A.C. Geotechnical.

Land Capability Assessment

Naring Road, Numurkah

Report Number: 21174

Distribution

Land Capability Assessment
Naring Road, Numurkah

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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	Description	Date
Rev0	Version 1	05/08/2021

1. SUMMARY

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

Designs wastewater load	4 Bedroom dwelling	900 L/day
Soil characteristics	Horizon A	Horizon B
Soil category	4a Clay Loam	5a Light clay
Indicative permeability	0.5-1.5 m/d	0.12-0.5 m/d
Critical site features	• Small lot sizes • High wastewater load • Proximity to No 6/6 Channel • Dispersive soil	
Minimum treatment requirements	Primary*	
Disposal system	Suitability	Area required
Absorption trenches	Suitable	180 m
Subsurface Irrigation	Suitable	290 m^2
ETA Beds	Suitable	80 m^2
Mound	Suitable	60 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 55 Naring Road, Numurkah for a proposed 90 lot subdivision.

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 subdivide the site into ninety (90) low density residential lot with a minimum area of 4000 m^2 each. The wastewater load for a four (4) bedroom dwelling has been assumed for each lot.

3. SITE DESCRIPTION

3.1 Site Location

The subject site is located on the north-east corner of Numurkah Road and Naring Road. The site is surrounded by similar size properties, the assumed land use of these properties is summarised in **Table 3.1** Below.

Table 3.1 -Surrounding land use

North	Agriculture & wastewater treatment plant
South	Agriculture
East	Agriculture
West	Agriculture

3.2 Site Topography and Condition

The site is current used for agricultural purposes. The surface is relatively level. Several small dams are located on the site as well as detached shedding. No 6/6 irrigation channel runs through the site in a north-south direction.

Vegetation on the site comprises open pasture and scattered mature trees

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

3.3 Key Site Information

Table 3.2 -Key site features

Site Address	Naring Road, Numurkah
Owner/Applicant	Onleys
Local Council	Moira
Zoning	Farming Zone (FZ) – Low Density Residential Zone (LDRZ)
Total Land Area	Lots proposed from 4000 m^2 - 5166 m^2
Domestic Water Supply	Reticulated/Tank
Anticipated wastewater loads (Litres/day)	EPA Code of practice - onsite wastewater management (2016) Household without water reduction fixtures: 180 L / person / day. Persons = no. bedrooms + 1 (4 + 1 = 5 persons) **Design wastewater load** 5 x 180 = 900 L / day
Organic Material Loading Design Rates	EPA Code of practice - onsite wastewater management (2016) 60 g per person per day (5 x 60) = 300 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 Class B (1000 - 3500 mg/L TDS) www.vvg.org.au
Water Table	Local registered bores in the area suggest the ground water is held approximately 10 m below the surface
Climate	Average annual rainfall 441.7 mm
Flood Potential	Outside a 1 in 100-year flood event
Water catchment area	N/A
Bodies of water / waterways	No 6/6 Channel, small site dams
Vegetation	Pasture grasses, scattered native trees
Exposure	Generally open
Slope	Relatively level
Landform	Plains
Erosion Potential	Negligible
Surface Drainage	Good
Rocks and Rock Outcrop	None

3.4 Site Geology

According to the Geological Survey of Victoria, the site is in an area of Cainozoic aged Alluvial deposits belonging to Shepparton Formation - Fluvial: prior stream, valley-backfill and floodplain deposits; clay, sand, silt, gravel.

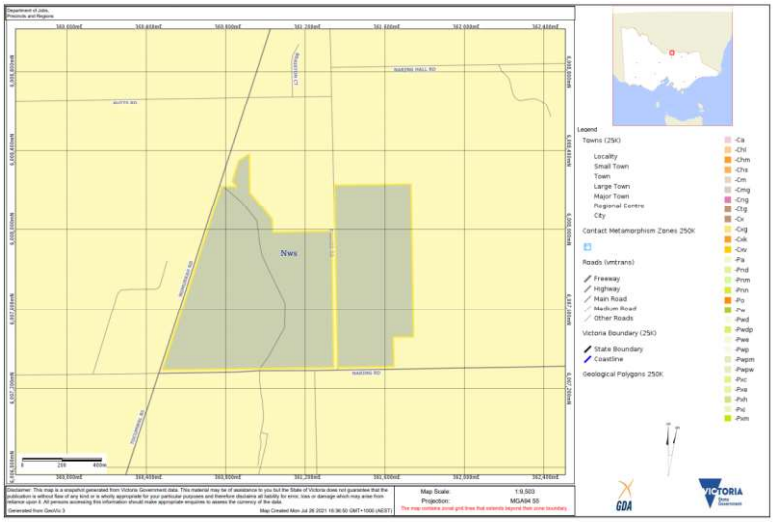


Figure 2.1 Extract of Geological from GeoVic 3

4. SOIL ASSESSMENT AND CONSTRAINTS:

4.1 Soil Profile

The soil profile encountered during the investigation consisted of clayey silt overlaying medium plasticity silty clay. Refusal on hard, dry clay was encountered at an approximate depth of 800 mm bgl across the site.

The critical soil horizon are the medium plasticity silty 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

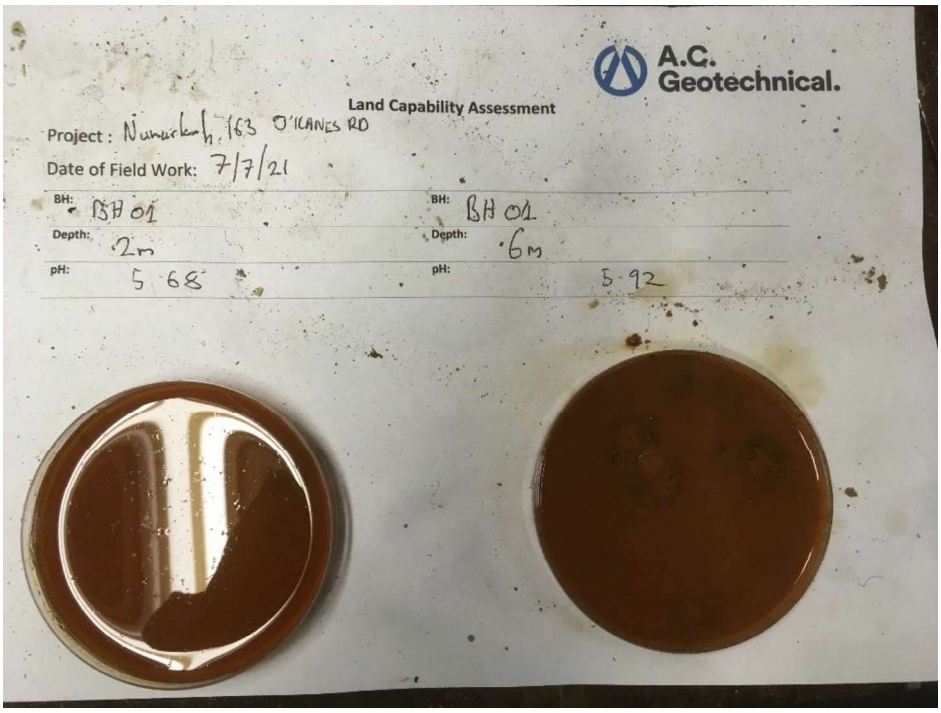
A general assessment of the site exposure is as follows:

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

Table 4.1 -Summary of soil assessment

BORE HOLE	SAMPLE DEPTH: 200mm		SAMPLE DEPTH: 600mm	
SOIL ASSESSMENT (AS1547-2012)	**SOIL HORIZON: A**		**SOIL HORIZON: B**	
Soil Colour	Red/brown		Red/brown	
Soil Texture	Clay loam		Clay loam	
Coarse Fragments (%)	None		None	
Soil Structure	Moderate structure		Strong structure	
Soil Dispersion	Dispersive		Dispersive	
Soil Permeability	0.5-1.5 mm/d		012-0.5 mm/d	
Soil Category	4a		5a	
Design Irrigation Rate / Design Loading Rate	DIR	3.5 mm/d	DLR	5.0 mm/d
pH 1:5 Ratio Electronic Method	5.68		5.92	
Electrical Conductivity	62 µS/cm	/1000 = .062 dS/m	79 µS/cm	/1000 = .079 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 eight (8) locations across the site (see plan, **Attachment A**). 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.

Table 4.2 -Summary of insitu permeability

CONSTANT HEAD PERMEABILITY	
Rate of loss of water from reservoir (Q)	67.767 cm^2/min
Indicative permeability (K_{sat})	0.044 m/day
Indicative permeability (K_{sat})	0.627 m/day

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

The corresponding Ksat value of 0.627 m/day in EPA Onsite Wastewater Management – Code of Practice Publication No. 891.4 July 2016 Appendix A Table 9 is category 5 (light clay soil.

