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Strategic Bushfire Study

Bega Urban Land Release Planning Proposal, Bega,
NSW



Prepared for: Bega Valley Shire Council

C/- ADW Johnson

28 May 2025

AEP Ref: 5123

Revision: 02

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Client Name	Bega Valley Shire Council C/- ADW Johnson
AEP Project Team	Chris Wark Maria Jedensjo

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1.0 Introduction

At the request of ADW Johnson, on behalf of Bega Valley Shire Council (The Client), Anderson Environment & Planning (AEP) have undertaken the necessary investigations to inform the production of a Strategic Bushfire Study (SBS) for the rezoning of land within the Bega Urban Land Release Precinct (Bega ULRP).

The Planning Proposal will be assessed as per Division 3.2 of the Environmental Planning and Assessment Act 1979 (EP&A Act). As a result, Section 3.18 requires concurrence from the Rural Fire Service (RFS) to enable the planning proposal to proceed on Bushfire Prone Land. This report addresses the required heads of consideration relevant to obtaining concurrence from the RFS.

Consideration has been given to the Draft Bushfire Prone Land package which contains a change to the recently introduced Local Planning Direction 4.3 which commenced on 1 March 2022 and replaced previous Direction 4.4.

This report is specifically intended to assess the bushfire protection measures set out in Chapter 4 of “Planning for Bushfire Protection 2019” (PBP) to provide direction for future development planning within the site.

For the purposes of referencing, this document should be referred to as:

Anderson Environment & Planning (2025). Strategic Bushfire Study for Planning Proposal at Bega Urban Land Release Precinct, NSW. Unpublished report for Bega Valley Shire Council, May 2025.

2.0 Site Particulars

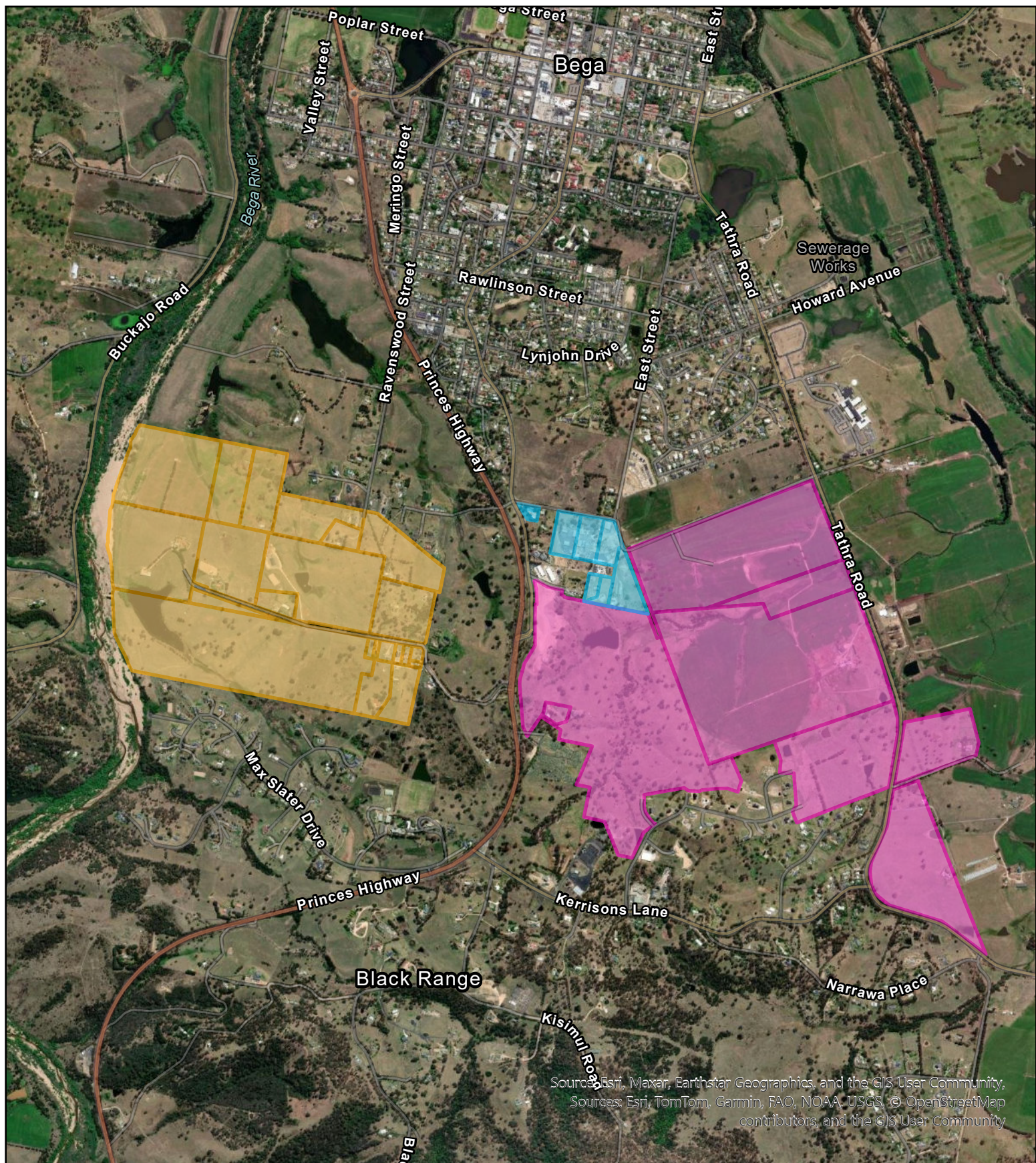
The proposed development is located within Bega Valley Shire LGA and consists of three precincts that are to be rezoned to allow for additional residential dwellings. **Table 1** shows the site location, precinct location and size, as well as the size of the affected lots within each precinct.

Figure 1 depicts the extent of the Subject Site overlain on an aerial photograph of the locality.

Table 1 – Site Particulars

Item	Comments
Client	Bega Valley Shire Council.
Address	Bega Precinct, Bega Urban Land Release.
Title(s)	<ul style="list-style-type: none"> Western precinct – Lot 1 DP124058, Lot 2 DP613365, Lot 51 DP836485, Lot 1 DP195102, Lot 7 DP986507, Lot 582 DP833035, Lot 581 DP833035, Lot 9 DP799413, Lot 6 DP986507, Lot 8 DP799413, Lot 7 DP799413, Lot 1 DP783221, Lot 73 DP812308, Lot 71 DP812308, Lot 71 DP878662, Lot 74 DP812308, Lot 72 DP812308, Lot 70 DP878662, Lot 20 DP1219302, and Lot 52 DP836485; Central precinct – Lot 240 DP750190, Lot 7005 DP1057325, Lot 241 DP750190, Lot 242 DP750190, Lot 239 DP750190, Lot 7006 DP1057325, Lot 2 DP1077434, and Lot 3 DP1077434; and Eastern precinct – Lot 2 DP524618, Lot 1512 DP1077898, Lot 9 DP1260384, Lot 2 DP1101354, Lot 1 DP1101354, and Lot 1 DP1164038.
Study Area	<p>The Study Area consists of the following precincts (Figure 1):</p> <ul style="list-style-type: none"> Western precinct: 167.73ha; Central precinct: 12.54ha; and Eastern precinct: 238.52ha. <p>The numbers is the size of the affected lots within each precinct. The Study Area also includes an assessment of all hazard vegetation within the site and out to approx. 700m.</p>
Subject Site	Three precincts identified as part of the Bega Urban Land Release Precinct. Figure 1 shows the size of the affected lots within each precinct.
LGA	Bega Valley Shire Council
Zoning	<ul style="list-style-type: none"> Western precinct is currently zoned RU2 – Rural Landscape zone; The central precinct is currently zoned E3 – Productivity Support, SP2 – Infrastructure, and RE2 – Private Recreation; Eastern precinct is currently zoned R5 – Large Lot Residential, and RU1 – Primary Production. <p>As per Bega Valley Local Environmental Plan 2013.</p>

Item	Comments
Current Land Use	<p>The area covered by the Bega Valley Bush Fire Management Committee (BFMC), includes the Local Government Area of Bega Valley, include the following land Managers and their total percentage of it:</p> <ul style="list-style-type: none"> • National Parks and Wildlife Service: 40%; • Forests NSW: 25%; • Privately owned land: 22%; • Other: 9%; • Local Government: 3.5%; • Department of Lands: 0.3%; and • Commonwealth: <0.01%. <p>The current land use within each precinct is the following:</p> <ul style="list-style-type: none"> • Western precinct – largely undeveloped, with some pockets of large lot residential development and historic rural living / industries on large parcels. • The central precinct – contains Bega chlorine and fluoride plant, a pumping station, private recreation land, and industries on large parcels. • Eastern precinct – the new Bega South East Regional Hospital, established detached residential development to the north, and land used for rural/agriculture.
Surrounding Land Use	<ul style="list-style-type: none"> • Western precinct – bounded by land zoned RU2 (rural landscape) to the north, land zoned R5 (village) to the east and south, and a riparian corridor to the west. • The central precinct – bounded by residential land to the north, rural primary production land to the east, land zoned E4 (general industrial) and RU5 (village) to the south, and land zoned RU5 (village) and RU2 (rural landscape) to the west. • Eastern precinct – bounded by the Princes Highway along its western boundary, and low-lying rural production land which is flood affected to its east.
Riparian Areas	<p>There are several mapped first order streams within all precincts, including one dam in the eastern precinct; and a mapped second order stream in the western precinct that is also mapped key fish habitat.</p>

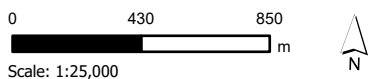


- Eastern Precinct Lots
- Central Precinct Lots
- Western Precinct Lots

Figure 1 - Lots within each Precinct Location

Address: Bega, NSW
 Client: Bega Valley Shire Council
 AEP Ref: 5123 | Date: 08 April 2025

Imagery: ESRI
 Spatial Reference: GDA2020 MGA Zone 55



Disclaimer: While reasonable care has been taken to ensure the information on this map is accurate and up-to-date, errors or omissions may still occur. Please verify the accuracy of all information before use. Note that boundaries are not survey accurate and do not scale off this plan.

