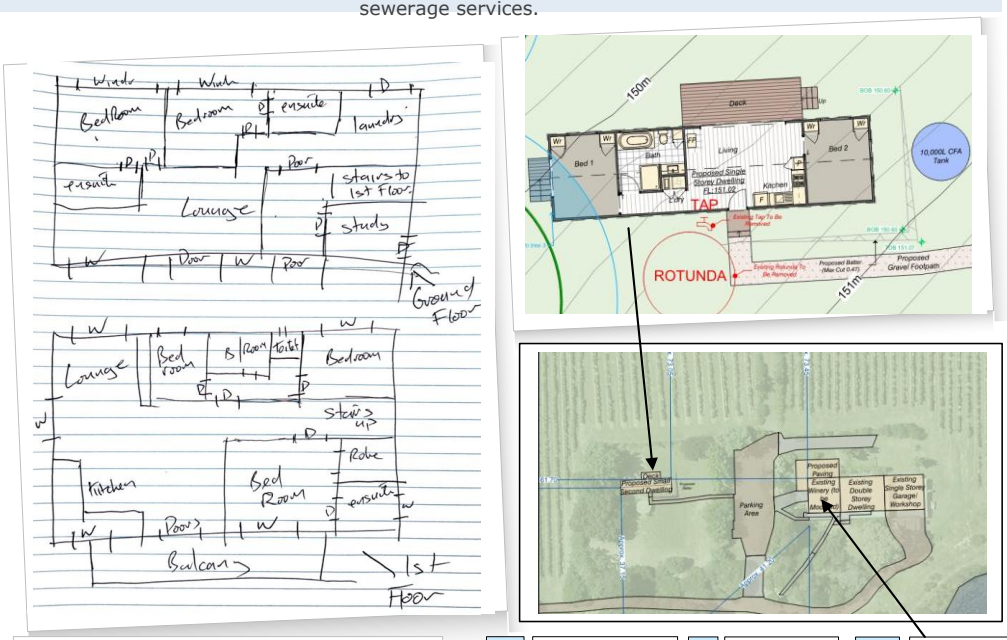
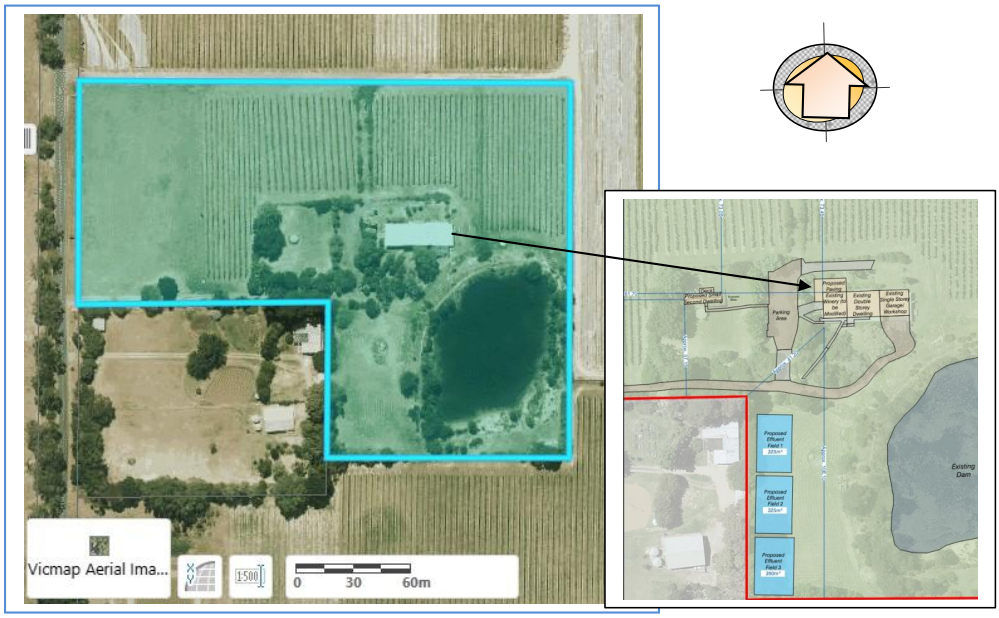


Figure 1 Proposed development plan

6 BEDROOMS | 1 CABIN | 20 CELLAR DOOR

Occupancy capacity = - Residence 100% - 7 days, CABIN & CELLAR DOOR full 3 days /week



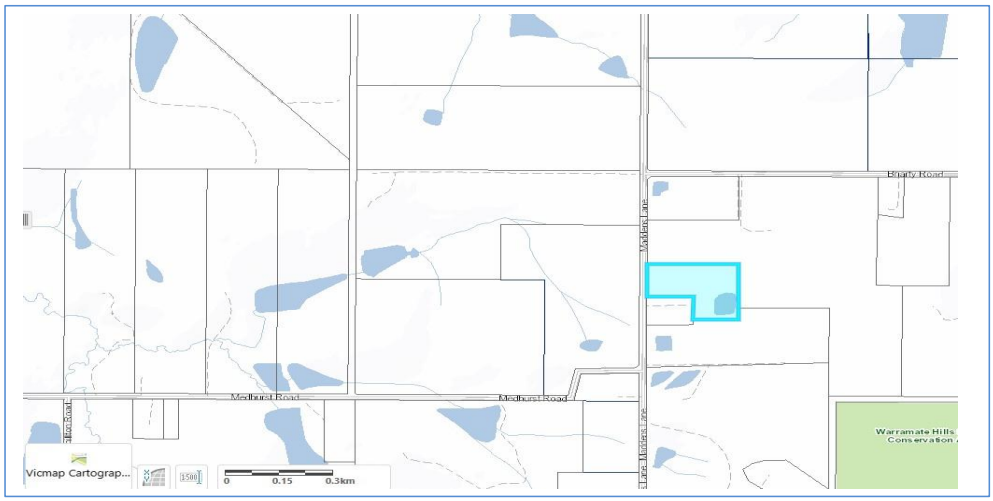


Figure 2 Locality plan for proposed development. **Map reference: Melway 283 A 5**

3. Site and Soil assessment

EWS Environmental undertook site investigations on the 26 October and 9 November 2023.

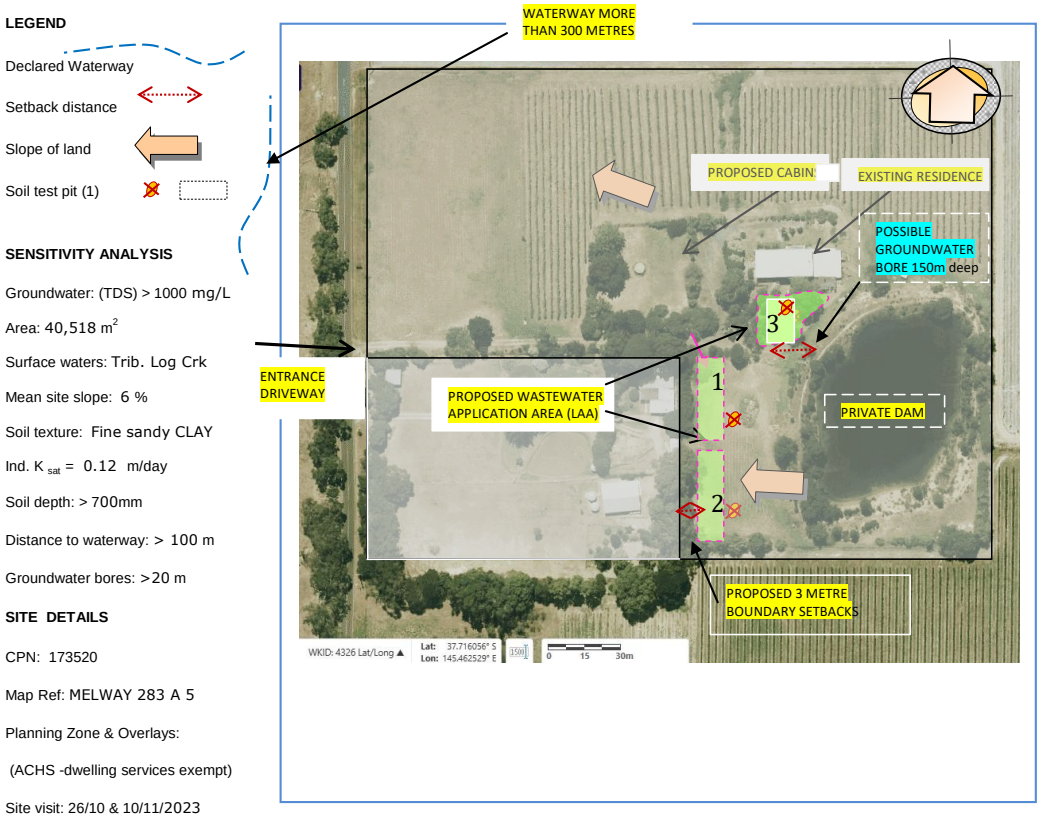
3.1 Site Key Features

Any site constraints and/or need for mitigation measures are summarized in Table 1, addressing the key features of the site in relation to effluent management for the proposed site.

