A.C. Geotechnical.

Land Capability Assessment

287 Smiths Road, Toolangi

REPORT NUMBER: 20247

Distribution

Land Capability Assessment
287 Smiths Road, Toolangi

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For and on behalf of
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Accreditation	Land Capability Assessment for On-site Wastewater Management Certificate CET, 2015
Experience	10 years' experience in geotechnical engineering and environmental assessments, with a focus on wastewater management across all states of Australia.

EDITION	DISCRIPTION	DATE
Rev0	Version 1	21/12/2020
Rev1	Version 2	24/12/2020

1. SUMMARY

The following summary table should be read in conjunction with the entire report.

Designs wastewater load	Average wastewater load over a week	2785 L/day
Soils characteristics	Horizon A	Horizon B
Soil category	4b Clay Loam	5b Medium clay
Indicative permeability	0.12-0.5 m/d	0.06-0.12 m/d
Critical site features	• Site Dam • Existing septic system and disposal area • High annual rainfall • High wastewater Load	
Minimum treatment requirements	Primary	
Disposal system	Suitability	Area required
Absorption trenches	Suitable	557 m
Subsurface Irrigation	Suitable	1,750 m^2
ETA Beds	Suitable	400 m^2
Mound	Suitable	510 m^2
Wastewater can be sustainably disposed to land		Yes

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2. INTRODUCTION

A.C. Geotechnical Pty Ltd (AC) have been engaged to undertake a Land Capability Assessment (LCA) for an approximately 40,000 m^2 site at 287 Smiths Road, Toolangi.

The objectives of the assessment was to determine the following:

- Sub-surface ground profile and geological setting.
- The depth to groundwater (if encountered).
- The permeability of the soil profile.
- The capability of the site to sustainably manage wastewater within the allotment boundaries.
- A management program that should be put into place to minimise health and environmental impacts of on-site wastewater management, including the impact on surface water and groundwater, and
- Information about the site and soil conditions.

2.1 Proposed Development

It is proposed to use the site to host events and overnight camping. The facilities will have the capacity for 150 day guessed and 50 overnight campers. No commercial kitchen is included in the proposed site use.

2.2 Existing Septic System

There is an existing primary treatment system onsite for the existing dwelling. The system consists of primary treatment of wastewater and disposal to land via absorption trenches, the disposal area and septic tank is located down of the existing site dam. The existing system appears to be in good working order, the soils in this located were found to be in a moist condition and similar to those encountered outside the disposal area.

3. SITE DESCRIPTION

3.1 Site Location

The subject site is located on the west side of Smiths Road, approximately 2.8 km north- east of Healesville-Kinglake Road Junction. The site is surrounded by various sized properties, the assumed land use of these properties is summarised in **Table 2.1** Below.

Table2.1 -Surrounding land use

North	Agriculture
South	Rural residential / lifestyle property
East	Agriculture (Smiths Road)
West	Rural residential / lifestyle property

3.2 Site Topography and Condition

The site has an existing dwelling and multiple other structures, including natural swimming pool, pergola, sheds and retaining walls. An access track has been cut into the north side of the site and swings around through the centre, with retaining wall supporting the upslope side. A site dam is located in the north-east corner with the existing septic tank and absorption trenches located to the south.

The east half of the site has a moderate to steep slope down to the east, the site levels off at the top of the hill (west half of site)

Vegetation on the site comprises open turf with a permitter of native shrubs and trees.

Site photographs are included in **Appendix B.**

3.3 Key Site Information

Table2.2 -Key site features

Site Address	287 Smiths Road, Toolangi
Owner/Applicant	Brendan Ricci
Local Council	Murrindindi
Zoning	Farming Zone (FZ)
Total Land Area	Approximately 40,000 m^2
Domestic Water Supply	Reticulated/Tank
Anticipated wastewater loads (Litres/day)	EPA Code of practice - onsite wastewater management (2016) Public area – meeting hall with kitchenette (10L/person/day) Camping Ground – Recreation area with showers and toilets (100L/person/day **Peak design wastewater load** 150 guests x 10L/person/day = 1500L/day 50 Campers x 100l/day = 5,000L/day Total: 6,500L/day **Weekly averaged** Assumed worst case of 3 function in one week at full capacity 3 x 6,500 / 7 = 2785L/day
Organic Material Loading Design Rates	EPA Code of practice - onsite wastewater management (2016) Public area Guest 5/person/day Camping ground 40g/person/day **Peak daily organic loading** (150 x5) + (50 x 40) = 2750 g/day **Weekly average** Assumed worst case of 3 function in one week at full capacity 3 x 2750 / 7 = 1178 g/day
Availability of sewer	Sewer is not likely to become available to this area in the near future
Groundwater Quality	Groundwater is classified as Potable (0 - 500 mg/L TDS) www.vvg.org.au
Water Table	Local registered bores in the area suggest the ground water is held approximately 50 - 100 m below the surface

Climate	Average annual rainfall 1346.4 mm
Flood Potential	Outside a 1 in 100-year flood event
Water catchment area	N/A
Vegetation	Pasture grasses, scattered native trees
Exposure	Generally open
Slope	Moderate to step down to the east
Landform	Hills
Erosion Potential	Minimal
Surface Drainage	Good
Rocks and Rock Outcrop	None
Geology	Devonian Aged Metamorphic

3.4 Site Geology

According to the Geological Survey of Victoria, the site is in an area of Devonian Aged Metamorphic

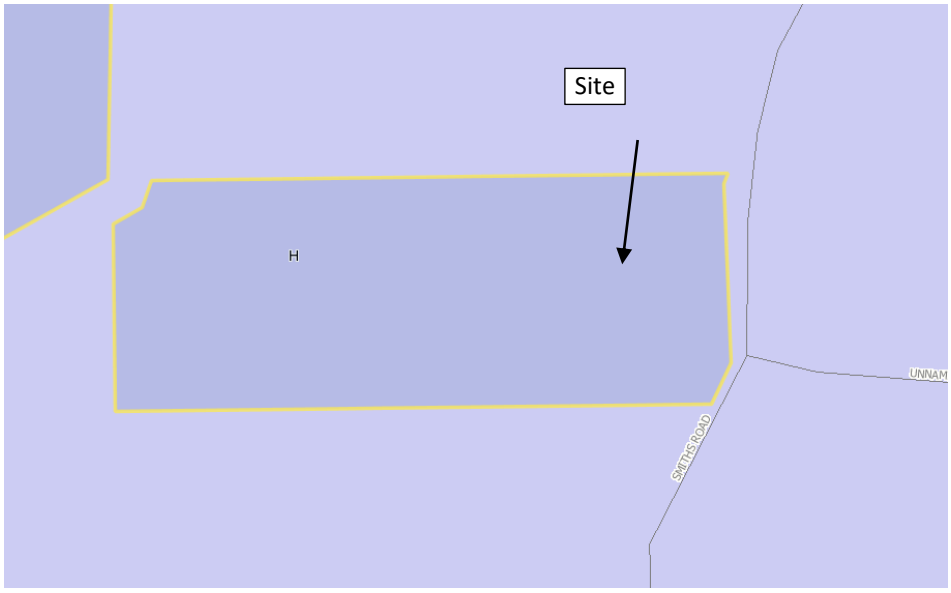

Figure 2.1 Extract of Geological from GeoVic 3

4. SOIL ASSESSMENT AND CONSTRAINTS:

4.1 Soil Profile

The soil profile encountered during the investigation consisted of brown clayey silt (light CLAY) overlaying orange/brown silty clay (Light clay)

No groundwater was encountered during this investigation.

No abnormal moisture conditions were identified through this assessment

Borelogs are included in **Appendix C.**

4.2 Site Exposure

A general assessment of the site exposure is as follows:

The site is exposed to the prevailing winds. The proposed effluent disposal area is generally exposed to sun and wind all year round.

