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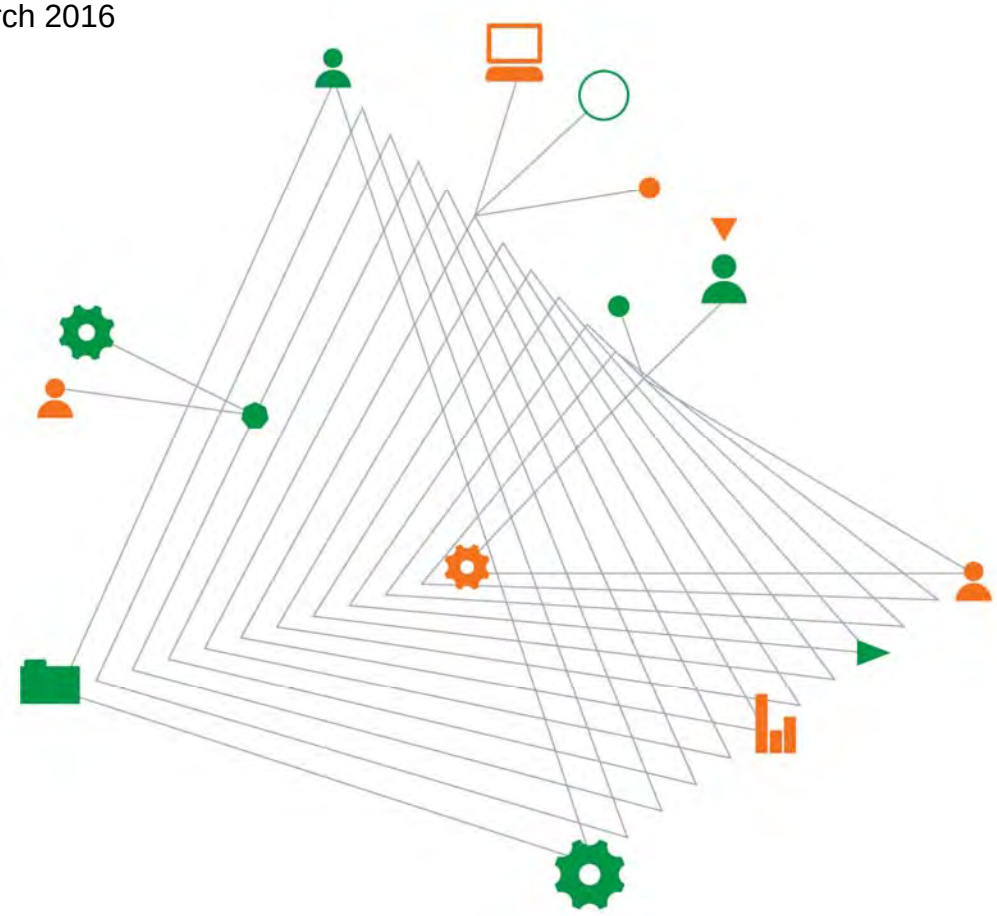
Department of Environment, Land, Water and Planning

Wye River and Separation Creek - Geotechnical, Land Capability and Wastewater Solutions

Land Capability Assessment

31 March 2016



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Wye River and Separation Creek - Geotechnical, Land Capability and Wastewater Solutions

Prepared for
Department of Environment, Land, Water and Planning

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31 March 2016

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Draft	1	Pdf	Siraj Perera	18/03/2016
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Appendices

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1. Introduction

Land capability assessment (LCA) is required for the development of un-sewered residential lots, to determine the ability of a site to sustainably manage wastewater within its boundaries, and to identify risks.

A key issue associated with the bushfire resettlement program is to understand the extent that domestic wastewater can be managed at an individual site level, and whether alternative or community based multi-site systems will be beneficial, in particular where sites are constrained on a technical basis. This report explores the constraints associated with onsite domestic wastewater disposal at Wye River and Separation Creek.

The study areas are shown on Figure 1a and 1b for Wye River and Separation Creek respectively.

1.1. Aims

The aim of the study is to reduce planning and environmental risks by undertaking an intensive land capability assessment and constraints evaluation for bushfire affected sites, and to present the results in a consolidated report.

1.2. Scope and approach

Land capability assessment is commonly conducted on a site by site basis, following the submission of a development application that details the site residence layout and area set aside for any proposed wastewater treatment system. An investigation is then carried out that considers the land area available, soil and site factors.

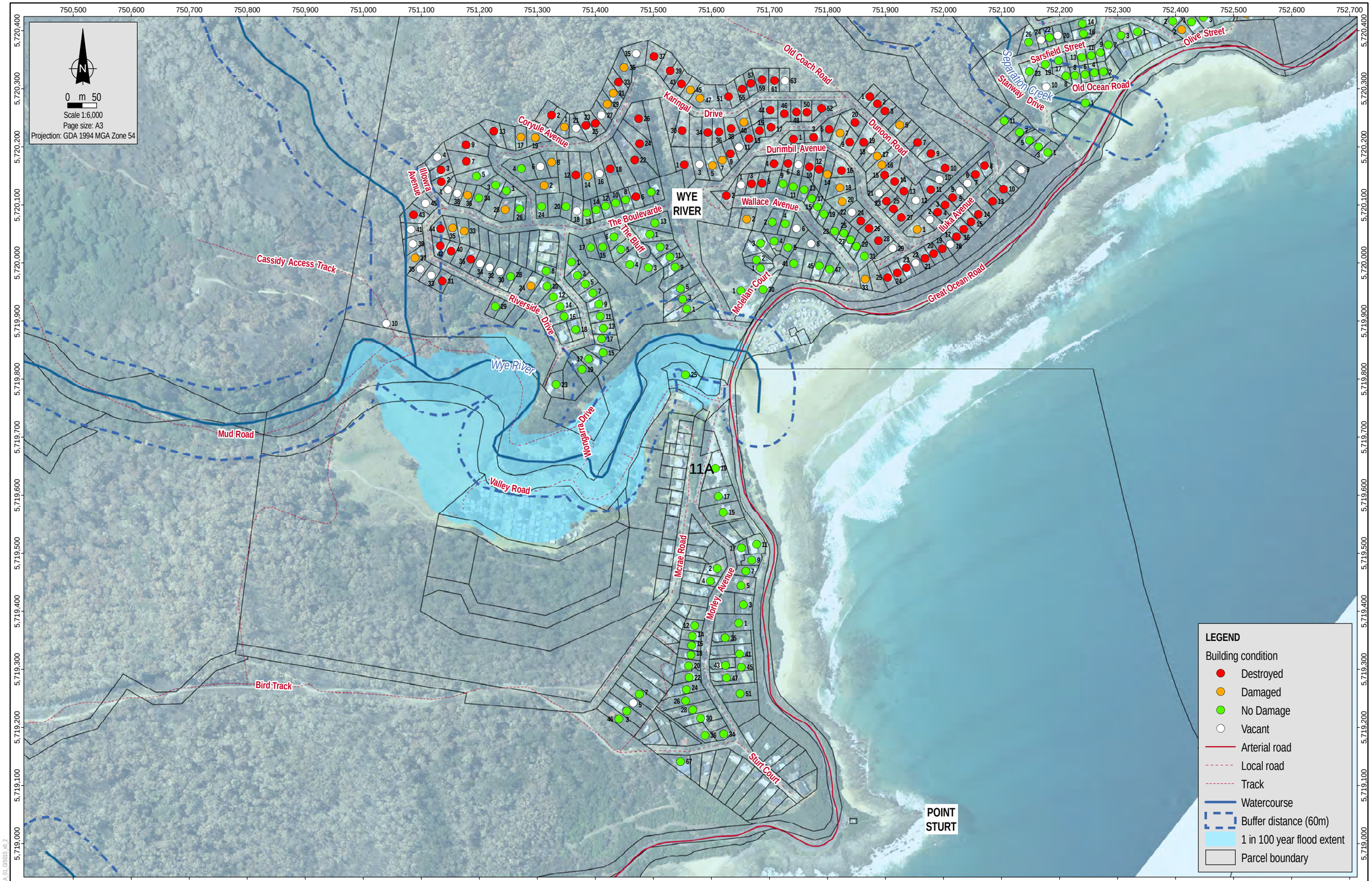
The consolidated high-level approach adopted herein was necessary due to the absence of specific site planning information such as dwelling size, block plan, treatment system, and infiltration or re-use areas. These are all factors which would normally be known at the LCA stage, but are largely unknown at the present time of investigation for most of the fire-affected sites.

The approach adopted for the Wye River and Separation Creek sites instead comprises a broad land capability assessment that considers multiple sites and grouping of categories, building upon existing knowledge.

1.3. Standards and guidelines

The assessment was carried out with consideration of the regulatory standards, guidelines and policy documents of relevance for undertaking onsite wastewater land capability assessments, including:

- Australian Standard/New Zealand Standard (AS/NZS) 1547:2012 (2012): Onsite domestic wastewater management.
- Environment Protection Authority (EPA) Publication 746.1 (2003): Land capability assessment for onsite domestic wastewater management.
- EPA Publication 891.3 (2013): Code of practice onsite wastewater management.
- EPA Publication 746.1 (2003): LCA for onsite domestic wastewater management.
- State Environment Protection Policy - Groundwaters of Victoria (1997).



Source:
Building condition derived from A.S. Miner 'Wye River Bushfires 2015 - Property owner geotechnical and tree status spreadsheet.xlsx'
Roads, watercourses and parcel boundaries from VICMAP.
Flood extent from DELWP.
Imagery and flood extent from DEWLP (captured 9 January 2016).

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Study area
Wye River

Figure No: **1A**

MXD Reference: 11630AA_01_GIS010_v0_2

Source:
Building condition derived from A.S. Miner 'Wye River Bushfires 2015 - Property owner geotechnical and tree status spreadsheet.xlsx'
Roads, watercourses and parcel boundaries from VICMAP.
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Study area
Separation Creek

Figure No:
1B

MXD Reference: 11630AA_01_GIS010_v0_2

Other references and sources were considered, in particular:

- Whitehead and Associates (2015).
- Dahlhaus and Miner (2004).

1.3.1. Recent site LCAs

A number of recent land capability assessment reports were available for specific sites, and were summarised as part of this assessment. This summary is provided in Appendix A.

2. Environment

2.1. Climate

Based on the Köppen–Geiger climate classification system, Wye River and Separation Creek are classified as climate type Cfb - a class of maritime temperate climate. Cfb climates usually occur on the western sides of continents between the latitudes of 45° and 60° however in Australia the occurrence is in the south-east of the continent, where summers are moderated due to cool ocean currents, and winters can be milder than other climates in similar latitudes.

Weather data is not officially recorded for Wye River and Separation Creek. The nearest Bureau of Meteorology station is located approximately 12 km north east at Lorne.

2.1.1. Rainfall

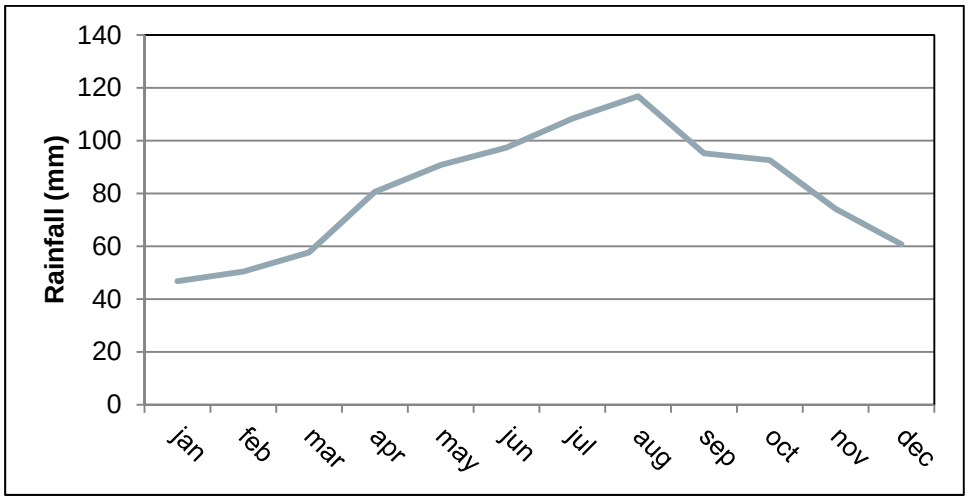
Precipitation data for Lorne is unlikely to be representative of Wye River and Separation Creek, due to the significant orographic influence at these localities. However climate modelling has been previously used to predict rainfall distribution for Wye River. Table 2.1 and Chart 2.1 present this data from Dahlhaus (2002, cited in Dahlhaus and Miner, 2003). The modelling indicates a mean monthly precipitation of 81 mm and an annual precipitation of 971.6 mm for Wye River. Separation Creek has not been modelled separately, but is expected to be similar due to the adjacency of the townships.

Table 2.1 Wye River modelled rainfall data (after Dahlhaus, 2002)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Rainfall (mm)	46.8	50.4	57.7	80.6	90.8	97.4	108.4	116.7	95.2	92.6	74.2	60.8	**971.6**

Source: Dahlhaus (2002) cited in Dahlhaus and Miner (2003)

Chart 2.1 Wye River modelled rainfall



2.1.2. Evaporation

Class A pan evaporation data is available for Wurdiboluc Reservoir, located 17 km north-east of Anglesea for the period of 1970 to 2011. An average yearly total of 1351 mm evaporation is reported, with pan evaporation greatly exceeding rainfall during the summer months. As evaporation is highly influenced by physical factors such as humidity, wind speed, cloud cover and solar radiation, it is possible that the Wurdiboluc Reservoir data may not be precisely representative of Wye River and Separation Creek, due to the different physiography of these locations. Nevertheless, the Wurdiboluc data provides a suitable starting point for understanding Wye River and Separation Creek evaporation.