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3.0 Proposed Development

The proposal is seeking to progress a rezoning process for the developable lands to create new urban neighbourhoods that will provide for diversity of housing choice in the Bega Valley Shire residents. Bega Valley Shire's population is forecast to grow to 38,138 by 2036, which requires an additional 1,070 homes in the next 14 years. The estimated dwelling yield from this proposal is 2,113 dwellings which is calculated to meet the requirements for the next 40 years. Increasing residential density in the Bega Study Area will require a change in the land zoning. In particular the existing rural land zones RU1, RU2 and R5, which are intended to maintain rural production and character through larger lots.

The proposal has been divided into three (3) precincts as follows:

- Western precinct (affected lot area: 167.73ha, proposed area: 85ha);
- Central precinct (affected lot area: 12.54ha, proposed area: 18ha); and
- Eastern precinct (affected lot area: 238.52ha, proposed area: 114ha).

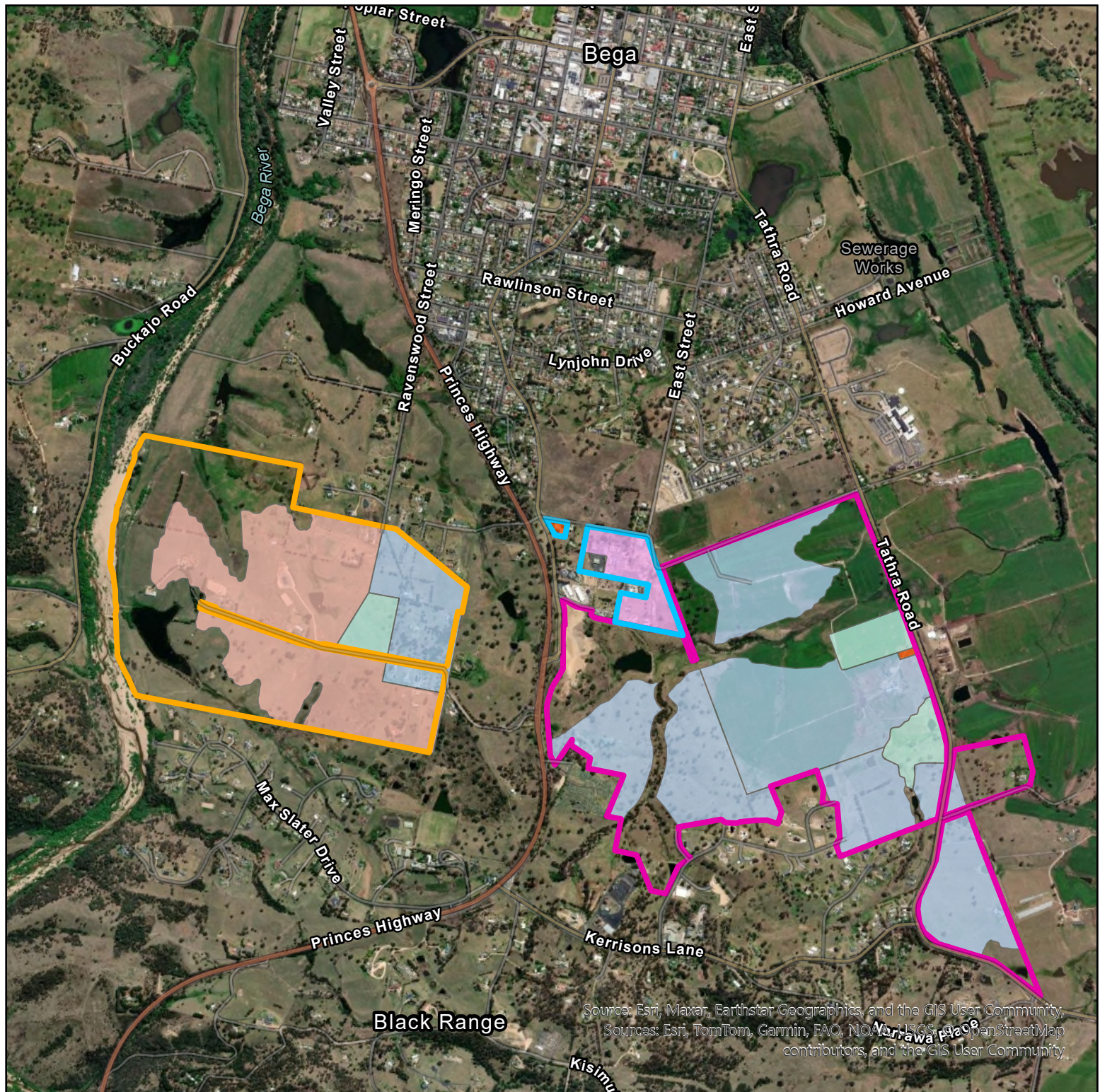
The sizes of the precincts shown above, the total area of the affected lots within each precinct, and the total land size of the proposal as per consultant brief and adopted structure plan. Some lots will only be partially affected by the proposal.

The size of the precincts has been determined by the alignment of the Princes Highway (which bisects the Study Area), and the cluster of industrial and community land uses in the central precinct which presents opportunity for mixed use development on the periphery of the traditional Bega township).

Table 2 provides information about current and proposed land zoning. **Figure 2** depicts the plan of proposed rezoning within the Planning Proposal Boundary.

Table 2 – Proposed Provisions

Current Zoning	Proposed Zoning
Western precinct	
RU2 – Rural Landscape zone	R2 – Low Density Residential R5 – Large Lot Residential RE1 – Public Recreation
Central Precinct	
E3 – Productivity Support	E2 – Commercial Centre E1 – Local Centre
SP2 – Infrastructure	E2 – Commercial Centre E3 – Productivity Support
RE2 – Private Recreation	RE1 – Public Recreation
Eastern Precinct	
R5 – Large Lot Residential	R2 – Low Density Residential E1 – Local Centre RE1 – Public Recreation
RU1 – Primary Production	R2 – Low Density Residential RE1 – Public Recreation C2 – Environmental Conservation



- Western Precinct Lots
- Central Precinct Lots
- Eastern Precinct Lots

Land Zoning within the Proposed affected Area

- E1
- E2
- R2
- R5
- RE1
- RU1

Address: Bega, NSW
Client: Bega Valley Shire Council | AEP Ref: 5123 | Date: April 2025

Imagery: ESRI Hybrid (Dec 2024)
Spatial Reference: GDA2020 MGA Zone 55

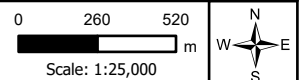


Figure 2 - Zoning Plan within the Proposed affected Area



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Note:
1. Boundaries are not survey accurate
2. Do not scale off this plan

4.0 Consultation with NSW Rural Fire Service

In February 2024, the NSW RFS provided comment on the Bega Structure Plans with recommendations of items to be included in a Strategic Bushfire Study, as follows:

- Where staged development is to occur Council should give consideration to appropriate mechanisms to ensure that undeveloped areas do not constitute a hazard to areas being developed;
- As development occurs Council may wish to consider updating the Bushfire Prone Land Mapping to reflect the extent of managed land;
- Where public open space may be reliably considered to be managed land a formal plan of management that addresses fuel management should be considered;
- Where natural features, such as riparian areas, are to be enhanced/rehabilitated consideration should be given to any potential impacts on bushfire protection measures for existing and proposed development;
- Future subdivision/development of the land complies with Planning for Bushfire Protection 2019 (PBP 2019).

These items have been considered as part of the recommendations and assessment within this report.

5.0 Legislation and Policies

5.1 *Environmental Planning and Assessment Act (EPA Act)*

In January 2020, the NSW Bushfire Inquiry recommended moving to a risk-based strategic planning approach when planning for bushfires. One of the intentions of the package is to improve the integration of bushfire into strategic land use planning, and ensure our communities are resilient to bushfires through changes in the NSW Planning system.

A Draft Bushfire Prone Land Package was exhibited for public consultation from 3 -30 July 2024 and included the following draft documents:

- Draft Bushfire Policy for Land Use Planning (the Policy)
- Draft (updated) Local Planning Direction 4.3, Planning for Bushfire Protection (the Direction); and
- Draft (updated) Bushfire Planning System Circular (the Circular).