4.3 Soil Assessment

Table3.1 -Summary of soil assessment

BORE HOLE	**SAMPLE DEPTH: 200mm**		**SAMPLE DEPTH: 600mm**	
SOIL ASSESSMENT (AS1547-2012)	**SOIL HORIZON: A**		**SOIL HORIZON: B**	
Soil Colour	Brown		Orange/brown	
Soil Texture	Clay loam		Light clay	
Coarse Fragments (%)	None		None	
Soil Structure	Weakly Structures		Moderately	
Soil Dispersion	Nondispersive		Nondispersive	
Soil Permeability	> 0.12-0.5 mm/d		> 0.06-0.12 mm/d	
Soil Category	4b		5b	
Design Irrigation Rate / Design Loading Rate	DIR	3.5 mm/d	DLR	5.0 mm/d
pH 1:5 Ratio Electronic Method	6.72		6.68	
Electrical Conductivity	64 µS/cm	/1000 = .064 dS/m	70 µS/cm	/1000 = .070 dS/m
Salinity Hazard	Non-saline		Non-saline	

4.4 Field Assessed Permeability:

An investigation on the soil profile was assessed in-situ and permeability testing conducted as outlined in AS 1547-2012 using the constant-head test method. The constant-head test was conducted in four locations across the site (see plan, Figure 2). The field assessed permeability was calculated using the Talsma-Hallam constantly maintained head of water equation identified in AS 1547-2012.

$$K_{sat} = \frac{4.4\ Q\ [0.5\sinh^{-1}(H/2r) - \sqrt{\{(r/H)^2 + 0.25\}} + r/H]}{2\pi H^2}$$

Where:
K_{sat} = saturated hydraulic conductivity of the soil in cm/min
4.4 = correction factor for a systematic under-estimate of soil permeability in the mathematical derivation of the equation
Q = rate of loss of water from the reservoir in cm^3/min
H = depth of water in the test hole in cm
r = radius of the test hole in cm.

Table3.2 -Summary of insitu permeability

CONSTANT HEAD PERMEABILITY	
Rate of loss of water from reservoir (Q)	14.033 cm^2/min
Indicative permeability (K_{sat})	0.009 m/day
Indicative permeability (K_{sat})	0.129 m/day

Note: The results in the table above are based on average readings taken from the test holes.

The corresponding Ksat value of 0.129 m/day in EPA Onsite Wastewater Management – Code of Practice Publication No. 891.4 July 2016 Appendix A Table 9 is category 4 (clay loam soil).

4.5 Critical site Features

The critical site features are:

- Site Dam
- Existing septic system and disposal area
- High annual rainfall
- High wastewater Load

5. LAND CAPABILITY ASSESSMENT MATRIX

The table below is a Land Capability Assessment (LCA) following the EPA Publication 746.1. The LCA has been developed for the whole site however soils information relates to soils within the vicinity of the building envelope.

Table4.1 -Land capability assessment matrix - Site

Land Features	Land Capability Class Rating					Site Rating	Comments	Mitigation
	Very Good (1)	Good (2)	Fair (3)	Poor (4)	Very Poor (5)			
	General Characteristics							
Site drainage / runoff	No visible signs of dampness	Moist soil but no standing water		Visible signs of dampness i.e. water tolerant plants	Water ponding on surface	1	Well drained site	N/A
Runoff	None	Low	Moderate	High	Very High	1	Large lot size	Maintain suitable setback distances from site boundaries.
Flood / inundation potential (yearly return exceedance)	Never		< 1 in 100	>1 in 100 to < 1 in 20	> 1 in 20	1	Outside a 1 in 100-year flood event	N/A
Proximity to water courses	> 60 metres			< 60 metres		4	Dam onsite	Located septic system and disposal area downslope of dam
Slope (%)	0 - 2	2 - 8	8 – 12	12 – 20	> 20	3	8-12 %	Run trenches/beds parallel with slope contours

Land Features	Land Capability Class Rating					Site Rating	Comments	Mitigation
	Very Good (1)	Good (2)	Fair (3)	Poor (4)	Very Poor (5)			
Landslip	No potential for failure		Low potential for failure	High potential for failure	Present or Past Failure	1	No landslip potential	Maintain current level of surface cover where practical
Groundwater table (m) seasonal watertable depth	>5.0	2.5 – 5.0	2.0 – 2.5	1.5 – 2.0	<1.5	1	Groundwater held between 50 – 100 m below the surface	N/A
Rock Outcrops (% of land surface containing rocks >200mm)	0%	<10%	10-20%	20-50%	>50%	1	None	N/A
Erosion Potential	No erosion potential	Minor	Moderate	High	Severe erosion potential	2	Minor erosion potential due to high rainfall and slope	Maintain current level of surface cover where practical
Exposure	High sun and wind exposure		Moderate	Low sun and wind exposure		1	High exposure to sun & wind	N/A
Landform	Hill crests, convex side slopes and plains		Concave side slopes and foot slopes		Floodplains and incised channels	1	Hills	N/A
Vegetation Type (land application area)	Turf or pasture				Dense Forest	1	Open turf	N/A
Fill	No Fill present		Fill Present			1	No fill encountered	N/A

Land Features	Land Capability Class Rating					Site Rating	Comments	Mitigation
	Very Good (1)	Good (2)	Fair (3)	Poor (4)	Very Poor (5)			
Rainfall (mm/yr)[2]	<450	450 - 650	650 – 750	750 - 1000	>1000	5	Average annual rainfall of 1346.4 mm	LAA size to be determined by water balance calculations
Pan evaporation (mm/yr)[3]	>1500	1250 - 1500	1000 – 1250	-	<1000	3	Annual evaporation of 1099.01	LAA size to be determined by water balance calculations

Table4.2 -Land capability assessment matrix - Soils

	Soil Profile Characteristics							
Profile depth	>2.0m	1.5–2.0m	-	1.0–1.5m	<1.0m	1	Deep soil profile	N/A
Shrinkage* (%)	Low <4%	Moderate 4-12%	High 12-20%	Very High >20%		2	Medium plasticity silty clay	N/A
Permeability* (m/d)	0.15–0.30	0.08–0.15 0.30-0.60	0.06-0.08 0.60-1.50	- 1.50-2.00	<0.06 >2.00	2	Clay loam soils	LAA size to be determined by water balance calculations
Soil Permeability Category [1]	2 and 3	4		5	1 and 6	2	Clay loam soils	LAA size to be determined by water balance calculations
Coarse fragments* (%)	<10	10-20	20-40		>40	1	Non encountered	N/A
Emerson Test* (dispersion / slaking)	4,6,8	5	7	2,3	1	1	Nondispersive	N/A

Soil Profile Characteristics

Electrical Conductivity (Ece) (dS/m)	<0.3	0.3-0.8	0.8-2.0	2.0-4.0	>4.0	1	Non saline	N/A
pH	6-8		4.5-6		<4.5, >8	1	Neutral soils	N/A

[1] Source: AS1547-2012
[2] Source BOM station – Toolangi (Mount St Leonard DPI)(086142)
[3] Source BOM station – Coldstream (086383) 2019
* Relevant to soil layer(s) associated with wastewater application

6. MANAGEMENT PROGRAM:

The onsite wastewater system design and management program must suit the capability of the site and will consider the proposed development. The following sections discuss the inputs used to assess the suitability and requirements of EPA approved land based systems. Detailed design for the system is beyond the scope of this study.

6.1 Treatment System

Primary treatment of all wastewater is considered suitable for disposal to land at this site, however some land application methods require secondary treatment of wastewater to operate sustainable and efficiently.

Untreated domestic wastewater typically has values of 200-300mg/L biochemical oxygen demand (BOD5) and 200-300mg/L total suspended solids (TSS). Indicative target effluent quality for secondary treatment systems are < 20mg/L BOD5, < 30mg/L TSS and <10cfu/100mL E.Coli.

If secondary treatment of wastewater is preferred, the two most common options capable of achieving the desired performance are, aerated wastewater treatment systems (AWTS) and single pass sand filters. A summary of these systems is outlined below.

6.1.1 Aerated Wastewater Treatment System (AWTS)

AWTS are pre-fabricated or pre-engineered treatment systems designed to treat small wastewater flows. They are tank-based systems that typically employ the following processes:

- Settling of solids and flotation of scum in an anaerobic primary chamber.
- Oxidation and consumption of organic matter through aerobic biological processes.
- Clarification – secondary settling of solids; and
- Disinfection prior to disposal.

Good maintenance of AWTS (e.g. removal of sludge) is essential to ensure a consistently high level of performance. By law, AWTS are required to be serviced quarterly by an approved maintenance contractor.

