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BUSHFIRE CONSULTING

Bushfire Strategic Study

Snowy Mountains Special Activation Precinct

Prepared for

WSP

BPAD Bushfire Planning & Design Accredited Practitioner Level 3

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Glossary

This section defines those core terms and concepts which are adopted throughout the body of this report.

Term	Definition
Asset Protection Zone (APZ)	A fuel-reduced area surrounding a built asset or structure which provides a buffer zone between a bushfire hazard and an asset. The APZ includes a defendable space within which firefighting operations can be carried out. The size of the required APZ varies with slope, vegetation and FFDI.
Bushfire	A general term used to describe fire in vegetation, includes grass fire.
Bushfire attack mechanisms	The various ways in which a bushfire can impact upon people and property and cause loss or damage. These mechanisms include flame contact, radiant heat exposure, ember attack, fire wind and smoke.
Bushfire Attack Level (BAL)	A means of measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact. The BAL is used as the basis for establishing the requirements for construction to improve protection of building elements and to articulate bushfire risk.
Bushfire Design Requirements	A separate (Attachment 17) design document to assist the master planning with requirements and specifications to provide compliance with PBP 2019.
Bushfire prone land (BFPL)	An area of land that can support a bushfire or is likely to be subject to bushfire attack, as designated on a bushfire prone land map.
Bushfire Hazard	Any vegetation that has the potential to threaten lives, property or the environment.
Bushfire Strategic Study	Provides the opportunity to assess whether new development is appropriate in the bushfire hazard context.
Bushfire Threat	Potential bushfire exposure of an asset due to the proximity and type of a hazard and the slope on which the hazard is situated.
Risk	The degree of risk presented by that interaction will depend on the likelihood and consequence of the bushfire occurring. Risk may be defined as the chance of something happening, in a specified period of time that will have an impact on objectives. It is measured in terms of consequences and likelihood.

Risk assessment	A systematic process of evaluating the potential risks that may be involved in a projected activity or undertaking, having regard to factors of likelihood, consequence, vulnerability and tolerability.
Risk-based land use planning	The strategic consideration of natural hazard risk and mitigation in informing strategic land use planning activities.
Hazard	A hazard is any source of potential harm or a situation with a potential to cause loss. A hazard is therefore the source of risk.
Likelihood	The chance of an event occurring. Likelihood may be represented as a statistical probability (such as an Annual exceedance probability), or whether this is not possible, it can be represented qualitatively using measures such as 'likely', 'possible' and 'rare'.
Managed land	Land that has vegetation removed or maintained to a level that limits the spread and impact of bushfire. This may include developed land (residential, commercial or industrial), roads, golf course fairways, playgrounds, sports fields, vineyards, orchards, cultivated ornamental gardens and commercial nurseries. Most common will be gardens and lawns within curtilage of buildings. These areas are managed to meet the requirements of an APZ.
Mitigation	The lessening or minimizing of the adverse impacts of a bushfire event. The adverse impacts of bushfire cannot be prevented fully, but their scale or severity can be substantially lessened by various strategies and actions. Mitigation measures include engineering techniques, retrofitting and hazard-resistant construction as well as on ground works to manage fuel and separate assets from bushland.
Planning for Bushfire Protection 2019 (PBP 2019)	NSW Rural Fire Service publication effective from 1 March 2020 which is applicable to all new development on bushfire prone land in NSW.

1. Executive Summary

Bushfire is a key consideration and design requirement in the development of the Snowy Mountains Special Activation Precinct. The Cooma Monaro Local Government Area and the Snowy Mountains has a history of large and high consequence bushfires that have interrupted the community and significantly impacted the natural environment, most notably in 2003 and 2019/20.

The Snowy Mountains Special Activation Precinct is seeking to stimulate year-round economic activity and employment to grow a one season destination into a four-season destination. This will change the bushfire risk profile by bringing additional people into the area during the bushfire danger period.

The provision of bushfire safety is a complex area of land use planning and development assessment. The NSW Rural Fire Service (RFS) document *Planning for Bushfire Protection 2019* (PBP 2019) provides the framework for new development in NSW within a strong legislative framework.

A significant amount of work has been undertaken with stakeholders throughout the Snowy Mountains Special Activation Precinct project to incorporate and meet the bushfire requirements. Jindabyne and surrounds are able to meet the bushfire requirements. However, work is ongoing with the NSW Rural Fire Service (RFS) and other stakeholders for the alpine areas and resorts which are located within the environmentally significant setting of the Kosciusko National Park. For the Alpine areas fundamental tension exists between maintaining environmental and cultural values and providing bushfire safety requirements for new development.

The alpine resort areas are currently predominantly used for short-term tourist accommodation and are Special Fire Protection Purpose (SFPP) development. Much of the existing building stock within the alpine areas has not been constructed to current bushfire building requirements for development in a bushfire prone area[1]. Many developments are restricted by leasehold arrangements and are constrained by environmental and ecology issues for management within the sensitive alpine areas.

The Strategic Bushfire Study has been developed with a range of stakeholders. Several meetings have been held between the Department of Planning Industry and Environment (DPIE) and the RFS to work through key issues and to provide a sound basis for the Snowy Mountains Special Activation Precinct moving forward. The RFS have been open to risk-based approaches to new development in the alpine areas. A fundamental consideration in bushfire prone areas is the recognition that not all land is

[1] Planning for Bushfire Protection 2019 p. 53

suitable for development in terms of an acceptable risk profile, including impact on the environment and that not all development should be supported.

Strategic development proposals in bushfire prone areas require the preparation of a Strategic Bushfire Study. This document has been completed in accordance with PBP 2019 strategic principles and the requirements identified within Table 4.2.1 of PBP 2019 (Appendix 2). This Snowy Mountains Special Activation Precinct Bushfire Strategic Study is not an operational document and is based on a probable worst-case design fire scenario of a 1:50 year bushfire event affecting the areas[2].

In a bushfire context, strategic land use planning must ensure that future land uses are in appropriate locations to minimise the risk to life and property from bushfire attack. The broad principles which apply to this analysis are[3]:

- *ensuring land is suitable for development in the context of bushfire risk and broader environmental impacts*
- *ensuring new development on BFPL will comply with the minimum requirements of PBP 2019*
- *minimising reliance on performance-based solutions*
- *providing adequate infrastructure associated with emergency evacuation and firefighting operations; and*
- *facilitating appropriate ongoing land management practices.*

The Strategic Bushfire Study has assessed Jindabyne for compliance with PBP and provided minimum asset protection zone requirements for the proposed development areas.

[2] As required by Planning for Bushfire Protection 2019
[3] Planning for Bushfire Protection 2019 p. 34

2. Introduction

Blackash Bushfire Consulting has been engaged by WSP for the NSW Department of Planning, Industry and Industry (the Department) to complete a *Bushfire Strategic Study* for the Snowy Mountains Special Activation Precinct. The Department has prepared a Master Plan for the Snowy Mountains Special Activation Precinct. The Snowy Mountains Special Activation Precinct Master Plan study area (Figure 1) and the *Bushfire Strategic Study* includes the focus areas of:

- Jindabyne Townsite
- High-visitation resort areas of Kosciuszko National Park including Thredbo Alpine Village, Charlotte Pass Alpine Village, Bullock Flat Terminal and Perisher Range Alpine Resort

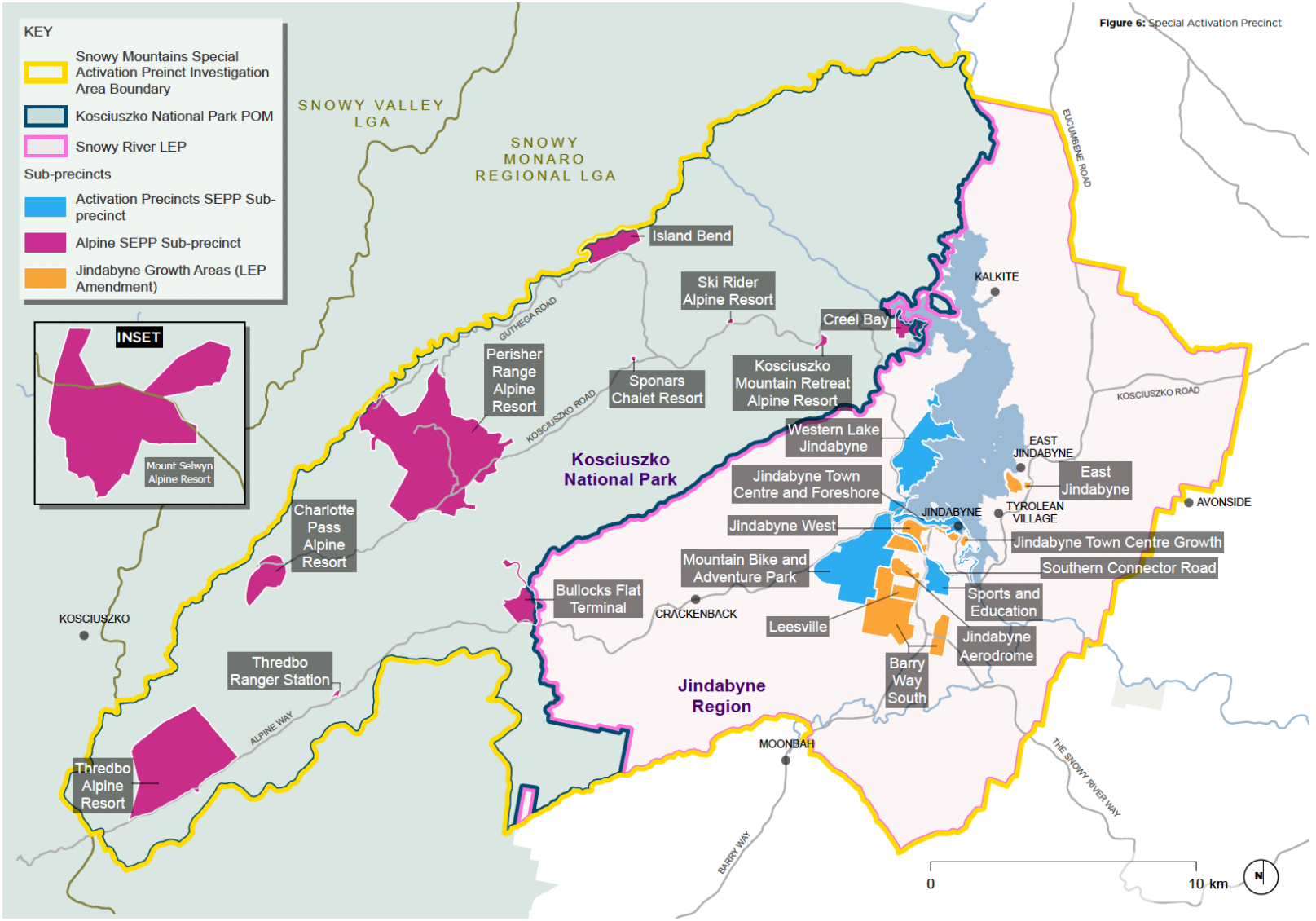
The Snowy Mountains Special Activation Precinct Master Plan program facilitates job creation and economic development in designated areas of regional NSW through infrastructure investment and fast-tracked, streamlined planning. Spe3cial Activation Precincts are a place-based approach to 'activate' strategic locations that are areas of state or regional significance.

The *Bushfire Strategic Study* builds on the earlier *Bushfire Context Analysis* by Blackash Bushfire Consulting and is an assessment of the ability of the Snowy Mountains Special Activation Precinct areas to meet the NSW Rural Fire Service (RFS) document *Planning for Bushfire Protection 2019* (PBP 2019), in particular the strategic planning principles.

The following key documents have been considered in undertaking the development of the Strategic Bushfire Study:

- Kosciuszko National Park Plan of Management
- Kosciuszko National Park Reserve Fire Management Strategy
- Go Jindabyne Master Plan
- Snowy Monaro Bushfire Risk Management Plan 2009
- Planning for Bushfire Protection 2019
- Bushfire and Biodiversity Assessment for
- the Perisher Range Resorts
- Thredbo Community Protection Plan

Figure 1 Snowy Mountains Special Activation Precinct Master Plan Study Area (source NSW Department of Planning, Industry and Environment)



3. Background

On 15 November 2019, the NSW Government announced its commitment to investigating the Snowy Mountains Special Activation Precinct, to revitalise the Snowy Mountains into a year-round destination and Australia's Alpine Capital, with Jindabyne at its heart. A focus on year-round adventure- and eco-tourism, improving regional transport connectivity, shifting towards a carbon neutral region through investment in renewable energies and offsetting, increasing the lifestyle and wellbeing activities on offer, and supporting Jindabyne's growth as Australia's national winter Olympics training base will be priorities for the Snowy Mountains Special Activation Precinct.

The South East and Tablelands Regional Plan 2036 sets the overarching strategic direction for the region. The Snowy Mountains Special Activation Precinct will seek to implement Direction 3 of the Regional Plan, which is '*to develop the Snowy Mountains into Australia's premier year-round alpine destination*'.

Special Activation Precincts are a "whole-of-government" approach to regional economic development and planning, bringing together the local Council and relevant agencies across the NSW Government. Special Activation Precincts are unique to regional NSW and bring together planning and investment to stimulate economic development and create jobs in line with the competitive advantages and economic strengths of a region. The Snowy Mountains Special Activation Precinct adopts a place-based solution to economic development and are being delivered through the $4.2-billion Snowy Hydro Legacy Fund.

The new Activation Precinct State Environmental Planning Policy (SEPP) sets the planning framework through which Snowy Mountains Special Activation Precinct will be delivered. The Snowy Mountains Special Activation Precinct established a three-tier planning framework, including the Activation Precincts SEPP, Snowy River Local Environmental Plan and State Environmental Planning Policy (Kosciuszko National Park - Alpine Resorts).

4. Strategic Planning for Bushfires

The strategic planning system is particularly important in contributing to the creation of resilient, safe and sustainable communities. This study has undertaken comprehensive consideration of bushfires risk by interrogating the landscape context and risks, as well as applying risk management principles in the approach to strategic planning and development controls that will adequately mitigate identified risks.

The bushfire planning decisions in this document are based on the best available evidence to ensure that new development - people, homes and businesses are not exposed to unacceptable risk from bushfire.

The strategic context is to gain understanding as to the level of risk and determine if people should be exposed to this risk. Strategic planning by its very virtue requires these matters to be considered and decisions to be in the best interest of those that will realise and bear the burden of future risk.

Improved land use planning decisions and building controls for developments in bushfire prone areas are intrinsic to an integrated approach to the fire management. The application of legislation, policy, and guidelines provides one of the most effective means of bushfire planning to ensure future developments are resilient and capable of protecting life.

The importance of sound land use planning has been recognised in most significant bushfire inquiries, including Natural Disasters in Australia which noted that land use planning that takes into account natural hazard risks is the single most important mitigation measure in preventing future disaster losses in areas of new development and that planning and development controls must be effective, to ensure that inappropriate developments do not occur[4].

A balanced approach to new development in Bush Fire Prone Areas that recognises the need to protect human life, provide safe operating environment for fire and emergency services while having due regard to the environmental impacts, development potential of land and the need to cater for growing populations has been applied throughout the development of this document.

[4] Ellis, S et al (2004) National Inquiry on Bushfire Mitigation and Management (p.92)

5. Landuse Planning Considering Bushfire Risk

Australia has a history of high consequence bushfires, which have caused loss of life, damage and disruption. Risk based land use planning provides the tolerable bushfire risk levels through documents such as PBP 2019, legislation, policy and guidelines.

Land use planning is an effective tool in minimising or avoiding the impact of natural hazards such as bushfire. Risk based land use planning has consistently been identified as one of the key means to reduce natural disaster risks to assets and communities. Improved risk-based land use planning in areas that are subject to natural hazard are fundamental to developing and enhancing resilient development, critical infrastructure and communities.

For land use planning relating to bushfire, the State, through the RFS establishes the risk appetite of government, through the development and implementation of high-level land use planning legislation, regulation and policy (such as PBP 2019). The role of government in dealing with complex proposals and projects is to consider often competing views, such as the tension between providing asset protection zones and impact on biodiversity on the desired planning outcomes.

A multi-disciplinary collaborative approach that includes emergency and hazard managers, planners, stakeholders and the community has been undertaken throughout the Snowy Mountains Special Activation Precinct process to deliver risk-based bushfire assessment with sustainable outcomes for the Snowy Mountains Special Activation Precinct.

6. Legislative Context

The landuse planning framework as it relates to landuse planning and bushfire in NSW includes:

Strategic planning phase

- *Environmental Planning and Assessment Act, 1979* (EP&A Act) s.9.1 Directions by the Minister (cf previous s 117) where PBP 2019 should be considered in applying the Section 9.1 Direction. PBP is called up by the s. 9.1 directive giving it legislative weight.
- Section 9.1(2) of the EPA Act provides Planning Direction 4.4 *Planning for Bushfire Protection* (Attachment 1). Importantly, a planning proposal must:
    - *(a) have regard to Planning for Bushfire Protection*
    - *(b) introduce controls that avoid placing inappropriate developments in hazardous areas, and*
    - *(c) ensure that* bushfire hazard reduction is not prohibited within the APZ.

Development assessment

- **Bushfire Prone Land** is designated in accordance with s.10.3 of the EPA Act. Bushfire prone land (BFPL) is land that has been identified and prepared by local council which can support a bushfire or is subject to bushfire attack and certified by the Commissioner of the NSW RFS. The Bushfire Prone Land Maps provide a trigger for formal assessment of new development and compliance with PBP 2019.
- **Integrated development** s.4.46 of the EPA Act and 4.47 Development that is integrated development (cf previous s 91A) requires a bushfire safety authority (BFSA) is under Section 100B of the RF Act from the NSW RFS for residential and rural residential subdivision and Special Fire Protection Purpose (SFPP) developments on BFPL. An application for a BFSA must address the extent to which the development complies with PBP 2019.
    - Special fire protection purpose" means the purpose of the following:
      (a) a school,
      (b) a child care 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

- Building work on BFPL must comply with the requirements of the **National Construction Code** (NCC). Under the Deemed to Satisfy provisions of the NCC, building work on BFPL must comply with Australian Standard 3959 *Construction of buildings in bushfire-prone areas* (*AS 3959*) or the National Association of Steel Framed Housing (2014) *Steel Framed Construction in Bushfire Areas* (NASH Standard).

Exempt and Complying Development

Section 100B of the Rural Fires Act 1997 (RF ACT) specifically excludes complying development for the purposes of the EPA Act despite any environmental planning instrument. This removes the availability of complying development codes to be prepared and used for residential and rural residential subdivision and SFPP development.

Some straightforward residential, commercial and industrial development can be undertaken as Exempt or Complying Development under various SEPPs and LEPs. Exempt Development is minor building works that can be carried out without development approval, such as decks, garden sheds, carports and fences. Complying Development can be undertaken on lower risk BFPL for infill residential development up to and including BAL-29 where the appropriate construction requirements and all other relevant development standards have been met. To date, Complying Development is not permitted on higher risk BFPL (BAL-40 or BAL-FZ) and a DA is required in these circumstances.

In certain circumstances, a BAL Certificate must be obtained from the local council or a person recognised by the NSW RFS as a suitably qualified consultant in bushfire assessment, stating that the development meets deemed to satisfy provisions and is not located in BAL 40 or BAL-FZ.

State Environmental Planning Policy (Kosciuszko National Park—Alpine Resorts) 2007

Matters to be considered by consent authority include 1 (b) *the extent to which the development will achieve an appropriate balance between the conservation of the natural environment and any measures to mitigate environmental hazards (including geotechnical hazards, bushfires and flooding)*.

General Obligations

All owners and land managers (both public and private) have a duty to prevent the occurrence and spread of bushfires on or from their land. This responsibility is legislated under section 63 of the Rural Fires Act 1997.

Risk management is undertaken through Bushfire Risk Management Plans (BFRMP) and associated works plans. Annual programs to implement the treatments identified in the BFRMP will be undertaken by the relevant land managers and firefighting authorities. Treatments may include such things as hazard reduction burning, land use planning, grazing, community education, fire trail maintenance and community engagement.

Kosciuszko National Park

Fire management within the Kosciuszko National Park is governed by various legislative requirements and policies, most notably the provisions of the RF Act and National Parks and Wildlife Act 1974 (NPWS Act). NPWS considers fire management to be one of the most important management tasks in managing its estate. A wide range of legislation and policy underpins fire management planning in NPWS estate. NPWS review fire fighting and prescribed burning annually.

The overall management of the Park is prescribed by objectives stated in the National Parks and Wildlife Act 1974. It is a requirement under that Act that no operations and actions are to be undertaken which are contrary to the Plan of Management (POM). The KNP POM states as an overarching principle: "Maintain or improve the condition of the natural and cultural values that together make the Park a special place."

The *Kosciuszko National Park Plan of Management* (Kosciuszko POM) provides a framework of objectives, principles and policies to guide the long-term management of the broad range of values contained in the park. It contains a suite of actions to be undertaken by the National Parks and Wildlife Service (NPWS) and other organisations to protect and conserve the values of the park. Detailed fire management objectives are outlines in the Kosciuszko POM.

The KNP POM (NPWS, 2007b) further states the following specific fire management objectives:

- Fire management is aimed at ensuring:
    - No human life is lost or person injured as a result of fire;
    - Infrastructure within and beyond the boundaries of the Park is not damaged from fire;
    - Important natural features, especially alpine areas, restricted, rare or endemic plant or animal communities and species, and karst systems, are protected from detrimental impacts associated with fire;
    - A natural diversity of vegetation communities and age classes is promoted;
    - Fire does not contribute to catchment instability and water quality problems;
    - Sites and features of cultural significance are protected from fire; and
    - wilderness quality and scenic amenity are retained.

- Fire suppression and protection operations are undertaken in ways that minimise adverse effects on the values of the Park;
- Fire detection and access infrastructure and operations permit rapid suppression of fire; Prescribed burning is strategic in nature and undertaken in ways that minimise associated adverse effects;
- The incidence of unplanned fires ignited from human causes in the Park is minimised;
- Fire management decision-making is informed by the results of relevant research; and
- Fire management is strategically coordinated across the greater landscape and multiple land tenures and involves the community.

The *Kosciuszko National Park Fire Management Strategy 2008–2013* provides direction and fire management strategies for fire management activities within Kosciuszko National Park to fulfil the National Park and Wildlife Service (NPWS)_ obligations under various legislation and Government policy.

NSW Fire Brigades has responsibility for response and suppression of structural fires within alpine resort areas.

7. Planning for Bushfire Protection 2019

All new development on bushfire prone land must comply with PBP 2019. The **aim** of PBP 2019 (p. 10) is *to provide for the protection of human life and minimise impacts on property from the threat of bushfire, while having due regard to development potential, site characteristics and protection of the environment*.

The **objectives** (PBP 2019 p. 10) are to:

- *Afford buildings and their occupants protection from exposure to a bushfire*
- *Provide for a defendable space to be located around buildings*
- *Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings*
- *Ensure that appropriate operational access and egress for emergency service personnel and occupants is available*
- *Provide for ongoing management and maintenance of Bushfire Protection Measures; and*
- *Ensure that utility services are adequate to meet the* needs of firefighters

PBP 2019 articulates the regulatory framework for new development in NSW, along with the relevant bushfire protection measures to be contemplated in the delivery of bushfire-resilient design, development and ongoing management. The document provides detailed provisions for various types of development which is focussed at residential and SFPP development.

To achieve compliance with PBP 2019, proposals must comply with either the acceptable solutions or the performance criteria (see Figure 2). The RFS currently assess all performance-based applications against PBP 2019. NSW has a state variation to the BCA that excludes a deemed to satisfy arrangement for BAL Flame Zone applications.

While PBP 2019 is a performance-based document, the RFS have established and confirmed minimum standards for new development (PBP 2019 p. 26 and within each performance criteria – p. 43 for residential subdivision and p. 55 for SFPP development).

- *For new residential development, APZ requirements are based on radiant heat level exposure to buildings not exceeding 29kW/m² (calculated on a flame temperature of 1090 Kelvin).*
- *SFPP developments, 10kW/m² (calculated on a flame temperature of 1200 Kelvin) is the maximum exposure at any point of the building wall or façade.*

Some dispensations are provided for specific types of SFPP development such as camping, bed and breakfast/ farm stay, ecotourism and manufactured home estates (PBP 2019 p. 55). Many of the

bushfire requirements for SFPP development make expansion within the alpine areas difficult, particularly the tension between the provision of asset protection zones and retention of some the most fragile ecosystems in Australia – the alpine grasses and snow gum areas. PBP 2019 provides options for innovative approaches, particularly for eco-tourism development to new development within the Alpine Resorts that provides a risk-based approach to new and existing development. This work is ongoing, and the Department are working closely with the RFS to finalise approaches for use in the Alpine areas, particularly in the FFDI which is a fundamental input to APZ calculation.

Eco Tourist Development

PBP 2019 (p. 51) identifies the unique opportunity afforded to eco-tourism development:

> *Ecotourism – Due to its focus on the natural environment and creating minimal impact, the principles of ecotourism and the establishment of APZs for bushfire 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 objectives to reduce the environmental footprints of these types of developments. The emphasis is therefore placed on emergency management, leaving early and non-operation on days of extreme or catastrophic fire weather.*
>
> *At least one building must be provided on site that can be used as a refuge for the maximum number of occupants on site. The building must have a minimum 10kW/m2 APZ, be constructed to BAL-12.5 and have vehicular access. Cabins must be within a 100m walking distance of the refuge building.*

The performance requirements within PBP 2019 are focused on larger sites, with multiple buildings. The wording within PBP 2019, limits opportunity for smaller scale developments (i.e. single buildings) to utilise the assessment framework and to propose options that are commensurate with the bushfire risk and the mechanisms that are available to provide for the protection of life.

Due to the unique nature of the alpine areas and the need to minimise environmental impact while meeting bushfire requirements, the ecotourism principles are a key consideration. This would see reduced APZ with an increased construction standard and a focus on emergency management and evacuation protocols. The RFS have been open to a risk based approach to the Snowy Mountains Special Activation Precinct and this work with the RFS is ongoing.

Infill development refers to the development of land by the erection of, or addition to a building, which is within an existing allotment and does not require the spatial extension of services[5]. Existing

[5] Planning for Bushfire Protection 2010 p. 111

services may include public roads, electricity, water or sewerage. Infill development includes alterations and additions to existing development and knockdown and rebuilds of an existing asset.

PBP 2019 recognises the constraints associated with existing development and acknowledges that:

> *where a development expectation arises from the zoning of the land to build, rebuild, alter or add to a dwelling in pre-existing subdivisions, attempts should be made to find a solution taking into account the level of risk present. The expectation of building or altering a house is recognised even though the ability to provide for APZs or access requirements now required for residential development may not be possible* (PBP 2019 p. 64).

Proposals for infill (PBP 2019 p. 64) development are to meet the following objectives:

- *provide a defendable space to enable unimpeded access for firefighting around the building;*
- *provide better bushfire outcomes on a redevelopment site than currently exists, commensurate with the scale of works proposed; design and construct buildings commensurate with the bushfire risk;*
- *provide access, services and landscaping to aid firefighting operations;*
- *not impose an increased bushfire management and maintenance responsibility on adjoining land owners; and*
- *increase the level of bushfire protection to existing dwellings based on the scale of the proposed work and level of bushfire risk.*

Similar principles apply to **infill SFPP development** with a key focus being to provide a 'better bushfire risk outcome' than currently exists for the proposal (PBP 2019 p. 52). The objectives that apply to existing SFPP development are as follows:

- *provide an appropriate defendable space;*
- *site the building in a location which ensures appropriate separation from the hazard to minimise potential for material ignition; provide a better bushfire protection outcome for existing buildings;*
- *new buildings should be located as far from the hazard as possible and should not be extended towards or situated closer to the hazard than the existing buildings (unless they can comply with section 6.8);*
- *ensure there is no increase in bushfire management and maintenance responsibility on adjoining land owners without their written confirmation;*

- *ensure building design and construction enhances the chances of occupant and building survival; and provide for safe emergency evacuation procedures including capacity of existing infrastructure (such as roads).*

PBP 2019 also provides a framework for '**other' development** which includes commercial uses, industrial uses, infrastructure and development which involves large numbers of people. These development types must meet the aim and objectives of PBP 2019.

Alpine SFPP Infill Development

PBP 2019 recognises the unique landscape and challenges of development within Kosciuszko National Park.

PBP 2019 (p. 53) notes that:

> *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 specific objectives 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;*
- *written consent from the land managers is provided for all proposed works outside of the sub lease or leasehold area;*
- *proposed APZs outside of the sub lease or leasehold area are supported by a suitable legal mechanism to ensure APZs are managed under a binding legal agreement in perpetuity;*
- *ensure building design and construction standards enhance the chances of occupant and building survival; and*
- *provide safe emergency evacuation procedures*

The above objectives would form the basis of performance-based requirements for the Snowy Mountains Special Activation Precinct.

At a Snowy Bushfire Meeting held on 1 June 2020, the RFS indicated that the infill objectives apply to existing and infill development within the Park. At a Snowy Bushfire Meeting held on 29 September 2020, the RFS confirmed that all new development would need to meet the full requirements for subdivision and SFPP development in accordance with PBP 2019.

