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## **BUSHFIRE ASSESSMENT REPORT**

### **LINNEAUS ESTATE**

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**Lot 1 DP 1031848**

**951 Broken Head Road, Broken Head**

**Proposed Ecotourism & Mixed Development**

Prepared for: NSW Rural Fire Service

Prepared by: Peter Thornton

BPAD-L3 Accredited Practitioner

**Date: 15 February 2021**

**Ref: 18/092**

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## CONTENTS

1.0	EXECUTIVE SUMMARY .....	4
2.0	SUMMARY OF RECOMMENDATIONS .....	5
2.1	Asset Protection Zones and Construction Standards .....	5
2.2	Existing Cabins .....	7
2.4	Utilities .....	9
2.5	Emergency Evacuation Plan .....	9
2.6	Bush Fire Management Plan (BFMP) .....	10
2.7	Landscaping .....	10
3.0	INTRODUCTION .....	11
4.0	BUSHFIRE THREAT ASSESSMENT .....	17
4.1	Overview .....	17
4.2	Bushfire prone land map .....	18
4.3	Bushfire hazard assessment .....	19
5.0	ASSET PROTECTION ZONES AND CONSTRUCTION STANDARDS .....	21
6.0	ACCESS AND WATER SUPPLY .....	35
7.0	UTILITIES .....	46
8.0	LANDSCAPING .....	47
9.0	EMERGENCY AND AVACUATION PLANNING .....	50
10.0	CONCLUSION .....	51
	APPENDIX A .....	53
	APZ plan	
	Trees within the APZ to remain	

## 1.0 EXECUTIVE SUMMARY

This report has been prepared to assess the proposed eco-tourism and mixed-use development at Lot 1 DP 1031848, 951 Broken Head Road Broken Head as described in Section 3 of this report. The development is assessed as a Special Fire Protection Purpose (SFPP) and the report has been prepared pursuant to the requirements of Planning for Bushfire Protection 2019 (PBP2019) to accompany an application for a Bush Fire Safety Authority (BFSa) pursuant to s100B of the Rural Fires Act 1979.

Extensive consultation with NSW Rural Fire Service has been undertaken in the form a number of bushfire design briefs, meetings including an on-site meeting on the 2<sup>nd</sup> December 2020 with Alan Bawden (NSW RFS), Stephen Connelly (Consultant Planner) and Peter Thornton (Bushfire Consultant) in relation to the development and a number of performance solutions proposed as part of this report to achieve the objectives of Section 6.4 PBP2019.

The recommendations of the report meet these objectives in the follow ways –

- A defensible space is provided around all proposed buildings not proposed to be sacrificial during a bushfire event.
- Adequate minimum separation has been provided to the buildings recommended to have bushfire attack level (BAL) construction to minimise potential material ignition.
- A better bushfire protection outcome for existing buildings has been achieved by providing increased asset protection zones, evacuation planning and management, upgraded access and water supply, and a mechanism to ensure ongoing management and maintenance by the requirement for a Bushfire Management Plan to be included and referenced on the Fire Safety Schedule.
- New buildings will have separation distances compliant with Section 6.8 PBP2019 with exception to the sacrificial cabins which comply with the acceptable solutions for ecotourism.
- The existing development will be provided with two on-site evacuation buildings demonstrated not to receive a forecast 10kW/m<sup>2</sup> of radiant heat from the fire front. This provides additional refuge options for the occupants associated with the existing development.
- Safe emergency evacuation procedures are recommended for the existing and proposed development.

The report reflects the outcomes of this consultation process in establishing compliance with the performance criteria of Planning for Bushfire Protection 2019.

The following table is provided as a summary of the method of assessment for each consideration relating to Planning for Bushfire Protection 2019.

MEASURE	METHOD OF ASSESSMENT
Construction Standards	Acceptable Solutions plus Performance Solutions
APZ Required	Acceptable Solutions plus Performance Solutions
Water Supply	Acceptable Solution
Electricity Supply	Acceptable Solution
Gas Supply	Acceptable Solution
Landscape	Acceptable Solutions plus Performance Solutions
Access	Performance Solution
Emergency Evacuation	Acceptable Solution

## 2.0 SUMMARY OF RECOMMENDATIONS

The following summary of recommendations is provided for consideration prior to the preparation of the final performance solution bushfire assessment report for the proposed eco-tourism development.

### 2.1 Asset Protection Zones and Construction Standards

1. The proposed primary refuge building (CB.02), depot, wellness and sanitary building and food offering buildings (CB.04) are to be constructed to BAL 29 AS 3959-2018 plus Section 7.5 Planning for Bushfire Protection 2019. Gutter guards must be provided to all buildings and comply with AS 3959-2018.

Walkways and the bin-store within the asset protection zone of building CB.02 are to be completely constructed of non-combustible material.

2. The second refuge building (CB.03) is to be constructed to BAL 12.5 AS 3959-2018 plus Section 7.5 Planning for Bushfire Protection 2019. Gutter guards must be provided to all buildings and comply with AS 3959-2018.
3. The depot building is to have the following inner protection areas managed and maintained in accordance PBP2019 Table 7.4a, Appendix 4 of Planning for Bushfire Protection 2019 and the requirements of 'Standards for Asset Protection Zones' RFS 2005.

DEPOT BUILDING ASPECT	INNER PROTECTION AREA
South	12m
West	15m
East	9m
North	9m

4. At the commencement of works and in perpetuity, the yellow shaded area as shown on the APZ plan prepared by Harley Graham Architects dated 21/09/2020 Drawing reference "PRECINCT PLAN - APZ. Rev 04", as shown in Figure 1, shall be managed and maintained as an inner protection area to prevent the spread of a fire towards the buildings in accordance with Appendix 4 of Planning for Bushfire Protection 2019 and the requirements of 'Standards for Asset Protection Zones' RFS 2005.

The exception to the above are the trees nominated to remain with the asset protection zone around building CB.02 as shown in Figure 3. It is noted the fuels beneath these trees are to consist only of mown grass or non-combustible material and trees canopies skirted approximately 2m above finished ground level. In this regard a landscape plan and management plan are to be prepared and approved prior to the release of the construction certificate.

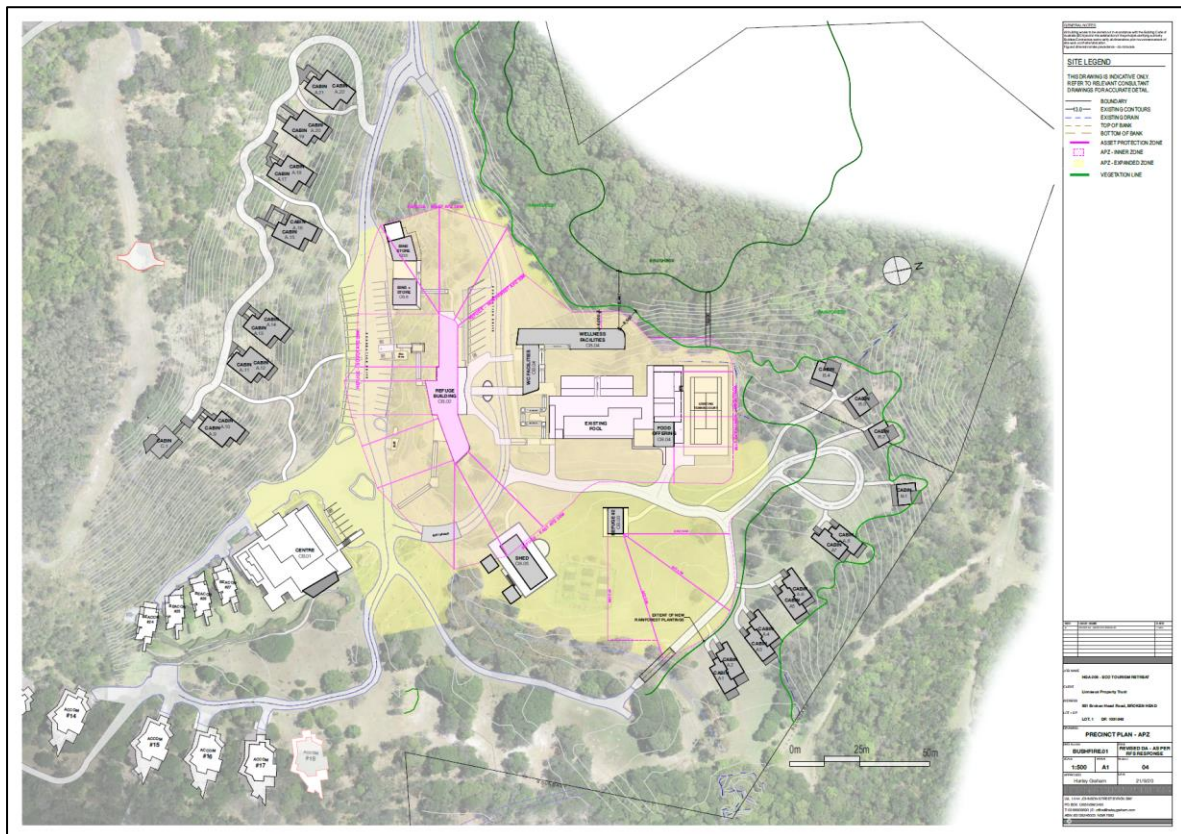


Figure 1 – Required APZ shown by yellow shaded areas to ensure continuity and a clustered managed area.

## **2.2 Existing Cabins subject to Change of Use – Ecotourism**

The asset protection zones approved with the original Court Consent *NSW LEC BHCF s96 10449B of 1998 – Rev Consent – May 2004* are to remain and must be included in the recommended Bushfire Management Plan (BMP) for the proposed development.

## **2.3 Water Supply and Access**

Water supply and access are essentially interlinked and therefore the following recommendations are proposed –

### **2.3.1 Access**

1. The access from the entry to the property to the proposed refuge building is to comply with the acceptable solutions of Table 6.8b Planning for Bushfire Protection 2019 with exception to the following –
  - a) Only one property access is required.
  - b) The existing sealed width of the property access road may remain provided an unobstructed carriageway width of minimum 5.5m is achieved throughout. Passing bays are required for a width of 6m over a 20m length every 200m (approximately) along the road. These passing bays are to be sealed.
  - c) The bridge to the east of building CB.02 proposed to form part of the trafficable pathway providing access to the evacuation building CB.03 is to comply with Table 6.8b PBP2019 relating to load capacity.
  - d) Reductions in carriageway widths are permitted to 3.5m over a maximum 30m distance. This will cater for the culvert and entry locations identified in the traffic report prepared by Geolink, UPR 3080-1069 third issue dated 20/01/2021.
  - e) The property access road is to comply with plans prepared by Geolink Pty Ltd Illustration SK-BF01v3, SK-BF02v3 and SK-BF03v3.
  - f) The pedestrian pathways provided to the proposed cabins to be located as shown on the Drawing prepared by Geolink Drawing No. 3080/C030 Rev B dated 15/9/2020 as shown in Figure 2.
  - g) All pedestrian pathways are to comply with the relevant legislation, codes and standards applicable to ensure safe access and egress for occupants and fire fighters.



All pedestrian pathways to the evacuation buildings associated with cabins for people with disabilities (north precinct) shall comply with AS 1428.1-2009 and relevant clauses of the Building Code of Australia 2019. Should a performance solution be proposed for access to the cabin for people with disabilities then bushfire evacuation will need to be considered and incorporated in the Emergency Evacuation Plan and Procedure.

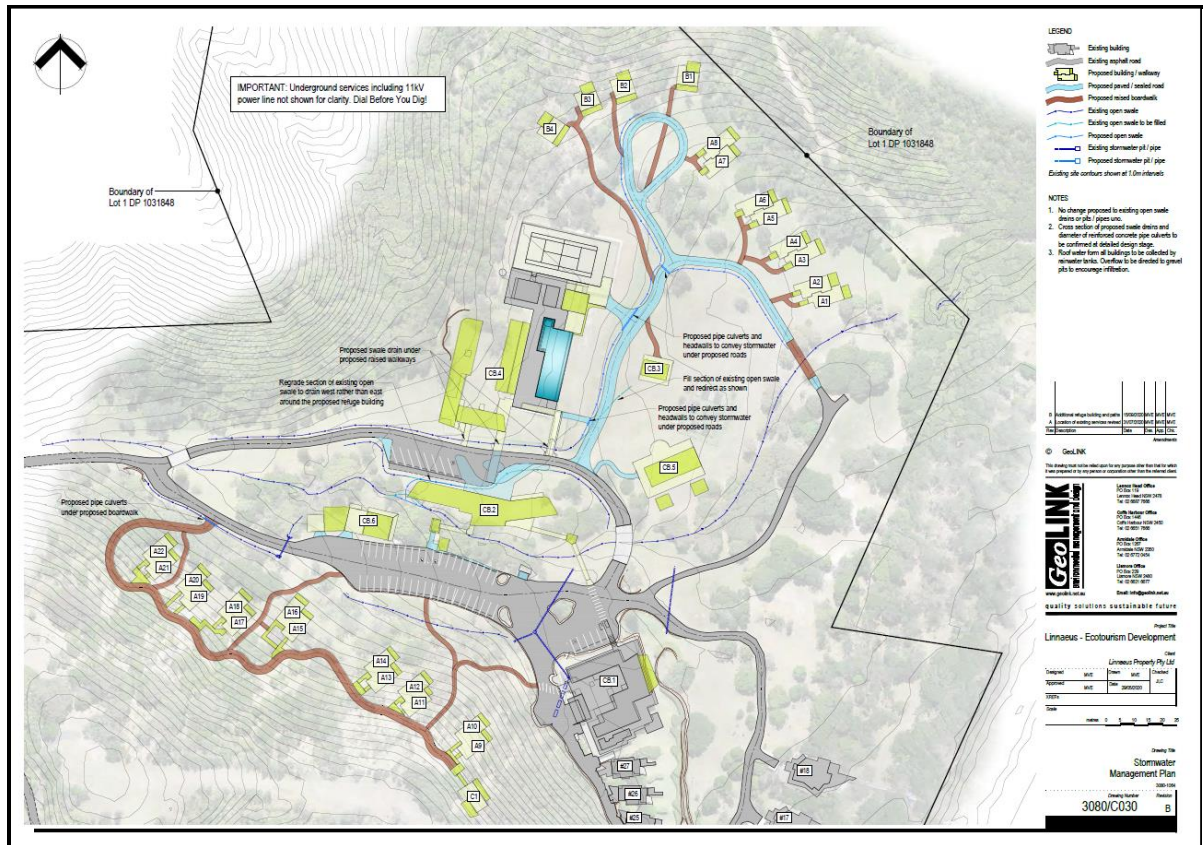


Figure 2 – Pedestrian pathways to evacuation buildings.

