

Bushfire Risk Assessment Kialla North Growth Corridor



February 2022

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Report by Daniel Casullo

Cover image: Looking west into the Grassland vegetation onsite

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1. INTRODUCTION

Practical Ecology have been commissioned by the Greater Shepparton City Council to provide a bushfire risk assessment for the area within the Tatura Structure Plan to inform the future development of the site.

1.1 Background

The *Greater Shepparton Housing Strategy 2011* (GSHS) was designed to guide the long-term identification and provision of residential land within the City of Greater Shepparton and was incorporated into the Greater Shepparton Planning Scheme in 2012.

It is understood that in 2017 the Kialla North Growth Corridor was the subject of Amendment C195 to the Planning Scheme which rezoned the land to the Urban Growth Zone – Part A to safeguard the area for future development as a strategic residential growth corridor. The council and the Victorian Planning Authority (VPA) have prepared the *Shepparton Mooroopna 2050: Regional City Growth Plan* to provide a guide for the sustainable development of Shepparton and Mooroopna to the year 2050. The Growth Plan envisages that the Kialla North Growth Corridor will accommodate for approximately 2,150 future residents and will hold a combination of low and standard density residential development.

The council have allocated budget towards the preparation of background reports to inform this process which includes the assessment of bushfire risk. The entirety of the site is located within the Bushfire Prone Area (BPA). Additionally, the land adjacent to the northern site boundary within the creek line is within the Bushfire Management Overlay (BMO). Due to this, the land is subject to the planning implications enforced under Clause 13.02–1S, Clause 53.02 Bushfire Planning and Clause 44.06 Bushfire Management Overlay. We have addressed these requirements in the following report which include sections detailing the Bushfire Hazard Site Assessment, Bushfire Hazard Landscape Assessment and Bushfire Risk Assessment.

Clause 13.02–1S's objective is to strengthen the protection and resilience of settlements and communities from bushfire through risk-based planning that prioritises the protection of human life. While it does not list strict requirements and decision guidelines, it contains multiple strategies which need to be considered when determining bushfire risk in planning. One of these strategies, 'Use and development control in a Bushfire Prone Area', dictates which developments within Bushfire Prone Areas need to consider bushfire risk as part of their planning permission:

- Subdivisions of more than 10 lots.
- Accommodation.
- Child care centre.
- Education centre.
- Emergency services facility.
- Hospital.

- Indoor recreation facility.
- Major sports and recreation facility.
- Place of assembly.
- Any application for development that will result in people congregating in large numbers.

Since the expected development can be considered under one or more the above categories, this assessment seeks to determine the bushfire risk to the site and evaluate it against the requirements of Clause 13.02-1S to ensure it can proceed safely.

It should be noted that since only part of this site is within the BMO but the entire site is within a Bushfire Prone Area, this assessment will not be suitable for individual developments required to address the BMO (separate Bushfire Management Statements will be required). It will however allow developments only within a Bushfire Prone Areas to forego a planning response under Clause 13.02-1S (as long as the recommendations of this report are followed) and will allow applications within the BMO to be streamlined. The council may also consider a site-specific schedule within the BMO areas in order to define a required BAL construction standard. This would be reliant on the general development design creating the right defendable space although this would potentially eliminate the need for future permits for each subdivision. Alternatively, precincts can be established based on the BMO boundaries so Bushfire Management Statements cover the required area and are limited in number.

1.2 Scope

In order to provide a full assessment under Clause 13.02-1S and adequately determine the bushfire risk to this site and any subsequent developments which occur here, this assessment will encompass the following:

- An assessment of the site and the area within 150m of the boundary to determine the vegetation classifications and slopes as per *Australian Standards 3959-2018: Construction of Buildings in Bushfire Prone Areas* (AS3959-2018);
- A review of the access and egress conditions around and within the site;
- A review of the managed vegetation and other infrastructure within the assessment and any hazard that may be present;
- A review of the wider landscape including bushfire history, potential bushfire conditions under prevailing conditions and potential refuges;
- An assessment of the determined bushfire risk against Clause 44.06 and Clause 53.02 (while the BMO only applies over part of the site, these measures form an excellent benchmark for bushfire safety);
- An assessment of the determined bushfire risk against the individual strategies of Clause 13.02-1S how well they are met across various areas of the site and surrounding areas, and.
- A list of recommendations for the subject site based on the determined bushfire risk and the strategies of Clause 13.02-1S.

1.3 Executive Summary

The subject site is located within Kialla North and is approximately 485 ha and situated on largely flat topography. The area is composed primarily of open farmland with scattered dwellings present throughout. Access is provided along the eastern, southern and western boundaries via main roads although no access is provided along the northern boundary due to the presence of Broken River corridor with its' corridor of riparian forests. Internal access is currently limited due to the private land present although new access designed for bushfire safety could be easily implemented due to the flat topography and minimal vegetation present.

The site adjoins to farmland to the east and south which extends outwards for many kilometres. The northern boundary of the site follows the length of Broken River which consists of dense vegetation and the urban development of Kialla is located to the west of the site. The broader landscape consists primarily of open farmland to the east and south. The outskirts of the City of Shepparton are located to the north of the site before it transitions to open farmland further east. A mixture of commercial and residential development is present to the west of the site within Kialla. This area then transitions to dense vegetation located within the Shepparton Regional Park which follows the path of the Goulburn River within this area.

No bushfires have impacted the site according to the available databases although a small-scale bushfire did impact the land in 2019 immediate to the sites' northern boundary within the vegetation following Broken River. Fire runs from the north-west can be in excess of 3 km and would transect the vegetation within Broken River and the associated reserves. The risk is reduced however as the vegetation in this area is largely restricted to the area immediately adjacent to the Broken River which is flanked by residential development to the north and south. Fire runs from the south-west would be of lower intensity grassfires and considering the existing road network would likely be suppressed prior to impact on the site. There is however the potential for short yet fast fire runs occurring within the site so these need to be taken into consideration through the potential development process.

The subject site was split into 11 areas of consistent conditions to determine individual risk and hazard outcomes. The risk was considered low for all areas excluding Area 1, 4, 5 and 6. Areas 5 and 6 form part of the 150m assessment area outside of the site boundaries and are located adjacent to the vegetation within Area 3 and were therefore considered of Moderate risk. Area 1 and 4 are located to the south of Area 3 and could be impacted by a fire run from the north west through Area 3 which could see the present grassland ignited through ember attack or fire front. The hazard was considered low for all area's excluding Area 3 due to the Forest type vegetation present.

Despite only the immediate area to the northern site boundary being within the BMO, all areas were considered against Clause 53.02 which was used as a benchmark for bushfire safety. All of the components of Clause 53.02 can be easily addressed thanks to the proximity to developed areas and the reduced amount of vegetation in the wider landscape.

