Bushfire Protection Assessment

Residential Subdivision and Built Form – Stage 1

53A & 53B Warriewood Road, Warriewood

Sekisui House Services (NSW) Pty Limited

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DOCUMENT TRACKING

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Project Number	24NEW8684
Project Manager	Tahlia Thompson
Prepared by	Tahlia Thompson and Mark Woods
Reviewed by	Bruce Horkings FPAA BPAD Accredited Practitioner No. BPAD29962-L3
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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.

ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd.

Template 2.1.4

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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	*Environmental Planning and Assessment Act 1979*
FDI	Fire Danger Index
IPA	Inner Protection Area
NASH	*National Association of Steel-framed Housing*
NCC	National Construction Code
PBP	'Planning for Bush Fire Protection 2019' and 'Addendum to Planning for Bush Fire Protection 2022'
RF Act	*Rural Fires Act 1997*
RFS	NSW Rural Fire Service
SA	Standards Australia
SFR	Short Fire Run

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 and Built Form

1.1 Description of Proposal

The proposed development relates to a Development Application (DA) for the subdivision of super lot (under DA2024/1079) into nine (9) residential lots and erection of nine (9) dwellings including two (2) semi-detached dwellings and seven (7) attached dwellings. The proposed development creates proposed Lots 5-13 contained within the super lot boundary as proposed under DA2024/1079 (Figure 1 and Figure 2).

This Integrated Development Application (DA) will be lodged concurrent to the community title subdivision (DA2024/1079) which also addressed the broader requirements for subdivisions including access, APZs, and utility connections. DA2024/1079 was lodged 26 August 2024 and seeks consent 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. This is the first (1st) of the three (3) separate subdivision and built form DAs which uses consistent subdivision plan from DA2014/1079. Revisions to the original DA from the Council assessment process will accord with the subject DA to ensure alignment.

The parent subdivision (DA2024/1079) is partially located on land identified as bush fire prone land (BFPL) within the ePlanning Spatial Viewer[1] however, Stage 1 of the development is not.

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.

This assessment is based on the following information sources:

- Background documentation provided by Sekisui House;

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

- Information contained within the site plan provided by Sekisui House, completed by YSCO Geomatics ref: 6321/18, 'Plan of proposed community scheme subdivision of Lot 2 in unreg. DP. Being 53A&B Warriewood Rd. Warriewood. Northern Beaches LGA', dated 15 October 2024;
- Information contained within the site plan provided by Sekisui House, completed by Shawood, Architectural Drawings – 53A & 53B Warriewood Road, Warriewood, Rev. 04, dated 11 December 2024;
- Lot 5 – 13 Engineers plans in DWG format sent via email by Max Chipchase from Sekisui House on 12 December 2024;
- 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;
- Eco Logical Australia (ELA) 2024. Bushfire Protection Assessment – Residential Subdivision – 53A & 53B Warriewood Rd, Warriewood, dated August 2024.
- GIS analysis including online spatial resources (i.e. Google Earth, SIX Maps, Nearmap and the NSW Government Planning Portal);
- Nearmap aerial imagery dated 23 November 2024; and
- Site inspection 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	☑	☑	3.1
Landscaping	☑	☐	3.2
Construction standard	☑	☑	3.3
Access	☑	☐	3.4
Water supply	☑	☐	3.5
Electrical services	☑	☐	3.6
Gas services	☑	☐	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.