### 2.3.2 Water supply

2. The existing and proposed fire hydrant system is to provide coverage of all buildings (except the proposed cabins), with pressure and flows in accordance with AS 2419.1-2005 and comply with Table 6.8(b)(c) PBP2019 (ecotourism). The fire-fighting capacity is nominated at 90KL from a static supply. Full design details and design certification is required by a person deemed by the applicant and Byron Shire Council as a Competent Fire Safety Practitioner (CFSP). The design is to nominate the maintenance requirements for the system with the design and maintenance requirements included on the Fire Safety Schedule.



3. A minimum 10 000L non-combustible tank with compliant RFS fittings is to be provided to the depot building and accessible as shown in the civil engineers plan Illustration SK-BF02v2. It is recommended that a minimum 5hp or 3kW petrol or diesel fire fighter pump be provided (no electric pumps) and shielded against bush fire attack. An associated hose and reel for firefighting is to be connected to the pump and shall be 19mm internal diameter. The fire hose reel is to be constructed in accordance with AS/NZS 1221:1997, and installed in accordance with the relevant clauses of AS 2441:2005. A design is to nominate the maintenance requirements for the system with the design and maintenance requirements included on the Fire Safety Schedule.
4. It is recommended that a hose and reel for firefighting be provided for the refuge building, wellness centre and food outlet building and be connected to the existing water supply system. The size of the fire hose shall be a minimum 19mm internal diameter. The fire hose reel is to be constructed in accordance with AS/NZS 1221:1997 and installed in accordance with the relevant clauses of AS 2441:2005. The NSW Rural Fire Service have also required fire hose reels to be located to provide coverage of each sacrificial cabin (*RFS email 4.12.20*).

Full design details and design certification is required by a person deemed by the applicant and Byron Shire Council as a Competent Fire Safety Practitioner (CFSP). A design is to nominate the maintenance requirements for the system with the design and maintenance requirements included on the Fire Safety Schedule.

## **2.4 Utilities**

Electricity and gas services shall comply with Table 6.8c Planning for Bushfire Protection 2019.

## **2.5 Emergency evacuation plan**

An Emergency Evacuation Plan (EEP) is to be prepared and approved by the consent authority prior to occupation of the proposed development and is to be referenced in the Fire Safety Schedule associated with the Construction Certificate.

A traffic management report is to be prepared by a competent person adequately addressing the following-

- The amount of traffic likely to be generated during an emergency evacuation;
- The capacity of the broader road network to facilitate safe emergency evacuation;
- Limitations/constraints inherent in the road system; and
- Management of potential traffic conflicts (such as emergency vehicles versus evacuating members of the public).

## 2.6 Bush Fire Management Plan (BFMP)

A Bush Fire Management Plan (BFMP) to be prepared detailing all approved Bushfire Protection Measures (BPM) and approved prior to the issue of a Construction Certificate. The BFMP must be referenced in the Fire Safety Schedule associated with the construction certificate, providing a mechanism to ensure on-going maintenance and management of the Bushfire Protection Measures associated with the Bush Fire Safety Authority.

## 2.7 Landscaping

Landscaping is to comply with the requirements of Appendix 4 PBP2019 with exception to the tree canopy coverage within the APZ of Building CB.02 as shown in Figure 3. In this regard a landscape plan is to be prepared with specific management practices outlined in this report. The plan is to be assessed by a BPAD L3 accredited bushfire practitioner and approved by NSW Rural Fire Service.

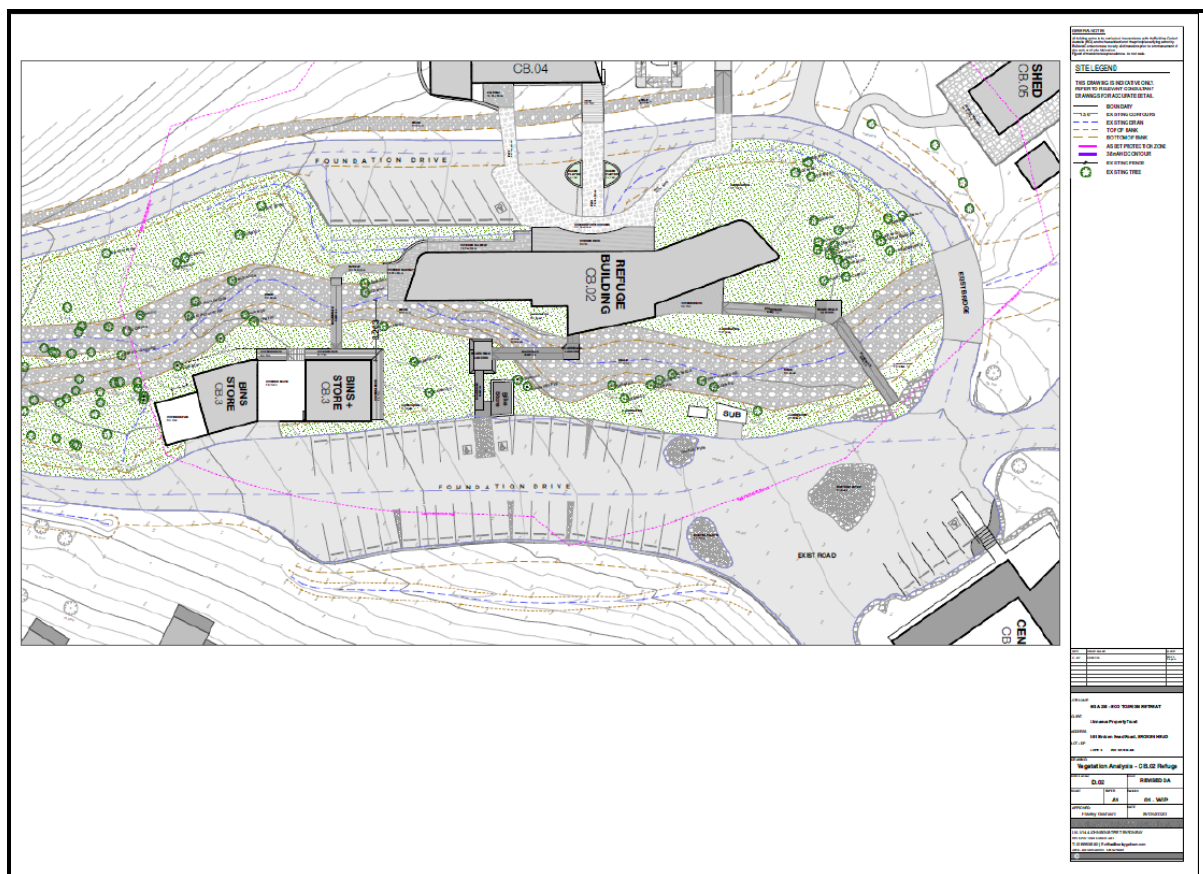


Figure 3 – Specific trees permitted to remain in the APZ for surround building CB.02.

## 3.0 INTRODUCTION

### 3.1 GENERAL

The proposed eco-tourism and mixed-use development is located on Lot 1 DP 1031848, 951 Broken Head Road, Broken Head, known as Linnaeus Estate. The existing site is understood to comprise an educational use development with associated accommodation having an occupancy of approximately 112 people. The existing development would be considered an existing Special Fire Protection Purpose (SFPP) development pursuant to Planning for Bushfire Protection 2019.

The subject site is located on the eastern side of Broken Head Road and adjacent to the eastern coastline of the Pacific Ocean and midway (approximately 5km) between the townships of Lennox Head to the south and Suffolk Park to the north as shown in Figure 4.



Figure 4 – Location of the subject property to the broader area.

The proposed main area of the ecotourism development is located directly within the existing developed area of the property utilizing the existing internal property access road as identified with the 'large yellow circle' in Figure 5. The proposed depot is located approximately 450m from the entry to the property and to the southwest of the primary development as identified with the 'small yellow circle' in Figure 5.





Figure 5: Location of subject property and development

*NSW Govt. Six Maps*

Given the site exists with its current building locations and infrastructure any development on the site, with particular note to the access, will require a level of performance assessment and/or compliance with the intent of improving the current bushfire protection measures from that which currently exist. In this regard a level of upgrade relating to asset protection zones, evacuation planning, refuge, water supply and access have been assessed with recommendations to achieve this intent.

The recommendations within this report address the performance solutions and intent of Planning for Bushfire Protection 2019 and provide support for an integrated application for a Bush Fire Safety Authority pursuant to s100B of the Rural Fires Act 1979 whilst acknowledging as outlined in PBP2019 that bushfire is a natural phenomenon and there can never be any guarantee that a building or occupants will not be adversely affected by bushfire.

Inherently there is a broad range of bushfire protection measures which will require hydraulics, civil engineering, evacuation planning, construction standards, ecological and electrical expertise for detailed design. The report provides recommendations that will require technical input in some areas at the development application stage and others to be detailed following consent and with the application for construction certificate. A number of recommendations in the report have relied upon initial advice from a number of

professionals during the design phase and in turn this report is to be read in conjunction with the technical reports submitted with the development application.

### **3.2 SIGNIFICANT ENVIRONMENTAL FEATURES**

An assessment is to be undertaken, if applicable, with regard to:

- State Environmental Planning Policy (Koala Habitat Protection) 2019
- Biodiversity Conservation Act 2016 (NSW)
- Local Land Services Act 2013 (NSW)
- Land Management (Native Vegetation) Code 2017 (NSW)
- National Parks and Wildlife Act 1974 (NSW)
- Environmental Protection and Biodiversity Conservation Act 1999 (Cwlth)

This report does not specifically consider the above legislation and in this regard this report should be read in conjunction with the Statement of Environmental Effects submitted with the development application. It is noted there will be some vegetation removal and vegetation regeneration proposed for the development.

### **3.3 REPORT DETAILS**

Report Reference No.:	18/092
Property Address:	Lot 1 DP 1031848, 951 Broken Head Road, Broken Head
Client:	Linnaeus Property Pty Ltd
Local Government Area:	Byron Shire Council
Proposal:	Eco-tourism and mixed development
Drawings:	Harley Graham Architects, D.02, 9.4.2020: C.02, 6.4.2020: C.03, 6.4.2020: APZ Dwg 01 dated 26.3.2020. See Appendix A, B and C for other relevant plans referenced by this report.
Report Prepared By:	Peter Thornton MFireSafeEng, BPAD – L3 Accredited Practitioner

### 3.4 PROPOSED DEVELOPMENT

The following description of the proposed development has been provided by the consultant town planner:

#### GENERAL DESCRIPTION OF PROPOSAL

*Consent is sought to for a mixed-use development of the Linnaeus property permitting certain of the existing facilities to continue to be used for private education; allowing the remaining existing facilities to also be used for eco-tourism and providing further new facilities for eco-tourism purposes.*

*The private education residences (#2 and 34) and the private education accommodation (#12-16) located within the 7(f1) zone and unbuilt #18 will continue with a private education use. Approved, but not built private education accommodation (#19-23 and #28-33) will not be constructed. Approval is sought to utilise the remaining existing built private education accommodation units (#3-11 and 17) and the existing built centre accommodation units (#24-27) for Eco Tourism purposes. Further, 1 new rainforest retreat (Type C building); 4 new tree house cabins (Type B buildings); and 22 new beach cabins (Type A buildings) are proposed to be constructed and used for Eco Tourism accommodation*

*Full details in relation to the architecture of the proposed development is provided in the **Plan Set**.*

*In support of the Eco Tourism accommodation, consent is sought to erect a fire refuge building and construct a depot and parking precinct. Ancillary to the Mixed Use generally, buildings proposed include poolside facilities, a shed in the vegetable growing area and minor alterations to the existing centre.*

*The Mixed-Use population estimates for the Linnaeus Estate are set out in **Table 3.1** below. In this table, the Eco Tourism components of the proposal are shown in green shading.*

**TABLE 3.1 MIXED USE POPULATION ESTIMATES<sup>1</sup>**

<b>Building Type</b>	<b>No. of units</b>	<b>PpU</b>	<b>Population</b>
Private education residences	2	4.5	9
Existing Private Education Centre Accommodation units used for Eco Tourism	4	2	8
Existing Private Education Accommodation units used for Eco Tourism	10	3.5	35
Private Education accommodation units not built	11	0	0
Private Education accommodation unit not built, but may be constructed shortly	1	3.5	3.5
Private Education accommodation units in 7F1 zone	5	3.5	17.5
Eco Tourism Cabins	27	2	54
Unallocated capacity			21.5
<b>TOTAL</b>			<b>148.5</b>

PpU = persons per Unit. The total population specified in this table reflects the policy position of Council set out in its Rural Land Use Strategy (33 lots × 4.5 persons per lot).

### 3.5 EXISTING RESIDENTIAL TO CHANGE USE TO ECOTOURISM

The applicant is proposing to change the use of a number of the nominated existing SFPP cabins to eco-tourism status as shown in Figure 6 and 7. In this regard the occupant characteristics are not dissimilar from each other and will rely heavily on the required Emergency Evacuation Procedures recommended by this report.

On-site evacuation buildings are proposed as part of this development and will need to be incorporated in the procedures with early triggers to allow for sufficient premovement and movement times.