Due to the presence of the Bushfire Prone Area (BPA) throughout the majority of the site, bushfire risk needs to be considered at the planning level under Clause 13.02-1S Bushfire Planning. The overarching requirement to protect human life can be addressed through the site being largely low-

risk in its current condition with the minimal bushfire risk being further reduced through good urban design.

Some areas have been considered of High risk although through the provision of development and thus the application of the BMO and relevant Bushfire policy the risk can be reduced to an acceptable level. The required BAL-12.5 construction standard can be achieved throughout the site with only some setbacks required along the northern boundary in response to the Forest vegetation and fuel load along the Broken River, and from the revegetation occurring through the Urban Floodway Zone passing through the centre of the site (Area 8). This area should have setbacks in place in accordance with a Grassland classification. A setback will also be required in response to the Grassland vegetation external to the site although this would likely be achieved through the existing road reserve in most locations.

In response to the Forest vegetation along Broken River, it is recommended to include a perimeter road between Area 3 and the proposed development as to provide separation from the hazard along with immediate access and egress from the area. The separation provided by a perimeter road is unlikely to meet the required setback from the vegetation within Area 3 to meet the BAL-12.5 standard. A Park reserve could be implemented as to meet this required setback. Any proposed vegetation within this area would have to meet the requirements of defensible space.

It is also advised to direct the anticipated low density residential development to the northern portion of the site. This would see larger lot sizes with managed vegetation which can act as a buffer from potential fire runs.

Additionally, as potential development is likely to be staged, a sufficient buffer should be implemented throughout all stages of development as to mitigate the impacts of potential short yet fast grass fire runs that can occur within the site.

2. BUSHFIRE HAZARD LANDSCAPE ASSESSMENT

The bushfire risk to the site was considered at the landscape scale to develop an understanding of the likely conditions which threaten the site and then the local and site scales to determine the impact these conditions would have. The results of this assessment are presented below.

There were some limitations to this assessment as a result of the site conditions. Since the majority of the site is within private land developed and used as farmland there was limited access throughout and therefore the majority of the site assessment was conducted from surrounding road reserves and aerial photos.

Additionally, due to the majority of area within the site being within private land we were only able to conduct one Fuel Load Assessment. We will use all available resources to ensure accuracy of assessment within these limitations and provide the best possible results and recommendations addressing bushfire risk.

2.1 Landscape assessment

The bushfire hazard landscape assessment provides information on the bushfire hazard more than 150 m away from the Growth Area. The surrounding landscape is displayed on Figure 1 and the bushfire conditions are displayed on Map 2.

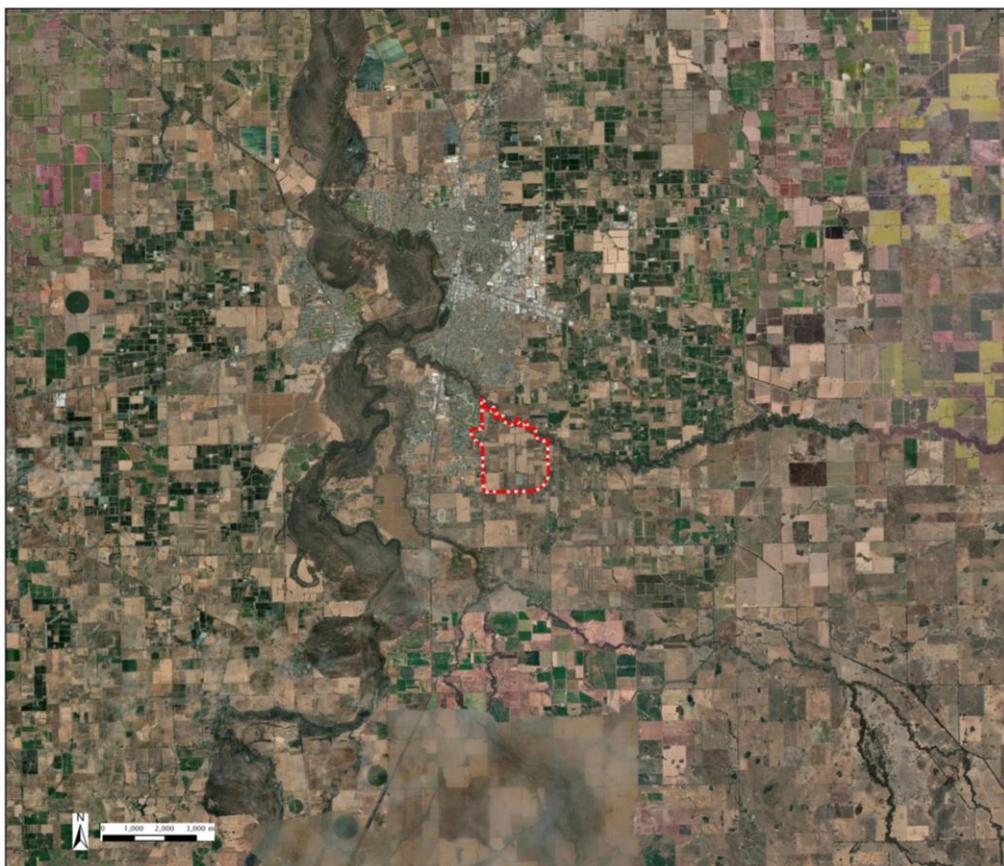


Figure 1. Landscape surrounding the site

2.1.1 Local landscape

The subject site is located adjacent to farmland to the east and south. The northern boundary of the site is located within the Broken River Water Frontage which sees it adjoining to dense vegetation, the land then transitions to open farmland shortly after. The southern extent of the sites western boundary adjoins to managed pasture which then transitions to newly developed residential development to the northwest. Further north beyond Cardinia Court lies the established development within Kialla. The Ganaway Reserve is located to the north-west of the site amongst residential development. The reserve contains scattered trees and shrubs and is located nearby to parks and recreational areas.

2.1.2 Wider landscape

The site is located to the east of the established development within Kialla and surrounded largely by open farmland to the east and south on a flat topography. Broken River and its adjoining vegetation continue further east following the Midland Highway for many kilometres. To the north of the site lies the City of Shepparton. This sees a mixture of higher density development within the city itself and open farmland on the outskirts to the east. To the west of the site the land contains a mixture of residential and commercial development along with the Shepparton Aerodrome. Seven Creeks Regional Park is located further west and forms part of the urban-bushland interface between the Shepparton Regional Park and the Goulburn Valley Highway. This vegetated regional park follows the Goulburn River further north and south for many kilometres.

2.2 Bushfire history

Map 1 below details the bushfire conditions and history

No Bushfires have occurred onsite according to the available databases.

A small-scale bushfire did impact the land in 2019 immediate to the sites northern boundary within the vegetation following Broken creek. Other small bushfires have occurred within the Shepparton Regional Park to the west of the site between 2010–2020. This area is approximately 6 km to the west of the site with some patches of vegetation exceeding 1.5 km in width. Multiple prescribed burns have occurred within this same stretch of area between 2009–2015.