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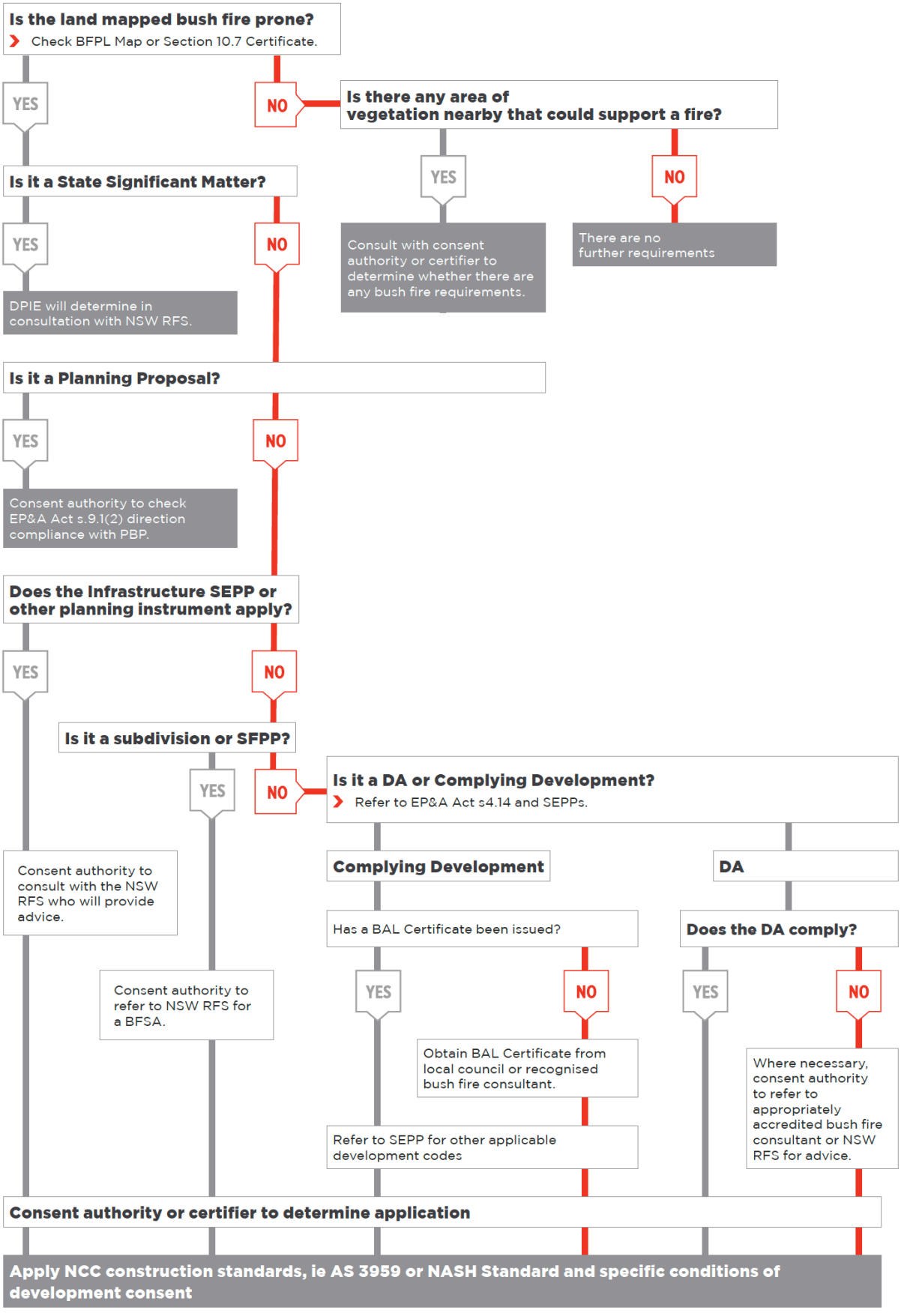
Figure 2 Assessment process for development in bushfire prone areas (source PBP 2019 p. 23)



7.1. Planning for Bushfire Protection Strategic Planning

PBP 2019 (p. 19) notes that:

> *The most important objective for strategic planning is to identify whether new development is appropriate subject to the identified bushfire risk on a landscape scale. An assessment of proposed land uses and potential for development to impact on existing infrastructure is also a key element of the strategic planning process in bushfire prone areas. Land use planning policies can be introduced to limit the number of people exposed to unacceptable risk.*

The Snowy Mountains Special Activation Precinct planning instruments and policies are required to ensure that bushfire management principles are given appropriate consideration. In a bushfire context, strategic planning must ensure that future land uses are in appropriate locations to minimise the risk to life and property from bushfire attack. An expectation should be that future development will be able to comply with PBP 2019 at the DA stage or by meeting specific standards for a streamlined assessment. The mechanism of sign off will need to be considered as part of the Snowy Mountains Special Activation Precinct work, particularly the provisions relating to a Bushfire Safety Authority for subdivision or SFPP development.

PBP 2019 (p. 34) identifies the broad principles for strategic planning which apply to the risk assessment of an area which includes:

- *ensuring land is suitable for development in the context of bushfire risk;*
- *ensuring new development on BFPL will comply with PBP 2019;*
- *minimising reliance on performance-based solutions;*
- *providing adequate infrastructure associated with emergency evacuation and firefighting operations; and*
- *facilitating appropriate ongoing land management practices*.

Importantly, PBP 2019 (p. 34) articulates the strategic planning principles that should provide for the exclusion of inappropriate development in bushfire prone areas as follows:

- *the development area is exposed to a high bushfire risk and should be avoided;*
- *the development is likely to be difficult to evacuate during a bushfire due to its siting in the landscape, access limitations, fire history and/or size and scale;*
- *the development will adversely effect other bushfire protection strategies or place existing development at increased risk;*

- *the development is within an area of high bushfire risk where density of existing development may cause evacuation issues for both existing and new occupants; and*
- *the development has environmental constraints to the area which cannot be overcome.*

A new requirement of PBP 2019 is that strategic development proposals in bushfire prone areas require the preparation of a *Strategic Bushfire Study*. This document will be completed as part of this project. PBP 2019 requires that a Strategic Bushfire Study must include, as a minimum, the components identified in Table 1.

PBP 2019 (p. 34) notes that:

> *Once these strategic issues have been addressed, an assessment of whether the proposal can comply with this document should be carried out. If the strategic issues cannot be resolved then the proposal cannot comply with PBP and will not be supported by the NSW RFS.*

Table 1 Requirements of a Bushfire Strategic Study (PBP 2019 p. 35)

ISSUE	DETAIL	ASSESSMENT CONSIDERATIONS
Bush fire landscape assessment	A bush fire landscape assessment considers the likelihood of a bush fire, its potential severity and intensity and the potential impact on life and property in the context of the broader surrounding landscape.	❯ The bush fire hazard in the surrounding area, including: ❯ Vegetation ❯ Topography ❯ Weather ❯ The potential fire behaviour that might be generated based on the above; ❯ Any history of bush fire in the area; ❯ Potential fire runs into the site and the intensity of such fire runs; and ❯ The difficulty in accessing and suppressing a fire, the continuity of bush fire hazards or the fragmentation of landscape fuels and the complexity of the associated terrain.
Land use assessment	The land use assessment will identify the most appropriate locations within the masterplan area or site layout for the proposed land uses.	❯ The risk profile of different areas of the development layout based on the above landscape study; ❯ The proposed land use zones and permitted uses; ❯ The most appropriate siting of different land uses based on risk profiles within the site (i.e. not locating development on ridge tops, SFPP development to be located in lower risk areas of the site); and ❯ The impact of the siting of these uses on APZ provision.
Access and egress	A study of the existing and proposed road networks both within and external to the masterplan area or site layout.	❯ The capacity for the proposed road network to deal with evacuating residents and responding emergency services, based on the existing and proposed community profile; ❯ The location of key access routes and direction of travel; and ❯ The potential for development to be isolated in the event of a bush fire.
Emergency services	An assessment of the future impact of new development on emergency services.	❯ Consideration of the increase in demand for emergency services responding to a bush fire emergency including the need for new stations/ brigades; and ❯ Impact on the ability of emergency services to carry out fire suppression in a bush fire emergency.
Infrastructure	An assessment of the issues associated with infrastructure and utilities.	❯ The ability of the reticulated water system to deal with a major bush fire event in terms of pressures, flows, and spacing of hydrants; and ❯ Life safety issues associated with fire and proximity to high voltage power lines, natural gas supply lines etc.
Adjoining land	The impact of new development on adjoining landowners and their ability to undertake bush fire management.	❯ Consideration of the implications of a change in land use on adjoining land including increased pressure on BPMs through the implementation of Bush Fire Management Plans.

8. Bushfire prone land

The study area is identified as being within 'bushfire prone land' (see Figure 3) for the purposes of Section 10.3 of the EPA Act and the legislative requirements for development on bushfire prone lands are applicable. All development on bushfire prone land must consider and comply with PBP 2019 and the Ministerial Direction for development on 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 that has been identified by council, which can support a bushfire or is subject to bushfire attack. Bushfire prone land maps are prepared by local council and certified by the Commissioner of the NSW RFS.

Based on the review of high-resolution air photography for the study area and surrounds, the certified Bushfire Prone Map (Figure 3) underrepresents the on-ground bushfire hazard, particularly the grassland/ crop areas. Snowy Monaro Regional Council has produced a draft Snowy Monaro Bushfire Prone Land Map (Figure 4) that captures additional bushfire prone areas and more accurately depicts the availability of areas to be subject to bushfire attack. The draft Bushfire Prone Map was sent to RFS 1 October 2019 for review and Certification.

Insets of each of the study areas Bushfire Prone Maps is shown in a separate attachment as per the following:

- Attachment 3 Bushfire Prone Land Map Jindabyne
- Attachment 4 Bushfire Prone Land Map Thredbo
- Attachment 5 Bushfire Prone Land Map Charlotte Pass
- Attachment 6 Bushfire Prone Land Map Little Thredbo
- Attachment 7 Bushfire Prone Land Map Perisher, Smiggins & Blue Cow
- Attachment 8 Bushfire Prone Land Map Ski Rider
- Attachment 9 Bushfire Prone Land Map Sponars Chalet
- Attachment 10 Bushfire Prone Land Map Kosciuszko Tourist Park

Bushfire prone maps are an indication of potential bushfire attack and are not a risk assessment of land.

Figure 3 Certified Bushfire Prone Land Map

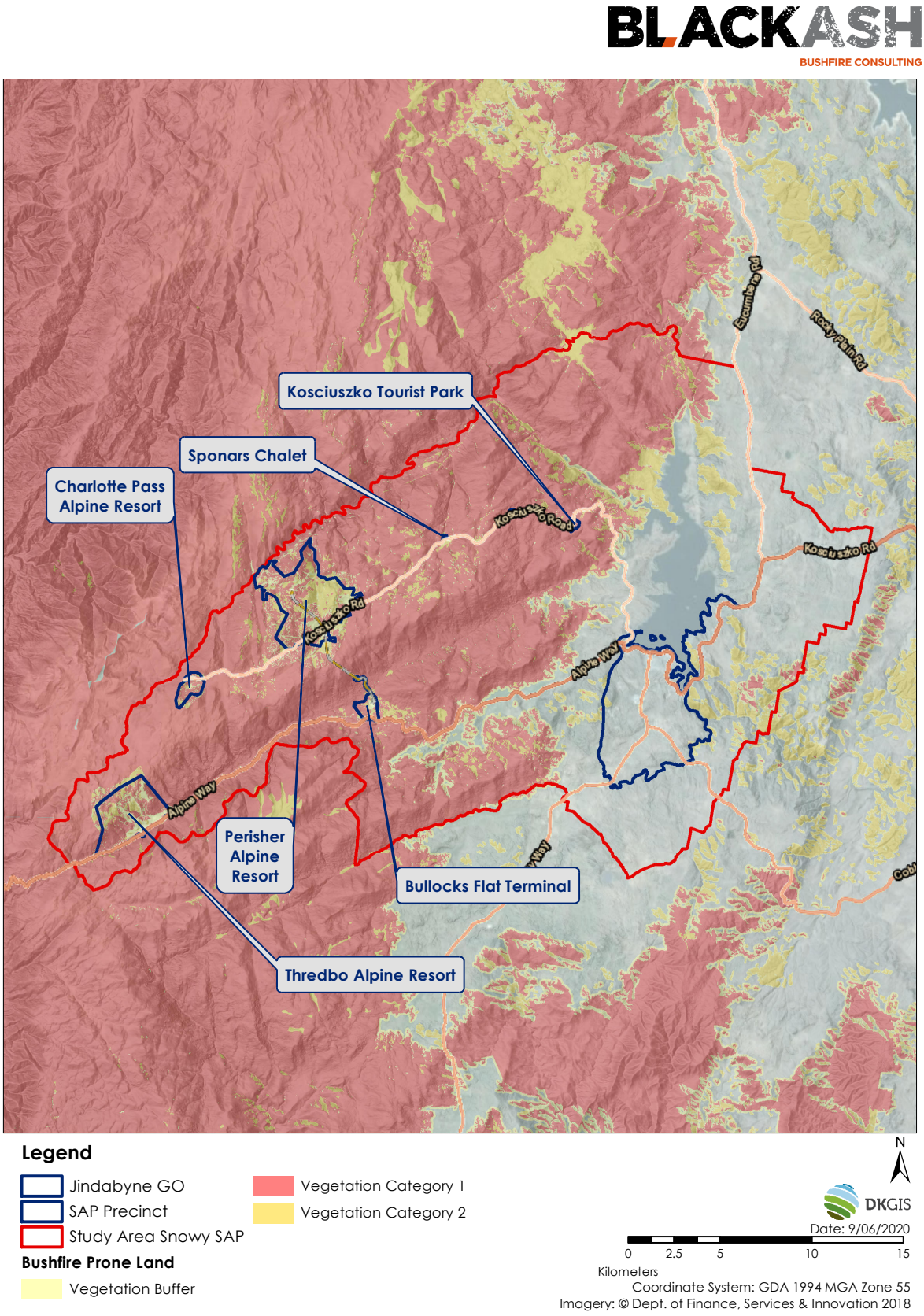
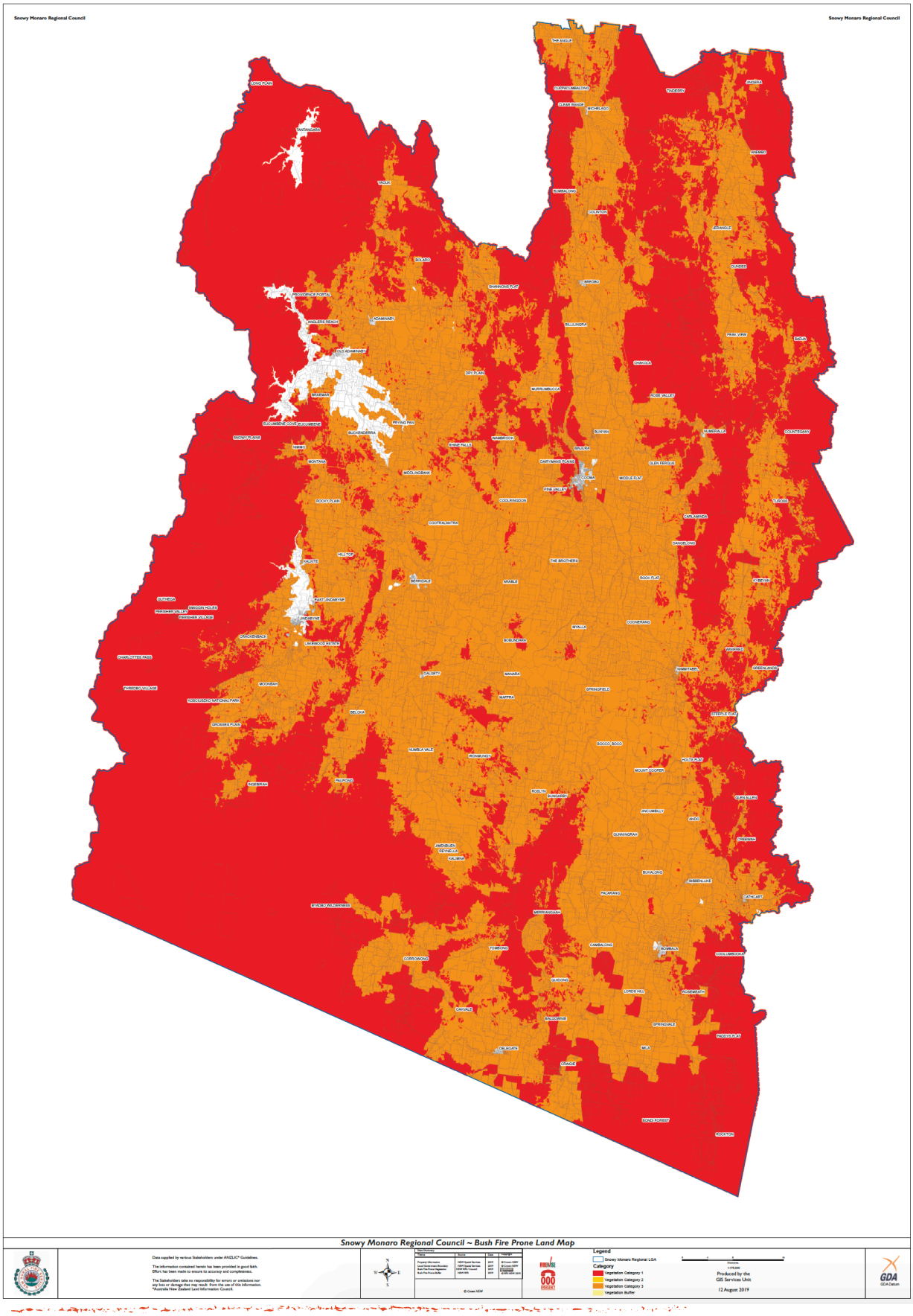


Figure 4 Draft Bushfire Prone Map with RFS for Certification



9. Components of the Strategic Bushfire Study

A Strategic Bush Fire Study must include, as a minimum, the components in Table 4.2.1. (Appendix 4) which is in the following sections.

9.1. Bushfire Landscape Assessment

A bushfire landscape assessment considers the likelihood of a bushfire, its potential severity and intensity and the potential impact on life and property in the context of the broader surrounding landscape.

The study area is bushfire prone (section 9), particularly with the revised and yet to be certified Bushfire Prone Map prepared by Snowy Monaro Regional Council (Figure 7).

9.1.1. Vegetation Assessment

Vegetation is the fundamental component of determining the bushfire behaviour. Vegetation, in broad terms provides the available fuel to be consumed by a bushfire. Fuel load and arrangement represents a considerable component in dictating to a large degree the behaviour of fire in terms of intensity, rate of spread and flame height, and typically relates to dead plant material less than 6mm thick, and live plant material thinner than 3mm.

Vegetation type, density and arrangement can further influence fire behaviour and intensity. Vertical and horizontal continuity is also a significant element. Thus, vegetation forms a critical element of analysis throughout this report. The vegetation provides a basis for the determination for bushfire intensity (section 10.1.6) mapping.

The vegetation assessment has been completed in accordance with PBP 2019. The predominant Vegetation is classified by structure or formation using the system adopted by David Keith (2004) and by the general description using PBP 2019. Vegetation types give rise to radiant heat and fire behaviour characteristics. The predominant vegetation has been determined for the site over a distance of at least 140 metres in all directions from the proposed site boundary or key assets on the development site. Where a mix of vegetation types exist, the type providing the greater hazard is said to predominate.

The vegetation mapping has been completed for the study area as:

Figure 5 Jindabyne Vegetation Assessment
Figure 6 Thredbo Vegetation Assessment

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Figure 5 Jindabyne Vegetation Assessment