2.1.3. Climate zone

Whitehead and Associates (2015) categorised Wye River as Climate Zone 2, with five to six moisture surplus months per year. These are periods when rainfall exceeds evapotranspiration, resulting in meteorological water being retained in the soil profile.

2.2. Geology and soils

Wye River and Separation Creek have developed around small estuaries along the coastal fringe on the south-eastern flank of the Otway Ranges of the Victorian Southern Uplands (Dahlhaus and Miner, 2003). The bedrock geology at Wye River and Separation Creek comprises the Lower Cretaceous sedimentary Eumeralla Formation. Lithology comprises volcanolithic sandstone, siltstone, mudstone, conglomerate, and occasional coal (Edwards et al, 1996). Quaternary aged alluvial deposits are present in the estuarine areas, and comprise sand, gravel and silt, associated with the present day stream systems.

The surrounding topography is steep and has the form of highly dissected bedrock spurs and ridges, typical of the geomorphology of the southern flanks of the Otway ranges.

Soils are reported to vary from shallow stony loams in the actively eroding parts of the landscapes, to gradational brown and yellow soils and colluvium, and the depth of soil profile is related to the steepness of slopes (Dahlhaus and Miner, 2003). In places where slopes are very steep the soils are very thin or absent. Where the topography is less steep, the profiles vary from thin stony skeletal soils to thicker weakly gradational profiles, typically less than 1.5 m thick (Dahlhaus and Miner, 2003). Thicker deposits occur where colluvium has accumulated, or at the base of landslides where soils may contain poorly sorted large clasts in a finer matrix.

Mottled orange-brown and grey to dark-grey soils, with waterlogging (gleying) are present within the valleys (Dahlhaus and Miner, 2003).

Where thicker soils have developed (greater than 1 m) these may be susceptible to tunnel erosion, due to the slaking and dispersible nature of the soils, especially in Separation Creek (Dahlhaus and Miner, 2003).

2.3. Hydrology

Wye River and Separation Creek have catchment areas of approximately 24 km^2 and 8 km^2 respectively. Drainage patterns are dendritic, and typical of dissected landscapes with a certain degree of structural control. In addition, landslides also influence drainage.

2.4. Hydrogeology

The regional groundwater occurrence is within a fractured rock aquifer, in the host Eumeralla Formation. Groundwater flow systems are likely to include both intermediate and local systems with a significant topographic control on recharge and discharge.

Perched groundwater systems are also expected, and locally associated with the inter-relationship between soil and underlying rock, with seepage and springs expected on slopes and cuttings. Such features are likely to be ephemeral due to seasonality.

Groundwater recharge rates are likely to be high, 15% or more, due to the limited thickness and stony nature of soil on ridges and spurs. Based on the indicated rainfall, this would likely to lead to infiltration rates of approximately 150 mm/year or greater. Actual infiltration will be higher during winter and spring, based on the seasonality of rainfall, and reduced evapotranspiration during the cooler part of the year.

Groundwater resources have not been significantly developed for domestic or other supply. Based on the conceptual hydrogeology the host formations are likely to provide poor groundwater yields of water of fresh to brackish quality. Although actual data were not available, Dahlhaus and Miner (2003) indicated an expected TDS of <1,500 mg/L based on generalisations of steep hydraulic gradients and short local flow systems.

A single groundwater bore is registered on the Victorian Groundwater Database and located on the public reserve south of Riverside Drive (Dahlhaus and Miner, 2003). The bore is reported as 65.5 m depth, but further information is unknown.

3. Field assessment

The scope of work included undertaking site visits, hand augering of soil test bores, and obtaining soil samples for laboratory analysis.

An initial site visit was conducted by a Coffey Senior Principal to gain an overview of the affected areas, access and geomorphology, and to develop a first-hand understanding of the landscape aspects and constraints posed by the environmental setting. This initial reconnaissance of the area informed aspects of the subsequent fieldwork program to account for situational and geological factors.

Following the initial site visit, a targeted field program was scheduled to establish site specific data for the land capability analysis. Only limited time was available for field investigations and the scope was designed accordingly. Field staff were required to visit, assess and record information relevant to land capability analysis at as many of the affected sites as practicable, within context of the site accessibility, noting that the available hazard assessments indicated that a range of sites were not safely accessible.

Mobile digital GIS equipment was used in the field to enable real-time data capture, with upload to the Coffey server. This enabled efficient integration with GIS and webmap for subsequent review and analysis.

3.1. Site visits

Site visits were conducted by Coffey staff to assess and record information relevant to land capability analysis at as many of the affected sites as practicable, within context of the site accessibility. The weather during the site visits and preceding days was warm to hot and dry. Minor rain was experienced during the latter part of the field assessment.

The field work including visual site assessment together with soil sampling. Two sites were not accessed due to owner consent not being provided. These sites were:

- 40 Riverside Drive Wye River.
- 6 Mitchell Grove Wye River.

Particular attention was given to features or factors that may constrain the application of domestic wastewater to land. Each site visited was assessed against the following general criteria:

- Overall soil and landscape (topography) features including site drainage.
- Any identified soil/water features indicative of springs, or soil waterlogging.
- Rock outcrops, shallow bedrock, or other restrictive, hardpan or impervious layers.
- Presence of cobbles, boulders etc.
- Evidence of desiccation cracking in soils.
- Evidence of salinity, such as presence of salt tolerant vegetation or salt scalded ground.
- Nearby or onsite drainage lines or springs.
- Location of surface water onsite and on adjoining properties (e.g., dams, ponds).
- Evidence of existing septic or wastewater systems.
- Any obvious constraints on adjoining properties.

A number of sites were identified based on previous safety assessments as being unsafe for general access due to onsite hazards. In these cases, site assessment was made from either the roadside or from adjacent properties.

3.2. Soil bores and logging

Soil assessment is necessary to evaluate the reaction of the soil to constant application of effluent with relatively high concentrations of salts. Of particular interest is the potential reduction of permeability caused by sodium and potassium ions. The assessment comprised an intrusive soil investigation, undertaken at selected sites, and included hand augering of soil bores and sampling for laboratory analysis. Twenty sites were selected to:

- Enable an examination of the soil profile, horizons and features.
- Identify the presence of groundwater or capillary zone water.
- Determine soil category and classification of soil permeability.
- Sample for laboratory analysis.

In accordance with AS/NZS 1547:2012 the procedure involved augering the soil to 2 m (where possible) and laying the retrieved soil on the ground in sequence for description and bore logging:

- Each borehole was logged in accordance with AS/NZS 1547:2012 Appendix B4.
- Soil properties were recorded consistently in accordance with AS/NZS 1547:2012 Appendix B4, Table B2.
- In addition, reference was made to Tables E2, E3 and E4 in AS/NZS 1547:2012 Appendix E to ensure logging and classification consistency.

The soil bore locations are provided on Figures 2a and 2b. Bore logs are provided in Appendix B.

3.3. Laboratory analysis

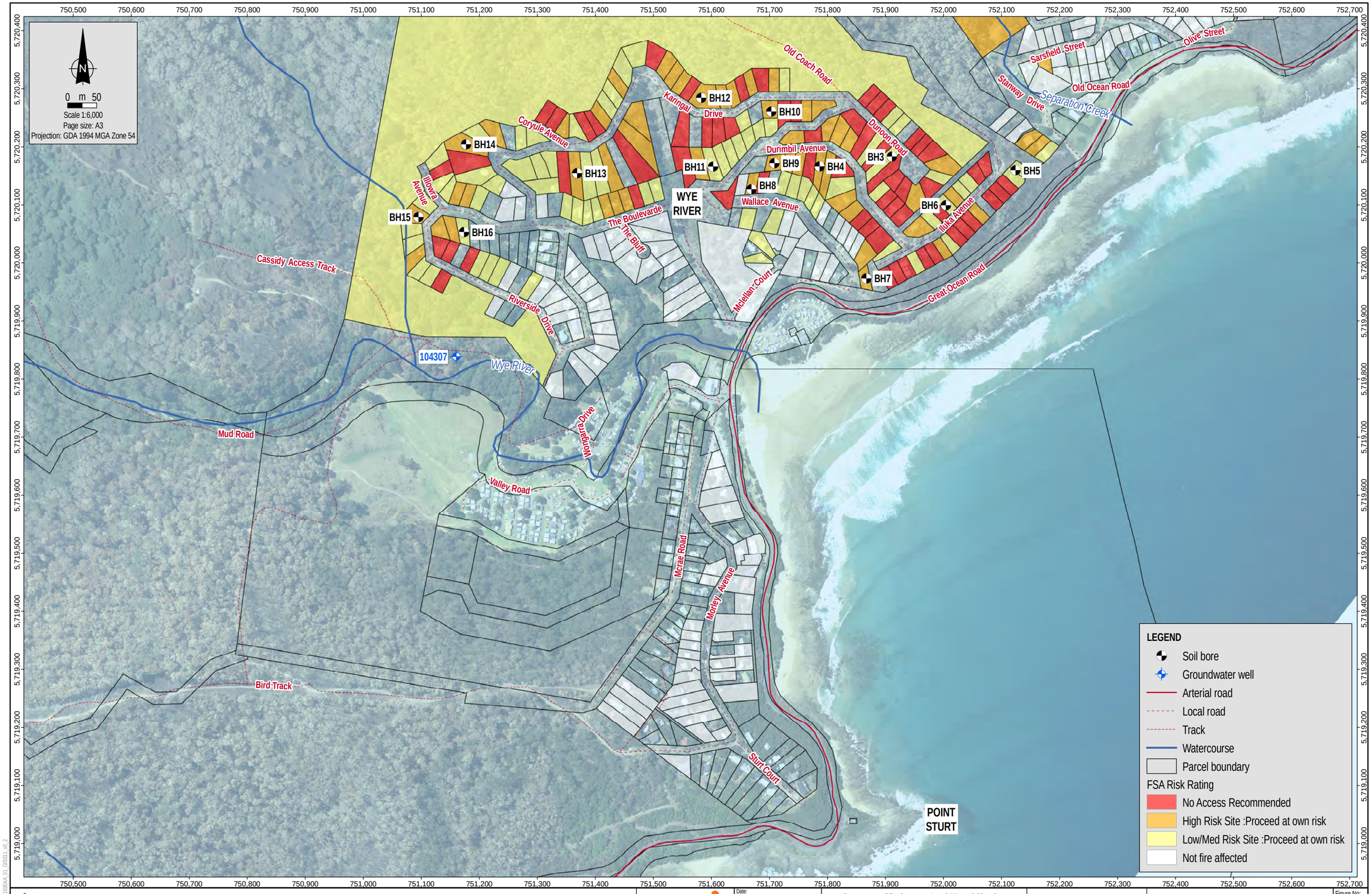
Soils with highly dispersible and often heavy clay subsoils of great age are common in Australia. Lower effluent application rates may be required to make allowance for reduced soil permeability in soils with such sodic and dispersible properties (EPA, 2013). In addition, sodic and dispersible soils are often highly erodible, and may have reduced bearing strengths when wet.

To understand these characteristics for the Wye River and Separation Creek soils, samples from each borehole were submitted to ALS (a NATA accredited laboratory) to analyse for:

- Exchangeable sodium percentage – to investigate sodicity.
- Emerson aggregate tests – to investigate dispersion.

The samples selected for analysis were representative of the 0.5 m depth horizon for all bores, to ensure a consistent approach representative of conditions that would apply to trench or other infiltration systems.

The laboratory reports are provided in Appendix C and discussed in Section 3.4.



Source:
FSA risk rating from Colac Otway Shire.
Soil bores from Coffey. Groundwater well from DELWP.
Roads, watercourses and parcel boundaries from VICMAP.
Imagery and flood extent from DEWLP (captured 9 January 2016).

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Soil bore locations Wye River

Figure No: 2A

MXD Reference: 11630AA_01_GIS011_v0_2

751,900 752,000 752,100 752,200 752,300 752,400 752,500 752,600 752,700 752,800 752,900 753,000

5,720,800 5,720,700 5,720,600 5,720,500 5,720,400 5,720,300 5,720,200

N

0 m 50

Scale 1:3,000
Page size: A3
Projection: GDA 1994 MGA Zone 54

BH20 BH19 BH18 BH17 BH2 BH1 BH3 BH5

Wye Road
Dollar Drive
Bass Avenue
Mitchell Grove
Harrington Street
SEPARATION CREEK
Olive Street
Sarsfield Street
Great Ocean Road
Old Ocean Road
Stanway Drive
Separation Creek
Dunoon Road
Iluka Avenue

LEGEND

- Soil bore
- Arterial road
- Local road
- Track
- Watercourse
- Parcel boundary

FSA Risk Rating

- No Access Recommended
- High Risk Site :Proceed at own risk
- Low/Med Risk Site :Proceed at own risk
- Not fire affected

Source:
FSA risk rating from Colac Otway Shire.
Soil bores from Coffey. Groundwater well from DELWP.
Roads, watercourses and parcel boundaries from VICMAP.
Imagery and flood extent from DEWLP (captured 9 January 2016).

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Soil bore locations Separation Creek

Figure No: 2B

MXD Reference: 11630AA_01_GIS011_v0_2

3.4. Soil analysis

3.4.1. Soil category

The assessment and classification of soil was undertaken in consideration of the EPA Publication 891.3 Code of Practice for onsite wastewater management, and AS/NZS 1547:2012. Under the standard, soil profile inspections, which consider several important soil properties, are used as the main tool to determine soil categories. Table 3.1 relates soil categories under the standard with observed textures and structure.