2.3 Landscape bushfire scenarios

During bushfire season, bushfires are propelled by powerful hot north–westerly winds from central Australia before a south–westerly change occurs. This south–westerly change brings cooler, humid winds from the Southern Ocean which can reduce bushfire intensity or result in less intense bushfires approaching from the south–west.

The most likely approach for fire is from the north and north–west due to winds from this direction being more common in high fire risk conditions.

Fire runs from the north–west can be in excess of 3km and would transect the vegetation within Broken River and the associated reserves. The risk from fire runs from this aspect are however reduced as the present vegetation is largely restricted to the river area and is located immediate to residential development to the north and south. Archer Street would also act as a buffer from incoming bushfire approach and would aid in suppression efforts. If an ignition were to occur to the east of Archer Street within said vegetation the resulting bushfire could impact the site and move further north–west toward Doyles Road through the creek line.

Fire runs from the north outside of the site boundaries can be in excess of 1km and would cross primarily Grassland type vegetation on a flat topography. This grassfire could then progress into the Forest type vegetation within the Broken Creek line which could see a transition to a higher intensity bushfire. The associated increase in fuel load would see an increase in ember attack which could promote ember spotting within the site and subsequent grassfires.

Fire runs from the south or south–west can be in excess of 2km although are likely to be of lower intensity grassfires. These fire runs would also be largely buffered by River Road which would aid in suppression efforts.

Given the size of the site, there is the potential for short sharp grass fire runs occurring within the site. This potential threat should be considered through staged development to ensure appropriate buffers are maintained.

2.4 Landscape typology

Planning Practice Note 65 provides a typology of bushfire landscapes (see Table 1).

The landscape can be best described as a Type 2 as a bushfire approaching from the north-west could result in neighbourhood-scale destruction along the northern boundary of the site. The landscape is not considered as severe as a Type 3 due to bushfire approach being largely restricted to one aspect.

Table 1. Landscape typology as presented in Planning Practice Note 65 (DTPLI 2014)

Type 1	Type 2	Type 3	Type 4
<ul style="list-style-type: none"> - There is little vegetation beyond 150 metres of the site (except grasslands and low-threat vegetation). - Extreme bushfire behaviour is not possible. - The type and extent of vegetation is unlikely to result in neighbourhood scale destruction of property. - Immediate access is available to a place that provides shelter from bushfire. 	<ul style="list-style-type: none"> - The type and extent of vegetation located more than 150 metres from the site may result in neighbourhood-scale destruction as it interacts with the bushfire hazard on and close to a site. - Bushfire can only approach from one aspect and the site is located in a suburban, township or urban area managed in a minimum fuel condition. - Access is readily available to a place that provides shelter from bushfire. This will often be the surrounding developed area. 	<ul style="list-style-type: none"> - The type and extent of vegetation located more than 150 metres from the site may result in neighbourhood-scale destruction as it interacts with the bushfire hazard on and close to a site. - Bushfire can approach from more than one aspect. - The site is located in an area that is not managed in a minimum fuel condition. - Access to an appropriate place that provides shelter from bushfire is not certain. 	<ul style="list-style-type: none"> - The broader landscape presents an extreme risk. - Evacuation options are limited or not available.

2.5 Victorian Fire Risk Register (VFRR)

The risk and threat ratings recorded within the VFRR are displayed on Map 3 and Map 4

The VFRR has categorised the area to the north-east of the site adjacent to Broken River as high risk and moderate threat. The high-risk categorisation can be attributed to the area's proximity to the vegetation within Broken River. The VFRR has assumed the potential for fire front impact and ember attack from a fire run from the north-west, the risk is reduced however as the vegetation present is largely restricted to the river banks. The threat has taken on the lowest categorisation that the VFRR details which is moderate threat. This can be attributed to the minimal vegetation present and the surrounding residential development.

3. BUSHFIRE HAZARD SITE ASSESSMENT

The bushfire hazard site assessment provides information on the bushfire hazard within the Growth Area and within 150m of the boundary as per the requirements of the Bushfire Management Overlay. The assessed bushfire conditions and the results of this assessment are displayed on Map 2, Map 3 and Map 4.

3.1 Subject site

The results of the vegetation assessment are displayed on Map 2 and Table 2

The subject site is composed primarily of open paddocks which can be considered Grassland type Vegetation with scattered dwellings present throughout. Forest type vegetation as per AS3959:2018 is present along the northern boundary of the site within Broken River. The Urban Flood Way Zone is present running through the centre of the site which connects through to the Ganaway Reserve. This area is proposed for revegetation works in accordance with the proposed development plan which will see a similar density of vegetation as currently present within Kialla Lakes.

The vegetation observed within the assessment area was Forest and Grassland type vegetation as per AS3959–2018. Slopes within this area were predominately level. As per AS3959–2018, Table 2 provides the distances required to meet the defensible space requirements for BAL–12.5.

Table 2. Classified vegetation present within the site

Vegetation type	Forest	Grassland
Slope (up/down)	Level	Level
Slope (degrees)	0-2°	0-2°
Defendable space required for BAL 12.5 (m)	48	19

A Fuel Hazard Assessment as per DSE's *Overall Fuel Hazard Assessment Guide* (Hines et al. 2010a) was performed at the end of McPhees Road within the Public Conservation and Resource Zone (see Map 2 for location). Refer to Appendix 1 for the detailed results of this assessment. This area was the only location identified where it was possible/feasible to conduct the assessment as the majority of the site is located within private land. This area can be seen as representative for the vegetation present on the banks of Broken River.

The results obtained from the assessment were typical of what is standardised for Forest type vegetation as per AS3959–2018 (see Appendix 1 for the results). The canopy cover was 50% which falls within the expected 30–70% foliage cover for Forest vegetation, the elevated fuel layer was also 50% which is also in line with expected results. The understorey fuel load was 15 tonnes/ha with a total fuel load (including the canopy) of 25 tonnes/ha.

3.1.1 Forest

Forest vegetation as per AS3959–2018 consists of a canopy layer between 10–30m high (can be taller) with foliage cover of between 30–70%. There is also an elevated fuel layer of shrubs along with ground story fuels (grasses and herbs). This vegetation is typically dominated by Eucalypts but also includes Pine plantations and denser covering of exotic trees. Forest vegetation is present within and along Broken River (see Figure 4)

3.1.2 Grassland

Grassland vegetation as per AS3959–2018 is dominated by grass and herb species and can contain canopy and elevated fuel layers of varying heights as long as the foliage cover is less than 10%. The majority of the site is composed of managed pasture which is considered as Grassland vegetation as per AS3959–2018 (see Figure 2).

3.1.3 Low Threat Vegetation

Low Threat vegetation as per AS3959–2018 consists of vegetation managed to minimal fuel conditions including maintained lawns, golf courses, maintained public reserves and parklands, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and wind breaks. Areas of Low Threat include the existing residential development within Kialla to the west of the site (see Figure 10).

