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Bushfire Strategic Study: Cleveland Road

Newquest Property Pty Ltd

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Template 2.8.1

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1. Introduction

1.1 Background

This report was commissioned by Newquest Property Pty Ltd to investigate the bushfire protection requirements associated with the potential residential subdivision of Lot A, DP 156446, Lot 1 DP 194419, Lot 1 DP 1126171, Lot 1 DP 741423 (South) and Lot 1 DP 730326, Lot 2 DP 730326, Lot 59 DP 1125379, Lot 1 DP 156208, Lot 1 DP 532391, Lot 401 & 402 DP 1254873, Lot 200 and Lot 201 DP 803810, Lot 310, 312 and 313 of DP1188000, Lot 100 DP 1086479, Lot 1 DP 999485 (North) Road, Dapto (hereafter known as the 'subject land') located as shown in **Figure 1**. This report presents a due diligence assessment of a preliminary proposal to subdivide the subject land for residential allotments and is suitable for the purpose for which it was commissioned.

The subject land is identified as bush fire prone land by Wollongong City Council (Council) Bush Fire Prone Land (BFPL) Map. The subject land is affected by both Category 1 and Vegetation Buffer (RFS 2015) as shown in **Figure 2**.

Planning for Bush Fire Protection (PBP) (RFS, 2019) outlines broad principles and assessment considerations for strategic planning. It also specifies that bushfire protection measures need to be considered at the strategic planning stage to provide an opportunity to assess the suitability of future land uses within the broader bush fire hazard setting to ensure that future land use can meet the objectives of PBP. As such, this study addresses the minimum requirements for a strategic study, as listed in Table 4.2.1 of PBP 2019, with additional information provided where necessary and summarised in **Table 1** below. This study has been prepared to inform and assist with the preparation of the rezoning proposal for the subject land.

Table 1 – Summary of requirements for a strategic bush fire study (PBP 2019).

Issue	Detail
Bush fire landscape assessment	A bush fire landscape assessment considers the likelihood of a bush fire, its potential severity and intensity and the potential impact on life and property in the context of the broader surrounding landscape.
Land use assessment	The land use assessment will identify the most appropriate locations within the masterplan area or site layout for the proposed uses.
Access and egress	A study of the existing and proposed road networks both within and external to the masterplan area and site layout.
Emergency services	An assessment of the future impact of the new development on emergency services provision.
Infrastructure	An assessment of the issues associated with infrastructure provision.
Adjoining land	The impact of new development on adjoining landowners and their ability to undertake bush fire management.

Section 4.46 (formerly 91A) *Environmental Planning and Assessment Act 1979* requires a bushfire assessment of residential subdivision proposals on bush fire prone land, following the process and methodology set out within Section 100B of the *Rural Fires Act 1997*, Clause 44 of the *Rural Fires Regulation 2013* and PBP.

This assessment lists the minimum and recommended bushfire requirements required for the proposed subdivision to achieve compliance with the above legislation and policy.

1.2 Location and description of the subject land

The subject land consists of eighteen land parcels on the northern, north eastern and southern side of Cleveland Road.

The subject land is currently zoned E2 (Environmental Conservation) and RU2 (Rural Landscape) under the Wollongong Local Environment Plan (LEP) (West Dapto) 2009 (Wollongong City Council 2009).

The area of the subject land is approximately 366ha with frontage to Cleveland Road on the south and Fowlers Road on the east. The allotments are currently covered in exotic pastures with areas of forest vegetation along the northern boundaries and drain lines to the south and south-west of the site. The surrounding development consists of rural holdings to the south and west, and established residential development to the north and east (**Figure 1**).

