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Bushfire Protection Assessment

Subdivision

53A & 53B Warriewood Road, Warriewood

Sekisui House

DOCUMENT TRACKING

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LIMITATIONS

The bushfire protection measures recommended in this report do not completely remove the risk to life and property, and they do not guarantee that a development will not be impacted by a bushfire event. This is substantially due to the degree of vegetation management, the unpredictable nature and behaviour of fire, and extreme weather conditions.

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Abbreviations

Abbreviation	Description
AS 3959	Australian Standard AS 3959:2018 'Construction of buildings in bushfire-prone areas'
APZ	Asset Protection Zone
BAL	Bushfire Attack Level
BFPL	Bush fire prone land
BPM	Bushfire protection measures
BFSA	Bush Fire Safety Authority
DA	Development Application
DtS	Deemed-to-Satisfy
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
FDI	Fire Danger Index
IPA	Inner Protection Area
NASH	National Association of Steel-framed Housing
NCC	National Construction Code
OPA	Outer Protection Area
PBP	'Planning for Bush Fire Protection 2019' and 'Addendum to Planning for Bush Fire Protection 2022'
RF Act	<i>Rural Fires Act 1997</i>
RFS	NSW Rural Fire Service
SA	Standards Australia

1. Property and Proposal

Table 1 identifies the subject property and outlines the type of development proposed.

Table 1: Subject site and development proposal summary

Street address:	53A & 53B Warriewood Rd, Warriewood
Postcode:	2102
Lot/DP no:	Lot 2 and Lot 3 DP1115877
Local Government Area:	Northern Beaches Council
Fire Danger Index (FDI)	100
Current land zoning:	R3 – Medium Density Residential
Type of development proposed:	Residential subdivision

1.1 Description of Proposal

The proposal is for the five (5) lot Community Title Subdivision of the site, including the future public reserve, the extension of Lorikeet Grove, an internal road, stormwater works, associated landscaping and tree removal to facilitate the future residential development of the site. Three (3) super lots (Lot 3, Lot 4 and Lot 5) are proposed which will be further subdivided at a later date (Figure 1). The subject land is located approximately 22 km north of Sydney Central Business District (CBD).

The subdivision is located on land identified as bush fire prone land (BFPL) within the ePlanning Spatial Viewer¹.

1.2 Assessment Process

The proposal was assessed in accordance with Section 100B of the *Rural Fires Act 1997*, Clause 45 of the *Rural Fires Regulation 2022*, *Planning for Bush Fire Protection* (RFS 2019a) and *Addendum to Planning for Bush Fire Protection* (RFS 2022), herein collectively referred to as PBP.

Being integrated development, the development requires development consent from NSW Rural Fire Service (RFS) in the form of a Bush Fire Safety Authority. The proposed subdivision conforms with PBP by either meeting acceptable solutions or performance criteria as identified in Table 2.

This assessment is based on the following information sources:

- Background documentation provided by Sekisui House;
- Information contained within the site plan provided by Sekisui House, completed by YSCO Geomatics ref: 6321/15B, 'Plan of proposed community scheme subdivision of Lot 2 in unreg. DP. Being 53A&B Warriewood Rd. Warriewood. Northern Beaches LGA', dated 17 April 2024;
- Information contained within the site plan provided by Sekisui House, completed by YSCO Geomatics ref: 6321/16B, 'Plan of proposed subdivision of Lots 2&3 in DP1115877 and Lot 3 in DP942319 Being 53A&B Warriewood Rd. Warriewood. Northern Beaches LGA', dated 17 April 2024;

¹ <https://www.planningportal.nsw.gov.au/spatialviewer/#/find-a-property/address>

- Swept path plan contained within the civil engineering works plan provided by Sekisui House 'DRWG-Civil-210181-00-DA-Enspire-240701-WarriewoodRd Issued for Development Application', dated 1 July 2024;
- GIS analysis including online spatial resources (i.e. Google Earth, SIX Maps, Nearmap and the NSW Government Planning Portal);
- Nearmap aerial imagery dated 7 April 2024; and
- Site inspection previously undertaken on 2 March 2023

Table 2 identifies the bushfire protection measures assessed and whether an acceptable or performance based solution is proposed.

Table 2: Summary of bushfire protection measures assessed

Bushfire Protection Measure	Acceptable Solution	Performance Solution	Report Section
Asset Protection Zones	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	3.1
Landscaping	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.2
Construction standard	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	3.3
Access	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	3.4
Water supply	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.5
Electrical services	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.6
Gas services	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.7

1.3 Significant Environmental Features

An assessment of significant environmental features, threatened species, populations or ecological communities under the *Biodiversity Conservation Act 2016* that may potentially be affected by the proposed bushfire protection measures has not been undertaken in this report as it is covered by other parts of the Development Application (DA) process.

The impact footprint of the bushfire protection measures (e.g. Asset Protection Zone [APZ]) is identified within this report and therefore capable of being assessed by a suitably qualified person. Northern Beaches Council is the determining authority for this development; they will assess more thoroughly any potential environmental issues.

1.4 Aboriginal Cultural Heritage

An assessment of any Aboriginal cultural heritage objects (within the meaning of the *National Parks and Wildlife Act 1974*) that may potentially be affected by the proposed bushfire protection measures has not been undertaken in this report as it is covered by other parts of the Development Application (DA) process.