4.5 Critical site Features

The critical site features are:

- Small lot sizes
- High wastewater load
- Proximity to No 6/6 Channel
- Dispersive soil

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.

Table 5.1 -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	No abnormal moisture conditions	N/A
Runoff	None	Low	Moderate	High	Very High	3	Potential for runoff due to small lot subdivision	Appropriate setback distances must be adhered to
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 level	N/A
Proximity to water courses	> 60 metres			< 60 metres		4	No 6/6 channel and small site dams	Setback distances from channel must be maintained and backfilling of dams required.
Slope (%)	0 - 2	2 - 8	8 – 12	12 – 20	> 20	1	Relatively level	N/A

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	N/A
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 at approximately 10 m below the surface	N/A
Rock Outcrops (% of land surface containing rocks >200mm)	0%	<10%	10-20%	20-50%	>50%	1	None encountered	N/A
Erosion Potential	No erosion potential	Minor	Moderate	High	Severe erosion potential	1	No erosion potential	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 and wind	N/A
Landform	Hill crests, convex side slopes and plains		Concave side slopes and foot slopes		Floodplains and incised channels	1	Plains	N/A
Vegetation Type (land application area)	Turf or pasture				Dense Forest	1	Open pasture, assumed turf and landscaped areas after development	N/A
Fill	No Fill present		Fill Present			1	No fill present	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	1	Average annual rainfall of 441.7 mm	LAA size to be determined by water balance calculations
Pan evaporation (mm/yr)[3]	>1500	1250 - 1500	1000 – 1250	-	<1000	1	Annual evaporation of 1575.5 mm	LAA size to be determined by water balance calculations

Table 5.2 -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 and light clay soils	LAA size to be determined by water balance calculations
Soil Permeability Category [1]	2 and 3	4		5	1 and 6	4	Clay loam and light clay soils	LAA size to be determined by water balance calculations
Coarse fragments* (%)	<10	10-20	20-40		>40	1	None encountered	N/A
Emerson Test* (dispersion / slaking)	4,6,8	5	7	2,3	1	4	Slaking & some dispersion	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		
pH	6-8		4.5-6		<4.5, >8	5	Slightly acidic soils	N/A

[1] Source: AS1547-2012
[2] Source BOM station – Numurkah (080101)
[3] Source BOM station – Shepparton Airport (081125) 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 lots will be heavily restricted on the possible location of the disposal system due to proximity to No 6/6 Channel and soil renovation will be required to reduce the dispersive characteristics of the insitu soils. Secondary treatment of wastewater is also an option for this site.

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.

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. Setback distances are included in **Section 6.6.1**.

6.2.1 Septic tank sizing

The minimum septic tank size should be 3,000 L.

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 6.1.**

Table 6.1 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, however some lots may be heavily restricted by required setback distances to waterways.
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
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

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 design system parameters used for the water balance calculations are summarised in **Table 6.2**.

Table 6.2 Design System Parameter

Treatment system	Application System	DIR / DLR (mm/day)	Runoff coefficient	Maximum storage depth
Primary treatment	Absorption trenches	5		
Secondary treatment	ETA Beds	12	25%	200 mm
	Mound System*	16	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, with the exception of absorption trenches. LAA sizing calculations are included in **Appendix D**. The minimum required disposal area for each system is summarised in **Table 6.3**.

Table 6.3 Required Land Application Area (LAA)

Disposal system	Minimum reserve size required
Wastewater output	900 L / day
Absorption trenches	180 m (1.0 m wide trenches)
Subsurface irrigation	290 m^2
ETA Beds	80 m^2
Mound	60 m^2

6.5 Preferred System Description

Primary treatment of wastewater with disposal via absorption trenches is suitable for the proposed subdivided lots. Secondary treatment of wastewater with disposal may be preferred on heavily restricted lots, refer top Section 6.8. Secondary treatment of wastewater will enable a 50% reduction of the setback distances from site features, which will greatly increase the suitable disposal area on the lots, in particular lots located along No 6/6 Channel.

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

Table 6.4 – Minimum Setback Distances

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 Soil Renovation

Due to the dispersive characteristics of the insitu clay soils encountered at the site, soil renovation is recommended if only primary treatment of wastewater is undertaken. The following method should be adopted:

- Gypsum should be initially applied to the trench base at a rate of 1kg/m^2

This information should be included on the Council Permit.

6.8 Proposed lot limitations

A summary of key site restrictions are included in Table 6.5

Table 6.5 Summary of restrictions on individual lots

Stage / Location	Lot Number	Position of disposal area	Restrictions / Requirements
Stage 1 – West of channel	1	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 1 – West of channel	2	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 1 – West of channel	3	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater

Stage 1 – West of channel	4	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 1 – West of channel	5	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 1 – West of channel	6	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 1 – West of channel	7	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 1 – West of channel	8	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 1 – West of channel	9	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 1 – West of channel	10	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 1 – West of channel	11	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 1 – West of channel	12	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 1 – West of channel	13	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 1 – West of channel	14	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 1 – West of channel	15	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 1 – West of channel	16	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 2 – West of channel	17	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 2 – West of channel	17	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 2 – West of channel	17	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 2 – West of channel	17	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 2 – West of channel	17	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 2 – West of channel	17	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 2 – West of channel	23	Heavily Restricted	Setback distance from No 6/6 Channel water edge Primary Treatment – 30 m / Secondary treatment 60 m Soil renovation for disposal of primary treated wastewater
Stage 2 – West of channel	24	Heavily Restricted	Setback distance from No 6/6 Channel water edge Primary Treatment – 30 m / Secondary treatment 60 m Soil renovation for disposal of primary treated wastewater
Stage 2 – West of channel	25	Heavily Restricted	Setback distance from No 6/6 Channel water edge Primary Treatment – 30 m / Secondary treatment 60 m Soil renovation for disposal of primary treated wastewater
Stage 2 – West of channel	26	Heavily Restricted	Setback distance from No 6/6 Channel water edge Primary Treatment – 30 m / Secondary treatment 60 m Soil renovation for disposal of primary treated wastewater
Stage 2 – West of channel	27	Heavily Restricted	Setback distance from No 6/6 Channel water edge Primary Treatment – 30 m / Secondary treatment 60 m Soil renovation for disposal of primary treated wastewater
Stage 3 – West of channel	28	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 3 – West of channel	29	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 3 – West of channel	30	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 3 – West of channel	31	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 3 – West of channel	32	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 3 – West of channel	33	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 3 – West of channel	34	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 3 – West of channel	35	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 3 – West of channel	36	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 3 – West of channel	37	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 3 – West of channel	38	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 3 – West of channel	39	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 3 – West of channel	40	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 3 – West of channel	41	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
North – West of Channel	42	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
North – West of Channel	43	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
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North – West of Channel	45	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
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North – West of Channel	48	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
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North – West of Channel	50	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
North – West of Channel	51	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
North – West of Channel	52	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
North – West of Channel	53	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
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North – West of Channel	61	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
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North – West of Channel	64	Heavily Restricted	Setback distance from No 6/6 Channel water edge Primary Treatment – 30 m / Secondary treatment 60 m Soil renovation for disposal of primary treated wastewater
North – West of Channel	65	Heavily Restricted	Setback distance from No 6/6 Channel water edge Primary Treatment – 30 m / Secondary treatment 60 m Soil renovation for disposal of primary treated wastewater
North – West of Channel	66	Heavily Restricted	Setback distance from No 6/6 Channel water edge Primary Treatment – 30 m / Secondary treatment 60 m Soil renovation for disposal of primary treated wastewater
North – West of Channel	67	Heavily Restricted	Setback distance from No 6/6 Channel water edge Primary Treatment – 30 m / Secondary treatment 60 m Soil renovation for disposal of primary treated wastewater
North – West of Channel	68	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
North – West of Channel	69	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 1 – East of channel	1	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 1 – East of channel	2	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 1 – East of channel	3	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 1 – East of channel	4	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 1 – East of channel	5	Heavily Restricted	Setback distance from No 6/6 Channel water edge Primary Treatment – 30 m / Secondary treatment 60 m Soil renovation for disposal of primary treated wastewater
Stage 2 – East of channel	6	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 2 – East of channel	7	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 2 – East of channel	8	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 2 – East of channel	9	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 2 – East of channel	10	Heavily Restricted	Setback distance from No 6/6 Channel water edge Primary Treatment – 30 m / Secondary treatment 60 m Soil renovation for disposal of primary treated wastewater
Stage 2 – East of channel	11	Heavily Restricted	Setback distance from No 6/6 Channel water edge Primary Treatment – 30 m / Secondary treatment 60 m Soil renovation for disposal of primary treated wastewater
Stage 2 – East of channel	12	Heavily Restricted	Setback distance from No 6/6 Channel water edge Primary Treatment – 30 m / Secondary treatment 60 m Soil renovation for disposal of primary treated wastewater
Stage 2 – East of channel	13	Heavily Restricted	Setback distance from No 6/6 Channel water edge Primary Treatment – 30 m / Secondary treatment 60 m Soil renovation for disposal of primary treated wastewater
Stage 2 – East of channel	14	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 3 – East of channel	15	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 3 – East of channel	16	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 3 – East of channel	17	Setback distances at per Section 6.6.1	Soil renovation for disposal of primary treated wastewater
Stage 3 – East of channel	18	Heavily Restricted	Setback distance from No 6/6 Channel water edge Primary Treatment – 30 m / Secondary treatment 60 m Soil renovation for disposal of primary treated wastewater
Stage 3 – East of channel	19	Heavily Restricted	Setback distance from No 6/6 Channel water edge Primary Treatment – 30 m / Secondary treatment 60 m Soil renovation for disposal of primary treated wastewater
Stage 3 – East of channel	20	Heavily Restricted	Setback distance from No 6/6 Channel water edge Primary Treatment – 30 m / Secondary treatment 60 m Soil renovation for disposal of primary treated wastewater
Stage 3 – East of channel	21	Heavily Restricted	Setback distance from No 6/6 Channel water edge Primary Treatment – 30 m / Secondary treatment 60 m Soil renovation for disposal of primary treated wastewater

