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Level 3

BUSH FIRE STRATEGIC STUDY

The Foundations, Portland NSW

BE BUSHFIRE READY
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Abbreviations and Acronyms

APZ	Asset Protection Zone
AS/NZS 1221:1997	Australian Standard – Fire hose reels
AS1596-2014	Australian Standard – The storage and handling of LP Gas
AS2419-2017	Australian Standard – Fire hydrant installations
AS2441:2005	Australian Standard – Fire hose reels installation
AS3745:2010	Australian Standard – Planning for emergencies in facilities
BAL	Bush fire Attack Level
BCA	Building Code of Australia
BEMC	Bushfire Environmental Management Consultancy
BFAR	Bush Fire Assessment Report
BFMC	Bush Fire Management Committee
BFSS	Bush Fire Strategic Study
BPA	Bush fire Prone Area (Also Bush fire Prone Land)
BPL Map	Bush fire Prone Land Map
BPMs	Bush fire Protection Measures
BV	Biodiversity Values
DCP	Development Control Plan
DEM	Digital Elevation Model
DSF	Dry Sclerophyll Forest
EP&A Act	*NSW Environmental Planning and Assessment Act 1979*
FFDI	Forest Fire Danger Index
GEV	Generalised Extreme Value
GFDI	Grass Fire Danger Index
ha	Hectare
HOC	Heat Of Combustion
IPA	Inner Protection Area
kJ/kg	Kilo Joules per Kilo gram
LGA	Local Government Area
NSP	Neighbourhood Safer Place
OPA	Outer Protection Area
PBP	Planning for Bush fire Protection
PCT	Plant Community Type
RF Act	*Rural Fires Act 1997*
RF Regs	*Rural Fires Regulations 2013*
RHG	Restricted Head Growth
SEED	Sharing and Enabling Environmental Data in NSW
SFPP	Special Fire Protection Purpose
SFR	Short Fire Run
t/ha	Tonnes per hectare
WUI	Wildland Urban Interface

Executive Summary

BEMC Pty Ltd was engaged by Catalyst Project Consulting to complete a Bush Fire Strategic Study (BFSS) to inform and assist with the planning proposal for The Foundations, Portland NSW.

The contents of the Study provide detail to address all the components, measures and matters requested and demonstrate that the proposed development within The Foundations, Portland can comply with the requirements of Planning for Bushfire Protection 2019. Planning for Bushfire Protection 2019 requires certain protective measures be met to make a building less likely to suffer damage or destruction from bush fires. It is not the intention of the measures to prevent the development of land in bush fire prone areas.

The Study aims to:

- Assess the existing bushfire risk in and around The Foundations, Portland.
- Manage bushfire risk in accordance with Planning for Bushfire Protection 2019, and
- Identify potential bushfire threats, suitable asset protection zones from features such as riparian corridors, protected vegetation and revegetated areas, and road network requirements.

The landscape bushfire risk includes assessment of bushfire hazard, potential fire behaviour and bushfire history within the study area. Additionally, the impacts of climate change in regard to bushfire risk have been assessed, with the effects of climate change likely to result in a harsher fire-weather climate. The Forest Fire Danger Index 83 has been adopted with regard to a bushfire weather analysis relevant to the locality.

The landscape bushfire risk analysis indicates that the potential for attack by bushfires exists in most years, if not all, due to weather conditions and fuel continuity. It is also reasonably foreseeable that Bushfire Attack Levels under Catastrophic Fire Danger Rated days could occur and therefore assessment of individual allotment risks under the Planning for Bushfire Protection 2019 benchmarks are appropriate to identify bushfire protection measures specific to individual allotments that cannot be achieved at this scale of assessment.

The indicative road layout provides for multiple access routes, although ensuring adequate access from the west to north-east, and north to south will facilitate emergency management arrangements and response. The extent of revegetated open areas and riparian areas may result in increased risk to access options being cut off. Appropriate consideration to revegetation and asset protection zones in these areas will mitigate the risk of bushfire adequately.

This study has been evaluated in relation to the feasibility of bushfire protection measures. The required bushfire protection measures in accordance with Planning for Bushfire Protection 2019 can be achievable within The Foundations, Portland and will reduce the bushfire risk associated with future development that will occur within the Portland precincts. All asset protection zones will be within urban capable land.

1 INTRODUCTION

BEMC Pty Ltd was engaged by Catalyst Project Consulting to complete a Bush Fire Strategic Study (BFSS) to inform planning proposal for The Foundations, Portland NSW, hereafter referred to as the site (**Figure 1**).

It is noted that several lots which border the site are owned by Crown Lands. The intent is to include these Crown Lands lots for rezoning as part of the Planning Proposal. It is understood that Crown Lands supports the Planning Proposal in principle, Crown Lands has yet to divest ownership of these lots. Overall concept master planning for the future development of the Portland site has envisaged the future rezoning and development of those Crown Lots so that they may be used in a compatible manner with the remainder of the Portland site.

1.1 BACKGROUND

Strategic planning occurs at a state, regional and local government level. It often covers a large area, can include several different land uses, and establishes longer term development options.

Land use planning can be an effective tool in minimising or avoiding the impact of natural hazards such as bush fire. From a risk management perspective, the safest approach is always to avoid high risk areas. Local land use strategies and LEPs should consider and identify land affected by natural hazards and direct development away from inappropriate and constrained lands.

In a bush fire context, strategic planning must ensure that future land uses are in appropriate locations to minimise the risk to life and property from bush fire attack. Services and infrastructure that facilitate effective suppression of bush fires also need to be provided for at the earliest stages of planning.

The bush fire risk is considered at the macro-scale, looking at fire runs, steep slopes, and any areas of isolation. The amount of proposed development interfacing vegetation will also be considered.

Firefighting access and evacuation potential must be considered, and an assessment of traffic volumes and evacuation routes will be required. The potential for these evacuation routes to be non-trafficable during a bush fire event will be factored into the assessment.

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 bush fire 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 bush fire risk and should be avoided.
- The development is likely to be difficult to evacuate during a bush fire due to its siting in the landscape, access limitations, fire history and/or size and scale.
- The development will adversely affect other bush fire 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.

1.2 Aims and Objectives of Study

Strategic development proposals in bush fire prone areas require the preparation of a Strategic Bush Fire Study. The level of information required for such a study will be dependent upon the nature of any planning instrument changes, scale of the proposal, the bush fire risk and its potential impact upon the wider infrastructure network.

The Strategic Bush Fire Study provides the opportunity to assess whether new development is appropriate in the bush fire hazard context. It also provides the ability to assess the strategic implications of future development for bush fire mitigation and management.

A Strategic Bush Fire Study must include:

- 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 land use assessment will identify the most appropriate locations within the masterplan area or site layout for the proposed land uses.
- A study of the existing and proposed road networks both within and external to the masterplan area or site layout.
- An assessment of the future impact of new development on emergency services.
- An assessment of the issues associated with infrastructure and utilities, and
- The impact of new development on adjoining landowners and their ability to undertake bush fire management.

Once these strategic issues have been addressed, an assessment of whether the proposal can comply with PBP2019 should be carried out.

1.3 Assessment Area and surrounds

The Planning Proposal developed by Willow Tree Planning (2020) indicates the site lies immediately north of the current Portland town centre, around 26km north-west of the City of Lithgow and around 164km west of the Sydney CBD. It lies within the Central Tablelands of NSW, south of Mudgee Wine Country and to the west of the Blue Mountains range. It is generally bound by Forest Street to the north, Carlton Street and Kiln Street to the west, High Street and Williwa Street to the east, and Williwa Street and Laurie Street to the south (refer to **Figure 1 and Figure 2**).

Although small, the town centre of Portland includes essential and specialist retail and a range of recreational facilities. It is also one of the few authentic Art Deco towns in New South Wales.

The site currently exists as a mostly vacant and partially cleared areas with four large lakes which originated as lime quarries. These have stepped back walls, are filled with water, and are surrounded by rehabilitation plantings. They range in depth from 15-70m and have a combined surface area of around 18.3ha.

Key geographical features of the site and its surrounds are a steep topography in a downwards direction from all boundaries, descending into the four manmade quarry lakes onsite. There are significant viewscapes available from the north and north-west of the site into the lakes area and dense vegetation

to the north of the site, buffering onto the site's northern rural edge. These features create a natural site boundary. Limestone Creek traverses the site from north to south. Two unnamed creek tributaries traverse the site from south to south-west and from the north-east.

The site currently exists as a mostly vacant and partially cleared areas with four large lakes which originated as lime quarries. The site is not currently being used for any dedicated use. A 66kV electricity transmission line bisects the south-eastern corner of the site. Internal circulation throughout the site is provided by unsealed vehicle access tracks.

The site is irregular in shape, and lies adjacent to the following existing land uses and zones (refer to Figure 4):

- R2 Low Density Residential zoned dwellings to the east, a pocket of RE1 Public Recreation zoned land, and St Joseph's School Portland.
- R2 Low Density Residential and R5 Large Lot Residential zoned dwellings, Portland Produce (a grain and livestock feed retailer) and Roxburgh Street Reserve to the north.
- R2 Low Density Residential zoned dwellings and the SP2 zoned Blue Mountains railway line to the west, and
- R1 General Residential land to the south, including St Stephens Anglican Church.

The Portland town centre lies directly to the south of the site (refer to **Figure 1, Figure 2** and **Figure 3**).

- ▪ R2 Low Density Residential (including existing residential accommodation).
- ▪ IN2 Light Industrial (including Fire and Rescue NSW Portland Fire Station).
- ▪ RE1 Public Recreation (including Portland Olympic Pool, sports field and Portland Showground).
- ▪ B2 Local Centre (including the Portland town centre consisting of a range of retail, commercial and services uses such as cafes, restaurants, service station, childcare centre, pub, grocery stores, Australia Post, hairdressing salon), and
- ▪ R1 General Residential (including existing residential dwellings).

Surrounding crown lands have been included into the Planning Proposal for an appropriate planning outcome to be achieved across the entire site, it is therefore recommended that Lithgow City Council consider rezoning these Crown Land lots to provide certainty over the future planning potential of this overall site.

1.4 Planning Process and Proposal

The Planning Proposal developed by Willow Tree Planning (2020) indicates a concept masterplan for the site. The intended urban design outcome is for the site to become a tourism and community-based ecosystem celebrating the area's unique offerings, place attributes, and people. This will include recreation activities and a museum celebrating Portland's history, as well as the following:

- Around 71 R2 Low Density Residential lots.
- Around 103 R1 General Residential lots.
- Senior Housing.
- Employment and entertainment land.
- Land zoned RE2 Private Recreation to support parks, walkways, caravanning, camping/glamping and suitable tourist and visitor accommodation.
- B4 Mixed Use zoned land to support commercial, retail, tourism and employment land uses.
- RE2 Private Recreation zoned man-made quarry lake in the east of the site to support future works to improve dam wall integrity (where required), and
- Adaptive reuse of heritage cottages at the site.

While portions of the site are zoned under the Lithgow Local Environmental Plan 2014 (LLEP2014) (for B4 Mixed Use, R1 General Residential, R2 Low Density Residential and R5 Large Lot Residential), much of the site is mapped as Deferred Matter under the LLEP2014. These sections of the site remain zoned 2(v) Village under the Lithgow City Local Environmental Plan 1994 (LCLEP1994). The Planning proposal seeks to amalgamate the Deferred Matter portions of the site into the more recent LLEP2014 and apply suitable planning controls across the entire site as follows:

- Rezone the site to permit a range of suitable residential, tourist, recreation, commercial, employment uses and specialised land uses, and
- Remove the minimum lot size control as it currently applies to the land zoned R1 in the south-west of the site as well as the R2 zoned land in the east of the site and maintain no minimum lot size across the site in its entirety.

The Planning Proposal seeks adaptive reuse of a previous quarry/cement works site for a range of positive economic uses. Adoption of the amendments put forward in the Planning Proposal would allow the site to provide a range of residential accommodation, seniors' living, and tourist-related infrastructure to boost region's economic activity. It would also create active linkages to, and include the reuse of, the site's State Heritage items.