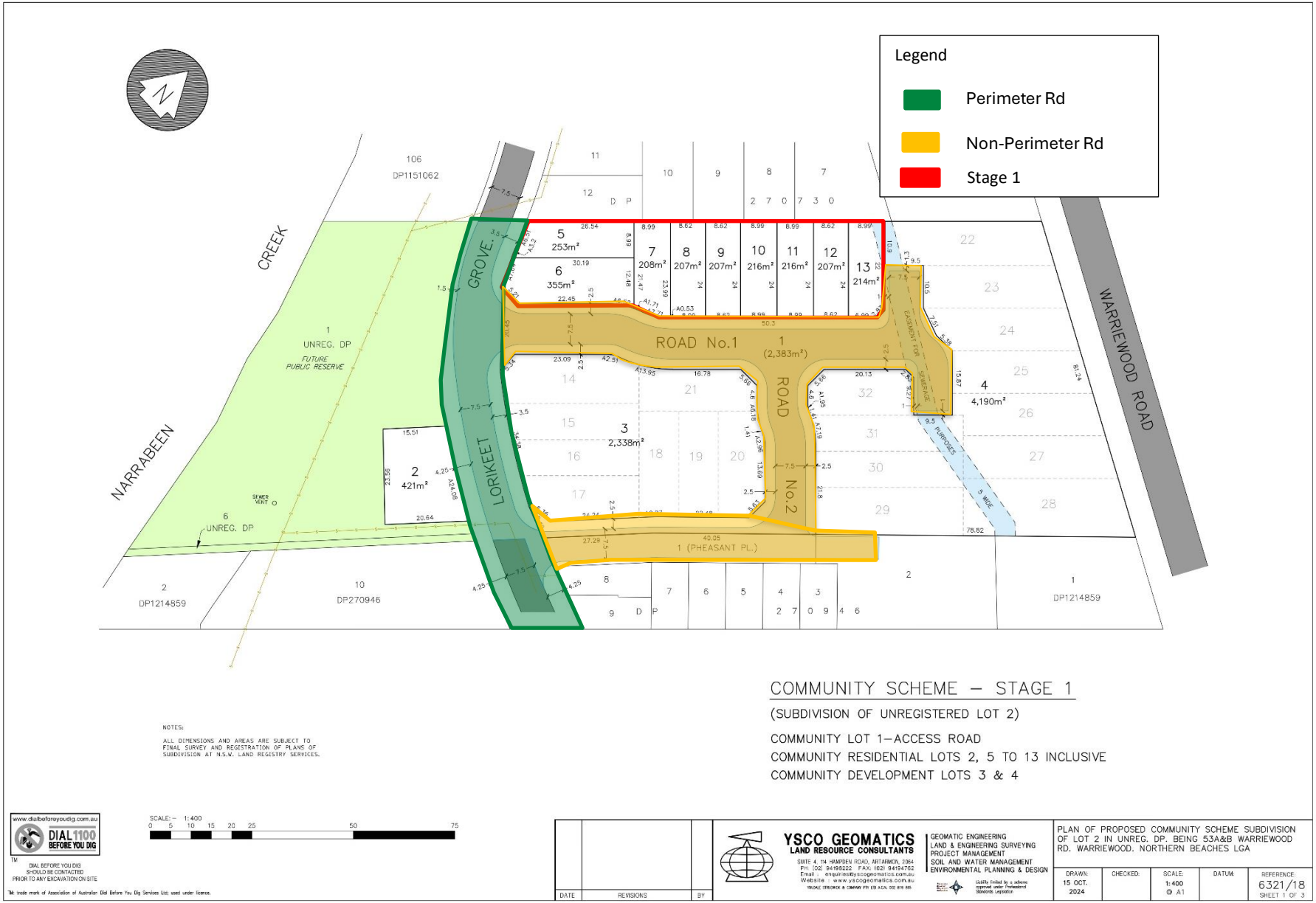

Figure 1: Subdivision Layout

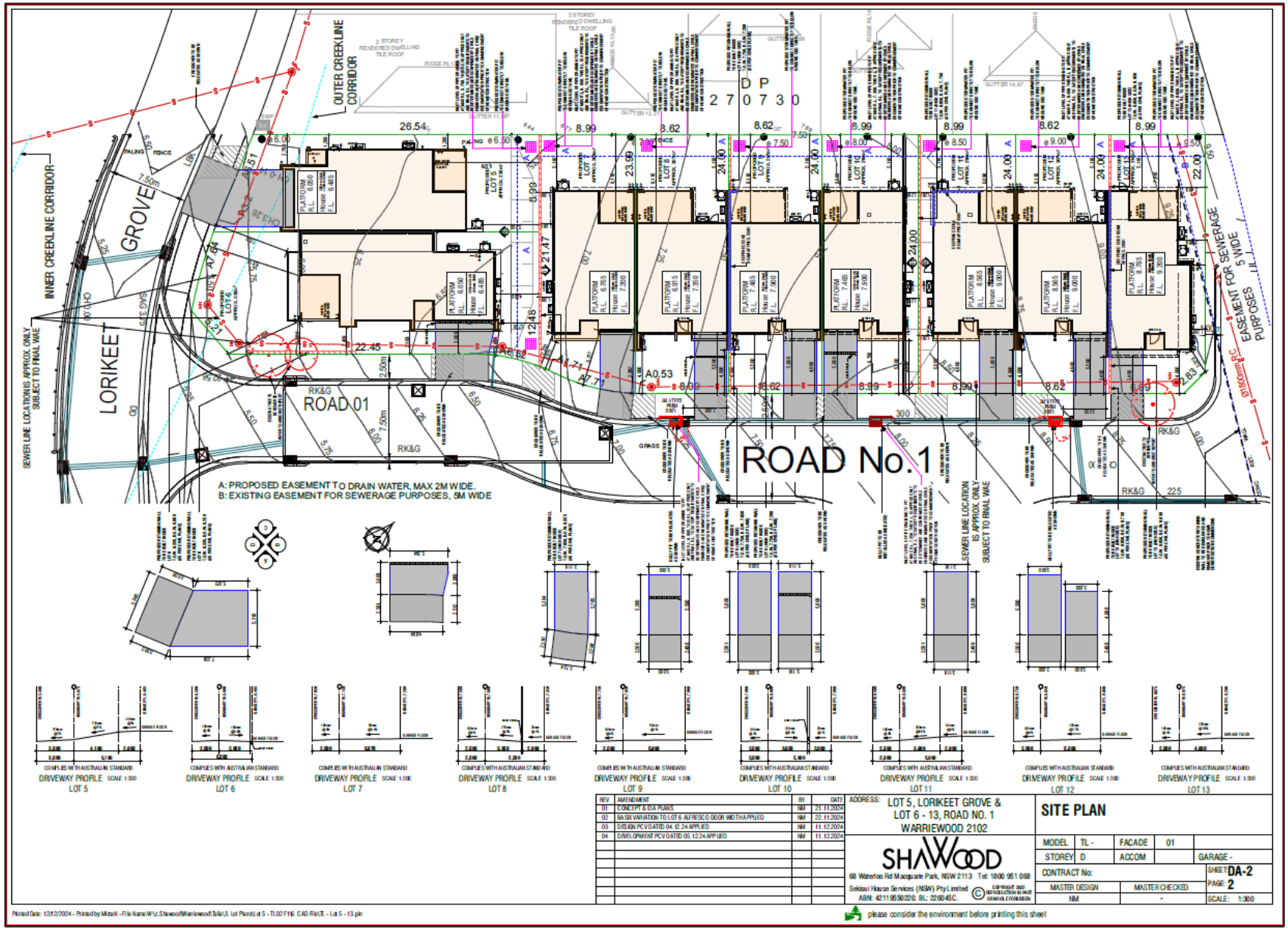

Figure 2: Stage 1 Built Form Plan

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'.

The assessment considers the remainder of the site to be managed as a temporary APZ to IPA standards in accordance with PBP (Appendix A), until all stages under the parent subdivision (DA2024/1079) are

developed and constructed to ensure the surrounding land does not become a hazard during development. Refer to Figure 3 which depicts the temporary APZ in Yellow.

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	Bushfire Attack Level (BAL)	Comments
T1 West	1.5° downslope	Forest (Coastal Swamp Forest)*	29 m	≥16 m*	BAL-29: 16 - <22 m BAL-19: 22 - <28 m BAL-12.5: 28 - <100 m	*APZ determined using SFR modelling consistent with the parent subdivision as documented within the Bushfire Protection Assessment completed (ELA 2024) for DA2024/1079. This modelling of the APZ and construction results in a radiant heat level exposure to buildings not exceeding 29 kW/m². Modelling report is included in Appendix B.
T2 and T3 South & South-west	1.5° downslope	Forest (Coastal Swamp Forest)*	29 m	≥16 m*	BAL-29: 16 - <22 m BAL-19: 22 - <28 m BAL-12.5: 28 - <100 m	As per above.
T4 South-east	All upslope and flat land	Forest	24 m	≥24 m	BAL-29: 24 - <33 m BAL-19: 33 - <45 m BAL-12.5: 45 - <100 m	APZ provided by residential development and public road infrastructure.
T5 East	>0° to 5° downslope	Grassland	12 m	≥12 m	BAL-29: 12 - <17 m BAL-19: 17 - <25 m BAL-12.5: 25 - <50 m	APZ provided by residential development and public road infrastructure.
All other directions	Managed Land					