5.1.1 The Policy

In preparing this report, the following strategic planning principles of the Draft Bushfire Policy for Land Use Planning have been considered:

- Consider bushfire risk in a landscape context;
- Avoid inappropriate developments in high-risk bushfire locations or circumstances, in particular development of a higher vulnerability such as for a Special Fire Protection Purpose within the meaning of the *Rural Fires Act 1997*, where the level of bushfire risk is not considered appropriate; and
- Identify and consider the cumulative impacts of bush fire risk for existing and future communities.

5.1.2 The Direction

Direction 4.4 - Planning for Bushfire Protection is a Ministerial Direction issued under section 9.1 of the *Environmental Planning and Assessment Act 1979* (EPA Act), relevant to land use planning for the rural and environmental lands and waterways covered by the Rural Strategy. Direction 4.4 was updated and replaced by Direction 4.3 – Planning for Bushfire Protection. The objectives of the Local Planning Direction 4.3 are the following:

- To protect life, property and the environment from bushfire hazards, by discouraging the establishment of incompatible land uses in bush fire prone areas; and
- To encourage sound management of bushfire prone areas.

This direction applies to all local government areas when a relevant planning authority prepares a planning proposal that will affect, or is in proximity to, land mapped as bushfire prone land. This applies where the relevant planning authority is required to prepare a bushfire prone land map under section 10.3 of 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.

5.1.3 The Circular

The Draft bushfire planning system circular outlines the planning considerations for development on bushfire prone land, including application to planning proposals.

5.2 Rural Fires Act 1997

The objectives of this Act are to provide:

- For a prevention, mitigation and suppression of fires;
- For the coordination of bushfire fighting and fire prevention;
- For the protection of persons from injury or death, and property from damages arising from fires;
- For the protection of infrastructure and environmental, economic, agricultural and community assets from damage arising from fires; and
- For the protection of the environment.

5.3 Planning for Bushfire Protection 2019

This document is a policy that provides development standards for all developments that are building and designing on bushfire prone land in NSW. This document provides standards and guidance for the following:

- Strategic land use planning;
- New residential and rural residential subdivision allotments;
- Development in regards to special fire protection purpose;
- Bushfire protection measures for new buildings: and
- Upgrading and maintaining existing developments.

6.0 Bushfire Hazard Assessment

6.1 Bushfire Prone Land Mapping

Examination of the NSW Planning Portal, Bushfire Prone Land (BPL) mapping (2025) confirms that following Bushfire Prone Land mapping:

- Western precinct – Vegetation Category 3 and Vegetation Buffer;
- Central precinct – Vegetation Category 3 and Vegetation Buffer; and
- Eastern precinct – Vegetation Category 3 and Vegetation Buffer.

This designation has triggered the need for the assessment herewith. **Figure 3** depicts the Bushfire Prone Land Mapping.

Appendix 1 of the PBP provides the steps required to determine the level of bushfire hazard that applies to the site. Factors influencing the hazard level include:

- The formation of vegetation surrounding the site (as defined by Keith 2004);
- The distance between vegetation and the site (or proposed buildings therein);
- The effective slope for each patch of vegetation; and
- The Fire Danger Index (FDI) of the council area within which the development occurs.

These factors together provide an indication of the level of threat posed to the development from any vegetation retained within the site and surrounding vegetation in the event of a bushfire, and the required mitigation measures to be taken in the form of Asset Protection Zones (APZs) and building construction standards.

6.2 Vegetation, Topography and Slope Analysis

Appendix A1.2 of *Planning for Bushfire Protection 2019* provides a methodology for determining the predominant bushfire prone vegetation within 140m of the development site or asset. These vegetation formations include the following:

- Rainforest;
- Wet sclerophyll forest;
- Dry sclerophyll forest;
- Woodland;
- Tall heath;
- Short heath; and
- Grassland.

The vegetation within and surrounding the precincts is mainly managed rural land, with open grassland and some scattered trees. It has been classified as unmanaged Grassland hazard for due to the lack of woody plants. Other vegetation features include the following:

- The western side of the western precinct is bounded by a riparian corridor with managed rural land on the other side of the stream;
- The northern side is bounded by managed rural land and Bega town;

- The eastern side is bounded by managed rural land, and a riparian corridor at approx. 500-1200m distance; and
- The southern side is bounded by managed rural lands leading into Black Range State Park at approx. 2km distance.

The landscape topography within and surrounding the proposed precincts is characteristic by a mix of rolling coastal hills, and wide river valleys. It is a transitional zone between the elevated slopes of the Great Dividing Range, and coastal plains. The diverse topography supports various a variety of vegetation types, and influences rainfall distribution (higher rainfall in the steeper mountainous areas outside the Study Area). A Topographic Map is shown in **Figure 4**.

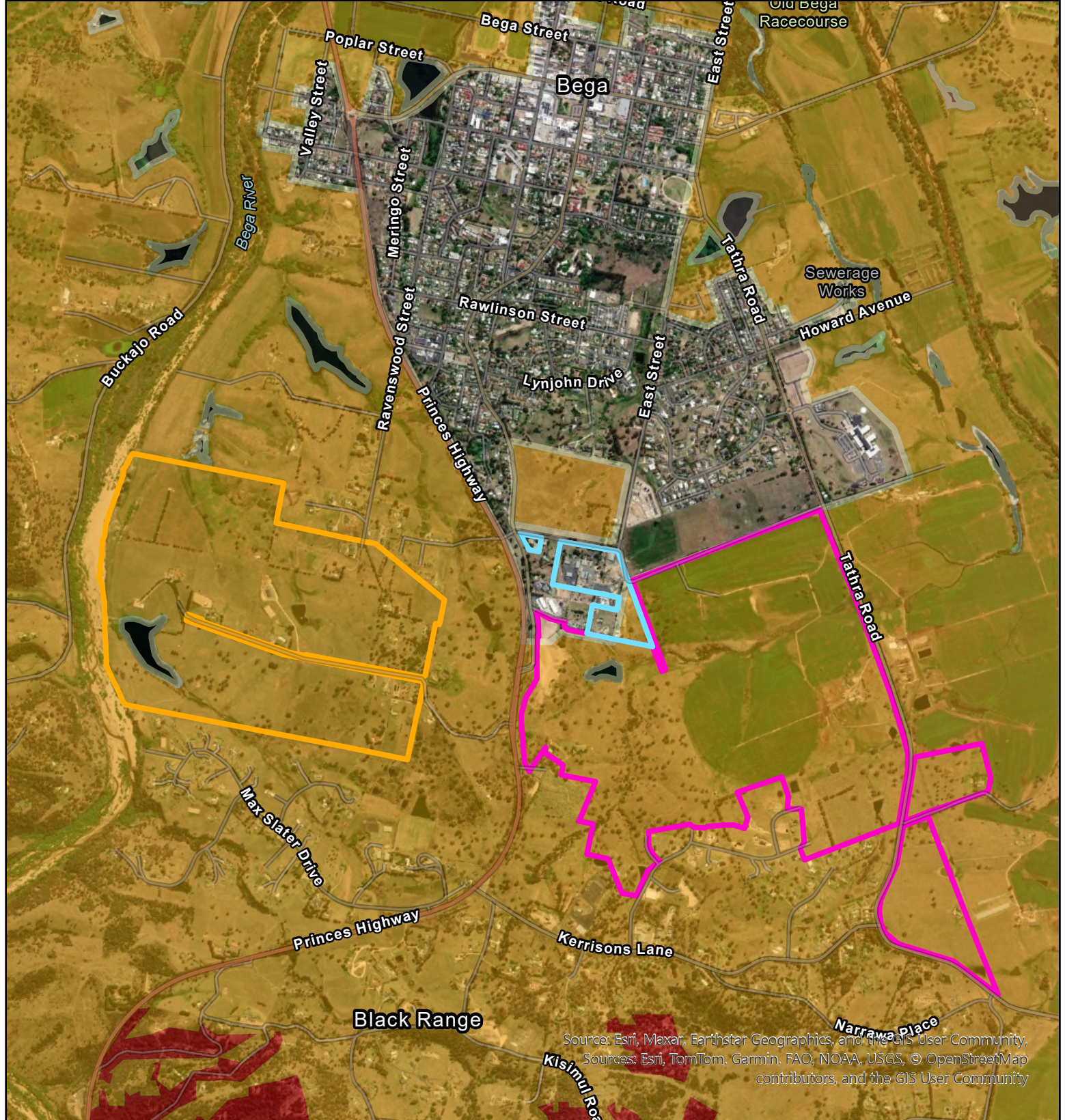
The slope of the land under the classified vegetation has a direct influence on the rate of the fire spread, the intensity of the fire, and the radiant heat flux. Slope assessment is categorised either into a downslope vegetation class between >0 to 20 degrees, or upslope a class (all upslopes are considered 0 degrees). Slopes within the precincts vary between upslope and flat to approx. 15°. Hazard vegetation surrounding the precincts also have similar contours and slopes.