6.9 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.

6.9.1 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:

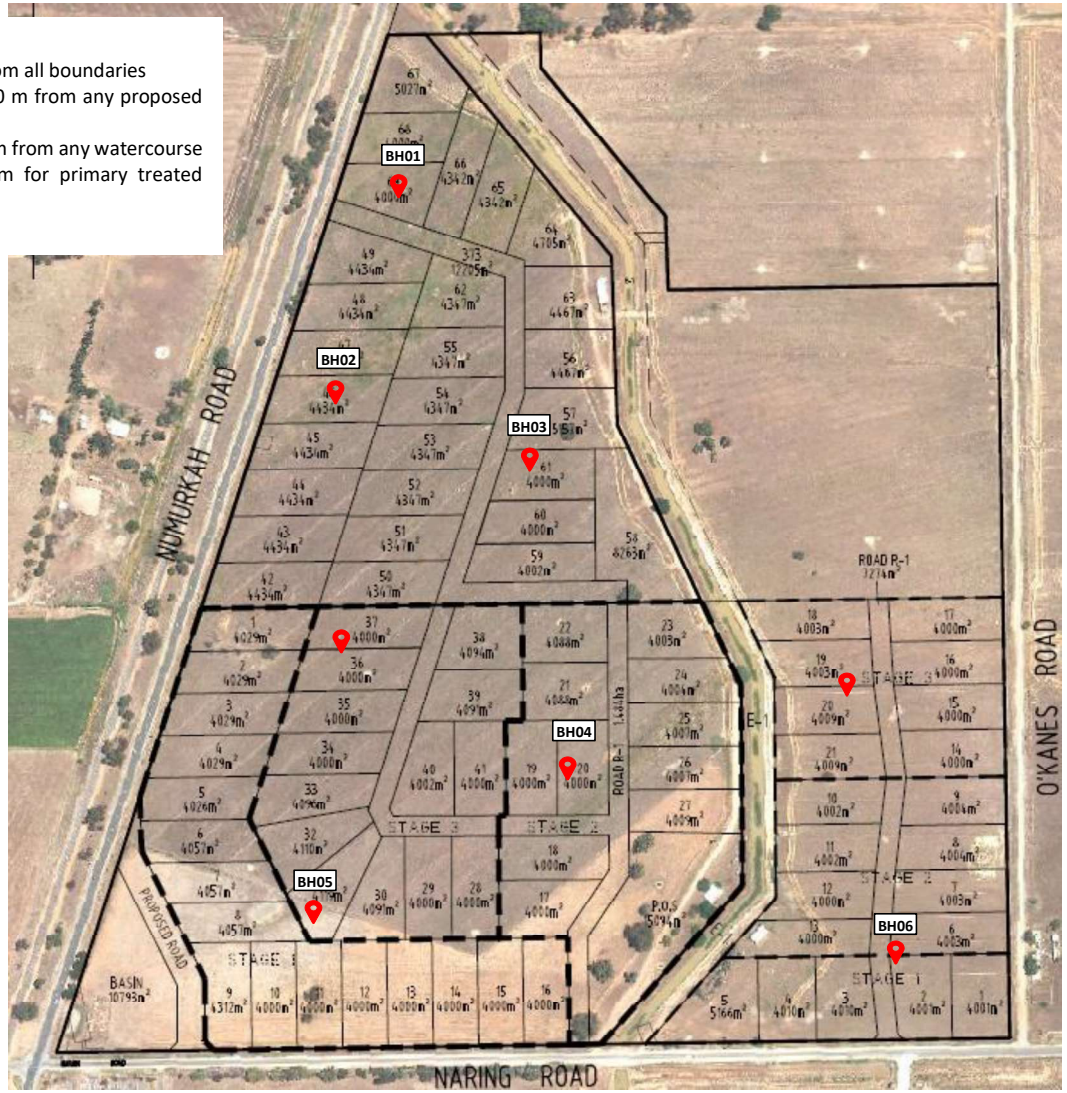
From this investigation it is concluded that the use of an on-site wastewater treatment and disposal system is environmentally sustainable for the proposed subdivision if the recommendations made in this report are followed.

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 Framework
- 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 area must be setback a minimum of 6.0 m from any proposed structures
3. LAA area must be setback a minimum of 30 m from any watercourse for Secondary treated wastewater or 60 m for primary treated wastewater
4. Setback distances outlines in **Section 6.6.1.**



A.C. Geotechnical.

Not to Scale

Investigation locations are approximate

Legend

Investigation Location

Attachment A: Site Plan 21174

Naring Road

Numurkah

Date of field work: 7 July 2021

Appendix B

Site Photographs

A.C. Geotechnical.

A.C. Geotechnical.

Appendix C

Borelog

Borehole Record BH01

A.C. Geotechnical.

Project Number	21174	Date	7/07/2021
Project	Land Capability Assessment	Drilling Method	HA
Location	Naring Road, Numurkah	Logged	AC

Depth (m)	Description	
0.00	Clayey SILT (ML): Low plasticity, orange/brown, soft-firm, moist, near plastic limit	
		Disturbed sample - 0.2 m
0.20	Silty CLAY (CI): Medium plasticity, orange/brown, very stiff to hard, moist, dry of plastic limit.	
		Disturbed sample - 0.6 m
0.70	Borehole terminated - Refusal on hard clay	

Borehole Record BH02

A.C. Geotechnical.

Project Number	21174	Date	7/07/2021
Project	Land Capability Assessment	Drilling Method	HA
Location	Naring Road, Numurkah	Logged	AC

Depth (m)	Description	
0.00	Clayey SILT (ML): Low plasticity, orange/brown, soft-firm, moist, near plastic limit	
		Disturbed sample - 0.2 m
0.20	Silty CLAY (CI): Medium plasticity, orange/brown, very stiff to hard, moist, dry of plastic limit.	
		Disturbed sample - 0.6 m
0.75	Borehole terminated - Refusal on hard clay	

Borehole Record BH03

A.C. Geotechnical.

Project Number	21174	Date	7/07/2021
Project	Land Capability Assessment	Drilling Method	HA
Location	Naring Road, Numurkah	Logged	AC

Depth (m)	Description	
0.00	Clayey SILT (ML): Low plasticity, orange/brown, soft-firm, moist, near plastic limit	
		Disturbed sample - 0.2 m
0.20	Silty CLAY (CI): Medium plasticity, orange/brown, very stiff to hard, moist, dry of plastic limit.	
		Disturbed sample - 0.6 m
0.80	Borehole terminated - Refusal on hard clay	

Borehole Record BH04

A.C. Geotechnical.

Project Number	21174	Date	7/07/2021
Project	Land Capability Assessment	Drilling Method	HA
Location	Naring Road, Numurkah	Logged	AC

Depth (m)	Description	
0.00	Clayey SILT (ML): Low plasticity, orange/brown, soft-firm, moist, near plastic limit	
		Disturbed sample - 0.2 m
0.20	Silty CLAY (CI): Medium plasticity, orange/brown, very stiff to hard, moist, dry of plastic limit.	
		Disturbed sample - 0.6 m
0.70	Borehole terminated - Refusal on hard clay	

Borehole Record BH05

A.C. Geotechnical.