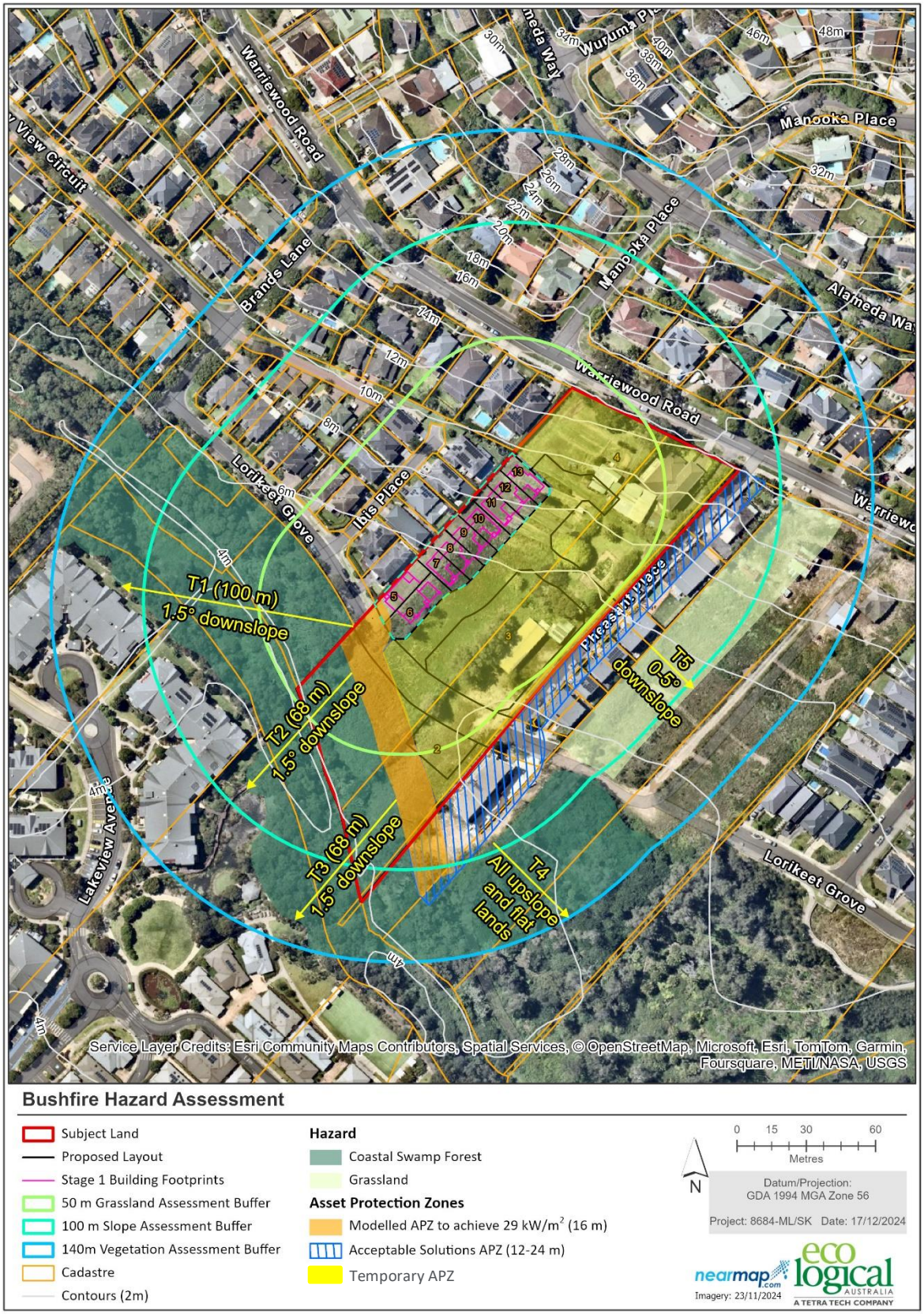

Figure 3: Bushfire Hazard Assessment

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 for Stage 1. The other stages of the broader development are to be managed as a temporary APZ to IPA requirements in accordance with (Appendix A), until all stages under the parent subdivision (DA2024/1079) are developed and constructed to ensure the surrounding land does not become a hazard during development. This assessment is consistent with the broader parent subdivision as documented within the Bushfire Protection Assessment completed (ELA 2024) for DA2024/1079. The footprint of the APZ is 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 with 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/m² 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 and Acceptable Solutions** *Transects 1-3* APZs provided in accordance with a performance solution using SFR modelling consistent with the parent subdivision as documented within the Bushfire Protection Assessment completed (ELA 2024) for DA2024/1079 and as outlined in Section 3.1.1 of this report. *Transects 4-5* 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 from 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 B 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 ≤29 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 3.3.3 for further details).

3.3 Construction Standards

The building construction standard for the proposed nine (9) dwellings, including two (2) semi-detached dwellings on Lots 5 and 6 and seven (7) attached dwellings on Lots 7 to 13 is determined by their Bushfire Attack Level (BAL) and then applying the appropriate construction specifications. The separation distances for different BALs are provided in Table 3 and Figure 4

The compliance of the proposed construction of dwellings with Section 7.4 of PBP is documented in Table 8.

Table 8: Construction requirements (adapted from Table 7.4a of PBP)

Performance Criteria	Acceptable Solutions	Compliance Notes
The intent may be achieved where:		