6.1.2 Sand Filters

Sand filters provide advanced secondary treatment to water that has already undergone primary treatment in a septic tank or similar device. They contain approximately 600mm depth of filter media (usually medium to coarse sand, but other media can be incorporated) within a lined excavation containing an underdrain system. Selection of the filter media is critical, and a carefully designed distribution network is necessary. A dosing well and pump is normally used to allow periodic dosing. Depending on the desired level of treatment, sand filters can be single pass or may incorporate partial recirculation.

6.2 Treatment System Location

Based on requirements of EPA 891.4, above-ground and in-ground treatment systems must comply with the same setback distances to building footings and boundary fences as land application systems.

6.2.1 Septic tank sizing

The septic tank/treatment system should be designed for a surcharge load of 6,500 L/day and for an average wastewater load of 2,785 L/Day (averaged over a week)

6.3 Land Application

A range of possible land application systems have been considered, such as absorption trenches/beds, evapotranspiration/absorption (ETA) beds, mound systems and sub-surface irrigation. AS1547:2012 outlines factors affecting the construction and operation of common land application systems and a guide to selecting a system taking into consideration site features, subsurface soil conditions and identified constraints. The suitability of EPA approved land based systems are discussed in **Table 5.1.**

Table 5.1 Land Application System

Land Application	Description	Site Suitability
Absorption Trenches	Trenches are the most common type of land application system and are generally used on lots which are reasonably flat and where water soaks into the soil readily in all weather conditions. Commonly, distribution pipes, self-supporting arch trenching or box trenching are laid in trenches filled with aggregate/rock. Effluent then soaks into the surrounding soil.	Suitable
ETA Beds	Beds are shallower forms of trenches. Because beds have smaller sidewall area compared with trenches, the absorption provided by sidewall loading is reduced. This is compensated for by reducing the design loading rate.	Suitable
Mound System	A mound system permits the absorption area to be sited in a location where the natural water table or impermeable rock approaches the ground surface. The mound is filled with medium-grade sand to provide suitable filtering before intercepting the natural soils. A pump/siphon dosing system distributes effluent uniformly through a bed of aggregate placed at the top of the mound. The sand media in the mound system acts as a secondary treatment system, removing the need for a separate sand filter or AWTS	Suitable, large construct costs due to slope of site.
Sub-surface Irrigation	Subsurface drip irrigation requires secondary treated effluent dosing lines buried in the topsoil at shallow depth. Irrigation systems operate by both soil absorption and evapotranspiration from plants/trees	Suitable, however required are large disposal area.

6.3.1 Disposal systems

Water balance modelling has been undertaken to calculate the minimum size of the LAA. The water balance takes into account the average annual rainfall, evaporation data, the daily effluent load, the design irrigation/loading rates for secondary treated effluent, the seasonal crop factor and the retained rainfall. The water balance model is designed so that the land application area is based upon a depth of saturated soil (i.e. water stored within indicative soil porosity) that meets the upper

limits of acceptance for each land application method. The water balance must ensure that the soil can sustain growth during the summer months. The specific parameters adopted for land application using sub-surface irrigation are outlined in **Table 5.2**.

Table 5.2 System Parameter

Treatment system	Application System	DIR / DLR	Runoff coefficient	Maximum storage depth
Primary treatment	Absorption trenches	5	-	-
Secondary treatment	ETA Beds	8	25%	200 mm
	Mound System*	8	25%	0 mm
	Sub-surface irrigation	3.5	25%	0 mm

* Mound disposal system incorporates a secondary treatment sand media, removing the requirement for a separate secondary treatment system

6.4 Land Application Outputs

Minimum Land Application Area (LAA) sizing for each application method was calculated using . Water balance calculations. LAA sizing calculations are included in **Appendix D**.

Table 5.3 Required Land Application Area (LAA)

Disposal system	Minimum reserve size required
Wastewater output	2,785 L / day (average)
Absorption trenches	557 m (1.0 m wide trench)
Subsurface irrigation	1,750 m^2
ETA Beds	400 m^2
Mound	510 m^2

6.5 Preferred System Description

It is understood that a worm farm treatment system is preferred. Disposal to land can be via absorption trenches, the trench must have a minimum depth of 600 mm with a minimum distance of 1.0 m between trenched. Due to the slope of the site, all trench must run parallel with the contours of the site.

Secondary treatment with disposal via subsurface irrigation, ETA beds or a mound are also suitable for this site.

6.6 Designated Area

The Land Application Area (LAA) shall be located in a designated area to enhance evapotranspiration and shall:

- Not be used for purposes that compromise the effectiveness of the system or access for maintenance.
- Be used only for effluent application.
- Have boundaries clearly delineated by appropriate vegetation or other type of border.
- Have no run-off seepage or effluent beyond the designated area.

The site plan in **Appendix A** presents several potential areas suitable for LAA placement as well as setback areas from site features which must be maintained. Please note that the final LAA placement is the responsibility of the owner and should be included in a detailed design providing the minimum LAA and setback distances are maintained.

The required LAA will be smaller than that marked on the site plan. An appropriately sized LAA, as discussed in **Section 6.4,** must be located entirely within the area nominated on the site plan

Setback distances for primary and secondary treated wastewater disposal in included in **Section 6.6.1**.

6.6.1 Setback Distances

The minimum setback distances for primary and secondary treated wastewater below should be used to assist in placement of wastewater envelops for this site

Landscape feature or structure	Setback distance (m) (primary treated wastewater	Setback distance (m) (secondary treated wastewater
Building		
Wastewater field up-slope of building	6	3
Wastewater field down-slope of building	3	1.5
Wastewater field up-slope of cutting/escarpment	30	15
Allotment boundary		
Wastewater field up-slope of Allotment boundary	6	3
Wastewater field down-slope of Allotment boundary	3	1.5
Services		
Water supply pipe	3	1.5
Wastewater field up-slope of potable supply channel	300	150
Wastewater field down-slope of potable supply channel	20	10
Gas supply pipe	3	1.5
In-ground water tank	15	7.5
Stormwater drain	6	3
Recreational areas		
Children's grasses playground	6	3
In-ground swimming pool	6	3
Surface water – up-slope of		

Waterway, non-potable creeks, dams, channels	60	30
Groundwater bores		
Category 2b to 6 soils	40	20

6.7 Monitoring, Operation and Maintenance

The septic tank is de-sludged every 3 years; however, this frequency may vary depending on the following conditions.

- whether the tank is an adequate size for the daily wastewater flow
- the composition of the household and personal care products
- the amount of organic matter, fat, oil and grease washed down the sinks
- the use of harsh chemicals such as degreasers
- overuse of disinfectants and bleaches
- the use of antibiotics and other drugs, especially dialysis and chemotherapy drugs
- whether any plastic or other non-organic items are flushed into the tank.

After pump-out, tanks must not be washed out or disinfected. They should be refilled with water to reduce odours and ensure stability of plumbing fixtures. A small residue of sludge will always remain and will assist in the immediate re-establishment of bacterial action in the tank.

To ensure the treatment systems function adequately, residents must:

- Use soapy water (made from natural unscented soap), vinegar and water or bi-carbonate of soda and water to clean toilets and other water fixtures and fittings.
- Read labels to learn which bathroom and laundry products are suitable for septic tanks. Generally plain, noncoloured, unscented and unbleached products will contribute to a well-functioning septic tank.
- Use detergents with low levels of salts (e.g., liquid detergents), sodium absorption ratio, phosphorus and chlorine (see www.lanfaxlabs.com.au).
- Wipe oils and fats off plates and saucepans with a paper towel and dispose of in the kitchen compost bin.
- Use a sink strainer to restrict food scraps entering the septic system.
- Ensure no structures such as pavements, driveways, patios, sheds or playgrounds are constructed over the tank or absorption trench area.
- Ensure the absorption trench area is not disturbed by vehicles or machinery.
- Engage a service technician to check the sludge and scum levels, pumps and alarms annually.
- Keep a record of the location of the tank and the trenches and all maintenance reports (including the dates of tank pump-outs, tank inspections and access openings) and ensure the service technician sends a copy of the maintenance report to the local Council
- Have the tank desludged when the combined depth of the scum and sludge is equal to the depth of the middle-clarified layer.

