# Kempsey - Armidale Road Restoration

## Appendix O

## Bushfire Hazard Assessment

# Bushfire Hazard Assessment

## Kempsey Road Restoration

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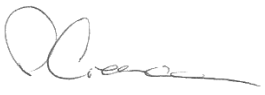
# Bushfire Disclaimer

This report in no way suggests or guarantees that a bushfire or grass fire will not occur at the Project Site and/ or impact the proposed development. Furthermore, the measures recommended in this report do not guarantee that loss of life, injury and / or property damage will not occur during a bushfire or grass fire event. The severity and impact of a bushfire or grass fire event can be influenced by matters such as vegetation management, human behaviour and extreme weather conditions.

This report advises on matters published by the NSW Rural Fire Service in the guideline Planning for Bushfire Protection 2019 and other advice available from that organisation. Due consideration has been given to site conditions, the nature of the proposed development and to appropriate legislation and documentation available at the time of writing. The report is therefore current at the time of writing only.

**Certification**

| | Name | Signature | Date |
|---|---|---|---|
| Prepared by | Paul Creenaune |  | 25/10/2023 |
| Reviewed by | Veronica Silver |  | 08/11/2023 |

| UPR | Description | Issued By | Date Issued |
|---|---|---|---|
| 4055-1060 | Bushfire Hazard Assessment | Paul Creenaune | 08/11/2023 |
| | | | |
| | | | |

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# Executive Summary

This Bushfire Hazard Assessment has been prepared to support a Review of Environmental Factors for the proposed restoration of Kempsey Road and Lower Creek Road in the Armidale Regional Council local government area.

The Kempsey Road project is being carried out by Armidale Regional Council to restore unsealed sections of the roads (approximately 50 km) situated in a rural area between Armidale and Kempsey. The roads were damaged during the 2019/ 2020 bushfires and subsequent 2020/ 2021 flooding. The proposed road restoration project includes provision of temporary workers accommodation (camp), equipment compound, fuel storage, site office, etc. Three potential sites have been identified for the proposed workers accommodation (camp) and main compound, which are the primary focus of this report.

The bushfire assessment has found that Site 0 is the preferred site for the camp, main compound and main site office. Site 0 has sufficient space to provide asset protection zones without the need for further clearing and has less bushfire prone land/ vegetation in close proximity when compared to the alternative sites.

The Bushfire Hazard Assessment has taken into consideration the nature of the proposed development, the vegetation creating a bushfire hazard, the effective slope and Fire Danger Index for the site in accordance with Planning for Bush Fire Protection 2019. The Bushfire Hazard Assessment demonstrates that the recommended bushfire protection measures are available and can be implemented to facilitate the proposed development in accordance with the requirements of Planning for Bush Fire Protection 2019.

The following table provides a summary of the recommendations for each bushfire protection measure outlined in Planning for Bush Fire Protection 2019.

| Bushfire Protection Measure | Recommendation |
|---|---|
| Asset Protection Zones | ■ APZs for the camp and main compound are to be provided in accordance with **Table 4.1** and **Illustration 4.1, 4.2** or **4.3** for the relevant site.<br>■ The camp and main compound area and surrounding APZ are to be established and managed as an Inner Protection Area in accordance with Appendix A4.1.1 of Planning for Bush Fire Protection 2019. |
| Construction standards | ■ Camp and compound buildings are to be constructed to comply with Section 3 and 7 (BAL 29) of AS3959-2018 'Construction of Buildings in Bushfire Prone Areas' and Section 7.5.2 of Planning for Bush Fire Protection 2019. |
| Access | ■ Access to the camp and main compound is to comply with Table 7.4a of Planning for Bush Fire Protection 2019 and is to include a trafficable area around the perimeter of each facility within the APZ. |
| Water, Electricity and Gas Services | ■ A total 200,000 litre static fire fighting water supply is to be provided for the camp and compound sites. The fire fighting water supply is required in addition to the domestic supply required to service the camp and compound buildings and the water supply required to service the bushfire sprinkler system and any fire hose reels or similar required under the National Construction Code.<br>■ The fire fighting water supply is to be installed and maintained in accordance with Table 7.4a of Planning for Bush Fire Protection 2019.<br>■ Electricity and gas services are to comply with Table 7.4a of Planning for Bush Fire Protection 2019. |

| Bushfire Protection Measure | Recommendation |
|---|---|
| Landscaping | ■ Landscaping is to comply with the standards for an Inner Protection Area, as outlined in Planning for Bush Fire Protection 2019 – Appendix A4.1.1. |
| Emergency Management | ■ Prior to the commencement of operations, a Bush Fire Emergency Management and Evacuation Plan consistent with the NSW RFS publication: *A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan*, and AS 3745:2010 'Planning for emergencies in facilities' is to be prepared.<br>■ A Bushfire Operations Plan is to be prepared as part of the Site Construction Management Plan. |

# 1. Introduction

## 1.1 Scope and Purpose

GeoLINK has been engaged to prepare a Bushfire Hazard Assessment for the proposed restoration of Kempsey Road and Lower Creek Road. This report will accompany a Review of Environmental Factors (REF) for the Activity.

The Kempsey Road project is being carried out by Armidale Regional Council to restore unsealed sections of the roads (approximately 50 km) situated in a rural area between Armidale and Kempsey. The roads were damaged during the 2019/ 2020 bushfires and also during the 2020/ 2021 flooding. The proposed road restoration project includes provision of temporary workers accommodation, equipment compound, fuel storage, site office, etc. Three potential sites have been identified for the proposed workers accommodation (camp) and main compound, which are the primary focus of this report.

Part of the land on which the proposed development is located is mapped as bushfire prone land.

This report serves to:

- identify the proposed development and site characteristics;
- determine and assess the bushfire threat; and
- recommend appropriate bushfire protection measures in accordance with Planning for Bush Fire Protection 2019 to minimise the impact of bushfire on the development.

## 1.2 Legislative Framework

The assessment contained in this report has been prepared with regard to:

- *Environmental Planning and Assessment Act 1979* (EP&A Act);
- Environmental Planning and Assessment Regulation 2021;
- *Rural Fires Act 1997*;
- Australian Standard 3959:2018 'Construction of Buildings in Bushfire Prone Areas';
- NASH Standard 'Steel Framed Construction in Bushfire Areas (2021)';
- National Construction Code (NCC); and
- Planning for Bushfire Protection (PBP) 2019.

The *Rural Fires Act 1997* and the *Environmental Planning and Assessment Act 1979* (EP&A Act) institute a framework for environmental planning and assessment to consider bushfire hazard issues.

The proposed development is regarded as 'Other Development' for the purpose of PBP 2019. In this regard, the camp sites have been assessed as 'other residential development' in accordance with Section 8.2 of PBP 2019. The main site office and main site compound will contain temporary infrastructure that will be in place for the duration of the project. These facilities have been assessed having regard to the aim and objectives of PBP 2019. Facilities such as concrete batch plants, laydown areas, quarries and satellite offices have also been assessed with regard to the aim and objectives of PBP 2019.

In addition to the requirements of PBP 2019, buildings in bushfire prone areas are also subject to the requirements of the NCC. This report does not assess compliance with the NCC. In this regard, the Principal Certifying Authority is to be consulted to confirm compliance with the requirements of the NCC.

# 2. Background

## 2.1 Location and Description

The Activity will be carried out along approximately 45 km of Kempsey Road, extending from Chainage 118850 to 73000, and 5 km of Lower Creek Road from its intersection with Kempsey Road at Lower Creek within the Armidale Local Government Area (LGA) (refer to **Illustration 2.1**).

The location of the project is relatively remote, with limited access options and limited communication services in several areas.

Within the overall project site, three locations have been identified as potential sites for the camp and main compound. **Table 2.1** provides a quick reference for the location and description details of these sites.

**Table 2.1 Site Detail Summary**

| Site Details | Site 0 | Site 2 / 3 |
|---|---|---|
| Lot / DP | Lot 211 DP 1097997<br>Lot 25 DP 751451 | Lot 361 DP 585467 |
| Street Address | 8493 Kempsey Road, Lower Creek<br>8574 Kempsey Road, Lower Creek | 8969 Kempsey Road, Lower Creek |
| Elevation | 130 – 140 m AHD | 130 – 150 m AHD |
| Armidale Regional Local Environmental Plan 2012 | Zone RU1 Primary Production | Zone RU1 Primary Production |
| Fire Weather District | New England | New England |
| Fire Danger Index (FDI) | 80 | 80 |
| Fire Control Centre | Armidale | Armidale |

Site 0 covers land to the north and south of Kempsey Road and includes a 1st Option for the camp on the northern side of Kempsey Road adjacent to the Lower Creek NSW Rural Fire Service (RFS) brigade shed, and a 1st Option for the main compound on the southern side of Kempsey Road, opposite the camp. Both sites are located on Lot 211 DP 1097997. An Alternative 1st Option site for the camp and compound is also identified on the northern side of Kempsey Road on Lot 25 DP 751451, immediately to the west of the 1st Option camp site. These sites are located in open grassland paddocks, with a strip of remnant native vegetation along the Kempsey Road reserve and in a gully to the north.

Sites 2 and 3 are located adjacent to each other and cover land on the eastern and western sides of Kempsey Road on Lot 361 DP 585467. Site 2 is located on the eastern side of Kempsey Road and comprises a narrow strip of land between Kempsey Road and the Macleay River. Site 2 is identified as an Alternative 2nd Option for the camp and major compound. Site 3 is located immediately south-west of Site 2 and includes land in the eastern and western sides of Kempsey Road. The land on the eastern side of Kempsey Road is identified as the camp and major compound 2nd Option and occupies a narrow strip of land between Kempsey Road and the Macleay River. The site is bordered by native vegetation to the east and remnant native vegetation to the west along the Kempsey Road reserve. The area of Site 3 on the western side of Kempsey Road is also identified as the camp and major

compound Alternative 2nd Option. Site 3 adjoins unmanaged native vegetation to the north, east and south. Sites 2 and 3 are located adjacent to the Macleay River (east) and an unnamed intermittent watercourse to the north and west. The riverbank from Sites 2 and 3 to the Macleay River is steep (>$20^0$).

A detailed description of each site is provided in **Section 3**.

This report does not include an assessment of any threatened species or threatened ecological community under the *Biodiversity Conservation Act 2016*, or any Aboriginal object or place within the meaning of the *National Parks and Wildlife Act 1974*. Refer to the Review of Environmental Factors for further information.


**LEGEND**

- Kempsey Road restoration project alignment
- Subject site

0 20 km

## Site Locality - Illustration 2.1



***Information shown is for illustrative purposes only***
*Drawn by: AB Checked by: RE Reviewed by: PTC*
*Source of base data: Open Street Map*
*Date: 30/10/2023*

## 2.2 Zoning and Land Use

The project site is zoned RU1 Primary Production under the provisions of Armidale Regional Local Environmental Plan 2012.

The site is predominantly within the Kempsey Road reserve area and isolated areas of adjacent private property. The potential sites for the camp and compound are vacant grazing land.