The proposed building can withstand bush fire attack in the form of embers, radiant heat and flame contact.	BAL is determined in accordance with Tables A1.12.5 to A1.12.7 of PBP.	**Satisfies Performance Criteria and Acceptable Solutions** BAL for construction of Lots 5-13 determined in accordance with a performance solution using SFR modelling consistent with the parent subdivision as documented within the Bushfire Protection Assessment completed (ELA 2024) for DA2024/1079 as outlined in Section 3.1.1 of this report and Table A1.12.5 of PBP.
	Construction provided in accordance with the National Construction Code (NCC) and as modified Section 7.5 of PBP.	**To comply** Construction in accordance with *AS 3959 OR NASH* standard as modified by Section 7.5 of PBP is required.
Proposed fences and gates are designed to minimise the spread of bush fire.	Fencing and gates are constructed in accordance with Section 7.6 of PBP.	**To comply** Specification detailed in Section 3.3.3 of this report.
Proposed Class 10a buildings are designed to minimise the spread of bush fire.	Class 10a buildings are constructed in accordance with Section 8.3.2 of PBP.	**To comply** No class 10a structures proposed as part of this DA.

3.3.1 Bushfire Attack Level (BAL) – Lots 5 to 13

BAL for construction of Lots 5-13 determined in accordance with a performance solution using SFR modelling consistent with the parent subdivision as documented within the Bushfire Protection Assessment completed (ELA 2024) for DA2024/1079 as outlined in Section 3.1.1 of this report and Table A1.12.5 of PBP. Construction Requirements

The Deemed-to-Satisfy (DtS) provisions of the NCC for construction requirements for buildings in designated bush fire prone areas are specified in:

- *AS 3959:2018 Construction of buildings in bushfire prone areas* (SA 2018); and
- *NASH NS 300 – NASH Standard for Steel Framed Construction in Bushfire Areas 2021* (NASH 2021).

Construction shall comply with Sections 3 (General requirements) and 5 (BAL-12.5) of *AS 3959:2018* or *NASH Standard (NS300*) for Lot 7 to 13. Construction for Lot 5 and Lot 6 shall comply with Sections 3 (General Requirements) and a combination of 6 (BAL-19) and 7 (BAL-29) of *AS 3959:2018* or *NASH Standard (NS300)* as appropriate. Refer to construction specifics for each lot in below Table 9.