For all development requiring APZs, the Forest Fire Danger Index (FFDI) must be identified. The proposed precincts and surrounds occur within the Far South Coast area with the existing conditions considered to have a FFDI of 100, and Grassland Fire Danger Index (GFDI) of 130, as per NSW Rural Fire Service (2019) NSW Local Government Areas FDI. It is likely that over time the FFDI will increase as Australia becomes hotter and drier, so any Asset Protection Zones (APZs) derived from this report should be considered the minimum required and the final APZ for each development should be determined on an individual basis at the time of application.

The minimum distance for APZs for residential developments within the proposed precincts will be a minimum of 10/12m for grassland/woodland hazard on a flat slope and 36/42m for Special Fire Protection Developments (SFPP), such as schools, child care centres, hospitals, retirements villages and hotel etc.

While APZs are important perhaps the most important consideration for strategic planning is to identify whether a new development is placed in an appropriate location subject to the identified bush fire risk on a landscape scale. Placing vulnerable development in areas where there is a long-fire run or high likelihood of impact with limited access should not occur regardless of the APZ.

Appendix A contains photos showing the vegetation types and slopes within and around the Subject Site.



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community.
Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

- Western Precinct Lots

Central Precinct Lots

Eastern Precinct Lots
- ### NSW Bush Fire Prone Lands

Category: Buffer

Category 1

Category 2

Category 3

Address: Bega, NSW
Client: Bega Valley Shire Council | AEP Ref: 5123 | Date: April 2025

Imagery: ESRI Hybrid (Dec 2024)
Spatial Reference: GDA2020 MGA Zone 55

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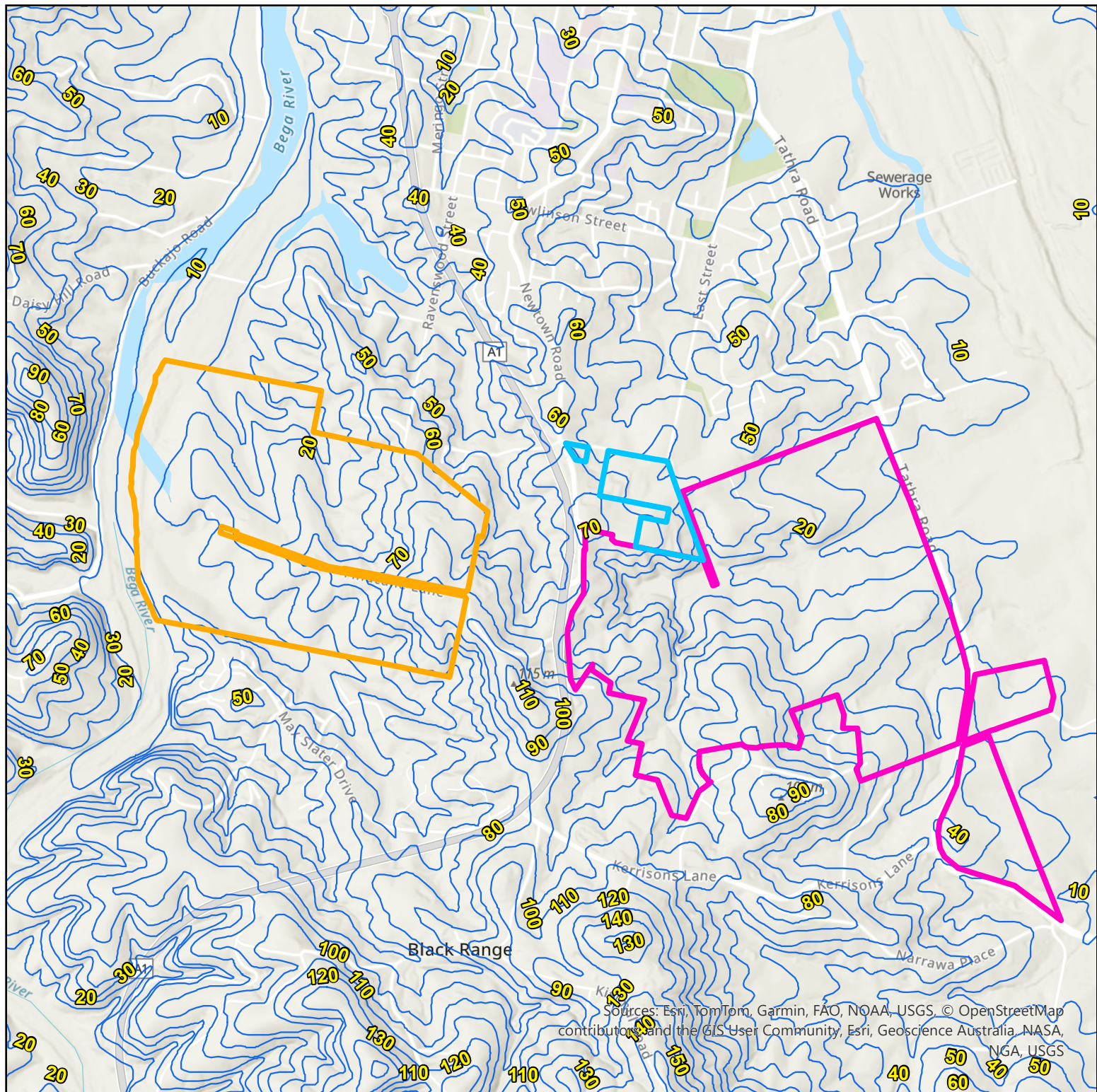
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Figure 3 - Bushfire Prone Land



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Legend

- Western Precinct Lots
- Central Precinct Lots
- Eastern Precinct Lots
- Contour - 10m

Address: Bega, NSW
 Client: Bega Valley Shire Council | AEP Ref: 5123 | Date: April 2025

Imagery: ESRI Topographic Map (Dec 2024)
 Spatial Reference: GDA2020 MGA Zone 55

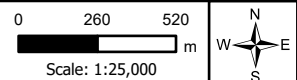


Figure 4 - Topography Map



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6.3 PBP Performance Criteria Assessment

Chapter 4 of PBP 2019 refers to Strategic Planning. Under EP&A Act s4.14, the consent authority must be satisfied that the development on bushfire prone land conforms to PBP. If not, it must consult with the Commissioner of the NSW RFS. This applies to any development other than subdivision of land that could lawfully be used for residential purposes or development for a SFPP.

Strategic Planning (Chapter 4 in PBP 2019) will be considered in accordance with the acceptable solutions and performance criteria specified in Section 4.2 and Table 4.2.1 (refer to **Table 3**).

Table 3 – Bushfire Issues and Strategic Assessment

Criteria and Risk Items	Consideration	Assessment
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.	<p>The bush fire hazard in the surrounding area, including:</p> <ul style="list-style-type: none"> • Vegetation • Topography • Weather 	<p>The land within and surrounding the three (3) precincts are mainly managed rural land, with open grassland and some scattered trees. The northern side of the precincts are bounded by Bega town. The eastern and western sides of the precincts have riparian corridors stretching from north to south. The southern side of the precincts is bounded by managed rural land directly to the south. However, approx. 2km south is the Black Range State Park.</p> <p>The slopes within and surrounding the proposed precincts are best classified as rolling hills and river flat plains. Slopes vary throughout the precincts and surrounds from flat to an approx. 15° rise.</p> <p>Weather in the Bega area follows most Australian weather patterns with a hot period from November to March. Between November to March is also the time where the greatest amount of rain falls.</p> <p>Within the summer months in the morning Bega will have light winds blowing in from the northeast and east, with stronger winds from the south and southwest. During the afternoon the breezes from the northeast and east will tend to blow more strongly with less frequent strong winds from the southwest.</p>
	Potential Fire Behaviour	<p>The lack of forests in close proximity to the precincts generally precludes the risk of large canopy fires within and on surrounding lands.</p> <p>Grass fires are likely to be the greatest hazard to the new precincts with the most likely run, coming from the south or southwest, starting in the Black Range and pushed by a strong breeze from that direction.</p>

Criteria and Risk Items	Consideration	Assessment
		<p>Another possibility would be a fire starting in Tanja State Forest and pushed towards Bega and the proposed precincts by strong late afternoon breeze.</p> <p>While there are riparian corridors to the east and west it is not considered likely that these will lead to a high degree of fire risk to future development.</p>
	Bushfire History in the area.	<p>There is only one historic fire that has directly impacted the proposed precinct areas. This fire occurred in 1951/52 and burned through the entire Bega region from the northwest. Since that time other fires have occurred in the Tanja State Forest to the east and northeast (1980/81, 1987/88 and 2017/18), with the latter fire running into Tathra township.</p> <p>Historic fires have also occurred to the south in 1986/87 and 1990/91 though these were contained to the forest well to the south of the proposed precincts.</p> <p>Figure 5 shows the historic fire locations in and around the precincts.</p>
	Potential fire paths and intensity	<p>Canopy fire to the precincts is likely to be limited given that there is substantial space between forest hazard and the precincts. Grassfires are more likely to impact the proposed precincts though there are some areas of revegetation that will run through the eastern precinct.</p> <p>These fires are likely to be of a lower intensity than if canopy was present nearby.</p> <p>The most likely fire path that could affect the western precinct is likely from the west or northwest based on topology, though winds generally would come from other directions.</p> <p>The eastern and central precincts are most likely to be affected by a fire from the eastern or southern areas, with fire pushed</p>