Project Number	21174	Date	7/07/2021
Project	Land Capability Assessment	Drilling Method	HA
Location	Naring Road, Numurkah	Logged	AC

Depth (m)	Description	
0.00	Clayey SILT (ML): Low plasticity, orange/brown, soft-firm, moist, near plastic limit	
		Disturbed sample - 0.2 m
0.20	Silty CLAY (CI): Medium plasticity, orange/brown, very stiff to hard, moist, dry of plastic limit.	
		Disturbed sample - 0.6 m
0.60	Borehole terminated - Refusal on hard clay	

Borehole Record BH06

A.C. Geotechnical.

Project Number	21174	Date	7/07/2021
Project	Land Capability Assessment	Drilling Method	HA
Location	Naring Road, Numurkah	Logged	AC

Depth (m)	Description	
0.00	Clayey SILT (ML): Low plasticity, orange/brown, soft-firm, moist, near plastic limit	
		Disturbed sample - 0.2 m
0.20	Silty CLAY (CI): Medium plasticity, orange/brown, very stiff to hard, moist, dry of plastic limit.	
		Disturbed sample - 0.6 m
0.85	Borehole terminated - Refusal on hard clay	

Appendix D

Constant Head Calculations & Water Balance

INSITU CONSTANT HEAD PERMEABILITY

A.C. Geotechnical.

Project Address:	55 Naring Road	**Project Number:**	21174
Location:	Numurkah	**Date:**	29/07/2021
Client:	Murray Park		

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	240	230	170	230	
5					
10					
15					
20	160	210	80	225	**Average**
Q (cm2/min)	118.17704	29.54426	132.94917	7.386065	**72.01413375**
Ksat (cm/min	0.075953332	0.018988333	0.085447499	0.004747083	**0.046284062**
Ksat (m/d)	1.093727985	0.273431996	1.230443983	0.068357999	**0.666490491**

INSITU CONSTANT HEAD PERMEABILITY

A.C. Geotechnical.

Project Address:	55 Naring Road	**Project Number:**	21174
Location:	Numurkah	**Date:**	29/07/2021
Client:	Murray Park		

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	190	220	210	230	
5					
10					
15					
20	140	172	183	183	**Average**
Q (cm2/min)	73.86065	70.906224	39.884751	69.429011	**63.520159**
Ksat (cm/min	0.047470833	0.045571999	0.02563425	0.044622583	**0.040824916**
Ksat (m/d)	0.68357999	0.656236791	0.369133195	0.642565191	**0.587878792**

ABSORPTION TRENCH SIZE CALCULATIONS

Project Address:	55 Naring Road	**Project Number:**	21174
Location:	Numurkah	**Date:**	29/07/2021
Client:	Murray Park		

INPUT DATA		
Daily flow allowance (per person	180	L
Daily wastewater volume	900	L
Effluent quality	Primary	
Soil texture	Light clay	
Soil structure	Strongly	
Soil category	5a	
Indicative Permeability	0.12-0.5	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 =	**257**	**m**	**Length =**	**180**	

WATER BALANCE
ETA BEDS

A.C. Geotechnical.

Project Address:	55 Naring Road	**Project Number:**	21174
Location:	Numurkah	**Date:**	29/07/2021
Client:	Murray Park		

INPUT DATA		
Daily flow allowance (per person	180	L
Daily wastewater volume	900	L
Effluent quality	Secondary	
Effective rainfall	0.75	%
Soil texture	Light clay	
Soil structure	Strongly	
Soil category	0.12-0.5	
Indicative Permeability	0.12-0.5	Ksat

ETA BEDS		
DLR	12	mm/d
Porosity	40	%
Maximum 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	Numurkah (080101)
Evaporation Data	Shepparton Airport (081125)

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)		33.2	32.9	32.4	34.8	37.4	36.9	40.3	43.7	39	36.6	38.5	36	441.7
Evaporation (mm)		275.1	189.6	161.5	98.8	44.7	31.4	34.3	53.3	85.6	149.2	192.5	259.5	1575.5
Output														
Evapotranspiration (mm)		233.84	161.16	137.28	59.28	26.82	18.84	20.58	31.98	51.36	126.82	163.63	220.58	1252.2
Percolation (mm)		372	336	372	360	372	360	372	372	360	372	360	372	4380
Total Output (mm)		605.84	497.16	509.28	419.28	398.82	378.84	392.58	403.98	411.36	498.82	523.63	592.58	5632.2
Inputs														
Effective Rainfall (mm)		24.9	24.675	24.3	26.1	28.05	27.675	30.225	32.775	29.25	27.45	28.875	27	331.28
Application Rate (mm)		348.75	315	348.75	337.5	348.75	337.5	348.75	348.75	337.5	348.75	337.5	348.75	4106.3
Total Inputs (mm)		373.65	-497.2	373.05	363.6	376.8	365.18	378.98	381.53	366.75	376.2	366.38	375.75	4437.5
Storage Calculations														
Waste Loading (mm)		580.94	472.49	484.98	393.18	370.77	351.17	362.36	371.21	382.11	471.37	494.75	565.58	
Volume of Wastewater (mm)		27900	25200	27900	27000	27900	27000	27900	27900	27000	27900	27000	27900	328500
Cumulative Storage (mm)		0	0	0	0	0	0	0	0	0	0	0	0	
Area													**80**	**m2**
Width													**3**	**m**
Length													**16**	**m**

WATER BALANCE
SUBSURFACE IRRIGATION

Project Address:	55 Naring Road	**Project Number:**	21174
Location:	Numurkah	**Date:**	29/07/2021
Client:	Murray Park		

INPUT DATA		
Daily flow allowance (per person	180	L
Daily wastewater volume	900	L
Effluent quality	Secondary	
Effective rainfall	0.75	%
Soil texture	Clay loam	
Soil structure	Moderate	
Soil category	4a	
Indicative Permeability	0.5-1.5	Ksat

SUBSURFACE IRRIGATION		
DLR	3.5	mm/d
Porosity	45	%
Maximum 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	Numurkah (080101)
Evaporation Data	Shepparton Airport (081125)

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)		33.2	32.9	32.4	34.8	37.4	36.9	40.3	43.7	39	36.6	38.5	36	441.7
Evaporation (mm)		275.1	189.6	161.5	98.8	44.7	31.4	34.3	53.3	85.6	149.2	192.5	259.5	1575.5
Output														
Evapotranspiration (mm)		233.84	161.16	137.28	59.28	26.82	18.84	20.58	31.98	51.36	126.82	163.63	220.58	1252.2
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)		342.34	259.16	245.78	164.28	135.32	123.84	129.08	140.48	156.36	235.32	268.63	329.08	2529.7
Inputs														
Effective Rainfall (mm)		24.9	24.675	24.3	26.1	28.05	27.675	30.225	32.775	29.25	27.45	28.875	27	331.28
Application Rate (mm)		96.207	86.897	96.207	93.103	96.207	93.103	96.207	96.207	93.103	96.207	93.103	96.207	1132.8
Total Inputs (mm)		121.11	-259.2	120.51	119.2	124.26	120.78	126.43	128.98	122.35	123.66	121.98	123.21	1464
Storage Calculations														
Waste Loading (mm)		317.44	234.49	221.48	138.18	107.27	96.165	98.855	107.71	127.11	207.87	239.75	302.08	
Volume of Wastewater (mm)		27900	25200	27900	27000	27900	27000	27900	27900	27000	27900	27000	27900	328500
Cumulative Storage (mm)		0	0	0	0	0	0	0	0	0	0	0	0	
Land area required													**290**	**m2**

WATER BALANCE
MOUND SYSTEM

A.C. Geotechnical.

Project Address:	55 Naring Road	**Project Number:**	21174
Location:	Numurkah	**Date:**	29/07/2021
Client:	Murray Park		

INPUT DATA		
Daily flow allowance (per person	180	L
Daily wastewater volume	900	L
Effluent quality	Secondary	
Effective rainfall	0.75	%
Soil texture	Clay loam	
Soil structure	Moderate	
Soil category	4a	
Indicative Permeability	0.5-1.5	Ksat

MOUND SYSTEM		
DLR	16	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	Numurkah (080101)
Evaporation Data	Shepparton Airport (081125)

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)		33.2	32.9	32.4	34.8	37.4	36.9	40.3	43.7	39	36.6	38.5	36	441.7
Evaporation (mm)		275.1	189.6	161.5	98.8	44.7	31.4	34.3	53.3	85.6	149.2	192.5	259.5	1575.5
Output														
Evapotranspiration (mm)		233.84	161.16	137.28	59.28	26.82	18.84	20.58	31.98	51.36	126.82	163.63	220.58	1252.2
Percolation (mm)		496	448	496	480	496	480	496	496	480	496	480	496	5840
Total Output (mm)		729.84	609.16	633.28	539.28	522.82	498.84	516.58	527.98	531.36	622.82	643.63	716.58	7092.2
Inputs														
Effective Rainfall (mm)		24.9	24.675	24.3	26.1	28.05	27.675	30.225	32.775	29.25	27.45	28.875	27	331.28
Application Rate (mm)		465	420	465	450	465	450	465	465	450	465	450	465	5475
Total Inputs (mm)		489.9	-609.2	489.3	476.1	493.05	477.68	495.23	497.78	479.25	492.45	478.88	492	5806.3
Storage Calculations														
Waste Loading (mm)		704.94	584.49	608.98	513.18	494.77	471.17	486.36	495.21	502.11	595.37	614.75	689.58	
Volume of Wastewater (mm)		27900	25200	27900	27000	27900	27000	27900	27900	27000	27900	27000	27900	328500
Cumulative Storage (mm)		0	0	0	0	0	0	0	0	0	0	0	0	
Basal Area													**60**	**m2**