The impact footprint of the bushfire protection measures (e.g. APZ) is identified within this report and therefore capable of being assessed by a suitably qualified person. Northern Beaches Council is the determining authority for this development; they will assess more thoroughly any potential Aboriginal cultural heritage issues.



Figure 1: Subdivision Layout

2. Bushfire Hazard Assessment

2.1 Process

The site assessment methodology from Appendix 1 of PBP has been applied in this assessment to determine the required APZ for the subdivision development.

Figure 2 and Table 3 show the effective slope and predominant vegetation representing the highest bushfire threat potentially posed to the subdivision from various directions.

2.2 Vegetation Assessment

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

The predominant vegetation has been determined from the State Vegetation Type Map (SVTM; DCCEEW 2022) and revised where required by a site assessment completed in March 2023.

2.3 Slope Assessment

In accordance 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 under the classified vegetation.

The effective slope has been determined from 2 m contour data and revised where required by site assessment.

2.4 Summary of Assessment

The predominant vegetation west to south-east of the proposed subdivision has been determined by the SVTM and identified as 'Northern Paperbark-Swamp Mahogany Saw-sedge Forest' which falls within the 'Coastal Swamp Forest' vegetation class (Keith 2004) and is classified as 'Forest by PBP. The site inspection confirmed the vegetation is predominantly highly disturbed and scattered forested wetland vegetation forming part of Narrabeen Creek riparian corridor.

There are short fire runs (between 68 m and 100 m) towards the site through the vegetation at the west/south-west therefore, this vegetation has been assessed under the Short Fire Run (SFR) modelling approach, Section A1.11.2 of PBP.

The vegetation to the east of the development is classified as 'grassland' under PBP.

The effective slope under the vegetation hazard in the west/south-west has a short downward slope to the creek and a short upslope on the opposite side. As such, the effective slope is considered to be 'all upslopes and flat land'. However, for the purpose of SFR modelling, a conservative approach has been taken for the slope assessment under this vegetation, being '1.5 degrees downslope'.

The effective slope under the vegetation hazard in the south-east falls into the slope category of 'all upslopes and flat land'. The effective slope under the vegetation to the east falls into the slope category of '>0-5 downslope'.

In all other directions, there are managed lands in the form of existing residential development and road reserves connecting to the subdivision development.

Table 3: Bushfire hazard assessment and APZ requirements

Transect #	Slope	PBP Vegetation Formation	Required APZ	Proposed APZ	Comments
T1, T2 & T3 West to south	1.5° downslope	Forest (Coastal Swamp Forest)*	29 m	≥16 m*	*APZ determined using SFR as per A1.11.2 of PBP and detail in Section 3.1.1 below. This modelling of the APZ results in a radiant heat level exposure to buildings not exceeding 29 kW/m². Modelling report is included in Appendix C.
T4 South-east	All upslope and flat land	Forest	24 m	≥24 m	APZ provided by residential development and public road infrastructure.
T5 East	>0° to 5° downslope	Grassland	12 m	≥12 m	APZ provided by residential development and public road infrastructure.
All other directions	Managed Land				



Figure 2: Bushfire Hazard Assessment

3. Bushfire Protection Measures

3.1 Asset Protection Zones

Table 3 shows the dimensions of the required APZ and where relevant, information on how the APZ is to be provided is included. The footprint of the APZ is also shown on Figure 2.

Due to the limited fire runs through the vegetation to the SW-S towards the site, SFR modelling has been used within the NBC Bushfire Attack Assessor (BFAA) tool to determine the APZ as detailed in Section 3.1.1.

The compliance of the proposed APZ with Section 5.3.1 of PBP is documented in Table 4.

Table 4: APZ requirements and compliance (adapted from Table 5.3a of PBP)

Performance Criteria	Acceptable Solutions	Compliance Notes
The intent may be achieved where:		
Potential building footprints will not be exposed to radiant heat levels exceeding 29 kW/m ² on each proposed lot.	APZs are provided in accordance with Tables A1.12.2 and A1.12.3 based on the FDI.	Satisfies Performance Criteria <i>Transects 1-3</i> APZs provided in accordance with a performance solution using SFR as outline in Section 3.1.1 of this report. <i>Transects 4-5</i> APZ provided in accordance with Table A1.12.2 as shown in Table 3 and Figure 2.
APZs are managed and maintained to prevent the spread of a fire towards the building.	APZs are managed in accordance with the requirements of Appendix 4 of PBP.	To comply APZ to be managed in accordance with PBP. Fuel management specifications provided in Appendix A.
The APZ is provided in perpetuity.	APZs are wholly within the boundaries of the development site.	Satisfies Performance Criteria APZ contained within the development site from the west to the south-west and APZ at the south-east and east are contained in the adjoining road reserve and residential development adjacent to the subject land.
APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is minimised.	APZs are located on lands with a slope less than 18 degrees.	Complies APZ is not located on slopes greater than 18°.