Criteria and Risk Items	Consideration	Assessment
		in from Reedy Swamp by easterly breezes that are common in the area.
	Fire Management Operations Assessment of 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.	<p>Bushfire hazards are minimal, generally grassland or smalls areas of open woodland. There is an area of vegetation that is to be regenerated to woodland that will run through the eastern precinct and along the southern border of the Central precinct. This is a riparian area and should be fairly narrow. While it has to provide a fire path to future development in the precincts it is not connected to larger areas of woodland that would allow for a broader scale fire and as such the threat is considered limited.</p> <p>Roads currently present would provide limited ability to combat a bushfire given that most areas are farmland. With new subdivision and development, it is expected that additional roads and upgrades to existing roads would increase the ability of fire fighters to combat a bushfire in the area.</p>
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.	Risk profile of different areas of the development layout	<p>Western Precinct</p> <p>This area is surrounded by rural lands with a central hill. Hazard vegetation is unmanaged grassland and potentially the riparian corridor to the west. The biggest challenge for this precinct will be ensuring appropriate access points onto the Princes Highway, capable of allowing for the volume of traffic that will be generated. Given the current access it is not considered suitable for this area to support an SFPP development currently.</p> <p>Central Precinct</p> <p>This is currently an industrial area Vegetation hazards are limited to the south and west. This northern part of this precinct could support SFPP development in the west and north with</p>

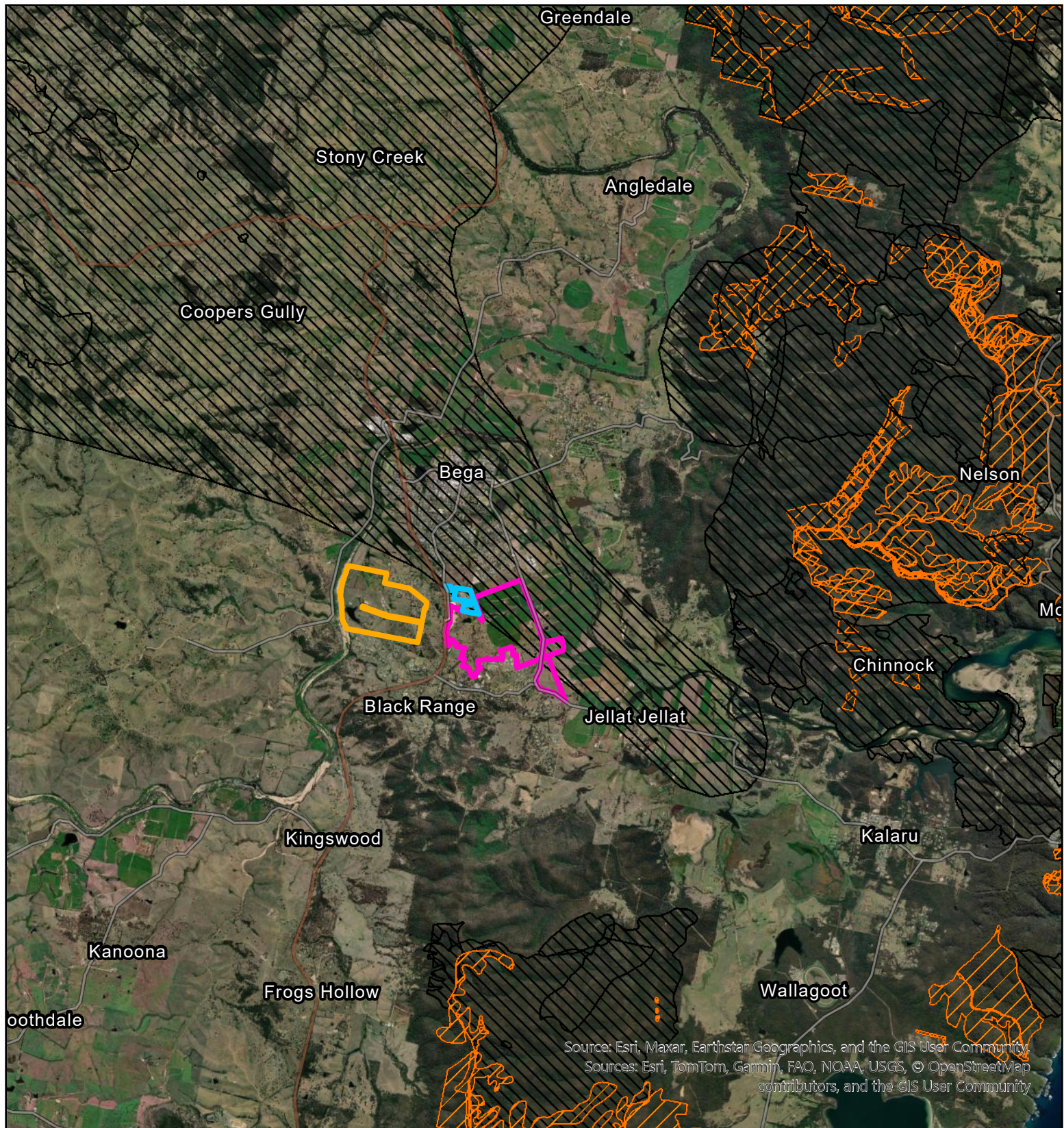
Criteria and Risk Items	Consideration	Assessment
		<p>multiple access roads and sufficient distance from hazard vegetation. The southern part of this precinct, to the north of the cemetery is limited in access, and likely to remain so. This area is surrounded to the west, north and east by areas proposed for revegetation which could create evacuation problems and any development in this area would require a secondary access point, possibly to the east across the riparian area.</p> <p>Eastern Precinct</p> <p>The eastern precinct, similar to the western precinct, is surrounded by rural lands, though it also has an area of riparian vegetation to the north and east that is proposed for regeneration. The riparian area separates this precinct into two, with the northern area likely being suitable for residential development, though Boundary Road will need upgrading for this to occur.</p> <p>The southern area will have accessibility considerations that development will need to be considerate of in relation to the riparian vegetation to the north and west. There is suitable land for perimeter roads to be provided that will provide fire fighting access in this area and allow for residential development. SFPP development should be limited to the eastern and southeastern areas, adjoining Tathra Road. Tathra road will again likely require upgrades to support the increased level of traffic.</p>
	Land use zones and permitted uses.	<p>Given the above assessment, the proposed residential, public recreation and environmental zoning is deemed suitable within the Planning Proposal Boundary.</p> <p>Any areas that will include future SFPP developments must consider the provision of SFPP APZs.</p>

Criteria and Risk Items	Consideration	Assessment
	<p>Siting considerations</p> <p>Appropriate siting of different land uses based on risk profiles within the site</p>	<p>The western precinct is currently not suitable for SFPP developments given the limited accessibility to this area. If this were fixed and easy links to the Princes Highway were established then this area could support an SFPP development, noting the ridge running through the middle of the precinct would not be the optimal location for such.</p> <p>The eastern precinct could support an SFPP development in the east and southeast, connected directly to Tathra Road, but the western and norther areas are considered unsuitable due to the presence of hazard vegetation in the riparian corridors and the current lack of access.</p> <p>The northwest corner of the central precinct is best placed currently to support SFPP development being insulated from hazard vegetation and having a good network of roads connected to it.</p>
	Siting and APZ provisions	<p>Provision of APZs with each of the precincts appears acceptable. Hazard vegetation is generally grassland, and in some cases woodland, which have relatively small APZ requirements. Slopes for the most part are not above 15° which would allow for maintenance to occur on them.</p> <p>In general, each of the precincts could afford an area for SFPP development, noting the caveats mentioned for each previously. The southern part of the central precinct is likely the most constrained area and it is unclear if this area could support the required access roads as part of new development.</p>
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 current road network would need to be upgraded to provide for the additional amount of traffic movement. This would include Boundary Road, Tathra Road and the entry points onto the Princes Highway. Newtown Road would also

Criteria and Risk Items	Consideration	Assessment
		likely require an upgrade to support a potential traffic increase. New roads, and connections to the Princes Highway, would be required for the Western precinct to be developed to ensure adequate access and egress in the case of an emergency.
	Location of key access routes and direction of travel.	<p>Key access roads associated with the precinct are the Princes Highway and Tathra Road. Both of these roads run North to South and connect into the township of Bega. Boundary road is also likely to be a key road connecting the east and west of the new precincts and providing for movement between the two in the case that one is closed.</p> <p>It will be important to ensure that there is adequate road access onto the Princes Highway before development of the western precinct occurs.</p> <p>Evacuation into Bega is highly unlikely to be broken for any of the precincts, noting that if the Princes Highway is closed in the west, then egress from Bega would be limited to Tathra Road and other smaller, minor roads to the east with limited ability to carry large volumes of traffic.</p> <p>The closure of the Princes Highway around Bega is not considered a high risk given the limited availability of canopy fuel in and around the Bega area.</p>
	Potential for development to be isolated in the event of a bush fire.	It is very unlikely that any of the precincts would become isolated from Bega township. There is a small chance that a fire running up the western side of the Princes Highway could cut the western precinct off but this is considered highly unlikely to happen.
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.	The addition of a large amount of residential zoned land has the potential to increase the demand for emergency services and it is recommended that an examination of the current emergency services capabilities and resources is undertaken