3.2 Access conditions

The existing road network provides main road access along the entire perimeter of the site. Archer Street provides access along the western boundary which adjoins to River Road along the site's southern boundary and then onto Doyle's Road along the eastern boundary. Access is limited along the northern boundary with McPhees Road providing the only point of access. Due to the private land present internal access to the site is currently limited to Hoppers Road.

It can be assumed that internal access will be provided through staged development which can be easily accommodated due to the flat topography and minimal vegetation onsite. This will ensure that proposed development will be in close proximity to a public road and access and egress can be readily provided to emergency services. These requirements are in accordance with Approved Measure 2.2 of Clause 53.02 Bushfire Planning.

4. BUSHFIRE RISK ASSESSMENT

In order to provide a detailed analysis of the bushfire conditions and the appropriate responses for future developments, we need to examine the current risk and hazard from each part of the assessment area (parts are divided based on current usages, management and the developments present. These sections then need to be considered against the current bushfire policy, specifically Clause 13.02-1S Bushfire Planning and Clause 53.02 Bushfire Planning which address general bushfire concerns and the requirements under the BMO respectively.

4.1 Site analysis

Considering all of the results above we can divide the growth areas based on the conditions and usage observed and determine the risk posed to each zone and the hazard it poses to the surrounding areas. The Kialla North Growth Corridor was divided into 11 numbered zones which are described in detail below and provided on Map 3 and Map 4.

Area 1

Location	Northern portion of site
Risk category	Moderate
Hazard category	Low
Details	<p>Consists of managed pasture with some scattered dwellings (see Figure 2). The area is flanked by the vegetation within Area 3 to the north and east, managed pasture to the south and residential development to the west.</p> <p>The risk is considered moderate due to the area being located immediate to Area 3 to the north. A bushfire within the vegetation to the north could potentially transmit into and impact the area via either fire front or ember attack. The risk is reduced however due to the minimal vegetation present within the Area and the surrounding Areas. Considering this, the hazard is also considered low due to minimal vegetation present in the form of managed pasture.</p>
Photos	 <p>Figure 2. Managed pasture</p>

Area 2

Location	Southern portion of site
Risk category	Low
Hazard category	Low
Details	<p>This area makes up the majority of the site and consists of managed pasture with some scattered dwellings present (see Figure 3). This Area is flanked by managed pasture to the north, east and south and residential development interspaced with managed pasture to the west. The north-eastern corner of this Area is adjacent to the vegetation within Area 3.</p> <p>The risk is considered low as for the most part there is sufficient separation from the vegetation within Area 3. The south-eastern corner of the Area however is adjacent to the vegetation within Area 3 and therefore appropriate setbacks in this area will therefore need to be considered. The hazard is also considered low due to the comparatively lower density grassland vegetation present. This hazard will be further reduced through the provision of development.</p>
Photos	 <p style="text-align: center;">Figure 3. Managed pasture</p>

Area 3

Location	Northern boundary of the site following the Broken River vegetation
Risk category	High
Hazard category	High
Details	<p>Consists of Forest vegetation along Broken River (see Figure 4). This area is flanked by managed pasture to the north, east and south. The inner development within Kialla is present to the west.</p> <p>The risk is considered high as the area is susceptible to fire front impact from the north–west through the vegetation along Broken River, external to the site. The hazard is also considered high as the associated fuel load of the vegetation present is enough to see fire front transmission into the adjacent areas within the site. Ember attack could also see the provision of spot fires into the site.</p>
Photos	 <p>Figure 4. Forest vegetation on the banks of Broken River</p>

Area 4

Location	North–western corner
Risk category	Moderate
Hazard category	Low
Details	<p>Consist of low–density residential development amongst managed pasture. (see Figure 5). The area is flanked by the vegetation within Area 3 to the north, managed pasture to the east and south and residential development to the west.</p> <p>The risk is considered moderate due to the proximity to the vegetation within Area 3. Fire runs from the north–west could potentially see fire front impact and ember attack into the area. The risk is reduced however due to the surrounding managed pasture which would likely see a transition to a lower intensity grassfire on impact. The hazard is considered low due to the minimal vegetation present that is likely to reduce fire intensity on impact.</p>

<p>Photos</p>	 <p>Figure 5. The managed pasture present within the low-density development</p>
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Area 5

<p>Location</p>	<p>Northern boundary</p>
<p>Risk category</p>	<p>Moderate</p>
<p>Hazard category</p>	<p>Low</p>
<p>Details</p>	<p>Consists of managed pasture and a single dwelling (see Figure 6). This area is flanked by managed pasture to the north and east and the vegetation within Area 3 to the south and west</p> <p>The risk is considered moderate due to the proximity to Area 3. This Area could see potential impact from fire runs from the north west through the vegetation along Broken River. The hazard is considered low due to the minimal vegetation present.</p>
<p>Photos</p>	 <p>Figure 6. Managed pasture</p>

Area 6

Location	Northern boundary
Risk category	Moderate
Hazard category	Low
Details	<p>Similar to Area 5, consists of a small patch of managed pasture. This area is adjacent to the vegetation within Area 3 to the north-west and south. Managed pasture is present to the north and east.</p> <p>The risk is considered moderate due to the proximity to Area 3. A fire run from the north-west through Broken River could see impact on the area. The threat is considered low due to the minimal vegetation present.</p>
Photos	A photo could not be attained within this Area due to it being within inaccessible private land.

Area 7

Location	North-western corner with residential areas
Risk category	Low
Hazard category	Low
Details	<p>Composed entirely of residential development (see Figure 7). This area is flanked by the vegetation along Broken River to the north, managed pasture within the site to the east and residential development to the south. The Ganaway Reserve is present to the west of this area.</p> <p>The risk is considered low due to the surrounding residential development acting as a buffer from fire runs from the north-west and south-west. The hazard is also considered low due to the minimal vegetation present.</p>
Photos	 <p>Figure 7. Residential development along Gordon Drive</p>

Area 8

Location	Running through the centre of the site
Risk category	Low
Hazard category	Low
Details	<p>This area is located within the Urban Floodway Zone and will be revegetated as part of the proposed development plan. This revegetation will be similar to what has occurred further upstream within Ganaway Reserve (see Figure 8).</p> <p>The risk is considered low due to the surrounding areas being composed of managed pasture which would see a lower intensity grassfire if a fire run were to occur within the site. The hazard is also considered low as the area will be sparsely revegetated with scattered trees and shrubs and it is assumed the grassy understorey will be routinely managed as it has been further upstream.</p>
Photos	 <p>Figure 8. Managed vegetation along the waterway within the western portion of Area 8</p>

