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ZYGT Pty Ltd
c/- Jayson Blaine
Craig and Rhodes
PO Box 3220
Rhodes NSW 2138

Ref/Job No: 18HNG_11524

6 March 2019

Dear Jayson,

RE: Bushfire Advice – Proposed Subdivision – 53B Warriewood Road, Warriewood

This report was commissioned by ZYGT Pty Ltd to prepare bushfire constraints advice in relation to Lot 15 in proposed subdivision at 53B Warriewood Road, Warriewood (hereafter known as the 'subject land'). This advice investigates what method of assessment would maximise the developable area within Lot 15 to achieve the residential approval threshold of a maximum radiant heat exposure of 29 kW/m^2.

This report presents a due diligence assessment which is suitable for the purpose for which it was commissioned, however further assessment may be required if there are significant changes to the development concept and layout, proposed uses or change in State bushfire protection legislation or policy.

1. Methodology

The advice provided herein is based on the following research and knowledge:

- A desktop analysis of the vegetation and topography within and surrounding the subject land;
- Review of background information including previous bushfire assessments undertaken on the site and surrounding area (Eco Logical Australia, 14SYDECO-0090, 18HNG_11524, 18SYD_11707);
- Plan of Subdivision – Craig & Rhodes, Ref 076-18 dated 15 January 2019 (**Figure 1**);
- AS 3959-2009 Construction of buildings in bushfire prone areas (AS 3959-2009);
- 'Planning for Bush Fire Protection 2006' (PBP 2006);
- Pre-release 'Planning for Bush Fire Protection' 2018 (PBP 2018); and
- Other related NSW Rural Fire Service (RFS) policy in regards to bushfire planning for residential subdivision developments in bushfire prone areas.

This assessment of the proposed development is based on the preliminary concept plan in **Figure 1**. Any change to the development design will require re-assessment.

2. Vegetation

There are two (2) areas of bushfire hazard found within 140 metres of proposed Lot 15. The closest hazard to the subject land consists of the remnant riparian forest conserved within the Narrabeen Creek riparian corridor and associated buffer adjacent to the south-western boundary of the proposed subdivision. The corridor consists predominantly of highly disturbed and scattered forested wetland vegetation, with a predominate understorey of weed species and exotic grasses.

As shown in **Figure 2**, the riparian 'buffer' vegetation directly adjoins the south-western boundary of the subject land and extends to the north-west. Part of this development proposal will include revegetation of the entire public reserve (proposed Lot 17) resulting in the bushfire hazard extending into the subject land. The riparian corridor is approximately 60 m wide and classified as 'forested wetland' under PBP 2006. The effective slope falls under the PBP 2006 slope category of '>0-5 degrees downslope'.

The second hazard is present within the riparian corridor and properties to the south-east of the subject land. However, these hazard areas are separated from the subject site by existing managed and cleared lands within the neighbouring property to the immediate east. These areas are included within the Narrabeen Creek riparian 'buffer' and is also classified as 'forested wetland' under PBP 2006.

The overall vegetation classification is Coastal Freshwater Swamp Forest (ELA, Flora and Fauna Assessment 18SYD_11707) which is identified as 'forest' under PBP 2018 and AS 3959-2009.

3. Slope

The slope class 'most significantly affecting fire behaviour' has been considered for a distance of at least 100 m. This is conducted by measuring the worst-case scenario slope where the vegetation occurs over 100 m transects from the vegetation boundary.

An analysis of 10 m contour data shows the land under the bushfire hazard affecting the proposed development ranges from 'All upslopes and flat land' to '>0-5 degrees downslope'.

Figure 2 shows the location where these slope calculations have occurred.

4. Asset Protection Zone (APZ) investigation under PBP 2006 and Method 2 Assessment

The APZ has been determined using both the acceptable solutions of PBP 2006 (Table A2.4) and Method 2 calculations (AS 3959-2009) using fuel loads from Table A2.1 of PBP 2006.

The NBC Bushfire Attack Assessor was used to refine the width of APZ in accordance with Appendix B: Detailed Methodology for Determining the Bushfire Attack Level (BAL) – Method 2 of Australian Standard 3959: Construction of buildings in bushfire-prone areas' 2009. The results of this assessment are shown in **Appendix A**.

As outlined in CB3 of the Appendix B of AS 3959-2009 the vegetation classification system and associated fuel loads in AS 3959-2009 are based on a national system. Vegetation classification systems specific to the relevant State or accepted as an alternate to the national system. In NSW a system has been established by Keith (2004) and the fuel loads identified in PBP have been extensively researched. This assessment utilises the fuel loadings for a 'forested wetland' in accordance with Table A2.1 of PBP 2006.

Table 1 details the results of this preliminary assessment and APZ are also shown in **Figure 2**.

Table 1: Preliminary determination of APZ under PBP 2006 and Method 2 Assessment.

Lot # OR direction from development boundary	Transect #	Slope[1]	Vegetation[2]	PBP required APZ (PBP 2006)[3]	AS 3959-2009 BAL-29 APZ[4]	Modelled 29 kW/m^2 APZ[5]	Comments
North-west	1	>0-5° downslope	Forested Wetland	25 m	32 m	18 m	APZ provided by managed lands within 53A adjoining the north-western boundary.
South-west	2	>0-5° downslope	Forested Wetland	25 m	32 m	18 m	APZ provided proposed residue lot (Lot 16).
South-east	3	Upslope/flat	Forested Wetland	20 m	25 m	16 m	APZ provided by managed land within 53C adjoining the south-eastern boundary.