Criteria and Risk Items	Consideration	Assessment
		to ensure there is adequate ability to service the increased residential density and use from these new precincts. The review should also examine whether there is a need for a Neighbourhood Safer Place.
	Impact on the ability of emergency services to carry out fire suppression in a bush fire emergency.	Assuming the appropriate access roads are put in place and perimeter roads are present throughout the new precincts around new developments then it is considered that the precincts will result in increased access to hazard vegetation. The precincts are unlikely to have any impact on bushfire hazard reduction works though the revegetation riparian area may require management on occasion to ensure that it does not become too overgrown and create a more substantial bushfire hazard.
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.	It is expected that future developments in all three precincts would be serviced by a reticulated water supply system extended from existing and proposed residential areas. This may require additional supply and/or pumping capabilities, both of which should be examined as part of the services assessment. The reticulated water supply and street hydrant access will need to be delivered in accordance with AS 2419.1–2021. It is expected that as development occurs new infrastructure would be installed to ensure that pressure and flow is maintained.
	Life safety issues associated with fire and proximity to high voltage power lines, natural gas supply lines etc.	It is expected that electrical transmission would be delivered via underground conduits. No high voltage lines currently run through the precincts and any natural gas supply lines would be installed underground.

Criteria and Risk Items	Consideration	Assessment
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.	<p>The planning proposal is likely to reduce the risk of bushfire to the adjoining land, given the areas proposed will be managed to a larger extent than they currently are, therefore, reducing the risk of grass fires. It is likely that the precincts will also fragment grassland fire runs as well as providing better access to these areas than is currently present.</p> <p>All APZs can be contained within the Precinct Area and these would not increase the pressure on BPMs on adjoining lands.</p>



Legend

- Western Precinct Lots
- Central Precinct Lots
- Eastern Precinct Lots

NPWS Fire History

- Prescribed Burn
- Wildfire

Address: Bega, NSW
Client: Bega Valley Shire Council | AEP Ref: 5123 | Date: April 2025

Imagery: ESRI Hybrid (Dec 2024)
Spatial Reference: GDA2020 MGA Zone 55

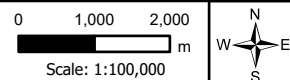


Figure 5 - Fire History



Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

Note:
1. Boundaries are not survey accurate
2. Do not scale off this plan

Bushfire Hazard Assessment

6.4 Construction Standards – AS 3959-2018

The Australian Standard 3959-2018 Construction of buildings in bushfire prone areas, details six (6) levels of construction standards that are required for buildings, depending upon the expected impact of a bushfire from adjacent areas. These Bushfire Attack Levels (BALs) are measured from the edge of the hazard and incorporate vegetation type and slopes (see above) to determine the relevant distance for each BAL rating (and associated construction standard).

It is recommended that all proposed buildings be built of non-combustible material and consideration be given to ensuring the weepholes and other gaps in walls be filled or covered with a metal mesh with a gap aperture of no greater than 2mm.

7.0 Other Considerations

The following analysis (**Table 4**) applies to the Subject Site in reference to environmental features present.

Table 4 – Other Site Constraints

Item	Comments
Riparian Corridors	There are a number of riparian corridors running through the precincts. These are currently mostly cleared or with reeds/rushes within them. A large riparian corridor will split the eastern precinct and be revegetated to woodland.
State Environmental Planning Policy (Resilience and Hazards) 2021	No features relating to this SEPP will be impacted, therefore it does not apply.
State Environmental Planning Policy (Biodiversity Conservation) 2021	The actions proposed do impact riparian lands and watercourses in the eastern precinct that is mapped under this SEPP. Therefore, the SEPP does apply and further assessment is required.
Areas of geological interest	None known to be present within the Subject Site.
Environmental protection zones or steep lands (>18°)	No environmental protection zones have been identified within the precincts. Slopes within the precinct and surrounds appear to have a maximum of 15°. There may be some small areas where slope is greater than 18° but the size of the precincts is such that these areas could be avoided.
Land slip or flood prone areas	The Study Area is not located in land slip areas. The western precinct contains flood prone areas in the southwestern corner and northeastern area associated with riparian corridors.
National Parks estate or various other reserves	None present within the Subject Site.
Threatened species matters	Given the large size of the Proposal Boundary, it is likely that threatened species would be present and these will need to be assessed at an individual project level.
Aboriginal Heritage	None known to be present within the Subject Site.

7.1 Development Regulations – Bushfire Prone Land Package

7.2 The Policy

In preparing this report, the following strategic planning principles of the Draft Bushfire Policy for Land Use Planning have been considered:

- Consider bushfire risk in a landscape context;
- Avoid inappropriate developments in high-risk bushfire locations or circumstances, in particular development of a higher vulnerability such as for a Special Fire Protection Purpose within the meaning of the *Rural Fires Act 1997*, where the level of bushfire risk is not considered appropriate; and

- Identify and consider the cumulative impacts of bush fire risk for existing and future communities.

Bushfire impacts have been considered with regard to the landscape and likely fire runs towards the future development in determining the suitability of the proposed precincts. Considerations in regard to access and egress have been examined along with recommendations on the appropriate placement of high-risk developments.

While bushfire may have an immediate direct impact as the bushfire event occurs, including loss of life, property and infrastructure, indirect impacts can also occur that can have long-lasting impacts to the community and environment. These indirect impacts can include long-lasting health issues from smoke inhalation, social impacts from housing and infrastructure losses and may impact soil and water quality.

The provision of appropriate Bushfire Protection Measures in the form of appropriate siting and location of structures combined with Asset Protection Zones and appropriate construction standards should ensure that social impacts from loss of structures is minimised. By promoting emergency evacuation plans for residents, so that they evacuate well ahead of the bushfire, this reduces the risk of smoke inhalation and other health impacts resulting from nearby fires.

7.3 The Direction

Table 5 shows the assessment of the 4.3 directions.

Table 5 – Local Planning Direction 4.3 Assessment

Direction 4.3	
Directions	Assessment
1. 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 3.34 of the Act, and prior to undertaking community consultation in satisfaction of clause 4, Schedule 1 to the EP&A Act, and take into account any comments so made.	Consultation with the RFS was sought and received with the comments incorporated and addressed into this report. A copy of the RFS feedback is located within Appendix B .
2. A planning proposal must: <ul style="list-style-type: none"> a) have regard to Planning for Bushfire Protection 2019, b) introduce controls that avoid placing inappropriate developments in hazardous areas, and c) ensure that bushfire hazard reduction is not prohibited within the Asset Protection Zone (APZ). 	The Planning Proposal has been assessed against Chapter 4 of PBP 2019 and has provided location recommendations for sensitive development in areas that are positioned away from hazard vegetation with good access. SFPP developments are to be confined to areas where the full SFPP APZ can be implemented.

<p>3. A planning proposal must, where development is proposed, comply with the following provisions, as appropriate:</p> <ul style="list-style-type: none"> a) provide an Asset Protection Zone (APZ) incorporating at a minimum: <ul style="list-style-type: none"> 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. 	<p>Asset Protection Zones (APZs) have been examined but, given the size of the precincts and the fact that site specific APZs are to be derived at the DA stage that are specific to the type of development proposed only the minimums required have been mentioned within this report. This is also inline with the draft Local Planning Direction. Each precinct has sufficient space and ability to provide for required APZs.</p> <p>Two access roads connecting to the Princes Highway will need to be constructed before full use of the western precinct is achieved. It is possible that a single access road could suffice for part of the development of this precinct but this would need to be assessed as part of the staged development of the precinct.</p> <p>Boundary Road and Tathra Road will need to be upgraded as part of the eastern and central precinct development.</p> <p>Reticulated water is to be provided to the entire development. Where this is not possible then static water to the specification required in the PBP is to be provided.</p> <p>The precincts have been located such that they are located in mainly grassland areas with limited areas of hazard vegetation creating incursions into the area. A riparian area is present that cuts through the eastern precinct, however given that the vegetation will be fragmented from other areas of canopy and limited in size it is considered that it will not constitute an unacceptable increase in risk to future developments in this area assuming appropriate setbacks and access provisions are provided.</p> <p>Inner Protection Area management should be in line with PBP 2019. Future DAs will be required to specify the management of IPAs within the proposed development in line with the current Planning for Bushfire Document.</p>
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8.0 Bush Fire Emergency Management

Although the Planning Proposal is not at the detailed design phase, consideration also needs to be applied to Bush Fire Emergency Management and how the proposal has considered principles, strategies and outcomes that could be considered or adopted in the event of a catastrophic bushfire event.