Table 3.1 Soil categories (AS/NZS 1547:2012)

Soil category	Soil texture	Structure	Indicative permeability (K_{sat})(m/d)
1	Gravels and sands	Structureless (massive)	>3.0
2	Sandy loams	Weakly structured Massive	>3.0 1.4 – 3.0
3	Loams	High/moderate structured Weakly structured or massive	1.5 – 3.0 0.5 – 1.5
4	Clay loams	High/moderate structured Weakly structured Massive	0.5 – 1.5 0.12 – 0.5 0.06 – 0.12
5	Light clays	Strongly structured Moderately structured Weakly structured or massive	0.12 – 0.5 0.06 – 0.12 <0.06
6	Medium to heavy clays	Strongly structured Moderately structured Weakly structured or massive	0.06 – 0.5 <0.06 <0.06
After Table 5.1 in AS/NZS 1547:2012. Refer to the standard for notes supporting the above classification scheme			

Based on the site soil field investigations, the soil profile intersected at Wye River ranges from a yellow brown silty loam to a brown silty clay loam with moderate structure, underlain by weathered sandstone and siltstone bedrock of the Eumeralla Formation (Figure 3a). The depth to rock varies but is typically intersected at approximately 1 mbgs. The indicated permeability (Ksat - EPA Publication 891.3) of these shallow soils is likely to range between 1.5 to 3.0 m/day.

0 m 50
Scale 1:6,000
Page size: A3
Projection: GDA 1994 MGA Zone 54

WYE RIVER

POINT STURT

BH3 (4d)
BH4 (3c)
BH5 (4d)
BH6 (4b)
BH7 (3c)
BH8 (3c)
BH9 (4d)
BH10 (4d)
BH11 (4d)
BH12 (4d)
BH13 (4b)
BH14 (3c)
BH15 (5c)
BH16 (3c)

Old Coach Road
Olive Street
Sarsfield Street
Great Ocean Road
Old Ocean Road
Stanway Drive
Dunoon Road
Koonya Avenue
Karingal Drive
Coryule Avenue
Illowra Avenue
Durimbil Avenue
Wallace Avenue
Iluka Avenue
The Boulevarde
The Bluff
Riverside Drive
Cassidy Access Track
Mcellan Court
Wongarra Drive
Wye River
Mud Road
Valley Road
Morley Avenue
Mcrae Road
Bird Track
Sturt Court

Soil classification
1: SAND
2a: Loamy SAND
2b: Sandy LOAM
3a: Fine sandy LOAM
3b: LOAM
3c: Silty LOAM
4a: Sandy clay LOAM
4b: Fine sandy CLAY
4c: Clay LOAM
4d: Silty clay LOAM
5a: Sandy CLAY
5b: Light CLAY
5c: Silty CLAY
6a: Medium CLAY
6b: Heavy CLAY

LEGEND
Soil bore (soil classification)
Building condition
Destroyed
Damaged
No Damage
Vacant
Arterial road
Local road
Track
Watercourse
Parcel boundary

Source:
Building condition derived from A.S. Miner 'Wye River Bushfires 2015 - Property owner geotechnical and tree status spreadsheet.xlsx'
Groundwater well from DELWP. Soil bores and soil classification from Coffey.
Roads, watercourses and parcel boundaries from VICMAP.
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Soil classification
Wye River

Figure No: 3A

MXD Reference: 11630AA_01_GIS013_v0_2

751,900 752,000 752,100 752,200 752,300 752,400 752,500 752,600 752,700 752,800 752,900 753,000

5,720,800 5,720,700 5,720,600 5,720,500 5,720,400 5,720,300 5,720,200

N

0 m 50

Scale 1:3,000
Page size: A3
Projection: GDA 1994 MGA Zone 54

BH20 (4b)
BH19 (6a)
BH18 (5c)
BH17 (5c)
BH2 (5c)
BH1 (5c)
BH3 (4d)
BH5 (4d)

SEPARATION CREEK

Bass Avenue
Harrington Street
Mitchell Grove
Dollar Drive
Wye Road
Olive Street
Sarsfield Street
Great Ocean Road
Old Ocean Road
Stanway Drive
Dunoon Road
Iluka Avenue
Separation Creek

Soil classification
1: SAND
2a: Loamy SAND
2b: Sandy LOAM
3a: Fine sandy LOAM
3b: LOAM
3c: Silty LOAM
4a: Sandy clay LOAM
4b: Fine sandy CLAY
4c: Clay LOAM
4d: Silty clay LOAM
5a: Sandy CLAY
5b: Light CLAY
5c: Silty CLAY
6a: Medium CLAY
6b: Heavy CLAY

LEGEND
Soil bore (soil classification)
Building condition
Destroyed
Damaged
No Damage
Vacant
<not specified>
Arterial road
Local road
Track
Watercourse
Parcel boundary

Source:
Building condition derived from A.S. Miner 'Wye River Bushfires 2015 - Property owner geotechnical and tree status spreadsheet.xlsx'
Groundwater well from DELWP. Soil bores and soil classification from Coffey.
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Soil classification Separation Creek

Figure No: **3B**

MXD Reference: 11630AA_01_GIS013_v0_2

The soil profile at Separation Creek was found to typically comprise brown silty clay with moderate structure (Figure 3b). The depth to rock also varies but is typically intersected at approximately 1 metre below ground surface (mbgs). The indicated permeability (Ksat) of these shallow soils is likely to range between 0.06 to 0.12 m/day.

The soil profiles observed and interpretation is generally consistent with previous work reported across the area.

3.4.2. Dispersion

The Emerson aggregate test measures the stability of the soil structure. For land capability analysis it is used to assess soil dispersibility and susceptibility to erosion and structural degradation. Table 3.2 relates Emerson class numbers with wastewater application constraints.

Table 3.2 Emerson class

Emerson class	1-2	3-6	7-8
Effect	**Severe dispersion** Class 1-2 soils have a major limitation to wastewater application.	**Moderate dispersion** Class 3-6 soils may have some limitations on wastewater application.	**Low dispersion or stable** Class 7-8 soils are water stable, and neither of these classes limits wastewater application.

For 18 of the 20 samples, the laboratory analysis returned an Emerson class number 3. Class 3 indicates moderate potential for dispersible behaviour.

Where soils are shown to be dispersible, under AS/NZS 1547:2012 the soil is required to be re-classified as Category 6 and any effluent disposal system on such soils designed for conservative design loading rates. However soil improvement such as addition of gypsum, lime or organic matter provides a potential mitigation against dispersible soils, and in addition management of the sodium adsorption ratio (SAR) of the effluent can also assist in reducing soil dispersion.

3.4.3. Sodicity

Sodicity refers to a soil condition in which the percentage of exchangeable sodium is high enough to cause significantly increased clay dispersion, which in turn leads to decreased soil structural stability and potentially decreased soil permeability. Based on the Victorian Land Capability Assessment Framework (MAV, 2014), an exchangeable sodium percentage (ESP) greater than 6% may cause damage to the soil structure. Based on the laboratory results, 18 out of the 20 soil samples have an ESP >6%, and hence it is concluded that soils across the region are generally sodic.

Sodic soils have a significant percentage of exchangeable sodium on their cation exchange complex. Their structure then becomes adversely affected when in contact with water containing certain levels of dissolved salt, such as effluent from domestic wastewater treatment systems. Effluents with a SAR of three or more (at salinity levels which are typical of domestic effluent) can cause sodic soils to disperse, the long-term absorption rate to reduce dramatically, and the application system to fail (AS/NZS 1547:2012).

Where sodic soils are encountered, the addition of gypsum, lime or organic matter to the soil in the application area increases the salinity of the soil moisture without increasing the sodium level. This can lower its SAR and can help to correct the problem.

3.4.4. Permeability

Soil permeability has been classified in accordance with EPA Publication 891.3 Section 3.6.1 requirements and based on the latest version of AS/NZS 1547:2012 'Site-and-Soil Evaluation' procedures. These include soil texture, structure, and swell potential tests, and can be used as an alternative determination of soil permeability in the absence of field measurements. Table 3.1 provides the classification, relating soil category to permeability.

Based on the results obtained from the soil investigations (Section 3.4) the soil permeability range expected across the soils at Separation Creek is 0.06 to 0.12 m/day, and for Wye River is 1.5 to 3.0 m/day.

3.4.5. Depth to rock

The depth of soil cover over bedrock is an important consideration, in particular for conventional effluent absorption trenches or evapotranspiration/seepage trenches and beds. Soil cover needs to be sufficiently deep to store effluent during periods of wet weather and low evapotranspiration.

To be adequate for final effluent treatment, depth of soil should preferably exceed 1.2 m for trenches of 0.6 m depth, but further separation to rock may be required if soils are highly permeable or have preferential pathways. Different depths may apply for other system types, such as mounds, and sub-surface irrigation systems.

4. Land capability assessment

Historically, onsite dispersal of domestic wastewater effluent has typically involved disposal by ground absorption, evapotranspiration or irrigation.

In analysing the results of the investigation, and taking into account the EPA guidelines and AS/NZS1547:2012, it is considered that factors having the greatest effect on whether onsite wastewater dispersal is practicable for a property are:

- Land slope.
- Property/lot size.
- Soil classification.

However other factors can also be constraining, depending on the site and its situation.

4.1. Constraints

4.1.1. Site slope analysis

Steep slopes may make construction of soil absorption systems difficult and there is a greater likelihood of encountering shallow bedrock on steep slopes than gentle slopes. One result of this is that wastewater may seep to the surface in down slope areas.

In considering topography, the land surface shape must be taken into account when assessing the amount and rate of water run-on and run-off from the site. A slope that spreads surface water out over a wide area as it runs down the slope promotes site drainage, whereas a slope that concentrates water in a smaller area promotes soil water logging and surface ponding. In addition, steeper slopes promote faster run-off rates, decreasing the time the wastewater is effectively retained and/or treated on site.

The topography and slope also provide an indication on the likely depth to rock and thickness of soil profile. Steep slopes are generally associated with shallow soil cover, whereas gentle slopes are generally associated with deeper soil cover.

The COS Domestic Wastewater Management Plan sets out the following criteria for assessing slope constraints:

- Constraint class: High Slope > 12%.
- Constraint class: Moderate Slope 8% to 12%.
- Constraint class: Low Slope < 8%.

The digital elevation model for the study areas is presented on Figures 4a and 4b. The average gradient for each parcel of land assessed in Wye River and Separation Creek is >12%.

In cases where steep slope is a constraining factor, a range of approaches may be feasible to mitigate the constraint, but would require individual assessment:

- Applying a lower effluent loading rate over a larger area.
- Designing an irrigation system to ensure even distribution of effluent over the slope.
- Terracing to create level land application areas.

Source:
Building condition derived from A.S. Miner 'Wye River Bushfires 2015 - Property owner geotechnical and tree status spreadsheet.xlsx'
Slope derived by Coffey from DELWP supplied 0.5m LiDAR contours.
Roads, watercourses and parcel boundaries from VICMAP.
Imagery and flood extent from DEWLP (captured 9 January 2016).

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Date: 30.03.2016
Project: ENAUABTF0DELWPAA
File Name: 11630AA_01_F012A_GIS

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Wye River and Separation Creek
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Slope analysis
Wye River

Figure No: **4A**

M:\D Reference\ 11630AA_01_GIS012_v0_1

751,900 752,000 752,100 752,200 752,300 752,400 752,500 752,600 752,700 752,800 752,900 753,000

5,720,800 5,720,700 5,720,600 5,720,500 5,720,400 5,720,300 5,720,200

Wye Road
Dollar Drive
Bass Avenue
Mitchell Grove
Harrington Street
SEPARATION CREEK
Olive Street
Sarsfield Street
Great Ocean Road
Old Ocean Road
Stanway Drive
Separation Creek
Dunoon Road
Iluka Avenue

LEGEND

Building condition
- Destroyed
- Damaged
- No Damage
- Vacant
- <not specified>

Arterial road
Local road
Track
Watercourse
Parcel boundary

Slope (Degree)
- 0 - 5
- 6 - 10
- 11 - 20
- 21 - 30
- 31 - 40
- 41 - 50
- 51 - 71

N

0 m 50

Scale 1:3,000
Page size: A3
Projection: GDA 1994 MGA Zone 54

Source:
Building condition derived from A.S. Miner 'Wye River Bushfires 2015 - Property owner geotechnical and tree status spreadsheet.xlsx'
Slope derived by Coffey from DELWP supplied 0.5m LiDAR contours.
Roads, watercourses and parcel boundaries from VICMAP.
Imagery and flood extent from DEWLP (captured 9 January 2016).

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Department of Environment, Land, Water & Planning

Wye River and Separation Creek
Geotechnical, Land Capability and Wastewater Solutions Project

VICTORIA State Government | Environment, Land, Water and Planning

Slope analysis
Separation Creek

Figure No:
4B

MXD Reference: 11630-AA_01_GIS012_v0_1

4.1.2. Useable lot area

A well designed land application area can provide for long-term sustainable effluent loading, however difficulties may be encountered in the disposal of effluent on small properties, where past practices in many cases has led to the installation of inadequate areas. Undersized land application areas are likely to fail and impact adversely on the environmental and public health.

The COS Domestic Wastewater Management Plan sets out the following criteria for useable lot area analysis:

- Constraint class: High <0.15 ha.
- Constraint class: Moderate 0.15 ha to 0.4 ha.
- Constraint class: Low 0.4 ha to 40 ha.
- Constraint class: Compliant >40 ha.

These areas assume useable area assessed based on a building footprint of 500 m^2 for an average building envelope and improvements.

4.1.3. Flood hazard

Flooding inhibits wastewater absorption and may physically damage effluent tanks and drainage systems. Wastewater subsequently rising to the surface may become a public health hazard. Effluent absorption areas should not be sited in areas subject to flooding.

With respect to flood inundation and its relationship to protection of surface waters, properties that are located within a 1 in 20 year flood inundation overlay are considered to be unsuitable for the onsite dispersal of wastewater. An assessment was made for the Wye River and Separation Creek properties based on the available 1:100 flood overlay.

