



BUSHFIRE THREAT ASSESSMENT

**FOR
PROPOSED MULTI-DWELLING
HOUSING (MOVEABLE DWELLINGS) &
COMMUNITY FACILITIES AT**

**33-41 MAGPIE HOLLOW ROAD,
SOUTH BOWENFELS, NSW 2790**

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Executive Summary

A Bushfire Threat Assessment Report (BTA) has been prepared by Firebird ecoSultants Pty Ltd at the request of MAAS Group Properties for proposed multi-dwelling housing (moveable dwellings) & community facilities operated as a Manufactured Housing Estate at 33-41 Magpie Hollow Road, South Bowenfels NSW 2790. The report forms part of the supporting documentation for a Development Application (DA) to be submitted to City of Lithgow Council (LGC) because the site is mapped as Bushfire Prone Land (BPL) under the Environmental Planning & Assessment Act 1979 (s10.3 – Bush fire prone land).

The development is required to satisfy EP&A Act 1979 (Section 4.46 – What is Integrated Development) for the residential subdivision and the relevant Council will refer the BAR to the NSW RFS to satisfy the Rural Fire Act 1997 (s100B) for the subdivision and Special Fire Protection Purposes development.

Dwellings within the manufactured home estate will be constructed to the appropriate construction standards under AS3959 or NASH Standard. In accordance with Section 6.3.2 of the document 'Planning for Bushfire Protection 2019' this type of development does not require separate development consent for each manufactured home after the estate is granted development consent.

Public assembly buildings are not defined as Special Fire Protection Purposes (SFPP) by the Rural Fires Regulation but require referral under EP&A Act s.4.14 to the NSW RFS. Buildings used for public assembly with a floor space area of greater than 500m² are required to consider bush fire. These developments will be treated technically as SFPP due to the evacuation challenges presented by large numbers of occupants. Assembly buildings can accommodate large numbers of persons of various physical capabilities. Emergency management planning for these developments must account for the total number of occupants and be commensurate with the level of risk. These developments must not experience radiant heat levels of greater than 10kW/m² on any part of the building. Due to the variation in risk associated with the occupants of assembly buildings, a variety of bush fire safety solutions may apply based on the merits of the situation.

This Report demonstrates how the development conforms with the document titled 'Planning for Bushfire Protection' (PBP). The aim of PBP is to provide for the protection of human life and minimise the impacts on property from the threat of bush fire, while having due regard to development potential, site characteristics and protection of the environment (p.10) as well as AS3959-2018 Construction of Buildings in Bush Fire Prone Areas.

In summary, the following is recommended to enable the proposal to meet the relevant legislative requirements for the proposed development:



1. Asset Protection Zone (APZ) - The APZ provides space and reduced fuel loads to ensure radiant heat levels at the buildings are below critical limits and to prevent direct flame contact.

- APZs have been provided in accordance with Table A1.12.1 in PBP 2019 and AS3959-2018 Appendix B-Detailed Method 2 for the relevant developments and will be established appropriately on the adjoining land as well as inclusive of road reserves provided in perpetuity. See Chapter 4 and Figure 4-1 for APZs within the subject site.
- These distances are to be managed as described under 'Planning for Bushfire Protection (Appendix 4 – Asset Protection Zone Requirements)' and the document titled 'Standards for Asset Protection Zones'.
- Based on the APZs provided in Chapter 4, we understand that future moveable dwellings may be sited to achieve 29kW/m^2 , which would result in BAL-29 or less.
- Based on the APZs provided in Chapter 4, we understand that future community facilities exceeding 500sqm in size may be sited to achieve $<10\text{kW/m}^2$, which would result in BAL-12.5.

2. Roads - Access standards provide for emergency evacuation and firefighting operations

- The perimeter roads identified on the subdivision plan are compliant with the following acceptable solution criteria from Table 5.3b and Table 6.8b in PBP 2019:
 - › 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;
 - › 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.

It is noted that the proposed road network allows for one primary access / egress point however a secondary emergency access point is provided to the existing public road. The proposed perimeter road is able to separate future development from potential bushfire threat and complies with all other criteria for perimeter roads in accordance with Planning for Bushfire Protection 2019.

This proposed road layout is a better outcome for the retention of existing vegetation within the site (gully), though to be maintained for the most part, for its ecological significance. This is further supported by the Biodiversity Constraints report prepared by AREA Environmental and Heritage Consultants Pty Ltd detailing the importance of existing vegetation at the site.

- The non-perimeter roads identified on the subdivision plan are compliant with the following acceptable solution criteria from Table 5.3b and Table 6.8b in PBP 2019:

- › Minimum 5.5m carriageway width kerb to kerb;
- › Parking is provided outside 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 overhanging clearance of 4m to any overhanging obstructions, including tree branches, is provided.

3. Construction Standards – Construction standards seek to increase the protection of the habitable buildings from bushfire. The shorter the APZ (distance between the external wall of the habitable building and the unmanaged vegetation), then the higher the construction standard, which is referred to as the BAL

- Based on the APZs provided above, the proposed moveable dwellings may be sited to achieve 29kW/m², which would result in BAL-29 or less and any future proposed community facilities exceeding 500sqm in size may be sited to achieve <10kW/m², which would result in BAL-12.5.

4. Water Supplies – A water supply is required for firefighting operations

- It is expected that reticulated water and associated fire hydrants are to be provided for the Manufactured Housing Estate and comply with the relevant criteria in Table 6.8c in PBP 2019.

5. Emergency Management

- A Bushfire Emergency Management and Evacuation Plan is prepared consistent with the NSW RFS document: A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan, & AS3745:2010 for future community facilities.

I certify the development conforms to the relevant specifications and requirements of Planning for Bushfire Protection 2019



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Terms & Abbreviations

Abbreviation	Meaning
APZ	Asset Protection Zone
AS2419 -2005	Australian Standard – Fire Hydrant Installations
AS3959-2018	Australian Standard – Construction of Buildings in Bush Fire Prone Areas
BCA	Building Code of Australia
BPA	Bush Fire Prone Area (Also Bushfire Prone Land)
BFPL Map	Bush Fire Prone Land Map
BPMs	Bush Fire Protection Measures
BFSA	Bush Fire Safety Authority
CC	Construction Certificate
DA	Development Application
EPA Act	<i>NSW Environmental Planning and Assessment Act 1979</i>
FFDI	Forest Fire Danger Index
FMP	Fuel Management Plan
ha	hectare
IPA	Inner Protection Area
LGA	Local Government Area
LGC	City of Lithgow Council
NCC	National Construction Code
OPA	Outer Protection Area
PBP	Planning for Bushfire Protection 2019
PoM	Plan of Management
RF Act	Rural Fires Act 1997
RF Regulation	Rural Fires Regulation



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2 INTRODUCTION

A Bushfire Threat Assessment Report (BTA) has been prepared by Firebird ecoSultants Pty Ltd at the request of MAAS Group for proposed multi-dwelling housing (moveable dwellings) & community facilities operated as a Manufactured Housing Estate at 33-41 Magpie Hollow Road, South Bowenfels, hereafter referred to as the “site” (refer to Figure 1-1 for site locality). Refer to Appendix A for Proposed Site Plans.

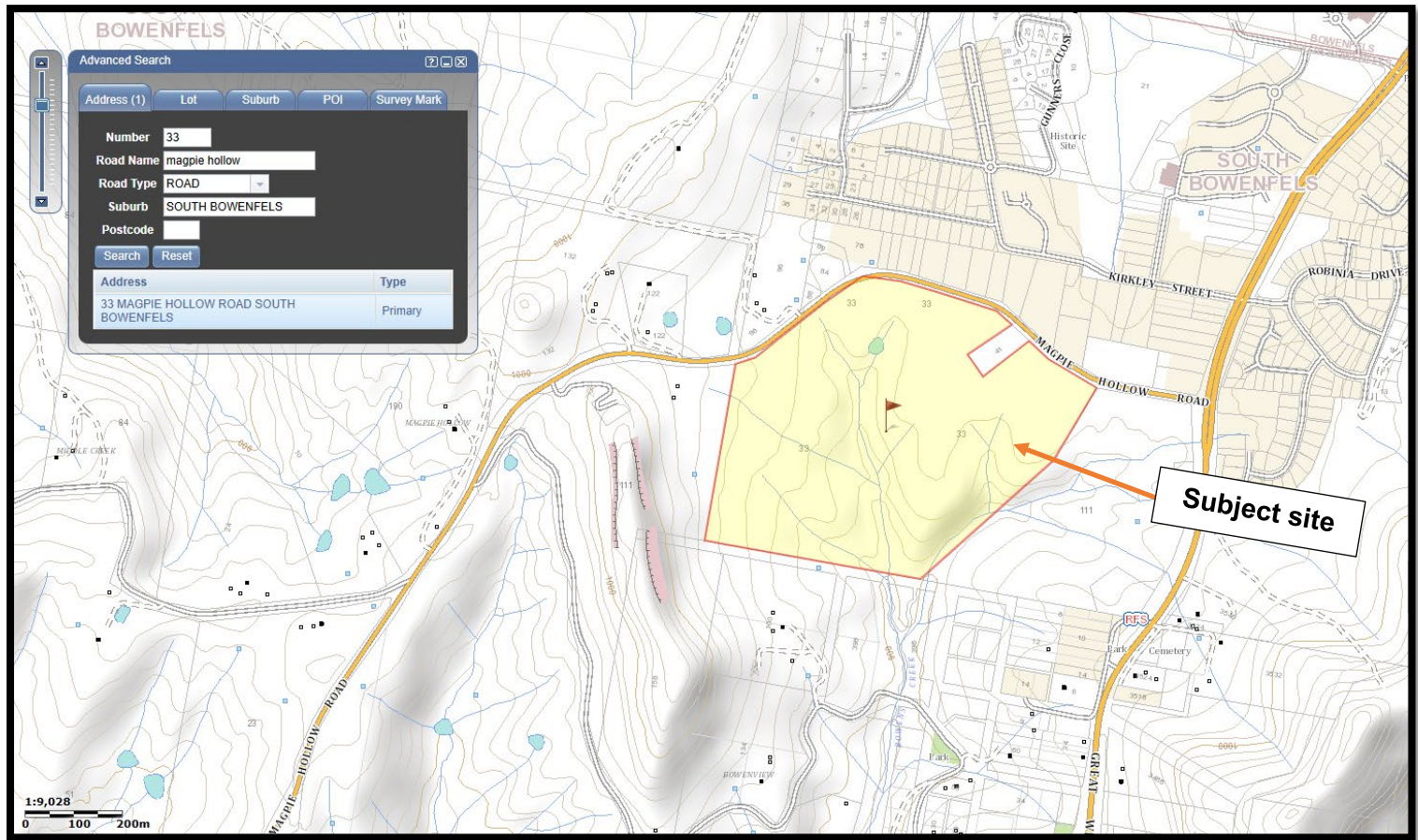
This BTA is suitable for submission with a Development Application (DA) and provides information on measures that will enable the development to comply with ‘Planning for Bushfire Protection’ (NSW RFS, 2019), hereafter referred to as PBP (RFS, 2019).

This assessment aims to consider and assess the bushfire hazard and associated potential threats relevant to such a proposal, and to outline the minimum mitigative measures which would be required in accordance with the provisions of the Environmental Planning and Assessment Amendment (Planning for Bushfire Protection) Regulation 2007 and the Rural Fires Amendment Regulation 2007 (RF Amendment Regulation 2007).

2.1 Site Particulars

Locality:	33-41 Magpie Hollow Road, South Bowenfels NSW 2790
Lot & DP:	Lot 1 & Lot 2 in DP 1229039
LGA:	City of Lithgow Council
Current Land Use:	Vacant land on Lot 2; Existing dwelling on Lot 1 to be retained.
Forest Danger Index:	100 FFDI

Figure 2-1: Site Location (Six Maps)





2.2 Description of the Proposal

This DA relates to the proposal for multi-dwelling housing (moveable dwellings) & community facilities operated as a Manufactured Housing Estate. Refer to Appendix A for proposed plans.

2.3 Legislative Requirements

The Site has been mapped as Bush Fire Prone Land Map (BFPLM) by LGC.

This report forms part of the supporting documentation for a Development Application (DA) to be submitted to LGC.

This BTA has been prepared using current legislative requirements and associated guidelines for assessment of bushfire protection, these being:

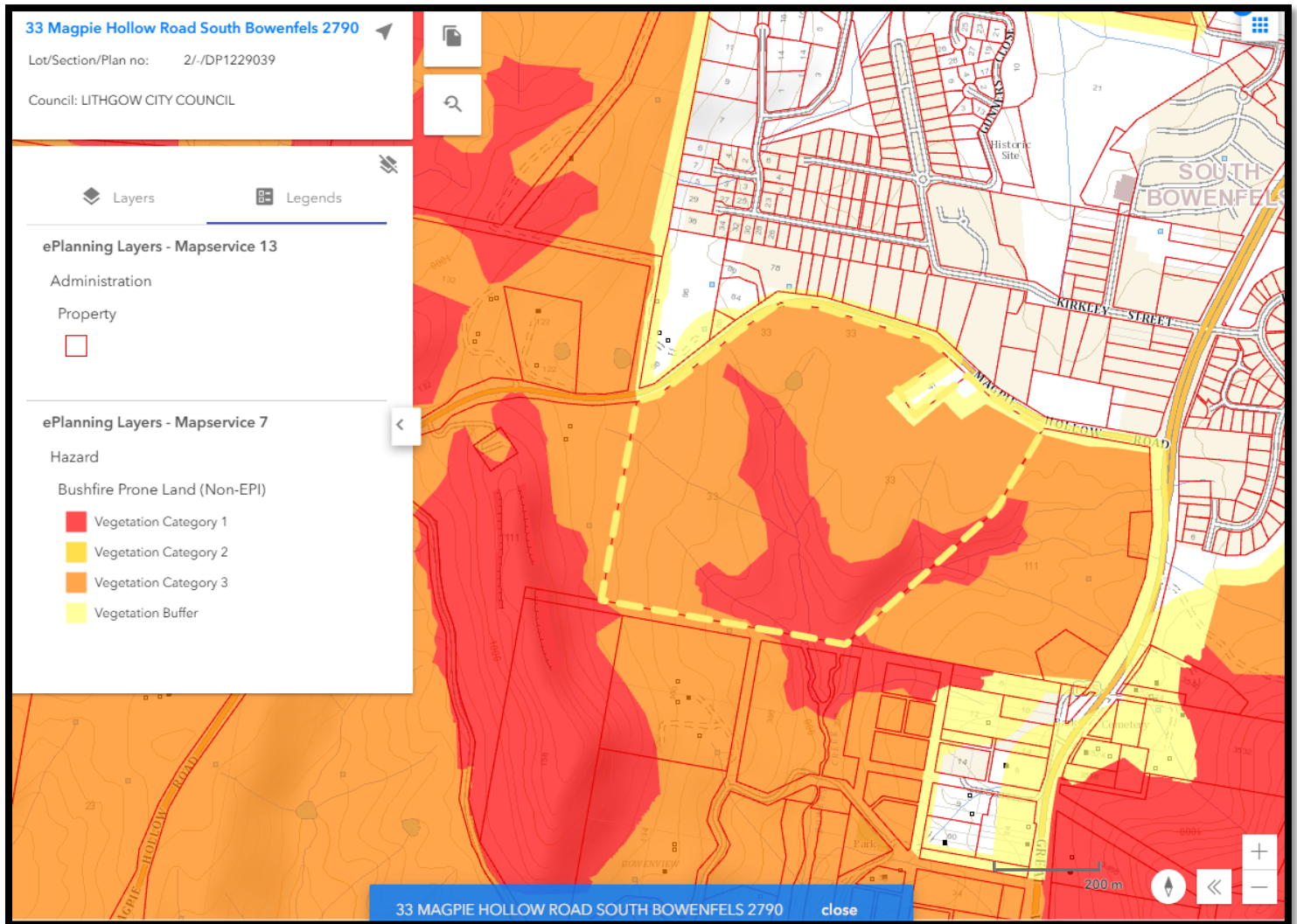
- PBP (RFS, 2019);
- AS3959-2018 Construction of Buildings in Bushfire Prone Area; and

2.4 Objectives of Assessment

This report has been prepared to address the requirements of Clause 44 of the Rural Fires Regulation. This BTA also addresses the six key Bush Fire Protection Measures (BFRMs) in a development assessment context being:

- The provision of clear separation of buildings and bush fire hazards, in the form of fuel-reduced APZ and their components being Inner Protection Areas (IPA's) and Outer Protection Areas (OPA's);
- Sitting and design of the proposal;
- Construction standards;
- Appropriate access standards for residents, fire-fighters, emergency workers and those involved in evacuation;
- Adequate water supply and pressure, and utility services; and
- Suitable landscaping, to limit fire spreading to a building.

