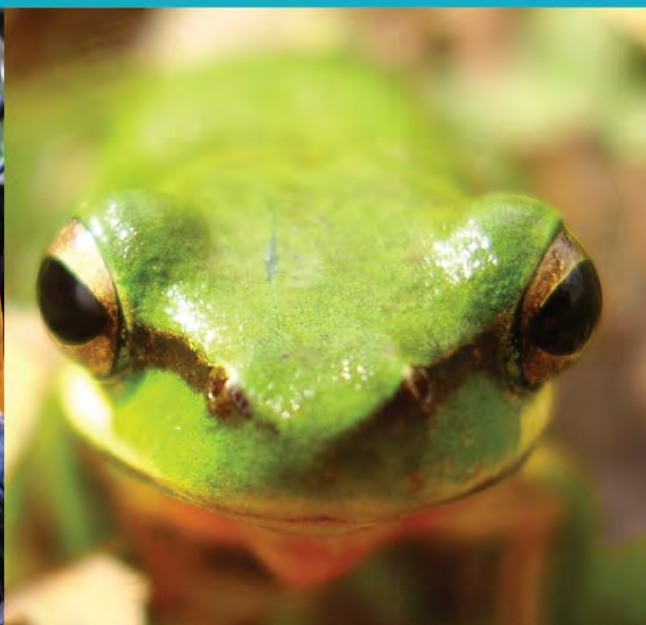




**TRAVERS
BUSHFIRE
& ECOLOGY**
A TBE ENVIRONMENTAL COMPANY



BUSHFIRE PROTECTION ASSESSMENT

Planning Proposal

Lot 71, DP 706546

71 St Andrews Rd

Varroville

Under Section 9.1 (2) Direction No 4.4 of the EP&A Act

10 June 2021

(REF: 18GAT03BF)

BUSHFIRE PROTECTION ASSESSMENT

Planning Proposal

Lot 71, DP 706546, 71 St Andrews Rd, Varroville

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<i>File:</i>	18GAT03BF

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Disclaimer:

This report has been prepared to provide advice to the client on matters pertaining to the particular and specific development proposal as advised by the client and / or their authorised representatives. This report can be used by the client only for its intended purpose and for that purpose only. Should any other use of the advice be made by any person, including the client, then this firm advises that the advice should not be relied upon. The report and its attachments should be read as a whole and no individual part of the report or its attachments should be relied upon as meaning it reflects any advice by this firm. The report does not suggest or guarantee that a bush or grass fire will not occur and or impact the development. The advice does advise on matters published by the NSW Rural Fire Service in their guidelines 'Planning for bush fire protection 2019 and other advice available from that organisation.

The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features is to be confirmed by a registered surveyor.

EXECUTIVE SUMMARY HEADING

Travers bushfire & ecology prepared a bushfire protection assessment report for the proposed rezoning and future residential subdivision of Lot 71 DP 706546, 71 St Andrews Rd, Varroville of the site in December 2018.

Subsequent to that report Gateway Determination (PP_2020_CAMPB_004_00) has since been received from the Department of Planning, Industry and Environment (DPIE). As part of the determination, Condition 2 states that prior to public exhibition the Bushfire Protection Assessment report is to be updated as follows:

Consider the availability of the additional road access being provided through the East Leppington Precinct, and if this connection is not viable, determine whether the evacuation route along St Andrew Road is adequate.

With respect to the availability of the road access through the East Leppington Precinct, a recent Land and Environment Court ruling has resulted in the road connection (to Aqueduct Street) being lost with the Commissioner ruling that this land could be subdivided into 4 Torrens Title allotments.

This updated bushfire report has been prepared to address the access requirements as outlined in *Planning for Bushfire Protection 2019* which was legislatively adopted in the *Environmental Planning and Assessment Regulations* in March 2020. This updated report includes an assessment of the road design and highlights the required bushfire protection measures, including asset protection zones (APZs), for future development based on the revised concept design.

The proposal seeks to rezone land to the west of the internal easement as R2 Low Density Residential with the remaining land being part E2 Environmental Conservation (with dwelling entitlement), RE1 Public Recreation and Special Purposes – Drainage.

The key principle for the proposal is to ensure that future development is capable of complying with *PBP*. Planning principles for the proposal include the provision of adequate access including perimeter roads, establishment of adequate APZs for future housing, specifying minimum lot depths to accommodate APZs and the introduction of controls which avoid placing inappropriate developments in hazardous areas and placement of combustible material in APZs.

Our assessment found that bushfire can potentially affect the site from the bushland located beyond St Andrew Road to the south-west and the vegetation associated with the electrical services easement and proposed E2 zoned land located within the eastern portion of the site resulting in possible ember attack, radiant heat and potentially flame attack.

The bushfire risk posed to the planning proposal can be mitigated if appropriate bushfire protection measures (including APZs) are put in place and managed in perpetuity.

The assessment has concluded that future development on site will provide compliance with the planning principles of *PBP*.

GLOSSARY OF TERMS

AHIMS	Aboriginal Heritage Information System
APZ	Asset protection zone
AS1596	<i>Australian Standard – The storage and handling of LP Gas</i>
AS2419	<i>Australian Standard – Fire hydrant installations</i>
AS3745	<i>Australian Standard – Planning for emergencies in facilities</i>
AS3959	<i>Australian Standard – Construction of buildings in bushfire-prone areas 2018</i>
BCA	<i>Building Code of Australia</i>
BSA	Bushfire safety authority
DA	development application
DCP	Development Control Plan
DPIE	Department of Planning, Industry and Environment
EEC	endangered ecological community
FDI	fire danger index
FMP	fuel management plan
IPA	inner protection area
LEP	<i>Local environmental plan</i>
OPA	outer protection area
PBP 2019	<i>Planning for bush fire protection 2019</i>
RFS	NSW Rural Fire Service
SFPP	special fire protection purpose

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1. INTRODUCTION

Travers bushfire & ecology has been requested by *GAT & Associates* to undertake an updated bushfire protection assessment for the proposed rezoning and future residential subdivision of Lot 71 DP 706546, 71 St Andrews Rd, Varroville.

The proposal is located on land mapped by *Campbelltown City Council* as being bushfire prone (refer Figure 1.1). *Direction 4.4, Planning for Bush Fire Protection 2019 (PBP)* identifies matters for consideration for planning proposals that will affect, or are in proximity to land mapped as bushfire prone.

As such, the proposal is subject to the requirements of Section 9.1(2) of *the Environmental Planning and Assessment Act 1979 (EP&A Act)* which requires Council to consult with the Commissioner of the NSW Rural Fire Service (RFS) and to take into account any comments by the Commissioner.



Figure 1-1– Bushfire prone land map
(source: NSW Planning Portal, 2021)

1.1 Aims of the assessment

The aims of the bushfire protection assessment are to:

- respond to condition 2 of the Gateway Determination with the provision of an updated bushfire report to address road design;
- review the bushfire threat to the landscape;
- undertake a bushfire attack assessment in accordance with *PBP 2019*;
- provide advice on planning principles, including the provision of perimeter roads, APZs and other specific fire management issues; and
- review the potential to carry out hazard management over the landscape, taking into consideration the proposed retention of trees within the final development plans.