NOTE:

- The site is not in a special water supply catchment area.
- The site experiences negligible stormwater run-on.
- There is no evidence of a shallow watertable or other significant constraints, and
- The risk of effluent transport offsite is very low.

Figure 3 provides a site analysis plan describing the location of the proposed envelopes and other development works, wastewater management system components and physical site features.



Address:
23 Maddens Lane, Gruyere

Figure 3: Site analysis plan

3.2 Development and Site Photographs

Test pit (1 & 2) showing profile

Modified Emerson Test- see Appendix A1

View of proposed LAA looking south

View of possible house site LAA

Location: 23 Maddens Lane, Gruyere Date: 10/11/ 2023

Table 1: Site Assessment

Feature	Description	Constraint	Measures
Buffer Distances	All relevant buffer distances in Table 5 of the Code (2016) are achievable.	Minor	NN*
Climate	Mean annual rainfall 882 mm. Mean annual pan'A' evaporation is 1151 mm.	Minor	NN
Drainage	No visible signs of surface dampness, spring activity or hydrophilic vegetation in the proposed effluent management area.	Moderate	Adopt low DIR
Erosion & Landslip	No evidence of sheet or rill erosion; the erosion hazard is low. No evidence of landslip and landslip potential is low.	Minor	NN
Exposure & Aspect	Slope aspect and wind exposure influence on LAA.	Moderate	NN
Flooding	The proposed effluent management area is located above the 1:100 year flood level.	Minor	NN
Groundwater	No signs of shallow groundwater tables to 1.5 m depth. No potential groundwater bores within 20 m of the proposed effluent area. Groundwater total dissolved solids, TDS >1000 mg/L.	Minor	NN
Imported Fill	No imported fill material observed on the site.	Nil	NN
Land Available for LAA	Considering all the constraints, the site has ample suitable land for application of effluent.	Nil	NN
Landform	Natural drainage with no spreading over linear plannar slope with no significant drainage lines intersect site.	Moderate	Locate with appropriate setbacks
Rock Outcrops	No evidence of surface rocks or outcrops.	Nil	NN
Run-on & Runoff	Minor stormwater run-on and run-off hazard.	Nil	NN
Slope	The effluent management area has a slope of 6 percent.	Nil	NN
Surface Waters	No waterways traverse the site requiring minimum setback to treatment /effluent area.	Nil	NN
Vegetation	Grass vegetation is adequate to control erosion and for water and nutrient uptake from the wastewater.	Moderate	NN.

*__NN__: mitigation measures not needed

3.3 Soil Key Features

The site's soils have been assessed for their suitability for onsite waste-water management by a soil survey and field analysis as outlined below.

Site assessment criteria

This assessment has been undertaken in accordance with the MAV/EPA's *Code of Practices/ Guidelines for Onsite Wastewater Management* and AS/NZS 1547: *Onsite Domestic Wastewater Management*.
Soil assessment and design for wastewater management was taken from AS/NZS 1547, where appropriate.

Site investigations

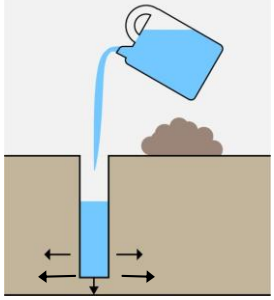
A key feature of the investigations is a soil permeability assessment in each landscape element or soil type area for effluent attenuation within the boundaries of the premises.

EPA's Code of Practices / Guidelines and Regulations permits various methods to determine the soil permeability. One based on visual and tactile estimation of indicative permeability, the other is the "constant-head" test from AS/NZS 1547 'Site and Soil Evaluation' procedures.

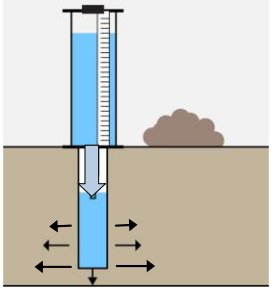
Constant Head Test

The *"constant –head"* test, allows water to runs out of an unlined test hole in to the ground which is replenished at the same rate from a reservoir, so that the head of water in the hole remains the same.

Step 1 -Pre-soaking of test holes



Step 2 – Measure rate of infiltration



The loss of water from the reservoir is measured over time and a mathematical model is used to calculate the co-efficient of permeability, known as, K_{sat} from the measurement.
The physical soil analysis assessment includes soil texture, structure and a shrink /swell potential test, as a substitute for actual water based measurement of soil

Textural Soil Test

Step 1 – Prepare soil bolus and assess soil category and structure

Step 2 – Categorise soil type

Soil permeability has been determined from the critical properties of texture, structure and shrink/swell potential using the method specified in AS/NZS 1547:2012 that prescribes conservative design loading rates.

Reference: EPA Publication 891.4:2016, Table 9

See attachment 'A' for all soil test results and field records.

Soil permeability has been determined from the critical properties of texture, structure and shrink/swell potential using the method specified AS/NZS 1547:2012 that prescribes conservative design loading rates.

If there is any doubt or dispute the above constant head test should be used.

Comment [s1]:

Table 2: Soil Assessment

Feature	Assessment	Constraint	Comment
Soil Depth	Topsoil: < 400 mm Clay LOAM	Minor Mitigation: **NN**	*A - auger E- exposure* *(Topsoil > 250mm) YES/~~NO~~*
	Subsoil: > 400 mm. Total soil depth greater than 1.5 m, no hardpans occur.	Minor Mitigation: **NN**	
Soil Texture & Structure	Topsoil: Category	Minor Mitigation: **NN**	
	Subsoil: Category **4 (b)** Structure: **Weak** as per AS/NZS/NZS 1547:2012	Major Mitigation: **NN**	*Sub-surface dispersal preferred*
Soil Permeability	Limiting soil layer: Fine sandy CLAY (K_{sat}) **0.12** m/day saturated conductivity (AS/NZS1547:2012);	Minor Mitigation: **NN**	*More than 600mm of unsaturated soil beneath base of dispersal system*
Design Loading Rates	Design Loading Rate (DLR) for system). Subsoil **3.5** mm/day, saturated conductivity (K_{sat}) (AS/NZS1547:2012);	Minor Mitigation: **NN**	*Appendix R- AS/NZS 1547*
Modified Emerson Aggregate Test (test AS/NZS 1547)	Topsoil: minor slaking with no dispersion. Minor – No change, Moderate – Slakes with minor fret, Major - Dispersion clouding solution [p109]	Minor Mitigation: **NN**	*See field soil dispersion test results*
	Subsoil: slaking with mild fret dispersion	Moderate Mitigation: **NN**	
Rock Fragments	Coarse fragments less than 2% (400 mm depth). No fragments throughout remainder of profile. Minor 0 -10%, Moderate 10 -20%, Major >20% [7] [p25]	Minor Mitigation: **NN**	
Watertable Depth	Groundwater not encountered,	Minor	
pH	Topsoil pH is slightly acidic; subsoils slightly higher. Soil conditions not affecting plant growth.	Minor pH > 6 Mitigation: **NN**	**pH** = 6
Electrical Conductivity	EC is a measures of soil salinity (µS/cm) Minor <800, Moderate 800 -2000, Major >2000	Minor	Good vegetation growth on irrigation area
Cation Exchange Capacity (CEC)	Present soil conditions do not appear to be restricting plant growth. Minor >15, Moderate 5 -15, Major <5 meq+/100g [7] [p65]	Minor Mitigation: **NN**	*As the EAT tests do not indicate signs of turbidity or dispersion, laboratory tests for soil fertility are not necessary as per MAV Table 2, for gypsum dosing.*
Sodicity (ESP)	Exchangeable Sodium concentrations ESP value is low with no long-term soil sodicity monitoring required. Present soil conditions are not restricting plant growth. Minor 0- 6%, Moderate 6 - 8%, Major >8 % [4] [p113]	**Minor** Mitigation: **NN**	
SAR	Sodium absorption ratio not a constraint. Minor < 3, Moderate < 8 & ESP > 8%, Major > 3 [p95]	**Minor** Mitigation: **NN**	
Phosphorus adsorption capacity	Phosphorus adsorption capacity was not specifically tested but is expected to be moderate to high due to the extent of clay present at relatively shallow depths.	Minor Mitigation: **NN**	

NN: mitigation measures not needed

Reference: Hazelton, P and Murphy, B. (2007). *Interpreting Soil Test Results – What Do All The Numbers Mean?* CSIRO Publishing, Melbourne