## 2.3 Proposed Development

The scope of works for the proposed activity includes:

a) Permanent Works

- Install 64 new culverts.
- Replace 165 existing culverts.
- Inlet and outlet treatments at culverts.
- Longitudinal open drainage reinstatement.
- Scour protection at six bridges.
- Downslope slip remediation, including soil nail wall at 163 locations, gravity retaining walls 26 locations and H1 slope at eight locations.
- Pavement reinstatement to pre-disaster condition.
- Unbound pavement construction and bitumen sealing of 2,785 m.

b) Temporary Works

- Construction of temporary passing bays, U-turn bays.
- Construction of temporary and permanent stockpile sites.
- Establishment of workers accommodation camp, batch plants, compounds and other minor ancillary sites.
- Utilisation of existing quarries.
- Removal and/ or trimming trees where they pose a risk to worker's safety.
- Upslope slip remediation (scaling, rock bolting, removal of boulders, netting) where they pose a risk to worker's safety.

### 2.3.1 Site Office and Compound

The main site office and compound will house the construction and client teams and will typically consist of site office, meeting/ induction room, male ablution, female ablution, first aid room and prayer room, approximately 37 x 6 m x 3 m modular units, and a kitchen. The compound access road and carpark will be sealed, and security fencing with gates installed around the perimeter.

The satellite offices are proposed to be moved throughout the project site as works progress.

A fuel storage area will be established within the main site compound in a hardstand area that is bunded and have 6 x 20,000L storage tanks. Plant and machinery along the project alignment will be re-fuelled during the day where possible and during out of hours (nights). It is expected that 2 x 4,500 L fuel trucks will undertake the refuelling.

### 2.3.2 Camp (worker's accommodation)

The camp is proposed to accommodate up to 200 people and will consist of 6 m x 3 m prefabricated modular units. The camp will include individual rooms with ensuite, laundry linen service, dining halls, wet mess, gymnasium, indoor and outdoor recreational areas, 3 x 30,000L potable water storage tanks and pumps, Reverse Osmosis Sewage treatment system including storage tanks and WIFI access. **Figure 2.1** shows the proposed camp layout.

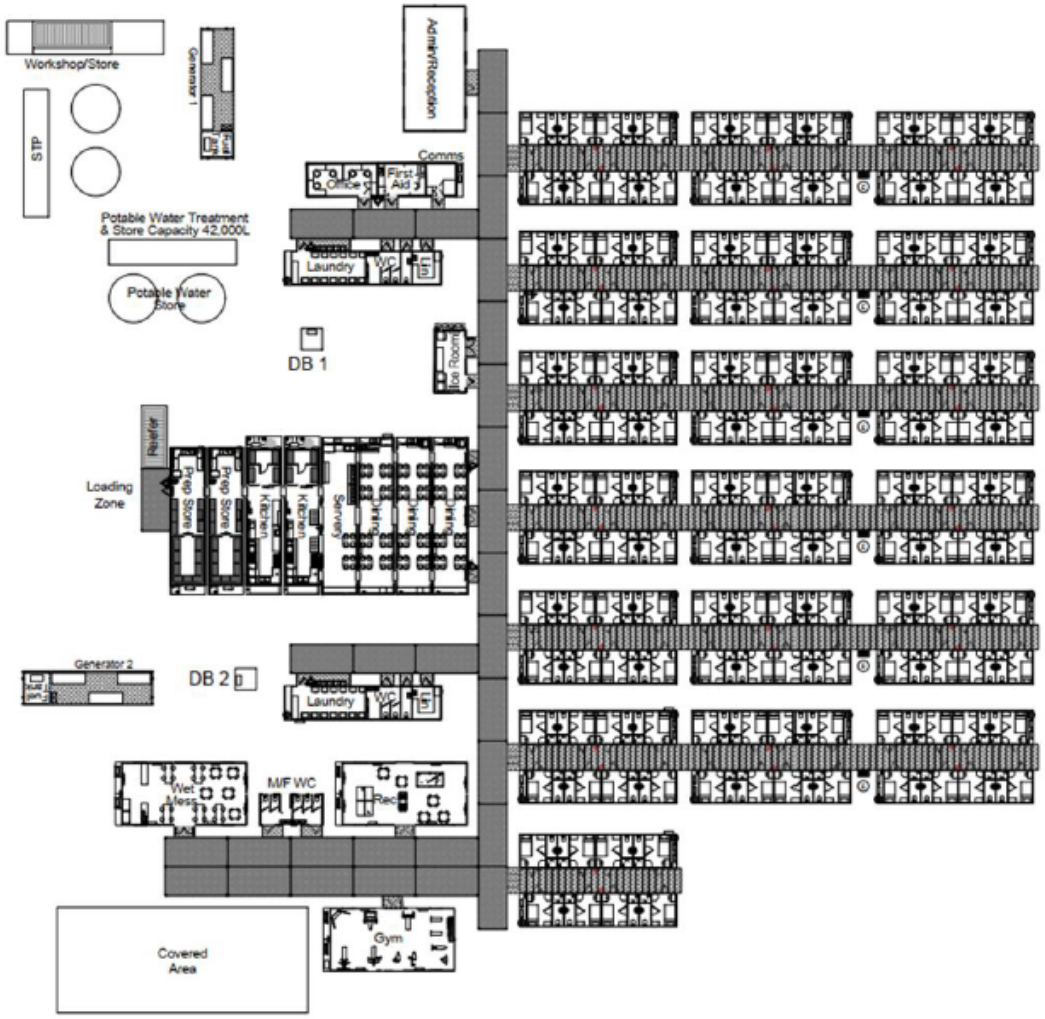



**Figure 2.1 Proposed Camp Layout**

# 3. Bushfire Hazard Assessment

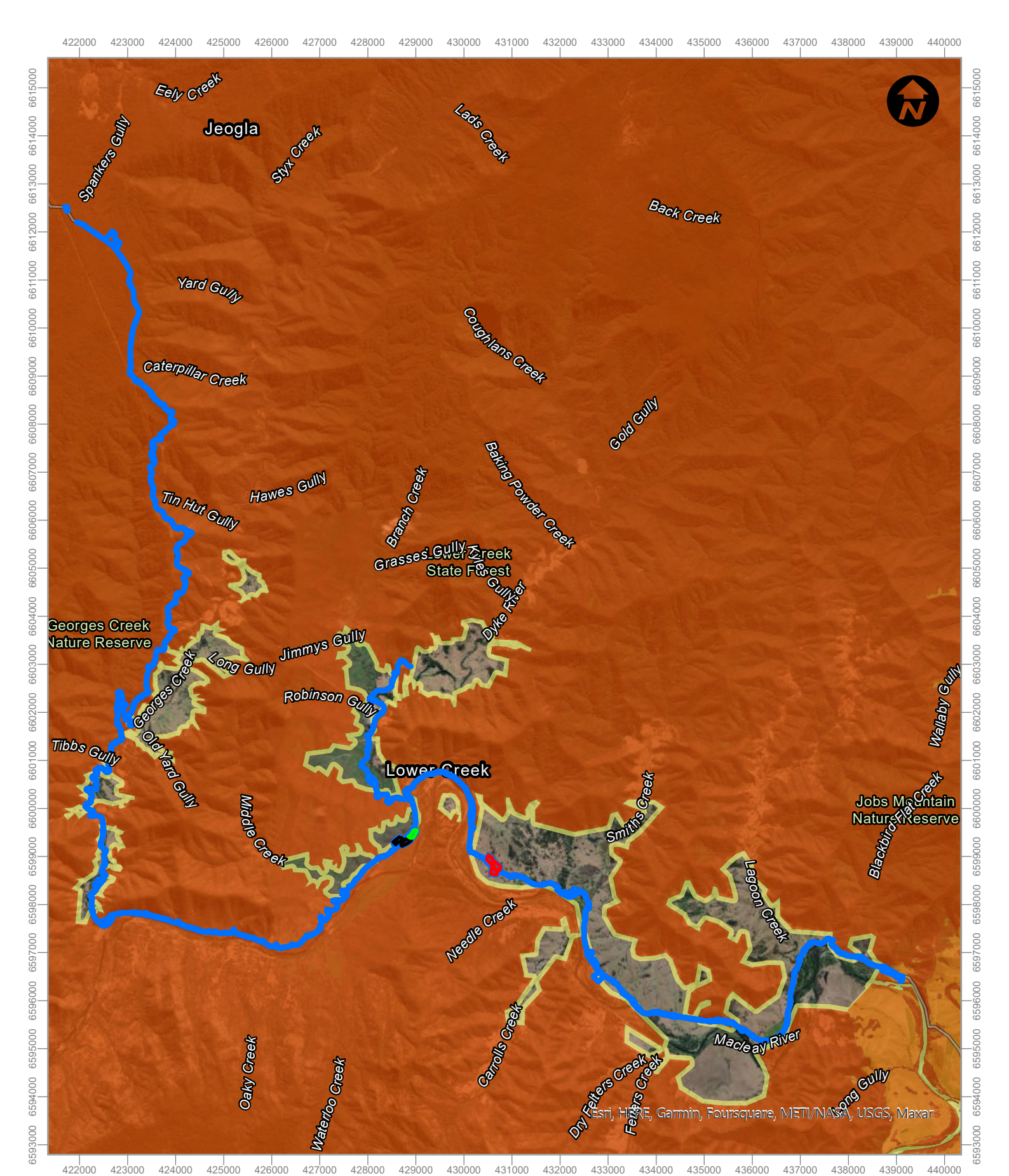
The following subsections were informed by a site visit undertaken by GeoLINK on 17 October 2023.

## 3.1 Bushfire Prone Land

Armidale Regional Council's bushfire prone land mapping has been prepared as a requirement of Section 10.3 of the EP&A Act and in accordance with the NSW Rural Fire Services (RFS) *Guideline to Bushfire Prone Land Mapping*. Armidale Regional Council's bushfire prone land mapping indicates that the project site is classified as bushfire prone land and contains areas of Category 1 Vegetation and Vegetation Buffer. Isolated areas of cleared grazing land within the project site are generally not mapped as bushfire prone land.

PBP 2019 and the RFS *Guideline to Bushfire Prone Land Mapping* recognise unmanaged grassland as a potential bushfire hazard. Accordingly, surrounding agricultural grassland areas have been assessed as a potential bushfire hazard where they are not mapped as bushfire prone land.

The surrounding land is also classified as bushfire prone land comprising predominantly Category 1 Vegetation and Vegetation Buffer. The bushfire prone land mapping for the overall project site and immediate surrounds is shown in **Illustration 3.1**, with detailed illustrations included for the potential camp/ compound sites in **Illustration 3.2, 3.3** and **3.4**.