NUTRIENT BALANCE

Project Address:	55 Naring Road	**Project Number:**	21174
Location:	Numurkah	**Date:**	29/07/2021
Client:	Murray Park		

Nitrogeb Balance -Nitrogen		
Hydraulic Loading	900	l/day
Effluent N concentration	25	mg/l
Daily N loading	22500	mg/day
Annual N loading	8212500	mg/year
Denitrification loss	20	%
Denitrification loss	6570000	mg/year
Total annual N loading	6.57	kg/year
Plant uptake	220	kg/ha/year
Minimum area for uptake	**299**	**m2**

Appendix E

Property Reports

PROPERTY REPORT

Environment, Land, Water and Planning

From www.planning.vic.gov.au at 26 July 2021 04:33 PM

PROPERTY DETAILS

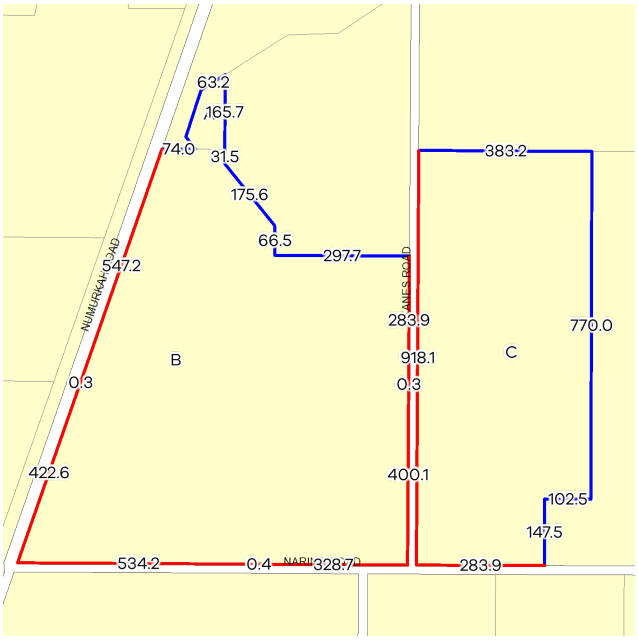
Address:	**55 NARING ROAD NUMURKAH 3636**
Crown Description:	**This property has 3 parcels. See table below**
Standard Parcel Identifier (SPI):	**See table below**
Local Government Area (Council):	**MOIRA** www.moira.vic.gov.au
Council Property Number:	**7971**
Directory Reference:	**Vicroads 32 J3**

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 on the Victorian Building Authority website https://www.vba.vic.gov.au

SITE DIMENSIONS

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



Area: 915332 sq. m (91.53 ha)
Perimeter: 6141 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.

2 overlapping dimension labels are not being displayed

Calculating the area from the dimensions shown may give a different value to the area shown above

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

ADDRESS DETAILS

These addresses have been found for this property

Address
55 NARING ROAD NUMURKAH 3636
163 OKANES ROAD NUMURKAH 3636

PARCEL DETAILS

The letter in the first column identifies the parcel in the diagram above

	Lot/Plan or Crown Description	SPI
A	Lot 1 PS644395	1\PS644395
B	Lot 2 PS644395	2\PS644395
	PARISH OF KATUNGA	
C	Allot. 13C Sec. C	13C~C\PP2852

PROPERTY REPORT

Environment, Land, Water and Planning

UTILITIES

Rural Water Corporation: **Goulburn-Murray Water**

Urban Water Corporation: **Goulburn Valley Water**

Melbourne Water: **Outside drainage boundary**

Power Distributor: **POWERCOR**

STATE ELECTORATES

Legislative Council: **NORTHERN VICTORIA**

Legislative Assembly: **SHEPPARTON**

PLANNING INFORMATION

Planning Zone: FARMING ZONE (FZ)
FARMING ZONE - SCHEDULE 1 (FZ1)
LOW DENSITY RESIDENTIAL ZONE (LDRZ)
SCHEDULE TO THE LOW DENSITY RESIDENTIAL ZONE (LDRZ)
PUBLIC USE ZONE - SERVICE AND UTILITY (PUZ1)

Planning Overlay: DEVELOPMENT PLAN OVERLAY (DPO)
DEVELOPMENT PLAN OVERLAY - SCHEDULE 11 (DPO11)
LAND SUBJECT TO INUNDATION OVERLAY (LSIO)
LAND SUBJECT TO INUNDATION OVERLAY SCHEDULE (LSIO)
RURAL FLOODWAY OVERLAY (RFO)
RURAL FLOODWAY OVERLAY SCHEDULE (RFO)
SPECIFIC CONTROLS OVERLAY (SCO)
SPECIFIC CONTROLS OVERLAY - SCHEDULE 1 (SCO1)

Areas of Aboriginal Cultural Heritage Sensitivity:

All or part of this property is an 'area of cultural heritage sensitivity'.

Planning scheme data last updated on 21 July 2021.

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.
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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

PROPERTY REPORT

Environment, Land, Water and Planning

Areas of Aboriginal Cultural Heritage Sensitivity

All or part of this property is an 'area of cultural heritage sensitivity'.

'Areas of cultural heritage sensitivity' are defined under the Aboriginal Heritage Regulations 2018, and include registered Aboriginal cultural heritage places and land form types that are generally regarded as more likely to contain Aboriginal cultural heritage.

Under the Aboriginal Heritage Regulations 2018, 'areas of cultural heritage sensitivity' are one part of a two part trigger which require a 'cultural heritage management plan' be prepared where a listed 'high impact activity' is proposed.

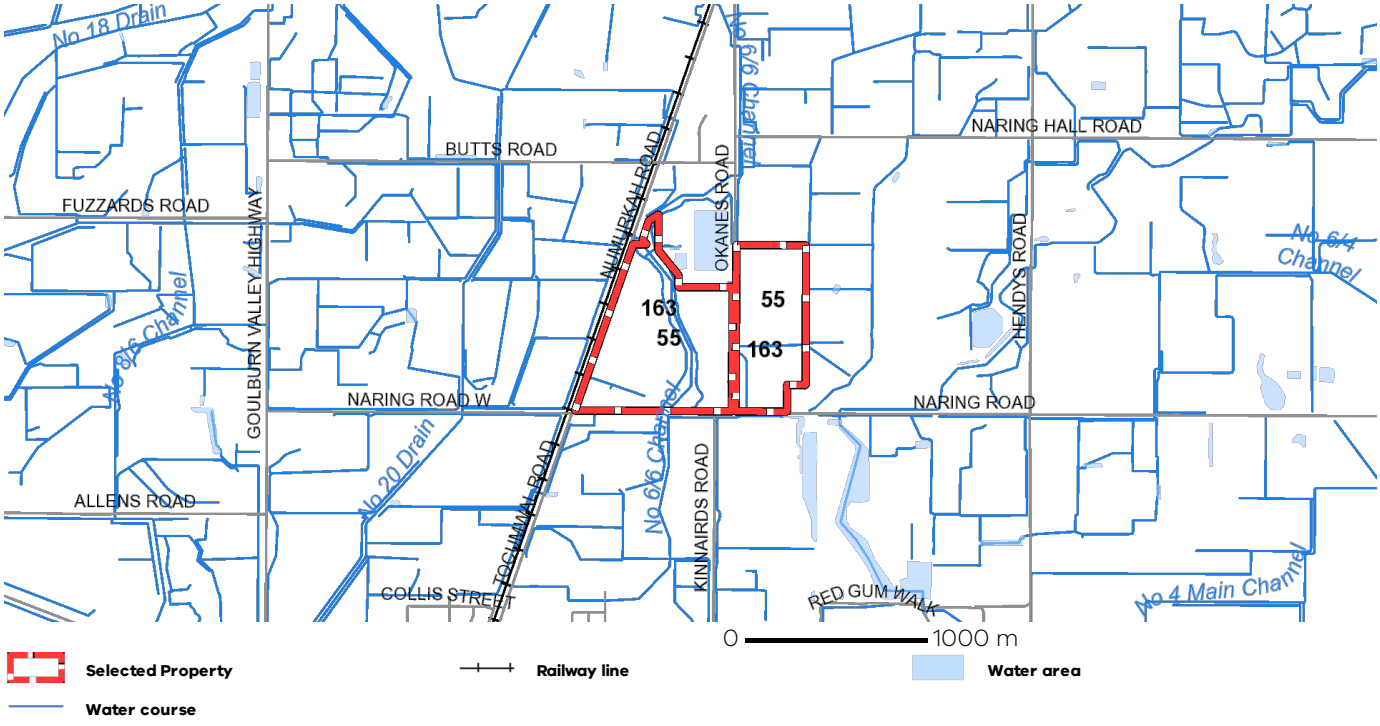
If a significant land use change is proposed (for example, a subdivision into 3 or more lots), a cultural heritage management plan may be triggered. One or two dwellings, works ancillary to a dwelling, services to a dwelling, alteration of buildings and minor works are examples of works exempt from this requirement.

