11 March 2019

RBWI Pty Ltd
C/- Paul Nichols
Project Manager, 'Clover Hill'
C/- paulnichols28@gmail.com

Dear Paul,

RE: Revised subdivision proposal – 269 North Macquarie Road, Calderwood

This letter outlines the revised bushfire protection strategy for the proposed subdivision of the above property currently under assessment by Shellharbour City Council (DA 0569/2017). The need for a revised strategy is in response to the proposed changes to the management of the native vegetation within the E3 zoned land within the property.

A Bushfire Assessment Report was prepared by Peterson Bushfire dated 16th November 2017 (attached) for the previous subdivision layout under which the E3 zone was proposed to be 'managed land' in the form of scattered woodland canopy trees over a maintained understorey. The NSW Rural Fire Service (RFS) issued a Bush Fire Safety Authority dated 5th January 2018 approving the 'managed land' strategy, and other protection measures such as the road layout and the 50 m Asset Protection Zone (APZ) in the south-west corner of the property.

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The bushfire protection strategy surrounding the management of the E3 zone has been amended in response to Council's request to allow the regeneration of the vegetation in the E3 zone into the climax community of 'Forest Red Gum – Thin-leaved stringybark grassy woodland'.

The revised strategy is based on the principle upon which the Stage 2A subdivision for the adjoining Lendlease development to the north was approved. The bushfire report prepared for Stage 2A by Eco Logical Australia bushfire consultant Dan Copland (letter dated 28 July 2015) demonstrated that the proposed lots did not require an APZ to the E3 zone within the subject property as the vegetation within the zone was not mapped as 'bushfire prone vegetation'. More importantly, it was shown that the patch of vegetation within the E3 zone was less than 1 hectare in size and more than 100 m from the nearest classified hazard being the forest on Johnsons Spur to the south-west. Because of these parameters it was argued that the vegetation within the E3 zone was not a hazard in line with the RFS document *Guide for Bushfire Prone Land Mapping* and hazard exclusion clause 2.2.3.2(b) of Australian Standard *AS 3959-2009 Construction of buildings in bushfire-prone areas*. RFS issued a Bush Fire Safety Authority (dated 12th August 2015) consistent with the Eco Logical Australia report. Not requiring an APZ for the E3 zone was also consistent with the approved Calderwood Concept Plan.

A detailed assessment by Peterson Bushfire of the E3 zone and bushfire hazard within the E2 zone on Johnsons Spur to the south-west has found that the vegetation within the E3 zone exceeds 1 hectare (the E3 zone is approximately 1.4 hectares) and is within 100 m of the forest to the south-west (the forest at the boundary of the subject property is approximately 85 m from the E3 zone). If the E3 zone was left to regenerate into a natural community, it would be considered a 'woodland' hazard and require APZs to the proposed lots as shown on Figure 1.

In order to remain consistent with the Concept Plan approval and prevent the classification of the E3 zone as a bushfire hazard and the associated flow-on effects such as APZ placement into the surrounding lots and APZ and BAL impacts to the adjoining Lendlease development, the vegetation within the E3 zone is proposed to be managed at specific boundary locations as shown on Figure 2. The vegetation management will reduce the size of the patch to no greater than 1 hectare and ensure it is at least 100 m from the forest to the south-west, hence achieving the same principle as originally approved for the adjoining Stage 2A of the Lendlease development.

The proposed areas of management will be maintained under the guidance of a Vegetation Management Plan (VMP) to ensure the understorey fuels do not regenerate into a bushfire hazard.

The habitat corridor shown on Figure 2 is designed to facilitate fauna movements between the E3 zone and E2 zone to the south-west. The corridor will be placed within proposed Lots 401 and 424 which will be burdened by way of an easement to ensure maintenance of the understorey and

retention of native trees to ensure compliance with APZ fuel management standards as outlined with the Bushfire Assessment Report and RFS Bush Fire Safety Authority.