**LEGEND**

- Kempsey Road restoration project boundary
- Site 0
- Site 2
- Site 3
- Vegetation category 1
- Vegetation category 2
- Vegetation category 3
- Vegetation buffer

0 2 km

## Bushfire Prone Land - Illustration 3.1

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*Drawn by: AB Checked by: RE Reviewed by: PTC*
*Source of base data: ESRI World Imagery*
*Date: 30/10/2023*


**LEGEND**

- Batch, major compound and laydown
- Camp
- Camp, compound, laydown alternate 1rst option
- Kempsey Road restoration project boundary
- Cadastre
- Vegetation category 1
- Vegetation buffer

0 80 Metres

## Bushfire Prone Land - Site 0 - Illustration 3.2



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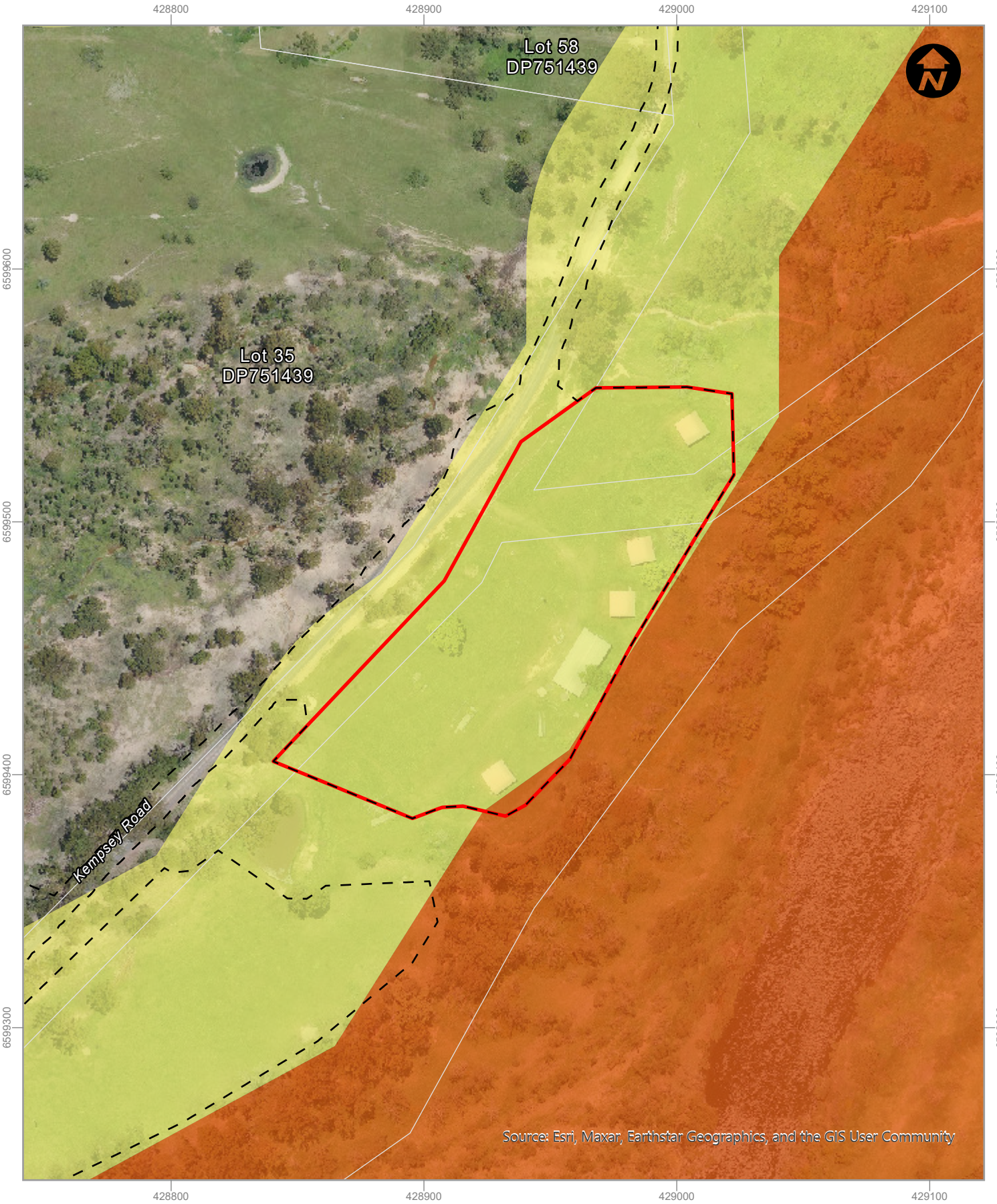
*Source of base data: ESRI World Imagery*
*Date: 30/10/2023*




**LEGEND**

- Camp, major compound or laydown - alternative option
- Kempsey Road restoration project boundary
- Cadastre
- Vegetation category 1
- Vegetation buffer

0 40 Metres

## Bushfire Prone Land - Site 2 - Illustration 3.3

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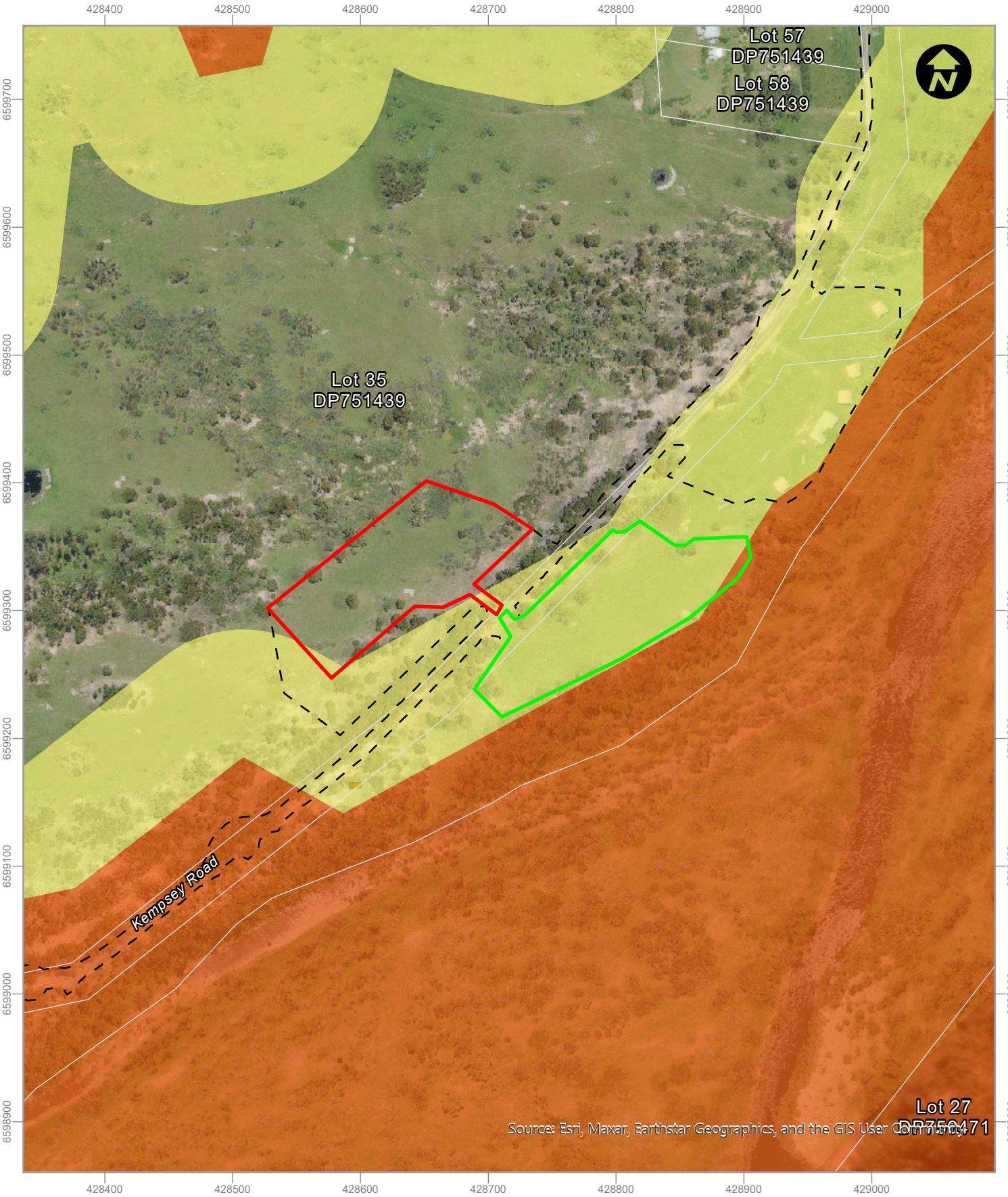


**LEGEND**

- Batch, camp, compound or Laydown - alternative option
- Batch, camp, compound or Laydown - 2nd option
- Kempsey Road restoration project boundary
- Cadastre
- Vegetation category 1
- Vegetation category 2
- Vegetation buffer

0 80 Metres

## Bushfire Prone Land - Site 3 - Illustration 3.4

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## 3.2 Vegetation

Vegetation classifications for the purpose of assessing bushfire hazard are based on vegetation formations and fuel loads outlined in PBP 2019.

Vegetation surrounding Site 0, Site 2 and Site 3 has been assessed in terms of potential bushfire hazard over a distance of 140m, using the formation classes provided within Figure A1.2 of PBP 2019. The dominant vegetation formation in each relevant direction of the respective sites is outlined in **Table 3.1, 3.2** and **3.3**.

### 3.2.1 Site 0

Site 0 covers land to the north and south of Kempsey Road adjacent to the NSW RFS Lower Creek brigade shed. The site is surrounded by grassland, except for a gully traversing upslope to the north-west which contains dry sclerophyll forest vegetation and the roadside vegetation along Kempsey Road, which comprises remnant dry sclerophyll forest (refer to **Plates 3.1** to **3.4**). The dominant vegetation formation in each relevant direction of Site 0 is shown in **Illustration 3.5** and outlined in **Table 3.1**

**Table 3.1 Vegetation Formation – Site 0**

| Direction | Predominant Vegetation Formation |
|---|---|
| North (west) | Forest |
| North (central and north-east) | Grassland |
| East | Woodland |
| | Grassland |
| South | Forest (Remnant) * |
| | Grassland |
| South-west | Forest (Remnant) * |
| North-west | Grassland |

* The vegetation along the road reserve of Kempsey Road is a linear strip of dry sclerophyll forest with an overall width <50 m. This vegetation has been classified as 'remnant vegetation' (equivalent to 'rainforest') in accordance with Appendix A1.11.1 of PBP 2019.

**Plate 3.1 Dry sclerophyll forest in the gully to north-west**

**Plate 3.2 Grassland to north-east**

**Plate 3.3 Roadside vegetation adjacent to Site 0**

**Plate 3.4 View south-west of Kempsey Road towards Macleay River**

### 3.2.2 Site 2

Site 2 is located on the eastern side of Kempsey Road, between Kempsey Road and the Macleay River. The northern edge of Site 2 borders an unnamed watercourse running in a gully from west to east, with dry sclerophyll forest within the gully and to the north. The land to the east falls steeply to the Macleay River, with the river bank and dry river bed containing dry sclerophyll forest. Similar vegetation is located on the eastern side of the Macleay River and to the south of Site 2. Kempsey Road is located to the west of Site 2, with predominantly dry sclerophyll forest within the road reserve and adjacent land to the west (refer to **Plates 3.5** to **3.8**). The dominant vegetation formation in each relevant direction of Site 2 is shown in **Illustration 3.6** and outlined in **Table 3.2**.

**Table 3.2 Vegetation Formation – Site 2**

| Direction | Predominant Vegetation Formation |
|---|---|
| North-east | Forest |
| East | Forest |
| South | Forest |
| West / North-west | Forest |

**Plate 3.5 Gully to north of Site 2**

**Plate 3.6 Steep forested slope to Macleay River**

**Plate 3.7 View south across Site 2**

**Plate 3.8 Forest and gully to north-west**

### 3.2.3 Site 3

Site 3 is located immediately to the south-west of Site 2 and comprises land on the eastern and western side of Kempsey Road. Site 3 is surrounded by grassland and dry sclerophyll forest. The dry sclerophyll forest vegetation in the road reserve of Kempsey Road has been assessed as remnant vegetation (refer to **Plates 3.9** to **3.14**). The dominant vegetation formation in each relevant direction of Site 3 is shown in **Illustration 3.7** and outlined in **Table 3.3**.