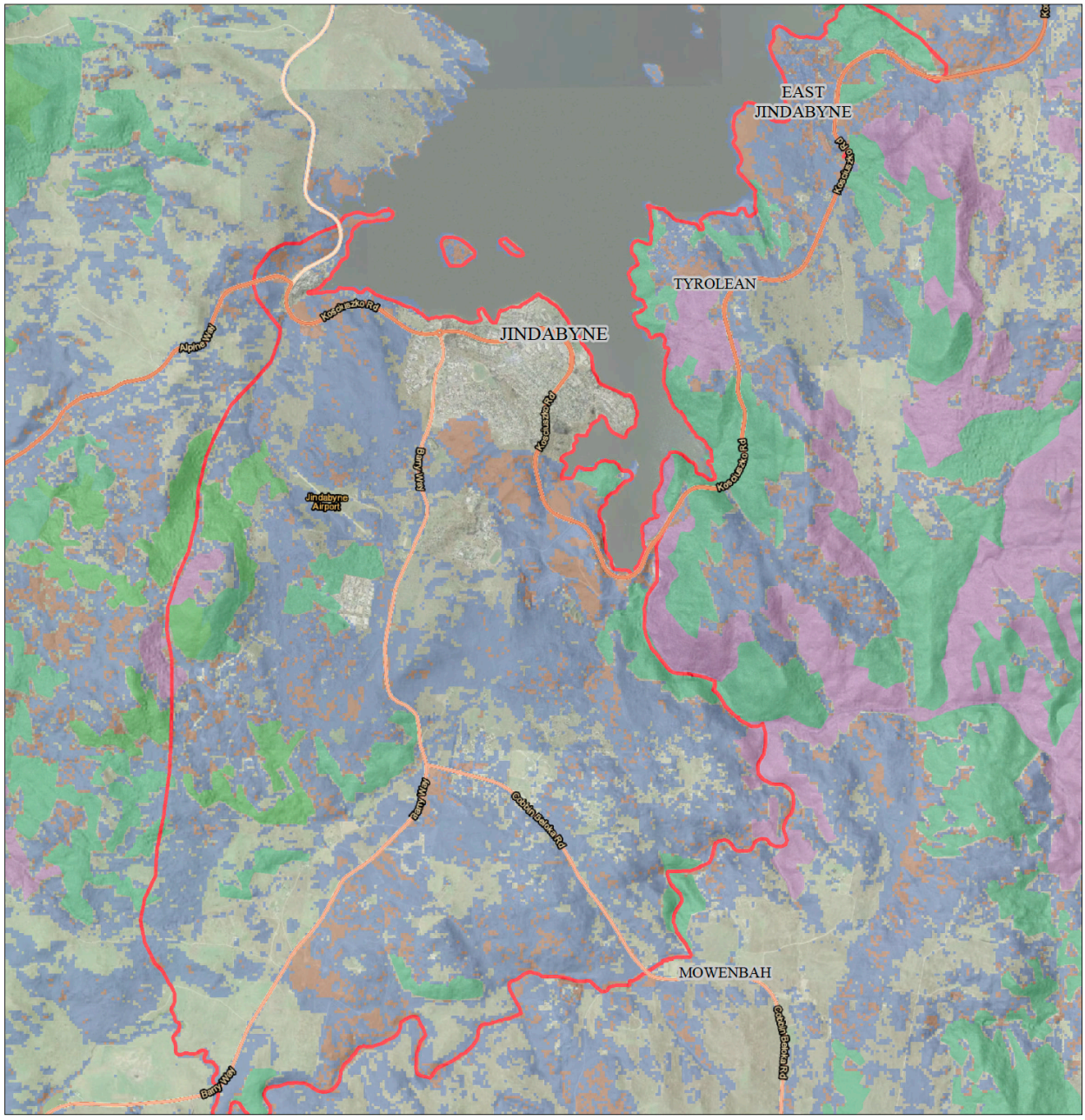

Figure 6 Thredbo Vegetation Assessment

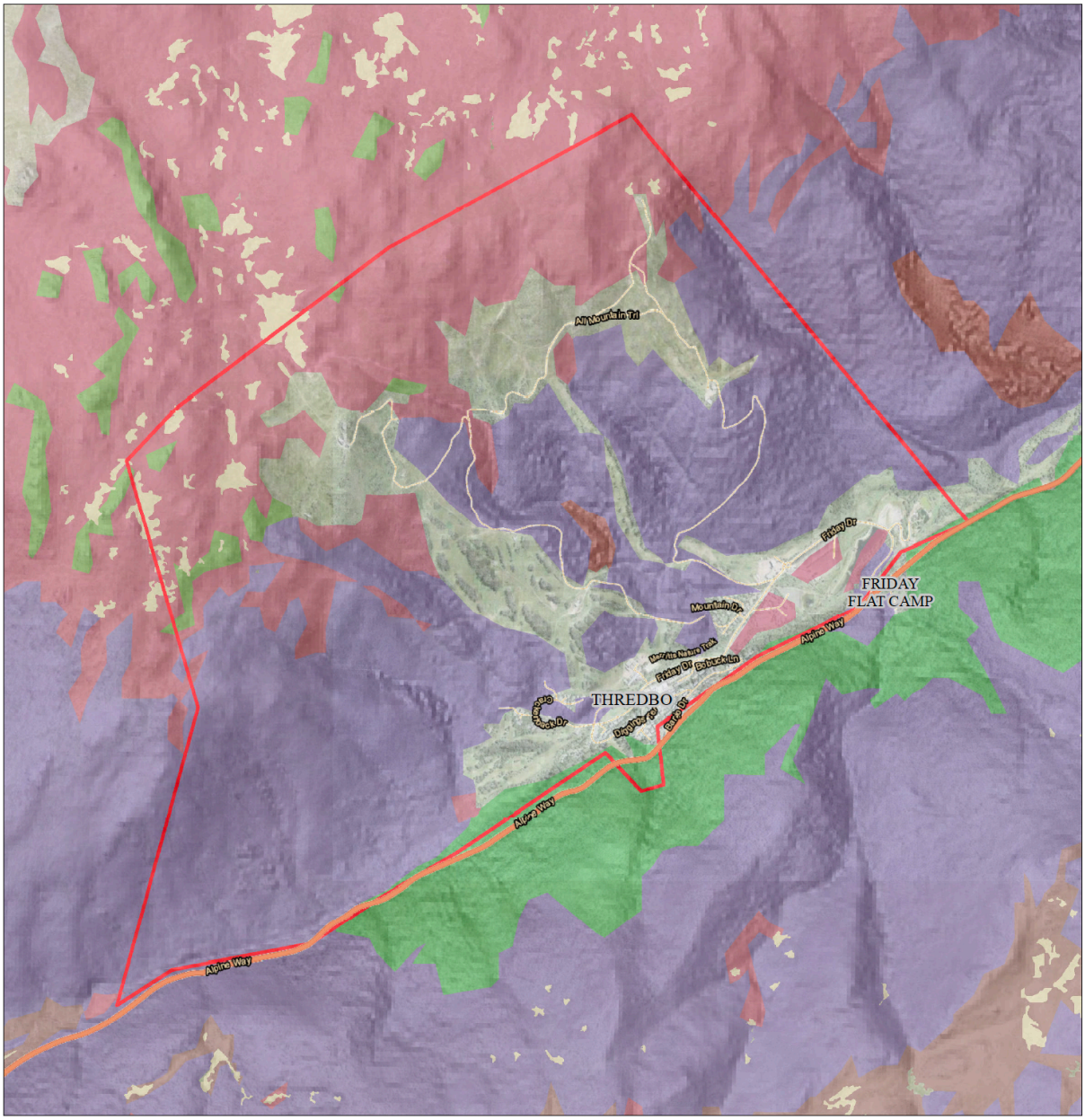

Figure 7 Charlotte Pass Vegetation Assessment

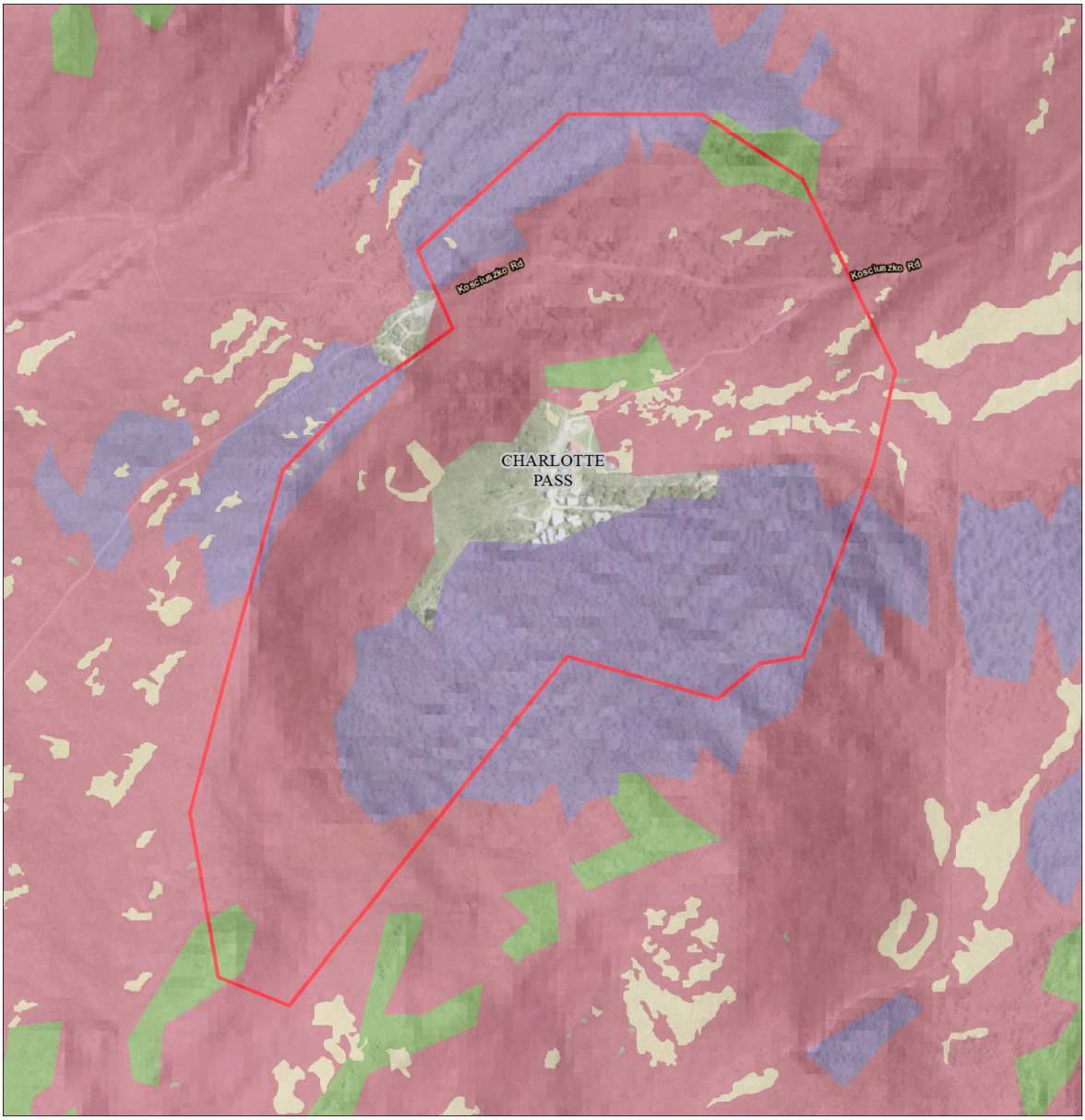

Figure 8 Bullocks Flat Vegetation Assessment

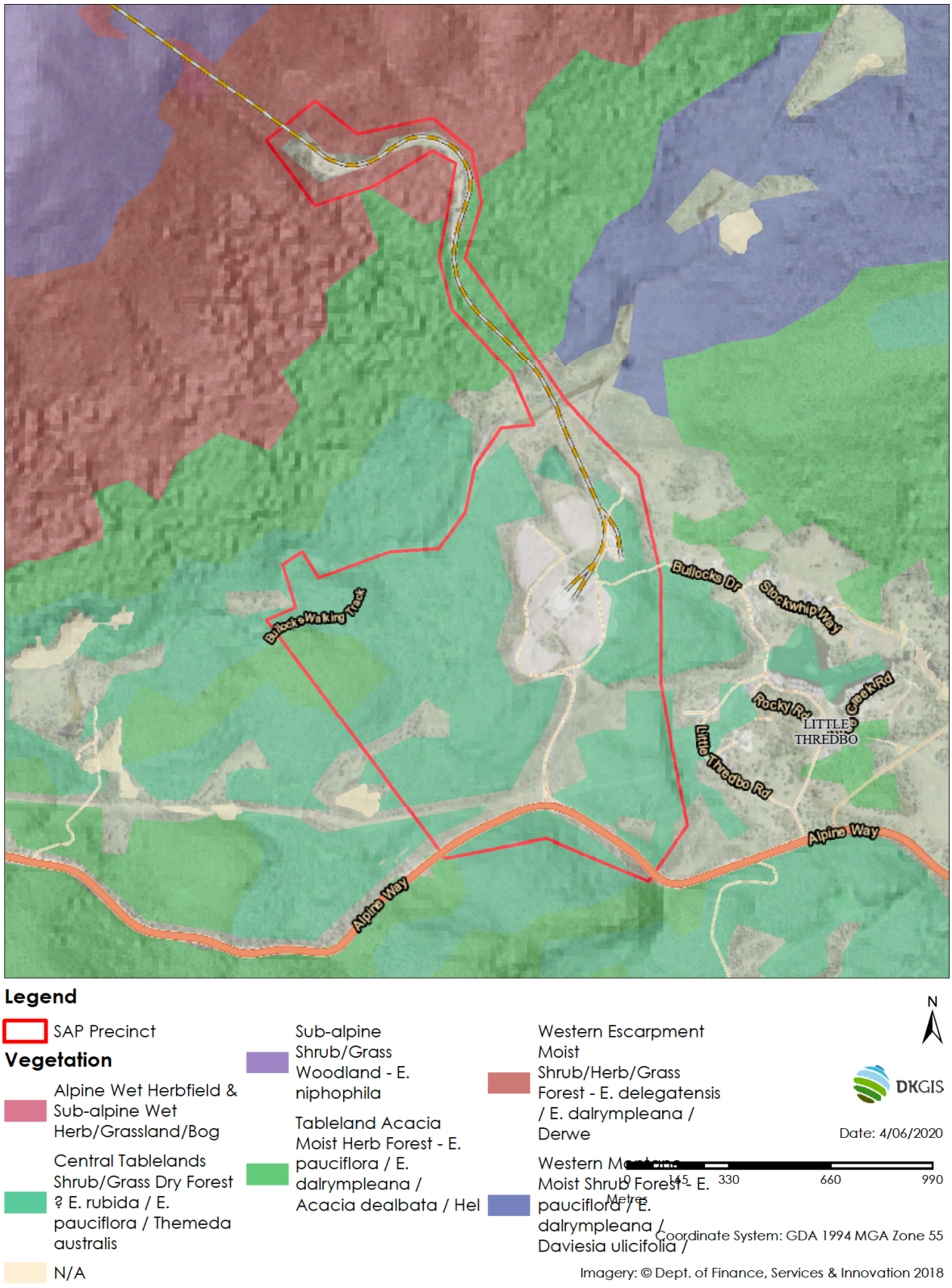

Figure 9 Perisher, Guthega, Smiggins Vegetation Assessment

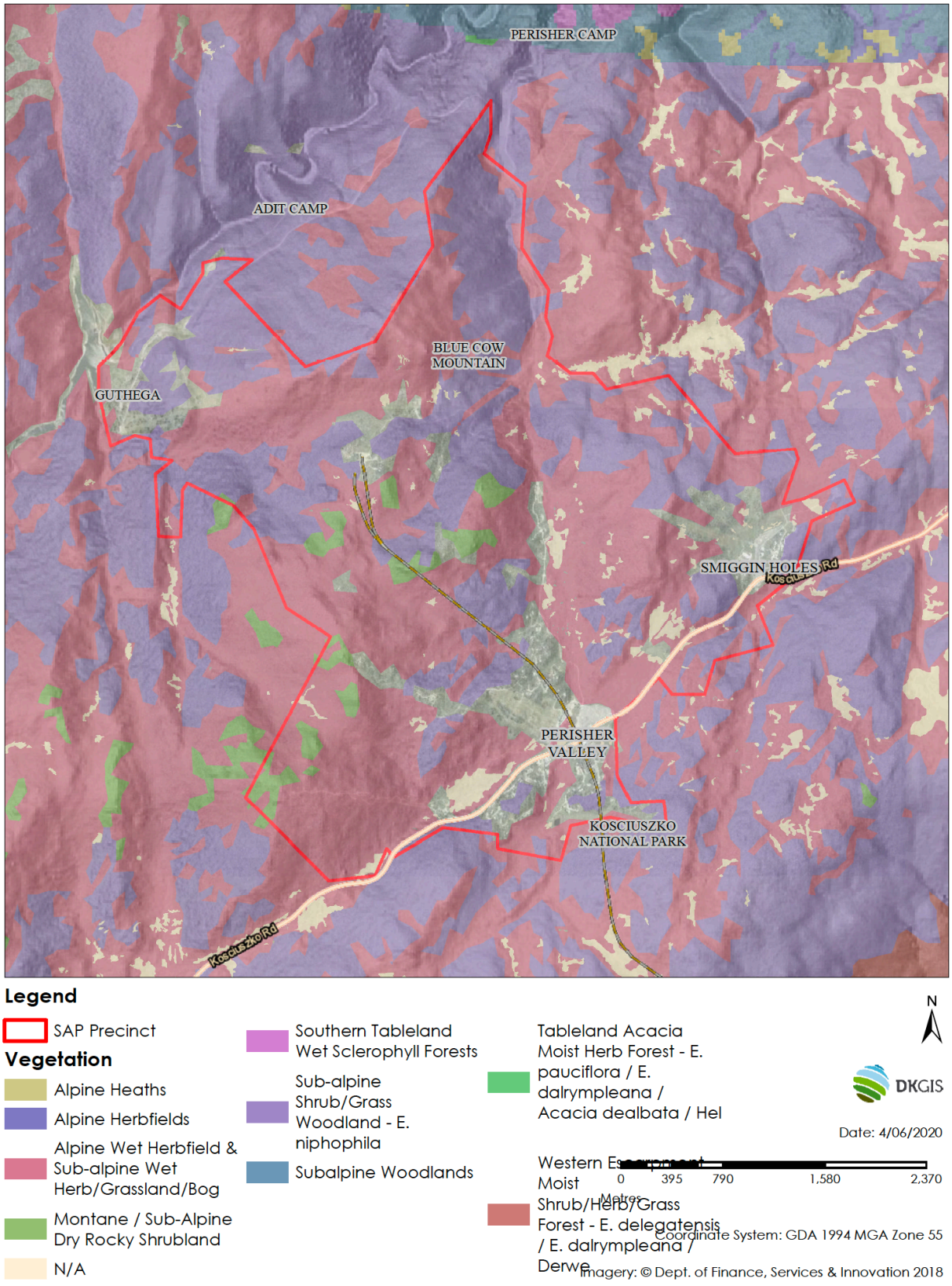

Figure 10 Sponars Vegetation Assessment

Figure 11 Ski Rider Chalet Vegetation Assessment

Figure 12 Kosciuszko Tourist Park Vegetation Assessment

9.1.2. Snowy Monaro Bushfire Risk Management Plan

The Snowy Monaro Bushfire Management Committee *Bushfire Risk Management Plan* (BFRMP) July 2009, has been prepared by the Snowy Monaro Bushfire Management Committee pursuant to section 52 of the Rural Fires Act, 1997. A BFRMP is a strategic document which identifies community assets at risk and sets out a five-year program of coordinated multi-agency treatments to reduce the risk of bushfire to these assets. Treatments may include such things as hazard reduction burning, grazing, community education, fire trail maintenance and establishing community firewise groups.

The Snowy Monaro BFMC area is located in south eastern New South Wales and includes the local government areas of Cooma-Monaro and Snowy Monaro Regional Council.

9.1.3. Climate and bushfire season

The BFRMP (p. 8) notes that:

> *The typical / average climate in the Snowy Monaro BFMC area is cool temperate. Winters are long and cold, with temperatures regularly falling below freezing and periodic snowfalls occurring through the region. Due to the Monaro's location (lee of the Snowy Mountains) a rain shadow effect is experienced throughout the region, creating low and irregular annual rainfall.*
>
> *Rain falls predominantly in summer and winter, with a slight summer dominance. The bushfire season generally runs from October to March. In some years, good summer rains, drier than normal autumn conditions, severe winter frosts and gale force winds have created a further fire danger period throughout the winter months.*
>
> *Prevailing weather conditions associated with the bushfire season in the Snowy Monaro BFMC area are north-westerly or south-westerly winds accompanied by high daytime temperatures and low relative humidity. Afternoon wind changes often hamper fire-fighting efforts. There are also frequently dry lightning storms occurring during the bushfire season.*

9.1.4. History of bushfire frequency and ignition cause

The BFRMP (p. 9) notes that:

> *The Snowy Monaro BFMC area has on average 54 bushfires per year, of which 2 on average can be considered to be major fires. The main sources of ignition in the Snowy Monaro BFMC area*

are:

Lightning Strikes

Lightning activity in the district is mainly across the mountains and on the escarpment to the east, which is normally (but not always) accompanied by rainfall. Thunderstorm activity generally occurs in late spring and summer.

Camp Fires

The increasing number of recreation users within the area of the Plan during summer, may result in an increased incidence of potential fire escape.

Accidental (powerlines, slashing etc)

Arcing of high voltage electrical power lines in high winds and slashing within the summer months can result in the ignition of fire.

Arson

This activity occurs mainly in the summer months and usually on high fire days. It also can occur during school holidays (but not always).

Escapes from legal and illegal burning

This activity results from landholders and land managers lighting fires on their own land or neighbouring land and is mainly in rural areas of the BFMC and occurring all year round.

9.1.5. Bushfire History

The bushfire history affecting the study area is shown in Figure 8. Detailed Fire History is at:

- Attachment 10 Bushfire History Jindabyne
- Attachment 11 Bushfire History Thredbo
- Attachment 12 Bushfire History Charlotte Pass
- Attachment 13 Bushfire History Little Thredbo
- Attachment 14 Bushfire History Perisher Valley
- Attachment 15 Bushfire History Ski Rider
- Attachment 16 Bushfire History Sponars Chalet
- Attachment 16 Bushfire History Kosciuszko Tourist Park

Much of the study area was affected by the 2003 bushfire. The Kosciuszko POM (p. 196) notes:

Under drought conditions during the 2002-2003 summer period, a series of wildfires ignited by lightning strikes burnt 486 000 ha of the park and a total of 1.1 million ha across the Australian Alps. The ecological consequences of such major fire events can be profound, resulting in changes to vegetation community distributions and age classes, loss of habitat, localised extinctions, severe soil erosion and rapid deterioration of water quality.

The fire history in and about individual sites is complex. The fire history for the study area is shown in Figure 16.

The difficulty in accessing and suppressing a fire, the continuity of bush fire hazards or the fragmentation of landscape fuels and the complexity of the associated terrain.

9.1.6.The 2019/ 2020 Bushfire Season

The Snowy Mountains has a history of large and high consequence bushfires that have interrupted the community and significantly impacted the natural environment, most notably in 2003 and 2019/2020.

The 2019/2020 fires stopped to the west of the study area but had significant potential to spread into the Alpine Resorts, Jindabyne and surrounds. The Mt Selwyn resort was destroyed by the fires. The RFS Fire Spread Prediction Maps are shown for Saturday 4 January 2020 (Figure 13) and Friday 10 January 2020 (Figure 14). Figure 15 shows the extent of fires on the east coast on Saturday 4 February 2020. These maps show the potential of the fires to run into the study areas. The asset losses associated with fires in the vicinity of the study area are shown in Table 2.

In terms of context, the RFS issued a Visitor Leave Zone notice on 7 January 2020 advising visitors to leave a large area of the Snowy Mountains and Snowy Monaro Region (Attachment 2). On Friday 10 January 2020, at 10.51am Kosciuszko National Park issued an evacuation notice which applied to all of Kosciuszko National Park and resorts.

Fire seasons are becoming more complex with an increase in the frequency, severity and complexity of extreme weather and cascading events, intersecting with other stressors that require joint agency planning and interoperability[6]. This is being exacerbated by climate change.

The 2020 bushfire season saw Fires stretching from far north coast to far south coast and as far west as Albury with more than 11,770 fires between July 2019 and March 2020. Of these, more than 105 fires

[6] AFAC (2018) Climate Change and the Emergency Management Sector

reached Emergency Warning level (17 on 8 November) with 430 Emergency Alerts campaigns issued[7]. The insured loss[8] for the 2019 – 2020 bushfire season for NSW, Qld, SA and Victoria, declared on 8 November 2019 saw 38,181 claims lodged across the country with estimated insured losses of $2.32 billion, with NSW accounting for 81 per cent ($1.85 billion) of the insured losses. Non-insured losses will be significantly higher.

[7] NSW Rural Fire Service

[8] https://www.insurancecouncil.com.au/assets/media_release/2020/280520%20Insurance%20bill%20for%20season%20of%20natural%20disasters%20climbs%20over%20$5.19b.pdf

Figure 13 RFS Fire Spread Prediction Map 4 January 2020

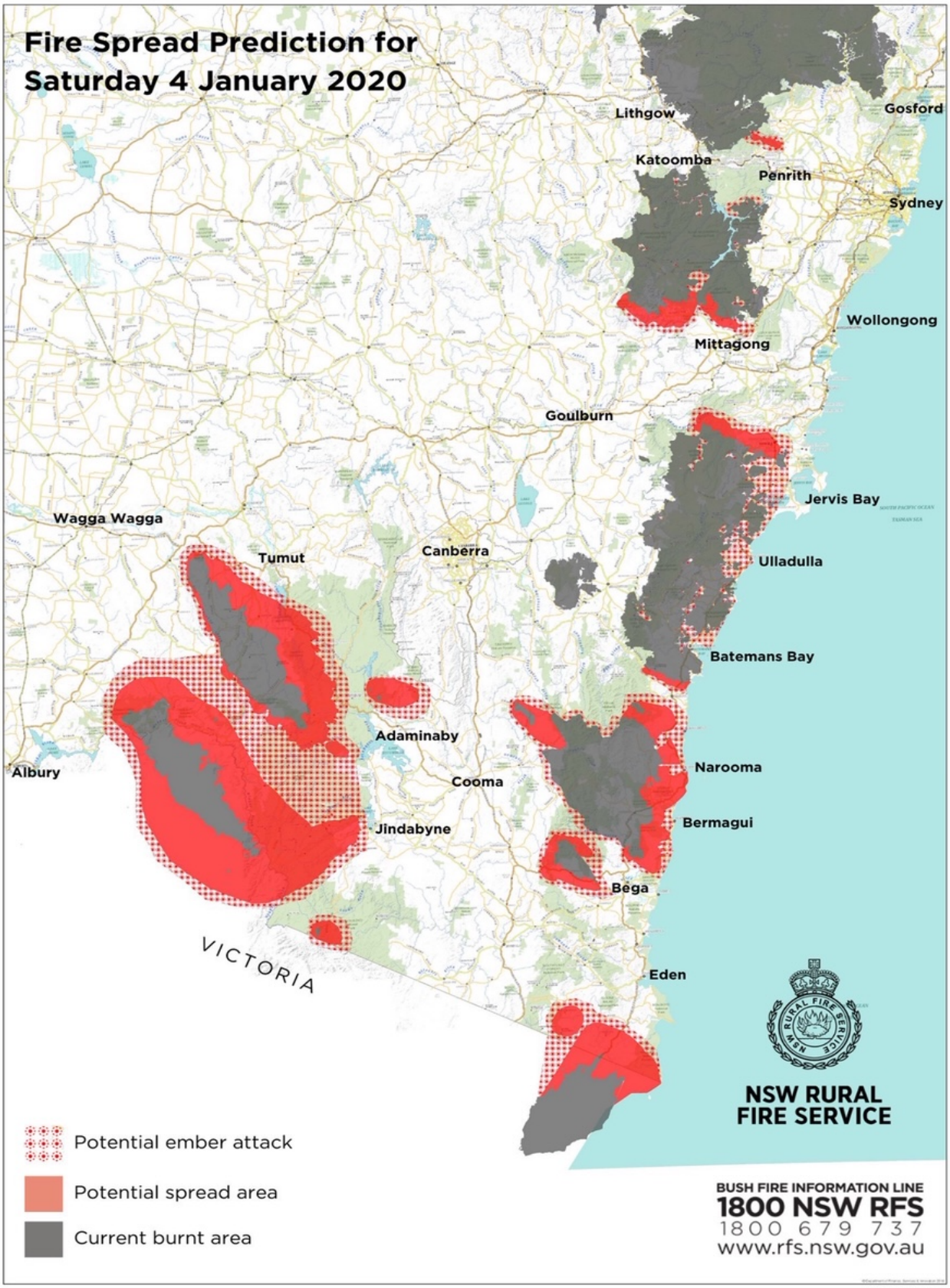

Figure 14 RFS Fire Spread Prediction Map 10 January 2020

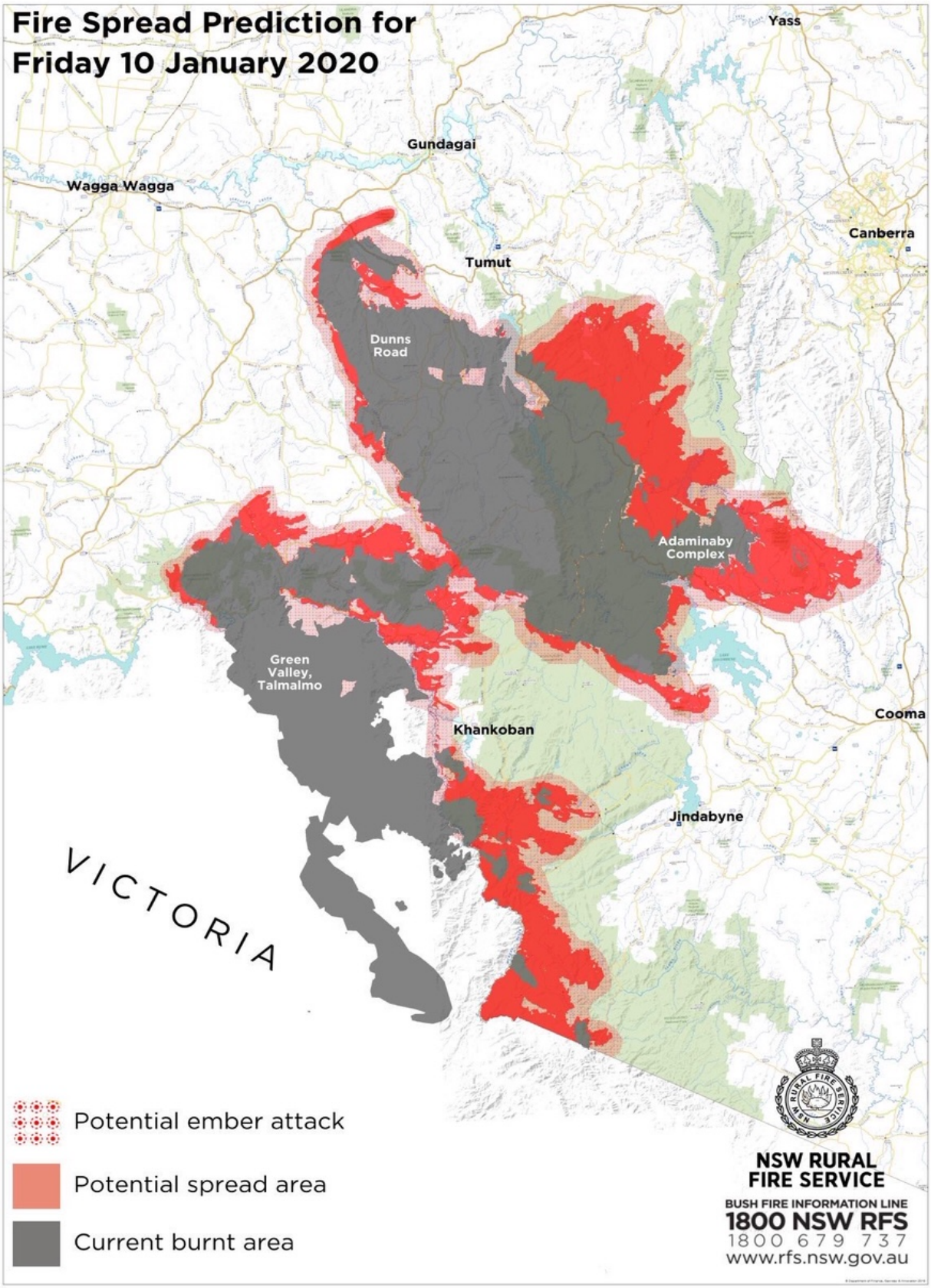

Table 2 Snowy Monaro Bushfire losses

LGA	SUBURB	House - Destroyed	Facility - Destroyed	Outbuilding - Destroyed	House - Damaged	Facility - Damaged	Outbuilding - Damaged	House - Untouched	Facility - Untouched	Outbuilding - Untouched	Grand Total
Snowy Monaro	BUMBALONG	7	5	23	2	1	5	13	2	24	82
Snowy Monaro	COUNTEGANY	5		10	1		3	27		17	63
Snowy Monaro	JERANGLE	4		13	2	1	3	18		20	61
Snowy Monaro	COLINTON	3		7	3		4	25		47	89
Snowy Monaro	ROCKTON	3		9			5	9	1	15	42
Snowy Monaro	CATHCART	2		15	1		2	6		12	38
Snowy Monaro	NUMERALLA	2		5	3			8		11	29
Snowy Monaro	YAOUK	2		6			1	6		8	23
Snowy Monaro	CREEWAH	1		2	1			12		9	25
Snowy Monaro	MICHELAGO	1		3				10		9	23
Snowy Monaro	PADDYS FLAT	1		1	1						3
Snowy Monaro	ADAMINABY									2	2
Snowy Monaro	BADJA			3				12		23	38
Snowy Monaro	BREDBO							1	6	3	10
Snowy Monaro	GLEN ALLEN			2	1			6			9
Snowy Monaro	KIANDRA		8	1		1			1		11
Snowy Monaro	KYBEYAN							1		2	3
Snowy Monaro	PEAK VIEW			2			1	16		22	41
Snowy Monaro	SHANNONS FLAT							1			1
Snowy Monaro	TINDERRY							2			2
Snowy Monaro	TUROSS							6		15	21
Grand Total		**31**	**13**	**102**	**15**	**3**	**24**	**179**	**10**	**239**	**616**

Figure 15 Extent of bushfires on east coast 4 January 2020

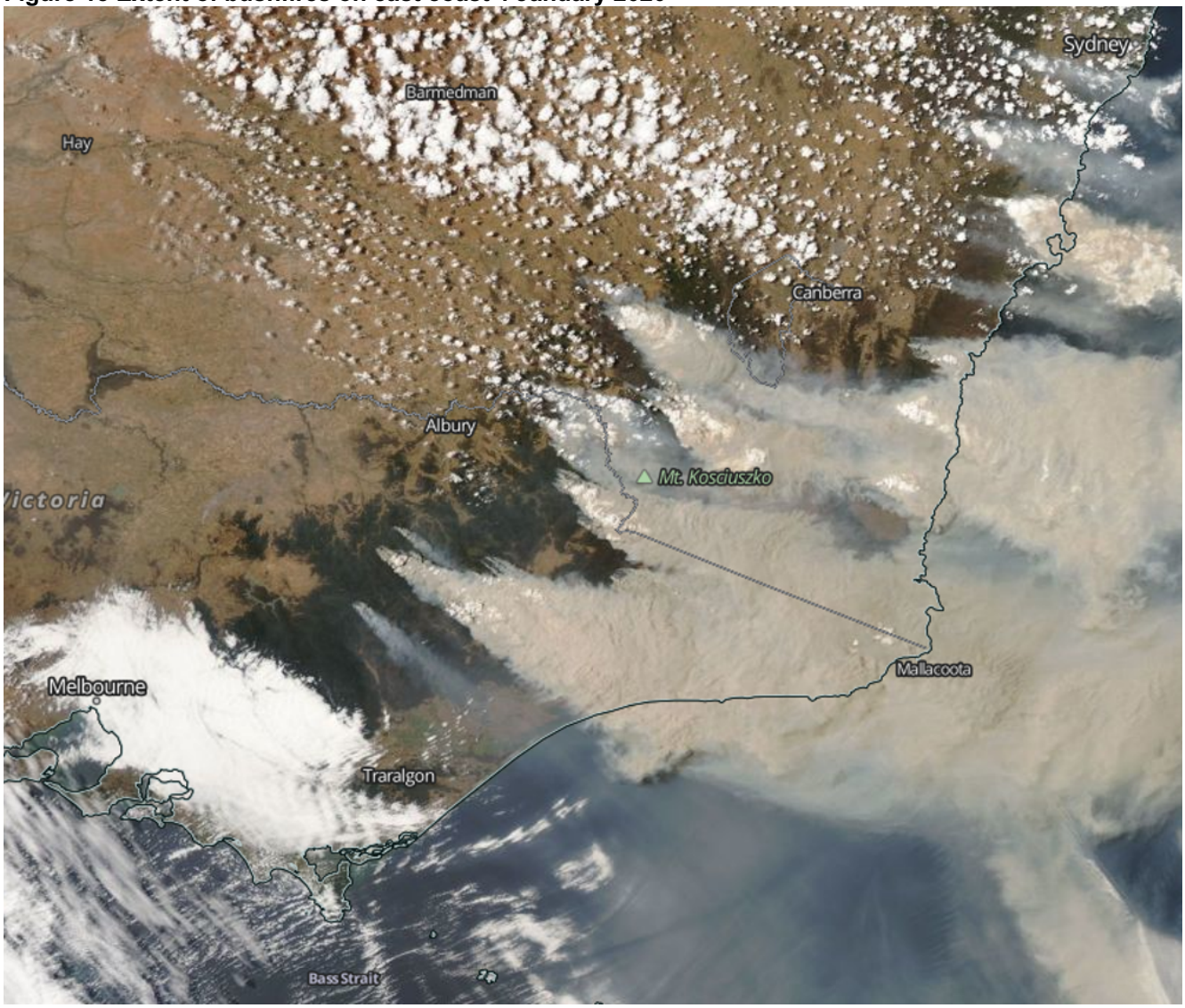

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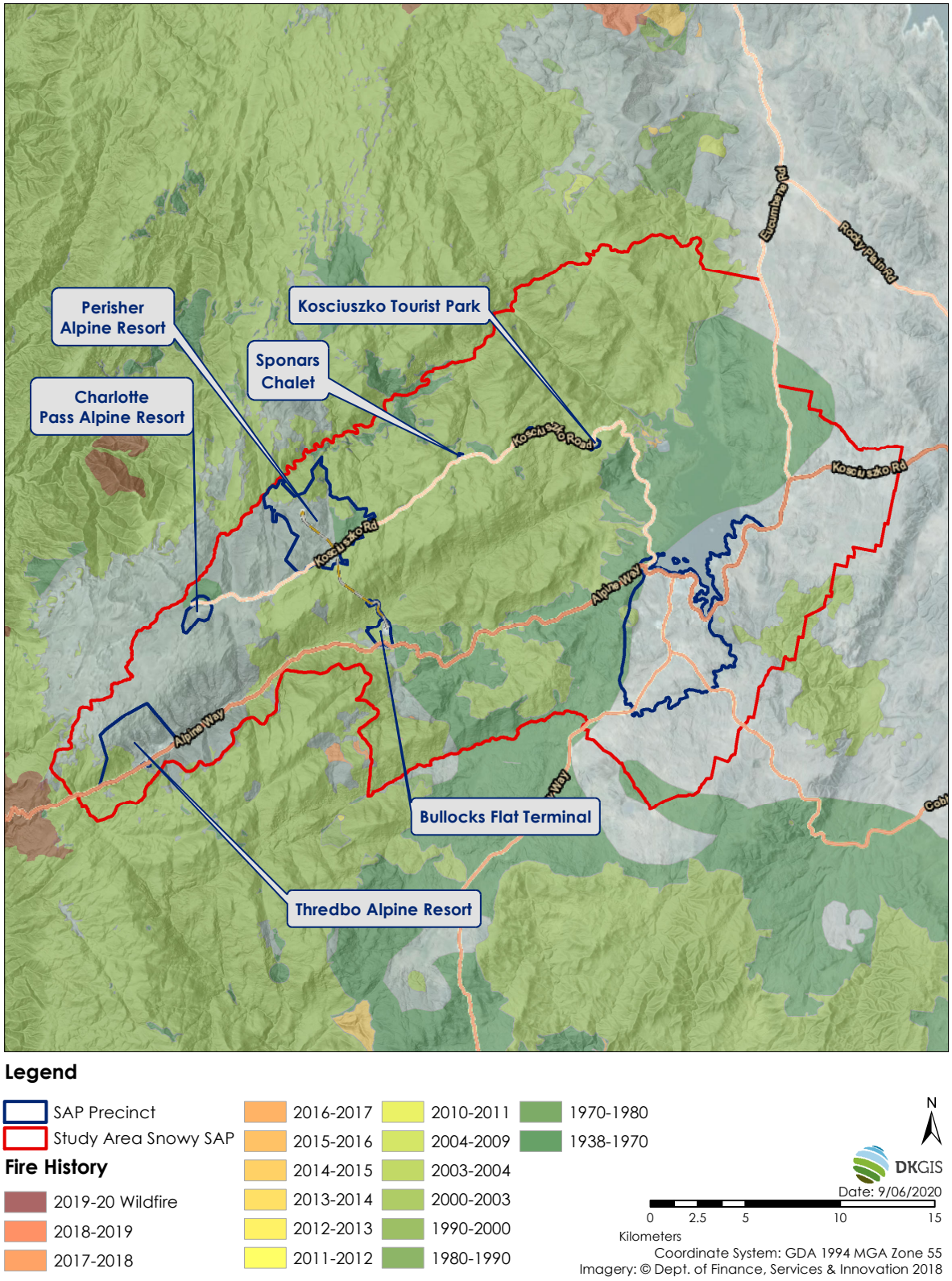
Figure 16 Fire History



9.1.7. Fire Weather & Assessment

The fire weather for development assessment is dictated by PBP 2019 and assumes a credible worst-case scenario with a design fire as a 1:50 year event and an absence of any other mitigating factors relating to aspect or prevailing winds. The fire weather is articulated by the Forest Fire Danger Index (FFDI) which measures the degree of danger of fire in Australian vegetation.