[1] Slope most significantly influencing the fire behaviour of the site having regard to vegetation found. Slope classes are according to PBP.

[2] Predominant vegetation is identified, according to PBP and *"*Where *a mix of vegetation types exist the type providing the greater hazard is said to be predominant".*

[3] Assessment according to Table A2.4 of PBP 2006.

[4] Assessment according to Table 2.4.2 of AS 39590-2009.

[5] APZ determined by Method 2 calculations (AS 3959-2009), PBP 2006 fuel loads from Table A2.1 and an effective slope of 1.5° downslope. See Appendix A for modelling results.

5. Asset Protection Zone (APZ) investigation under PBP 2018 and Method 2 Assessment

The APZ has been determined using both the acceptable solutions of PBP 2018 (Table A1.12.2) and Method 2 calculations (AS 3959-2009) using fuel loads from Table A1.12.8 of PBP 2018.

The NBC Bushfire Attack Assessor was used to determine refined APZ requirements for Transect 2 in accordance with Appendix B: Detailed Methodology for Determining the Bushfire Attack Level (BAL) – Method 2 of *Australian Standard 3959: Construction of buildings in bushfire-prone areas' 2009.* The results of this assessment are shown in **Appendix A**.

As outlined in CB3 of Appendix B of AS 3959-2009, the vegetation classification system and associated fuel loads in AS 3959-2009 are based on a national system. Vegetation classification systems specific to the relevant State or accepted as an alternate to the national system. In NSW, a system has been established by Keith (2004) and the fuel loads identified in PBP 2018 have been recently updated based on current research. This assessment utilises the amended NSW fuel loadings for 'forest' in accordance with Table A1.12.8 of PBP 2018.

Table 2 details the results of this preliminary assessment and APZ are also shown in **Figure 2**.

Table 2: Preliminary determination of APZ under PBP 2018 and Method 2 Assessment

Lot # OR direction from development boundary	Transect #	Slope[1]	Vegetation[2]	PBP required APZ (PBP 2018)[3]	Modelled 29 kW/m^2 APZ[4]	Comments
North-west	1	Downslope >0 to 5 degrees	Forest	29 m	26 m	APZ provided by managed lands within 53A adjoining the north-western boundary.
South-west	2	Downslope >0 to 5 degrees	Forest	29 m	26 m	APZ provided proposed residue lot (Lot 16).
South-east	3	All upslopes and flat land	Forest	24 m	24 m	APZ provided by managed land within 53C adjoining the south-eastern boundary.

[1] Slope most significantly influencing the fire behaviour of the site having regard to vegetation found. Slope classes are according to PBP.

[2] Predominant vegetation is identified, according to PBP and *"Where a mix of vegetation types exist the type providing the greater hazard is said to be predominant".*

[3] Assessment according to Table A1.12.2 of PBP 2018.

[4] APZ outcome based on Method 2 calculations (AS 3959-2009), PBP 2018 fuel loads from Table A1.12.8 and an effective slope of 1.5° downslope. See **Appendix A** for modelling results.

7. Discussion

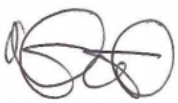
Based on preliminary results **Section 4** and **5** of this report, the smallest APZ dimension of 18 m is achieved using PBP 2006 fuel loads and Method 2 Assessment as shown in **Figure 2**.

The Development Application (DA) submitted for this proposal will require referral to the NSW Rural Fire Service (RFS). It must be noted that as the RFS will assess the performance based approach and bushfire modelling, their approval of the methodology and accompanying results cannot be guaranteed, despite ELA's best efforts. Furthermore, should PBP 2018 be enacted prior to DA, the Method 2 results contained herein could differ. DA should be submitted prior to 1 May 2019.

Proposed residue Lot 16 will be required to be managed to Inner Protection Area (IPA) standards in perpetuity and RFS will require assurance of this. Management of proposed Lot 16 will need to be shown under a Plan of Management (PoM), Vegetation Management Plan (VMP) or 88b instrument to give RFS this assurance.

8. Conclusion

The developable area within proposed Lot 15 can be maximised (subject to RFS approval) by submitting a performance solution using PBP 2006 fuel loads and Method 2 Assessment as shown in **Figure 2**, prior to the legislation introducing the newer version of PBP (likely 1 May 2019).



Natalie South
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FPAA BPAD-A Certified Practitioner No. BPAD29962-L3