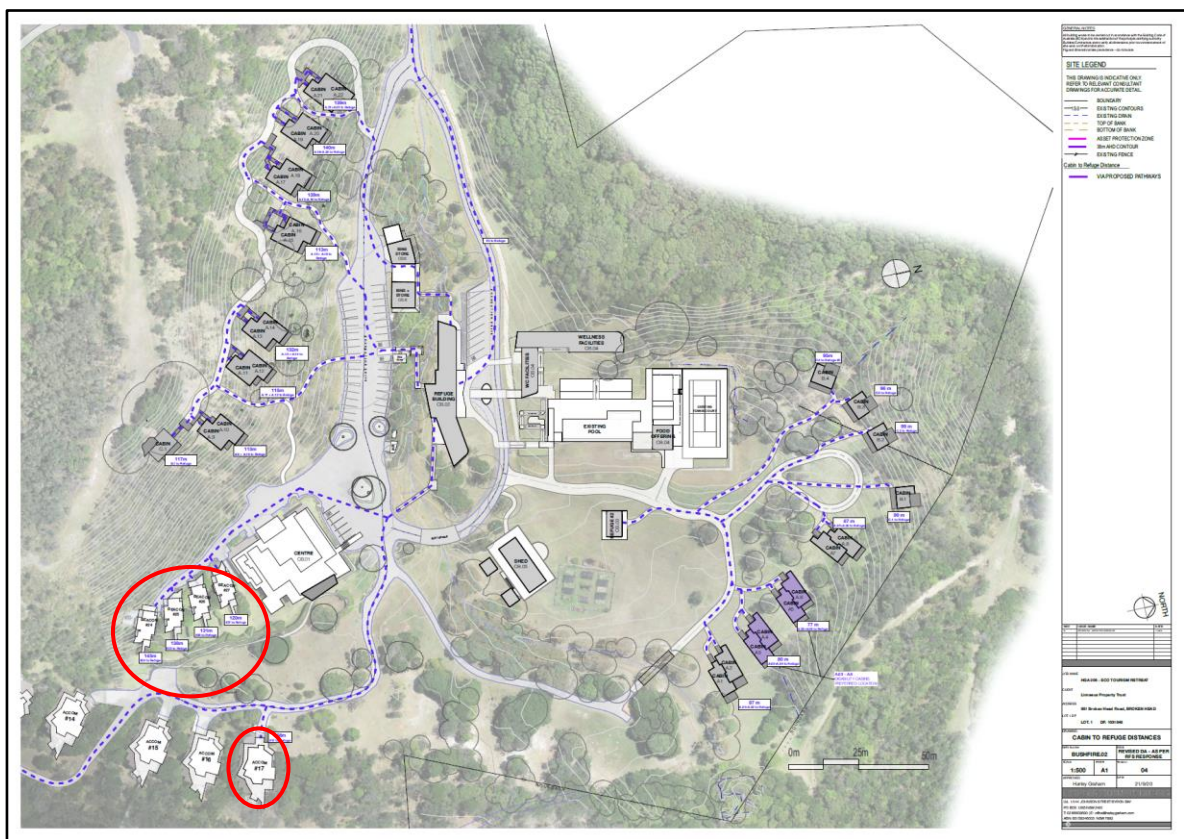


Figure 6: Site plan of the northern precinct locating proposed buildings and the existing accommodation sought to also to be used for eco-tourism (red outline).



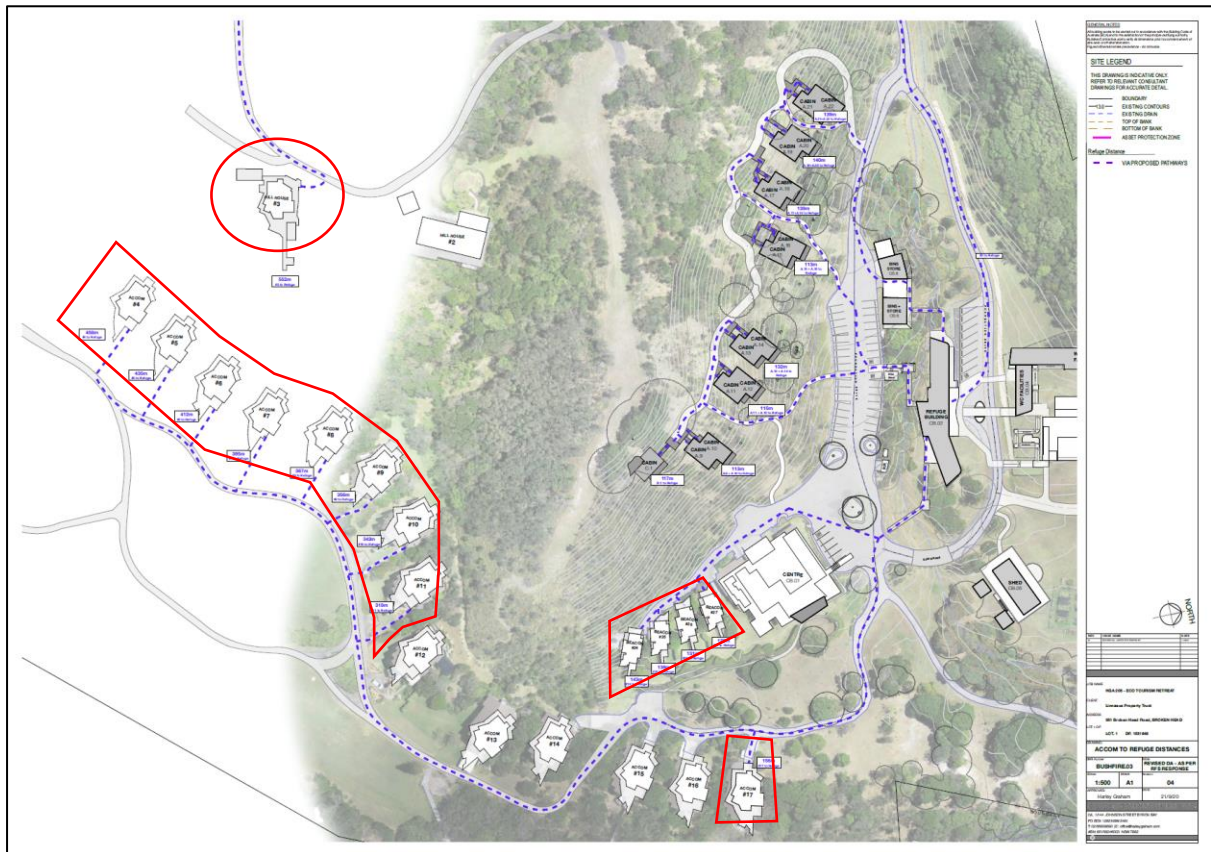


Figure 7 – Southern precinct of the development consists of existing private education accommodation buildings sought to also be used for eco-tourism cabins.

The following information has been received relating to the bushfire protection measures included within the original court consent outlined as follows. It is assumed, unless otherwise advised, that these conditions are still current for the existing development. In turn these conditions are relied upon as part of this bushfire assessment report.

*F13 - A 20m inner radiation zone measured from the outer wall of the building is to be kept free of all combustible undergrowth and ground litter which must not exceed a level of 0.5 kg per square metre. Combustible trees should not form a continuous canopy or line between the fire source and the building. All fire suppressant rainforest trees and shrubs should be retained within this area. To the reasonable satisfaction of Council's Fire Control Officer.*

*F14 - A 20m outer radiation zone measured from the perimeter of the inner radiation zone is to be maintained. Ground litter must be kept at a level not to exceed 0.5 kg per m<sup>2</sup> to the reasonable satisfaction of Council's Fire Control Officer.*

*F15 - An adequate turning circle area of 20m diameter or equivalent maneuvering space is to be constructed in accordance with Council's specification of Engineering Works. Area to be kept clear of all obstruction.*

*F16 - All under-floored areas to be enclosed with metal gauze or other approved suitable materials.*

*F17 - All eaves are to be boxed in and gutters maintained free of litter.*

*Source: Existing NSW LEC BHCF s96 10449B of 1998 – Rev Consent – May 2004*

It is recommended the original bushfire conditions of consent be maintained which may require confirmation with conditions of consent re-enforcing these conditions for the existing buildings subject to the change of use to eco-tourism. The location of asset protection zones and other bushfire protection measures are to be shown on a Bush Fire Management Plan (BFMP) which is to include all bushfire protection measures existing and proposed.

The BFMP is to include asset protection zones, water supply, access and construction standards required for the development. This plan will create a better outcome for the subject property and the residents on adjoining properties as it will promote a co-ordinate and more efficient bushfire brigade response in a bushfire event.

The existing development has fire hydrants and fire hose reels within the site for occupant preparation and suppression. The proposed development will provide the Rural Fire Service with an opportunity to specify the preparation of an Evacuation Plan and Fire Management Plan thereby creating a more controlled and safer environment during a bushfire event should the development proceed.

## **4.0 BUSHFIRE THREAT ASSESSMENT**

### **4.1 OVERVIEW**

The bushfire threat assessment as required by Planning for Bushfire Protection 2019 comprises the identification of the vegetation formations and the effective slope of the land within the bushfire hazard considered most likely to influence the bushfire behaviour as required by Appendix 1 of PBP2019.

## 4.2 BUSHFIRE PRONE LAND MAP

The bushfire prone mapping identifies the subject allotment as being bushfire prone as shown in Figure 8, having a combination of Category One, Two and Three vegetation types which is considered reasonably accurate, although there are areas where, with the assistance of the consultant ecologist the boundaries of these vegetation categories has been more accurately defined in the vicinity of the development. These areas are shown in the Figure 9 in Section 4.3 of this report.

There are large expanses of managed land to the west and southwest of the ecotourism development which the existing property access traverses. The bushfire mapping incorrectly identifies the majority of these managed areas as a grassland (Category 3) bushfire hazard.

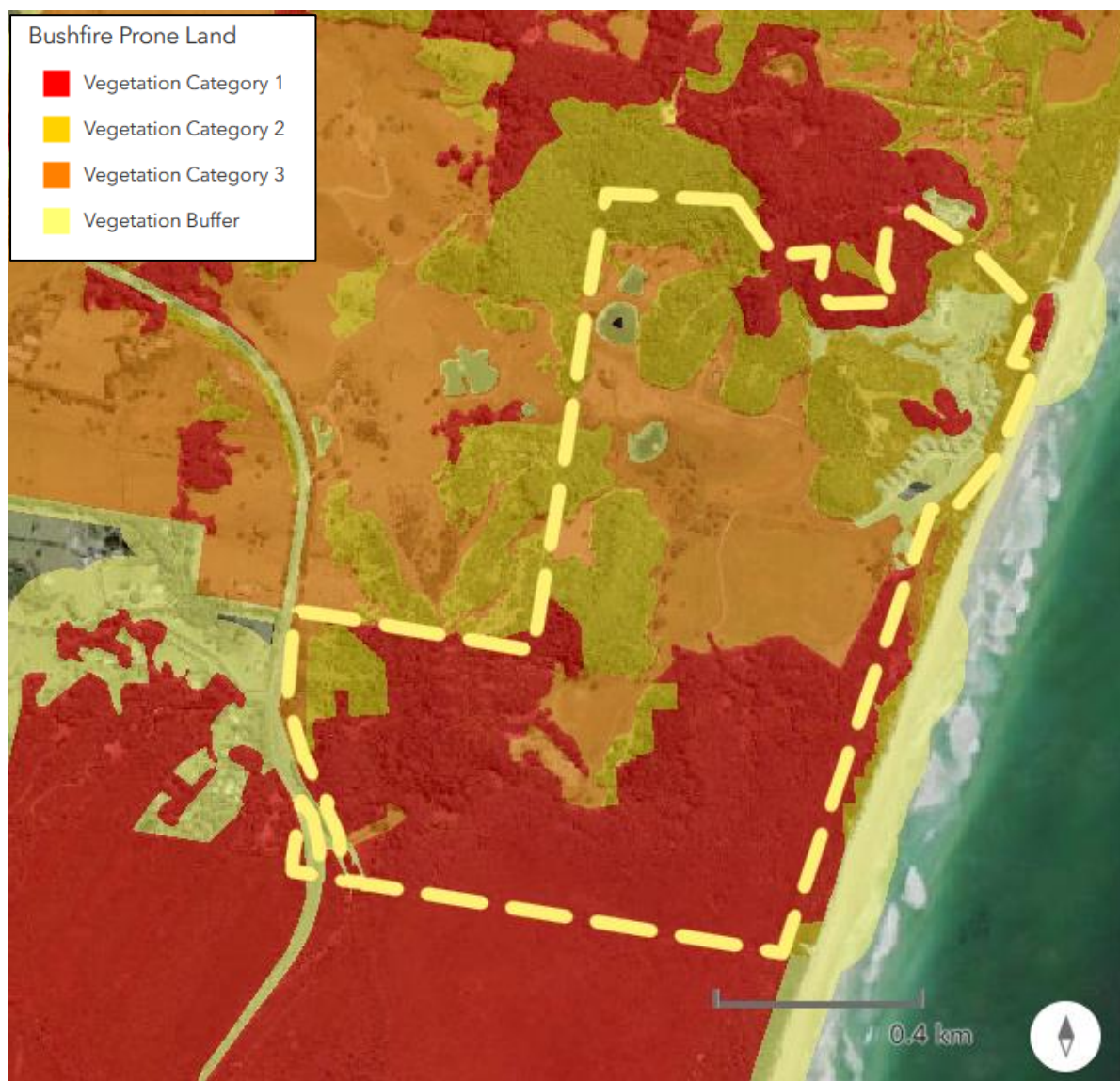


Figure 8 – Bushfire prone land mapping.

NSW Planning Portal (01.02.21)

### **4.3 BUSHFIRE HAZARD ASSESSMENT**

The existing bushfire hazard impacting the primary ecotourism area of the development as shown in Figure 9 is a combination of rainforest, forest and tall heath (scrub). The applicant is also proposing to assist regeneration to enhance the areas to the northeast and southwest around the proposed cabins with rainforest plantings which has been taken into account with this bushfire assessment report.

The development being an eco-tourism development permits the cabins to be scarified in a bushfire event due to the nature of an eco-tourism use however this is based on a having a safe refuge building/s that can be demonstrated as not receiving levels of radiant heat exceeding  $10\text{kW/m}^2$ . In turn the bushfire threat to the cabins is not considered, but rather the assessment will be focused on the remaining proposed buildings.

For the development area (excluding the depot) the bushfire risk from all aspects has been considered, although some aspect pose a higher risk to others.

#### **East**

The bushfire hazard to the east is generally a combination of rainforest and dunal vegetation having a very short direct fire run of approximately 80m from an easterly direction. Beyond the hazard to the east is the Pacific Ocean which results in a forecast fire having a limited intensity not likely to reach 100% equilibrium when the initiation, growth and acceleration time is taken into consideration.