The FFDI is used as a key input for calculating radiant heat and setbacks required for various development types within PBP 2019. Variation of the FFDI, up or down, will have significant impact on the outputs for new development.

For the purposes of PBP 2019, the FFDI required to be used for development assessment purposes is based on local government boundaries. The Snowy Monaro Local Government Area (LGA) has an FFDI area has a Fire Danger Index (**FDI**) of 80[9]. The Alpine Resort areas have a FFDI of 50 for alpine areas (Table A1.12.7 of PBP 2019) that is applied to alpine areas. Snowy Valleys LGA has an FFDI of 80[10].

PBP 2019 does not provide a deemed to satisfy table for reduced FFDI for subdivision or SFPP development within the alpine resort areas. However, PBP 2006 (p. 65) provides clarity that an FFDI of 50 is applied to the alpine resort areas and Table A1.12.7 within PBP 2019 applies to alpine areas. To date, the RFS have taken a default position for new SFPP development within the alpine resorts would be to apply to 10kW requirement of Table A1.12.1 of PBP 2019 which is based on an FFDI of 100 and a flame temperature of 1200K. This is not in keeping with the surrounding LGA FFDIs for Snowy Valleys LGA and Snowy Monaro LGA.

The Department of Planning Industry and Environment (DPIE) have submitted the *Thredbo Fire Danger Index Analysis* paper completed by Risk Frontiers to the RFS with data supporting the 1:50 year FFDI for Thredbo. This is the evidence base to assist the RFS to apply the requirements of PBP for the alpine resorts. The *Thredbo Fire Danger Index Analysis* paper found that:

> *Annual maximum FFDI values at Thredbo 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 40-50, with one extreme year (1985) reaching 71. From our analysis of this dataset, we estimate the 50-year ARI value to be 53. This result is based on the best fit Fréchet extreme value distribution and the 95% confidence interval at this ARI is from 35 to 86.*

[9] NSW Local Government Areas FDI (NSW Rural Fire Service)
[10] NSW Local Government Areas FDI (NSW Rural Fire Service)

In keeping with PBP 2006 and PBP 2019 an FFDI 50 should be applied to alpine resort areas for new development and assessment purposes.

9.1.8. Fire Runs

Two types of hazard are relevant for the subject area in terms of bushfire hazard including:

- landscape hazard – where large expanses of contiguous bushland provide for large scale fires to run across the landscape and impact assets. These fires would generally be called 'campaign' fires by the NSW RFS as they burn for an extended period of time across large areas.
- localised hazard – can occur in smaller fragmented areas of vegetation larger than 1 hectare in size and will often be considered as local fires or small scale fires that can start in close proximity to assets and run quickly before they are suppressed. These fires do not form larger campaign fires.

These two types of hazard scenarios present different types of fire behaviour, fire intensity and potential rate of spread characteristics. Importantly, they can be planned for differently. As a general rule of thumb, landscape scale fires occur on days of elevated Bushfire Danger Ratings and as such a degree of planning can be undertaken be emergency managers. This may include closure of National Parks on Total Fire Ban (TOBAN) days.

The Jindabyne and alpine area precincts are exposed to both landscape-level and localised bushfire hazards. PBP 2019 takes a precautionary view for new development in Bushfire Prone Areas with a 1:50 year fire weather scenario (or 98th percentile) used as the design fire (PBP 2019 p. 84). This provides a probable worst case for a planning framework to consider bushfire risk. Similarly, PBP 2019 does not use aspect as an indicator of bushfire risk, with the underlying assumption being a fire can impact an asset from any direction at maximum intensity. These components negate the need for detailed consideration of fire runs into the Snowy Mountains Special Activation Precinct areas, as a probable worst-case assessment is required as part of the assessment against PBP 2019.

That being said, it is accepted that the potential for landscape scale campaign fires and localised fires to sequentially or simultaneously impact on the study area is highly likely.

9.1.9. Fire Intensity

Fire intensity describes the energy released from the bushfire or characteristics of the fire behavior such as flame length and rate of spread. A widely used measure of fire intensity is fireline intensity, which is the rate of heat transfer per unit length of the fire line (measured in kWm^2) and represents the radiant energy release in the flaming front. One kW/m is equivalent to the energy released by a small bar radiator. Fire intensity depends upon how much fuel is burnt and how fast it burns. Fireline intensity is a good measure of how likely the fire is to propagate and how difficult it will be to stop, and thus it is a critical component of fire behavior models used to inform fire-suppression activities. Fire severity refers to the ecosystem impacts of a fire such as mortality of trees or loss in biodiversity.

PBP 2019 and the *Australian Standard for Construction of Buildings in Bushfire Prone Aras* (AS3959) uses the radiant heat as an indicator of bushfire risk and to determine the size of APZs and commensurate construction level from AS3959 (see section 11.3).

Bushfire intensity mapping has been completed for key areas within the alpine resort areas. The assessment of bushfire intensity for this study leverages on a classification of topography (slope and aspect) and vegetation formations / fuel across the study area. The assessment has used the base requirements within PBP 2019 as inputs for the modelling.

The models provide an indication of the potential head fire intensity from the direction of attack for the scenario's being modelled, with intensities greater than 4,000 kW/m generally considered uncontrollable in all weather conditions. Table 3 provides an indication of RFS fire intensity.

The models were generated spatially for the specific locations within the study area utilising the following parameters to identify the potential bushfire intensity:

- Terrain (slope and aspect);
- Fuel (vegetation);
- Likely bushfire weather scenarios including the Forest Fire Danger Index (FFDI) and wind direction.

The modelling approach calculates potential head fire intensity using established fire intensity formulae

documented in Cheney et al 2012 (for Forest and Woodland), Anderson et al 2015 (for Heath and Shrubland), and Cheney et al 1998 (for Grassland).

Table 3 Bushfire Intensity – source NSW RFS Crew Leader Manual

Fire Danger	Flame height (@12.5 T/Ha)	Intensity (KW/m) (@12.5 T/Ha)	Significance and recommended strategy
Low	0 - 0.5m	0 - 50	Fire should generally self extinguish
Moderate	0.5 - 1.5m	50 - 500	Hand tool line should hold fire. Direct attack recommended.
High	1.5 - 3.0m	500 - 2000	Too intense for direct attack. Parallel attack recommended.
Very High	3.0 - 10m	2000 - 4000	Crown fire at upper intensities. Indirect attack recommended.
Extreme	> 10m	> 4000	Crowning, spotting and major fire runs likely. Control efforts probably ineffective. Defensive strategy recommended.

It is noted that each bushfire event is different, responding to changes in fuel, weather conditions and FFDI. Thus, the models are an indication of what could be experienced under the bushfire weather scenario modelled provided the fuel and terrain are similar to the input data used in the model.

It is important to note that the models of potential fire intensity do not provide an indication of ignition risk or the rate of spread of a bushfire. It is specifically noted that, although the grassland areas will not carry a fire of the same intensity as the forested areas, these areas potentially have the highest risk of ignition and rate of spread. Conversely, fires within the grassland areas are potentially more controllable under certain weather conditions given the lower potential fire intensities in these locations.

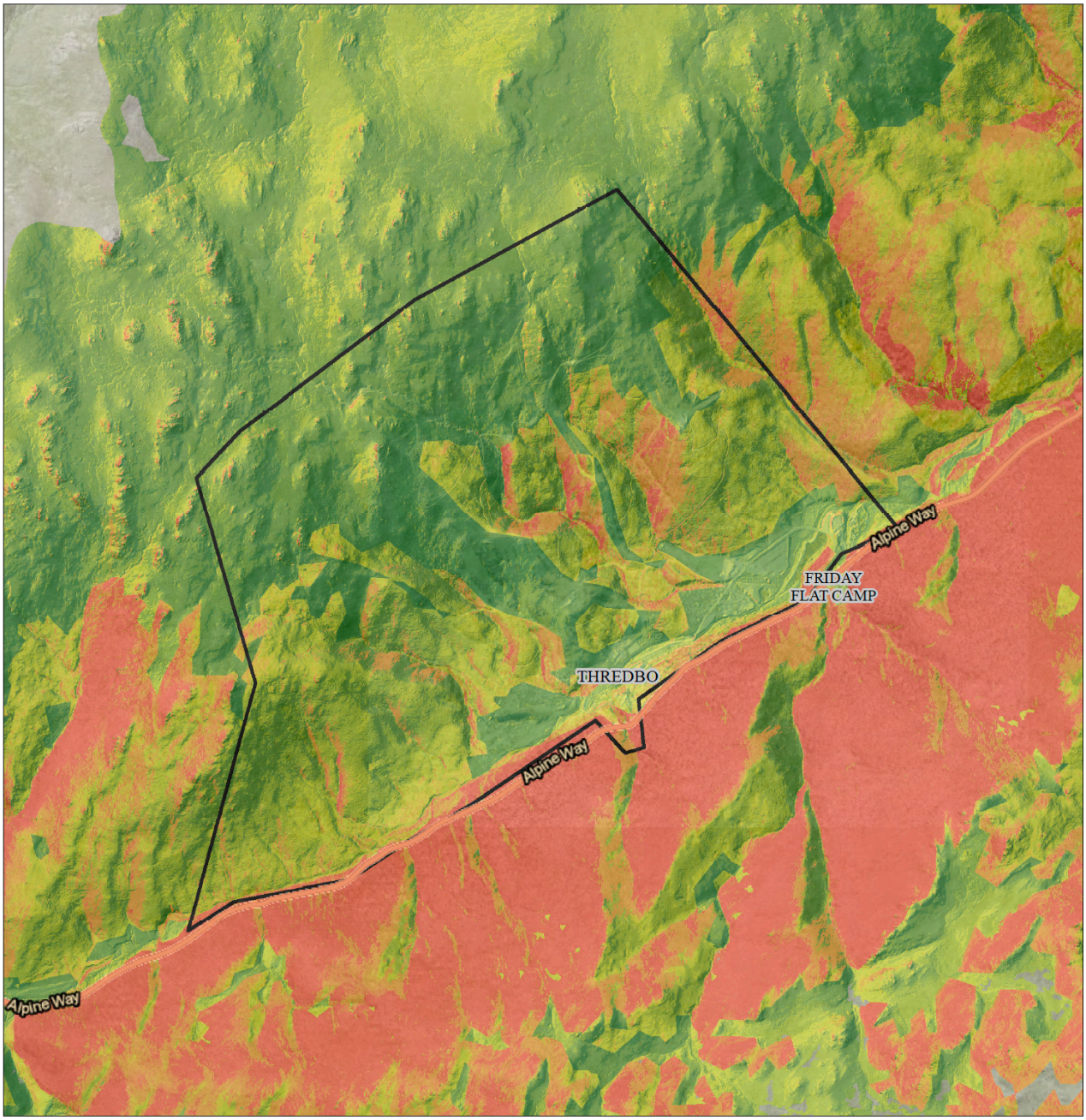
It is lastly noted that the above intensity modelling approach does not account for events under extreme fire behaviour / weather including such phenomena as:

- Spotting/Fire storm;
- Fire tornado/whirls;
- Pyro-convective events;

The Bushfire Intensity mapping has been provided at:

Figure 17 Thredbo Bushfire Intensity
Figure 18 Charlotte Pass Bushfire Intensity
Figure 19 Bullocks Flat Bushfire Intensity

Figure 17 Bushfire Intensity Thredbo



Legend

- SAP Precinct

Fire Intensity (kW/m)

- < 500
- 500 - 2,000
- 2,000 - 2,500
- 2,500 - 5,000
- 5,000 - 10,000
- 10,000 - 15,000
- 15,000 - 25,000
- 25,000 - 50,000
- 50,000 - 75,000
- > 75,000

N

DKGIS

Date: 22/07/2020

0 340 680 1,360 2,040
Metres

Coordinate System: GDA 1994 MGA Zone 55

Imagery: © Dept. of Finance, Services & Innovation 2018

Figure 18 Charlotte Pass Bushfire Intensity

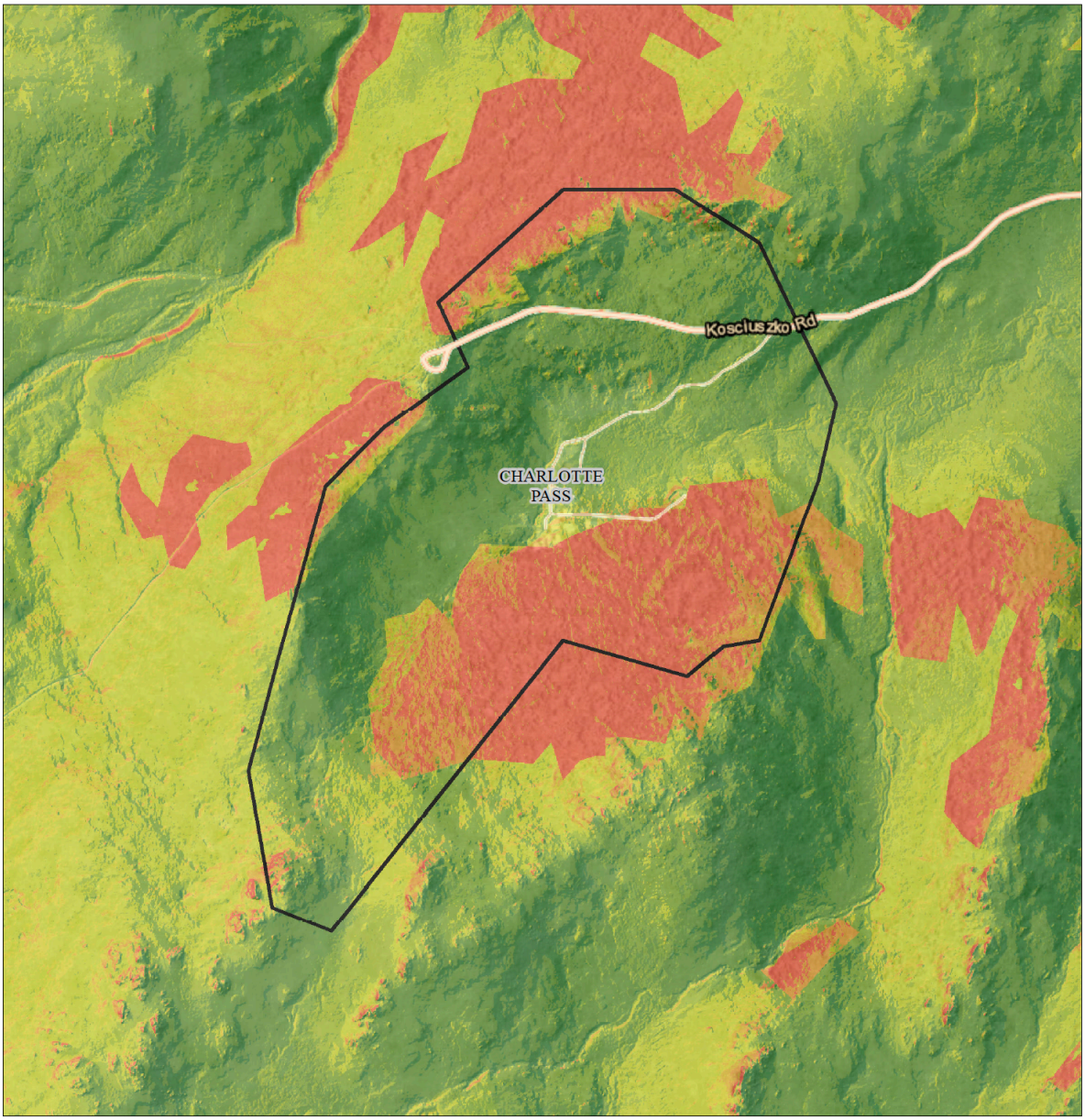
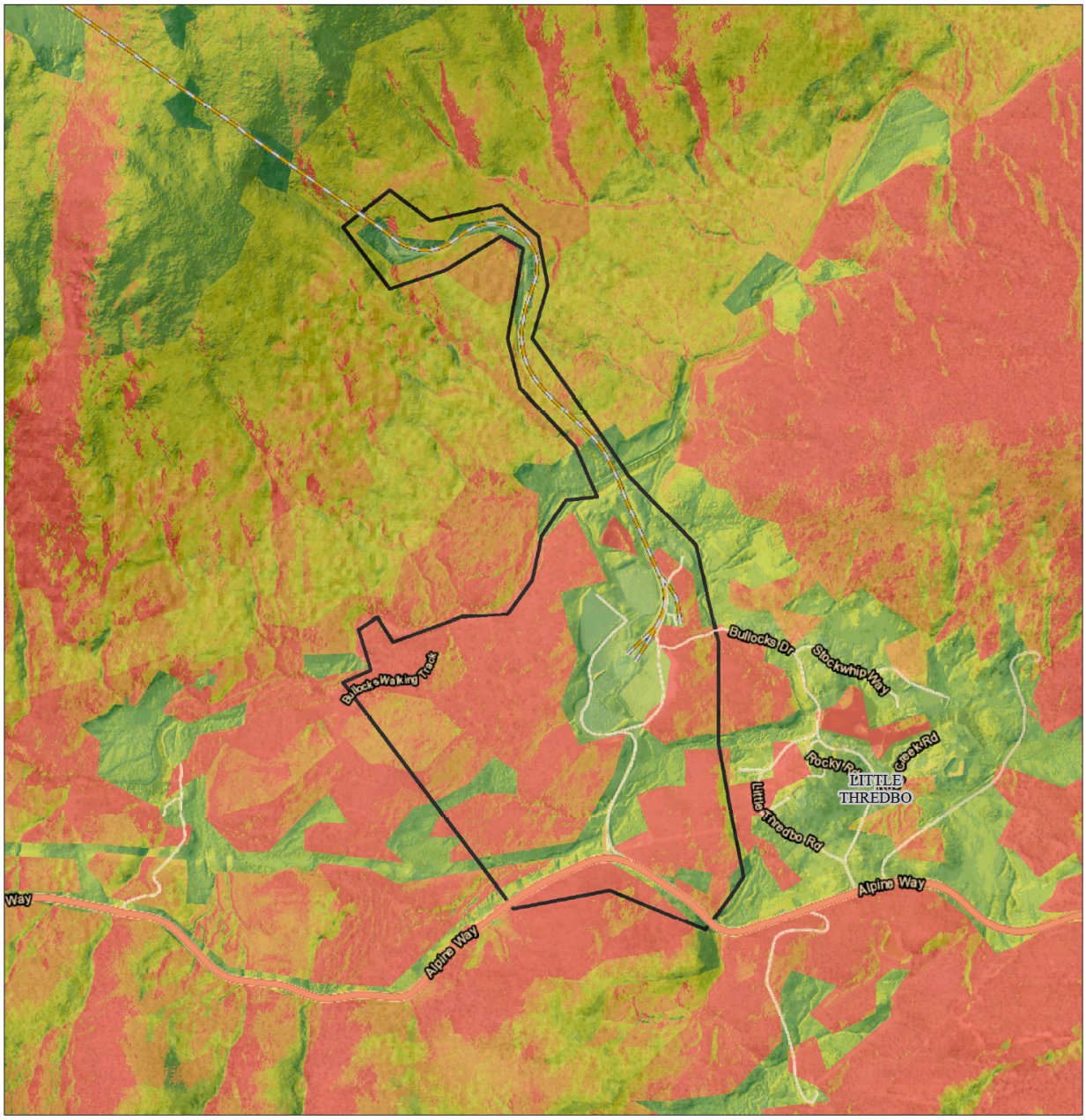


Figure 19 Bullocks Flat Bushfire Intensity



Legend

- SAP Precinct

Fire Intensity (kW/m)

- < 500
- 500 - 2,000
- 2,000 - 2,500
- 2,500 - 5,000
- 5,000 - 10,000
- 10,000 - 15,000
- 15,000 - 25,000
- 25,000 - 50,000
- 50,000 - 75,000
- > 75,000