BPAD Bushfire Planning & Design Accredited Practitioner Level 3

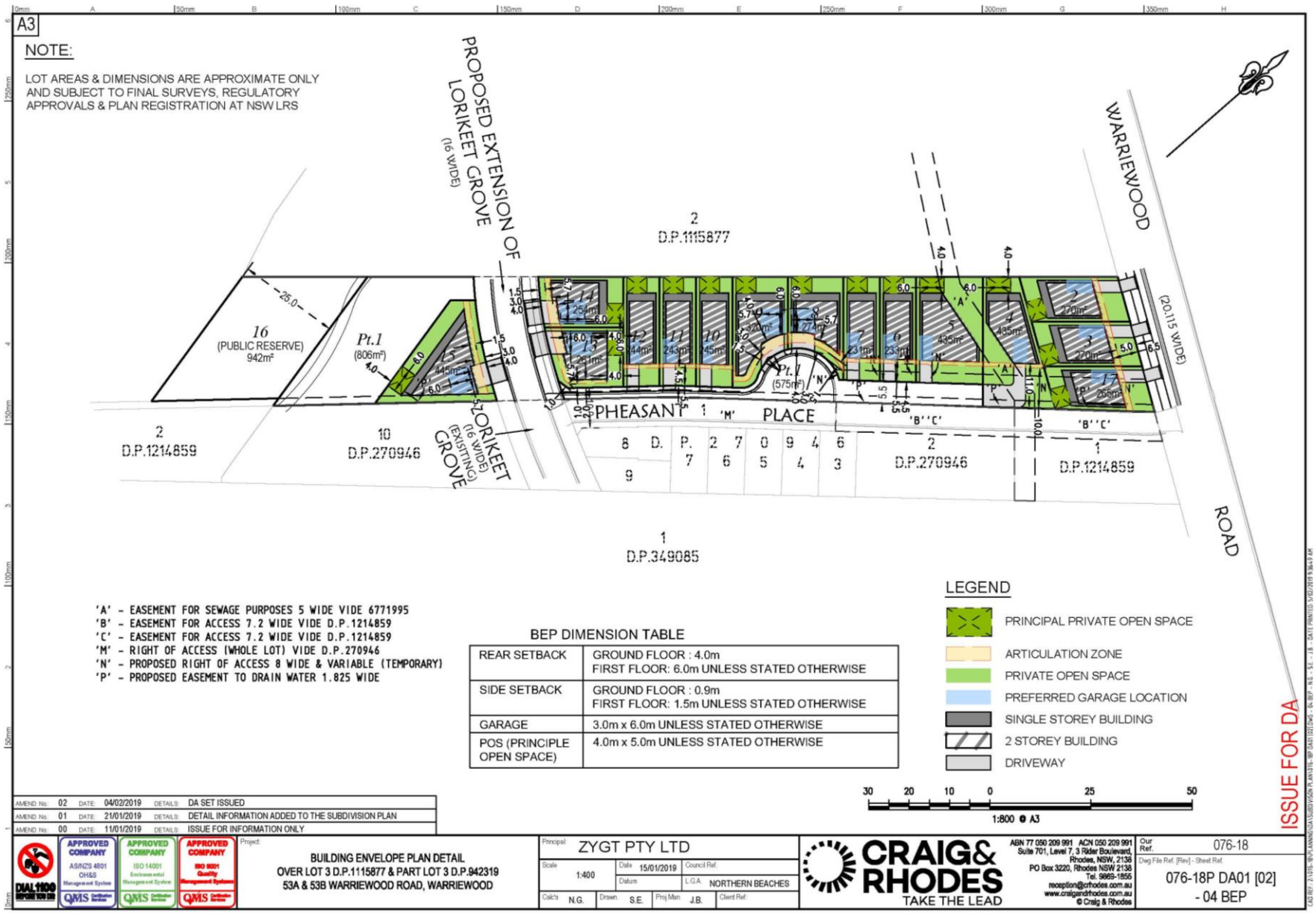

Figure 1: Plan of Subdivision

Figure 2: Indicative Asset Protection Zone (APZ)

Appendix A – Bushfire Attack Assessor Report

NBC Bushfire Attack Assessment Report V2.1

AS3959 (2009) Appendix B - Detailed Method 2

Printed: 6/03/2019 **Assessment Date:** 25/02/2019

BPAD Bushfire Planning & Design Accredited Practitioner Level 3

Site Street Address: 53B Warriewood Road, Warriewood

Assessor: Bruce Horkings; Ecological Australia

Local Government Area: Manly **Alpine Area:** No

Equations Used

Transmissivity: Fuss and Hammins, 2002
Flame Length: RFS PBP, 2001
Rate of Fire Spread: Noble et al., 1980
Radiant Heat: Drysdale, 1985; Sullivan et al., 2003; Tan et al., 2005
Peak Elevation of Receiver: Tan et al., 2005
Peak Flame Angle: Tan et al., 2005

Run Description: NW - PBP 2006

Vegetation Information

Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	1.5 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	15	**Overall Fuel Load(t/ha):**	20

Site Information

Site Slope:	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m):	Default	**APZ/Separation(m):**	18

Fire Inputs

Veg./Flame Width(m):	100	**Flame Temp(K)**	1090

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg)	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100

Program Outputs

Category of Attack:	HIGH	**Peak Elevation of Receiver(m):**	6.91
Level of Construction:	BAL 29	**Fire Intensity(kW/m):**	20628
Radiant Heat(kW/m2):	27.24	**Flame Angle (degrees):**	64
Flame Length(m):	15.38	**Maximum View Factor:**	0.423
Rate Of Spread (km/h):	2	**Inner Protection Area(m):**	18
Transmissivity:	0.848	**Outer Protection Area(m):**	0

