BUSHFIRE ASSESSMENT REPORT

Proposed Residential Subdivision

20 & 20A Cantwell Road, Lochinvar

Prepared for Trustee of the Roman Catholic Church for the Diocese of Maitland Newcastle

Bushfire Planning Australia

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Reference: 23100 Lochinvar

Prepared for Trustee of the Roman Catholic Church for the Diocese of Maitland Newcastle c/o Monteath & Powys
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Disclaimer and Limitation

This report is prepared solely for the Trustee of the Roman Catholic Church for the Diocese of Maitland Newcastle c/- Monteath & Powys Pty Ltd (the 'Client') for the specific purposes of only for which it is supplied (the 'Purpose'). This report is not for the benefit of any other person; either directly or indirectly and is strictly limited to the purpose and the facts and matters stated in it and will not be used for any other application.

This report is based on the site conditions surveyed at the time the document was prepared. The assessment of the bushfire threat made in this report is made in good faith based on the information available to Bushfire Planning Australia at the time.

The recommendations contained in this report are considered to be minimum standards and they do not guarantee that a building or assets will not be damaged in a bushfire. In the making of these comments and recommendations it should be understood that the focus of this document is to minimise the threat and impact of a bushfire.

Finally, the implementation of the adopted measures and recommendations within this report will contribute to the amelioration of the potential impact of any bushfire upon the development, but they do not and cannot guarantee that the area will not be affected by bushfire at some time.

Document Status: 23100 - Bushfire Assessment Report

Version	Status	Purpose	Author	Review Date
1	Draft	Draft for Review	Katrina Greville	10 November 2024
2	Draft	Draft for Client Review	Stuart Greville	31 January 2025
3	Final	Final for Submission	Stuart Greville	6 February 2025

Certification

As the author of this Bushfire Threat Assessment (BAR), I certify this BAR provides the detailed information required by the NSW Rural Fire Service under Clause 45 of the Rural Fires Regulation 2022 and Appendix 2 of Planning for Bushfire Protection 2019 for the purposes of an application for a bush fire safety authority under section 100B(4) of the Rural Fires Act 1997.

BPAD Bushfire Planning & Design Accredited Practitioner Level 2

Stuart Greville

Accredited Bushfire Practitioner

BPAD-26202

Date: 6 February 2025

In signing the above, I declare the report is true and accurate to the best of my knowledge at the time of issue.

Executive Summary

Bushfire Planning Australia (BPA) has been engaged by Trustee of the Roman Catholic Church for the Diocese of Maitland Newcastle c/- Monteath & Powys Pty Ltd (the 'Client') to undertake a Bushfire Assessment Report (BAR) for the proposed residential subdivision located at 20 & 20A Cantwell Road, Lochinvar (the 'subject site'); legally known as Lot 1 & 2 DP1299958 respectively.

The site is located within the Lochinvar Urban Release Area in the Maitland Local Government Area Bush Fire Planning – Urban Release Area Map.

The proposed subdivision will create 138 residential lots, 2 drainage reserves and ancillary services. The subdivision will be constructed across three stages.

This BAR found that the site is currently exposed to a low to medium bushfire hazard contained to the revegetated riparian corridor through the middle of the site which is an ecotone of *woodland* (Coastal Valley Grassy Woodland), *forested wetland* (Coastal Floodplain Wetland) and freshw*ater wetland* (Coastal Freshwater Lagoon) vegetation formations. For the purposes of this assessment, the worst-case scenario derived from the maximum fuel loads, being a *woodland*, was adopted for the riparian corridor.

In summary, the following key recommendations have been designed to enable the proposed residential development to achieve the aims and objectives of Planning for Bushfire Protection 2019 (PBP 2019):

Asset Protection Zones

1. All land within the site zoned R1 Residential; excluding the riparian corridors shall be managed as an Inner Protection Area (IPA) as outlined within Appendix 4 of PBP 2019 and the RFS document Standards for asset protection zones;

Access

2. All roads are to be constructed in accordance with the layout indicated in **Appendix A.**
3. Perimeter roads comply with the following general requirements of Table 5.3b of PBP 2019 and the following:
    a. 8m wide road width measured kerb to kerb;
    b. Hydrants are located clear of parking areas;
    c. Curves of roads have a minimum inner radius of 6m;
    d. The road crossfall does not exceed 3 degrees; and
    e. A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches is provided.
4. Non-perimeter roads located shall comply with the following general requirements of Table 5.3b of PBP 2019:
    f. 5.5m wide road width measured kerb to kerb;
    g. Hydrants are located clear of parking areas;
    h. Curves of roads have a minimum inner radius of 6m;
    i. The road crossfall does not exceed 3 degrees; and
    j. A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches is provided.
5. Any temporary turning heads shall be constructed in accordance Appendix A3.3 of PBP 2019;
6. Vegetation within road verges (including swales) to be consistent with a grassland vegetation classification with tree canopy less than 10% at maturity;

Construction Standards

7. All future dwellings to be constructed on the proposed lots shall have due regard to the specific considerations given in the National Construction Code: Building Code of Australia (BCA) which makes specific reference to Australian Standard AS3959-2018 Construction of buildings in bushfire prone areas (AS3959-2018) and the NASH Standard Steel Framed Construction in Bushfire Prone Areas;
8. Vegetation with the stormwater basins; including associated batters shall be planted consistent with a grassland vegetation classification with tree canopy less than 10% at maturity;

Water and Utility Services

9. All new lots are to be connected to a reliable water supply network and that suitable fire hydrants are located throughout the development site that are clearly marked and provided for the purposes of bushfire protection. Fire hydrant spacing, sizing and pressure shall comply with AS2419.1 2005 and section 5.3.3 of PBP 2019; and

Landscaping

10. Consideration should be given to landscaping and fuel loads on site to decrease potential fire hazards on site. All landscaping shall be in accordance with Appendix 4 of PBP 2019.

Emergency and Evacuation Planning

11. A Bushfire Emergency Management and Evacuation Plan (BEMEP) shall be prepared that is consistent with the RFS Guidelines 'Development Planning – A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan December 2014'.

This assessment has been made based on the bushfire hazards observed in and around the site at the time of inspection and production and demonstrates the development has satisfied the aims and objectives of Planning for Bushfire Protection 2019.

Finally, should the above recommendations be implemented, the existing bushfire risk should be suitably mitigated to offer an acceptable level of protection to life and property for those persons and assets occupying the site, but they do not and cannot guarantee that the area will not be affected by bushfire at some time and that property and life damage/loss will not occur.

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Terms and 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
BAR	Bushfire Assessment Report
BCA	Building Code of Australia
BC Act	NSW Biodiversity Act 2016
BMP	Bush Fire Management Plan
BPA	Bush Fire Prone Area (Also Bushfire Prone Land)
BPL	Bush Fire Prone Land
BPLM	Bush Fire Prone Land Map
BPM	Bush Fire Protection Measures
DoE	Commonwealth Department of the Environment
DPI Water	NSW Department of Primary Industries – Water
DSF	Dry Sclerophyll Forest
EPA Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
FDI	Fire Danger Index
FMP	Fuel Management Plan
ha	hectare
IPA	Inner Protection Area
LGA	Local Government Area
MCC	Maitland City Council
OPA	Outer Protection Area
OEH	NSW Office of Environment and Heritage
PBP 2019	Planning for Bushfire Protection 2019
RF Act	Rural Fires Act 1997
RF Regulation	Rural Fires Regulation
RFS	NSW Rural Fire Service

1. Introduction

Bushfire Planning Australia (BPA) has been engaged by Trustee of the Roman Catholic Church for the Diocese of Maitland Newcastle c/- Monteath & Powys Pty Ltd (the 'Client') to undertake a Bushfire Assessment Report (BAR) for the proposed residential subdivision located at 20 & 20A Cantwell Road, Lochinvar (the 'subject site'); legally known as Lot 1 & 2 DP1299958 respectively.

The proposed subdivision will create 138 residential lots and two drainage reserves. The subdivision will be constructed across three stages.

The assessment aims to provide a bushfire risk assessment which considers and assesses the bushfire hazard and associated potential bushfire threat relevant to the proposed development on a landscape scale. The assessment outlines the minimum mitigative measures which would be required in accordance with the BAR, provisions of the New South Wales Rural Fire Service (RFS) publication *Planning for Bushfire Protection 2019* (PBP 2019) and the *Rural Fires Regulation 2022*.

1.1. Aims and Objectives

This BAR aims to assess the bushfire threat and recommends a series of bushfire protection measures that aim to minimise the risk of adverse impact of bush fires on life, property and the environment.

This assessment has been undertaken in accordance with Appendix 2 of *Planning for Bushfire Protection 2019* and clause 45 of the *Rural Fires Regulation 2022*. This assessment also addresses the aim and objectives of PBP 2019, being:

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

2. Site Description

Table 1: Site Description

Address	20 & 20A Cantwell Road, Lochinvar
Title	Lot 1 & 2 DP1299958
LGA	Maitland City Council
Study Area	14.64 ha
Land Use Zone	R1 General Residential and C3 Environmental Corridor (**Figure 1**)
Bushfire Prone Land	The entire site is mapped as Vegetation Category 3 bushfire prone land (**Figure 3**)
Context	The subject site is located to the east of Cantwell Road and includes a narrow riparian corridor (C3 zone land) running through the middle of the site. The site is currently vacant of any dwellings or buildings and has historically been used for grazing purposes which extends to the north and east of the site. St Joseph's College Diocese of Maitland Newcastle is located to the south of the site whilst rural residential properties exist to the west, although separated by Cantwell Road. The site is identified as Lochinvar Urban Release Area in the Maitland Local Government Area Bush Fire Planning - Urban Release Area Map.
Topography	Majority of the site is flat with a slight elevation along the riparian corridor and to the north-eastern corner of the site.
Fire Danger Index	100

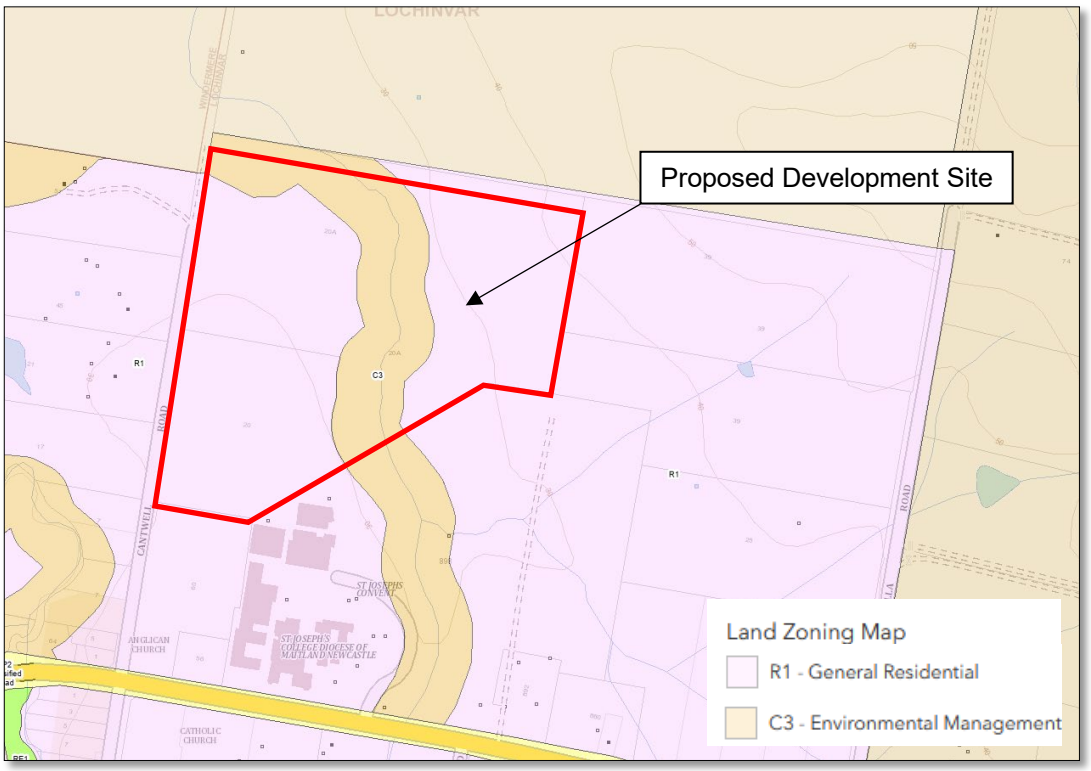

Figure 1: Land Use Zone Map (Maitland Local Environment Plan 2011)

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Figure 2

Site Location

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Subject site

100m buffer

140m buffer

SOURCE:
Base Map © Department of Customer Service 2020

N
W E
S

0 100 200 300 400 500
Meters

A3 Scale: 1:10,000

File:23100-Lochinvar-Fig1-SiteLocation-241113 Date: 13/11/2024

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2.1. Bushfire Planning - Urban Release Area

The subject site is located within Maitland Local Government Area (LGA) Bushfire Planning - Urban Release Area Map – Section 6 Lochinvar as indicated on **Figure 3** and **Figure 4**. As a subdivision of land within an URA, the assessment undertaken as part of the preparation of the BAR may exempt the proposed lots from reassessment of bushfire matters when future landowners are ready to construct a dwelling on their lot/s.