1.2 Project synopsis

The proposal seeks to rezone the western extent of Lot 71 DP 706546 from E3 Environmental Management to R2 Low Density Residential (minimum lot size 700sq/m) (refer Figure 1.1). The eastern portion (including the internal services easement) is proposed to be rezoned as part E2 Environmental Conservation (with dwelling entitlement), RE1 Public Recreation and Special Purposes – Drainage.

The majority of the Cumberland Plain Woodland (CPW) vegetation, identified within the Flora and Fauna Assessment compiled by *Travers bushfire & ecology* (April, 2021) to the east of the easement will be retained as a biodiversity / riparian corridor with a single dwelling entitlement. An indicative dwelling footprint has been identified within Schedule 1 attached.

In accordance with the Concept Services Plan prepared by *Lean Lackenby & Hayward* (refer Figure 1.2), access to the site will be provided via an upgrade of St Andrews Road with a secondary egress point (as required under PBP, 2019) proposed to be provided to Grantham Crescent in the north-east.

This report has highlighted the bushfire constraints, minimum APZs as well as recommendations for future road design, building construction, water supply and utilities.



Campbelltown Local Environmental Plan 2015

Land Zoning Map - Sheet LZN_006

Zone

B1	Neighbourhood Centre
B2	Local Centre
B3	Commercial Core
B4	Mixed Use
B5	Business Development
E1	National Parks and Nature Reserves
E2	Environmental Conservation
E3	Environmental Management
E4	Environmental Living
IN1	General Industrial
IN2	Light Industrial
R2	Low Density Residential
R3	Medium Density Residential
R4	High Density Residential
R5	Large Lot Residential
RE1	Public Recreation
RE2	Private Recreation
RU2	Rural Landscape
RU5	Village
RU6	Transition
SP1	Special Activities
SP2	Infrastructure
W1	Natural Waterways
DM	Deferred Matter
SEDP	SEPP (State Significant Precincts) 2005 Edmondson Park South
SWGc	South West Growth Centre