Table 3: Soil Characteristics

Characteristic	Level of Constraint			Assessed Constraint
	Nil or Minor	Moderate	Major	
Electrical Conductivity	<0.8	0.8 - 2	>2	Minor [EC µS/cm (µS/cm/1000= dS/m)
Emerson Agg. Test (Modified AS/NZS 1547)	No change to aggregate	Aggregates slake	Aggregates disperse clouding solution	Minor
Gleying (Munsell Soil Colour Chart)	Nil	Evidence of greenish grey / black or bluish grey / black soil	Predominant greenish grey / black, bluish grey / black colours	Minor
Mottling (Munsell Soil Colour Chart)	Generally uniform brownish or reddish colour mottles	Imperfectly drained soils have grey and/or yellow brown mottles	Poorly drained soils predominant yellow brown or reddish	Minor
pH (range for plants)	5.5 - 8 is optimum range for plants	4.5 - 5.5 suitable for acid-loving plants	<4.5, >8	Minor [pH > 6
Rock Fragments (size & volume %)	0 – 10%	10 – 20 %	>20%	Minor Floaters hole 3
Sodicity [4] (ESP %)	<6%	6 – 8%	>8%	Minor
Soil Depth to Rock or impermeable layer	>1.5 m	1.5 – 1 m	<1 m	Minor
Soil Structure (pedality)	Highly or Moderately structured	Weakly-structured	Structureless, Massive or hardpan	Moderate
Soil Texture, (indicative permeability)	Cat. 2b, 3a, 3b, 4a	Cat. 4b, 4c, 5a	Cat. 1, 2a, 5b, 5c, 6	Moderate
Water table depth below base of the LAA	>2 m	2 – 1.5 m	<1.5 m	Moderate

Legend:

Nil or Minor: If all constraints are minor, conventional/standard designs are generally satisfactory.

Moderate: For each moderate constraint an appropriate design modification over and above that of a standard design, should be outlined.

Major: Any major constraint might prove an impediment to successful on-site wastewater management, or alternatively will require in-depth investigation and incorporation of sophisticated mitigation measures in the design to permit compliant onsite wastewater management.

Vegetation Impacts

Wastewater dispersal must be irrigated so as to not exceed the optimum water and nutrient requirements of the vegetation within the premises. Nutrient and organic uptake application rates are taken from EPA's Publication 168, *Guidelines for Wastewater Irrigation,* April 1991.

The guidelines and criteria followed for the design of the proposed wastewater effluent dispersal area are based on EPA's Codes of Practice / Guidelines for *Onsite Wastewater Management*. The purpose of which is to protect public health and the *environment.* To this end it is a requirement of *State Government policy*, that wastewater dispersal is sustainable and does not pose an environmental risk including impacts on vegetation beyond the boundaries of the allotment.

In selecting suitable areas for effluent dispersal the following checks for constraints were noted:

- Waterway, springs, dams and likely seasonal wet areas;
- Upslope stormwater run-off, groundwater seepage, springs and depressions;
- Unsuitable topographical features, ground conditions and other structures.

3.4 Risk Assessment

Table 4: Risk Assessment of Site Characteristics

Characteristic	Level of Constraint			Level of Constraint
	Nil or Minor	**Moderate**	**Major**	
Aspect (affects solar radiation received)	North / North-East North-West	East / West / South-East / South-West	South	Minor (Open West)
Climate (rainfall & evaporation difference)	Excess evaporation over rainfall	Rainfall approximates to evaporation	Excess of rainfall over evaporation	Minor
Erosion (potential for erosion)	Nil or minor	Moderate	Severe	Minor
Exposure to sun and wind	Full sun, high wind or minimal shading	Dappled light	Limited patches to heavily shaded	Minor
Imported Fill	No fill or good minimal topsoil fill	Moderate coverage and fill is good quality	Poor quality fill and variable quality fill	Minor
Flood frequency (ARI)	Less than 1 in 100 years	Between 100 and 20 years	More than 1 in 20 years	Minor
Groundwater bores	No bores onsite within 20 metres	Setback from bores on adjacent property compliant	Not compliant with requirements	Minor
Land area available for LAA	Exceeds LAA and buffer distance	Meets LAA and duplicate LAA and buffer distance	Insufficient area for LAA	Minor
Landslip (or potential)	Nil **EMO** – No,	Minor to moderate **EP**= 7 **EAT** – Non dispersive	High or Severe **Slope** 6%,	Minor
Rock outcrops (% of surface)	<10%	10-20%	>20%	Minor
Slope Form (water shedding ability)	Convex or divergent side-slopes	Straight side-slopes	Concave or converge side-slopes	Minor
Slope gradient (%)				
(a) for absorption trenches and beds	<6%	6-15%	>15%	Minor
(b) for subsurface irrigation	<10%	10-30%	>30%	Minor
Soil Drainage (qualitative)	No visible signs of even in wet season	Some signs or likelihood of dampness	Moisture-loving plants,water ponding	Minor
Soil Drainage (Field Handbook p151)	Rapidly drained. / Well drained.	Moderately well drained.	Imperfectly drained. / Very poorly drained.	Moderately well drained
Stormwater run-on	Low likelihood of run-on.		High likelihood of inundation	Minor
Surface waters - setback distance (m)	Complies with Code 891.		Does not comply with Code	Minor
Vegetation coverage over the site	Plentiful healthy growth & nutrient uptake		Limited or sparse vegetation or no vegetation	Minor

Risk constraints summary	3	2	1	Sum
Useable lot size 2000-4000			1	1
Average slope 10-20%			1	1
Soil suitability Cat. 3 - 6		2		2
Proximity to water bore			1	1
Proximity to waterway			1	1
Land prone to flooding			1	1
Depth to groundwater	Compliant		(Σ) =	7

LEGEND

High risk	**3**
Moderate risk	**2**
Low risk	**1**

Risk Score:

High	13 -18
Moderate	7 – 12
Low	.... 6 or less

4. Wastewater Management Systems

The following sections provide an overview of a suitable onsite wastewater management system, with sizing and design considerations and justification for its selection. Further detailed design for the system may be undertaken at the time of the application to Council.

4.1 Wastewater treatment system

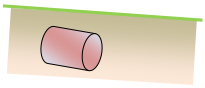
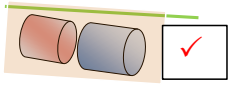
Although the preferred septic treatment and dispersal system is for pressure compensating subsurface irrigation, large remote sites may be better served with a more simple robust system.
Any on-site wastewater application (eg. septic tank or secondary treatment system) requires a *JAS-ANZ* or equal *Certificate of Conformity*.

Treatment system options listed at the above website are deemed capable of achieving the desired level of performance. The property owner has the responsibility for the final selection of the treatment system which should be included with the *A20* application to install an *Onsite Wastewater Management System*.

The following sections provide an overview of a suitable onsite wastewater management system, with sizing and design considerations and justification for its selection. Detailed design for the system should be undertaken at the time of the application submitted to Council.

The pros & cons depend on site and waste characteristics listed below:

Table 5: PROS and CONS of options for treatment of wastewater.

TREATMENT METHOD	PROS	CONS
Option A – Primary settling to reduce grease and solids  30% pollutant removal	☑ Minimal maintenance ; ☑ Less expensive operating costs although technically problematic. ☑ Robust operation.	☒ Design service life of 15 years; ☒ Must be connected to sewer immediately it become available; ☒ Not suitable for type 1 or 2 soils; ☒ Sensitive to terrain slope & setbacks to waterway; ☒ Requires a lot > 2000 m^2.
Option B – Secondary system such as aerated systems  90% pollutant removal	☑ Design service life of 30 years; ☑ Default "*best practice*" system ☑ Suitable for type 1 & 2 soils; ☑ Copes with higher organic and nutrient loads; ☑ Suitable for lots < 2000m^2;	☒ Higher maintenance costs; ☒ Higher energy costs; ☒ Slightly higher installation cost;

4.2 Effluent Management System

A range of possible land application systems have been considered, such as absorption trenches, evapo-transpiration / absorption (ETA) beds, subsurface irrigation and mounds.

The options for dispersal of treated effluent are limited to those either specifically approved by EPA or systems installed in accordance with Australian Standard AS/NZS 1547:2012.

Design wastewater flow

"The *Environment Protection Regulations 2021* requires the adoption of "*appropriate standards"* (Regulation 4). This report adopts the figure of 150 Litres/person as the best "reasonably practicable option" for design and management purposes (Regulation 161) of accommodation cabins.

EPA Guidelines recommend for typical domestic house situations 150-180 litres/person and "best practice" with WELS 3/4 star fittings and appliances a figure of 180 Litres is appropriate for dwelling design purposes.

Sizing the Irrigation System

To determine the irrigation area, water balance modelling has been undertaken using the method and modeling tool in the *Victorian Land Capability Assessment Framework* (2014) and EPA Codes.