N

DKGIS

Date: 22/07/2020

0 195 390 780 1,170

Metres

Coordinate System: GDA 1994 MGA Zone 55

Imagery: © Dept. of Finance, Services & Innovation 2018

Figure 20 Perisher Valley Bushfire Intensity

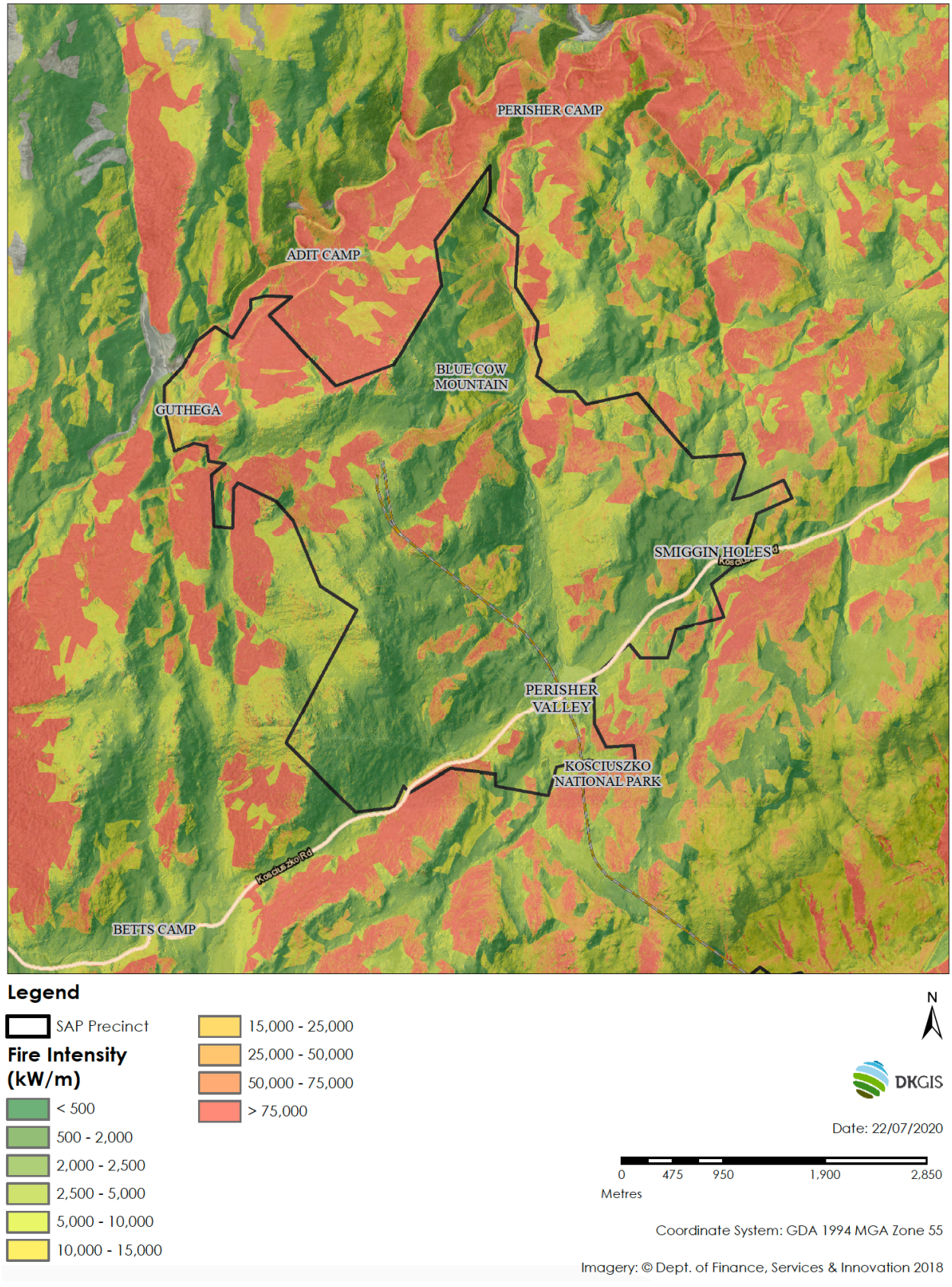


Figure 21 Sponars Bushfire Intensity

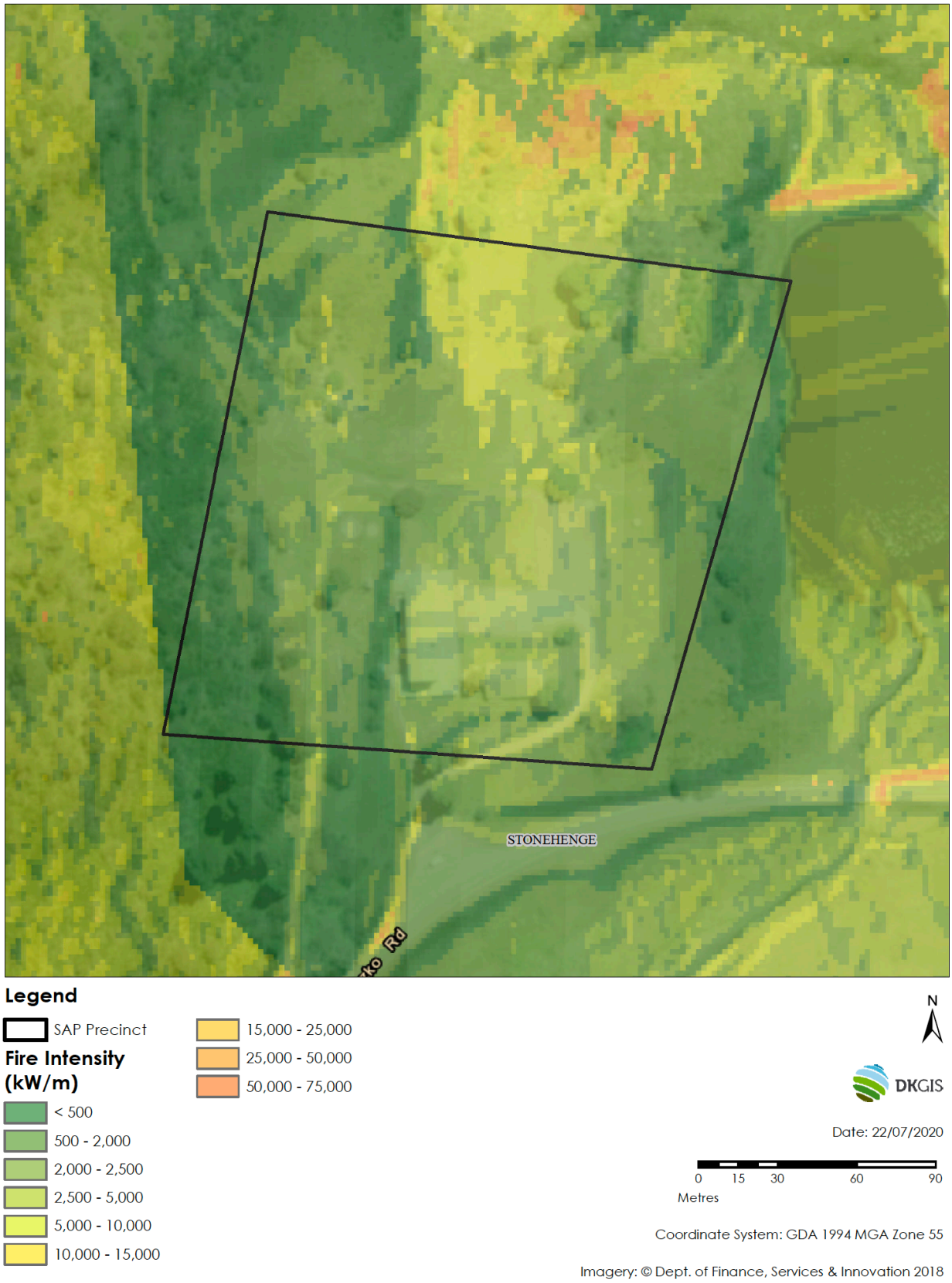


Figure 22 Ski Rider Bushfire Intensity

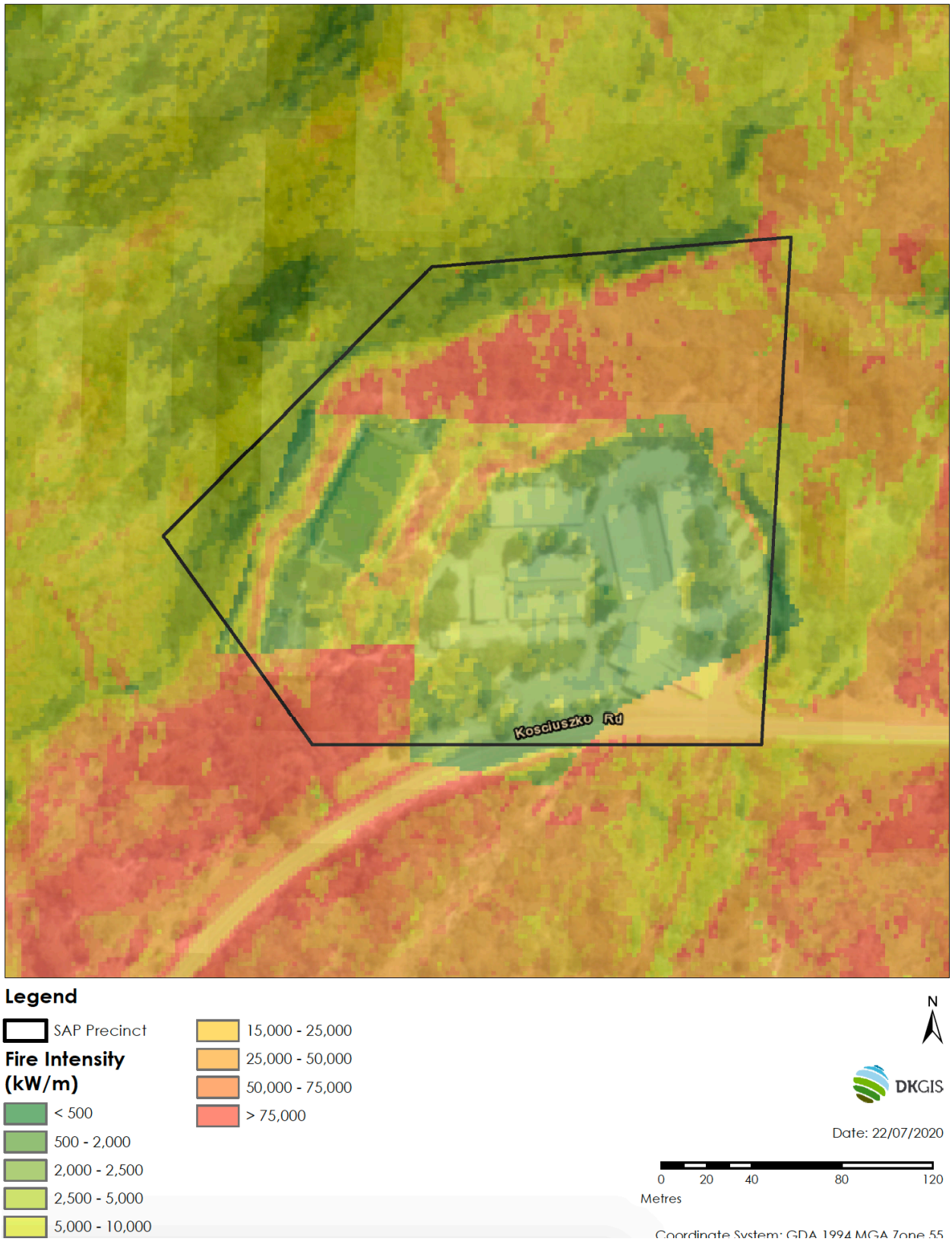
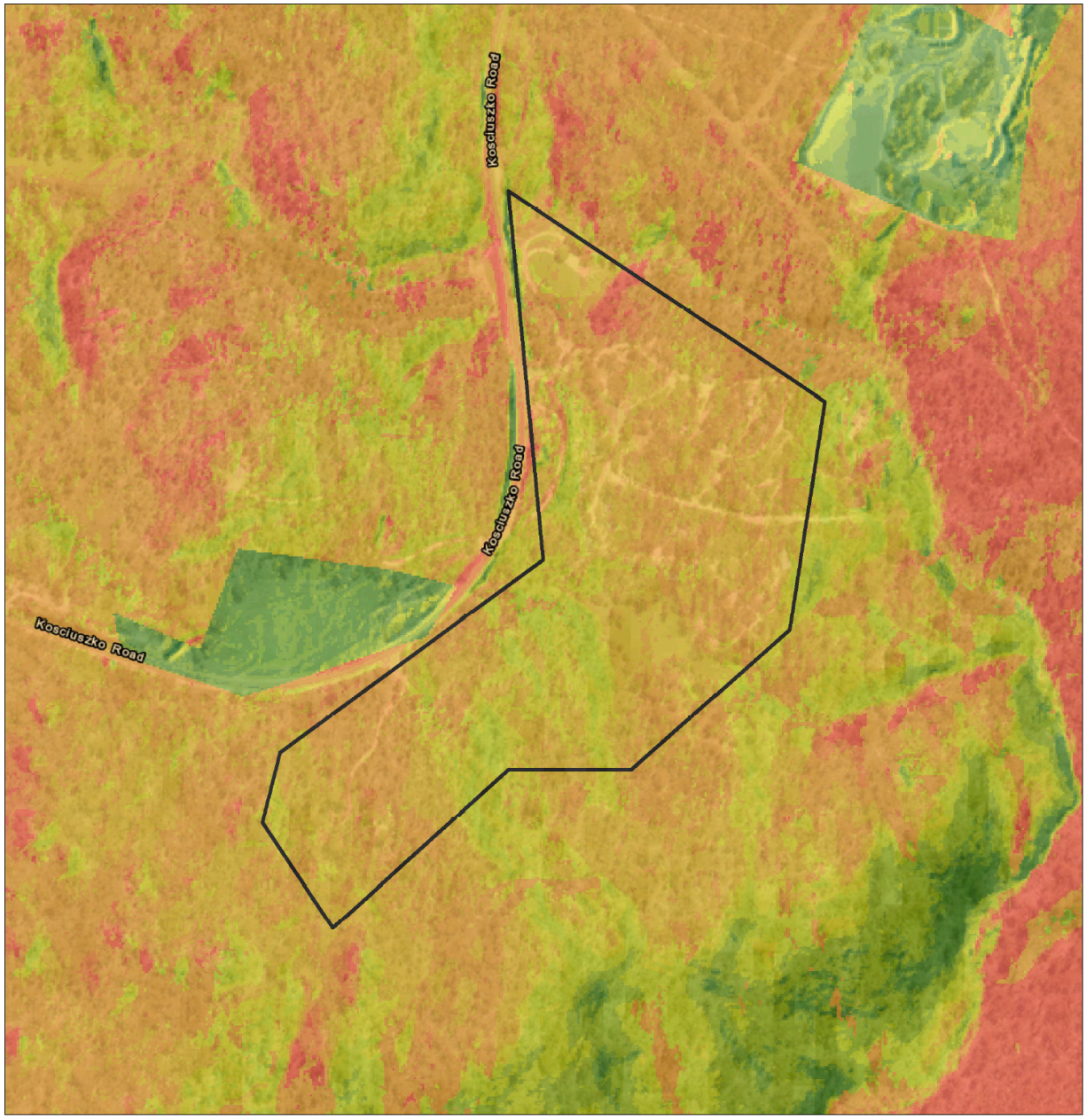


Figure 23 Kosciuszko Tourist Park Bushfire Intensity



9.2. Landuse Assessment

PBP 2019 requires that the land use assessment will identify the most appropriate locations within the master plan area or site layout for the proposed land uses. Matters for consideration (once other functional areas have completed studies) will be:

- The risk profile of different areas of the development layout based on the above landscape study;
- The proposed land use zones and permitted uses;
- The most appropriate siting of different land uses based on risk profiles within the site (i.e. not locating development on ridge tops, SFPP development to be located in lower risk areas of the site); and
- The impact of the siting of these uses on APZ provision.

This landuse risk assessment is not a bushfire management plan. This risk assessment seeks to analyse the extent of bushfire risk relevant to the Snowy Mountains Special Activation Precinct, for consideration by DPIE and other government organisations, particularly National Parks and Wildlife Service and the Rural Fire Service. The core objective of this risk assessment is to determine the suitability of the Snowy Mountains Special Activation Precinct and areas identified within it to respond to bushfire risk. This will address the fundamental strategic planning principle within PBP 2019 of if an area is suitable for development.

PBP 2019 (p. 34) notes that

> *Some specific locations have significant fire history and are recognised as known fire paths. These areas may require detailed analysis. The broad principles which apply to this analysis are:*
>
> - *ensuring land is suitable for development in the context of bushfire risk;*
> - *ensuring new development on BFPL will comply with PBP;*
> - *minimising reliance on performance-based solutions; providing adequate infrastructure associated with emergency evacuation and firefighting operations; and*
> - *facilitating appropriate ongoing land management practices.*
>
> *Strategic planning should provide for the exclusion of inappropriate development in bush fire prone areas as follows:*
>
> - *the development area is exposed to a high bushfire risk and should be avoided;*
> - *the development is likely to be difficult to evacuate during a bushfire due to its siting in the landscape, access limitations, fire history and/or size and scale;*

- *the development will adversely effect other bushfire protection strategies or place existing development at increased risk;*
- *the development is within an area of high bush fire risk where density of existing development may cause evacuation issues for both existing and new occupants; and*
- *the development has environmental constraints to the area which cannot be overcome.*

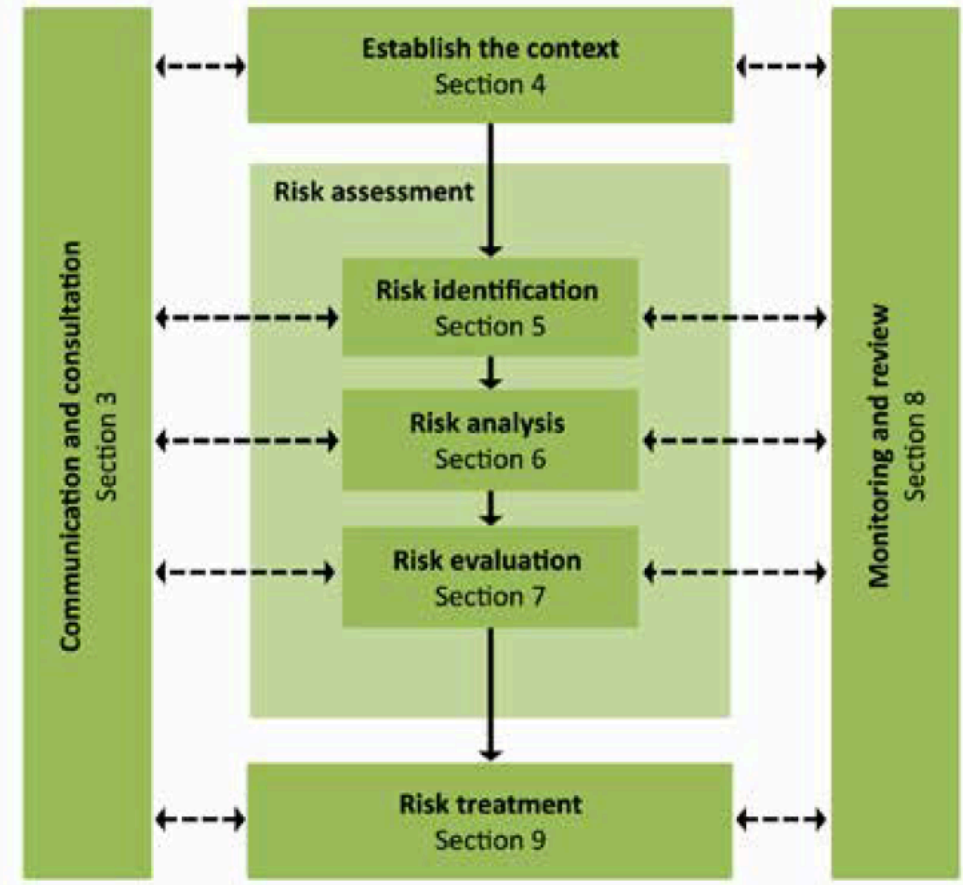
9.2.1. Bushfire Risk Identification

Risk is defined as 'the effect of uncertainty on objectives'. Managing risk helps government, organisations, institutions, businesses and communities make good decisions in an environment full of uncertainty. Good risk management identifies and protects what people and society value.

NERAG provides a contextualised, emergency-related risk assessment method consistent with the Australian Standard *AS/NZS ISO 31000:2018 Risk management – principles and guidelines*. NERAG provides a method (Figure 24) to contextualise, assess and manage emergency risks so that action can be taken and good decisions made to minimise harm and loss when shocks and stresses occur. For the purposes of this risk assessment, the likelihood and consequence criteria relate to the average occurrence of an FFDI 80 fire event which is the accepted fire weather event for land use planning and building construction provisions in Jindabyne (FFDI 80) and the alpine areas (FFDI 80).

For the Strategic Bushfire Study, the risk assessment follows the parameters set out by PBP 2019 in terms of matters to consider in making a determination as the availability of an area for future use.

Figure 24 NERAG Risk Assessment Process



9.2.2. Bushfire Attack Potential

Figure 6 and 7 provide the bushfire prone nature of the land and hence the bushfire potential of the study areas. For the remote locations, it should be assumed that all bushfire prone land will burn. Determining the acceptable level of risk is explored in the following section.

9.2.3. Defining Acceptable Risk

In order to understand the nature of bushfire risks posed to the assets, people within the study area and people using access roads to and from the study area, it is critical to contemplate the elements of bushfire risk which may be relevant.

The tolerable level risk has been provided by PBP 2019 (see Table 7 and Table 8). The radiant heat and forms of bushfire attack can be reduced by increasing the size of the asset protection zones. However, this may have other knock on effects such as impacts on ecological integrity of adjoining land and indeed, the ability of developers and landholders to undertake works outside the site boundaries (i.e. within adjoining private or public land – National Park).

With respect to property loss, CSIRO studies have found that approximately 98% of all building loss has been found to occur on days when the FFDI exceeded 45 (Blanchi & Lucas, 2010). In events where the FFDI exceeds 50, fire suppression at any part of a fire line is virtually impossible due to the intensity and unpredictable behaviour of a fire (Leonard & Blanchi, 2012). The management of risk will need to be carefully considered within the Special Activation Precinct framework. Building design and construction, fuel management (APZ and separation), and restriction of use of the sites during forecast bad fire weather are the only effective defence mechanisms available once the FFDI has exceeded 50 (Blanchi & Lucas, 2010; Leonard & Blanchi, 2012).

In considering risk to life, it is incumbent to examine historical bushfire-related life loss research. In 2012, the CSIRO in conjunction with the Bushfire Corporative Research Centre undertook a comprehensive study into matters of both life and house loss across utilising over 110 years (1901-2011) of data across 260 bushfire events (Blanchi et al. 2012). Over this period, a total of 825 known civilian and firefighter fatalities have occurred (Blanchi et al. 2012)[11]. Important findings of this research are as follows:

- Fire weather and proximity to forest are very strong contextual drivers for defining the potential for fatalities to occur.
- 78% of all fatalities occurring within 30m of the forest and 50% of all fatalities occurring on days exceeding an FFDI of 100
- The location of fatal exposure provides a useful context with 58% occurring out in the open and 28% occurring inside structures, of particular interest is the fact that for bushfires occurring under weather conditions exceeding an FFDI value of 100, fatalities within structures represents over 75% of all fatalities.

[11] https://www.bushfirecrc.com/sites/default/files/managed/resource/life_house_loss_report_final_0.pdf

- 50% of all recorded facilities have occurred on days exceeding FFDI 100 (most fatalities occur as a result of infrequent but high magnitude events)
- Late evacuation is the most common activity persons were engaged in at time of death (30.3 per cent) followed by sheltering inside a structure (24.8 per cent) and defending a property outside (20.7 per cent)
- For those instances where sufficient data is available with respect to fatalities occurring during the act of evacuation, most were trapped on roads by either fallen trees or become bogged, the remainder having run off the road due to poor visibility as a result of smoke conditions;
- In terms of location of fatal exposure, 50 per cent occurred out in the open (including persons found outside structures and outside vehicles), 28 per cent occurred inside structures and in events where FFDI exceeded 100, fatalities within structures represented over 75 per cent of life loss
- The percentage of fatalities within structures appears to be increasing over time, mostly attributed to the 2009 Victorian Bushfires where 118 of the 173 fatalities occurred inside a structure
- Most fatalities occur between the hours of 3pm and 9pm – when FFDI is at its peak (3pm) and when summer cool-change winds occur. 90 per cent of fatalities occur immediately after afternoon wind changes

In considering the above findings, there remain two key contextual matters which reflect the extent of fatalities in certain situations, including:

1. there is a direct relationship between fire intensity (as a function of FFDI) and both property and life loss, over distance from the bushland interface; and
2. the afternoon cool-wind change is likely a key phenomenon in situations where life loss occurs. These winds change the direction of the fire front, where the wide fire flank transitions to the head of the fire, creating a drastic spike in fire intensity and rate of spread over a wide distance and in a direction, which is not anticipated by the general community. These situations can lead to higher proportions of people taking passive shelter (i.e. the window to evacuate has passed) and attempting late evacuation, as can the 'wait and see' mindset. Topographic conditions can also result in the same effect, where residents may not be aware of an approaching fire until it reaches a nearby ridgeline.

Considering the isolation and high risk nature of the sites within the alpine areas and the Snowy Mountains Special Activation Precinct area, a key risk management activity will be to not expose people to unreasonable risk and to provide multiple redundant systems/ options for people who may be caught by fire and cannot evacuate out of bushfire prone areas.

The most effective way to reduce loss of life risk is to not occupy the sites above established thresholds for FFDI and fires within the surrounding landscape. This would need to occur with an understanding of the evacuation time from the sites to a central location and or out of the mountains. Planning for bushfire evacuation is an immensely difficult task. Unlike flood and other events, bushfire events are not a 'known quantity'. There is no surety in when or where an ignition may occur, the direction it may spread, the extent of possible ember attack, fire propagation etc. The impact of smoke and limited visibility in emergency situations, coupled with wind impact, can lead to issues on tracks and roads as people attempt to evacuate. The evacuation planning for the Snowy Mountains Special Activation Precinct will be a crucial consideration and determinant for utilisation.

9.3. Access and Egress

PBP 2019 requires a study of the existing and proposed road networks both within and external to the master plan area or site layout. Key considerations are:

- The capacity for the proposed road network to deal with evacuating residents and responding emergency services, based on the existing and proposed community profile;
- The location of key access routes and direction of travel; and
- The potential for development to be isolated in the event of a bushfire.

These requirements will need to be considered by the traffic engineers and master planners.

9.3.1. Planning for Bushfire Protection Isolated Development and Activities

The Alpine Resorts, proposed new development areas and associated areas are isolated development (within a remote area[12]) by PBP 2019 where occupants may need to travel large distances through bushfire prone vegetation, and firefighters may be hindered from providing assistance. The range of activities undertaken within the National Park places people in remote areas. The Mt Kosciuszko walk is one of Australia's most iconic walks with thousands of people walking the trail over the Christmas and New Year period. From a Master planning perspective, the activities within the KNP will need to be considered and how these translate to the NPWS Operations Plans.

PBP 2019 (p. 40) provides provisions that will need to be considered as part of the Snowy Mountains Special Activation Precinct:

- *access and egress within the developable land and along the adjoining public road system shall include safety provisions for attending emergency service vehicles and evacuating residents, including road widths and management of vegetation along road verges. Clearing or modifying vegetation in roadside verges of existing road reserves may not be permitted;*
- *subdivision design shall include perimeter roads separating developable lots from hazardous bushland areas. The objective of perimeter roads is to not only provide a fuel free area adjacent to the hazard but to also ensure suitable unrestricted access for firefighting and fire management purposes. Maintenance of perimeter roads shall be the responsibility of the cluster community;*

[12] Planning for Bushfire Protection 2019 p. 111

- *access for maintenance of APZ and other fuel management activities;*
- *larger APZs outside of the range prescribed in PBP and increased Bushfire Attack Level (BAL) to proposed buildings to create a safer area for occupants and firefighters remaining on site; and*
- *firefighting water supply and associated firefighting equipment (i.e. pump and hose) for each dwelling in addition to any reticulated water supplies.*

PBP 2019 requires that the location and design of access roads enables safe access and egress for people attempting to leave the area at the same time that emergency service personnel are arriving to undertake firefighting operations. However, as the alpine resorts are isolated development, the reliance on road infrastructure to and from the resorts may be reduced. Commensurately, emphasises on access arrangements within the resorts will need careful consideration to facilitate emergency management arrangements. Parking and availability of unimpeded access will be a key consideration in the master planning process.

9.3.2. Emergency Management and Evacuation

For isolated development, particularly within the alpine areas, emergency management arrangements and evacuation will be crucial to ensuring that the right balance is found between the availability of areas to be developed with the absolute need to protect human life and to provide a safe operating environment for fire fighters.

Matters for policy consideration & special policy frameworks for the Alpine Areas include:

- Community Refuges[13]
- Neighbourhood Safer Places and places of last resort
- Private Bushfire Shelters[14]
- Management arrangements within the National Park and triggers for various actions
- Construction standards and designs to provide minimum standards
- Evacuation planning & arrangements
- Networked systems and alerts
- Messaging and warnings

[13] https://www.cfa.vic.gov.au/plan-prepare/community-fire-refuges
[14] https://www.abcb.gov.au/Resources/Publications/Education-Training/Private-Bushfire-Shelters

- Communication towers and communications networks and vulnerability[15]
- Community Protection Plans[16]
- Other warning mechanisms – i.e. sirens[17]
- Plans of Management and associated works

The focus of the Emergency Management and Evacuation arrangements should recognise the isolated nature of the Alpine Areas and put in place strategies that do not expose people to the effects of bushfire attack.

9.4. Emergency Services

The RFS is established by the Rural Fires Act 1997 (NSW). One of the objects of the Act is to provide 'for the protection of persons from injury or death, and property from damage, arising from fires' (s 3(c)). To this end the RFS is to 'provide rural fire services' in proclaimed rural fire districts (ss 6 and 9(1)(a)) and to assist the other emergency services, including Fire and Rescue NSW (FRNSW) (s 9(1)(b)).

For each local government area there should be a local emergency management plan prepared by the Local Emergency Management Committee (State Emergency and Rescue Management Act 1989 (NSW) ss 27-32). A function of the Committee is to 'facilitate local level emergency management capability through inter-agency co-ordination, co-operation and information sharing arrangements' (s 29(1A)(e)). The 2017 Snowy Monaro Local Emergency Management Plan (EMPLAN) has been prepared by the Snowy Monaro Local Emergency Management Committee.

Any fire fighting authority may make the first response to a bushfire. This responding fire fighting authority will take immediate steps to advise the land manager and relevant fire fighting authority in whose area the fire is burning, or will advise in accordance with any Memorandum of Understanding or Mutual Aid Agreement, of action being taken.

Mutual Aid Agreements (MAA) at a local level enhance interagency communication and community safety. They enable sharing of resources and the providing of better services to the community. A Memorandum of Understanding (MOU) exists between the RFS and Fire and Rescue NSW (FRNSW) to ensure a complementary and comprehensive fire service for the community of NSW. It recognises the complementary urban and rural focus of the respective services and the FRNSW's additional rescue and

[15] https://www.rfs.nsw.gov.au/__data/assets/pdf_file/0012/4314/Practice-Note-1-11-Telecommunications-Towers-in-Bush-Fire-Prone-Areas.pdf
[16] https://www.rfs.nsw.gov.au/plan-and-prepare/know-your-risk/community-protection-plans
[17] https://www.cfa.vic.gov.au/warnings-restrictions/community-alert-sirens

statewide hazmat roles.

9.4.1. Water supply

Water supply is one of the key bushfire protection measures identified by NSWRFS in PBP 2018. All future development will need to comply with the water requirements of PBP 2019.

9.4.2. Roads and the road network

Consideration of risk relating to road infrastructure is generally associated with permitting safe Evacuation rather than direct impact on the road itself. However, damage can occur as a result of traffic accidents, tree falls and melting pavement as a result of bushfire attack. Road reserves for this reason should typically be void of vegetation wherever possible.

Jindabyne is serviced by a number of roads that provide options for evacuation within the township. The alpine areas are services by Alpine Way which is a through road – although it traverses large expanses of bushfire prone vegetation and Kosciusko Road which is not a through road. The roads and those caught using them in the event of a bushfire are considered highly vulnerable to the various forms of bushfire attack. No upgrades to roads have been proposed as part of the Snowy Mountains Special Activation Precinct.

9.4.3. Electricity Infrastructure

Consideration of electricity supplies is important from a bushfire resilience perspective in terms of the community's ability to access information and warnings, to power pumps to essential services (i.e. to pump stations and reservoirs), etc. Notwithstanding this, power outages in bushfire events is common however, undergrounding of services can mean all the difference during emergencies in addition to avoid a potential new ignition sources.

9.4.4.Telecommunications

Telecommunications and data (digital connectivity) has become the cornerstone of modern bushfire and emergency management. State and territory governments issue emergency warnings to the community with the Emergency Alert system. An emergency warning is a message signaling an imminent hazard such as a bushfire, which may include advice on protective measures.

Emergency Alert is the national telephone warning system used by emergency services to send voice messages to landlines and text messages to mobile phones within a defined area about likely or actual emergencies. Emergency Alert is one way of warning communities and will not be used in all circumstances by emergency services. Emergency Alert relies on telecommunications networks to send messages, and message delivery cannot be guaranteed due to a range of reasons. The purpose of an emergency warning is to inform the community of an impending or current threat and to prompt an appropriate response or action.

Emergency warnings are a primary tool for disaster management and play a significant role in the protection and resilience of Australian communities. Emergency warnings have the potential to significantly reduce the impact of disasters on communities, properties and the environment when they are combined with the community's understanding of environmental risks and disaster preparedness.

The rapid progression of technology and increasing number of warning options, together with community expectations that timely and accurate emergency warnings can always be delivered, has increased the complexity of managing emergency warnings.[18]

With the proposed increase in visitation to the Snowy Mountains and the provision of emergency warnings will be a fundamental component of an integrated emergency management capability, particularly for NPWS to advise people when remote areas may not be suitable for activities. These will have to be fleshed out by land and emergency managers to provide an appropriate management regimen for users within the National Park and associated areas.

Additional information will need to be sought as part of this project from telecommunication providers for telecommunications coverage and signal strength. Land and emergency managers will have to determine the acceptable level of coverage and put in place management arrangements that reflect the ability to provide emergency warnings. Depending on the findings, additional coverage may need to be negotiated with telecommunications providers.

[18] https://knowledge.aidr.org.au/media/5654/australias-emergency-warning-arrangements.pdf

9.4.5. Gas utilities

Gas infrastructure and bushfire are at obvious odds and thus, it is important the treatment of gas utilities is undertaken with the potential threat of bushfire in mind. This is articulated in PBP 2019.

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10. Overview of bushfire attack mechanisms

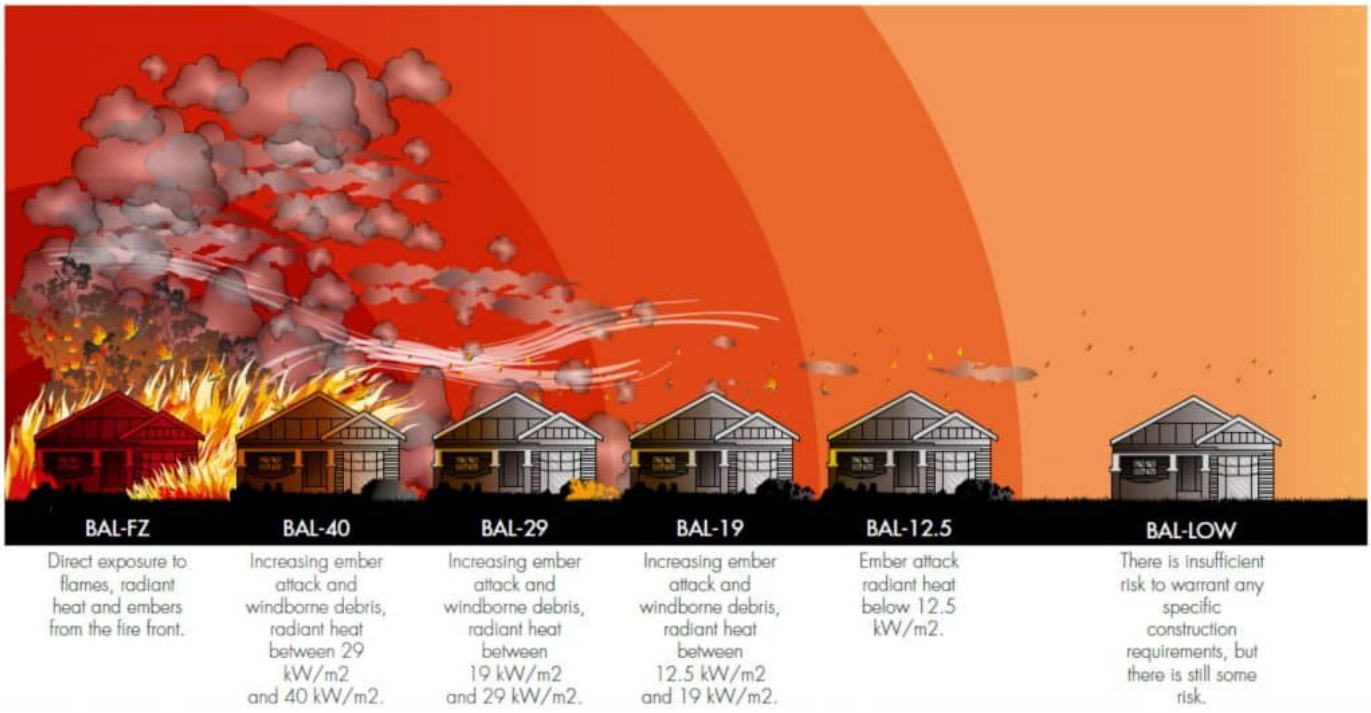
Bushfires have long remained a fundamental characteristic of the Australian bush landscape, and likewise Australians have long retained a strong affinity with bush environments. There remain a number of common factors which are associated with bushfire hazard and events and these include the incidence of fire weather, availability of fuel along with its type, structure and continuity or fragmentation, and the context of development at the bushland interface.

Bushfire attack refers to the various methods (see Figure 9) in which bushfire may impact upon life and property and principally encompass:

- Direct flame contact
- Ember attack
- Radiant heat flux
- Fire-driven wind
- Smoke

In the progression of a bushfire event, these methods interact either exclusively or in concert and are explained in the following section.

Figure 25 Forms of Bushfire Attack



10.1. Direct flame contact

Direct flame attack refers to flame contact from the main fire front, where the flame which engulfs burning vegetation is one and the same as that which assumes contact with the building. It is the highest level of bushfire attack as a consequence of direct flame contact from the fire front in addition to radiant heat flux and ember attack.

10.2. Ember attack

The convective forces of bushfire raise burning embers into the atmosphere on prevailing winds and deposit them to the ground ahead of the fire front. Typically, ember attack occurs approximately 30 minutes prior to the arrival of the fire front and continues during the impact of the fire front and for several hours afterwards, thus it is the longest lasting impact of bushfire attack.

Ember attack is attack by smoldering or flaming windborne debris that is capable of entering or accumulating around a building, and that may ignite the building or other combustible materials and debris.

In essence, building loss via ember attack relates largely to the vulnerabilities of each building, its distance from hazardous vegetation and whether an occupant (or the like) is present to actively defend it. It is estimated by the CSIRO that approximately 80 to 90 per cent of buildings lost by bushfire are lost as a result of ember attack either in isolation or in combination with radiant heat impact.

10.3. Radiant heat flux

Exposure to radiant heat remains one of the leading causes of fatalities associated with bushfire events. Measured in kilowatts per m^2 ($kWm^{2)}$, radiant heat is the heat energy released from the fire front which radiates to the surrounding environment, deteriorating rapidly over distance.

In terms of impact on buildings, radiant heat can pre-heat materials making them more susceptible to ignition, or can cause non-piloted ignition of certain materials if the energy transmitted reaches a threshold level. Radiant heat can also damage building materials such as window glazing, allowing openings into a building through which embers may enter. Radiant heat impact is an especially important factor in building-to-building ignition, with buildings becoming the fire source feature.

In terms of radiant heat exposure for humans, it can cause pain to unprotected skin in milder situations or life threatening and fatal injury in higher exposure thresholds. The effects of radiant heat are shown in Table 3.