Under the Aboriginal Heritage Act 2006, where a cultural heritage management plan is required, planning permits, licences and work authorities cannot be issued unless the cultural heritage management plan has been approved for the activity.

For further information about whether a Cultural Heritage Management Plan is required go to http://www.aav.nrms.net.au/aavQuestion1.aspx

More information, including links to both the Aboriginal Heritage Act 2006 and the Aboriginal Heritage Regulations 2018, can also be found here - https://www.aboriginalvictoria.vic.gov.au/aboriginal-heritage-legislation

Area Map



PLANNING PROPERTY REPORT

Environment, Land, Water and Planning

From www.planning.vic.gov.au at 26 July 2021 04:35 PM

PROPERTY DETAILS

Address:	**55 NARING ROAD NUMURKAH 3636**
Crown Description:	**More than one parcel - see link below**
Standard Parcel Identifier (SPI):	**More than one parcel - see link below**
Local Government Area (Council):	**MOIRA** www.moira.vic.gov.au
Council Property Number:	**7971**
Planning Scheme:	**Moira** Planning Scheme - Moira
Directory Reference:	**Vicroads 32 J3**

This property has 3 parcels. For full parcel details get the free Property report at Property Reports

UTILITIES

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

STATE ELECTORATES

Legislative Council:	**NORTHERN VICTORIA**
Legislative Assembly:	**SHEPPARTON**

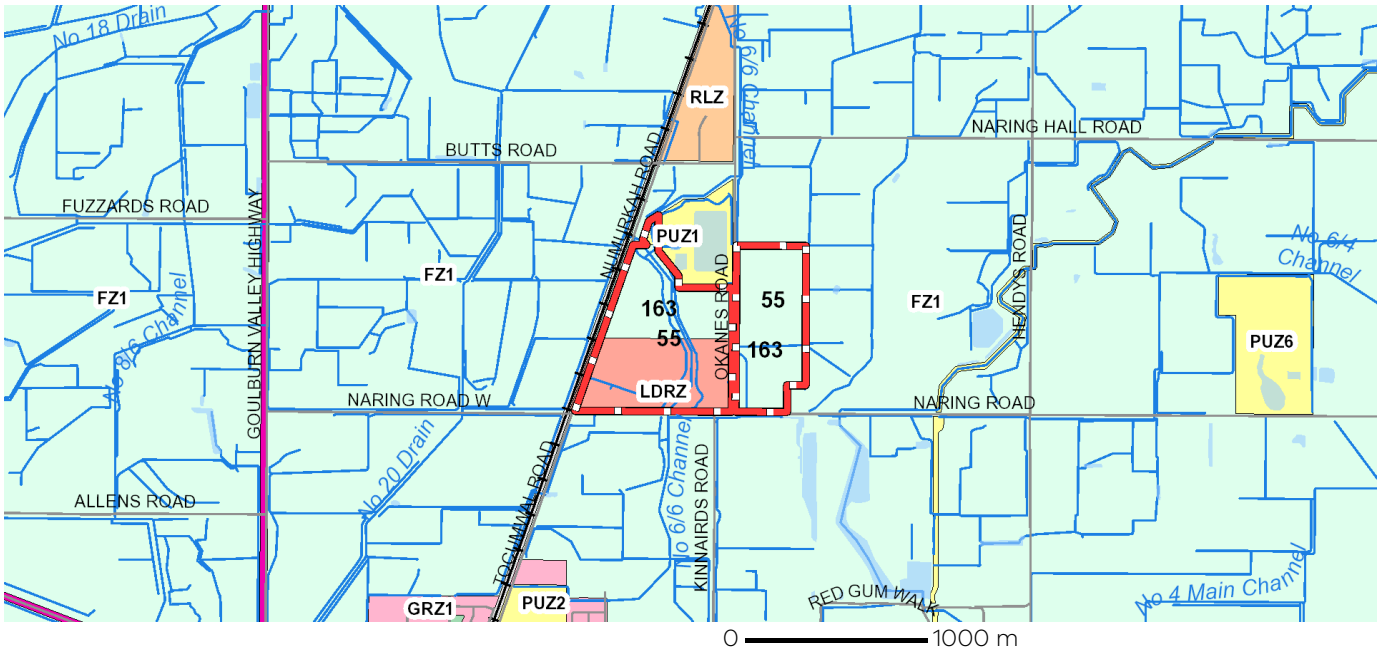
OTHER

Registered Aboriginal Party:	**Yorta Yorta Nation Aboriginal Corporation**

View location in VicPlan

Planning Zones

FARMING ZONE (FZ)
FARMING ZONE - SCHEDULE 1 (FZ1)
LOW DENSITY RESIDENTIAL ZONE (LDRZ)
SCHEDULE TO THE LOW DENSITY RESIDENTIAL ZONE (LDRZ)
PUBLIC USE ZONE - SERVICE AND UTILITY (PUZ1)



FZ - Farming	GRZ - General Residential	LDRZ - Low Density Residential
PPRZ - Public Park and Recreation	PUZ1 - Public Use-Service and Utility	PUZ2 - Public Use-Education
PUZ4 - Public Use-Transport	PUZ6 - Public Use-Local Government	RDZ1 - Road-Category 1
RLZ - Rural Living	Railway line	Water area
Water course		

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

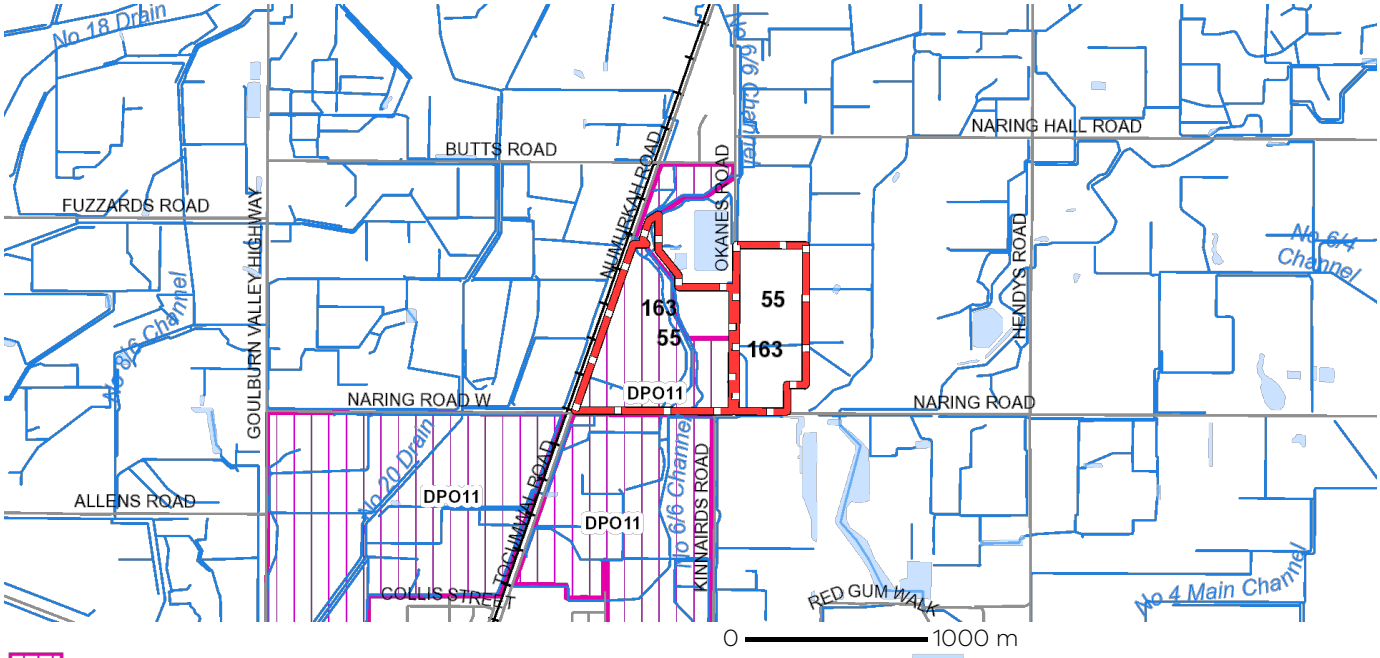
PLANNING PROPERTY REPORT

Environment, Land, Water and Planning

Planning Overlays

DEVELOPMENT PLAN OVERLAY (DPO)