Figure 1 Location Map
Lot Boundary
Crownlands
0
100
200 m
BEMC
Portland
BATHURST
LITHGOW
940
930
920
910
950

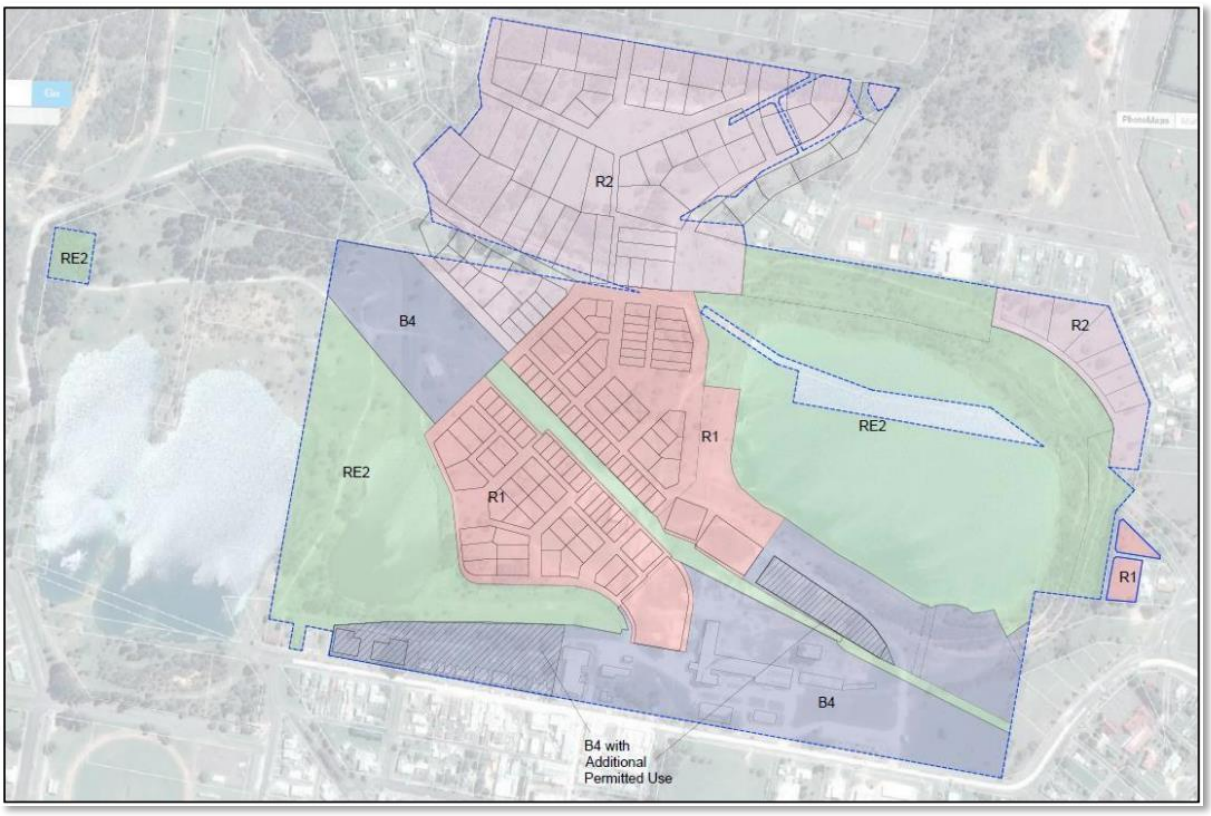


Figure 2 Proposed Land Zones (Roberts Day, 2020)

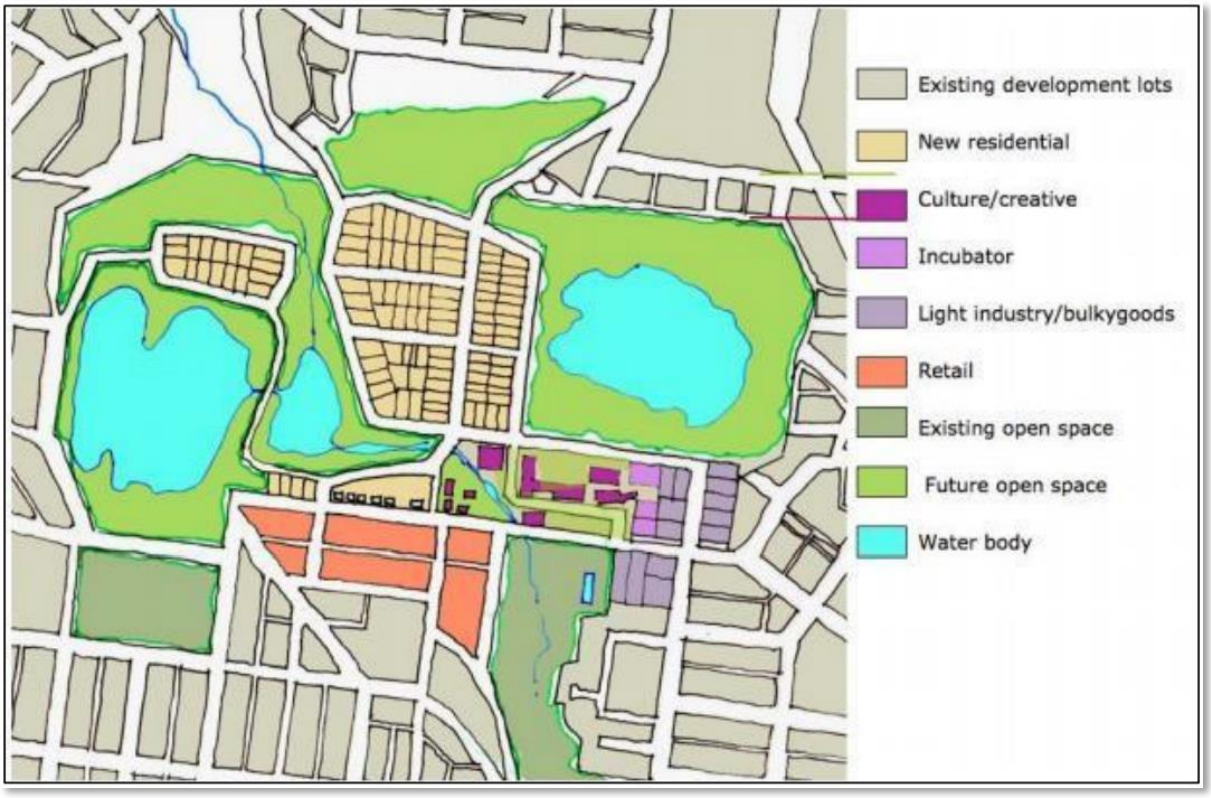


Figure 3 Possible future Urban Form (Lithgow City Council, 2010)

2 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.

2.1 BUSHFIRE HAZARD

The Foundations at Portland is classified as bushfire prone land and is located within a wider landscape of Bushfire prone land illustrated in **Figure 4**. This is expected to change as the precincts are developed, with an indicative future bushfire prone land map based on expected retained vegetation.

Bushfire prone land mapping is a trigger for the consideration of bushfire protection measures for new developments. Bushfire prone land is separated into three categories based on vegetation type and potential bushfire risk:

- Vegetation Category 1 (red): Land considered to be the highest risk for bushfire and surrounded by a 100m buffer (buffer is yellow)
- Vegetation Category 2 (light orange): Land is considered to be a lower bush fire risk than categories 1 and 3. Surrounded by a 30m buffer (buffer is yellow).
- Vegetation Category 3 (dark orange): Land is considered to be a medium bush fire risk. Surrounded by a 30m buffer (buffer is yellow).

Planning for Bushfire Protection 2019 requires certain protective measures to be met to make a building less likely to suffer damage or destruction from bushfires. It is not the intention of the measures to prevent the development of land in bushfire-prone areas. However, to provide adequate protection from bushfires, it may be necessary to modify the style, construction material or sighting of a building

The largest potential fire hazard is the vast forested areas to the west, north-west and south-west along with the unmanaged grasslands and woodland vegetation to the north. The existing bushfire prone lands has been classified using the methodology with NSW RFS Guide for bush fire prone land mapping version 5b (2015).

2.2THE VEGETATION, TOPOGRAPHY AND WEATHER IN THE SURROUNDING AREA.

This section assesses the attributes that contribute to wildfire behaviour and risk.

2.2.1 Vegetation

The vegetation in and around the site consists of Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands; South Eastern Highlands Bioregion transiting to Snow Gum - Candle Bark woodland on broad valley flats of the tablelands and slopes; South Eastern Highlands Bioregion, Broad-leaved Peppermint - Ribbon Gum grassy open forest in the north east of the South Eastern Highlands Bioregion and Southern Tableland Grassy Woodlands on lower elevations.

These Plant Community Type (PCTs) correspond to Southern Tableland Dry Sclerophyll Forests and Southern Tableland Grassy Woodlands classification based on available fuel loads for sub-formations are provided through vegetation fuel monitoring project administered by the University of Wollongong, University of Melbourne and CSRO Ecosystems Science and Bush fire Dynamics and Applications. The results of this research are commonly referred to as the 'NSW Comprehensive Fuel Loads'.

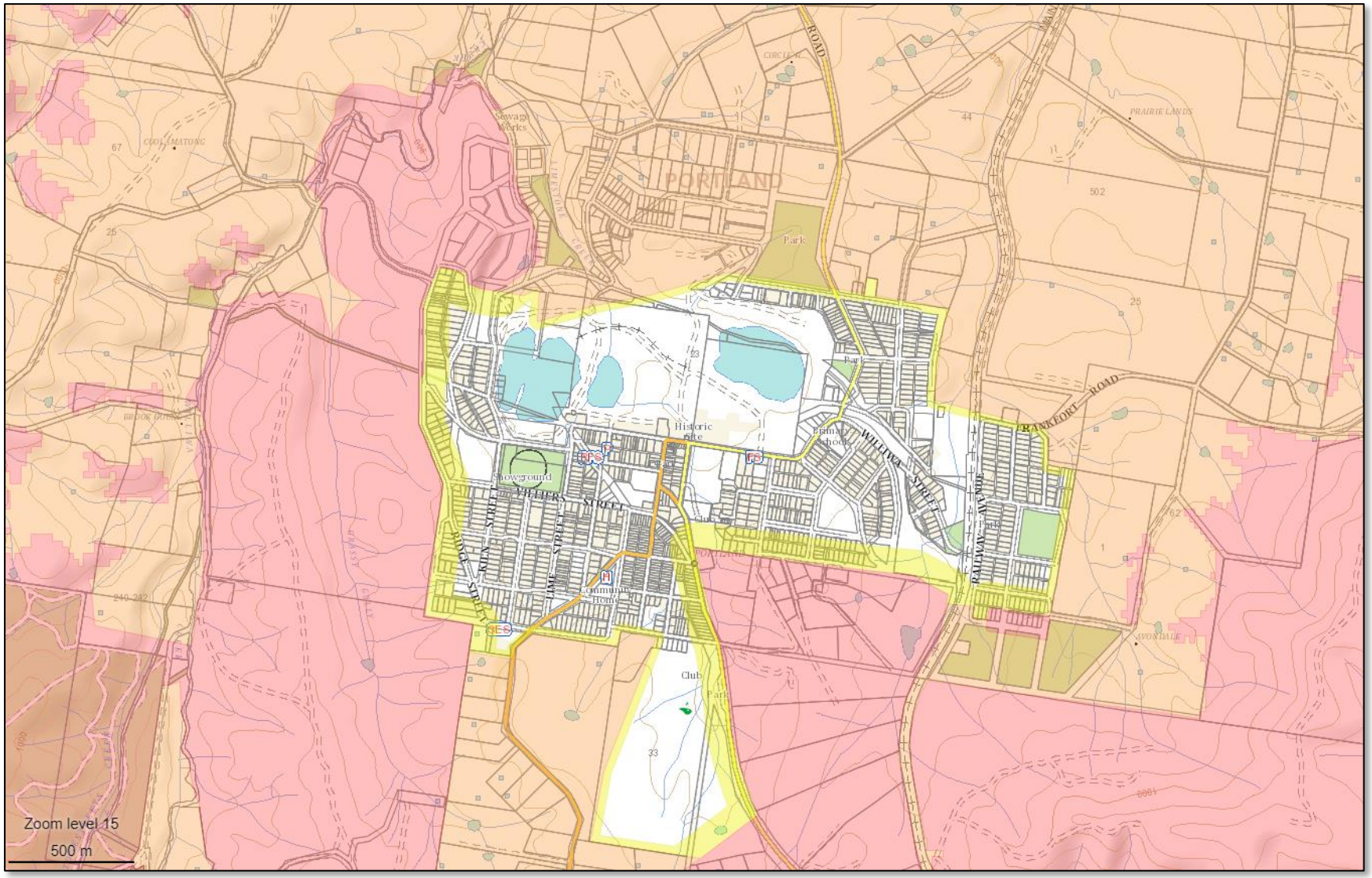


Figure 4 Bush fire Prone Land Map (Extract Lithgow Council, 2021)

It is expected that the spatial extent of these PCT will evolve, and change based on various factors including:

- Landscaping and revegetation plans developed for open space recreational areas.
- Vegetation removal for residential development.
- Consideration of management and revegetation of riparian corridors (associated with dams) that may result in changes to vegetation formation in these areas.