The other fire characteristic would be a flanking fire which will reduce the likelihood of direct and perpendicular exposure to the fire front thereby limiting radiant heat flux received by the development. In turn the impact from a fire traversing from the easterly direction is not as high as that from some of the other aspects.

The development is generally at a lower elevation than the predominant bushfire hazard to the north, northwest, west, southwest and south with the hazard located on upslopes away from the development. The upslopes will reduce the rate of spread of a fire, resulting in a decreased fire intensity at the proposed asset protection zone interface than that of a bushfire hazard located on flat ground or a downslope.

#### **West and north-west**

To the west/northwest the bushfire hazard is split into vegetation classifications as shown in Figure 9 and verified by the consultant ecologist on site. The upslopes extend for a minimum distance of 50m (south) to greater than 100m from the bushfire hazard interface thereby being a sufficient distance to have an effect on reducing the fire's rate of spread and intensity when measured at the interface of the asset protection zone.

### **South and south-west**

To the south and southwest there is a combination of a number of varied vegetation classifications, which have been classified previously with RFS assessments as being rainforest. The application proposes to re-generate the rainforest vegetation on the northern slopes where the tree top cabins are proposed which will solidify the determination of rainforest classification on the upslope from the on-site evacuation building CB.02.

Further beyond the upslope to the south there is a cleared fire access area on the top of the ridge with the topography beyond the ridge to the south being a downslope of 10-15 degrees with relatively short fire runs. The vegetation classifications are varied however there is some brushbox vegetation to the southwest with a mixture of scrub and rainforest sections. Taking the worst case scenario of forest vegetation a split assessment to determine the most likely slope to impact the tree house buildings from this direction has been considered.

The downslope on the southern side of the ridge is approximately 80-100m from the on-site evacuation building CB.02 and in turn the rainforest classification on the upslope and directly adjacent to the recommended asset protection zone interface is considered most likely to influence the bushfire behaviour.

Further to the southwest and south of the development area are large areas of cleared, open land consisting of a combination of both managed land and grassland dissected with internal property access roads.





Figure 9 – Vegetation classifications pursuant to D. Keith

Source: Geolink 2020

## 5.0 ASSET PROTECTION ZONES AND CONSTRUCTION STANDARDS

### 5.1 General

Asset Protection Zones are areas established and maintained to ensure that bushfire fuels are progressively reduced between the development and the bushfire hazard. The asset protection zone incorporates an Inner Protection Area (IPA) having reduced fuel loadings of approximately 3t/ha.

The assessment to establish the asset protection zones required for the 10kW/m<sup>2</sup> on-site evacuation buildings and the proposed Class 5-9 building are summarised in the following tables for each building. It is noted that a performance solution has been prepared to establish the reduced asset protection zones accounting for the bushfire hazard being located on upslopes where a reduced rate of spread and intensity is forecast thereby leading to a reduced asset protection as identified in the following tables.



Photo 1 – Well managed land within the development.

The applicant has confirmed the Class 9b buildings do not exceed 500m<sup>2</sup> and therefore are not treated similar to a Special Fire Protection Purpose development. The proposed eco-tourism cabins will not be provided with asset protection zones, however existing cabins with previously approved and bushfire conditions will be adhered to and maintained.

The recommended minimum asset protection zones for each building, whilst demonstrated as capable of achieving compliance, will be extended into existing open areas capable of being managed in order to address the performance of pathway travel distances from the new cabins to the refuge building, and also reduce the bushfire risk to adjoining properties by providing separation and defendable space to counter additional planting proposed. Figure 1 indicates an example of the location of extended APZ areas.

Advice received by the applicant is that the revegetation around the proposed cabins will be rainforest classification and in turn the APZs have been established on this basis.

## **5.2 On-Site Evacuation Building CB.02 – 10kW/m<sup>2</sup>**

Table No. 1 is a summary of the bushfire assessment for the primary on-site evacuation building denoted on the plan as building CB.02. The recommended asset protection zones are established to comply with the accepted methodology being a combination of acceptable solutions (Table A1.12.1 PBP2019) and performance solutions modelling the reduced rate of spread of the upslope topography where the hazard is located and split assessment relating to the two different vegetation classifications.

The performance solutions have been undertaken in consultation with the NSW Rural Fire Service through the bushfire design brief process outlining the methodology proposed. The performance solution is providing in Section 5.5 of this report.



<b>Table 1: Bushfire Assessment - On-Site Evacuation Building CB.02 – 10kW/m<sup>2</sup></b>				
<b>ASPECT</b>	<b>SLOPE</b>	<b>VEGETATION CLASS</b>	<b>Minimum APZ recommended</b>	<b>Comment</b>
South/SW	10° upslope	Rainforest	25m	See performance solution.
West	Flat	Rainforest	38m	Acceptable Solutions Table A1.12.1 PBP2019
East	Flat	Rainforest	38m	Acceptable Solutions Table A1.12.1 PBP2019
Northwest	10° upslope	Rainforest	30m	See performance solution
North	Upslope	Rainforest	38m	Acceptable Solutions Table A1.12.1 PBP2019

The building CB.02 will be provided with gutter guards and constructed to comply with the requirements BAL 29 AS 3959-2018 plus Section 7.5 Planning for Bushfire Protection 2019. It is noted the radiant heat levels forecast are equivalent to BAL 12.5 however a redundancy to increase the construction standard has been provided following the analysis of the landscaping performance solution within this report.

### **5.3 On-Site Evacuation Building CB.03 – 10kW/m<sup>2</sup>**

Table No. 2 is a summary of the bushfire assessment for the second on-site evacuation building denoted on the plan as building CB.03. The recommended asset protection zones are established to comply with the accepted methodology being a combination of acceptable solutions (Table A1.12.1 PBP2019) and performance solutions modelling the reduced rate of spread of the upslope topography where the hazard is located and split assessment relating to the two different vegetation classifications.

The performance solutions have been undertaken in consultation with the NSW Rural Fire Service through the bushfire design brief process outlining the methodology proposed. The performance solution is providing in Section 5.6 of this report.

<b>Table 2: Bushfire Assessment - On-Site Evacuation Building CB.03 – 10kW/m<sup>2</sup></b>				
<b>ASPECT</b>	<b>SLOPE</b>	<b>VEGETATION CLASS</b>	<b>Minimum APZ recommended</b>	<b>Comment</b>
South/SW	10° upslope	Rainforest	25m	See performance solution – it is noted the APZ to the south is extensive due to the clustered APZs relating to other buildings on site.
West	Flat	Rainforest	38m	See performance solution – it is noted the APZ to the south is extensive due to the clustered APZs relating to other buildings on site.
East	Flat	Rainforest	38m	Acceptable Solutions Table A1.12.1 PBP2019
North/NW	Upslope	Rainforest	38m	Acceptable Solutions Table A1.12.1 PBP2019
Northeast	0-5° d/slope	Rainforest	47m	Acceptable Solutions Table A1.12.1 PBP2019

Building CB.03 will be provided with gutter guards and constructed to comply with the requirements BAL 12.5 AS 3959-2018 plus Section 7.5 Planning for Bushfire Protection 2019.

#### **5.4 Wellness Centre, Food Offering and Sanitary Facilities CB.04 – 29kW/m<sup>2</sup>**

Table No. 3 is a summary of the bushfire assessment for the wellness and sanitary facilities and food offering buildings denoted on the plan as building CB.03. The recommended asset protection zones are established to comply with the accepted methodology being a combination of acceptable solutions (Table A1.12.3 PBP2019) and performance solutions modelling the reduced rate of spread of the upslope topography where the hazard is located and split assessment relating to the two different vegetation classifications.

The performance solution has been undertaken in consultation with the NSW Rural Fire Service through the bushfire design brief process outlining the methodology proposed. The performance solution is providing in Section 5.6 of this report.

**Table 3: Bushfire Assessment – Wellness, Sanitary and Food Offering Buildings CB.04 – 29kW/m<sup>2</sup>threshold.**

ASPECT	SLOPE	VEGETATION CLASS	Minimum APZ recommended	Comment
West/NW	10° upslope	Rainforest	Minimum 6m	See performance solution
South/SW	Flat and Upslope	Rainforest	9m	Acceptable Solutions Table A1.12.3 PBP2019
East	Flat	Rainforest	9m	Acceptable Solutions Table A1.12.3 PBP2019
North/NW	Upslope	Rainforest	9m	Acceptable Solutions Table A1.12.3 PBP2019
Northeast	0-5° d/slope	Rainforest	12m	Acceptable Solutions Table A1.12.3 PBP2019

The building CB.04 will be constructed and provided with gutter guards to comply with the requirements of BAL 29 AS 3959-2018 plus Section 7.5 Planning for Bushfire Protection 2019.

It is noted that buildings deemed to be Class 10a buildings as defined by the Building Code of Australia 2019 (CB.05 and CB.06) by the accredited building certifier are to be constructed with non-combustible external cladding and be separated by at least 10m from the building recommended to have a Bushfire Attack Level (BAL) AS 3959-2018. Advice received is that the consultant Building Surveyor has identified these buildings as Class 10a uses.

## 5.5 Depot Building – 29kW/m<sup>2</sup>

Table No. 4 is a summary of the bushfire assessment for Depot building which is remote and located to the southwest of the primary development area. The recommended asset protection zones are established to comply with the accepted methodology being a combination of acceptable solutions (Table A1.12.3 PBP2019).



Figure 10 – Summary of bushfire hazard vegetation adjacent to the Depot.

<b>Table 4: Bushfire Assessment – Depot Building – 29kW/m<sup>2</sup>threshold.</b>				
<b>ASPECT</b>	<b>SLOPE</b>	<b>VEGETATION CLASS</b>	<b>APZ DEPOT</b>	<b>Construction AS 3959-2018</b>
South/SW	0-5° d/s	Rainforest Forest* (rainforest close to interface is primary hazard)	12m	BAL 29 plus s7.5 PBP2019
West	5-10° d/s	Rainforest	15m	BAL 29 plus s7.5 PBP2019
East	Upslope	Rainforest	9m	BAL 29 plus s7.5 PBP2019
North	Upslope	Rainforest	9m	BAL 29 plus s7.5 PBP2019

The building CB.04 will be constructed and provided with gutter guards to comply with the requirements of BAL 29 AS 3959-2018 + Section 7.5 Planning for Bushfire Protection 2019.

## 5.6 Shed CB.05 – 29kW/m<sup>2</sup>

The shed located to the east of the primary on-site evacuation building is located within the proposed clustered asset protection zone.

<b>Table 5: Asset protection zones for the shed – CB.05</b>				
<b>Aspect</b>	<b>Slope</b>	<b>Vegetation class</b>	<b>APZ depot</b>	<b>Construction AS 3959-2018</b>
Southwest	Upslope	Rainforest	9m	BAL 29 plus s7.5 PBP2019
West	Upslope	Rainforest	9m	BAL 29 plus s7.5 PBP2019
East	Flat	Rainforest	9m	BAL 29 plus s7.5 PBP2019
North	Upslope	Rainforest	9m	BAL 29 plus s7.5 PBP2019

## 5.7 PERFORMANCE SOLUTIONS APZs Buildings CB.02 and CB.04

### 5.7.1 – General

The applicant is proposing an eco-tourism development and given the nature of this type of use and further ecological assessments establishing the ecological value within the site and limitations for clearing vegetation, the applicant has advised they would like to implement this option pursuant to s6.3.1 PBP2019 which states –

*Ecotourism – Due to its focus on the natural environment and creating minimal impact, the principles of ecotourism and the establishment of APZs for bush fire mitigation are often in conflict. All relevant parties must accept that there is an increase for the potential for loss of structures due to the competing objective to reduce the environmental footprints of these types of developments. The emphasis is therefore place on emergency management, leaving early and non-operation on days of extreme or catastrophic fire weather.*

It is understood the owners have discussed this concept with their insurers as required by the NSW RFS Fact Fact for Ecotourism which was applicable during early to mid design development phase of development prior to the implementation of PBP2019 on the 1<sup>st</sup> March 2020.

A site inspection was undertaken with the consultant ecologist where the interface where the rainforest vegetation to the west/northwest on the lower slopes intersects with the brushbox dominated forest commencing further up the slope. The location of the two vegetation classification are identified in Figure 9. In this regard a split assessment using the upslope modelling for the Wellness Centre has been prepared.

A split assessment has been undertaken of the two vegetation classifications to the northwest of building CB.02 (10kW/m<sup>2</sup> building) and to the west of Building CB.04 as shown on the architectural plans. The split assessment is consistent with the prescriptive

methodology of PBP2019 Appendix 1 Section A1.2 – Determine Vegetation Formation which states –

*‘Where mixes of vegetation formations are located together, the vegetation formation providing the greater hazard shall be used for the purpose of assessment. The combination of vegetation and slope that yields the worst case scenario shall be used.’*

This is further supported by Clause 2.2.3.1 of AS 3959-2018 which whilst is not an assessment method in NSW is an Australian Standard that has been consistently applied in all other states and in NSW up to March 2020.

*‘Vegetation shall be classified in accordance with Table 2.3. Where there is more than one vegetation type, each type shall be classified and assessed separately’.*

The split assessment for the 10kW/m<sup>2</sup>, on-site evacuation building CB.02 is used from the acceptable solutions of Table 6.8b PBP2019. Figure No 11 provides visual identification of the direction and location of the proposed Design Fires.