**Table 3.3 Vegetation Formation – Site 3**

| Direction | Predominant Vegetation Formation |
|---|---|
| **East of Kempsey Road** | |
| North-east | Grassland |
| East | Forest |
| South | Forest |
| West / North-west | Forest |
| **West of Kempsey Road** | |
| North-west | Forest |
| North-east | Forest |
| East | Forest (Remnant) * |
| South | Forest |
| South-west | Grassland |
| West | Forest |

* The vegetation along the road reserve of Kempsey Road is a linear strip of dry sclerophyll forest with an overall width <50 m. This vegetation has been classified as 'remnant vegetation' (equivalent to 'rainforest') in accordance with Appendix A1.11.1 of PBP 2019.

**Plate 3.9** View north-east over Site 3 (east of Kempsey Road)

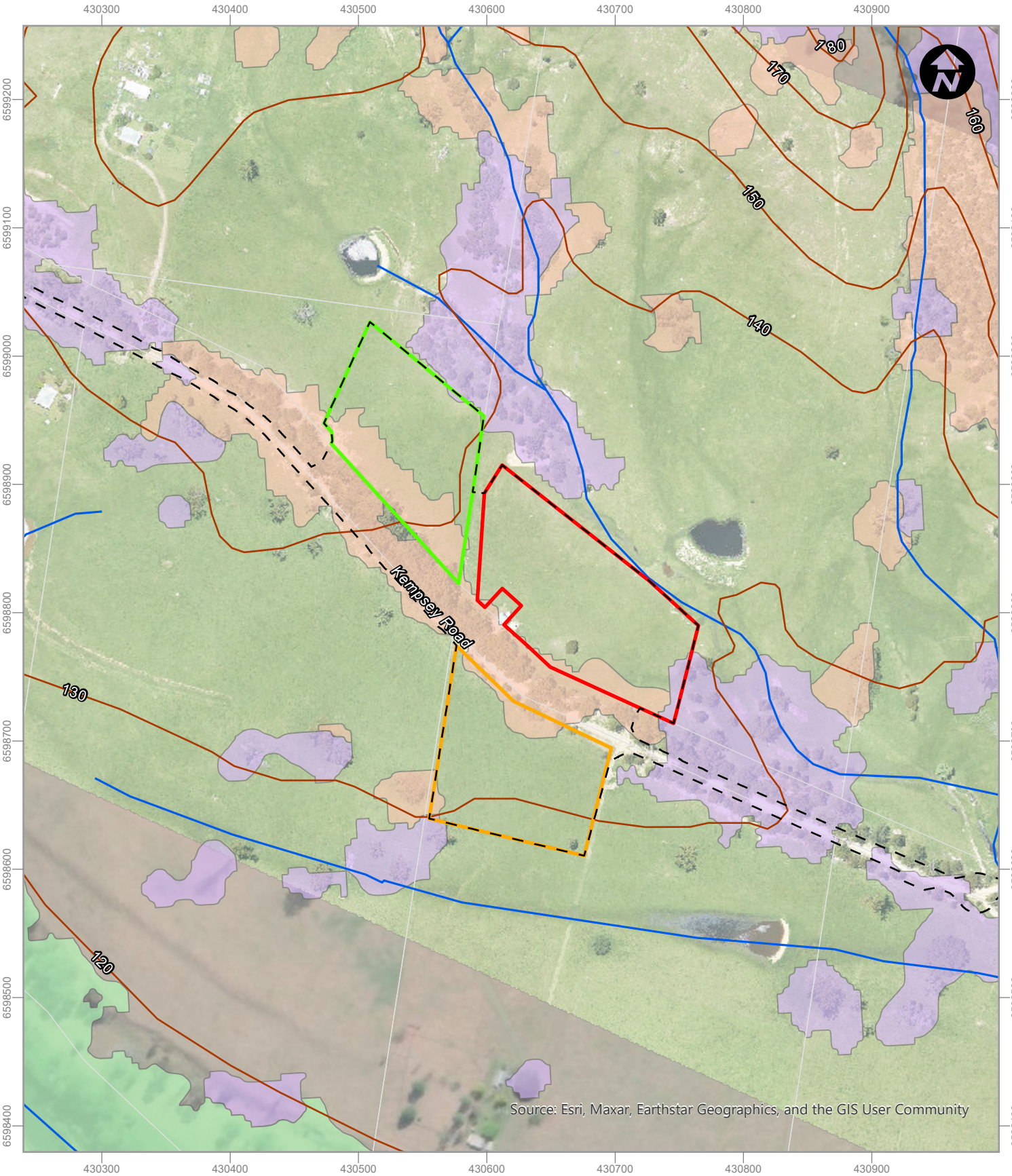
**Plate 3.10** View south over Site 3 (east of Kempsey Road)

**Plate 3.11** Roadside vegetation adjacent to Site 3

**Plate 3.12** View south-west (west of Kempsey Road)

**Plate 3.13** Forested slope to west

**Plate 3.14** Vegetation in gully to north




**LEGEND**

- Camp
- Batch, major compound and laydown
- Camp, compound, laydown alternate 1rst option
- Kempsey Road restoration project boundary
- Cadastre

**NSW State Vegetation Type**

- Dry Sclerophyll Forests (Shrub/grass sub-formation)
- Forested Wetlands
- Grassy Woodlands

- Contours at 2m intervals
- Watercourse

0 80 Metres

## Site Analysis - Site 0 - Illustration 3.5

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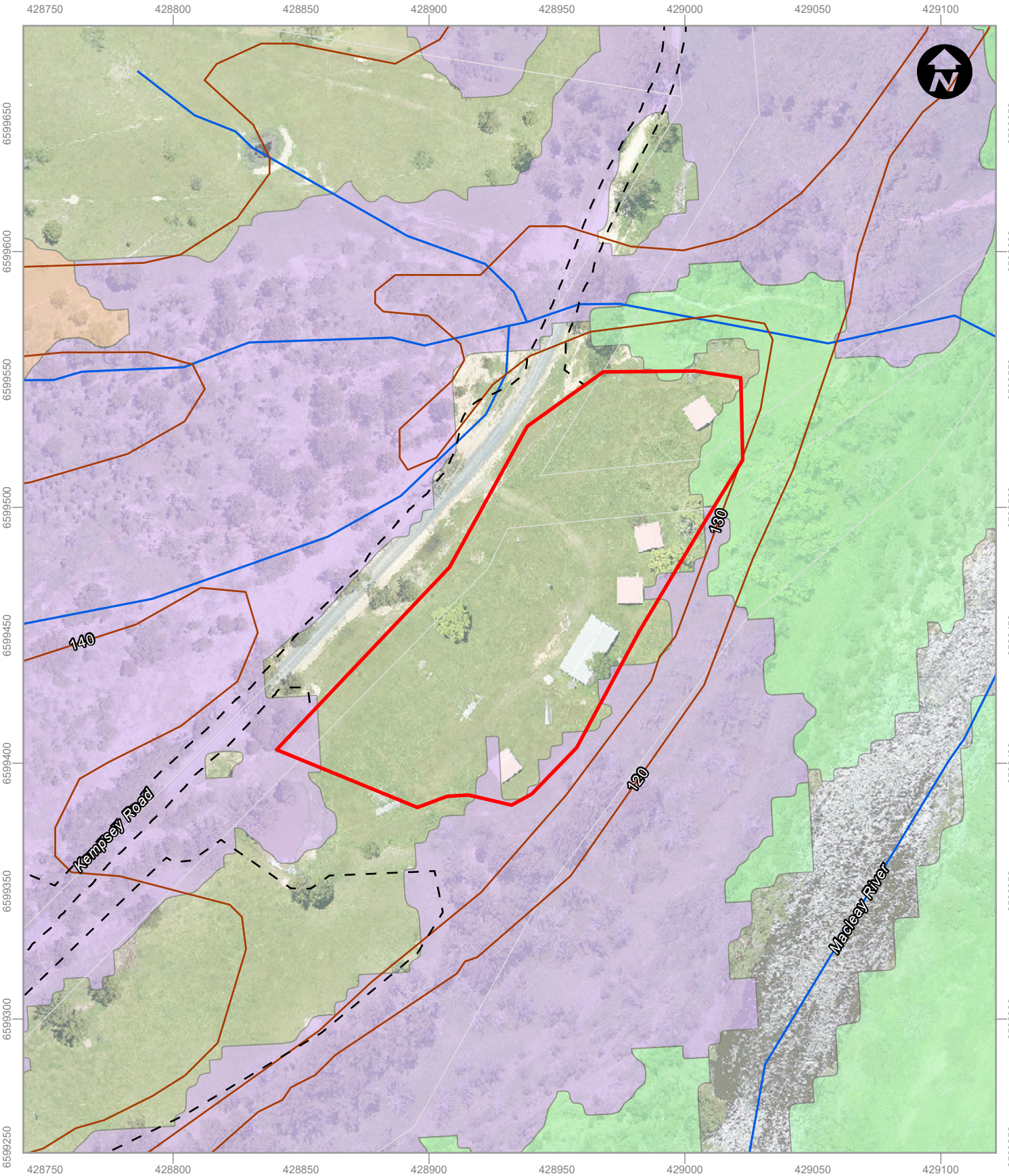


**LEGEND**

- Camp, major compound or laydown - alternative option
- Cadastre
- Contours at 2m intervals
- Watercourse

**NSW State Vegetation Type**

- Dry Sclerophyll Forests (Shrub/grass sub-formation)
- Forested Wetlands
- Grassy Woodlands

0 40 Metres

## Site Analysis - Site 2 - Illustration 3.6



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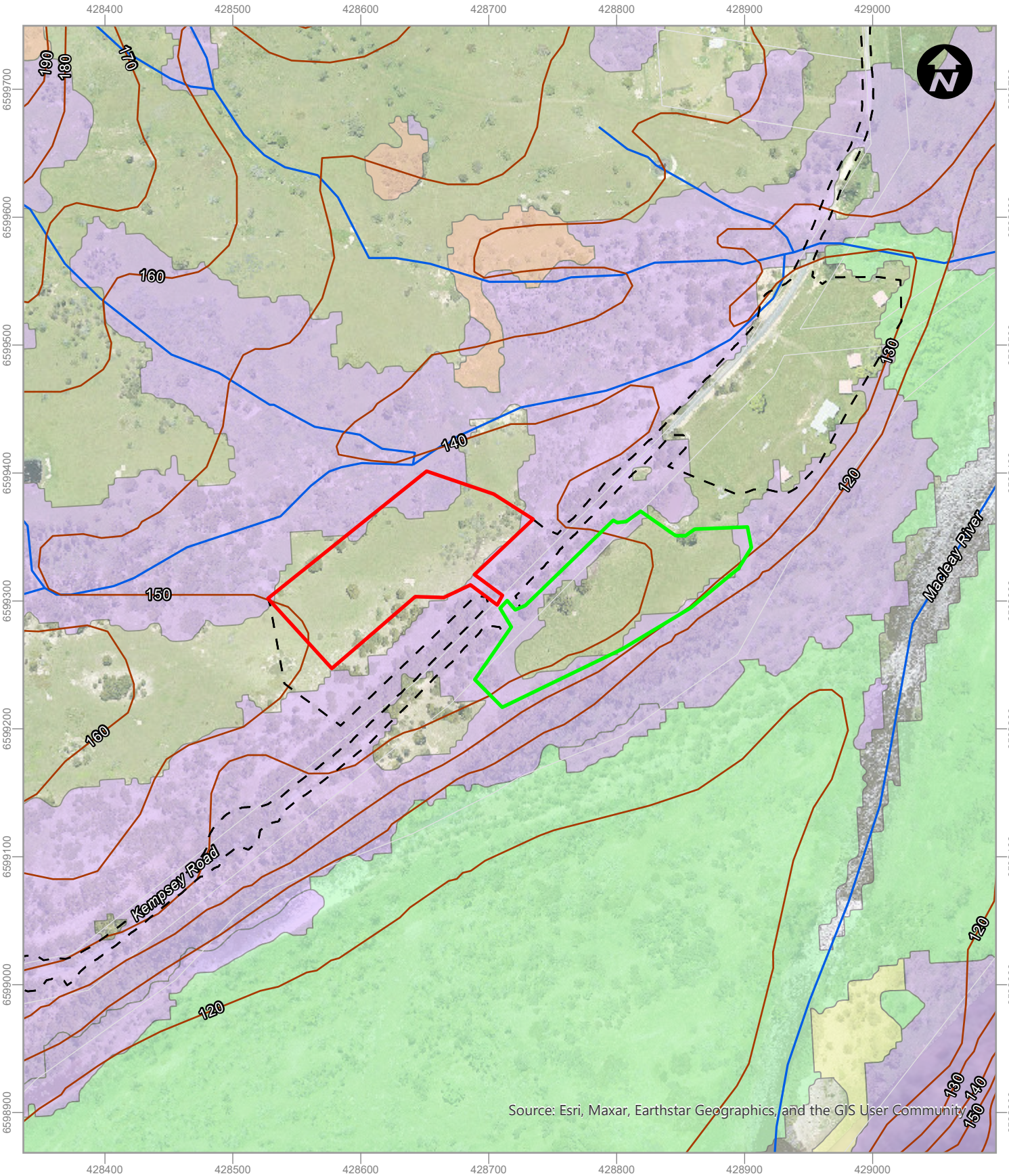
*Source of base data: ESRI World Imagery*
*Date: 30/10/2023*