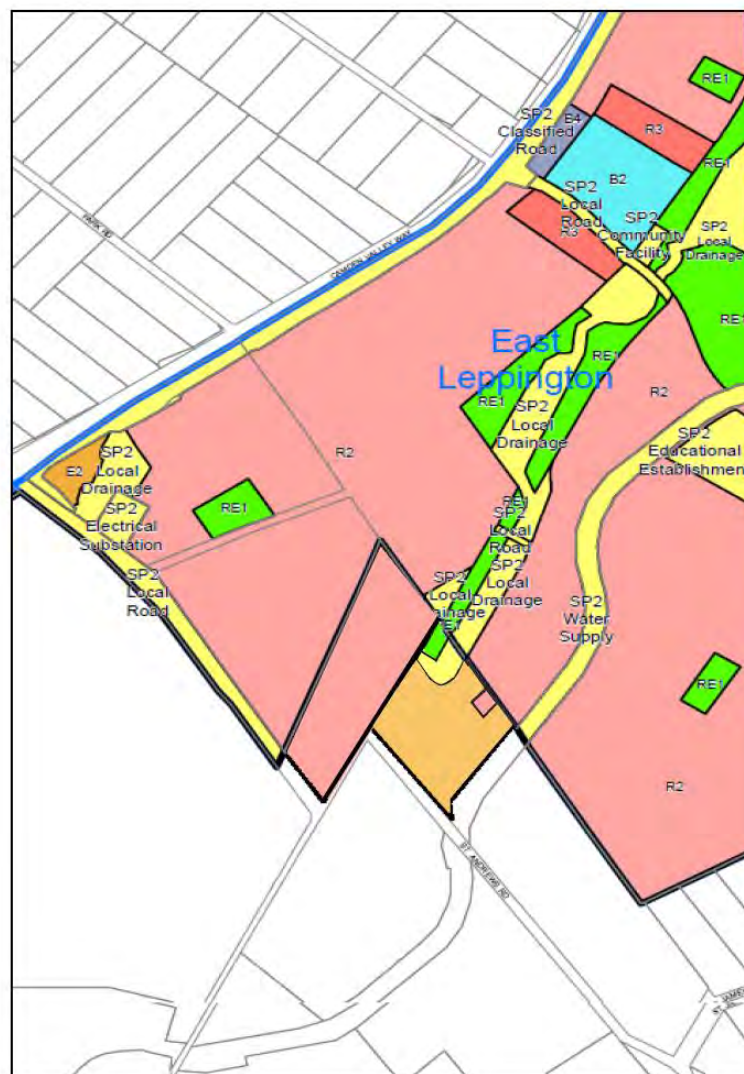


Figure 1-2– Proposed zoning

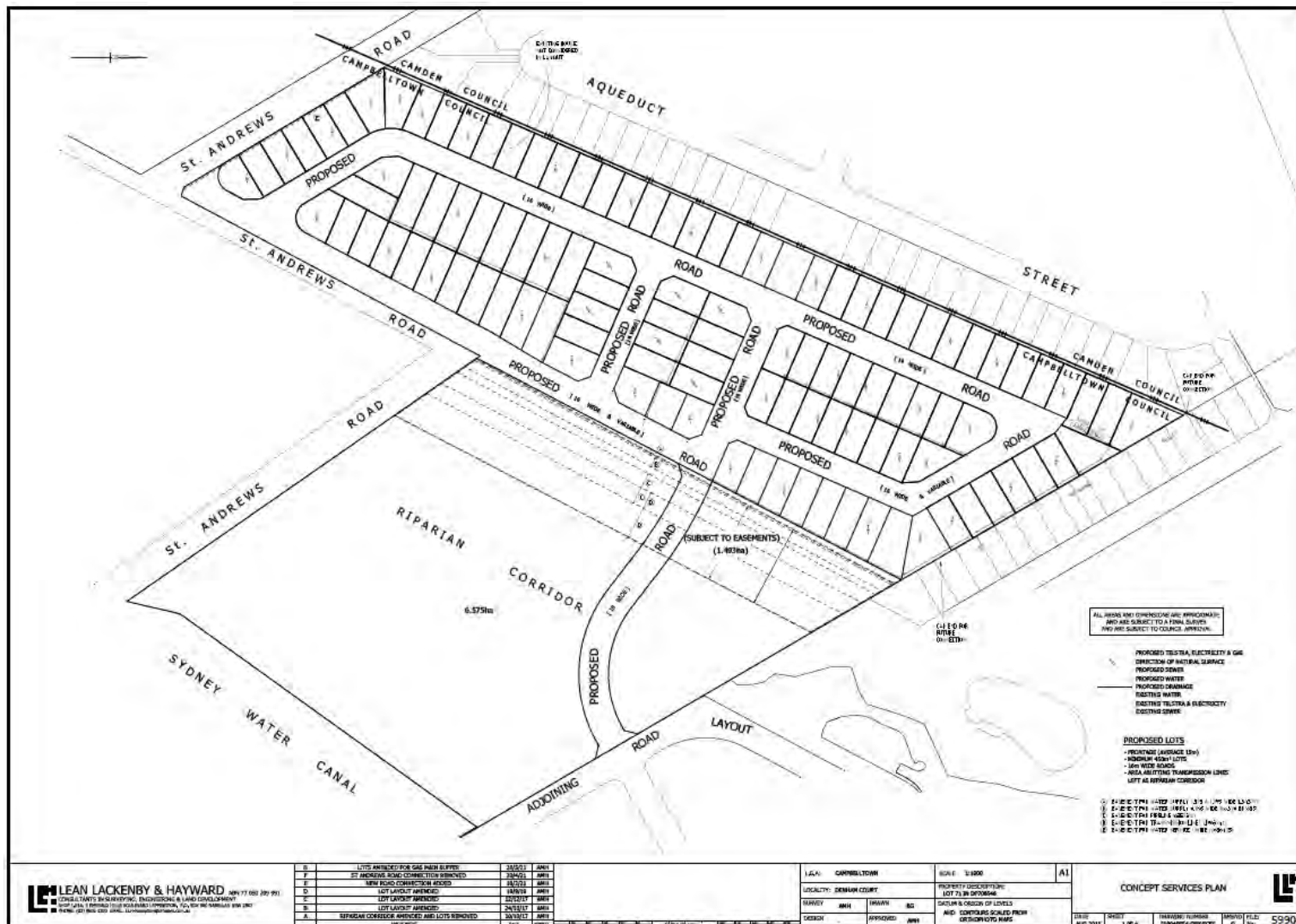


Figure 1-3– Proposed subdivision

(Source: Lean Lackenby & Hayward, ref: 59904, version G, dated 25.05.2021)

1.3 Information collation

To achieve the aims of this report, a review of the information relevant to the property was undertaken prior to the initiation of field surveys. Information sources reviewed include the following:

- Proposed zoning and subdivision prepared by *Lackenby & Hayward*, ref 59904, Version G, dated 25.05.2021)
- Campbelltown Local Environmental Plan 2015
- Flora and Fauna Assessment, 2021 prepared by *Travers bushfire & ecology*
- *NearMap* aerial photography
- Topographical maps *DLPI of NSW* 1:25,000
- *Australian Standard 3959 Construction of buildings in bushfire-prone areas*
- *Planning for Bush Fire Protection 2019 (PBP)*
- *Community Resilience Practice Notes 2/12 Planning Instruments and Policies*.

1.4 Site description

The site is located at Lot 71 DP 706546, 71 St Andrews Rd, Varroville (refer *Figure 1-4*). It is situated to the north-east of the exiting St Andrews Road and to the west of Sydney Water Canal within the local government area (LGA) of Campbelltown.

The surrounding land to the north and west has been recently subdivided forming part of an urban release area.

Table 1-1 provides a summary of the planning, cadastral, topographical, and disturbance details of the subject site.

Table 1-1 – Site features

Location	71 St Andrews Road, Varroville
Local government area	Campbelltown
Grid reference	297400E 6237200N
Topography	Situated on a mostly flat landscape with a very gentle rise to the south-east of the site along Andrews Road.
Vegetation	Where present, native vegetation has an open woodland structure. Trees are around 15-25m tall in most areas, there is a limited mid-storey or nil, and a ground layer of grasses and forbs. The vegetation is modified throughout the study area due to previous clearing and continued grazing and cultivation processes.
Existing land use	Cattle grazing/managed
Clearing	The understorey has been previously cleared for indicated land uses.



Figure 1-4 – Aerial appraisal

(source – NearMap, 2020)

1.5 Legislation and planning instruments

Is the site mapped as bushfire prone?	Yes
Proposed development type	Rezoning
Must the development consider Section 9.1(2) Direction No 4.4 of the EP&A Act?	Yes – the relevant authority must consult with the Commissioner of the NSW RFS.
Significant environmental features	A flora & fauna report has also been prepared by Travers bushfire & ecology (May, 2021). The report outlines that the planning proposal is unlikely to result in a significant impact on any threatened species, populations or EECs or their habitats. The indicative dwelling footprint and associated APZ has been placed to minimise impact on the EEC vegetation.
Details of any Aboriginal heritage	No known.
Does the proposal rely on an alternative solution?	Yes – Method 2 AS3959 to determine APZ distances based on the NSW RFS Comprehensive Fuel Loads

2. BUSHFIRE STRATEGIC STUDY

PBP 2019 includes the requirement to prepare a Strategic Bush Fire Study for rezoning applications. The level of information required is dependent upon the nature of the scale of the proposal, the bushfire risk and its potential impact upon the wider infrastructure network.

The Strategic Bush Fire Study is designed 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 bushfire mitigation and management.

Table 2-1 assesses the proposed development in terms of the broader bushfire landscape, land use as well as access and egress and associated infrastructure in accordance with Table 4.2.1 of *PBP 2019*.

Sections 3–5 outlines the relevant performance criteria to be achieved for future development in accordance with Section 5 of *PBP 2019*.

Table 2-1 – Bushfire Strategic Study.

Issue	Detail	Assessment Considerations	Proposal's compliance
Bushfire 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.	<ul style="list-style-type: none"> • The bush fire hazard in the surrounding area, including: <ul style="list-style-type: none"> ○ Vegetation ○ Topography ○ Weather • The potential fire behaviour that might be generated based on the above; • Any history of bush fire in the area, • Potential fire runs into the site and the intensity of such fire runs. • The difficulty in accessing and suppressing a fire, the continuity of bush fire hazard or the fragmentation of land scape fuels and the complexity of the associated terrain. 	<p>The site is bound by residential land to the north-east and north-west, Sydney Water Canal to the south-east and St Andrews Road to the south-west. A cleared electrical easement traverses the central portion of the site which will provide a fire break between the proposed R2 zone and the retained bushland.</p> <p>The bushland within the eastern portion of the site and extending within the adjoining land to the south-west is located on level to upslope topography.</p> <p>The typical / average climate in the Campbelltown area is for a warm temperate climate with high summer rainfalls between January and March with the bushfire season generally running from August to March. During the fire season, weather conditions of concern are hot, dry winds, particularly from the north-west accompanied by temperatures above 30 degrees. These conditions are sometimes followed by a rapid change producing strong southerly winds and high intensity storms, with concentrated periods of lightning with little rain (source: Macarthur Bush Fire Risk Management Plan 2012)</p> <p>A review of the fire history information from The Central Resource for Sharing and Enabling Environmental Data in NSW (SEED) reveals no fire history data for the site. The nearest record shows a wildfire impacting the vegetation at Holsworthy Military Reserve located 9.3m to the west during 2002 – 2003.</p> <p>Potential fire runs into the site would be from the bushland associated with Woodland Conservation Area in the south-west and south of the site. This bushland can be accessed via St Andrews Road to the immediate south-west or via Friend Road and Bergin Circuit which is located on the western side of the reserve. Access can also be achieved via the existing vehicular</p>