Indications of failing septic tanks and soil absorption trenches

- Seepage along effluent absorption trench lines in the soil.
- Lush green growth down-slope of the soil absorption trench lines.
- Lush green growth down-slope of the septic tank.
- Inspection pits and/or the soil absorption trenches consistently exhibiting high water levels.
- Soil absorption trench lines become waterlogged after storms.
- General waterlogging around the land disposal area.
- Presence of dead and dying vegetation (often native vegetation) around and down-slope of the land disposal areas.
- A noxious odour near the tank and the land disposal area.
- Blocked water fixtures inside the house, with sewage overflowing from the relief point.
- High sludge levels within the primary tank (within about 150 mm of inlet pipe).
- Flow obstructed and not able to pass the baffle in the tank.
- The scum layer blocking the effluent outflow.

6.7.1 Storm Water Management

All stormwater must be disposed of to the legal point of discharge.

Note: An agricultural drain (AG) must be installed on the high side of the wastewater envelope. The drain is to be installed a minimum of 100mm into the naturally occurring clay soils and allow sufficient fall to intercept and drain all overland and subsurface run-off to a legal point of discharge. If a legal point of discharge cannot be obtained, the drainage line may discharge directly to the surface soils, a minimum distance of 10 metres beyond the wastewater disposal area.

7. CONCLUSIONS:

After considering the theoretical wastewater load, loading conditions (likely operating days per week and seasonal nature of the operation), natural features and climatic conditions of the site it is considered sustainable to disposal of wastewater onsite, if the above recommendations are adhered to.

8. REFERENCES:

- Environmental Protection Authority – Guidelines for Environmental Management Code of Practice – Onsite Wastewater Management, July 2016 ~ Publication 891.4
- Municipal Association Victoria (MAV) January 2014, Model Land Capability Assessment Report
- Australian/New Zealand Standard AS/NZS 1547-2012 – On-site domestic wastewater management.
- A.C. Geotechnical Pty Ltd - Field and Laboratory data (where applicable) collected and recorded.
- Environmental Protection Authority - "Code of Practice - Septic Tanks", March 1996" ~ Publication 451.
- Environmental Protection Authority, Information Bulletin- "Land Capability Assessment for onsite Domestic Wastewater Management", March 2003 ~ Publication 746.1.

Notes

1. LAA must be setback a minimum of 6.0 m from all boundaries
2. LAA must be potions downslope of the existing site dam
3. Setback distances outlines in **Section 6.6.1.**

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Not to Scale
Investigation locations are approximate

Legend
- Investigation Location
- Existing septic system/disposal area
- Proposed disposal area

Attachment A: Site Plan 20247
287 Smiths Road
Toolangi
Date of field work: 11 December 2020

Appendix B

Site Photographs

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Appendix C

Borelog

Borehole Record BH01

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Project Number	20247	Date	11/12/2020
Project	Land Capability Assessment	Drilling Method	HA
Location	287 Smiths Road, Toolangi	Logged	AC

Depth (m)	Description	
0.00	Clayey SILT (ML): Low plasticity, brown, firm, moist, near plastic limit.	Disturbed sample - 0.2 m
0.50	Silty CLAY (CI): Medium plastic, orange/brown, firm to stiff, moist, near plastic limit.	Disturbed sample - 0.6 m
2.00	Borehole terminated - target depth achieved	

Appendix D

Constant Head Calculations & Water Balance

INSITU CONSTANT HEAD PERMEABILITY

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Project Address:	287 Smith Road	**Project Number:**	20247
Location:	Toolangi	**Date:**	18/12/2020
Client:	Brendan Ricci		

INPUT DATA

Borehole			**Reservoir**		
Borehole diameter	100	cm	**Diameter**	97	mm
Borehole Depth	500	cm	**Base area**	295.4426	mm2
Water level from surface	250	cm			
Depth of water in hole	250	cm			

FIELD DATA

	Test 1	Test 2	Test 3	Test 4	
Time intervals (min)	Water depth in reservoir				
Initial Depth	200	200	200	200	
5					
10					
15					
20	190	188	193	191	**Average**
Q (cm2/min)	14.77213	17.726556	10.340491	13.294917	**14.0335235**
Ksat (cm/min	0.009494167	0.011393	0.006645917	0.00854475	**0.009019458**
Ksat (m/d)	0.136715998	0.164059198	0.095701199	0.123044398	**0.129880198**

ABSORPTION TRENCH SIZE CALCULATIONS

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Project Address:	287 Smith Road	**Project Number:**	20247
Location:	Toolangi	**Date:**	18/12/2020
Client:	Brendan Ricci		

INPUT DATA

Daily flow allowance (per person	0 L
Daily wastewater volume	2785 L
Effluent quality	Primary
Soil texture	Light clay
Soil structure	Moderately
Soil category	5b
Indicative Permeability	0.06-0.12 Ksat
Design Loading Rate	5 mm/d

ABSORPTION TRENCHES

L = Q / (DLR x W)

Where:

L = length of trench

Q = Design daily flow in L/day

DLR = Design Loading rate in mm/d

W = width of trench in m

Width of trench	0.7 m	Width of trench	1 m
Length =	**796 m**	**Length =**	**557**

WATER BALANCE
ETA BEDS

A.C. Geotechnical.

Project Address:	287 Smith Road	**Project Number:**	20247
Location:	Toolangi	**Date:**	18/12/2020
Client:	Brendan Ricci		

INPUT DATA		
Daily flow allowance (per person	0	L
Daily wastewater volume	2785	L
Effluent quality	Secondary	
Effective rainfall	0.75	%
Soil texture	Light clay	
Soil structure	Moderately	
Soil category	0.06-0.12	
Indicative Permeability	0.06-0.1 Ksat	

ETA BEDS		
DLR	8	mm/d
Porosity	40	%
Maximum Storage Depth	200	mm

Crop Factor - standard pasture	0.85	0.85	0.85	0.6	0.6	0.6	0.6	0.6	0.6	0.85	0.85	0.85	
crop factors -Lucene	0.95	0.9	0.85	0.8	0.7	0.55	0.55	0.65	0.75	0.85	0.95	1	
Crop factor - Shade	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
Crop factor - woodlot	1	1	1	1	1	1	1	1	1	1	1	1	

Rainfall Data	Toolangi (Mount St Leonard DPI)(086142)
Evaporation Data	Coldstream (086383

Parameter	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Days in month		31	28	31	30	31	30	31	31	30	31	30	31	365
Rainfall (mm)		86.2	74.8	84.7	106.2	123.2	109.8	118.2	137.3	133.8	127.3	126.6	118.3	1346.4
Evaporation (mm)		187.1	132	114	72.8	43.7	25.2	32.9	45.8	64.6	99.7	122.1	159.2	1099.1
Output														
Evapotranspiration (mm)		159.04	112.2	96.9	43.68	26.22	15.12	19.74	27.48	38.76	84.745	103.79	135.32	862.99
Percolation (mm)		248	224	248	240	248	240	248	248	240	248	240	248	2920
Total Output (mm)		407.04	336.2	344.9	283.68	274.22	255.12	267.74	275.48	278.76	332.75	343.79	383.32	3783
Inputs														
Effective Rainfall (mm)		64.65	56.1	63.525	79.65	92.4	82.35	88.65	102.98	100.35	95.475	94.95	88.725	1009.8
Application Rate (mm)		215.84	194.95	215.84	208.88	215.84	208.88	215.84	215.84	208.88	215.84	208.88	215.84	2541.3
Total Inputs (mm)		280.49	-336.2	279.36	288.53	308.24	291.23	304.49	318.81	309.23	311.31	303.83	304.56	3551.1
Storage Calculations														
Waste Loading (mm)		342.39	280.1	281.38	204.03	181.82	172.77	179.09	172.51	178.41	237.27	248.84	294.6	
Volume of Wastewater (mm)		86335	77980	86335	83550	86335	83550	86335	86335	83550	86335	83550	86335	1E+06
Cumulative Storage (mm)		0	0	0	4.845	38.863	74.968	111.72	155.05	185.51	164.08	124.12	45.363	
Area													**400**	**m2**
Width													**3**	**m**
Length													**80**	**m**

WATER BALANCE
SUBSURFACE IRRIGATION

A.C. Geotechnical.