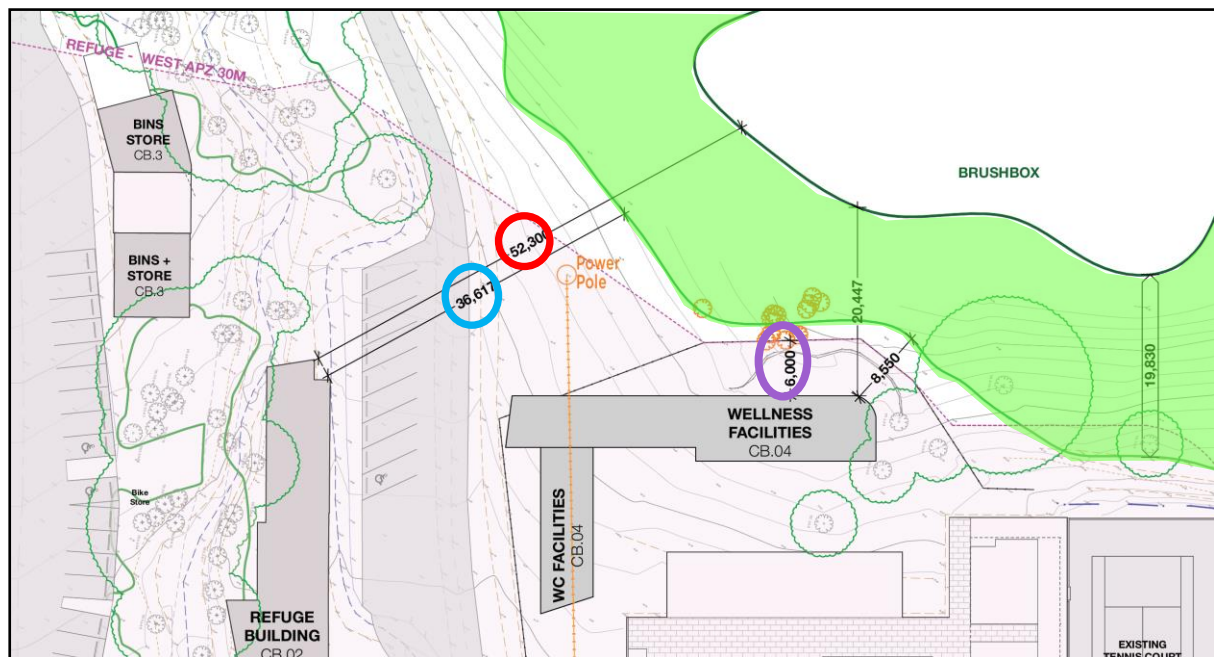


Figure 11 – Distance from buildings to the rainforest vegetation (green shading) and brushbox forest. Design Fire No. 1 – Red Circle, Design Fire No. 2 – Blue Circle, Design Fire No. 3 – Purple Circle.

### **5.7.2 APZ - Acceptable Solution – On-Site Evacuation Building CB.02**

*‘The building is provided with an APZ in accordance with Table A1.12.1 in Appendix 1’.*

### **5.7.3 APZ - Performance Criteria – On-Site Evacuation Building CB.02**

*‘Radiant heat levels of greater than 10kW/m<sup>2</sup> (calculated at 1200K) will not be experienced on any part of the building’.*

### **5.7.4 APZ - Acceptable Solution – Wellness Centre CB.04**

*‘APZs are provided commensurate with the construction of the building; and  
‘a defensible space is provided’.*

### **5.7.5 APZ - Performance Criteria – Wellness Centre CB.04**

*‘an APZ is provided in accordance with Table A1.12.2 or A1.12.3 in Appendix 1’.*

### **5.7.6 BCA Methodology**

The building works need to comply with the performance requirement of P2.7.5 of the Building Code of Australia (BCA). The assessment will be a combination of both deemed-to-satisfy provisions and performance solution pursuant to Part A2.1(3). Part A2.2 of the Housing Provisions identifies how you would satisfy the performance requirements and provides as follows:

- (1) *A Performance Solution must –*
  - (a) *Compliance with all relevant Performance Requirements; or*
  - (b) *The solution is at least equivalent to the Deemed-to-Satisfy Provisions,*

This assessment will demonstrate the proposal will comply with the performance requirement as outlined in A2.2(1)(a) of the BCA Housing Provisions. The assessment method used in the study will be verification method accepted by the appropriate authority being the NSW Rural Fire Service pursuant to A2.2(2)(b)(ii) relating to the upslope modelling methodology using a quantitative verification analysis consistent with Planning for Bushfire Protection 2019.



The methodology adopted in formulating the performance solution is based on that described in the *International Fire Engineering Guidelines 2005*, RFS Practice Note 03/06 and AS 3959-2018. The Guidelines provide guidance for the design of performance solutions for the BCA in order to establish an acceptable level of compliance with the relevant performance requirement.

### **5.7.7 Trial Designs**

The trial design be as follows for each building.

#### **Building CB.02 – On-site evacuation building**

1. A 30m asset protection zone is to be provided to the northwest of the building measured from the wall of the building to the interface of the bushfire hazard/APZ interface. The APZ is to be established, managed and maintained to the reduce the risk of fire spread from the bushfire hazard to the subject building.

#### **Building CB.04 – Wellness centre**

1. The building is to be constructed to comply with the requirements of BAL 29 AS 3959-2018 plus Section 7.5 Planning for Bushfire Protection 2019.
2. A 6m asset protection zone is to be provided to the west of the building measured from the wall of the building to the interface of the bushfire hazard/APZ interface. The APZ is to be established, managed and maintained to the reduce the risk of fire spread from the bushfire hazard to the subject building.

### **5.7.8 Acceptance Criteria**

#### Evacuation Building CB.02

Radiant heat received by the building is not to exceed 10kW/m<sup>2</sup>

#### Wellness Centre CB.04

Radiant heat received by the building is not to exceed 29kW/m<sup>2</sup> and the building constructed to reduce the risk of ignition.

### 5.7.9 Design Fire No. 1 – Building CB.02 – Forest - Northwest

Design Fire No. 1 is provided for brush-box forest located on a 10 degree upslope to the northwest where the forest is located approximately 52m from the refuge building as shown in Figure 11. The design fire will use a 1200K flame temperature with a Fire Danger Index of 80 as agreed with the NSW Rural Fire Service during the consultation phase of reporting given the location of the development adjacent to the east coast of Australia and approximately 65km direct to the Queensland border. The relevant inputs and outputs are shown in Figure 12.

<b>Table 6: Bushfire Assessment for On-Site Refuge Building (CB.2) Brushbox forest</b>				
<b>Aspect</b>	<b>Slope</b>	<b>Vegetation class</b>	<b>SFPP On-Site Evac Building CB.02</b>	<b>&lt;10kW/m<sup>2</sup></b>
Northwest	10° upslope	Forest	52m	Yes

<b>Run Description:</b> Design Fire No. 1 – Northwest Building CB.02			
<b><u>Vegetation Information</u></b>			
<b>Vegetation Type:</b>	Forest	<b>Vegetation Group:</b>	Forest and Woodland
<b>Vegetation Slope:</b>	10 Degrees	<b>Vegetation Slope Type:</b>	Upslope
<b>Surface Fuel Load(t/ha):</b>	25	<b>Overall Fuel Load(t/ha):</b>	35
<b>Vegetation Height(m):</b>	2	Only Applicable to Shrub/Scrub and Vesta	
<b><u>Site Information</u></b>			
<b>Site Slope:</b>	5 Degrees	<b>Site Slope Type:</b>	Upslope
<b>Elevation of Receiver(m):</b>	Default	<b>APZ/Separation(m):</b>	52
<b><u>Fire Inputs</u></b>			
<b>Veg./Flame Width(m):</b>	100	<b>Flame Temp(K)</b>	1200
<b><u>Calculation Parameters</u></b>			
<b>Flame Emissivity:</b>	95	<b>Relative Humidity(%):</b>	25
<b>Heat of Combustion(kJ/kg)</b>	18600	<b>Ambient Temp(K):</b>	308
<b>Moisture Factor:</b>	5	<b>FDI:</b>	80
<b><u>Program Outputs</u></b>			
<b>Category of Attack:</b>	LOW	<b>Peak Elevation of Receiver(m):</b>	10.38
<b>Level of Construction:</b>	BAL 12.5	<b>Fire Intensity(kW/m):</b>	21768
<b>Radiant Heat(kW/m2):</b>	8.28	<b>Flame Angle (degrees):</b>	76
<b>Flame Length(m):</b>	12.02	<b>Maximum View Factor:</b>	0.095
<b>Rate Of Spread (km/h):</b>	1.2	<b>Inner Protection Area(m):</b>	38
<b>Transmissivity:</b>	0.777	<b>Outer Protection Area(m):</b>	14

Figure 12 – Design Fire 1 establishes radiant heat received will be less than 10kW/m<sup>2</sup> from the location of the forest vegetation to the northwest.

## Analysis

Design Fire No 1 establishes the distance between the forest vegetation and the refuge is sufficient to demonstrate the radiant heat from a fire at that location does not forecast a radiant heat to the refuge building exceeding 10kW/m<sup>2</sup>. The modelling forecasts a radiant heat flux of 8.28kW/m<sup>2</sup> will be received by the building with a 30m asset protection zone between the building and the total hazard in this direction.

### 5.7.10 Design Fire No. 2 – Building CB.02 – Rainforest - Northwest

Design Fire No. 2 is provided for rainforest located on a 10° upslope to the northwest where the forest is located approximately 30m from the refuge building as shown in Figure 11.

The design fire will use a 1200K flame temperature with a Fire Danger Index of 80 as agreed with the NSW Rural Fire Service during the consultation phase of reporting given the location of the development adjacent to the east coast of Australia and approximately 65km direct to the Queensland border. The relevant inputs and outputs are shown in Figure 13.

<b>Table 7: Bushfire Threat Assessment for On-Site Refuge Building (CB.2) rainforest</b>				
Aspect	Slope	Vegetation class	SFPP On-Site Evacuation	<10kW/m <sup>2</sup>
Northwest	10° upslope	Rainforest	30m	Yes

<b>Run Description:</b> Design Fire 2			
<b><u>Vegetation Information</u></b>			
<b>Vegetation Type:</b>	Rainforest	<b>Vegetation Group:</b>	Forest and Woodland
<b>Vegetation Slope:</b>	10 Degrees	<b>Vegetation Slope Type:</b>	Upslope
<b>Surface Fuel Load(t/ha):</b>	10	<b>Overall Fuel Load(t/ha):</b>	13.2
<b>Vegetation Height(m):</b>	0	Only Applicable to Shrub/Scrub and Vesta	
<b><u>Site Information</u></b>			
<b>Site Slope:</b>	3 Degrees	<b>Site Slope Type:</b>	Upslope
<b>Elevation of Receiver(m):</b>	Default	<b>APZ/Separation(m):</b>	30
<b><u>Fire Inputs</u></b>			
<b>Veg./Flame Width(m):</b>	100	<b>Flame Temp(K)</b>	1200
<b><u>Calculation Parameters</u></b>			
<b>Flame Emissivity:</b>	95	<b>Relative Humidity(%):</b>	25
<b>Heat of Combustion(kJ/kg)</b>	18600	<b>Ambient Temp(K):</b>	308
<b>Moisture Factor:</b>	5	<b>FDI:</b>	80
<b><u>Program Outputs</u></b>			
<b>Category of Attack:</b>	LOW	<b>Peak Elevation of Receiver(m):</b>	3.91
<b>Level of Construction:</b>	BAL 12.5	<b>Fire Intensity(kW/m):</b>	3284
<b>Radiant Heat(kW/m2):</b>	6.74	<b>Flame Angle (degrees):</b>	82
<b>Flame Length(m):</b>	4.71	<b>Maximum View Factor:</b>	0.074
<b>Rate Of Spread (km/h):</b>	0.48	<b>Inner Protection Area(m):</b>	30
<b>Transmissivity:</b>	0.815	<b>Outer Protection Area(m):</b>	0

Figure 13 – Method 2 modelling to rainforest – Northwest of refuge

## Analysis

The modelling establishes a 30m APZ to the northwest of the refuge building toward the rainforest vegetation on the interface of the managed land will establish a forecast radiant heat flux to the refuge building of 6.74kW/m<sup>2</sup> which is within the upper radiant heat threshold permitted being 10kW/m<sup>2</sup>. Therefore compliance with the nominate performance criteria of Planning for Bushfire Protection 2019 is achieved.

### 5.7.11 Design Fire No. 3 – Wellbeing Building CB.04 – West

Design Fire No. 3 is provided for rainforest located on a 10 degree upslope to the west where the rainforest is located approximately 6m from the Wellness Centre as shown in Figure 11. The design fire will use 1090K as the flame temperature.

<b>Table 8: Bushfire Threat Assessment for the Wellness Centre</b>				
Aspect	Slope	Vegetation class	Wellness Centre	<29kW/m <sup>2</sup>
Northwest	10° upslope	Rainforest	6m	Yes

<b>Run Description:</b> Design Fire 3	
<b><u>Vegetation Information</u></b>	
<b>Vegetation Type:</b>	Rainforest
<b>Vegetation Slope:</b>	10 Degrees
<b>Surface Fuel Load(t/ha):</b>	10
<b>Vegetation Height(m):</b>	0
<b>Vegetation Group:</b>	Forest and Woodland
<b>Vegetation Slope Type:</b>	Upslope
<b>Overall Fuel Load(t/ha):</b>	13.2
Only Applicable to Shrub/Scrub and Vesta	
<b><u>Site Information</u></b>	
<b>Site Slope:</b>	5 Degrees
<b>Elevation of Receiver(m):</b>	Default
<b>Site Slope Type:</b>	Upslope
<b>APZ/Separation(m):</b>	6
<b><u>Fire Inputs</u></b>	
<b>Veg./Flame Width(m):</b>	100
<b>Flame Temp(K)</b>	1090
<b><u>Calculation Parameters</u></b>	
<b>Flame Emissivity:</b>	95
<b>Heat of Combustion(kJ/kg)</b>	18600
<b>Relative Humidity(%):</b>	25
<b>Moisture Factor:</b>	5
<b>Ambient Temp(K):</b>	308
<b>FDI:</b>	80
<b><u>Program Outputs</u></b>	
<b>Category of Attack:</b>	HIGH
<b>Level of Construction:</b>	BAL 29
<b>Peak Elevation of Receiver(m):</b>	2.61
<b>Radiant Heat(kW/m2):</b>	27.31
<b>Fire Intensity(kW/m):</b>	3284
<b>Flame Length(m):</b>	4.71
<b>Flame Angle (degrees):</b>	62
<b>Rate Of Spread (km/h):</b>	0.48
<b>Maximum View Factor:</b>	0.406
<b>Transmissivity:</b>	0.884
<b>Inner Protection Area(m):</b>	6
<b>Outer Protection Area(m):</b>	0

Figure 14 – Design Fire 3 provides a 6m APZ to the Wellness centre for BAL 29.