Figure 2-2: Bushfire Prone Land Map (NSW Planning Portal)





3 METHODOLOGY

3.1 Vegetation Assessment

Vegetation surveys and vegetation mapping carried out on the site has been undertaken as follows:

- Aerial Photograph Interpretation to map vegetation cover and extent
- Confirmation of the vegetation assemblage typology present.

3.2 Slope Assessment

Slope assessment has been undertaken as follows:

- Aerial Photograph Interpretation in conjunction with analysis of electronic contour maps with a contour interval of 10m.



4 SITE ASSESSMENT

The following assessment has been undertaken in accordance with the requirements of PBP (RFS, 2019).

4.1 Vegetation & Slope Assessment

In accordance with PBP (RFS 2019), an assessment of the vegetation over a distance of 140m in all directions from the site was undertaken. Vegetation that may be considered a bushfire hazard was identified in all directions from the site. This assessment is depicted in Table 3-1 and Figure 3-1 that shows the vegetation post development.

In accordance with PBP (RFS 2019), an assessment of the slope that the vegetation considered a bushfire hazard was undertaken and the results are presented in Table 3-1 below.

Table 4-1: Vegetation Classification

Direction	Vegetation Type	Slope
North	Managed Land – Existing residential development	N/A
Southeast	Grassy woodland vegetation	Varying slopes between downslope 10-20°
East	Grassland	Downslope (0-5°)
South	Grassy woodland vegetation	Varying slopes between downslope 10-20°
West	Grassy woodland vegetation	Varying slopes between downslope 10-20°

NOTE: original Bushfire Report prepared by Envirowest Consulting Pty Ltd (Ref: R8532bf) and subsequent DA approval (refer to Appendix C) refers to intention to manage the woodland in the gully within the site as a publicly accessible parkland maintained by Lithgow City Council. Maintenance activities are expected to include removal of woody weed understorey species and slashing of grasses.

For the purposes of this report and supporting the DA, the vegetation within the gully in the site will be classified as Woodland vegetation where relevant.



5 BUSHFIRE PROTECTION ASSESSMENT

5.1 Asset Protection Zones (APZ)

The PBP (RFS, 2019) guidelines has been used to determine the widths of the APZs required for habitable buildings within the site using the vegetation and slope data identified in Section 3-1 of this report.

The site lies within Lithgow Local Government Area and therefore is assessed under a FDI rating of 100. Using the results from the Site Assessment (section 3-1 of this report) the deemed to satisfy APZ requirements for the proposed buildings within the site was determined using Table A1.12.2 in PBP (RFS, 2019) and AS3959-2018 Appendix B-Detailed Method 2 for residential development and Table A1.12.1 in PBP for SFPP development. Refer to Table 4-1 for required APZs for the proposed multi-dwellings and Table 4-2 for required APZs for community facilities.

The APZs provided via the performance-based assessment establish the required separation distances and a better outcome than the previously approved layout to the East of the gully only. Refer to Appendix E for previous subdivision plan for East of gully.

Table 5-1: Recommended APZs for Future dwellings (residential)

Proposed Lot No.	Direction from Indicative Building Envelope	Vegetation Classification within 140m	Effective Slope (within 100m)	APZ to be Provided ¹	Comment
Lots 1-17 inclusive	West / Southwest	Woodland	Downslope 10°	17m	Using AS3959-2018 Appendix B-Detailed Method 2. Refer to Appendix C.
Lots 18-36 inclusive	West / Southwest	Woodland	Downslope 11.3°	18.2m	Using AS3959-2018 Appendix B-Detailed Method 2. Refer to Appendix C.
Lots 37-47 inclusive	West / Southwest	Woodland	Downslope 11.3°	18.2m	Using AS3959-2018 Appendix B-Detailed Method 2. Refer to Appendix C.
Lots 48-68 inclusive	West / Southwest	Woodland	Downslope 18.7°	27.5m	Using AS3959-2018 Appendix B-Detailed Method 2. Refer to Appendix C.
Lots 69-88 inclusive	West / Southwest	Woodland	Downslope 18.7°	27.5m	Using AS3959-2018 Appendix B-Detailed

Proposed Lot No.	Direction from Indicative Building Envelope	Vegetation Classification within 140m	Effective Slope (within 100m)	APZ to be Provided ¹	Comment
					Method 2. Refer to Appendix C.
Lots 90-97 inclusive	All elevations	No vegetation within 140m	N/A	N/A	Acceptable Solution PBP 2019
Lots 98-121 inclusive	West / Southwest	Woodland	Downslope 15.9°	23.5m	Using AS3959-2018 Appendix B-Detailed Method 2. Refer to Appendix C.
Lots 122-147 inclusive	West / Southwest	Woodland	Downslope 15.9°	23.5m	Using AS3959-2018 Appendix B-Detailed Method 2. Refer to Appendix C.
	South and East	Woodland	Downslope 13.8°	21m	Using AS3959-2018 Appendix B-Detailed Method 2. Refer to Appendix C.
	Southeast	Woodland	Downslope 18.7°	27.5m	Using AS3959-2018 Appendix B-Detailed Method 2. Refer to Appendix C.
Lots 148-152 inclusive	South	Woodland	Downslope 10.2°	17.2m	Using AS3959-2018 Appendix B-Detailed Method 2. Refer to Appendix C.
Lots 153-162 inclusive	Southeast	Woodland	Downslope 15-20°	32m	Acceptable Solution PBP 2019
Lots 163-175 inclusive	Southeast	Woodland	Downslope 15-20°	32m	Acceptable Solution PBP 2019
	South	Woodland	Downslope 15.3°	22.8m	Using AS3959-2018 Appendix B-Detailed Method 2. Refer to Appendix C.
Lots 176-182 inclusive	South	Woodland	Downslope 10.2°	17.2m	Using AS3959-2018 Appendix B-Detailed Method 2. Refer to Appendix C.
	South and Southeast	Woodland	Downslope 13.8°	21m	Using AS3959-2018 Appendix B-Detailed

Proposed Lot No.	Direction from Indicative Building Envelope	Vegetation Classification within 140m	Effective Slope (within 100m)	APZ to be Provided ¹	Comment
Lots 183-203 inclusive					Method 2. Refer to Appendix C.
	West	Woodland	Downslope 15.9°	23.5m	Using AS3959-2018 Appendix B-Detailed Method 2. Refer to Appendix C.

¹ Minimum required APZs to be established in order to achieve <29kW/m² in accordance with AS3959-2018 Appendix B-Detailed Method 2 where relevant. Refer to Appendix D for Radiant Heat Calculations.

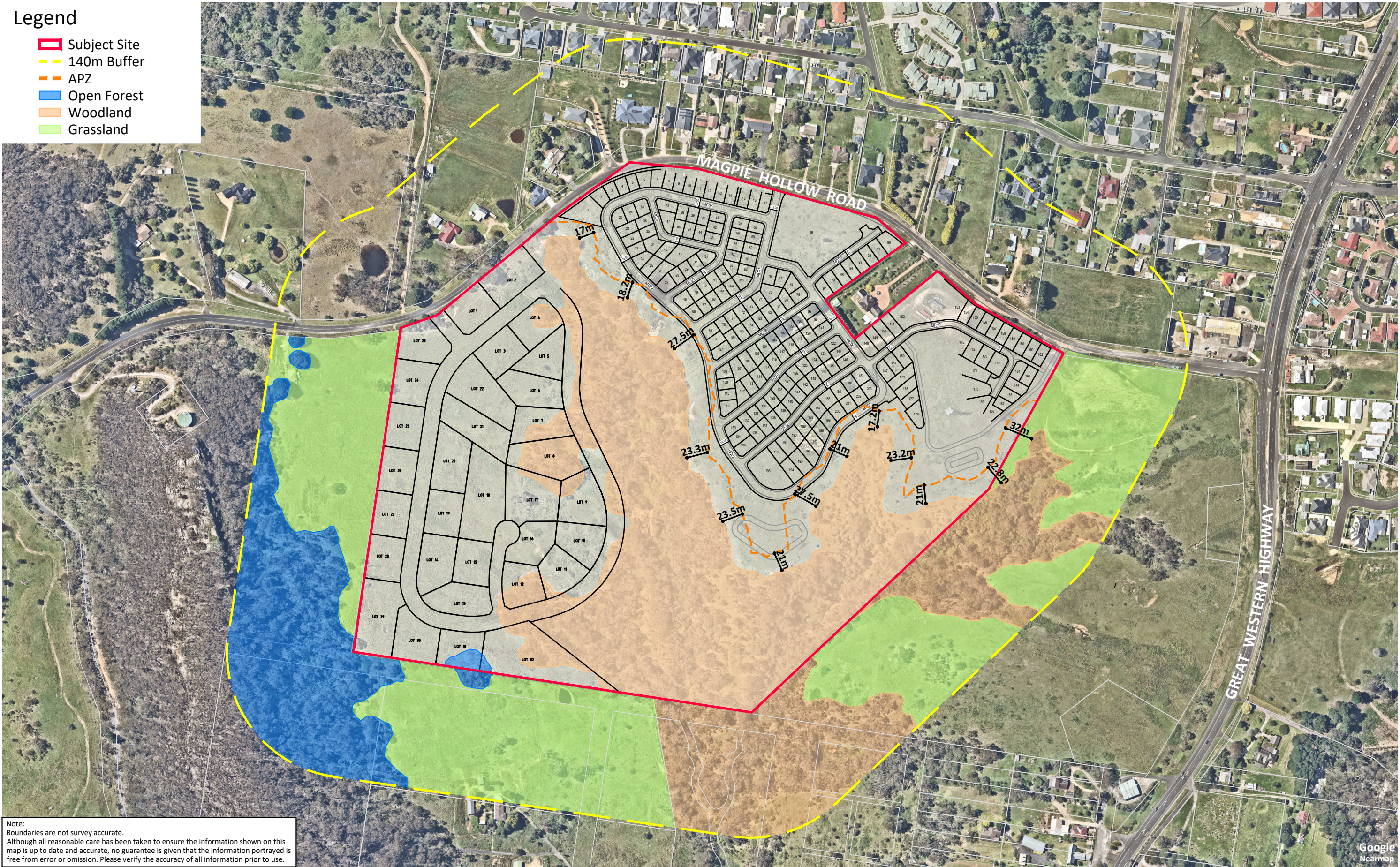
Table 5-2: Recommended APZs for Future Community Facilities (>500sqm)

Proposed Lot No.	Direction from Indicative Building Envelope	Vegetation Classification within 140m	Effective Slope (within 100m)	APZ to be Provided ¹	Comment
Lot 89	All elevations	No vegetation within 140m	N/A	N/A – APZ not required as future development will void any existing vegetation within 140m of the lot and will be considered managed land.	Acceptable solution in accordance with PBP (RFS, 2019)

¹ APZ as per Table A1.12.1 in PBP 2019

Legend

- Subject Site
- 140m Buffer
- APZ
- Open Forest
- Woodland
- Grassland



Note:
Boundaries are not survey accurate.
Although all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

FIGURE 5-1:ASSET PROTECTION ZONES

CLIENT

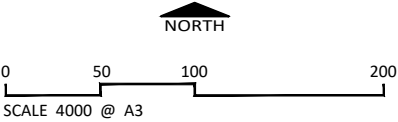
SITE DETAILS

DATE

Client

No.33-41 Magpie Hollow Road South Bowenfels

8 July 2025



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6 DWELLING DESIGN & CONSTRUCTION

Building design and the materials used for construction of future dwellings should be chosen based on the information contained within AS3959-2018, and accordingly the designer / architect should be made aware of this recommendation. It may be necessary to have dwelling plans checked by the architect involved to ensure that the proposed dwellings meet the relevant Bushfire Attack Level (BAL) as detailed in AS3959-2018.

The determinations of the appropriate BAL are based upon parameters such as weather modelling, fire-line intensity, flame length calculations, as well as vegetation and fuel load analysis. The determination of the construction level is derived by assessing the:

- Relevant FFDI = e.g. 100
- Flame temperature
- Slope
- Vegetation classification; and
- Building location.

The following BAL, based on heat flux exposure thresholds, are used in the standard:

(a) **BAL – LOW** The risk is considered to be **VERY LOW**

There is insufficient risk to warrant any specific construction requirements but there are still some risks.

(b) **BAL – 12.5** The risk is considered to be **LOW**

There is a risk of ember attack.

The construction elements are expected to be exposed to a heat flux not greater than 12.5 k/m².

(c) **BAL – 19** The risk is considered to be **MODERATE**

There is a risk of ember attack and burning debris ignited by wind borne embers and a likelihood of exposure to radiant heat.

The construction elements are expected to be exposed to a heat flux not greater than 19 kW/m².

(d) **BAL-29** The risk is considered to be **HIGH**

There is an increased risk of ember attack and burning debris ignited by windborne embers and a likelihood of exposure to an increased level of radiant heat.



The construction elements are expected to be exposed to a heat flux no greater than 29 kW/m².

(e) **BAL-40** The risk is considered to be **VERY HIGH**

There is much increased risk of ember attack and burning debris ignited by windborne embers, a likelihood of exposure to a high level of radiant heat and some likelihood of direct exposure to flames from the fire front.

The construction elements are expected to be exposed to a heat flux no greater than 40 kW/m².

(f) **BAL-FZ** The risk is considered to be **EXTREME**

There is an extremely high risk of ember attack and burning debris ignited by windborne embers, a likelihood of exposure to an extreme level of radiant heat and direct exposure to flames from the fire front.

The construction elements are expected to be exposed to a heat flux greater than 40 kW/m².

6.1 Determination of Bushfire Attack Levels

Using a FFDI of 100, the information relating to vegetation, slope and according to Table A1.12.5 of PBP 2019 and AS3959-2018 Appendix B-Detailed Method 2 that determined the appropriate BAL. The results from this bush fire risk assessment are detailed below in Table 6-1–Bush Fire Attack Assessment.

Table 6-1: Determination of BALs for Dwellings within site

Vegetation Type (shaded = Method 2)	Separation Distance from vegetation	Bushfire Attack Level (BAL)	Construction Section
Woodland (downslope 10°)	17-<25m	BAL-29	Sect 3 & 7 of AS3959
	25-<35m	BAL-19	Sect 3 & 6 of AS3959
	35-<100m	BAL-12.5	Sect 3 & 5 of AS3959
	>100m	BAL-LOW	No construction requirements
Woodland (downslope 10.2°)	17.2-<25m	BAL-29	Sect 3 & 7 of AS3959
	25-<35m	BAL-19	Sect 3 & 6 of AS3959
	35-<100m	BAL-12.5	Sect 3 & 5 of AS3959



Vegetation Type (shaded = Method 2)	Separation Distance from vegetation	Bushfire Attack Level (BAL)	Construction Section
	>100m	BAL-LOW	No construction requirements
Woodland (downslope 11.3°)	18.2-<27m	BAL-29	Sect 3 & 7 of AS3959
	27-<37m	BAL-19	Sect 3 & 6 of AS3959
	37-<100m	BAL-12.5	Sect 3 & 5 of AS3959
	>100m	BAL-LOW	No construction requirements
Woodland (downslope 13.8°)	21-<30m	BAL-29	Sect 3 & 7 of AS3959
	30-<41m	BAL-19	Sect 3 & 6 of AS3959
	41-<100m	BAL-12.5	Sect 3 & 5 of AS3959
	>100m	BAL-LOW	No construction requirements
Woodland (downslope 15.3°)	22.8-<32m	BAL-29	Sect 3 & 7 of AS3959
	32-<44m	BAL-19	Sect 3 & 6 of AS3959
	44-<100m	BAL-12.5	Sect 3 & 5 of AS3959
	>100m	BAL-LOW	No construction requirements
Woodland (downslope 15.6°)	23.2-<33m	BAL-29	Sect 3 & 7 of AS3959
	33-<44m	BAL-19	Sect 3 & 6 of AS3959
	44-<100m	BAL-12.5	Sect 3 & 5 of AS3959
	>100m	BAL-LOW	No construction requirements
Woodland (downslope 15.7-15.9°)	23.3/23.5-<33m	BAL-29	Sect 3 & 7 of AS3959
	33-<45m	BAL-19	Sect 3 & 6 of AS3959
	45-<100m	BAL-12.5	Sect 3 & 5 of AS3959
	>100m	BAL-LOW	No construction requirements
Woodland (downslope 18.7°)	27.5-<38m	BAL-29	Sect 3 & 7 of AS3959
	38-<51m	BAL-19	Sect 3 & 6 of AS3959

Vegetation Type (shaded = Method 2)	Separation Distance from vegetation	Bushfire Attack Level (BAL)	Construction Section
	51-<100m	BAL-12.5	Sect 3 & 5 of AS3959
	>100m	BAL-LOW	No construction requirements
Woodland downslope (15-20°)	32-<44m	BAL-29	Sect 3 & 7 of AS3959
	44-<59m	BAL-19	Sect 3 & 6 of AS3959
	59-<100m	BAL-12.5	Sect 3 & 5 of AS3959
	>100m	BAL-LOW	No construction requirements
Grassland downslope (0-5°)	12-<17m	BAL-29	Sect 3 & 7 of AS3959
	17-<25m	BAL-19	Sect 3 & 6 of AS3959
	25-<50m	BAL-12.5	Sect 3 & 5 of AS3959
	>50m	BAL-LOW	No construction requirements

Given the information in Table 6-1 above and APZs are installed accordingly within the lots, moveable dwellings will be able to comply with AS3959-2018 and can achieve BAL-29 or less.