3.1.1 Short Fire Run Modelling (T1 – T3)

3.1.1.1 Introduction

The expected bushfire attack from the Coastal Swamp Forest vegetation to the west to the south-west (T1-T3) is reduced by site factors below that of the standard design fire underpinning acceptable

solutions in PBP and Australian Standard (AS) 3959:2018 'Construction of buildings in bushfire-prone areas' (SA 2018). Specifically, the length of fire run and fire width in a bushfire attack is restricted by the juxtaposition of the proposed development with the narrow vegetation corridor.

3.1.1.2 Methodology

The Short Fire Run (SFR) model design is based on the published RFS methodology 'Short Fire Run: methodology for assessing bush fire risk for low risk vegetation' (RFS 2019b) and incorporated into the NBC Bush Fire Attack Assessor (BFAA) v4.1 software tool. This is an accepted methodology under A1.11.2 of PBP for assessing narrow vegetation corridors. The steps are summarised below:

- The growth of a fire is determined using a point ignition from a given location maximising the fire run (travel distance) with the developing fire shape in the form of an ellipse;
- The Length/Breadth (L/B) ratio of the ellipse at its widest point is used to quantify the head fire width (in metres);
- The flame height is calculated using a Project Vesta formula using the elevated fuel height as specified in the RFS methodology;
- The predicted head fire width and flame height is then used as inputs to the Method 2 of AS 3959-2018 using the NBC Bushfire Attack Assessor V4.1 model to determine the modified view factor and radiant heat flux output of the design fires;
- The approach to determine the radiant heat flux exposure and corresponding Bushfire Attack Level (BAL), known as Method 2, is described in 'Appendix B Detailed method for determining the Bushfire Attack Level (BAL) – Method 2' in AS 3959:2018;
- Site specific inputs and bushfire modelling calculations were undertaken using the approved software tool NBC Bushfire Attack Assessor V4.1; and
- The flame width equates to the horizontal dimension whilst the flame height is the vertical dimension of the modified view factor.

3.1.1.3 Site inputs

Specific inputs used to evaluate the design fire is listed below and detailed in Table 5:

- Surface and Overall fuel load values for the Keith formation (2004) Coastal Swamp Forest;
- Fuel load and elevated fuel height data for Coastal Swamp Forest is as listed in RFS SFR methodology (RFS 2019b); and
- The fire run lengths has been measured from a Geographical Information Systems (GIS) as shown in Figure 2.

Table 5: Summary of site-specific inputs for design fire

Transect #	Site slope	Effective Slope	Vegetation	Surface fuel load (t/ha)	Overall fuel load (t/ha)	Elevated fuel height max. (m)	Length of fire run (m)	Flame width (m)
T1	0°	1.5° downslope	Coastal Swamp Forest	22.6	34.1	1.4	100	36.6
T2 & T3	0°	1.5° downslope	Coastal swamp Forest	22.6	34.1	1.4	68	24.89

3.1.1.4 Results and Discussion

Appendix C contains the calculations for both SFR and Method 2 bushfire attack assessor modelling. Based on the SFR model outputs in Table 6, the proposed development can provide the 16 m APZ which achieves $\leq 29 \text{ kW/m}^2$ radiant heat flux.

Table 6: Summary of Short Fire Run Model results

Design Fire #	Separation Distance (m)	Radiant Heat (kW/m^2)	Level of Construction
T1 – T3 (West to south-west)	≥ 16	≤ 28.89	BAL-29

3.2 Landscaping

The compliance of the proposed landscaping with Section 5.3.1 of PBP is documented in Table 7.

Table 7: Landscaping requirements and compliance (adopted from Table 5.3a of PBP)

Performance Criteria	Acceptable Solutions	Compliance Notes
The intent may be achieved where:		
Landscaping is managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven embers to cause ignitions.	Landscaping is in accordance with Appendix 4 of PBP; and	To comply APZ / Landscaping is to be designed and managed in accordance with PBP. Landscaping specifications provided in Appendix A.
	Fencing is constructed in accordance with Section 7.6 of PBP.	To comply Fencing to be constructed in accordance with Section 7.6 of PBP (see Section 3.3.1 for further details).

3.3 Construction Standards

The Bushfire Attack Level (BAL) for future dwellings within the proposed subdivision will be determined during the individual dwelling Complying Development Certificate (CDC) or DA process, however, a maximum of BAL-29 is provided by the subdivision design.

Lot 1, Lot 2 and Lot 4 may require a performance solution using SFR to demonstrate a BAL of \leq BAL-29 at individual DA stage.

3.3.1 Fences and Gates

To comply with Section 7.6 of PBP, all fencing and gates are to be constructed of hardwood or non-combustible material. Where fencing is within 6 m of a building or in areas of BAL-29 or greater, they should be made of non-combustible material only.

3.3.2 Class 10a Buildings (sheds etc.)

To comply with Section 8.3.2 of PBP, future Class 10a structures within 6 m of any proposed dwelling must be constructed in accordance with the NCC. Where the structure is greater than 6 m, no bushfire requirements apply.

3.4 Access

Public road access to the subdivision is via Lorikeet Grove and Pheasant Place.

Figure 1 and Figure 2 show the internal and perimeter access within the subdivision, with Figure 1 identifying how each road type has been assessed. The performance criteria and acceptable solutions for each of these access types are shown in Table 15, Table 16 and Table 17 (Appendix B), along with comment on the subdivision design compliance or otherwise.