Run Description:	NW - PBP 2018		
Vegetation Information			
Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	1.5 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	22.6	**Overall Fuel Load(t/ha):**	34.1
Site Information			
Site Slope:	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m):	Default	**APZ/Separation(m):**	26
Fire Inputs			
Veg./Flame Width(m):	100	**Flame Temp(K)**	1090
Calculation Parameters			
Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg)	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100
Program Outputs			
Category of Attack:	HIGH	**Peak Elevation of Receiver(m):**	10.34
Level of Construction:	BAL 29	**Fire Intensity(kW/m):**	52991
Radiant Heat(kW/m2):	27.94	**Flame Angle (degrees):**	61
Flame Length(m):	23.64	**Maximum View Factor:**	0.443
Rate Of Spread (km/h):	3.01	**Inner Protection Area(m):**	26
Transmissivity:	0.83	**Outer Protection Area(m):**	0

Run Description: SE - PBP 2006

Vegetation Information

Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	0 Degrees	**Vegetation Slope Type:**	Level
Surface Fuel Load(t/ha):	15	**Overall Fuel Load(t/ha):**	20

Site Information

Site Slope:	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m):	Default	**APZ/Separation(m):**	16

Fire Inputs

Veg./Flame Width(m):	100	**Flame Temp(K)**	1090

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg)	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100

Program Outputs

Category of Attack:	HIGH	**Peak Elevation of Receiver(m):**	6.28
Level of Construction:	BAL 29	**Fire Intensity(kW/m):**	18600
Radiant Heat(kW/m2):	28.4	**Flame Angle (degrees):**	63
Flame Length(m):	14.1	**Maximum View Factor:**	0.437
Rate Of Spread (km/h):	1.8	**Inner Protection Area(m):**	16
Transmissivity:	0.854	**Outer Protection Area(m):**	0

Run Description: SE - PBP 2018

Vegetation Information

Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	0 Degrees	**Vegetation Slope Type:**	Level
Surface Fuel Load(t/ha):	22.6	**Overall Fuel Load(t/ha):**	34.1

Site Information

Site Slope:	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m):	Default	**APZ/Separation(m):**	24

Fire Inputs

Veg./Flame Width(m):	100	**Flame Temp(K)**	1090

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg)	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100

Program Outputs

Category of Attack:	HIGH	**Peak Elevation of Receiver(m):**	9.5
Level of Construction:	BAL 29	**Fire Intensity(kW/m):**	47781
Radiant Heat(kW/m2):	28.1	**Flame Angle (degrees):**	61
Flame Length(m):	21.72	**Maximum View Factor:**	0.443
Rate Of Spread (km/h):	2.71	**Inner Protection Area(m):**	24
Transmissivity:	0.835	**Outer Protection Area(m):**	0

Bushfire Protection Assessment

16 lot subdivision

53B Warriewood Road, Warriewood

15 January 2019

BPAD Bushfire Planning & Design Accredited Practitioner Level 3

DOCUMENT TRACKING

Item	Detail
Project Name	Bushfire Protection Assessment, 16 lot subdivision - 53B Warriewood Road, Warriewood
Project Number	18HNG_11542
Client Name	ZYGT Pty Ltd
Project Manager	Natalie South 1/51 Owen Street, Huskisson NSW 2540 Phone: 02 4201 2266
Prepared by	Natalie South
Reviewed by	Bruce Horkings
Approved by	Bruce Horkings FPAA BPAD L3 Certified Practitioner No. BPAD29963-L3
Status	Final
Version Number	1
Last saved on	15 January 2019

This report should be cited as 'Eco Logical Australia January 2019. Bushfire Protection Assessment, 16 lot subdivision - 53B Warriewood Road, Warriewood'.

ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd with assistance from Craig & Rhodes.

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1 Property and proposal

Table 1: Subject site summary

Street address or property name:	53B Warriewood Road		
Suburb, town or locality:	Warriewood	**Postcode:**	2102
Lot/DP no:	Lot 3 DP 1115877		
Local Government Area:	Northern Beaches Council		
Zoning:	R3 – Medium Density Residential		
Type of development:	Residential subdivision		

1.1 Description of proposal

The proposal is for subdivision of 1 lot into 16 lots (See **Figure 1**).

The subdivision consists of 14 residential lots, 1 public reserve, 1 residue lot and associated roads and infrastructure.

1.2 Assessment process

The proposal was assessed in accord with Section 100B of the *Rural Fires Act 1997* and 'Planning for Bush Fire Protection 2006' (RFS 2006), herein referred to as PBP (See **Appendix A** for a summary of the assessment process).

Assessment included a review of background documentation, design team consultation and GIS analysis.

Table 2 identifies the bushfire protection measures assessed and whether these involved acceptable or performance solutions.

Table 2: Summary of bushfire protection measures assessed

Bushfire Protection Measure	Acceptable Solution	Performance Solution	Report Section
Asset Protection Zones	☑	☐	3.1
Construction standard	☑	☐	3.3
Access	☑	☐	3.4
Water supply	☑	☐	3.5
Gas and electrical supplies	☑	☐	3.5

1.3 Bush fire prone land status

The subdivision includes land classified as bush fire prone on the Northern Beaches Council's bush fire prone land (BFPL) map[1].