**LEGEND**

- Batch, camp, compound or Laydown - alternative option
- Batch, camp, compound or Laydown - 2nd option
- Kempsey Road restoration project boundary
- Cadastre
- Contours at 2m intervals
- Watercourse

**NSW State Vegetation Type**

- Dry Sclerophyll Forests (Shrub/grass sub-formation)
- Forested Wetlands
- Grassy Woodlands
- Wet Sclerophyll Forests (Grassy sub-formation)

0 80 Metres

## Site Analysis - Site 3 - Illustration 3.7

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*Source of base data: ESRI World Imagery*
*Date: 30/10/2023*

## 3.3 Slope

The effective slope is the slope of the land beneath the vegetation assessed as being a hazard that will have the greatest influence on bushfire behaviour in relation to the development. The effective slope for the respective sites has been assessed over 100 m in each relevant direction and is outlined in **Table 3.4**.

**Table 3.4 Effective Slope**

| Aspect | Effective Slope |
|---|---|
| **Site 0** | |
| North (West) | >5-10$^0$ (to gully), then upslope/ flat |
| North (Central and North-east) | >0-5$^0$ (gully), then upslope/ flat |
| East | >0-5$^0$ |
| South | Upslope/ flat (road reserve) |
| | >5-10$^0$ |
| South-west | Upslope/ flat |
| North-west | Upslope/ flat |
| **Site 2** | |
| North-east | >10-15$^0$ (gully), then upslope/ flat |
| East | >20$^0$ |
| South | >20$^0$ |
| West / North-west | Upslope/ flat (road reserve) |
| | >10-15$^0$ (to gully), then upslope/ flat |
| **Site 3 - east of Kempsey Road** | |
| North-east | >0-5$^0$ |
| East | >20$^0$ |
| South | >20$^0$ |
| West/ North-west | >0-5$^0$ |
| **Site 3 – west of Kempsey Road** | |
| North-west | >5-10$^0$ (to gully), then upslope/ flat |
| North-east | >0-5$^0$ |
| East | >0-5$^0$ |
| South | >10-15$^0$ |
| South-west | Upslope/ flat |
| West | Upslope/ flat |

## 3.4 Fire Weather District

Armidale Regional Council local government area is located within the ‘New England’ fire weather district, with a Fire Danger Index (FDI) of 80.

# 4. Bushfire Protection Measures

## 4.1 Asset Protection Zones

PBP 2019 describes an asset protection zone (APZ) as a fuel reduced area surrounding a built asset or structure which provides a buffer zone between a bushfire hazard and the asset. The APZ provides:

- a buffer zone between a bushfire hazard and an asset;
- an area of reduced bushfire 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.

In accordance with Section 8.2 of PBP 2019, residential developments, other than single dwellings and subdivisions (i.e. the camp), must also meet the requirements Chapter 7 of PBP 2019. In this regard, the minimum APZs for the proposed camp are based on a radiant heat threshold of 29 kW/m$^2$ and have been determined in accordance with Table A1.12.3 and the methodology outlined in Appendix A1.1 of PBP 2019, using the relevant vegetation formation, effective slope and FDI. The same APZ threshold has been applied to the main compound.

**Table 4.1** outlines the relevant site characteristics and minimum required APZ for a radiant heat threshold of 29 kW/m$^2$.

**Table 4.1 Proposed Asset Protection Zones**

| Direction | Vegetation Formation | Effective Slope | Minimum APZ (29 kW/m$^2$) |
|---|---|---|---|
| **Site 0** | | | |
| North (west) | Forest | >5-10$^0$ (to gully), then upslope/ flat | 20 m * |
| North (central and north-east) | Grassland | >0-5$^0$ (gully), then upslope/ flat | 11 m |
| East | Woodland | >0-5$^0$ | 13 m |
| | Grassland | >0-5$^0$ | 11 m |
| South | Remnant | Upslope/ flat | 9 m |
| | Grassland | >5-10$^0$ | 12 m |
| South-west | Remnant | Upslope/ flat | 9 m |
| North-west | Grassland | Upslope/ flat | 10 m |
| * The >5-10$^0$ slope into the gully contains grassland vegetation with the forest located on the upslope terrain. The minimum APZ is based on the forest vegetation. | | | |
| **Site 2** | | | |
| North-east | Forest | >10-15$^0$ (gully), then upslope/ flat | 39 m |
| East | Forest | >20$^0$ | 91 m * |
| South | Forest | >20$^0$ | 91 m * |

| Direction | Vegetation Formation | Effective Slope | Minimum APZ (29 kW/m$^2$) |
|---|---|---|---|
| West / North-west | Forest | Upslope/ flat (road reserve) | 20 m |
| | | >10-15$^0$ (to gully), then upslope/ flat | 39 m |
| **Site 3 – east of Kempsey Road** | | | |
| North-east | Grassland | >0-5$^0$ | 11 m |
| East | Forest | >20$^0$ | 91 m * |
| South | Forest | >20$^0$ | 91 m * |
| West / North-west | Forest | Upslope/ flat | 20 m |
| **Site 3 – west of Kempsey Road** | | | |
| North-west | Forest | >5-10$^0$ (to gully), then upslope/ flat | 31 m |
| North-east | Forest | >0-5$^0$ | 25 m |
| East | Forest | Upslope/ flat | 20 m |
| South | Forest | >10-15$^0$ | 39 m |
| South-west | Grassland | Upslope/ flat | 10 m |
| West | Forest | Upslope/ flat | 20 m |

* Performance Solution – see below

**Performance Solution**

Performance based solutions allow for flexibility in responding to site specific conditions and constraints while still meeting the relevant performance criteria.

The hazard to the east of Site 2 and 3 is located on a steep slope down to the Macleay River. The slope of the bank is approximately 30$^0$ downslope, which exceeds the effective slope parameters of the acceptable solutions in PBP 2019. As such, a performance solution is provided to determine the minimum APZ distance for BAL 29, with the verification method based on a site-specific calculation using Method 2 from AS 3959:2018 (Appendix B).

The relevant performance criteria from PBP 2019 – Table 7.4a is that:

> **APZs are provided commensurate with the construction of the building.**

In accordance with PBP 2019 – Section 8.2.1, multi-dwelling housing or worker's accommodation is to provide an APZ based on a radiant heat threshold of 29 kW/m$^2$ for any new dwelling.

Due to the steep slope to the east, a calculation has been performed to determine the minimum separation distance required to ensure that the proposed buildings are not exposed to radiant heat levels exceeding 29 kW/m$^2$.

The performance solution calculation shows that a minimum 91 m separation distance/ APZ is required to ensure radiant heat levels do not exceed 29 kW/m$^2$ (refer to **Appendix A**).

The minimum APZ for Site 0 is shown in **Illustration 4.1**. The APZ is shown internally around the perimeter of the proposed facility site (camp or compound). There is potential for the APZ to be located outside the perimeter of the facility where it doesn't extend onto adjoining land.

The minimum APZs required for Site 2 cover almost the entire site and significantly constrain the available building footprint. There is limited opportunity to provide the APZ outside the facility boundary due to steep slopes, a water course to the north and road to the west (refer to **Illustration 4.2**).

The minimum APZs for Site 3 cover the entire area on the eastern side of Kempsey Road. Similar to Site 2, there is limited opportunity to provide the APZs outside the facility boundary on the eastern side of Kempsey Road. The APZ could be provided around the proposed camp site on the western side of Kempsey Road, subject to adequate clearing of vegetation (refer to **Illustration 4.3**).

Based on the ability to provide minimum APZs and the extent of surrounding bushfire hazard vegetation, Site 0 is the preferred site for the camp and main compound. Site 0 has the ability to enable APZs to be provided that exceed the minimum requirement, which is encouraged where possible.

The compound and camp areas, and surrounding APZs, will consist of open areas with minimal fuel at ground level that could be set alight by bushfire. Some trees and shrubs are permissible within the APZ, provided crown separation can be achieved and vegetation does not overhang buildings. Storage of combustible materials will be avoided in the APZ.

The APZ will be established and managed as an Inner Protection Area (IPA) in accordance with Appendix A4.1.1 of PBP 2019 (refer to **Appendix B**).