The preferred system of dispersal is pressure compensating subsurface irrigation. Subsurface irrigation will provide even and widespread dispersal of the treated effluent within the root-zone of plants. It will also ensure that the risk of effluent being transported off-site will be negligible.

Forecast daily wastewater flow

EPA Guidelines (2024**)** requires potential future flow rates to be based number of people who may be intending to live on the premises. A wastewater flow assessment is required to be based on any additional room(s) that could be closed off with a door and used as a bedroom for the purposes of this calculation.

The Council may choose to reduce the number of potential bedrooms based on evidence from floor plans where a room is unlikely to be used as a bedroom.

This design assumes that wastewater flow based on the EPA's Guidelines has a potential occupancy using the criteria of : *(Number of rooms with doors) +1* persons x Litres/day. *N⁰. of bedrooms*:* ***6***,
*All bedrooms plus rooms that could be closed off with a door.

Water usage efficiency – WELS star rating (litres/day)

Residents	1 stars -220 L/d	2 stars -200 L/d	3 stars -180 L/d	4 stars -150 L/d	5 stars -120 L/d
4 persons	880	800	720	600	480
5 persons	1100	1000	900	750	600
6 persons	1320	1200	1080	900	720
7 persons	1540	1400	1260		840
8 persons	1760	1600	1440	1200	960

Design applications rates

The wastewater dispersal area is calculated on the potential future flow rates determined from the number of people who may be intending to live on the premises and the design irrigation rate from

EPA Guidelines**,** Table 4.9 - *Soil Categories and Recommended Maximum Design Loading Rates*.

Soil Classification
600mm limiting application rate.

Soil texture: Fine sandy CLAY
Soil structure: Weak
Soil Category**: 4 (b)**
Indicative K_{sat}: 0.12 m/day

Design Application (mm/day)

Subsurface Drip Irrigation: **3.5** mm/day

ETA – LPED irrigation: **3.0** mm/day

WICK Trenches: **20** mm/day

Indicative areas for dispersal

= **930** m^2

4.3 Sizing of the effluent dispersal field

To determine the necessary size of the irrigation field, the water balance modelling tool prescribed in the Victorian Land Capability Assessment Framework (2014) and EPA Guidelines have been used.

Water supply	Appliances & fixtures	No. of persons	Design (Litre/day	Weekly design calculations	Maximum daily flow
Town supply	WELS 3 star	Residence 5 + study	180	(6 +1) x 180	1260 Litre/day
Town/tank	WELS 3 star	Cabin by 4 x 3days Cellar Door 29 guests	150 x12 days 20 x2 x 3 x16 L/d	(1800) /7 days (1920)/ 7 days	257 Litre/day 275 Litre/day

Residence for 7 persons is 1260 L/day and Cabin & Cellar Door 532 L/day,Total 1792 say 1800L/day

The dimensions of the irrigation dispersal field of have been calculated using the application rates from Table 4.9 of the EPA Guidelines (2023). The calculations are summarised overpage.

The field sizing equation can be expressed as:

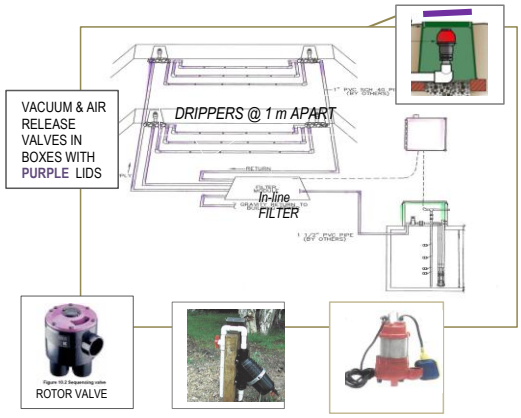
Formula: LAND IRRIGATION A = Q/DIR*(Sf),

where

A = irrigation area (m²)
Q = daily flow (L/day)
DIR = Design irrigation rate (mm/day) –
adopt most constraining horizon (600mm).
Slope factor (Ref: AS/NZS 1547- M2)

Area = 1800 / (3.5)
= 514 m^2

for limiting water balance area,
see **Section 4.4**



Residence @ 1260 L/day = 650 m^2

Cabin & Cellar Door @ 532 L/d = 275 say60m^2

Total 930 m^2

Total = 650 + 275 = 925 m^2 over minimum 3 zones of more than 310 m^2 say 23m x 13.4m

EPA Code (Clause 2.2.2) states that – "*subsurface irrigation from all waste treatment systems is best* practice". However, having regard to the soil and site features this option is considered a low risk option as preferred by *Environment Protection Regulation 28*.

Best option
Provide two (1200 Litre/day) secondary treatment plants with Certificates of Conformance discharge with a pumped discharge to pressure compensating sub surface dripper spread over a field of three (3) zones.

The options considered includes the following systems which are currently available for use:

a) Evapo-transpiration(ETA) trenches;
b) Mound system raised above ground level;
c) Low pressure effluent distribution systems (LPED);
d) Conventional soil absorption trenches, and
e) Wick trench or bed systems.

The Land Application Area must be sufficient to ensure nutrients are assimilated by the soils and vegetation. As well climate modelling is use to check hydraulic and nutrient balances has also been undertaken.

Water Balance

The MAV nominated area method is used to calculate the area required to balance all inputs and outputs to the water balance. The water balance can be expressed by the following equation:

Precipitation + Effluent Applied = Evapo-transpiration + Percolation

Data used in the water balance includes:

- Mean monthly rainfall and mean monthly pan evaporation;
- Average daily effluent load in litres per day (from Table 4 of the Code);
- Design application rate (DIR or DLR) in millimetres /day (from Table 9 of the EPA Code);
- Crop factor – 0.6 to 0.8; and
- Retained rainfall – 75 % with cut-off drain.

Nutrient balance

State environmental policy requires effluent management to prevent the transport of nutrients to surface waters or negative impacts on the groundwater's beneficial uses and vegetation.

In clayey soils phosphorus is normally not a limiting factor due to adsorption onto clay particles.

For sustainable long-term nutrient management, when **nitrogen** is the limiting factor the annual uptake of nitrogen by vegetation is the main mechanism used to account for nutrient attenuation.

The nitrogen load and uptake are summarised below, with calculations provided in **Appendix B.**

- *Calculate the mean annual generation of the nutrient is use to establish total nitrogen loading.*
- *Adopt uptake of grasses @ 200 kgTN /ha.year, Ref:EPA Guidelines for Wastewater Irrigation, No.168.*
- *Allow 20% loss through denitrification, volatilisation, microbial attack and other processes,*

Hydraulic loading is the limiting design parameter, see Section 4.4 – Water & Nutrient Balances.

Salt balance

For long-term management of salt (sodium) levels in water supply and the addition of contributed by washing and use of laundry detergents may cause soils to become less permeable.

Measures to minimise salinity effects include reduced detergent use, low irrigation rates, growing salt tolerant grasses in dispersal area and restricting salt levels in effluent to less than 500 mgTDS/litre.

Leaching of salt is quantified using a water balance to ensure adequate remove of salt for the dispersal field. Typical salt input is about 375 mgTDS/L, with water supply levels below 600.

Water and nutrient balance spreadsheet calculations for most limiting results show that the minimum land application area (LAA) required for irrigation.