Please don't hesitate to call should you seek further clarification.

Yours sincerely,

David Peterson
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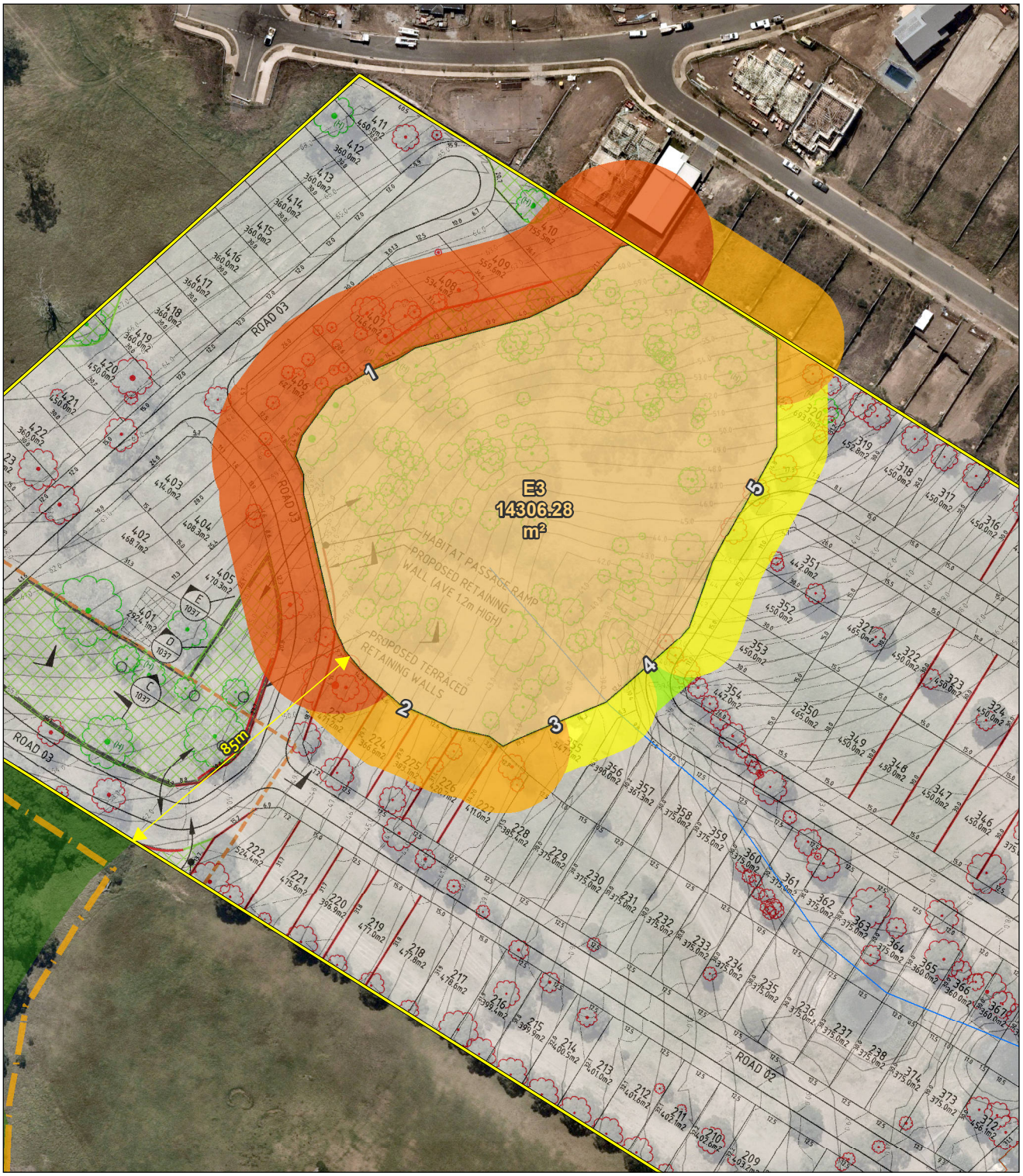

