BLACKASH
BUSHFIRE CONSULTING

Bushfire Hazard Assessment

Perisher Views
Perisher Views Lot 1, DP 1192372

Department of Planning and Environment

Issued under the Environmental Planning and Assessment Act 1979

Approved Application No DA 21/11288

Granted on the 23 June 2023

Signed M Brown

Sheet No 2 of 44

Prepared for

Geoanalysis Pty Ltd

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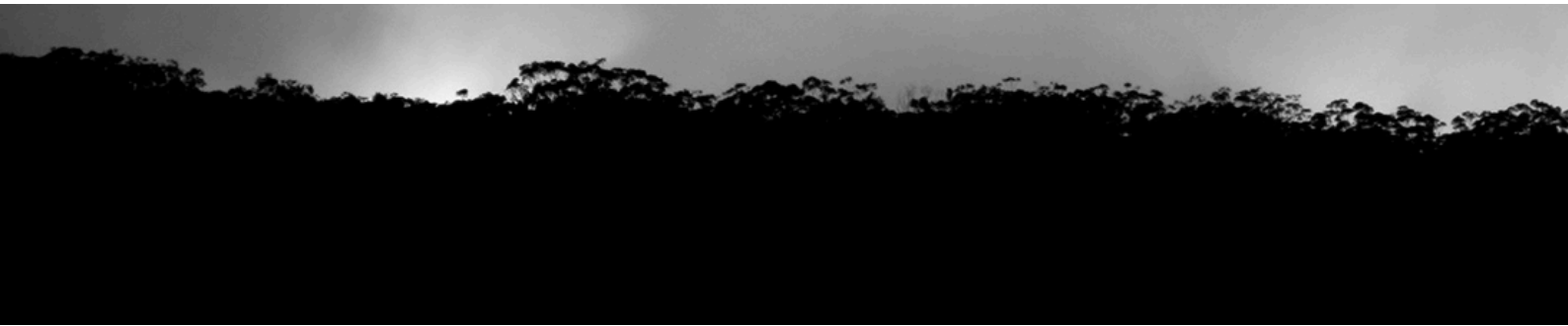
BPAD Bushfire Planning & Design Accredited Practitioner Level 3



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Glossary of Terms

APZ	Asset protection zone
AS2419	*Australian Standard – Fire hydrant installations*
AS3745	*Australian Standard – Planning for emergencies in facilities*
AS3959	*Australian Standard – Construction of buildings in bushfire-prone areas 2009*
BAL	*Bushfire attack level*
BCA	*Building Code of Australia*
BSA	Bushfire safety authority
EPA Act	*Environmental Planning & Assessment Act 1979*
FDI	Fire danger index
ha	Hectare
m	Metres
PBP	*Planning for Bush Fire Protection 2006*
RF Act	*Rural Fires Act 1997*

1. Executive Summary

Perisher Views is a proposed new ski lodge located on an existing cleared and managed allotment within the environmentally significant setting of Kosciusko National Park. The alpine resort areas are predominantly used for short-term tourist accommodation and are Special Fire Protection Purpose (SFPP) developments.

The site is of low bushfire risk, due to its location close to the base of Perisher's Front Valley, proximity to other lodges and low bushfire hazard alpine vegetation that is small in size and narrow in shape.

The development site is an existing serviced allotment that has an approved entitlement to build a 24-bed commercial ski lodge including accommodation for an onsite manager. As such, development of the site meets the definition of infill development. Chapter 6.6 of Planning for Bushfire Protection 2019 (PBP) recognises the challenges associated with infill development within the Alpine resorts and provides a pragmatic approach to balancing bushfire risk, user amenity and the significant environmental values of Kosciuszko National Park. However, during pre-DA consultation with the Rural Fire Service (RFS), this pathway was rejected by the RFS on the basis that this pathway was only available to existing SFPP facilities, not existing serviced allotments. The RFS directed that Asset Protection Zones (APZs) should comply with table A1.12.1 of PBP. This table is the same table that would be used for a 1000 bed hospital in the bushfire prone Blue Mountains. It does not reflect the Fire Danger Index (FDI) in the alpine areas, does not include APZs for Alpine Complex vegetation and does not take into consideration the vulnerability characteristics of the occupants.

The applicant consulted with NPWS regarding the APZs required under table A1.12.1. The APZs, being up to 100 metres in width were considered to have an unacceptably high environmental impact on the fragile alpine environment. Environmentally acceptable APZs that are commensurate with the bushfire risk were identified in consultation with NPWS and form the basis for this assessment. The applicant engaged Risk Frontiers to undertake an assessment of historic data for the site to determine an appropriate FDI for the site. This analysis (see attachment 1) identified an FDI of 43 as being applicable to Perisher Valley.

PBP provides for performance-based approaches that meet the aim and objectives of PBP. PBP recognises that '*particular SFPP developments demonstrate different characteristics and may require different levels of protection*'. PBP recognises reasons for setting tailored objectives include;

1. Lower occupancy levels (maximum of 24 people)
2. The presence of a manager on site thereby improving the potential for informed emergency evacuation decisions

PBP recognises that short-term tourist accommodation has a lower risk profile than other types of SFPP development and has varied performance criteria for several different types of tourist development. As there are as few as 2 undeveloped infill lots in Perisher it is not surprising that there is not a specific section in PBP allocated to these lots, however the proposed development shares similar characteristics with;

1. Bed and Breakfast and Farmstay accommodation – there will be a manager on site and there are low occupancy rates (maximum 24 people including the manager and staff)
2. Holiday lets – if the building is constructed to BAL29 it will be able to withstand bushfire attack at the site

Radiant heat levels have been calculated based on the site specific FDI of 43 and the maximum APZs permitted by NPWS. This has identified that the north-eastern aspect will receive the highest radiant heat exposure at 21.9kW/m². This is based on a conservative assessment of the vegetation as Sub-alpine woodland, slope of 11 degrees and a 100 metre wide fire front. Other aspects have much lower radiant heat levels, with the lowest being 6kW/m² on both the northern and western aspects.

The commercial focus of the operation is as a ski lodge operating during the winter months when the site is typically snowbound and there is no bushfire risk. However, in accordance with the Draft Snowy Mountains Special Activation Precinct (Snowy SAP) which is seeking to bolster year round utilisation of the alpine areas, the lodge has the capacity to operate year round. Specific bushfire protection measures in this regard to mitigate bushfire risk to occupants, the building and firefighters are;

1. APZs to ensure radiant heat exposure is below 29kw/m²
2. Construction to BAL 29
3. Provision of defendable space for fire fighters
4. Preparation of a detailed evacuation plan including the requirement for an onsite manager to be present whenever the building is occupied

This report seeks to find a balance between the safe utilisation of the site, whilst satisfying the aim, objectives and relevant provisions of PBP. The report emphasises the sustainability of the building within acceptable and predicted levels of bushfire attack and the emergency management and evacuation arrangements provided by PBP to ensure the safety of occupants. A summary of the application is provided in Table 1.

The application is able to comply with PBP.

Table 1 Bushfire Report Summary

Development Type	Integrated Development Special Fire Protection Purpose
Subtype	Short Term Tourist Accommodation/ Holiday Let/ Bed and Breakfast
Bushfire Safety Authority required	Yes
Referral to NSW Rural Fire Service	Yes
Deemed to Satisfy or Performance	Performance
Performance aspects	• Asset Protection Zones • Forest Fire Danger Rating determination • Construction – modelled using FPAA Flamesol • Emergency Management and Evacuation arrangements

2. Introduction

Blackash Bushfire Consulting has been engaged by Geoanalysis Pty Ltd to provide a Bushfire Hazard Assessment for a new ski lodge within an existing cleared and managed area at Perisher Resort. The proposal is known as 'Perisher Views' (Lot 1, DP 1192372) and is situated adjacent to Front Valley (the site) within the existing Perisher Ski Resort (see figure 1).

The development site (Lot 1, DP 1192372) is an existing lot which has an approved entitlement to build a 24-bed commercial ski lodge. The development site is on existing serviced land (water, power, sewer). The application will be for short term tourist accommodation/ holiday let/bed and breakfast being an integrated development which is identified as tourist Special Fire Protection Purpose (SFPP).

Perisher Views is a 24 bed commercial lodge, comprising of 10 double rooms and a 2 bedroom suite. Being a fully catered commercial lodge, an onsite manager will be present at all times when it is occupied. This provides on site supervision to direct use of the lodge and to coordinate any emergency management arrangements relating to bushfire in accordance with the Bushfire Emergency Management and Evacuation Plan.

Perisher Views is located within the environmentally significant setting of Kosciusko National Park. The alpine resort areas are predominantly used for short-term tourist accommodation and are Special Fire Protection Purpose (SFPP) developments in accordance with s.100B of the Rural Fires Act (RF Act). As an SFPP development, the development application (DA) will require a Bushfire Safety Authority (BFSA) to be issued by the NSW Rural Fire Service (RFS).

The BFSA authorises development to the extent that it complies with standards required by the RFS Commissioner. These standards are outlined in the aim and objectives of Planning for Bushfire Protection 2019 (PBP) and can be met through compliance with the deemed to satisfy provisions or an alternative solutions approach of PBP.

Many of the bushfire requirements for SFPP development make expansion within the alpine areas difficult. There is particular tension between the provision of asset protection zones and retention of some of the most fragile ecosystems in Australia – the alpine grasses and snow gum areas. PBP provides options for innovative approaches using the performance-based framework within PBP that provides a risk-based approach to new development.

The development site is constrained by leasehold arrangements and the need to minimise the ecological footprint while providing for the protection of life and mitigation of fire on the structure. This report seeks to find a balance between the safe utilisation of the site, whilst satisfying the aim, objective and provisions of PBP 2019. Emphasis within the report has been placed on providing APZ,

construction commensurate with the bushfire risk and the emergency management and evacuation arrangements provided by PBP.

This assessment has been prepared by Lew Short, Principal Blackash Bushfire Consulting (FPAA BPAD-A Certified Practitioner No. BPD-PA-16373) who is recognised by the RFS as qualified in bushfire risk assessment and has been accredited by the Fire Protection Association of Australia as a suitably qualified consultant to undertake alternative solution proposals. An inspection was completed on 28 October 2020 and again on 25 May 2021supported by GIS analysis and the consulting ecologist for the project (Eco Logical Australia Pty Ltd).

Meetings have been held with NPWS and DPIE on several occasions to discuss the application. Pre DA documentation was provided to the RFS. The application has responded to comments from these key stakeholders.