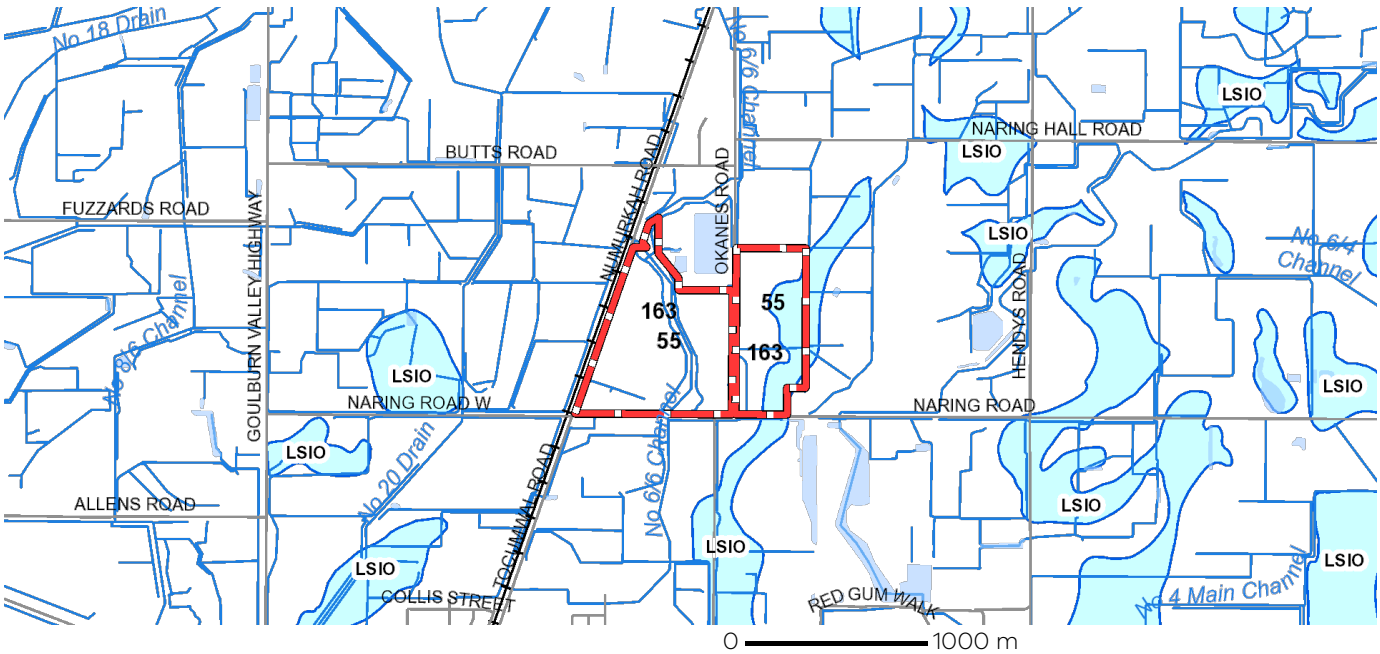
DEVELOPMENT PLAN OVERLAY - SCHEDULE 11 (DPO11)



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

LAND SUBJECT TO INUNDATION OVERLAY (LSIO)

LAND SUBJECT TO INUNDATION OVERLAY SCHEDULE (LSIO)



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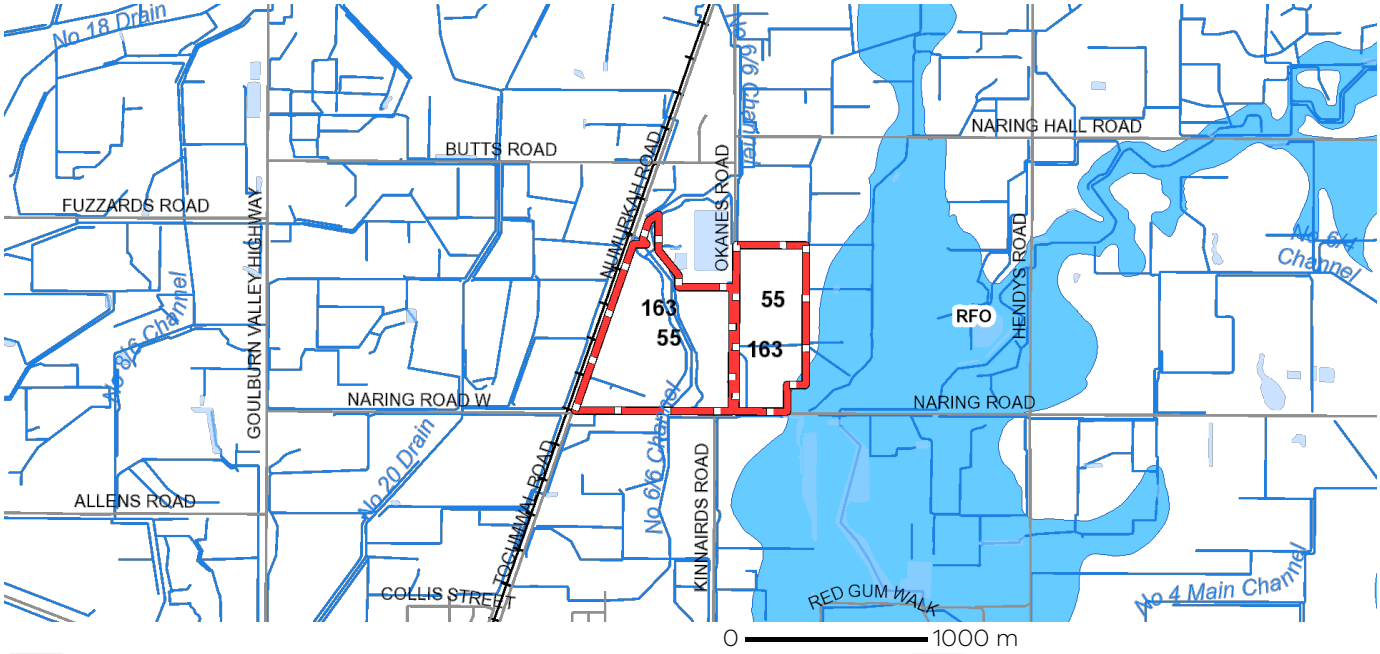
PLANNING PROPERTY REPORT

Environment, Land, Water and Planning

Planning Overlays

RURAL FLOODWAY OVERLAY (RFO)

RURAL FLOODWAY OVERLAY SCHEDULE (RFO)

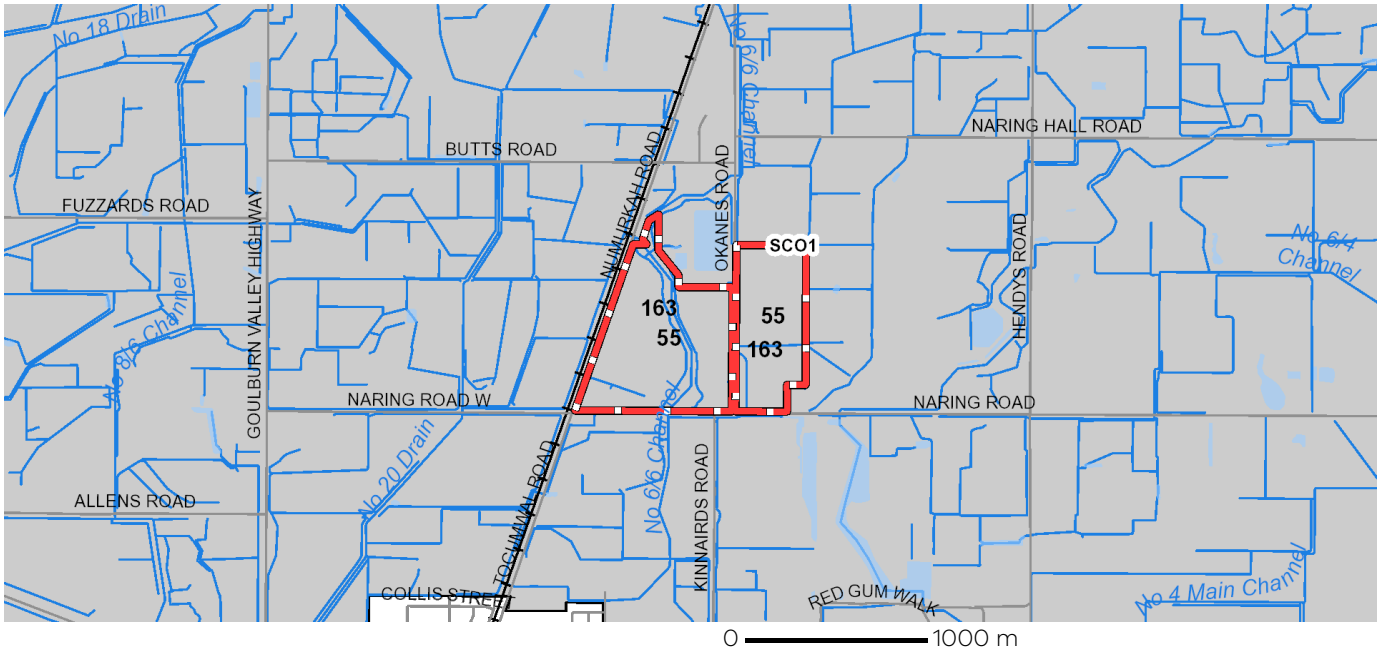


RFO - Rural Floodway | **Railway line** | **Water area** | **Water course**

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

SPECIFIC CONTROLS OVERLAY (SCO)