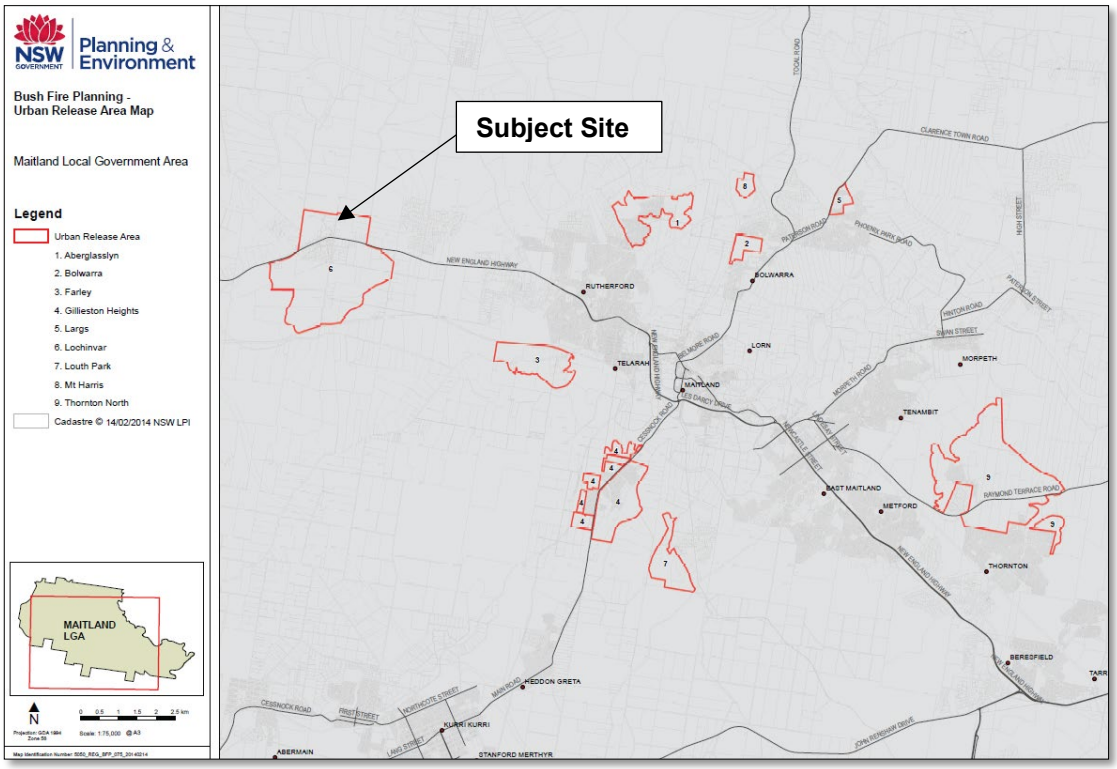


Figure 3: Lochinvar Bushfire URA Area Plan

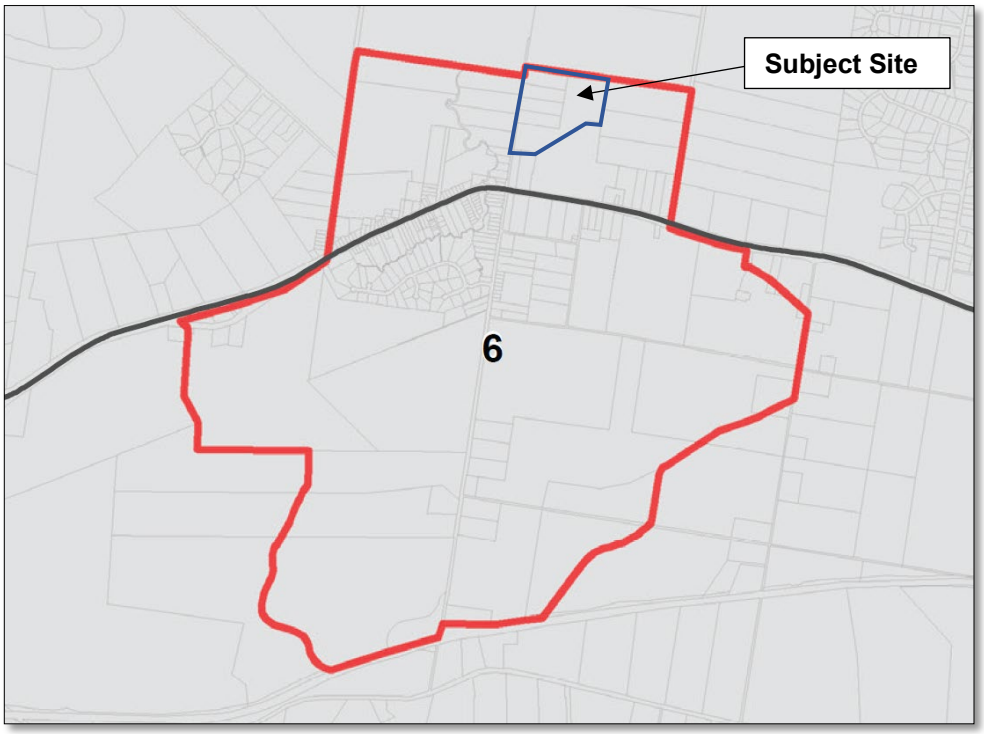


Figure 4: Lochinvar Bushfire URA Area Plan

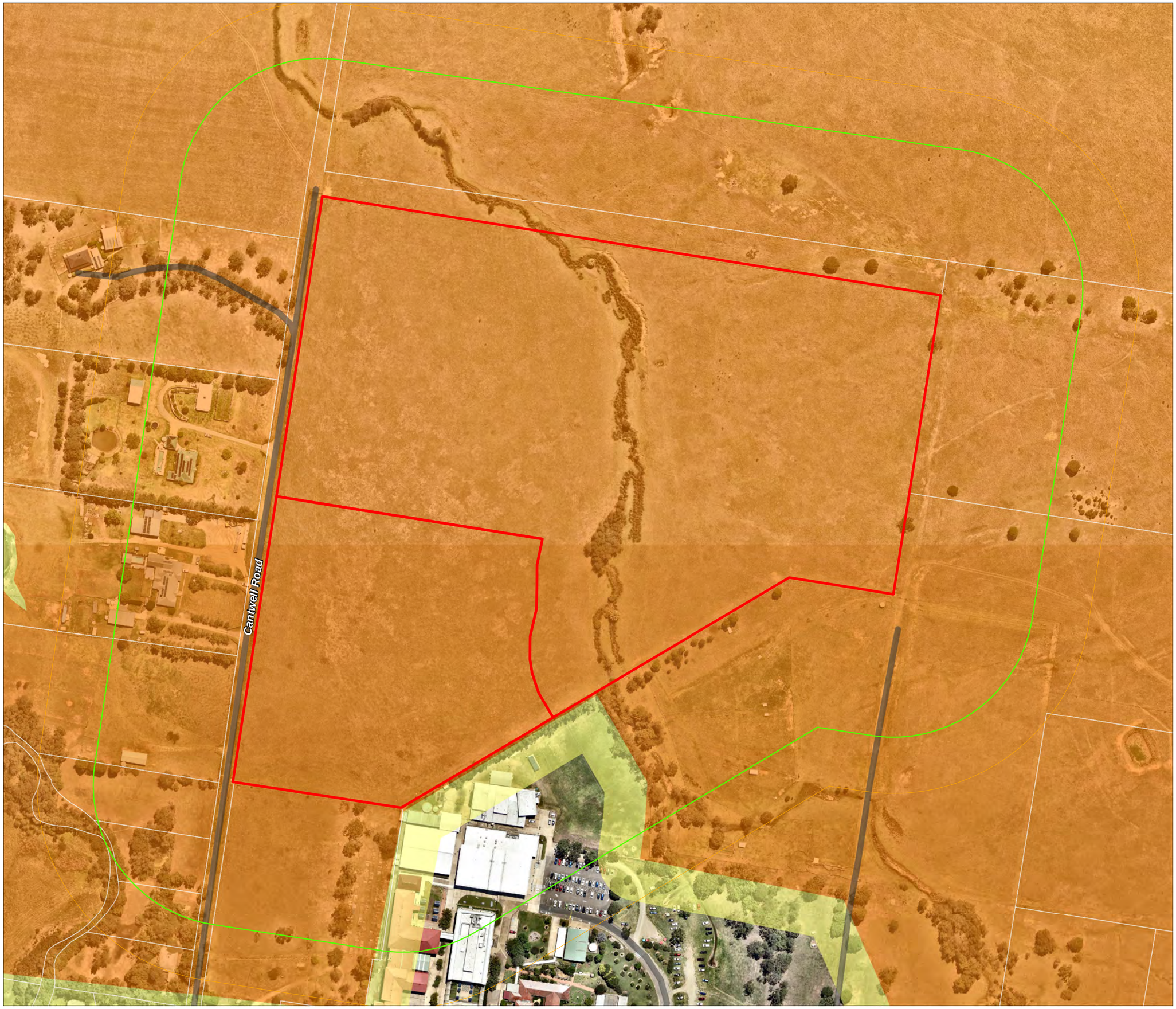
2.2. Bushfire Prone Land

Bushfire activity is prevalent in landscapes that carry fuel and the two predominant bushfire types are grassland and forest fires. Factors such as topographic characteristics and quantity of fuel loads influence the intensity and spread of fire. The scale of a bushfire hazard is tailored to the characteristics of the hazard, the size and characteristics of the affected population, types of land use exposed to bushfire, predicted development growth pressures and other factors affecting bushfire risk.

Figure 4 demonstrates the entire development site is mapped as Vegetation Category 3 bushfire prone land.

Vegetation Category 3 bushfire prone land surrounds the site within and beyond 140m in all directions with exception of Vegetation Buffer located to the south of the site, being the existing St Joseph's College site.

The vegetation gully located through the middle of the site is identified as the primary bushfire hazard.



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Job No: 23100

Figure 5

NSW Bush Fire Prone Land

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Subject Site
140m Buffer
100m Buffer

Bushfire Prone Land

Vegetation Category 3
Buffer

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2024
Aerial photo: NearMap 26/02/2023
NSW Bush Fire Prone Land: NSW Rural Fire Service 2023

N
W E
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0 25 50 75 100 125
Meters

A3 Scale: 1:2,500

File:23100-Lochinvar-Fig2-BFPL-241113 Date: 13/11/2024

2.3. Proposed Development

The proposed development seeks consent for a residential subdivision that will create 138 residential lots and 2 detention basins and ancillary services on Lot 1 & 2 DP1299958.

The proposed development will include construction of both public through roads, perimeter roads and non-perimeter roads, providing access to each lot and a connection to the adjoining proposed subdivision to the east of the site as shown in **Figure 7** (subject to a separate development application approval DA/2023/415).

The plan of subdivision is contained in **Appendix A** and shown in **Figure 6.**

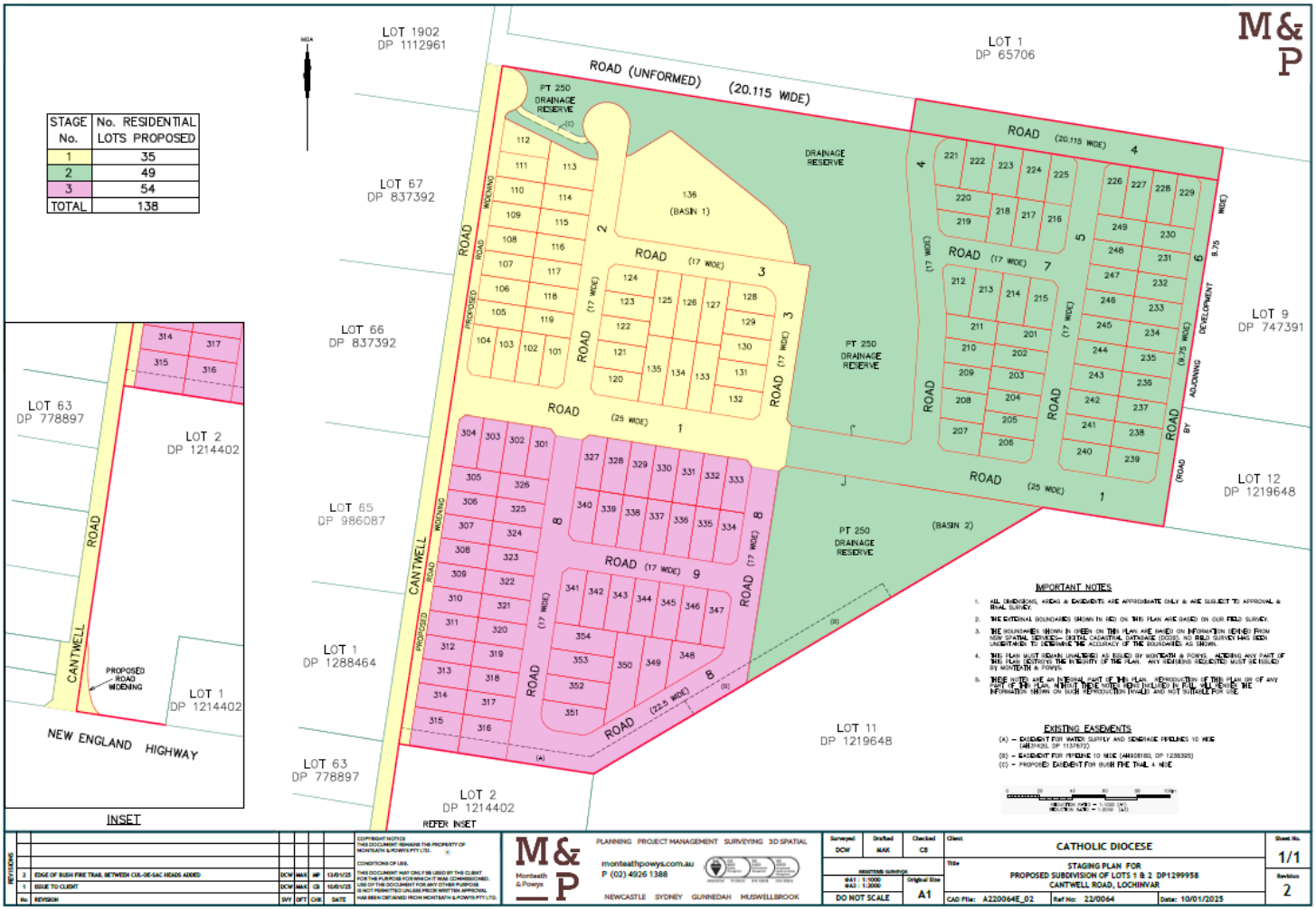

Figure 6: Staging Plan of Proposed Subdivision (Monteath and Powys)