## Analysis

The modelling confirms a 6m asset protection zone to the west/northwest of the Wellness Centre will be sufficient to allow the building to be constructed to BAL 29 AS 3959-2018 plus s7.5 Planning for Bushfire Protection 2019. The acceptance criteria as been satisfied.

### 5.7.12 Design Fire No. 4 – Building CB.02 – Rainforest – South.

Design Fire No. 4 is undertaken to model the upslope of the proposed rainforest revegetation to the south of the proposed on-site refuge building. The consultant ecologist has nominated the revegetation and vegetation enhancement of this area as rainforest vegetation as shown in Figure 9.

<b>Table 9: Bushfire Threat Assessment for south of the refuge building CB.02</b>				
<b>Aspect</b>	<b>Slope</b>	<b>Vegetation class</b>	<b>Evacuation building (refuge)</b>	<b>&lt;10kW/m<sup>2</sup></b>
South	10° upslope	Rainforest	22m	Yes

<b>Run Description:</b> Design Fire 4			
<b><u>Vegetation Information</u></b>			
<b>Vegetation Type:</b>	Rainforest	<b>Vegetation Group:</b>	Forest and Woodland
<b>Vegetation Slope:</b>	10 Degrees	<b>Vegetation Slope Type:</b>	Upslope
<b>Surface Fuel Load(t/ha):</b>	10	<b>Overall Fuel Load(t/ha):</b>	13.2
<b>Vegetation Height(m):</b>	0	Only Applicable to Shrub/Scrub and Vesta	
<b><u>Site Information</u></b>			
<b>Site Slope:</b>	0 Degrees	<b>Site Slope Type:</b>	Level
<b>Elevation of Receiver(m):</b>	Default	<b>APZ/Separation(m):</b>	22
<b><u>Fire Inputs</u></b>			
<b>Veg./Flame Width(m):</b>	100	<b>Flame Temp(K)</b>	1200
<b><u>Calculation Parameters</u></b>			
<b>Flame Emissivity:</b>	95	<b>Relative Humidity(%):</b>	25
<b>Heat of Combustion(kJ/kg)</b>	18600	<b>Ambient Temp(K):</b>	308
<b>Moisture Factor:</b>	5	<b>FDI:</b>	80
<b><u>Program Outputs</u></b>			
<b>Category of Attack:</b>	LOW	<b>Peak Elevation of Receiver(m):</b>	2.34
<b>Level of Construction:</b>	BAL 12.5	<b>Fire Intensity(kW/m):</b>	3284
<b>Radiant Heat(kW/m2):</b>	9.7	<b>Flame Angle (degrees):</b>	83
<b>Flame Length(m):</b>	4.71	<b>Maximum View Factor:</b>	0.104
<b>Rate Of Spread (km/h):</b>	0.48	<b>Inner Protection Area(m):</b>	22
<b>Transmissivity:</b>	0.834	<b>Outer Protection Area(m):</b>	0

Figure 15 – Modelling of 10 degree upslope rainforest south of the refuge building.

## **Analysis**

The modelling concludes that a minimum 22m asset protection zone to the south, southwest and southeast of the refuge building will be sufficient to ensure the radiant heat flux forecast to the refuge building will be <10kW/m<sup>2</sup> thereby complying with the nominated performance and acceptance criteria of this report. However as a further level of redundancy the required APZ will be increased to 25m.

## **6.0 ACCESS AND WATER SUPPLY**

### **6.1 General**

The proposed development is located on an existing site having an approved use (educational) which is consistent with defined Special Fire Protection Purpose development. Section 6.4 of Planning for Bushfire Protection 2019 provides commentary and objectives for this circumstance with the primary advice being that of early consultation early with the NSW Rural Fire Service early in the design process.

In this regard on-going consultation including correspondence, meetings and an on-site meeting have taken place with the NSW RFS over the past 1-2 years commencing with the requirements of Planning for Bushfire Protection 2006 at the early to mid-stages of design and then transitioning to the current Planning for Bushfire Protection 2019 legislated March 2020.

Specific discussions relating to the existing access and water supply capabilities, the requirement to upgrade not only to provide a better bushfire outcome for the existing development but also to adequately address the requirements for the proposed development. The applicant has engaged civil and hydraulic consultants to provide an assessment of the existing access and water supply function and the upgrading of both to meet an adequate level of performances. Specific consideration was given to the emergency management planning requirements of PBP2019 Table 6.8d specific to Ecotourism outlining the consideration for developments where extended travel distances are through bushfire prone land.

In the above regard the consultant Traffic Engineers (Geolink) have assessed the existing internal property access roads for the existing and proposed development. Based on some upgrading recommendations and extensions to the existing network, the report concludes that adequate Bush Fire Emergency Management and Evacuation Planning can be achieved. Photo 2 indicates well maintained internal roads. The consultant civil engineer has proposed access and turn around areas adjacent to both on-site evacuation buildings CB.02 and CB.03. This includes the potential upgrading of one existing bridge to ensure compliance



with the minimum load capacity required by Planning for Bushfire Protection 2019 as shown in photo 3.



Photo 2 – Existing access roads are well constructed



Photo 3 – Existing bridge to comply with load capacity.

Similarly the hydraulic consultants have assessed the water supply and provided recommendations for the upgrade of areas of the water supply by extending the existing system and providing additional hydrants. The hydraulic consultants are to provide design certification that the existing and proposed hydrants will comply with the coverage and pressure and flow requirements for the Class 5-9 buildings pursuant to Planning for Bushfire Protection 2019 and AS 2419.1-2005.

From a bushfire assessment perspective the cabins are sacrificial as previously discussed and therefore specific hydrant coverage is not required however the NSW RFS requested at the site meeting that a structural fire initiated within the cabin should be considered as required by other legislation. In this regard the applicant has advised the hydraulic and civil engineers will be addressing this separately within their report and in turn does not form part of this bushfire report.

The acceptable solution for access to and from the sacrificial cabins requires the cabins to be located 100m walking distance to the on-site evacuation ( $10\text{kW/m}^2$ ) buildings. The plans have been amended to ensure all cabins in the northern precinct meet this requirement. The accessible units for people with a disability have been relocated within this cluster of cabins and advice received is that the pathways will comply with the relevant legislative requirements in this regard.

The cabins in the southern cluster are located above the evacuation building had have a minimum travel distance of 113m and a maximum of 140m it being noted that egress will be downhill via recommended compliant stairs and walkways. The construction of the



pathways and stairs must be compliant with all relevant legislation for safe access and egress as determined by the consent authority. Whilst the performance solution relating to the acceptable solution relates specifically to safety of fire fighting vehicles for access to the refuge building, there will be an assessment undertaken on occupant safety to advance to the on-site evacuation building. This will be largely around early triggers in evacuation planning and the adequate construction of the paths of travel.

## **6.2 Cabin accommodation is further than 100m from the refuge building; and access and water supply assessment.**

The design development for the proposal has been approximately 2 years with the majority of the design and bushfire advice based on Planning for Bushfire Protection 2006 and Draft Planning for Bushfire Protection 2018. It is noted these two documents did not specify a minimum distance from the cabins to the refuge.

Generally the existing access has been accepted given the proposed development is for eco-tourism, it is an infill site and a 10kW/m<sup>2</sup> refuge, together with the location of the development to the east coast.

Recently Planning for Bushfire Protection 2019 was adopted on 1<sup>st</sup> March 2020 with an added acceptable solution that requires the accommodation to be within 100m of the refuge building.

The proposed locations of the cabins in relation to the on-site refuge building have previously been accepted in their current proposed locations however the report will provide further information to demonstrate compliance with the performance criteria of Table 6.8b (access) PBP2019 in order to re-confirm the current cabin and refuge locations are accepted.

It is noted the proposal to change the use of existing residential accommodation dwellings No. 3-11, 17 and 24-27 to ecotourism accommodation demonstrates a better bushfire outcome due to the construction of specific on-site evacuation buildings and proposed evacuation planning for the entire development. A better bushfire outcome has been demonstrated for these buildings.

### **6.2.1 Acceptable Solution**

The acceptable solution in Table 6.8b PBP2019 requires –

*"Accommodation is within 100m of the refuge building;*

The proposed southern cabins are located greater than 100m but less than 150m from the proposed on-site evacuation building EB.02 when measured along the required pedestrian pathways to this building. The distance from the existing dwellings being the subject of change of use, in particular Units 3-11 are further remote from the on-site refuges. However it is considered reasonable to assess the existing dwellings slightly differently given these buildings currently provide accommodation to occupants with transient characteristics. In this regard the inclusion of a 10kW/m<sup>2</sup> building on the subject property will provide these occupants a safer environment in a bushfire event with good early evacuation planning procedures as recommended.

The cabins (including for people with disabilities) in the northern precinct will be within 100m of the second on-site refuge building which has now been confirmed with the amended plans.

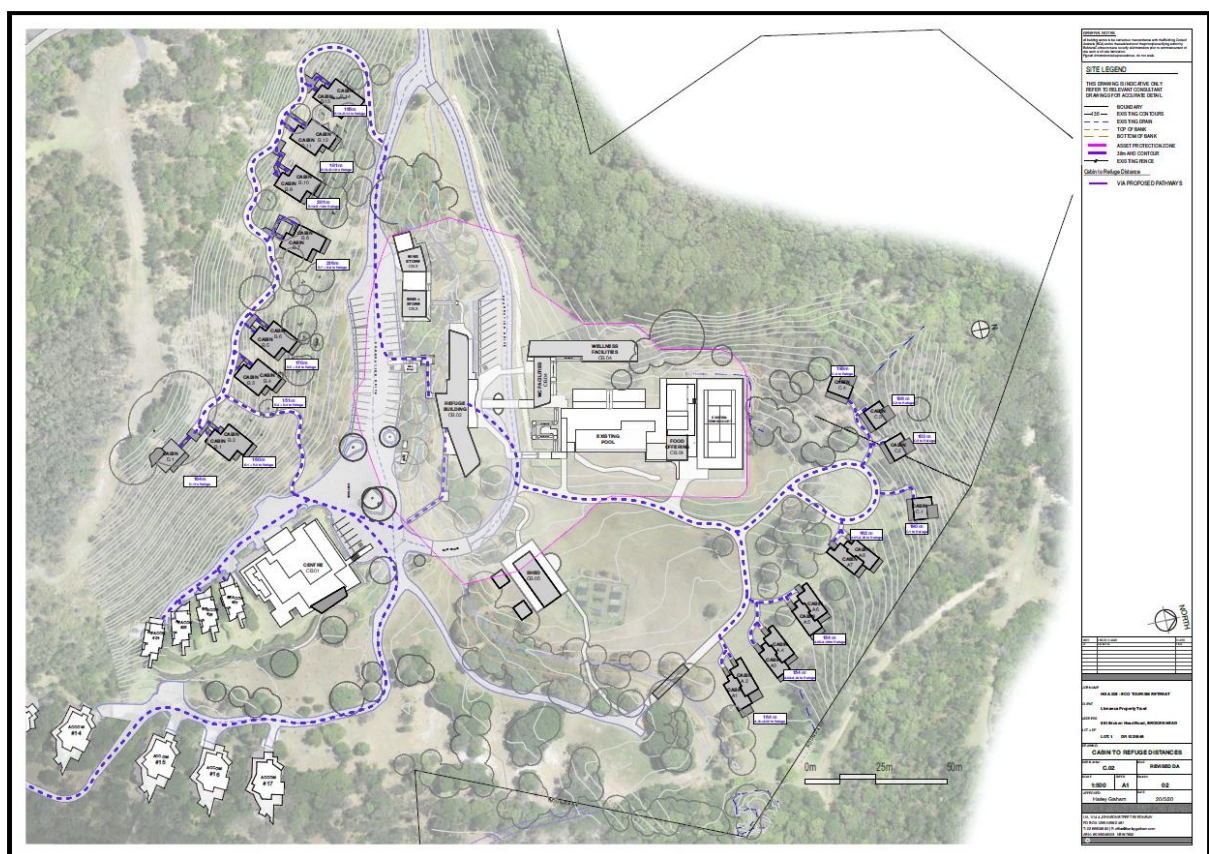


Figure 16 – Travel distances and pathways from the proposed cabins to the on-site refuge building.

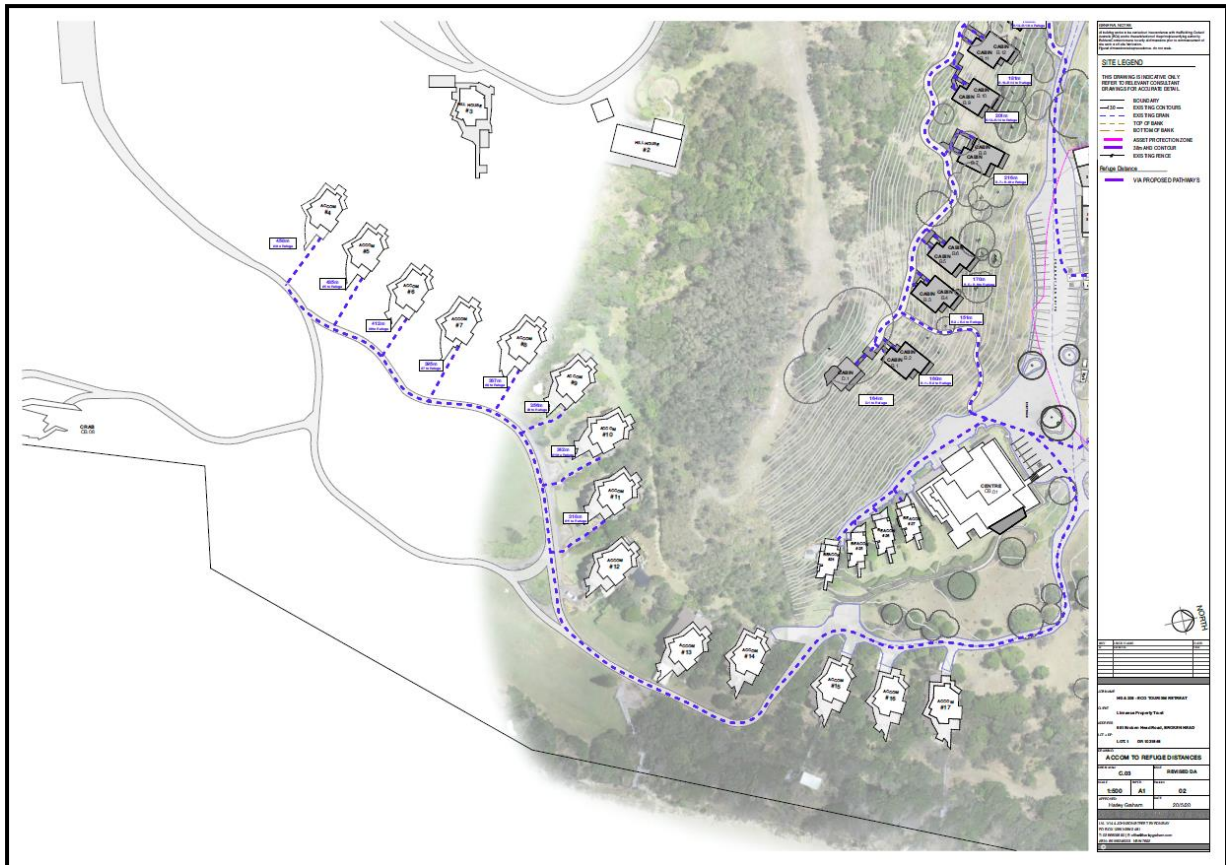


Figure 17 – Access from the existing cabins (subject to change of use) along the existing roadway to the refuge building. Existing dwelling No. 3 route not shown.