Project Address:	287 Smith Road	**Project Number:**	20247
Location:	Toolangi	**Date:**	18/12/2020
Client:	Brendan Ricci		

INPUT DATA		
Daily flow allowance (per person	0	L
Daily wastewater volume	2785	L
Effluent quality	Secondary	
Effective rainfall	0.75	%
Soil texture	Clay loam	
Soil structure	Weakly	
Soil category	4b	
Indicative Permeability	0.12-0.5 Ksat	

SUBSURFACE IRRIGATION		
DLR	3.5	mm/d
Porosity	45	%
Maximum Storage Depth	50	mm

Crop Factor - standard pasture	0.85	0.85	0.85	0.6	0.6	0.6	0.6	0.6	0.6	0.85	0.85	0.85	
crop factors -Lucene	0.95	0.9	0.85	0.8	0.7	0.55	0.55	0.65	0.75	0.85	0.95	1	
Crop factor - Shade	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
Crop factor - woodlot	1	1	1	1	1	1	1	1	1	1	1	1	

Rainfall Data	Toolangi (Mount St Leonard DPI)(086142)
Evaporation Data	Coldstream (086383

Parameter	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Days in month		31	28	31	30	31	30	31	31	30	31	30	31	365
Rainfall (mm)		86.2	74.8	84.7	106.2	123.2	109.8	118.2	137.3	133.8	127.3	126.6	118.3	1346.4
Evaporation (mm)		187.1	132	114	72.8	43.7	25.2	32.9	45.8	64.6	99.7	122.1	159.2	1099.1
Output														
Evapotranspiration (mm)		159.04	112.2	96.9	43.68	26.22	15.12	19.74	27.48	38.76	84.745	103.79	135.32	862.99
Percolation (mm)		108.5	98	108.5	105	108.5	105	108.5	108.5	105	108.5	105	108.5	1277.5
Total Output (mm)		267.54	210.2	205.4	148.68	134.72	120.12	128.24	135.98	143.76	193.25	208.79	243.82	2140.5
Inputs														
Effective Rainfall (mm)		64.65	56.1	63.525	79.65	92.4	82.35	88.65	102.98	100.35	95.475	94.95	88.725	1009.8
Application Rate (mm)		49.334	44.56	49.334	47.743	49.334	47.743	49.334	49.334	47.743	49.334	47.743	49.334	580.87
Total Inputs (mm)		113.98	-210.2	112.86	127.39	141.73	130.09	137.98	152.31	148.09	144.81	142.69	138.06	1590.7
Storage Calculations														
Waste Loading (mm)		202.89	154.1	141.88	69.03	42.32	37.77	39.59	33.005	43.41	97.77	113.84	155.1	
Volume of Wastewater (mm)		86335	77980	86335	83550	86335	83550	86335	86335	83550	86335	83550	86335	1E+06
Cumulative Storage (mm)		0	0	0	0	7.0143	16.987	26.731	43.061	47.394	0	0	0	
Land area required													**1750**	**m2**

WATER BALANCE
MOUND SYSTEM

A.C. Geotechnical.

Project Address:	287 Smith Road	**Project Number:**	20247
Location:	Toolangi	**Date:**	18/12/2020
Client:	Brendan Ricci		

INPUT DATA		
Daily flow allowance (per person	0	L
Daily wastewater volume	2785	L
Effluent quality	Secondary	
Effective rainfall	0.75	%
Soil texture	Clay loam	
Soil structure	Weakly	
Soil category	4b	
Indicative Permeability	0.12-0.5 Ksat	

MOUND SYSTEM		
DLR	8	mm/d
Porosity	40	%
Storage Depth	0	mm

Crop Factor - standard pasture	0.85	0.85	0.85	0.6	0.6	0.6	0.6	0.6	0.6	0.85	0.85	0.85	
crop factors -Lucene	0.95	0.9	0.85	0.8	0.7	0.55	0.55	0.65	0.75	0.85	0.95	1	
Crop factor - Shade	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
Crop factor - woodlot	1	1	1	1	1	1	1	1	1	1	1	1	

Rainfall Data	Toolangi (Mount St Leonard DPI)(086142)
Evaporation Data	Coldstream (086383

Parameter	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Days in month		31	28	31	30	31	30	31	31	30	31	30	31	365
Rainfall (mm)		86.2	74.8	84.7	106.2	123.2	109.8	118.2	137.3	133.8	127.3	126.6	118.3	1346.4
Evaporation (mm)		187.1	132	114	72.8	43.7	25.2	32.9	45.8	64.6	99.7	122.1	159.2	1099.1
Output														
Evapotranspiration (mm)		159.04	112.2	96.9	43.68	26.22	15.12	19.74	27.48	38.76	84.745	103.79	135.32	862.99
Percolation (mm)		248	224	248	240	248	240	248	248	240	248	240	248	2920
Total Output (mm)		407.04	336.2	344.9	283.68	274.22	255.12	267.74	275.48	278.76	332.75	343.79	383.32	3783
Inputs														
Effective Rainfall (mm)		64.65	56.1	63.525	79.65	92.4	82.35	88.65	102.98	100.35	95.475	94.95	88.725	1009.8
Application Rate (mm)		169.28	152.9	169.28	163.82	169.28	163.82	169.28	169.28	163.82	169.28	163.82	169.28	1993.2
Total Inputs (mm)		233.93	-336.2	232.81	243.47	261.68	246.17	257.93	272.26	264.17	264.76	258.77	258.01	3003
Storage Calculations														
Waste Loading (mm)		342.39	280.1	281.38	204.03	181.82	172.77	179.09	172.51	178.41	237.27	248.84	294.6	
Volume of Wastewater (mm)		86335	77980	86335	83550	86335	83550	86335	86335	83550	86335	83550	86335	1E+06
Cumulative Storage (mm)		0	0	0	0	0	0	0	0	0	0	0	0	
Basal Area													**510**	**m2**

NUTRIENT BALANCE

Project Address:	287 Smith Road	**Project Number:**	20247
Location:	Toolangi	**Date:**	18/12/2020
Client:	Brendan Ricci		

Nitrogeb Balance -Nitrogen		
Hydraulic Loading	2785	l/day
Effluent N concentration	25	mg/l
Daily N loading	69625	mg/day
Annual N loading	25413125	mg/year
Denitrification loss	20	%
Denitrification loss	20330500	mg/year
Total annual N loading	20.3305	kg/year
Plant uptake	220	kg/ha/year
Minimum area for uptake	**924**	**m2**

Appendix E

Property Reports

Property Report from www.land.vic.gov.au on 14 December 2020 12:50 PM

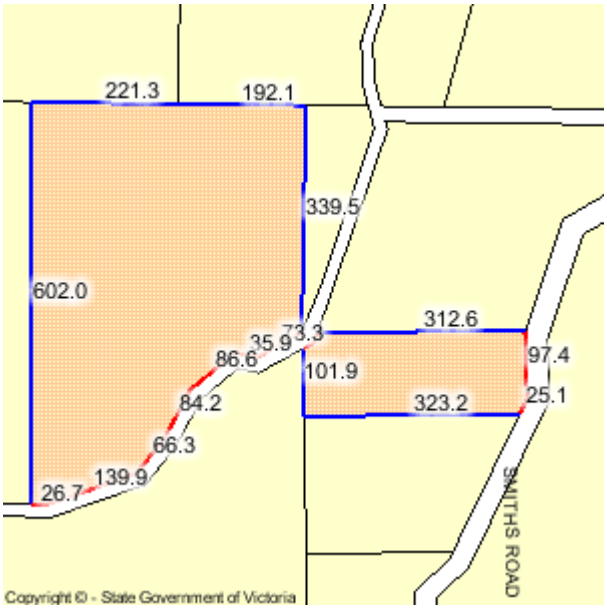
Address: 287 SMITHS ROAD TOOLANGI 3777
Lot and Plan Number: Lot 1 PS336190
Standard Parcel Identifier (SPI): 1\PS336190
Local Government (Council): MURRINDINDI **Council Property Number:** 7623
Directory Reference: VicRoads 79 J2

This property is in a designated bushfire prone area.
Special bushfire construction requirements apply. Planning provisions may apply.