It is expected that revegetation and modification of the current hazard is likely to occur to reflect the varying proposed land uses, indicated as local, district and regional open spaces. The indicative management and revegetation of these areas is as follows:

- **Local open space:** <2ha and will be highly embellished 'park' with playgrounds, paths and require extensive management, with minimal retained existing vegetation apart from individual trees.
- **District open space:** 2-5ha and will be highly embellished. Likely to include sports fields and therefore minimal retained existing vegetation.
- **Regional open space:** Typically, 30% of the park will be highly embellished (water features, playgrounds, paths, signage) and 70% regenerated to native vegetation condition i.e., native bushland areas.

The spatial extent and continuity of these vegetation types are yet to be finalised; however, regional open spaces have the potential to support both higher intensity and difficult to control fires subject to their location and arrangement.

The landscaping of the proposed open spaces should aim towards local and district criteria, providing vegetation corridors in a south-west to north-east orientation, perpendicular to a potential north-westerly fire run. This arrangement will mitigate high intensity run runs into the development area.

It is expected that such risk can be managed through design, management, and maintenance without impacting on the environmental values of the regional open spaces.

The vegetation classification with the 'NSW Comprehensive Fuel Loads' has been used within the Appendix B AS3959:2018 radiant heat modelling illustrated in **Table 1** (section 3).

2.2.2 Topography

The site is located through the small valley floor between elevated forested areas to the west and east. Limestone Creek forms a head waters of the Turon River to the north. The valley to the north and south undulates between 860m ASL along creek lines to 940m small valley plateaus before rising to the sandstone ridgeline to the west and south to over 1040m

The site is located at the base of the valley floor with the immediately topography rising in all direction, except of drainage of limestone creek to the north.

A running wildfire from the west and north-west will be subject to downhill spread within 200m of the site. This potential for downhill spread will reduce fire intensity and the rate of spread, and therefore may assist in efforts to control potential fires. However, upslope spread (greater than 200m to the west of the site) has the potential to cause longer distance spotting and impacts on the proposed development area.

The topography of the site and significant slopes are illustrated in **Figure 5**.


Downslope
Upslope
Upslope
Upslope
Upslope
Upslope
900
910
920
930
940
950
960
970
Figure 5 Vegetation and contour mapping
Transect
Lot Boundary
Crownlands
400m Buffer
Unmanaged grasslands
Southern Tableland DSF
Cadastral
Nearmap reprojected
0 100 200 m
BEMC

2.2.3 Wildfire Weather

A wildfire weather analysis was undertaken in order to identify the likely wildfire weather conditions that the site could experience from different direction. Weather data developed by Lucas (2010) under the National Historical Fire Weather Dataset (1972-2015) incorporates the daily Forest Fire Danger Index, where suitable inputs are available, from over 70 weather stations across Australia. Data from the Bathurst weather stations were analysed to determine the maximum Forest Fire Danger Index for a 1 in 50-year event, being the accepted recurrence period for land use planning in Planning for Bushfire Protection 2019.

Climate change in Australia (2021) provides an indication predicted weather within the central slope of NSW. The following predictions are made:

- Average temperatures will continue to increase in all seasons (very high confidence).
- More hot days and warm spells are projected with very high confidence. Fewer frosts are projected with high confidence.
- Average winter rainfall is projected to decrease with high confidence. There is only medium confidence in spring decrease. Changes in summer and autumn are possible but unclear.
- Increased intensity of extreme rainfall events is projected, with high confidence, and
- A harsher fire-weather climate in the future (high confidence)

Planning for Bushfire Protection 2019 considers a Fire Danger Index of 80 for the central west, although considering climate change scenarios this study utilises Douglas (2017) fire weather climate analysis that utilises a 1:50 recurrence value within a Generalised Extreme Value analysis. The Generalised Extreme Value methodology and its use to analyse bushfire weather data is discussed in a number of papers by Douglas *et al* (2014; 2016).

Douglas (2017) determines a FFDI of 83 for Bathurst that will be implemented through this study. **Plate 1** below illustrates the wind directions (Wind Roses) for Bathurst weather station between 1972 to 2009 for FFDI>50. This illustrates the dominant worst-case wildfire weather from the west-northwest.

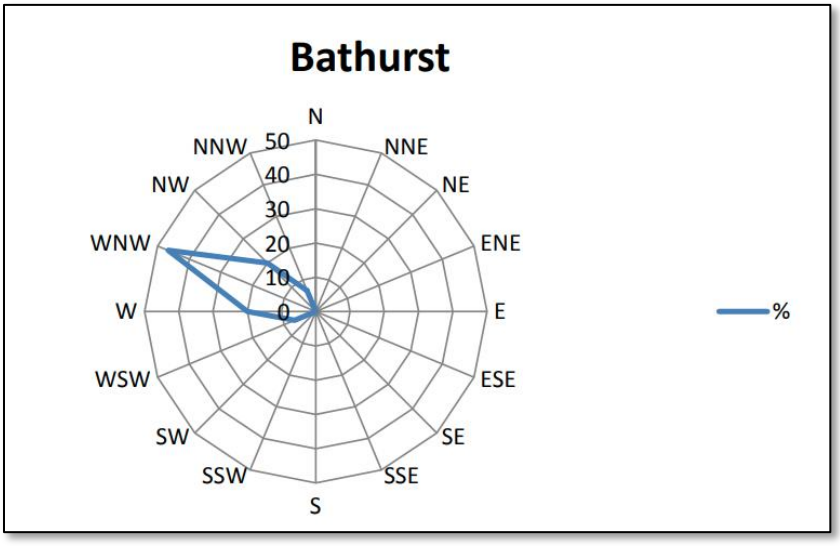


Plate 1 Wind direction during FFDI>50 – Bathurst (Extract Douglas, 2017)

2.1 WILDFIRE HISTORY

The Lithgow Bush Fire Risk Management Plan (2020) identifies on average, 128 bush/grass fires per year, most commonly in grasslands and forested areas adjacent to villages, of which an average of 3 per year may be considered to be major fires (>20ha).

October 2019 and 2013 fire activity included two significant fire events for the Lithgow BFMC area. The Gosper's Mountain Fire commenced in October 2019 in a remote area of the Wollemi National Park. This fire burnt an area of 512,626ha, of which 225,882 is within the Lithgow BFMC area. This is the largest recorded fire in the Lithgow BFMC area. The State Mine Fire in October 2013 commenced at Marrangaroo and impacted 56,590 hectares as it spread north, east and south of Lithgow township.

The main sources of ignition for bush/grass fires in the Lithgow BFMC area are:

- Lightning activity (mainly associated with late spring and early summer).
- Escaped fires from legal burning activities by private landowners/occupiers, and
- Illegal / careless burning activities by private landowners/occupiers.

Figure 7 shows the fire history within 5km from 1982 – 2019 for both prescribed burns and unplanned fire (wildfire) from the NSW RFS and National Parks and Wildlife Service and NSW RFS fire history mapping data set.

To the west, there have been a variety of wildfires in Winburndale Nature Reserve (NR) and Sunny Corner State Forest (SF), 10km to the west. This includes

- 4346ha 1971 Wildfire season.
- 3184ha Clear creek/ Bald Hill creek in April 1972.
- 2989ha Winburndale Rivulet\Lagoon Creek\McCanns Gully in 1977.
- 401ha Lagoon Creek in April 1987.
- 62ha Mount Schofield Road in 1987-88.
- 87ha McCanns Gully APZ\ Sunny Corner SF in 1991-2.
- 185ha Lagoon Creek in April 1997.
- 10ha Sunny corner in 2000
- 22ha Sunny corner in 2000-1.
- 18ha 2002/03 fire season.
- 19ha Mt Schofield in 2006-7.
- 30ha Old Camp in 2006-7.
- 2ha Ridge Street in 2017-18 (500m west of site).

Four hazard reduction burns are recorded:

- McCanns Gully hazard reduction 11km to the west of 895ha (Winburndale NR).
- MAQ_Middle_Arm_Creek_LMZ hazard reduction 15km to the west of 1074ha (Winburndale NR).
- 1985/6 Prescribed Burn Hazard Reduction 8km to the west of 16ha (Sunny Corner SF).
- 1999/00 Prescribed Burn Hazard Reduction 7km to the south-west of 8ha (Sunny Corner SF).

To the east, there is three wildfires within 3km. These include

- 60ha Cullen Bullen Road Fire in 2011 (500m north-east of site)
- 479,513ha Gospers Mountain in 2019/20
- 361ha View St, Lidsdale in 2019/20.

2.2 POTENTIAL FIRE BEHAVIOUR

It is noted that each wildfire event is different, responding to changes in fuel, weather conditions and terrain. Wildfire modelled predictions provide an indication of what conditions may be expected to impact on the site.

It is important to note that models of potential fire intensity do not provide ignition risk or the rate of spread of a bushfire; and these are important considerations in likelihood and evacuation risk (respectively). The prediction models also do not consider extreme fire behaviour / weather including such phenomena as:

- Spotting/Fire storm – ember attack and spread ahead of the head fire front.
- Fire tornado/whirls - occur when the turbulent wind conditions combine with the increasing heat from the fire to create a rotating eddy of air.
- Lateral vortices - arises due to wind-terrain-fire interactions that produce vertical vorticity, which rapidly propagates a fire across steep, leeward slopes in a direction nearly perpendicular to the ambient wind direction.
- Junction zones (Jump fires) - point or area where two separate fires meet up and become one fire. Also known as the area of coalescence. Fire intensity generally increases at a junction zone, due to combined convection forces.
- Eruptive fires – extreme acceleration of rate of spread and intensity of a fire in a limited space and time that can overwhelm and suppression capacity.
- Conflagrations - violent pyro-convective events in the atmosphere, that produce fire thunderstorms or pyro-cumulonimbus.
- Downbursts - a strong downward current of air from a cumulonimbus cloud, which is usually accompanied by intense rain or a thunderstorm, or
- Pyro-convective events – when heat and moisture generated by bushfires create clouds and even thunderstorms.

Cruz and Alexander (2019) supported by Cruz et al. (2020) suggested the 10% wind speed rule of thumb form forest fire forward rate of spread was more appropriate for estimating forward fire spread than current modelling. In this case, wildfires with Winburndale Nature Reserve and Sunny corner State forest to the west have the potential, under worst-case conditions to impact on Portland village within the day of ignition. Human intervention and suppression would restrict the rate of spread, although this is dependent on deployment safety and asset availability.

The outcomes of the AS3959 Appendix B radiant heat modelling are provided in **Table 1.**

The Lithgow Bush fire Risk Management Plan identified the landscape to the north-west, west and south-west of the proposed development is classified as a Strategic Fire Advantage Zone. This will provide some level of protection to the proposed development for 3-5years following a prescribed burn treatment of the Strategic Fire Management Zone. No prescribed burn history is recorded in this area.