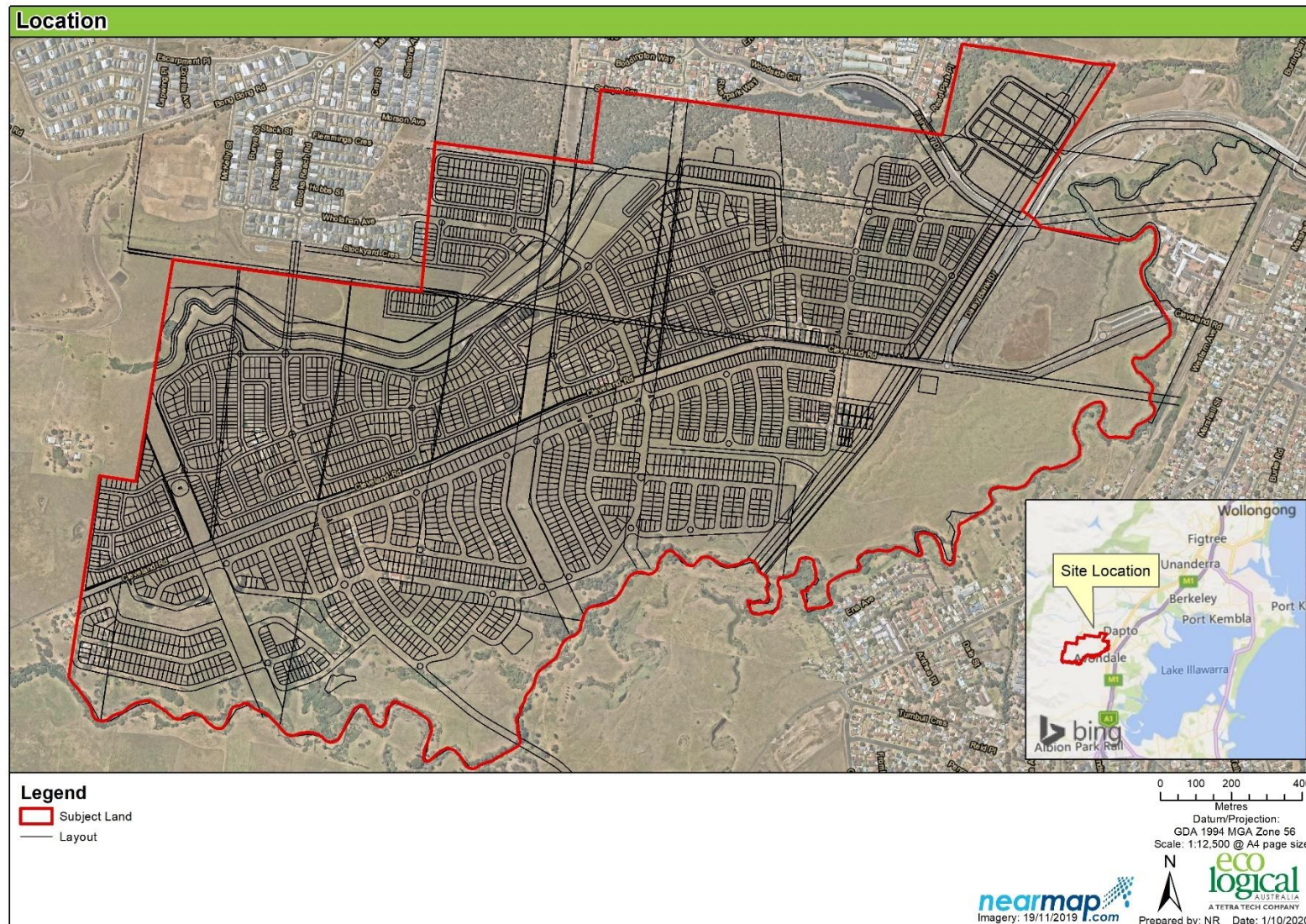


Figure 1: Location of subject land

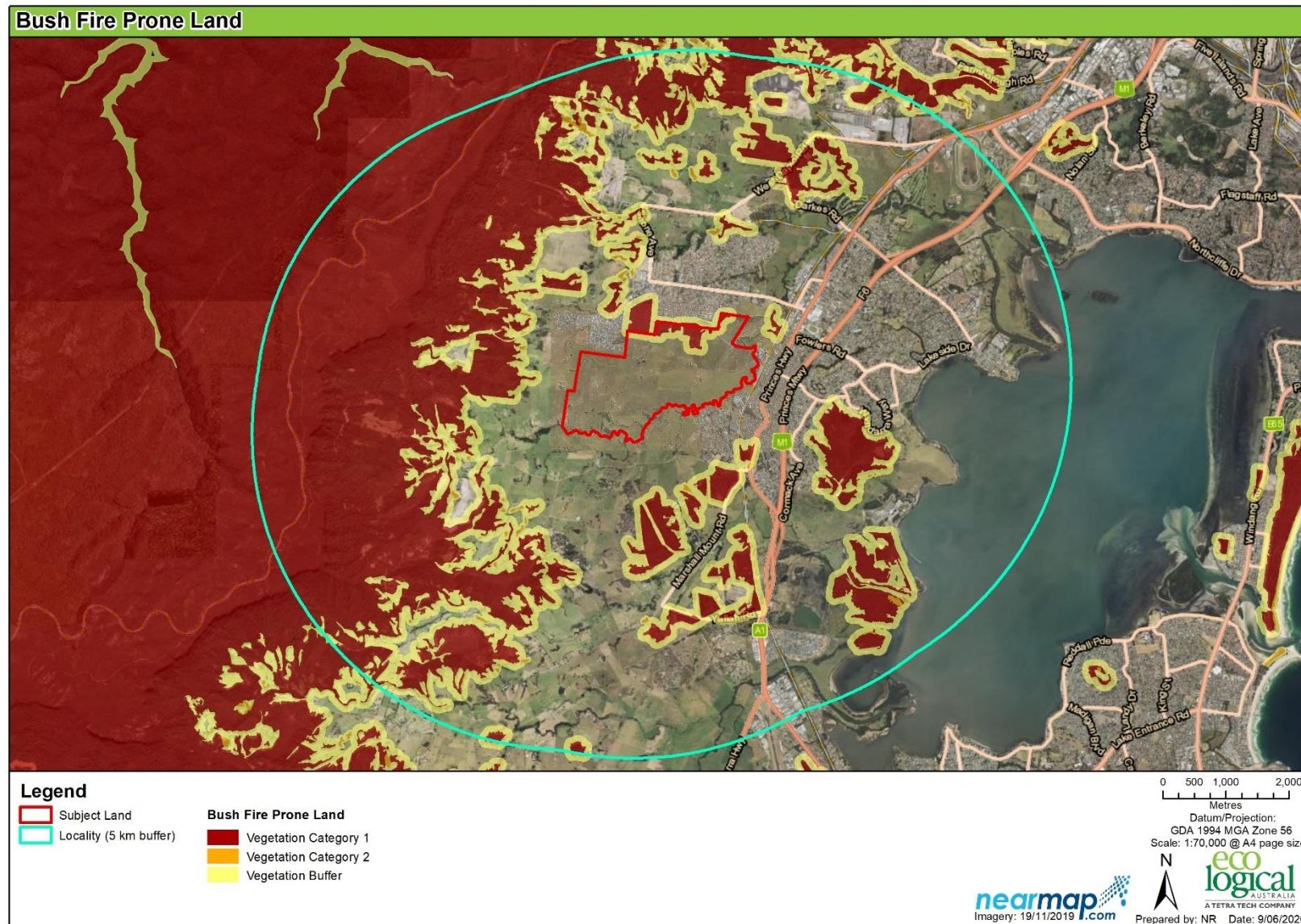


Figure 2: Extract from Wollongong City Council Bush Fire Prone Land Map

1.3 Preliminary Concept

The preliminary concept is to seek approval for rezoning to allow for residential development in accordance with LEP 2009 provisions.

The bushfire protection requirements for the development vary dependent upon the classification of the development under bushfire related policy and legislation. The following provides high level advice of how this development could be considered by Council and the NSW Rural Fire Service (RFS) for the different proposed uses.

Note that schools, childcare centres, tourist accommodation, retirement villages or any other development that is classified as Special Fire Protection Purpose (SFPP) development under PBP require significantly larger Asset Protection Zones (APZs) than those specified for residential development. These types of developments should consider this additional constraint. SFPP developments also have more stringent requirements for internal access roads which would also need to be considered should this type of development be proposed within the subject land

This advice is based on PBP, refer to **Section 2** of this report for further details.

1.3.1 Residential Development

For residential / rural-residential subdivision development, RFS approval is required under Section 100B of the *Rural Fires Act 1997*. Approval at the Development Assessment stage is based on compliance against a number of areas meeting either acceptable or performance-based solutions as identified in PBP.

Assessment of bushfire protection measures include APZ, construction standards, water supply, access, utilities, emergency management and environmental issues.

Multi-storey residential development (buildings exceeding three storeys in height) have additional specific issues and technical considerations in the context of PBP. This includes population (capacity), location of the building, egress and increased demand on road infrastructure, building construction (e.g. façade, balconies), car parking, height of the building, implications of collapse, floor to floor fire spread, and access for firefighters. Further assessment will be required for multi-story residential development.

1.3.2 Special Fire Protection Purpose Development (SFPP)

RFS approval is required under Section 100B of the Rural Fires Act for SFPP developments. The specific development types which are considered as SFPP are listed within the Rural Fires Act and now include under PBP 2019 function centres, hotels/resorts. Due to the vulnerable nature of occupants of SFPP developments, there is a greater emphasis on emergency management as well as on separation (i.e. setbacks) from the hazard. This is through the reliance on larger APZ as well as the combination of other bushfire protection measures.