Legend

- dist_to_E3
- Subject Land

Zone

- E2 Environmental Conservation
- E3 Environmental Management

Vegetation Formations

- Forest

Asset Protection Zone

- Asset Protection Zone - 12m
- Asset Protection Zone - 15m
- Asset Protection Zone - 20m
- Asset Protection Zone - 25m

N

DKGIS

Date: 8/03/2019

0 5 10 20 30 40
Metres

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Nearmap

Figure 1: APZ required to E3 Zone if Unmanaged

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Legend

- Subject Land
- E3 Zone to be reforested with fully structured under-story - 9548.77m²
- E3 Zone to be cleared/managed - 4758.27m²

Zone

- E2 Environmental Conservation
- E3 Environmental Management

Vegetation Formations

- Forest

N

DKGIS

Date: 8/03/2019

0 5 10 20 30 40

Metres

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Nearmap

Figure 2: Proposed Vegetation Management Strategy

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Bushfire Assessment

Residential Subdivision

269 North Macquarie Road, Calderwood

RBWI Pty Ltd

16 November 2017

(Ref: 17050)

report by
david peterson

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Contents

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1 Introduction

Street or property name:	269 North Macquarie Road		
Suburb, town or locality:	Calderwood	**Postcode:**	2527
Lot/DP no:	Lot 1 DP 558196		
Local Government Area:	Shellharbour City Council		
Type of development:	Subdivision creating low density residential lots		

1.1 Background

RBWI Pty Ltd commissioned Peterson Bushfire to prepare a bushfire assessment for a proposed residential subdivision of a property identified as containing bushfire prone land. This report presents the assessment and recommendations to ensure compliance with the relevant bushfire protection legislation and policy.

This bushfire assessment has been prepared by a consultant accredited by the Fire Protection Association of Australia's BPAD scheme (Accreditation No. BPD-L3-18882).

1.2 Location and description of proposal

The subject land is located amongst the Calderwood Valley site under development by Lendlease as shown in Figure 1. The site is situated on the gently sloping south-eastern extremity of Johnsons Spur and adjoins forest and rainforest on the sheltered southern aspects of the ridgeline to the west of the subject land. The lands to the north, east and south are at varying stages of subdivision planning, approval and construction.

The subdivision consists of low density residential lots and public roads within the land zoned R2 and a residue lot zoned E3 as shown on the plan of subdivision included as Figure 2.

1.3 Assessment requirements

The subject land is identified as bushfire prone land by Shellharbour City Council as it is within 100 m of stands of bushland that have the potential to carry a bushfire. The Shellharbour Bushfire Prone Land Map as it pertains to the subject land can be viewed in Figure 3.

Section 91A *Environmental Planning and Assessment Act 1979* requires a bushfire assessment of residential development proposals on bushfire prone land following the process and methodology set out within s100B *Rural Fires Act 1997*, Clause 44 of the *Rural Fires Regulation 2008* and the NSW Rural Fire Service (RFS) document *Planning for Bushfire Protection 2006* (referred to as PBP throughout this report).

Legend

Subject Land'