A summary of the compliance assessment with PBP can be found in Table 8 below whilst all access performance solutions are detailed in Table 9.

Table 8: Access summary of compliance

Access type	Acceptable Solution	Performance Solution	Further details
General	☑	☑	Table 9 and Table 15
Perimeter road	☑	☑	Table 9 and Table 16
Non-perimeter road	☑	☑	Table 9 and Table 17
Property Access	N/A	N/A	N/A

Table 9: Access performance solution

Assessment Item #	Access Type	Description	Performance Criteria	Acceptable Solution	Comments
1	General	Perimeter road	Firefighting vehicles are provided with safe, all-weather access to structures	Perimeter roads are provided for residential subdivisions of three or more allotments;	<p>Perimeter access is provided to the east by the existing road (Pheasant Place) on the adjoining subdivision.</p> <p>Lorikeet Grove provides perimeter access along the south-west to south-east however, there is no perimeter road to Lot 2 (South of Lorikeet Grove). The Performance Criteria is met based on the following:</p> <ul style="list-style-type: none"> • Firefighting vehicles are provided safe-all weather access to the future dwelling on Lot 2 as it will be no greater than 70 m (from its furthest point) from a hydrant on Lorikeet Grove. • Furthermore, firefighters will have direct access to the hazard in the south-west (including the rear of Lot 2) via the managed Council reserve.
2				<p>All roads are through roads;</p> <p>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;</p>	<p>All roads are through roads aside from Road 01 however, this roads is <200 m in length and provides a 'T' turning area to access 5 lots. The 'T' turning area <u>does not</u> meet the PBP vehicle turning head requirements of Figure A3.3 however, the PBP performance criteria is met based on the following:</p> <ul style="list-style-type: none"> • The 'T' turning area provides 11 m long arms and is suitable for a Category 1 firefighting vehicle to manoeuvre, refer swept path diagram (Figure 4) which is based on Heavy Rigid Vehicle design specifications.
3	General	Perimeter road (Lorikeet Grove)	Firefighting vehicles are provided with safe, all-	Where kerb and guttering is provided on perimeter roads, roll	Lorikeet Grove provides upright kerbing to the hazard side of the road. It is understood Council requires upright kerbing for

Assessment Item #	Access Type	Description	Performance Criteria	Acceptable Solution	Comments
			weather access to structures	top kerbing should be used to the hazard side of the road;	pedestrian safety and restriction to illegal parking. The PBP performance criteria is met based on the following: <ul style="list-style-type: none"> The kerb design allows firefighting vehicles access to mount kerb.
4	General	All 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.	15t capacity is proposed, the PBP performance criteria is achieved based on the following: <ul style="list-style-type: none"> Capacity is suitable for a Category 1 tanker, the site is unlikely to be serviced by anything larger than a Cat 1 tanker given these are the largest most used in these urban scenarios, therefore 15t is considered sufficient.
5	Perimeter Roads	Lorikeet Grove	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 during firefighting and emergency management on the interface.	Minimum 8m carriageway width kerb to kerb;	Lorikeet Grove provides a 7.5 m wide carriageway (no allowance for parking outside of this) and incorporates the following features: <ul style="list-style-type: none"> Typical section (Figure 3) shows 2 x 3.75 m lanes; Parking must be prohibited on the hazard side of the road; Furthermore, the low hazard riparian corridor and short fire runs in forested wetland are of a lower bushfire risk; and The road design is consistent with approved and constructed Lorikeet Grove which the perimeter road is an extension of. Potentially the carriageway is 5.4 m (no parking on hazard side and 2.1 m available for parking on parts of non-hazard side). The PBP performance criteria based on the following:

Assessment Item #	Access Type	Description	Performance Criteria	Acceptable Solution	Comments
					<ul style="list-style-type: none"> Access roads are designed to allow safe access/egress for firefighting vehicles while residents evacuate by; <ul style="list-style-type: none"> The 5.4 m carriageway allows safe passing for 2.4 m wide Category 1 firefighting vehicle and residents evacuating simultaneously; and Road will prohibit parking to hazard side ensuring no obstructions. Access roads are designed to allow safe operational environment for emergency service personnel during firefighting and emergency management on the interface; <ul style="list-style-type: none"> The 5.4 m carriageway allows safe passing for firefighting vehicles simultaneously based on Category 1 tanker width of 2.4 m; and Road will prohibit parking to hazard side ensuring no obstructions.
6	Perimeter Roads	Lorikeet Grove	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 during firefighting and emergency management on the interface.	Parking provided outside of the carriageway width;	The perimeter road design does not provide designated parking outside the carriageway width. Parking will be permitted within the 7.5 m carriageway to the non-hazard side only. The PBP performance criteria is met based on the performance solution in assessment item #5 above.