Further information about the building control system and building in bushfire prone areas can be found in the Building Commission section of the Victorian Building Authority website www.vba.vic.gov.au

Site Dimensions

All dimensions and areas are approximate. They may not agree with the values shown on a title or plan.



Area: 238533 sq. m
(23.9 ha)
Perimeter: 2769 m

For this property:
Site boundaries
Road frontages

Dimensions for individual parcels require a separate search, but dimensions for individual units are generally not available.

4 dimensions shorter than 18m not displayed

Calculating the area from the dimensions shown may give a different value to the area shown above - which has been calculated using all the dimensions.

For more accurate dimensions get copy of plan at
Title and Property Certificates

State Electorates

Legislative Council: NORTHERN VICTORIA
Legislative Assembly: EILDON

Utilities

Rural Water Corporation: Goulburn-Murray Water
Urban Water Corporation: Goulburn Valley Water
Melbourne Water: outside drainage boundary
Power Distributor: AUSNET (Information about choosing an electricity retailer)

Planning information continued on next page

Planning Zone Summary

Planning Zone: FARMING ZONE (FZ)
SCHEDULE TO THE FARMING ZONE (FZ)

Planning Overlays: BUSHFIRE MANAGEMENT OVERLAY (BMO)
ENVIRONMENTAL SIGNIFICANCE OVERLAY (ESO)
ENVIRONMENTAL SIGNIFICANCE OVERLAY - SCHEDULE 1 (ESO1)

Planning scheme data last updated on 9 December 2020.

A **planning scheme** sets out policies and requirements for the use, development and protection of land.
This report provides information about the zone and overlay provisions that apply to the selected land.
Information about the State and local policy, particular, general and operational provisions of the local planning scheme that may affect the use of this land can be obtained by contacting the local council or by visiting Planning Schemes Online

This report is NOT a **Planning Certificate** issued pursuant to Section 199 of the *Planning and Environment Act 1987.*
It does not include information about exhibited planning scheme amendments, or zonings that may abut the land.
To obtain a Planning Certificate go to Titles and Property Certificates

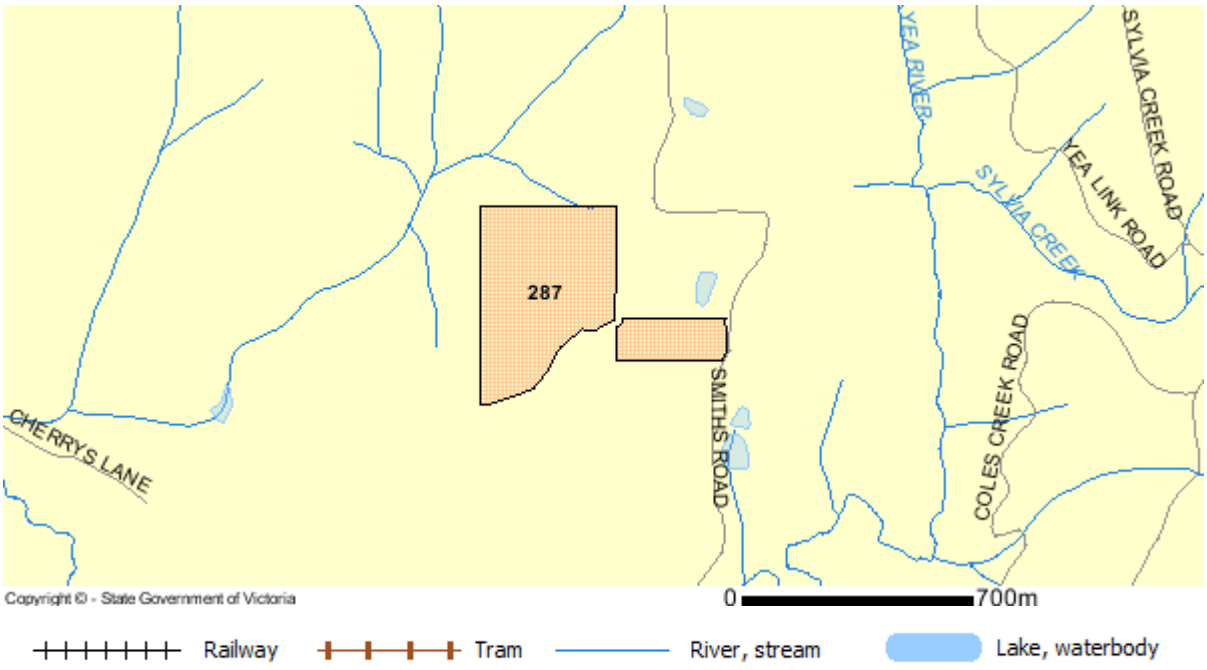
The Planning Property Report includes separate maps of zones and overlays

For details of surrounding properties, use this service to get the Reports for properties of interest

To view planning zones, overlay and heritage information in an interactive format visit Planning Maps Online

For other information about planning in Victoria visit www.planning.vic.gov.au

Area Map



PLANNING PROPERTY REPORT

Environment, Land, Water and Planning

From www.planning.vic.gov.au at 14 December 2020 12:49 PM

PROPERTY DETAILS

Address:	**287 SMITHS ROAD TOOLANGI 3777**
Lot and Plan Number:	**Lot 1 PS336190**
Standard Parcel Identifier (SPI):	**1\PS336190**
Local Government Area (Council):	**MURRINDINDI** www.murrindindi.vic.gov.au
Council Property Number:	**7623**
Planning Scheme:	**Murrindindi** Planning Scheme - Murrindindi
Directory Reference:	**Vicroads 79 J2**

UTILITIES

Rural Water Corporation:	**Goulburn-Murray Water**
Urban Water Corporation:	**Goulburn Valley Water**
Melbourne Water:	**Outside drainage boundary**
Power Distributor:	**AUSNET**