**LEGEND**

- Camp
- Batch, major compound and laydown
- Camp, compound, laydown alternate 1rst option
- Kempsey Road restoration project boundary
- Cadastre
- Asset protection zone
- Watercourse

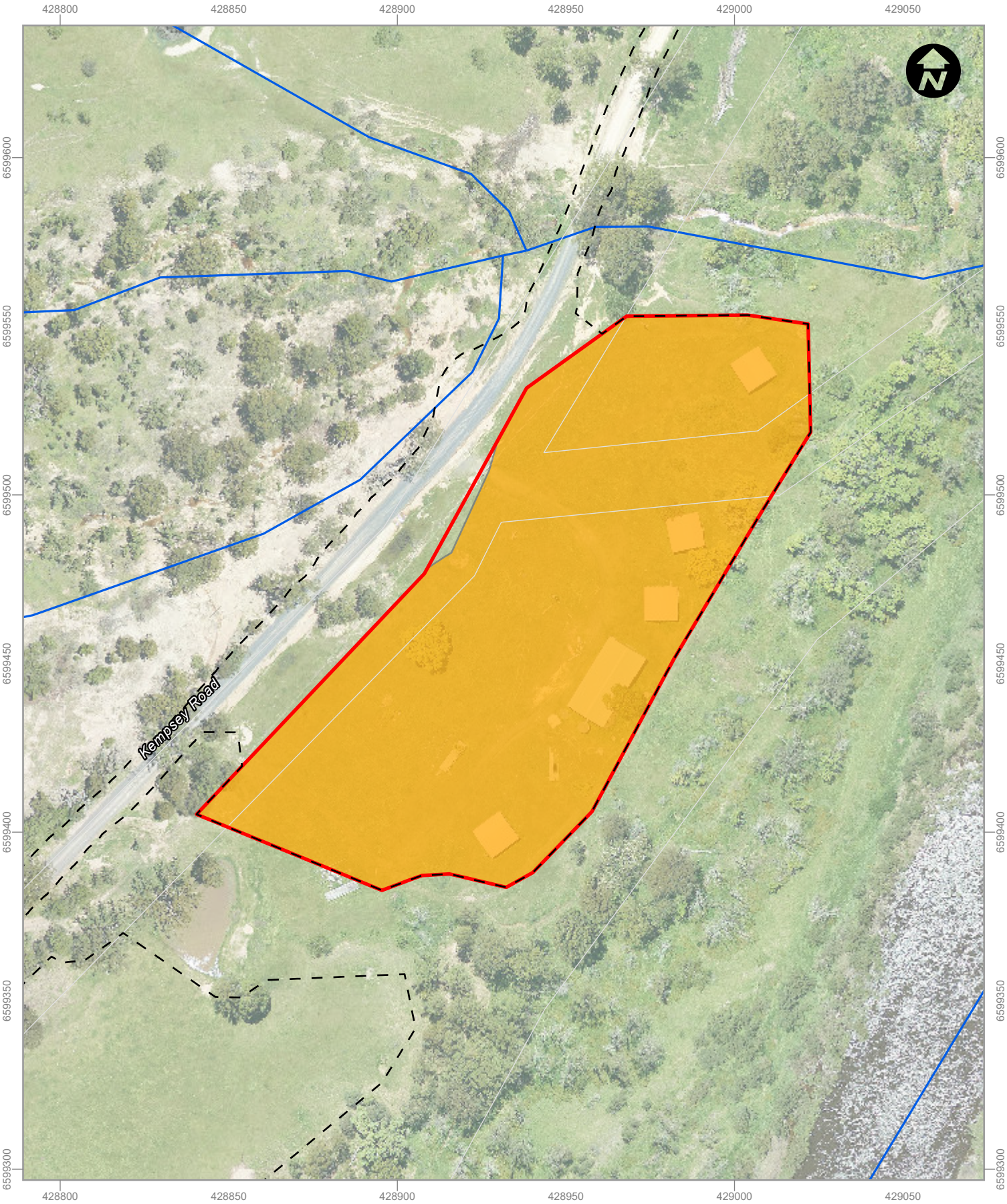
0 40 Metres

## Asset Protection Zone - Site 0 - Illustration 4.1

GeoLINK environment | engineering | planning | design

Bushfire Hazard Assessment – Kempsey Road Restoration
4055-1069

***Information shown is for illustrative purposes only***
*Drawn by: AB Checked by: RE Reviewed by: PTC*
*Source of base data: ESRI World Imagery*
*Date: 31/10/2023*




**LEGEND**

- Camp, major compound or laydown - alternative option
- Kempsey Road restoration project boundary
- Cadastre
- Asset protection zone
- Watercourse

0 30 Metres

# Asset Protection Zone - Site 2 - Illustration 4.2

GeoLINK environment | engineering | planning | design

Bushfire Hazard Assessment – Kempsey Road Restoration
4055-1069

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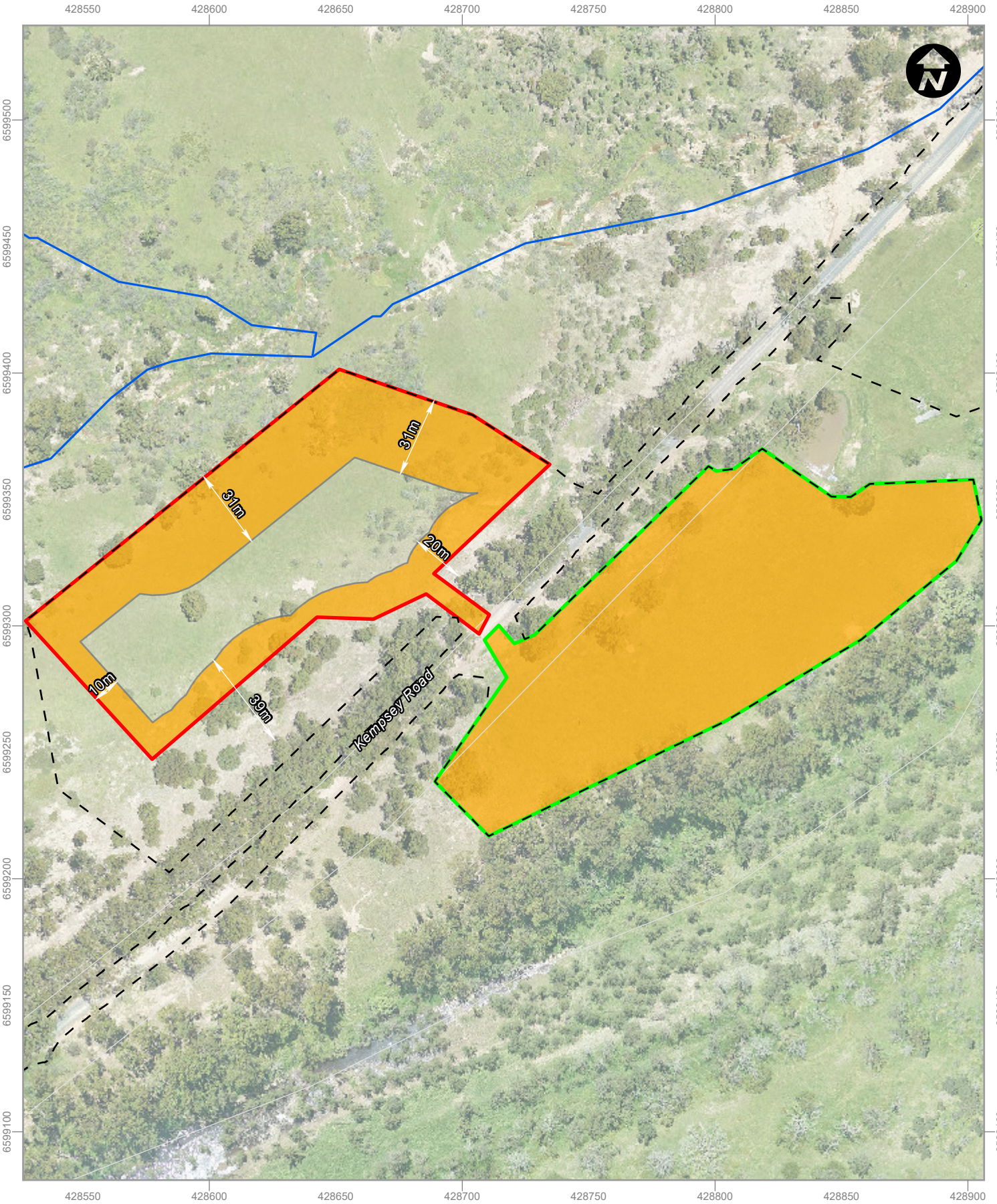
*Source of base data: ESRI World Imagery*
*Date: 30/10/2023*




**LEGEND**

- Batch, camp, compound or Laydown - alternative option
- Batch, camp, compound or Laydown - 2nd option
- Kempsey Road restoration project boundary
- Cadastre
- Asset protection zone
- Watercourse

0 40 Metres

## Asset Protection Zone - Site 3 - Illustration 4.3

GeoLINK environment | engineering | planning | design

Bushfire Hazard Assessment – Kempsey Road Restoration
4055-1069

***Information shown is for illustrative purposes only***
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*Source of base data: ESRI World Imagery*
*Date: 30/10/2023*

**Table 4.2** outlines the extent to which the proposed APZs comply with the performance criteria and acceptable solution requirements of Table 7.4a of PBP 2019.

**Table 4.2 APZ Compliance with PBP 2019**

| Performance Criteria | Acceptable Solution | Application |
|---|---|---|
| APZs are provided commensurate with the construction of the building; and<br><br>A defendable space is provided. | An APZ is provided in accordance with Table A1.12.2 or A1.12.3 in Appendix 1. | The minimum APZs comply with Table A1.12.3. Larger APZs are encouraged, where possible.<br><br>The minimum APZs will provide a defendable space around the camp and compound. |
| APZs are managed and maintained to prevent the spread of a fire towards the building. | APZs are managed in accordance with the requirements of Appendix 4 of PBP. | APZs are to be managed in accordance with Appendix 4 of PBP 2019 (refer to **Appendix A**). |
| The APZ is provided in perpetuity.<br><br>APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is minimised. | APZs are wholly within the boundaries of the development site.<br><br>APZ are located on lands with a slope less than 18 degrees. | The proposed APZs are to be provided within the site for the duration of the project.<br><br>The APZs are located on slopes <$18^0$. |

## 4.2 Construction Standards

The standard of building construction required to provide bushfire protection is based on the Bushfire Attack Level (BAL). The BAL is used to describe the level of potential bushfire attack on a property (ember attack, radiant heat and direct flame contact) and is based on radiant heat flux exposure thresholds (expressed in kilowatts per metre squared – $kW/m^2$), as described in Table A1.7 of PBP 2019.

Bushfire Attack Levels (BALs) are determined in accordance with PBP 2019 - Table A1.12.6 and the corresponding construction requirements are contained in Australian Standard AS3959-2018: 'Construction of Buildings in bushfire prone areas' or NASH Standard 'Steel framed construction in bushfire areas' (2021).

The BAL for the proposed camp and compound modular buildings is based on the APZ assessment in **Table 4.1**, being the minimum APZs for BAL 29. Therefore, the modular buildings in the camp should comply with BAL 29.

The modular buildings in the compound are predominantly Class 5-8 buildings under the National Construction Code (NCC), including offices, meeting rooms, kitchen and amenities. In accordance with Section 8.3.1 of PBP 2019, *the NCC does not provide any bushfire specific performance requirements for these particular classes of buildings. As such AS 3959 and the NASH Standard are not considered as a set of Deemed to Satisfy provisions, however compliance with AS 3959 and the NASH Standard must be considered when meeting the aim and objectives of PBP*. **Section 5** outlines the proposed response to the aim and objectives of PBP 2019.

In order to satisfy the objectives of PBP 2019, it is recommended that the modular buildings in the main compound are also constructed to BAL 29.

### 4.2.1 Sprinkler System

A bushfire sprinkler system is proposed to provide additional protection to the camp buildings. The sprinkler protection system will activate and respond via proprietary bushfire threat escalation algorithms when a fire threat is present. The bushfire threat escalation algorithms automatically switch the bushfire sprinkler system on and off in response to the fire threat. This system is fully automated and can see small fires near the site and/ or a fire front over 250 m away, activating the sprinkler system. The system can operate without the need for anyone to be on site during a bushfire event. **Figure 4.1** shows a typical system in operation and the coverage provided to the camp buildings.


**Figure 4.1 Bushfire Sprinkler System**

### 4.2.2 Additional Construction Requirements

To ensure the performance criteria for construction standards given in Section 7.4 of PBP 2019 can be met, Section 7.5.2 adopts additional measures over and above AS 3959. These additional measures apply to construction of the modular camp and compound buildings.