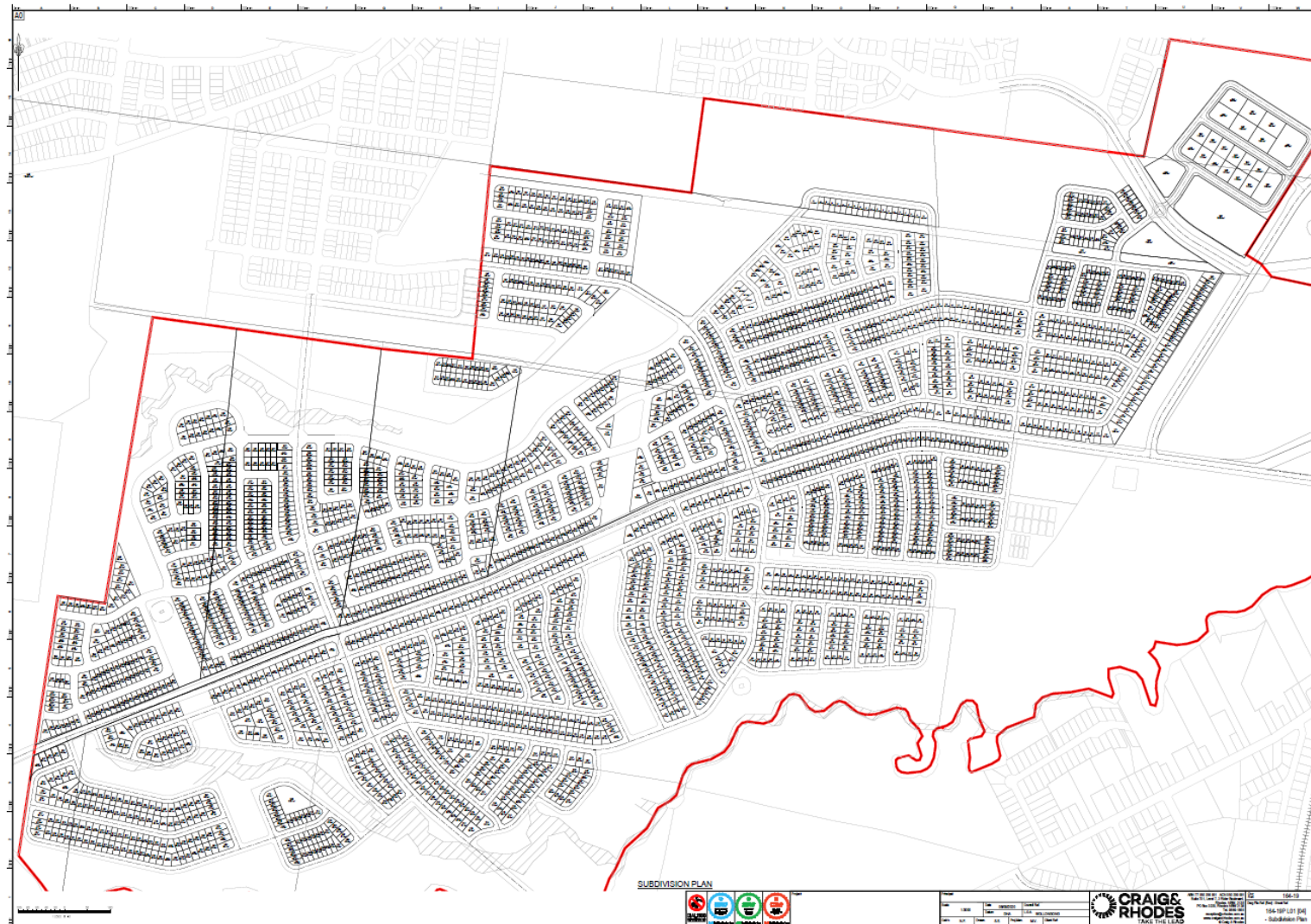


Figure 3: Masterplan (Source Craig & Rhodes, 8 September 2020)

2. Methods and approach

This bushfire assessment followed the methods and approach outlined in **Table 2** below.

Table 2: Methods and approach

Step	Tasks	Considerations
Review	A review of relevant reports and plans occurred.	Concept Masterplan provided by Craig & Rhodes (dated 23.09.2020). Wollongong City Council Bush Fire Prone Land Map; Wollongong LEP data
Desk top analysis	Review and analysis of all available mapping layers in GIS relevant to bushfire hazard.	GIS layers include: satellite imagery, vegetation mapping, topographical data (e.g. contours), biodiversity layer, land zoning and other environmental protection layers.
Site Assessment	Vegetation, slope and landscape assessment.	Site assessment in accordance with PBP methodology.
Assessment	Determine all relevant bushfire protection measures.	Desktop assessment in accordance with PBP methodology and other related NSW RFS policy with regard to bushfire planning for residential, commercial and SFPP developments in bushfire prone areas.
Reporting	Preparation of bushfire assessment.	Carry out all necessary reporting required for residential subdivision proposals for development of bushfire prone land.

This assessment lists the minimum and recommended bushfire requirements in accordance with PBP for the proposed development based on the masterplan in **Figure 3** to achieve compliance with the above legislation and related policy.

3. Bushfire Landscape Risk Assessment

The landscape bushfire risk includes assessment of bushfire hazard, potential fire behaviour and bushfire history within a 5 km radius of the Subject Land, herein called the 'study area'.

An assessment of the bushfire hazard is necessary to determine the application of bushfire protection measures such as APZ location and dimension. The following sub-sections provide a detailed account of the vegetation communities (bushfire fuels) and the topography (effective slope) that combine to create the bushfire hazard that may affect bushfire behaviour impacting the subject land.

3.1 Vegetation communities influencing bushfire

The 'predominant vegetation' influencing fire behaviour approaching and within the subject land has been assessed strictly in accordance with the methodology specified within PBP.

The vegetation has been determined by site assessment as well as proposed areas of revegetation on the north. The site is dominated by managed grasslands in the centre of the site with the main bushfire threat from vegetated areas edging site. While the WCC Bush Fire Prone Land Map (**Figure 2**) does not identify any bushfire hazard within the land on the south of Cleveland Road, this map was prepared (10 January 2014) before 'grassland' was considered a bush fire prone vegetation type as per the current 'Guide for Bush Fire Prone Land Mapping' Version 5b (GBFPLM) released in November 2015 (RFS 2015). Bush Fire Prone Land mapping is intended to be a planning trigger rather than definitive mapping. As shown in **Figure 5**, the primary bushfire hazard affecting the southern side of Cleveland Road primarily consists of 'forest' vegetation along the riparian corridor areas in the south and south-west of the site. The riparian corridor is subject to separate constraints advice (ELA 2018b) that has been considered as part of this assessment. The surrounding properties to the north, north-west and south-west consist of 'grassland' vegetation.

The primary bushfire hazard affecting the northern side of Cleveland Road is areas of dense vegetation on the northern boundary and proposed riparian corridors. The majority of the vegetation to the north and north west is classified Illawarra Lowland Grassy Woodland and areas of Coastal Swamp Oak Forest, classified by PBP as 'Woodland' and 'Forest' respectively.

For areas of vegetation that provide a potential fire run directly towards buildings not exceeding 50 m is classified as 'low hazard vegetation' by PBP. Low hazard vegetation uses 'rainforest' setbacks and construction levels as a surrogate for the reduced fire behaviour expected from small and/or narrow areas of vegetation. Where the potential fire run exceeds 50 m, the hazard has been classified as 'forest' based on the vegetation assessment for the site undertaken by ELA (2018a). The vegetation communities identified were Coastal Grassy Red Gum Forest and Lowland Woollybutt-Melaleuca Forest, both classified as 'forest' by PBP. The proposed riparian corridor from the Forest vegetation on the north that meets the west of the site is classified as 'Forest'.

The vegetation to west and north west has been classified as 'grassland' by PBP.

Vegetation has been classified into Keith Formations and Keith Class (Keith 2004) and assigned a potential total fuel load (tonnes / hectare) using Table A1.12.8 from PBP (RFS 2019) as shown in **Table 3**.

Table 3: Vegetation formation, class and fuel allocation for the study area

Vegetation formation	Keith Class	Overall fuel including bark and canopy (t/ha)*
Forest	Coastal Grassy Red Gum Forest	36.1
Riparian Corridor (Low Hazard)	Rainforest	13.2
Forest	Lowland Woollybutt-Melaleuca Forest	36.1
Grassland	Exotic and agricultural grassland	6

*Overall fuel load including from Table A1.12.8 from PBP (RFS 2019)

Landscaping and revegetation within the development footprint has the potential to alter the bushfire hazard classification and require additional or reduced APZs based on the design and ongoing management. A bushfire risk review of landscaping and revegetation plans is therefore recommended at an early stage in the preparation of these plans.