Issue	Detail	Assessment Considerations	Proposal's compliance
			<p>tracks associated with the electrical easement which traverses the central portion of the site and continues further south-west.</p> <p>Sydney Water Canal also provides a 20m wide fire break in the south-east.</p> <p>The provision of compliant access and asset protection zones will provide safe firefighting access to all bushland areas.</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.	<ul style="list-style-type: none"> The risk profile of different areas of the development layout based on the above landscape study; The proposed land use zones and the resultant permitted land uses; The most appropriate siting of different land uses based on risk profiles within the site (i.e. not locating development on ridgetops, SFPP development to be located in lower risk areas of the site); and The impact of the siting of these uses on APZ provision. 	<p>The planning proposal seeks approval for the rezone the western portion of the subject site from E3 – Environmental Management to R2 – Low Density Residential with the eastern portion of the site containing one dwelling entitlement only.</p> <p>Based on the low density residential coupled with the provision of future bushfire protection measures; the proposed development is capable of supporting the required asset protection zones equivalent to the bushfire risk exposure. This is also consistent with the recent development of land to the north and west of the site.</p>
Access and egress	A study of the existing and proposed road networks both within and external to the masterplan area or site layout.	<ul style="list-style-type: none"> The capacity for the proposed road network to deal with evacuating residents and responding emergency services, based on the existing and proposed community profile; The location of key access routes and direction of travel, and The potential for development to be isolated in the event of a bush fire. 	<p>Future access to the site will be provided via two (2) entry points, St Andrews Road in the south and Grantham Crescent in the north.</p> <p>The surrounding development to the north-east and north-west is low density residential development and the proposed development is not expected to have a significant impact on the existing road network.</p> <p>These egress routes allows for two (2) options in an evacuation in a bushfire event.</p>

Issue	Detail	Assessment Considerations	Proposal's compliance
Emergency services	An assessment of the future impact of new development on emergency services provision.	<ul style="list-style-type: none"> Consideration of the increase in demand for emergency services responding to a bush fire emergency (including the need for new stations / bridges); and Impact on the ability of emergency services to carry out fire suppression in a bush fire emergency. 	<p>NSW RFS has a volunteer fire brigade at Catherine Fields, a 7 minute drive (5.5km) to the west. Fire and Rescue NSW has a station located on the corner of Ben Lomond Road and Campbelltown Road, a 13-minute (9.3km) drive to the south-east. The proximity of both services is considered adequate and no further stations are required.</p> <p>The proposed development will comply with <i>PBP</i> with the provision of access to the bushfire hazard, APZs and building construction standards to increase the site's resilience to bushfire attack and improve firefighting access.</p>
Infrastructure	An assessment of the issues associated with infrastructure provision.	<ul style="list-style-type: none"> The ability of the reticulated water system to deal with a major bush fire event (particularly in terms of water pressure); and Life safety issues associated with fire and proximity to high voltage power lines, natural gas supply lines etc. 	<p>There is an electrical easement with traverses the central portion of the property. This easement is routinely maintained and currently does not support any vegetation.</p> <p>A hydraulic consultant will be engaged at DA stage to ensure the reticulated water supply will comply with <i>PBP</i>.</p>
Adjoining land	The impact of new development on adjoining landowners and their ability to undertake bush fire management.	<ul style="list-style-type: none"> 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 proposed development will provide for <i>PBP</i> complying bushfire protection measures with all measures being implemented within the site. Adjoining landholders are not required to increase their bushfire management responsibility.</p>

3. BUSHFIRE THREAT ASSESSMENT

To assess the bushfire threat and to determine the required width of an APZ for a development, a review of the elements that comprise the overall threat needs to be completed.

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

3.1 Hazardous fuels

PBP guidelines require the identification of the predominant vegetation formation in accordance with David Keith (2004) if using the simplified acceptable solutions in *PBP* 2019, or alternatively the vegetation class if adopting the comprehensive vegetation fuel loads (as allowable when undertaking an assessment under Method 2 of AS3959). The hazardous vegetation is calculated for a distance of at least 140m from a proposed building envelope.

The hazardous vegetation within 140m of the planning proposal is identified within the Flora and Fauna Report prepared by this firm and consists of:

Table 3-1 – Vegetation communities

Aspect	Vegetation community	Vegetation formation (refer Note 1)	Vegetation class (refer Note 1)
South-west and east	Grey Box – Forest Red Gum grassland woodland on flats of the Cumberland Plain (PCT 849)	Woodlands	Coastal Valley Grassy Woodland

Note 1 – Whilst the vegetation is classified as a Coastal Valley Grassy Woodland with an understorey of predominantly grassland (refer photos 1 & 2) this assessment has considered the likelihood of the ground layer / shrub layer to grow back overtime as a result of changed land practices.

As a result a worst case scenario has been adopted and the most appropriate formation being a Dry Sclerophyll Forest (shrub/grass) has been adopted. The closest vegetation classification based on the area is determined as Cumberland Dry Sclerophyll Forest (fuel load of 14/24.97 t/ha).

This is higher than the identified Coastal Valley Grassy Woodland fuel load of 10/18.07 t/ha.



Photo 3-1– Woodland vegetation to the south-west (beyond St Andrews Road)



Photo 3-2 – Woodland vegetation within the proposed E2 zone surrounding the proposed single dwelling.

3.2 Effective slope

The effective slope is determined by reviewing the slopes within 100m of the development boundary. Effective slope refers to that slope which provides the most effect upon likely fire behaviour. A mean average slope may not in all cases provide sufficient information such that an appropriate assessment can be determined. The effective slope within the hazardous vegetation is level to upslope.

3.3 Bushfire attack assessment

The following assessment has determined the APZ and BAL levels via the following approaches;

- Appendix B Method 2 (alternative solution) of AS3959 Construction of buildings in bushfire prone areas (2009).

A fire danger index (FDI) of 100 has been used to calculate bushfire behaviour on the site based on its location within the Greater Sydney region. Table 3-2 provides a summary of the bushfire attack assessment based on residential development and the methodologies identified above.

Table 3-2 – Bushfire attack assessment

Aspect	Vegetation formation within 140m of development / Fuel load	Effective slope of land	Minimum APZ (refer Note 1)	Building construction standard (metres) (refer Note 1)
Proposed R2 zoned land				
North-west & north-east	Managed land & land subject to future development	N/A	N/A	N/A
South-east (within electrical services easement)	Cumberland Dry Sclerophyll Forest (14/24.97 t/ha)	Level to upslope	16	BAL 29 (16-<23) BAL 19 (23 - <32) BAL 12.5 (32-<100)
South-west				
Single dwelling entitlement (E2 zoned land) –update once final plan is provided				
East and south	Cumberland Dry Sclerophyll Forest (14/24.97 t/ha)	Level to upslope	16	16
North-west				

Notes: * Slope is either 'U' meaning up slope or 'C' meaning cross slope or 'D' meaning down slope

Note 1 - A performance-based assessment using Appendix B of AS3959 was undertaken to determine the required APZ and BAL levels based on the comprehensive fuel loads associated with Cumberland

Dry Sclerophyll Forest on a level slope. The results of the assessment are provided below and were prepared using the bushfire attack level calculator developed by *Flamesol*.