Area 9

Location	Western boundary, south of Mokoan Avenue
Risk category	Low
Hazard category	Low
Details	<p>Consists of a single dwelling amongst managed pasture and the streamside reserve within Area 8 (see Figure 9). Beyond this, residential development is present to the north, south and west. Managed pasture is present to the east beyond Archer Street.</p> <p>The risk is considered low as fire runs from either aspect are highly unlikely due to the surrounding residential development and road network. The hazard is also considered low due to the minimal vegetation present.</p>

<p>Photos</p>	 <p>Figure 9. Dwelling present adjacent to managed pasture</p>
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Area 10

<p>Location</p>	<p>Central along the Western boundary</p>
<p>Risk category</p>	<p>Low</p>
<p>Hazard category</p>	<p>Low</p>
<p>Details</p>	<p>Consists of standard density residential development adjacent to the vegetated streamside (see Figure 10). This area is surrounded largely by residential development which then transitions to managed pasture to the east beyond Archer Road.</p> <p>The risk and hazard are considered low due to the surrounding residential development and the minimal vegetation present.</p>
<p>Photos</p>	 <p>Figure 10. Higher density residential development.</p>

Area 11

Location	Western boundary, south of Whitton Avenue
Risk category	Low
Hazard category	Low
Details	<p>Consists of standard density residential development (see Figure 11). This area is flanked by managed pasture to the east and south</p> <p>The risk is considered low due to the surrounding residential development and road network. The threat is also considered low due to the minimal vegetation present.</p>
Photos	 <p>Figure 11. Residential development.</p>

4.2 Legislation and policy

In order to provide an assessment of the bushfire risk which can be utilised by council and by future developers seeking planning applications, the assessment of the bushfire risk needs to be considered against the current bushfire legislation.

Due to the presence of Bushfire Prone Area throughout the entirety of the site, bushfire risk needs to be considered at the planning level under Clause 13.02–1S Bushfire Planning. The Bushfire Management Overlay is present along the northern boundary of the site, surrounding the vegetation along broken river and the immediate land. Despite the BMO's limited presence, it serves as an excellent benchmark for bushfire safety which includes the incorporation of Clause 53.02. We will assess the site under both clauses.

4.2.1 Clause 53.02

Clause 44.06 Bushfire Management Overlay states that applications within the BMO must meet the requirements of Clause 53.02 unless a specific schedule of the BMO states otherwise (through exemption or alternative measures). The required responses under this Clause are based on the application types and include:

- Clause 53.02–3 Dwellings in existing settlements applies to single dwellings on properties within residential zonings (Neighbourhood Residential Zone, General Residential Zone, Residential Growth Zone, Urban Growth Zone, Low Density Residential Zone, Township Zone or Rural Living Zone). These applications can make certain assumptions regarding the landscape risk and available services so they do not require a landscape scale assessment and have much simpler application requirements.
- Clause 53.02–4.1 – 4.3 apply to all other developments except subdivisions. These measures are designed to review the landscape and local conditions with greater scrutiny since, unlike existing settlements, whether or not the landscape risk is acceptable or if particular amenities such as suitable access are available is not known.
- Clause 53.02–4.4 Subdivision objectives refers to subdivisions and employs aspects of 4.1 – 4.4 even if the application is within an existing settlement since the application needs to consider whether the proposed change in usage and/or population density can be accommodated by existing systems. These applications also have to be considered under Clause 13.02–1S (see Section 4.2.2 for further details).

Clause 53.02–4.4 has been considered appropriate for this site as despite the land being within the Urban Growth Zone (UGZ) it will be subject to subdivision through the proposed development process.

To fulfil the purpose, and allow application of Clause 53.02, objectives, measures to address the objectives, and decision guidelines are detailed within the Clause. These are defined below:

- **Objectives.** An objective describes the outcome that must be achieved in a completed development.
- **Approved measures (AM).** An approved measure meets the objective.
- **Alternate measures (AltM).** An alternative measure may be considered where the responsible authority is satisfied that the objective can be met. The responsible authority may consider other unspecified alternative measures.
- **Decision guidelines.** The decision guidelines set out the matters that the responsible authority must consider before deciding on an application, including whether any proposed alternative measure is appropriate.

We will focus on the Approved Measures of Clause 53.02–4.4; these are detailed in Table 3 below. The response under the Approved measures detailed below are in the context of the entire site, these measures are generally applied to smaller parcels of land so we have aimed to make our response most relevant where possible.

Table 3. Approved measures to meet Clause 53.02–4.4 Subdivision objectives

Clause 53.02–4.4 Subdivision objectives		
To provide lots that are capable of being developed in accordance with the objectives of Clause 53.02. To specify at the subdivision stage bushfire protection measures to develop a lot with a single dwelling on land zoned for residential or rural residential purposes.		
Measure	Requirement	Applicable
AM5.1	An application to subdivide land, other than where AM 5.2 applies, demonstrates that each proposed lot is capable of meeting: <ul style="list-style-type: none"> • The defensible space in accordance with Table 2 Columns A, B or C and Table 6 Clause 53.02–5. • The approved measures in Clause 53.02–4.1 and Clause 53.02–4.3. 	No – 5.2 applies
AM5.2	An application to subdivide land zoned for residential or rural residential purposes must be accompanied by a plan that shows: <ul style="list-style-type: none"> • Each lot satisfies the approved measure in AM 2.1. • A building envelope for a single dwelling on each lot that complies with AM 2.2 and provides defensible space in accordance with: <ul style="list-style-type: none"> – Columns A or B of Table 2 to Clause 53.02–3 for a subdivision that creates 10 or more lots; or – Columns A, B or C of Table 2 to Clause 53.02–3 for a subdivision that creates less than 10 lots. The bushfire attack level that corresponds to the defensible space provided in accordance with Table 2 to Clause 53.02–3 must be noted on the building envelope <ul style="list-style-type: none"> • Defensible space wholly contained within the boundaries of the proposed subdivision. • Defensible Space may be shared between lots within the subdivision. Defensible space for a lot may utilize communal areas, such as roads, where that land can meet the requirements for defensible space. • Vegetation management requirements in accordance with Table 6 to implement and maintain the defensible space required under this approved measure. • Water supply and access that complies with AM 4.1 	Yes – requires consideration
AM 5.3	An application to subdivide land to create 10 or more lots provides a perimeter road adjoining the hazardous vegetation to support firefighting.	Yes – requires consideration
AM 5.4	A subdivision manages the bushfire risk to future development from existing or proposed landscaping, public open space and communal areas.	Yes – requires consideration

Landscape Assessment

Subdivision applications utilise Approved Measure 2.1 and 2.2 from Clause 53.02–4.1 to determine if the risk from the surrounding landscape can be mitigated to an acceptable level. These measures are provided in detail below.

AM 2.1

The bushfire risk to the development from the landscape beyond the site can be mitigated to an acceptable level.