Table 4 The effects of radiant heat (NSWRFS 2006)

Radiant Heat Flux	Likely Effects	Approx. distances
>29 – 110 kW/m²	Flame Zone	0 - 20 metres
29 kW/m²	Ignition of most timbers without piloted ignition (3 minutes exposure) (Level 3 construction) during the passage of a bush fire. Toughened glass could fail.	20 metres
19 kW/m²	Screened float glass could fail (Level 2 construction) during the passage of a bush fire.	27 metres
12.5 kW/m²	Standard float glass could fail (Level 1 construction) during the passage of a bush fire. Some timbers can ignite with prolonged exposure and with piloted ignition source (eg embers)..	40 metres
10 kW/m²	Critical conditions. Firefighters not expected to operate in these conditions although they may be encountered. Considered to be life threatening < 1 minute in protective equipment. Fabrics inside a building could ignite spontaneously with long exposures.	45 metres
7 kW/m²	Likely fatal to unprotected person after exposure for several minutes	55 metres
4.7 kW/m²	Extreme conditions. Firefighter in protective clothing will feel pain. (60 seconds exposure)	70 metres
3 kW/m²	Hazardous conditions. Firefighters expected to operate for a short period (10 minutes)	100 metres
2.1 kW/m²	Unprotected person will suffer pain after 1 minute exposure – non fatal.	140 metres

10.4. Fire driven wind

The convective forces of bushfire typically result in strong to gale force fire-driven winds which in itself, can lead to building damage. The typical effects of fire driven wind include the conveyance of embers, damage from branches and debris hitting the building, as well as direct damage to vulnerable building components such as lifting roofs or roof materials and the damage / breakage of windows.

10.5. Smoke

Smoke emission remains a secondary effect of bushfire and is one which is typically not addressed by bushfire assessments. Irrespective, it is important to note the potentially severe impact of smoke emission on the human respiratory system. It can lead to difficulties in breathing, severe coughing, blurred or otherwise compromised vision, and can prove fatal. It is also important to note that toxic smoke can occur during bushfire, particularly where buildings or materials are ignited. With regard to evacuation, it can reduce visibility and create difficulties for particularly vulnerable persons.

11. Bushfire Attack Levels

The Bushfire Attack Level (**BAL**) is a means of measuring the severity of a building's or sites potential exposure to ember attack, radiant heat and direct flame contact (see Table 5). In the Building Code of Australia through AS3959, the BAL is used as the basis for establishing the requirements for construction to improve protection of building elements and to understand the radiant heat exposures for people in the open.

The determination of BALs for key areas would be a key component for the master planning for the sites within the subject area.

Table 5 Radiant Heat Flux and Bushfire Attack Levels (source PBP 2019 p. 85)

Heat flux exposure	Description	AS 3959 construction level
N/A	Minimal attack from radiant heat and flame due to the distance of the building from the vegetation, although some attack by burning debris is possible. There is insufficient threat to warrant specific construction requirements.	BAL-LOW
≤12.5	Attack by burning debris is significant with radiant heat (not greater than 12.5kW/m^2). Radiant heat is unlikely to threaten building elements (such as unscreened glass). Specific construction requirements for ember protection and accumulation of debris are warranted.	BAL-12.5
>12.5 ≤19	Attack by burning debris is significant with radiant heat flux (not greater than 19kW/m^2) threatening some building elements (such as screened glass). Specific construction requirements for embers and radiant heat are warranted.	BAL-19
>19 ≤29	Attack by burning debris is significant and radiant heat flux (not greater than 29kW/m^2) threatens building integrity. Specific construction requirements for ember and higher levels of radiant heat are warranted. Some flame contact is possible.	BAL-29
>29 ≤40	Radiant heat flux and potential flame contact could threaten building integrity.	BAL-40
>40	Significant radiant heat and significantly higher likelihood of flame contact from the fire front will threaten building integrity and result in significant risk to residents.	BAL-FZ

The BAL assessment is not part of the scope of works for the Bushfire Context Assessment or Bushfire Strategic Study.

12. Asset protection zones

An APZ is a buffer zone between a bushfire hazard and buildings. The APZ is managed progressively to minimise fuel loads and reduce potential radiant heat levels, flame, smoke and ember attack. The appropriate APZ distance is based on FFDI, vegetation type, slope and the nature of the development. The APZ can include roads or land managed to be consistent with APZ standards set out in RFS document *Standards for Asset Protection Zones*.

The APZ provides a fuel-reduced, physical separation between buildings and bushfire hazards. The APZ is a key element in the suite of bushfire measures and dictates the type of construction necessary to mitigate bushfire attack. There is a converse relationship between the size of the APZ and the BAL. The larger the APZ, the lower the BAL. The smaller the APZ, the higher the BAL.

A fundamental principle within PBP 2019 (p. 28) is that:

> *An APZ imposed by a development consent condition must be maintained for the lifetime of the development, unless modified by a subsequent consent. In order to guarantee that an APZ can be managed in perpetuity, APZs should be contained within the overall development site and not on adjoining lands.*

APZ considerations, including inputs, outputs, acceptable locations and acceptable management will need to be worked through as part of the Snowy Mountains Special Activation Precinct design and development process.

The APZs associated with new SFPP development are based on vulnerable SFPP Uses achieving 10kW of radiant heat at the building and lower risk SFPP achieving BAL 29. The APZ requirements for new SFPP development in accordance with PBP 2019 are considerable (see Table 6) and specific refence is made within Table A1.12.1 of PBP 2019 relating to sub alpine woodland (yellow highlight in Table 6) that makes clear RFS intent to capture these particular vegetation types within the table for SFPP development (see Section 9.1.7).

APZs for some of the areas within the master plan around Jindabyne are shown in Attachment 19. The Sports and Education Precinct is a key sub precinct that has existing and proposed new development that is SFPP. The Sports Precinct has an existing Bushfire Management Plan that provides some asset protection and managed areas.

Table 6 Special Fire Protection Purpose APZ Requirements

Minimum distances for APZs – SFPP developments (≤10kW/m², 1200K)

KEITH VEGETATION FORMATION	EFFECTIVE SLOPE				
	Up slopes and flat	>0°-5°	>5°-10°	>10°-15°	>15°-20°
	Distance (m) from the asset to the predominant vegetation formation				
Rainforest	38	47	57	69	81
Forest (wet and dry sclerophyll) including Coastal Swamp Forest, Pine Plantations and Sub-Alpine Woodland	67	79	93	100	100
Grassy and Semi-Arid Woodland (including Mallee)	42	50	60	72	85
Forested Wetland (excluding Coastal Swamp Forest)	34	42	51	62	73
Tall Heath	50	56	61	67	72
Short Heath	33	37	41	45	49
Arid-Shrublands (acacia and chenopod)	24	27	30	34	37
Freshwater Wetlands	19	22	25	28	30
Grassland	36	40	45	50	55

Similarly, for subdivision, sub alpine woodland is identified as a vegetation formation with commensurate APZs (Table 7) and is based on the Snowy Monaro FFDI of 80 as per RFS *NSW Local Government Areas FDI* (May 2017).

Table 7 Minimum distances for new residential subdivision

Minimum distances for APZs – residential development, FFDI 80 areas (≤29kW/m², 1090K)

KEITH VEGETATION FORMATION	EFFECTIVE SLOPE				
	Up slopes and flat	>0°-5°	>5°-10°	>10°-15°	>15°-20°
	Distance (m) from the asset to the predominant vegetation formation				
Rainforest	9	12	15	20	25
Forest (wet and dry sclerophyll) including Coastal Swamp Forest, Pine Plantations and Sub-Alpine Woodland	20	25	31	39	48
Grassy and Semi-Arid Woodland (including Mallee)	11	13	17	21	27
Forested Wetland (excluding Coastal Swamp Forest)	8	10	13	17	22
Tall Heath	16	18	20	22	25
Short Heath	9	10	12	13	15
Arid-Shrublands (acacia and chenopod)	6	7	8	9	10
Freshwater Wetlands	5	6	6	7	8
Grassland	10	11	12	14	16

The provision of APZs for Jindabyne has been calculated and provided at Attachment 19. The proposed development areas are large enough to accommodate the required APZs within the boundaries of the development areas. The provision of APZs for Jindabyne can meet the requirements of PBP 2019.

For new lease areas and new tourist development within the Alpine areas, the RFS have indicated that APZs should be applied in accordance with PBP 2019. The provision of APZs for the Alpine areas is being worked through with the RFS and other key stakeholders.

13. Conclusion

The Bushfire Context Analysis has been completed for the Snowy Mountains Special Activation Precinct. This Bushfire Context Analysis considers the extent of potential bushfire risk relevant to the existing and proposed utilisation of the Snowy Mountains Special Activation Precinct and the development of the Master plan for the area.

This assessment has been undertaken through the lens of meeting the minimum requirements of PBP 2019 and a risk-based land use planning in order to analyse the extent of bushfire risk considerations and the legislative and policy considerations to provide for the protection of human life and minimise impacts on property from the threat of bushfire, while having due regard to development potential, site characteristics and protection of the environment.

This report has identified the most appropriate balance between risk acceptability and the unique challenges within the alpine areas. Bushfire will be a key consideration in the development of the Snowy Mountains Special Activation Precinct Master Plan. The APZ requirements for areas within the master plan around Jindabyne are shown in Attachment 19.

Appendix 1 References

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NSW Government (1979) Environmental Planning and Assessment Act 1979. NSW Government Printer

Appendix 2 Strategic Bushfire Study Requirements

source Planning for Bushfire Protection 2019 p. 35.

Table 4.2.1

Bush Fire Strategic Study

ISSUE	DETAIL	ASSESSMENT CONSIDERATIONS
Bush fire landscape assessment	A bush fire landscape assessment considers the likelihood of a bush fire, its potential severity and intensity and the potential impact on life and property in the context of the broader surrounding landscape.	❯ The bush fire hazard in the surrounding area, including: ❯ Vegetation ❯ Topography ❯ Weather ❯ The potential fire behaviour that might be generated based on the above; ❯ Any history of bush fire in the area; ❯ Potential fire runs into the site and the intensity of such fire runs; and ❯ The difficulty in accessing and suppressing a fire, the continuity of bush fire hazards or the fragmentation of landscape fuels and the complexity of the associated terrain.
Land use assessment	The land use assessment will identify the most appropriate locations within the masterplan area or site layout for the proposed land uses.	❯ The risk profile of different areas of the development layout based on the above landscape study; ❯ The proposed land use zones and permitted uses; ❯ The most appropriate siting of different land uses based on risk profiles within the site (i.e. not locating development on ridge tops, SFPP development to be located in lower risk areas of the site); and ❯ The impact of the siting of these uses on APZ provision.
Access and egress	A study of the existing and proposed road networks both within and external to the masterplan area or site layout.	❯ The capacity for the proposed road network to deal with evacuating residents and responding emergency services, based on the existing and proposed community profile; ❯ The location of key access routes and direction of travel; and ❯ The potential for development to be isolated in the event of a bush fire.
Emergency services	An assessment of the future impact of new development on emergency services.	❯ Consideration of the increase in demand for emergency services responding to a bush fire emergency including the need for new stations/ brigades; and ❯ Impact on the ability of emergency services to carry out fire suppression in a bush fire emergency.
Infrastructure	An assessment of the issues associated with infrastructure and utilities.	❯ The ability of the reticulated water system to deal with a major bush fire event in terms of pressures, flows, and spacing of hydrants; and ❯ Life safety issues associated with fire and proximity to high voltage power lines, natural gas supply lines etc.
Adjoining land	The impact of new development on adjoining landowners and their ability to undertake bush fire management.	❯ Consideration of the implications of a change in land use on adjoining land including increased pressure on BPMs through the implementation of Bush Fire Management Plans.

Attachment 1 Planning Direction

(source https://www.planning.nsw.gov.au/-/media/Files/DPE/Directions/ministerial-direction-s9-1-consolidated-list-environment-planning-and-assessment-2020-04-17.pdf?la=en)

4.4 Planning for Bushfire Protection

Objectives

(1) The objectives of this direction are:

- (a) to protect life, property and the environment from bush fire hazards, by discouraging the establishment of incompatible land uses in bush fire prone areas, and
- (b) to encourage sound management of bush fire prone areas.

Where this direction applies

(2) This direction applies to all local government areas in which the responsible Council is required to prepare a bush fire prone land map under section 146 of the *Environmental Planning and Assessment Act 1979* (the EP&A Act), or, until such a map has been certified by the Commissioner of the NSW Rural Fire Service, a map referred to in Schedule 6 of that Act.

When this direction applies

(3) This direction applies when a relevant planning authority prepares a planning proposal that will affect, or is in proximity to land mapped as bushfire prone land.

What a relevant planning authority must do if this direction applies

(4) In the preparation of a planning proposal the relevant planning authority must consult with the Commissioner of the NSW Rural Fire Service following receipt of a gateway determination under section 56 of the Act, and prior to undertaking community consultation in satisfaction of section 57 of the Act, and take into account any comments so made,

(5) A planning proposal must:

- (a) have regard to *Planning for Bushfire Protection 2006*,
- (b) introduce controls that avoid placing inappropriate developments in hazardous areas, and
- (c) ensure that bushfire hazard reduction is not prohibited within the APZ.

(6) A planning proposal must, where development is proposed, comply with the following provisions, as appropriate:

- (a) provide an Asset Protection Zone (APZ) incorporating at a minimum:
  - (i) an Inner Protection Area bounded by a perimeter road or reserve which circumscribes the hazard side of the land intended for development and has a building line consistent with the incorporation of an APZ, within the property, and
  - (ii) an Outer Protection Area managed for hazard reduction and located on the bushland side of the perimeter road,
- (b) for infill development (that is development within an already subdivided area), where an appropriate APZ cannot be achieved, provide for an appropriate performance standard, in consultation with the NSW Rural Fire Service. If the provisions of the planning proposal permit Special Fire Protection Purposes (as defined under section 100B of the *Rural Fires Act 1997*), the APZ provisions must be complied with,
- (c) contain provisions for two-way access roads which links to perimeter roads and/or to fire trail networks,
- (d) contain provisions for adequate water supply for firefighting purposes,
- (e) minimise the perimeter of the area of land interfacing the hazard which may be developed,
- (f) introduce controls on the placement of combustible materials in the Inner Protection Area.

Consistency

(7) A planning proposal may be inconsistent with the terms of this direction only if the relevant planning authority can satisfy the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General) that the council has obtained written advice from the Commissioner of the NSW Rural Fire Service, to the effect that, notwithstanding the non-compliance, the NSW Rural Fire Service does not object to the progression of the planning proposal.

Direction 4.4 – issued 1 July 2009

Attachment 2 Visitor Leave Zone

BUSH FIRE INFORMATION

COMMUNITY NEWSLETTER

Information for VISITORS & TOURISTS in the Snowy Monaro Region

Issued at 7 January, 2020 at 10:30am

Situation

A large part of the Snowy Monaro region remains in a Visitor Leave Zone (see map).

It remains unsafe for visitors and tourists to be in this area.

While all fires across the region are at Advice level, these fires continue to actively burn. Cooler conditions are currently being experienced, however, conditions will change.

Outlook

Under predicted weather conditions for Friday 10 January, higher temperatures and north-westerly winds will increase fire activity across the Snowy Monaro region and fires may impact areas within the Visitor Leave Zone.

Advice

- Visitors and tourists should not plan to be in the Visitor Leave Zone as we approach Friday 10 January
- Visitors and tourists currently located in the Visitor Leave Zone are advised to leave

Evacuation Centres

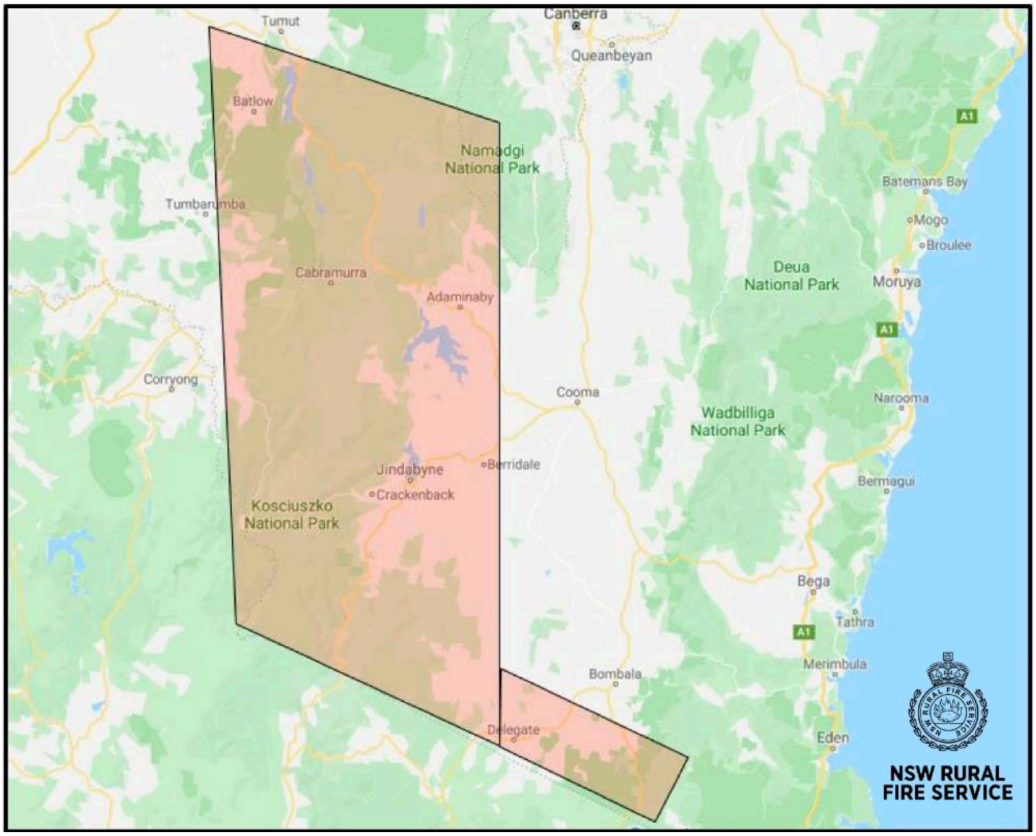
Evacuation centres in Bombala and Cooma are temporarily closed due to cooler conditions but will be opened if needed as fire activity increases. For anyone requiring emergency accommodation or assistance should call 1800 018 444.

Information

- Updates on this fire are also available at www.rfs.nsw.gov.au or by calling call 1800 NSW RFS (1800 679 737).
- For information on road conditions or closures, please call the NSW RTA on 131 700 or check www.rta.nsw.gov.au. Remember roads may be closed without warning.
- Online registration for register.find.reunite at www.register.redcross.org.au
- **If you need to report a new fire or require urgent assistance, dial Triple Zero (000).**

Stay up to date at www.rfs.nsw.gov.au or by calling 1800 NSW RFS (1800 679 737)

Visitor Leave Zone



For current incidents or major fire updates visit www.rfs.nsw.gov.au **RFS State Duty Media Officer (02) 9898 1855**

Attachment 3 Bushfire Prone Land Map Jindabyne

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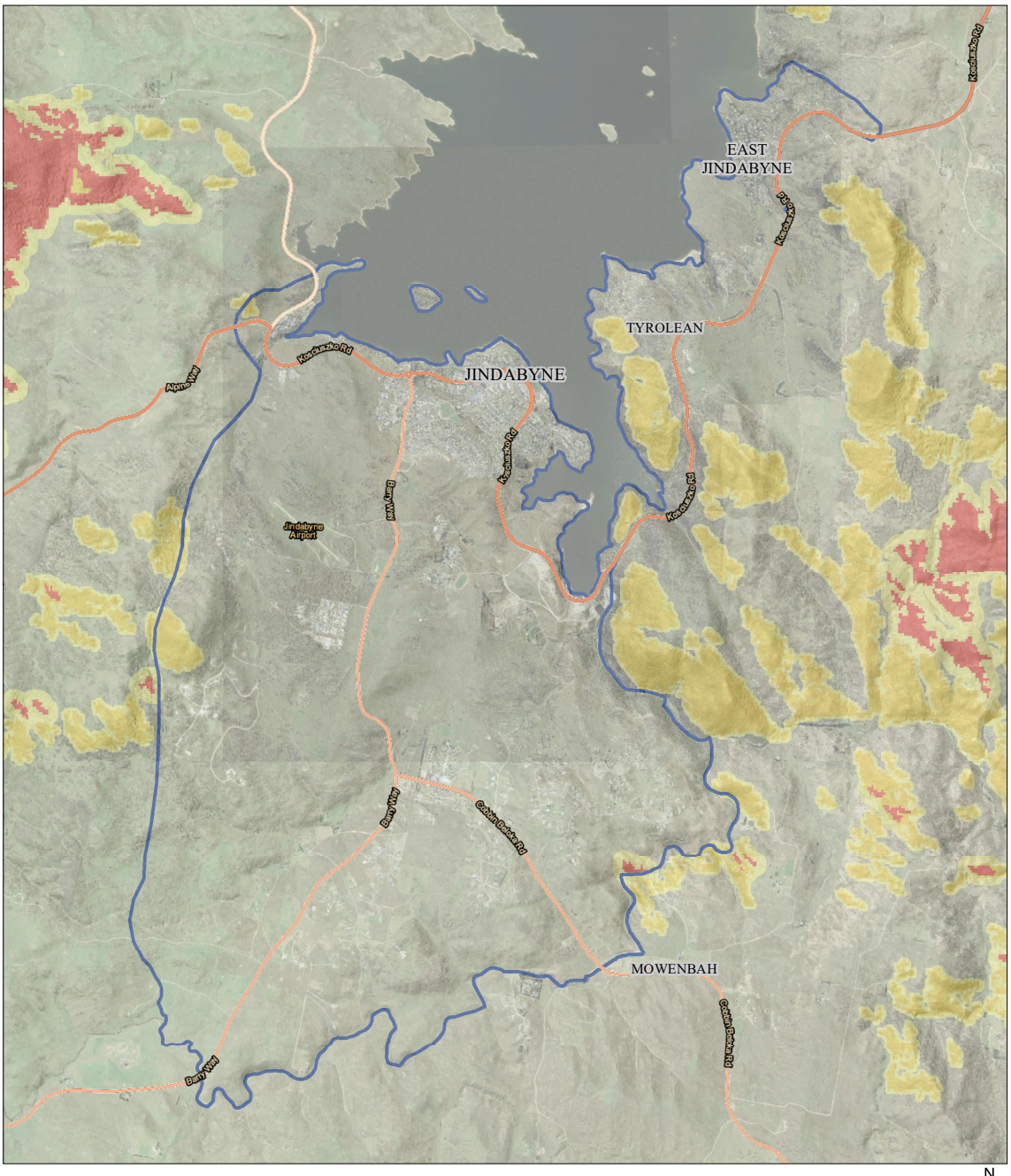

Legend

- Jindabyne GO

Bushfire Prone Land

- Vegetation Buffer
- Vegetation Category 1
- Vegetation Category 2

N

DKGIS
Date: 4/06/2020

0 250 500 1,000 1,500
Metres

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

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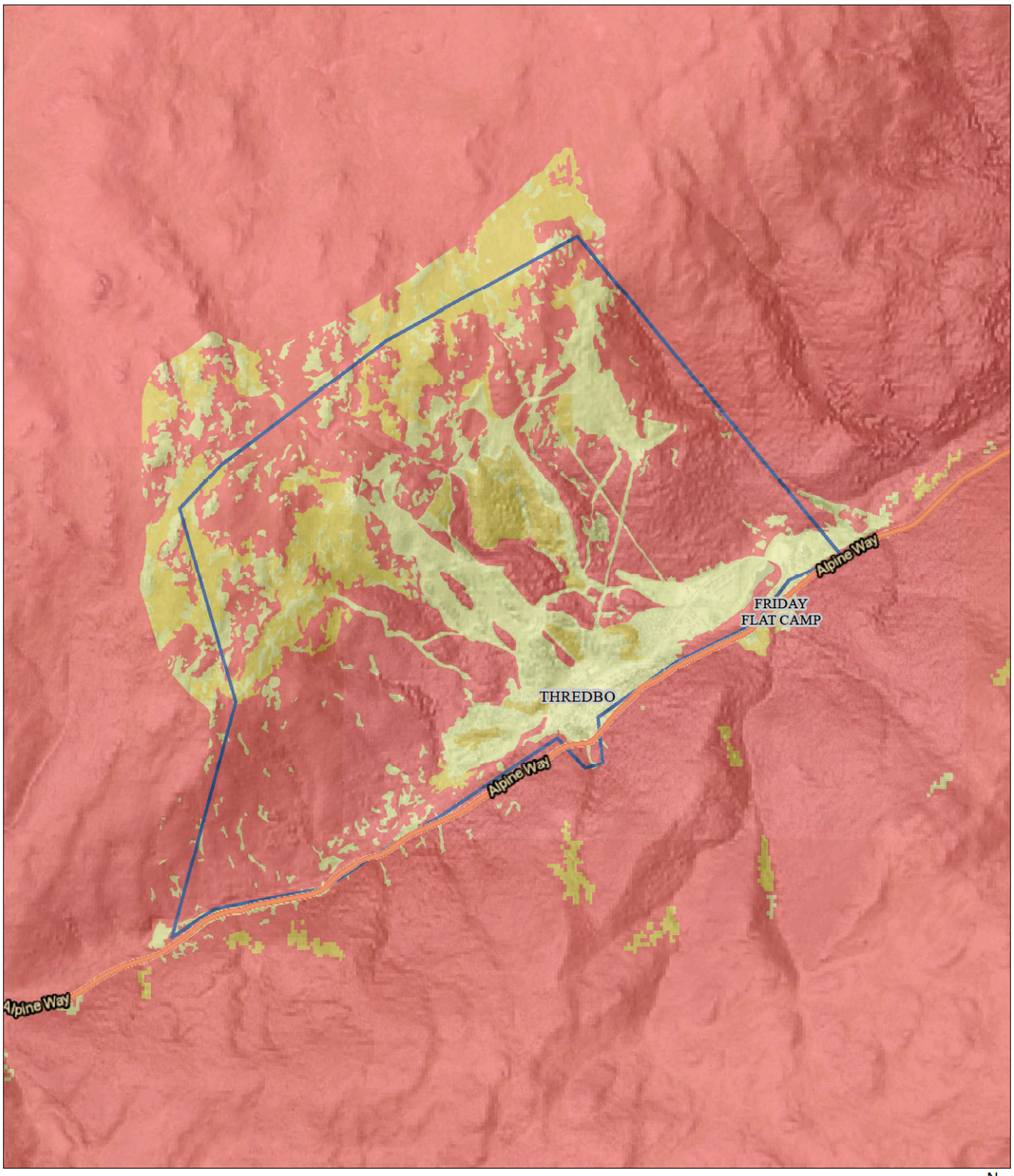
Attachment 4 Bushfire Prone Land Map Thredbo



Legend

SAP Precinct

Bushfire Prone Land

Vegetation Buffer

Vegetation Category 1

Vegetation Category 2

N

DKGIS

Date: 4/06/2020

0 335 670 1,340 2,010

Metres

Coordinate System: GDA 1994 MGA Zone 55

Imagery: © Dept. of Finance, Services & Innovation 2018

Attachment 5 Bushfire Prone Land Map Charlotte Pass

Legend

- SAP Precinct

Bushfire Prone Land

- Vegetation Buffer
- Vegetation Category 1
- Vegetation Category 2

N

DKGIS

Date: 4/06/2020

0 137.5 275 550 825

Metres

Coordinate System: GDA 1994 MGA Zone 55

Imagery: © Dept. of Finance, Services & Innovation 2018

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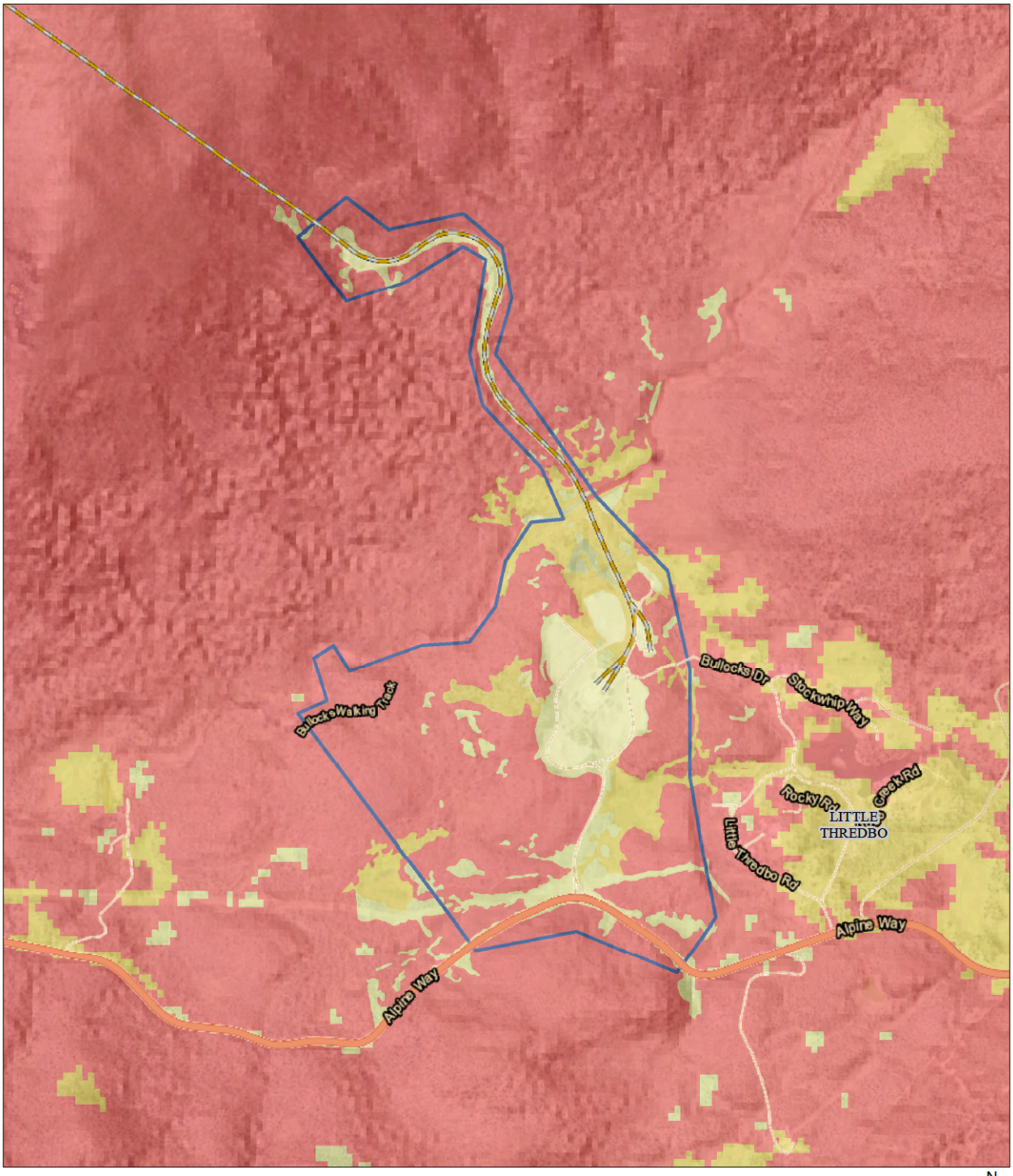
Attachment 6 Bushfire Prone Land Map Little Thredbo