3.2 Slopes influencing bushfire

The 'effective slope' influencing fire behaviour approaching and within the subject land has been assessed by identifying slope interfaces within the slope class categories specified within PBP. This is conducted by measuring the worst-case scenario slope where the vegetation occurs over 100 m distance from the vegetation boundary and identifying where the changes in slope class occur along the interface.

The riparian vegetation to the south of the subject land falls into the PBP slope category '>0-5 degrees downslope' or '>5-10 degrees downslope'. The grassland vegetation falls into the PBP slope category '>0-5 degrees downslope' or upslope/flat'. The vegetation on the north west falls into the PBP slope category 'all upslopes/flat land' and on the north east '>0-5 degrees downslope'. These are displayed in **Table 4** and **Figure 5**.

3.3 Bushfire Weather

The typical / average climate in the Illawarra Bush Fire Management Committee (IBFMC) area is generally humid temperate experiencing fresh south west to north west winds in August and September coinciding with the start of the bushfire season until the onset of summer rains and coastal showers in March. Lower than average rainfall can extend the bushfire season into early autumn. Adverse fire weather conditions associated with the bush fire danger period in the Illawarra Zone are due to strong west to north westerly winds and low drought indices.

3.4 Bushfire History

Figure 4 shows the fire history for the study area for both prescribed burns and unplanned fire (wildfire) from the NPWS fire history mapping data set, with no fires occurring on the subject land over this period (1920-2018), with a large fire in 2001-2002 the most significant fire in the area for the period. This fire burnt predominately west of the site along the Illawarra Escarpment, an area which experiences the majority of the fire activity within the Illawarra (IBFMC 2016).

Whilst no wildfires of significance have occurred in the study area or on the site, there have been many over the past decades that under different circumstances could have spread to the site. Every fire poses a different suite of risks and control options and future fires may reach the subject land.

The Illawarra Bush Fire Risk Management Plan (BFRMP) (IBFMC 2016) identifies that the *main* sources of ignition in the IBFMC area are:

- Arson;
- Car Dumping;
- Lighting;
- Electrical Power Lines;
- Escapes from legal burning; and
- Illegal burning activities.

3.5 Summary of landscape bushfire risk

Although fire history indicates the probability of a landscape-wide fire or major fire attack on the subject land is low, it is feasible and the extent of Forest and Grassland surrounding the site suggests that it is likely, at least over the next 50 years.

Based on the fire history, landscape fire advantages and the proposed development enabling appropriate bushfire protection measures, the Study does not consider the development proposal as in an unacceptable bushfire landscape.

The landscape risk analysis indicates a risk level where it is feasible to design and build resilience into the community that matches or exceeds the bushfire risk in the landscape. The total elimination of bushfire risk is not necessary or feasible; as is the situation for any bush fire prone land.