Table 6-2: Determination of BALs for Proposed Community Facility >500sqm

Vegetation Type	Separation Distance from vegetation	Bushfire Attack Level (BAL)	Construction Section
No vegetation within 140m of the subject site	>140m	BAL-12.5	Sect 3 & 5 of AS3959

Given the information in Table 6-2 above and APZs are installed accordingly within the lot, future community facility will be able to comply with AS3959-2018. This may be subject to further assessment under Section 4.14 of the EP&A Act depending on location and retained vegetation within the site.

Legend

- Subject Site
- 140m Buffer
- APZ
- Woodland
- Grassland
- BAL FZ
- BAL 40
- BAL 29
- BAL 19
- BAL 12.5

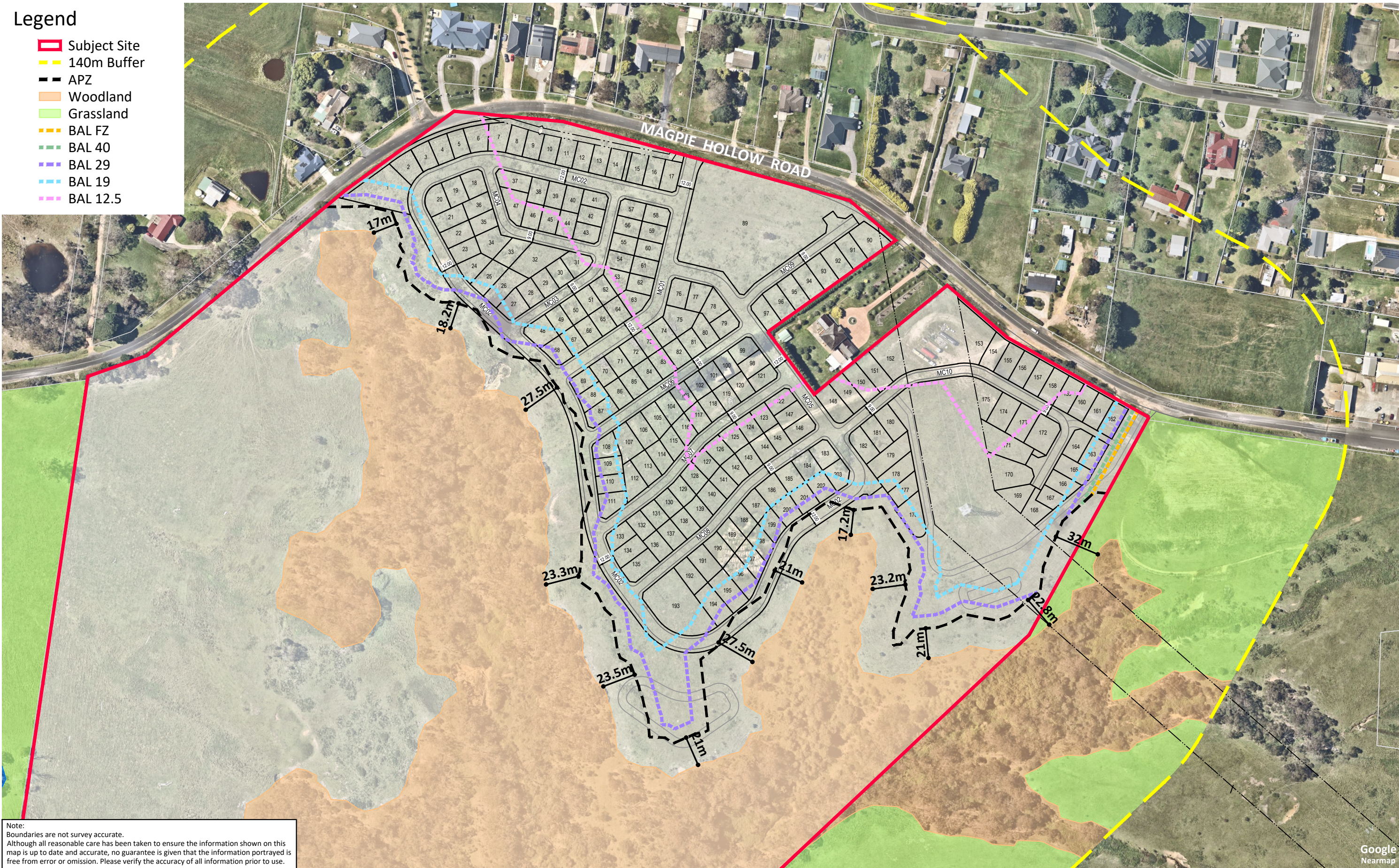
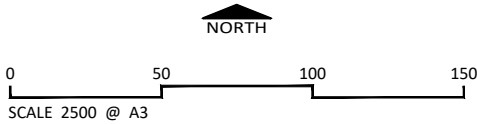


FIGURE 6-1: BUSHFIRE ATTACK LEVELS

CLIENT Client
SITE DETAILS No.33-41 Magpie Hollow Road South Bowenfels
DATE 12 August 2025



Firebird ecoSultants Pty Ltd
ABN - 16 105 985 993
Level 1, 146 Hunter Street, Newcastle NSW 2300
P O Box 354 Newcastle NSW 2300



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7 COMPLIANCE

The proposal is for a residential subdivision, multi-dwelling development & community facilities as part of a Manufactured Housing Estate therefore development standards apply. Table 7-1 details the proposed compliance with Development Standards for Residential and Rural Residential Subdivisions and SFPP Development.

Table 7-1: Proposed Subdivision and SFPP Compliance with Development Standard

Acceptable Solutions	Performance Criteria	Compliance
Asset Protection Zones Subdivision		
› APZs are provided in accordance with Tables A1.12.2 and A1.12.3 based on the FFDI.	potential building footprints must not be exposed to radiant heat levels exceeding 29 kW/m ² on each proposed lot.	Complies with Performance Criteria – APZs for the site have been provided in accordance with AS3959-2018 Appendix B-Detailed Method 2 for relevant areas. Refer to Appendix C for Radiant Heat Calculations. APZs can be applied using Table A1.12.2 of PBP 2019.
› APZs are managed in accordance with the requirements of Appendix 4.	APZs are managed and maintained to prevent the spread of a fire towards the building.	Complies with Acceptable Solution – APZs on site are to be managed in accordance with Appendix 4 of the PBP 2019.
› APZs are wholly within the boundaries of the development site	the APZs is provided in perpetuity	Complies with Acceptable Solution – APZs on site occur entirely within the boundary of the site.
› APZs are located on lands with a slope less than 18 degrees.	APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is minimised.	Complies with Acceptable Solution – APZs on site occur over slopes <18°.



Asset Protection Zones SFPP

› The building is provided with an APZ in accordance with Table A1.12.1 in Appendix 1.	› Radiant heat levels of greater than 10kW/m² (calculated at 1200K) will not be experienced on any part of the building.	Complies with Acceptable Solution – Any future community facility exceeding 500sqm complies with the APZs provided in Table A1.12.1 of PBP 2019 and it expected to have a separation of 140m.
› APZs are located on lands with a slope less than 10 degrees.	› APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is minimised.	Complies with Acceptable Solution – APZs are located on lands with a slope less than 10 degrees
› The APZ is managed in accordance with the requirements of Appendix 4 of PBP 2019, and is wholly within the boundaries of the development site; › APZ are wholly within the boundaries of the development site; › Other structures located within the APZ need to be located further than 6m from the refuge building.	› APZs are managed and maintained to prevent the spread of fire to the building; › The APZ is provided in perpetuity.	Complies with Acceptable Solution – APZs are to be managed in accordance with Appendix 4 of PBP 2019.
› An APZ in accordance with Table A1.12.1 in Appendix 1 of PBP 2019 is provided to all new dwellings; or › An APZ in accordance with Table A1.12.2 or A1.12.3 in Appendix 1 of PBP 2019 is provided where it is demonstrated that all new dwellings will be constructed in accordance with BAL-29.	Manufactured home estates: APZs can achieve radiant heat levels that are commensurate with the construction standard for the proposed dwellings.	Complies with Performance Criteria – APZs have been provided based on AS3959-2018 Appendix B-Detailed Method 2 where relevant for the proposed dwellings and will not be exposed to a radiant heat level greater than 29kW/m². Refer to Appendix D for Bushfire Attack Assessment Report.



Landscaping Subdivision and SFPP

› landscaping is in accordance with Appendix 4; and fencing is constructed in accordance with section 7.6.	landscaping is designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven embers to cause ignitions.	Complies with Acceptable Solution – All landscaping within the site will meet the requirements of the acceptable solution.
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Access (General Requirements) Subdivision

› 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	firefighting vehicles are provided with safe, all-weather access to structures.	Complies with Performance Criteria – It is noted that the proposed road network allows for one primary access / egress point however a secondary emergency access point is provided to the existing public road. The proposed perimeter road is able to separate future development from potential bushfire threat and complies with all other criteria for perimeter roads in accordance with Planning for Bushfire Protection 2019. This proposed road layout is a better outcome for the retention of existing vegetation within the site (gully), though to be maintained for the most part, for its ecological significance. This is further supported by the Biodiversity Constraints report prepared by AREA Environmental and Heritage Consultants Pty Ltd detailing the importance of existing vegetation at the site. All proposed lots will have direct unobstructed access to a private road system that will be managed by the operator of the estate.
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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 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.	the capacity of access roads is adequate for firefighting vehicles.	Complies with Acceptable Solution – All roads within the site are designed to meet the requirements of the acceptable solution.
› 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 appropriate access to water supply.	Complies with Acceptable Solution – Hydrants will be provided that are compliant with the estate regulations.



› 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 (General Requirements) SFPP		
› SFPP access roads are two-wheel drive, all weather roads; › Access is provided to all structures; › Traffic management devices are constructed to not prohibit access by emergency services vehicles; › Access roads must provide suitable turning areas in accordance with Appendix 3; 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.	› Firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation.	Complies with Acceptable Solution – The proposed road layout complies with the requirements of the acceptable solution.
› The capacity of road surfaces and any bridges/causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes); bridges and causeways are to clearly indicate load rating.	› The capacity of access roads is adequate for firefighting vehicles.	Complies with Acceptable Solution – The proposed road layout can comply with the requirements of the acceptable solution.
› Hydrants are located outside of parking reserves and road carriageways to ensure accessibility to reticulated water for fire suppression;	› There is appropriate access to water supply.	Complies with Acceptable Solution – Hydrants can be suitably located or suitable access can be provided to static water supply.



› Hydrants are provided in accordance with the relevant clauses of AS2419.1:2005; and › There is suitable access for a Category 1 fire appliance to within 4m of the static water supply where no reticulated water supply is available.		
Perimeter Roads Subdivision and SFPP		
› 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 as well as providing a safe operational environment for emergency service personnel during firefighting and emergency management on the interface.	Complies with Performance Criteria – Perimeter roads are compliant with all the requirements of the acceptable solution. It is noted that there is only one way in / out of the development site however an emergency secondary access point has been provided in the event of a bushfire / emergency evacuation situation.



Non-Perimeter Roads Subdivision and SFPP

› 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.	access roads are designed to allow safe access and egress for firefighting vehicles while residents are evacuating.	Complies with Acceptable Solution – Non-perimeter roads comply with the requirements of the acceptable solution.
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Property Access Subdivision

› 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.	firefighting vehicles can access the dwelling and exit the property safely.	Complies with Acceptable Solution – All future lots are to be connected to a privately managed road by a driveway <70m. The future operator of the estate will maintain the road reserve.
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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		
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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.		
Water Supplies Subdivision and SFPP		
› 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.	adequate water supplies are provided for firefighting purposes.	Complies with Acceptable Solution – Reticulated water supply and hydrants are to be provided to the estate.
› fire hydrant, spacing, design and sizing complies with the relevant clauses of Australian Standard AS 2419.1:2005; › 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.	Water supplies are located at regular intervals; and the water supply is accessible and reliable for firefighting operations.	Complies with Acceptable Solution – Reticulated water supply and hydrants are to be provided to the estate.
› fire hydrant flows and pressures comply with	flows and pressure are appropriate.	Complies with Acceptable Solution –



the relevant clauses of AS 2419.1:2005.		Reticulated water supply and hydrants are to be provided to the estate.
› 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.	the integrity of the water supply is maintained.	Complies with Acceptable Solution – All above ground water service pipes will meet the requirements.
Electricity Services Subdivision and SFPP		
› 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.	location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of buildings.	Can Comply with Acceptable Solution – Installation of future electricity transmission can comply with the acceptable solution.
Gas Services Subdivision and SFPP		
› 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;	location and design of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.	Can Comply with Acceptable Solution – All future dwellings are able to meet the requirements for gas services.



› 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.		
EMERGENCY MANAGEMENT SFPP		
› Bush Fire Emergency Management and Evacuation Plan is prepared consistent with the: ➤ The NSW RFS document: A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan; ➤ NSW RFS Schools Program Guide; ➤ Australian Standard AS3745:2010 Planning for emergencies in facilities; and ➤ Australian Standard AS4083:2010 Planning for emergencies – Health care facilities (where applicable). › The Bush Fire Emergency Management and Evacuation Plan should include planning for early relocation of occupants.	› A Bush Fire Emergency Management and Evacuation plan is prepared.	Complies with Acceptable Solution – A Bushfire Emergency Management and Evacuation Plan is to be prepared for the manufactured housing estate and community facilities.



Note: A copy of the Bush Fire Emergency Management and Evacuation Plan should be provided to the Local Emergency Management Committee for its information prior to occupation of the development.		
› An Emergency Planning Committee is established to consult with residents (and their families in the case of aged care accommodation and schools) and staff in developing and implementing an Emergency Procedures Manual; and › Detailed plans of all emergency assembly areas including on site and off site arrangements as stated in AS3745:2010 and are clearly displayed, and an annually emergency evacuation is conducted.	› Appropriate and adequate management arrangements are established for consultation and implementation of the Bush Fire Emergency Management and Evacuation Plan.	N/A – the proposal is not for an aged care or school.

8 CONCLUSION & RECOMMENDATIONS

In summary, a Bushfire Risk Assessment has been undertaken for multi-dwelling housing (moveable dwellings) & community facilities operated as a Manufactured Housing Estate at 33-41 Magpie Hollow Road, South Bowenfels. The report forms part of the supporting documentation for a Development Application (DA) to be submitted to LGC.

If the recommendations contained within this report are duly considered and incorporated, it is considered that the fire hazard present is containable to a level necessary to provide an adequate level of protection to life and property on the subdivision. In summary, the following is recommended to enable the proposal to meet the relevant legislative requirements for the proposal:

1. Asset Protection Zone (APZ) - The APZ provides space and reduced fuel loads to ensure radiant heat levels at the buildings are below critical limits and to prevent direct flame contact.

- APZs have been provided in accordance with Table A1.12.1 in PBP 2019 and AS3959-2018 Appendix B-Detailed Method 2 for the relevant developments and will be established appropriately on the adjoining land as well as inclusive of road reserves provided in perpetuity. See Chapter 4 and Figure 4-1 for APZs within the subject site.
- These distances are to be managed as described under 'Planning for Bushfire Protection (Appendix 4 – Asset Protection Zone Requirements)' and the document titled 'Standards for Asset Protection Zones'.
- Based on the APZs provided in Chapter 4, we understand that future moveable dwellings may be sited to achieve 29kW/m^2 , which would result in BAL-29 or less.
- Based on the APZs provided in Chapter 4, we understand that future community facilities exceeding 500sqm in size may be sited to achieve $<10\text{kW/m}^2$, which would result in BAL-12.5.