Legend

- SAP Precinct

Bushfire Prone Land

- Vegetation Buffer
- Vegetation Category 1
- Vegetation Category 2

N

DKGIS

Date: 4/06/2020

0 175 350 700 1,050

Metres

Coordinate System: GDA 1994 MGA Zone 55

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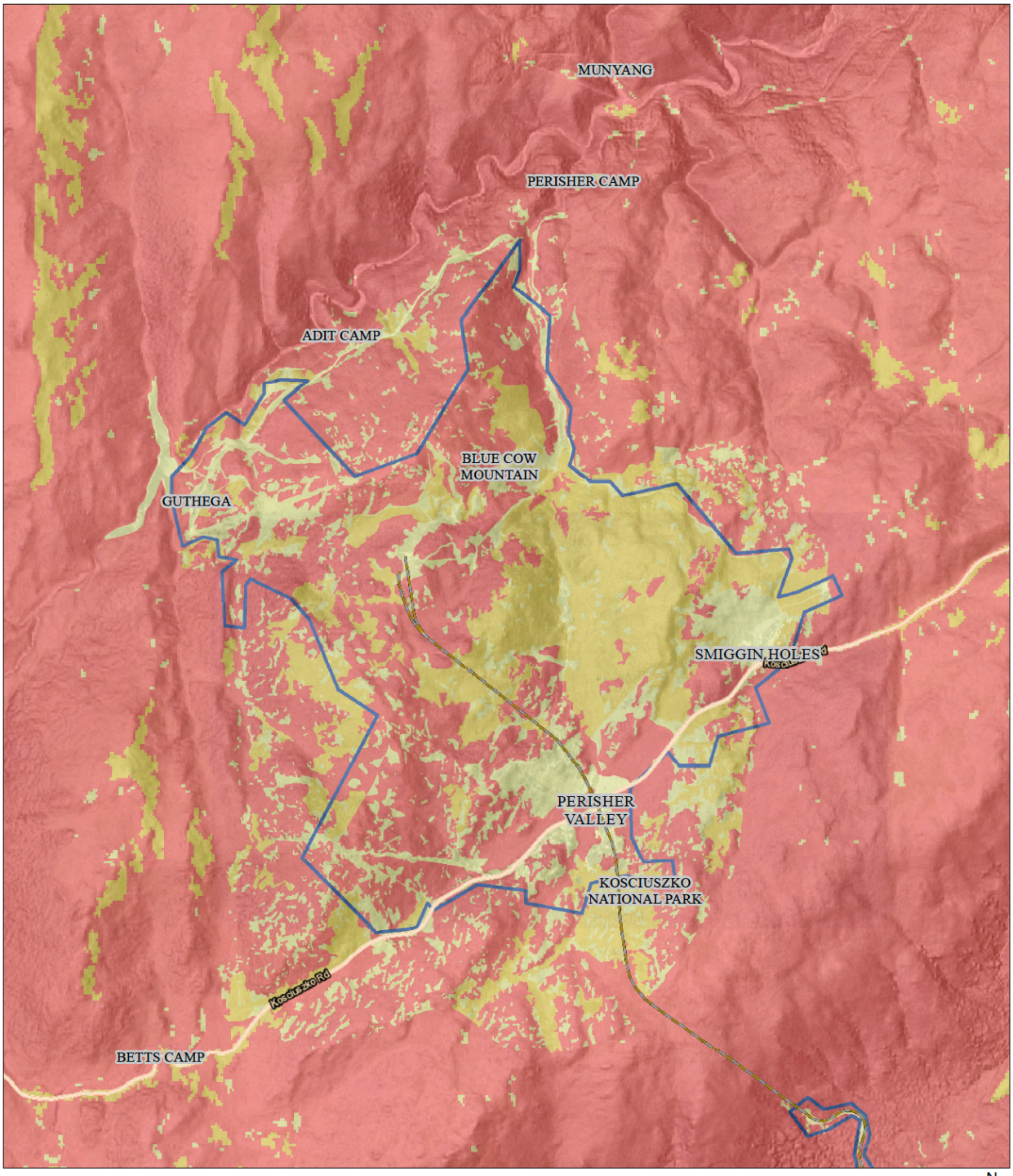
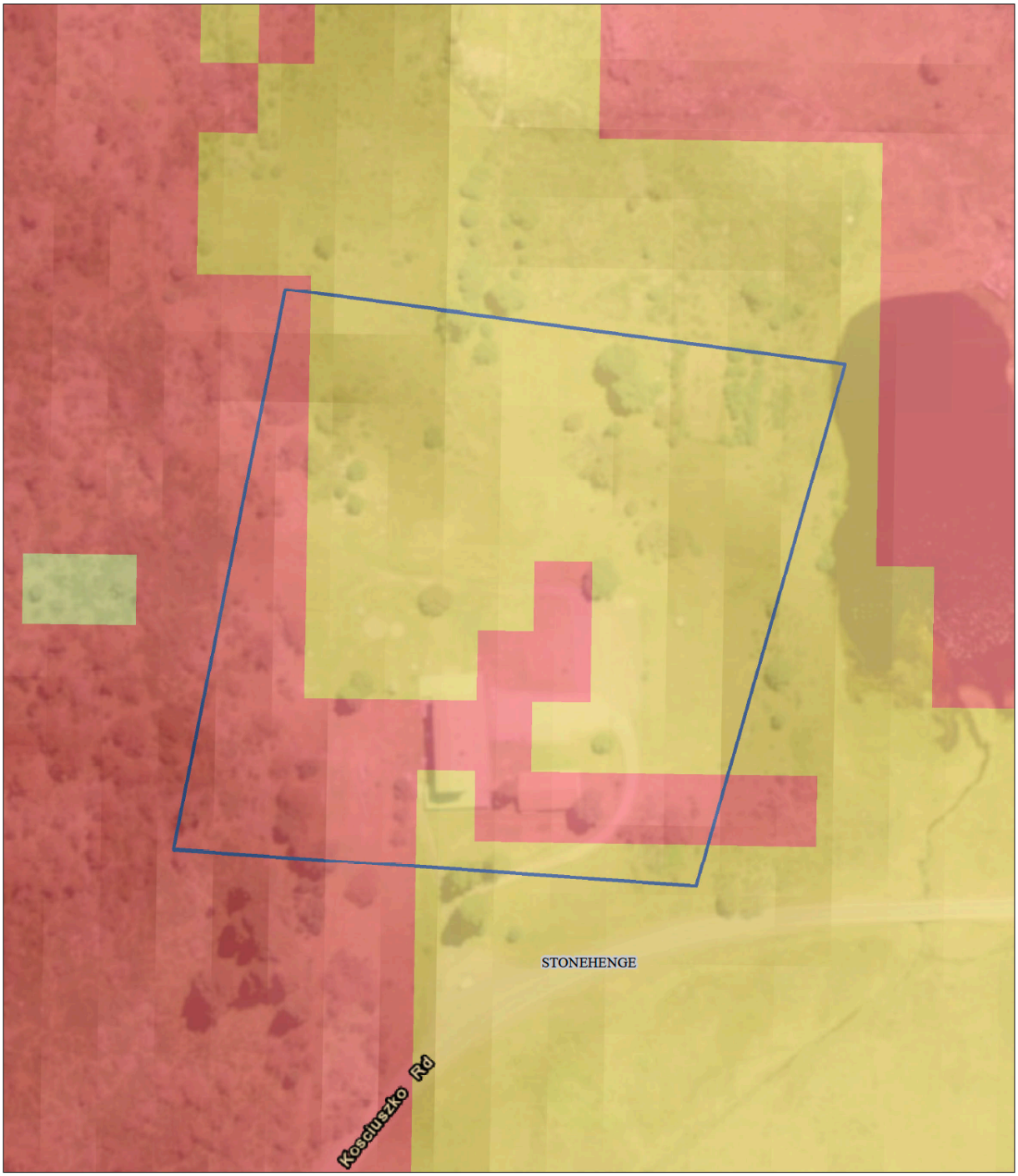
Attachment 7 Bushfire Prone Land Map Perisher, Smiggins & Blue Cow



Attachment 8 Bushfire Prone Land Map Sponars



Legend

SAP Precinct

Bushfire Prone Land

Vegetation Buffer

Vegetation Category 1

Vegetation Category 2

N

DKGIS

Date: 4/06/2020

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Metres

Coordinate System: GDA 1994 MGA Zone 55

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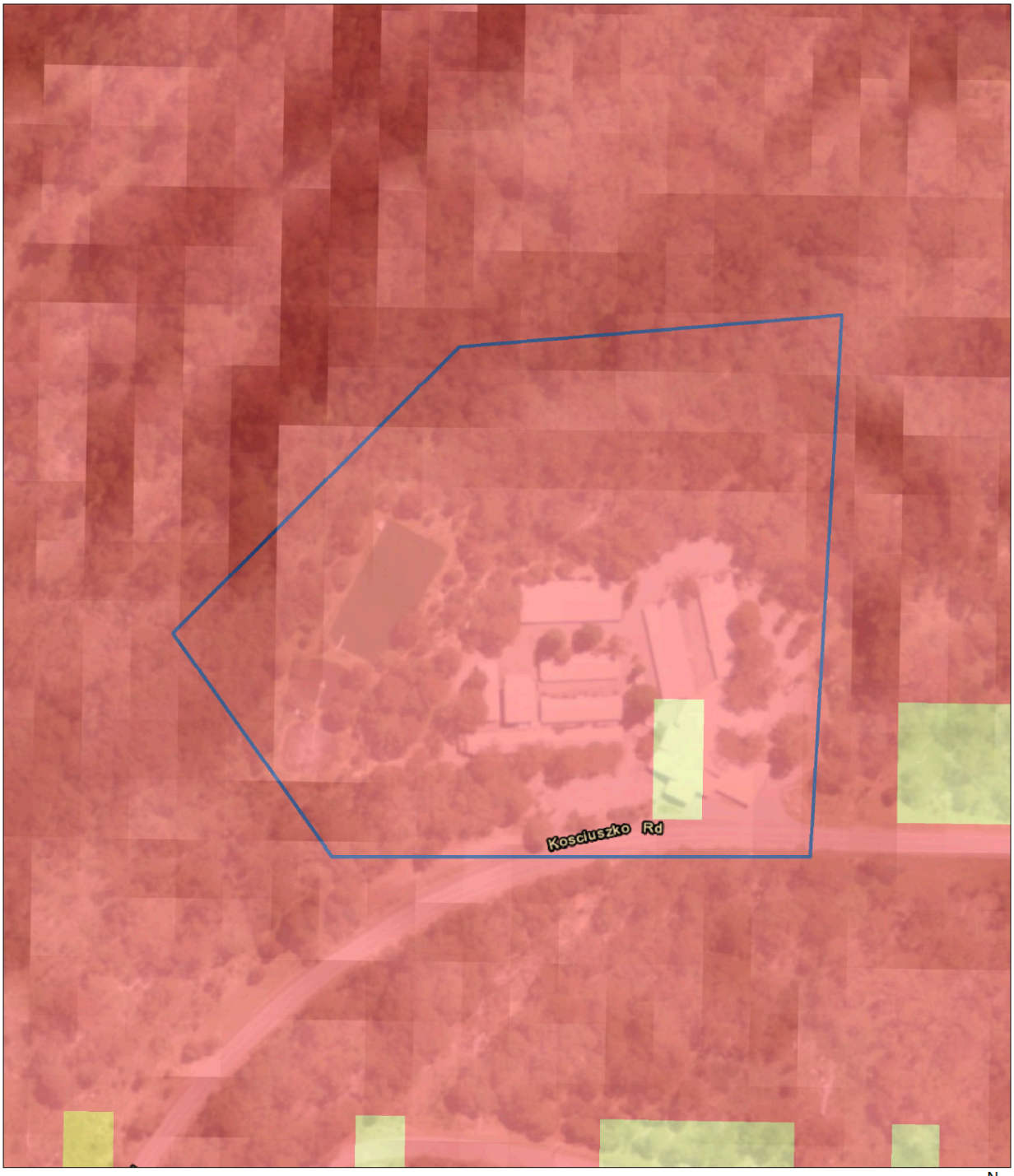
Attachment 9 Bushfire Prone Land Map Sponars Chalet



Legend

- SAP Precinct

Bushfire Prone Land

- Vegetation Buffer
- Vegetation Category 1
- Vegetation Category 2

N

DKGIS

Date: 4/06/2020

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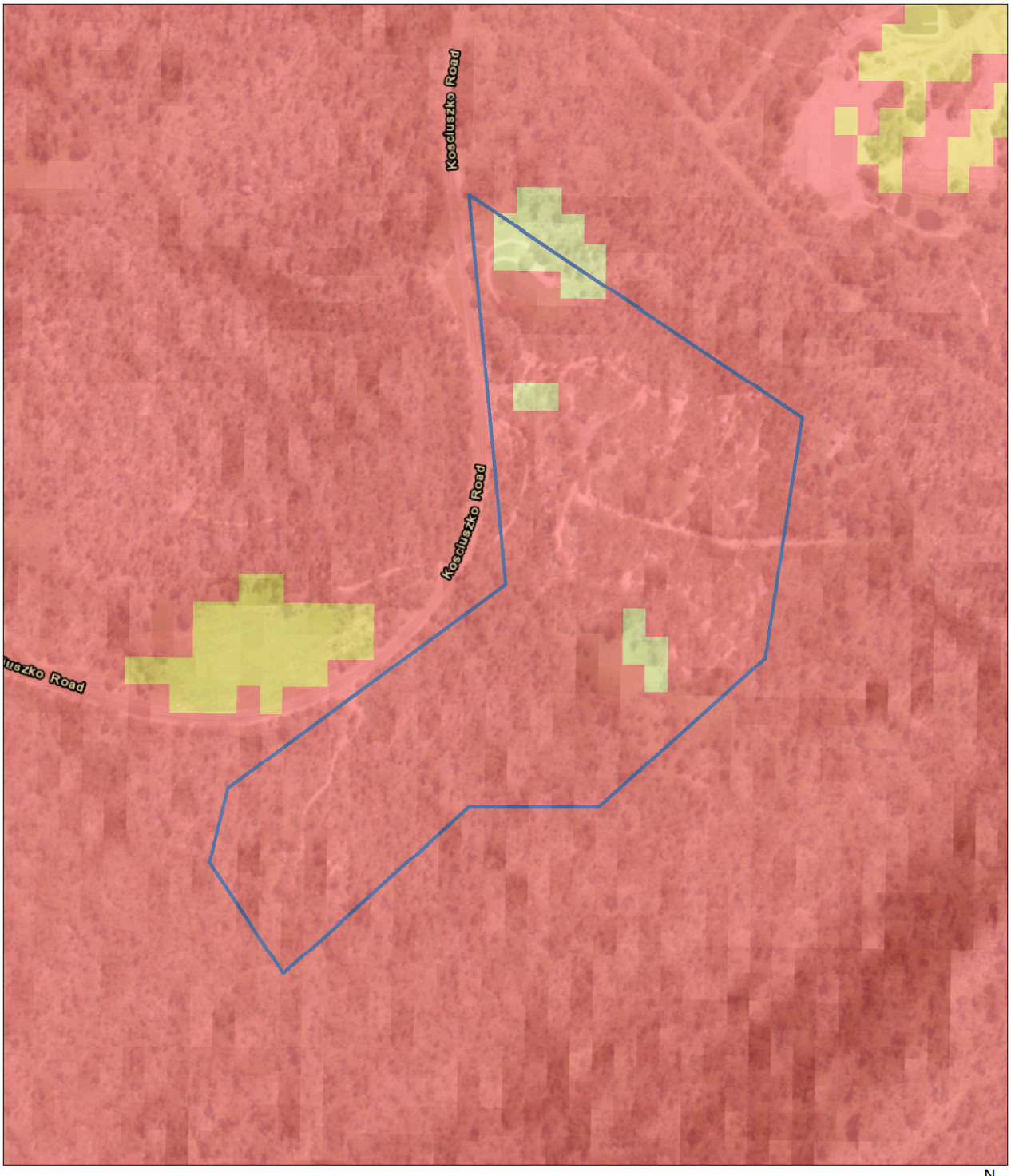
Metres

Coordinate System: GDA 1994 MGA Zone 55

Imagery: © Dept. of Finance, Services & Innovation 2018

Attachment 10 Bushfire Prone Land Map Kosciuszko Tourist Park



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SAP Precinct

Bushfire Prone Land

Vegetation Buffer

Vegetation Category 1

Vegetation Category 2

N

DKGIS

Date: 4/06/2020

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Metres

Coordinate System: GDA 1994 MGA Zone 55

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Attachment 11 Bushfire History Jindabyne

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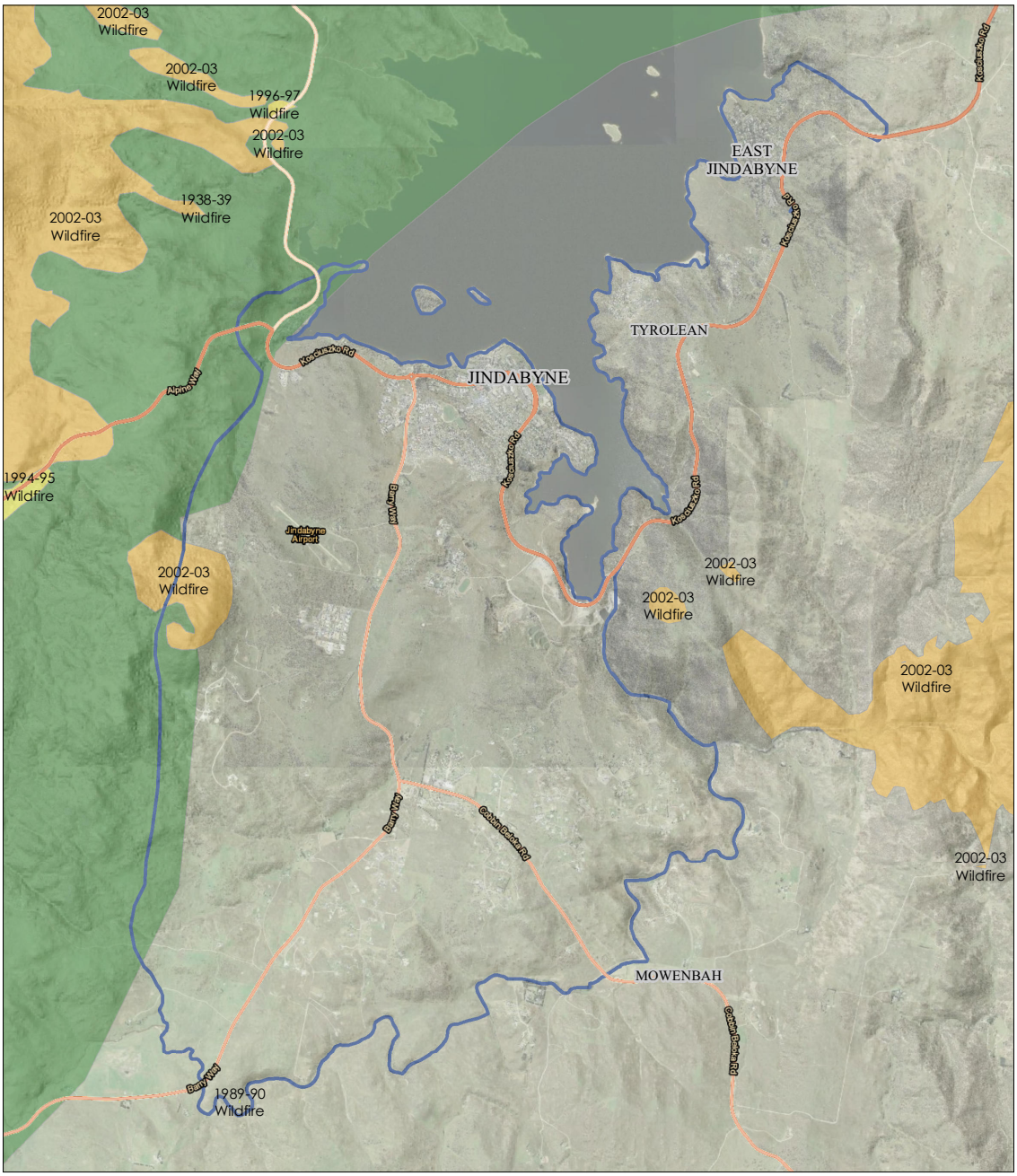

Legend

- Jindabyne GO
- **NPWS - Fire History**
- 2002-03 Wildfire
- 1996-97 Wildfire
- 1994-95 Wildfire
- 1989-90 Wildfire
- 1938-39 Wildfire

N

DKGIS
Date: 4/06/2020

0 500 1,000 2,000 3,000
Metres

Coordinate System: GDA 1994 MGA Zone 55
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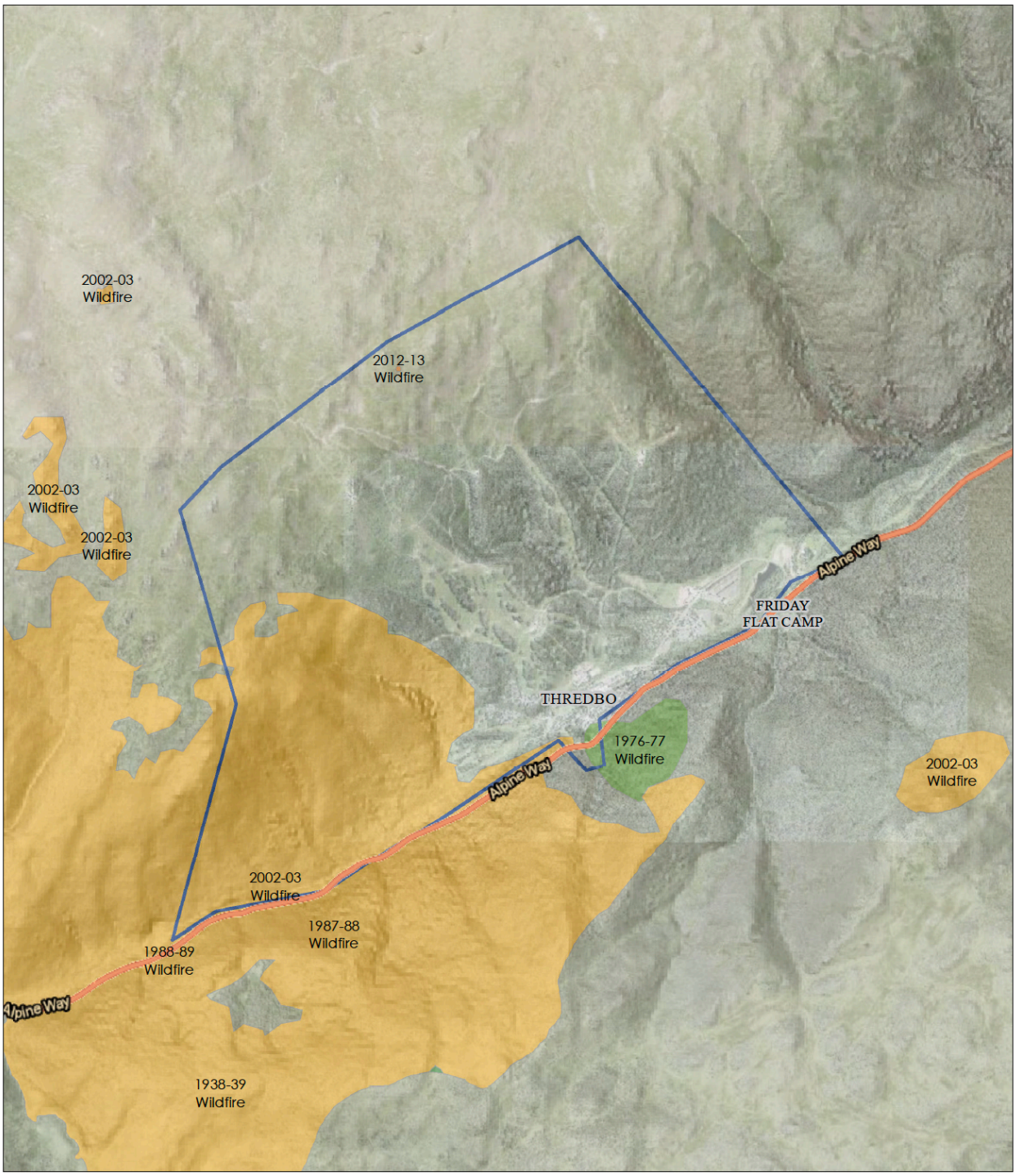
Attachment 12 Bushfire History Thredbo



Legend

- SAP Precinct
- **NPWS - Fire History**
- 2012-13 Wildfire
- 2002-03 Wildfire
- 1988-89 Wildfire
- 1987-88 Wildfire
- 1976-77 Wildfire
- 1938-39 Wildfire

N

DKGIS
Date: 4/06/2020

0 335 670 1,340 2,010
Metres

Coordinate System: GDA 1994 MGA Zone 55
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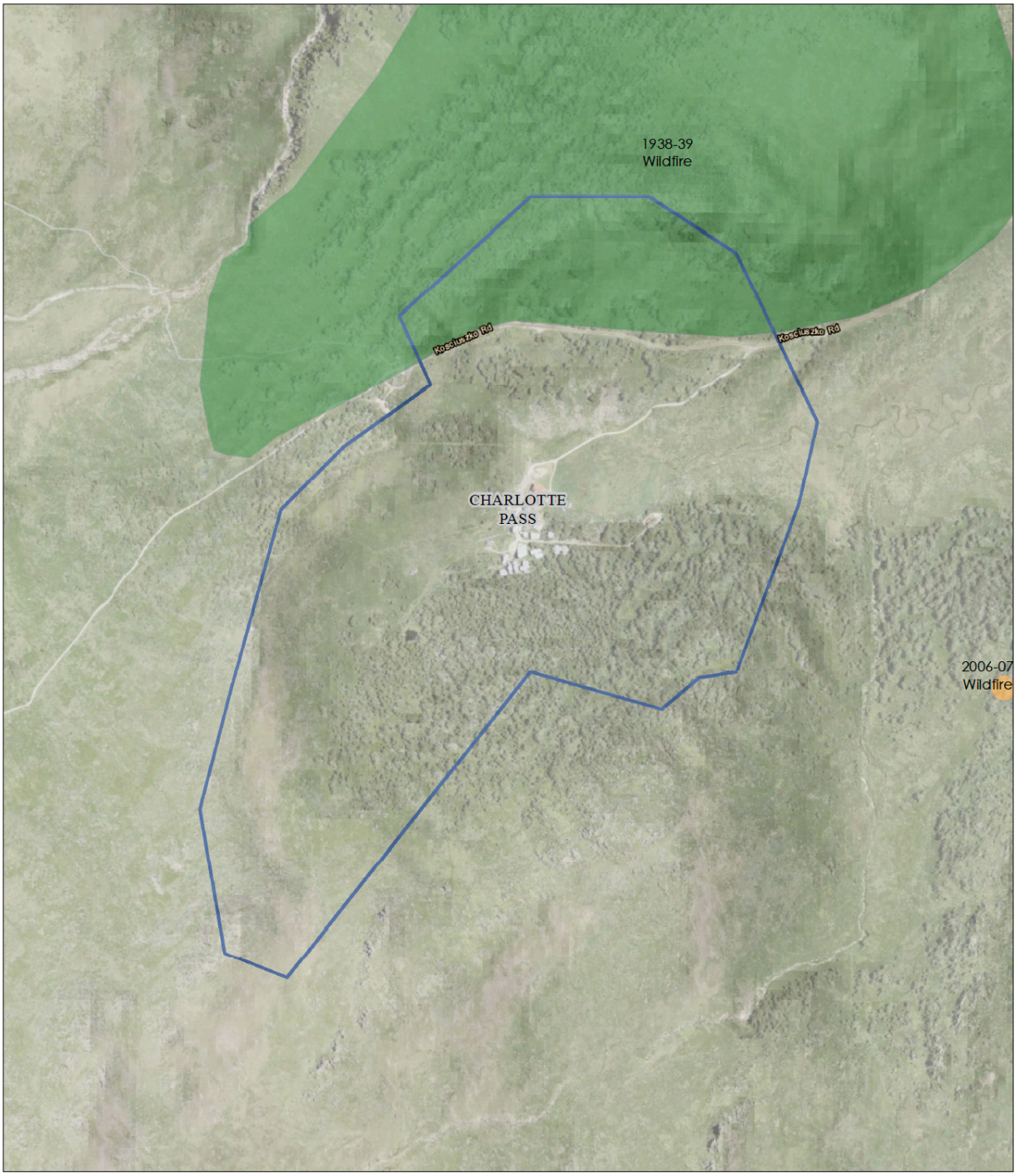
Attachment 13 Bushfire History Charlotte Pass



Legend

SAP Precinct

NPWS - Fire History

2006-07 Wildfire

1938-39 Wildfire

N

DKGIS

Date: 4/06/2020

0 137.5 275 550 825

Metres

Coordinate System: GDA 1994 MGA Zone 55

Imagery: © Dept. of Finance, Services & Innovation 2018

Attachment 14 Bushfire History Little Thredbo

Legend

- SAP Precinct
- **NPWS - Fire History**
- 2013-14 Wildfire
- 2002-03 Wildfire
- 1995-96 Wildfire
- 1990-91 Wildfire
- 1938-39 Wildfire