View location in VicPlan

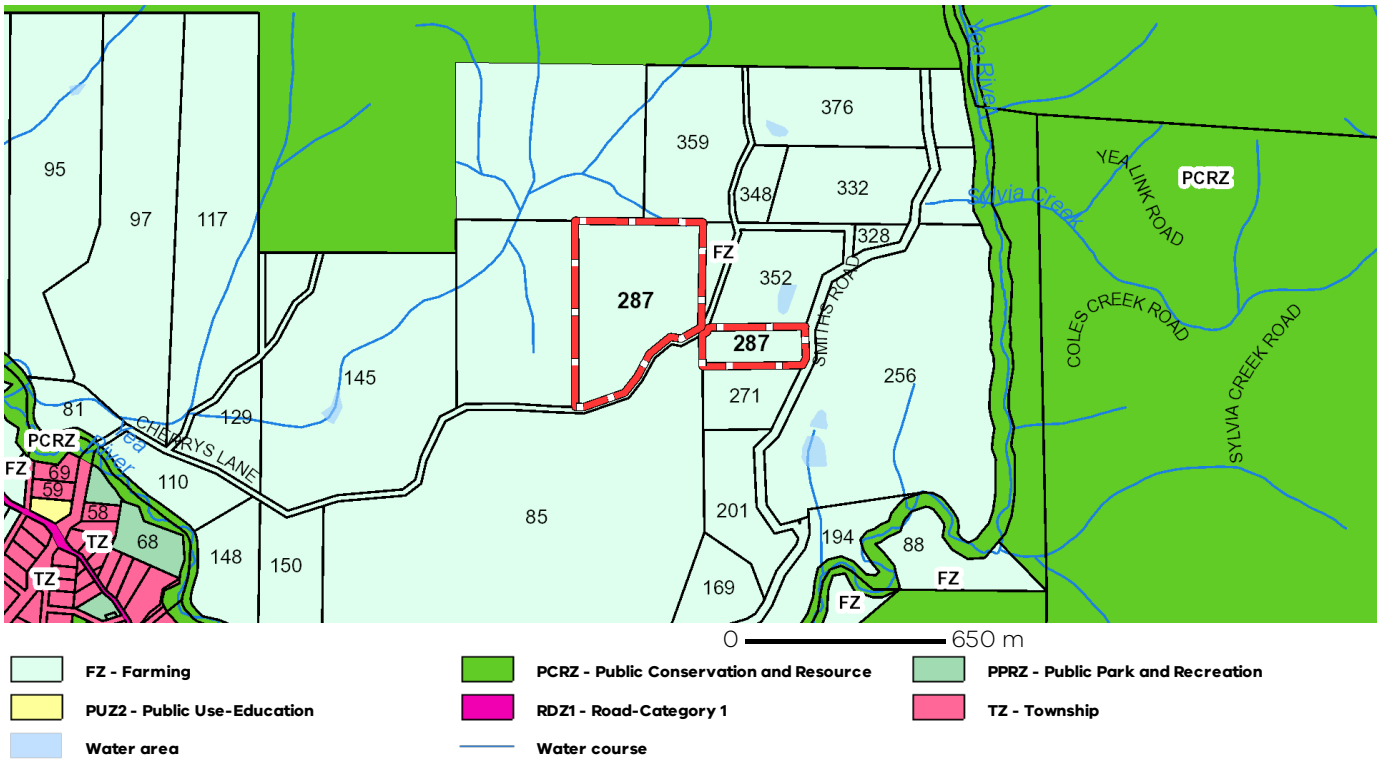
STATE ELECTORATES

Legislative Council:	**NORTHERN VICTORIA**
Legislative Assembly:	**EILDON**

Planning Zones

FARMING ZONE (FZ)

SCHEDULE TO THE FARMING ZONE (FZ)

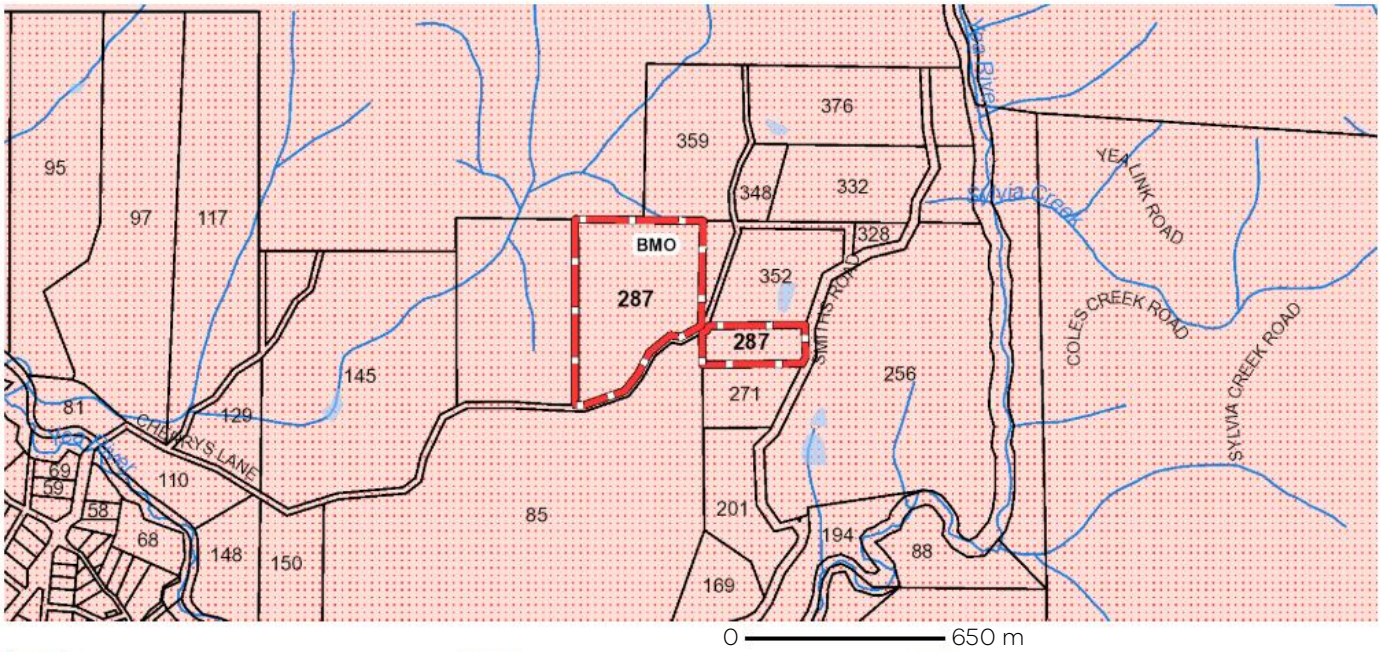


Note: labels for zones may appear outside the actual zone - please compare the labels with the legend.

PLANNING PROPERTY REPORT

Planning Overlays

BUSHFIRE MANAGEMENT OVERLAY (BMO)

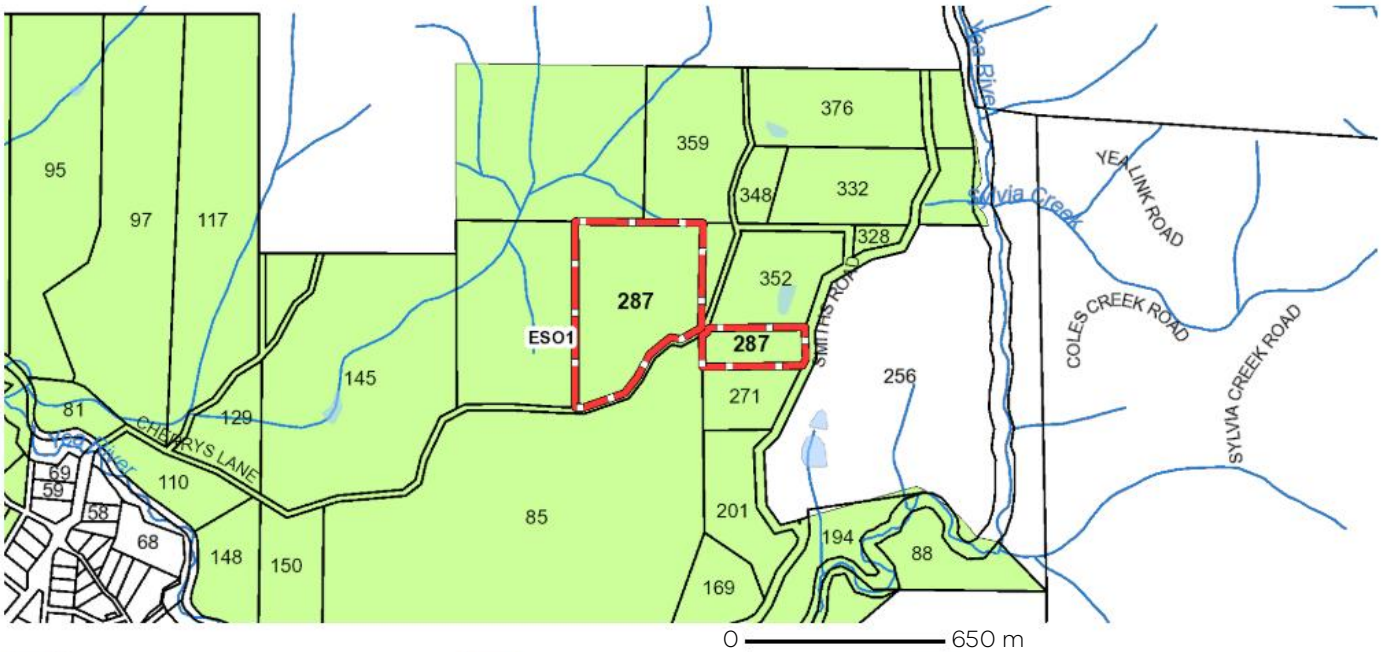


BMO - Bushfire Management **Water area** **Water course**

Note: due to overlaps, some overlays may not be visible, and some colours may not match those in the legend

ENVIRONMENTAL SIGNIFICANCE OVERLAY (ESO)

ENVIRONMENTAL SIGNIFICANCE OVERLAY - SCHEDULE 1 (ESO1)



ESO - Environmental Significance **Water area** **Water course**

Note: due to overlaps, some overlays may not be visible, and some colours may not match those in the legend