2. Roads - Access standards provide for emergency evacuation and firefighting operations

- The perimeter roads identified on the subdivision plan are compliant with the following acceptable solution criteria from Table 5.3b and Table 6.8b in PBP 2019:
 - › 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;
 - › 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.

It is noted that the proposed road network allows for one primary access / egress point however a secondary emergency access point is provided to the existing public road. The proposed perimeter road is able to separate future development from potential bushfire threat and complies with all other criteria for perimeter roads in accordance with Planning for Bushfire Protection 2019.

This proposed road layout is a better outcome for the retention of existing vegetation within the site (gully), though to be maintained for the most part, for its ecological significance. This is further supported by the Biodiversity Constraints report prepared by AREA Environmental and Heritage Consultants Pty Ltd detailing the importance of existing vegetation at the site.

- The non-perimeter roads identified on the subdivision plan are compliant with the following acceptable solution criteria from Table 5.3b and Table 6.8b in PBP 2019:
 - › Minimum 5.5m carriageway width kerb to kerb;
 - › Parking is provided outside 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 overhanging clearance of 4m to any overhanging obstructions, including tree branches, is provided.

3. Construction Standards – Construction standards seek to increase the protection of the habitable buildings from bushfire. The shorter the APZ (distance between the external wall of the habitable building and the unmanaged vegetation), then the higher the construction standard, which is referred to as the BAL

- Based on the APZs provided above, the proposed moveable dwellings may be sited to achieve 29kW/m², which would result in BAL-29 or less and any future proposed community facilities exceeding 500sqm in size may be sited to achieve <10kW/m², which would result in BAL-12.5.

4. Water Supplies – A water supply is required for firefighting operations

- It is expected that reticulated water and associated fire hydrants are to be provided for the Manufactured Housing Estate and comply with the relevant criteria in Table 6.8c in PBP 2019.



5. Emergency Management

- A Bush Fire Emergency Management and Evacuation Plan is prepared consistent with the NSW RFS document: A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan, and AS3745:2010

Provided the recommendations stated above are implemented in full Firebird ecoSultants Pty Ltd is of the opinion that the proposed development is able to meet the aims and objectives of PBP (RFS, 2019).



9 BIBLIOGRAPHY

Department of Bush Fire Services (undated). *Bush Fire Readiness Checklist*.

NSWFB (1988). *Hazard Reduction for the Protection of Buildings in Bushland Areas*. New South Wales Fire Brigades.

NSW Rural Fire Service (1997). *Bush Fire Protection for New and Existing Rural Properties*. September 1997, NSW Government.

NSW Rural Fire Service (2006). *Planning for Bushfire Protection – A Guide for Councils, Planners, Fire Authorities, Developers and Home Owners*.

NSW Rural Fire Service (2019). *Planning for Bushfire Protection – A Guide for Councils, Planners, Fire Authorities, Developers and Home Owners*.

NSW Rural Fire Service (2005). Standards for Asset Protection Zones. NSW Rural Fire Service.

NSW Rural Fire Service (2002). *Circular 16/2002: Amendments to the Rural Fires Act 1997 – hazard reduction and planning requirements*.

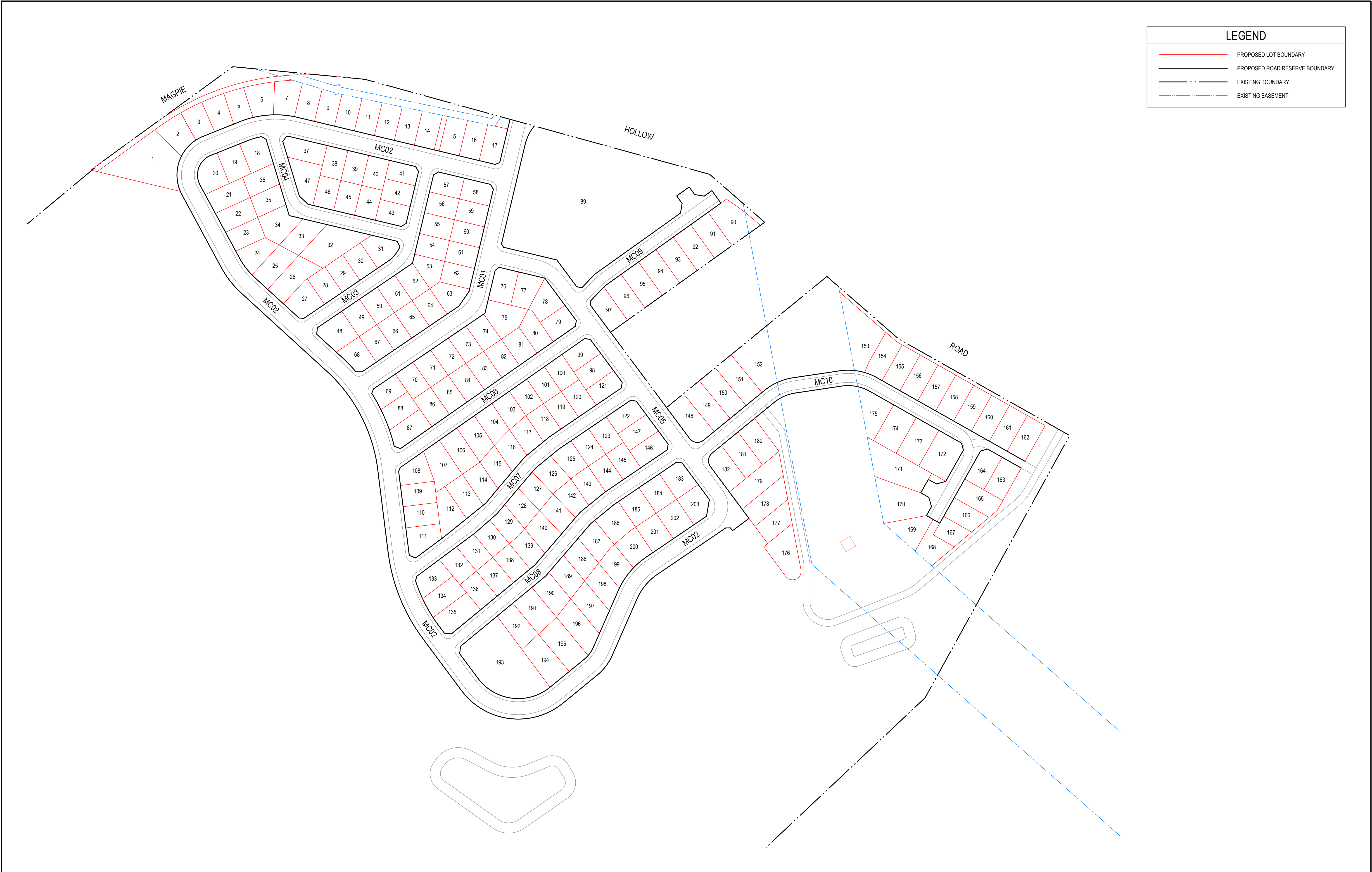
Planning NSW & NSW Rural Fire Service (2001). *Planning for Bushfire Protection – A Guide for Councils, Planners, Fire Authorities, Developers and Home Owners*.

Ramsay, GC and Dawkins, D (1993). *Building in Bushfire-prone Areas – Information and Advice*. CSIRO and Standards Australia.

Rural Fires and Environmental Assessment Legislation Amendment Act 2002.

Standards Australia (2018). *AS 3959 – 2018: Construction of Buildings in Bushfire-prone Areas*.

APPENDIX A PROPOSED SITE PLANS



REV	DESCRIPTION	ISSD	APP	DATE	PROJECT MANAGER	CLIENT	ARCHITECT	SCALE	NORTH	PROJECT TITLE	STATUS		
A	ISSUED FOR INFORMATION	ED	BC	206.25	B. CLARK		- THIS DRAWING HAS BEEN PREPARED USING COLOUR, AND WILL BE INCOMPLETE IF COPIED TO BLACK AND WHITE. - DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL CONTRACT DOCUMENTS. - THE COPYRIGHT OF THIS DRAWING REMAINS WITH GROUNDSWELL ENGINEERS PTY LTD - GROUNDSWELL ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY. - ALL UTILITY SERVICES INDICATED ON THE DRAWINGS ORIGINATE FROM SUPPLIED DATA OR DIA. BEFORE YOU DIG SEARCHES, AND THEREFORE THEIR ACCURACY AND COMPLETENESS IS NOT GUARANTEED	 SCALE 1:1000	  54 HUDSON STREET, HAMILTON NSW 2303	14 MAGPIE HOLLOW ROAD, SOUTH BOWENFELS, NSW 2790	FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION		
					T. SQUIRES								
					C. WALKER-HEALON								
					TBD								

APPENDIX B ASSET PROTECTION ZONES

APPENDIX 4

ASSET PROTECTION ZONE REQUIREMENTS

In combination with other BPMS, a bush fire hazard can be reduced by implementing simple steps to reduce vegetation levels. This can be done by designing and managing landscaping to implement an APZ around the property.

Careful attention should be paid to species selection, their location relative to their flammability, minimising continuity of vegetation (horizontally and vertically), and ongoing maintenance to remove flammable fuels (leaf litter, twigs and debris).

This Appendix sets the standards which need to be met within an APZ.

A4.1 Asset Protection Zones

An APZ is a fuel-reduced area surrounding a building or structure. It is located between the building or structure and the bush fire hazard.

For a complete guide to APZs and landscaping, download the NSW RFS document *Standards for Asset Protection Zones* at the NSW RFS Website www.rfs.nsw.gov.au.

An APZ provides:

- a buffer zone between a bush fire hazard and an asset;
- an area of reduced bush fire fuel that allows for suppression of fire;
- an area from which backburning or hazard reduction can be conducted; and
- an area which allows emergency services access and provides a relatively safe area for firefighters and home owners to defend their property.

Bush fire fuels should be minimised within an APZ. This is so that the vegetation within the zone does not provide a path for the spread of fire to the building, either from the ground level or through the tree canopy.

An APZ, if designed correctly and maintained regularly, will reduce the risk of:

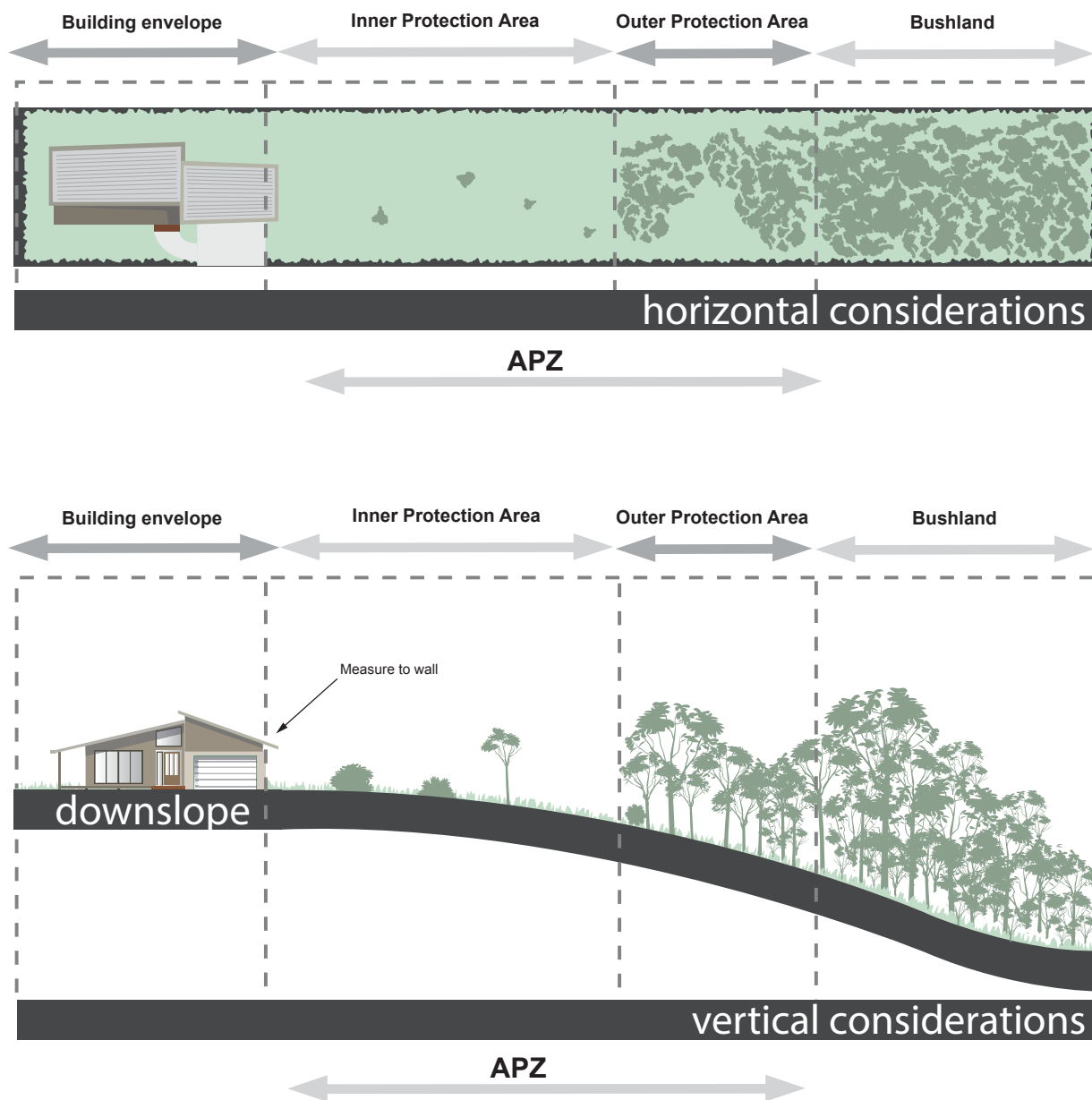
- direct flame contact on the building;
- damage to the building asset from intense radiant heat; and
- ember attack.

The methodology for calculating the required APZ distance is contained within Appendix 1. The width of the APZ required will depend upon the development type and bush fire threat. APZs for new development are set out within Chapters 5, 6 and 7 of this document.

In forest vegetation, the APZ can be made up of an Inner Protection Area (IPA) and an Outer Protection Area (OPA).

Figure A4.1

Typical Inner and Outer Protection Areas.



A4.1.1 Inner Protection Areas (IPAs)

The IPA is the area closest to the building and creates a fuel-managed area which can minimise the impact of direct flame contact and radiant heat on the development and act as a defensible space. Vegetation within the IPA should be kept to a minimum level. Litter fuels within the IPA should be kept below 1cm in height and be discontinuous.

In practical terms the IPA is typically the curtilage around the building, consisting of a mown lawn and well maintained gardens.

When establishing and maintaining an IPA the following requirements apply:

Trees

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

Shrubs

- 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% ground cover; and
- clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation.

Grass

- 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.

A4.1.2 Outer Protection Areas (OPAs)

An OPA is located between the IPA and the unmanaged vegetation. It is an area where there is maintenance of the understorey and some separation in the canopy. The reduction of fuel in this area aims to decrease the intensity of an approaching fire and restricts the potential for fire spread from crowns; 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.

When establishing and maintaining an OPA the following requirements apply:

Trees

- tree canopy cover should be less than 30%; and
- canopies should be separated by 2 to 5m.

Shrubs

- shrubs should not form a continuous canopy; and
- shrubs should form no more than 20% of ground cover.

Grass

- grass should be kept mown to a height of less than 100mm; and
- leaf and other debris should be removed.

An APZ should be maintained in perpetuity to ensure ongoing protection from the impact of bush fires. Maintenance of the IPA and OPA as described above should be undertaken regularly, particularly in advance of the bush fire season.

APPENDIX C APPROVED PREVIOUS BUSHFIRE ASSESSMENT

Bushfire Assessment

Proposed subdivision of Lot 2 DP1229039, 41 Magpie Hollow Road, Bowenfels
NSW

Approved by Lithgow City Council

Development

Application No.: DA022118

Dated: 29/10/2018

Signed

Ref: R8532bf

Date: 5 September 2017

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Services



Client: CEH Survey
1 Rutherford Lane
Lithgow NSW 2790

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Senior Environmental Scientist

Checked by: Greg Madafiglio PhD
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Authorising Officer: Greg Madafiglio PhD
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Interested authorities: Lithgow City Council

Report number: R8532bf

Date: 5 September 2017

Executive summary

Background

An eighty lot subdivision is proposed for Lot 2 DP1229039, 41 Magpie Hollow Road, Bowenfels NSW. The subdivision will create seventy nine rural-residential lots, one parkland area and public roads.