Assessment Item #	Access Type	Description	Performance Criteria	Acceptable Solution	Comments
7	Non-perimeter roads	Road 01 and 02	Access roads are designed to allow safe access and egress for firefighting vehicles while residents are evacuating.	Parking is provided outside of the carriageway width;	<p>The non-perimeter roads provide 7.5 m wide carriageway (Figure 3) (no allowance for parking outside of this) and incorporates the following features:</p> <ul style="list-style-type: none"> • Typical section shows (Figure 3) 2 x 3.75 m lanes; and • No designated parking bays outside of carriageway. <p>Potentially the carriageway is 5.4 m (no parking on one side).</p> <p>The PBP performance criteria based on the following:</p> <ul style="list-style-type: none"> • Access roads are designed to allow safe access/egress for firefighting vehicles while residents evacuate by; <ul style="list-style-type: none"> ○ The 5.4 m carriageway allows safe passing for 2.4 m wide Category 1 firefighting vehicle and residents evacuating simultaneously; and ○ Road will prohibit parking to one side of the road to ensure no obstructions.
8	Non-perimeter roads	Road 01	Access roads are designed to allow safe access and egress for firefighting vehicles while residents are evacuating.	Roads are through roads, and these are linked to the internal road system at an interval of no greater than 500m;	<p>Road 01 is a dead end road however, the road is linked to an internal road system at an interval <500 m.</p> <p>The PBP performance criteria is met based on the performance solution in assessment item #2.</p>

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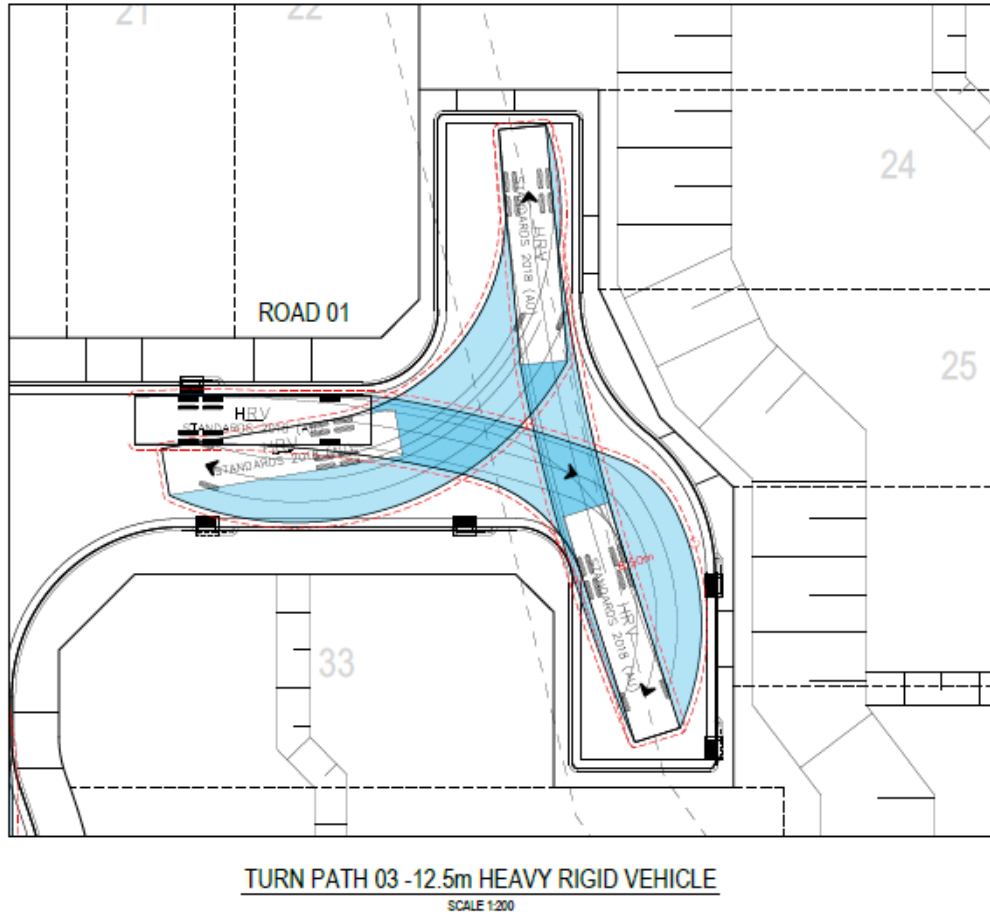


Figure 4: Road 01 'T' turning area swept path diagram.

3.5 Water Supplies

The compliance assessment of the proposed water supply with Section 5.3.3 of PBP is documented in Table 10.

Table 10: Assessment of requirements for the supply of water services (adapted from Table 5.3c of PBP)

Performance Criteria	Acceptable Solution	Compliance Notes
Adequate water supplies is provided for firefighting purposes.	<ul style="list-style-type: none"> 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. 	To comply Proposal to be serviced by a reticulated water supply.
Water supplies are located at regular intervals; and The water supply is accessible and reliable for firefighting operations.	<ul style="list-style-type: none"> Fire hydrant, spacing, design and sizing complies with the relevant clauses of AS 2419.1:2021 <i>Fire hydrant installations – System design, installation and commissioning</i> (SA 2021); 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. 	To comply The advice of a relevant authority or suitably qualified professional should be sought, for certification of design and installation in accordance with relevant legislation, Australian Standards and Table 5.3c and Table 5.3d of PBP.
Flows and pressure are appropriate.	<ul style="list-style-type: none"> Fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1:2021 (SA 2021). 	