In accordance with PBP 2019 – Section 7.5.2, the following variations to AS 3959 apply for the purposes of NSW G5.2(a)(i) of Volume One and NSW 3.10.5.0(c)(i) of Volume Two of the National Construction Code (NCC);

- clause 3.10 of AS 3959 is deleted and any sarking used for BAL-12.5, BAL-19, BAL-29 or BAL-40 shall:
  - be non-combustible; or
  - comply with AS/NZS 4200.1, be installed on the outside of the frame and have a flammability index of not more than 5 as determined by AS 1530.2; and
- clause 5.2 and 6.2 of AS 3959 is replaced by clause 7.2 of AS 3959, except that any wall enclosing the subfloor space need only comply with the wall requirements for the respective BAL; and
- clause 5.7 and 6.7 of AS 3959 is replaced by clause 7.7 of AS 3959, except that any wall enclosing the subfloor space need only comply with the wall requirements for the respective BAL.

## 4.3 Access

The project will provide improved access along Kempsey Road for all road users in the locality.

During construction, access for residents, service providers and emergency services will be affected, with the road potentially blocked due to open trenches or construction plant. The project operation will ensure that arrangements are in place for emergency access for local residents and emergency services, and will include:

- Emergency response procedures will be workshopped with emergency services and the Local Emergency Management Committee.
- Establish regular meetings with all emergency services to predict likely impacts in emergency response planning.
- Develop emergency response procedures, including identified helipad areas, rapid response traffic controls and direct communication protocols with emergency services.
- Assess viability of VHF radio for communication across the site.
- Provide satellite phones and/ or VHF radios for each crew.

Access to the camp and compound sites will be directly from Kempsey Road, with all of the potential sites immediately adjacent to the public road.

**Table 4.3** outlines the extent to which the camp and compound access complies with the relevant acceptable solution requirements of Table 7.4a of PBP 2019.

**Table 4.3 Access Compliance with PBP 2019**

| Performance Criteria | Acceptable Solution | Application |
|---|---|---|
| Firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation. | Property access roads are two-wheel drive, all-weather roads. | The camp and compound access road and carpark will be sealed.<br>In order to provide access to all structures and hazard vegetation, it is recommended that a trafficable area be provided around the perimeter of the camp and compound, within the APZ. |
| 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), | Can comply. |
| | Bridges and causeways are to clearly indicate load rating. | Can comply. |
| There is appropriate access to water supply. | Hydrants are provided in accordance with the relevant clauses of AS 2419.1:2021; | N/A |
| | There is suitable access for a Category 1 fire appliance to within 4 m of the static water supply where no reticulated supply is available. | Vehicular access is to be provided to within 4 m of the static water supply. |
| Firefighting vehicles can access the | At least one alternative property access road is provided for individual dwellings or groups of | The camp and compound are located less than 200 m from |

| Performance Criteria | Acceptable Solution | Application |
|---|---|---|
| dwelling and exit the property safely | dwellings that are located more than 200 metres from a public through road; | Kempsey Road. An alternative access route is not required. |
| | There are no specific access requirements in an urban area where an unobstructed path (no greater than 70 m) 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 70 kph) that supports the operational use of emergency firefighting vehicles. In circumstances where this cannot occur, the following requirements apply: | |
| | Minimum 4 m carriageway width; | Minimum 4 m wide carriageway widths to be provided. |
| | In forest, woodland and heath situations, rural property roads have passing bays every 200 m that are 20 m long by 2 m wide, making a minimum trafficable width of 6 m, at the passing bay; | N/A – access roads are <200 m. |
| | A minimum vertical clearance of 4 m to any overhanging obstructions, including tree branches; | Minimum 4 m vertical clearance to be provided. |
| | Property access must provide a suitable turning area in accordance with Appendix 3; | The camp and compound access must provide a turning area in accordance with Appendix 3 of PBP 2019 (refer to **Appendix C**). |
| | Curves have a minimum inner radius of 6 m and are minimal in number to allow for rapid access and egress; | Can comply – subject to final design. |
| | The minimum distance between inner and outer curves is 6 m; | Can comply – subject to final design. |
| | The crossfall is not more than 10 degrees; | Can comply – subject to final design. |
| | Maximum grades for sealed roads do not exceed 15 degrees and not more than 10 degrees for unsealed roads; and | Road grades within the camp and compound are $<10^0$. |
| | A development comprising more than three dwellings has formalised access by dedication of a road and not by right of way | The camp is contained within a single lot (multiple land holders are not involved). |

| Performance Criteria | Acceptable Solution | Application |
|---|---|---|
| | Note: Some short constrictions in the access may be accepted where they are not less than 3.5 m wide, extend for no more than 30 m and where the obstruction cannot be reasonably avoided or removed. | Any short constrictions must not be less than 3.5 m wide or extend for more than 30 m. |

## 4.4 Services – Water, Electricity and Gas

As the potential sites for the camp and compound are not serviced by reticulated water supply, a static water supply for fire fighting will be required. The static water supply for fire fighting is required in addition to the domestic supply required to service the camp and compound buildings (3 x 30,000 litre potable water storage tanks and pumps) and the water supply required to service the bushfire sprinkler system (2 x 22,500 litre tanks).

Electricity supply to each of the potential camp and compound sites will be available from generators.

No details regarding gas services are available at this stage.

**Table 4.5** outlines the extent to which the water, electricity and gas services comply with the relevant acceptable solution requirements of Table 7.4a of PBP 2019.

**Table 4.4 Water, Electricity and Gas Compliance with PBP 2019**

| Performance Criteria | Acceptable Solution | Application |
|---|---|---|
| **Water Supplies** | | |
| An adequate water supply is provided for firefighting purposes. | Reticulated water is to be provided to the development, where available; and | N/A |
| | A static water supply is provided where no reticulated water is available. | A static water supply for fire fighting is to be provided. |
| Water supplies are located at regular intervals; and<br>the water supply is accessible and reliable for firefighting operations. | Fire hydrant spacing, design and sizing comply with the relevant clauses of AS 2419.1:2021; | N/A |
| | Hydrants are not located within any road carriageway; and | N/A |
| | Reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads. | N/A |
| Flows and pressure are appropriate. | Fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1:2021. | N/A |
| The integrity of the water supply is maintained. | All above-ground water service pipes external to the building are metal, including and up to any taps. | Above ground service pipes external to any buildings are to be metal. |
| A static water supply is provided for firefighting | Where no reticulated water supply is available, water for | Table 5.3d requires a minimum 20,000 litres for lots >1 ha or |

| Performance Criteria | Acceptable Solution | Application |
|---|---|---|
| purposes in areas where reticulated water is not available. | firefighting purposes is provided in accordance with Table 5.3d; | 5,000 litres per dwelling for multi-dwelling housing.<br>The camp and compound sites are both located on lots >1 ha, with the indicative camp layout (refer to **Figure 2.1**) containing 38 modular accommodation buildings and ancillary units (e.g. kitchen, dining, recreation rooms). The compound will include approximately 37 modular units.<br>A fire fighting water supply of 190,000 litres will be required to satisfy PBP 2019 (i.e. 5,000 litres x 38 accommodation units). It is recommended that a total 200,000 litre static fire fighting water supply be provided for the camp and compound sites.<br>Site 0 has vehicular access to the Macleay River which could also be used as a supplementary water source.<br>The fire fighting water supply is required in addition to the domestic supply required to service the camp and compound buildings and the water supply required to service the bushfire sprinkler system and any fire hose reels or similar required under the NCC. |
| | A connection for firefighting purposes is located within the IPA or non-hazard side and away from the structure; 65 mm Storz outlet with a ball valve is fitted to the outlet; | A 65 mm Storz outlet with ball valve is to be fitted to the statis water supply tank(s). |
| | Ball valve and pipes are adequate for water flow and are metal; | Ball valve and pipe sizes to provide adequate flow to the Storz outlet.<br>Ball vale and pipes are to be metal. |
| | Supply pipes from tank to ball valve have the same bore size to ensure flow volume; | |
| | Underground tanks have an access hole of 200mm to allow tankers to refill direct from the tank; | N/A |
| | A hardened ground surface for truck access is supplied within 4 m; | Vehicular access is to be provided to within 4 m of the static water supply. |

| Performance Criteria | Acceptable Solution | Application |
|---|---|---|
| | Above-ground tanks are manufactured from concrete or metal; | Tanks are to be concrete or metal. |
| | Raised tanks have their stands constructed from non-combustible material or bush fire-resisting timber (see Appendix F of AS 3959); | N/A |
| | Unobstructed access can be provided at all times; | Unobstructed access is to be provided to the static water supply. |
| | Underground tanks are clearly marked; | N/A |
| | Tanks on the hazard side of a building are provided with adequate shielding for the protection of firefighters; | Shielding to be provided for tanks adjacent to hazard vegetation. |
| | All exposed water pipes external to the building are metal, including any fittings; | Above ground service pipes external to any buildings are to be metal. |
| | Where pumps are provided, they are a minimum 5hp or 3kW petrol or diesel-powered pump, and are shielded against bush fire attack; any hose and reel for firefighting connected to the pump shall be 19mm internal diameter; and | Any fire fighting pumps are to comply. |
| | Fire hose reels are constructed in accordance with AS/NZS 1221:1997, and installed in accordance with the relevant clauses of AS 2441:2005. | Any fire hose reels are to be constructed in accordance with AS/NZS 1221:1997, and installed in accordance with the relevant clauses of AS 2441:2005. |
| **Electricity Services** | | |
| Location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of buildings. | Where practicable, electrical transmission lines are underground; and | The compound will be constructed to minimise ground disturbance, therefore, no underground electricity services will be provided. |
| | Where overhead, electrical transmission lines are proposed as follows:<br>■ lines are installed with short pole spacing (30 m), unless crossing gullies, gorges or riparian areas; and<br>■ no part of a tree is closer to a power line than the distance set out in accordance with the specifications in ISSC3 | Vegetation clearance is to be maintained for overhead electricity lines, where applicable. |

| Performance Criteria | Acceptable Solution | Application |
|---|---|---|
| | Guideline for Managing Vegetation Near Power Lines. | |
| **Gas Services** | | |
| Location and design of gas services will not lead to ignition of surrounding bushland or the fabric of buildings. | Reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 and the requirements of relevant authorities, and metal piping is used; | Any bottled gas services are to be installed and maintained in accordance with PBP 2019. |
| | All fixed gas cylinders are kept clear of all flammable materials to a distance of 10 m 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. | |

## 4.5 Landscaping

Landscaping within the APZ is to comply with the standards for an Inner Protection Area, as outlined in PBP 2019 – Appendix A4.1.1 (refer to **Appendix A**) and is to include an area of low cut lawn or pavement adjacent to the modular buildings in the camp and compound.

Any fencing within 6 m of the modular buildings is to be constructed of non-combustible materials.

## 4.6 Emergency Management

Due to the disparate and isolated nature of the work site it is recommended that a Bushfire Emergency Management and Evacuation Plan be prepared for the project. The Bushfire Emergency Management and Evacuation Plan should include actions to maintain a level of preparedness, to prepare for bushfire occurring in the locality, to adequately communicate relevant actions and to respond to local fire activity.

The Bushfire Emergency Management and Evacuation Plan should be consistent with the NSW RFS publication: *A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan*, and AS 3745:2010 'Planning for emergencies in facilities'.

## 4.7 Operational Management

Construction activities associated with the project have the potential to generate ignition of the surrounding bushland. Potential ignition sources could include hot works (e.g. welding, grinding or gas cutting), equipment (e.g. pumps, generators) or vehicles (e.g. hot muffler). Mitigation measures should be in place to minimise the potential for unplanned ignitions to occur and to undertake a quick response to any ignitions that do occur to stop a fire spreading.