A desktop study, site inspection, and site assessment was undertaken of the subdivision to determine compliance with *Planning for Bushfire Protection* (2006).

Objectives of the investigation

A site assessment was conducted in accordance with the procedures detailed in *Planning for Bushfire Protection* (NSW Rural Fire Service 2006) to determine compliance of the subdivision with acceptable solutions provided in *Planning for Bushfire Protection*.

Summary of the assessment

An inspection of the site was made on 13 July 2017.

The site has a historical land-use of grazing on improved pastures and woodland remnants. Vegetation on the site comprised grasslands and woodlands. Slopes ranged from 0° to 5° within the proposed residential lots to >15° to 18° within the parkland area on proposed Lot 82.

The subdivision includes seventy nine residential lots ranging in size from 2,001m² to 9,757m². The subdivision has been designed to include a perimeter road which forms a buffer between the woodland vegetation on proposed Lot 82 and the residential lots.

The subdivision plan complies with the acceptable solutions provided within *Planning for Bushfire Protection*. Suitable asset protection zones are available in the form of road reserves and dwelling setbacks.

Most roads will be two lane, bitumen sealed through roads with one road being a dead end of less than 200m in length. The engineering design of the roads has not been finalised but is recommended to be in accordance with *Planning for Bushfire Protection*. Property access roads will be less than 200m in length and an alternative access will not be required. Management of other requirements for property access roads will be undertaken by future lot owners. No fire trials are proposed.

A reticulated water supply will be available on the site. The engineering design of the water supply has not been finalised but is recommended to be in accordance with *Planning for Bushfire Protection*.

Electricity and gas services will be underground.

No significant environmental features impact on the development.

A bushfire management plan in accordance with *Planning for Bushfire Protection* (2006) should be prepared on a site specific basis prior to dwelling construction. Implementation of bushfire plans will require that future landholders are familiar with *Planning for Bushfire Protection* which is available for viewing on the NSW Rural Fire Service website, www.rfs.nsw.gov.au.

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1. Introduction

A large lot residential subdivision is proposed for Lot 2 DP1229039 Magpie Hollow Road, South Bowenfels NSW. The subdivision will include residential lots, access roads and a publicly accessible parkland. The site is approximately 34 hectares in size and requires assessment for compliance with NSW Rural Fire Service *Planning for Bushfire Protection* (NSW Rural Fire Service 2006).

2. Scope of work

Envirowest Consulting Pty Ltd was commissioned by CEH Survey to undertake an assessment of a proposed residential subdivision at Lot 2 DP1229039 Magpie Hollow Road, South Bowenfels NSW for compliance with *Planning for Bushfire Protection* (NSW Rural Fire Service 2006).

3. Site assessment

3.1 Site identification

The site under assessment is Lot 2 DP1229039 Magpie Hollow Road, South Bowenfels NSW (Figure 1). The total lot size is approximately 34 hectares. The subdivision will create seventy nine large lot residential lots, one parkland area and public roads (Figure 2).

3.2 Site description

A description of the site was made from a desktop study and field inspection. Information for the desktop study was obtained from topographic maps, aerial photographs and soil and geological maps. A site inspection and assessment was undertaken on 13 July 2017. Detailed landscape and vegetation descriptions were made across the site.

The current land-use for the site is grazing of stock on improved pastures. At the time of the investigation neighbouring land-use consisted of grazing on semi-improved pasture, grazed woodland and residential.

3.3 Topography

The site is a mid-slope with a gentle inclination of 0° to 5° across the majority of the area. Two drainage gullies including Bowens Creek traverse the site from the north west to south and from the east to the south. Slopes increase around the drainage gullies to 15° to 18°.

3.4 Soils and geology

The site is within the Lithgow and Marrangaroo Soil Landscape (King 1993). Soil in the Lithgow Soil landscape consists of moderately deep and moderately well drained red podzolic soils, yellow leached earths and yellow earths on upper slopes and well-drained areas. Moderately deep to deep imperfectly drained solods/yellow solodic soils on lower slopes and in areas of poor drainage.

Soil from the Marrangaroo Soil Landscape (King 1993) is located along the drainage gully. Soils consist of moderately deep, imperfectly drained yellow solodic soils and yellow podzolic soils on lower slopes and near drainage lines.

The site is underlain by the Berry Formation and Illawarra Coal Measures. Horizontal bedded shale, sandstone, siltstone, mudstone, claystone, limestone, coal, torbanite and conglomerate are the main rock types (King 1993).

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3.5 Vegetation

Vegetation on the site consisted of improved pasture grasslands including native and introduced pasture species with weeds. The site has been predominately cleared of native tree species with the exception of the drainage gully on proposed Lot 82 which contains a woodland remnant.

Neighbouring vegetation comprised grazed grasslands and woodlands. Ornamental species are planted on the neighbouring lots to the north.

4. Bushfire Assessment

The bushfire assessment is designed to identify provisions to be considered when a development, subdivision or rural dwelling is proposed. The plan is to comply with s.79C of the *Environmental Planning and Assessment Act*, 1979.

The provisions to be applied depending on the vegetation formation are:

- Development and maintenance of Asset Protection Zones on the hazard side of the development;
- Provision and maintenance of adequate access;
- Design, staging and siting of the development;
- Provision of appropriate water supply and availability during times of bushfire emergency.

The following information should be read in conjunction with *Planning for Bushfire Protection* which is produced by the NSW Rural Bushfire Service and Planning NSW (2006). The reference is a guide for homeowners for effective bushfire protection strategies.

4.1 Site description

Lot and DP	Lot 2 DP1229039		
Address	41 Magpie Hollow Road, Bowenfels NSW (Figure 1)		
Location of building envelope (UTM)	Zone 56H	E232355m	N6288771m
Zoning	Present – Rural Proposed – Large lot residential Adjacent land – Large lot residential, rural		
Area (ha)	Approximately 33 hectares		
Aerial photograph	Figure 3		
Ground photographs	Figure 7		
Development	Large lot residential subdivision (Integrated development)		

4.2 Vegetation formation

Vegetation on the site comprises grasslands and woodlands (Figure 4). The grasslands are predominantly located within areas to be developed for residential land-use. The grasslands are expected to be reclassified as managed land in the future following construction of dwellings and habitation of the lots.

Woodlands are predominantly located within proposed Lot 82. The woodland area has had minimal maintenance and contains mature eucalypts as well as woody weed understorey species. Lot 82 is proposed to be a publicly accessible parkland maintained by Lithgow City Council. Maintenance activities are expected to include removal of woody weed understorey species and slashing of grasses. Steeper areas of Lot 82 will be maintained as treed riparian zones. The woodlands on Lot 82 may be reclassified as managed land following development of the parkland area.

Grasslands occur to the east of the site and are used for grazing. Grasslands and woodlands occur to the south and west of the site. No change to the off-site vegetation is expected in the future.

Land-use to the north is Magpie Hollow Road and large lot residential. The vegetation is classified as managed land.

4.3 Effective slope

Maximum effective slope to the south within proposed Lot 82 is $>15^{\circ}$ to 18° (Figure 5). Effective slope to the east is $>5^{\circ}$ to 10° . Effective slope to the west is 0° . A bushfire hazard was not identified to the north.

4.4 Significant environmental feature

4.4.1 Riparian corridors

Bowens Creek and associated intermittent drainage lines drain through the central and south eastern sections of the site. The majority of the creek and drainage lines will be located within proposed Lot 82 which is a parkland reserve. Minimal impact on the riparian corridor is expected.

4.4.2 SEPP 14 – Coastal wetlands

None identified within 140m of the development.

4.4.3 SEPP 26 – Littoral rainforests

None identified within 140m of the development.

4.4.4 SEPP 44 – Koala habitat

No koalas are recorded on the site or within 1km of the site according to a search of the NSW Bionet database.

4.4.5 Areas of geological interest

None identified within 140m of the site.

4.4.6 Environmental protection zones or steep lands ($>18^{\circ}$)

None identified within 140m of the site.

4.4.7 Land slip or flood prone areas

None identified within 140m of the site.

4.4.8 National parks estate or various other reserves

None identified within 140m of the site.

4.5 Threatened species, populations, endangered ecological communities and critical habitat

No endangered or vulnerable fauna or flora species were identified as occurring within 500m of the site.

Vegetation management will generally remain unchanged after the development. Several trees are expected to be removed to allow development of roads and dwellings. The majority of the trees will remain. No impact on threatened species, populations, endangered ecological communities or critical habitat will occur from the development. Threatened species, populations, endangered ecological communities or critical habitat are not constraints to development.

4.6 Aboriginal heritage

The owner was not aware of any details of Aboriginal heritage on the site. Aboriginal heritage is not a constraint to development.

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4.7 Bushfire assessment

4.7.1 Asset protection zones

A bushfire hazard exists on proposed Lot 82. The predominant vegetation within Lot 82 is woodland and has an effective slope of $>15^{\circ}$ to 18° . A 30m asset protection zone (APZ) is required for boundaries adjacent proposed Lot 82 on proposed Lots 10, 18 to 26, 49, 50, 52, 55, 57, 58 to 63, 72, 73, 74 and 75. The recommended asset protection zone will include the proposed 20m wide perimeter road and a recommended dwelling setback of 10m.

The recommended APZ to the east for Lots 70 and 71 is 15m which is provided by the 20m wide perimeter road and setback distance for the dwelling.

The recommended APZ to the west for Lots 1 to 7 and to the south for Lots 7 to 10 is 10m. It is recommended that the setback distance for the dwelling from the western and/or southern boundary is 10m to allow for the required APZ.

Vegetation for other lots and boundaries within the subdivision will be classified as managed land and APZ are not required.

Asset protection zones are described in Figure 6.

A bushfire management plan including asset protection zones and in accordance with Planning for Bushfire Protection (PBP) (2006) should be undertaken on a site specific basis prior to dwelling construction.

Acceptable solution	Comment	Compliance (Yes/No/NA/TBD)
An APZ is provided in accordance with Appendix 2 of PBP	APZ are provided in the form of road reserves and dwelling setbacks.	Yes
The APZ is wholly within the boundaries of the development site.	APZ are available within the development area. APZ for individual lots will be a combination of on-lot in the form of dwelling setbacks and off-lot in the form of road reserves.	Yes
APZs are managed in accordance with the requirements of Standards for Asset Protection Zones.	The APZs on individual lots will be managed by future land owners.	NA
The APZ is located on lands with a slope less than 18 degrees	Slopes greater than 18 degrees were not identified on the site.	Yes

TBD – To be designed

4.7.2 Water supply

A reticulated water supply is proposed for the subdivision. The engineering design of the reticulated system has not been finalised.

Acceptable solution	Comment	Compliance (Yes/No/NA/TBD)
Reticulated water supplies		
Reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads.	The reticulated water system is recommended to be designed in accordance with PBP.	TBD
Fire hydrant spacing, sizing and pressures comply with AS2419.1-2005.	Fire hydrants are recommended to be designed in accordance to Council requirements.	TBD

- Hydrants are not located within any road carriageway. - All above ground water and gas service pipes external to the building are metal.	Fire hydrants locations will be outside the road carriageway. Above ground water and gas service pipes on individual lots are recommended to be managed by future land owners. Management should be in accordance with PBP.	TBD NA
The provisions of parking on public roads are met.	Provision of parking on public roads will be in accordance with Section 4.7.4.	Yes
Non-reticulated water supply areas		
The minimum dedicated water supply required for firefighting purposes for each occupied building excluding drenching systems is 10,000L/lot.	The development will be serviced by reticulated water.	NA
A suitable connection for firefighting purposes is made available and located within the IPA and away from the structure. A 65mm Storz outlet with a gate or ball valve is provided.	The development will be serviced by reticulated water.	NA
Gate or Ball valve and pipes are adequate for water flow and are metal rather than plastic.	The development will be serviced by reticulated water.	NA
Underground tanks have an access hole of 200mm to allow tankers to refill direct from the tank. A hardened ground surface for truck access is supplied within 4m of the access hole.	The development will be serviced by reticulated water.	NA
Above ground tanks are manufactured of concrete or metal and raised tanks have their stands protected. Plastic tanks are not used. Tanks on the hazard side of a building are provided with adequate shielding for the protection of fire fighters.	The development will be serviced by reticulated water.	NA
All above ground water pipes external to the building are metal including and up to any taps. Pumps are shielded.	The development will be serviced by reticulated water.	NA

TBD – To be designed

4.7.3 Electrical and gas services

Underground electricity and reticulated gas is proposed for the subdivision. No changes to the existing 132kV power transmission line are proposed. Engineering details for the reticulated gas system have not been finalised.

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Acceptable solution	Comment	Compliance (Yes/No/NA/TBD)
Electricity services		
Where practicable, electricity transmission lines are underground.	Electricity transmission lines installed as part of the development will be underground. The existing 132kV power transmission line will not be modified.	Yes
- Where overhead electrical transmission lines are proposed: - Lines are installed with a short pole spacing (30m) unless crossing gullies, gorges or riparian areas - No part of a tree is closer to a power line than the distance set out in accordance with the specifications in <i>ISSC3 Guidelines for Managing Vegetation near Power Lines</i>	Underground electricity lines are proposed.	NA
Gas services		
Reticulated or bottle gas is installed and maintained in accordance with AS1596 and the requirements or relevant authorities. Metal piping is to be used.	The reticulated gas system is recommended to be designed to comply with AS1596.	TBD
All fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side of the installation.	Fixed gas cylinders on individual lots will be managed by future land owners. Management should be in accordance with PBP.	NA
If gas cylinders need to be kept close to the building, the release valves are directed away from the building and at least 2m away from any combustible material, so that they do not act as a catalyst to combustion. Connection to and from gas cylinders are metal.	Gas cylinders on individual lots will be managed by future land owners. Management should be in accordance with PBP.	NA
Polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not used.	Gas supply lines are recommended to be installed in accordance with PBP.	TBD
TBD – To be designed		

4.7.4 Public roads

Most roads will be two lane, bitumen sealed through roads with one road being a dead end of less than 200m in length. The engineering design of the roads has not been finalised but is recommended to be in accordance with *Planning for Bushfire Protection*.

Acceptable solution	Comment	Compliance (Yes/No/NA/TBD)
- Public roads are two-wheel drive, all weather roads - Urban perimeter roads are two way. Non-perimeter roads comply with Table 4.1 of PBP - The perimeter road is linked to the internal road system at an interval of less than 500m - Traffic management devices are constructed to facilitate access by emergency services - Public roads have a cross fall not exceeding 3 degrees - All roads are through roads. Dead ends are not more than 200m in length, incorporate a minimum 12m outer radius turning circle, are clearly signposted as a dead end and direct traffic away from the hazard. - Curves of roads (other than perimeter roads) are a minimum inner radius of 6m and minimal in number. - The minimum distance between inner and outer curves is 6m. - 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 - Minimum vertical clearance to a height of 4m above the road at all times. - The capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles. Bridges clearly indicate load rating. - Public roads greater than 6.5m wide to locate hydrants outside of parking reserves to ensure accessibility to reticulated water for fire suppression. - Public roads between 6.5m and 8m wide are No Parking on one side with the services (hydrants) located on this side. - Public roads up to 6.5m wide provide parking within parking bays and locate services outside of the parking bays to ensure accessibility to reticulated water for fire suppression.	All roads will have a bitumen seal and concrete curb and guttering. Perimeter and non-perimeter roads are 8m wide from kerb to kerb. Traffic management devices are recommended to be installed in accordance with Lithgow City Council requirements Public roads are recommended to be designed with cross falls of less than 3 degrees. Road four is a dead end road located in the south western section of the development. Road four is less than 200m in length and has a minimum 12m outer radius turning circle. Signs are recommended to be clearly displayed identifying Road Four as a dead end. Public roads are recommended to be designed with a minimum inner radius of 6m. Public roads are recommended to be designed to ensure the distance between inner and outer curves is greater than 6m. Grades of public roads are recommended to be in accordance with PBP. Vertical clearance above roads is recommended to be in accordance with PBP. Road surfaces are recommended to be designed to carry firefighting trucks weighing 15 tonnes. No bridges are proposed. Location of fire hydrants are recommended to be in accordance with PBP. Public roads will be 8m wide. Public roads will be 8m wide.	Yes Yes Yes TBD TBD Yes/TBD TBD TBD TBD TBD TBD TBD NA NA

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One way only public access roads are no less than 3.5m wide and provide parking within parking bays and located services outside the parking bays to ensure accessibility to reticulated water for fire suppression.	No one way only public roads are proposed for the development.	NA
Parking bays are a minimum of 2.6m wide from kerb edge to road pavement. No services or hydrants are located within the parking bays.	Parking bays are recommended to be designed in accordance with PBP.	TBD
Public roads directly interfacing the bush fire hazard vegetation provide roll top kerbing to the hazard side of the road.	Roll top kerbing is recommended to be constructed along roads adjacent the woodland.	TBD

TBD – To be designed

4.7.5 Fire Trails

No fire trails are proposed as part of the development.