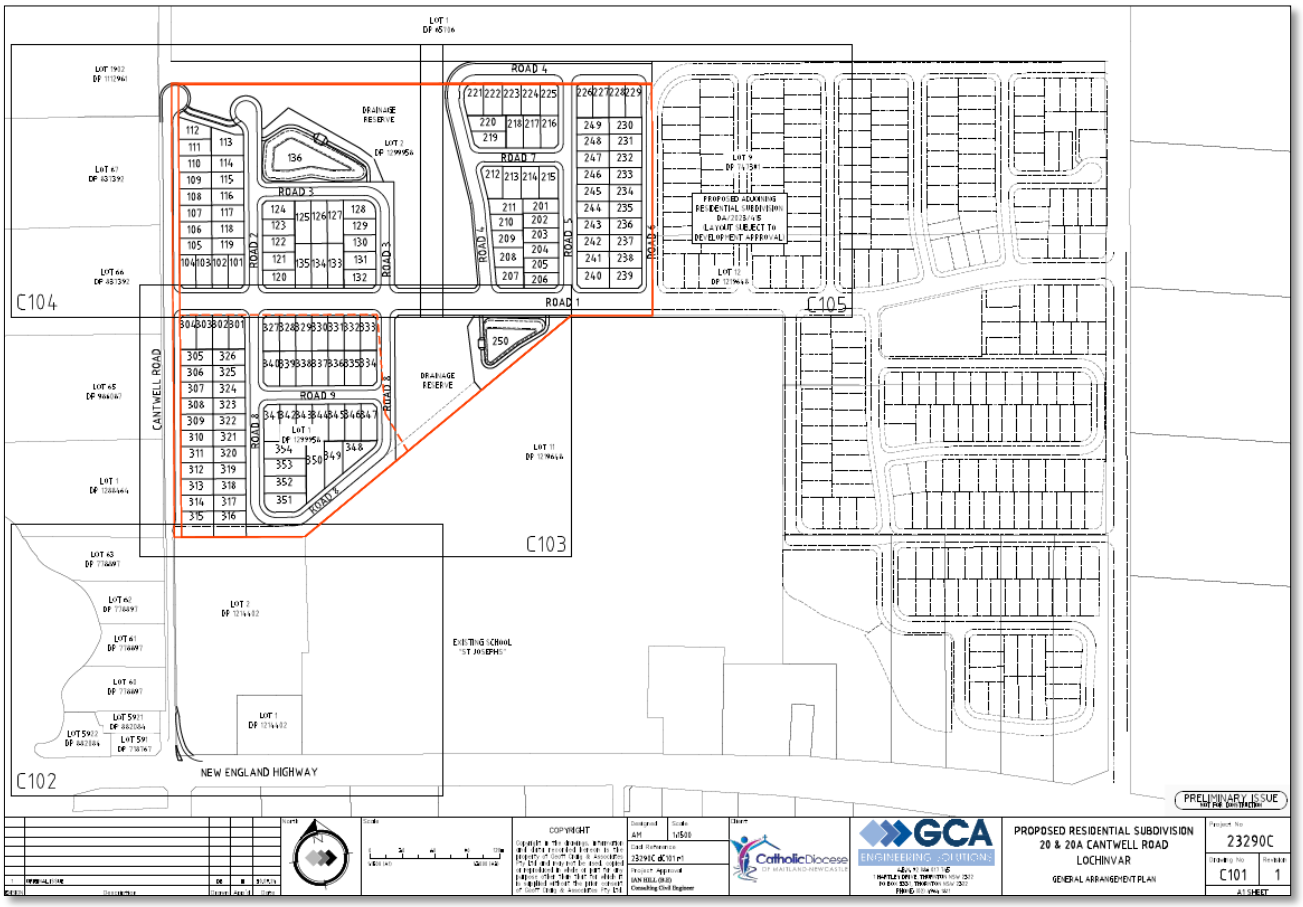

Figure 7: General Arrangement Plan - Proposed Adjoining Development

3. Bushfire Hazard Assessment

The bushfire hazard assessment will involve quantitative and qualitative assessments of the site. The quantitative assessment includes a detailed site inspection to record and review vegetation communities, slope and aspect both within and surrounding the site. The qualitative assessment will be based on the known bushfire behaviour of the subject land.

3.1. Vegetation Assessment

Vegetation classification over the site and surrounding area has been carried out as follows:

- Aerial Photograph Interpretation to map the vegetation classification and extent (NearMap historical series);
- Reference to NSW State Vegetation Type Formation Department of Planning, Industry and Environment 2023 (**Figure 8**);
- Reference to Anderson Environmental Planning Vegetation Types (January 2025) (**Figure 9**); and
- Site Inspection on 17 April 2024 by Bushfire Planning Australia - Stuart Greville (BPA).

In accordance with PBP 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 development footprint. The vegetation classification is based on Appendix 1 of PBP 2019; per Keith (2004). The unmanaged fuel loads detailed in the *Comprehensive Vegetation Fuel Loads* published by the NSW Rural Fire Service (RFS) in March 2019 have been adopted for the purpose of assessing the bushfire hazard. The findings of the site inspection were compared to the Keith Vegetation Formations mapping provided by the NSW RFS. The inconsistencies between the mapping sources were quantified during the site inspection.

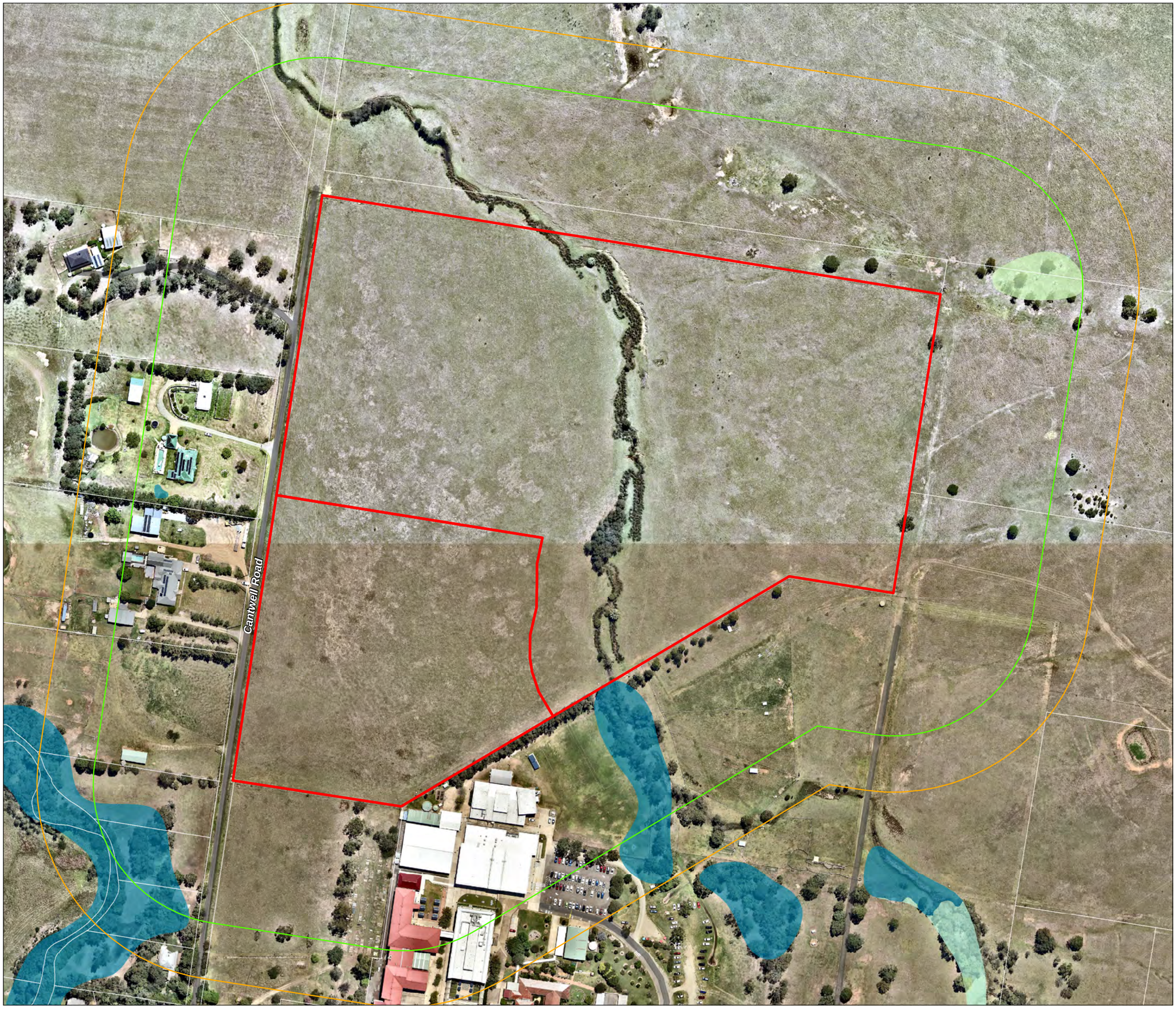

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Figure 8

NSW State Vegetation Type (Class)

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- Subject site
- 140m buffer
- 100m buffer

Vegetation Class

- Inland Riverine Forests
- Coastal Floodplain Wetlands
- Hunter-Macleay Dry Sclerophyll Forests

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2024
Aerial photo: NearMap 26/02/2023
NSW Vegetation Type: NSW Department of Planning, Industry and Environment 2023

N
W E
S

0 25 50 75 100 125
Meters

A3 Scale: 1:2,500

File:23100-Lochinvar-Fig3-Vegetation-SV-Class-241113 Date: 13/11/2024

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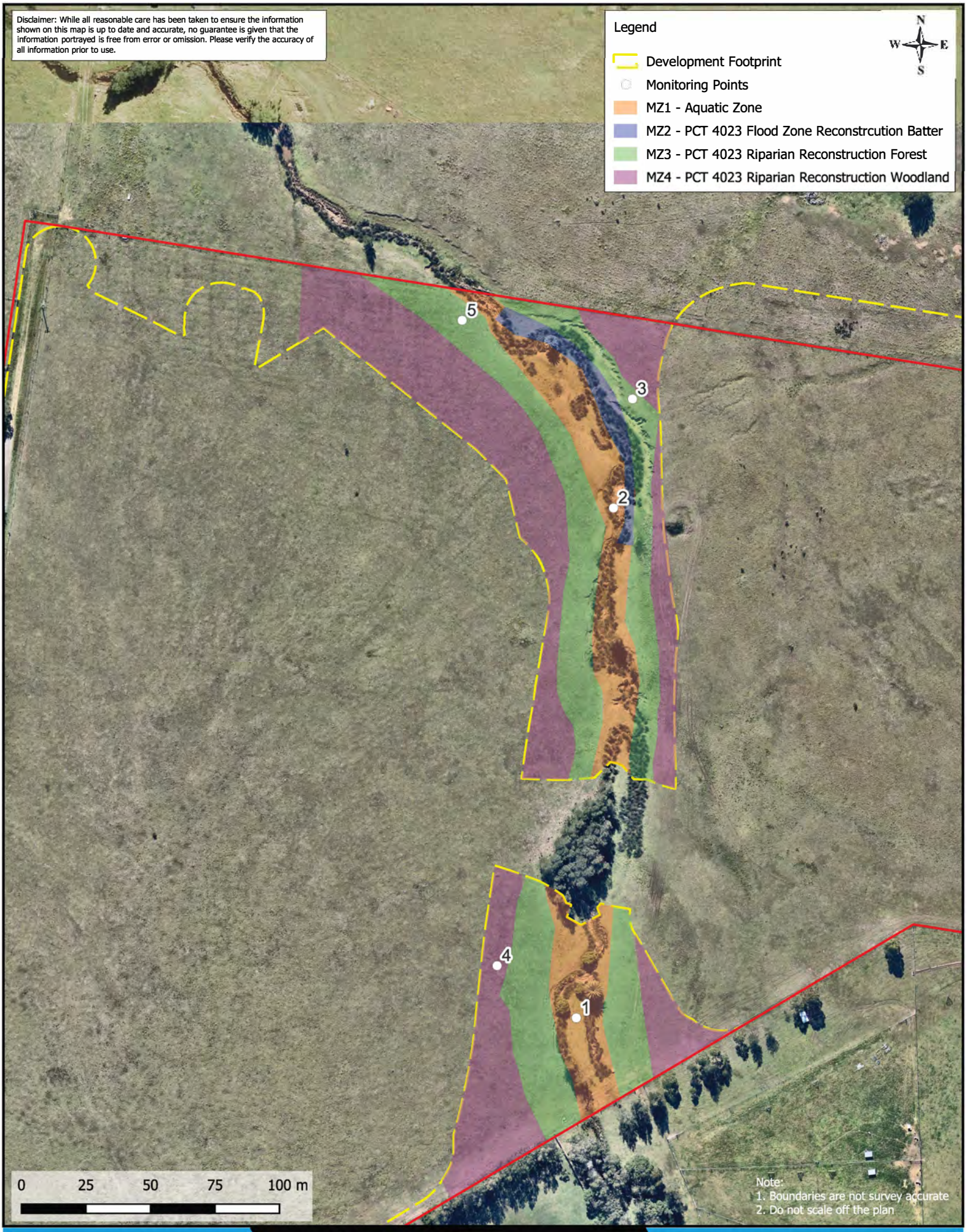

AEP

Figure 3 - Management Zones and Monitoring Points

Date: January 2025

Location: 20 &20A Cantwell Road Lochinvar NSW

Client: CDMN

AEP ref: 4951

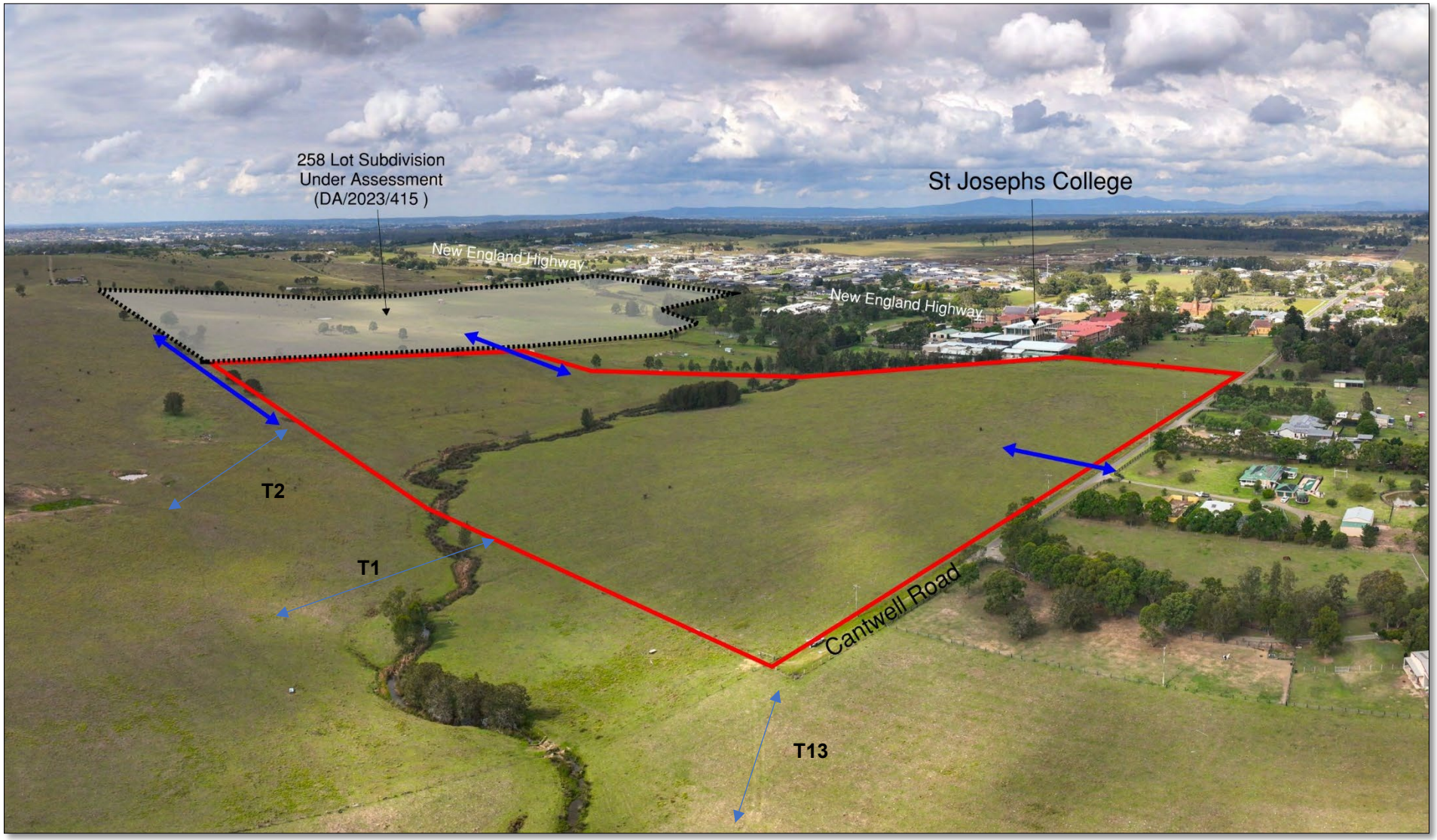

Plate 1: Looking south-east over site highlighting surrounding rural land uses and proposed access routes