None of the properties under this assessment were identified within the 1:100 year flood overlay area.

4.1.4. Setback and buffer distances

To minimise the potential risks, onsite wastewater management systems must be installed with a ‘buffer’ or ‘setback’ distance from the property boundaries and the surrounding environment. Setback distances from primary and secondary sewerage and grey water systems are provided in Table 5 of EPA Publication 891.3.

The following buffer distances are applicable:

- 20 m from potable or non-potable groundwater wells.
- 60 m from waterways that is not suitable for potable supply.
- 100 m from waterways in a potable water supply catchment.
- 6 m if areas up-gradient and 3 m if area down-gradient of property boundaries, swimming pools and buildings.

Based on the 150 properties assessed, 9 were located within 60 m of a surface water system while a majority of properties were located at distances greater than 100 m from surface water.

Proximity to streams and water bodies

The risk of excess nutrient loading and the subsequent eutrophication of open waterbodies is an environmental concern, and the risk of pathogen transport to water receptors is a public health concern.

For the site assessments, proximity to surface water systems was determined based on the closest lot boundary. However in reality the onsite treatment system may be located on the opposite side of the lot and therefore outside of the setback distances.

Depth to groundwater

The State Environment Protection Policy - Groundwaters of Victoria (1997) details actions required to protect groundwater, and requires that effluent disposal is carried out in such a manner that groundwater is protected from impact.

The depth to seasonal watertable (whether an unconfined or perched system) constrains the depth of soil available to receive and treat wastewater. EPA Publication 891.3 requires a minimum depth of 1.5 m between the base of the application system and the watertable. In the case where trenches and beds are utilised for application, these are generally constructed to 0.6 m depth. Hence, in that case the minimum acceptable depth to watertable will be 2.1 m.

In cases where this depth cannot be maintained, alternative approaches may be considered and may require specific detailed design. Potential approaches for mitigation, for example secondary treatment options and raised beds, are discussed in AS/NZS 1547:2012.

Groundwater was not encountered in any of the test boreholes during the field work.

Groundwater wells

To protect public health, EPA Publication 891.3 suggests that a septic effluent system is not allowed in areas where the immediate groundwater is used for domestic supply or where highly porous soils exist. In other areas where septic tanks are allowed, a minimum horizontal distance of 20 m is required between the location of any groundwater well and septic tank effluent area.

No domestic supply wells were identified in the vicinity of the Wye River and Separation Creek properties under assessment.

One groundwater bore (bore 104307) was registered on the Victorian Groundwater Database, and located in the public reserve on the north side of Wye River, south of Riverside Drive. Dahlhaus and Miner (2003) report that the 65.5 m deep bore was drilled in April 1968, probably under the drought-relief drilling campaign, for domestic groundwater supply. The lithology is reported as “grey sandstone” but depth to watertable, water quality or aquifer parameters are unknown. The bore is located on Figure 2.

4.1.5. Soil suitability

Based on the field assessments and laboratory analyses, the soils across the townships are sodic and moderately dispersible. The soil profiles are also shallow, with often limited depth of cover over bedrock.

Previous assessments of soil suitability (Whitehead and Associates and van de Graaf and Associates) assigned properties at Wye River in the moderate constraint class. It is expected that soil constraints for Separation Creek will be similar.

As discussed in the COS Domestic Wastewater Management Plan, in cases where the soil constraints at properties are limiting, it may be possible to mitigate against such constraints by:

- Secondary treatment with an AWTS or sand filter.
- Applying a lower loading rate.
- Improving soil by amendment.
- Importing suitable quality soil.

4.2. Land application water balance

An assessment of water application for domestic wastewater disposal has been conducted to provide guidance on land capability for the affected properties at Wye River and Separation Creek. The assessment takes into account:

- AS/NZS 1547:2012 soil categories.
- AS/NZS 1547:2012 design loading rates.
- A range of dwelling sizes up to 5 bedrooms.
- Soil categories assessed based on the field work conducted.

4.2.1. Design loading rates

EPA Publication 891.3 and AS/NZS 1547:2012 provide design advice for domestic wastewater loads expected under various design occupancy situations, for the purpose of land capability analysis, and are provided in Table 4.1. The wastewater loads assume a design flow of 150 L/d/person in accordance with EPA Publication 891.3.

Table 4.1 Design household wastewater flow

Number of bedrooms	Design occupancy (number of persons)	Design flow (L/household/day)
1 to 3	4	600
4	5	750
5	6	900
Refer EPA Publication 891.3 and AS/NZS 1547:2012 for design flow and peak occupancy rules.		

Table 4.2 provides the design effluent loading rates (DLR) and design effluent irrigation rates (DIR) for trench and bed (including ETA/ETS) land application treatment types and sub-surface and surface irrigation.

Table 4.2 Design effluent loading rates

Soil				Design effluent loading rate (mm/day)			
Category	Texture	Structure	Permeability (m/d)	Trenches and beds[1]		Sub-surface and surface irrigation	ETA/ETS[2] beds and trenches
				Primary[3] treated	Secondary treated		
1	Gravels and sands	Structureless (massive)	>3.0	20[1]	25	5	Refer note 4 of table L1 in AS/NZS 1547:2012
2	Sandy loams	Weakly structured	>3.0	20[1]	25	5	
		Massive	1.4 to 3.0	15	30	5	
3	Loams	High to moderate structured	1.5 to 3.0	15	30	4	
		Weakly structured/ massive	0.5 to 1.5	10	30	4	
4	Clay loams	High to moderate structured	0.5 to 1.5	10	30	3.5	12
		Weakly structured	0.12 to 0.5	6	20	3.5	8
		Massive	0.06 to 0.12	4	10	3.5	5
5	Light clays	Strongly structured	0.12 to 0.5	5	12	3	8
		Moderately structured	0.06 to 0.12	Refer notes 2 and 3 of table L1 in AS/NZS 1547:2012	10	3	Refer notes 2, 3 and 5 of table L1 in AS/NZS 1547:2012
		Weakly structured or massive	<0.06		8	3	
6	Medium to heavy clays	Strongly structured	0.06 to 0.5			2	
		Moderately structured	<0.06			2	
		Weakly structured or massive	<0.06			2	

Notes
1. Refer table L1 in AS/NZS1547:2012 for category 1 and 2 soils. Highly permeable soils may have low nutrient retention with risk to groundwater.
2. ETA/ETS systems not normally used on soil categories 1 to 3.
3. Conservative rate. Refer table L1 in AS/NZS1547:2012 for maximum rates.

Design loading rate analyses are tabulated in Appendix D, and assume soil Category 3a for Wye River and Category 5b for Separation Creek, based on the interpretation of the soil investigation results (Section 3.4.1).

Based on the analysis approximately 93% of the sites assessed have a potentially available dispersal area larger than the design dispersal area for primary treated effluent. However this analysis does not take into account other technical factors such as slope, soil type etc. (refer Section 4.3).

Where alternative dispersal systems are considered, such as irrigation of secondary treated effluent, specific design will be required and design irrigation rates (DIRs) adopted from EPA Publication 891.3 and Appendix M in AS/NZS 1547:2012. DIRs under such situations will also require reductions according to slope determined for specific site situations (refer Table M2 in Appendix M in AS/NZS 1547:2012).

4.3. LCA rating matrix

A matrix for LCA rating was developed to enable each property within the study areas to be classified based on suitability to support onsite treatment and dispersal of wastewater.

The rating matrix lists property characteristics such as size, slope, soil type and other features such as proximity to surface water systems and flooding potential which may affect the ability of the land to support onsite dispersal of wastewater. These property characteristics (risk factors) are graded into three classes (a rating between 1 and 3) with higher rating correlating with higher constraint (and corresponding low land capability) and therefore greater management inputs needed to ensure that environmental impact is minimised.

Table 4.3 presents the class ratings, and the rating matrix is presented in Appendix E.

Table 4.3 Class rating

Rating value	Definition
1	The **constraint is present at a low level** and is unlikely to limit opportunities for onsite wastewater management. Areas with high capacity for the proposed use.
2	The **constraint is present at a moderate level** and this limits the range of onsite wastewater management options that are appropriate for the site. Areas with fair capability for the proposed use.
3	The **constraint is present at a high level** and this severely restricts opportunities for sustainable onsite wastewater management.

4.3.1. Risk model

Following the construction of the LCA rating matrix, a risk assessment model was developed and based on a similar approach to the DRASTIC model (Aller et al., 1987) which attributes proportional weightings to a variety of risk factors. These risk factors are then applied to the lot parcels.

In analysing the results from the desktop study it is considered that land size, slope and soil type are the risk factors with the greatest influence on whether onsite wastewater dispersal is practicable for a property.

4.3.2. Risk model results

The results are tabulated in Appendix E and presented on Figure 5. The sum of each risk factor multiplied by its weighting determines the land capability class rating, based on a range between 1

and 3. The features with the highest ratings are those that are most constraining. As the land capability class rating increases so does the associated risk and, with it, the degree of difficulty for satisfying environmental protection under a domestic wastewater dispersal scheme.

Outcomes of the onsite wastewater containment assessment identified that 14 properties are very highly constrained, 124 properties are highly constrained and 12 properties are moderately constrained (classified as being partially able to contain treated wastewater on site) (Figure 5).

Table 4.4 Land capability class rating

Land capability class rating	Constraint rating	Description	Number of properties	Percentage of properties
Very Low	Very highly constrained	All treated wastewater cannot be readily managed on site under standard systems. Multiple risk factors do not meet the requirement specified in the EPA Publication 891.3 and Colac Otway Shire Council DWMP.	14	9.3
Low	Highly constrained	All treated wastewater cannot be readily managed on site under standard systems. One or more risk factors do not meet the requirement specified in the EPA Publication 891.3 and Colac Otway Shire Council DWMP.	124	82.7
Medium	Moderately constrained	The site is moderately constrained whereby at least one risk factor does not meet the requirements specified in the EPA Publication 891.3 and Colac Otway Shire Council DWMP. Additional site specific assessments will be required to fill data gaps and revise the LCA.	12	8.0
High	Marginally constrained	Treated wastewater may be sustainably contained on site under good standard practice, and is likely to meet the EPA Publication 891.3 and Colac Otway Shire Council DWMP.	0	0

The results of the assessment are found to be consistent with previous investigations across Wye River and Separation Creek for other studies.

751,000 751,250 751,500 751,750 752,000 752,250 752,500 752,750

5,720,500

5,720,250

5,720,000

5,719,750

Old Coach Road

Bass Avenue

Dollar Drive

Dollar Drive

Mitchell Grove

Harrington Street

Harrington Street

SEPARATION CREEK

Olive Street

Olive Street

Sarsfield Street

Old Ocean Road

Stanway Drive

Separation Creek

Coryule Avenue

Illowra Avenue

Karingal Drive

Koonya Avenue

Dunoon Road

Wallace Avenue

Durrimbil Avenue

Iluka Avenue

WYE RIVER

The Boulevarde

The Bluff

Cassidy Access Track

Riverside Drive

Mclellan Court

Wallace Avenue

Mud Road

Dune

Wye River

Wongarra

Morley Avenue

Valley Road

Mcrae Road

N

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Page size: A3
Projection: GDA 1994 MGA Zone 54

LEGEND

- Arterial road
- Local road
- Track
- Watercourse
- Parcel boundary

Land capability constraint rating

- Very highly constrained
- Highly constrained
- Moderately constrained

751,000 751,250 751,500 751,750 752,000 752,250 752,500 752,750

Source:
Land capability contraint rating from Coffey.
Roads, watercourses and parcel boundaries from VICMAP.
Imagery from DEWLP (captured 9 January 2016).

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A TETRA TECH COMPANY

Date: 29.03.2016
Project: ENAUABTF0DELWPAA
File Name: 11630AA_01_F020_GIS

Department of Environment, Land, Water & Planning

Wye River and Separation Creek
Geotechnical, Land Capability and Wastewater Solutions Project

VICTORIA State Government | Environment, Land, Water and Planning

Land capability constraint rating

Figure No: **5**

MXD Reference: 11630AA_01_GIS020_v0_1

5. Discussion

Based on the soil field investigations, the soil profile at Separation Creek is found to typically comprise brown silty clay with moderate structure underlain by weathered sandstone and siltstone bedrock of the Eumeralla Formation. The depth to rock varies but is typically intersected at approximately 1 meter below ground surface (mbgs). The soil profile intersected at Wye River ranges from a yellow brown silty loam to a brown silty clay loam with moderate structure. The depth to bedrock is also quite shallow and was intersected at approximately 1 mbgs.

For 18 of the 20 samples, the laboratory analyses returned an Emerson Class number 3. Class 3 indicates moderate potential for dispersion.

Based on the laboratory results, 18 out of the 20 soil samples have an ESP >6%, and hence it is concluded that soils across the region are generally sodic, a characteristic which can lead to decreased soil structural stability and potentially decreased soil permeability under domestic wastewater application.

In cases where the soil constraints at properties are limiting, it may be possible to mitigate against such constraints by:

- Secondary treatment with an AWTS or sand filter.
- Applying a lower loading rate.
- Improving soil by amendment.
- Importing good quality soil.

Land areas were assessed based on an assumption of a 500 m^2 building footprint for an average building envelope with improvements. This factor provides a significant constraint for many properties due to the limited area available for effluent dispersal.

The assessment also found that steep slope is a constraining factor for the majority of sites. In such cases, a range of approaches may be feasible to mitigate the constraint (providing other factors such as lot size are not limiting) but would require individual assessment. Potential mitigations could include:

- Applying a lower effluent loading rate over a larger area.
- Designing an irrigation system to ensure even distribution of effluent over the slope.
- Terracing to create level land application areas.