4.7.6 Property access

Property access roads will be less than 200m in length and an alternative access will not be required. Management of other requirements for property access roads will be undertaken by future lot owners.

Acceptable solution	Comment	Compliance (Yes/No/NA/TBD)
At least one alternative property access road is provided for individual dwellings (or groups of dwellings) that are located more than 200m from a public through road.	All building envelopes are less than 200m from a public through road and alternative access is not required.	Yes
Bridges clearly indicate load rating and pavements and bridges are capable of carrying a load of 15 tonnes.	Construction of bridges and roads on individual lots will be managed by future land owners. Management should be in accordance with PBP.	NA
Roads do not traverse a wetland or other land potentially subject to periodic inundation.	Wetlands or land subject to periodic inundation was not identified on the site.	NA
A minimum carriageway width of 4m for rural-residential areas, rural landholdings or urban areas with a distance of greater than 70m from the nearest hydrant point to the most external part of a proposed building.	Construction of roads on individual lots will be managed by future land owners. Management should be in accordance with PBP.	NA
In forest, woodland and heath situations, rural property access roads have passing bays every 200m.	Access roads are generally located in grasslands and less than 200m in length.	NA
A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches.	Vertical clearance will be managed by future land owners. Management should be in accordance with PBP.	NA
Internal roads for rural properties provide a loop road around any dwelling or incorporate a turning circle with a minimum 12m outer radius.	The development is for large lot residential.	NA
The minimum distance between inner and outer curves is 6m.	Construction of roads on individual lots will be managed by future land owners. Management should be in accordance with PBP.	NA

• The cross fall is not more than 10 degrees.	Construction of roads on individual lots will be managed by future land owners. Management should be in accordance with PBP.	NA
• Maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads.	Construction of roads on individual lots will be managed by future land owners. Management should be in accordance with PBP.	NA
• Access to a development comprising more than three dwellings have formalised access by dedication of a road and nor by right of way.	Each lot will have a unique access. Future land owners proposing to construct more than three dwellings will need to manage access in accordance with PBP.	NA

TBD – To be designed

4.7.7 Maintenance plans and emergency procedures

Future landowners will require maintenance plans and emergency procedures in accordance with Planning for Bushfire Protection (NSW Rural Fire Service 2006).

4.7.8 Construction standards

AS3959-2009 *Construction of buildings in bushfire-prone areas* describes the bushfire attack level for a building exposed to a bushfire hazard. The bushfire attack level is based on vegetation formation, distance to hazard, effective slope and FDI rating.

Bushfire attack levels for dwellings constructed on the site are expected to range from 12.5 to 40 following implementation of recommended asset protection zones. A bushfire management plan including construction standards in accordance with Planning for Bushfire Protection (2006) should be undertaken on a site specific basis prior to dwelling construction.

5. Conclusions

The current design of the development complies with the acceptable solutions outlined in Planning for Bushfire Protection (2006). The engineering design of roads and services have not been finalised but it is recommended the design comply with Planning for Bushfire Protection. Some of the acceptable solutions are not relevant at this stage but will be relevant once the individual lots are purchased. A bushfire management plan in accordance with Planning for Bushfire Protection (2006) should be undertaken on a site specific basis prior to dwelling construction.

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6. References

AS3959-2009 *Construction of buildings in bushfire-prone areas*

AUSLIG (1990) *Atlas of Australian Resources, Third Series, Volume 6, Vegetation* (Commonwealth of Australia)

Keith D (2004) *Ocean Shores to Desert Dunes* (Department of Environment and Conservation, Sydney)

King, DP (1992) *Soil Landscapes of the Wallerawang 1:100,000 Sheet* report (Department of Conservation and Land Management, NSW)

NSW Rural Fire Service (2006) *Planning for Bushfire Protection* (Planning & Environment Services: Sydney NSW)

OEH (2017) *OEH Bionet database* (New South Wales Office of Environment and Heritage)

7. Report limitations and intellectual property

This report has been prepared for the use of the client to achieve the objectives given the clients requirements. The Australian Standard 3959-2009, *Construction of buildings in bushfire prone areas*, and the NSW Rural Fire Service, *Planning for bushfire protection* (2006) have been used as guidelines in this report. Where limitations or uncertainties are known, they are identified in the report. No liability can be accepted for failure to identify conditions or issues which arise in the future and which could not reasonably have been predicted using the scope of the investigation and the information obtained.

This report including data contained, its findings and conclusions remain the intellectual property of Envirowest Consulting Pty Ltd. A licence to use the report for the specific purpose identified is granted after full payment for the services involved in preparation of the report. This report should not be used by persons or for purposes other than those stated, and not reproduced without the permission of Envirowest Consulting Pty Ltd.

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Figures

Figure 1. Site locality map

Figure 2. Proposed subdivision plan

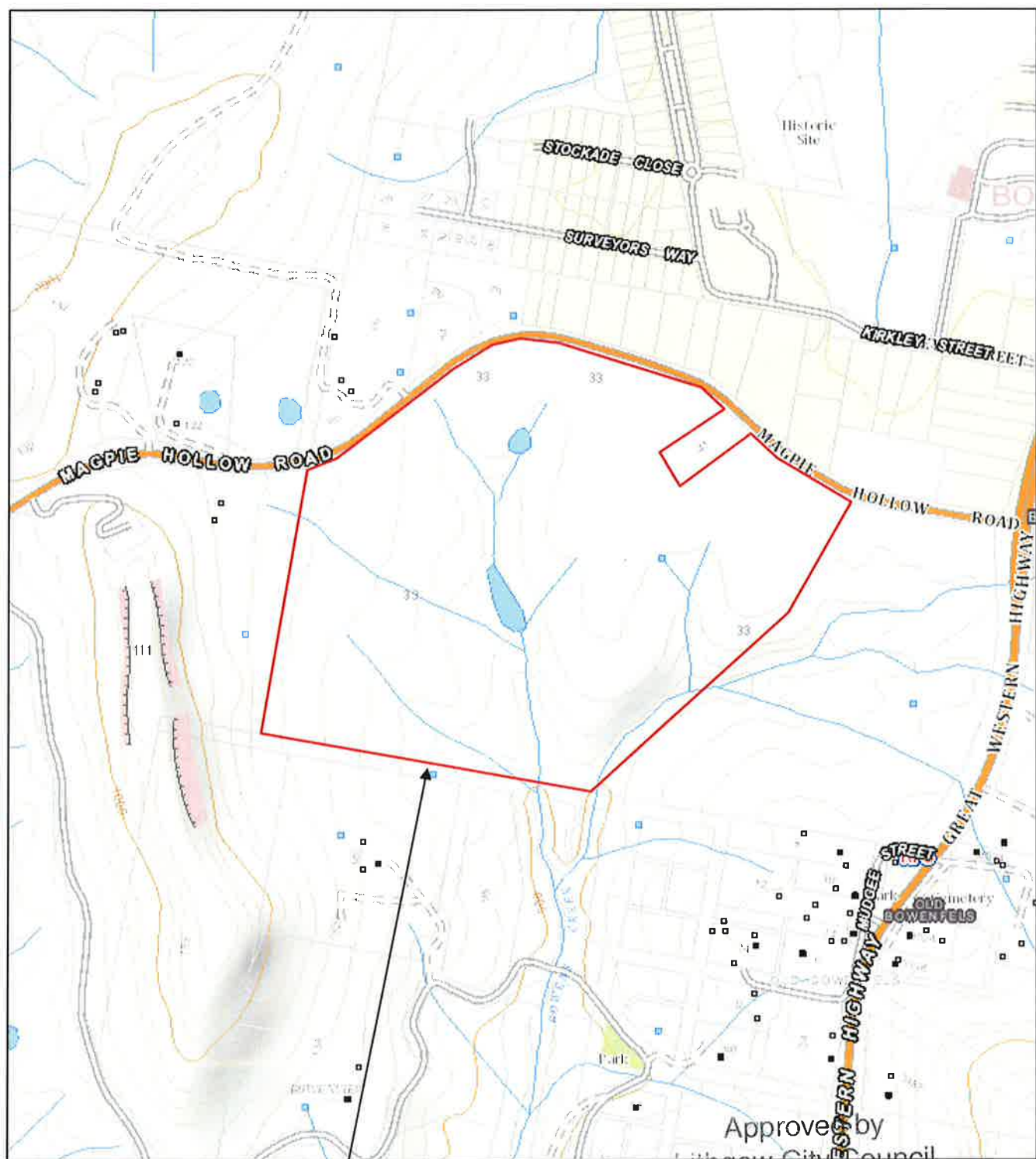
Figure 3. Aerial photograph and proposed subdivision plan

Figure 4. Vegetation classification

Figure 5. Effective slope

Figure 6. Asset protection zones

Figure 7. Ground photographs of the site



Site under assessment

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Figure 1. Site locality map

Lot 2 DP1229039 Magpie Hollow Road, South Bowenfels NSW

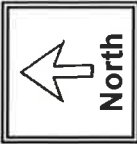


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Job – R8532bf

Drawn by: LD

Date: 24/8/2017



CEH SURVEY CEH SURVEY PTY LTD 1/11/2017 1/11/2017 1/11/2017	41 MAGPIE HOLLOW ROAD CONCEPT LOT LAYOUT	DWG No 4786 LC1S.DWG
DATE 1/1/2016	SCALE - 1:300 ON A3 SHEET	CEH REF: 44786
AMENDED 24/8/2017	SURVEYOR TWS	PS
DRAWN PS	CHECKED	

Figure 2. Proposed subdivision plan

Lot 2 DP1229039 Magpie Hollow Road, South Bowenfels NSW	
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Job - R8532bf	Drawn by: -
	Date: 24/8/2017

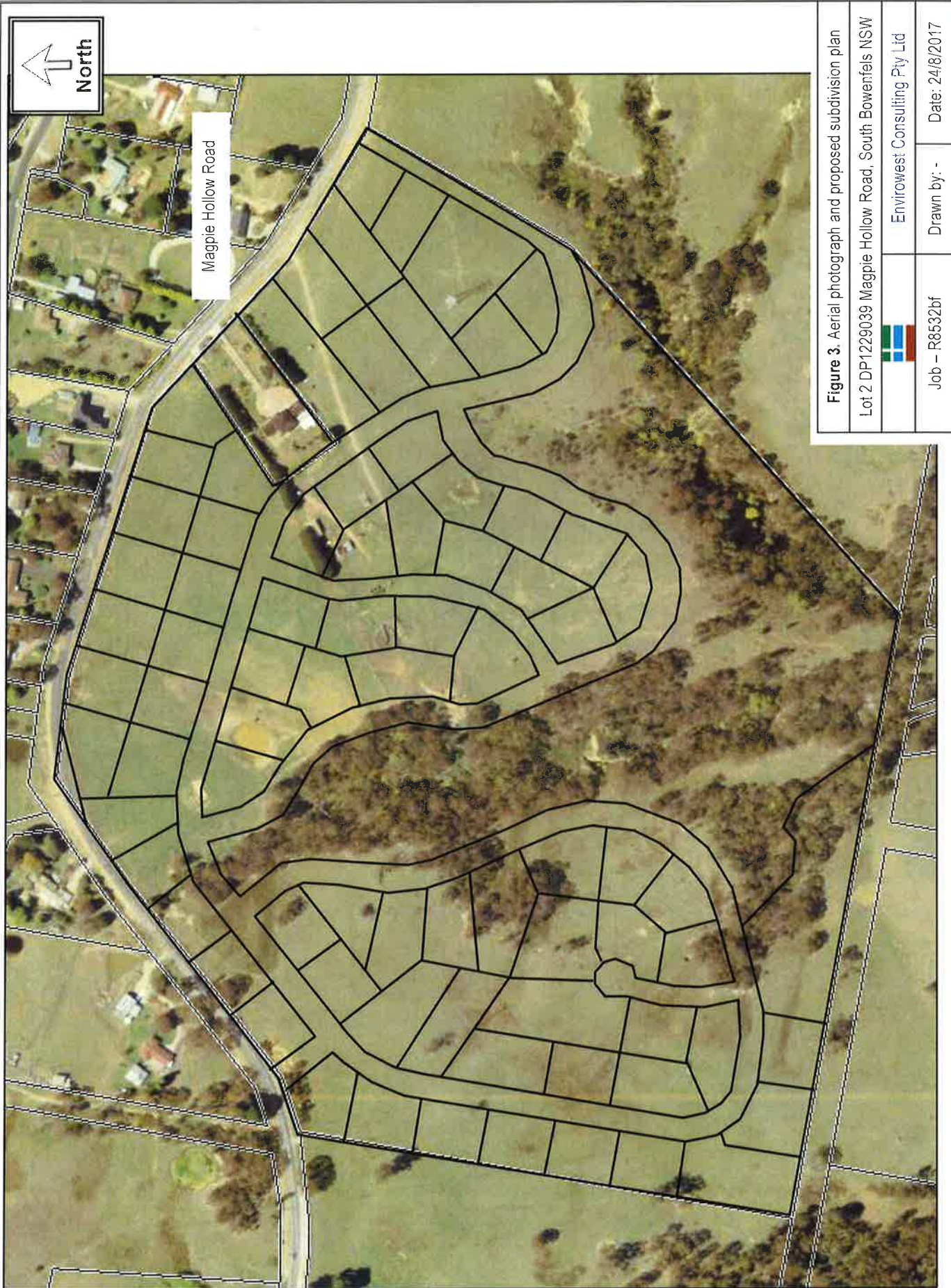
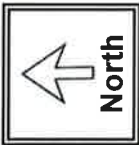
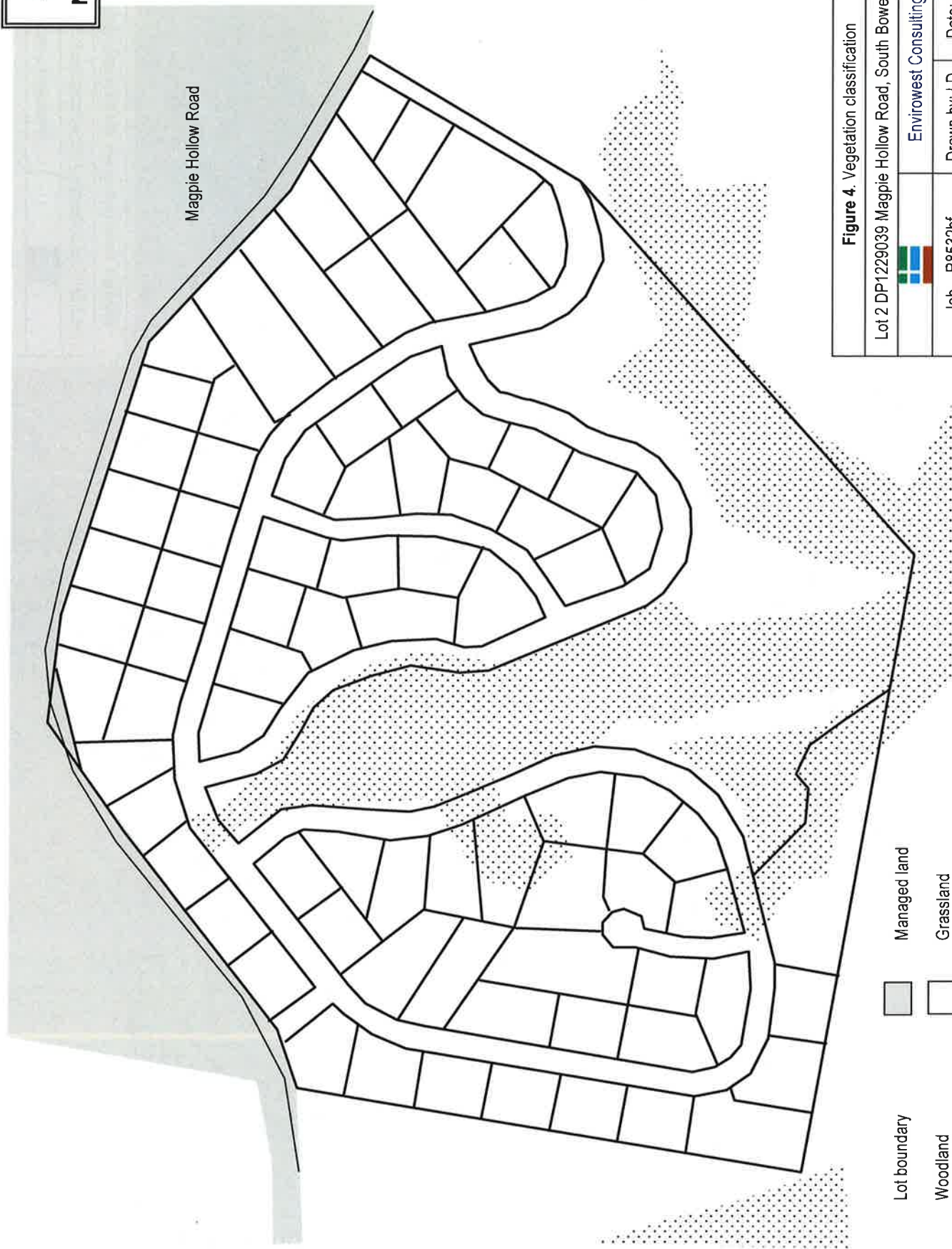