Figure 1 Site Location

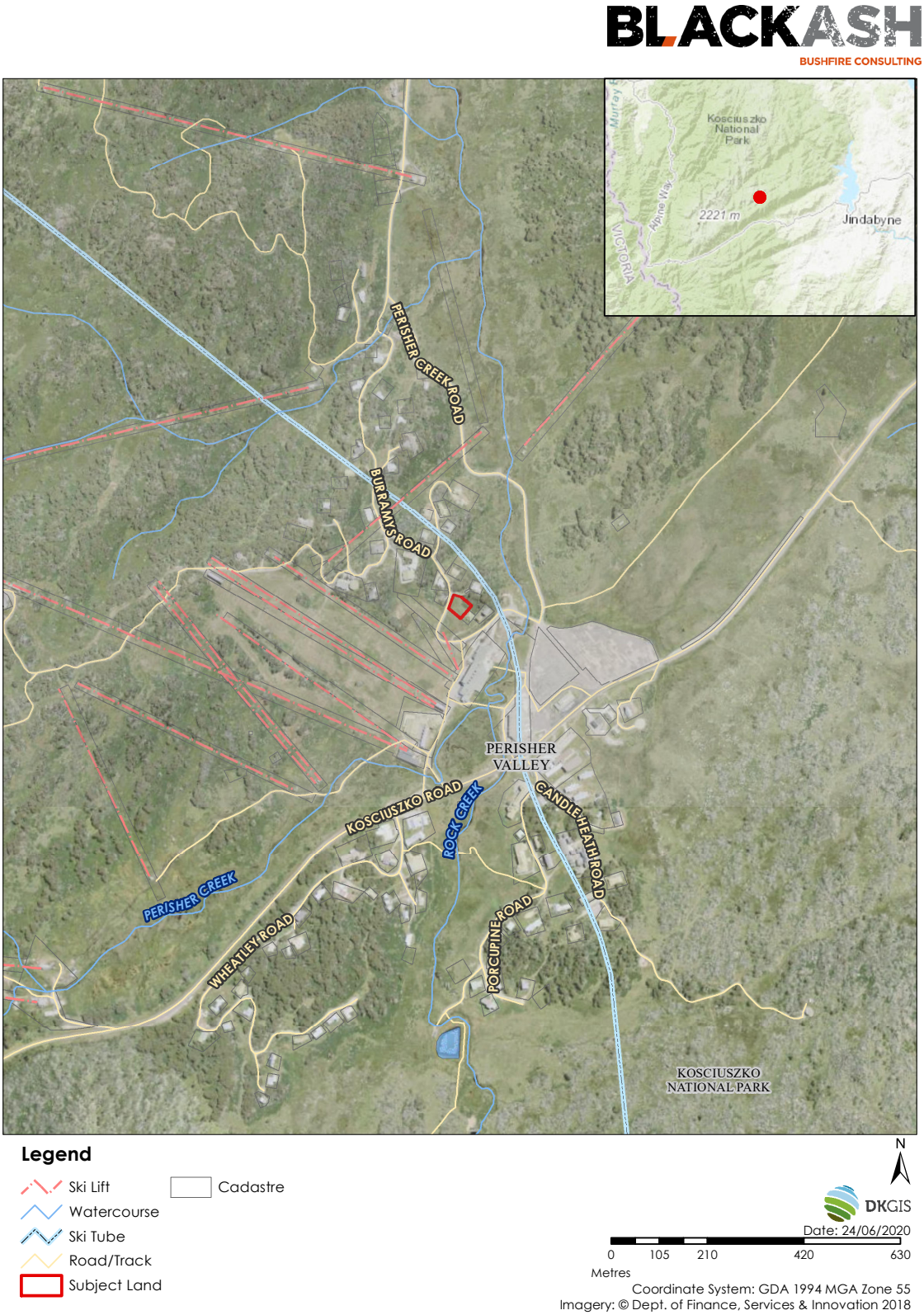
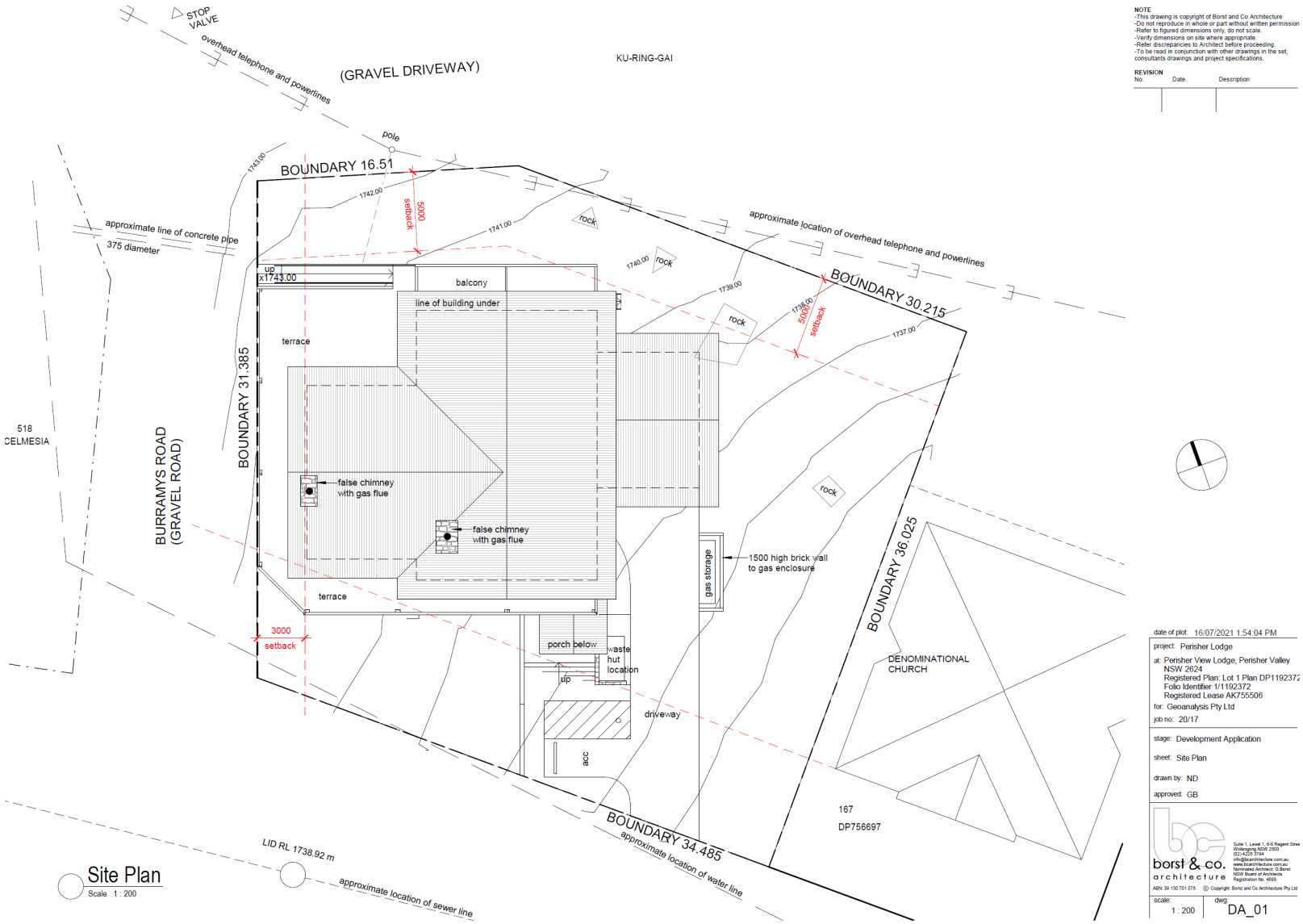


Figure 2 Site Context

Figure 3 Site Plan



3. The Proposal

The proposed development is for a 24 bed commercial ski lodge. The lodge will predominantly operate during the winter months, when the property is generally surrounded by snow and the bushfire risk is negligible.

The site is bounded by roads to the north, south and west and the non-denominational church to the east. Beyond the southern road lies the main ski runs of perisher, that are slashed and managed as low grasslands outside of the ski season. The managed areas are ski runs during winter. A power line is located between the northern boundary of the property and the access road to Ku-Ring-Gai Alpine Lodge. See Figure 2 for the site in context.

To the west of Burramys Road, two small snow gums are located between the road and Celmesia Lodge. To the north of the access road to Ku-ring-gai lodge a small remnant of subalpine woodland surrounds Ku-ring-gai and Merriment ski lodges. Across slope to the north-east of the site a small remnant of approximately 17 metres width is located approximately 13 metres from the site. The main ski centre and managed ski slopes are located to the south of the site. Unlike many of the existing lodges in Perisher, the site is not set in amongst Alpine Woodland, is located close to the base of the main ski slopes and is afforded rapid access to the carpark, ski tube terminal and perisher centre.

The proposed lodge would require the loss or modification of vegetation and associated habitats on the site either for the footprint of the lodge, access, services or asset protection zone (APZ). Much of the subject land is already heavily modified.

Figure 3 shows the footprint of the proposed development within the site, including setback distances to the Lot boundary. The artist impression is shown at Figure 4.

It is proposed that the lodge will mainly operate during the winter months, when the property is generally surrounded by snow and the bushfire risk is non-existent. Should Perisher become an all seasons operation and provide the necessary supporting infrastructure for summer use, then provisions should be included in the bushfire safety authority and development consent to enable letting of the property outside of the snow season. It is recommended that this includes construction to BAL29, the preparation of an evacuation, requiring an onsite manager at all times when the property is occupied and maintenance of the APZ identified in this document.

Figure 4 The Proposed Ski Lodge

Artist Impression

4. Legislative Framework

Alpine resort development assessments are governed by the State Environmental Planning Policy (Kosciuszko National Park-Alpine Resorts) 2007 (the Alpine SEPP). The Alpine SEPP aims to protect the natural and cultural heritage of land within the Alpine resorts and to encourage environmentally sustainable development.

One of the key requirements of the Alpine SEPP include:

> *All development to be subject to the assessment of environmental impacts to protect the unique alpine environment*

The proposed development is permitted with consent through The Alpine SEPP as tourist development. The Kosciuszko SEPP defines tourist accommodation as:

> *(a) a building or buildings used for the accommodation of visitors, including apartments, serviced apartments and lodges that may have facilities for the convenience of those visitors, such as conference facilities, entertainment facilities, recreation facilities and restaurants, or*
> *(b) staff accommodation, or*
> *(c) a hotel.*

PBP 2019 (p.53) recognises alpine resorts are located within the Kosciuszko National Park and include:

- *Thredbo*
- ***Perisher –including Perisher, Smiggins Holes, Mount Blue Cow and Guthega***
- *Charlotte Pass*
- *Selwyn Snow Resort*
- *Ski Rider Hotel; Kosciuszko Tourist Park*
- *Sponars Chalet*
- *Bullocks Flat Terminal*

The NSW DPIE Snowy Assessment Team is required to refer the application under Section 4.46 of the *Environmental Planning and Assessment Act, 1979* (EPA Act) as Integrated development to the RFS. Section 100B of the *Rural Fires Act 1997* (RF Act) states that:

> 1. *the Commissioner of the NSW RFS may issue a bushfire safety authority for:*
>   a) *a subdivision of bushfire prone land that could lawfully be used for residential or rural residential purposes; or*

b) development of bushfire prone land for a special fire protection purpose.

6. In this section special fire protection purpose means the purpose of the following—

(a) a school

(b) a childcare centre

(c) a hospital (including a hospital for the mentally ill or mentally disordered)

(d) a hotel, motel or other ***tourist accommodation***

(e) a building wholly or principally used as a home or other establishment for mentally incapacitated persons

(f) seniors housing within the meaning of State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004

(g) a group home within the meaning of State Environmental Planning Policy No 9—Group Homes

(h) a retirement village

(i) any other purpose prescribed by the regulations

The ski lodge is a Special Fire Protection Purpose development and must obtain a bushfire safety authority before DPIE can issue consent for the application. A bushfire safety authority authorises development to the extent that it complies with standards regarding setbacks, provision of water supply and other matters considered by the RFS Commissioner to be necessary to protect persons, property or the environment from danger that may arise from a bushfire.

Section 100B of the RFS Act is typically satisfied through compliance with the requirements of *PBP*. The application has been completed in accordance with the requirements of Section 44 of the *Rural Fires Regulation 2013* (RF Reg).

This assessment has been completed in accordance with the legislative framework for considering new development on Bushfire Prone Land.

5. Snowy Mountains Special Activation Precinct

The Snowy SAP was announced in November 2019 after feedback on the *Go Jindabyne* master plan revealed the need to expand the project focus to the Snowy Mountains region. The DPIE, in collaboration with the Department of Regional NSW, is currently developing a 40-year master plan for the Snowy Mountains SAP.

The Snowy Mountains SAP draft Master Plan is on public exhibition until 12 August 2021. Bushfire has been a key issue in the development of the Snowy SAP and Blackash has been engaged by the DPIE to provide reporting and technical assistance. Bushfire remains a key issue in the alpine resorts which is being worked through with the RFS.

The Master Plan aims to grow a strong one-season visitor economy into a successful four-season destination by stimulating economic development and investment and increasing year-round jobs in supporting industries. It also aims to leverage the region's natural beauty and unique climate to improve the tourism amenity of the area and invest in the region's infrastructure and services to meet the growing needs of permanent residents, seasonal workers and temporary visitors. As such, the Perisher Views application has been completed having regard to the Snowy SAP but it is not bound to the Snowy SAP. It has been completed as an independent application that will be submitted as a DA to the DPIE for merit based assessment.

One of the key issues that has been worked through between DPIE and RFS is the applicable Forest Fire Danger Index (FFDI) for the alpine reports. This matter is being reviewed by the RFS. However, this report has provided an independent FFDI analysis by climate scientists for Perisher which has provided a reliable assessment framework for the FFDI for the site.

6. Planning for Bushfire Protection 2019

PBP 2019 sets out an overall framework consisting of aims and objectives, specific objectives for defined development types, types of bushfire protection measures (**BPM**), which may be employed in a development, and performance criteria for each BPM. In this regard, the structure of PBP 2019 is similar to the structure of the National Construction Code (NCC) and provides considerable flexibility for outcomes. However, the aim of PBP in terms of ensuring appropriate consideration of risk and protection is paramount.