N

DKGIS

Date: 15/11/2017

0 250 500 1,000 1,500

Metres

Figure 1: The Location of the Subject Land

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Nearmap

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Legend

- Subject Land'
- Site Plan
- Retained Trees

N

DKGIS

Date: 15/11/2017

0 12.5 25 50 75 100
Metres

Figure 2: The Proposal

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Nearmap

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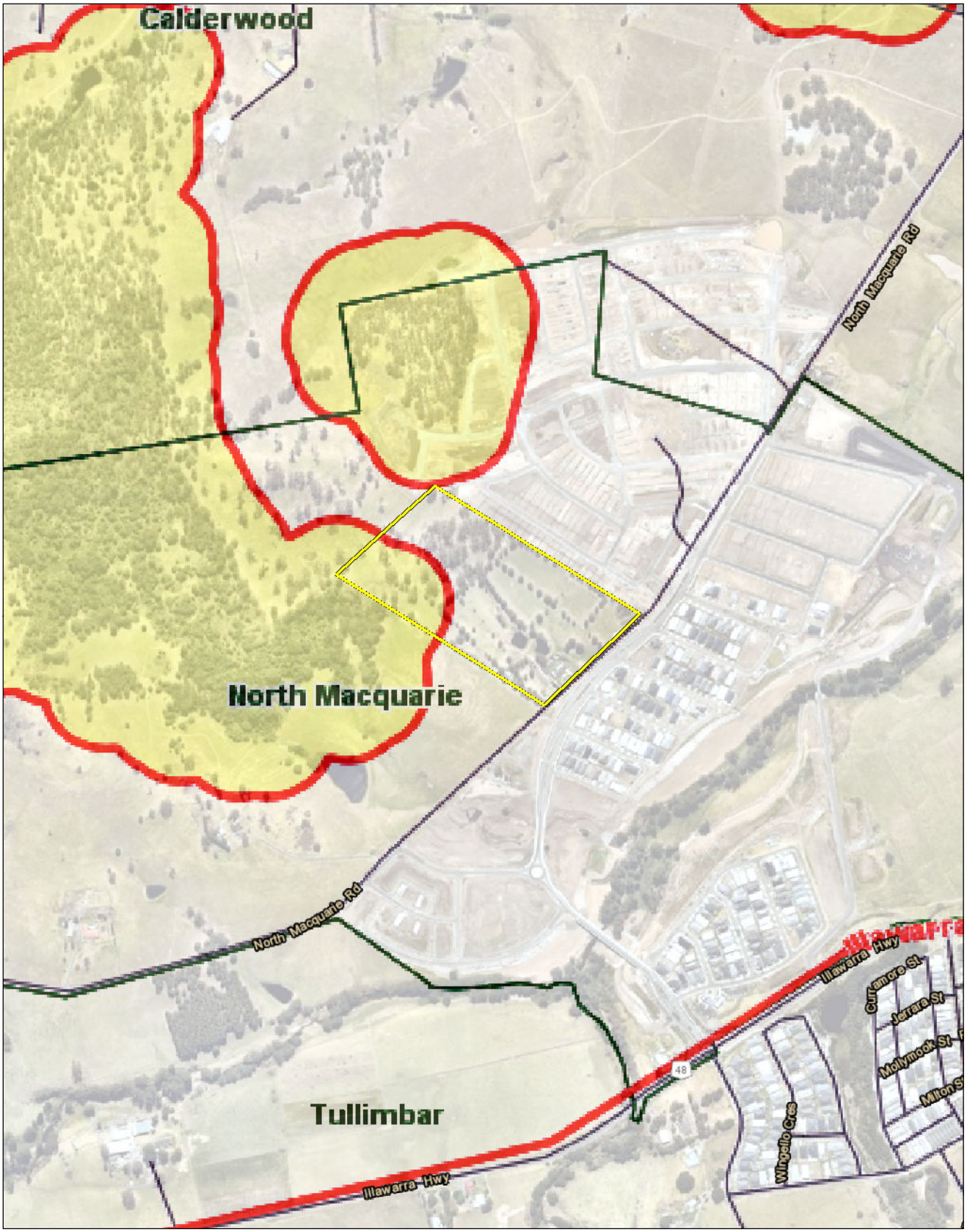

Legend

- Subject Land'
- Bushfire Prone Land

N

DKGIS

Date: 15/11/2017

0 100 200 400 600

Metres

Figure 3: Bushfire Prone Land

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Nearmap

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2 Bushfire hazard assessment

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

An inspection of the subject land and bushfire hazard took place on Monday 13th May 2016.

The hazard assessment below is consistent with that approved for the adjacent subdivisions by Lendlease.