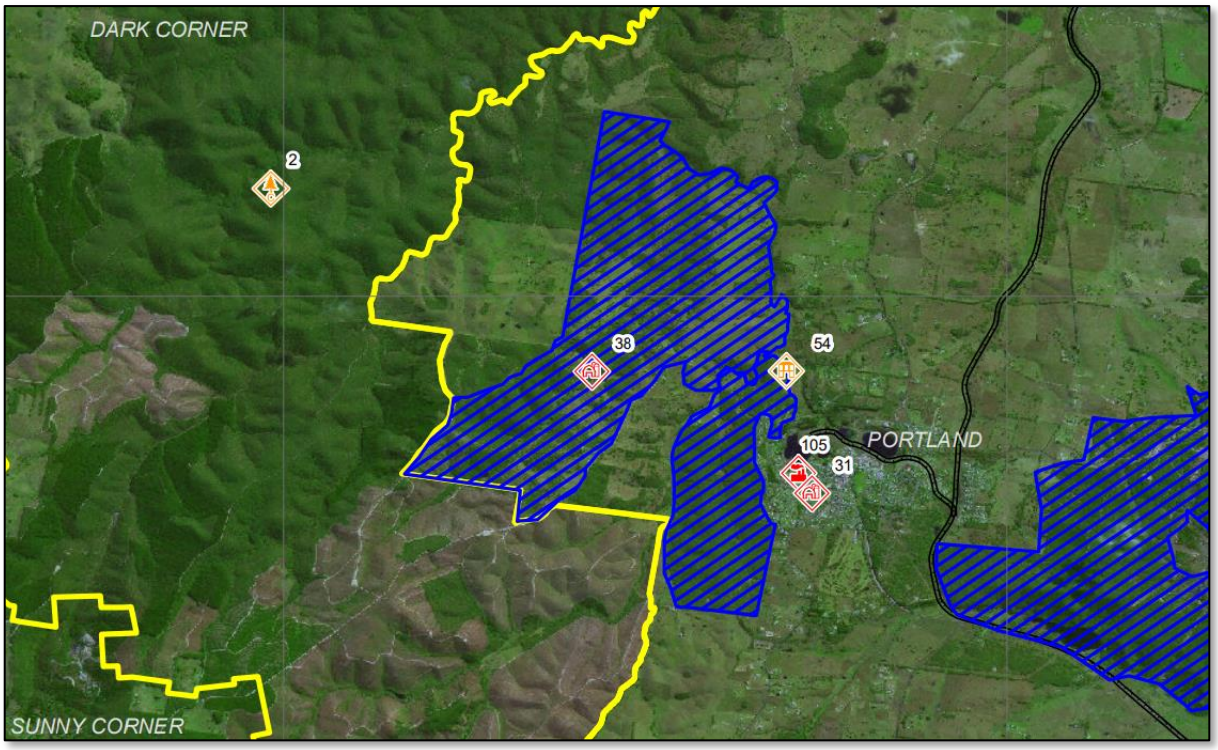


Figure 6 Extract from Lithgow BFRMP

2.2.1 Wildfire runs and intensity

The wildfire hazard is extensive to the west of the precinct within the broader landscape of Winburndale Nature Reserve and Sunny Corner State Forest. These forested areas have continuity with an unnamed low relief ridge immediately to the west of the site. A significant network of fire trails exists within this landscape. High intensity crown fire is possible from this direction. Residential development provides a 280m buffer, although small parcels of forested vegetation between Ridge and Burton Streets and Ridge and Laurie Streets bring the wildfire threat to within 160m, upslope to the western boundary of the development.

The wildfire hazard to the northwest consists of unmanaged grasslands and woodland transitioning into forests on the northern extent of the unnamed low relief ridge immediately to the west of the site. Fast moving grass fire burning into the forested areas can result in high intensity crown fire from this direction. The eastern aspect of the ridge is currently heavily disturbed, although it is envisaged revegetation will continue to native Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest. Although generally upslope of the development area, the earth contouring from the quarry operations has resulted in slight downslopes which can increase fire behaviour for short periods ad a wildfire burns through the area. This vegetation exists directly across Kin Road and comes within 20m of the site boundary.

The wildfire hazard to the north consists of unmanaged grasslands and woodland, and small patches of forest. Limestone Creek (dry creek) runs north from the site. Small patched of vegetation associated with Creek Street, Forest Street and Roxburgh Street (Roxburgh Street Reserve following natural regeneration) have ample size to support high intensity fires. Fast moving grass fire burning into the forested areas resulting in high intensity crown fire from this direction.

The wildfire hazard to the east and south of the development is low due to the residential land use of Portland. The wildfire hazard from the west, north-west and north potentially exposes the proposal to high intensity wildfires, however, this can be mitigated through the provision of bushfire protection measures.

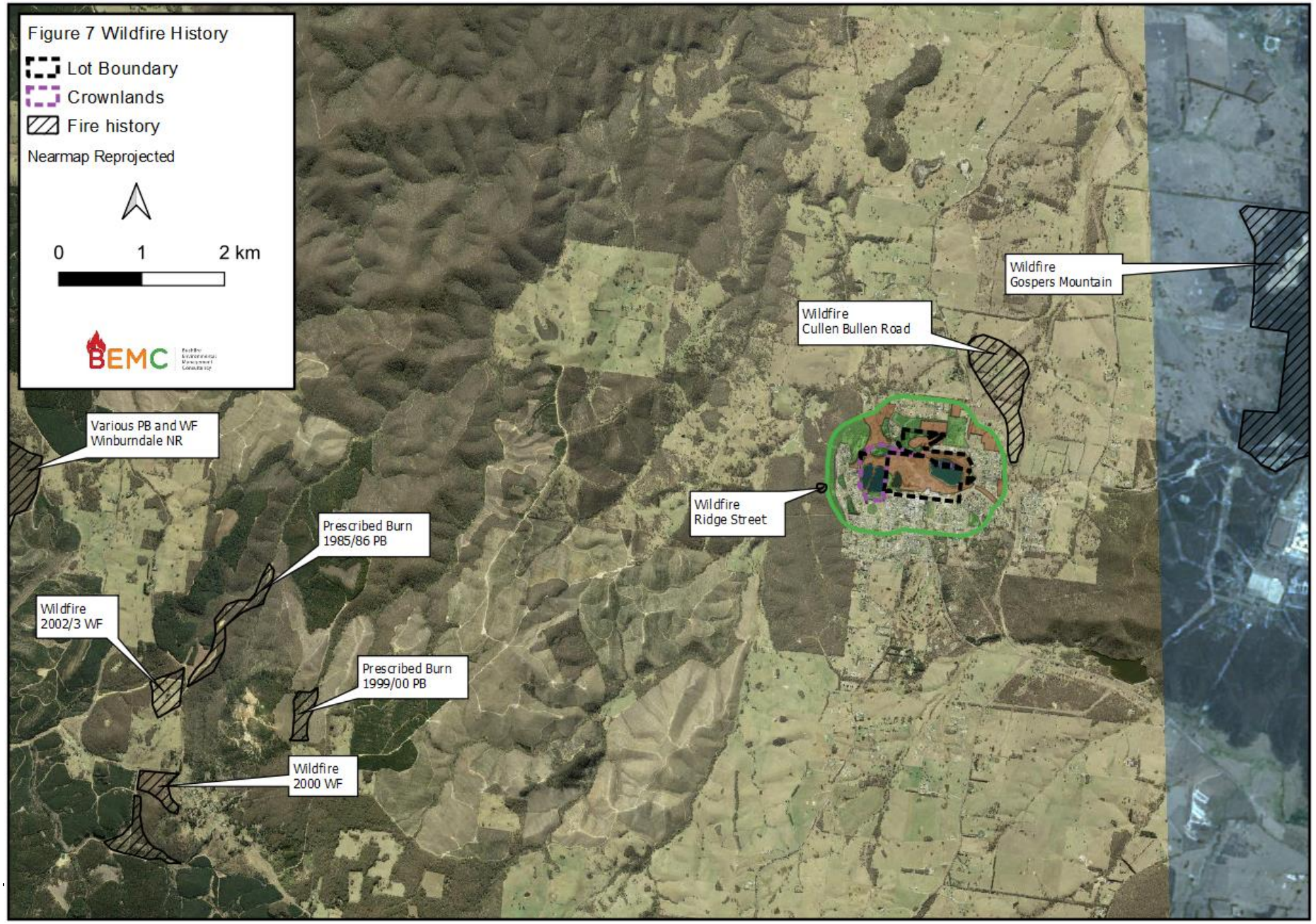


Figure 7 Wildfire History
Lot Boundary
Crownlands
Fire history
Nearmap Reprojected
0
1
2 km
BEMC
Wildfire
Gospers Mountain
Wildfire
Cullen Bullen Road
Various PB and WF
Winburndale NR
Wildfire
Ridge Street
Prescribed Burn
1985/86 PB
Wildfire
2002/3 WF
Prescribed Burn
1999/00 PB
Wildfire
2000 WF

2.3 WILDFIRE SUPPRESSION

The success of wildfire suppression relies on the interdependencies of:

- the ability to access the wildland urban interface (WUI). and suppressing a fire.
- The fire fuel load arrangement in relationship to topography.
- The continuity/fragmentation of wildfire hazards.
- The suppression assets.
- The growth stage of the wildfire, and
- Weather conditions at that time.

In a bushfire planning context, establishing adequate passive bush fire protection measures to support successful suppression efforts is critical. This includes:

- Defendable spaces enabling fire-fighting operations.
- Adequate access to water supplies to support wildfire suppression operations.
- Adequate Asset Protection Zones to mitigate the likelihood of building fires redirecting resources from wildfire suppression on the vegetation that creates the wildfire hazard within the wildland urban interface (WUI).
- Design of access roads shall enable safe access and egress for residents attempting to leave the area at the same time that emergency service personnel are arriving to undertake firefighting operations.
- Placement of utilities as to not impede emergency evacuations or firefighting efforts.

This study aims to provide recommendations within the planning framework to support wildfire suppression operations.

2.4 CONCLUSION

The following elements shall be considered in future planning:

- Significant fire weather come from the west-northwest.
- Calculating radiant heat and APZ separations utilising Forest Fire Danger Index of 83 better reflects future fire weather inclusive of predicted climate change.
- The landscaping of the proposed open spaces should aim towards local and district criteria, providing vegetation corridors in a south-west to north-east orientation, perpendicular to a potential north-westerly fire run. This arrangement will mitigate high intensity run runs into the development area.
- The landscaping of the proposed open spaces shall not introduce vegetation that creates a wildfire threat in proximity to future buildings.

3 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 Environmental Planning and Assessment Act and the Rural Fires Act 1997 are the primary legislative instruments relevant to bushfire planning for the site. As the Aerotropolis is mapped as Bush Fire Prone Land, Planning for Bushfire Protection 2019 is called up by these instruments and is a critical guide in assessing the bushfire risk suitability of the proposal.

Planning for Bushfire Protection 2019 outlines broad principles and assessment considerations for strategic planning. It also specifies that bushfire protection measures need to be considered at the strategic planning stage to ensure that the future development can comply with Planning for Bushfire Protection 2019 (as specified in Chapters 5-8 of Planning for Bushfire Protection 2019).

The aim and objectives of Planning for Bushfire Protection 2019 below, provide additional guidance for land use assessment within a Strategic Bushfire Study:

> *The aim of Planning for Bushfire Protection is to provide for the protection of human life and minimise impacts on property from the threat of bush fire, while having due regard to development potential, site characteristics and protection of the environment.*
>
> > *The objectives are to:*
> >
> > *i. Afford buildings and their occupants protection from exposure to a bush fire*
> > *ii. Provide for a defendable space to be located around buildings*
> > *iii. Provide appropriate separation between a hazard and buildings which, in combination with other measures, minimises material ignition*
> > *iv. Ensure that appropriate operational access and egress for emergency service personnel and residents is available*
> > *v. Provide for ongoing management and maintenance of bush fire protection measures*
> > *vi. Ensure that utility services are adequate to meet the needs of firefighters.*

3.1.1 Risk Profile

The feasibility of the proposal to comply with the bushfire protection measures within Planning for Bushfire Protection 2019 is a fundamental consideration of this study. Whilst bushfire protection measures and their performance requirements are a benchmark for development approval, at a strategic level study needs also to evaluate these measures within the landscape risk context. This study has therefore considered the:

- Footprint within the bushfire landscape and the need for adjustment of the protection measures given the landscape risks.
- Pattern and potential bushfire resilience of the development bushland interface.
- Potential cumulative risk associated with the protection measures.
- Risk profile of different areas and their appropriate land use, and
- Potential for application of innovative or emerging bushfire protection measures.