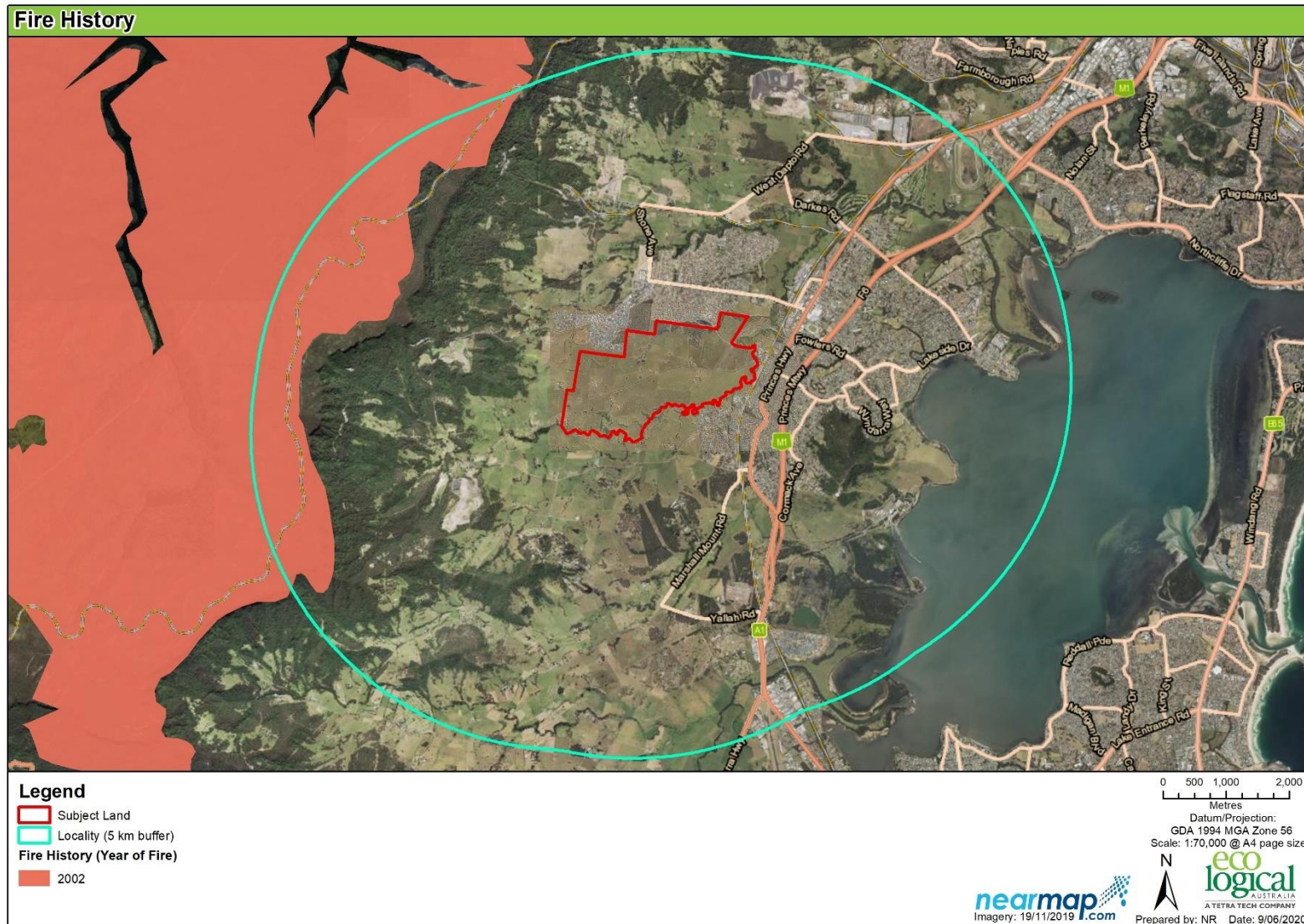


Figure 4: Fire History

Bushfire Hazard Assessment

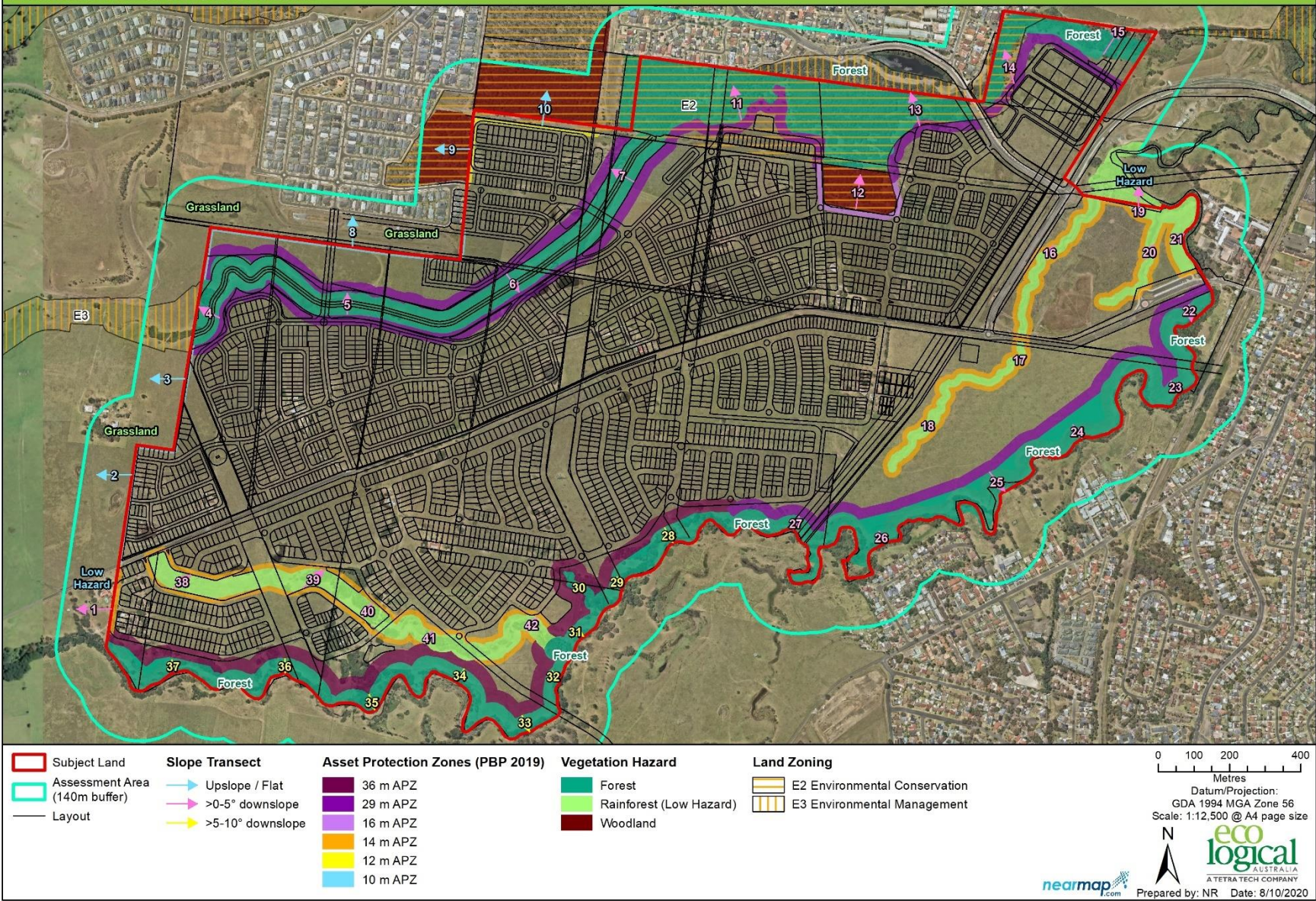


Figure 5: Preliminary Bushfire hazard assessment and Asset Protection Zones (APZ)

4. Bushfire protection measures

PBP requires the assessment of a suite of bushfire protection measures (BMPs) that in total afford an adequate level of protection. The measures required to be assessed for residential and SFPP development are listed in **Table 4** below and are discussed in detail in the remainder of this section.

The following BMPs are proposed by the development in response to the bushfire risks. BMPs are required to improve the community resilience to bush fire attack and improve property protection.

Application of the BMPs described in PBP minimise the risks from bushfire and ensure that the aims and objectives of PBP are met. This PBP approach has been applied for the subject site.

The following key bushfire protection measures are addressed in this assessment:

- APZs;
- Water supplies;
- Infrastructure (including access road provisions and other services);
- Evacuation and emergency management (including emergency access/egress arrangements); and
- Landscape management and garden design principles.

Table 4: PBP bushfire protection measures

Bushfire protection measures	Considerations
Asset Protection Zones (APZ)	Location and dimension of APZ setbacks from vegetation including prescriptions of vegetation management within the APZ.
Access	Provision of safe firefighting access for the proposed development is a critical factor to obtaining approval. Further assessments are to include access and egress in and out of a developable area such as alternate access, operational response and evacuation options. APZ perimeter access to be considered as is design standards of public roads and any fire trails.
Water supply and other utilities	List requirements for reticulated water supply and hydrant provisions, and any static water supplies for firefighting.
Building construction standards	Provide a guide on the application of construction standards for future buildings.
Landscaping	Principle aim to prevent flame impingement on buildings, provide defensible space for property protection, reduce fire spread, filter embers and reduce wind speed.
Emergency Management Planning	Principle aim to provide suitable emergency and evacuation (and relocation) arrangements for occupants of SFPP developments.
Environmental issues	RFS requires sufficient information to ascertain that the environmental values are or are not a constraint to development. The RFS is not providing an approval in relation to the loss or removal of these environmental assets, that is the role of the relevant consent authority.

4.1 Asset Protection Zones (APZ)

4.1.1 APZ location and dimension

APZs are areas located between bushfire hazards and development to provide a defensible space in which to undertake emergency operations and to provide a buffer from direct flame contact, and the impacts of radiant heat, smoke and embers. APZs should be wholly contained within the proposed lot or subject land for which they are benefitting or protecting. However, in some circumstances APZs may consist of managed areas outside an allotment e.g. managed open space, managed service easements and roads. Perimeter roads form part of the APZ's throughout the site. PBP has been used to determine the width of APZ for the proposed development using the vegetation and slope data identified in **Section 3**. **Table 5** details the results of this preliminary assessment and include APZ requirements for residential development. These APZ are also shown in **Figure 5**.

APZ are typically refined during subdivision stages, with the Structure Plan at re-zoning stage ensuring the APZ dimensions required at subdivision stage can be achieved. The final APZ requirements will be dependent on the eventual location of the development footprint and building envelopes, as a more detailed assessment of slope, vegetation and bushfire attack is required for each individual allotment. Future development of adjoining land would also influence APZ dimensions and locations. These APZs will need to be established within the subject land and incorporated into the design of the development.

The width of APZs is based on a combination of:

- Predominant vegetation (using structural classification);
- Effective slope (i.e. slope most affecting fire behaviour adjacent to the interface); and
- Fire Danger Index (FDI) of 100 (a catastrophic fire weather day).

There is potential to reduce the size of the APZ associated with the revegetation of the forest riparian corridors based on:

- Vegetation type. If the riparian corridor is to be revegetated with a vegetation formation with a lesser fuel load than 'Forest' (i.e. forested wetland or woodland) this will result in smaller APZ.
- Width of riparian corridor. If revegetation of the corridor is less than 50 m wide and less than 1 ha in area it can be classified as 'low hazard vegetation' by PBP. Low hazard vegetation uses 'rainforest' setbacks and construction levels as a surrogate for the reduced fire behaviour expected from small and/or narrow areas of vegetation. This will also result in a smaller APZ.