[1] https://www.planningportal.nsw.gov.au/find-a-property

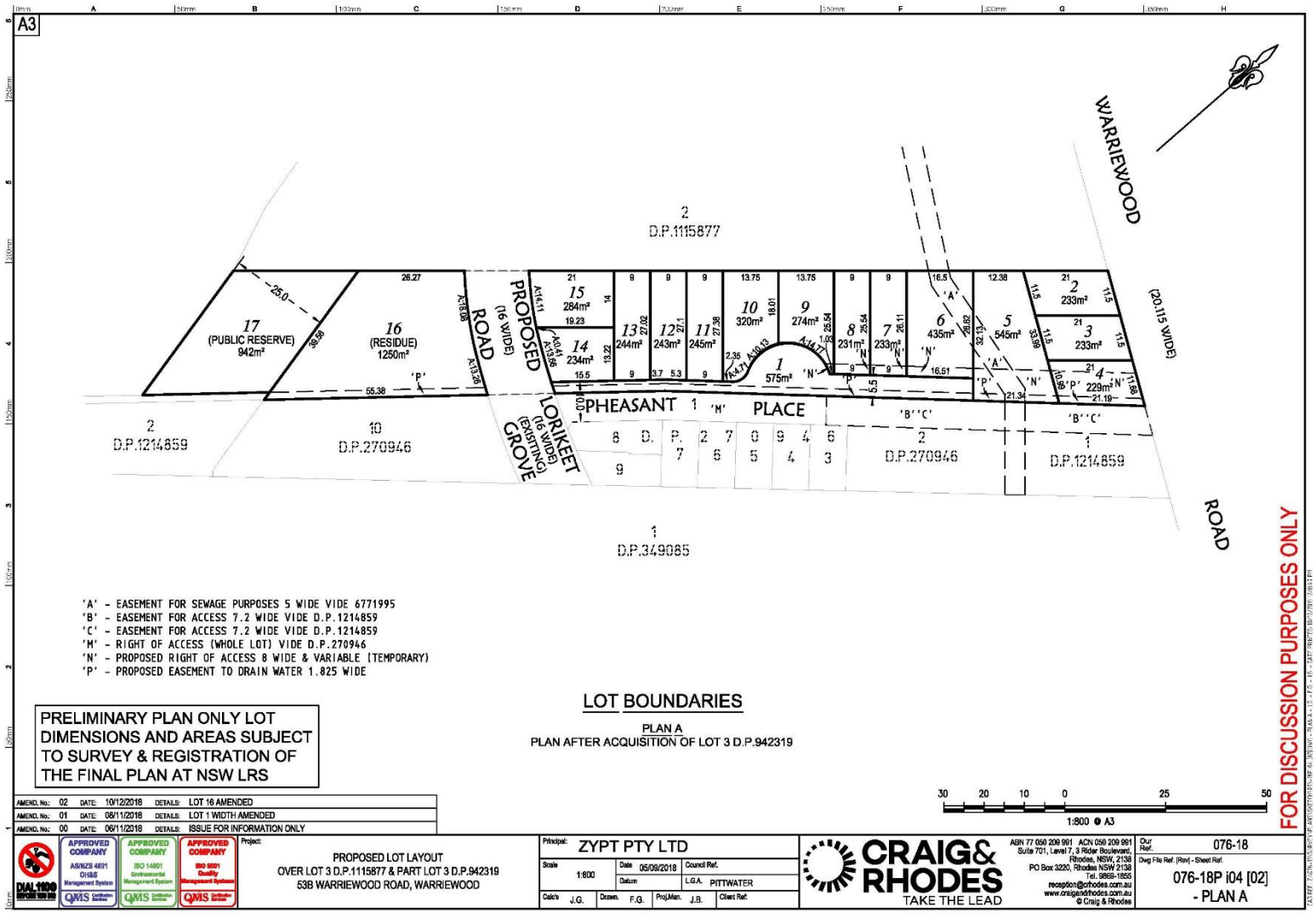


Figure 1: Subdivision layout

2 Bushfire threat assessment

Figure 2 shows the effective slope and predominant vegetation on transect lines representing the highest bushfire threat potentially posed to the subdivision from various directions.

The effective slope has been determined from 10 m contour data and the predominant vegetation has been determined from previous site inspections of the area.

There are two (2) areas of bushfire hazard found within 140 metres of the proposed subdivision perimeter. The closest hazard to the subject land consists of the remnant riparian forest conserved within the Narrabeen Creek riparian corridor and associated buffer adjacent to the south-western boundary of the proposed subdivision. The corridor consists predominantly of highly disturbed and scattered forested wetland vegetation, with a predominate understorey of weed species and exotic grasses.

As shown in **Figure 2**, the riparian 'buffer' vegetation directly adjoins the south-western boundary of the subject land and extends to the north-west. Part of this development proposal will include revegetation of the entire public reserve (proposed Lot 17) resulting in the bushfire hazard extending onto the subject land. The riparian corridor is approximately 60 m wide and classified as 'forested wetland' under PBP. The effective slope falls under the PBP slope category of '>0-5 degrees downslope'.

The second hazard is present within the riparian corridor and properties to the south-east of the subject land. However, these hazard areas are separated form the subject site by existing managed and cleared lands within the neighbouring property to the immediate east. These areas are included within the Narrabeen Creek riparian 'buffer' and is also classified as forested wetland. The effective slope under this hazard falls under the PBP slope category of 'all upslopes and flat land'.

Figure 2 and **Table 3** show the vegetation and slope information assessed. Where required additional information is provided within **Table 3** on why and how the chosen slope and vegetation has been calculated.

The site is located within the Local Government Area (LGA) of Northern Beaches Council and has a Fire Danger Index (FDI) of 100.