Table 9: Bushfire Attack Level

Stage	Lot #			Elevation			
		Roof	Sub-floor	North	South	East	West
1	5	BAL-29	BAL-29	BAL-19	BAL-29	BAL-19	BAL-29
1	6	BAL-29	BAL-29	BAL-19	BAL-29	BAL-19	BAL-29
1	7	BAL-12.5					
1	8	BAL-12.5					
1	9	BAL-12.5					
1	10	BAL-12.5					
1	11	BAL-12.5					
1	12	BAL-12.5					
1	13	BAL-12.5					

3.3.2 Additional Construction Requirements

Additional construction measures over and above that required under *AS 3959:2018* and *NASH*, including ember protection provisions, are identified in Section 7.5 of PBP, and may apply.

3.3.3 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.

3.3.4 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.

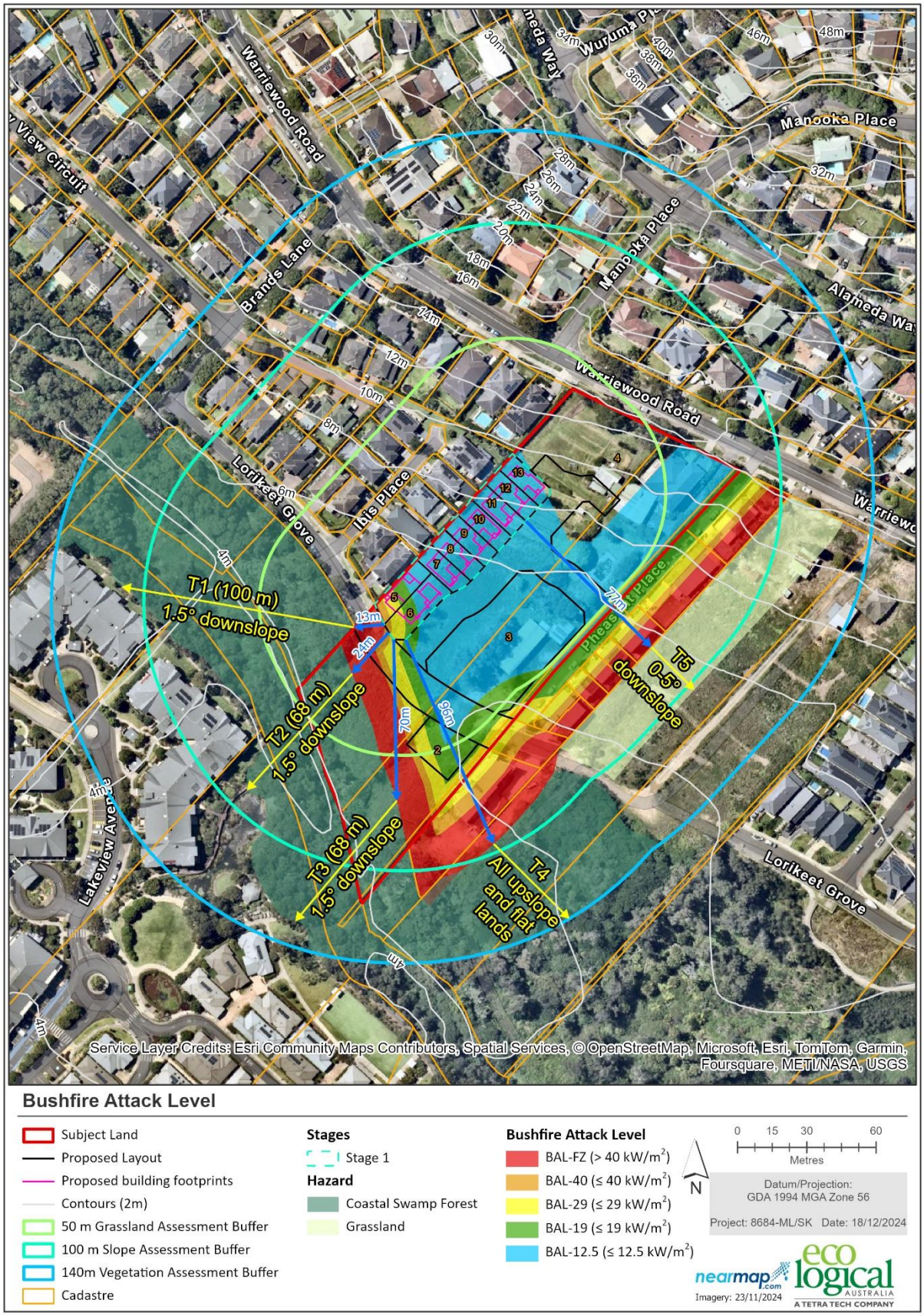

Figure 4: Bushfire Attack Level (BAL)