The onsite wastewater containment assessment identified that 14 properties are very highly constrained, 124 properties are highly constrained and 12 properties are moderately constrained (classified as being partially able to contain treated wastewater on site). The results of the assessment are found to be consistent with previous investigations across Wye River and Separation Creek.

6. References

Aller L, Lehr JH, and Petty, R. (1987). DRASTIC: A Standardized System to Evaluate Ground Water Pollution Potential using Hydrogeologic Settings. National Water Well Association, Ohio.

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EPA Publication 746.1 (2003) – Land Capability Assessment For Onsite Domestic Wastewater Management.

EPA Publication 891.3 (2013) – Code Of Practice Onsite Wastewater Management.

Edwards J, Tickell SJ, et al. (1996). Colac 1:250,000 Geological Map. Edition 2, November 1996. Geological Survey of Victoria.

Municipal Association of Victoria, Department of Environment and Sustainability and EPA Victoria (2014) Victorian Land Capability Assessment Framework.

Whitehead and Associates (2015). Colac Otway Shire Council Domestic Wastewater Management Plan Technical Document.

Important information about your Coffey Environmental Report

1. Introduction

This report has been prepared by Coffey for you, as Coffey's client, in accordance with our agreed purpose, scope, schedule and budget.

The report has been prepared using accepted procedures and practices of the consulting profession at the time it was prepared, and the opinions, recommendations and conclusions set out in the report are made in accordance with generally accepted principles and practices of that profession.

The report is based on information gained from environmental conditions (including assessment of some or all of soil, groundwater, vapour and surface water) and supplemented by reported data of the local area and professional experience. Assessment has been scoped with consideration to industry standards, regulations, guidelines and your specific requirements, including budget and timing. The characterisation of site conditions is an interpretation of information collected during assessment, in accordance with industry practice,

This interpretation is not a complete description of all material on or in the vicinity of the site, due to the inherent variation in spatial and temporal patterns of contaminant presence and impact in the natural environment. Coffey may have also relied on data and other information provided by you and other qualified individuals in preparing this report. Coffey has not verified the accuracy or completeness of such data or information except as otherwise stated in the report. For these reasons the report must be regarded as interpretative, in accordance with industry standards and practice, rather than being a definitive record.

2. Your report has been written for a specific purpose

Your report has been developed for a specific purpose as agreed by us and applies only to the site or area investigated. Unless otherwise stated in the report, this report cannot be applied to an adjacent site or area, nor can it be used when the nature of the specific purpose changes from that which we agreed.

For each purpose, a tailored approach to the assessment of potential soil and groundwater contamination is required. In most cases, a key objective is to identify, and if possible quantify, risks that both recognised and potential contamination posed in the context of the agreed purpose. Such risks may be financial (for example, clean up costs or constraints on site use) and/or physical (for example, potential health risks to users of the site or the general public).

3. Limitations of the Report

The work was conducted, and the report has been prepared, in response to an agreed purpose and scope, within time and budgetary constraints, and in reliance on certain data and information made available to Coffey. The analyses, evaluations, opinions and conclusions presented in this report are based on that purpose and scope, requirements, data or information, and they could change if such requirements or data are inaccurate or incomplete.

This report is valid as of the date of preparation. The condition of the site (including subsurface conditions) and extent or nature of contamination or other environmental hazards can change over time, as a result of either natural processes or human influence. Coffey should be kept appraised of any such events and should be consulted for further investigations if any changes are noted, particularly during construction activities where excavations often reveal subsurface conditions.

In addition, advancements in professional practice regarding contaminated land and changes in applicable statues and/or guidelines may affect the validity of this report. Consequently, the currency of conclusions and recommendations in this report should be verified if you propose to use this report more than 6 months after its date of issue.

The report does not include the evaluation or assessment of potential geotechnical engineering constraints of the site.

4. Interpretation of factual data

Environmental site assessments identify actual conditions only at those points where samples are taken and on the date collected. Data derived from indirect field measurements, and sometimes other reports on the site, are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact with respect to the report purpose and recommended actions.

Variations in soil and groundwater conditions may occur between test or sample locations and actual conditions may differ from those inferred to exist. No environmental assessment program, no matter how comprehensive, can reveal all subsurface details and anomalies. Similarly, no professional, no matter how well qualified, can reveal what is hidden by earth, rock or changed through time.

The actual interface between different materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions.

For this reason, parties involved with land acquisition, management and/or redevelopment should retain the services of a suitably qualified and experienced environmental consultant through the development and

use of the site to identify variances, conduct additional tests if required, and recommend solutions to unexpected conditions or other unrecognised features encountered on site. Coffey would be pleased to assist with any investigation or advice in such circumstances.

5. Recommendations in this report

This report assumes, in accordance with industry practice, that the site conditions recognised through discrete sampling are representative of actual conditions throughout the investigation area. Recommendations are based on the resulting interpretation.

Should further data be obtained that differs from the data on which the report recommendations are based (such as through excavation or other additional assessment), then the recommendations would need to be reviewed and may need to be revised.

6. Report for benefit of client

Unless otherwise agreed between us, the report has been prepared for your benefit and no other party. Other parties should not rely upon the report or the accuracy or completeness of any recommendation and should make their own enquiries and obtain independent advice in relation to such matters.

Coffey assumes no responsibility and will not be liable to any other person or organisation for, or in relation to, any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report.

To avoid misuse of the information presented in your report, we recommend that Coffey be consulted before the report is provided to another party who may not be familiar with the background and the purpose of the report. In particular, an environmental disclosure report for a property vendor may not be suitable for satisfying the needs of that property's purchaser. This report should not be applied for any purpose other than that stated in the report.

7. Interpretation by other professionals

Costly problems can occur when other professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, a suitably qualified and experienced environmental consultant should be retained to explain the implications of the report to other professionals referring to the report and then review plans and specifications produced to see how other professionals have incorporated the report findings.

Given Coffey prepared the report and has familiarity with the site, Coffey is well placed to provide such assistance. If another party is engaged to interpret the recommendations of the report, there is a risk that the contents of the report may be misinterpreted and Coffey disowns any responsibility for such misinterpretation.

8. Data should not be separated from the report

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, laboratory data, drawings, etc. are customarily included in our reports and are developed by scientists or engineers based on their interpretation of field logs, field testing and laboratory evaluation of samples. This information should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

This report should be reproduced in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties.

9. Responsibility

Environmental reporting relies on interpretation of factual information using professional judgement and opinion and has a level of uncertainty attached to it, which is much less exact than other design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. As noted earlier, the recommendations and findings set out in this report should only be regarded as interpretive and should not be taken as accurate and complete information about all environmental media at all depths and locations across the site.

Appendix A - Recent site LCA summaries

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Study Area	Site Address	Land Capability Assessment Rating
Separation Creek	10 Olive Street	Poor
Separation Creek	14 Bass Avenue	Moderate
Wye River	11 Dunoon Road	Very Poor
Wye River	17 Iluka Avenue	Poor
Wye River	23 Durimbil Avenue	Poor
Wye River	23 Karingal Drive	Very Poor
Wye River	35 Karingal Drive	Very Poor
Wye River	36 Karingal Drive	Very Poor
Wye River	44 Riverside Drive	Poor
Wye River	47 Karingal Drive	Very Poor
Wye River	61 Karingal Drive	Poor
Wye River	9 Karingal Drive	Very Poor

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Appendix B – Bore logs

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Drilling Log

Soil Boring **BH1**

Project *Bushfire emergency response assessment* Owner *Victorian Government*

Location *16 Olive Street, SC* Proj. No. *ENAUABTF11630AA*

Surface Elev. *NA* Total Hole Depth *2.0 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *55 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material _____ Rig/Core _____

Drill Co. _____ Method *Hand auger.*

Driller _____ Log By *PL, ST* Date *3/3/16* Permit # *NA*

Checked By _____ License No. _____

COMMENTS
Host rock not encountered.

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						**Silty CLAY**; dark brown, no coarse fragments, massive, no groundwater, dry.
		BH1-0.25				**Silty CLAY**; dark brown, no coarsefragments, massive,no groundwater, moist.
		BH1-0.5				**Silty CLAY**; orange/brown, no coarse fragments, massive, no groundwater, moist.
1		BH1-1.0				**Silty CLAY**; yellow/orange/brown, no coarse fragments, massive, no groundwater, moist.
		BH1-1.5				**Silty CLAY**; yellow/orange, no coarse fragments, massive, no groundwater, moist.
2		BH1-2.0				End of investigation at 2.0mbgs.
3						

Drilling Log

Soil Boring **BH2**

Project *Bushfire emergency response assessment* Owner *Victorian Government*

Location *12 Mitchell Grove, SC* Proj. No. *ENAUABTF11630AA*

Surface Elev. *NA* Total Hole Depth *1.3 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *55 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material _____ Rig/Core _____

Drill Co. _____ Method *Hand auger.*

Driller _____ Log By *PL, ST* Date *3/3/16* Permit # *NA*

Checked By _____ License No. _____

COMMENTS

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						**FILL: Silty CLAY**; dark brown, no coarse fragments, massive,no groundwater, dry.
						Silty CLAY; dark brown, no coarse fragments, massive,no groundwater, moist.
						Silty CLAY; orange/brown/yellow, no coarse fragments, massive,no groundwater, moist.
						Silty CLAY; orange/brown/yellow, no coarse fragments, massive, no groundwater, moist.
1						**Silty CLAY**; yellow/orange, no coarse fragments, massive, no groundwater, moist.
						End of investigation at 1.25mbgs.
2						
3						

Drilling Log

Soil Boring **BH3**

Project *Bushfire emergency response assessment* Owner *Victorian Government*

Location *16 Dunoon Road, WR* Proj. No. *ENAUABTF11630AA*

Surface Elev. *NA* Total Hole Depth *0.8 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *55 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material _____ Rig/Core _____

Drill Co. _____ Method *Hand auger.*

Driller _____ Log By *PL, ST* Date *3/3/16* Permit # *NA*

Checked By _____ License No. _____

COMMENTS

Extremely weathered siltstone, fine to medium grained sandstone with some clay. Hole abandoned at 0.75mbgs.

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
						Silty Clay LOAM; brown, no coarse fragments, massive, no groundwater, dry.
		BH3-0.25				**Silty Clay LOAM**; brown/yellow, no coarse fragments, massive, no groundwater, dry.
		BH3-0.5				**Fine Sandy CLAY**; yellow, no coarse fragments, massive, no groundwater, dry.
		BH3-0.65				End of investigation at 0.75mbgs.
1						
2						
3						

Drilling Log

Soil Boring **BH4**

Project *Bushfire emergency response assessment* Owner *Victorian Government*

Location *12 Durimbil Avenue, WR* Proj. No. *ENAUABTF11630AA*

Surface Elev. *NA* Total Hole Depth *0.8 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *55 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material _____ Rig/Core _____

Drill Co. _____ Method *Hand auger.*

Driller _____ Log By *PL, ST* Date *3/3/16* Permit # *NA*

Checked By _____ License No. _____

COMMENTS

Extremely weathered siltstone-sandstone from 0.6mbgs.

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) — Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						**Silty Clay LOAM**; brown, no coarse fragments, massive, no groundwater, dry.
		BH4-0.25				**Silty LOAM**; brown/yellow/orange, no coarse fragments, massive, no groundwater, dry.
		BH4-0.5				**Silty LOAM**; brown/yellow/orange, no coarse fragments, massive, no groundwater, dry.
		BH4-0.8				End of investigation at 0.8mbgs.
1						
2						
3						

Drilling Log

Soil Boring **BH5**

Project *Bushfire emergency response assessment* Owner *Victorian Government*

Location *9 Iluka Avenue, WR* Proj. No. *ENAUABTF11630AA*

Surface Elev. *NA* Total Hole Depth *0.9 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *55 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material _____ Rig/Core _____

Drill Co. _____ Method *Hand auger.*

Driller _____ Log By *PL, ST* Date *3/3/16* Permit # *NA*

Checked By _____ License No. _____

COMMENTS
Extremely weathered siltstone.

Depth (m.)	PID (ppm)	Sample ID / % Recovery / Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) — Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0					
					Silty Clay LOAM; brown, no coarse fragments, massive, no groundwater, dry.
		BH5-0.25			**Fine Sandy LOAM/Silty Clay LOAM**; yellow/orange, no coarse fragments, massive, no groundwater, dry.
		BH5-0.5			**Silty Clay LOAM**; yellow/orange, no coarse fragments, massive, no groundwater, dry.
		BH5-0.9			End of investigation at 0.9mbgs.
1					
2					
3					

Drilling Log

Soil Boring **BH6**

Project *Bushfire emergency response assessment* Owner *Victorian Government*

Location *4 Iluka Avenue, WR* Proj. No. *ENAUABTF11630AA*

Surface Elev. *NA* Total Hole Depth *1.1 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *55 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material _____ Rig/Core _____

Drill Co. _____ Method *Hand auger.*

Driller _____ Log By *PL, ST* Date *3/3/16* Permit # *NA*

Checked By _____ License No. _____

COMMENTS

Extremely weathered siltstone - Fine to medium grained sandstone.

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
						FILL: Silty Clay LOAM; brown, no coarse fragments, massive, no groundwater, dry.
		BH6-0.25				**Fine Sandy CLAY**; yellow/brown, no coarse fragments, massive, no groundwater, dry.
		BH6-0.5				**Fine Sandy CLAY**; yellow, no coarse fragments, massive, no groundwater, dry.
1						**Fine Sandy CLAY**; yellow, no coarse fragments, massive, no groundwater, dry.
		BH6-1.1				End of investigation at 1.1mbgs.
2						
3						

Drilling Log

Soil Boring **BH7**

Project *Bushfire emergency response assessment* Owner *Victorian Government*

Location *33 Wallace Avenue, WR* Proj. No. *ENAUABTF11630AA*

Surface Elev. *NA* Total Hole Depth *1.4 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *55 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material _____ Rig/Core _____

Drill Co. _____ Method *Hand auger.*

Driller _____ Log By *PL, ST* Date *3/3/16* Permit # *NA*

Checked By _____ License No. _____

COMMENTS
Tree roots.
Hihgly weathered clay and siltstone.
Extremely weathered siltstone - Fine grained sandstone.