The following land use risk profile has been identified in this study:

- The development site is large, approximately 62ha (84ha including the crown lands).
- Approximately 14ha is currently bush fire prone land.

- Depending on the amount of regeneration/revegetation of 'bushland' within local/district/regional open space over 60% of future development can be located within Bushfire Attack Level LOW i.e., internal areas no longer classified as bushfire prone land. This provides the potential for a high
    - bushfire resilience.
    - The perimeter to area ratio of the development is low compared to most other development proposed on bushfire prone land in NSW and is a direct result of the large scale of the development. A low perimeter to area ratio reduces bushfire risk and helps increase community resilience.
    - There is ample area to locate asset protection zones and other bushfire protection measures to meet the acceptable solutions within Planning for Bushfire Protection 2019;
    - There is ample area to locate any Special Fire Protection Purpose Development away from the hazard, and
    - No unusual cumulative risks have been identified. Complementary and consistent risk management through landscape and building design, and community programs are also feasible.

3.1.2 Siting of different land uses

Land use planning is an effective tool in minimising or avoiding the impact of natural hazards such as wildfire. In a wildfire context, strategic planning must ensure that future land uses are in appropriate locations to minimise the risk to life and property from bush fire attack. Services and infrastructure that facilitate effective suppression of bush fires also need to be provided for at the earliest stages of planning

The wildfire risk within this study is considered at the macro-scale, looking at fire runs, steep slopes and any areas of isolation. The amount of proposed development interfacing vegetation is also be considered.

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 bush fire risk and should be avoided.
- The development is likely to be difficult to evacuate during a bush fire due to its siting in the landscape, access limitations, fire history and/or size and scale.
- The development will adversely affect other bush fire 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.

The proposed development incorporate various land uses that are considered vulnerable to wildfires, such as senior living and public assemble buildings. Furthermore, recreational areas that will support vegetation that can create a wildfire threat are also proposed. The revegetation of the recreational areas should consider the location of vulnerable developments to mitigate wildfire threat.

- Around 71 R2 Low Density Residential lots.
- Around 103 R1 General Residential lots.
- Senior Housing.
- Employment and entertainment land.
- Land zoned RE2 Private Recreation to support parks, walkways, caravanning, camping/glamping and suitable tourist and visitor accommodation.
- B4 Mixed Use zoned land to support commercial, retail, tourism and employment land uses.

- RE2 Private Recreation zoned man-made quarry lake in the east of the site to support future works to improve dam wall integrity (where required), and
- Adaptive reuse of heritage cottages at the site.

Recreations (RE2 Private Recreation)

The RE2 recreational areas are dominate and centralised in the north-eastern and western areas of the proposal. The recreational land use located in the western portions of the proposal is exposed to wildfire threat. Appropriate Landscaping plans and vegetation management will be critical to ensure separations and wildfire threat in proximity to residential and commercial areas is mitigated. Excluding regeneration/revegetation of '*native bushland*' areas the vegetation within the recreational areas shall be maintained in accordance with NSW Rural Fire Service Standards for Asset Protection Zones (2005). The location of regeneration/revegetation of '*native bushland*' will be located not to possess a bushfire threat to residential and SFPP developments.

Residential (R1 General Residential)

The R1 residential areas are located centrally within the proposal. They boarder with RE2 lands to the north-east and south-west. The management of the RE2 lands associated with the R1 lands will need to be considered. Separations, such as perimeter roads incorporated into the design of the subdivision layouts.

Residential (R2 Low Density residential)

The R2 residential areas are located within the northern and north-eastern areas of the proposal. They boarder with RE2 lands to the west and south-west. The management of the RE2 lands associated with the R2 lands will need to be considered. The R2 land use has a larger lots size which enable residential development to be located away from wildfire threats, resulting on separations and APZ requirements being imposed on the landowner, without relying on planning provision such as perimeter roads.

Commercial Area (B4 Mixed use Zone)

The commercial land use is located within the southern and north-western areas of the proposal. The southern area is associated with existing commercial land use further south. The commercial land use located to the north-western is exposed to wildfire threat.

Special Fire Protection Purpose Development

Special Fire Protection Purpose (SFPP) Developments can be established in a range of land use zones. The specific development types which are considered as SFPP development are listed within the s100(b)(6) of the *Rural Fires Act.*

a) A school.
b) A childcare centre.
c) A hospital (including a hospital for the mentally ill or mentally disordered).
d) A hotel, motel, or other tourist accommodation.
e) A building wholly or principally used as a home or other establishment for mentally incapacitated persons.
f) Seniors housing within the meaning of State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004.
g) A group home within the meaning of State Environmental Planning Policy No 9—Group Homes,
h) A retirement village, or
i) Any other purpose prescribed by the regulations.

In relation to point (i) above, the Rural Fires Regulations define the following as prescribed purposes:

For the purposes of paragraph (i) of the definition of special fire protection purpose in section 100B (6) of the Act, the following purposes are prescribed:

a) *A manufactured home estate (within the meaning of State Environmental Planning Policy No 36—Manufactured Home Estates), comprising two or more caravans or manufactured homes, used for the purpose of casual or permanent accommodation (but not tourist accommodation).*
b) *A sheltered workshop, or other workplace, established solely for the purpose of employing persons with disabilities.*
c) *A respite care centre, or similar centre, that accommodates persons with a physical or mental disability or provides respite for carers of such persons.*
d) *Student or staff accommodation associated with a school, university, or other educational establishment, or*
e) *A community bush fire refuge approved by the Commissioner.*

Further, specific tourism uses including caravan parks, camping, primitive camping, bed and breakfast, farm stay accommodation, holiday lets and ecotourism, as well as residential based Special Fire Protection Purpose including manufactured home estates, home based childcare and tertiary institutions have specific requirements in Planning for Bushfire Protection 2019.

Due to the vulnerable nature of the occupants of SFPP developments, there is more reliance on the provision of an APZ and emergency management.

The specific objectives for SFPP developments are to:

- Minimise levels of radiant heat, localised smoke and ember attack through increased APZ, building design and siting.
- Provide an appropriate operational environment for emergency service personnel during firefighting and emergency management.
- Ensure the capacity of existing infrastructure (such as roads and utilities) can accommodate the increase in demand during emergencies as a result of the development, and
- Ensure emergency evacuation procedures and management which provides for the special characteristics and needs of occupants.

3.1.3 Vegetation and Landscaping

In choosing plants for landscaping consideration should be given to plants that possess properties, which help to protect buildings. If the plants themselves can be prevented from ignition, they can improve the survivability of buildings by:

- Filtering out wind-driven burning debris and embers.
- Acting as a barrier against radiation and flame, and
- Reducing wind forces.

Consequently, landscaping of the site should consider the following:

- Meet the specifications of an Inner Protection Area (IPA) detailed in PBP 2019.
- Priority given to retaining or planting species which have a low flammability and high moisture content.
- Priority given to retaining or planting species which do not drop much litter in the bush fire season, and which do not drop litter that persists as ground fuel in the bush fire season, and
- Create discontinuous or gaps in the vegetation to slow down or break the progress of fire towards the dwellings.

Consideration should be given to vegetation fuel loads present on site with particular attention to APZs. Careful thought must be given to the type and physical location of any proposed site landscaping. Inappropriately selected and positioned vegetation has the potential to 'replace' any previously removed fuel load.

Bearing in mind the desired aesthetic and environment sought by site landscaping, some basic principles help minimise the chance of such works contributing to the potential hazard on site.

Whilst it is recognised that fire-retardant plant species are not always the most aesthetically pleasing choice for site landscaping, the need for adequate protection of life and property requires that a suitable balance between visual and safety concerns be considered.

It is essential that any vegetation and landscaped areas and surrounds are subject to ongoing fuel management and reduction to ensure that fine fuels do not build up.

3.1.4 Asset protection zone provision.

Asset protection zones are typically refined during detailed design at the subdivision stage, with the structure plan at rezoning (the current stage) required to demonstrate that asset protection zones are achievable at subdivision.

The asset protection zones dimensions cited in this assessment will be refined for future development as a more detailed assessment of slope, vegetation and bushfire attack is undertaken for each precinct. The required Asset Protection Zones must be located within the development footprint.

Asset protection zones are managed areas located between bushfire hazards and development to provide a defendable space to facilitate emergency operations, and the provision of a buffer from direct flame contact, the impacts of radiant heat, smoke, and embers. As per Planning for Bushfire Protection 2019, asset protection zones are to be contained wholly within the proposed lot or subject land for which they are benefitting or protecting and located wholly within urban capable land.

However, in some circumstances asset protection zones may consist of managed areas outside an allotment e.g., managed open space, managed service easements and roads. Perimeter roads can form part of the asset protection zones.

The width of asset protection zones is based on a combination of:

- Predominant vegetation (using structural classification).
- Effective slope (i.e., slope most affecting fire behaviour adjacent to the interface), and
- Fire Danger Index of 83 (climate change projection).

APZ are provided between hazard and development. Where practical the APZ can be provided by the road network. All APZ will be on urban capable and local and district open parklands and not within environmental protection or conservation areas within Regional parklands.

Figure 8 show the proposed asset protection zones for the subject land, with dimensions determined based on vegetation, slope and Forest Fire Danger Index in accordance with Planning for Bushfire Protection 2019. **Table 1** provides the asset protection zones dimensions applied within Planning for Bushfire Protection 2019 and method 2 analysis through Appendix B of AS3959:2018 for residential and Special Fire Protection Purpose development.

Table 1 Indicative assets protection zones for residential and SFPP development

SLOPE	VEGETATION (PBP 2019)	APZ (*RESIDENTIAL)* PBP (2019)	APZ (SFPP) PBP (2019)	VEGETATION (METHOD 2)	APZ (RESIDENTIAL) FFDI 83 (METHOD 2)	APZ (SFPP) FFDI 83 (METHOD 2)
5 DEGREES UP	Forest	20m	67m	Southern Tableland DSF	14m	47m
LEVEL	Forest	20m	67m	Southern Tableland DSF	18m	57m
0-5 DEG DOWN	Forest	25m	79m	Southern Tableland DSF	22m	68m
5-10 DEG DOWN	Forest	31m	93m	Southern Tableland DSF	29m	81m
5 DEGREES UP	Grasslands	10m	36m	Southern Tableland Grassy Woodlands	14m	48m
LEVEL	Grassland	10m	36m	Southern Tableland Grassy Woodlands	10m	35m
0-5 DEG DOWN	Grassland	11m	40m	Southern Tableland Grassy Woodlands	13m	43m
5-10 DEG DOWN	Grassland	12m	45m	Southern Tableland Grassy Woodlands	16m	51m

3.1.5 Asset Protection Zone requirements

The following access specifications are reproduced from Planning for Bushfire Protection.
An APZ can consist of both an Inner Protection Area (IPA) and an Outer Protection Area (OPA) as indicated in **Plate 2**.