Calculated February 22, 2021, 1:50 pm (MDc v.4.9)

South-east & south-west

Minimum Distance Calculator - AS3959-2018 (Method 2)			
Inputs		Outputs	
Fire Danger Index	100	Rate of spread	1.68 km/h
Vegetation classification	Forest	Flame length	13.91 m
Understorey fuel load	14 t/ha	Flame angle	53 °, 63 °, 71 °, 75 °, 77 ° & 83 °
Total fuel load	24.97 t/ha	Elevation of receiver	5.55 m, 6.19 m, 6.57 m, 6.72 m, 6.77 m & 6.9 m
Vegetation height	n/a	Fire intensity	21,673 kW/m
Effective slope	0 °	Transmissivity	0.873, 0.855, 0.83, 0.804, 0.791 & 0.728
Site slope	0 °	Viewfactor	0.5988, 0.443, 0.3001, 0.2037, 0.1659 & 0.045
Flame width	100 m	Minimum distance to < 40 kW/m ²	11.5 m
Windspeed	n/a	Minimum distance to < 29 kW/m ²	15.5 m
Heat of combustion	18,600 kJ/kg	Minimum distance to < 19 kW/m ²	22.6 m
Flame temperature	1,090 K	Minimum distance to < 12.5 kW/m ²	31.9 m
		Minimum distance to < 10 kW/m ²	37.8 m

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

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

Elevation of receiver - Douglas & Tan, 2005

Flame angle - Douglas & Tan, 2005

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

4. SPECIFIC PROTECTION ISSUES

4.1 Asset protection zones (APZs)

Table 4-1 outlines the proposal's compliance with the performance criteria for APZs.

Table 4-1 – Performance criteria for asset protection zones (PBP 2019 guidelines pg. 43)

Performance criteria	Acceptable solutions	Acceptable solution	Performance solution	Comment
Potential building footprints will not be exposed to radiant heat levels exceeding 29kW/m ² on each proposed lot	APZs are provided in accordance with Tables A1.12.2 and A1.12.4 based on the FFDI	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Refer Section 2.3. APZ's have been determined based on an alternative solution ensuring radiant heat exposure of less than 29kW/m ² .
APZs are managed and maintained to prevent the spread of a fire towards the building	APZs are managed in accordance with the requirements of Appendix 4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The APZ will consist of road reserves and landscaped areas.
The APZ is provided in perpetuity	APZs are wholly within the boundaries of the development site	<input checked="" type="checkbox"/>	<input type="checkbox"/>	APZ's are confined within the boundary of the site and / or road reserves. A portion of the APZ will occur within the electrical easement and will be subject to an 88b instrument.
APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is minimised	The APZ is located on lands with a slope of less than 18°	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Complies. All slopes are less than 18 degrees.
Landscaping is designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven embers to cause ignitions	Landscaping is in accordance with Appendix 4	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Can be a condition of consent
	Fencing is constructed in accordance with section 7.6	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Can be a condition of consent (see Note 1 below).

Note 1: Section 7.6 of PBP states that all fences in bush fire prone areas should be made of either hardwood or non-combustible material. However, in circumstances where the fence is within 6m of a building or in areas of BAL 29 or greater, they should be made of non-combustible material only.

4.2 Building protection

In terms of future subdivision approval, the minimum APZ must be provided in accordance with *PBP*. The APZs provided in Table 3-2(Section 3.3) are based on a BAL 29 for those allotments fronting the hazard.

Although not required in terms of a planning proposal, the following advice in relation to building construction levels can be used for future planning and subdivision design.

The construction classification system is based on five (5) bushfire attack levels (BAL). These are BAL – Flame Zone (FZ), BAL 40, BAL 29, BAL 19 and BAL 12.5 AS3959 – *Construction of buildings in bushfire-prone areas (2018)*. The lowest level, BAL 12.5, has the longest APZ distance while BAL – FZ has the shortest APZ distance. These allow for varying levels of building design and use of appropriate materials.

Table 3-2 provides an indication of the BAL setbacks that are likely to apply for future building construction. These BAL levels are for planning purposes only and will be assessed / confirmed prior to building construction stage. The APZ depicted in Schedule 1 attached is based on BAL 29 building construction (for those lots fronting the hazard).

4.3 Hazard management

In terms of implementing and / or maintaining APZs, there is no physical reason that would constrain hazard management from being successfully carried out by normal means (e.g. mowing / slashing).

APZs are required to be managed as an IPA in accordance with RFS guidelines *Standards for Asset Protection Zones* (RFS, 2005), with landscaping design to comply with Appendix 4 of *PBP*. Appendix 2 provides maintenance advice for vegetation within the APZ

A summary of the guidelines for managing APZs is attached as Appendix 1 to this report.

Minimum APZs have been recommended and are depicted in Schedule 1. The asset protection zone extends within the electrical easement to the rear of eight (8) allotments. This APZ will be subject to an 88b easement which will be maintained by the owner of the large E2 zoned allotment.

4.4 Access for firefighting operations

The proposed internal road layout will include the provision of perimeter roads adjoining bushland areas as well as an interconnecting internal road system. No dead ends are proposed. Two access points to the subdivision will be provided via an upgrade to St Andrews Road in the south-west and a secondary link provided to Grantham Crescent in the north-east.

Future access to the proposed single dwelling entitlement within the E2 zoned land will be gained via Grantham Crescent in the north.

Table 4-2 below outlines the performance criteria and acceptable solutions for future access within residential subdivision design.

Table 4-2 – Performance criteria for access within residential subdivisions

Performance criteria		Acceptable solution	Acceptable solution	Performance solution	Comment
ACCESS (GENERAL REQUIREMENTS)	Firefighting vehicles are provided with safe, all weather access to structures.	Property access roads are two-wheel drive, all-weather roads	<input checked="" type="checkbox"/>		Complies.
		Perimeter roads are provided for residential subdivisions of three or more allotments.		<input checked="" type="checkbox"/>	Complies (refer Note 1).
		Subdivisions of three or more allotments have more than one access in and out of the development.	<input checked="" type="checkbox"/>		Complies
		Traffic management devices are constructed to not prohibit access by emergency services vehicles.	<input checked="" type="checkbox"/>		Can be a condition of consent.
		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.	<input checked="" type="checkbox"/>		Complies. All roads will be sealed.
		All roads are through roads	<input checked="" type="checkbox"/>		Complies.
		Dead end roads are not recommended, but if unavoidable, dead ends are not more than 200m in length, incorporate a minimum 12 metres outer radius turning circle, and are clearly sign posted as a dead end.	<input checked="" type="checkbox"/>		All roads are through roads.
		Where kerb and guttering are provided on perimeter roads, roll top kerbing should be used to the hazard side of the road.	<input checked="" type="checkbox"/>		Can be a condition of consent.
		Where access / egress can only be achieved through forest, woodland or heath vegetation, secondary access shall be provided to an alternate	<input checked="" type="checkbox"/>		Complies.