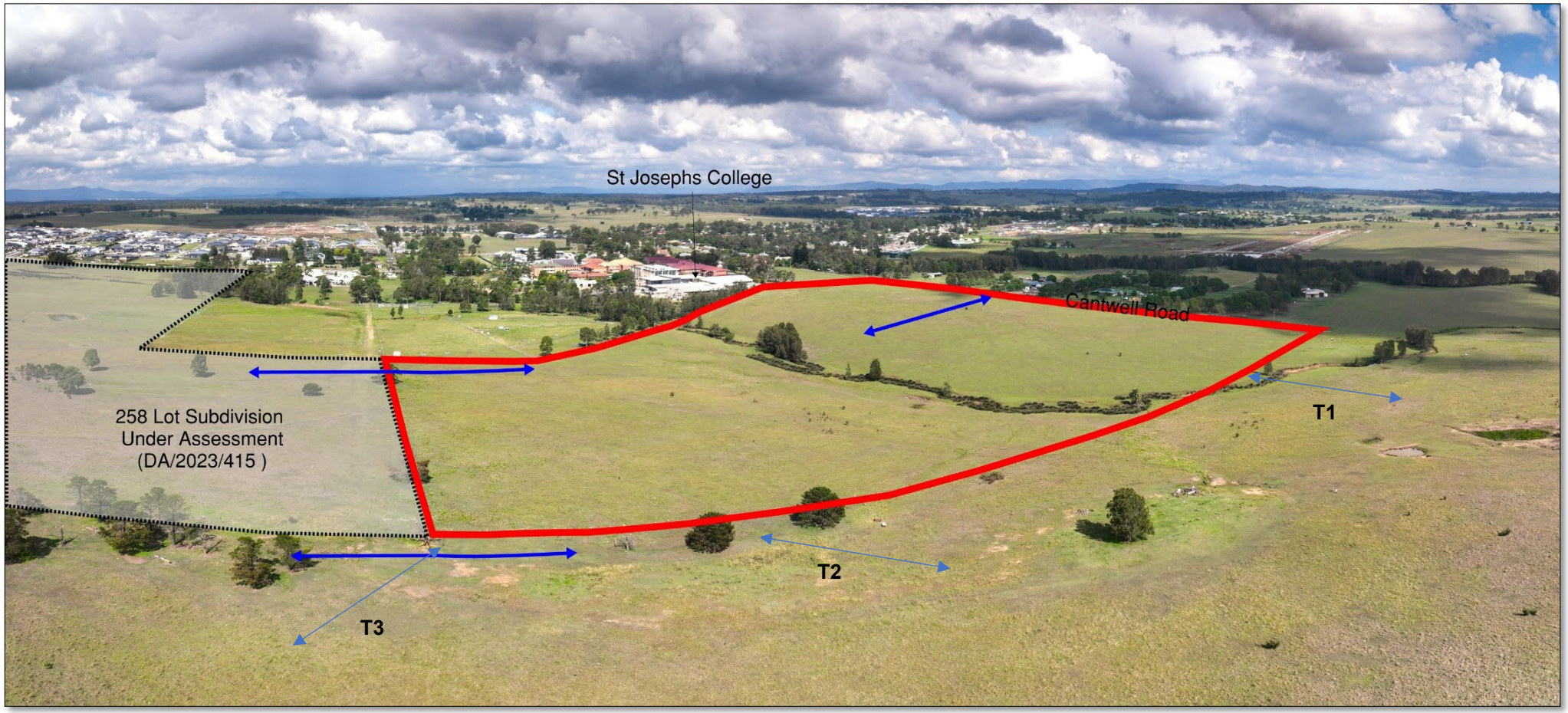

Plate 2: The proposed subdivision provides two (2) new public access routes into the adjoining residential subdivision

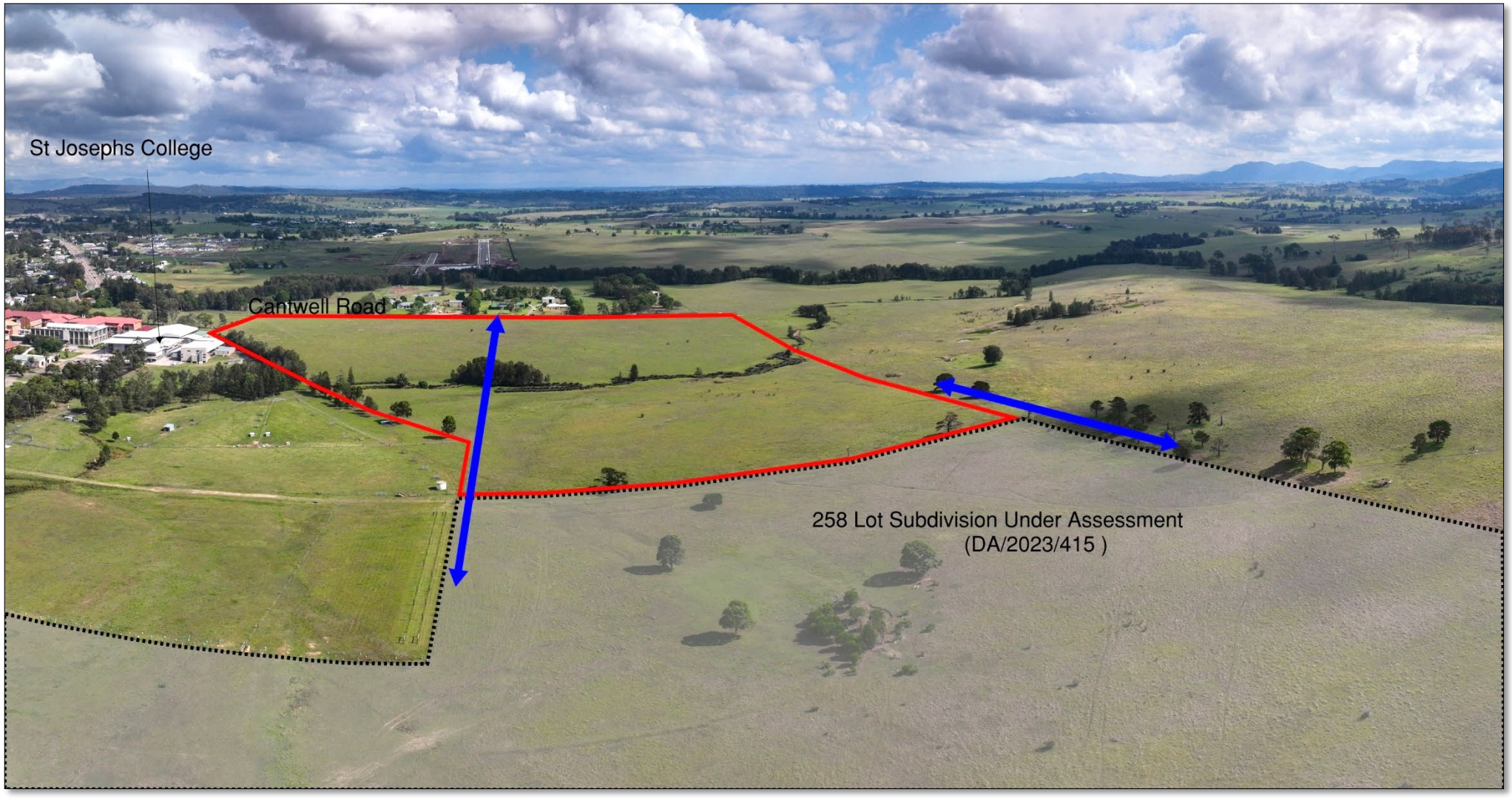

Plate 3: The bushfire hazard external to the development is a derived *grassland*, being land continuously used for grazing livestock

Plate 4: Northern boundary adjoins derived grassland

Plate 5: Low condition and disturbed riparian corridor to be widened and rehabilitated

Plate 6: Existing watercourse to be widened and revegetated as a *woodland*

Plate 7: Riparian corridor continues south towards New England Highway

Plate 8: T5 is located with the St Joseph's College school and operates as a teaching farm

Plate 9: Cantwell Road will be widened and reconstructed (T8)

3.2. Slope Assessment

The slope assessment was undertaken as follows:

- Review of LiDAR point cloud data – including DEM (NSW LPI).
- Site Inspection on 14 April 2024 by Bushfire Planning Australia - Stuart Greville (BPA).

An assessment of the slope over a distance of 140m in the hazard direction from the site boundary was undertaken. The effective slope was then calculated under the classified vegetation where there was a fire run greater than 50m. The topography of the site has been evaluated to identify both the average slope and by identifying the maximum slope present. These values help determine the level of gradient which will most significantly influence the fire behaviour of the site.

A series of figures were produced that demonstrate the slope within 140m from the subject site in several formats, including:

- Digital Elevation Model - **Figure 10**; and
- Slope analysis in gradients of 5 degrees - **Figure 11**.

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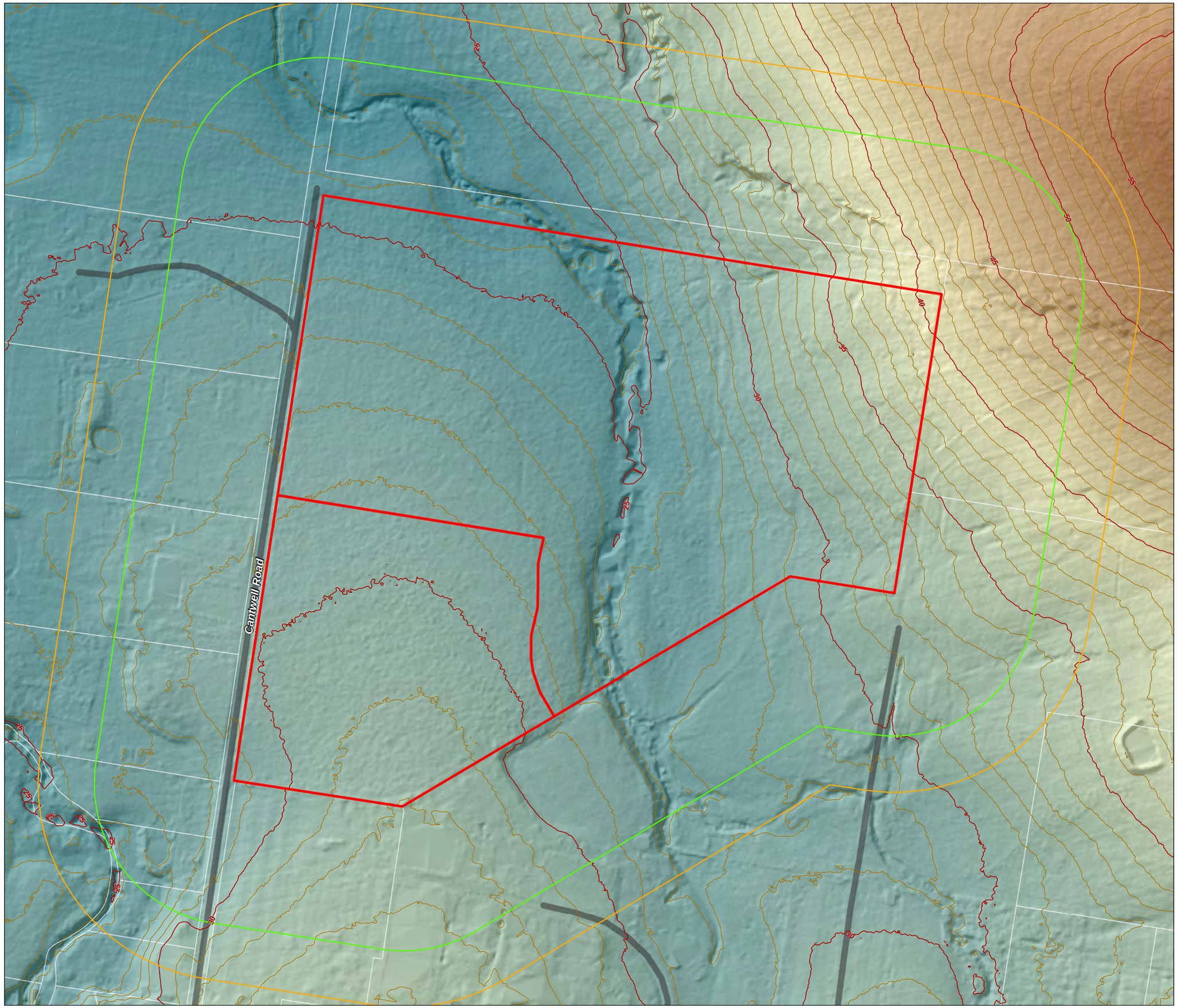
Job No: 23100

Figure 10

Digital Elevation Model



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- Subject Site
- 140m Buffer
- 100m Buffer
- Contour (5m)
- Contour (1m)

Elevation (AHD)

High : 60m

Low : 21m

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2024
Surface analysis based on CESSNOCK 1 metre Resolution LiDAR © Department Finance, Services and Innovation 2012

N W E S

0 25 50 75 100 125
Meters

A3 Scale: 1:2,500

File:23100-Lochinvar-Fig4-DEM-241113 Date: 13/11/2024

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Figure 11

Slope Analysis: LiDAR

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Subject site
140m buffer
100m buffer

Slope

0° - 5°
5° - 10°
10° - 15°
15° - 20°
>20°

Cantwell Road

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2024
Surface analysis based on CESSNOCK 1 metre Resolution LiDAR © Department Finance, Services and Innovation 2012
Aerial photo: Nearmap 26/02/2024

N
W E
S

0 25 50 75 100 125
Meters

A3 Scale: 1:2,500

File:23100-Lochinvar-Fig5-SlopeLiDAR-241113 Date: 13/11/2024

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3.3. Slope & Vegetation Assessment Results

All vegetation identified within the current Bush Fire Prone Land map was confirmed during the site inspection.