The PBP 2019 guidelines are performance-based, seeking to achieve a safe outcome based on innovation and the specific circumstances of the individual site and development proposal. PBP (p. 12) *uses a performance based approach and identifies objectives and detailed performance criteria to satisfy desired outcomes and meet the Aim and Objectives. Ultimately, any performance-based approach must demonstrate that bushfire protection is afforded to proposed developments commensurate with the assessed level of bushfire risk and the characteristics of the occupants.*

All development on BFPL must satisfy the aim and objectives of PBP 2019. The aim of PBP is:

> *to provide for the protection of human life and minimise impacts on property from the threat of bush fire, while having due regard to development potential, site characteristics and protection of the environment.*

The objectives are to:

i. *Afford buildings and their occupants protection from exposure to a bush fire*
ii. *Provide for a defendable space to be located around buildings*
iii. *Provide appropriate separation between a hazard and buildings which, in combination with other measures, minimises material ignition*
iv. *Ensure that appropriate operational access and egress for emergency service personnel and residents is available*
v. *Provide for ongoing management and maintenance of BPMs*
vi. *Ensure that utility services are adequate to meet the needs of firefighters.*

The specific objectives for SFPP developments (p. 28) are to:

- *provide for the special characteristics and needs of occupants. Unlike residential subdivisions, which can be built to a construction standard to withstand the fire event, enabling occupants and firefighters to provide property protection after the passage of fire, occupants of SFPP developments may not be able to assist in property protection. They are more likely to be adversely affected by smoke or heat while being evacuated.*
- *provide for safe emergency evacuation procedures. SFPP Developments are*

highly dependent on suitable emergency evacuation arrangements, which require greater separation from bushfire threats.

This report will demonstrate compliance with PBP.

6.1. PBP Assessment Framework

The proposal is within the Perisher precinct. PBP 2019 (p. 53) recognises the unique nature of development within the alpine areas, stating:

> *The alpine resorts are located within the environmentally significant setting of the Kosciusko National Park. The alpine resort areas are predominantly used for short- term tourist accommodation and are considered to be SFPP development. Much of the existing building stock has not been constructed to current requirements for development in a bushfire prone area.*
> *Leasehold arrangements combined with conflicting land management objectives present challenges in achieving APZs for SFPP developments in the alpine areas.*

The development site (Lot 1, DP 1192372) is an existing lot that **has an approved entitlement to build a 24-bed commercial ski lodge**. The development site has existing services (water, power, sewer).

PBP 2019 provides provision for SPFF infill development. The specific objectives (p. 53) that apply to SFPP infill development in the alpine resort areas are as follows:

- *provide an appropriate defendable space*
- *provide a better bushfire protection outcome for existing structures (e.g. via ember protection measures)*
- *ensure new building work complies with the construction standards set out in AS 3959*
- *to ensure ongoing management and maintenance responsibilities are in place where APZs are proposed outside of the sub lease or leasehold area*
- *provide safe emergency evacuation procedures*
- *Any additional construction requirements should be commensurate with the following*
    - *the scope of the proposed works, including any increase in size and footprint of the building*
    - *any additional capacity for the accommodation of guests and/or staff on site*
    - *the cost associated with the proposed upgrade of any building*

PBP 2019 provides an assessment framework for new SFPP development within the alpine areas.

The lot is serviced, and it meets the definition of 'Infill development' in PBP (p. 111). The proposal seeks development of the existing allotment and the proposal does not require the spatial extension of services (public roads, electricity, water and sewerage) as these are already provided to the Lot.

Although the proposed development meets the definition of infill development and meets all of the objectives of Chapter 6.6 Alpine Resorts, RFS identified during pre-DA consultation that the Alpine assessment pathway is only applicable to existing SFPP facilities, despite PBP stating that;

*'The specific objectives that apply to SFPP **infill development** in the alpine resort areas are as follows... '*

PBP (p. 50) recognises that there are different vulnerability characteristics within the suite of development classified as SFPP. It recognises that a hospital or aged-care facility will have very different vulnerability characteristics to a 24 bed lodge built in a low hazard alpine area. PBP states;

> *Different vulnerability characteristics have been identified for certain developments which are classified as SFPP under the RF Act and RF Reg. Varied performance criteria and acceptable solutions are identified for these particular uses in section 6.3. These SFPP developments may not be provided for in Table A1.12.1* ***and will need to be assessed on a performance basis on their own merits.***

This clause recognizes the different characteristics of occupants which it further outlines in the Objectives for Specific Uses (PBP p. 51) which provides a risk based approach such that:

> *Particular SFPP developments demonstrate different characteristics and may require different levels of protection. As such, tailored objectives are specified for these development types, though a BFSA is still required under RF Act s.100B.*
>
> *Typically, reasons for setting tailored objectives include, but are not limited to:*
>
> - *lower occupancy levels*
> - *the presence of a resident/manager on site, thereby improving the potential for informed emergency evacuation decisions*
> - *construction under AS 3959 or NASH Standard may be impractical (i.e. tents and caravans)*
>
> *Varied performance criteria and acceptable solutions are given for specific types of SFPP development in Tables 6.8a to 6.8d.*
>
> *Although construction levels or APZ requirements differ, it is imperative that water provision,*

emergency management and access provisions are provided commensurate with occupancy levels, assessed level of risk and characteristics of occupants.

The proposed lodge is a short term tourist SFPP development which shares characteristics with Bed and Breakfast accommodation and as Holiday Lets (PBP p. 51). For Holiday Lets, PBP (p. 51) states that:

> *Where a building is proposed to be used as a holiday let in an area with reticulated water, it does not back onto public reserves, and the setback and construction requirements of BAL-29 can be applied, they should be treated as a residential infill arrangement. Alternatively, a performance based solution will be required demonstrating adequate levels of bushfire safety before such a proposal can be supported by the NSW RFS.*

The site has managed ski slopes to the east and established buildings and managed areas to the north, west and south. Small areas of remnant vegetation exist surrounding some of the sites to the north and north east of the site which are fragmented.

A BAL of 29 has been used as the basis of the assessment as this is commensurate with the assessed level of risk for several forms of short-term tourist accommodation that are comparable to the proposed ski lodge.

This proposal meets the aim and objectives of PBP, as demonstrated below.

Aim/Objective	**Approach**
to provide for the protection of human life and minimise impacts on property from the threat of bush fire, while having due regard to development potential, site characteristics and protection of the environment.	• APZs provided for BAL 29 • Building constructed to appropriate BAL level • 24 bed lodge built to recognise development potential and requirement of NPWS lease • Bushfire attack level considers in detail the configuration of surrounding vegetation and slopes • A building manager will be present at all times when the building is occupied to provide supervision and implementation of emergency management arrangements.
Afford buildings and their occupants protection from exposure to a bush fire	Building constructed to appropriate BAL level, onsite manager must be present at all times when building is occupied
Provide for a defendable space to be located around buildings	Southern side of building is downslope and well shielded from the small remnants of alpine woodland located to the north of the site and has directed access to mains water (storz valve to be installed)

Provide appropriate separation between a hazard and buildings which, in combination with other measures, minimises material ignition	Building well setback from property boundary that in combination with surrounding roads, electricity line and other buildings provides an appropriate level of separation
Ensure that appropriate operational access and egress for emergency service personnel and residents is available	The site is located at the base of the ski slopes in close proximity to the main perisher centre and carpark. Operational access is provided via Burramys road, located immediately to the south and west of the site. The main entry point to the building is on the south-eastern corner of the building, that is well sheltered from the fire hazard on the northern aspect and is located within the defendable space
Provide for ongoing management and maintenance of BPMs	The site is a commercial property with management requirement built into the Environmental Management System for the site, a key NPWS requirement for all leaseholds in KNP.
Ensure that utility services are adequate to meet the needs of firefighters.	The main water supply pipe for Perisher is located on the southern boundary of the lot. A storz valve will be located on the south-eastern corner of the building.
Provide for the special characteristics and needs of occupants.	The site will be occupied during the winter months by people undertaking recreational activities. An onsite manager will be onsite at all times when the building is occupied.
Provide for safe emergency evacuation procedures.	An emergency evacuation plan will be prepared. This will emphasise the need for an onsite manager to be onsite at all times and for immediate compliance with park closures or evacuation directions.

6.2. Performance Based Approaches

PBP 2019 provides opportunity for a performance-based approach, and identifies objectives and detailed performance criteria to satisfy desired outcomes and meet the Aim and Objectives. As required by PBP 2019, this report demonstrates that the performance-based approach and modelling provides adequate bushfire protection to the proposed development commensurate with the assessed level of bushfire risk and the characteristics of the occupants.

The performance-based solution has been designed to achieve the appropriate level of protection by tailoring a package of measures which meet the intent and performance criteria relevant to the proposed development.

PBP 2019 recognises a risk-based approach to occupants and uses that can be identified in S.100B of the RF Act. Section 6.3 of PBP 2019 (p. 51) which articulates a risk-based approach depending on occupant characteristics:

> *Particular SFPP developments demonstrate different characteristics and may require different levels of protection. As such, tailored objectives are specified for these development types*

And

> *construction levels or APZ requirements differ, it is imperative that water provision, emergency management and access provisions are provided commensurate with occupancy levels, assessed level of risk and characteristics of occupants.*

This provides the opportunity for a merits-based assessment of the risk of the development and mix of Bushfire Protection Measures that responds to the risk and meets the aim and objectives of PBP. Given the fragile nature of the alpine areas, this is a particularly important aspect of balancing competing outcomes for minimizing the environmental footprint while mitigating the impact of bushfire for occupants, fire fighters and the asset.

PBP (p. 51) provides guidance for specific tourism uses. Holiday Lets provide a flexible approach to build an asset to BAL 29. This pathway has been taken with this application and the report demonstrates that the aim and objective of PBP can be satisfied.

6.3. Compliance Strategy

The design and compliance strategy will satisfy section 100B of the RF Act through a performance-based approach using Method 2 of PBP. This will be undertaken within the context of complying with the Aims and Objectives of PBP. Consideration will be given to the most appropriate construction approval regime and ongoing compliance of APZs will be ensured through implementation of the conditions of consent.

Fire protection requirements of the building are commensurate with National Construction Code (NCC) requirements and include;

1. Fire hydrants in accordance with Clause E1.3
2. Fire hose reels in accordance with Clause E1.4
3. Portable fire extinguishers in accordance with Clause E1.6
4. An automatic smoke detection and alarm system complying with Specification E2.2a
5. Exit signs and emergency lights provided in accordance with Clause E4.2 and E4.5

6.4. Design Strategy

The following design strategy has been used to inform the detailed design and engineering so that bushfire risk and occupant safety is appropriately addressed through:

1. The proposed design will comply with the aims and objectives of PBP 2019
2. APZ are maximised wherever possible consistent with PBP 2019
3. A defendable space is provided
4. The Design Fire is based on the methodology and assumptions in PBP 2019 and site-specific inputs which has been completed in consideration of the DTS provisions for FFDI 50 and a performance based assessment using site specific FFDI of 43
5. Buildings are designed and constructed to prevent fire spread during bushfires as intended by PBP 2019
6. The building is provided with an automatic smoke detection and alarm system complying with Specification E2.2a
7. Design is responsive to the vulnerability of the occupants
8. Not occupying the building during park closures or as directed by NPWS and RFS

6.5. Occupant Characteristics

Perisher Views is a 24 bed commercial lodge, comprising of 10 double rooms and a 2 bedroom suite. Based on the beds, occupancy will be limited to 24 people including staff.

Occupants within the building would comprise an onsite manager and short-term visitors that are using the lodge to access the ski fields during winter and the high outdoor activity associated with summer time use (bushwalking, mountain biking, fishing etc). It is considered that occupants would have a range of mobility levels and that they will be able to self-evacuate.

Fire hose reels and portable extinguishers are provided (see Section 6.3) for occupant use. However, suppression by such means is not relied upon. Detection and occupant warning systems are provided to alert occupants in the event of a fire within the structure.