Performance criteria	Acceptable solution	Acceptable solution	Performance solution	Comment
	point on the existing public road system.			
	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.	N/A	N/A	All roads are two (2) way.
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.	☑		Can be a condition of consent.
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.	☑		Can be a condition of consent.
	Hydrants are provided in accordance with AS 2419.1:2005.	☑		Can be a condition of consent.
	There is suitable access for a Category 1 fire appliance to within 4m of the static water supply where no reticulated supply is available.	N/A	N/A	Reticulated water is provided.

Note 1: A perimeter road has not been provided for eight (8) allotments in the northern portion of the site. The proposal maintains compliance with the performance requirements as firefighting vehicles are provided with safe access to the hazard via the proposed secondary road, the 16m APZ and cleared electrical easement which occurs in this area.

Performance criteria	Acceptable solution	Acceptable solution	Performance solution	Comment
PERIMETER ROAD	Access roads are designed to allow safe access and egress for	Are two-way sealed roads.	☑	Complies.
		Minimum 8m carriageway width kerb to kerb.	☑	Complies. Will be a condition of consent

Performance criteria	Acceptable solution	Acceptable solution	Performance solution	Comment
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.	Parking is provided outside of the carriageway width.	☑		Complies – can be a condition of consent
	Hydrants are located clear of parking areas.	☑		Can be a condition of consent.
	There are through roads, and these are linked to the internal road system at an interval of no greater than 500m.	☑		Complies.
	Curves of roads have a minimum inner radius of 6m.	☑		Can be a condition of consent.
	The maximum grade road is 15° and average grade is 10°.	☑		Can be a condition of consent.
	The road crossfall does not exceed 3°.	☑		Can be a condition of consent.
	A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.	☑		Can be a condition of consent

Performance criteria	Acceptable solution	Acceptable solution	Performance solution	Comment
PROPERTY ACCESS 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.	☑		Complies. All allotments are provided with direct frontage to the public road system.

4.5 Water supplies

Town reticulated water supply is available to the property in the form of an existing underground reticulated water system.

Table 4-3 – Performance criteria for reticulated water supplies

Performance criteria	Acceptable solutions	Acceptable solution	Performance solution	Comment
Adequate water supplies is provided for firefighting purposes.	Reticulated water is to be provided to the development, where available.	☑		Reticulated water is available to the development.
	A static water supply is provided for non-reticulated developments or where reticulated water supply cannot be guaranteed	N/A	N/A	
	Static water supplies shall comply with Table 5.3d.	N/A	N/A	
Water supplies are located at regular intervals. 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 2419.1:2005.	☑		Can be made a condition of consent.
	Hydrants are not located within any road carriageway.	☑		Can be made a condition of consent.
	Reticulated water supply to urban subdivisions uses a ring main system for areas for areas with perimeter roads.	☑		Can be made a condition of consent.
Flows and pressure are appropriate.	Fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1:2005.	☑		Can be made a condition of consent.
The integrity of the water supply is maintained.	All above-ground water service pipes are metal, including and up to any taps.	☑		Can be made a condition of consent.
	Above ground water storage tank shall be of concrete or metal	N/A	N/A	

4.6 Gas

The intent of measures is to provide adequate services of water for the protection of buildings during and after the passage of bushfire. Table 4-4 outlines the proposal's compliance with the acceptable solutions for reticulated water supply.

Table 4-4– Performance criteria for gas supplies (PBP guidelines pg. 47)

Performance criteria	Acceptable solutions	Acceptable solution	Performance solution	Comment
Location of gas services will not lead to the ignition of surrounding bushland or the fabric of buildings.	Reticulated or bottled gas bottles are to be installed and maintained in accordance with <i>AS/NZS 1596 (2014)</i> , the requirements of relevant authorities and metal piping is to be used.	<input checked="" type="checkbox"/>		Can be made a condition of consent.
	All fixed gas cylinders are to be kept clear of flammable materials to a distance of 10m and shielded on the hazard side.	<input checked="" type="checkbox"/>		Can be made a condition of consent.
	Connections to and from gas cylinders are metal.	<input checked="" type="checkbox"/>		Can be made a condition of consent.
	Polymer sheathed flexible gas supply lines are not used.	<input checked="" type="checkbox"/>		Can be made a condition of consent.
	Above ground gas service pipes are metal, including and up to any outlets.	<input checked="" type="checkbox"/>		Can be made a condition of consent.

4.7 Electricity

The intent of measures is to locate electricity so as not to contribute to the risk of fire to a building. Table 4-5 outlines the required acceptable solutions for the subdivision's electricity supply.

Table 4-5 – Performance criteria for electricity services (PBP guidelines pg. 47)

Performance criteria	Acceptable Solutions	Acceptable solution	Performance solution	Comment
Location of electricity services limit the possibility of ignition of	Where practicable, electrical transmission lines are underground.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The majority of electrical lines will be underground

Performance criteria	Acceptable Solutions	Acceptable solution	Performance solution	Comment
surrounding bushland or the fabric of buildings.	Where overhead electrical transmission lines are proposed: lines are installed with short pole spacing (30m), unless crossing gullies, gorges or riparian areas; and no part of a tree is closer to a power line than the distance set out in ISSC3 Guideline for Managing Vegetation Near Power Lines.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Complies – to be condition of consent.

5. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

This updated bushfire report has been prepared to address the access requirements as outlined in *Planning for Bushfire Protection 2019* and in response to Condition 2 of the Gateway Determination.

Our assessment found that bushfire can potentially affect the site from the bushland located beyond St Andrew Road to the south-west and the vegetation associated with the electrical services easement and proposed E2 zoned land located within the eastern portion of the site resulting in possible ember attack, radiant heat and potentially flame attack.

This report has concluded that due to potential for St Andrews Road to be cut off in a bushfire event it is recommended that a second access to point to the subdivision is required in order to comply with PBP 2019.

The assessment has concluded that future development on site will provide compliance with the planning principles of *PBP* and *Community Resilience Practice Note 2/12 – Planning Instruments and Policies* as outlined below.

Table 5-1 – Planning principles

Planning principles	Recommendations
Ensuring land is suitable for development in the context of bush fire risk	The proposed zoning is suitable for the site. With the application of bushfire protection measures the bushfire risk posed can be mitigated.
Ensuring new development on BFPL will comply with PBP	New development is capable of complying with <i>PBP</i> .
Minimising reliance on performance-based solutions	The APZ's have been provided in compliance with the acceptable solutions, with fuel loads adopted in the calculations greater than the minimum required for a grassy woodland.
Providing adequate infrastructure associated with emergency evacuation and firefighting operations	The proposed new access road/s and provision of utilities (gas and water) will support safe evacuation of residents and access by fire fighters.
Facilitating appropriate ongoing land management practices.	APZ's have been restricted within development allotments.
Strategic planning should provide for the exclusion of inappropriate development in bush fire prone areas as follows:	
The development is exposed to a high bush fire risk and should be avoided	The development site can support appropriate bushfire protection measures in response to the bushfire risk.