Understanding bushfires and potential hazards requires planning and consideration of hazard vegetation, slopes and fire behaviour (reviewed above). To ensure the land within each Precinct can be managed appropriately in the event of any level of bush fire, from low hazard advice to catastrophic, the following recommendations and commentary should be considered and incorporated into planning and DCP provision:

- All development must apply APZs appropriate to the development type proposed in line with Appendix 1 of PBP 2019 (or any newer version);
- All development is to provide perimeter roads and internal roads that meet the requirements of the NSW RFS PBP 2019 (or any newer version) for the specific development type;
- Dead-ends longer than 200m are not permitted, and dead-end roads must be clearly signposted and contain an appropriately sized turning area as defined in Appendix 3 of Planning for Bushfire Protection 2019 (or any newer version);
- Residential subdivision of three or more lots must provide dual access points onto public roads to ensure multiple entry and exit points can be used if one or more is blocked in the event of an emergency;
- Where property access roads run through woodland hazard vegetation, a secondary access and egress shall be provided;
- There is to be provision of reticulated water to all land within the precinct boundaries, or, if this is not possible, lots without reticulated water are to have sufficient space to provide for static water tanks for fire-fighting purposes;
- All land zoned for residential development must be able to provide lots capable of containing a building envelope with a maximum BAL rating of 29;
- Provision of refuge areas within the precincts are to be located within areas exposed to 10kW/m² of radiant heat or less. It is considered that the proposal has ample space for on-site refuges (utilising Neighbourhood Safer Places documentation) and is in close proximity to Bega where off-site refuges could be utilised;
- For on-site refuges, future Development Applications (DA) would need to consider the following:
 - Refuges should be able to accommodate all occupants away from the effects of the bushfire;
 - On-site refuges should be located away from bushland and in locations unlikely to be impacted by a bush fire;
 - Open air refuges should be located in areas exposed to less than 2kW/m² of radiant heat;
 - Refuge buildings should be constructed in a manner that minimises bush fire attack with appropriate APZs and ember protections and be located in an area exposed to less than 10kW/m² radiant heat; and
 - Refuge buildings should be maintained to ensure there are no combustible materials stored near or in close proximity to the building that will increase bushfire risk.
- For off-site refuges, future DAs would need to consider the following:
 - Location of refuges;
 - Transportation arrangements to refuge shelters;

- The time it takes to move occupants from the premises to another location is the minimum time required to evacuate safely. Take this into consideration and evacuate early;
- Size and Capacity of the refuge; and
- Availability of a facility nearby.
- Further to this the route towards the refuge would also need to consider transportation routes to ensure that movements are restricted from passing through bush fire affected areas or areas that may be affected by an approaching bushfire;
 - The precincts are located within predominantly cleared areas and, as discussed above, have the necessary area to provide suitable APZs, perimeter roads and multiple access and egress points to ensure safe movements to refuge buildings and evacuation in the event of a bush fire;
 - Future development would be serviced via upgrade to the existing accessways including Boundary Road and Tathra Road for the central and eastern precincts. New access roads would likely be required for the western precinct connecting to the Princes Highway.

In addition to the above, as per the Rural Fire Services “Development Planning: A guide to developing a Bush Fire Emergency Management and Evacuation Plan”, key facilities that are likely to require a Bush Fire Emergency Management and Action Plan to ensure safe sheltering and or evacuation in the event of a bush fire emergency are predominantly associated with at risk developments. As per the guidelines;

At risk developments are facilities that regularly have a large number of occupants that may rely on others for their wellbeing or be unfamiliar with the local area. As such a greater degree of planning and coordination is required to ensure occupants safety. In the event of a bush fire, a Bush Fire Emergency Management and Evacuation Plan will outline what actions are to occur and arrangements for relocation.

Key at risk developments that must consider evacuation plans typically include facilities referred to as Special Fire Protection Purpose (SFPP) development, which include;

- *School;*
- *Child care centres;*
- *Hospitals;*
- *hotel, motel or other tourist accommodation;*
- *a building wholly or principally used as a home or other establishment for mentally incapacitated persons;*
- *seniors housing within the meaning of State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004;*
- *a group home within the meaning of State Environmental Planning Policy No 9—Group Homes; and*
- *a retirement village.*

Other development types that may need to consider a Bush Fire Emergency Management and Evacuation Plan include commercial/industrial, multiple occupancy (land sharing) and community title estates.

At DA stage it should be a requirement, where large groups of people or where vulnerable people are present, that these types of facilities prepare and implement Bush Fire Emergency Management and Actions Plans which would detail specific requirements associated with the safe sheltering and evacuation in the event of an emergency.

9.0 Conclusion

Investigations undertaken for this Strategic Bushfire Study have revealed that the three precincts will be affected by unmanaged grassland hazard vegetation for the most part with an area of revegetated riparian woodland vegetation being present through the eastern precinct and below the central precinct.

The proposed precincts can provide for any required Asset Protection Zones, noting that specific APZs would be determined at DA stage. As such, the position of future subdivision plans will need to take this into consideration. Perimeter roads can be afforded within the proposed precincts, these would be located within the APZs of future developments.

With the exception of the central precinct the precincts are of sufficient size to provide suitable refuge areas in the event of a bushfire event. Tathra Road and Boundary Road will need to be upgraded but should provide suitable access and egress for the central and eastern precincts. The western precinct will require new roads connecting to the Princes Highway to provide suitable access and egress. It is considered that access and egress arrangements can be made appropriate, and no issues have been identified that would prohibit safe evacuation, inability to provide safe haven zones, or inhibit firefighting logistics should these roads be present and upgraded where required.

Emergency evacuation and refuges can be provided for within the western and eastern precincts with specific areas to be identified at a later stage with appropriate refuges to be guided by the Neighbourhood Safer Places guidelines. Internal refuge areas are to be located in areas that experience less than 10kW/m² radiant heat and open-air refuges in areas that experience less than 2kW/m² radiant heat. Development applications (DA) within the precincts will be assessed by the RFS to ensure suitable emergency evacuation procedures can be catered for. Where required, at the DA stage, emergency evacuation plans with associated refuge points within and outside the precincts should be prepared in accordance with Rural Fire Services Emergency Evacuation Guidelines.

A reticulated water supply system from established residential areas is expected to service the site, and street hydrant access will need to be delivered in accordance with AS2419.1 – 2021. Where reticulated water cannot be provided then static water is to be provided in line with the requirements of PBP 2019 (or the latest version thereof).

Upgrades to infrastructure is to be assessed as part of the Planning proposal to ensure that emergency services and utilities are appropriate to the expected growth from development of these areas.

It is considered that the proposed protection measures, principally APZ's, perimeter roads and relevant construction standards, could be provided to comply with the relevant requirements of PBP 2019 and AS-3959. When applied, these measures should be able to provide adequate protection to life and property within the proposed development in the event of a bushfire occurring in the immediate locality. However, it can never be guaranteed that the site and residents and property therein will not at some stage be affected by a bushfire event.

As such, it is considered that the Planning Proposal is able to meet the required objectives and principles of PBP 2019, Local Planning Direction 4.3.

10.0 References

Australian Building Codes Board. International Fire Engineering Guidelines. Edition 2005.

Environmental Planning & Assessment Act 1979. NSW Government.

Keith, D. (2004). Ocean Shores to Desert Dunes. DEC, Sydney.

NSW Rural Fire Service (2019). Planning for Bushfire Protection: A guide for councils, planners, fire authorities and developers. November 2019.

NSW Government, ePlanning Spatial Viewer – Bushfire Prone Land Map, accessed March 2025.

Rural Fires Act 1997. NSW Government.

Rural Fires Act Regulation 2013. NSW Government.

Standards Australia (2018) AS-3959 Construction of Buildings in Bushfire-Prone Areas.

Standards Australia (2010) AS-3745 Emergency Control Organisation and Procedures for Buildings, Structures and Workplaces' for Residential Accommodation.

Standards Australia (2021). AS-2419.1 Fire Hydrant System Design, Installation and Commissioning. Council of Standards Australia, 2021.

Appendix A – Site Photographs



Above: Looking east across the grassland of the Eastern Precinct
Below: Looking north across the central area of the Eastern Precinct





Above: Looking northeast from the cemetery into the western portion of the Eastern Precinct

Belo: Looking southwest from Finucanes Lane across southern section of the Western precinct.





**Above: Looking northeast towards the large dam in the Western Precinct;
Below: Looking south from the end of Ravenswood St into the Western Precinct.**





**Above: Looking north from the top of the Central precinct onto grassland hazard;
Below: Looking north from the southern side of the Central precinct.**



Appendix B – RFS Feedback



RFS



Department of Planning, Housing & Infrastructure (Parramatta)
Locked Bag 5022,
PARRAMATTA NSW 2124
Australia

Your reference: Dated 9 April 2024
Our reference: SPI20240411000046

ATTENTION: Graham Judge

Date: Thursday 2 May 2024

Dear Sir/Madam,

**Strategic Planning Instrument
Rezoning – Draft Proposal**

Council has prepared a scoping proposal for the planning proposal (Bega URA) and the Department of Planning and Environment is coordinating the consultation with relevant agencies on behalf of Bega Valley Shire Council.

I refer to your correspondence dated 09/04/2024 inviting the NSW Rural Fire Service (NSW RFS) to comment on the above Strategic Planning document.

The NSW RFS has considered the information submitted and provides the following comments.