A broad range of tools are readily available to all occupants regarding understanding bushfire weather and awareness of bushfires within vicinity of the site. These include:

- Local news and media
- Social media
- Emergency Alerts
- Fires Near Me app
- Incident response and emergency arrangements by NPWS and RFS

The following occupant Characteristics are provided:

Onsite Manager

Being a fully catered commercial lodge, an onsite manager will be present at all times when it is occupied. This provides on site supervision of direct use of the lodge and to coordinate any emergency management arrangements relating to bushfire in accordance with the *Bushfire Emergency Management and Evacuation Plan*. Generally, the onsite manager within the proposed development is expected to be an aware and alert adult capable of entering and leaving the building of their own accord. The onsite manager will be physically and mentally capable of making their own decisions and acting on them.

The onsite manager will have good familiarity with the building and the fire safety systems and be fully trained in emergency procedures.

Visitors/Guests

Visitors and guests will be inducted to the property upon arrival and made aware of emergency facilities and evacuation procedures.

In general, the Ski Lodge will be used by able bodied guests who are able to drive to and from the site, who will be able to make informed decisions and act on them. The guests will be active and informed members of the community. Occupants are expected to be awake during daylight hours and fully conscious and familiar with the building and layout. Guests will be short term but well aware of their surroundings.

It can be expected that occupants will have an understanding of general evacuation principles and the cause and effect relationship of fire alarms and the ability to implement evacuation if required.

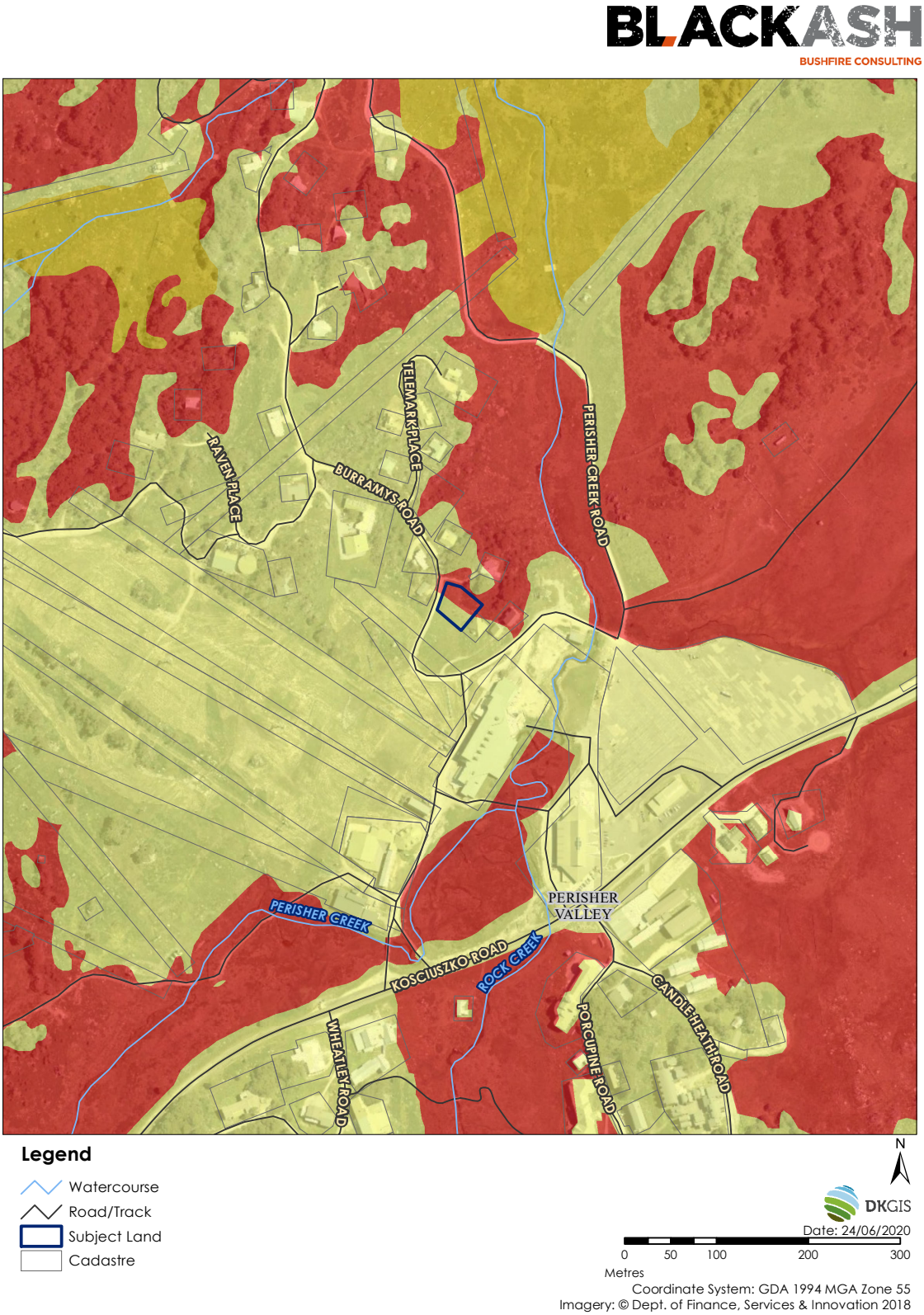
7. Bushfire Prone Land

The site is identified as 'bushfire prone land' for the purposes of Section 10.3 of the EPA Act and the legislative requirements for developing bushfire prone lands are applicable. The site is mapped as Category 1 Bushfire Prone Land and Buffer (see Figure 5). The buffer covers the areas that are used as ski runs during winter and which are managed during the summer months. The map is considered to accurately map and designate bushfire prone land.

Bushfire prone land maps provide a trigger for the development assessment provisions and consideration of sites that are bushfire prone.

Bushfire prone land (BFPL) is land which can support a bushfire or is likely to be subject to bushfire attack (radiant heat, embers or flame). Bushfire prone land maps are prepared by local council and certified by the Commissioner of the RFS.

Figure 5 Bushfire Prone Land Map



8. Bushfire Risk Management

The holiday let provisions within PBP 2019 provide performance criteria that are commensurate with the assessed vulnerability of the proposed ski lodge. As required by page 50 of PBP these type of proposals will need to be '*assessed on a performance basis on their own merits.*' to ultimately provide for the life safety of occupants, fire fighters, mitigating bushfire threat to the building and protecting the environment whilst having regard to the approved development potential of the site.

The NSW Snowy Mountains snow season are typically from the Queen's Birthday Long Weekend (early June) to the NSW Labour Day Long Weekend (early October)[1]. The snow melt continues well into January, keeping the ground wet and sustaining peat forming bogs and fens of the Snowy Mountains. This reduces the window for bushfire danger in the Alpine Areas significantly.

A separate *Bushfire Emergency Management and Evacuation Plan* (Evacuation Plan) will be provided prior to occupation of the site that meets the RFS *A guide to developing a Bush Fire Emergency Management and Evacuation Plan*.

Basic principles of the Evacuation Plan will be:

1. Perisher Views is not occupied by visitors during park closures or elevated danger
2. In the event of a bushfires within the vicinity of Perisher Views, the manager will evacuate the site to Jindabyne or other large centre out of bushfire prone areas
3. To act on instruction from NPWS and RFS

In accordance with PBP 2019:

- A separate bushfire management and evacuation plan will be prepared prior to occupation. It will be consistent with and builds on the NSW RFS document: *A Guide to developing a bushfire emergency management and evacuation plan*
- Defendable space will be provided within the site that meets RFS Standards for Asset Protection Zones
- A refuge area that ensures radiant heat exposure of less than 2 kW/m² for an open space or 10kW for a buildings is available within the Perisher resort area in the unlikely event that the site cannot be evacuated safely
- A risk assessment will be completed in the *Bushfire Emergency Management and Evacuation plan* that utilises a series of triggers commensurate with the Fire Danger Rating forecast and observed weather and the proximity of fires to initiate actions including:

[1] http://snowymountains.com.au/see-and-do/ski-snow

1. avoiding the risk – closing when bushfires are within designated distances of the site
2. removing a risk source – by managing the site as an Inner Protection Area
3. changing the likelihood of bushfire impact by removing people from the site and constructing the buildings to BAL 29
4. sharing the risk – providing an APZ that assists adjoining neighbours to reduce the bushfire risk
5. retaining the risk by informed decision – through appropriate insurance

The modern warnings framework and ability to issue up to date warnings and messages is an inherent strength of operational fire management. In the unlikely event that people are unable to evacuate the property in time, the property will be constructed to BAL 29 standards which is more than adequate for the assessed level of radiant heat of 21.9 kW/m^2. The windowless basement will be excavated into the ground and has concrete floors, walls and ceilings and could act as a bunker if required.

9. Bushfire Hazard Assessment

An assessment of the Bushfire prone land is necessary to determine the application of bushfire protection measures such as APZ locations, risk and Bushfire Attack Levels (BAL).

The vegetation formations (bushfire fuels) and the topography (effective slope) combine to create the bushfire threat that may affect bushfire behaviour at the site and which determine the planning and building response of the bushfire planning framework and PBP 2019.

The bushfire hazard affecting the investigation area was assessed during site inspections and using recent aerial photographs for at least a distance of 140m from the perimeters of the investigation area (in line with PBP 2019).

This assessment identifies the potential bushfire threat from both within and outside of the investigation area and provides an indication of bushfire potential for the site. The method used for this assessment is outlined in PBP 2019 and relies on consideration of vegetation and slope and is outlined below along with results.

9.1. Methodology

PBP 2019 provides a methodology to determine the size of any APZ that may be required to offset possible bushfire attack. These elements include the potential of a hazardous landscape that may affect the site and the effective slope within that hazardous vegetation.

The following assessment is prepared in accordance with Section 100B of the RF Act, Clause 44 of the RF Reg and PBP. This assessment is based on both a desktop assessment and site inspection of the site assessment utilising the following resources:

- *Planning for Bushfire Protection* (NSW RFS, 2019)
- Council Bushfire Prone Land Map
- Aerial mapping
- Detailed GIS analysis

The methodology used in this assessment is in accordance with PBP 2019 and is outlined in the following sections.

9.2. Forest Fire Danger Index

PBP has designated the appropriate fire areas and corresponding Forest Fire Danger Rating (FFDI). The FFDI within PBP 2019 is based on a historical fire weather assessment which assumes a credible worst-case scenario and an absence of any other mitigating factors relating to aspect or prevailing winds for a 1:50 year fire weather event.

Feedback from RFS as part of the pre-DA process was that an FFDI of 100 was required as a minimum and compliance with Table A1.12.1 of PBP. This RFS advice is not in keeping with the requirements of PBP and does not reflect the vulnerability characteristics of the proposed ski lodge nor the fire hazard in the alpine environment.

It is understood that the RFS have accepted that FFDI 50 can be relied upon for the alpine resorts. The alignment of the alpine resorts to rely on Table A1.12.7 of PBP is recognition of the agreed framework provided by PBP and Planning for Bushfire Protection 2006 (PBP 2006).

The FFDI 50 within PBP recognises the reduced bushfire threat associated with bushfire weather in the Snowy Mountains. The FFDI of 50 has been used in this report, consistent with the deemed to satisfy requirements of PBP 2019 in Table A1.12.7. As part of the application process and as a performance based approach, Blackash engaged Risk Frontiers who provided *Fire Danger Index Analysis for Perisher Valley* (5 June 2021) which is at Appendix 2.

Risk Frontiers concluded (p. 5) that:

> *Annual maximum FFDI values at Perisher Valley for the 70-year period from 1950/51 to 2019/2020 derived from the gridded BOM FFDI dataset have typically been in the range of 20-40, with one extreme year (1985) reaching 57. From our analysis of this dataset,* ***we estimate the 50-year ARI value to be 43.***

As such, a 43 FFDI has been used as the input for site specific modeling in the following sections.

9.3. Vegetation Assessment

The proposed development is located wholly within an existing disturbed area (Figure 6), within an allotment created by the NSW Office of Environment and Heritage. An assessment for environmental impact has been undertaken in the Statement of Environmental Effects submitted separately with the DA.

Clause 44 of the RF Regulation requires a classification of the vegetation on and surrounding the site out to a distance of 140 metres from the boundaries of the property in accordance with the system for classification of vegetation contained in PBP 2018.