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						**Silty Clay LOAM**; brown, no coarse fragments, massive, no groundwater, dry.
		BH7-0.25				**Silty LOAM**; brown, no coarse fragments, massive, no groundwater, dry.
		BH7-0.5				**Fine Sandy CLAY/ Silty CLAY**; orange/brown/yellow, no coarse fragments, massive, no groundwater, dry.
1						**SAND**; orange/yellow, no coarse fragments, massive, no groundwater, dry.
		BH7-1.35				End of investigation at 1.35mbgs.
2						
3						

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Drilling Log

Soil Boring **BH8**

Project *Bushfire emergency response assessment* Owner *Victorian Government*

Location *3 Wallace Avenue, WR* Proj. No. *ENAUABTF11630AA*

Surface Elev. *NA* Total Hole Depth *0.9 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *55 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material _____ Rig/Core _____

Drill Co. _____ Method *Hand auger.*

Driller _____ Log By *PL, ST* Date *3/3/16* Permit # *NA*

Checked By _____ License No. _____

COMMENTS
Tree roots.
Extremely weathered siltstone - Fine grained sandstone.

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						**Silty Clay LOAM**; brown, no coarse fragments, massive, no groundwater, dry.
		BH8-0.25				**Silty LOAM**; brown/yellow, no coarse fragments, massive, no groundwater, dry.
		BH8-0.5				**SAND**; orange, no coarse fragments, massive, no groundwater, dry.
		BH8-0.9				End of investigation at 0.9mbgs.
1						
2						
3						

Drilling Log

Soil Boring **BH9**

Project *Bushfire emergency response assessment* Owner *Victorian Government*

Location *4 Durimbil Avenue, WR* Proj. No. *ENAUABTF11630AA*

Surface Elev. *NA* Total Hole Depth *2.0 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *55 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material _____ Rig/Core _____

Drill Co. _____ Method *Hand auger.*

Driller _____ Log By *PL, ST* Date *3/3/16* Permit # *NA*

Checked By _____ License No. _____

COMMENTS
Tree roots.
Highly weathered siltstone - Fine grained sandstone.

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) — Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						**Silty Clay LOAM**; brown, no coarse fragments, massive, no groundwater, dry.
		BH9-0.25				**Silty Clay LOAM**; brown/orange, no coarse fragments, massive, no groundwater, moist.
		BH9-0.5				**Silty Clay LOAM**; brown/orange/yellow, no coarse fragments, massive, no groundwater, moist.
1		BH9-1.0				**Silty Clay LOAM**; brown/orange/yellow, no coarse fragments, massive, no groundwater, moist.
						Silty Clay LOAM; brown/grey/orange, no coarse fragments, massive, no groundwater, dry.
						Silty LOAM; grey/orange, no coarse framgents, massive, no groundwater, dry.
2						End of investigation at 2.0mbgs.
3						

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Drilling Log

Soil Boring **BH10**

Project *Bushfire emergency response assessment* Owner *Victorian Government*

Location *44 Karingal Drive, WR* Proj. No. *ENAUABTF11630AA*

Surface Elev. *NA* Total Hole Depth *1.0 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *55 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material _____ Rig/Core _____

Drill Co. _____ Method *Hand auger.*

Driller _____ Log By *PL, ST* Date *3/3/16* Permit # *NA*

Checked By _____ License No. _____

COMMENTS
0.0-0.25mbgs Tree roots.
0.25-0.5mbgs Tree roots, clay and silt.
0.5-1.0mbgs Extremeley weathered fine grained sandstone minor sitl and clay.

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						**Silty Clay LOAM**; brown, no coarse fragments, massive, no groundwater, dry.
		BH10-0.25				**Silty Clay LOAM**; brown/orange, no coarse fragments, massive, no groundwater, moist.
		BH10-0.5				**SAND**; brown/yellow/grey, no coarse fragments, massive, no groundwater, dry.
1		BH10-1.0				End of investigation at 1.0mbgs.
2						
3						

Drilling Log

Soil Boring **BH11**

Project *Bushfire emergency response assessment* Owner *Victorian Government*

Location *5 Koonya Road, WR* Proj. No. *ENAUABTF11630AA*

Surface Elev. *NA* Total Hole Depth *1.0 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *55 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material _____ Rig/Core _____

Drill Co. _____ Method *Hand auger.*

Driller _____ Log By *PL, ST* Date *3/3/16* Permit # *NA*

Checked By _____ License No. _____

COMMENTS

0.5-0.75mbgs Extremeley weathered siltstone. Bore hole abandoned at 0.75mbgs.

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						**Silty Clay LOAM**; brown, no coarse fragments, massive, no groundwater, dry.
		BH11-0.25				**Silty Clay LOAM**; brown/grey/orange, no coarse fragments, massive, no groundwater, dry.
		BH11-0.5				**Silty Clay LOAM**; brown/grey/orange, no coarse fragments, massive, no groundwater, dry.
		BH11-0.75				End of investigation at 0.75mbgs.
1						
2						
3						

Drilling Log

Soil Boring **BH12**

Project *Bushfire emergency response assessment* Owner *Victorian Government*

Location *47 Karingal Drive, WR* Proj. No. *ENAUABTF11630AA*

Surface Elev. *NA* Total Hole Depth *1.4 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *55 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material _____ Rig/Core _____

Drill Co. _____ Method *Hand auger.*

Driller _____ Log By *PL, ST* Date *3/3/16* Permit # *NA*

Checked By _____ License No. _____

COMMENTS

0.0-0.25mbgs Tree roots
0.25-0.5mbgs Wet soil
0.5-0.8mbgs Clay and fine grained sand, some silt.
0.8-1.0mbgs Orange/red ferrous staining, extremely weathered, fine grained sandstone.
1.0-1.35mbgs Extremely weathered, fine grained sandstone, minor silt, orange/red ferrous straining. Hole abandoned at 1.35mbgs.

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						brown, no coarse fragments, massive, no groundwater, moist.
						Silty Clay LOAM; brown, no coarse fragments, massive, no groundwater, wet.
						Silty Clay LOAM; brown, no coarse fragments, massive, no groundwater, moist.
1						**Sandy CLAY**; orange/yellow, no coarse fragments, massive, no groundwater, dry.
						Sandy CLAY; orange/yellow, no coarse fragments, massive, no groundwater, dry.
2						**Sandy CLAY**; orange/yellow/red, no coarse fragments, massive, no groundwater, dry. End of investigation at 1.35mbgs.
3						

Drilling Log

Soil Boring **BH13**

Project *Bushfire emergency response assessment* Owner *Victorian Government*

Location *12 Karingal Drive, WR* Proj. No. *ENAUABTF11630AA*

Surface Elev. *NA* Total Hole Depth *2.0 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *55 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material _____ Rig/Core _____

Drill Co. _____ Method *Hand auger.*

Driller _____ Log By *PL, ST* Date *3/3/16* Permit # *NA*

Checked By _____ License No. _____

COMMENTS

0.5-0.6mbgs Fine grained sand, minor silt with some clay.
2.0mbgs Extremely weathered, fine grained, sandstone.

Depth (m.)	PID (ppm)	Sample ID / % Recovery / Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) — Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0					**Silty Clay LOAM**; brown, no coarse fragments, massive, no groundwater, dry.
		BH13-0.25			**Fine Sandy CLAY**; brown, no coarse fragments, massive, no groundwater, dry.
		BH13-0.5			**Fine Sandy CLAY/SAND**; yellow/orange/brown, no coarse fragments, massive, no groundwater, dry.
					SAND; yello/orange, no coarse fragments, massive, no groundwater, dry.
1		BH13-1.0			**SAND**; yello/orange, no coarse fragments, massive, no groundwater, dry.
		BH13-1.5			**SAND**; yello/orange, no coarse fragments, massive, no groundwater, dry.
2		BH13-2.0			End of investigation at 2.0mbgs.
3					

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Drilling Log

Soil Boring **BH14**

Project *Bushfire emergency response assessment* Owner *Victorian Government*

Location *9 Karingal Drive WR* Proj. No. *ENAUABTF11630AA*

Surface Elev. *NA* Total Hole Depth *0.5 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *55 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material _____ Rig/Core _____

Drill Co. _____ Method *Hand auger.*

Driller _____ Log By *PL, ST* Date *3/3/16* Permit # *NA*

Checked By _____ License No. _____

COMMENTS
0.0-.1mbgs Topsoil
0.1-0.25mbgs Extremely weathered rock, siltstone from 0.1mbgs.
0.5mbgs Extremely weathered siltstone, angular rock fragment.
Borehole abandoned at 0.5mbgs
Third attempted bore hole for propoerty.
1st BH - 0.35mTD
2nd BH: 0.2mTD

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						**TOPSOIL**
						Silty CLAY; brown, no coarse fragments, massive, no groundwater, dry.
		BH14-0.25				**Silty LOAM**; yellow/brown, no coarse fragments, massive, no groundwater, dry.
		BH14-0.5				**Silty LOAM**; yellow/brown, no coarse fragments, massive, no groundwater, dry. End of investigation at 0.25mbgs.
1						
2						
3						

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Drilling Log

Soil Boring **BH15**

Project *Bushfire emergency response assessment* Owner *Victorian Government*

Location *43 The Boulevarde WR* Proj. No. *ENAUABTF11630AA*

Surface Elev. *NA* Total Hole Depth *1.8 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *55 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material _____ Rig/Core _____

Drill Co. _____ Method *Hand auger.*

Driller _____ Log By *PL, ST* Date *3/3/16* Permit # *NA*

Checked By _____ License No. _____

COMMENTS
0.0-0.1mbgs Topsoil
0.5mbgs 50:50 clay and silt.
0.75mbgs increase in clay content.
1.2mbgs 50% clay to 25%/25% fine grained sand and silt.
1.5mbgs Extremely weathered fine grained sandstone to siltstone with some clay.
1.75mbgs Extremely weathered fine grained sandstone to siltstone. Water added to recover sample. Bore gole abandoned at 1.75mbgs.

Depth (m.)	PID (ppm)	Sample ID / % Recovery / Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) — Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0					**Silty LOAM**; brown, no coarse fragments, massive, no groundwater, dry.
		BH15-0.25			**Silty LOAM**; yellow, no coarse fragments, massive, no groundwater, dry.
					Silty CLAY; brown, no coarse fragments, massive, no groundwater, dry.
		BH15-0.5			**Silty CLAY**; brown, no coarse fragments, massive, no groundwater, dry.
1		BH15-1.0			**Silty CLAY**; blue/orange/brown, no coarse fragments, massive, no groundwater, dry.
					Fine Sandy CLAY/ Silty CLAY; orange/brown, no coarse fragments, massive, no groundwater, dry.
					Fine Sandy CLAY; orange/brown, no coarse fragments, massive, no groundwater, dry.
		BH15-1.5			**Fine Sandy CLAY/ Silty CLAY**; yellow/orange, no coarse fragments, massive, no groundwater, dry.
		BH15-1.75			**Fine Sandy CLAY/ Silty CLAY**; yellow/orange, no coarse fragments, massive, no groundwater, dry. End of investigation at 1.75mbgs.
2					
3					

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Drilling Log

Soil Boring **BH16**

Project *Bushfire emergency response assessment* Owner *Victorian Government*

Location *4 Iluka Avenue, WR* Proj. No. *ENAUABTF11630AA*

Surface Elev. *NA* Total Hole Depth *1.0 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *55 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material _____ Rig/Core _____

Drill Co. _____ Method *Hand auger.*

Driller _____ Log By *PL, ST* Date *3/3/16* Permit # *NA*

Checked By _____ License No. _____

COMMENTS

0.75mbgs Extremely weatherered siltstone, siltstone fragments up to 20mm in size. 1.0mbgs Extremely weathered siltstone. Added water to recover sample. Siltstone fragments up to 20mm in size. BH16 abandoned at 1.0mbgs.

Depth (m.)	PID (ppm)	Sample ID / % Recovery / Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) — Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0					**Silty CLAY**; yellow/brown, no coarse fragments, massive, no groundwater, dry.
		BH16-0.25			**Silty LOAM**; yellow/grey/brown, no coarse fragments, massive, no groundwater, dry.
		BH16-0.5			**Silty LOAM**; yellow/grey, with coarse fragments, fragments size 10-20mm, massive, no groundwater, dry.
					Silty LOAM; yellow/grey, with coarse fragments, fragments size 20mm, massive, no groundwater, dry.
1		BH16-1.0			End of investigation at 1.0mbgs.
2					
3					

Drilling Log

Soil Boring **BH17**

Project *Bushfire emergency response assessment* Owner *Victorian Government*

Location *25 Harrington Street SC* Proj. No. *ENAUABTF11630AA*

Surface Elev. *NA* Total Hole Depth *0.9 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *55 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material _____ Rig/Core _____

Drill Co. _____ Method *Hand auger.*

Driller _____ Log By *PL, ST* Date *3/3/16* Permit # *NA*

Checked By _____ License No. _____

COMMENTS

0.75mbgs Extremely weatherered, fine grained sandstone.
0.9mbgs Fine grained sandstone, fragments of fine grained sandstone up to 20mm in size. Borehole abandoned at 0.9mbgs.