The majority of the development site and the surrounding land has historically been actively grazed and comprises a mixture of exotic and native pasture grasses.

There is an ecotone of vegetation confined to the riparian corridor which runs through the middle of the site. As part of the proposed development, a Facilitated Regeneration Approach will be undertaken within the existing degraded riparian corridor. A Biodiversity Management Plan (BMP) prepared by AEP Environmental Consulting identified the remaining vegetation within the riparian corridor as PCT 4023 *Coastal Valleys Riparian Forest*. The BMP has segregated the riparian corridor into four (4) separate management zones. Although the objective of each zone is to regenerate the vegetation to the same vegetation type (PCT 4023), each zone will be treated independently, resulting in various densities and structural compositions. The equivalent Keith vegetation classification is a *Coastal Floodplain Wetland*; being a type of *forested wetland*.

The two proposed detention basins located in the north-west and south-east corners of the site will be revegetated as a *freshwater wetland* and assessed accordingly.

Whilst vegetation to the north, south-east and south-west is actively grazed, there is no assurance that it will be reliably maintained <100mm at all times as required by PBP 2019. Similarly, the vegetation's worst-case potential must be considered therefore the purpose of this assessment vegetation to the north, south-east and south-west are assessed as a *grassland*.

Additionally, whilst there is a proposed residential subdivision on the adjoining lot to the east, this is currently under assessment (DA/2023/415) and until approved, this land is also assessed as a *grassland*.

To the south of the site, the riparian corridor identified as *forested wetland* vegetation extends from within the site and runs parallel to St Joesph's College Diocese of Maitland/Newcastle school, a Special Fire Protection Purpose (SFPP) building. Additionally, a second riparian corridor identified also as *forested wetland* vegetation exists south-west of the site, separated by Cantwell Road.

Within and beyond 140m west of the site, multiple rural residential properties (managed land) exist. Managed land is not required to be considered for the purposes of PBP 2019.

The results of hazard assessment are detailed in **Table 3** and shown in **Figure 12**.

Table 2: Vegetation Communities and Corresponding Structural Formations and Fuel Loads

Plant Community Type (PCT) To be regenerated	Vegetation Classification (Keith 2004)	Structural formation (Keith 2004)	Structural formation (PBP 2019)	Overall fuel load Tonnes/ha
PCT 4023 Coastal Valleys Riparian Forest	Coastal Floodplain Wetlands	Forested Wetlands	Forested Wetlands	15.1
	Grassland	Grassland	Grassland	6.0
	Coastal Freshwater Lagoon	Freshwater Wetlands	Freshwater Wetlands	4.4

Table 3: Slope and Vegetation Assessment Results

Transect	Vegetation Description	Vegetation Classification (PBP 2019)	Slope
T1 North	Actively grazed land assessed as grassland vegetation located to the north	*Grassland*	-0.7° Upslope
T2 North	Actively grazed land assessed as grassland vegetation located to the north	*Grassland*	0.7° Downslope
T3 North	Actively grazed land assessed as grassland vegetation located to the north-east beyond the temporary APZ	*Grassland*	-5.1° Upslope
T4 East	Future development (subject to approval) therefore assessed as grassland vegetation located to the east beyond the temporary APZ	*Grassland*	Flat
T5 South	Actively grazed land assessed as grassland vegetation located to the south	*Grassland*	0.7° Downslope
T6 South	Narrow riparian corridor continued south external to the site	*Forested Wetland* (Eastern Riverine Forest)	0.2° Downslope
T7 South	Actively grazed land assessed as grassland vegetation located to the south	*Grassland*	-1.1° Upslope
T8 South-west	Grassland transitioning to forested wetland vegetation west of the site and separated by Cantwell Road	*Grassland*	1.6° Downslope
T9 West	Actively grazed land assessed as grassland vegetation located to the west of the site and separated by Cantwell Road	*Grassland*	1.8° Downslope
T10 West	Existing rural residential dwellings	Excluded (Managed Land)	0.7° Downslope
T11 West	Existing Cantwell Road	Excluded (Road)	Flat
T12 On-site	Narrow riparian corridor running through the site and identified as the primary bushfire hazard	*Forested Wetland* (Coastal Floodplain Wetlands)	-1.0° Upslope
T13 North-west	Actively grazed land assessed as grassland vegetation located to the north-west and separated by Cantwell Road	*Grassland*	1.1° Downslope
T14 On-site	North-western corner of the site from the proposed perimeter road to the site's northern boundary	*Grassland*	1.5° Downslope
T15 On-site	Proposed detention basin located in the north-western corner of the site	*Freshwater Wetland* (Coastal Freshwater Lagoon)	1.8° Downslope
T16 On-site	Land / vegetation between the riparian corridor and the proposed road	*Forested Wetland* (Coastal Floodplain Wetlands)	3.1° Downslope

Transect	Vegetation Description	Vegetation Classification (PBP 2019)	Slope
T17 On-site	Land / vegetation between the riparian corridor and the proposed road	*Forested Wetland* (Coastal Floodplain Wetlands)	4.2° Downslope
T18 On-site	Land / vegetation between the riparian corridor and the proposed road	*Forested Wetland* (Coastal Floodplain Wetlands)	2.0° Downslope
T19 On-site	Land / vegetation between the riparian corridor and the proposed road	*Forested Wetland* (Coastal Floodplain Wetlands)	3.1° Downslope
MZ1	Aquatic Reconstruction Zone	*Forested Wetland* (Coastal Floodplain Wetlands)	2.0° Downslope
MZ2	PCT 4023 – Flood Reconstruction Batter	*Forested Wetland* (Coastal Floodplain Wetlands)	<4.2° Downslope
MZ3	PCT 4023 – Riparian Reconstruction - Forest	*Forested Wetland* (Coastal Floodplain Wetlands)	<4.2° Downslope
MZ4	PCT 4023 – Riparian Reconstruction - Woodland	*Forested Wetland* (Coastal Floodplain Wetlands)	<4.2° Downslope

Project: 23100 Lochinvar - Diocese
Job No: 23100

Figure 12

Slope & Vegetation Assessment

BUSHFIRE PLANNING AUSTRALIA

- Subject site
- 140m buffer
- 100m buffer
- 1.8m high radiant heat shield
- 10m VRZ
- 20m VRZ
- Channel TOB
- Contour (5m)
- Contour (1m)
- RL
- Downslope transect
- Upslope transect

Vegetation Class

- Grassland
- Grassland basin
- Freshwater Wetland (Coastal Freshwater Wetland)
- Coastal Floodplain Wetlands
- Forested Wetland (Coastal Floodplain Wetland)
- Forested Wetlands (Eastern Riverine Forest)
- Woodland (Coastal Valley Grassy Woodland)
- Hunter - Macleay Dry Sclerophyll Forests
- SFPP (School)
- Managed land

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2024
Aerial photo: NearMap 26/02/2023
Vegetation: Bushfire Planning Australia 2024
Surface analysis based on CESSNOCK 1 metre Resolution LiDAR © Department Finance, Services and Innovation 2012

N W E S

0 25 50 75 100 125
Meters

A3 Scale: 1:2,500

File:23100-Lochinvar-Fig6-SlopeVeg-250119 Date: 19/01/2025

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3.4. Significant Environmental Features

There are no known environmental features of significance within the development footprint or the balance of the site. The recommended bushfire protection measures have been designed to minimise any impacts on any identified significant environmental features.

As Council have instructed the Proponent to prepare a Biodiversity Management Plan detailing the rehabilitation of the riparian corridor, the bushfire assessment has assessed the bushfire hazard based on the BMP prepared by AEP Environmental Consulting.

3.5. Threatened Species, populations or ecological communities

The area of the site to be affected by the proposed development has been identified to minimise impact on any threatened species, population or EEC. All bushfire mitigation measures; including APZs have considered the existing and potential biodiversity values to minimise impact where possible.

3.6. Aboriginal Objects

A search of the AHIMS database (results contained in **Appendix B**) revealed there are no Aboriginal sites or places recorded near the site. All bushfire mitigation measures, such as APZs have considered this and been designed to minimise disturbing any artefacts if identified.

4. Bushfire Risk and Mitigation

4.1. Asset Protection Zones

An Asset Protection Zone (APZ) is an area surrounding a development that is managed to reduce the bushfire hazard to an acceptable level to mitigate the risk to life and property. The required width of the APZ varies with slope and the type of hazard. An APZ can consist of both an inner protection area (IPA) and an outer protection area (OPA).

4.1.1. Determining the Appropriate Setbacks

To achieve compliance with the performance criteria for APZs (Table 7.4a), the Acceptable Solutions outlined in Table A1.12.3 of PBP 2019 may be adopted as a deemed-to-satisify solution.

The final vegetation formations identified by the AEP BMP for each of the management zones (T16-T19) have been adopted to calculate the required APZs.

Alternatively, the appropriate APZ setback may be determined to achieve the Performance Criteria by adopting a performance-based solution. Based on the unique site characteristics identified by the BAR, the intensity of a bushfire event presented as the radiant heat exposure was calculated at several locations throughout the development site using the NBC Bushfire Attack Assessor V4.1. The nominated fuel loads for the respective vegetation classifications as published by the RFS in March 2019 have been used to determine the APZs and the effective slope obtained from the Digital Elevation Model (DEM) for each transect.

As the site lies within the Maitland City Council LGA, it is assessed under a FDI rating of 100. The Detailed Method (Method 2) outlined in Australian Standard *AS3959-2018 Construction of buildings in bushfire prone areas* was used to calculate the potential level of radiant heat flux generated at the nominated locations (see transects T1-T19). To ensure the APZs achieve the intent of Section 5.3 of PBP 2019, the APZs have been determined to ensure all lots are able to accomomodate a dwelling that will not be exposed to radiant heat levels exceeding 29kW/m^2.

The NBC Bushfire Attack Assessor report detailing the inputs used is contained in **Appendix D**.

Refer to **Table 4** and **Figure 13** for the recommended APZs

Table 4: Required and Recommended Asset Protection Zones

Transect	Vegetation Classification (PBP 2019)	Slope Class	PBP 2019 Table A1.12.2	APZ (<29kW/m²)
T1 – T5 North	*Grassland*	Upslope/ Flat	10m	10m
T6 South	*Forested Wetland* (Eastern Riverine Forest)	Flat* (0.2° Downslope)	10m	10m
T7 South	*Grassland*	-1.1° Upslope	10m	10m
T8 South-west	*Grassland*	1.6° Downslope	12m	12m
T9 West	*Grassland*	1.8° Downslope	12m	12m
T10 West	Excluded (Managed Land)	Flat* (0.7° Downslope)	N/A	N/A
T11 West	Excluded (Road)	Flat	N/A	N/A
T12 On-site	*Forested Wetland* (Coastal Floodplain Wetlands)	-1.0° Upslope	5m	5m
T13 North-west	*Grassland*	1.1° Downslope	12m	12m
T14 On-site	*Grassland*	1.5° Downslope	12m	12m
T15 On-site	*Freshwater Wetland* (Coastal Freshwater Lagoon)	Flat[1]	5m	5m
T16 On-site	*Forested Wetland* (Coastal Floodplain Wetlands)	>0.0° - <5.0° (3.1°) Downslope	12m	12m
T17 On-site	*Forested Wetland* (Coastal Floodplain Wetlands)	>0.0° - <5.0° (4.2°) Downslope	12m	12m
T18 On-site	*Forested Wetland* (Coastal Floodplain Wetlands)	>0.0° - <5.0° (2.0°) Downslope	12m	12m
T19 On-site	*Forested Wetland* (Coastal Floodplain Wetlands)	>0.0° - <5.0° (3.1°) Downslope	12m	12m

* All slopes less than 1 degree are considered insignificant and therefore assessed as 'flat'.
[1] The proposed detention basin is revegetated freshwater wetland with an effective 'flat' slope.

4.2. Landscaping and Vegetation Management

In APZs and IPAs, the design and management of the landscaped areas in the vicinity of buildings have the potential to improve the chances of survival of people and buildings. Reduction of fuel does not require the removal of all vegetation. Trees and plants can provide some bushfire protection from strong winds, intense heat and flying embers (by filtering embers) and changing wind patterns.

Generally landscaping in and around a bushfire hazard should consider the following:

- Priority given to retaining species that have a low flammability;
- Priority given to retaining species which do not drop much litter in the bushfire season and which do not drop litter that persists as ground fuel in the bush fire season;
- Priority given to retaining smooth barked species over stringy bark; and
- Create discontinuous or gaps in the vegetation to slow down or break the progress of fire towards the dwellings.

Landscaping within APZs and IPAs should give due regard to fire retardant plants and ensure that fuel loads do not accumulate as a result of the selected plant varieties.

The principles of landscaping for bushfire protection aim to:

- Prevent flame impingement on dwellings;
- Provide a defendable space for property protection;
- Reduce fire spread;
- Deflect and filter embers;
- Provide shelter from radiant heat; and
- Reduce wind speed.

Avoiding understorey planting and regular trimming of the lower limbs of trees also assists in reducing fire penetration into the canopy. Rainforests species such as Syzygium and figs are preferred to species with high fine fuel and/or oil content. Trees with loose, fibrous or stringy bark should be avoided. These trees can easily ignite and encourage ground fire to spread up to, and then through the crown of trees.

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

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

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

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

4.3. Access

In the unlikely event of a serious bushfire, it will be essential to ensure that adequate ingress / egress and the provision of defendable space are afforded in the subdivision layout. All dwellings must have direct access to a public road. Section 5.3.2 of PBP 2019 requires a development to provide safe operational access to structures and water supply for emergency services while residents are seeking to evacuate.