4.1.2 APZs for Special Fire Protection Purpose (SFPP) Development

APZs for SFPP development are larger than those for applied residential development due to the increased vulnerability of the occupants and the increased emergency management needs. These APZs are required to provide an APZ where radiant heat levels of greater than 10kW/m^2 (calculated at 1200K) will not be experienced on any part of the building. This assessment has not applied APZs for SFPP developments, but it is considered the site is not constrained in its ability to provide APZs for SFPP purposes.

The following development is identified as SFPP in s100(b)(6) of the Rural Fires Act:

- (a) a school,
- (b) a child care centre,
- (c) a hospital (including a hospital for the mentally ill or mentally disordered),
- (d) a hotel, motel or other tourist accommodation,
- (e) a building wholly or principally used as a home or other establishment for mentally incapacitated persons,
- (f) seniors housing within the meaning of State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004,
- (g) a group home within the meaning of State Environmental Planning Policy No 9—Group Homes,
- (h) a retirement village,
- (i) any other purpose prescribed by the regulations.

In relation to point (i) above, the Rural Fires Regulations define the following as prescribed purposes:

*For the purposes of paragraph (i) of the definition of **special fire protection purpose** in section 100B (6) of the Act, the following purposes are prescribed:*

- a manufactured home estate (within the meaning of State Environmental Planning Policy No 36—Manufactured Home Estates), comprising two or more caravans or manufactured homes, used for the purpose of casual or permanent accommodation (but not tourist accommodation),
- a sheltered workshop, or other workplace, established solely for the purpose of employing persons with disabilities,
- a respite care centre, or similar centre, that accommodates persons with a physical or mental disability or provides respite for carers of such persons,
- student or staff accommodation associated with a school, university or other educational establishment,
- a community bush fire refuge approved by the Commissioner.

4.1.3 Non-residential development types

It is recommended that development associated with employment lands, such as commercial and industrial development, be treated as residential development for the purpose of strategic planning. Non-habitable development of this kind has the opportunity to have an APZ less than that required for residential subdivision however this flexibility relies on the known use of the building, its design and construction standard, and can only be determined at the development application stage. Therefore, it is considered appropriate to assess residential sized APZs for such development at this stage in the planning process.

APZ for the areas of development as indicated in **Figure 5** are all able to be achieved on the subject land.

Table 5: Preliminary determination of APZ

Transect	Slope	Vegetation	PBP Residential required APZ ¹	PBP SFPP required APZ ²	Comment
1	Downslope >0 to 5 degrees	Low Hazard (riparian)	14 m	47 m	APZ along western boundary to be formed as part of lot subdivision design, including perimeter road layout.
2-3	All upslopes and flat land	Grassland	10 m	36 m	APZ along western boundary to be formed as part of lot subdivision design, including perimeter road layout.
4-7	Downslope >0 to 5 degrees	Forest	29 m	79 m	Further refinement of APZ could be undertaken based on management plan for riparian corridor
8	All upslopes and flat land	Grassland	10 m	36 m	APZ along northern boundary to be formed as part of lot subdivision design, including perimeter road layout.
9 & 10	All upslopes and flat land	Woodland	12 m	42 m	APZ along western boundary to be formed as part of lot subdivision design, including perimeter road layout.
11	Downslope >0 to 5 degrees	Forest	29 m	79 m	APZ along northern boundary to be formed as part of lot subdivision design, including perimeter road layout.
12	Downslope >0 to 5 degrees	Woodland	16 m	50 m	APZ along northern boundary to be formed as part of lot subdivision design, including perimeter road layout.
13-15	Downslope >0 to 5 degrees	Forest	29 m	79 m	APZ along northern boundary to be formed as part of lot subdivision design, including perimeter road layout.
16-21	Downslope >0 to 5 degrees	Low Hazard (riparian)	14 m	47 m	APZ along riparian corridor can be included within open space or perimeter roads.
22-27	Downslope >0 to 5 degrees	Forest	29 m	79 m	Further refinement of APZ could be undertaken based on management plan for riparian corridor.
28-37	Downslope >5 to 10 degrees	Forest	36 m	93 m	Further refinement of APZ could be undertaken based on management plan for riparian corridor.

¹ Minimum APZ required by PBP 2019 acceptable solution for residential development (Table A1.12.2).² Minimum APZ required by PBP 2019 acceptable solution for residential development (Table A1.12.1).

4.1.4 Vegetation management within the subject land

Landscaping and APZ within the subject land is to achieve the specifications of an Inner Protection Area (IPA) as described by PBP and as outlined below:

Trees

- canopy cover should be less than 15% (at maturity)
- trees (at maturity) should not touch or overhang the building
- lower limbs should be removed up to a height of 2 m above ground
- canopies should be separated by 2 to 5 m
- preference should be given to smooth barked and evergreen trees.

Shrubs

- create large discontinuities or gaps in the vegetation to slow down or break the progress of fire towards buildings
- shrubs should not be located under trees
- shrubs should not form more than 10% ground cover
- clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation.

Grass

- should be kept mown (as a guide grass should be kept to no more than 100 mm in height)
- leaves and vegetation debris should be removed.

4.2 Building construction standard

Construction standards are governed by NCC 2019 which calls up AS 3959-2018 for construction in bushfire prone areas. The construction standard is determined by the BAL for individual buildings as determined by the methodology of PBP. Variations to the AS 3959-2018 construction standard are also found in PBP.

Construction standards for residential buildings are based on an assessment of each buildings BAL exposure in accordance with the site assessment process detailed by PBP. The APZ specifications detailed in **Section 4.1.1** allow for new dwellings to be exposed to a maximum of BAL-29.

Construction standards for SFPP development depend on the type of development proposed, however for the more common types (i.e. function centres, hotels and the like) a construction level of BAL-12.5 under AS 3959-2018 is the acceptable solution given they are afforded increased setback to the hazard due to the larger APZs.

4.3 Access provisions

Where the proposed development is either residential or SFPP, then the specifically related PBP criteria will apply covering such areas as perimeter roads, internal access roads and access to water supplies, parking etc. Residential development will be required to comply with requirements of Table 5.3b of PBP (**Table 8; Appendix A**) whilst SFPP development will be required to comply with requirements of Table 6.8b of PBP (**Table 9, Appendix A**). Public road access to the subdivision is via Cleveland Road to the north and south of the proposed development areas. There should be at least two access and egress points along Cleveland Road for the proposed development.

Access provisions are not considered a constraint to the development. The proposed layout has the ability to comply with all provisions detailed in Table 8, which should be included in further progressions of the layout.

4.4 Utilities

The proposed development will be serviced by reticulated water.

The performance criteria and acceptable solutions for residential subdivisions for the proposed water, electricity and gas supplies with regards to Section 5.3.3 of PBP is detailed in **Table 6**. The performance criteria and acceptable solutions for SFPP development is detailed in **Table 7**. The masterplan is considered not constrained in its ability to comply with water, electricity and gas supplies.