4.4 Water and Nutrient Balances

Residence

1	Irrigation Area using MAV model for Nominated Area Water Balance, Nutrient Balance & Storage Calculations															
2	**Site Address:**	23 Maddens Lane, Gruyere - 7 person residence											EWS Ref: 230824			
3	**INPUT DATA**	100% occupancy			**Date:**	10-Nov-23						**Assessor:**	IR Lawrey *DipCE MIE Aust*			
4	Design Wastewater Flow	**Q**	1260	L/day	Based on maximum potential occupancy and derived from Table 4 in the EPA Code of Practice (2016).											
5	Effluent TN concentratio	TN	25	mg/L	Crop N uptake 220 kg/ha/yr equa	**60**	mgTN/day. Phosphorus sorption capacity not limiting.									
6	Design Loading Rate	DLR	**3.5**	mm/day	Based on soil class permeability and derived from Table 9 in EPA Code of Practice (2016) .											
7	Land Application Area	L	**648**	m sq	Land application area based on limiting factors.											
8	Crop Factor	C	0.6 -0.8	unitless	Estimates of evapotranpiration as a fraction of pan evaporation; varies over season and crop type.											
9	**Retained Rainfall**	RF	0.75	unitless	Proportion of rainfall that remains onsite and infiltrates, allowing for any runoff.											
10	Rainfall Data	Rainfall for Seville BOM 86367			Median 890	Design 890	mm	Run-off coefficient grassed areas: < 10% slope 0.90								
11	Evaporation Data	BOM evaporation data Scoresby			Upper Yarra 86104											
12																
13	**Parameter**	**Symbol**	**Formula**	**Units**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
14	Days in month	D	\	days	31	28	31	30	31	30	31	31	30	31	30	31	**365**
15	Rainfall	R	\	mm/month	57	36	39	65	81	91	85	90	81	100	80	77	**882**
16	Evaporation	E	\	mm/month	175	151	122	72	48	36	41	54	73	97	120	162	**1151**
17	Crop Factor	C			0.80	0.80	0.70	0.70	0.60	0.60	0.60	0.60	0.70	0.80	0.80	0.80	
18	**OUTPUTS**																
19	Evapotranspiration	ET	ExC	mm/month	140	121	85	50	29	22	25	32	51	78	96	130	**858**
20	Percolation	B	DIR x D	mm/month	109	98	109	105	109	105	109	109	105	109	105	109	**1278**
21	**Outputs**		ET+B	mm/month	249	219	194	155	137	127	133	141	156	186	201	238	**2136**
22	**INPUTS**																
23	Retained design rainfall	RR	R x RF	mm/month	43	27	29	49	61	68	64	68	61	75	60	58	**662**
24	Irrigation rate	W	(QxD)/L	mm/month	60	54	60	58	60	58	60	60	58	60	58	60	**710**
25	**Inputs**		RR+W	mm/month	103	81	90	107	121	127	124	128	119	135	118	118	**1371**
26	**STORAGE CALCULATION**																
27	Storage remaining from previous month			mm/month	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
28	Storage for the month	S	(RR+W)-(ET+B)	mm/month	-145.5	-137.3	-104.4	-48.3	-16.3	0.0	-9.1	-13.1	-37.0	-50.8	-82.7	-120.1	**-328.4**
29	Cumulative Storage	M		mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
30	Maximum Storage	N		mm	0.00												
31		V	NxL	L	0												
32	**LAND AREA REQUIRED FOR ZERO STORAGE**			m^2	190	184	237	354	510	**648**	563	532	396	352	268	217	312
33																	
34	MINIMUM AREA REQUIRED FOR ZERO STORAGE:				648	m^2		LAND APPLICATION AREA FOR MOST LIMITING NUTRIENT							420	m^2	
35								(Minimum area required with zero buffer setbacks)									
36	CELLS																

Cabins and Cellar Door

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	**Irrigation Area using MAV model for Nominated Area Water Balance, Nutrient Balance & Storage Calculations**																
2	**Site Address:**	23 Maddens Lane, Gruyere - Cellar Door & 3 Cabins												EWS Ref: 230824			
3	**INPUT DATA**	Winter occupancy 50% summer			**Date:**	9-Nov-23							**Assessor:**	IR Lawrey *DipCE MIE Aust*			
4	Design Wastewater Flow	Q	700	L/day	Based on maximum potential occupancy and derived from Table 4 in the EPA Code of Practice (2016).												
5	Effluent TN concentration	TN	25	mg/L	Crop N uptake 220 kg/ha/yr equal	60	mgTN/day. Phosphorus sorption capacity not limiting.										
6	Design Loading Rate	DLR	3.5	mm/da	Revised- 24 May 2024								ved from Table 9 in EPA Code of Practice (2016) .				
7	Land Application Area	L	360		360 x 532/700=274 m2								ctors.				
8	Crop Factor	C	0.6 -0.8	unitless	Estimates of evapotranpiration as a fraction of pan evaporation; varies over season and crop type.												
9	Retained Rainfall	RF	0.75	unitless	Proportion of rainfall that remains onsite and infiltrates, allowing for any runoff.												
10	Rainfall Data	Rainfall for Seville BOM 86367			Median 890	Design 890	mm		Run-off coefficient grassed areas: < 10% slope 0.90								
11	Evaporation Data	BOM evaporation data Scoresby			Upper Yarra 86104												
12																	
13	**Parameter**	**Symbol**	**Formula**	**Units**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
14	Days in month	D	\	days	31	28	31	30	31	30	31	31	30	31	30	31	**365**
15	Rainfall	R	\	mm/month	57	36	39	65	81	91	85	90	81	100	80	77	**882**
16	Evaporation	E	\	mm/month	175	151	122	72	48	36	41	54	73	97	120	162	**1151**
17	Crop Factor	C			0.80	0.80	0.70	0.70	0.60	0.60	0.60	0.60	0.70	0.80	0.80	0.80	
18	**OUTPUTS**																
19	Evapotranspiration	ET	ExC	mm/month	140	121	85	50	29	22	25	32	51	78	96	130	**858**
20	Percolation	B	DIR x D	mm/month	109	98	109	105	109	105	109	109	105	109	105	109	**1278**
21	**Outputs**		ET+B	mm/month	249	219	194	155	137	127	133	141	156	186	201	238	**2136**
22	**INPUTS**																
23	Retained design rainfall	RR	R x RF	mm/month	43	27	29	49	61	68	64	68	61	75	60	58	**662**
24		W	(QxD)/L	mm/month	60	54	60	58	60	58	60	60	58	60	58	60	**710**
25	**Inputs**		RR+W	mm/month	103	81	90	107	121	127	124	128	119	135	118	118	**1371**
26	**STORAGE CALCULATION**																
27	Storage remaining from previous month			mm/month	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
28	Storage for the month	S	(RR+W)-(ET+B)	mm/month	-145.5	-137.3	-104.4	-48.3	-16.3	0.0	-9.1	-13.1	-37.0	-50.8	-82.7	-120.1	**-328.4**
29	Cumulative Storage	M		mm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
30	Maximum Storage	N		mm	0.00												
31		V	NxL	L	0												
32	**LAND AREA REQUIRED FOR ZERO STORAGE**			m^2	105	102	132	197	283	360	313	296	220	195	149	120	173
33																	
34	MINIMUM AREA REQUIRED FOR ZERO STORAGE:				360	m^2		LAND APPLICATION AREA FOR MOST LIMITING NUTRIENT								233	m^2
35								(Minimum area required with zero buffer setbacks)									
36	CELLS																
37	Water Balance			Enter new data in blue cells													
38		XX		Red cells are automatically populated by the spreadsheet													
39		XX		Data in the yellow cells is calculated by the spreadsheet. DO NOT ALTER THESE CELLS											MAV model version 891.4		##########
40																	

The pros & cons depending on terrain, rainfall and soil conditions are listed below:

Table 7 - PROS and CONS of options for effluent dispersal.

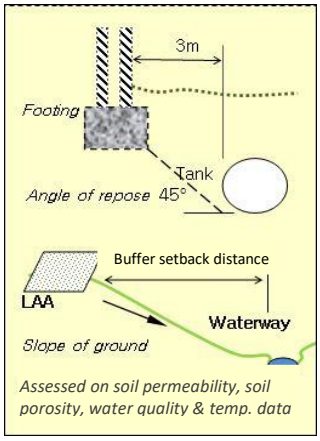
DISPERSAL METHOD	PROS	CONS
Option A – Pressure compensating drip irrigation ✓	☑ Suitable for shallow soil sites ☑ Not restricted due to rainfall ☑ Less soil depth required to others ☑	☒ Higher maintenance and capital replacement costs ☒ More expensive system ops with technical matters problematic ☒ Maximum slope of 30% ☒ Generally requires more space.
Option B – Mounds	☑ Raise level of effluent discharge ☑ Soil depth less important ☑ Minimal maintenance ☑ Suitable ground saturated sites ☑ Minimises polluted run-off risk	☒ Sensitive to terrain slope & setback to waterways ☒ Max. 15% slope situations ☒ May increase wetness at edge ☒ Toe seepage may occur.
Option C – LPED systems	☑ Lower energy requirement ☑ Complementary loading of system for balance flow ☑ Minimal maintenance ☑ Trench spacing up to 2m apart	☒ Sensitive to terrain slope & setback to waterways ☒ Minimum 250mm topsoil ☒ Not suitable type 1 & 2 soils
Option D – Wick trenches	☑ Lower energy requirement ☑ Compact system ☑ Complementary trench loading ☑ Balancing high & low flow days ☑ Minimal maintenance	☒ Sensitive to terrain slope & setback to waterways ☒ Experienced installer required ☒ Not suitable high rainfall areas ☒ Significant capital cost
Option E – ETA evapo-transpiration trenches & beds	☑ Compact system ☑ Complementary trench loading ☑ Balancing high & low flow days ☑ Minimal maintenance	☒ Sensitive to terrain slope & setback to waterways ☒ Experienced installer required ☒ Benching required steep slopes ☒ Significant capital cost

✓ Option(s) most likely to offer the best long-term solution; details are included in this report.

4.5 Buffer (Setback) Distances

Setback distances from effluent land application areas and treatment systems are required to help prevent human contact, maintain public amenity and protect sensitive environments. The relevant buffer distances for this site are taken from Table 5 of the Code.