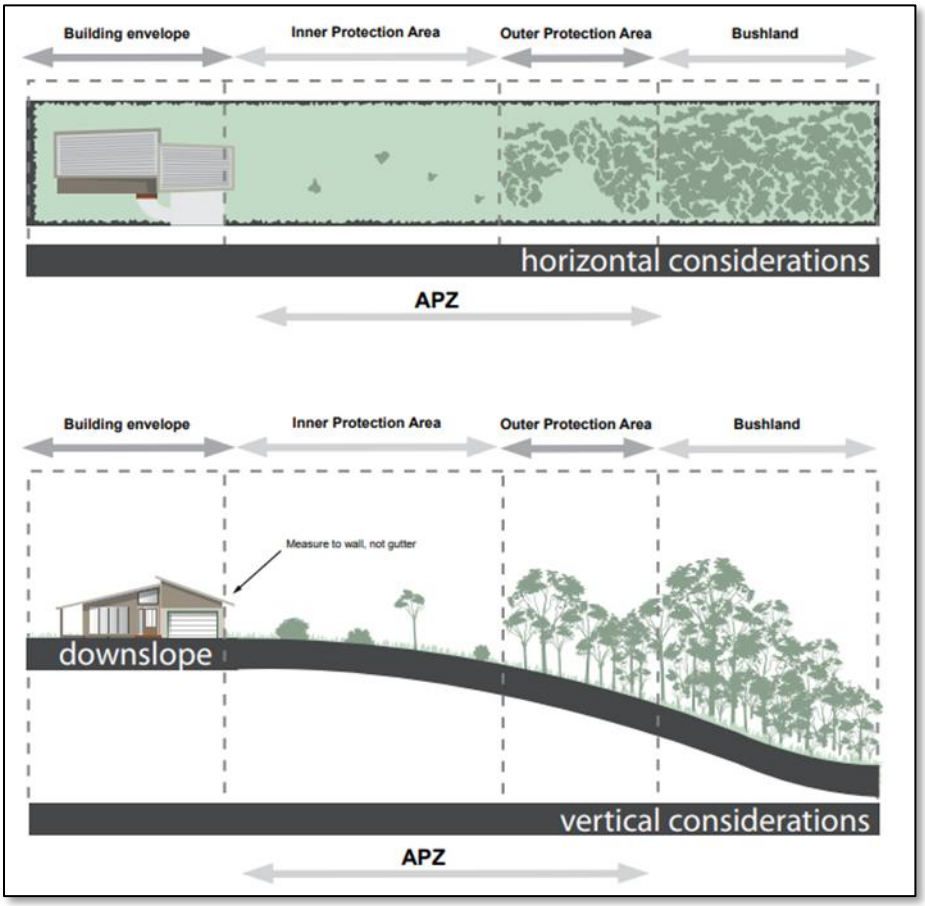


Plate 2 Components of an APZ (Figure A4.1 - PBP 2019)

An APZ can include the following:

- footpaths.
- lawns.
- discontinuous gardens.
- swimming pools.
- driveways.
- unattached non-combustible garages with suitable separation from the dwelling.
- open space / parkland, and
- car parking.

Isolated areas of shrub and timbered vegetation are generally not a bush fire hazard as they are not large enough to produce fire of an intensity that will threaten dwellings. These areas include narrow strips of vegetation along road corridors.

Any areas that are designated Asset Protection Zones, should be signposted to ensure community is aware that the area is to be maintained for Bush fire protection purposes, as indicated in **Plate 3**.

Plate 3 Indicative signage for Asset Protection Zones

Inner Protection Area (IPA)

The IPA extends from the edge of the OPA to the development. The IPA is the area closest to the asset and creates a fuel-managed area which can minimise the impact of direct flame contact and radiant heat on the development and be a defendable space. The intent of an IPA is to stop the transmission of flame and reduce the transmission of radiant heat by the elimination of available fire fuel. This area also allows airborne embers to fall safely without igniting further outbreaks and provides a safer firefighting position and is operationally important for implementation of clear fire control lines.

In practical terms the IPA is typically the curtilage around the dwelling, consisting of a mown lawn and well-maintained gardens. When establishing and maintaining an IPA the following requirements apply:

- Vegetation within the IPA should be kept to a minimum level. Litter fuels (leaves and vegetation debris) within the IPA should be continually removed and kept below 1cm in height and be discontinuous. There is minimal fine fuel at ground level which could be set alight by a bush fire.
- Canopy cover should be less than 15% (at maturity). Trees (at maturity) should not touch or overhang the building and should be separated by 2 to 5m.
- Lower limbs of canopy trees should be removed up to a height of 2m above ground.
- Preference should be given to smooth barked and evergreen trees.
- Large discontinuities or gaps in the shrub vegetation shall be established to slow down or break the progress of fire towards buildings.
- Shrubs should not be located under trees and not form more than 10% ground cover
- Clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation.
- Grasses should be kept mown (as a guide grass should be kept to no more than 100mm in height), and
- Woodpiles, wooden sheds, combustible material storage areas, large areas / quantities of garden mulch, stacked flammable building materials etc. are not permitted in the IPA.

Outer Protection Area (OPA)

An OPA is located between the IPA and the unmanaged vegetation. Vegetation within the OPA can be managed to a more moderate level. The reduction of fuel in this area substantially decreases the intensity of an approaching fire and restricts the pathways to crown fuels, reducing the level of direct flame, radiant heat, and ember attack on the IPA.

Because of the nature of an OPA, they are only applicable in forest vegetation. In practical terms the OPA is an area where there is maintenance of the understory and some separation in the canopy. When

establishing and maintaining an OPA the following requirements apply:

- Tree canopy cover should be less than 30%, canopies should be separated by 2 to 5m
- Shrubs should not form a continuous canopy and form no more than 20% of ground cover
- Grasses should be kept to no more than 100mm in height with leaf and other debris should be mown, slashed or mulched.

3.1.6 Impact of Climate change on asset protection zones

The required under Planning for Bushfire Protection 2019 are based on a Fire Danger Index of 80, whereas the results from the Douglas (2017) GEV weather analysis indicate a higher Forest Fire Danger Index setting is likely for the site, Forest Fire Danger 83. Radiant heat flux modelling was undertaken to determine the increase in asset protection zone distance required to account for a potential increase in the Forest Fire Danger Index due to the impacts of climate change. The modelling undertaken establishes the setback distances required under a higher Forest Fire Danger Index to achieve a Bushfire Attack Level-29 (<29 kW/m^2).

It is unclear what impact climate change may have vegetation fuel loads. This study utilises the potential highest fuel loads within the vegetation surrounding the site. The fuel loads for Southern Tableland Dry Sclerophyll Forests, with 22.5t/ha surface fuel loads and 30.85t/ha overall fuel loads has been implemented.

3.1.7 SFPP asset protection zones

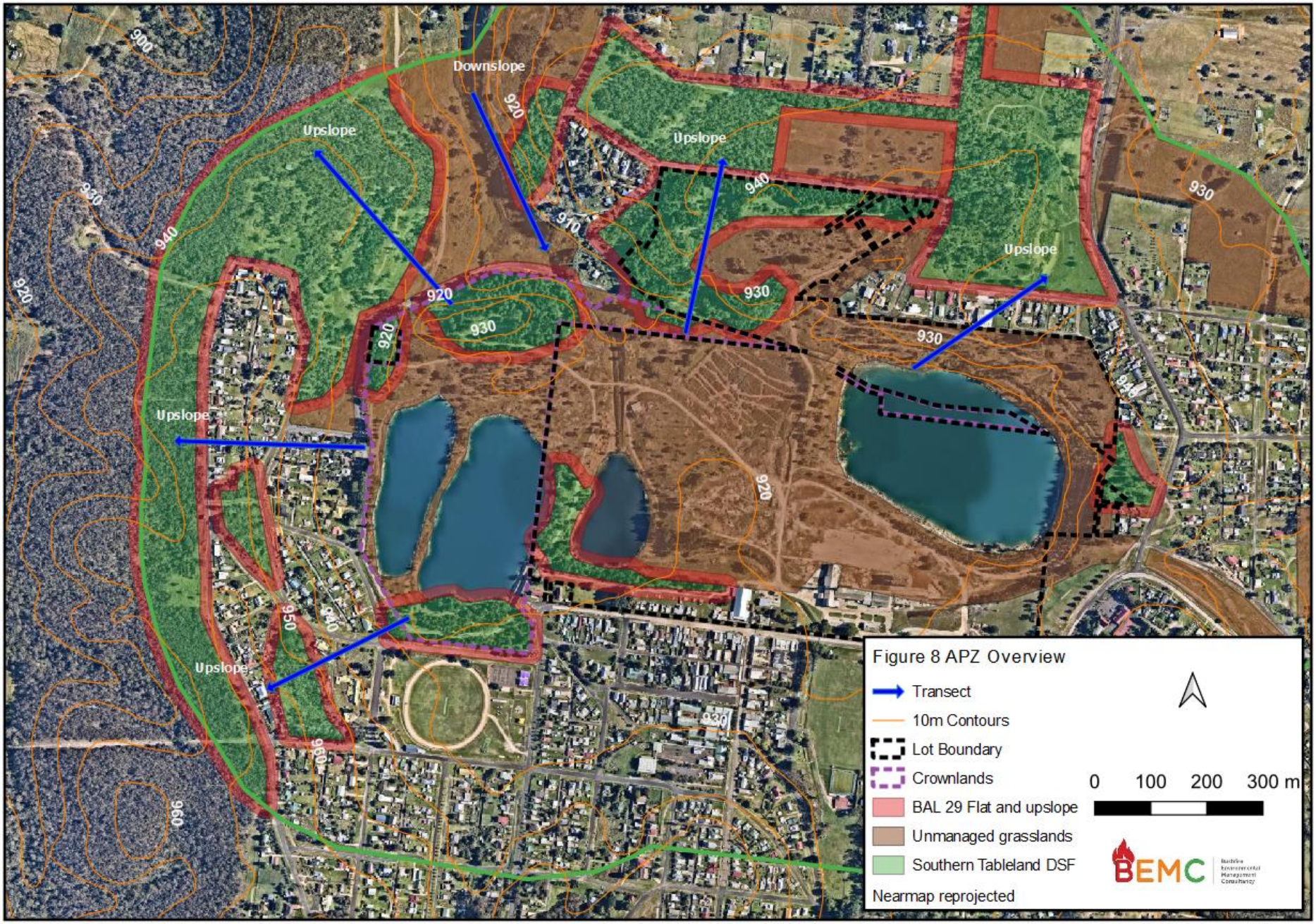
Asset protection zones for Special Fire Protection Purpose development, or sensitive uses, are larger than those applied to residential development and other developments or land uses due to the increased vulnerability of the occupants and the increased emergency management needs. These asset protection zones are required to provide an asset protection zones where radiant heat levels of greater than 10kW/m^2 (calculated at 1200K) will not be experienced on any part of the building.

Asset protection zones for SFPP developments are provided in **Table 1.**

3.1.8 Conclusion

The following elements shall be considered in future planning:

- The landscaping/regeneration/revegetation of local, district and regional recreational open spaces shall consider the requirements of NSW Rural Fire Service Standards for Asset Protection Zones (2005) and ensure vegetation that creates a wildfire threat is not introduced in proximity to the built environment.
- Asset protection zones separations should be established in consideration of predicted climate change and the impact this will have on fire weather.


Downslope
Upslope
Upslope
Upslope
Upslope
Upslope
900
910
920
930
940
950
960
Figure 8 APZ Overview
Transect
10m Contours
Lot Boundary
Crownlands
BAL 29 Flat and upslope
Unmanaged grasslands
Southern Tableland DSF
Nearmap reprojected
0 100 200 300 m
BEMC

4 ACCESS AND EGRESS

A study of the existing and proposed road networks both within and external to the masterplan area or site layout.

4.1.1 Proposed community profile

The has been no specific reporting on the proposed community that will occupy the site following development. The planning proposal suggests up to 174 residential lots, with senior living, caravan/camping parks, employment, entertainment, and recreational facilities. The planning of access and egress will be required to consider the SFPP developments and overnight occupied buildings.

4.1.2 Proposed road network

Safe access, egress and defendable spaces are required for emergency services in all developments occurring within Bush Fire Prone Land. The capacity for the proposed road network will need to accommodate evacuating residents, visitors unfamiliar with the local environment while supporting the ingress of responding emergency services.

The proposal aims to provide a cultural and light industry areas associated with the current compatible land uses in the south of the development site. Traffic to and from this area will need to consider adequate provisions for emergency response vehicle ingress to the north and west, while residents are evacuating to safer locations to the south and east.

Linkages to the existing road network surrounding the development site shall also consider the requirements emergency response vehicle ingress while residents are evacuating to safer locations. Furthermore, extra the provision of water hydrant locations along road networks should be considered at locations identified as elevated wildfire risk, with water hydrant place on both side of the road to mitigate road closures during response activities.