Depth (m.)	PID (ppm)	Sample ID / % Recovery / Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) — Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0					**Silty CLAY**; brown, no coarse fragments, massive, no groundwater, dry.
		BH17-0.25			**Silty CLAY**; brown/orange, no coarse fragments, massive, no groundwater, dry.
		BH17-0.5			**SAND**; grey/yellow, no coarse fragments, massive, no groundwater, dry.
					SAND; yellow/grey, no coarse fragments, massive, no groundwater, dry.
		BH17-0.9			End of investigation at 0.9mbgs.
1					
2					
3					

Drilling Log

Soil Boring **BH18**

Project *Bushfire emergency response assessment* Owner *Victorian Government*

Location *11 Mitchell Grove SC* Proj. No. *ENAUABTF11630AA*

Surface Elev. *NA* Total Hole Depth *2.0 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *55 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material _____ Rig/Core _____

Drill Co. _____ Method *Hand auger.*

Driller _____ Log By *PL, ST* Date *3/3/16* Permit # *NA*

Checked By _____ License No. _____

COMMENTS
0.0-0.1mbgs Topsoil.
1.2mbgs Increase in silt content.
1.5mbgs Extremely weatherered siltstone.
2.0mbgs Extremely weatherered siltstone.

Depth (m.)	PID (ppm)	Sample ID / % Recovery / Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) — Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0					**TOPSOIL**
					Silty CLAY; brown, no coarse fragments, massive, no groundwater, dry.
		BH18-0.25			**Silty LOAM**; brown, no coarse fragments, massive, no groundwater, dry.
		BH18-0.5			**Silty CLAY**; brown/orange, no coarse fragments, massive, no groundwater, moist.
					Silty CLAY; brown/orange, no coarse fragments, massive, no groundwater, moist.
1		BH18-1.0			**Silty CLAY**; orange/brown, no coarse fragments, massive, no groundwater, moist.
					Silty CLAY; orange/grey/brown, no coarse fragments, massive, no groundwater, moist.
		BH18-1.5			**Silty LOAM**; yellow/grey/orange, no coarse fragments, massive, no groundwater, moist.
2		BH18-2.0			**Silty LOAM**; yellow/grey/orange, no coarse fragments, massive, no groundwater, moist. End of investigation at 2.0mbgs.
3					

Drilling Log

Soil Boring **BH19**

Project *Bushfire emergency response assessment* Owner *Victorian Government*

Location *2 Bass Avenue SC* Proj. No. *ENAUABTF11630AA*

Surface Elev. *NA* Total Hole Depth *1.8 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *55 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material _____ Rig/Core _____

Drill Co. _____ Method *Hand auger.*

Driller _____ Log By *PL, ST* Date *3/3/16* Permit # *NA*

Checked By _____ License No. _____

COMMENTS

1.0mbgs Dark brown clay with other clay.
1.4mbgs Extremely weathered, fine grained sandstone and mudstone fragments.
1.5mbgs Fine grained sandstone and mudstone fragments.
1.8mbgs. Extremely weathered, fine grained sandstone, some mudstone fragments. Bore hole abandoned at 1.8mbgs.

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) — Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						grey, no coarse framgments, massive, no groundwater, dry.
		BH19-0.25				**Medium CLAY**; grey, no coarse framgments, massive, no groundwater, dry.
		BH19-0.5				**Medium CLAY**; grey/orange, no coarse framgments, massive, no groundwater, dry.
1		BH19-1.0				**Medium CLAY**
						Medium CLAY; darl brown/grey/orange, no coarse framgments, massive, no groundwater, moist.
						Fine Sandy Clay/ Silty CLAY
		BH19-1.5				**SAND**; orange/grey/yellow, no coarse grained fragments, massive, no groundwater, dry.
						SAND/ Medium CLAY; orange/grey, no coarse fragments, massive, no groundwater, dry.
		BH19-1.8				**SAND**; orange/grey/dark grey, no coarse grained fragments, massive, no groundwater, dry. End of investigation at 1.8mbgs.
2						
3						

Drilling Log

Soil Boring **BH20**

Project *Bushfire emergency response assessment* Owner *Victorian Government*

Location *16 Bass Avenue SC* Proj. No. *ENAUABTF11630AA*

Surface Elev. *NA* Total Hole Depth *0.7 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *55 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material _____ Rig/Core _____

Drill Co. _____ Method *Hand auger.*

Driller _____ Log By *PL, ST* Date *7/3/16* Permit # *NA*

Checked By _____ License No. _____

COMMENTS

0.4mbgs Fine grained sandstone.
0.5mbgs Fine grained sandstone fragments up to 20mm in size.
0.65mbgs Fine sandstone fragments up to 20mm in size.
Water added to recover sample.
Bore hole abandoned at 0.65mbgs.
1st attempted bore: 0.5mbgs.
2nd attempted bore: 0.25mbgs.

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) — Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						**Fine Sandy CLAY**; brown, no coarse fragments, massive, no groundwater, dry.
		BH20-0.25				**SAND**; yellow, no coarse fragments, massive, no groundwater, dry.
		BH20-0.5				**SAND**; yellow, with coarse fragments, fragments size 20mm, massive, no groundwater, dry.
						SAND; yellow, with coarse fragments, fragments size 20mm, massive, no groundwater, dry.
						End of investigation at 0.65mbgs.
1						
2						
3						

Appendix C – Laboratory soil reports

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ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM1602571**	Page	: 1 of 6
Client	: **COFFEY ENVIRONMENTS PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MR BEN PETRIDES	Contact	: Bronwyn Sheen
Address	: LEVEL 1, 436 JOHNSTON STREET ABBOTSFORD VIC, AUSTRALIA 3067	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: ben.petrides@coffey.com	E-mail	: bronwyn.sheen@alsglobal.com
Telephone	: +61 03 9290 7000	Telephone	: +61-3-8549 9636
Facsimile	: ----	Facsimile	: +61-3-8549 9601
Project	: ENAUABTF11630AA	QC Level	: NEPM 2013 B3 & ALS QC Standard
Order number	: ----	Date Samples Received	: 10-Mar-2016 16:01
C-O-C number	: ENAUABTF11630AA-001	Date Analysis Commenced	: 11-Mar-2016
Sampler	: ----	Issue Date	: 16-Mar-2016 14:52
Site	: ----		
		No. of samples received	: 73
Quote number	: ----	No. of samples analysed	: 20

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris		Brisbane Acid Sulphate Soils, Stafford, QLD
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.

- EA058 Emerson: V. = Very, D. = Dark, L. = Light, VD. = Very Dark
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH1/0.5	BH2/0.5	BH3/0.5	BH4/0.5	BH5/0.5
			Client sampling date / time	[03-Mar-2016]	[04-Mar-2016]	[04-Mar-2016]	[04-Mar-2016]	[04-Mar-2016]
Compound	CAS Number	LOR	Unit	EM1602571-002	EM1602571-007	EM1602571-011	EM1602571-014	EM1602571-017
				Result	Result	Result	Result	Result
EA058: Emerson Aggregate Test								
Color (Munsell)	----	-	-	Grayish Brown	Black	Light Yellowish Brown	Pale Brown	Brown
Texture	----	-	-	Clay Loam	Sandy Loam	Sandy Loam	Clay Loam	Clay Loam
Emerson Class Number	EC/TC	-	-	3	3	3	3	3
ED007: Exchangeable Cations								
Exchangeable Sodium Percent	----	0.1	%	6.4	9.7	8.3	5.6	14.8
ED008: Exchangeable Cations								
Exchangeable Sodium Percent	----	0.1	%	----	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH6/0.5	BH8/0.5	BH7/0.5	BH9/0.5	BH10/0.5
			Client sampling date / time	[04-Mar-2016]	[05-Mar-2016]	[05-Mar-2016]	[05-Mar-2016]	[05-Mar-2016]
Compound	CAS Number	LOR	Unit	EM1602571-020	EM1602571-023	EM1602571-026	EM1602571-029	EM1602571-034
				Result	Result	Result	Result	Result
EA058: Emerson Aggregate Test								
Color (Munsell)	----	-	-	Grayish Brown	Yellowish Brown	Dark Grayish Brown	Dark Grayish Brown	Brown
Texture	----	-	-	Clay Loam	Sandy Loam	Clay Loam	Silty Clay	Silty Clay
Emerson Class Number	EC/TC	-	-	4	3	3	3	3
ED007: Exchangeable Cations								
Exchangeable Sodium Percent	----	0.1	%	----	12.2	14.2	17.4	----
ED008: Exchangeable Cations								
Exchangeable Sodium Percent	----	0.1	%	2.9	----	----	----	16.9

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH11/0.5	BH12/0.5	BH13/0.5	BH14/0.5	BH16/0.5
			Client sampling date / time	[05-Mar-2016]	[05-Mar-2016]	[05-Mar-2016]	[07-Mar-2016]	[07-Mar-2016]
Compound	CAS Number	LOR	Unit	EM1602571-037	EM1602571-040	EM1602571-044	EM1602571-049	EM1602571-051
				Result	Result	Result	Result	Result
EA058: Emerson Aggregate Test								
Color (Munsell)	----	-	-	Dark Grayish Brown	Dark Grayish Brown	Brown	Light Yellowish Brown	Light Yellowish Brown
Texture	----	-	-	Clay Loam	Clay Loam	Sandy Loam	Clay Loam	Sandy Loam
Emerson Class Number	EC/TC	-	-	3	3	3	3	2
ED007: Exchangeable Cations								
Exchangeable Sodium Percent	----	0.1	%	11.4	20.8	21.5	7.0	10.6
ED008: Exchangeable Cations								
Exchangeable Sodium Percent	----	0.1	%	----	----	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	BH15/0.5	BH18/0.5	BH19/0.5	BH20/0.5	BH17/0.5
			Client sampling date / time	[07-Mar-2016]	[07-Mar-2016]	[07-Mar-2016]	[07-Mar-2016]	[07-Mar-2016]
Compound	CAS Number	LOR	Unit	EM1602571-054	EM1602571-059	EM1602571-064	EM1602571-069	EM1602571-071
				Result	Result	Result	Result	Result
EA058: Emerson Aggregate Test								
Color (Munsell)	----	-	-	Black	Very Dark Grayish Brown	Grayish Brown	Pale Brown	Yellowish Brown
Texture	----	-	-	Clay Loam	Clay Loam	Clay Loam	Sandy Loam	Clay Loam
Emerson Class Number	EC/TC	-	-	3	3	3	3	3
ED007: Exchangeable Cations								
Exchangeable Sodium Percent	----	0.1	%	7.8	11.7	11.9	13.8	10.6
ED008: Exchangeable Cations								
Exchangeable Sodium Percent	----	0.1	%	----	----	----	----	----

Appendix D – Design loading rates

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Study Area	Site Address	Site Area[a]	Available Area for Dispersal[b]	Design Irrigation / Loading Rates[c] (mm/day)			Design Dispersal Area (m^2) by dwelling size (number of bedrooms) [d]								
							Primary Treated Effluent			Secondary Treated Effluent			Sub-surface and Surface Irrigation		
		(m^2)	(m^2)	Primary Treated Effluent (maximum)	Secondary Treated Effluent	Sub-surface and Surface Irrigation	1 - 3 bedrooms	4 bedrooms	5 bedrooms	1 - 3 bedrooms	4 bedrooms	5 bedrooms	1 - 3 bedrooms	4 bedrooms	5 bedrooms
Separation Creek	8 Olive Street	737	237	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	2 Olive Street	4053	3553	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	10 Olive Street	736	236	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	12 Olive Street	614	114	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	14 Olive Street	1133	633	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	16 Olive Street	745	245	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	25 Harrington Street	728	228	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	2 Bass Avenue	852	352	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	14 Bass Avenue	837	337	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	16 Bass Avenue	836	336	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	18 Bass Avenue	1507	1007	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	10 Mitchell Grove	680	180	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	11 Mitchell Grove	963	463	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	12 Mitchell Grove	593	93	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	13 Mitchell Grove	631	131	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	14 Mitchell Grove	829	329	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	16 Mitchell Grove	945	445	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	21 Mitchell Grove	725	225	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	1-5 Bass Avenue	973	473	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	7 Bass Avenue	837	337	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	9 Bass Avenue	837	337	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	8 Bass Avenue	837	337	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	10 Bass Avenue	837	337	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	11 Bass Avenue	939	439	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	12 Bass Avenue	837	337	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	3 Mitchell Grove	515	15	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	5 Mitchell Grove	656	156	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	9 Mitchell Grove	786	286	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	17 Mitchell Grove	567	67	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	15 Mitchell Grove	755	255	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	23 Mitchell Grove	4054	3554	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	30 Harrington Street	500	0	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	9 Harrington Street	1071	571	5	10	3	120	150	180	60	75	90	200	250	300
Separation Creek	2 Sarsfield Street	641	141	5	10	3	120	150	180	60	75	90	200	250	300
Wye River	16 Dunoon Road	1189	689	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	4 Durimbil Avenue	834	334	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	6 Durimbil Avenue	570	70	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	7 Durimbil Avenue	1041	541	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	12 Durimbil Avenue	978	478	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	2 Koonya Avenue	1013	513	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	5 Koonya Avenue	1223	723	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	7 Koonya Avenue	943	443	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	9 Koonya Avenue	815	315	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	44 Karingal Drive	824	324	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	46 Karingal Drive	900	400	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	47 Karingal Drive	1705	1205	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	51-53 Karingal Drive	770	270	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	7 Karingal Drive	2034	1534	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	8 Karingal Drive	936	436	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	9 Karingal Drive	1870	1370	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	13 Karingal Drive	1149	649	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	26 Karingal Drive	1688	1188	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	24 Karingal Drive	2239	1739	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	18 Karingal Drive	1633	1133	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	12 Karingal Drive	1615	1115	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	14 Karingal Drive	1742	1242	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	17 Karingal Drive	771	271	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	19 Karingal Drive	767	267	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	1 Coryule Avenue	658	158	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	2-3 Coryule Avenue	808	308	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	25 Karingal Drive	678	178	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	23 Karingal Drive	892	392	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	2 Karingal Drive	1313	813	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	29 Karingal Drive	842	342	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	31 Karingal Drive	859	359	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	33 Wallace Street	682	182	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	33 Karingal Drive	810	310	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	35 Karingal Drive	1278	778	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	37 Karingal Drive	1179	679	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	39-41 Karingal Drive	810	310	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	45 Karingal Drive	729	229	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	30 Karingal Drive	1505	1005	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	34 Karingal Drive	948	448	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	36 Karingal Drive	977	477	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	38 Karingal Drive	792	292	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	40 Karingal Drive	679	179	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	48 Karingal Drive	656	156	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	50 Karingal Drive	659	159	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	52 Karingal Drive	820	320	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	55 Karingal Drive	713	213	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	57 Karingal Drive	706	206	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	59 Karingal Drive	961	461	15	30	4	40	50	60	20	25	30	150	188	225