In February 2024 the NSW Rural Fire Service (RFS) provided comment on the Bega and Wolumla Structure Plans recommending that *"future planning proposals located on bush fire prone land will need to be supported with a Strategic Bush Fire Study (SBS) in accordance with Chapter 4 of Planning for Bush Fire Protection 2019. (PBP 2019)"*. This advice still stands and applies to this scoping proposal.

The advice also identified a number of specific items that should be addressed as part of a Strategic Bush Fire Study including;

- Where staged development is to occur Council should give consideration to appropriate mechanisms to ensure that undeveloped areas do not constitute a hazard to areas being developed.
- As development occurs Council may wish to consider updating the Bush Fire Prone Land Mapping to reflect the extent of managed land.
- Where public open space may be reliably considered to be managed land a formal plan of management that addresses fuel management should be considered.
- Where natural features, such as riparian areas, are to be enhanced/rehabilitated consideration should be given to any potential impacts on bush fire protection measures for existing and proposed development.
- Future subdivision/development of the land complies with *Planning for Bush Fire Protection 2019 (PBP 2019)*.

This advice stands for the current scoping proposal.

These comments should be copied into, or referenced, in subsequent referrals.

Postal address

NSW Rural Fire Service
Locked Bag 17
GRANVILLE NSW 2142

Street address

NSW Rural Fire Service
4 Murray Rose Ave
SYDNEY OLYMPIC PARK NSW 2127

T (02) 8741 5555
F (02) 8741 5550
www.rfs.nsw.gov.au



RFS



For any queries regarding this correspondence, please contact David Webster on 1300 NSW RFS.

Yours sincerely,

Martha Dotter
**Supervisor Development Assessment & Plan
Built & Natural Environment**

Appendix C – CVs

DR MARIA JEDENSJO

Ecologist

Profile Summary

Maria works with AEP in the role of Ecologist. She has a Doctorate in Natural Science, with a background in the marine environmental fields. Her ecological knowledge is utilised in a diverse array of applications in her current role, with a growing knowledge of environmental legalisation, biodiversity approval pathways, and in the implementation of the NSW Biodiversity Assessment Method. Maria has extensive knowledge of marine biodiversity assessments, statistical analyses, writing grants, publishing scientific papers, teaching, and project management.

Academic Qualifications

- Doctor of Philosophy, 2019 (University of Zurich, Switzerland)
- Master of Science, 2006 (Lund University, Sweden)
- Bachelor of Science, 2004 (Lund University, Sweden)
- Certificate III in Conservation and Ecosystem Management, 2022 (TAFE)

Training, Licences and Professional Memberships

- NSW Class C Driver's Licence
- WHS NSW Construction Induction White Card
- First Aid (Provide First Aid HLTAID011)
- Working With Children Check
- Coxswain Grade 1 (near coastal)
- General purpose hand certificate
- CMAS two-star scuba diver

Professional Experience

Ecologist Anderson Environment & Planning Newcastle NSW	2023 – Present
Marine Mammal Observer Murdoch University and James Cook University Perth WA / Brisbane QLD	2007 - 2015
Research Assistant University of Queensland, Flinders University and James Cook University Brisbane QLD / Adelaide SA	2006 - 2010

Relevant Project Experience

Ecological Surveys and Analyses

- Targeted floral surveys *Cryptostylis hunteriana*
- Camera trapping surveys for ground and arboreal species – analyses

- Developing skills in ecological field surveying and habitat assessments, covering terrestrial flora and fauna
- Boat-based dolphin surveys (small and large boats)
- Aerial dolphin, whale, dugong and turtle surveys (Cessna airplanes)
- Marine mammal ecology and research
- GIS mapping and analysis

Ecological Assessment Reports

- Environmental impact assessment reports (including BDAR, BSSAR, BCAR, EAR, Wildlife Management Strategy Reports, and terrestrial wildlife risk assessments etc.)
- Bushfire Threat Assessment Reports
- Due Diligence Reports
- Fee Proposals

Publications

- Jedensjö, M., Kemper, C. M., Milella, M., Willems, E. P., & Krützen, M. (2020). Taxonomy and distribution of bottlenose dolphins (genus *Tursiops*) in Australian waters: an osteological clarification. *Canadian journal of zoology*, 98(7), 461-479.
- Parra, G. J., Cagnazzi, D., Jedensjö, M., Ackermann, C., Frere, C., Seddon, J., ... & Krützen, M. (2018). Low genetic diversity, limited gene flow and widespread genetic bottleneck effects in a threatened dolphin species, the Australian humpback dolphin. *Biological Conservation*, 220, 192-200.
- Jedensjö, M., Kemper, C. M., & Krützen, M. (2017). Cranial morphology and taxonomic resolution of some dolphin taxa (*Delphinidae*) in Australian waters, with a focus on the genus *Tursiops*. *Marine Mammal Science*, 33(1), 187-205.
- Beasley, I., Jedensjö, M., Wijaya, G. M., Anamiato, J., Kahn, B., & Krebs, D. (2016). Observations on Australian humpback dolphins (*Sousa sahulensis*) in waters of the Pacific Islands and New Guinea. In *Advances in marine biology* (Vol. 73, pp. 219-271). Academic Press.
- Parra, G. J., & Jedensjö, M. (2014). Stomach contents of Australian snubfin (*Orcaella heinsohni*) and Indo-Pacific humpback dolphins (*Sousa chinensis*). *Marine Mammal Science*, 30(3), 1184-98.

CHRIS WARK

Project Manager

Profile Summary

Chris has been with AEP since 2018 and works as a Senior Ecologist along with managing the Bushfire team within AEP. He has been involved in ecology for the past 15 years both in the UK and Australia undertaking a diverse range of terrestrial fauna surveys. Chris has a detailed knowledge of environmental and bushfire legislation and approvals pathways associated with both.

Chris' special interests and expertise include microbat roost investigations, ultrasonic survey and call identification, camera trapping for cryptic fauna, nocturnal survey of arboreal mammals.

With these skills and interests Chris leads the microbat and bushfire team at AEP and is involved in management of diverse range of projects across AEP including Biodiversity Assessments, Stewardship Site Assessments, Ecological Assessments, Clearing Methods Statements, Management Planning and Bushfire Threat Assessments.

Academic Qualifications

- Graduate Certificate in Bushfire Protection (2023)
- Diploma of Conservation and Land Management (2017)
- Bachelor of Teaching (Secondary School), University of Technology, NSW (2008)
- Bachelor of Science Hons (Ecology and Zoology), University of Sydney (2004)
- Bachelor of Science (Cell Biology and Biochemistry), University of Newcastle (2000)

Training, Licences and Professional Memberships

- NSW Class C Driver's Licence
- QLD WHS General Construction Induction (White Card)
- First Aid (Provide First Aid HLTAID011)
- Advanced Microbat Call Analysis Workshop
- Experienced 4wd operator
- GIS Mapping and training courses (ArcGIS, QGIS and Mapinfo)
- BTO Ringers association - expired
- CIEEM (Chartered Institute of Ecology and Environmental Management) - expired

Professional Experience

Senior Ecologist and Bushfire Manager Anderson Environment & Planning Newcastle NSW	2018 – Present
Ecological Consultant Applied Ecology Ltd Cambridge UK	2013 - 2017
Laboratory and Field Technician Cygnet Potato Breeders Cambridge UK	2012
Secondary School Teacher Taylors College Waterloo Sydney	2009 - 2011
Research Assistant and University Tutor Biological Sciences, University of Sydney Sydney NSW	2005 - 2007

Relevant Project Experience

Ecological Surveys

- Fauna survey including bird and reptile survey, spotlighting, koala habitat and SAT assessment, microbat emergence and return surveys along with transect surveys;
- Trapping and translocation work with mammals, reptiles, and amphibians;
- Camera trapping, acoustic detection, and call playback surveys;
- Vegetation quadrats and transects to identify flora species presence and abundance;
- Targeted vegetation transects for cryptic species;
- Brush-tailed Rock-wallaby habitat survey and macropod scat identification;
- Audio lure surveys including track and carnivore scat identification.

Ecological Assessment

- Fauna survey and identification utilising camera traps and audio technology
- Microbat survey, call analysis and ID
- GIS mapping and analysis
- Land conservation management
- Ecological field survey, covering terrestrial flora and fauna
- Arid zone ecology and feral cat management

Ecological Monitoring

- Ecological field survey, covering terrestrial flora and fauna, to inform the production of Ecological Reports within NSW and the UK;
- Assessment of sites using the Biodiversity Assessment Method (BAM) for the production of Biodiversity Assessment Reports (BDAR);



- Assessment of development proposals against the provisions of the EPBC Act, Koala Plans of Management, SEPP 44 and SEPP Koala Habitat Protection, Coastal Management SEPP and other associated legislative requirements;
- Analysis and reporting of microbat species relating to conservation and development within Australia and the UK.

Additional Project Experience

- Bushfire Threat Assessment analysis and reporting for Subdivision, State Significant Development (SSD), Infill, General residential, Special Fire Protection Purpose and Planning Proposal developments.
- GIS analysis and mapping for ecological reports, bushfire threat assessments, stewardship reporting and monitoring, management planning and development pathway planning and constraints assessment.