- 50 metre from groundwater bores in sandy soils, 20 m in clayey soils;
- 100 metre from waterways (potable supply) and 30 m for non-potable waterways;
- 6 metre if area up-gradient and 3 metre if area down-gradient of property boundaries, swimming pools and buildings (conservative values for primary effluent).



If setback distances are outside default values, ground water model may determined that all nutrients, pathogens and other pollutant wi not be transport beyond the site.

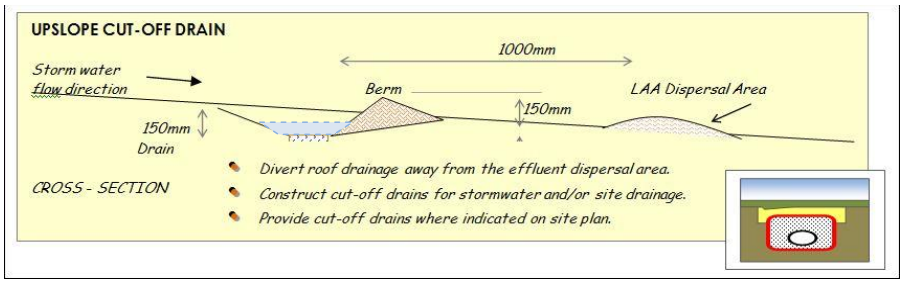
When all pollutants are attenuated within the premises boundaries there will be no cumulative impacts on surface waters or groundwater.

All buffer distances are achievable for this application. See Section

4.6 Stormwater Measures

Stormwater run-on poses a risk during significant rainstorm events. The construction and maintenance of a surface diversion drains will mitigate the limitations of site drainage.

Stormwater run-on is not expected to be a concern for the proposed irrigation area, due to the landform of the site and a relatively gentle cross slope for upslope diversion berms or drains.



4.7 Reserve Area

A reserve area of land (to remain free from development) for effluent dispersal to meet future unforeseen contingencies is mandatory:

- in special water supply catchment areas;
- where designated on plans of subdivision, and
- when required by councils, based on local experience.

A 1 metre spacing of irrigation driplines may provide the reserve area, see EPA Guidelines and MAV(2014) section 4.7.1.

5. Monitoring, Operation and Maintenance

Maintenance to be carried out in accordance with the EPA system approval and the *Certificate of Conformity* of the selected secondary treatment system and Council's permit conditions. The treatment system will only function adequately if appropriately and regularly maintained.

To ensure the treatment system functions adequately, residents must:

- Have a suitably qualified maintenance contractor service the wastewater system at the frequency required by Council under the approval to use;
- Ensure the septic tank is desludged / pump-out at least every 3 years;
- Use household cleaning products suitable for septic tanks;
- Keep as much fat and oil out of the system as possible;
- Don't put sanitary or hygiene products into the system,
- Do Not flush so called flushable wipes into the system, and
- Conserve water, use 3 STAR or better WELS rated fixtures and appliances.

To ensure the land application area (LAA) functions adequately, residents should:

- Regularly harvest (mow) vegetation within the LAA and remove this to maximise uptake of water and nutrients;
- Monitor and maintain the subsurface irrigation system following the manufacturer's recommendations;
- No structures/ paths erected over the Land application area;
- Avoid vehicle and livestock access to the LAA, to prevent compaction and damage;

- Ensure that the LAA is kept uniformly graded by filling any depressions with good quality topsoil (not clay) and
- Regularly clean any in-line filter or screen;
- Check water usage (water meter / winter water bills) to ensure discharge does not exceeding design.

Table for recording actions undertaken (✓)

Year/month	Water leaks	Service agent	Monitor effluent	Pump-out (3 yearly)	Effluent ponding	Keep records	Comments -& Remarks
Frequency	Regularly	As requires	Annually	Every 3 years	Every year	As required	

Operation & Maintenance of System

Servicing of the system must be undertaken as recommended by the supplier and in accordance with the *Environment Protection Regulations* (2021). Records of servicing (Section 6) must be kept for 5 years.

- A permit condition of the Council approval will require the regular servicing of the *wastewater treatment system* in accordance with manufacturer's instructions.
- The system should be inspected annually and report prepared by an accredited person.

6. Field and Performance Reporting

Operation & performance report for ***OWMS*** (*Environment Protection Regulations 2021*) *(Reg. xx)
Key regulatory elements to be included in maintenance and performance reports.

OWNER/OCCUPIER name (Duty holder) Reg.25… *Name of owner or occupier* ……

On-site wastewater management systems (OWMS) must be managed to ensure good working, appropriate maintenance and inform council of any failures (Reg. 160).

ADDRESS OF SYSTEM (OWMS): … *Name of owner or occupier* ……

MUNICIPALITY COUNCIL (LGA): …… CONTACT:……

An accredited service technician should carry out the following service and inspection of your on-site wastewater management system at least four (4) times per year. The results from the maintenance inspection on the condition key components are to be recorded and kept to 5 years.

TYPE OF WASTEWATER TREATMENT PLANT

ALL OPERATIONAL COMPONENTS OF *OWMS* SERVICED AS PER OPERATING MANAUL. . ☑
No odour detected: …….. Noise level < 40dBA: …. Remarks: …….
Laundry detergent used: …Liquid or powder: ……EC < 100 µS/cm ……

WATER QUALITY (Field tests): Odour free ☑… Turbidity >100mm ☑…. DO …….. mg/L. ☑
Simple field tests to indicate that effluent is of acceptable quality

LAST LABORTORY ANALYSIS RESULTS: BOD mg/L, TSS mg/L, DATE: ……..
Name of NATA Laboratory : …*Confirmation of field test observations by an accredited laboratory.*

IRRIGATION SYSTEM, Reg. 159(3): ☑…… WARNING SIGNS IN PLACE: …… ☑

IRRIGATION MAINTENANCE: Screens cleaned ☑ Driplines flushed: ☑ Root inhibitor added: ….
Owner may clean screens and flush driplines between services to manufacturer's instructions.

LAND APPLICATION AREA: No leakage or ponding ☑ ……..……..

SLUDGE (BIOSOLIDS) DATE LAST PUMPED: … …GYPSUM spread annually if required……

RECORD AND ADVISE DUTY HOLDER AS APPROPROIATE OF MATTERS REQUIRING ATTENTION:
Owner's general environmental duty.
……

Agreed report back Reported by
DATE: ……/……/…… TIME: …… am/pm ACTION BY: ……..……

OWMS INCIDENT REPORT, Reg.162(2): ……..……..……

NAME:…… CONTACT PHONE or EMAIL: ……..……
Accredited Service Technician *Accreditation, Reg.25:* *Technician has appropriate training?*

This record of service /performance or pump outs must be must be kept for 5 years. Reg.162(1).

Note: From 1 July 2022 the *Environment Protection Regulations 2021* requires:
"A person in management or control of land on which an on-site wastewater management system is located must notify the council, in whose municipal district the system is located, as soon as practicable after the person becomes aware, or reasonably should have been aware, that the system poses a risk of harm to human health or the environment or is otherwise not in good working order".

7. Conclusions

An LCA has been required by Council as per [EP Reg. 26(2) (e)] for the proposed OWMS.

The findings of this LCA [EP Reg.28] are that the *reasonably practicably* measures proposed will minimise the risks to human health and the environment.

As a result of our investigations it is concluded that sustainable onsite wastewater management is feasible with appropriate mitigation measures, as outlined, for the proposed 6 -bedroom residence at 24 Maddens Lane, Gruyere.

Specifically, it is recommended (as per attached site plan & specifications) that you:

- Install a two (2) wastewater treatment system with capacity for 1200 Litre/day and *Certificates of Conformance* to AS 1546.3:2017 for secondary wastewater treatment systems;
- Provide a land application area (LAA) plus a reserve area if needed for dispersal of effluent over an area of 2x 310 m^2 for stage 1 and additional 310 m^2 for stage 2, total 930 m^2 ,which should be subdivided into evenly three (3) sized zones;
- Install water saving fixtures and appliances rated to 3 or 4 Star WELS to minimise waste load;
- Keep records of all servicing and maintenance of the onsite wastewater management system for a period of 5 years in a format that has the key points detailed in Section 6.
- Use of low phosphorus and low sodium (liquid) detergents to improve effluent quality and maintain soil properties for growing plants; and
- Manage the operation and maintenance of the treatment and disposal system in accordance with manufacturer's recommendations, the Certificate of Conformity, the EPA Guidelines (2023).

General Environmental Duty

System maintenance:
Service contractors should record and electronically log all servicing with "Septic Track" or similar management system.

Stormwater measures:
- Divert roof drainage away from any effluent dispersal area.
- Maintain stormwater diversion cut-off drains to site drainage.