This measure can be easily met considering the reduced risk from the surrounding landscape and the sites proximity to the inner development within Kialla. Grassfires can potentially impact the site given the landscape context although these would likely be easily suppressed and the surrounding road network would act as a buffer. A bushfire could occur within the vegetation surrounding Broken River although the vegetation is restricted to this area and is therefore unlikely to harbour an uncontrollable fire front. This risk within this area can be addressed through the application of the requirements under the BMO.

AM 2.2

A building is sited to ensure the site best achieves the following:

- The maximum separation distance between the building and the bushfire hazard.
 - The building is in close proximity to a public road.
 - Access can be provided to the building for emergency service vehicles
-

It has been considered that the applicable setback in accordance with AS3959–2018 would provide sufficient separation from the vegetation along Broken River. A permitter road in addition to a form of managed open space such as a park reserve that meets the vegetation management requirements of defendable space would allow for the required setback to be met. A permitter road separating Area 8 from the proposed development would also provide adequate separation from this hazard.

It is also understood that the proposed development will incorporate low density development, this would likely see this low-density development directed to the areas adjacent to Broken River. This would create an area of lower population and more managed open space which would act as a buffer if a bushfire were to approach from the north-west.

It is assumed that the proposed development would see the incorporation of a road network that would provide immediate access and egress for emergency service vehicles whilst also create a setback/fuel break from the retained patches of vegetation within the site.

Site Assessment

Approved Measure 5.2 contains the site requirements to be met for new subdivision applications along with additional requirements regarding layout and management of properties (see below for the details).

AM 5.2

An application to subdivide land zoned for residential or rural residential purposes must be accompanied by a plan that shows:

- Each lot satisfies the approved measure in AM 2.1.
- A building envelope for a single dwelling on each lot that complies with AM 2.2 **and provides defensible space in accordance with:**
 - Columns A or B of Table 2 to Clause 53.02–5 for a subdivision that creates 10 or more lots; or
 - Columns A, B or C of Table 2 to Clause 53.02–5 for a subdivision that creates less than 10 lots.

The bushfire attack level that corresponds to the defensible space provided in accordance with Table 2 to Clause 53.02–5 must be noted on the building envelope
- Defensible space wholly contained within the boundaries of the proposed subdivision.
- Defensible Space may be shared between lots within the subdivision. Defensible space for a lot may utilize communal areas, such as roads, where that land can meet the requirements for defensible space.
- Vegetation management requirements in accordance with Table 6 to implement and maintain the defensible space required under this approved measure.
- Water supply and access that complies with AM 4.1

BAL Assessment

The vegetation observed within the 150m assessment area was Grassland and Forest. Slopes within this area were predominately level. As per AS3959–2018, Table 4 provides the distances required to meet the defensible space requirements for BAL–12.5.

Table 4. Classified vegetation present at Tatura

Vegetation type	Forest	Grassland	Low Threat
Slope (up/down)	Level	Level	Level
Slope (degrees)	0-2°	0-2°	0-2°
Defensible space required for BAL 12.5 (m)	48	19	N/A

The Forest vegetation surrounding Broken River is the greatest hazard to the site and requires the largest setback (48m). A road reserve may not provide the required setback if standard density residential development is to be placed adjacent to this area. Alternatively, A public space such as a maintained park reserve could be placed along this area to achieve the required setback. Vegetation within a potential park reserve used as a setback will have to meet defensible space management standards.

The Urban Floodway Zone within Area 8 will be revegetated in a similar state to what is present in the areas most western extent. This area can be considered Grassland type vegetation and the

development plan should consider the appropriate setback (19m) which could be in the form of a road reserve.

The required setback from the Grassland vegetation external to the site would likely be achieved through the provision of road reserves with possibly a slight setback in some areas. Considering the size of the site the development will be staged and therefore patches of Grassland vegetation will remain for periods of time. A setback from this vegetation will have to be put in place throughout the period of staged development to ensure adequate separation is attained at all times.

The proposed revegetation occurring within Area 8 would see scattered shrubs and trees with a managed grassy understorey. This area would therefore be deemed as a maintained public reserve/parkland and considered of Low Threat.

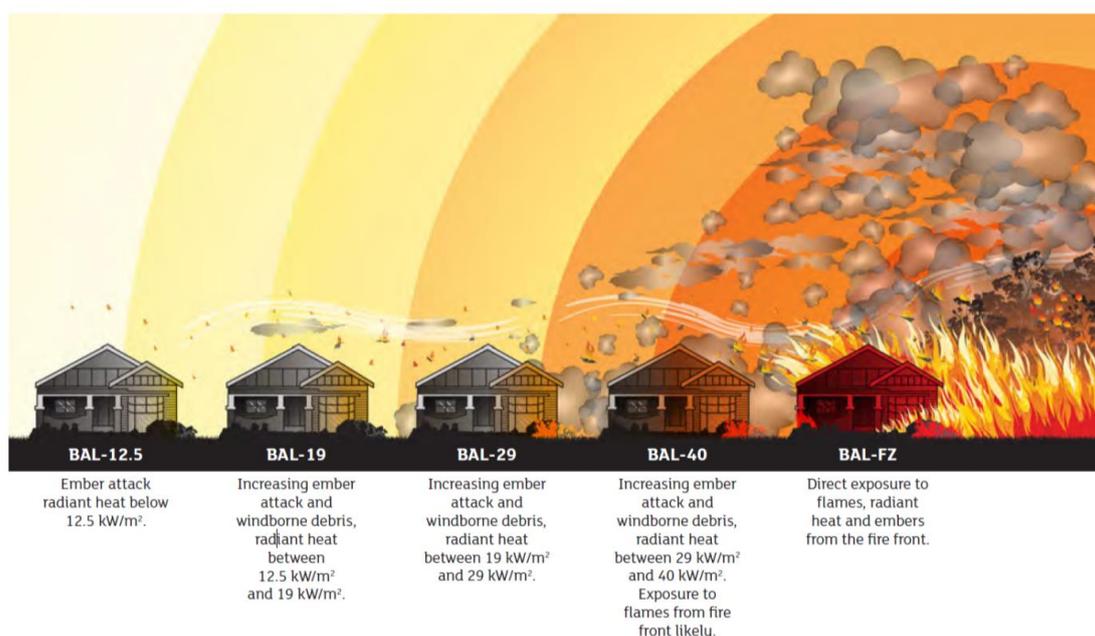


Figure 12. BAL levels (CFA 2012)

If the vegetation within Area 8 is to be managed to defensible space standards, as with any public space proposed within the site, they will have to meet the requirements as set out within Table 6 to Clause 53.02–5 which details the following:

- Grass must be short cropped and maintained during the declared fire danger period.
- All leaves and vegetation debris must be removed at regular intervals during the declared fire danger period.
- Within 10 metres of a building, flammable objects must not be located close to the vulnerable parts of the building.
- Plants greater than 10 centimetres in height must not be placed within 3m of a window or glass feature of the building.
- Shrubs must not be located under the canopy of trees.
- Individual and clumps of shrubs must not exceed 5 sq. metres in area and must be separated by at least 5 metres.
- Trees must not overhang or touch any elements of the building.
- The canopy of trees must be separated by at least 5 metres.