Planning principles	Recommendations
The development is likely to be difficult to evacuate during a bushfire due to landscape, access limitations, fire history and /or size and scale	Adequate access will be provided to the existing road network. The proposal adjoins existing development to the north-east and north-west. The scale of the development and lack of recent wildfire history will support evacuation efforts if required.
The development will adversely affect other bush fire protection strategies or place existing development at increased risk	The proposal will not increase the bushfire risk to the surrounding development.
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 proposal is not expected to cause evacuation issues for the existing population. The existing and proposed road network is capable of supporting the proposed rezoning.
The development has environmental constraints to the area which cannot be overcome.	An Ecological Assessment has been prepared by this firm to address the ecological constraints.

The following recommendations are provided to ensure that future residential development is in accordance with, or greater than, the requirements of *PBP*.

5.2 Recommendations

Recommendation 1 - The development is as generally indicated on the attached Schedule 1 – Plan of Bushfire Protection Measures.

Recommendation 2 - APZs are to be provided to the proposed development as outlined in Table 3.2 and as generally depicted within Schedule 1.

Recommendation 3 - The entire development area (propose R2 zone) is managed as an inner protection area (IPA) throughout the lifetime of the development and until each lot is sold / developed and the hazard is removed.

Recommendation 4 - At the issue of a subdivision certificate, a suitably worded instrument is required pursuant to section 88 of the Conveyancing Act 1919 for the purpose of a 16m asset protection zone (APZ) to be created within the electrical easement and to east of eight (8) development lots in accordance with Appendix 4 of *Planning for Bush Fire Protection 2019* as depicted in Schedule 1 – Bushfire Protection Measures (mxd ref: 18GAT03_BF001, dated 27/04/2021)

Recommendation 5 - Access is to comply with the performance requirements outlined in Section 5.3.2 of *Planning for Bush Fire Protection 2019*.

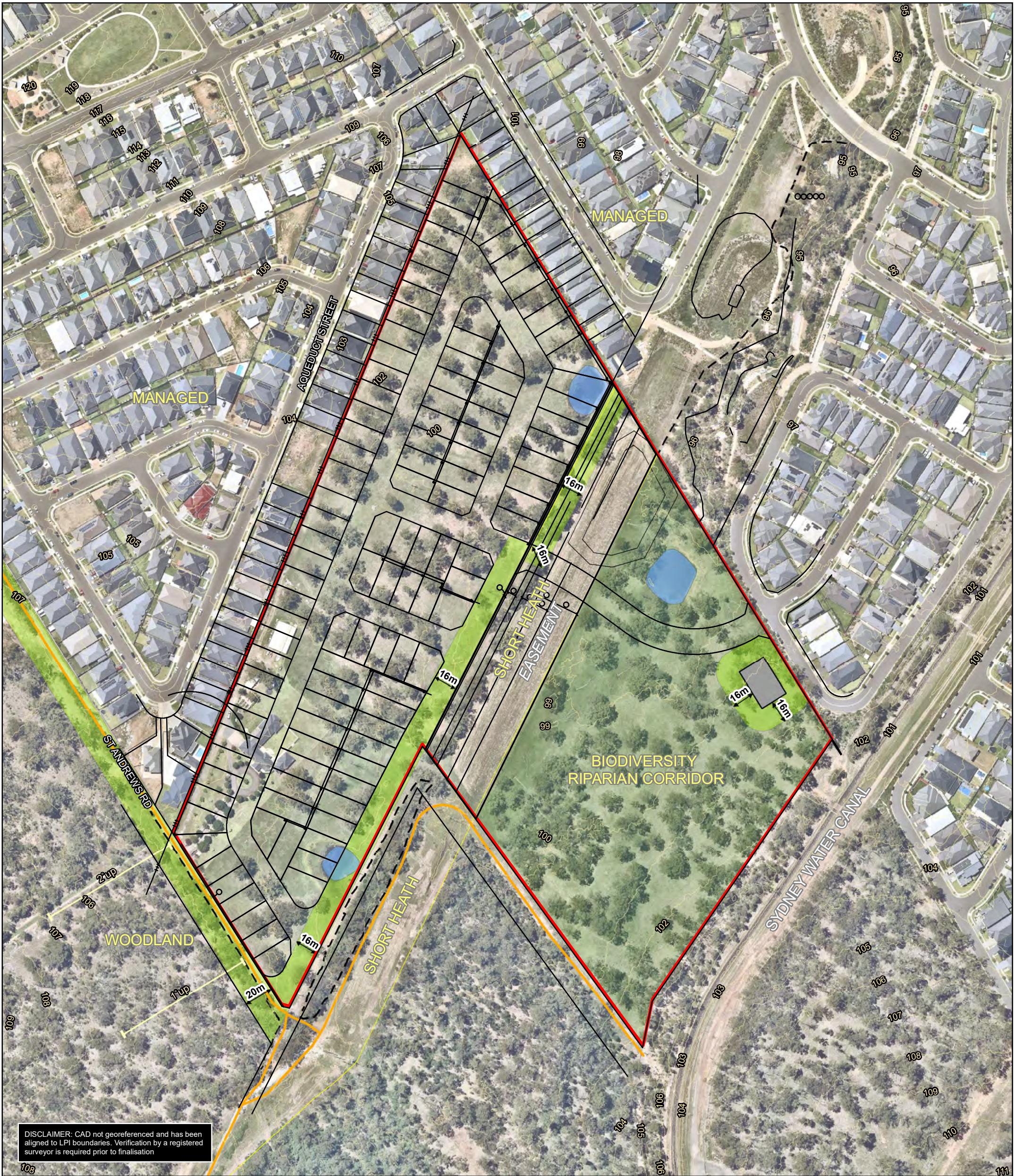
Recommendation 6 - Building construction standards for the proposed future dwellings are to be applied in accordance with *AS3959 Construction of buildings in bushfire prone areas (2018)*, and *Planning for Bush Fire Protection 2019*.

Recommendation 7 - Water, electricity and gas supply is to comply with Section 5.3.3 of *Planning for Bush Fire Protection 2019*.

Recommendation 8 - Fencing is to comply with Section 7.6 of *PBP*. All fences in bush fire prone areas should be made of either hardwood or non-combustible material. However, in circumstances where the fence is within 6m of a building or in areas of BAL 29 or greater, they should be made of non-combustible material only.

6. REFERENCES

- Australian Building Codes Board (2010) – *Building Code of Australia*, Class 1 and Class 10 Buildings Housing Provisions Volume 2.
- Chan, K.W. (2001) – *The suitability of the use of various treated timbers for building constructions in bushfire prone areas*. Warrington Fire Research.
- Councils of Standards Australia AS3959 (2018) – *Australian Standard Construction of buildings in bush fire-prone areas*.
- Hon Brad Hazzard (7 June 2012) – *Planning proposal to rezone land at Boundary Road, Medowie from 1 (c1) Rural Small Holdings Zone to 1(c5) Rural Small Holdings, 1(c4) Rural Small Holdings and 7(a) Environmental Protection*.
- Keith, David (2004) – *Ocean Shores to Desert Dunes – The Native Vegetation of New South Wales and the ACT*. The Department of Environment and Climate Change.
- Rural Fire Service (2006) - *Planning for bush fire protection– a guide for councils, planners, fire authorities and developers*. NSW Rural Fire Service.
- Rural Fire Service (2019) –*Planning for bushfire protection– a guide for councils, planners, fire authorities and developers*. NSW Rural Fire Service.
- Rural Fire Service (2006) - Bushfire Attack Software on RFS Web site.
- Tan, B., Midgley, S., Douglas, G. and Short (2004) - *A methodology for assessing bushfire attack*. RFS Development Control Service.