SPECIFIC CONTROLS OVERLAY - SCHEDULE 1 (SCO1)



SCO - Specific Controls | **Railway line** | **Water area** | **Water course**

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PLANNING PROPERTY REPORT

Environment, Land, Water and Planning

Areas of Aboriginal Cultural Heritage Sensitivity

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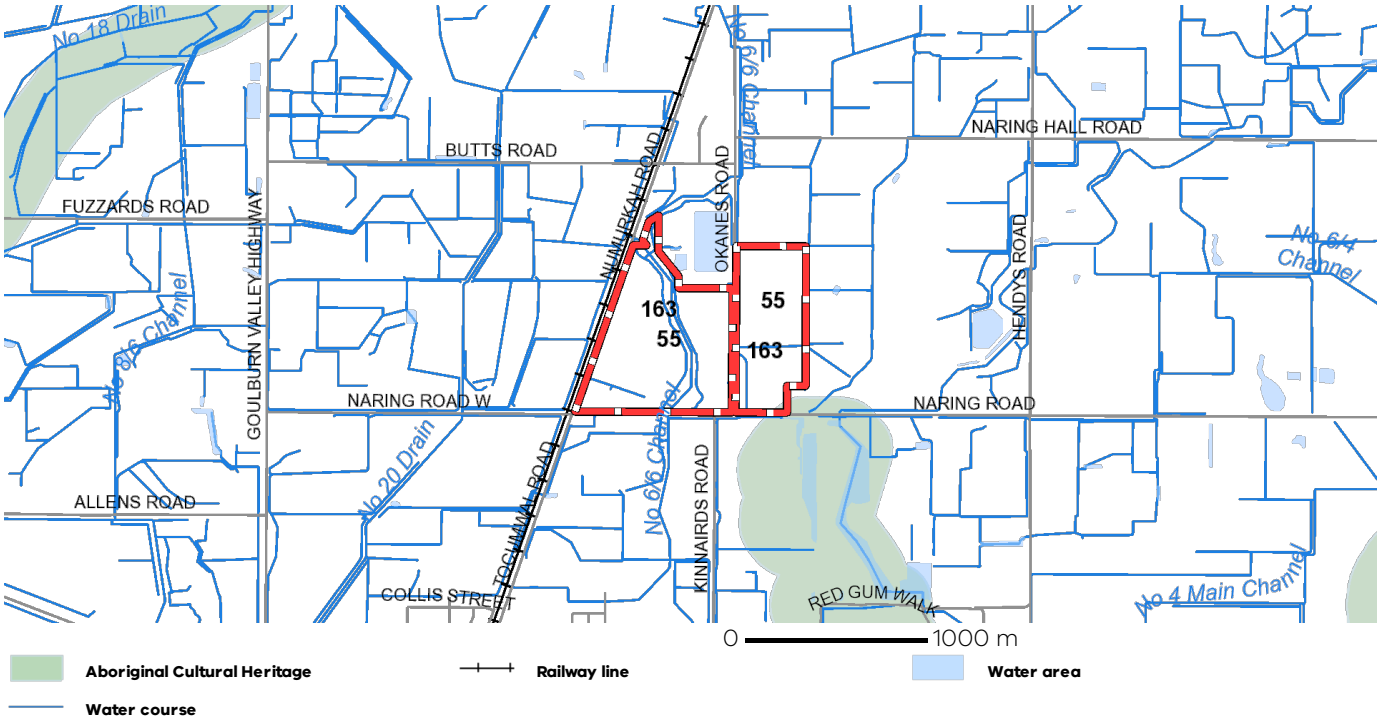

PLANNING PROPERTY REPORT

Further Planning Information

Planning scheme data last updated on 21 July 2021.

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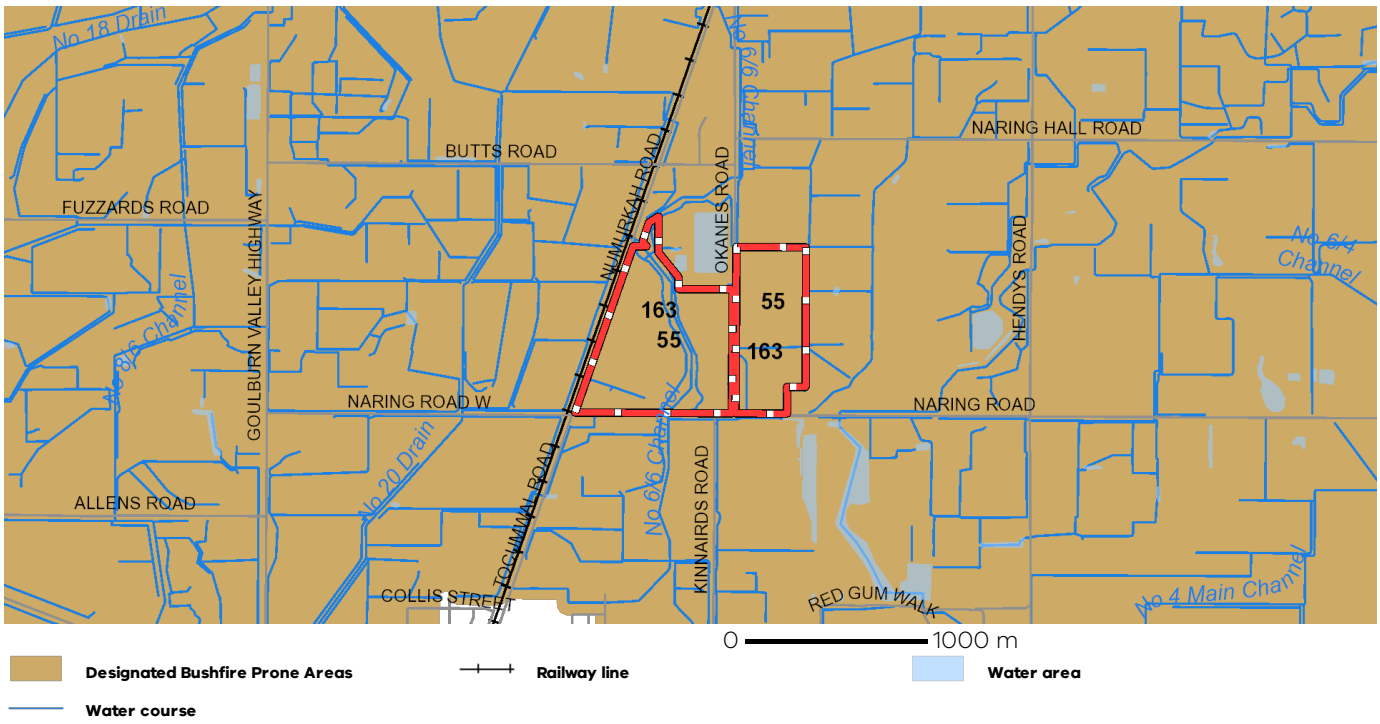
PLANNING PROPERTY REPORT

Environment, Land, Water and Planning

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

Native Vegetation

Native plants that are indigenous to the region and important for biodiversity might be present on this property. This could include trees, shrubs, herbs, grasses or aquatic plants. There are a range of regulations that may apply including need to obtain a planning permit under Clause 52.17 of the local planning scheme. For more information see Native Vegetation (Clause 52.17) with local variations in Native Vegetation (Clause 52.17) Schedule

To help identify native vegetation on his property and the application of Clause 52.17 please visit the Native Vegetation Information Management system https://nvim.delwp.vic.gov.au/ and Native vegetation (environment.vic.gov.au) or please contact your relevant council.

You can find out more about the natural values on your property through NatureKit NatureKit (environment.vic.gov.au)