Immediately noting all aspects of the development are exposed to a very low risk threat of bushfire; namely either a *grassland* (upslope) or from the regenerated riparian corridor (*forested wetland*) the bushfire hazard within and surrounding the development is classified as low; which significantly reduces the risk to evacuation and emergency access. The minimal significant bushfire prone vegetation has a reduced likelihood of fire impact and any bushfire that does ignite would be unlikely to support intense fire behaviour.

Refer to **Figure 14** and **Appendix A** for the development plans indicating the proposed access arrangements. Primary access will be provided from Cantwell Road with two (2) additional access points from the adjoining development to the east of the site (currently under assessment). A secondary emergency egress is provided from the northern end of Road 2 into Cantwell Road.

All new perimeter roads and non-perimeter roads are designed in accordance with Maitland City Council development control plan and engineering specifications.

The proposed perimeter and collector roads and the proposed 8m wide internal local streets (non-perimeter roads) are considered sufficiently wide enough to accommodate parking for light vehicles on both sides of road, outside of the primary vehicle carriageway. It is noted the standard for on-street parking required by Australian Standard *AS2890.5:2020 Parking facilities On-street parking* for roads with a speed limit of 50km/hr or less is to be between 2.0m and 2.3m. It is also noted that a RFS Category 1 Firefighting vehicle is 2.4m wide. Furthermore, applying the option of permitting short constrictions where the width of the access road may be reduced for sections less than 30m, an 8m wide road is considered wide enough to provide a continuous unobstructed carriageway with parking on both sides of the road. The combination of double width driveways along a typical residential local street will prevent a continuous line of parked cars on both sides of the local street.

In summary, it is considered the proposed road network provides safe, all-weather two-way through roads and safe operational access for emergency service personnel and evacuation purposes; complying with the relevant provisions contained in Section 5.3.2 of PBP.

4.4. Services - water, electricity and gas

4.4.1. Water

Fire hydrant spacing, sizing and pressure should comply with AS 2419.1:2005. Hydrants are not to be located within any road carriageway.

All sites within the proposed development will be connected to the internal reticulated water supply.

4.4.2. Electricity

All electricity services will be located underground.

4.4.3. Gas

Any reticulated or bottled gas should be installed and maintained according to the requirements of the relevant authorities and AS 1596:2014. It is expected that the location of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.

4.5. Construction Standards: Bushfire Attack Level

All buildings must satisfy the Performance Requirements of the National Construction Code: Building Code of Australia (BCA). Part 2.3 of Volume 2 of the BCA applies to dwellings located within designated bushfire areas, which are defined as:

> *Land which has been designated under a power in legislation as being subject, or likely to be subject to, bushfires.*

Accordingly, all forthcoming habitable buildings must satisfy the requirements of Part 3.7.4 of the BCA. The *Deemed-to-Satisfy* (DTS) provision of the BCA can only be achieved if dwellings in bushfire prone areas are constructed in accordance with Australian Standard *AS3959-2018 Construction of buildings in bushfire prone areas*. Alternatively, the DTS provisions can also be achieved if the habitable building is constructed in accordance with the NASH Standard 'Steel Framed Construction in Bushfire Areas'.

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.

The determinations of the appropriate bushfire attack level (BAL) is based on the maximum potential radiant heat exposure (**Figure 14**). BALs 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 BAL is derived by assessing the:

- Relevant FDI = *100*;
- Flame temperature = *1090K*;
- Slope = *varied*;
- Vegetation classification = *Woodland, Forested Wetland, Freshwater Wetland* and *Grassland*; and
- Building location.

Due to the provision of perimeter roads around the entire development, no future dwellings constructed on any lot will be exposed to radiant heat levels exceeding 29kW/m^2.

To demonstrate the BAL ratings for each transect, **Table 5** and **Figure 14** has been prepared in accordance with the methodology outlined in the RFS User Guide for Subdivision of Urban Release Areas on Bush Fire Prone land to represent the BALs required.

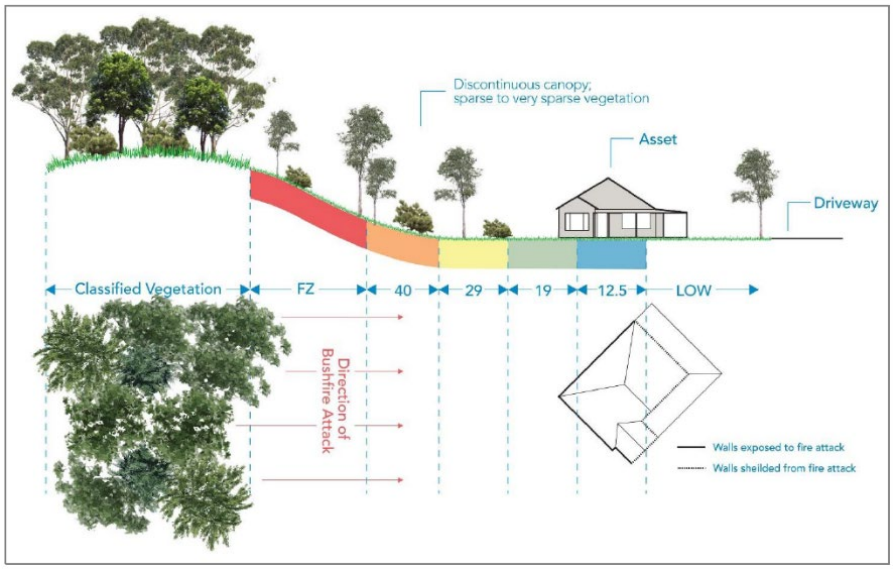

Figure 13: Bushfire Attack Level

Table 5: Required Bushfire Attack Levels (BALs)

Transect	Vegetation Classification (PBP 2019)	Slope	APZ (<29kW/m²)	Distance from Hazard	Bushfire Attack Level (BAL)
T1-T5 & T7	*Grassland*	Flat or Upslope	10m	0m-<8m	BAL-FZ
				8m-<10m	BAL-40
				10m-<15m	BAL-29
				15m-<22m	BAL-19
				22m-<50m	BAL-12.5
T8, T9, T13 & T14	*Grassland*	>0.0° - <5.0° Downslope	12m	0m-<9m	BAL-FZ
				9m-<12m	BAL-40
				12m-<17m	BAL-29
				17m-<25m	BAL-19
				25m-<50m	BAL-12.5
T15	*Freshwater Wetland* (Coastal Freshwater Lagoon)	Flat[1] (1.8° Downslope)	5m	0m-<4m	BAL-FZ
				4m-<5m	BAL-40
				5m-<7m	BAL-29
				7m-<11m	BAL-19
				11m-<100m	BAL-12.5
T6	*Forested Wetland* (Eastern Riverine Forest)	Flat* (0.2° Downslope)	10m	0m-<7m	BAL-FZ
				7m-<10m	BAL-40
				10m-<14m	BAL-29
				14m-<21m	BAL-19
				21m-<100m	BAL-12.5
T12	*Freshwater Wetland* (Coastal Freshwater Lagoon)	Upslope	5m	0m-<4m	BAL-FZ
				4m-<5m	BAL-40
				5m-<7m	BAL-29
				7m-<11m	BAL-19
				11m-<100m	BAL-12.5
T16, 17, T18 & T19	*Forested Wetland* (Coastal Floodplain Wetlands)	>0.0° - <5.0° Downslope	12m	0m-<9m	BAL-FZ
				9m-<12m	BAL-40
				12m-<18m	BAL-29
				18m-<23m	BAL-19
				23m-<100m	BAL-12.5
T10 & T11	*Excluded* (Managed Land & Road)	Flat	N/A	N/A	BAL-LOW

* All slopes less than 1 degree are considered insignificant and therefore assessed as 'flat'.
[1] The proposed detention basin is revegetated grassland with an effective 'flat' slope.

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Job No: 23100

Figure 14

Subdivision BAL Plan

BUSHFIRE PLANNING AUSTRALIA

- Subject site
- 140m buffer
- 100m buffer
- 10m VRZ
- 20m VRZ
- Channel TOB
- Asset Protection Zone

Required Bushfire Attack Levels (PBP 2019 Table A1.12.5)

- BAL - FZ
- BAL - 40
- BAL - 29
- BAL - 19
- BAL - 12.5

Vegetation Class

- Grassland
- Freshwater Wetlands
- Forested Wetlands (Coastal Floodplain Wetland)
- Forested Wetlands (Coastal Floodplain Wetland)
- Coastal Floodplain Wetlands
- Forested Wetland (Coastal Floodplain Wetland)
- Forested Wetlands (Eastern Riverine Forest)
- Hunter - Macleay Dry Sclerophyll Forests
- SFPP (School)
- Managed land

SOURCE:
Cadastral Boundary: NSW Department of Finance, Services and Innovation 2024
Aerial photo: NearMap 26/02/2023

N W E S

0 25 50 75 100 125
Meters

A3 Scale: 1:2,500

File:23100-Lochinvar-Fig9-BALs-250131 Date: 31/01/2025

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4.6. Emergency Services

There is a NSW Fire & Rescue Station located at 2 Mustang Drive, Rutherford, approximately 6.5km or 9 minutes drive away from the site (**Figure 15**). This station would likely be first responders with support from a second Fire & Rescue Station located at 2 Drinan Street, Branxton (13.7kms) if required (**Figure 16**).

Figure 15: NSW Fire & Rescue - Rutherford

Figure 16: NSW Fire & Rescue - Branxton Greta

5. Conclusion and Recommendations

Bushfire Planning Australia has undertaken a Bushfire Assessment Report for the proposed residential subdivision located at 20 & 20A Cantwell Road, Lochinvar.

The proposed staged subdivision will create 138 residential lots, 2 detention basins and ancillary services including roads and pathways. The subdivision will be constructed across three stages.

This BAR found that the site is currently exposed to a low bushfire hazard contained to the revegetated riparian corridor through the middle of the site which is a *forested wetland* (Coastal Floodplain Wetland) vegetation formation.

In summary, the following key recommendations have been designed to enable the proposed residential development to achieve the aims and objectives of PBP 2019:

Asset Protection Zones

1. All land within the site zoned R1 Residential; excluding the riparian corridors shall be managed as an Inner Protection Area (IPA) as outlined within Appendix 4 of PBP 2019 and the RFS document Standards for asset protection zones;

Access - Internal Roads

2. Perimeter roads comply with the following general requirements of Table 5.3b of PBP 2019 and the following:
    a. 8m wide road width measured kerb to kerb;
    b. Hydrants are located clear of parking areas;
    c. Curves of roads have a minimum inner radius of 6m;
    d. The road crossfall does not exceed 3 degrees; and
    e. A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches is provided.
3. Non-perimeter roads located shall comply with the following general requirements of Table 5.3b of PBP 2019:
    f. 5.5m wide road width measured kerb to kerb;
    g. Hydrants are located clear of parking areas;
    h. Curves of roads have a minimum inner radius of 6m;
    i. The road crossfall does not exceed 3 degrees; and
    j. A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches is provided.
4. Any temporary turning heads shall be constructed in accordance Appendix A3.3 of PBP 2019;
5. Vegetation within road verges (including swales) to be consistent with a grassland vegetation classification with tree canopy less than 10% at maturity;

Construction Standards

6. All future dwellings to be constructed on the proposed lots shall have due regard to the specific considerations given in the National Construction Code: Building Code of Australia (BCA) which makes specific reference to Australian Standard AS3959-2018 Construction of buildings in bushfire prone areas (AS3959-2018) and the NASH Standard Steel Framed Construction in Bushfire Prone Areas;
7. Vegetation with the stormwater basins; including associated batters shall be planted consistent with a grassland vegetation classification with tree canopy less than 10% at maturity;

Water and Utility Services

8. All new lots are to be connected to a reliable water supply network and that suitable fire hydrants are located throughout the development site that are clearly marked and provided for the purposes of bushfire protection. Fire hydrant spacing, sizing and pressure shall comply with AS2419.1 2005 and section 5.3.3 of PBP 2019; and

Landscaping

9. Consideration should be given to landscaping and fuel loads on site to decrease potential fire hazards on site. All landscaping shall be in accordance with Appendix 4 of PBP 2019.

Emergency and Evacuation Planning

10. A Bushfire Emergency Management and Evacuation Plan (BEMEP) shall be prepared that is consistent with the RFS Guidelines 'Development Planning – A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan December 2014'.

This assessment has been made based on the bushfire hazards observed in and around the site at the time of inspection and production and demonstrates the development has satisfied the aims and objectives of Planning for Bushfire Protection 2019.

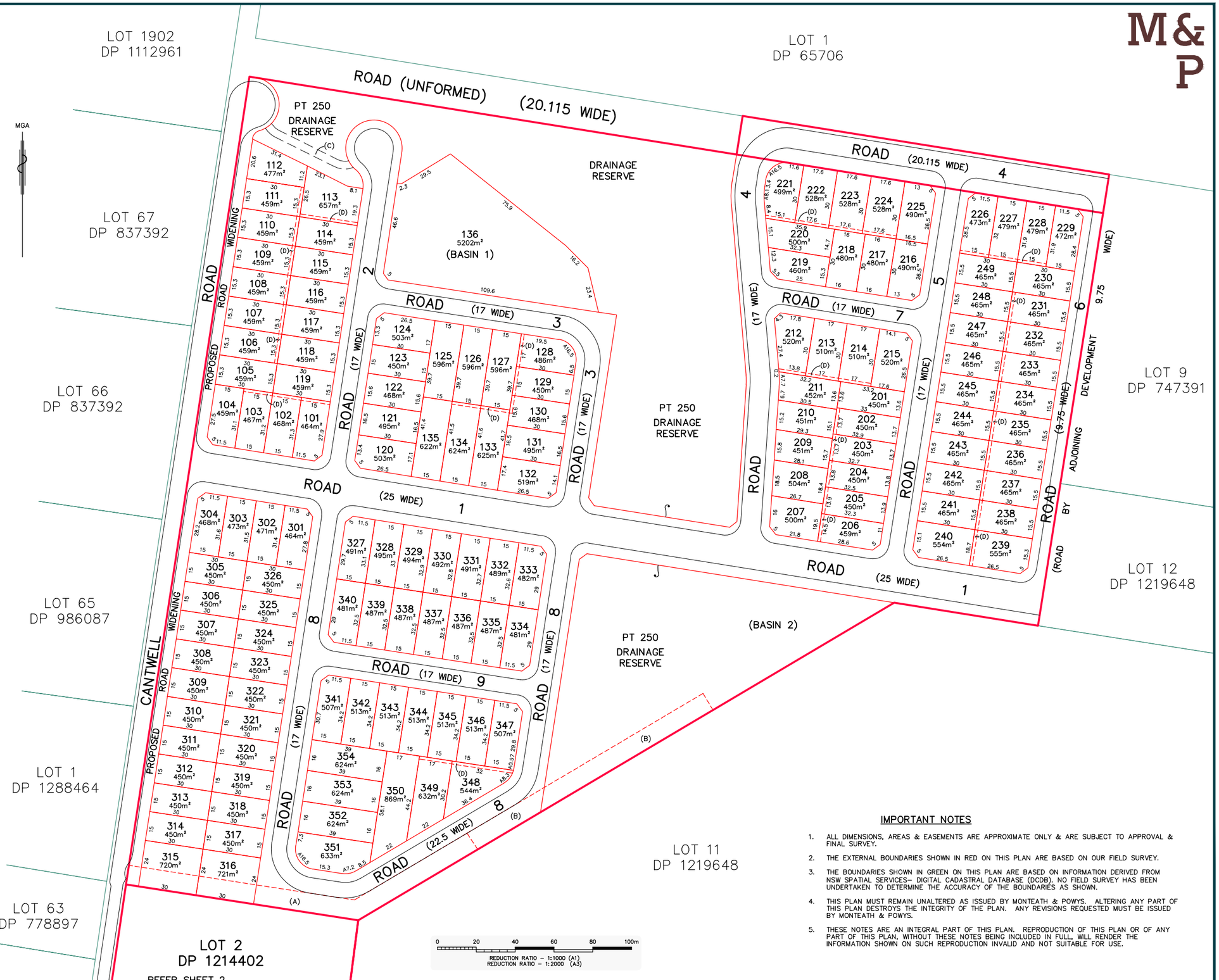
Finally, should the above recommendations be implemented, the existing bushfire risk should be suitably mitigated to offer an acceptable level of protection to life and property for those persons and assets occupying the site, but they do not and cannot guarantee that the area will not be affected by bushfire at some time and that property and life damage/loss will not occur.