A Bush Fire Operations Plan should be prepared as part of the Site Construction Management Plan to identify potential ignition risks and appropriate mitigation measures. This should include:

- Identifying bushfire risks and potential ignition sources at each work site.
- Measures to maintain bushfire awareness among workers.
- Measures to prevent ignitions.
- Identifying work that is not to be carried out during total fire bans or days of elevated fire danger.
- Availability of fire-suppression equipment.
- Storage and maintenance of fuels and other flammable materials.
- Procedures for notifying the RFS and on-site workers of any ignition.
- Emergency management procedures in line with the Bushfire Emergency Management and Evacuation Plan.

# 5. Aim and Objectives of PBP 2019

The main site office and main compound will contain temporary infrastructure that will be in place for the duration of the project. While the main compound has been assessed in **Section 4**, these facilities have also been assessed having regard to the aim and objectives of PBP 2019. Facilities such as concrete batch plants, laydown areas, quarries and satellite offices have also been assessed with regard to the aim and objectives of PBP 2019.

**Table 5.1** outlines the aim and objectives of PBP 2019 and how the project addresses these provisions.

**Table 5.1 PBP 2019 Aim and Objectives**

| Aim and Objectives | Application |
|---|---|
| **Aim** | |
| To provide for the protection of human life and minimise impacts on property from the threat of bushfire, while having due regard to development potential, site characteristics and protection of the environment. | This Bushfire Hazard Assessment outlines recommended measures to meet the aim of PBP 2019. |
| **Objectives** | |
| Afford buildings and their occupants protection from exposure to a bushfire; | The temporary accommodation and main site office buildings are recommended to incorporate bushfire protection measures, such as APZs, constructions standard, access, water, services and emergency management procedures to provide protection from exposure to bushfire. |
| Provide for a defendable space to be located around buildings; | The camp and main compound areas are to incorporate an APZ sufficient for BAL 29 in combination with a trafficable defendable space around the perimeter of each area. |
| Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings; | The camp and main compound buildings are to be constructed to BAL 29 in combination with appropriate APZs. Bushfire sprinklers are also proposed on the camp buildings to provide an additional layer of protection.<br><br>Remote work sites (e.g. concrete batch plants, laydown areas, quarries, etc.) and satellite offices will vary as the project progresses and rely on emergency management procedures to provide protection for workers. |
| Ensure that appropriate operational access and egress for emergency service personnel and occupants is available; | Access for emergency services is to be provided to the camp and main compound in accordance with PBP 2019.<br><br>The project operation will ensure that arrangements are in place for emergency access for local residents and emergency services. |
| Provide for ongoing management and maintenance of BPMs; and | The recommended bushfire protection measures are to be maintained for the duration of the project. |
| Ensure that utility services are adequate to meet the needs of firefighters. | A static water supply for fire fighting is to be provided at the camp and main compound in addition to the required domestic supply and water for the bushfire sprinkler system.<br><br>Electricity and gas services are to be provide in accordance with the requirements of PBP 2019. |

# 6. Recommendations and Conclusion

## 6.1 Recommendations

Based on the Bushfire Hazard Assessment outlined in **Section 3** and **Section 4**, Site 0 is the preferred site for the camp and main compound due to there being:

- lesser extent of bushfire prone vegetation within close proximity of the site;
- the ability to provide APZs that are greater than the required minimum (larger APZs are encouraged where possible); and
- vehicular access to the Macleay River for an additional fire fighting water source.

Notwithstanding the preference for Site 0, the following mitigation measures will be applied to whichever site is identified for the construction of the camp and main compound:

- APZs for the camp and main compound are to be provided in accordance with **Table 4.1** and **Illustration 4.1**, **4.2** or **4.3** for the relevant site.

- The camp and compound area and surrounding APZ are to be established and managed as an Inner Protection Area in accordance with Appendix A4.1.1 of PBP 2019.

- Camp and compound buildings are to be constructed to comply with Section 3 and 7 (BAL 29) of AS3959-2018 'Construction of Buildings in Bushfire Prone Areas' and Section 7.5.2 of PBP 2019.

- Access to the camp and main compound is to comply with Table 7.4a of PBP 2019 and is to include a trafficable area around the perimeter of each facility within the APZ.

- A total 200,000 litre static fire fighting water supply is to be provided for the camp and compound sites. The fire fighting water supply is required in addition to the domestic supply required to service the camp and compound buildings and the water supply required to service the bushfire sprinkler system and any fire hose reels or similar required under the National Construction Code.

- The fire fighting water supply is to be installed and maintained in accordance with Table 7.4a of PBP 2019.

- Electricity and gas services are to comply with Table 7.4a of PBP 2019.

- Landscaping is to comply with the standards for an Inner Protection Area, as outlined in PBP 2019 – Appendix A4.1.1.

- Prior to the commencement of operations, a Bush Fire Emergency Management and Evacuation Plan consistent with the NSW RFS publication: *A Guide to Developing a Bush Fire Emergency Management and Evacuation Plan*, and AS 3745:2010 'Planning for emergencies in facilities' is to be prepared.

- A Bushfire Operations Plan is to be prepared as part of the Site Construction Management Plan.

## 6.2 Conclusion

This Bushfire Hazard Assessment has taken into consideration the nature of the proposed activity, the existing vegetation, effective slope and FDI detailed within PBP 2019. Adequate and appropriate bushfire protection measures are available and can be implemented to minimise the risk of bushfire for the proposed Kempsey Road restoration project.

It is therefore recommended that the mitigation measures outlined in **Section 6.1** be applied to the proposed project.

**Paul Creenaune**
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*Grad Dip (Bushfire Protection)*
*BPAD – Level 2 (58899)*

# References


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# Copyright and Usage

# Appendix A

# APZ Performance Solution Calculation

# NBC Bushfire Attack Assessment Report V4.1

**AS3959 (2018) Appendix B - Detailed Method 2**

**Print Date:** 27/10/2023 **Assessment Date:** 27/10/2023

**Site Street Address:** Lower Creek, Lower Creek

**Assessor:** Paul Creenaune; GeoLINK

**Local Government Area:** Armidale Regional **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:** East

## Vegetation Information

**Vegetation Type:** Forest (including Coastal Swamp Forest)

**Vegetation Group:** Forest and Woodland

**Vegetation Slope:** 30 Degrees **Vegetation Slope Type:** Downslope

**Surface Fuel Load(t/ha):** 22 **Overall Fuel Load(t/ha):** 36.1

**Vegetation Height(m):** 2 Only Applicable to Shrub/Scrub and Vesta

## Site Information

**Site Slope:** 0 Degrees **Site Slope Type:** Level

**Elevation of Receiver(m):** Default **APZ/Separation(m):** 91

## 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:** **Peak Elevation of Receiver(m):** 35.6

**Radiant Heat(kW/m2):** 28.88 **Flame Angle (degrees):** 39

**Flame Length(m):** **Maximum View Factor:** 0.492

**Rate Of Spread (km/h):** 16.74 **Inner Protection Area(m):** 91

**Transmissivity:** 0.772 **Outer Protection Area(m):** 0

**Fire Intensity(kW/m):** 312177

# Appendix B

# APZ Standards

# 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).

### 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 defendable 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.

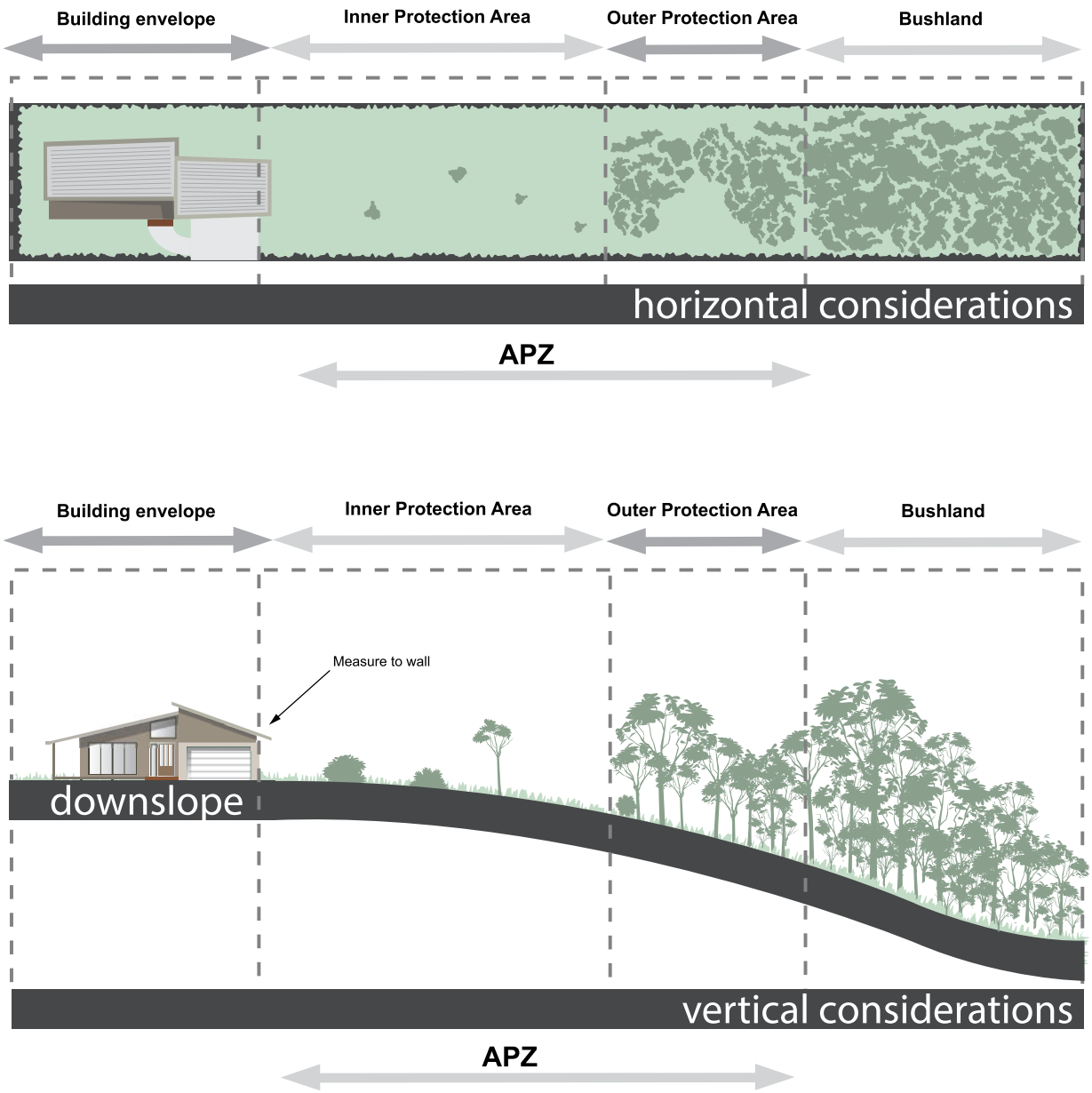
**Grass**

- 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.

## Figure A4.1

Typical Inner and Outer Protection Areas.



# Appendix C

# RFS Vehicle Turning Requirements

## A3.3 Vehicle turning head requirements

Dead ends that are longer then 200m must be provided with a turning head area that avoids multipoint turns. “No parking” signs are to be erected within the turning head.

The minimum turning radius shall be in accordance with Table A3.2. Where multipoint turning is proposed the NSW RFS will consider the following options:

### Figure A3.3

Multipoint turning options.