3.4 Access

Public road access to the subdivision is via Lorikeet Grove and Road No.1 as shown in Figure 1. No new public roads are proposed as part of the Stage 1 works as they are captured by the parent subdivision works under DA2024/1079 and the associated bushfire assessment (ELA 2024).

No additional public roads are proposed as access to the proposed dwellings is via a standard residential driveway off Lorikeet Grove or Road No.1. A fire tanker or pumper would attend to a fire at the property from the hardstand surface of Lorikeet Grove or Road No.1 which is within 70 m of the furthest point of the proposed dwellings. Additional access provisions for bushfire protection are not required to support this proposal as per Table 5.3b of PBP (extract below):

> *Note: There are no specific access requirements in an urban area where an unobstructed path (no greater than 70 m) 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 70 kph) that supports the operational use of emergency firefighting vehicles.*

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.	• 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.	• Fire hydrant, spacing, design and sizing complies with the relevant clauses of *AS 2419.1:2021 Fire hydrant installations – System design, installation and commissioning* (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.	• Fire hydrant flows and pressures comply with the relevant clauses of *AS 2419.1:2021* (SA 2021).	
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.	**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.	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).	**Complies** Electricity services to the subject site are located underground. **N/A**

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.	Reticulated or bottled gas is installed and maintained in accordance with *AS/NZS 1596:2014 The Storage and handling of LP Gas* (SA 2014), the requirements of relevant authorities, and metal piping is used; • 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.	**To comply (if proposed)** 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.

3.8 Staged Development

The development and construction within this Stage 1 forms part of a broader three (3) stage development. Detailed assessment of future stages will be undertaken for the subsequent future built form DAs, noting bushfire assessment was undertaken for DA2024/1079.

The other stages of the broader development are to be managed as a temporary APZ to IPA standards in accordance with PBP (Appendix A), until all stages under the parent subdivision (DA2024/1079) are developed and constructed to ensure the surrounding land does not become a hazard during development.

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 3. All the developable lots (Lot 2, Super lot 3 and Super lot 4 are to be managed as a temporary APZ in accordance with Appendix A.	☑	☑	3.1
Landscaping	Any future landscaping is to meet the requirements of PBP listed in Appendix A.	☑	☐	3.2
Construction standard	*Lots 5 to 13* The proposed dwellings on Lots 5 to 13 within the subdivision are to be constructed to BALs identified in Table 3 and Table 9 specifically and Figure 4; based on the construction specifications detailed in either *AS 3959-2018* or the *NASH standard,* including additional ember provisions detailed in Section 7.5 of PBP as required.	☑	☑	3.3
Access	No access requirements as dwellings will be accessed by a standard residential driveway.	☑	☐	3.4
Water supply	Development will be connected to a reticulated water supply.	☑	☐	3.5
Electricity service	Electricity supply located underground.	☑	☐	3.6
Gas service	Gas services (If installed) are to be installed and maintained in accordance with AS/NZS 1596:2014.	☑	☐	3.7

5. Recommendations

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

Tahlia Thompson
Bushfire Consultant

Mark Woods
Bushfire Consultant

Bruce Horkings
Principal Bushfire Consultant and Technical lead
FPAA BPAD Accredited Practitioner No. BPAD29962-L3

6. References

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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)
Trees	• 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.
Shrubs	• 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.
Grass	• 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.

Appendix B - 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		
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):	24.89	**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):**	6.01
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		
Short Fire Run Calculations			
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		

BAL Thresholds

	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		
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):	24.89	**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):**	6.01
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		
Short Fire Run Calculations			
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		

BAL Thresholds

	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

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