***De-commissioning existing septic system*:**
Abandoned existing tanks as per EPA Guidelines.

Vegetated zone below LAA:
On steep sites, brushes and shrubs such as cannas, ginger lily and hydrangeas, should be planted in the buffer strip below the LAA to attenuate nutrients.
Top up any depressions in irrigation area with compost (garden mix) material.

Water conservation
Install and maintain at premises (if not already) 3/4 star WELS rated water closets cisterns and shower rose heads.

OWMS – LCA SUMMARY REFERENCE: 230823

ADDRESS: **24 Maddens Lane, Gruyere** MAP REF: **MELWAY 283 A 5** CROSS ROAD: **Briarty Road**
LOT AREA : **40,518**m² SOIL TYPE: **Fine sandy CLAY** WATERWAY : **Trib. Log Crk.** LOADING RATE: **3.5** mm/day
No. OF BEDROOMS - **6 + 2** DAILY FLOW -**1260** + 530 LITRES/DAY DISPERSAL AREA: ~~1010~~ **930** m²

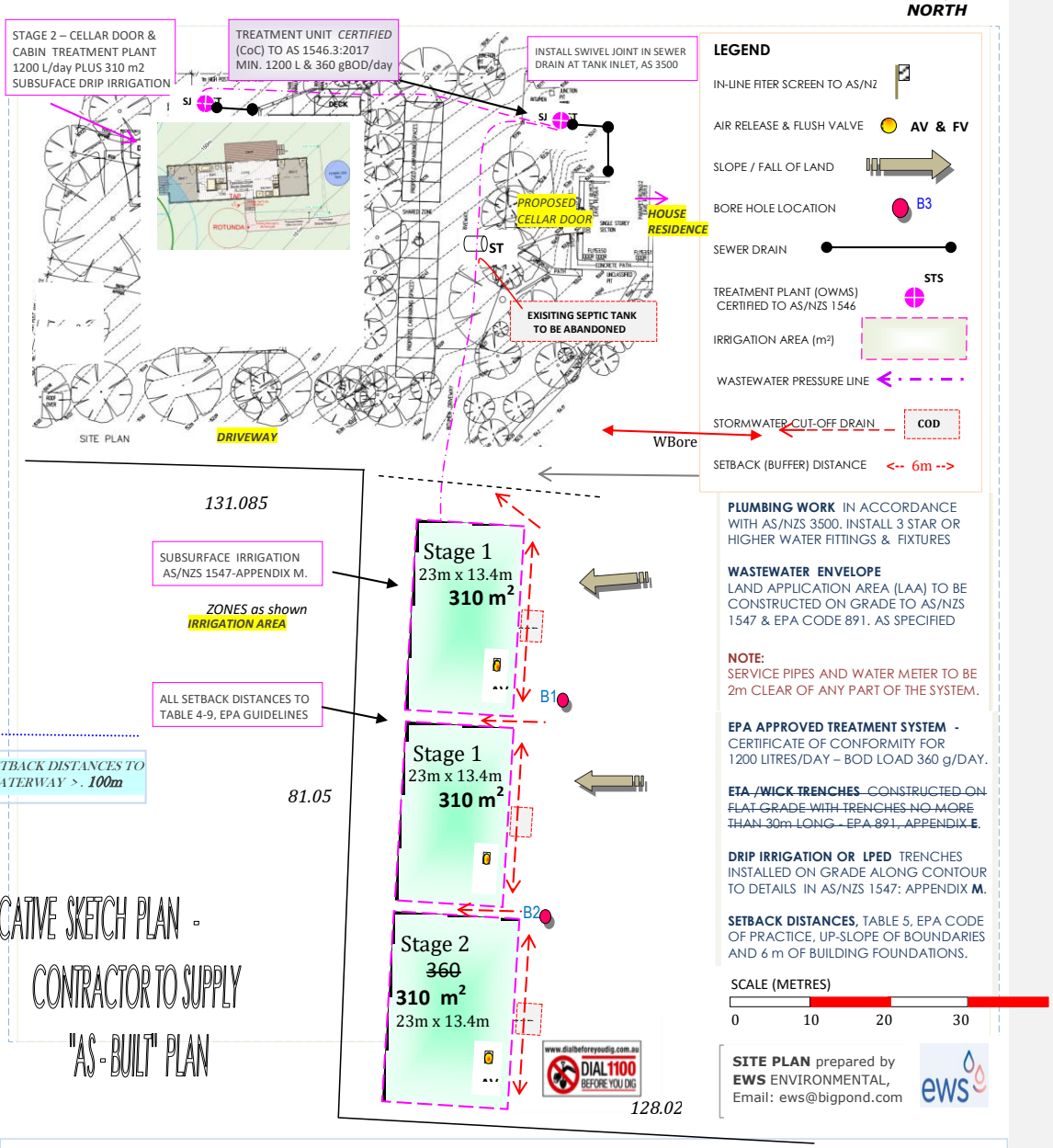


Figure 4: SITE PLAN DIMENSIONS IN METRES - DO NOT SCALE

8. References

State of knowledge (SoK), describes the body of accepted knowledge that is known or ought to be reasonably known about the harm or risks of harm to human health and the environment and the controls for eliminating or reducing those risks.

The following is a list of publications, guidelines and standard that have been relied upon to provide a reasonably practicable solution for onsite wastewater management in accordance with the environmental duty of persons under section 25(1) of the EP Act 2017.

1. **Canter, LW. and Knox RC.** (1986), *Septic Tank System Effects on Ground Water Quality*, Lewis Publishers Inc.

2. **Department of Sustainability and Environment,** *Planning permits for open water supply catchments*, November 2012.

3. **Environment Protection Authority** (2020). Industry guidance: Supporting you to comply with the general environmental duty, Publication 1741.1.

4. **Environment Protection Authority** (2024). Guidelines for onsite wastewater effluent dispersal and recycling.

5. **Environment Protection Authority** (2003). Guidelines for *Environmental Management: Use of Reclaimed Water,* Publication 464.2.

6. **Environment Protection Authority** (1991). *Guidelines for Wastewater Irrigation,* Publication 168.

7. **Hazelton, P and Murphy, B.** (2007). *Interpreting Soil Test Results,* CSIRO Publishing, Melbourne.

8. **Mc Donald , RC** et al (1998). *Australian Soil & Land Survey*, Field Handbook. CSIRO.

9. **McKenzie, N, Coughlan, K & Cresswell**, H. 2002, Soil Physical Measurement and Interpretation of Land Evaluation, CSIRO Publishing.

10. **Municipal Association of Victoria,** Department of Environment and Primary Industries and EPA Victoria (2014) *Victorian Land Capability Assessment Framework*.

11. **Standards Australia** / Standards New Zealand (2008). AS/NZS 1546.1:2012 *On-site domestic-wastewater treatment units –Part 1:Septic Tanks.*

12. **Standards Australia** (2017). AS/NZS 1546.3:2017 *On-site domestic-wastewater treatment units –Part 3: Aerated wastewater treatment systems.*

13. **Standards Australia** / Standards New Zealand (2012). AS/NZS 1547:2012 *On-site domestic-wastewater management.*

14. **USEPA** (2002) Onsite Wastewater Treatment Systems Manual. United States Environmental Protection Agency.

9. Acronyms & Definitions

- AS/NZS Australian & New Zealand Standards.
- CoC - Certificate of Conformance by *JASANZ* or equal accreditation organisation.
- EPA – Environment Protection Authority, Victoria.
- GED - General Environmental Duty.
- JAS-ANZ–Organisation providing internationally recognized accreditation services.
- LCA – Land capability assessment.
- LAA - Land application area.
- LPED – Low pressure effluent distribution,
- LPOD – Legal Point of Discharge (Stormwater).
- OWMS – Onsite Wastewater Management System.
- Reserve area - a duplicate land disposal area reserved for use when the original land disposal area needs to be rested for future unforeseen contingencies.
- Reticulated water -water supply obtained from mains supply, including any bore, stream or dam.
- Secondary treatment system - biological or physical treatment of sewage after primary treatment.
- Sewage means wastewater containing any human excreta, urine and toilet flush water and includes greywater (which is also called sullage and may include water from the shower, bath, basins, washing machine, laundry trough and kitchen);
- Unsewered area – land where no sewer pipes are adjacent to the allotment boundaries.
- Waterway – as defined by the Water Act 1989 - (Private off-stream dams are artificial assets).
- WELS – Water Efficiency Labelling Scheme.