APPENDIX D
TABLE D1: DESIGN LOADING RATES
ENAUABTF11630AA

Study Area	Site Address	Site Area[a]	Available Area for Dispersal[b]	Design Irrigation / Loading Rates[c] (mm/day)			Design Dispersal Area (m^2) by dwelling size (number of bedrooms) [d]								
							Primary Treated Effluent			Secondary Treated Effluent			Sub-surface and Surface Irrigation		
		(m^2)	(m^2)	Primary Treated Effluent (maximum)	Secondary Treated Effluent	Sub-surface and Surface Irrigation	1 - 3 bedrooms	4 bedrooms	5 bedrooms	1 - 3 bedrooms	4 bedrooms	5 bedrooms	1 - 3 bedrooms	4 bedrooms	5 bedrooms
Wye River	61 Karingal Drive	729	229	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	10 Durimbil Avenue	907	407	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	1 Durimbil Avenue	841	341	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	5 Durimbil Avenue	845	345	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	14 Durimbil Avenue	1172	672	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	16 Durimbil Avenue	977	477	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	18 Durimbil Avenue	1330	830	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	20 Durimbil Avenue	1155	655	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	23 Durimbil Avenue	657	157	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	24 Durimbil Avenue	717	217	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	25 Durimbil Avenue	656	156	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	26 Durimbil Avenue	648	148	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	27 Durimbil Avenue	806	306	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	28 Durimbil Avenue	1246	746	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	9 Durimbil Avenue	734	234	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	3 Durimbil Avenue	662	162	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	1 Iluka Avenue	1151	651	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	44 Riverside Drive	813	313	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	42 Riverside Drive	756	256	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	21 Iluka Avenue	641	141	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	23 Iluka Avenue	677	177	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	24 Iluka Avenue	677	177	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	25 Iluka Avenue	677	177	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	19 Iluka Avenue	621	121	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	20 Iluka Avenue	641	141	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	3 Iluka Avenue	630	130	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	5 Iluka Avenue	631	131	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	7 Iluka Avenue	631	131	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	8 Iluka Avenue	673	173	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	24 Riverside Drive	981	481	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	31 Riverside Drive	784	284	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	36 Riverside Drive	775	275	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	6 The Boulevarde	725	225	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	1 Koonya Avenue	1808	1308	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	5 Wallace Street	659	159	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	37 Riverside Drive	916	416	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	2 Illowra Avenue	674	174	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	3 Illowra Avenue	777	277	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	13 Koonya Avenue	659	159	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	15 Koonya Avenue	579	79	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	17 Koonya Avenue	680	180	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	28 The Boulevarde	1149	649	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	33 The Boulevarde	890	390	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	35 The Boulevarde	824	324	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	36 The Boulevarde	729	229	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	43 Riverside Drive	1115	615	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	4 Iluka Avenue	615	115	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	10-12 Iluka Avenue	649	149	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	13 Iluka Avenue	672	172	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	14 Iluka Avenue	671	171	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	15 Iluka Avenue	671	171	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	16 Iluka Avenue	671	171	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	17 Iluka Avenue	671	171	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	10 Dunoon Road	1366	866	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	9 Dunoon Road	1029	529	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	11 Dunoon Road	885	385	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	13 Dunoon Road	747	247	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	14 Dunoon Road	723	223	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	2 Dunoon Road	728	228	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	15 Dunoon Road	1278	778	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	17 Dunoon Road	971	471	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	19 Dunoon Road	1261	761	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	20 Dunoon Road	1066	566	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	7-8 Dunoon Road	646	146	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	5 Dunoon Road	727	227	15	30	4	40	50	60	20	25	30	150	188	225
Wye River	1 Dunoon Road	729	229	15	30	4	40	50	60	20	25	30	150	188	225

a - From lot survey cadastre
b - Assumes 500 m^2 development footprint
c - Refer to AS/NZS 1547:2012
d - Assumes water volume of 150 L/person/day

Appendix E – Land risk assessment

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APPENDIX E
TABLE E1: LAND RISK ASSESSMENT
ENAUABTF11630AA

Study Area	Site Address	Site Features 1 - High Capability 2 - Moderate Capability 3 - Low Capability					Site Score (un-weighted)	Overall Rating (weighted)	Land Capability Class Rating	Constraint Rating
		Site Available Area	Surface Water Protection	Topography and Site Drainage	Flood / Inundation Hazard	Soil Suitability				
		Weighting - 40	Weighting - 10	Weighting - 25	Weighting - 5	Weighting - 20				
Separation Creek	8 Olive Street	3	1	3	1	3	11	2.7	Low	Highly constrained
Separation Creek	2 Olive Street	1	1	3	1	3	9	1.9	Medium	Moderately constrained
Separation Creek	10 Olive Street	3	1	3	1	3	11	2.7	Low	Highly constrained
Separation Creek	12 Olive Street	3	1	3	1	3	11	2.7	Low	Highly constrained
Separation Creek	14 Olive Street	3	1	3	1	3	11	2.7	Low	Highly constrained
Separation Creek	16 Olive Street	3	1	3	1	3	11	2.7	Low	Highly constrained
Separation Creek	25 Harrington Street	3	1	3	1	3	11	2.7	Low	Highly constrained
Separation Creek	2 Bass Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Separation Creek	14 Bass Avenue	3	2	3	1	3	12	2.8	Very low	Very highly constrained
Separation Creek	16 Bass Avenue	3	3	3	1	3	13	2.9	Very low	Very highly constrained
Separation Creek	18 Bass Avenue	2	3	3	1	3	12	2.5	Low	Highly constrained
Separation Creek	10 Mitchell Grove	3	1	3	1	3	11	2.7	Low	Highly constrained
Separation Creek	11 Mitchell Grove	3	1	3	1	3	11	2.7	Low	Highly constrained
Separation Creek	12 Mitchell Grove	3	1	3	1	3	11	2.7	Low	Highly constrained
Separation Creek	13 Mitchell Grove	3	1	3	1	3	11	2.7	Low	Highly constrained
Separation Creek	14 Mitchell Grove	3	1	3	1	3	11	2.7	Low	Highly constrained
Separation Creek	16 Mitchell Grove	3	1	3	1	3	11	2.7	Low	Highly constrained
Separation Creek	19 Mitchell Grove	3	1	3	1	3	11	2.7	Low	Highly constrained
Separation Creek	21 Mitchell Grove	3	1	3	1	3	11	2.7	Low	Highly constrained
Separation Creek	1-5 Bass Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Separation Creek	7 Bass Avenue	3	2	3	1	3	12	2.8	Very low	Very highly constrained
Separation Creek	9 Bass Avenue	3	2	3	1	3	12	2.8	Very low	Very highly constrained
Separation Creek	8 Bass Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Separation Creek	10 Bass Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Separation Creek	11 Bass Avenue	3	3	3	1	3	13	2.9	Very low	Very highly constrained
Separation Creek	12 Bass Avenue	3	2	3	1	3	12	2.8	Very low	Very highly constrained
Separation Creek	3 Mitchell Grove	3	1	3	1	3	11	2.7	Low	Highly constrained
Separation Creek	5 Mitchell Grove	3	1	3	1	3	11	2.7	Low	Highly constrained
Separation Creek	9 Mitchell Grove	3	1	3	1	3	11	2.7	Low	Highly constrained
Separation Creek	17 Mitchell Grove	3	1	3	1	3	11	2.7	Low	Highly constrained
Separation Creek	15 Mitchell Grove	3	1	3	1	3	11	2.7	Low	Highly constrained
Separation Creek	23 Mitchell Grove	1	1	3	1	3	9	1.9	Medium	Moderately constrained
Separation Creek	30 Harrington Street	3	1	3	1	3	11	2.7	Low	Highly constrained
Separation Creek	9 Harrington Street	3	3	3	1	3	13	2.9	Very low	Very highly constrained
Separation Creek	2 Sarsfield Street	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	16 Dunoon Road	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	4 Durimbil Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	6 Durimbil Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	7 Durimbil Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	12 Durimbil Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	2 Koonya Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	5 Koonya Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	7 Koonya Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	9 Koonya Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	44 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	46 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	47 Karingal Drive	2	1	3	1	3	10	2.3	Medium	Moderately constrained
Wye River	51-53 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	7 Karingal Drive	2	1	3	1	3	10	2.3	Medium	Moderately constrained
Wye River	8 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	9 Karingal Drive	2	1	3	1	3	10	2.3	Medium	Moderately constrained
Wye River	13 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	26 Karingal Drive	2	1	3	1	3	10	2.3	Medium	Moderately constrained
Wye River	24 Karingal Drive	2	1	3	1	3	10	2.3	Medium	Moderately constrained
Wye River	18 Karingal Drive	2	1	3	1	3	10	2.3	Medium	Moderately constrained
Wye River	12 Karingal Drive	2	1	3	1	3	10	2.3	Medium	Moderately constrained
Wye River	14 Karingal Drive	2	1	3	1	3	10	2.3	Medium	Moderately constrained
Wye River	17 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	19 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	1 Coryule Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained

APPENDIX E
TABLE E1: LAND RISK ASSESSMENT
ENAUABTF11630AA

Study Area	Site Address	Site Features 1 - High Capability 2 - Moderate Capability 3 - Low Capability					Site Score (un-weighted)	Overall Rating (weighted)	Land Capability Class Rating	Constraint Rating
		Site Available Area	Surface Water Protection	Topography and Site Drainage	Flood / Inundation Hazard	Soil Suitability				
		Weighting - 40	Weighting - 10	Weighting - 25	Weighting - 5	Weighting - 20				
Wye River	2-3 Coryule Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	25 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	23 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	2 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	29 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	31 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	33 Wallace Street	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	33 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	35 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	37 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	39-41 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	45 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	30 Karingal Drive	2	1	3	1	3	10	2.3	Medium	Moderately constrained
Wye River	34 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	36 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	38 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	40 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	48 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	50 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	52 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	55 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	57 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	59 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	61 Karingal Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	10 Durimbil Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	1 Durimbil Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	5 Durimbil Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	14 Durimbil Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	16 Durimbil Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	18 Durimbil Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	20 Durimbil Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	23 Durimbil Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	24 Durimbil Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	25 Durimbil Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	26 Durimbil Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	27 Durimbil Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	28 Durimbil Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	9 Durimbil Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	3 Durimbil Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	1 Iluka Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	44 Riverside Drive	3	3	3	1	3	13	2.9	Very low	Very highly constrained
Wye River	42 Riverside Drive	3	3	3	1	3	13	2.9	Very low	Very highly constrained
Wye River	21 Iluka Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	23 Iluka Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	24 Iluka Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	25 Iluka Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	19 Iluka Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	20 Iluka Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	3 Iluka Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	5 Iluka Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	7 Iluka Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	8 Iluka Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	24 Riverside Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	31 Riverside Drive	3	3	3	1	3	13	2.9	Very low	Very highly constrained
Wye River	36 Riverside Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	6 The Boulevarde	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	1 Koonya Avenue	2	1	3	1	3	10	2.3	Medium	Moderately constrained
Wye River	5 Wallace Street	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	37 Riverside Drive	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	2 Illowra Avenue	3	2	3	1	3	12	2.8	Very low	Very highly constrained

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TABLE E1: LAND RISK ASSESSMENT
ENAUABTF11630AA

Study Area	Site Address	Site Features 1 - High Capability 2 - Moderate Capability 3 - Low Capability					Site Score (un-weighted)	Overall Rating (weighted)	Land Capability Class Rating	Constraint Rating
		Site Available Area	Surface Water Protection	Topography and Site Drainage	Flood / Inundation Hazard	Soil Suitability				
		Weighting - 40	Weighting - 10	Weighting - 25	Weighting - 5	Weighting - 20				
Wye River	3 Illowra Avenue	3	2	3	1	3	12	2.8	Very low	Very highly constrained
Wye River	13 Koonya Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	15 Koonya Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	17 Koonya Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	28 The Boulevarde	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	33 The Boulevarde	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	35 The Boulevarde	3	2	3	1	3	12	2.8	Very low	Very highly constrained
Wye River	36 The Boulevarde	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	43 Riverside Drive	3	3	3	1	3	13	2.9	Very low	Very highly constrained
Wye River	4 Iluka Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	9 Iluka Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	10-12 Iluka Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	13 Iluka Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	14 Iluka Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	15 Iluka Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	16 Iluka Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	17 Iluka Avenue	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	10 Dunoon Road	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	9 Dunoon Road	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	11 Dunoon Road	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	13 Dunoon Road	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	14 Dunoon Road	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	2 Dunoon Road	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	15 Dunoon Road	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	17 Dunoon Road	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	19 Dunoon Road	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	20 Dunoon Road	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	7-8 Dunoon Road	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	5 Dunoon Road	3	1	3	1	3	11	2.7	Low	Highly constrained
Wye River	1 Dunoon Road	3	1	3	1	3	11	2.7	Low	Highly constrained