Figure 3. Aerial photograph and proposed subdivision plan			
Lot 2 DP1229039 Magpie Hollow Road, South Bowentfels NSW			
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		Date: 24/8/2017	

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Maggie Hollow Road



Legend

- Lot boundary
- Managed land
- Woodland
- Grassland

Figure 4. Vegetation classification

Lot 2 DP1229039 Maggie Hollow Road, South Bowenfels NSW

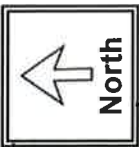


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Maggie Hollow Road

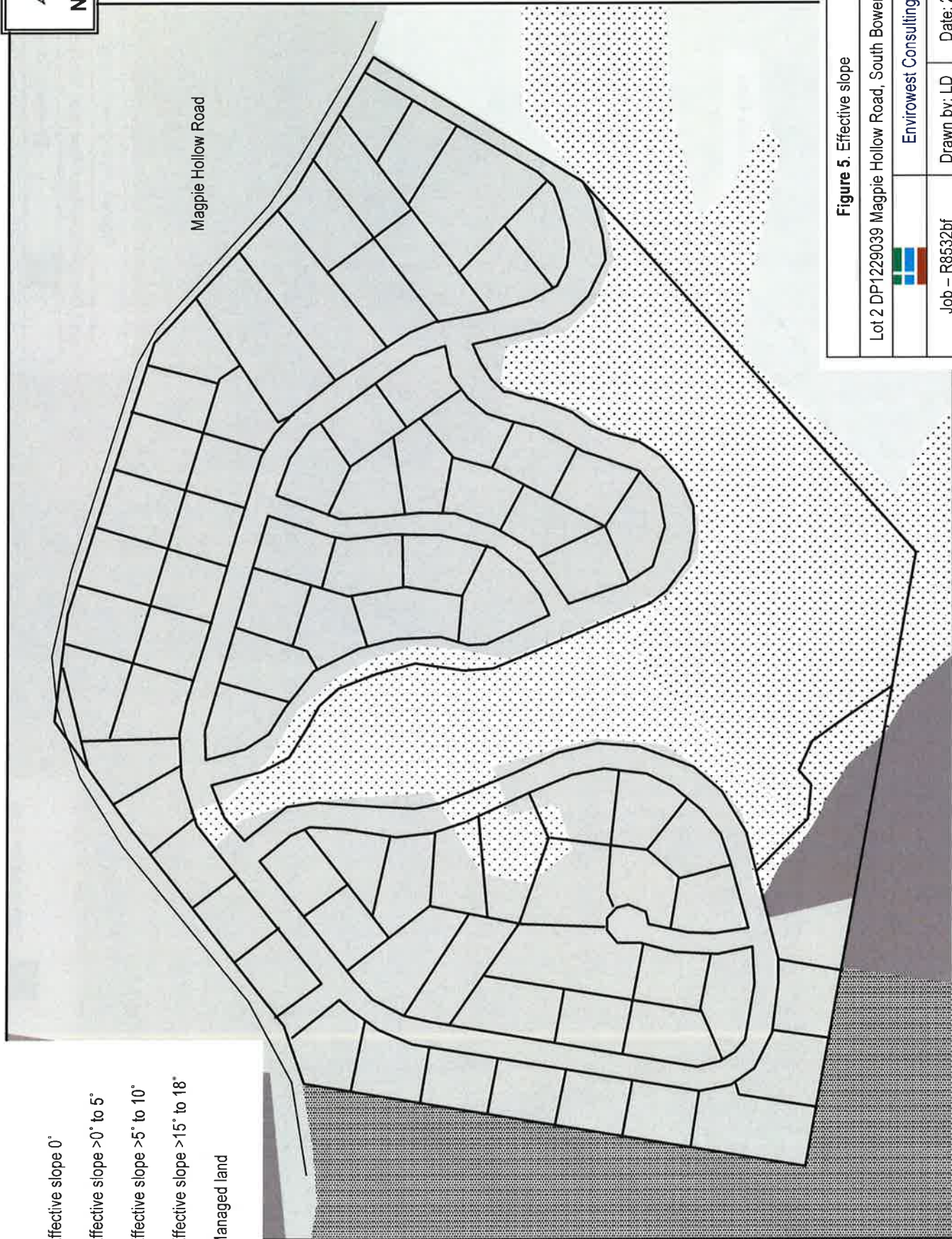
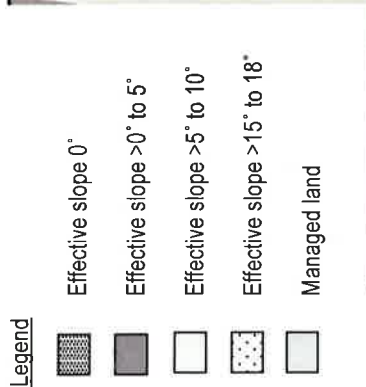


Figure 5. Effective slope

Lot 2 DP1229039 Maggie Hollow Road, South Bowenfels NSW

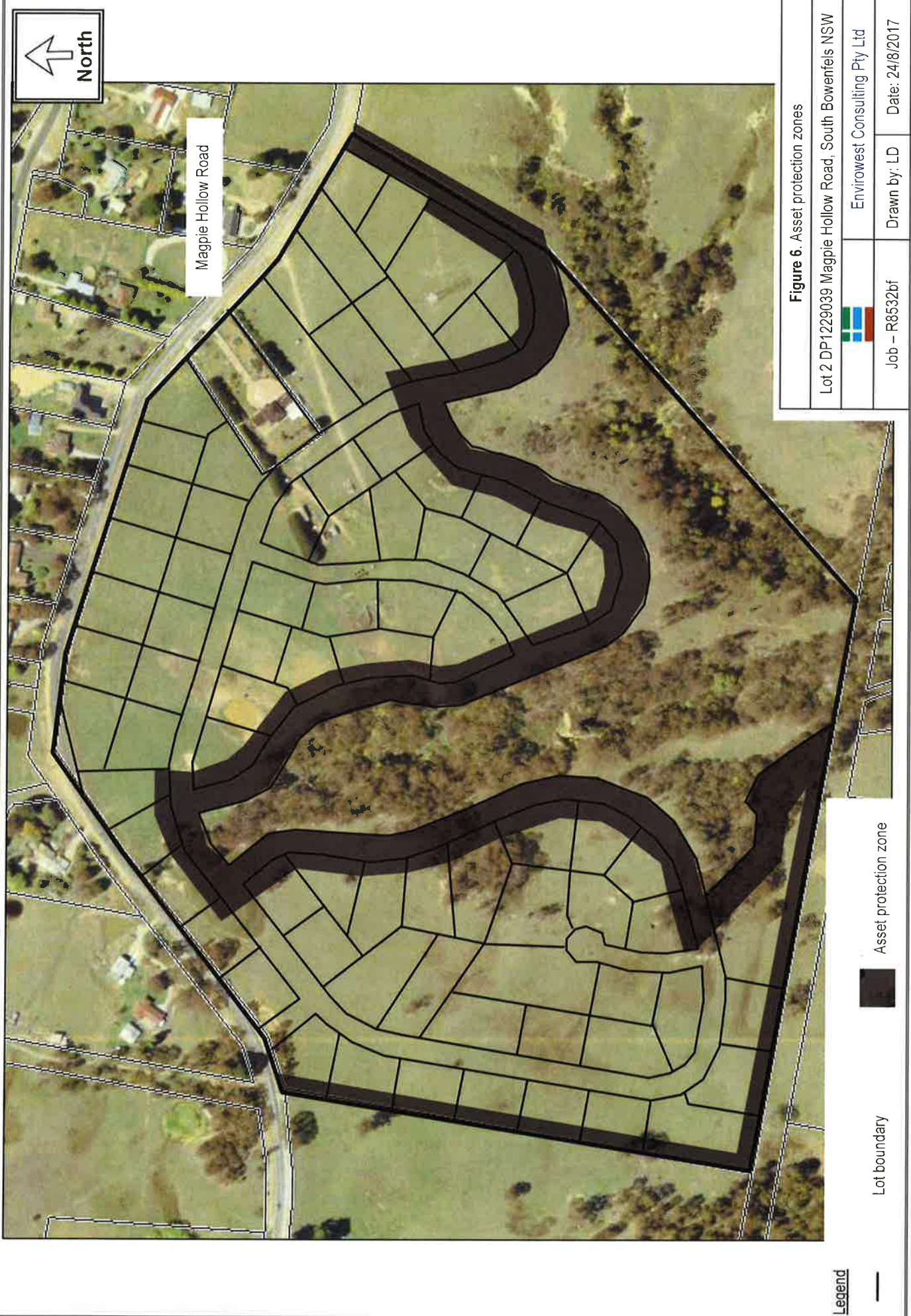
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Legend

— Lot boundary

■ Asset protection zone

Figure 6. Asset protection zones

Lot 2 DP1229039 Magpie Hollow Road, South Bowenfels NSW			
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Figure 7. Ground photographs of site



Looking north across proposed Lots 18 to 22



Looking south across proposed Lots 65 to 69



Woodland within proposed Lot 82



Woodland within proposed Lot 82

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APPENDIX D RADIANT HEAT CALCULATIONS



NBC Bushfire Attack Assessment Report V4.1

AS3959 (2018) Appendix B - Detailed Method 2

Print Date: 11/08/2025

Assessment Date: 11/08/2025

Site Street Address: Lithgow MASS, Lithgow

Assessor: Sarah Jones; Firebird ecoSultants Pty Ltd

Local Government Area: Lithgow

Alpine Area: No

Equations Used

Transmissivity: Fuss and Hammins, 2002

Flame Length: RFS PBP, 2001/Vesta/Catchpole

Rate of Fire Spread: Noble et al., 1980

Radiant Heat: Drysdale, 1985; Sullivan et al., 2003; Tan et al., 2005

Peak Elevation of Receiver: Tan et al., 2005

Peak Flame Angle: Tan et al., 2005

Run Description: Mid section

Vegetation Information

Vegetation Type: Tablelands Clay Grassy Woodland

Vegetation Group: Woodlands

Vegetation Slope: 15.9 Degrees

Vegetation Slope Type: Downslope

Surface Fuel Load(t/ha): 10.5

Overall Fuel Load(t/ha): 18.61

Vegetation Height(m): 0.9

Only Applicable to Shrub/Scrub and Vesta

Site Information

Site Slope: 0 Degrees

Site Slope Type: Downslope

Elevation of Receiver(m): Default

APZ/Separation(m): 23.5

Fire Inputs

Veg./Flame Width(m): 100

Flame Temp(K): 1090

Calculation Parameters

Flame Emissivity: 95

Relative Humidity(%): 25

Heat of Combustion(kJ/kg): 18600

Ambient Temp(K): 308

Moisture Factor: 5

FDI: 80

Program Outputs

Level of Construction: BAL 29

Peak Elevation of Receiver(m): 9.56

Radiant Heat(kW/m2): 28.99

Flame Angle (degrees): 61

Flame Length(m): 21.86

Maximum View Factor: 0.456

Rate Of Spread (km/h): 3.02

Inner Protection Area(m): 24

Transmissivity: 0.836

Outer Protection Area(m): 0

Fire Intensity(kW/m): 29032

BAL Thresholds

BAL-40: BAL-29: BAL-19: BAL-12.5: 10 kW/m2: Elevation of Receiver:

Asset Protection Zone(m): 18 23 33 45 67 6

Run Description:	Mid section				
<u>Vegetation Information</u>					
Vegetation Type:	Tablelands Clay Grassy Woodland				
Vegetation Group:	Woodlands				
Vegetation Slope:	15.7 Degrees	Vegetation Slope Type:	Downslope		
Surface Fuel Load(t/ha):	10.5	Overall Fuel Load(t/ha):	18.61		
Vegetation Height(m):	0.9	Only Applicable to Shrub/Scrub and Vesta			
<u>Site Information</u>					
Site Slope	0 Degrees	Site Slope Type:	Downslope		
Elevation of Receiver(m)	Default	APZ/Separation(m):	23.3		
<u>Fire Inputs</u>					
Veg./Flame Width(m):	100	Flame Temp(K):	1090		
<u>Calculation Parameters</u>					
Flame Emissivity:	95	Relative Humidity(%):	25		
Heat of Combustion(kJ/kg	18600	Ambient Temp(K):	308		
Moisture Factor:	5	FDI:	80		
<u>Program Outputs</u>					
Level of Construction:	BAL 29	Peak Elevation of Receiver(m):	9.44		
Radiant Heat(kW/m2):	28.9	Flame Angle (degrees):	61		
Flame Length(m):	21.59	Maximum View Factor:	0.454		
Rate Of Spread (km/h):	2.98	Inner Protection Area(m):	23		
Transmissivity:	0.837	Outer Protection Area(m):	0		
Fire Intensity(kW/m):	28634				
<u>BAL Thresholds</u>					
BAL-40: BAL-29: BAL-19: BAL-12.5: 10 kw/m2: Elevation of Receiver:					
Asset Protection Zone(m):	18	23	33	45	67
					6

Run Description:	northern section				
<u>Vegetation Information</u>					
Vegetation Type:	Tablelands Clay Grassy Woodland				
Vegetation Group:	Woodlands				
Vegetation Slope:	18.7 Degrees	Vegetation Slope Type:	Downslope		
Surface Fuel Load(t/ha):	10.5	Overall Fuel Load(t/ha):	18.61		
Vegetation Height(m):	0.9	Only Applicable to Shrub/Scrub and Vesta			
<u>Site Information</u>					
Site Slope	0 Degrees	Site Slope Type:	Downslope		
Elevation of Receiver(m)	Default	APZ/Separation(m):	27.5		
<u>Fire Inputs</u>					
Veg./Flame Width(m):	100	Flame Temp(K):	1090		
<u>Calculation Parameters</u>					
Flame Emissivity:	95	Relative Humidity(%):	25		
Heat of Combustion(kJ/kg	18600	Ambient Temp(K):	308		
Moisture Factor:	5	FDI:	80		
<u>Program Outputs</u>					
Level of Construction:	BAL 29	Peak Elevation of Receiver(m):	11.16		
Radiant Heat(kW/m2):	28.96	Flame Angle (degrees):	59		
Flame Length(m):	26.04	Maximum View Factor:	0.46		
Rate Of Spread (km/h):	3.66	Inner Protection Area(m):	28		
Transmissivity:	0.829	Outer Protection Area(m):	0		
Fire Intensity(kW/m):	35220				
<u>BAL Thresholds</u>					
	BAL-40:	BAL-29:	BAL-19:	BAL-12.5:	10 kw/m2: Elevation of Receiver:
Asset Protection Zone(m):	21	27	38	51	75
					6

Run Description:		northern section	
<u>Vegetation Information</u>			
Vegetation Type:		Tablelands Clay Grassy Woodland	
Vegetation Group:		Woodlands	
Vegetation Slope:		11.3 Degrees	Vegetation Slope Type: Downslope
Surface Fuel Load(t/ha):		10.5	Overall Fuel Load(t/ha): 18.61
Vegetation Height(m):		0.9	Only Applicable to Shrub/Scrub and Vesta
<u>Site Information</u>			
Site Slope		0 Degrees	Site Slope Type: Downslope
Elevation of Receiver(m)		Default	APZ/Separation(m): 18.2
<u>Fire Inputs</u>			
Veg./Flame Width(m):		100	Flame Temp(K): 1090
<u>Calculation Parameters</u>			
Flame Emissivity:		95	Relative Humidity(%): 25
Heat of Combustion(kJ/kg)		18600	Ambient Temp(K): 308
Moisture Factor:		5	FDI: 80
<u>Program Outputs</u>			
Level of Construction:		BAL 29	Peak Elevation of Receiver(m): 7.29
Radiant Heat(kW/m2):		28.99	Flame Angle (degrees): 62
Flame Length(m):		16.52	Maximum View Factor: 0.449
Rate Of Spread (km/h):		2.2	Inner Protection Area(m): 18
Transmissivity:		0.849	Outer Protection Area(m): 0
Fire Intensity(kW/m):		21137	
<u>BAL Thresholds</u>			
BAL-40: BAL-29: BAL-19: BAL-12.5: 10 kw/m2: Elevation of Receiver:			
Asset Protection Zone(m):		14	18
		27	37
		57	6