2.1 Predominant vegetation

The 'predominant vegetation' influencing fire behaviour approaching the site has been assessed in accordance with the methodology specified within PBP. The Shellharbour Bushfire Prone Land Map (Figure 3) identifies bushfire prone vegetation to the west of the subdivision. This study confirms the presence of bushfire prone vegetation to the west as forest and rainforest as described below and mapped on Figure 4.

Western corner

The western corner of the subject land adjoins a mixture of forest and rainforest vegetation. The Coastal Grassy Red Gum Forest grades into rainforest which is mapped as Illawarra Subtropical Rainforest by four mapping studies (Kevin Mills & Associates Pty Ltd 2001; NPWS 2002; Tindall, D. et al. 2004; Tozer, M.G. et al. 2010) and confirmed by site inspection as satisfying rainforest classification in accordance with Keith (2004) and PBP.

North-west and south-west boundaries

The north-west and south-west boundaries of the subject land adjoin the Lendlease development site which were currently under planning and approval for subdivision during report preparation. The interim management of these adjoining properties consists of grazing and therefore the lands are classified as 'managed', supporting short, Kikuyu grass only. The adjoining properties are not assessed as a grassland hazard due to the lack of native grasses. This assessment is consistent with the Lendlease Stage 2B and Stage 3B South subdivision approvals on the adjoining properties.

North-east and south-east boundaries

The lands to the north-east and south-east have been developed and therefore classified as managed lands.

E3 zone residue lot

The E3 zone within the site contains a stand of scattered overstorey eucalypts with a cleared and managed understorey. The E3 zone is proposed to be contained within a residue lot that

will be retained under ownership of the developer and will be subject to the next stage of development. In the interim, the lot management will continue to retain the trees and a managed understorey so that the stand of trees does not act as a bushfire hazard.

Stage 2A of the Lendlease development adjacent on the north-eastern boundary was granted a Bush Fire Safety Authority based on the same hazard assessment findings, that is, the stand of trees does not present a bushfire hazard in their managed state.

2.2 Effective slope

The ‘effective slope’ influencing fire behaviour has been assessed in accordance with the methodology specified within PBP. This is conducted by measuring the slope that would most significantly influence fire behaviour where the vegetation occurs over a 100 metre transect measured outwards from the development boundary. The slope was determined using 2 m contours (refer to Figure 4) and verified in the field.

Both the forest and rainforest hazards identified adjacent the western corner of the subject land are on a slope class of ‘downslope 10-15 degrees’.

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Legend

Subject Land'
Site Plan
Retained Trees
Contour - 2m

Zone

E2 Environmental Conservation
E3 Environmental Management

Vegetation Formations

Forest
Rainforest

Asset Protection Zone

N

DKGIS

Date: 15/11/2017

0 12.5 25 50 75 100
Metres

Figure 4: Bushfire Hazard Analysis and Asset Protection Zone

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Nearmap

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3 Bushfire protection measures

PBP requires the assessment of a suite of bushfire protection measures that in total provide an adequate level of protection for residential subdivision. The measures required to be assessed are listed in Table 1 below and are discussed in detail in the remainder of this section.

Table 1: PBP bushfire protection measures

Bushfire protection measures	Considerations
Asset Protection Zones (APZ)	Location and dimension of APZ building setbacks from vegetation including prescriptions of vegetation management within the APZ.
Access	Assessment to include subdivision access and egress, perimeter access, and design standards of public roads.
Water supply and other utilities	List requirements for reticulated water supply and hydrant provisions, and any static water supplies for fire-fighting.

3.1 Asset protection zones

Using the vegetation and slope data discussed in Section 2, APZs suitable for residential subdivision have been calculated. These have been mapped on Figure 4 and listed in Table 2.