The predominant vegetation is classified by structure or formation using the system adopted by *Ocean Shores to Desert Dunes* (Keith, 2004) and by the general description using PBP 2019. Vegetation types give rise to radiant heat and fire behaviour characteristics. The predominant vegetation is determined over a distance of at least 140 metres in all directions from the proposed site boundary. Where a mix of vegetation types exist, the type providing the greater hazard is said to predominate.

The vegetation assessment is shown in Figure 8 and is mix of disturbed grassland/ alpine complex with small areas of remnant sub alpine grassy woodland to the north east to north west of the site. The remnant vegetation is fragmented and broken up by surrounding development. The bushfire risk is minimal. The area is regularly maintained as part of the Perisher Resort ski runs. No trees are within the site. Looking beyond the site (figure 7), the Perisher main carpark is clearly evident that provides a fuel free area. Figure 7 is from the Perisher carpark looking toward the site.

The vegetation remnant located to the northeast and west of the site comprise of small, narrow and short remnants, interspersed with other lodges (Merriment and Kuringai) and alpine complex (Category 3 vegetation). Consistent with Sections A1.10 and A1.11 (and also the Aim of PBP 2019 to consider the characteristics of each site), these remnants have been identified as 'low hazard' and fire behaviour assessed as remnant.

The Test of Significance - Proposed Lodge – Lot 1 DP 1192372, Perisher Valley by Eco Logical Australia (14 August 2020) identifies the following:

> The development site and immediate surrounds are heavily modified as a result of historic disturbances associated with the development of the Perisher Ski Resort, as shown in Figure 2, Photo 1 and Photo 2. Most of the development site supports disturbed remnant Plant Community Type (PCT) 645 *Alpine Snow Gum shrubby open woodland at high altitudes in Kosciuszko NP, Australian Alps Bioregion*. It is characterised by a patchy cover of shrubs such as *Prostanthera cuneata* (Alpine Mint Bush), *Nematolepis ovatifolia*, *Ozothamnus alpinus* (Alpine Everlasting), *Ozothamnus secundiflorus* (Cascade Everlasting), *Grevillea australis* (Alpine

Grevillea), *Olearia phlogopappa* (Dusty Daisy-bush), *Orites lancifolius* (Alpine Orites), *Tasmannia xerophila* subsp. *xerophila* and *Melicytus dentatus* (Tree Violet).

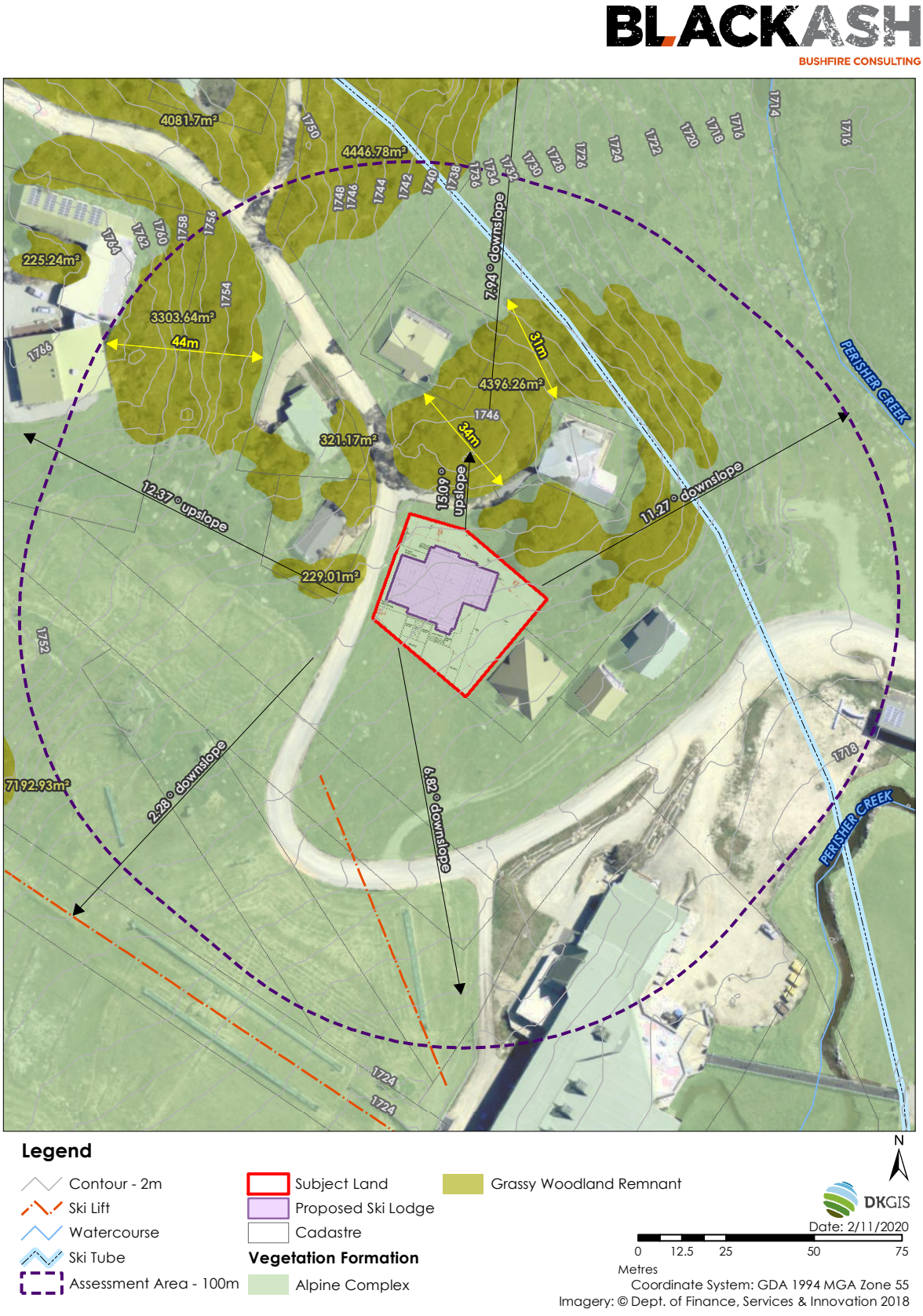
The groundcover is dominated by *Poa fawcettiae* (Smooth Blue Snowgrass), but also includes *Poa hiemata* (Soft Snowgrass), *Hovea montana* (Alpine Hovea), *Acaena novae-zelandiae* (Bidgee Widgee), *Craspedia aurantia, Asperula gunnii*, *Pimelea alpina, Carex breviculmis*, *Geranium antrorsum*, *Scleranthus biflorus* (Two-flowered Knawel), *Oreomyrrhis eriopoda* (Australian Carraway), *Viola betonicifolia* (Native Violet), *Microseris lanceolata* (Murrnong), and *Ranunculus graniticola* (Granite Buttercup).

The southern and western parts of the development site are heavily disturbed and support an exotic grassland dominated by exotic grasses *Dactylis glomerata* (Cocksfoot), *Anthoxanthum odoratum* (Sweet Vernal Grass), *Agrostis capillaris* (Browntop Bent), *Phalaris sp.*, and a range of exotic herbs, particularly *Hypochaeris radicata* (Flatweed), *Acetosella vulgaris* (Sheep Sorrel), and *Achillea millefolium* (Yarrow) with only scattered natives, mainly *Poa fawcettiae*.

Figure 6 Looking southeast from the north-western corner of the subject land.

Figure 7 From Perisher Carpark toward the site

Figure 8 Vegetation & Slope Assessment



9.4. Slopes Influencing Bushfire Behaviour

PBP 2019 requires an assessment of the slope of the land on and surrounding the property (out to a distance of 100 metres from the boundaries of the property or from the proposed development footprint.

The 'effective slope' influencing fire behaviour approaching the sites has been assessed in accordance with the methodology specified within PBP. This is conducted by measuring the worst-case scenario slope where the vegetation occurs over a 100 m transect measured outwards from the development boundary or the existing/ proposed buildings.

Figure 8 shows the slopes affecting the site. Slopes to the north of the site are upslope to a small knoll, then downslope. To the east, slopes are downslope 11.27 degrees. To the south, slopes are downslope at 6.82 degrees. To the west, slopes are downslope at 2.28 degrees. To the north east, slopes are upslope at 12.37 degrees. The slope on which the subalpine woodland is located is cross-slope 0-5. The steeper slope is located on the other side of the remnant woodland in the alpine complex. 'The effective slope is considered to be the slope under the vegetation which will most significantly influence the bushfire behaviour'.

9.5. APZ Requirements and Building Construction Requirements

The footprint of the lodge has been minimised to provide maximum separation to the boundary. In principle agreement has been reached with NPWS on the APZ Management Plan that provides APZ within the site and within discrete areas of NPWS land. APZ do not extend onto adjoining lease lands.

Existing land managed as APZ, including roads, the electricity easement and buildings have been included as part of the APZ for this site.

Table A1.12.7 of PBP 2019 (Table 2) has been used to identify the acceptable solution (APZ and construction) for the development using the vegetation and slope data identified in Sections 9.3 and 9.4.

In undertaking the modelling of radiant heat, a flame temperature of 1090K has been used instead of 1200K as documented in PBP 2019. 1200K is used within PBP 2019 for vulnerable (schools, hospitals, aged care etc) members of the community and to ensure that evacuation options are available which do not expose occupants or emergency services to high levels of radiant heat at exit points.

PBP provides for a reduced flame temperature of 1090K for Bed and Breakfast and Farmstay (p. 55) and home based childcare (p. 65) and residential subdivision (p 89) which is commensurate with the occupant characteristics (see Section 6.5) and the reduced risk associated with people in the holiday let.

The RFS *Comprehensive Vegetation Fuel Loads* (March 2019) has been used to provide the fuel loads for the vegetation within the Alpine Areas. The performance based calculations have used vegetation classification of Sub Alpine Woodlands fuel loads as per Table 3 and Alpine Complex as per Table 3.

The performance-based approach, showing the inputs and outputs for the site assessment and PBP requirements are shown in Table 4.

NPWS accepts the need to provide APZs associated with the development within NPWS lands. NPWS have advised the applicant (email dated 15 July 2021) that NPWS are granting APZ management approval for the life of the lease The agreed APZ Plan which will be embedded into the formal approval letter issued by NPWS, which is then valid for the life of the lease.