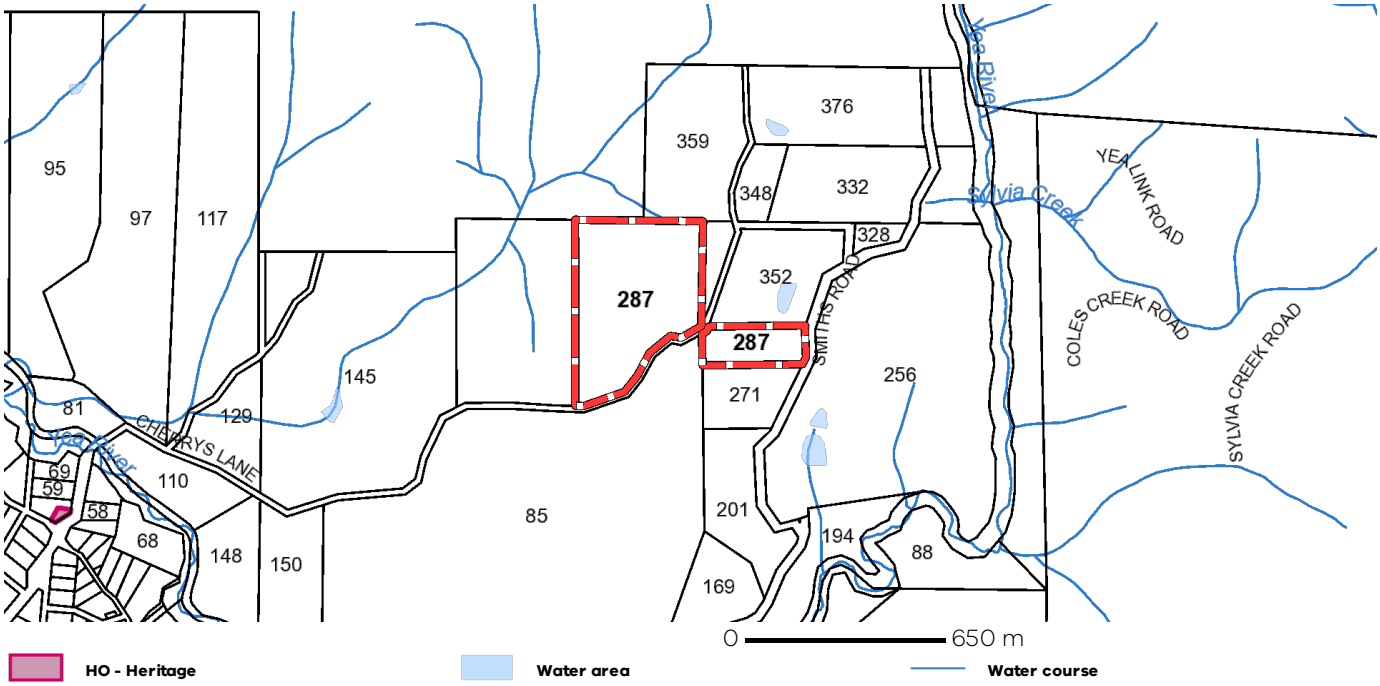
PLANNING PROPERTY REPORT

Planning Overlays

OTHER OVERLAYS

Other overlays in the vicinity not directly affecting this land

HERITAGE OVERLAY (HO)



Note: due to overlaps, some overlays may not be visible, and some colours may not match those in the legend

Further Planning Information

Planning scheme data last updated on 9 December 2020.

A **planning scheme** sets out policies and requirements for the use, development and protection of land.
This report provides information about the zone and overlay provisions that apply to the selected land.
Information about the State and local policy, particular, general and operational provisions of the local planning scheme that may affect the use of this land can be obtained by contacting the local council
or by visiting https://www.planning.vic.gov.au

This report is NOT a **Planning Certificate** issued pursuant to Section 199 of the ***Planning and Environment Act 1987.***
It does not include information about exhibited planning scheme amendments, or zonings that may abut the land.
To obtain a Planning Certificate go to Titles and Property Certificates at Landata - https://www.landata.vic.gov.au

For details of surrounding properties, use this service to get the Reports for properties of interest.

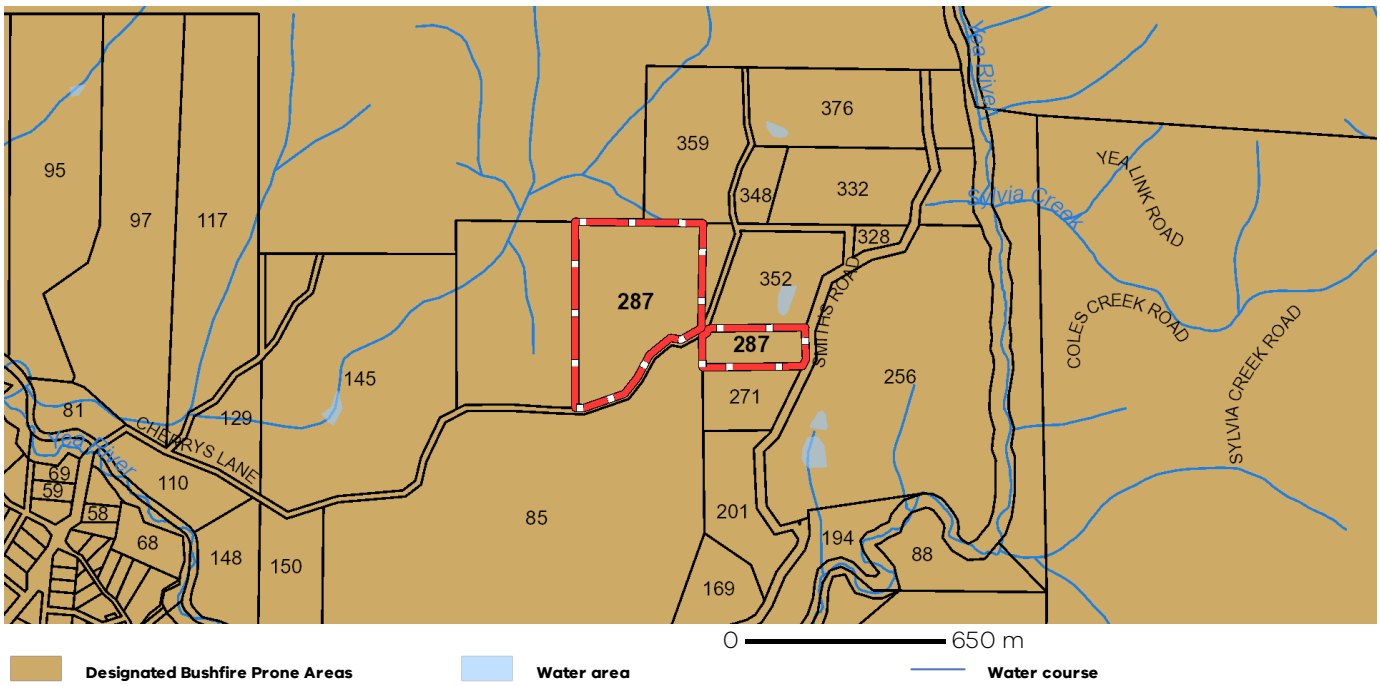
To view planning zones, overlay and heritage information in an interactive format visit
https://mapshare.maps.vic.gov.au/vicplan

For other information about planning in Victoria visit https://www.planning.vic.gov.au

PLANNING PROPERTY REPORT

Designated Bushfire Prone Areas

This property is in a designated bushfire prone area.
Special bushfire construction requirements apply. Planning provisions may apply.



Designated bushfire prone areas as determined by the Minister for Planning are in effect from 8 September 2011 and amended from time to time.

The Building Regulations 2018 through application of the Building Code of Australia, apply bushfire protection standards for building works in designated bushfire prone areas.

Designated bushfire prone areas maps can be viewed on VicPlan at https://mapshare.maps.vic.gov.au/vicplan or at the relevant local council.

Note: prior to 8 September 2011, the whole of Victoria was designated as bushfire prone area for the purposes of the building control system.

Further information about the building control system and building in bushfire prone areas can be found on the Victorian Building Authority website https://www.vba.vic.gov.au

Copies of the Building Act and Building Regulations are available from http://www.legislation.vic.gov.au

For Planning Scheme Provisions in bushfire areas visit https://www.planning.vic.gov.au