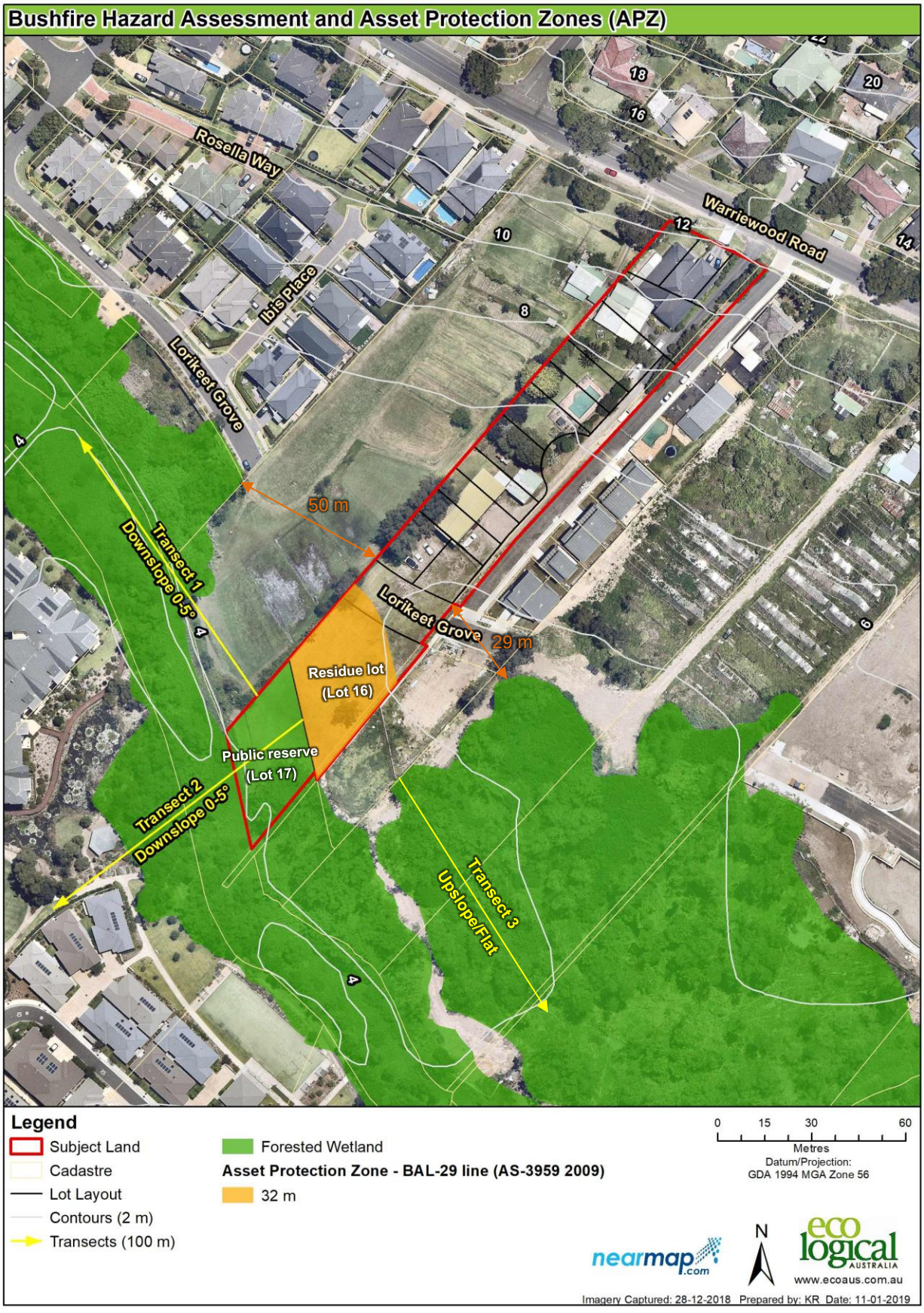


Figure 2: Bushfire hazard assessment and Asset Protection Zones (APZ)

3 Bushfire protection measures

3.1 Asset Protection Zones (APZ)

Table 3 shows the dimensions of the Asset Protection Zones (APZ) required in each of the transect line directions; and where relevant, information on how the APZ is to be provided is included. The footprint of the required APZ is also shown in **Figure 2**.

3.2 APZ maintenance plan

Part of the required APZ is provided by proposed residue lot (Lot 16) and proposed Lorikeet Grove extension (see **Figure 1**). Where the APZ is to be established it is to be managed to Inner Protection Area standards as follows:

- No tree or tree canopy is to occur within 2 m of the future building rooflines;
- The presence of a few shrubs or trees in the APZ is acceptable provided they:
  - Are well spread out and do not form a continuous canopy;
  - Are not species that retain dead material or deposit excessive quantities of ground fuel in a short period or in a danger period; and
  - Are located far enough away from the building so that they will not ignite future buildings by direct flame contact or radiant heat emission.
- Any landscaping or plantings should preferably be local endemic mesic species or other low flammability species;
- A minimal ground fuel is to be maintained to include less than 4 tonnes per hectare of fine fuel (fine fuel means ANY dead or living vegetation of <6 mm in diameter e.g. twigs less than a pencil in thickness. 4 t/ha is equivalent to a 1 cm thick layer of leaf litter); and
- Any structures storing combustible materials such as firewood (e.g. sheds) must be sealed to prevent entry of burning debris.