- There must be a clearance of at least 2 metres between the lowest tree branches and ground level.

Unless specified in a schedule or otherwise agreed in writing to the satisfaction of the relevant fire authority.

Water supply and access requirements

Approved Measure 4.1 details the requirements for water supply and access and is referenced under Approved Measure 5.2. **This is something which will need to be considered for lots within the BMO along the northern boundary of the site. For the lots outside of the BMO which encompasses the majority of the site, the below acts purely as a benchmark for bushfire safety and is not a requirement.**

AM 4.1

A building used for a dwelling (including an extension or alteration to a dwelling), a dependant person's unit, industry, office or retail premises is provided with:

- A static water supply for fire fighting and property protection purposes specified in Table 4 to Clause 53.02–5.
- Vehicle access that is designed and constructed as specified in Table 5 to Clause 53.02–5.

The water supply may be in the same tank as other water supplies provided that a separate outlet is reserved for fire fighting water supplies.

Water requirements are determined through the size of the property and whether or not a hydrant is present (see Table 5 below for the details). This requirement is stipulated within the BMO and are therefore not specifically required for properties outside of the BMO within the site.

Table 5. Static water supply requirements (Clause 53.02–5, table 4)

Lot sizes (m ²)	Hydrants	Effective capacity (L)	Fire authority fittings and access required
Less than 500	N/A	2,500	No
500–1,000	Yes	5,000	No
500–1,000	No	10,000	Yes
1,001 and above	N/A	10,000	Yes

Note 1: A hydrant is available if it is located within 120 meters of the rear of the building

Note 2: Fittings must be in accordance with the published requirements of the relevant fire authority

The access requirements are also based on similar principles where the length dictates the associated requirements (see Table 6 below). These requirements are stipulated within the BMO and are therefore not specifically required for properties outside of the BMO within the site.

Table 6. Access requirements (Clause 53.02–5, table 5)

Length	Requirements
Length of access is less than 30 metres	There are no design and construction requirements if fire authority access to the water supply is not required under AM4.1.
Length of access is less than 30 metres	Where fire authority access to the water supply is required under AM4.1 fire authority vehicles should be able to get within 4 metres of the water supply outlet.

Length	Requirements
Length of access is greater than 30 metres	<p>The following design and construction requirements apply:</p> <ul style="list-style-type: none"> • All-weather construction. • A load limit of at least 15 tonnes. • Provide a minimum trafficable width of 3.5 metres. • Be clear of encroachments for at least 0.5 metres on each side and at least 4 metres vertically. • Curves must have a minimum inner radius of 10 metres. • The average grade must be no more than 1 in 7 (14.4%) (8.1°) with a maximum grade of no more than 1 in 5 (20%) (11.3°) for no more than 50 metres. • Dips must have no more than a 1 in 8 (12.5 per cent) (7.1 degrees) entry and exit angle.
Length of access is greater than 100 metres	<p>A turning area for fire fighting vehicles must be provided close to the building by one of the following:</p> <ul style="list-style-type: none"> • A turning circle with a minimum radius of eight metres. • A driveway encircling the dwelling. • The provision of other vehicle turning heads – such as a T or Y head – which meet the specification of Austroad Design for an 8.8 metre Service Vehicle.
Length of access is greater than 200 metres	<p>Passing bays must be provided at least every 200 metres.</p> <ul style="list-style-type: none"> • Passing bays must be a minimum of 20 metres long with a minimum trafficable width of six metres.

Note 1: The length of access should be measured from a public road to either the building or the water supply outlet, whichever is longer.

4.2.2 Clause 13.02-1S

Clause 13.02-1S’s objective is to strengthen the resilience of settlements and communities to bushfire through risk-based planning that prioritises the protection of human life. It contains multiple strategies which need to be considered as part of any bushfire planning application either through the BMO or through separate assessment. These strategies include:

- Protection of human life,
- Bushfire hazard identification and assessment,
- Settlement Planning,
- Areas of biodiversity conservation value,
- Use and development control within a Bushfire Prone Area, and
- Policy guidelines and documents

The use and development control within a Bushfire Prone Area is detailed in Section 1.1 and states the types of development which need to be considered at the planning level within a Bushfire Prone Area so this has already been addressed. Additionally, the assessment utilises AS3959-2018 among other policy guidelines so this strategy can be considered addressed. The remaining strategies are discussed below.

Protection of Human Life

Give priority to the protection of human life by:

- Prioritising the protection of human life over all other policy considerations.
- Directing population growth and development to low-risk locations and ensuring the availability of, and safe access to, areas where human life can be better protected from the effects of bushfire.
- Reducing the vulnerability of communities to bushfire through the consideration of bushfire risk in decision-making at all stages of the planning process.

This strategy is very broad but focuses on ensuring that this ideal is at the forefront of any development when considering bushfire safety. Overall, the fact that this assessment is being performed and is addressing this Clause means that the protection of human life has been considered.

As detailed previously, the majority of the site has been considered of Low risk with the exception of Area 3 which is considered High. Through the provision of development and the application of the BMO within the required areas this area can then be considered of low risk. The present vegetation will be cleared and the main threat would be of ember attack which can be reduced through the implementation of setbacks in accordance with AS3959-2018 and through the application of the BMO.

Additionally, the site is located on the outskirts of Kialla where refuge can be readily sought within the existing urban development. The site itself also has the capacity for the inclusion of a BAL-LOW area. It is also assumed that the proposed development would include an internal road network adjoining to the existing permit roads, this would ensure immediate access and egress for residents and also acts as a fuel break/buffer from potential fire runs.

Bushfire hazard identification and assessment

Identify bushfire hazard and undertake appropriate risk assessment by:

- Applying the best available science to identify vegetation, topographic and climatic conditions that create a bushfire hazard.
- Considering the best available information about bushfire hazard including the map of designated bushfire prone areas prepared under the Building Act 1993 or regulations made under that Act.
- Applying the Bushfire Management Overlay in planning schemes to areas where the extent of vegetation can create an extreme bushfire hazard.
- Considering and assessing the bushfire hazard on the basis of:
 - Landscape conditions – meaning the conditions in the landscape within 20 kilometres and potentially up to 75 kilometres from a site;
 - Local conditions – meaning conditions in the area within approximately 1 kilometre from a site;
 - Neighbourhood conditions – meaning conditions in the area within 400 metres of a site; and,
 - The site for the development.
- Consulting with emergency management agencies and the relevant fire authority early in the process to receive their recommendations and implement appropriate bushfire protection measures. Ensuring that strategic planning documents, planning scheme amendments, planning permit applications and development plan approvals properly assess bushfire risk and include appropriate bushfire protection measures.
- Not approving development where a landowner or proponent has not satisfactorily demonstrated that the relevant policies have been addressed, performance measures satisfied or bushfire protection measures can be adequately implemented.