Performance Criteria	Acceptable Solution	Compliance Notes
The integrity of the water supply is maintained.	<ul style="list-style-type: none"> 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. 	To comply

3.6 Electricity Services

The compliance assessment of the proposed supply of electricity services with Section 5.3.4 of PBP is documented in Table 11.

Table 11: Assessment of requirements for the supply of electricity services (adapted from Table 5.3c of PBP)

Performance Criteria	Acceptable Solution	Compliance Notes
Location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of buildings.	<p>Where practicable, electrical transmission lines are underground;</p> <p>Where overhead, electrical transmission lines are proposed as follows:</p> <ul style="list-style-type: none"> 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 <i>ISSC3 Guide for the Management of Vegetation in the Vicinity of Electricity Assets</i> (ISSC3 2016). 	<p>Complies</p> <p>Electricity services to the subject site are located underground.</p> <p>N/A</p>

3.7 Gas Services

The compliance assessment of the proposed supply of gas services (reticulated or bottle gas) with Section 5.3.4 of PBP is documented in Table 12.

Table 12: Assessment of requirements for the supply of gas services (adapted from Table 5.3c of PBP)

Performance Criteria	Acceptable Solution	Compliance Notes
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 <i>AS/NZS 1596:2014 The Storage and handling of LP Gas</i> (SA 2014), the requirements of relevant authorities, and metal piping is used;</p> <ul style="list-style-type: none"> All fixed gas cylinders are kept clear of all flammable materials to a distance of 10 m and shielded on the hazard side; Connections to and from gas cylinders are metal; Polymer-sheathed flexible gas supply lines are not used; and Above-ground gas service pipes are metal, including and up to any outlets. 	<p>To comply</p> <p>The advice of a relevant authority or suitably qualified professional should be sought, for certification of design and installation in accordance with relevant legislation, Australian Standards and Table 5.3c of PBP.</p>

3.8 Staged Development

The proposed development will not be staged.

4. Conclusion

The proposed subdivision has been assessed against the specifications and requirements of PBP, as outlined in Table 13.

Table 13: Development bushfire protection measures and associated recommendations

Bushfire Protection Measures	Recommendations	Acceptable Solution	Performance Solution	Report Section
Asset Protection Zones	APZ dimensions are detailed in Table 3 and shown in Figure 2. Identified APZ to be maintained in perpetuity to the specifications detailed in Appendix A.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	3.1
Landscaping	Any future landscaping is to meet the requirements of PBP listed in Appendix A.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.2
Construction standard	BAL for dwellings to be determined at individual CDC/DA stage however, a maximum of BAL-29 is achievable.	<input type="checkbox"/>	<input type="checkbox"/>	3.3
Access	Access to meet standards summarised in Table 8 and street typical Section (Figure 3). Performance solution(s) detailed in Table 9 and Appendix B addresses the requirement for a perimeter road (to Lot 2), road widths and parking etc as specified in Table 15 to Table 17. Key implementation requirements include: 1. Parking prohibited to hazard side of perimeter road; and 2. Parking prohibited to one side of non-perimeter road.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	3.4
Water supply	Reticulated water supply to meet PBP specifications for a subdivision.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.5
Electricity service	Electricity supply located underground.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.6
Gas service	Gas services are to be installed and maintained in accordance with AS/NZS 1596:2014.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3.7

5. Recommendations

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



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6. References

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- National Association of Steel Framed Housing (NASH). 2021. *Steel Framed Construction in Bush Fire Prone Areas (NS300)*. NASH, Melbourne.
- NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW). 2022. *NSW State Vegetation Type Map*. Updated 30 November 2023. State Government of NSW.
- NSW Rural Fire Service (RFS). 2019a. *Planning for Bush Fire Protection: A Guide for Councils, Planners, Fire Authorities, Developers and Homeowners - issued December 2019*. NSW RFS, Sydney.
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- Standards Australia (SA). 2018. *Construction of buildings in bushfire-prone areas (including Amdt 1 and 2), AS 3959:2018*. SAI Global, Sydney.
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Appendix A - Asset Protection Zone and Landscaping Standards

The APZs specified in Table 3 and shown in Figure 2 are to be managed to IPA specifications Table 14. The identified APZs are to be maintained in perpetuity and management undertaken on an annual basis (as a minimum) and prior to the commencement of the bushfire season.

These APZ management specifications should be considered for any future landscaping and maintenance.

Further details on APZ implementation and management can be found on the NSW RFS website (<https://www.rfs.nsw.gov.au/resources/publications>).

Table 14: APZ management specifications

Vegetation Strata	Inner Protection Area (IPA)	Outer Protection Area (OPA)
Trees	<ul style="list-style-type: none"> Tree 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; and Preference should be given to smooth barked and evergreen trees. 	<ul style="list-style-type: none"> Tree canopy cover should be less than 30%; and Canopies should be separated by 2 to 5 m.
Shrubs	<ul style="list-style-type: none"> Create large discontinuities or gaps in the vegetation to slow down or break the progress of fire towards buildings should be provided; Shrubs should not be located under trees; Shrubs should not form more than 10% ground cover; and Clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation. 	<ul style="list-style-type: none"> Shrubs should not form a continuous canopy; and Shrubs should form no more than 20% of ground cover.
Grass	<ul style="list-style-type: none"> Should be kept mown (as a guide grass should be kept to no more than 100 mm in height); and Leaves and vegetation debris should be removed. 	<ul style="list-style-type: none"> Should be kept mown to a height less than 100 mm; and Leaf and other debris should be removed.