Specific management and evacuation plans may be required at a later stage especially for Special Fire Protection Purpose developments. The emergency management requirements and their capacity to meet response times and related safety measures is also critical.

The intent of the access requirements within Planning for Bushfire Protection 2019 are to provide safe operational access to structures and water supply for emergency services while residents are evacuating an area. The following access specifications are reproduced from Planning for Bushfire Protection 2019.

Table 2 Access performance criteria

PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS
FIREFIGHTING VEHICLES ARE PROVIDED WITH SAFE, ALL-WEATHER ACCESS TO STRUCTURES.	Property access roads are two-wheel drive, all-weather roads. Perimeter roads are provided for residential subdivisions of three or more allotments. Subdivisions of three or more allotments have more than one access in and out of the development. Traffic management devices are constructed to not prohibit access by emergency services vehicles

	Maximum grades for sealed roads do not exceed 15 degrees and an average grade of not more than 10 degrees or other gradient specified by road design standards, whichever is the lesser gradient. All roads are through roads. Dead end roads are not recommended, but if unavoidable, are not more than 200 metres in length, incorporate a minimum 12 metres outer radius turning circle, and are clearly sign posted as a dead end. Where kerb and guttering is provided on perimeter roads, roll top kerbing should be used to the hazard side of the road. Where access/egress can only be achieved through forest, woodland and heath vegetation, secondary access shall be provided to an alternate point on the existing public road system, and One way only public access roads are no less than 3.5 metres wide and have designated parking bays with hydrants located outside of these areas to ensure accessibility to reticulated water for fire suppression.
THE CAPACITY OF ACCESS ROADS IS ADEQUATE FOR FIREFIGHTING VEHICLES.	The capacity of perimeter and non-perimeter road surfaces and any bridges/causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes); bridges/causeways are to clearly indicate load rating.
THERE IS APPROPRIATE ACCESS TO WATER SUPPLY.	Hydrants are located outside of parking reserves and road carriageways to ensure accessibility to reticulated water for fire suppression. Hydrants are provided in accordance with the relevant clauses of AS 2419.1:2005 - Fire hydrant installations System design, installation and commissioning, and There is suitable access for a Category 1 fire appliance to within 4m of the static water supply where no reticulated supply is available.
ACCESS ROADS ARE DESIGNED TO ALLOW SAFE ACCESS AND EGRESS FOR FIREFIGHTING VEHICLES WHILE RESIDENTS ARE EVACUATING AS WELL AS PROVIDING A SAFE OPERATIONAL ENVIRONMENT FOR EMERGENCY SERVICE PERSONNEL DURING FIREFIGHTING AND EMERGENCY MANAGEMENT ON THE INTERFACE.	Are two-way sealed roads. Minimum 8m carriageway width kerb to kerb. Parking is provided outside of the carriageway width. Hydrants are located clear of parking areas. Are through roads, and these are linked to the internal road system at an interval of no greater than 500m. Curves of roads have a minimum inner radius of 6m. The maximum grade road is 15 degrees and average grade of not more than 10 degrees. The road crossfall does not exceed 3 degrees, and A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.

ACCESS ROADS ARE DESIGNED TO ALLOW SAFE ACCESS AND EGRESS FOR FIREFIGHTING VEHICLES WHILE RESIDENTS ARE EVACUATING.	Minimum 5.5m carriageway width kerb to kerb. Parking is provided outside of the carriageway width. Hydrants are located clear of parking areas. Roads are through roads, and these are linked to the internal road system at an interval of no greater than 500m. Curves of roads have a minimum inner radius of 6m. The road crossfall does not exceed 3 degrees, and A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.
FIREFIGHTING VEHICLES CAN ACCESS THE DWELLING AND EXIT THE PROPERTY SAFELY.	There are no specific access requirements in an urban area where an unobstructed path (no greater than 70m) is provided between the most distant external part of the proposed dwelling and the nearest part of the public access road (where the road speed limit is not greater than 70kph) that supports the operational use of emergency firefighting vehicles. In circumstances where this cannot occur, the following requirements apply: - Minimum 4m carriageway width. - In forest, woodland and heath situations, rural property access roads have passing bays every 200m that are 20m long by 2m wide, making a minimum trafficable width of 6m at the passing bay. - A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches. - Provide a suitable turning area in accordance with Appendix 3. - Curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress. - The minimum distance between inner and outer curves is 6m. - The crossfall is not more than 10 degrees. - Maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads, and - A development comprising more than three dwellings has access by dedication of a road and not by right of way. *Note: Some short constrictions in the access may be accepted where they are not less than 3.5m wide, extend for no more than 30m and where the obstruction cannot be reasonably avoided or removed. The gradients applicable to public roads also apply to community style development property access roads in addition to the above.*

4.1.3 Access points and isolation in the event of a bush fire.

Multiple access points are an essential bushfire protection measure to be considered for the development as roads have the potential to be exposed to the bushfire hazard, predominately from the north west, and be cut off.

The indicative road layout provides for multiple access routes both east-west and north-south across the site in the event of fires either approaching or burning within the site. The extent of revegetation of the recreational areas may result in increased risk and access options being cut off. However, this will be assessed in more detail at the precinct levels as access arrangements and landscape planning (revegetation) are refined. It is expected that given the size of the site and number of access options indicated, the risk of isolation of the site or a precinct is negligible.

4.1.4 Conclusion

Detailed precinct planning will provide public roads that can readily incorporate the access requirements of Planning for Bushfire Protection 2019 (**Table 2**) and achieve:

- A road design that facilitates the safe access and egress for residents and emergency service personnel, including multiple access/egress options for each area.
- Access that meets the acceptable solutions detailed in Planning for Bushfire Protection 2019 (where relevant), especially the provision of perimeter roads (of sufficient width and capacity) separating developed land from bushfire prone vegetation and the provision of alternative access.
- A road design with adequate capacity to facilitate satisfactory emergency evacuation, and
- Provision of fire trail/s (if required) to support operational activities in strategic locations.

The subject land has the potential to comply with the Planning for Bushfire Protection 2019 acceptable solutions but also is expected to provide a major linked network to achieve access throughout Portland. Lower intensity fire may enter proposed green recreational spaces, but the design of these spaces can minimise fire spread and any potential restriction of localised traffic movement. Furthermore, urban edge roads linked at short intervals to the secondary and major road network provide rapid egress to Bushfire Attack Level LOW areas and potential Neighbourhood Safer Places.

5 EMERGENCY SERVICES

The following is recommended for strategic land use planning to achieve the objectives and strategic planning principles of Planning for Bushfire Protection 2019 relating to emergency management. Strategic emergency management planning is undertaken in collaboration with emergency service organisations within the strategic land use planning process, to establish preferred future outcomes (i.e., resource adequacy and emergency evacuation) that have implications for land use planning, including:

a) Consideration of the increase in demand for emergency services.
b) Emergency evacuation planning, and
c) Evacuation adequacy assessment.

5.1.1 Increase in demand for emergency services

Portland village is within NSW Fire and Rescue response area. Both NSW RFS Portland and NSW Fire and Rescue stations are located within the village of Portland, servicing a population of approx. 2,500 residences. The proposed development will increase the residential population to over 3,000, increase vulnerable people (aged care and schools), and increase visitation (unfamiliar to the local area).

There are several Rural Fire Service brigades within the region, although response time to a fire incident within Portland will greatly vary. As an indication. the travel time form the surrounding NSW RFS brigades are:

- Cullen Bullen – 12 mins.
- Sunny Corner – 13mins.
- Marrangaroo – 17mins, and
- Yetholme – 18mins.

Making provisions for additional capacity within or servicing the Portland may be warranted. In this regard, liaison with relevant emergency service organisation is needed, along with the provision of funding mechanisms and the allocation of any land required for Brigade Stations or the like.

5.1.2 Ability of emergency services

An assessment of the ability of emergency services to carry out fire suppression in a bush fire emergency has been undertaken and includes the following:

- An analysis of the most relevant bushfire attack scenario.
- Identification of ingress routes and fire-fighting assets.
- Identification of evacuation and refuge locations for community, and
- An evaluation of evacuation adequacy and option for the shortcomings identified.

A variety of access routes to the east and south are available to current residential and mixed-use areas that can facilitate evacuation of the development to safer areas.

Vehicle access is available to the village from the south, north and east, providing alternate access and evacuation routes depending on the wildfire scenario.

Road linkages exist to the west and north of the proposed development, providing access to the bushfire threat and adjacent residential areas. Vehicle movement between the west and north of the development is limited to Creek Street across Limestone Creek.

Providing internal road configuration to support vehicle movement from the west to the north would be beneficial mitigating the current pressure on Creek Street across Limestone Creek to the north of the development.

5.1.3 Neighbourhood Safer Places

Off-site evacuation is time consuming, causes a range of significant community disruptions and is resource demanding for emergency services. This Assessment has found that localised evacuation to Neighbourhood Safer Places is both feasible and highly desirable.

The potential for Neighbourhood Safer Places was assessed in accordance with the criteria and principles documented in RFS 2017. Utilising Appendix B AS3959:2018 radiant heat calculations, a distance of 115m on level ground from Southern Tablelands DSF is required to reach radiant heat exposures <2kW/m^2 and is shown in **Figure 9** from current forested areas.

RFS (2017) defines a Neighbourhood Safer Places as follows:

> *A Neighbourhood Safer Place is a building or an open space that may provide for improved protection of human life during the onset and passage of a bush fire. It is a location where people facing an immediate threat to their personal safety can gather and seek shelter from the impact of a bush fire. Their function is to provide a place of last resort for a person to seek shelter at during the passage of the bush fire front.*
>
> *Neighbourhood Safer Places are not to be confused with Fire Refuges, Recovery Centres, Assembly Areas, Evacuation Centres or Informal Places of Shelter*

Table 3 Assessment Criteria for Neighbourhood Safer Places (NSW RFS 2017)

FACTOR	PERFORMANCE CRITERIA	ACCEPTABLE SOLUTION	COMMENT
RADIANT HEAT	Building is located and constructed to enhance the chance for survival for humans in attendance from the radiant heat of a bush fire.	Building is situated to prevent direct flame contact, material ignition and radiant heat levels of 10kW/m^2; or Provide 139 metres separation distance from a bush fire hazard.	Separation to achieve 139m or 10kW/m^2 required to APZ standards.
	Open Space is located to enhance the chance for survival for humans in attendance from the radiant heat of a bush fire.	Open Space is situated and maintained to prevent direct flame contact, material ignition and radiant heat levels of 2kW/m^2; or Provide 310 metres separation distance from a bush fire hazard.	Substantial proportion of the development footprint available to provide for a maximum radiant heat level of 2kW/m^2 to meet these criteria
MAINTENANCE OF THE SITE AND THE LAND ADJACENT	Area between bush fire hazard and the site is maintained to a level that ensures the radiant heat levels at the Building/Open Space meet the Performance Criteria for Radiant Heat.	The site and land adjacent to the site between the Building/Open Space and the bush fire hazard is managed land or maintained in accordance with NSW RFS document Standards for Asset Protection Zones.	Landscape management practises will be determined at later stages in the development process, however all internal areas will meet the required standards for APZ.