The lots adjacent the forest and rainforest at the western corner of the subject land require an APZ ranging from 20 to 50 m. As shown on Figure 4, the majority of the APZ will be 50 m wide due to the predominance of the forest. The APZ reduces to 25 m at the eastern end where the effective slope reduces for those lots situated along the contour from the hazard.

The APZ will be contained within proposed lots and a perimeter road to be maintained by the occupiers and Council, respectively.

Table 2: APZ determination

Interface[1]	Vegetation[2]	Slope[3]	Required APZ[4]
Western corner	Rainforest	Downslope 10-15˚	20 m
Western Corner	Forest	Downslope 10-15˚	50 m
Western corner	Forest	Downslope 0-5˚	25 m
E3 zone	Managed	Not required	Not required
North-west & south-west	Managed	Not required	Not required
North-east & south-east	Managed	Not required	Not required

[1] Hazard interface.

[2] Predominant vegetation classification over 140 m from subdivision boundary.

[3] Effective slope assessed over 100 m from subdivision boundary where the bushfire hazard occurs.

[4] Asset Protection Zone (APZ) required by Table A2.4 of Planning for Bushfire Protection 2006.

3.2 Vegetation management

The APZ is to be managed to achieve the performance objectives of an Inner Protection Area (IPA) as described by PBP. The following fuel management guidelines have been designed as a guide to achieve the performance objectives of and IPA:

- Canopy treatment: Trees are required to have a discontinuous canopy by achieving gaps between crowns between 2 to 5 m. Small clumps of trees can remain forming one larger crown providing larger gaps to the next adjacent crown of minimum 5 m is achieved.
- Understorey treatment: Shrubs, saplings and understorey vegetation should not be within the APZ.
- Groundcover treatment: Groundcovers such as grasses are to be regularly mowed or slashed to minimal height (i.e. 100 mm), and ground fuels are to be reduced by removing all dead vegetative material and raking and removing leaf litter and other fine fuels.

Landscaping across the subdivision is to achieve the principles listed in Appendix 5 of *Planning for Bushfire Protection 2006*.

3.3 Access

Alternate access and egress

PBP requires an access design that enables safe evacuation whilst facilitating adequate emergency and operational response. All bushfire prone areas should have an alternate access or egress option depending on the bushfire risk, the density of the development, and the chances of the road being cut by fire for a prolonged period.

The subdivision layout has a logical public road layout that will provide three access/egress points at the south-eastern end onto North Macquarie Road. The proposed access leads away from the bushfire threat located to the west and links to the main road servicing Calderwood Valley therefore is the most logical access point for the subdivision.

The proposed cul-de-sac road is longer than the PBP Acceptable Solution threshold of 200 m, however this is considered acceptable in this case as the design of the road in the context of the bushfire hazard can satisfy the performance criteria, as follows:

1. Less than 100 m of the road is adjacent a bushfire hazard. This section of the road acts as the perimeter road between the proposed lots and the hazard identified adjacent the western corner. PBP permits no-through access roads that traverse 200 m of bushland, therefore it is considered that having only 100 m of bushland on only one side of the road satisfies the performance criteria.
2. The remainder of the road outside of the 100 m stretch identified above will be within the subdivision and flanked by the proposed lots. Adjoining the lots will be managed lands; either paddocks under development adjacent or lots within the subdivision.

3. An alternate road will be available by way of a loop within the western corner of the site providing an option to access the western corner without driving by the hazard. The lots in the western corner will have an alternate access down to North Macquarie Road.

The subdivision layout satisfies PBP access objectives in relation to access and egress.

Perimeter access

The hazard interface location at the western corner has adequate access provided by the way of a public perimeter road. Therefore, the subdivision layout satisfies PBP access objectives in relation to perimeter access.

Design and construction standards

The public roads have been designed in accordance with the PBP design and construction standards as repeated in Table 3 on the following page. The subdivision layout is able to satisfy PBP access objectives.