Table 2 DTS APZ and BAL PBP 2019

Table A1.12.7

Determination of BAL, FFDI 50 – alpine areas

	KEITH VEGETATION FORMATION	BUSH FIRE ATTACK LEVEL (BAL)				
		BAL-FZ	BAL-40	BAL-29	BAL-19	BAL-12.5
		Distance (m) asset to predominant vegetation class				
ALL UPSLOPE AND FLAT LAND	Rainforest	< 5	5 -< 7	7 -< 10	10 -< 15	15 -< 100
	Forest (wet and dry sclerophyll) including Coastal Swamp Forest, Pine Plantations and Sub-Alpine Woodland	< 11	11 -< 15	15 -< 22	22 -< 30	30 -< 100
	Grassy and Semi-Arid Woodland (including Mallee)	< 6	6 -< 8	8 -< 12	12 -< 17	17 -< 100
	Forested Wetland (excluding Coastal Swamp Forest)	< 5	5 -< 6	6 -< 9	9 -< 13	13 -< 100
	Tall Heath	< 12	12 -< 16	16 -< 23	23 -< 32	32 -< 100
	Short Heath	< 7	7 -< 9	9 -< 14	14 -< 20	20 -< 100
	Arid-Shrublands (acacia and chenopod)	< 5	5 -< 6	6 -< 9	9 -< 14	14 -< 100
	Freshwater Wetlands	< 4	4 -< 5	5 -< 7	7 -< 11	11 -< 100
	Alpine Complex	< 4	4 -< 6	6 -< 8	8 -< 12	12 -< 100
	Grassland	< 6	6 -< 8	8 -< 11	11 -< 17	17 -< 50
> 0 > 5 DEGREES – DOWNSLOPE	Rainforest	< 6	6 -< 8	8 -< 12	12 -< 18	18 -< 100
	Forest (wet and dry sclerophyll) including Coastal Swamp Forest, Pine Plantations and Sub-Alpine Woodland	< 14	14 -< 18	18 -< 26	26 -< 36	36 -< 100
	Grassy and Semi-Arid Woodland (including Mallee)	< 7	7 -< 10	10 -< 14	14 -< 21	21 -< 100
	Forested Wetland (excluding Coastal Swamp Forest)	< 6	6 -< 8	8 -< 11	11 -< 16	16 -< 100
	Tall Heath	< 13	13 -< 18	18 -< 26	26 -< 36	36 -< 100
	Short Heath	< 8	8 -< 10	10 -< 15	15 -< 22	22 -< 100
	Arid-Shrublands (acacia and chenopod)	< 5	5 -< 7	7 -< 11	11 -< 16	16 -< 100
	Freshwater Wetlands	< 4	4 -< 6	6 -< 8	8 -< 12	12 -< 100
	Alpine Complex	<5	5 -< 6	6 -< 10	10 -< 14	14 -< 100
	Grassland	< 7	7 -< 9	9 -< 13	13 -< 19	19 -< 50
> 5 > 10 DEGREES – DOWNSLOPE	Rainforest	< 8	8 -< 11	11 -< 16	16 -< 23	23 -< 100
	Forest (wet and dry sclerophyll) including Coastal Swamp Forest, Pine Plantations and Sub-Alpine Woodland	< 17	17 -< 22	22 -< 32	32 -< 43	43 -< 100
	Grassy and Semi-Arid Woodland (including Mallee)	< 9	9 -< 12	12 -< 17	17 -< 25	25 -< 100
	Forested Wetland (excluding Coastal Swamp Forest)	< 7	7 -< 9	9 -< 14	14 -< 20	20 -< 100
	Tall Heath	< 15	15 -< 20	20 -< 29	29 -< 40	40 -< 100
	Short Heath	< 9	9 -< 12	12 -< 18	18 -< 25	25 -< 100
	Arid-Shrublands (acacia and chenopod)	< 6	6 -< 8	8 -< 12	12 -< 18	18 -< 100
	Freshwater Wetlands	< 5	5 -< 6	6 -< 10	10 -< 14	14 -< 100
	Alpine Complex	< 5	5 -< 7	7 -< 11	11 -< 16	16 -< 100
	Grassland	< 7	7 -< 10	10 -< 15	15 -< 22	22 -< 50
> 10 > 15 DEGREES – DOWNSLOPE	Rainforest	< 10	10 -< 13	13 -< 20	20 -< 29	29 -< 100
	Forest (wet and dry sclerophyll) including Coastal Swamp Forest, Pine Plantations and Sub-Alpine Woodland	< 21	21 -< 28	28 -< 39	39 -< 52	52 -< 100
	Grassy and Semi-Arid Woodland (including Mallee)	< 11	11 -< 15	15 -< 22	22 -< 31	31 -< 100
	Forested Wetland (excluding Coastal Swamp Forest)	< 9	9 -< 12	12 -< 18	18 -< 26	26 -< 100
	Tall Heath	< 17	17 -< 22	22 -< 32	32 -< 44	44 -< 100
	Short Heath	< 10	10 -< 13	13 -< 20	20 -< 29	29 -< 100
	Arid-Shrublands (acacia and chenopod)	< 7	7 -< 9	9 -< 14	14 -< 20	20 -< 100
	Freshwater Wetlands	< 5	5 -< 7	7 -< 11	11 -< 16	16 -< 100
	Alpine Complex	< 6	6 -< 8	8 -< 12	12 -< 18	18 -< 100
	Grassland	< 8	8 -< 12	12 -< 17	17 -< 25	25 -< 50
> 15 > 20 DEGREES – DOWNSLOPE	Rainforest	< 13	13 -< 17	17 -< 26	26 -< 36	36 -< 100
	Forest (wet and dry sclerophyll) including Coastal Swamp Forest, Pine Plantations and Sub-Alpine Woodland	< 26	26 -< 34	34 -< 47	47 -< 63	63 -< 100
	Grassy and Semi-Arid Woodland (including Mallee)	< 14	14 -< 19	19 -< 28	28 -< 38	38 -< 100
	Forested Wetland (excluding Coastal Swamp Forest)	< 7	7 -< 15	15 -< 23	23 -< 32	32 -< 100
	Tall Heath	< 19	19 -< 25	25 -< 36	36 -< 49	49 -< 100
	Short Heath	< 11	11 -< 15	15 -< 23	23 -< 32	32 -< 100
	Arid-Shrublands (acacia and chenopod)	< 7	7 -< 10	10 -< 16	16 -< 23	23 -< 100
	Freshwater Wetlands	< 6	6 -< 8	8 -< 13	13 -< 18	18 -< 100
	Alpine Complex	< 7	7 -< 9	9 -< 14	14 -< 21	21 -< 100
	Grassland	<10	10 -< 13	13 -< 20	20 -< 28	28 -< 50

Table 3 NSW RFS *Comprehensive Vegetation Fuel Loads*

VEGETATION	VEGETATION CLASSIFICATION	SURFACE AND ELEVATED	OVERALL FUEL LOAD (INCLUDING BARK AND CANOPY)
Woodlands	Coastal Valley GW	10	18.07
	Tablelands Clay GW	10.5	18.61
	New England GW	10.5	20.2
	Southern Tableland GW	10.5	19.01
	Sub-alpine woodlands	18	27.3
	Western Slopes GW	10.5	18.3
	Floodplain transition woodlands	10.5	18.9
Semi-arid woodlands (grassy)	Inland floodplain woodlands; north-west floodplain woodlands; riverine plain woodlands; Brigalow Clay Plain woodlands	5.9	9.0
Semi-arid woodlands (PBP - Use for all classes except Dune Mallee and Sand plain Mallee)	North-west alluvial sand woodlands; riverine sandhill woodlands; inland rocky hill woodlands; subtropical semi-arid woodlands; western peneplain woodlands; semi-arid sand plain woodlands; desert woodlands	11.9	14.5
Semi-arid woodlands (PBP - Semi-arid woodlands (shrubby) – Mallee	Dune Mallee woodlands; Sand plain mallee woodlands	13.3	16.5
Forested Wetlands (Coastal swamp forest)	Coastal swamp forests	22.6	34.1
Forested Wetlands (Riverine forest)	Coastal floodplain wetlands; Eastern riverine forests; inland riverine forests	8.2	15.1
Heathlands (PBP - Tall Heath)	Keith: May include classes: Sydney coastal heaths; Coastal headland heaths; Wallum sand heath. PBP Note: Use for Heath > 2 metres. This example calculated @ 4metres height for PBP.	36.9	36.9
Heathlands, Freshwater Wetlands and Alpine Complex (PBP - Short Heath)	Keith: Includes classes: South Coast heaths; Northern montane heaths; Sydney montane heaths; Southern montane heaths; Coastal heath swamps (Freshwater wetlands formation); Alpine heaths (Alpine complex formation). May include classes: Sydney coastal heaths; Coastal headland heaths; Wallum sand heaths. PBP Note: Use for heath < 2m tall. This example calculated @ 2 metres height for PBP.	15.0	15.0
Arid shrublands (acacia)	Keith: North-west Plain Shrublands; Gibber Transition Shrublands; Stony Desert Mulga Shrublands; Sand Plain Mulga Shrublands. PBP Note: This example calculated @ 1.5 metres height for PBP.	6.2	6.2
Arid shrublands (chenopod)	Keith: Riverine Chenopod Shrublands; Aeolian Chenopod Shrublands; Gibber Chenopod Shrublands. PBP Note: This example calculated @ 1.5 metres height for PBP.	3.2	3.2
Freshwater Wetlands (PBP – Does not include class Heath swamp, which is included in short heath.)	Keith: Montane bogs and fens; Coastal freshwater lagoons; Montane lakes; Inland floodplain swamps; Inland floodplain shrublands. PBP Note: This example calculated @ 1 metre height for PBP.	4.4	4.4
Alpine Complex	Keith: Alpine herblands; Alpine fjaeldmarks; Alpine bogs and fens. PBP Note: Does not include class Alpine heaths, which is included in short heath. This example calculated @ 1 metre height for PBP.	5.8	5.8
Grassland	Keith: Maritime Grasslands, Temperate Montane Grasslands, Western Slopes Grassland, Riverine Plain Grasslands and Semi-arid Floodplain Grasslands. PBP Note: Dominated by perennial grasses and the presence of broad- leaved herbs on flat topography. Lack of woody plants. Plants include grasses, daisies, legumes, geraniums, saltbushes and copperburrs.	6.0	6.0

Table 4 Site Assessment and APZ/ Radiant Heat Summary

Aspect	Slope[1]	Vegetation[2]	PBP required APZ[3] for BAL 29	Proposed APZ[4]	Calculations	Radiant Heat Output	Construction Standard[5]	Comment
North	15.09 upslope then 7.94 downslope	Sub alpine woodland 34m wide then Alpine Complex on lee side of the slope.	15m 6m Total of 25.6m	25.6m to edge of managed APZ Assessed as sub alpine woodland	Appendix 2 Appendix 3	For sub alpine woodland 6.37kW	BAL 12.5	Narrow remnant Sub Alpine Woodland in and around lodges to the north and north east of the site reduce the flame width. Flame width left as 100m wide. The Alpine Complex is shielded out by Sub Alpine Woodland.
North east	11.27 downslope	Alpine Complex then trees between the two lodges to the north east, then Alpine Complex. Assessed as sub alpine woodland	28m	North east 24 at closest point to edge of APZ	Appendix 4	21.93	BAL 29	Assessed as Sub Alpine Woodland as a worst case scenario as this is the predominant vegetation that will affect fire behaviour. There are three trees to the north east between the two lodges. These are not considered to represent a significant hazard. The lodges reduce the flame width from this aspect Adjoining lodge to the east and south as managed land
East	11.27 downslope	Alpine Complex then trees between the two lodges to the north east, then Alpine Complex. Assessed as sub alpine woodland	28m	East 24m to site boundary to be managed as APZ. Larger separations up to 19m	Appendix 4	21.93	BAL 29	Assessed as Sub Alpine Woodland as a worst case scenario as this is the predominant vegetation that will affect fire behaviour. There are minimal trees between the buildings. These are not considered to represent a significant hazard. The lodges reduce the flame width from this aspect Adjoining lodge to the east and south as managed land
South to church	6.82 downslope	Alpine Complex/ managed land	7m	10m to boundary with church. Land within church is managed and fuel is removed by the church. APZ is greater than 10m.	Managed land within church	Church building	BAL 12.5	The APZ is taken to the site boundary and within 2m of the church land. The church regularly maintains the land. The church building removes the bulk of hazard to the south.
South ski run	6.82 downslope	Alpine Complex	7m	17m at closest point	Appendix 5	11.3kW	BAL 12.5	Ski run managed alpine complex
West	12.37 upslope	Alpine Complex	6m	17.6m at closest point	Appendix 6	6.06	BAL 12.5	Ski run managed alpine complex