Further details on APZ implementation and management can be found on the NSW RFS website including:

https://www.rfs.nsw.gov.au/__data/assets/pdf_file/0010/13321/Standards-for-Asset-Protection-Zones.pdf.

Table 3: Bushfire hazard assessment and APZ requirements

Lot # OR direction from development boundary	Transect #	Slope	Vegetation	PBP required APZ (PBP 2006)	BAL-29 required APZ (AS 3959-2009)	Proposed APZ	Comments
North-west	1	Downslope >0 to 5 degrees	Forested Wetland	20 m	32 m	≥32 m	APZ provided by managed lands within 53A adjoining the north-western boundary.
South-west	2	Downslope >0 to 5 degrees	Forested Wetland	20 m	32 m	≥32 m	APZ provided proposed residue lot (Lot 16) and proposed Lorikeet Grove extension.
South-east	3	All upslopes and flat land	Forested Wetland	15 m	25 m	≥25 m	APZ provided by managed land within 53C adjoining the south-eastern boundary.

3.3 Construction standard

The Bushfire Attack Level (BAL) for future dwellings within the proposed subdivision will be determined at the individual dwelling Complying Development Certificate (CDC) or Development Application (DA) stage, however, a maximum of BAL-29 is provided by the subdivision design using AS 3959-2009 fuel loads.

3.4 Access

Public road access to the subdivision is via an extension to Lorikeet Grove which forms part of the existing residential development areas to the north-west and south-east of the subject site. The proposed public road layout within the subdivision consists of a central public road, providing a perimeter road between the proposed lots and the riparian corridor. Lot 16 is situated on the riparian corridor side of the public road however, as this lot is not proposed to be developed. There is no perimeter road proposed for the north-western boundary as there is no bushfire hazard and this will be subject to future development as part of the Warriewood Valley Release Area.

As shown in **Figure 1**, the proposed development utilises the existing 'temporary' access handle from the development to the south-east which runs to the north-east connecting with Warriewood Road. The access handle is temporary in terms of providing access to the residential lots from Warriewood Road until the further stages of development are complete to the north-west and south-east of the subject site. The proposed road layout will provide direct public road access to all of the proposed lots within that portion of the site.

One the surrounding road network is completed, the 'temporary' access handle will become a dead end road consisting of a cul-de-sac which will access proposed Lots 9-13 and a 5.5 m paved roadway extending beyond the cul-de-sac which will provide access to proposed lots 5 – 8. The dead end road will require a 12 m outer radius circle to comply with PBP as per specifications in **Table 6**.

The performance criteria and acceptable solutions for each of these access types are shown in **Appendix B**, along with comment on the subdivision design compliance or otherwise. All access within the subdivision meets the acceptable solutions within PBP.

3.5 Services – Water, electricity and gas

3.5.1 Water

The proposal will be serviced by a reticulated water supply. **Table 4** identifies the acceptable solution requirements of Section 4.1.3 of PBP for which the proposal is compliant with, subject to the following specifications:

Table 4: Performance criteria for reticulated water supplies (PBP page 27)

Performance Criteria	Acceptable Solutions	Complies
The intent may be achieved where:		
• water supplies are easily accessible and located at regular intervals	• reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads.	Can comply
	• fire hydrant spacing, sizing and pressures comply with AS 2419.1 – 2005. Where this cannot be met, the RFS will require a test report of the water pressures anticipated by the relevant water supply authority. In such cases, the location, number and sizing of hydrants shall be determined using fire engineering principles.	Can comply
	• hydrants are not located within any road carriageway	Can comply
	• all above ground water and gas service pipes external to the building are metal, including and up to any taps.	Can comply
	• the provisions of parking on public roads are met.	Can comply

3.5.2 Electricity services

Electricity supply to / within the subject land is located underground and therefore complies with Section 4.1.3 of PBP.

3.5.3 Gas services

Gas services (reticulated or bottle gas) are compliant with Section 4.1.3 of PBP, subject to the following specifications:

- Any gas services are to be installed and maintained in accordance with Australian Standard AS/NZS 1596 *The storage and handling of LP Gas* (SA 2014). Metal piping is to be used;
- All fixed gas cylinders are kept clear of all flammable materials to a distance of 10 metres and shielded on the hazard side of the installation;
- If gas cylinders need to be kept close to the building, the release valves are directed away from the building and at least 2 metres away from any combustible material, so that they do not act as a catalyst to combustion. Connections to and from gas cylinders are metal; and
- Polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not used.

4 Assessment of environmental issues

An assessment of significant environmental features, threatened species or Aboriginal relics identified under the *Biodiversity Conservation Act 2016* or the *National Parks Act 1974* that will affect or be affected by the bushfire protection proposals in this report has not been undertaken as it is covered by other parts of the DA process. However, site impacts have been minimised by carefully selected bushfire protection measures. The impact footprint of these measures e.g. APZ is clearly identified within this report and therefore capable of being clearly assessed by suitably qualified persons as required.

Northern Beaches Council is the determining authority for this development; they will assess more thoroughly any potential environmental and heritage issues.

5 Conclusion

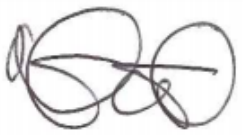
The proposed subdivision complies with either the acceptable or performance solutions within 'Planning for Bush Fire Protection 2006', (see **Table 2**). All performance solutions used are substantiated within the section of this assessment identified in **Table 5**.