Table 6: Performance criteria and acceptable solutions for water, electricity and gas services for residential and rural residential subdivisions (adapted from Table 5.3c of PBP)

Performance Criteria	Acceptable Solution
Adequate water supplies is provided for firefighting purposes.	Reticulated water is to be provided to the development where available; A static water supply and hydrant supply is provided for non-reticulated developments or where reticulated water supply cannot be guaranteed; and Static water supplies shall comply with Table 5.3d of PBP.
Water supplies are located at regular intervals; and The water supply is accessible and reliable for firefighting operations.	Fire hydrant, spacing, design and sizing complies with the relevant clauses of Australian Standard AS 2419.1 (SA 2005); Hydrants are not located within any road carriageway; and Reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads.
Flows and pressure are appropriate.	Fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1 (SA 2005).
The integrity of the water supply is maintained.	All above-ground water service pipes are metal, including and up to any taps; and Above-ground water storage tanks shall be of concrete or metal.
Location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of buildings.	Where practicable, electrical transmission lines are underground; Where overhead, electrical transmission lines are proposed as follows: Lines are installed with short pole spacing (30 m), unless crossing gullies, gorges or riparian areas; and No part of a tree is closer to a power line than the distance set out in ISSC3 Guide for the Management of Vegetation in the Vicinity of Electricity Assets (ISSC3 2016).
Location and design of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.	Reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 – The Storage and handling of LP gas, the requirements of relevant authorities, and metal piping is used;

Performance Criteria	Acceptable Solution
	<p>All fixed gas cylinders are kept clear of all flammable materials to a distance of 10 m and shielded on the hazard side;</p> <p>Connections to and from gas cylinders are metal;</p> <p>Polymer-sheathed flexible gas supply lines are not used; and</p> <p>Above-ground gas service pipes are metal, including and up to any outlets.</p>

Table 7: Performance criteria and acceptable solutions for water, electricity and gas services for SFPP development (Table 6.8c)

Performance Criteria	Acceptable Solutions
The intent may be achieved where:	
An adequate water supply for firefighting purposes is installed and maintained.	<p>reticulated water is to be provided to the development, where available, or</p> <p>a 10,000 litres minimum static water supply dedicated for firefighting purposes is provided for each occupied building where no reticulated water is available.</p>
the water supply is accessible and reliable for firefighting operations	<p>hydrants are not located within any road carriageway; and</p> <p>reticulated water supply to SFPPs uses a ring main system for areas with perimeter roads; and</p>
flows and pressure are appropriate	fire hydrant flows and pressures comply with the relevant clauses AS2419:2005, and
the integrity of the water supply is maintained	all above-ground water service pipes external to the building are metal, including and up to any taps; and
water supplies are adequate in areas where reticulated water is not available	<p>a connection for firefighting purposes is located within the IPA or non-hazard side and away from the structure; a 65mm Storz outlet with a ball valve is fitted to the outlet; and</p> <p>ball valve and pipes are adequate for water flow and are metal; and</p> <p>supply pipes from tank to ball valve have the same bore size to ensure flow volume; and</p> <p>underground tanks have an access hole of 200mm to allow tankers to refill direct from the tank; and</p> <p>a hardened ground surface for truck access is supplied within 4m of the access hole; and</p> <p>above-ground tanks are manufactured from concrete or metal; and</p> <p>raised tanks have their stands constructed from non-combustible material or bush fire-resisting timber (see Appendix F AS 3959), and</p> <p>unobstructed access is provided at all times; and</p> <p>tanks on the hazard side of a building are provided with adequate shielding for the protection of firefighters; and</p> <p>underground tanks are clearly marked; and</p> <p>all exposed water pipes external to the building are metal, including any fittings; and</p> <p>where pumps are provided, they are a minimum 5hp or 3kW petrol or diesel-powered pump, and are shielded against bush fire attack; any hose and reel for firefighting connected to the pump shall be 19mm internal diameter; and</p> <p>fire hose reels are constructed in accordance with AS/NZS 1221:1997 Fire hose reels, and installed in accordance with the relevant clauses of AS 2441:2005 Installation of fire hose reels.</p>
	where practicable, electrical transmission lines are underground, and

Performance Criteria	Acceptable Solutions
location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of buildings	<p>where overhead, electrical transmission lines are proposed as follows:</p> <p>lines are installed with short pole spacing (30m), unless crossing gullies, gorges or riparian areas; and</p> <p>no part of a tree is closer to a power line than the distance set out in accordance with the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines</p>
location and design of gas services will not lead to ignition of surrounding bushland or the fabric of buildings	<p>reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 and the requirements of relevant authorities, and metal piping is used; and</p> <p>all fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side; and</p> <p>connections to and from gas cylinders are metal; and</p> <p>if gas cylinders need to be kept close to the building, safety valves are directed away from the building and at least 2m away from any combustible material, so they do not act as a catalyst to combustion; and</p> <p>polymer-sheathed flexible gas supply lines to gas meters adjacent to buildings are not used; and</p> <p>above-ground gas service pipes external to the building are metal, including and up to any outlets.</p>

5. Emergency management procedures

SFPP developments must provide suitable emergency management plans addressing emergency evacuation arrangements for occupants. Acceptable solutions for emergency management plans are covered in Table 6.8d of PBP and not considered a constraint to the development however any future proposal will need to comply with the relevant criteria.

5.1 Emergency Services

The following is recommended for strategic land use planning to achieve the objectives and strategic planning principles relating to emergency management. Strategic emergency management planning is undertaken in collaboration with emergency service organisations within the strategic land use planning process, to establish preferred future outcomes (i.e. emergency evacuation) that have implications for land use planning, including:

- a. Emergency evacuation planning;
- b. Evacuation adequacy assessment.

There are limited emergency services in proximity to the precinct. Given the overarching development of the West Dapto Urban Release Area, it is expected further services will provide adequate emergency response within the vicinity of the subject land. There are currently three RFS brigades within 20 minutes travel time of the subject site:

- Dapto Fire Station Fire and Rescue (2.4 km, 7 minutes travel time to east).
- Dapto Rural Fire Brigade (4.5 km, 6 minutes travel time to north-west); and
- Horsley Park RFS (8 km, 9 minutes travel time to south east).

It is recommended that any future development be consistent with Illawarra BFRMP.

6. Evacuation

6.1 Off-site refuges

The West Dapto Urban Release Area adjoins the existing residential area of Dapto. This residential area is not mapped as Bushfire Prone Land and as such provides numerous off-site refuge options. A suitable off-site refuge is Dapto Mall located 2.5 kms and 6 minute drive from the subject land.

As noted, given the overarching development of West Dapto Urban Release Area, it is expected further services and off-site refuge options will be provided within the vicinity of the subject land. It is not likely that access is impeded to off-site refuges.

6.2 On-site last resort option

The residential nature of any future development will likely offer options for on-site refuge within the development, combined with the construction of future dwellings to construction standards (See **Section 4.2**).

7. Environmental issues

Environmental issues will need to be assessed separately to this bushfire advice with the impacts of the bushfire protection measures forming part of any environmental impact assessment.

8. Adjoining Land

Future development will not be reliant on any off-site bushfire mitigation measures. All buildings and use will be designed to be resilient to bushfire attack in circumstances where no additional fuel management occurs outside of APZs etc.

The proposed land uses should not have a deleterious impact on the ability for bushfire management activities to be undertaken on adjoining land. Given the adherence to bushfire protection measures and other land use planning requirements, the proposed land uses should not increase bushfire management needs for retained and/or adjoining bushfire prone vegetation.