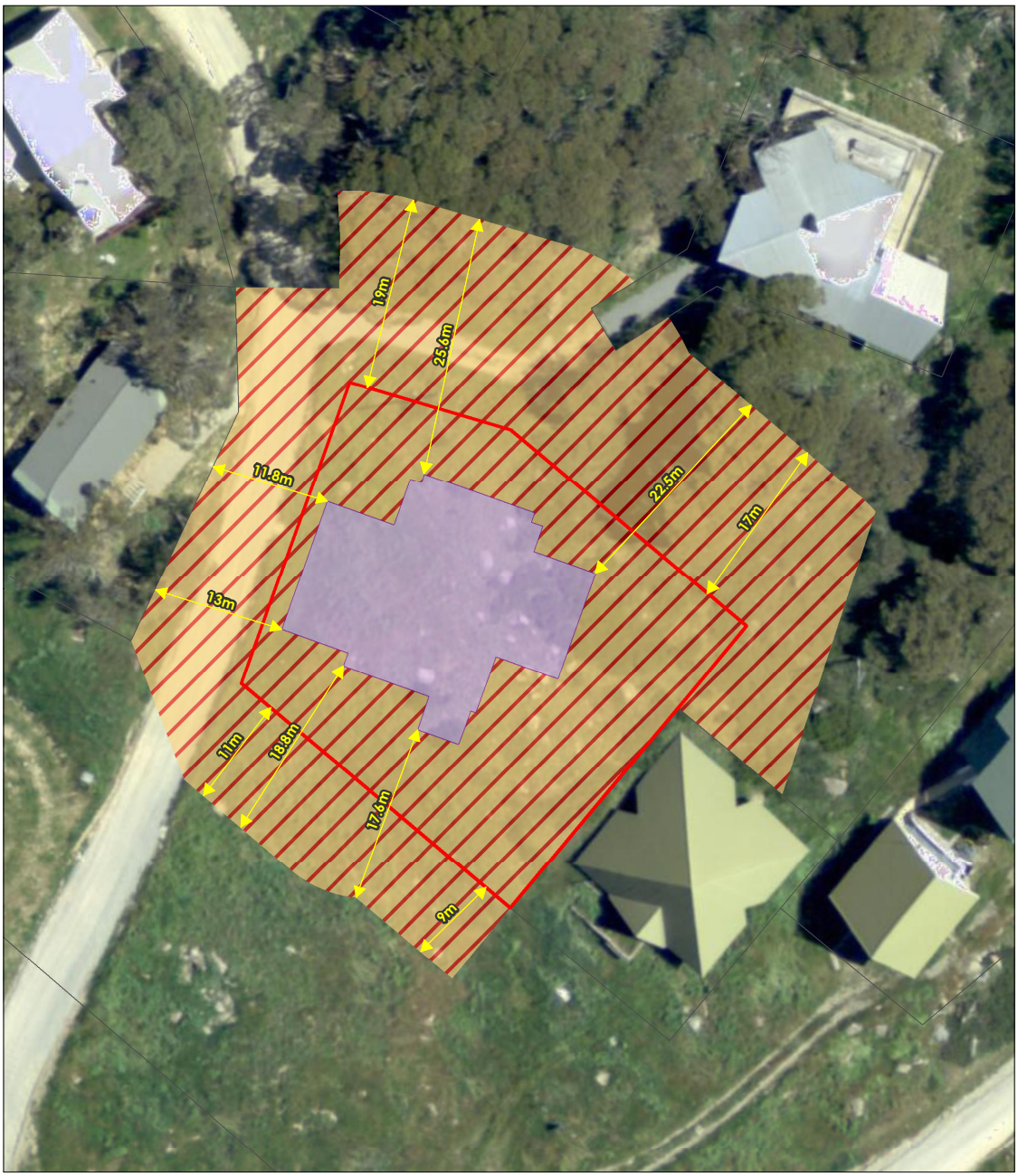
Key to Table 4

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

- [2] Predominant vegetation is identified, according to PBP and "Where a mix of vegetation types exist the type providing the greater hazard is said to be predominate".
- [3] Assessment according to Table A1.12.7 of PBP 2019 to meet BAL 29.
- [4] APZ provided as shown in Figure 9 and 10.
- Assessment using Flamesol by the FPAA according to Method 2 of AS3959.

Figure 9 APZ Extent

BLACKASH
BUSHFIRE CONSULTING



Legend

- Proposed Building
- Subject Land
- Cadastre
- APZ area from APZ Management Plan

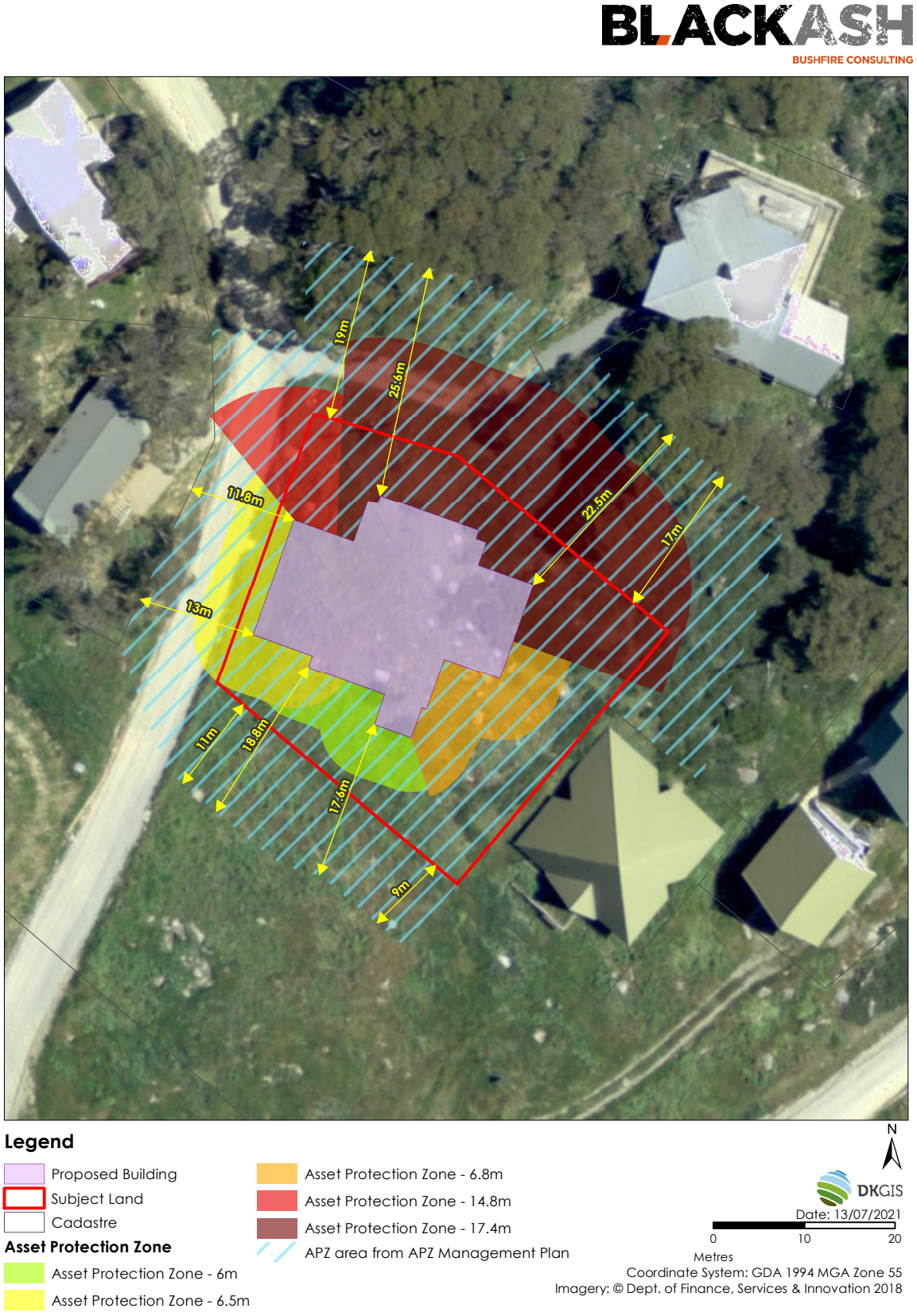
N

DKGIS
Date: 13/07/2021

0 10 20
Metres

Coordinate System: GDA 1994 MGA Zone 55
Imagery: © Dept. of Finance, Services & Innovation 2018

Figure 10 APZ to Achieve BAL 29



Assessment Outcomes

Table 4 shows the inputs, assumptions and outputs of the performance based approach. The performance solution using detailed bushfire modelling has been undertaken to demonstrate that an APZ as agreed with NPWS can meet the performance criteria of Section 4.2.7 of PBP for Special Fire Protection Purpose (SFPP) developments.

To achieve this the FPAA Bushfire Attack Assessor was used to determine refined APZ and construction requirements in accordance with Appendix B: Detailed Methodology for Determining the Bushfire Attack Level (BAL) – Method 2 of Australian Standard 3959: Construction of buildings in bushfire-prone areas' 2009 (Standards Australia 2009).

The site assessment has determined that the proposed Perisher Views building is within BAL 19 as a worst case scenario to the south to the Lot boundary with the church. However, the land within the church lot could be considered as managed land. All other aspects are able to meet BAL 12.5. As a failsafe, Figure 10 shows the DTS APZs to achieve BAL 29. All APZs can be provided such that BAL 19 is the highest level of bushfire attack. However, the applicant is prepared to build to **BAL 29** in accordance with AS3959 to increase the resilience of the buildings and provide redundancy in the construction of the building.

As such, the APZ will be managed to provide defendable space within the subject site in accordance with RFS Standards for Asset Protection Zones and the Perisher Views APZ Management Plan.

9.6. Fire Spread Control and BCA fire compliance

In addition to meeting the requirements of PBP 2019, the new building will provide the following internal works to meet BCA and Australian Standard requirements:

- A smoke detection system will be installed in accordance with NCC and AS1670.1: 2004
- The building will be equipped with portable fire extinguishers in accordance with Clause E1.6 of the NCC and AS2444: 2001
- Exit signage in accordance with AS 2293.1:2005
- Emergency lighting in accordance with AS 2293.1:2005 will be installed throughout the buildings to assist the evacuation of occupants in low light conditions
- The fire hydrant system incorporating internal and external hydrant connections as required to ensure coverage in accordance with AS 2419.1:2005

These measures are part of the performance based approach for the design and construction of the ski lodge. These elements compliment the BAL 29 construction in accordance with AS3959 and provide a high degree of inherent protection to the building.

From a firefighting perspective, the site and building had defendable space around its entirety and good access to three sides of the building via public roads and adjoining driveways.

9.7. Additional Fire Safety Measures

The DEPI requires additional fire safety measures within tourist accommodation buildings in the NSW Alpine Resorts and require the following fire prevention measures over and above PBP 2019. These include:

Annual fire safety statement

Each year, the owner (or lessee in the Alpine Resort areas) of a building or premises is required to submit an annual fire safety statement.

Fire safety certificate

Any new or altered buildings must submit a fire safety certificate. The statement confirms that each essential fire safety measure has been assessed by a competent fire safety practitioner and was assessed to be capable of performing to a standard no less than that specified in a/the schedule.

10. Evacuation and Emergency Management

A comprehensive *Bushfire Emergency Management and Evacuation Plan* will be provided prior to occupation (separate document). The bushfire evacuation procedures will be completed in accordance with NSW Rural Fire Service *Guide to Developing A Bushfire Emergency Management Plan* and meet the requirements of Australian Standard AS 3745-2010 – *Planning for Emergencies in facilities*. On-site and off-site evacuation procedures will be included.

Given its location, a series of triggers will be provided within the *Bushfire Emergency Management and Evacuation Plan* depending on various fire and weather scenarios. When the building is occupied, it will have an on site manager who is familiar with the requirements and is able to implement the *Bushfire Emergency Management and Evacuation Plan.*

The Emergency Management arrangements and the Bushfire Evacuation Plan will cater for a wide range of scenarios including large campaign fires and fast run fires impacting the site within a short time frame. Evacuation off site will be provided for within the Evacuation plan and a fall-back option for fast run fires has identified a large assembly area that are at the 2kW range for radiant heat.

The evacuation plan will provide a number of contingency shelter and evacuation options for the event. The Evacuation Plan will identify that the safest option is to be out of bushfire prone areas in the event of a fire. In a worst-case scenario where the manager does not have adequate time to evacuate the property, the Evacuation Plan will outline measures for the manager to remain on site, bearing in mind that the building is designed and built to be capable of withstanding an approaching bushfire and there is a sub-ground basement with no windows and concrete walls floors and ceilings that could provide a short-term bunker if required.

The focus on the Evacuation Plan has been to put in place strategies that do not expose the occupants to the effects of bushfire attack and focus on eliminating exposure to bushfire threat by providing a framework for the site manager to determine the safest options, engaging with the occupants regarding forecast bushfire risk and providing for early evacuation from site if there are fires in the vicinity.

A resort wide emergency / evacuation plan is in place which is the responsibility of the NPWS.

The site is not able to provide a designated refuge area. However, as a redundancy, a number of options exist within the Perisher precinct, including the main Perisher car parking area and the Perisher Valley National Parks Office area.

11. Water Supplies

The development will have mains water available for firefighting purposes. Fire hydrants are located along Burramys Road. A hydrant with storz valve will be provided adjacent to the south-east corner of the building.

12. Gas and electrical supplies

Existing electricity supply will be used for the site. The existing power is above ground.
Any future gas service to the development must be installed and maintained in accordance with AS 1596. Gas cylinder relief valves must be directed away from buildings and away from any combustible materials, specifically:

- 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, and
- all fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side, and
- connections to and from gas cylinders are metal, and
- 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, and
- polymer-sheathed flexible gas supply lines to gas meters adjacent to buildings are not used, and
- above-ground gas service pipes external to the building are metal, including and up to any outlets.