Appendix B - Access Standards

Table 15: General access requirements (adapted from Table 5.3b of PBP)

Performance Criteria	Acceptable Solutions	Compliance notes
The intent may be achieved where:		
Firefighting vehicles are provided with safe, all-weather access to structures.	Property access roads are two-wheel drive, all-weather roads;	Not applicable No property access roads proposed.
	Perimeter roads are provided for residential subdivisions of three or more allotments;	Complies with acceptable solution AND performance criteria Perimeter road is provided to all lots ASIDE from Proposed Lot 2. The Performance solution is detailed in Table 9.
	Subdivisions of three or more allotments have more than one access in and out of the development;	Complies The subdivision can be accessed via Lorikeet Grove (north-west) and Pheasant Circuit (north-east) which connects to Warriewood Road.
	Traffic management devices are constructed to not prohibit access by emergency services vehicles;	To comply Detail not provided at this stage.
	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;	To comply Detail not provided at this stage.
	All roads are through roads;	Complies with performance criteria The performance solution is detailed in Table 9.
	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;	Complies with performance criteria The performance solution is detailed in Table 9.
	Where kerb and guttering is provided on perimeter roads, roll top kerbing should be used to the hazard side of the road;	Complies with performance criteria The performance solution is detailed in Table 9.

Performance Criteria	Acceptable Solutions	Compliance notes
	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;	Complies Two (2) access/egress points are provided i.e. via Lorikeet Grove (south-west) and the existing Pheasant Circuit (east) which connects to Warriewood Road.
	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.	Not applicable No one-way public roads proposed.
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.	Complies with performance criteria The performance solution is detailed in Table 9.
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;	To comply Detail not provided at this stage.
	Hydrants are provided in accordance with the relevant clauses of AS 2419.1:2017 – Fire hydrant installations system design, installation and commissioning; and	To comply The advice of a relevant authority or suitably qualified professional should be sought, for certification of design and installation in accordance with relevant legislation, Australian Standards and Table 5.3c of PBP
	There is suitable access for a Category 1 fire appliance to within 4m of the static water supply where no reticulated supply is available.	Not applicable Subdivision serviced by reticulated water.

Table 16: Perimeter road requirements (adapted from Table 5.3b of PBP)


Performance Criteria	Acceptable Solutions	Compliance Notes
The intent may be achieved where:		
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 during firefighting and emergency management on the interface.	Are two-way sealed roads;	Complies The perimeter road (Lorikeet Grove) will be a sealed and two-way road.
	Minimum 8m carriageway width kerb to kerb;	Complies with performance criteria Performance solution detailed in Table 9.

Performance Criteria	Acceptable Solutions	Compliance Notes
	Parking provided outside of the carriageway width;	Complies with performance criteria Performance solution detailed in Table 9.
	Hydrants are located clear of parking areas;	To comply Detail not provided at this stage.
	There are through roads, and these are linked to the internal road system at an interval of no greater than 500m;	Complies Perimeter road is a through road and connects with public road network (internal or external) at intervals <500 m.
	Curves of roads have a minimum inner radius of 6m;	To comply The advice of a relevant authority or suitably qualified professional should be sought, for certification of design and installation in accordance with relevant legislation, Australian Standards and Table 5.3b of PBP.
	The maximum grade road is 15 degrees and average grade is 10 degrees;	
	The road crossfall does not exceed 3 degrees;	
	A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.	

Table 17: Non-perimeter road requirements (adapted from Table 5.3b of PBP)

Performance Criteria	Acceptable Solutions	Compliance notes
The intent may be achieved where:		
Access roads are designed to allow safe access and egress for firefighting vehicles while residents are evacuating.	Minimum 5.5m width kerb to kerb;	Complies All non-perimeter roads provide 7.5 m wide carriageways.
	Parking is provided outside of the carriageway width;	Complies with performance criteria Performance solution detailed in Table 9.
	Hydrants are located clear of parking areas;	To comply Detail not provided at this stage.
	Roads are through roads, and these are linked to the internal road system at an interval of no greater than 500m;	Complies with performance criteria Performance solution detailed in Table 9.
	Curves of roads have a minimum inner radius of 6m	To comply The advice of a relevant authority or suitably qualified professional should be sought, for certification of design and installation in accordance with relevant legislation, Australian Standards and Table 5.3b of PBP.
	The road crossfall does not exceed 3 degrees;	
	A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.	