9. Conclusion and Recommendations

This report presents a Bushfire Strategic Assessment of a proposed residential subdivision of the subject land. Recommendations on how to achieve compliance with s100B *Rural Fires Act 1997*, Clause 44 of the *Rural Fires Regulation 2013* and PBP are located within **Section 4**. They include the provision of APZs, adequate access, water supply for firefighting, the safe installation of utilities, and discussion of building construction standards for future dwellings.

All opportunities / constraints identified should be considered in conjunction with any environmental impact and rezoning studies. The most crucial bushfire protection measures that will require careful design of the proposed subdivision relate to the provision of APZs and the provision of safe firefighting access. A number of strategies have been provided in the form of planning controls such that the risk from bushfire is reduced to an appropriate level and a level that meets the deemed to satisfy bushfire protection requirements.

The strategies used to reduce the bushfire risk associated with the re-zoning, include:

- Setbacks from bushfire prone vegetation (APZs);
- Integration of non-combustible infrastructure within APZs such as roads, easements and parking areas;
- Access and egress from the site through a well-designed road system with multiple connections to existing and/or future roads;
- Underground electricity and gas services;
- Compliant water supplies; and
- Emergency response planning.

More detailed bushfire assessment to accurately prescribe setbacks, roading and landscaping is required at the Development Application stage, however the re-zoning application has provisions that allow this more detailed designed to occur smoothly and achieve the deemed to satisfy standards within NSW.

The minimum APZs to be applied to the development are those corresponding with BAL-29 to avoid high construction costs and minimise material/design constraints for future dwellings within the proposed subdivision. Public road access to the proposed development requires design in accord with the PBP specifications in Table 8. Provision of appropriate APZs and safe firefighting access for the proposed subdivision are critical factors to obtaining approval from the NSW Rural Fire Service for any future residential development of the subject land.



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Appendix A - Access

Table 8: Performance criteria and acceptable solutions for access for residential and rural residential subdivisions (adapted from Table 5.3b of PBP)

Performance Criteria		Acceptable Solutions
The intent may be achieved where:		
ACCESS (GENERAL REQUIREMENTS)	firefighting vehicles are provided with safe, all-weather access to structures.	property access roads are two-wheel drive, all-weather roads; and
		perimeter roads are provided for residential subdivisions of three or more allotments; and
		subdivisions of three or more allotments have more than one access in and out of the development; and
		traffic management devices are constructed to not prohibit access by emergency services vehicles; and
		maximum grades for sealed roads do not exceed 15 degrees and an average grade of not more than 10 degrees or other gradient specified by road design standards, whichever is the lesser gradient; and
		all roads are through roads.
		dead end roads are not recommended, but if unavoidable, dead ends are not more than 200 metres in length, incorporate a minimum 12 metres outer radius turning circle, and are clearly sign posted as a dead end; and
		where kerb and guttering is provided on perimeter roads, roll top kerbing should be used to the hazard side of the road; and
		where access/egress can only be achieved through forest, woodland or heath vegetation, secondary access shall be provided to an alternate point on the existing public road system.
		one way only public access roads are no less than 3.5 metres wide and have designated parking bays with hydrants located outside of these areas to ensure accessibility to reticulated water for fire suppression
PERIMETER ROADS	the capacity of access roads is adequate for firefighting vehicles	the capacity of perimeter and non-perimeter road surfaces and any bridges/causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes); bridges/causeways are to clearly indicate load rating.
	there is appropriate access to water supply	hydrants are located outside of parking reserves and road carriageways to ensure accessibility to reticulated water for fire suppression;
		hydrants are provided in accordance with AS 2419.1:2005;
		there is suitable access for a Category 1 fire appliance to within 4m of the static water supply where no reticulated supply is available.
	access roads are designed to allow safe access and egress for firefighting vehicles while residents are evacuating as well as providing a safe operational environment for emergency service personnel	perimeter roads are two-way sealed roads; and minimum 8m carriageway width kerb to kerb; and parking provided outside of the carriageway width; and hydrants are located clear of parking areas; and

	Performance Criteria	Acceptable Solutions
NON-PERIMETER ROADS	during firefighting and emergency management on the interface.	are through roads, and these are linked to the internal road system at an interval of no greater than 500m; and
		curves of roads have a minimum inner radius of 6m; and
		the maximum grade road is 15° and average grade is 10°; and
		the road crossfall does not exceed 3°; and
		a minimum vertical cleared of 4m to any overhanging obstructions, including tree branches, is provided.
	access roads are designed to allow safe access and egress for firefighting vehicles while residents are evacuating	minimum 5.5m width kerb to kerb; and
		parking is provided outside of the carriageway width; and
		hydrants are located clear of parking areas; and
		roads are through roads, and these are linked to the internal road system at an interval of no greater than 500m; and
		curves of roads have a minimum inner radius of 6m; and
PROPERTY ACCESS		the road crossfall does not exceed 3°; and
		a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.
	firefighting vehicles can access the dwelling and exit the property safely	There are no specific access requirements in an urban area where an unobstructed path (no greater than 70m) is provided between the most distant external part of the proposed dwelling and the nearest part of the public access road (where the road speed limit is not greater than 70kph) that supports the operational use of emergency firefighting vehicles
		In circumstances where this cannot occur, the following requirements apply:
		minimum carriageway width of 4m;
		in forest, woodland and heath situations, rural property access roads have passing bays every 200m that are 20m long by 2m wide, making a minimum trafficable width of 6m at the passing bay; and
		a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches; and
		provide a suitable turning area in accordance with Appendix 3; and
		curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress; and
		the minimum distance between inner and outer curves is 6m; and
		the crossfall is not more than 10°; and
		maximum grades for sealed roads do not exceed 15° and not more than 10° for unsealed roads; and

Performance Criteria	Acceptable Solutions
	<p>a development comprising more than three dwellings has formalised access by dedication of a road and not by right of way.</p> <p>Note: Some short constrictions in the access may be accepted where they are not less than 3.5m wide, extend for no more than 30m and where the obstruction cannot be reasonably avoided or removed. The gradients applicable to public roads also apply to community style development property access roads in addition to the above.</p>

Table 9: Performance criteria and acceptable solutions for access for SFPP development (Table 6.8b)

Performance Criteria	Acceptable Solutions
The intent may be achieved where:	
FIREFIGHTING VEHICLES	<p>firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation</p> <p>SFPP access roads are two-wheel drive, all-weather roads, and</p> <p>access is provided to all structures;</p> <p>traffic management devices are constructed to not prohibit access by emergency services vehicles</p> <p>access roads must provide suitable turning areas in accordance with Appendix 3; and</p> <p>one way only public access roads are no less than 3.5 metres wide and have designated parking bays with hydrants located outside of these areas to ensure accessibility to reticulated water for fire suppression.</p>
ACCESS ROAD CAPACITY	<p>the capacity of access roads is adequate for firefighting vehicles</p> <p>Same as that for subdivision</p>
ACCESS TO WATER	<p>there is appropriate access to water supply</p> <p>Same as that for subdivision</p>
PERIMETER ROADS	<p>Perimeter access roads are designed to allow safe access and egress for firefighting vehicles while occupants are evacuating as well as providing a safe operational environment for emergency service personnel during firefighting and emergency management on the interface</p> <p>Same as that for subdivision</p>
NON-PERIMETER ROADS	<p>Non-perimeter access roads are designed to allow safe access and egress for firefighting vehicles while occupants are evacuating</p> <p>Same as that for subdivision</p>