13. Access

The existing road network within the Perisher Range Resorts is already established and allows for two-wheel drive all weather access (outside of the winter period when the roads are snow bound). Burramys Road is a through Road.

The Perisher precinct is considered isolated development. During the summer period, the roads into Perisher are actively managed by NSW National Parks and Wildlife Service. The gatehouses at the two control points to the alpine areas control the through movement of traffic. In the event of bushfires, these roads would be closed, preventing access into the Perisher area.

Similarly, access out of the Perisher area is tightly managed and controlled by NPWS and emergency services. The Evacuation Plan will provide details that the road is not to be used in the event of a bushfire impacting or affecting the trafficability of the road and that occupants are to act under instruction from fire fighting and emergency services.

14. Recommendations

The following recommendations are made for the bushfire protection measures for the site.

1. A comprehensive Bushfire Emergency Management and Evacuation Plan will be provided prior to occupation (separate document).
2. The building is built to BAL 29 in accordance with the *Australian Standard for Construction of Buildings in Bushfire Prone Areas*.
3. The entire site is managed as an Inner Protection Area in accordance with RFS *Standards for Asset Protection Zones*.
4. The area as shown in Figure 9 is managed as an APZ and the Draft Perisher Views APZ Management Plan is finalised with NPWS.
5. 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.
6. Each year, the owner (or lessee in the Alpine Resort areas) of a building or premises is required to submit an annual fire safety statement.

15. Conclusion

Perisher Views is located within the environmentally significant setting of the Kosciusko National Park. The proposed APZ resulting in bushfire attack below BAL 29 is one of the larger APZs in the alpine environment, the proposed lodge will be one of the most bushfire resilient places and has significantly less risk then similar recently approved developments in the alpine resorts.

The proposal will be used for short-term tourist accommodation with similar characteristics as holiday lets. Given the sensitive nature of the alpine areas, a risk-based approach has been taken with the performance-based assessment. As such, the risk based assessment in this report has demonstrated that the proposal is compliant with the aim, objectives, and specific requirements of *Planning for Bushfire Protection 2019*.

In the author's professional opinion, the bushfire protection measures demonstrated in this report comply with *Planning for Bush Fire Protection 2019* and the RFS ought to issue a Bushfire Safety Authority.

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Appendix 1 References

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Appendix 2 FFDI 43 – 15.09 Upslope Sub Alpine Woodland

Calculated June 9, 2021, 11:51 am (MDc v.4.9)

Minimum Distance Calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	43	Rate of spread	0.32 km/h
Vegetation classification	Woodland	Flame length	5.4 m
Understorey fuel load	18 t/ha	Flame angle	58 °, 69 °, 78 °, 83 °, 85 ° & 91 °
Total fuel load	27.3 t/ha	Elevation of receiver	1.89 m, 1.99 m, 1.83 m, 1.47 m, 1.21 m & 0 m
Vegetation height	n/a	Fire intensity	4,624 kW/m
Effective slope	-15.09 °	Transmissivity	0.891, 0.882, 0.869, 0.851, 0.841 & 0.766
Site slope	5 °	Viewfactor	0.577, 0.4291, 0.2871, 0.1918, 0.1561 & 0.0428
Flame width	100 m	Minimum distance to < 40 kW/m²	4.5 m
Windspeed	n/a	Minimum distance to < 29 kW/m²	6 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	9.1 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	13.7 m
		Minimum distance to < 10 kW/m²	16.8 m

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Calculated July 16, 2021, 2:09 pm (BALc v.4.9)

15.09 upslope sub alpine woodland

Bushfire Attack Level calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	43	Rate of spread	0.32 km/h
Vegetation classification	Woodland	Flame length	5.4 m
Understorey fuel load	18 t/ha	Flame angle	78 °
Total fuel load	27.3 t/ha	Panel height	5.28 m
Vegetation height	n/a	Elevation of receiver	4.88 m
Effective slope	-15.09 °	Fire intensity	4,624 kW/m
Site slope	-5 °	Transmissivity	0.8169999999999999
Distance to vegetation	25.6 m	Viewfactor	0.1025
Flame width	100 m	Radiant heat flux	6.37 kW/m²
Windspeed	n/a	Bushfire Attack Level	BAL-12.5
Heat of combustion	18,600 kJ/kg		
Flame temperature	1,090 K		

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Appendix 3 FFDI 43 – 7.94 downslope Alpine Complex

FPA AUSTRALIA | FLAMESOL

Calculated June 9, 2021, 12:11 pm (MDc v.4.9)

Minimum Distance Calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	43	Rate of spread	4.89 km/h
Vegetation classification	Tussock	Flame length	6.39 m
Understorey fuel load	5.8 t/ha	Flame angle	57 °, 69 °, 78 °, 83 °, 85 ° & 90 °
Total fuel load	5.8 t/ha	Elevation of receiver	2.22 m, 2.35 m, 2.18 m, 1.76 m, 1.46 m & 0 m
Vegetation height	n/a	Fire intensity	14,659 kW/m
Effective slope	7.94 °	Transmissivity	0.889, 0.879, 0.863, 0.844, 0.832 & 0.758
Site slope	5 °	Viewfactor	0.59, 0.4296, 0.2887, 0.1935, 0.1571 & 0.0432
Flame width	100 m	Minimum distance to < 40 kW/m²	5.1 m
Windspeed	45 km/h	Minimum distance to < 29 kW/m²	7.1 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	10.7 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	16 m
		Minimum distance to < 10 kW/m²	19.7 m

Rate of Spread - Marsden-Smedley et al. 1995

Flame length - Byram, 1959

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Appendix 4 FFDI 43 – 11.27 downslope Alpine Complex

FPA AUSTRALIA | FLAMESOL

Calculated June 9, 2021, 12:12 pm (MDc v.4.9)

Minimum Distance Calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	43	Rate of spread	6.15 km/h
Vegetation classification	Tussock	Flame length	7.1 m
Understorey fuel load	5.8 t/ha	Flame angle	57 °, 69 °, 78 °, 83 °, 85 ° & 90 °
Total fuel load	5.8 t/ha	Elevation of receiver	2.47 m, 2.61 m, 2.42 m, 1.97 m, 1.64 m & 0 m
Vegetation height	n/a	Fire intensity	18,445 kW/m
Effective slope	11.27 °	Transmissivity	0.888, 0.876, 0.859, 0.839, 0.827 & 0.754
Site slope	5 °	Viewfactor	0.5879, 0.4297, 0.2884, 0.1949, 0.1583 & 0.0435
Flame width	100 m	Minimum distance to < 40 kW/m²	5.7 m
Windspeed	45 km/h	Minimum distance to < 29 kW/m²	7.9 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	11.9 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	17.6 m
		Minimum distance to < 10 kW/m²	21.6 m

Rate of Spread - Marsden-Smedley et al. 1995

Flame length - Byram, 1959

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Calculated July 16, 2021, 2:20 pm (BALc v.4.9)

11.27 downslope sub alpine woodland

Bushfire Attack Level calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	43	Rate of spread	2.02 km/h
Vegetation classification	Woodland	Flame length	16.43 m
Understorey fuel load	18 t/ha	Flame angle	72 °
Total fuel load	27.5 t/ha	Panel height	15.63 m
Vegetation height	n/a	Elevation of receiver	5.84 m
Effective slope	11.27 °	Fire intensity	28,720 kW/m
Site slope	5 °	Transmissivity	0.831
Distance to vegetation	22.5 m	Viewfactor	0.3471
Flame width	100 m	Radiant heat flux	21.93 kW/m²
Windspeed	n/a	Bushfire Attack Level	BAL-29
Heat of combustion	18,600 kJ/kg		
Flame temperature	1,090 K		

Rate of Spread - Mcarthur, 1973 & Noble et al., 1980

Flame length - NSW Rural Fire Service, 2001 & Noble et al., 1980

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Appendix 5 FFDI 43 – 6.82 downslope Alpine Complex

Calculated June 9, 2021, 12:08 pm (MDc v.4.9)

Minimum Distance Calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	43	Rate of spread	4.52 km/h
Vegetation classification	Tussock	Flame length	6.16 m
Understorey fuel load	5.8 t/ha	Flame angle	58 °, 68 °, 78 °, 83 °, 85 ° & 90 °
Total fuel load	5.8 t/ha	Elevation of receiver	2.16 m, 2.25 m, 2.09 m, 1.7 m, 1.4 m & 0 m
Vegetation height	n/a	Fire intensity	13,568 kW/m
Effective slope	6.82 °	Transmissivity	0.889, 0.88, 0.864, 0.846, 0.834 & 0.76
Site slope	5 °	Viewfactor	0.5808, 0.4326, 0.2867, 0.1942, 0.1567 & 0.0431
Flame width	100 m	Minimum distance to < 40 kW/m²	5 m
Windspeed	45 km/h	Minimum distance to < 29 kW/m²	6.8 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	10.4 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	15.4 m
		Minimum distance to < 10 kW/m²	19.1 m

Rate of Spread - Marsden-Smedley et al. 1995

Flame length - Byram, 1959

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Appendix 6 FFDI 43 – 12.37 upslope Alpine Complex

Calculated June 9, 2021, 12:04 pm (MDc v.4.9)

Minimum Distance Calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	43	Rate of spread	1.2 km/h
Vegetation classification	Tussock	Flame length	3.35 m
Understorey fuel load	5.8 t/ha	Flame angle	58 °, 69 °, 78 °, 84 °, 86 ° & 92 °
Total fuel load	5.8 t/ha	Elevation of receiver	1.17 m, 1.23 m, 1.13 m, 0.89 m, 0.71 m & 0 m
Vegetation height	n/a	Fire intensity	3,609 kW/m
Effective slope	-12.37 °	Transmissivity	0.896, 0.89, 0.881, 0.869, 0.861 & 0.79
Site slope	5 °	Viewfactor	0.5755, 0.4276, 0.2831, 0.1878, 0.1518 & 0.0414
Flame width	100 m	Minimum distance to < 40 kW/m²	2.8 m
Windspeed	45 km/h	Minimum distance to < 29 kW/m²	3.8 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m²	5.7 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m²	8.699999999999999 m
		Minimum distance to < 10 kW/m²	10.8 m

Rate of Spread - Marsden-Smedley et al. 1995

Flame length - Byram, 1959

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Calculated July 16, 2021, 2:46 pm (BALc v.4.9)

6.82 downslope to church

Bushfire Attack Level calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	43	Rate of spread	4.52 km/h
Vegetation classification	Tussock	Flame length	6.16 m
Understorey fuel load	5.8 t/ha	Flame angle	84 °
Total fuel load	5.8 t/ha	Panel height	6.13 m
Vegetation height	n/a	Elevation of receiver	1.58 m
Effective slope	6.82 °	Fire intensity	13,568 kW/m
Site slope	5 °	Transmissivity	0.841
Distance to vegetation	17 m	Viewfactor	0.1767
Flame width	100 m	Radiant heat flux	11.3 kW/m²
Windspeed	45 km/h	Bushfire Attack Level	BAL-12.5
Heat of combustion	18,600 kJ/kg		
Flame temperature	1,090 K		

Rate of Spread - Marsden-Smedley et al. 1995

Flame length - Byram, 1959

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Calculated July 16, 2021, 2:44 pm (BALc v.4.9)

12.37 upslope alpine complex

Bushfire Attack Level calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	43	Rate of spread	1.2 km/h
Vegetation classification	Tussock	Flame length	3.35 m
Understorey fuel load	5.8 t/ha	Flame angle	79 °
Total fuel load	5.8 t/ha	Panel height	3.29 m
Vegetation height	n/a	Elevation of receiver	3.18 m
Effective slope	-12.37 °	Fire intensity	3,609 kW/m
Site slope	-5 °	Transmissivity	0.839
Distance to vegetation	17.6 m	Viewfactor	0.0949
Flame width	100 m	Radiant heat flux	6.06 kW/m²
Windspeed	45 km/h	Bushfire Attack Level	BAL-12.5
Heat of combustion	18,600 kJ/kg		
Flame temperature	1,090 K		

Rate of Spread - Marsden-Smedley et al. 1995

Flame length - Byram, 1959

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

Radiant heat flux - Drysdale, 1999, Sullivan et al., 2003, Douglas & Tan, 2005

Attachment 1 Fire Danger Index Analysis for Perisher Valley