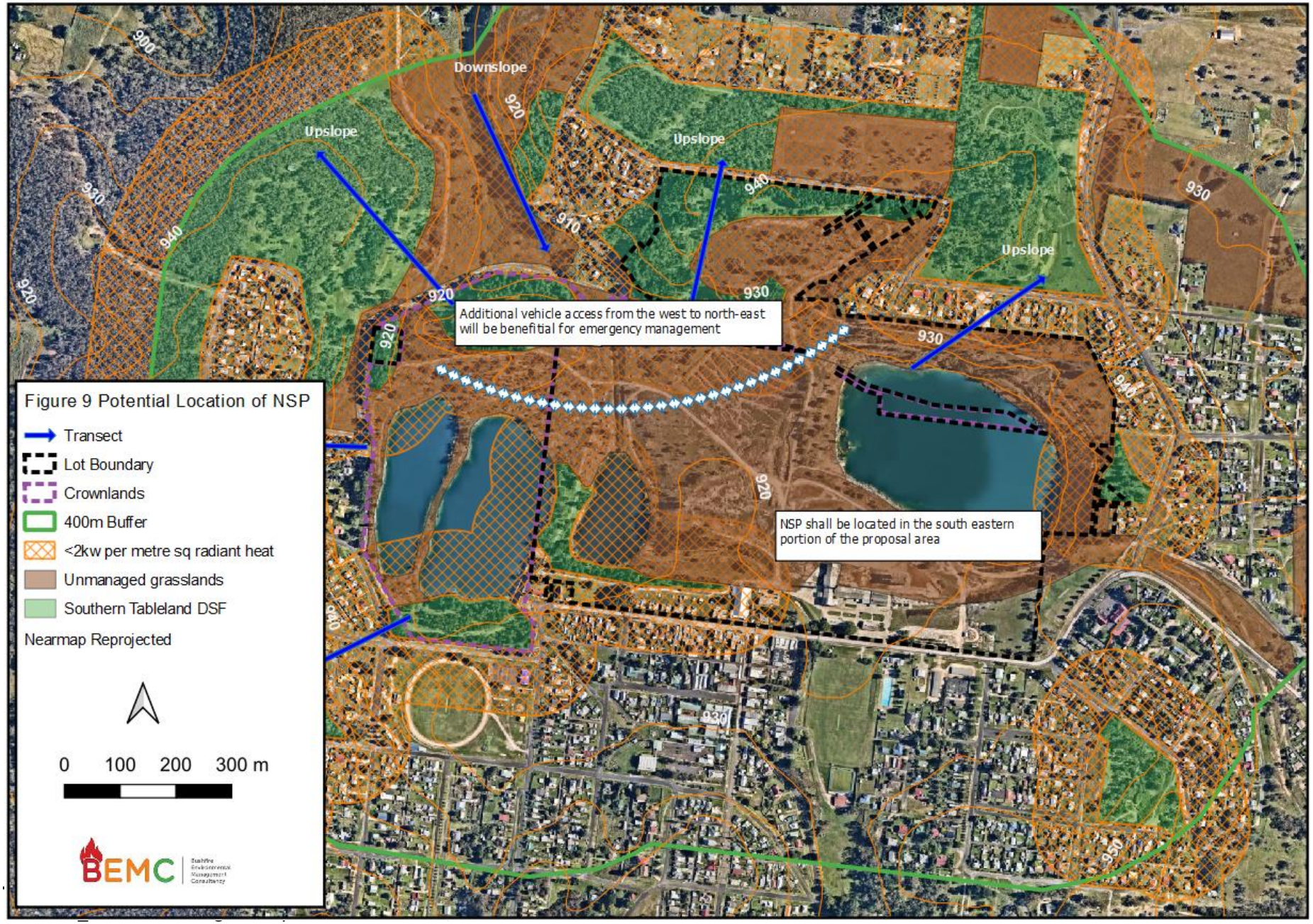

Downslope
Upslope
Upslope
Upslope
900
920
930
940
970
Additional vehicle access from the west to north-east will be benefitial for emergency management
NSP shall be located in the south eastern portion of the proposal area
Figure 9 Potential Location of NSP
Transect
Lot Boundary
Crownlands
400m Buffer
<2kw per metre sq radiant heat
Unmanaged grasslands
Southern Tableland DSF
Nearmap Reprojected
0 100 200 300 m
BEMC

Table 4 Principle for NSP Site Identification (NSW RFS 2017)

CONSIDERATION	PRINCIPLES
SITE SELECTION	An NSP should provide a safer place for the community
	The community should be moving away from the bush fire hazard to access the NSP over short distances where possible.
	NSP locations should reflect community need and bush fire risk.
MOVING TO A NSP	An NSP should not be isolated from the community.
	The community should not be impeded from reaching the NSP area in a bush fire situation.
CAPACITY	Additional NSPs should be sought where it is likely current or potential NSPs cannot accommodate those likely to use it.
	Demand for use of an NSP reflects a community's level of bush fire preparedness.

There is only one existing Neighbourhood Safer Places within or near the site which exists as open space based on the nature of the surrounding landscape at the corner of Lime Street and Villiers Street, Portland. Wallerawang Public school is the next closest NSP approximately 11km to the south-east.

Egress to each of these Neighbourhood Safer Places is dependent on access options remaining open, as discussed in Section 4 of this study.

5.1.4 Conclusion

The following elements shall be considered in future planning:

- Given the overarching size and development and limited availability of local NSP, the provision of a further NSP within this development would be preferable. **Figure 9** provides an indicative analysis of radiant heat to determine possible locations for a future NSP.
- Providing internal road configuration to support vehicle movement from the west to the north would be beneficial mitigating the current pressure on Creek Street across Limestone Creek to the north of the development.
- Making provisions for additional capacity within or servicing the Portland area may be warranted. In this regard, liaison with relevant emergency service organisation is needed, along with the provision of funding mechanisms and the allocation of any land required for Brigade Stations or the like.

6 INFRASTRUCTURE

An assessment of the issues associated with infrastructure and utilities is completed within this section.

6.1.1 Reticulated water system

Suitable water supply arrangements shall be provided for firefighting that meet the NSW RFS requirements. It is essential to ensure that any water sources are maintained at the appropriate capacity. Water capacities, access for firefighters (tanker or pedestrian) and the provision of appropriate connections must also be considered when determining if a proposed water source is suitable. Provided water supply must be available for the lifetime of the development.

To ensure future development can comply through acceptable solutions, preliminary building envelope should be designated, and hydrants should be spaced not greater than 70m from the furthest elevation of a potential residential building. This will result in the hydrant spacing reduced along the supply lines associated with the road easements.

The intent of the water supply requirements within PBP 2019 is to provide adequate services of water for the protection of buildings during and after the passage of a bush fire, and to locate gas and electricity so as not to contribute to the risk of fire to a building. The performance criteria for water supply for residential and rural subdivisions is provided in **Table 5.**

Table 5 Performance criteria of water supply

PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS
ADEQUATE WATER SUPPLIES IS PROVIDED FOR FIREFIGHTING PURPOSES.	Reticulated water is to be provided to the development where available. A static water and hydrant supply is provided for non-reticulated developments or where reticulated water supply cannot be guaranteed; and static water supplies shall comply with Table 5.3d.
WATER SUPPLIES ARE LOCATED AT REGULAR INTERVALS, AND THE WATER SUPPLY IS ACCESSIBLE AND RELIABLE FOR FIREFIGHTING OPERATIONS.	Fire hydrant, spacing, design and sizing complies with the relevant clauses of Australian Standard AS 2419.1:2017. Hydrants are not located within any road carriageway; and Reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads
FLOWS AND PRESSURE ARE APPROPRIATE	Fire hydrant flows and pressures comply with Table 2.2 of AS 2419.1:2017.
THE INTEGRITY OF THE WATER SUPPLY IS MAINTAINED	All above-ground water service pipes are metal, including and up to any taps; and Above-ground water storage tanks shall be of concrete or metal.

6.1.2 Electricity and gas

Gas and electricity should be located so as not to contribute to the risk of fire or impede the firefighting effort.

Table 6 Performance criteria of gas supply

PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS
LOCATION AND DESIGN OF GAS SERVICES WILL NOT LEAD TO IGNITION OF SURROUNDING BUSHLAND OR THE FABRIC OF BUILDINGS.	Reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 - The storage and handling of LP Gas, the requirements of relevant authorities, and metal piping is used; All fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side, Connections to and from gas cylinders are metal, Polymer-sheathed flexible gas supply lines are not used; and Above-ground gas service pipes are metal, including and up to any outlets.

It is preferable that electrical transmission lines are underground where practical to reduce the risk of ignition. Any existing overhead powerlines that are to be retained shall be managed and will in accordance with the Guide for the Management of Vegetation in the Vicinity of Electricity Supply Infrastructure (ISSC3 2016).

It is possible a number of the existing feeder lines will become part of the development footprint within managed open spaces. These open spaces will be of a design that will potentially lower the existing low ignition risk and will pose no risk bushfire impact to the power supply. Details for compliance with Planning for Bushfire Protection 2019 are provided in **Table 7.**

Table 7 Performance criteria of electricity supply

PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS
LOCATION OF ELECTRICITY SERVICES LIMITS THE POSSIBILITY OF IGNITION OF SURROUNDING BUSH LAND OR THE FABRIC OF BUILDINGS.	Where practicable, electrical transmission lines are underground. Where overhead, electrical transmission lines are proposed as follows: - Lines are installed with short pole spacing of 30m, unless crossing gullies, gorges or riparian areas; and - No part of a tree is closer to a power line than the distance set out in ISSC3 Guideline for Managing Vegetation Near Power Lines.

6.1.3 Conclusion

The following elements shall be considered in future planning:

- Fire hydrant, spacing, design and sizing complies with the relevant clauses of Australian Standard AS 2419.1:2017.
- Preliminary building envelope should be designated, and hydrants should be spaced not greater than 70m from the furthest elevation of a potential residential building.
- Electricity to be placed underground where possible.

7 ADJOINING LAND

The impact of new development on adjoining landowners and their ability to undertake wildfire management is assessed within this section. All development occurring on Bush Fire Prone Land will be required to be assessed at Development Application stage where appropriate bushfire protection measures will be identified and implemented.

The proposed land uses should not have a harmful impact on the ability for wildfire management activities to be undertaken on adjoining land. The following elements have been identified to be considered in future planning.

Access

Providing adequate access from the west to the north-east and north to south to support the movement of emergency management and community evacuation.

Internal road system to comply with acceptable solutions of Planning for Bushfire Protection 2019.

Increasing wildfire threat

Appropriately located and designed open spaces will not increase the wildfire threat.

Landscaping within proximity to built areas to comply with NSW Rural Fire Service *Standards for Asset Protection Zones* (2005).

Water supply

Fire hydrant, spacing, design and sizing complies with the relevant clauses of Australian Standard AS 2419.1:2017

Emergency management

Provision of access west to north-east, and north to south as recommended with this report, and the consideration of the provisions of further NSP and fire station will increase the community resilience to wildfire attack.

7.1.1 Conclusion

The proposed land uses should not increase bushfire management needs for adjoining land use if adherence to acceptable solutions of Planning for Bushfire Protection 2019 and other land use planning requirements.

8 CONCLUSION

Several strategies have been provided in the form of planning controls to reduce the bushfire risk to an appropriate level. These planning controls are consistent with deemed to satisfy bushfire protection requirements outlined in Planning for Bushfire Protection 2019, and this study shows that all bushfire protection requirements can be achieved.

The Foundation Site, Portland has been evaluated in relation to the feasibility of bushfire protection measures. The required bushfire protection measures in accordance with Planning for Bushfire Protection 2019 are achievable within the Foundation Site, Portland and reduce the bushfire risk associated with the development that will occur within the Foundation Site, Portland.

Notable elements of the Assessment supporting this conclusion are:

- All Planning for Bushfire Protection 2019 required bushfire protection measures can reasonably be accommodated within the large development footprint.
- Capacity exists to enhance the bushfire protection measures through the staged implementation of development in the Foundation Site, Portland.
- The large development footprint can ensure the location of SFPP development are located in the south or east, which offer greater bush fire safety.
- The large development footprint enables all major egress roads (including west to north-east) to be located where there is limited to no risk of impact by bushfire. Most secondary roads are also located on future non-bushfire prone land.
- Neighbourhood Safer Places and further fire station can be strategically located to ensure 'out of area' evacuation is not required enabling substantial improvements to community resilience.
- Landscape design controls clearly indicating regeneration and revegetation in consideration of APZ requirements across the development footprint will further reduce the bushfire attack potential, particularly from burning debris.
- Underground electricity and gas services.
- Compliant water supplies.
- Emergency response planning required at a later stage of development planning.

More detailed bushfire assessment to accurately prescribe setbacks, roads and landscaping is required at the precinct planning level, however this initial strategic assessment will be used to inform more detailed designed to occur smoothly and achieve the deemed to satisfy standards within NSW.

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