The proposed hydrants to the north of the refuge building provide coverage of the Class 5-9 buildings e.g. Wellness facilities, food offering building and pool area. The plans have been amended to include a second refuge building in the northern precinct of the site and will be accessible via the eastern timber bridge which will require compliant loading capacities. The amended access plans will allow a fire appliance to access the second refuge building and the associate hydrant point.

### 6.2.2 Performance Criteria

The performance criteria associated with the subject acceptable solution is detailed below. It is noted the performance criteria only references the access of fire fighting vehicles to the proposed refuge building rather than making a reference to the occupants.

The methodology will specifically address the performance criteria relating to the fire-fighting vehicles but as an additional measure will address the egress of occupants from the cabin to the refuge building.



*“Fire-fighting vehicles are provided with safe, all-weather access to the proposed refuge building”*

### 6.2.3 Discussion

As previously outlined the methodology must demonstrate compliance with the aforementioned performance criteria which is to provide safe, all-weather access to the proposed refuge building. In this regard the civil engineer has prepared a plan and traffic report to address the safe, all-weather access to the proposed refuge buildings.

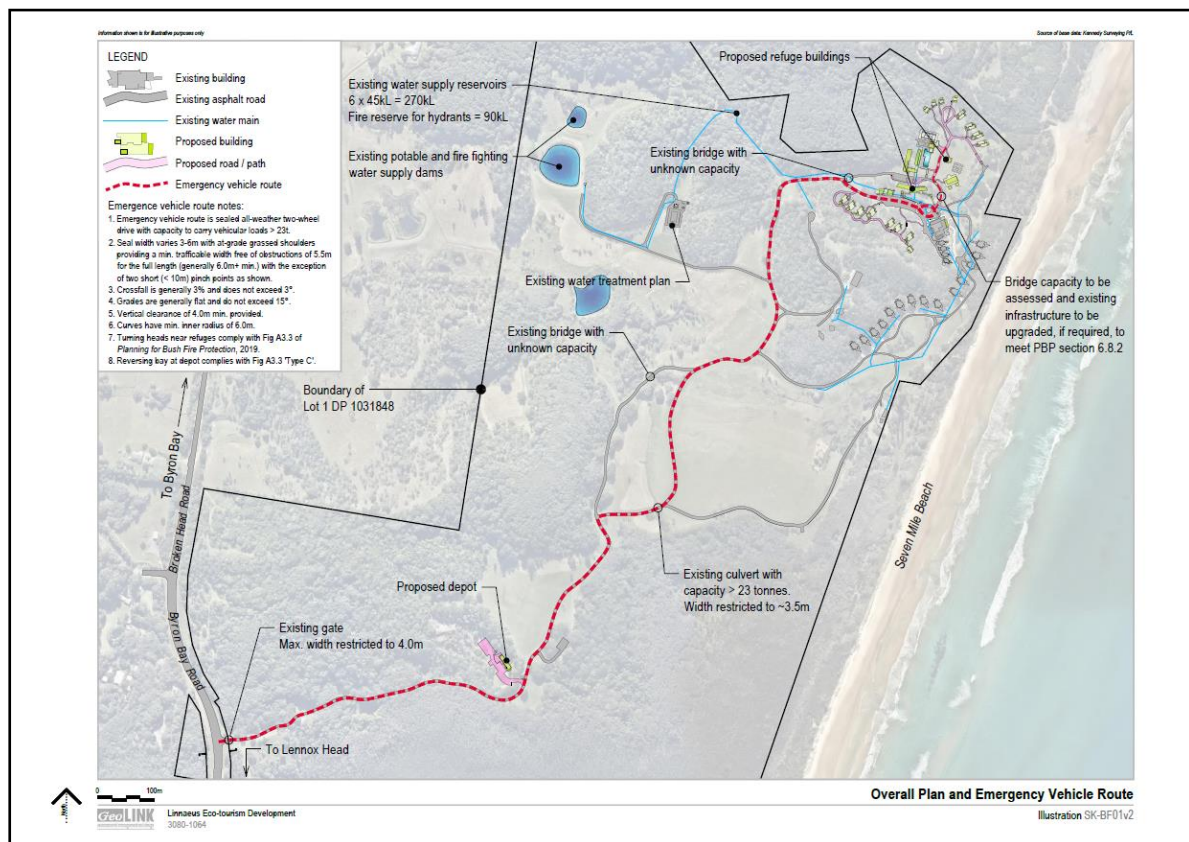


Figure 18 – Fire-fighting appliance access route to the proposed safe refuge buildings.

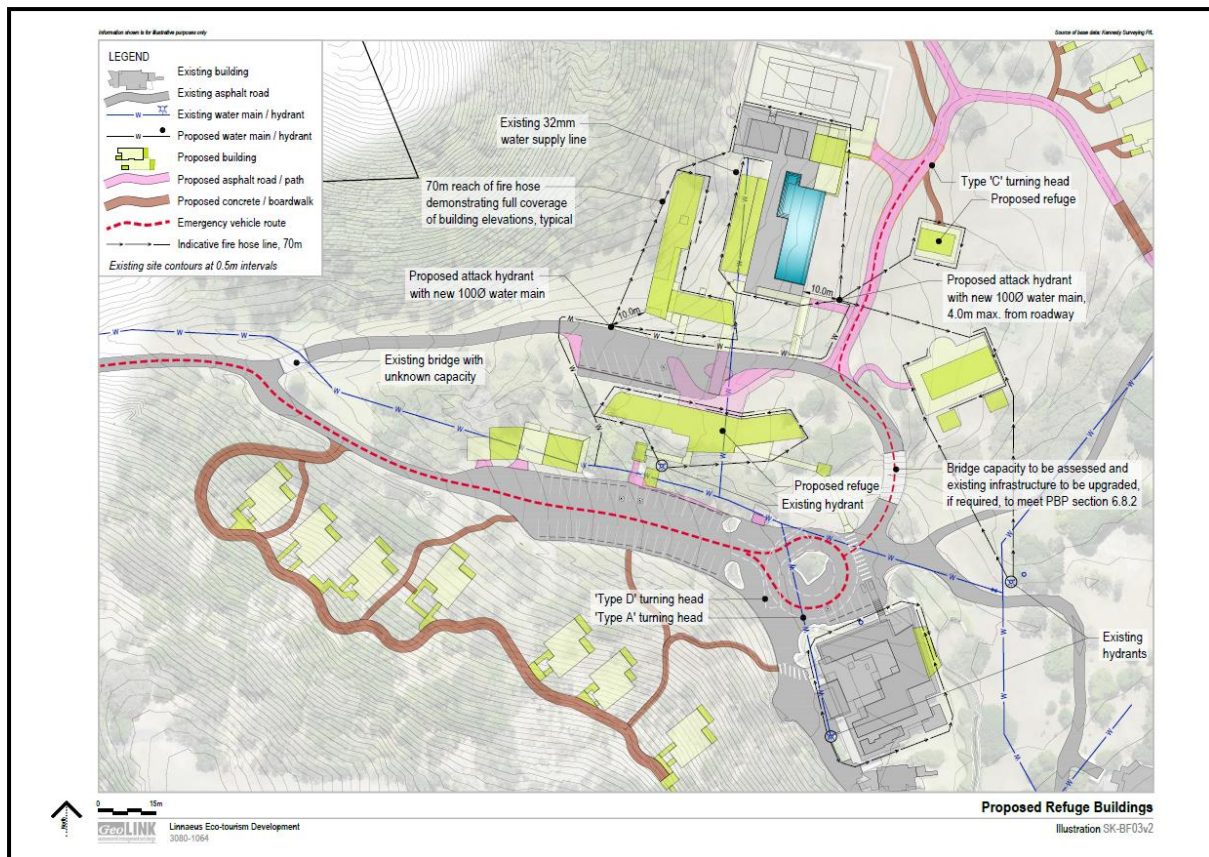


Figure 19 – Internal property access road providing appliance access and turn around adjacent to the proposed refuge buildings.

The civil engineers plan, and the traffic report prepared by Michelle Erwin Geolink Pty Ltd in relation to emergency evacuation and has provided the following comments to address the performance criteria -.

#### ***“Emergency Vehicular Access and Evacuation Traffic.***

*A Bush Fire Emergency Management and Evacuation Plan will need to be prepared, consistent with the NSW RFS guidelines and AS 3745:2010 Planning for Emergencies in Facilities in accordance with Table 6.8d of Planning for Bush Fire Protection (PBP) (NSW Rural Fire Service, 2019). A copy of this document should be provided to the relevant local authorities prior to occupation of the development.*

*Items to be determined and addressed in the plan are detailed below.*

**a) Capacity of road surfaces and any bridges/causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes).**

*The main route between the site entry and the refuge building crosses three bridges constructed in the late 1990s. Although fully loaded firefighting vehicles have been known to cross these bridges on a number of occasions, documentation is not readily available specifying their load capacity. However, a secondary route is available, bypassing all three bridges. This route will be marked in some way as the emergency vehicle route.*

**b) Hydrants are to be located outside parking reserves and carriageways in accordance with the relevant clauses of AS 2419.1. Where no reticulated supply is available, suitable access within 4m of the static water supply must be available.**

*The majority of the site is serviced by a reticulated water supply fed by a large water reservoir. The system includes several in-ground fire hydrants was designed in accordance with AS 2419.1. A recent (April 2020) test has been carried out on the system and the most disadvantaged hydrant, demonstrating current compliance with AS 2419.1 with respect to flow and pressure. The route to the two refuge buildings provides access to a hydrant (one existing and one proposed) which can service all sides of the refuge buildings with a 60m hose length and 10m jet stream.*

*Turning is available using Type A, B or C turning head as per Figure A3.3 of PBP2019. The only building without access to a reticulated system is the depot building in the south western portion of the site. This area has been designed to accommodate a fire truck with turning head Type C and access to a 10kL water tank with Storz fitting.*

**c) The amount of travel likely to be generated during an emergency evacuation.**

*The worst case would be the maximum number of expected vehicles on site at any one time. Assuming all proposed available parking on site were occupied, this equates to 111 vehicles.*

**d) The capacity of the broader road network to facilitate safe emergency evacuation.**

*Assuming a worst-case scenario of the maximum expected vehicles on-site at any one time all (111) exiting the site and turning right onto Broken Head Road during the peak hour traffic, SIDRA modelling demonstrates that the delays for exiting vehicles will be minor (< 10 seconds), with this movement still offering a LOS A.*

*The model was again adjusted to increase the northbound flow of traffic on Byron Bay / Broken Head Road by 50% and allow for a generous 20 emergency (heavy) vehicles entering the site from the south, being the worst case as this movement opposes the right turn*



movement out of the development site. The SIDRA modelling still provided an expected LOS A for all movements, with the worst delay being for the traffic exiting the development, at 11.9 seconds. At this rate, all 111 vehicles would be able to leave the site within 22 minutes.

***e) Limitations/constraints inherent in the road system and management of potential traffic conflicts (such as emergency vehicles versus evacuating members of the public).***

*PBP2019 requires acceptable solutions to address several performance criteria associated with this type of development, as detailed in Tables 5.3b and 6.8b. The proposed development achieves most of these, with one exception regarding the specified 'minimum 4m carriageway width.*

*The access road from the site entry to the refuge building varies from 3-6m sealed all-weather two-wheel drive carriageway. However, given the existing shoulders are grassed, flush with the carriageway and free of obstructions with sufficient width to provide a minimum total trafficable width of 5.5m (generally 6.0m+) for the full length with two short (< 10m) pinch points. The pinch points include the entry gate and an existing culvert.*

*Both have clear sight distance, and it is expected that in the event of evacuating occupants needing to pass entering emergency vehicles, the evacuating vehicles will be able to pull aside to allow the emergency vehicle(s) to pass. This will be particularly important at the entry gate given that all exiting and entering vehicles must pass through this point. The culvert restriction, however, is on one of two available routes for non-heavy vehicles to enter/exit the site."*

Source: Geolink 2020

The civil engineers traffic assessment has been submitted with the application to demonstrate the adequacy of the existing property access road and addressed two areas reduced in width over a length of less than 10m being a culvert and the front gate. It is suggested that there may be a need for a give-way sign in these locations however this will be addressed in the final traffic report.

Although the occupants are not referenced in the performance criteria this report does provide an assessment in this regard given the pedestrian pathways from the cabins to the refuge building are constructed primarily for the occupants. The locations of the cabins have been previously accepted with past bushfire design briefs however additional measures will be included to address the 100m travel distance limitation.

In this regard the distances from each cabin along the pathways proposed are identified as part of the civil engineering plans prepared by Geolink and shown in Figure 3 of this report.

The travel distances from the cabins via the pathways to the on-site refuge are provided with distance measured along the paths on the proposed plans.

The travel distance to the asset protection zone areas if extended beyond the minimum required for the refuge building will allow occupants to traverse the pathway and reach the APZ within the 100m distance. The trigger for early evacuation will be such that the slightly extended travel time required from the new cabins to the south to the refuge will be catered for to ensure the available safe egress time (ASET) is greater than the required safe egress time (RSET).