N

DKGIS

Date: 4/06/2020

0 175 350 700 1,050

Metres

Coordinate System: GDA 1994 MGA Zone 55

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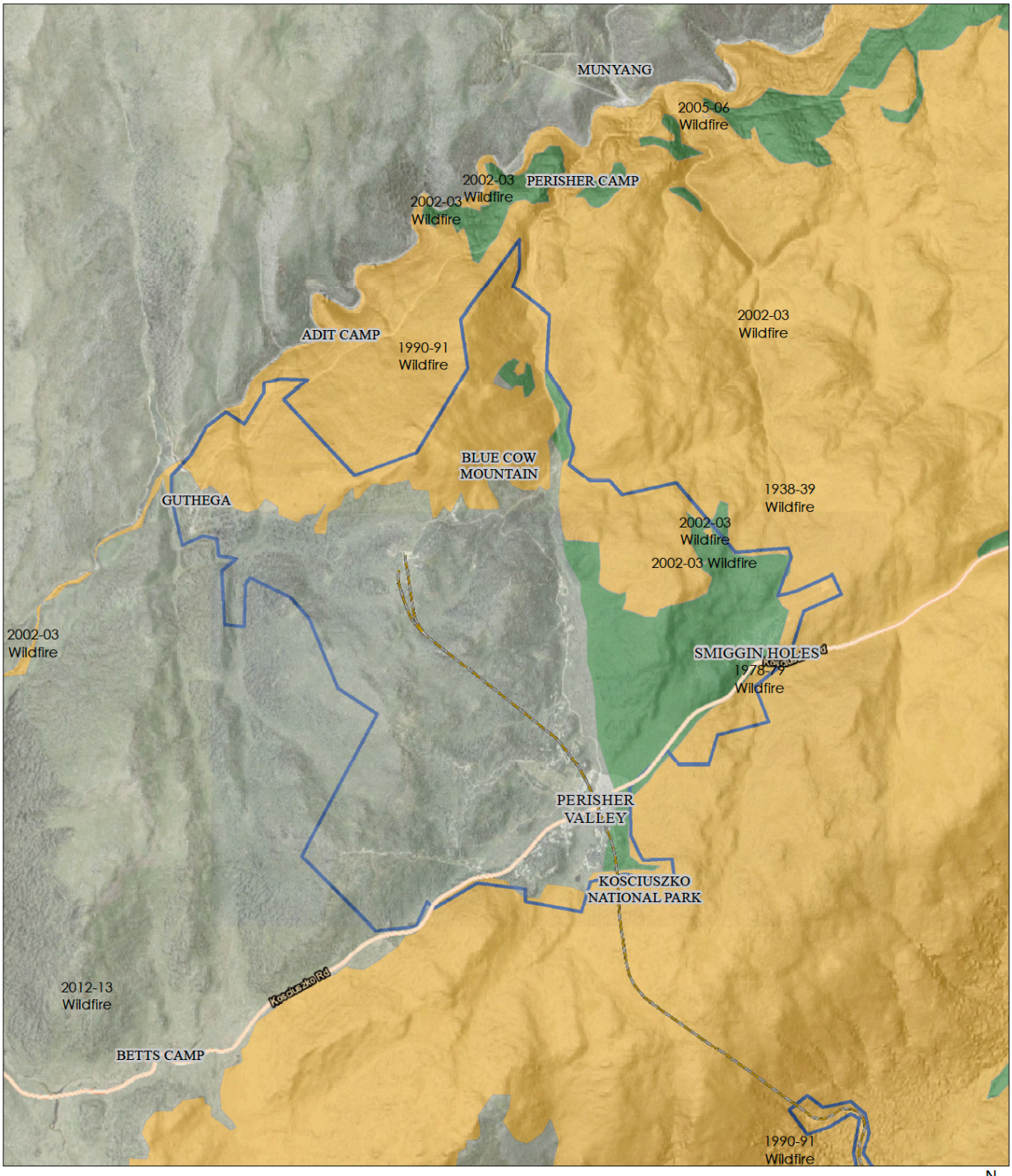
Attachment 15 Bushfire History Perisher Valley



Legend

- SAP Precinct
- **NPWS - Fire History**
- 2012-13 Wildfire
- 2005-06 Wildfire
- 2002-03 Wildfire
- 1990-91 Wildfire
- 1978-79 Wildfire
- 1938-39 Wildfire

N

DKGIS
Date: 4/06/2020

0 475 950 1,900 2,850
Metres

Coordinate System: GDA 1994 MGA Zone 55
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Attachment 16 Bushfire History Sponars

Legend

SAP Precinct

NPWS - Fire History

2002-03 Wildfire

1938-39 Wildfire

N

DKGIS

Date: 4/06/2020

0 15 30 60 90

Metres

Coordinate System: GDA 1994 MGA Zone 55

Imagery: © Dept. of Finance, Services & Innovation 2018

Attachment 17 Bushfire History Ski Rider

Legend

- SAP Precinct

NPWS - Fire History

- 2002-03 Wildfire
- 1990-91 Wildfire
- 1938-39 Wildfire

N

DKGIS

Date: 4/06/2020

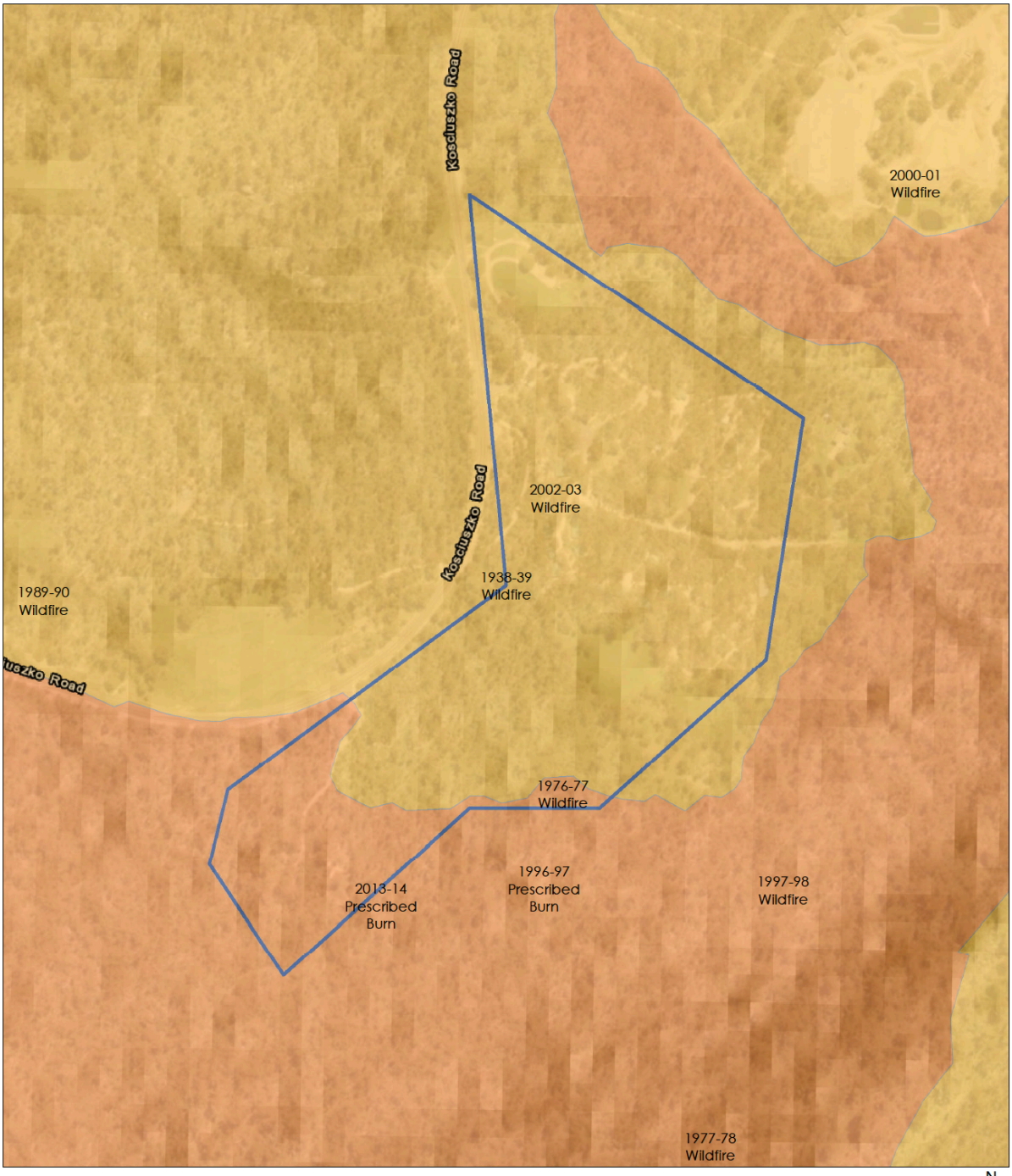
0 20 40 80 120

Metres

Coordinate System: GDA 1994 MGA Zone 55

Imagery: © Dept. of Finance, Services & Innovation 2018

Attachment 18 Bushfire History



Attachment 19 Jindabyne Precinct APZ Requirements

Jindabyne West Sub Precinct

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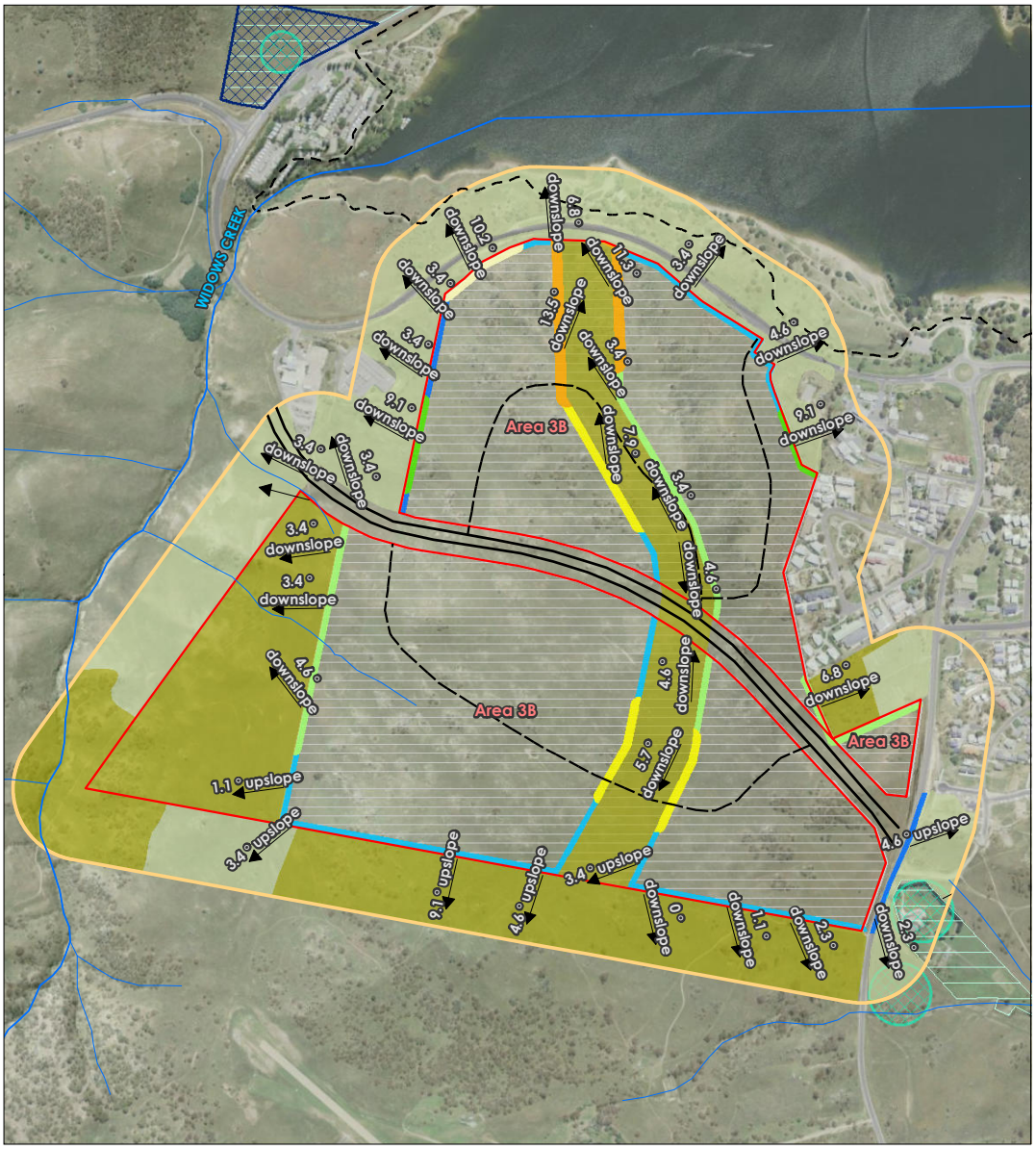

Legend

- Connector Road
- Proposed Road
- Hydrology
- Walking Trail
- Residential
- Commercial
- Intesificaiton Opportunity
- Residential Neighbourhood
- Vegetation Assessment Area - 140m
- Precinct

Vegetation Formation

- Grassland
- Woodland

Asset Protection Zone

- Asset Protection Zone - 10m
- Asset Protection Zone - 11m
- Asset Protection Zone - 12m
- Asset Protection Zone - 13m
- Asset Protection Zone - 14m
- Asset Protection Zone - 17m
- Asset Protection Zone - 21m

N

DKGIS

Date: 20/01/2021

0 190 380

Metres

Coordinate System: GDA 1994 MGA Zone 55

Imagery: © Dept, Customer Service

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East Jindabyne Sub Precinct

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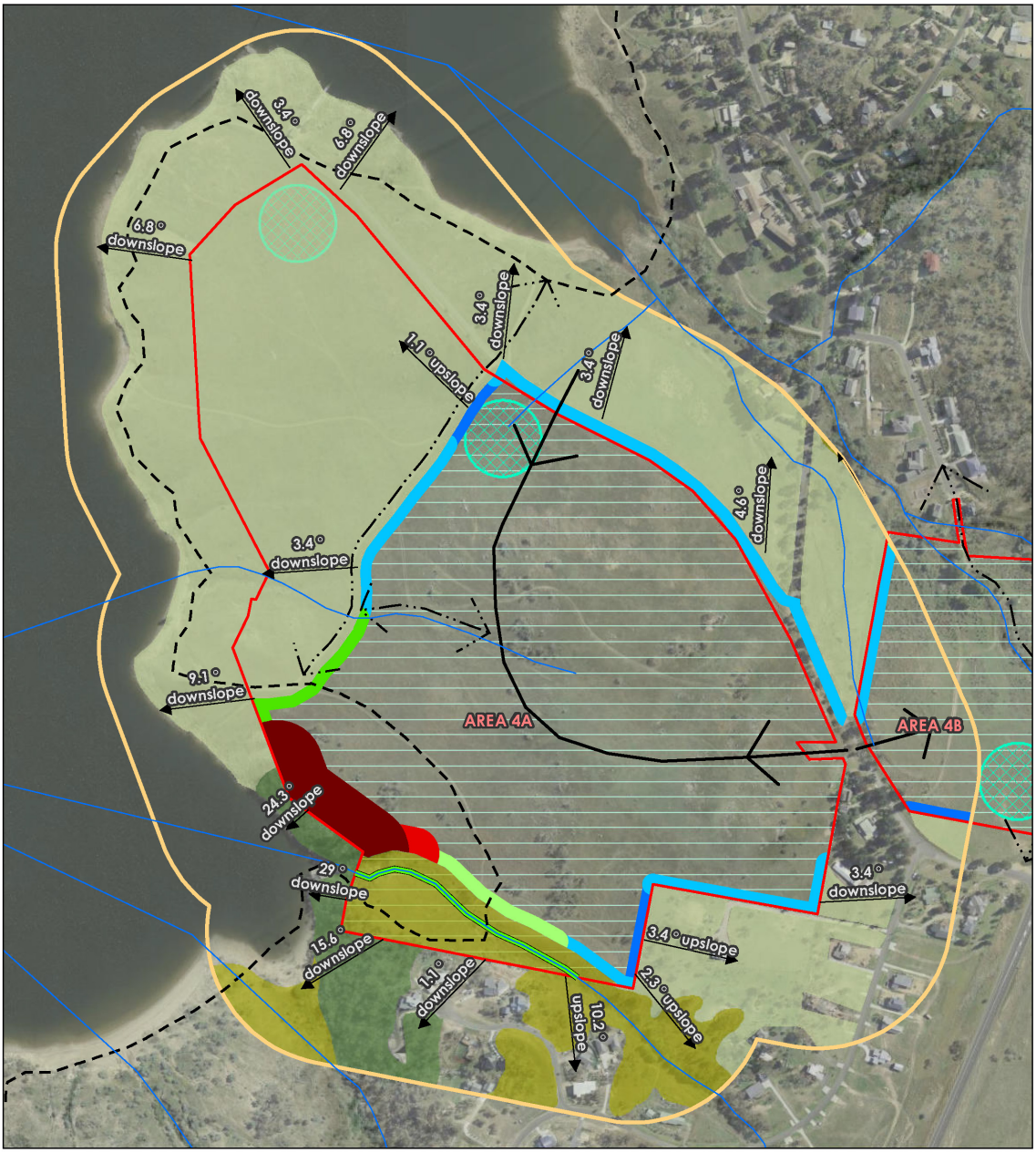

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East Jindabyne Sub Precinct

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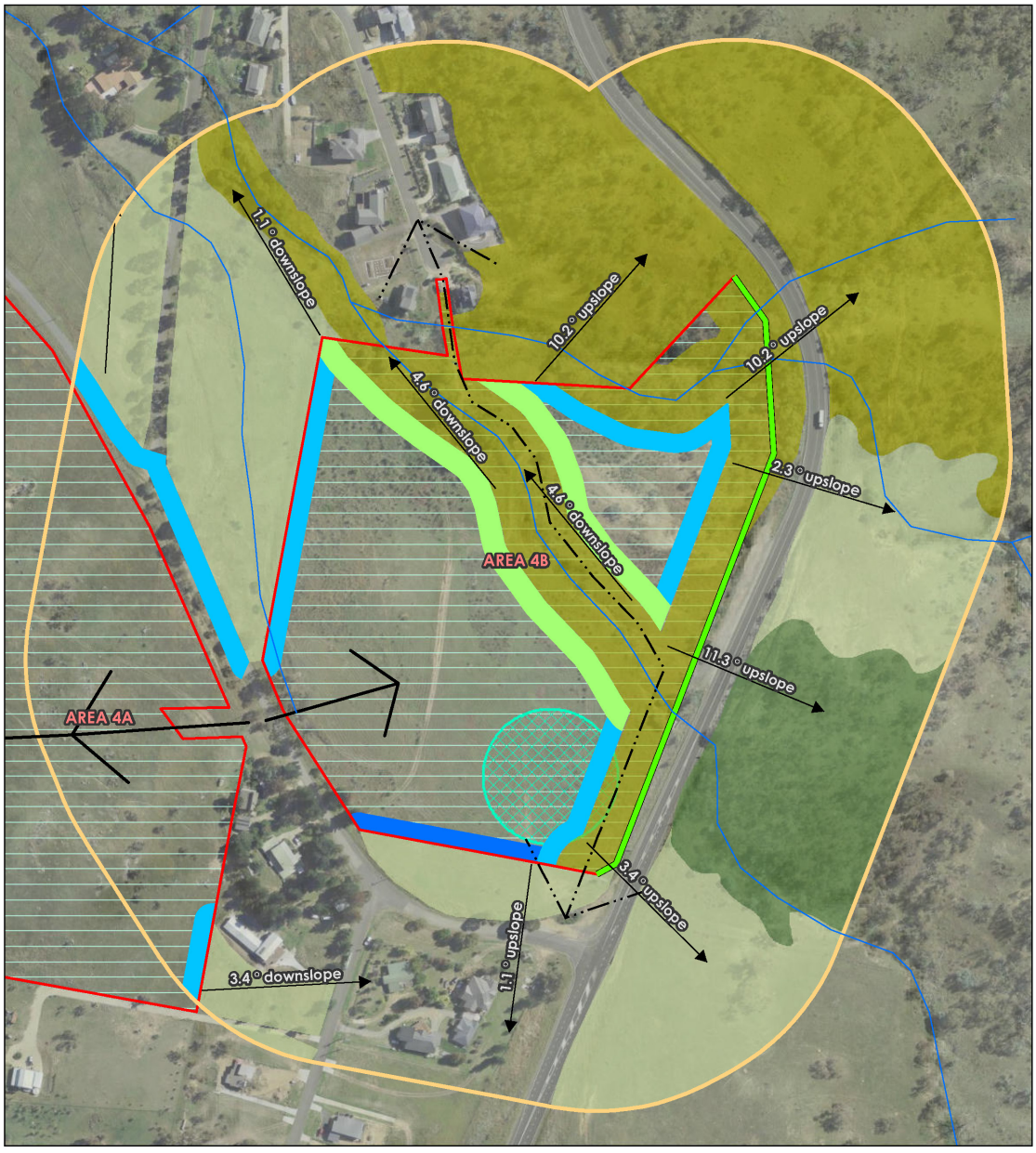

Legend

- Hydrology
- Green Infrastructure
- Pedestrian & Cycling Connection
- Roads
- Vegetation Assessment Area - 140m
- Commercial Precinct
- Residential Neighbourhood
- Precinct

Asset Protection Zone

- Asset Protection Zone - 10m
- Asset Protection Zone - 11m
- Asset Protection Zone - 13m

Vegetation Formation

- Forest
- Grassland
- Woodland

N

DKGIS

Date: 18/01/2021

0 55 110

Metres

Coordinate System: GDA 1994 MGA Zone 55

Imagery: © Dept, Customer Service

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Western Lake Sub Precinct

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Legend

- Hydrology
- Walking Trail
- Proposed MTB
- Roads
- Pedestrian and Cycling Connection

N

DKGIS

Date: 18/01/2021

0 95 190

Metres

Coordinate System: GDA 1994 MGA Zone 55

Imagery: © Dept, Customer Service

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Leesville Sub Precinct

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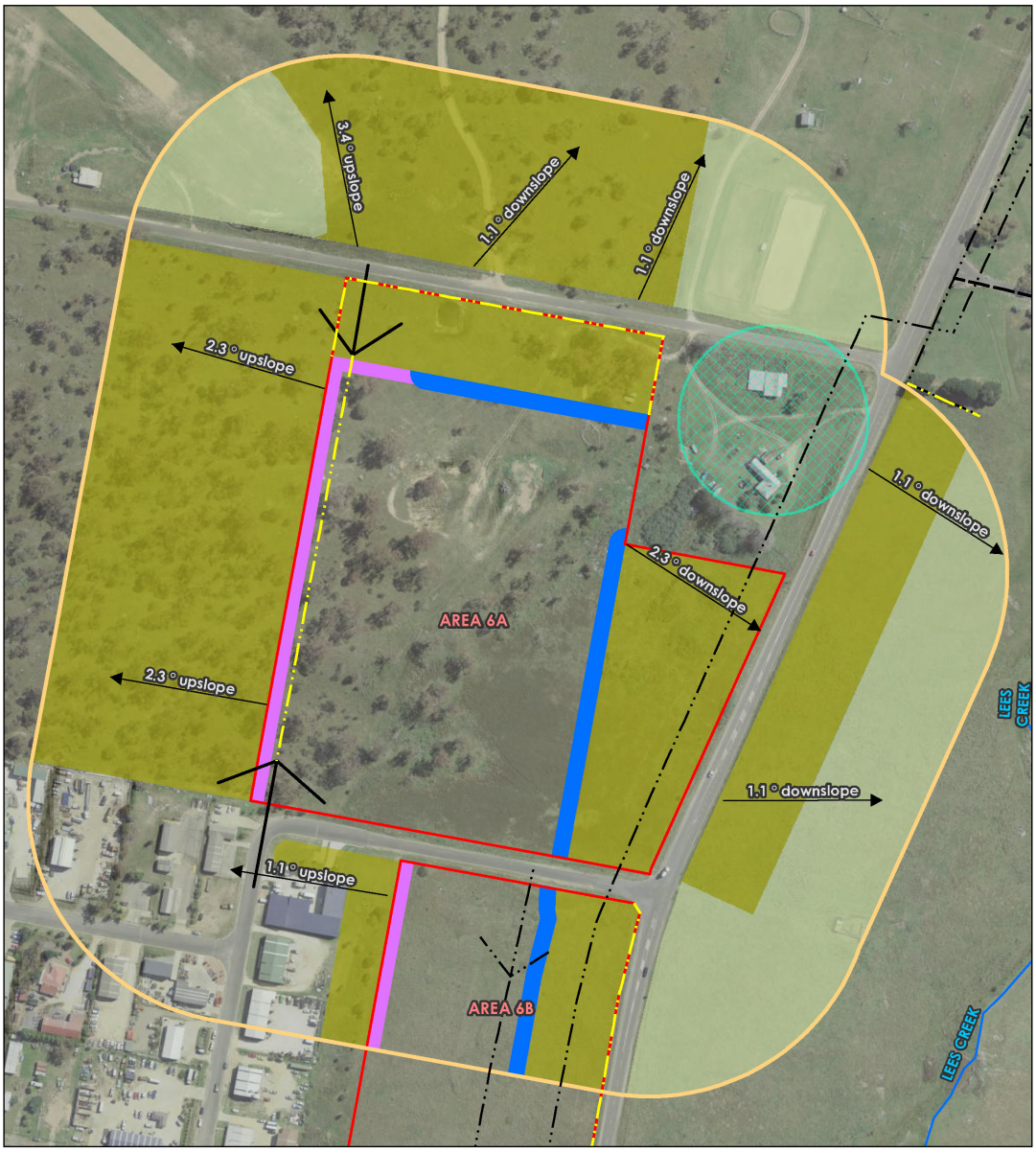

Legend

- Hydrology
- Industry & Commercial
- New Roads
- Roads
- Pedestrian and Cycling Connection
- Vegetation Assessment Area - 140m
- Commercial
- Precinct

Asset Protection Zone

- Asset Protection Zone - 8m
- Asset Protection Zone - 10m

Vegetation Formation

- Grassland
- Woodland

N

DKGIS

Date: 18/01/2021

0 62.5 125

Metres

Coordinate System: GDA 1994 MGA Zone 55

Imagery: © Dept, Customer Service

Leesville Sub Precinct

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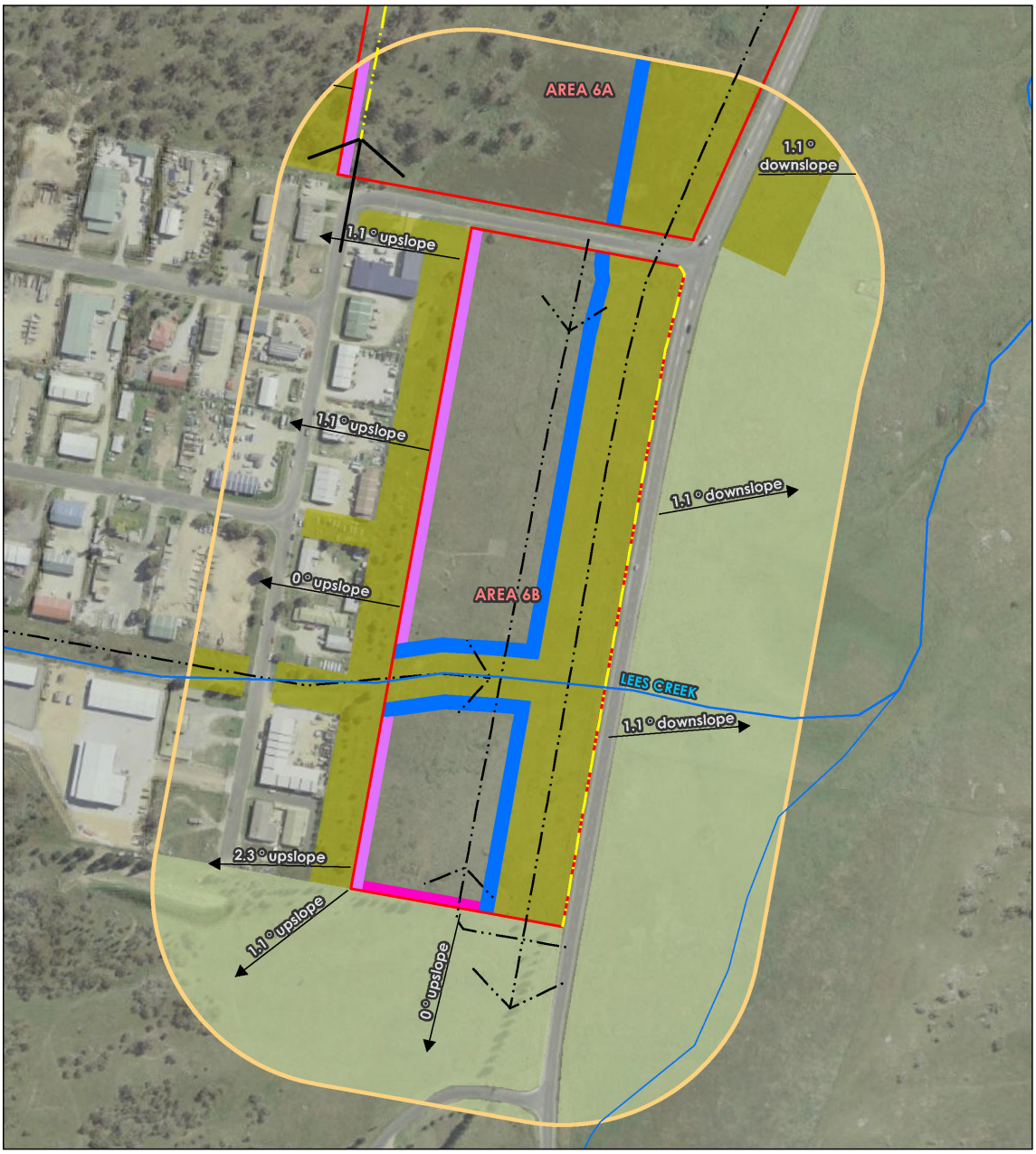

Legend

- Hydrology
- Industry & Commercial
- Roads
- Pedestrian and Cycling Connection
- Vegetation Assessment Area - 140m
- Precinct

Asset Protection Zone

- Asset Protection Zone - 7m
- Asset Protection Zone - 8m
- Asset Protection Zone - 10m

Vegetation Formation

- Grassland
- Woodland

N

DKGIS

Date: 18/01/2021

0 70 140

Metres

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Leesville Sub Precinct

BLACKASH
BUSHFIRE CONSULTING

Legend

- Hydrology
- Industry & Commercial
- Pedestrian and Cycling Connection
- Vegetation Assessment Area - 140m
- Precinct

Asset Protection Zone

- Asset Protection Zone - 8m
- Asset Protection Zone - 10m
- Asset Protection Zone - 12m

Vegetation Formation

- Woodland

N

DKGIS

Date: 18/01/2021

0 65 130

Metres

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