6. References

- Keith (2004). Ocean Shores to Desert Dunes – The Native Vegetation of New South Wales and the ACT.
- NSW Rural Fire Service (2005). *Standards for Asset Protection Zones*. NSW Rural Fire Service.
- NSW Rural Fire Service (2019). 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: Plan of Proposed Residential Subdivision

STAGE No.	No. RESIDENTIAL LOTS PROPOSED
1	35
2	49
3	54
TOTAL	138



EXISTING EASEMENTS

(A) – EASEMENT FOR WATER SUPPLY AND SEWERAGE PIPELINES 10 WIDE (AH31420, DP 1137872)
(B) – EASEMENT FOR PIPELINE 10 WIDE (AH908180, DP 1238395)
(C) – PROPOSED EASEMENT FOR BUSH FIRE TRAIL 4 WIDE
(D) – PROPOSED EASEMENT FOR DRAINAGE OF WATER 1.5 WIDE

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1. ALL DIMENSIONS, AREAS & EASEMENTS ARE APPROXIMATE ONLY & ARE SUBJECT TO APPROVAL & FINAL SURVEY.
2. THE EXTERNAL BOUNDARIES SHOWN IN RED ON THIS PLAN ARE BASED ON OUR FIELD SURVEY.
3. THE BOUNDARIES SHOWN IN GREEN ON THIS PLAN ARE BASED ON INFORMATION DERIVED FROM NSW SPATIAL SERVICES– DIGITAL CADASTRAL DATABASE (DCDB). NO FIELD SURVEY HAS BEEN UNDERTAKEN TO DETERMINE THE ACCURACY OF THE BOUNDARIES AS SHOWN.
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REVISIONS

No	REVISION	SVY	DFT	CHK	DATE
5	INTERALLOTMENT DRAINAGE EASEMENTS ADDED	DCW	MAK	MP	31/01/25
4	SECOND SHEET ADDED	DCW	MAK	MP	23/01/25
3	ROAD WIDENING CADASTRE ADDED	DCW	MAK	CB	09/01/25
2	UPDATE TO ROAD NUMBERING	DCW	MAK	CB	16/10/24
1	ISSUE TO CLIENT	DCW	MAK	CB	09/09/24

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Surveyed	Drafted	Checked
DCW	MAK	CB

REGISTERED SURVEYOR
@A1 : 1'-0" = 1'-0"
@A3 : 1:2000
DO NOT SCALE

Original Size: A1

Client: CATHOLIC DIOCESE

Title: PROPOSED SUBDIVISION OF LOTS 1 & 2 DP1299958 AND LOT 2 DP 1214402 CANTWELL ROAD, LOCHINVAR

CAD File: A220064C_05 | Ref No: 22/0064 | Date: 09/09/2024

Sheet No. 1/2

Revision 5

DIAGRAM
SCALE – 1:200

REVISIONS							
5	INTERALLOTMENT DRAINAGE EASEMENTS ADDED	DCW	MAK	MP	31/01/25	COPYRIGHT NOTICE THIS DOCUMENT REMAINS THE PROPERTY OF MONTEATH & POWYS PTY LTD. ©
4	SECOND SHEET ADDED	DCW	MAK	MP	23/01/25	
3	ROAD WIDENING CADASTRE ADDED	DCW	MAK	CB	09/01/25	CONDITIONS OF USE. THIS DOCUMENT MAY ONLY BE USED BY THE CLIENT FOR THE PURPOSE FOR WHICH IT WAS COMMISSIONED. USE OF THE DOCUMENT FOR ANY OTHER PURPOSE IS NOT PERMITTED UNLESS PRIOR WRITTEN APPROVAL HAS BEEN OBTAINED FROM MONTEATH & POWYS PTY LTD.
2	UPDATE TO ROAD NUMBERING	DCW	MAK	CB	16/10/24	
1	ISSUE TO CLIENT	DCW	MAK	CB	09/09/24	
No	REVISION	SVY	DFT	CHK	DATE	

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NEWCASTLE SYDNEY GUNNEDAH MUSWELLBROOK

Surveyed	Drafted	Checked	Client	Sheet No.
DCW	MAK	CB	CATHOLIC DIOCESE	2/2
REGISTERED SURVEYOR			Title	Revision
@A1 : 1:500 @A3 : 1:1000		Original Size	PROPOSED SUBDIVISION OF LOTS 1 & 2 DP1299958 AND LOT 2 DP 1214402 CANTWELL ROAD, LOCHINVAR	5
DO NOT SCALE		A1	CAD File: A220064C_05	Ref No: 22/0064	Date: 09/09/2024

Appendix B: AHIMS Search Results

AHIMS Web Services (AWS)
Search Result

Your Ref/PO Number : 23100 Lochivar

Client Service ID : 949564

Katrina Greville

21 Costata Crescent
Adamstown New South Wales 2289

Attention: Katrina Greville

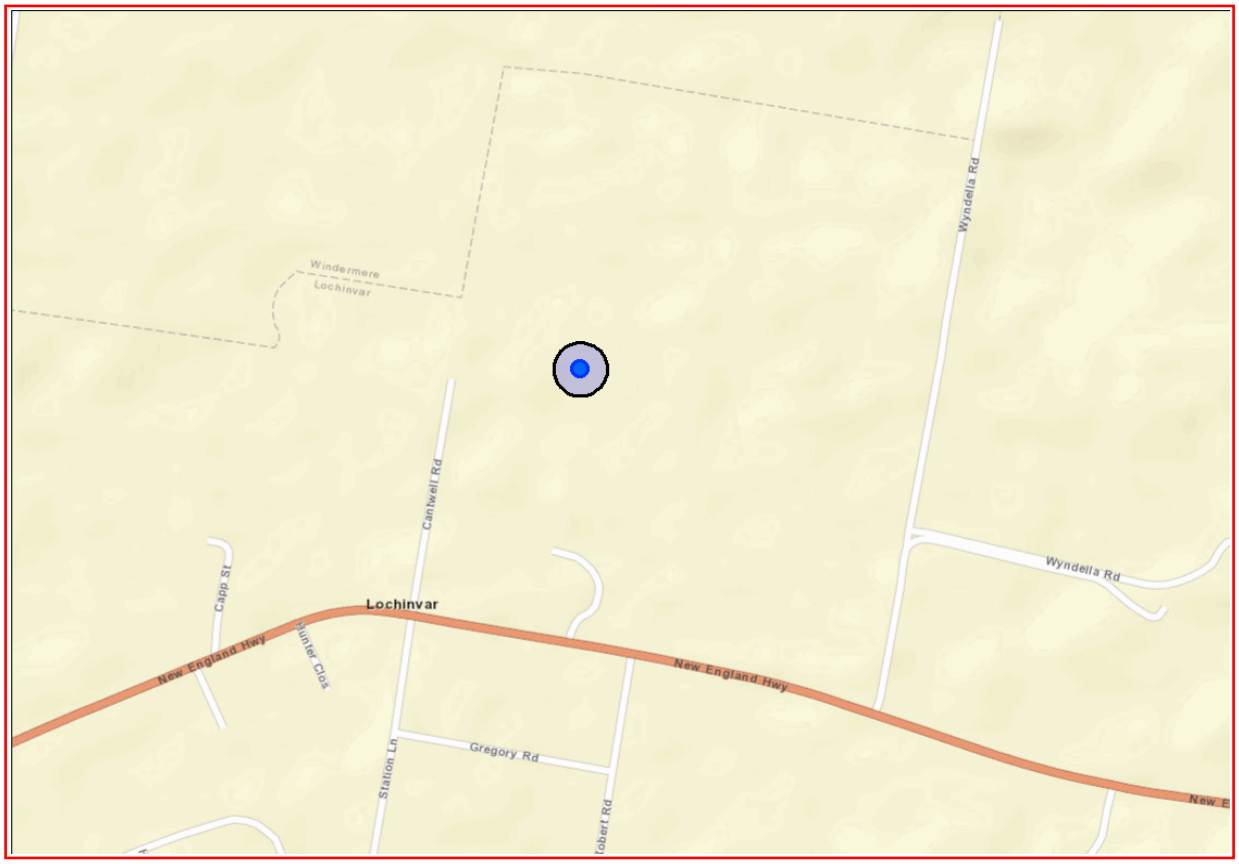
Email: klmukevski@bigpond.com

Date: 12 November 2024

Dear Sir or Madam:

AHIMS Web Service search for the following area at Address : 20A CANTWELL ROAD LOCHINVAR 2321 with a Buffer of 50 meters, conducted by Katrina Greville on 12 November 2024.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	**Aboriginal sites are recorded in or near the above location.**
0	**Aboriginal places have been declared in or near the above location. ***

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Heritage NSW and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

Level 6, 10 Valentine Ave, Parramatta 2150
Locked Bag 5020 Parramatta NSW 2124
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Appendix C: Planning for Bushfire Protection 2019 Compliance Table

Table 1: Aims and Objectives of Planning for Bushfire Protection 2019

Objectives	Satisfied	Comment
➢ Afford buildings and their occupants protection from exposure to a bush fire	✓	All future lots within the proposed development provide sufficient separation from the nearest bushfire hazard by use of adequate APZs, and public perimeter roads and ensure adequate water supplies are available for firefighting purposes.
➢ Provide for a defendable space to be located around buildings	✓	Defendable space by way of an APZ is provided between all new lots and the bushfire hazard to ensure radiant heat levels are below critical limits (29kW/m^2).
➢ Provide appropriate separation between a hazard and buildings, which, in combination with other measures, prevent the likely fire spread to buildings	✓	APZs are provided between the new lots and the hazard, which in addition to other mitigation measures such as suitable construction, provide an acceptable level of protection to the buildings, and prevent the spread of fire to the buildings and onto adjoining buildings.
➢ Ensure that safe operational access and egress for emergency service personnel and residents is available	✓	The proposed extension of the existing Cantwell Road will provide primary and secondary access to the proposed development. Additional access to the east will be provided through the adjoining subdivision (currently under assessment). A new internal road network will also provide direct access to each lot.
➢ Provide for ongoing management and maintenance of BPMs	✓	All owners will be responsible for the management and maintenance of the private property.
➢ Ensure that utility services are adequate to meet the needs of firefighters	✓	The development will provide all essential utility services to meet the needs of firefighters, including a reliable water supply.

Table 2: Performance Criteria and Acceptable Solutions for Residential Subdivisions (Chapter 5 PBP 2019)

PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	COMPLIES	COMMENT
✓ - **Acceptable Solution** **AS - Alternative Solution**			
5.3.1 APZs **Table 5.3a** **Intent of Measure:** *To provide sufficient space and maintain reduced fuel loads, so as to ensure radiant heat levels at buildings are below critical limits and to prevent direct flame contact with a building.*			
ASSET PROTECTION ZONES	Potential building footprints must not be exposed to radiant heat levels exceeding 29kW/m^2 on each proposed lot.	APZs are provided in accordance with Tables A1.12.2 and A1.12.3 based on the FFDI.	✓	All new lots are able to accommodate a building envelope that ensures future dwellings are exposed to BAL-29 or less; thereby ensuring no dwellings are exposed to radiant heat levels greater than 29kW/m^2. The APZs were calculated using a combination of the Acceptable Solutions (Table A1.2.2) and Method 2 (AS39590-2018) to demonstrate the minimum required APZ.
	APZs are managed and maintained to prevent the spread of a fire towards the building.	The APZ is managed in accordance with the requirements of Appendix 4	✓	All new landowners will be required to manage their respective lot as an IPA.
	The APZ is provided in perpetuity.	APZs are wholly within the boundaries of the development site.	✓	There are no exceptional circumstances that would require an APZ to be located external to the development site.
	APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is negated.	The APZ is not located on lands with a slope exceeding 18°	✓	The maximum slope of the site is 7.0 ° downslope or less.
LANDSCAPING	Landscaping is designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven embers to cause ignitions.	Landscaping is in accordance with APZ standards (see Appendix 4). Fencing is constructed in accordance with section 7.6.	✓	All new landscaping has considered the requirements of APZs per Appendix 4. All new fencing will be colorbond or similar non-combustible material.

PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	COMPLIES	COMMENT
✓ - Acceptable Solution AS - Alternative Solution			
5.3.2 Access **Table 5.3b** *To provide safe operational access for emergency services personnel in suppressing a bush fire, while residents are accessing or egressing an area.*			
ACCESS (General Requirements)	Fire fighters are provided with safe all-weather access to structures	Property access roads are two-wheel drive, all-weather roads	✓	All new roads are a minimum 8m wide (including non-perimeter roads) and satisfy PBP 2019 and Maitland City Council engineering standards. A minimum of two (2) access routes will be provided to the subdivision following completion of the first stage.
		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.	✓	
		Access roads must provide suitable turning areas in accordance with Appendix 3.	✓	
	The capacity of access roads is adequate for firefighting vehicles.	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.	✓	All new roads are designed in accordance with MCC engineering specifications. The proposed roads will have sufficient load capacity for all firefighting vehicles.
	There is appropriate access to water supply.	Hydrants are located outside of parking reserves and road carriageways to ensure accessibility to reticulated water for fire suppression.	✓	All proposed lots are able to be connected to a reticulated water supply.
		Hydrants are provided in accordance with AS2419.1:2005	✓	
		There is suitable access for Category 1 fire appliance to within 4m of the static water supply where no reticulated supply is available.	✓	

	PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	COMPLIES	COMMENT
✓ - Acceptable Solution AS - Alternative Solution				
PERIMETER ROADS	Perimeter access roads are designed to allow safe access and egress for medium rigid firefighting vehicles while occupants are evacuating as well as providing a safe operational environment for emergency service personnel during firefighting and emergency management on the interface.	There are two-way sealed roads.	✓	The entire development is protected by a perimeter road. All perimeter roads are a minimum 8m and are designed in accordance with the relevant PBP 2019 design requirements. It is recommended the RFS do not impose a condition requiring parking to be provided outside of the carriageway as the proposed development has a combination of 8m -11m wide perimeter roads; compromising a series of parking and passing bays.
		8m carriageway width kerb to kerb.	✓	
		Hydrants are to be located clear of parking areas.	✓	
		There 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° and average grade is 10°.	✓	
		The road crossfall does not exceed 3°.	✓	
		A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches;	✓	
NON-PERIMETER ROADS	Non-perimeter access roads are designed to allow safe access and egress for medium rigid firefighting vehicles while occupants are evacuating.	Minimum 5.5m width kerb to kerb.	✓	All roads; including non-perimeter roads are 8m wide will be constructed in accordance with PBP 2019. It is recommended the RFS do not impose a condition requiring parking to be provided outside of the carriageway as the proposed development has a combination of 8m -10.5m wide perimeter roads. The lower risk bushfire hazard and the multiple evacuation routes result in a reduced risk of obstructions occurring to emergency services accessing the site.
		Parking is provided outside of the carriageway.	✓	
		Hydrants are to be located clear of parking areas.	✓	
		There 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° and average grade is 10°.	✓	
		The road crossfall does not exceed 3°.	✓	
		A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches is provided.	✓	

	PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	COMPLIES	COMMENT
✓ - Acceptable Solution AS - Alternative Solution				
PROPERTY ACCESS	Firefighting vehicles can access the dwelling and exit the property safely.	There are no specific access requirements in an urban area where an unobstructed path (no greater than 70m) is provided between the most distance external part of the proposed dwelling and the nearest part of the public access road.	N/A	
		In circumstances where this cannot occur, the following requirements apply: Minimum 4m carriageway width;	N/A	
		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;	N/A	
		A minimum vertical clearance of 4m to any overhanging obstructions, including tree branches;	N/A	
		Provide a suitable turning area in accordance with Appendix 3;	N/A	
		Curves of roads have a minimum inner radius of 6m;	N/A	
		The road crossfall does not exceed 10°;	N/A	
		The maximum grade road is 15° and average grade is 10°;	N/A	
		A development comprising more than three dwellings has access by dedication of a road and not by right of way.	N/A	

	PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	COMPLIES	COMMENT
✓ - Acceptable Solution AS - Alternative Solution				
5.3.3 Services – Water, electricity and gas **Table 5.3c** *To provide adequate services for water for the protection of buildings during and after the passage of a bushfire, and not to locate gas and electricity so as not to contribute to the risk of fire to a building.*				
WATER	Adequate water supplies is provided for firefighting purposes	Reticulated water is to be provided to the development, where available.	✓	A reticulated water supply is provided.
		A static water supply is provided where no reticulated water is available	N/A	
		Static water supplies shall comply with Table 5.3d	N/A	
	Water supplies are located at regular intervals The water supply is accessible and reliable for firefighting operations	Fire hydrant spacing, design and sizing comply with AS2419.1:2005;	✓	A reticulated water supply is provided.
		Hydrants are not located within any road carriageway;	✓	
		Reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads.	✓	A reticulated water supply is provided.
	Flows and pressures are appropriate	Fire hydrant flows and pressures comply with AS2419.1:2005.	✓	
	The integrity of the water supply is maintained	All above ground water service pipes are metal, including and up to any taps.	✓	
ELECTRICITY	Location of electricity services limits the possibility of ignition of surrounding bushland or the fabric of buildings.	Where practicable, electrical transmission lines are underground.	✓	The proposed new lots will be connected to the existing underground electricity service.
		Where overhead electrical transmission lines are proposed as follows: → lines are installed with short pole spacing (30 metres), 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 accordance with the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines	N/A	

PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS	COMPLIES	COMMENT
✓ - Acceptable Solution AS - Alternative Solution			
GAS	Location of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.	Reticulated or bottled gas is installed and maintained in accordance with AS 1596:2014 and the requirements of relevant authorities, metal piping is to be used.	✓	Any new gas connections will be underground and will be unlikely to create an additional hazard risk to surrounding bushland.
		All fixed gas cylinders are kept clear of all flammable materials to a distance of 10 metres 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.		

Appendix D: NBC Bushfire Attack Assessor Results

NBC Bushfire Attack Assessment Report V4.1

AS3959 (2018) Appendix B - Detailed Method 2

Print Date: 17/01/2025 **Assessment Date:** 17/01/2025

Site Street Address: 23100 20 & 20A Cantwell Road, Lochinvar

Assessor: Stuart Greville; Bushfire Planning Australia

Local Government Area: Maitland **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: T1 to T5 & T7

Vegetation Information

Vegetation Type: Grassland
Vegetation Group: Grassland
Vegetation Slope: 0 Degrees **Vegetation Slope Type:** Level
Surface Fuel Load(t/ha): 6 **Overall Fuel Load(t/ha):** 6
Vegetation Height(m): 0 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):** 10

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:** 130

Program Outputs

Level of Construction: BAL 29 **Peak Elevation of Receiver(m):** 3.88
Radiant Heat(kW/m2): 29 **Flame Angle (degrees):** 64
Flame Length(m): 8.63 **Maximum View Factor:** 0.438
Rate Of Spread (km/h): 16.9 **Inner Protection Area(m):** 0
Transmissivity: 0.872 **Outer Protection Area(m):** 0
Fire Intensity(kW/m): 52390

BAL Thresholds

	BAL-40:	BAL-29:	BAL-19:	BAL-12.5:	10 kw/m2:	Elevation of Receiver:
Asset Protection Zone(m):	0	0	0	0	0	0

Run Description: T10 & T11 Rural Properties & Road

Vegetation Information

Vegetation Type: Non-Hazard

Vegetation Group: Non-Hazard

Vegetation Slope: 0 Degrees

Vegetation Slope Type: Level

Surface Fuel Load(t/ha): 0

Overall Fuel Load(t/ha): 0

Vegetation Height(m): 0

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): 1

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: 100

Program Outputs

Level of Construction: BAL 29

Peak Elevation of Receiver(m): 0

Radiant Heat(kW/m2): 29

Flame Angle (degrees): 0

Flame Length(m): 0

Maximum View Factor: 0

Rate Of Spread (km/h): 0

Inner Protection Area(m): 0

Transmissivity: 0.905

Outer Protection Area(m): 0

Fire Intensity(kW/m): 0

BAL Thresholds

	BAL-40:	BAL-29:	BAL-19:	BAL-12.5:	10 kw/m2:	Elevation of Receiver:
Asset Protection Zone(m):	0	0	0	0	0	6

Run Description: T12 Riparian Corridor

Vegetation Information

Vegetation Type: Coastal Freshwater Lagoons

Vegetation Group: Freshwater Wetlands

Vegetation Slope: 1 Degrees

Vegetation Slope Type: Upslope

Surface Fuel Load(t/ha): 4.4

Overall Fuel Load(t/ha): 4.4

Vegetation Height(m): 1

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): 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: 100

Program Outputs

Level of Construction: BAL 29

Peak Elevation of Receiver(m): 1.75

Radiant Heat(kW/m2): 29

Flame Angle (degrees): 65

Flame Length(m): 3.86

Maximum View Factor: 0.428

Rate Of Spread (km/h): 2.15

Inner Protection Area(m): 0

Transmissivity: 0.889

Outer Protection Area(m): 0

Fire Intensity(kW/m): 4884

BAL Thresholds

	BAL-40:	BAL-29:	BAL-19:	BAL-12.5:	10 kw/m2:	Elevation of Receiver:
Asset Protection Zone(m):	0	0	0	0	0	0

Run Description: T15 Detention basin

Vegetation Information

Vegetation Type: Grassland

Vegetation Group: Grassland

Vegetation Slope: 0 Degrees

Vegetation Slope Type: Level

Surface Fuel Load(t/ha): 6

Overall Fuel Load(t/ha): 6

Vegetation Height(m): 0

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): 10

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: 130

Program Outputs

Level of Construction: BAL 29

Peak Elevation of Receiver(m): 3.88

Radiant Heat(kW/m2): 29

Flame Angle (degrees): 64

Flame Length(m): 8.63

Maximum View Factor: 0.438

Rate Of Spread (km/h): 16.9

Inner Protection Area(m): 0

Transmissivity: 0.872

Outer Protection Area(m): 0

Fire Intensity(kW/m): 52390

BAL Thresholds

	BAL-40:	BAL-29:	BAL-19:	BAL-12.5:	10 kw/m2:	Elevation of Receiver:
Asset Protection Zone(m):	0	0	0	0	0	0

Run Description: T16 & T19 riparian corridor

Vegetation Information

Vegetation Type: Coastal Valley Grassy Woodland

Vegetation Group: Woodlands

Vegetation Slope: 3.1 Degrees

Vegetation Slope Type: Downslope

Surface Fuel Load(t/ha): 10

Overall Fuel Load(t/ha): 18.07

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): 14

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: 100

Program Outputs

Level of Construction: BAL 29

Peak Elevation of Receiver(m): 5.28

Radiant Heat(kW/m2): 29

Flame Angle (degrees): 63

Flame Length(m): 11.85

Maximum View Factor: 0.443

Rate Of Spread (km/h): 1.49

Inner Protection Area(m): 0

Transmissivity: 0.862

Outer Protection Area(m): 0

Fire Intensity(kW/m): 13875

BAL Thresholds

	BAL-40:	BAL-29:	BAL-19:	BAL-12.5:	10 kw/m2:	Elevation of Receiver:
Asset Protection Zone(m):	10	14	20	29	45	6

Run Description: T17 Riparian corridor

Vegetation Information

Vegetation Type: Coastal Valley Grassy Woodland

Vegetation Group: Woodlands

Vegetation Slope: 4.2 Degrees

Vegetation Slope Type: Downslope

Surface Fuel Load(t/ha): 10

Overall Fuel Load(t/ha): 18.07

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): 15

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: 100

Program Outputs

Level of Construction: BAL 29

Peak Elevation of Receiver(m): 5.6

Radiant Heat(kW/m2): 29

Flame Angle (degrees): 63

Flame Length(m): 12.57

Maximum View Factor: 0.444

Rate Of Spread (km/h): 1.6

Inner Protection Area(m): 0

Transmissivity: 0.859

Outer Protection Area(m): 0

Fire Intensity(kW/m): 14970

BAL Thresholds

	BAL-40:	BAL-29:	BAL-19:	BAL-12.5:	10 kw/m2:	Elevation of Receiver:
Asset Protection Zone(m):	11	15	21	30	47	6

Run Description: T18 riparian corridor

Vegetation Information

Vegetation Type: Coastal Valley Grassy Woodland

Vegetation Group: Woodlands

Vegetation Slope: 2 Degrees

Vegetation Slope Type: Downslope

Surface Fuel Load(t/ha): 10

Overall Fuel Load(t/ha): 18.07

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): 13

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: 100

Program Outputs

Level of Construction: BAL 29

Peak Elevation of Receiver(m): 4.96

Radiant Heat(kW/m2): 29

Flame Angle (degrees): 63

Flame Length(m): 11.14

Maximum View Factor: 0.441

Rate Of Spread (km/h): 1.38

Inner Protection Area(m): 0

Transmissivity: 0.864

Outer Protection Area(m): 0

Fire Intensity(kW/m): 12861

BAL Thresholds

	BAL-40:	BAL-29:	BAL-19:	BAL-12.5:	10 kw/m2:	Elevation of Receiver:
Asset Protection Zone(m):	10	13	19	27	43	6

Run Description: T6 Riparian Corridor - south of site

Vegetation Information

Vegetation Type: Eastern Riverine Forests

Vegetation Group: Forested Wetlands

Vegetation Slope: 0 Degrees

Vegetation Slope Type: Level

Surface Fuel Load(t/ha): 8.2

Overall Fuel Load(t/ha): 15.1

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): 10

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: 100

Program Outputs

Level of Construction: BAL 29

Peak Elevation of Receiver(m): 3.68

Radiant Heat(kW/m2): 29

Flame Angle (degrees): 64

Flame Length(m): 8.18

Maximum View Factor: 0.437

Rate Of Spread (km/h): 0.98

Inner Protection Area(m): 0

Transmissivity: 0.873

Outer Protection Area(m): 0

Fire Intensity(kW/m): 7677

BAL Thresholds

	BAL-40:	BAL-29:	BAL-19:	BAL-12.5:	10 kw/m2:	Elevation of Receiver:
Asset Protection Zone(m):	6	9	14	10	34	6

Run Description: T8, T9, T13 & T14

Vegetation Information

Vegetation Type: Grassland

Vegetation Group: Grassland

Vegetation Slope: 1.8 Degrees

Vegetation Slope Type: Downslope

Surface Fuel Load(t/ha): 6

Overall Fuel Load(t/ha): 6

Vegetation Height(m): 0

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): 11

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: 130

Program Outputs

Level of Construction: BAL 29

Peak Elevation of Receiver(m): 4.13

Radiant Heat(kW/m2): 29

Flame Angle (degrees): 64

Flame Length(m): 9.18

Maximum View Factor: 0.438

Rate Of Spread (km/h): 19.13

Inner Protection Area(m): 11

Transmissivity: 0.87

Outer Protection Area(m): 0

Fire Intensity(kW/m): 59318

BAL Thresholds

	BAL-40:	BAL-29:	BAL-19:	BAL-12.5:	10 kw/m2:	Elevation of Receiver:
Asset Protection Zone(m):	0	0	0	0	0	0