Table 5: Summary of bushfire protection measures assessed

Bushfire Protection Measures	Complies	Requirements	Acceptable Solution	Performance Solution	Report Section
Asset Protection Zones	☑	APZ dimensions are detailed in **Table 3** and **Figure 2**.	☑	☐	3.1
APZ Maintenance plan	☑	Identified APZ to be maintained in perpetuity to the detailed specifications in **Section 3.2**.	☑	☐	3.2
Construction standard	☑	BAL for dwellings to be determined at individual CDC/DA stage however, a maximum of BAL-29 (using AS 3959-2009 fuel loads) is achievable.	☑	☐	3.3
Access	☑	Access to meet standards detailed in **Table 6**.	☑	☐	3.4
Water supply	☑	Reticulated water supply to meet PBP acceptable solution specifications for a subdivision.	☑	☐	3.5.1
Electricity service	☑	Electricity supply located underground.	☑	☐	3.5.2
Gas service	☑	Gas services are to be installed and maintained in accordance with AS/NZS 1596:2014.	☑	☐	3.5.3

6 Recommendations

It is recommended that the subdivision be issued a Bush Fire Safety Authority.



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7 References

Industry Safety Steering Committee 3 (ISSC3). 2016. *ISSC3 Guide for the Management of Vegetation in the Vicinity of Electricity Assets*. November 2016. NSW.

NSW Rural Fire Service (RFS). 2006. *Planning for Bush Fire Protection: A Guide for Councils, Planners, Fire Authorities, Developers and Home Owners* including the 2010 Appendix 3 Addendum. Australian Government Publishing Service, Canberra.

Standards Australia (SA). 2009. *Construction of buildings in bushfire-prone areas (including Amendments 1 – 3)*, AS 3959-2009. SAI Global, Sydney.

Standards Australia (SA). 2014. *The storage and handling of LP Gas*, AS/NZS 1596:2014. SAI Global, Sydney.

Standards Australia (SA). 2017. *Fire hydrant installations - System design, installation and commissioning*, AS 2419.1, Eighth edition 2017, SAI Global, Sydney.

Appendix A – Assessment process

Vegetation types

In accord with PBP the predominant vegetation class has been assessed for a distance of at least 140 m from the subject land in all directions.

Effective slope

In accord with PBP, the slope that would most significantly influence fire behaviour was determined over a distance of 100 m from the boundary of the proposed development where the vegetation was found.

Asset Protection Zone determination

AS 3959-2009 has been used to determine the width of required Asset Protection Zone (APZ) for the proposed development using the vegetation and slope data identified in **Section 2**.

Appendix B – Access specifications

Table 6: Performance criteria for proposed public roads (PBP page 21)

Performance Criteria	Acceptable Solutions	Complies
The intent may be achieved where:		
• firefighters are provided with safe all weather access to structures (thus allowing more efficient use of firefighting resources)	• public roads are two-wheel drive, all weather roads	Can comply
• public road widths and design that allows safe access for firefighters while residents are evacuating an area	• urban perimeter roads are two-way, that is, at least two traffic lane widths (carriageway 8 metres minimum kerb to kerb), allowing traffic to pass in opposite directions. Non perimeter roads comply with Table 4.1 – Road widths for Category 1 Tanker (Medium Rigid Vehicle)	Complies
	• the perimeter road is linked to the internal road system at an interval of no greater than 500 metres in urban areas	Complies
	• traffic management devices are constructed to facilitate access by emergency services vehicles	Can comply
	• public roads have a cross fall not exceeding 3 degrees	Can comply
	• public 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 direct traffic away from the hazard	Can comply – See recommendation in **Section 3.4**.
	• curves of roads (other than perimeter roads) are a minimum inner radius of six metres	Can comply
	• 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	Can comply
	• there is a minimum vertical clearance to a height of four metres above the road at all times	Can comply
• the capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles	• the capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles (approximately 15 tonnes for areas with reticulated water, 28 tonnes or 9 tonnes per axle for all other areas). Bridges clearly indicated load rating	Can comply

Performance Criteria	Acceptable Solutions	Complies
• roads that are clearly sign posted (with easy distinguishable names) and buildings / properties that are clearly numbered	• public roads greater than 6.5 metres wide to locate hydrants outside of parking reserves to ensure accessibility to reticulated water for fire suppression	Can comply
	• public roads between 6.5 metres and 8 metres wide are No Parking on one side with the services (hydrants) located on this side to ensure accessibility to reticulated water for fire suppression	Can comply
• there is clear access to reticulated water supply	• public roads up to 6.5 metres wide provide parking within parking bays and located services outside of the parking bays to ensure accessibility to reticulated water for fire suppression	Can comply
	• one way only public access roads are no less than 3.5 metres wide and provide parking within parking bays and located services outside of the parking bays to ensure accessibility to reticulated water for fire suppression	Not applicable
• parking does not obstruct the minimum paved width	• parking bays are a minimum of 2.6 metres wide from kerb to kerb edge to road pavement. No services or hydrants are located within the parking bays	Can comply
	• public roads directly interfacing the bush fire hazard vegetation provide roll top kerbing to the hazard side of the road	Not applicable

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