Appendix A: Soil Bore Log

SOIL BORE LOG

EWS Environmental, www.ews.land
Email: ews@bigpond.com Phone: 0413 62 32 02

Client:	*Andrew Vogt*	Test pit No.	*TP 1 – TP2*
Site:	*24 Maddens Lane, Gruyere*	Assessor:	*JR Lawrey*
Date:	*10/11/ 2023*	Excavation:	*Spade & auger*
Notes:	*Refer to site analysis plan Fig. 3 for bore holes position*		

 # 1 BORE HOLE - PROFILE DESCRIPTION

Depth (m)	Log	Horizon	Texture	Structure	Colour	Mottles	Fragments	Moisture	Comments
0.10		*A1*	*Clay LOAM*				*nil*	*dry*	*Organic*
0.30									
0.40									*Category*
0.70				*Weak*		*nil*		*dry*	*4 (b)*
0.90		*B1*	*Fine sandy CLAY*		*Light Brown*		*<10%*		

 # 2 BORE HOLE - PROFILE DESCRIPTION

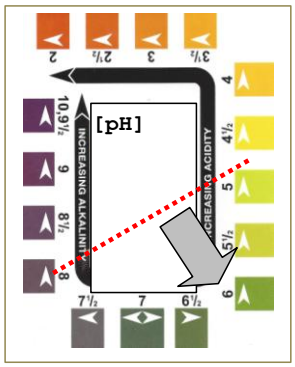
Depth (m)	Log	Horizon	Texture	Structure	Colour	Mottles	Fragments	Moisture	Comments
0.10		*A1*	*Clay LOAM*				*nil*	*dry*	*Organic*
0.20									
0.30									*Category*
0.70						*nil*		*dry*	*4 (b)*
0.90		*B1*	*Fine sandy CLAY*	*Weak*	*Light Brown*		*<10%*		

 # 3 BORE HOLE - PROFILE DESCRIPTION

Depth (m)	Log	Horizon	Texture	Structure	Colour	Mottles	Fragments	Moisture	Comments
0.10		*A1*	*Clay LOAM*				*nil*	*dry*	*Organic*
0.30									
0.40									*Category*
0.70				Three (3) hole attempted but hid rock floaters at 400mm on each occasion. Groundwater bore nearby.			*Rock floater*	*dry*	*Not rated*
0.90		*B1*							

Appendix A1 - Field Soil Test & Notes

Test {**pH**} Ref: CSIRO soil test kit



pH = [ph

Test {**EC**} Electrical conductivity

pH test

- > 6
- 4.5 to 8
- <4.5 or >8

pH

{EC} Electrical conductivity
(µS/cm =dS/m x10^{-3}

- < 0.8
- 0.8 to 2
- > 2

EC = < 100 µS/cm

Test: {**EAT**} – Emerson Aggregate.

[EAT] Modified (AS/NZS 1547:E7

1. No change ☐
2. Aggregate slakes ☑
3. Aggregate disperses ☐
4. Worked ball disperses ☐

EAT = Class 2

Soil fertility:
Is Gypsum application required (pH>6)? ~~YES~~, NO Application rate: kg/m²
Is Lime /dolomite required (pH<6) ? ~~YES~~, NO Application rate: kg/m²

Colour:
Dark, **Light**, Yellow, Reddish, Yellowish
Black, Grey, **Brown**, Yellow, Red

Drainage:
Rapid , Well drained, **Moderate**, Imperfect, Poor

Vegetation:
Plentiful, Virgin, **Sparse,** Cultivated, Natural,
No wet plants, Tall, Low, Isolated clumps

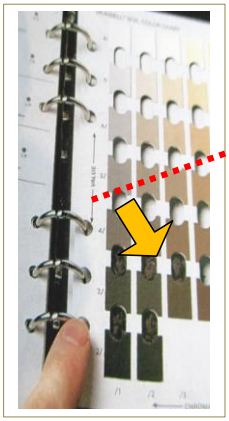
Soil Permeability (AS/NZS 1547)

	Slope:	**MF**
	<10%	0
	10 - 20%	20%
	> 20%	50%

Slope form:

	Convergent	(
	Plannar	|
	Divergent	)
	Waxing	↱
	Linear	↘
	Waning	↳

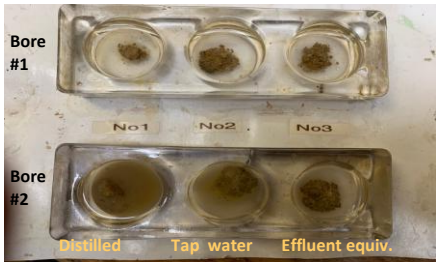
Colour



Soil test Gritness- Ribbon (mm) Category.

	1 SAND	25	**1**
	2 Sandy Loam	30	**2**
	3 LOAM	40	**3**
✓	**4** Clay **LOAM**	50	**4**
	5 Light **CLAY**	60	**5**
	6 Med. - Heavy	>75	**6**

Soil Category: **4 (b)** , K_{sat} **0.12 metre/day**



Emerson test = non dispersive to effluent

Field tests conducted by: J R Lawrey MIEAust No. 142295 Date: *10/11/ 2023*

Attachment

Informative information for landlords and tenants

Extract from Environment Protection Regulations 2021

OWMS - ***on-site wastewater management system*** means an on-site wastewater treatment plant and includes all beds, sewers, drains, pipes, fittings, appliances and land used in connection with the treatment plant;

Regulation 159

(1) A person in management or control of land on which an *OWMS* is located must take all reasonable steps to ensure the system is:

1. Operated so to not to pose a risk to human health or the environment.
2. Maintained the system in good working order, and
3. Prevent the contents of system from overflowing.

Regulation 160

An owner of land on which an *OWMS* is located must provide to the person in management or control of the system:

1. Written information regarding the correct operation and maintenance of the system.

Regulation 161

A person in management or control of land on which an *OWMS* is located after 1 July 2022 must notify Council (responsible authorities) as soon as practicable that they become aware that the system is a risk to human health or the environment or is not in good working order.

Regulation 162

(1) An owner of land on which an *OWMS* is located must:

Keep and hold a record of all maintenance activities (including any pump-outs and services records) carried out on the system for 5 years, and

(2) An owner of land on which an *OWMS* is located must:

Make available for inspection by responsible authorities any records kept.

Attachment

LCA wastewater assessment summary & checklist

Report element	Information	Data	Page	Comments /remarks	Check
	Applicant	Contractor/Owner	1	Andrew Vogt	☑
1. Introduction and	Site **Ad**dress	24 Maddens Lane, Gruyere			
Background	**R**eport **N**umber	230823		Dated: 10 November 2023	
	P**h**one (Mobile)	0418 144 896			
	Email			vogtandrew691@gmail.com	
	Location town	PC: 3770		24 Maddens Lane, Gruyere	
	Map **R**ef:	Melway 283 A 5		MELWAY	
	Xross Road (nearest)	~300 m		Briarty Road	☑
	Council (Municipality)	CPN 173520		Yarra Ranges	
2. Description of	**P**roperty area (m^2)	40,518 m^2	3		
Development	Land **z**oning & Overlays	Nil		Yarra Ranges - Planning scheme, CMA	
	Bedrooms	6		Number of persons 7	
	Flow per person (L/d)	180 litres/day		Tank water / Town water	
	Date of report	13 Nov. 2023		Date of report: 13 November 2023	☑
3. Site and	**T**ype of soil (colour)	Fine sandy CLAY	5	Soil type & Category Colour	
Soil assessment	K_s Soil permeability	0.12 m/day		~~Mottling, Sodic, Collapsing soil~~	
	vStructure	Weak		~~Massive ,~~ Moderate, ~~Weak~~	
	uSoil Category	4 (b)		~~Landslip, Filled, Rock, Flooding~~	
	Salinity **EC & pH**	[EC <0.08 [ph 7		~~Divergent~~, Plannar, ~~Convergent~~	
	Groundwater	150 m		Depth to groundwater **VVG**	
1. Wastewater	**F**low daily (L/day)	180 litres/day		WELS 3 star, Organic load @ 60 gBOD	
System	**Ir**rigation **R**ate (mm/d)	3.5 mm/day		DLR **[8]** mm/day	☑
	Rainfall (mm/year)	882		BoM	
	Evapo-transpiration (mm)	1151 mm/year		BoM	
	Water/Nitrogen **BAL**	950 m^2		Section 4.4 LCA	☑
2. Monitoring & Maintenance	Salinity **EC & pH**	[EC <0.08 [ph 6	19		
	Waterway- Creek	**>100** m		Trib. Trib. Stringybark Crk.	
	Land **as**pect	West		~~Full or partial shade~~, Full sun	
	Site **ev**aluation date	10/11/ 2023		Ex. Septic tank- Yes, tBR	
3. Service & performance			20	U/G –NA	☑
	Water **q**uality	20/30 mg/L		Type of treatment min. 1200 L/day	
4. Conclusions & Site Plan	**C**oC–AS 1546.3: 2017	Section 7.	21	Figure 4	☑
5. References	*So**K** – EP Act 2017, s*	Section 8	22	*"State of Knowledge"*	
6. Acronyms & definitions	*EP **Act** 2017*	Section 9	23		☑