3.4 Water supply and utilities

Water supply

The development will require fire hydrants to be installed to comply with *AS 2419.1 – 2005 Fire Hydrant Installations - System Design, Installation and Commissioning* (AS 2419) so that all sides of a building envelope are within 70 m of a hydrant by lay of the hose (or 90 m with a tanker parked in-line maximum 20 m from the hydrant).

Electricity supply

In accordance with PBP, electricity should be underground wherever practicable. Where overhead electrical transmission lines are installed, the vegetation clearance distances are to comply with *ISSC 3 Guideline for Managing Vegetation Near Power Lines* (Industry Safety Steering Committee 2005). The guidelines specify a clearance distance of 0.5 m for a typical connection for residential dwellings.

Gas supply

Any gas services are to be installed and maintained in accordance with *AS/NZS 1596-2008 The storage and handling of LP gas*.

Table 3: Design and construction for public roads

Performance Criteria	Acceptable Solutions
• *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*
• *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 PBP Table 4.1 – Road widths for Category 1 Tanker (Medium Rigid Vehicle), which is a minimum of 6.5 metre carriageway for two-way road with inside edge curve radius >100 and swept path 2.5 metres.* • *The perimeter road is linked to the internal road system at an interval of no greater than 500 metres in urban areas* • *Traffic management devices are constructed to facilitate access by emergency services vehicles* • *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* • *Curves of roads (other than perimeter roads) are a minimum inner radius of six metres* • *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* • *There is a minimum vertical clearance to a height of four metres above the road at all times*
• *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*
• *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* • *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*
• *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* • *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*
• *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* • *Public roads directly interfacing the bush fire hazard vegetation provide roll top kerbing to the hazard side of the road*

4 Conclusion and recommendations

4.1 Summary

The proposal consists of a residential subdivision predominately surrounded by managed lands with the exception of rainforest and forest on the lower slopes of Johnsons Spur adjacent the western corner of the subject land.

Planning for Bushfire Protection 2006 requires Asset Protection Zones ranging from 20 m to 50 m between the identified hazards and building envelopes. The proposed subdivision layout provides the required separation in the form of a subdivision perimeter road and a building setback within residential lots.

In addition to Asset Protection Zones, the proposed access and recommended water supply and utility measures comply with *Planning for Bushfire Protection 2006*.

4.2 Conclusion

This report presents an assessment of a residential subdivision at 269 North Macquarie Road, Calderwood. The assessment demonstrates that the proposal, together with the recommendations (see below), complies with s100B *Rural Fires Act 1997*, Clause 44 of the *Rural Fires Regulation 2008* and *Planning for Bushfire Protection 2006* (refer to Section 3 – Bushfire Protection Measures).

4.3 Recommendations

The recommendations made within this assessment are repeated below:

1. Minimum Asset Protection Zones are to be provided to the subdivision as identified in Figure 4 and Table 2, Section 3.1.

2. Landscaping and ongoing vegetation management within the Asset Protection Zones is to achieve the performance requirements of an Inner Protection Area (IPA) as described by *Planning for Bushfire Protection 2006*.

3. The design and construction of subdivision roads is to comply with the *Planning for Bushfire Protection 2006* specifications and requirements for public roads as listed in Table 3, Section 3.2.

4. The subdivision will require fire hydrants to be installed to comply with AS 2419.1 – *2005 Fire Hydrant Installations - System Design, Installation and Commissioning* (AS 2419) so that all sides of a building envelope are within 70 m of a hydrant by lay of the hose (or 90 m with a tanker parked in-line maximum 20 m from the hydrant).

5. Electricity should be underground wherever practicable. Where overhead electrical transmission lines are installed, the vegetation clearance distances are to comply with *ISSC 3 Guideline for Managing Vegetation Near Power Lines* (Industry Safety Steering

Committee 2005). The guidelines specify a clearance distance of 0.5 m for a typical connection for residential dwellings.

6. Any gas services are to be installed and maintained in accordance with *AS/NZS 1596-2008 The storage and handling of LP gas*.

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