Run Description:	northern section				
<u>Vegetation Information</u>					
Vegetation Type:	Tablelands Clay Grassy Woodland				
Vegetation Group:	Woodlands				
Vegetation Slope:	10 Degrees	Vegetation Slope Type:	Downslope		
Surface Fuel Load(t/ha):	10.5	Overall Fuel Load(t/ha):	18.61		
Vegetation Height(m):	0.9	Only Applicable to Shrub/Scrub and Vesta			
<u>Site Information</u>					
Site Slope	0 Degrees	Site Slope Type:	Downslope		
Elevation of Receiver(m)	Default	APZ/Separation(m):	17		
<u>Fire Inputs</u>					
Veg./Flame Width(m):	100	Flame Temp(K):	1090		
<u>Calculation Parameters</u>					
Flame Emissivity:	95	Relative Humidity(%):	25		
Heat of Combustion(kJ/kg	18600	Ambient Temp(K):	308		
Moisture Factor:	5	FDI:	80		
<u>Program Outputs</u>					
Level of Construction:	BAL 29	Peak Elevation of Receiver(m):	6.81		
Radiant Heat(kW/m2):	28.88	Flame Angle (degrees):	63		
Flame Length(m):	15.3	Maximum View Factor:	0.446		
Rate Of Spread (km/h):	2.01	Inner Protection Area(m):	17		
Transmissivity:	0.851	Outer Protection Area(m):	0		
Fire Intensity(kW/m):	19323				
<u>BAL Thresholds</u>					
	BAL-40:	BAL-29:	BAL-19:	BAL-12.5:	10 kw/m2: Elevation of Receiver:
Asset Protection Zone(m):	13	17	25	35	54
					6

Run Description:	Southern Section				
<u>Vegetation Information</u>					
Vegetation Type:	Tablelands Clay Grassy Woodland				
Vegetation Group:	Woodlands				
Vegetation Slope:	15.6 Degrees	Vegetation Slope Type:	Downslope		
Surface Fuel Load(t/ha):	10.5	Overall Fuel Load(t/ha):	18.61		
Vegetation Height(m):	0.9	Only Applicable to Shrub/Scrub and Vesta			
<u>Site Information</u>					
Site Slope	0 Degrees	Site Slope Type:	Downslope		
Elevation of Receiver(m)	Default	APZ/Separation(m):	23.2		
<u>Fire Inputs</u>					
Veg./Flame Width(m):	100	Flame Temp(K):	1090		
<u>Calculation Parameters</u>					
Flame Emissivity:	95	Relative Humidity(%):	25		
Heat of Combustion(kJ/kg	18600	Ambient Temp(K):	308		
Moisture Factor:	5	FDI:	80		
<u>Program Outputs</u>					
Level of Construction:	BAL 29	Peak Elevation of Receiver(m):	9.38		
Radiant Heat(kW/m2):	28.86	Flame Angle (degrees):	61		
Flame Length(m):	21.46	Maximum View Factor:	0.453		
Rate Of Spread (km/h):	2.96	Inner Protection Area(m):	23		
Transmissivity:	0.837	Outer Protection Area(m):	0		
Fire Intensity(kW/m):	28438				
<u>BAL Thresholds</u>					
	BAL-40:	BAL-29:	BAL-19:	BAL-12.5:	10 kw/m2: Elevation of Receiver:
Asset Protection Zone(m):	18	23	33	44	67
					6

Run Description:	southern section				
<u>Vegetation Information</u>					
Vegetation Type:	Tablelands Clay Grassy Woodland				
Vegetation Group:	Woodlands				
Vegetation Slope:	15.3 Degrees	Vegetation Slope Type:	Downslope		
Surface Fuel Load(t/ha):	10.5	Overall Fuel Load(t/ha):	18.61		
Vegetation Height(m):	0.9	Only Applicable to Shrub/Scrub and Vesta			
<u>Site Information</u>					
Site Slope	0 Degrees	Site Slope Type:	Downslope		
Elevation of Receiver(m)	Default	APZ/Separation(m):	22.8		
<u>Fire Inputs</u>					
Veg./Flame Width(m):	100	Flame Temp(K):	1090		
<u>Calculation Parameters</u>					
Flame Emissivity:	95	Relative Humidity(%):	25		
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308		
Moisture Factor:	5	FDI:	80		
<u>Program Outputs</u>					
Level of Construction:	BAL 29	Peak Elevation of Receiver(m):	9.21		
Radiant Heat(kW/m2):	28.89	Flame Angle (degrees):	61		
Flame Length(m):	21.06	Maximum View Factor:	0.453		
Rate Of Spread (km/h):	2.9	Inner Protection Area(m):	23		
Transmissivity:	0.838	Outer Protection Area(m):	0		
Fire Intensity(kW/m):	27855				
<u>BAL Thresholds</u>					
	BAL-40:	BAL-29:	BAL-19:	BAL-12.5:	10 kw/m2: Elevation of Receiver:
Asset Protection Zone(m):	17	23	32	44	66
					6

Run Description:	southern section				
<u>Vegetation Information</u>					
Vegetation Type:	Tablelands Clay Grassy Woodland				
Vegetation Group:	Woodlands				
Vegetation Slope:	14.5 Degrees	Vegetation Slope Type:	Downslope		
Surface Fuel Load(t/ha):	10.5	Overall Fuel Load(t/ha):	18.61		
Vegetation Height(m):	0.9	Only Applicable to Shrub/Scrub and Vesta			
<u>Site Information</u>					
Site Slope	0 Degrees	Site Slope Type:	Downslope		
Elevation of Receiver(m)	Default	APZ/Separation(m):	21.8		
<u>Fire Inputs</u>					
Veg./Flame Width(m):	100	Flame Temp(K):	1090		
<u>Calculation Parameters</u>					
Flame Emissivity:	95	Relative Humidity(%):	25		
Heat of Combustion(kJ/kg	18600	Ambient Temp(K):	308		
Moisture Factor:	5	FDI:	80		
<u>Program Outputs</u>					
Level of Construction:	BAL 29	Peak Elevation of Receiver(m):	8.77		
Radiant Heat(kW/m2):	28.9	Flame Angle (degrees):	61		
Flame Length(m):	20.05	Maximum View Factor:	0.452		
Rate Of Spread (km/h):	2.74	Inner Protection Area(m):	22		
Transmissivity:	0.84	Outer Protection Area(m):	0		
Fire Intensity(kW/m):	26359				
<u>BAL Thresholds</u>					
	BAL-40:	BAL-29:	BAL-19:	BAL-12.5:	10 kw/m2: Elevation of Receiver:
Asset Protection Zone(m):	17	22	31	42	64
					6

Run Description:		southern Section	
<u>Vegetation Information</u>			
Vegetation Type:		Tablelands Clay Grassy Woodland	
Vegetation Group:		Woodlands	
Vegetation Slope:		13.8 Degrees	Vegetation Slope Type: Downslope
Surface Fuel Load(t/ha):		10.5	Overall Fuel Load(t/ha): 18.61
Vegetation Height(m):		0.9	Only Applicable to Shrub/Scrub and Vesta
<u>Site Information</u>			
Site Slope		0 Degrees	Site Slope Type: Downslope
Elevation of Receiver(m)		Default	APZ/Separation(m): 21
<u>Fire Inputs</u>			
Veg./Flame Width(m):		100	Flame Temp(K): 1090
<u>Calculation Parameters</u>			
Flame Emissivity:		95	Relative Humidity(%): 25
Heat of Combustion(kJ/kg)		18600	Ambient Temp(K): 308
Moisture Factor:		5	FDI: 80
<u>Program Outputs</u>			
Level of Construction:		BAL 29	Peak Elevation of Receiver(m): 8.48
Radiant Heat(kW/m2):		28.84	Flame Angle (degrees): 62
Flame Length(m):		19.21	Maximum View Factor: 0.451
Rate Of Spread (km/h):		2.61	Inner Protection Area(m): 21
Transmissivity:		0.842	Outer Protection Area(m): 0
Fire Intensity(kW/m):		25116	
<u>BAL Thresholds</u>			
BAL-40: BAL-29: BAL-19: BAL-12.5: 10 kw/m2: Elevation of Receiver:			
Asset Protection Zone(m):		16	21
		30	41
		62	6

Run Description:	southern section				
<u>Vegetation Information</u>					
Vegetation Type:	Tablelands Clay Grassy Woodland				
Vegetation Group:	Woodlands				
Vegetation Slope:	10.2 Degrees	Vegetation Slope Type:	Downslope		
Surface Fuel Load(t/ha):	10.5	Overall Fuel Load(t/ha):	18.61		
Vegetation Height(m):	0.9	Only Applicable to Shrub/Scrub and Vesta			
<u>Site Information</u>					
Site Slope	0 Degrees	Site Slope Type:	Downslope		
Elevation of Receiver(m)	Default	APZ/Separation(m):	17.2		
<u>Fire Inputs</u>					
Veg./Flame Width(m):	100	Flame Temp(K):	1090		
<u>Calculation Parameters</u>					
Flame Emissivity:	95	Relative Humidity(%):	25		
Heat of Combustion(kJ/kg	18600	Ambient Temp(K):	308		
Moisture Factor:	5	FDI:	80		
<u>Program Outputs</u>					
Level of Construction:	BAL 29	Peak Elevation of Receiver(m):	6.9		
Radiant Heat(kW/m2):	28.85	Flame Angle (degrees):	63		
Flame Length(m):	15.48	Maximum View Factor:	0.446		
Rate Of Spread (km/h):	2.04	Inner Protection Area(m):	17		
Transmissivity:	0.851	Outer Protection Area(m):	0		
Fire Intensity(kW/m):	19592				
<u>BAL Thresholds</u>					
	BAL-40:	BAL-29:	BAL-19:	BAL-12.5:	10 kw/m2: Elevation of Receiver:
Asset Protection Zone(m):	13	18	25	35	54
					6

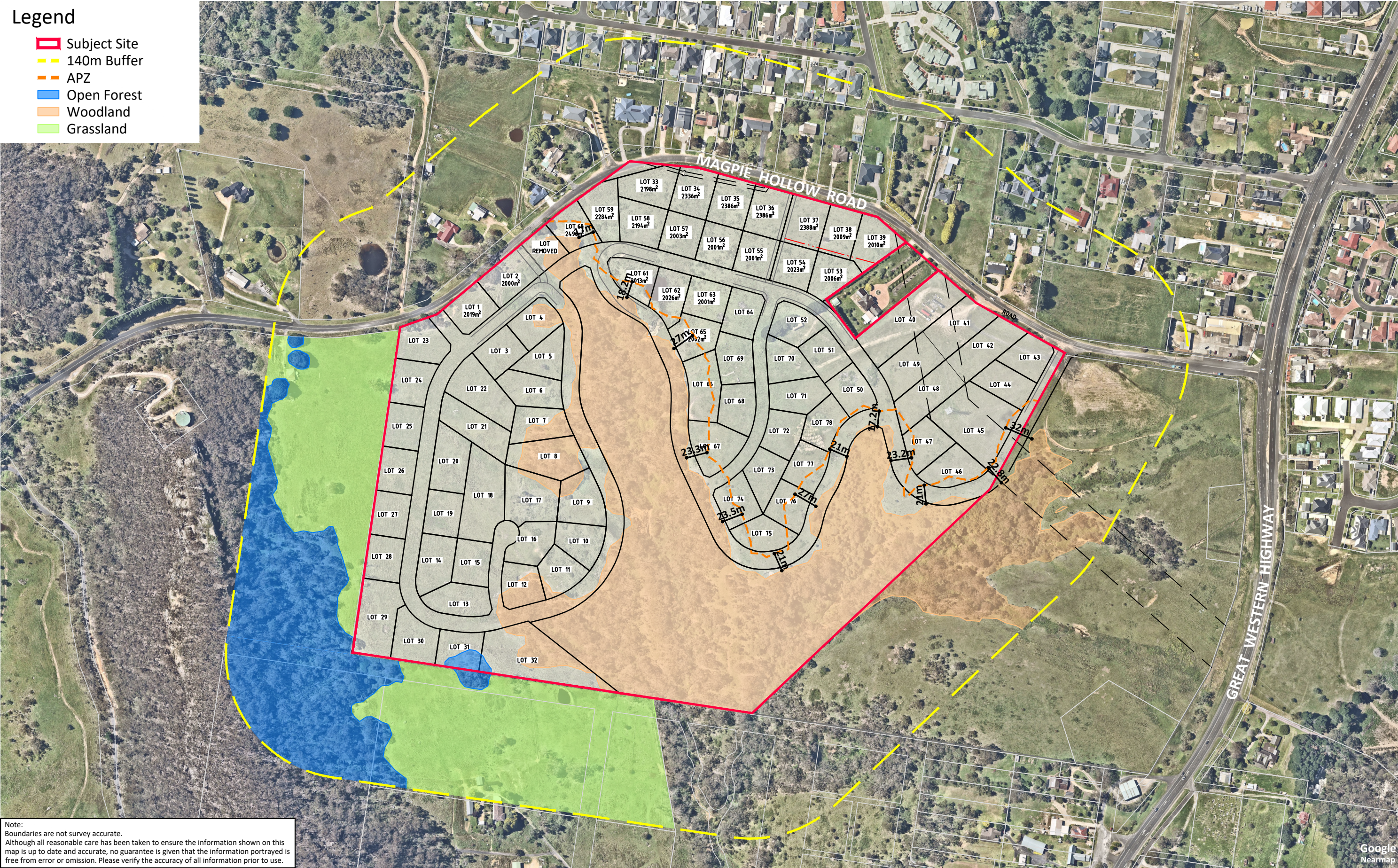
Run Description:	Southern Section - USE Acceptable APZ PBP				
<u>Vegetation Information</u>					
Vegetation Type:	Tablelands Clay Grassy Woodland				
Vegetation Group:	Woodlands				
Vegetation Slope:	21 Degrees	Vegetation Slope Type:	Downslope		
Surface Fuel Load(t/ha):	10.5	Overall Fuel Load(t/ha):	18.61		
Vegetation Height(m):	0.9	Only Applicable to Shrub/Scrub and Vesta			
<u>Site Information</u>					
Site Slope	0 Degrees	Site Slope Type:	Downslope		
Elevation of Receiver(m)	Default	APZ/Separation(m):	31.5		
<u>Fire Inputs</u>					
Veg./Flame Width(m):	100	Flame Temp(K):	1090		
<u>Calculation Parameters</u>					
Flame Emissivity:	95	Relative Humidity(%):	25		
Heat of Combustion(kJ/kg	18600	Ambient Temp(K):	308		
Moisture Factor:	5	FDI:	80		
<u>Program Outputs</u>					
Level of Construction:	BAL 29	Peak Elevation of Receiver(m):	12.78		
Radiant Heat(kW/m2):	28.66	Flame Angle (degrees):	58		
Flame Length(m):	30.14	Maximum View Factor:	0.459		
Rate Of Spread (km/h):	4.29	Inner Protection Area(m):	32		
Transmissivity:	0.821	Outer Protection Area(m):	0		
Fire Intensity(kW/m):	41277				
<u>BAL Thresholds</u>					
	BAL-40:	BAL-29:	BAL-19:	BAL-12.5:	10 kw/m2: Elevation of Receiver:
Asset Protection Zone(m):	23	30	42	56	81
					6

APPENDIX E LAYOUT

PREVIOUS SUBDIVISION

Legend

- Subject Site
- 140m Buffer
- APZ
- Open Forest
- Woodland
- Grassland

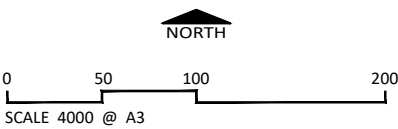


Note:
Boundaries are not survey accurate.
Although all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

FIGURE X: PREVIOUS LAYOUT AGAINST APZS

CLIENT
SITE DETAILS
DATE

Client
No.33-41 Magpie Hollow Road South Bowenfels
21 January 2025



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