Appendix C – Bushfire Attack Assessor Modelling

 NBC Bushfire Attack Assessment Report V4.1 AS3959 (2018) Appendix B - Detailed Method 2 Print Date: 10/07/2024 Assessment Date: 20/03/2024	
Site Street Address:	53A & 53B Warriewood Road, Warriewood
Assessor:	Bruce Horkings; Eco Logical Australia (ELA)
Local Government Area:	Northern Beaches Alpine Area: No
Equations Used	
Transmissivity: Fuss and Hammins, 2002 Flame Length: RFS PBP, 2001/Vesta/Catchpole 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 Short Fire Run - Methodology for Assessing Bush Fire Risk for Low Risk Vegetation May 2019; NSW RFS	
Run Description:	T1 - SFR
Vegetation Information	
Vegetation Type:	Coastal Swamp Forests
Vegetation Group:	Forested Wetlands
Vegetation Slope:	1.5 Degrees Vegetation Slope Type: Downslope
Surface Fuel Load(t/ha):	22.6 Overall Fuel Load(t/ha): 34.1
Vegetation Height(m):	1.4 Only Applicable to Shrub/Scrub and Vesta
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):	36.6 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	
Level of Construction:	BAL 29 Peak Elevation of Receiver(m): 6.34
Radiant Heat(kW/m2):	28.89 Flame Angle (degrees): 55
Flame Length(m):	15.47 Maximum View Factor: 0.443
Rate Of Spread (km/h):	3.01 Inner Protection Area(m): 16
Transmissivity:	0.858 Outer Protection Area(m): 0
Fire Intensity(kW/m):	52991
Short Fire Run Calculations	
Fire Run(m):	100 Length to Breadth Ratio: 2.82
Full Ellipse Length(m):	100.75 Headfire Backfire Ratio: 29.85
Travel Duration (mins):	1.99 Total Ellipse Length(m): 103.35
ROS and H/B Ratio:	51.81
BAL Thresholds	
	BAL-40: BAL-29: BAL-19: BAL-12.5: 10 kw/m2: Elevation of Receiver
Asset Protection Zone(m):	13 16 22 28 39 6

Run Description: T2 - SFR	
<u>Vegetation Information</u>	
Vegetation Type:	Coastal Swamp Forests
Vegetation Group:	Forested Wetlands
Vegetation Slope:	1.5 Degrees
Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	22.6
Overall Fuel Load(t/ha):	34.1
Vegetation Height(m):	1.4
	Only Applicable to Shrub/Scrub and Vesta
<u>Site Information</u>	
Site Slope:	0 Degrees
Site Slope Type:	Level
Elevation of Receiver(m):	Default
APZ/Separation(m):	16
<u>Fire Inputs</u>	
Veg./Flame Width(m):	24.89
Flame Temp(K):	1090
<u>Calculation Parameters</u>	
Flame Emissivity:	95
Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600
Ambient Temp(K):	308
Moisture Factor:	5
FDI:	100
<u>Program Outputs</u>	
Level of Construction:	BAL 29
Peak Elevation of Receiver(m):	6.01
Radiant Heat(kW/m2):	26.09
Flame Angle (degrees):	51
Flame Length(m):	15.47
Maximum View Factor:	0.399
Rate Of Spread (km/h):	3.01
Inner Protection Area(m):	16
Transmissivity:	0.86
Outer Protection Area(m):	0
Fire Intensity(kW/m):	52991
<u>Short Fire Run Calculations</u>	
Fire Run(m):	68
Length to Breadth Ratio:	2.82
Full Ellipse Length(m):	100.75
Headfire Backfire Ratio:	29.85
Travel Duration (mins):	1.36
Total Ellipse Length(m):	70.28
ROS and H/B Ratio:	51.81
<u>BAL Thresholds</u>	
	BAL-40: BAL-29: BAL-19: BAL-12.5: 10 kw/m2: Elevation of Receiver
Asset Protection Zone(m):	13 15 20 25 33 6

Run Description: T3 - SFR	
<u>Vegetation Information</u>	
Vegetation Type:	Coastal Swamp Forests
Vegetation Group:	Forested Wetlands
Vegetation Slope:	1.5 Degrees
Surface Fuel Load(t/ha):	22.6
Vegetation Height(m):	1.4
Vegetation Slope Type:	Downslope
Overall Fuel Load(t/ha):	34.1
	Only Applicable to Shrub/Scrub and Vesta
<u>Site Information</u>	
Site Slope:	0 Degrees
Elevation of Receiver(m):	Default
Site Slope Type:	Level
APZ/Separation(m):	16
<u>Fire Inputs</u>	
Veg./Flame Width(m):	24.89
Flame Temp(K):	1090
<u>Calculation Parameters</u>	
Flame Emissivity:	95
Heat of Combustion(kJ/kg)	18600
Moisture Factor:	5
Relative Humidity(%):	25
Ambient Temp(K):	308
FDI:	100
<u>Program Outputs</u>	
Level of Construction:	BAL 29
Radiant Heat(kW/m2):	26.09
Flame Length(m):	15.47
Rate Of Spread (km/h):	3.01
Transmissivity:	0.86
Fire Intensity(kW/m):	52991
Peak Elevation of Receiver(m):	6.01
Flame Angle (degrees):	51
Maximum View Factor:	0.399
Inner Protection Area(m):	16
Outer Protection Area(m):	0
<u>Short Fire Run Calculations</u>	
Fire Run(m):	68
Full Ellipse Length(m):	100.75
Travel Duration (mins):	1.36
ROS and H/B Ratio:	51.81
Length to Breadth Ratio:	2.82
Headfire Backfire Ratio:	29.85
Total Ellipse Length(m):	70.28
<u>BAL Thresholds</u>	
	BAL-40: BAL-29: BAL-19: BAL-12.5: 10 kw/m2: Elevation of Receiver
Asset Protection Zone(m):	13 15 20 25 33 6