As shown in Figure 20 the asset protection zones in the locality of the proposed cabins have been increased in order to further accommodate the extended travel distances from the proposed cabins to the refuge building. The expanded APZ will also assist in providing a better outcome for the adjoining properties by having a large area requiring management to an asset protection zone standard whilst providing additional measure to assist in fire brigade intervention.

It is expected that very early evacuation triggers specific to the site and the increased movement time will be easily accommodated with quicker pre-movement times. For example to traverse an additional 40m down-stairs would take an additional 57 seconds when descending stairs (*The SFPP handbook of Fire Protection Engineering 4<sup>th</sup> Edition 2008*) at a conservative 0.7m/s. Early triggers will be set to evacuate hours before the impact of fire and more likely will be pre-emptive of severe, extreme and catastrophic days.

Similarly, whilst the distance from the existing cabins subject to change of use to eco-tourism cabin use is a greater distance ranging up to 552m for existing dwelling No. 3 and 458m for existing dwelling No. 4, a better outcome for occupants of the building will be created. This is due to the ability to create specifically managed evacuation procedures for the eco-tourism development and the provision of the 10kW/m<sup>2</sup> on-site initial refuge building.

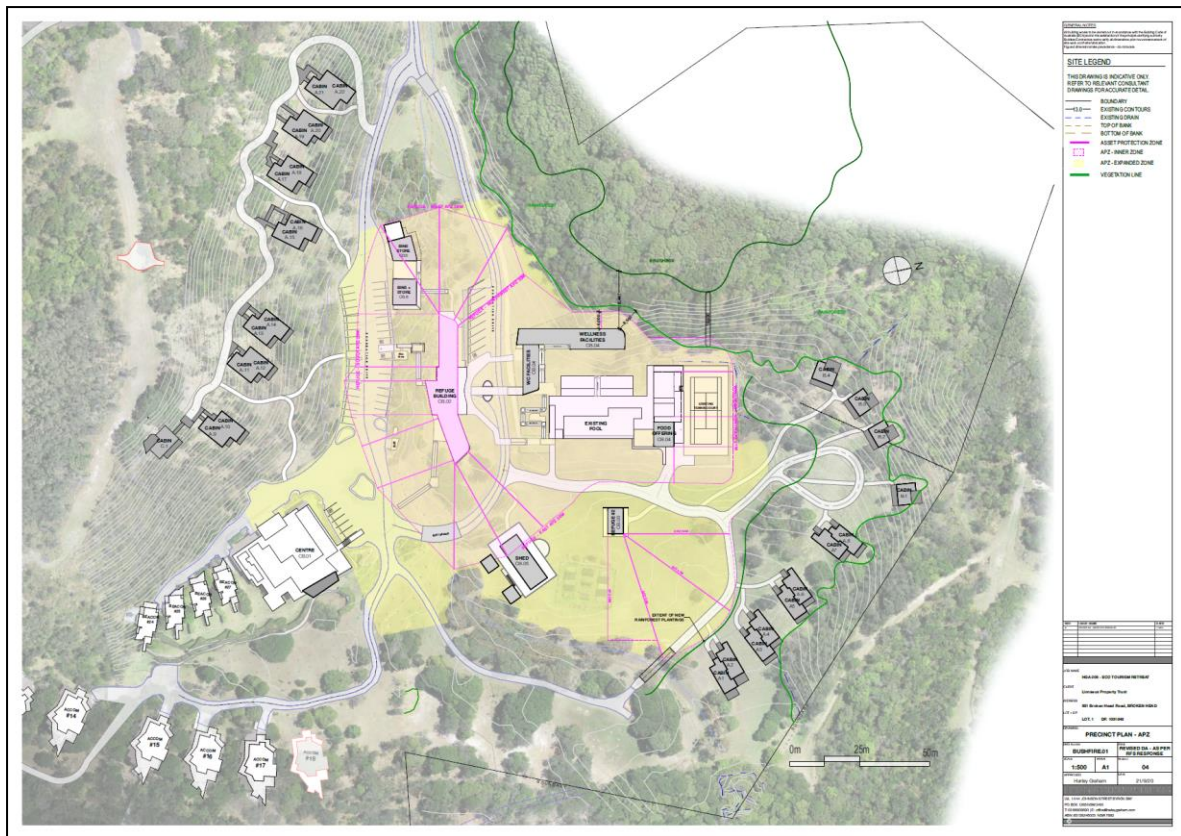


Figure 20 – Potential further expansion of the asset protection zone (yellow shading) beyond that required by the refuge building.

Given there will be a chief warden ensuring all occupants have adequate induction and monitoring and management in relation to evacuation and communications will be specific to these uses thereby providing a much more coordinated approach that currently exists.

For fire brigade intervention the access road has been identified and assessed by the civil engineer. Consultation between the hydraulic and civil engineer established a coordinated approach ensuring the emergency service route will be adequate for a medium rigid vehicle with access provided to the existing hydrant system.

Due to the uncertainty of the load capacity of the two existing bridges providing access to the Wellness Centre and food outlet building, the hydraulic design consultants Willow and Sparrow Pty Ltd have recommended two attack fire hydrants to be located to the north of the refuge building with pressure and flows complying with AS 2419.1-2005. With the latest plans and the second on-site refuge building proposed, the eastern existing bridge will need to be confirmed or upgraded to comply with the minimum 23 ton load capacity thereby allowing access to the refuge building and water supply. The civil plans have been upgraded in this regard.

The applicant and the consent authority must ensure adequate documentary evidence is provided to confirm the hydraulic designs and certification is prepared by a Competent Fire Safety Practitioner (CFSP) prior to approval.

#### **6.2.4 Conclusion**

The methodology outlined for safe egress for fire-fighting vehicles to the refuge building to demonstrate compliance with the performance criteria has been aided by the design information provided by the consultant civil engineer as part of the traffic impact assessment. The existing road will be improved to accommodate the proposed buildings and where traversing the road to the existing dwellings there will be no changes to that previously approved.

The consideration of fire-brigade intervention in relation to both access and water supply has also been addressed with access provided to all existing hydrants (within 4m) however two additional attack hydrants have been proposed by the hydraulic consultant allowing fire fighters to carry and connect to attach hydrants with pressure and flows complying with AS 2419.1-2005.

The additional fire hydrants and upgrading for coverage, pressure and flow requirements to meet AS 2419.1 will create additional capacity and aid for fire-fighters than currently exists. The subject property is an important strategic property for NSW RFS in bushfire events in the locality and the upgrade of water supply and internal roads as proposed will create a better outcome and additional fire-fighting assistance in the locality.

## **7.0 UTILITIES**

### **7.1 ELECTRICITY SERVICES**

New electrical transmission lines, if required, are to comply with Section 6.8.3 and Table 6.8c of PBP2019 as follows:

- where practicable, electrical transmission lines are underground;
- where overhead, electrical transmission lines are proposed as follow:
  - lines are installed with short pole spacing (30m), 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 accordance with the specifications in *ISSC3 Guideline for Managing Vegetation Near Power Lines*.

## 7.2 GAS SERVICES

The following aspects are to comply with Section 6.8.3 and Table 6.8c of PBP2019 should a gas service be considered:

- reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 and the requirements of relevant authorities, and metal piping is used;
- all fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side;
- connections to and from gas cylinders are metal;
- if gas cylinders need to be kept close to the building, safety valves are directed away from the building and at least 2m away from any combustible material, so they do not act as a catalyst to combustion;
- polymer-sheathed flexible gas supply lines to gas meters adjacent to buildings are not to be used; and
- above-ground gas service pipes external to the building are metal, including and up to any outlets.

Gas installations to comply with AS 3959-2018.

## 8.0 LANDSCAPING

### 8.1 General

The proposed landscaping is to comply with Table 6.8a PBP2019 (landscaping) which references Appendix 4 PBP2019. It is noted that an Inner Protection Area is to have a maximum canopy coverage of 15% within the asset protection zone. Due to ecological considerations there is a request to have the canopy area extending and this is the subject of this section of the report.

### 8.2 Landscaping within the asset protection zone of Building CB.02

An inspection was undertaken in April 2020 with the consultant ecologist and architects for the purpose of establishing the trees that are to be removed and those proposed for retention. The trees nominated in Figure 21 have been determined as being acceptable to be retained in an effort to balance ecological and bushfire requirements. The trees within the asset protection zone to remain are generally rainforest species and some coastal banksia. The assessment has taken into account canopy separation and the relationship of the plantings within the IPA and the bushfire hazard.







Photo 4 - Trees to be skirted and managed beneath



Photo 5 – Open managed areas

To the west is a small disconnected pocket of rainforest on flat ground however the disconnection and the types of trees together with the flat ground will not promote canopy fire from this direction. Further, the recommendation to manage under the trees within the IPA and with minimal grass fuel loads, smooth bark and skirted canopy there will be no ladder effect capable of occurring to spread fire toward the building.

As a redundancy measure in the unlikely scenario that radiant heat levels within the IPA are increased the report recommends the construction of Building CB.02 to be constructed to BAL 29 AS 3959-2018 thereby increasing the resilience of the building against increased radiant heat.

***Provide a defensible space for property protection*** – The defensible space defined as an area within the asset protection zone that provides an environment in which a person can undertake property protection after the passage of a bush fire with some level of safety. In this regard it is considered that the distance established with the short fire runs will be sufficient defensible space. Further, the intensity of the fire is not considered to be high and therefore direct attack would be a possibility and no high levels of residual heat is likely.

***Reduce fire spread*** –

Trees within the asset protection zone that are required to remain for ecological reasons will need to have all dead material within them removed and skirted for approximately 2m above ground level. These requirements will need to be included in the vegetation/fuel management plan (VFMP) as part of a condition of the Bush Fire Safety Authority. This will ensure that fire spread does not occur from the unmanaged hazard by removing surface and elevated fuels which are required for spread of fire and continuous flame.

**Deflect and filter embers** – The disconnection to the primary bushfire hazards is considered sufficient to demonstrate a canopy fire within the trees in the IPA is not likely to occur. The rainforest trees in the IPA such as the figs can actually offer additional shielding from radiant heat and also prevent embers from reaching the building. It will be recommended that gutter guards complying with AS 3959-2018 be included in the design of the building.

## 9.0 EMERGENCY AND EVACUATION PLANNING

Emergency and evacuation planning is a critical measure for a Special Fire Protection Purpose to provide a higher level of co-ordination and safety for the occupants in a bushfire event. It is extremely important that the emergency plan is constantly monitored and amended when required and that training of staff, participants and stakeholders is sustained at a high level.

An emergency evacuation procedure and detailed plans of all Emergency Assembly Areas (onsite and offsite) are to be prepared in accordance with Section 6.8.4 and Table 6.8d of PBP2019. In this regard, the following aspects are to be implemented and adhered to:

- a Bush Fire Emergency Management and Evacuation Plan is to be prepared consistent with the NSW RFS document: A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan, and AS 3745:2010.
- for proposals in isolated or remote areas which involve large travel distances through bush fire prone vegetation, the following issues should be determined and addressed:
  - the amount of travel likely to be generated during an emergency evacuation;
  - the capacity of the broader road network to facilitate safe emergency evacuation;
  - limitations/constraints inherent in the road system; and
  - management of potential traffic conflicts (such as emergency vehicles versus evacuating members of the public).
- the Bush Fire Emergency Management and Evacuation Plan must consider a mechanism for the early relocation of occupants on days when adverse fire weather is notified or adverse fire activity occurs in the local government area in which the development operates.
- a copy of the Bush Fire Emergency Management and Evacuation Plan is to be provided to the Local Emergency Management Committee for its information prior to occupation of the development.

- an Emergency Planning Committee is to be established to consult with residents (and their families in the case of aged care accommodation and schools) and staff in developing and implementing an Emergency Procedures Manual.
- detailed plans of all emergency assembly areas including on-site and off-site arrangements as stated in AS 3745:2010 are to be clearly displayed, and an annually emergency evacuation is conducted.

## **10.0 CONCLUSION**

This assessment demonstrates the proposed development will be compliant with the intent of Planning for Bushfire Protection 2019 having regard to the objectives and considerations of PBP2019.

## DISCLAIMER

This report was prepared for the purposes and exclusive use of the stated client to accompany an application to Byron Shire Council specifically relating to the proposed proposed development on the subject property, and is not to be used for any other purpose or by any other person or Corporation. BCA Check Pty Ltd accepts no responsibility for any loss or damage suffered howsoever arising to any person or Corporation who may use or rely on this report in contravention of the terms of this clause. This report is not intended for or to be used where aluminium composite panels or intumescent paints are proposed. The report is not to be construed as an assessment of the building materials or compliance with the recommended bushfire attack level/s.

As identified in Planning for Bushfire Protection 2019 and the Building Code of Australia the report is to provide recommendations to reduce the risk of ignition and does not guarantee the complete protection of the building in the event of bush fire or that the building will not be adversely impacted upon. The report is not to be construed as providing protection to the sacrificial cabins and any financial loss to the development from adverse impact in a bushfire event. Reporting has been based on the relevant Council and Rural Fire Service Guidelines however recommendations or suggestions given in this report are based on our site investigation at the time of reporting. In some cases site conditions may change dramatically within a few years due to rapid vegetation re-growth and invading weed species.

## REFERENCES

NSW Rural Fire Service and Planning NSW (2019), *Planning for bushfire protection, A guide for councils planners fire authorities developers and homeowners*. Rural Fire Service NSW Australia.

Standards Australia, (2018), AS3959 *Construction of buildings in bushfire prone areas*, Australian Standards, Sydney.

National Fire Protection Association (2008) *The SFPE Handbook of Fire Protection Engineering 4<sup>th</sup> Edition 2008*, Quincy, Massachusetts.

## LEGISLATION

Environmental Planning and Assessment Act 1979 and Regulations 2000. *New South Wales*. Parliamentary Counsel's Office, NSW Government Information Service.

Rural Fires Act 1997. *New South Wales*. Parliamentary Counsel's Office, NSW Government Information Service.

Rural Fires Regulation. *New South Wales*. Parliamentary Counsel's Office, NSW Government Information Service.



## **APPENDIX A**

### **APZ Plan**

Trees remaining in the APZ