DISCLAIMER: CAD not georeferenced and has been aligned to LPI boundaries. Verification by a registered surveyor is required prior to finalisation

Legend

Lot boundary (source: LPI)	Constructed dams
Contours 1m (source: LiDAR)	Biodiversity corridor
Easement	Asset Protection Zone (APZ)
Existing external access	
Edge of vegetation	

Aerial source: Nearmap



<p>PROJECT & MXD REFERENCE</p> <p>St Andrews Rd, Varroville</p> <p>18GAT03_BF001</p>	<p>DATE & ISSUE NUMBER</p> <p>27/04/2021</p> <p>Issue 1</p>	<p>SCALE & COORDINATE SYSTEM</p> <p>1:2,500</p> <p>GDA 1994 MGA Zone 56</p>
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TITLE

Schedule 1 - Bushfire Protection Measures

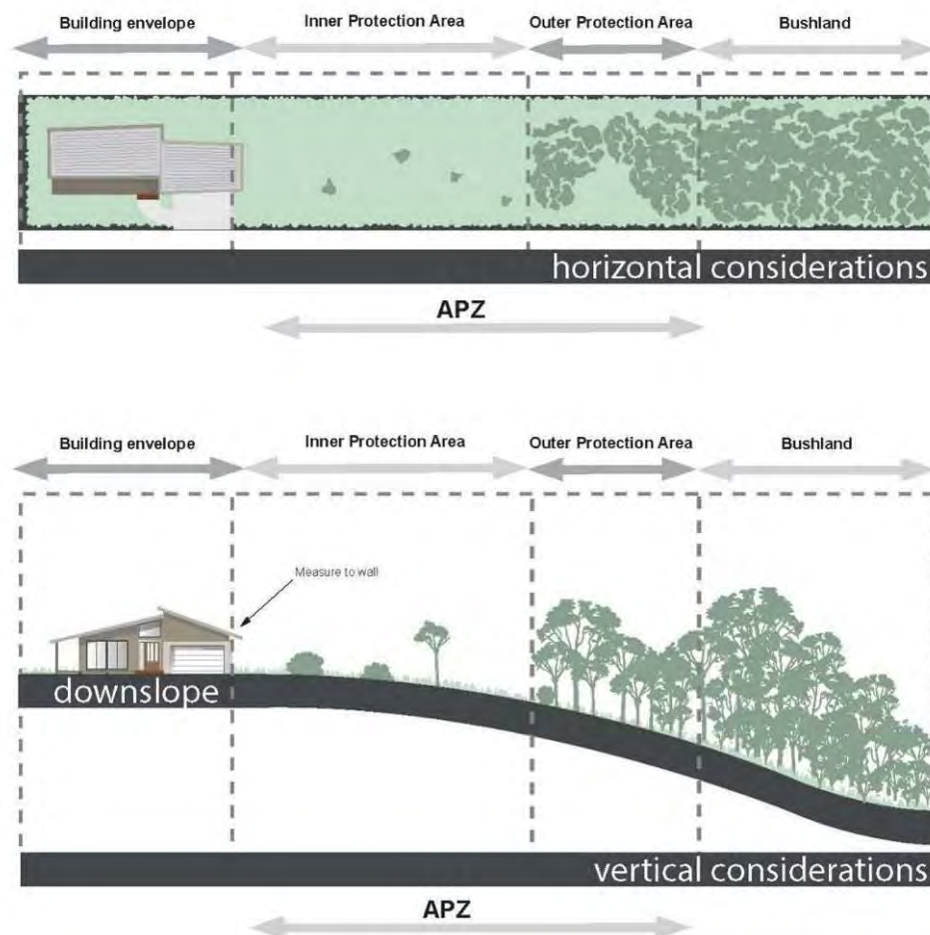
Document Path: N:\GIS STORAGE\N Drive\18GAT03 St Andrews Rd Varroville\MXD\18GAT03_BF001.mxd

Disclaimer: The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered surveyor.

APPENDIX 1. MANAGEMENT OF ASSET PROTECTION ZONES

The RFS provides basic advice in respect of managing APZs through documents such as, *Standards for Asset Protection Zones* (RFS, 2005), with landscaping to comply with Appendix 5 of *PBP*.

The APZ generally consists of two subordinate areas, an inner protection area (IPA) and an outer protection area (OPA). The OPA is closest to the bush and the IPA is closest to the dwellings. The property is to be managed to IPA standards only. A typical APZ is graphically represented below:



APZs and progressive reduction in fuel loads (Source: PBP, 2019)

Note: Vegetation management as shown is for illustrative purposes only. Specific advice is to be sought regarding vegetation removal and retention from a qualified and experienced expert to ensure APZs comply with the RFS performance criteria.

The following provides maintenance advice for vegetation within the IPA and OPA. The APZ is to be maintained in perpetuity and should be undertaken regularly, particularly in advance of the bushfire season.

Inner protection area (IPA)

Fuel loads within the IPA are to be maintained so it does not exceed 4t/ha.

Trees are to be maintained to ensure;

- canopy cover does not exceed 15% at maturity;
- trees (at maturity) do not touch or overhang the building;
- lower limbs should be removed up to a height of 2m above ground;
- tree canopies should be separated by 2 to 5m; and
- preference should be given to smooth barked and evergreen trees.

Shrubs are to be maintained to ensure;

- create large discontinuities or gaps in the vegetation to slow down or break the progress of fire towards buildings should be provided;
- shrubs should not be located under trees;
- shrubs should not form more than 10% of ground cover; and
- clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of vegetation.

Grass is to be maintained to ensure:

- grass should be kept mown (as a guide grass should be kept to no more than 100mm in height); and
- leaves and vegetation debris should be removed (litter fuel within the IPA should be kept below 1cm)

General advice for landscaping is provided below:

- Suitable impervious areas being provided immediately surrounding the building such as courtyards, paths and driveways;
- Restrict planting in the immediate vicinity of the building which may over time and if not properly maintained come into contact with the building;
- When considering landscape species consideration needs to be given to estimated size of the plant at maturity;
- Avoid species with rough fibrous bark, or which retain/shed bark in long strips or retain dead material in their canopies;
- Use smooth bark species of trees species which generally do not carry a fire up the bark into the crown;
- Avoid planting of deciduous species that may increase fuel at surface / ground level (i.e. leaf litter);
- Avoid climbing species to walls and pergolas;
- Locate combustible materials such as woodchips / mulch, flammable fuel stores away from the building;
- Locate combustible structures such as garden sheds, pergolas and materials such as timber garden furniture away from the building; and
- Use of low flammability vegetation species.