Sections 2 and Section 3 use the best available science and data to determine the bushfire risk at the scales detailed above and the requirements of the BMO have been applied here in detail so overall, this assessment addresses this strategy. The CFA will need to be consulted on this development plan and the recommendations being made.

Settlement Planning

Plan to strengthen the resilience of settlements and communities and prioritise protection of human life by:

- Directing population growth and development to low-risk locations, being those locations assessed as having a radiant heat flux of less than 12.5 kilowatts/square metre under AS 3959–2018 Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2018).
- Ensuring the availability of, and safe access to, areas assessed as a BAL-LOW rating under AS 3959–2018 Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2018) where human life can be better protected from the effects of bushfire.
- Ensuring the bushfire risk to existing and future residents, property and community infrastructure will not increase as a result of future land use and development.
- Achieving no net increase in risk to existing and future residents, property and community infrastructure, through the implementation of bushfire protection measures and where possible reduce bushfire risk overall.
- Assessing and addressing the bushfire hazard posed to the settlement and the likely bushfire behaviour it will produce at a landscape, settlement, local, neighbourhood and site scale, including the potential for neighbourhood-scale destruction.
- Assessing alternative low risk locations for settlement growth on a regional, municipal, settlement, local and neighbourhood basis.
- Not approving any strategic planning document, local planning policy, or planning scheme amendment that will result in the introduction or intensification of development in an area that has, or will on completion have, more than a BAL-12.5 rating under AS 3959–2018.

This strategy is the most important one which needs to be addressed by this assessment. This strategy is designed to prevent subdivisions and other developments which result in people congregating in large numbers from being constructed in dangerous locations. The primary means of achieving this is an explicit ban on developments where BAL-12.5 as per AS3959–2018 cannot be attained by every stage of development.

Overall, the site is well positioned to meet the requirements of this strategy. The area is large and is not only predominately managed farmland but has similarly managed terrain on most sides. The vast majority of the site is capable of meeting the BAL-12.5 construction standard with only a few minor setbacks required as detailed within Table 4. Vegetation within setbacks must adhere to defensible space standards.

Additionally, access to areas Considered BAL-LOW can also be readily sought within the inner development of Kialla to the west of the site. Technically, due to the Bushfire Prone mapping covering the entirety of the site, the incorporation of a BAL-LOW area at existing conditions may not be possible. The provision of development will likely see the clearance of large areas of Grassland type vegetation within the site which intern will further reduce the risk at large and potentially allow for areas assessed as BAL-LOW if the Bushfire Fire Prone mapping of the area is to be reassessed.

The enforcement of the BMO within the applicable areas will further reduce the risk to the site, particularly to settlement located nearby to retained vegetation. The provision of development will

likely see the clearance of large areas of Grassland type vegetation within the site which in turn will further reduce the risk.

Solely from a bushfire perspective, placing standard density development across the entirety of the site can be considered safe since as the chances of a fire approaching, even under prevailing conditions is very low and reduced further by the surrounding road network acting as a fuel break/buffer. Additionally adequate access is available through the surrounding road network which can adjoin to an internal road network. The use of a perimeter road in addition to a potential park reserve adjacent to Area 3 would allow for the required setback from the vegetation. We are aware that the development is likely to include the incorporation of low-density development within the site. Considering this, it is recommended to direct this low-density development within Area 1 and 4 as this in addition to a road reserve/park reserve would act as a buffer from potential fire runs from the north-west as detailed previously.

It is also advised to locate high risk uses (schools, kinder gardens, aged care facilities, etc.) within Area 2 as to ensure adequate separation from the bushfire hazard within Area 3.

Areas of high biodiversity conservation value

Ensure settlement growth and development approvals can implement bushfire protection measures without unacceptable biodiversity impacts by discouraging settlement growth and development in bushfire affected areas that are of high biodiversity conservation value.

The site is composed largely of exotic pasture with the exception of Area 3 and the western end of Area 8. The majority of Area 3 is unlikely to be impacted as it is within the Public Conservation and Resource Zone. Some adjacent vegetation may be impacted through the provision of development although not enough to be considered as having unacceptable biodiversity impacts. The western end of Area 8 will remain in its current state with the remainder of the area being revegetated in a similar manner.

4.3 Recommendations

After considering the bushfire risks and hazards present along with the requirements of the relevant legislation and policy, we can conclude that the implementation of standard density residential development within the site is suitable. As stated previously, there is minimal vegetation and fuel loads within the site or within the broader landscape with the exception of the vegetation surrounding Broken Creek. This sees a low-risk categorisation for all areas within the site excluding Area 1, 4, 5 and 6. The site adjoins to the existing development within Kialla and has sufficient access via the existing road network and through the provision of development which will see implementation of an internal road network.

The main bushfire risk posed to the site is the vegetation surrounding Broken River. A setback of 48m will be required to meet a BAL-12.5 standard. It is recommended to implement a perimeter road adjacent to Area 3 as to allow for immediate access and egress for the area whilst providing for a setback from the bushfire hazard within Area 3. Perimeter roads should adjoin to roads within the settlement that lead away from the hazard to ensure safe egress for occupants within the nearby lots. These roads should then adjoin to the broader road network within the settlement. Road widths are to comply with those of the relevant fire authority (DELWP 2020).

Additionally, a park reserve could be implemented along the boundary as to provide additional separation. Landscaping within a park reserve or any other vegetated public open space will have to be bushfire responsive with routine fuel management occurring as to ensure a bushfire risk is not created over time. If this area is to be used as a setback, then defendable space management standards will have to be adhered to.

We are aware that as part of the proposed development plan there will be a mixture of standard and low-density residential development within the site. Considering this, it is recommended to direct low-density development within Area 1 and 4 as these areas are nearby to the main bushfire hazard at large. The implementation of lower density development would see the provision of larger lot sizes with a lower population density and more managed land. This would effectively act as a buffer from fire runs from the north-west.

It is recommended to locate high risk uses (schools, kinder gardens, aged care facilities, etc.) within Area 2 as to ensure adequate separation from the bushfire hazard within Area 3.

The Urban Floodway Zone which passes through the centre of the site will also be revegetated as part of the development plan. It is recommended that revegetation within the area is restricted to a similar density of vegetation as to what has already been put in place in the areas most western portion. This area is to be considered Grassland and adjacent development should have the appropriate setback (19m) put in place which can be potentially achieved through a road reserve.

A setback will also need to be put in place from the Grassland vegetation external to the site, this will likely be achieved through the existing road reserve in most locations. Additionally, as potential development is likely to be staged, a sufficient buffer should be implemented as to mitigate the impacts of potential short yet fast grass fire runs that can occur within the site. Vegetation located within setbacks across the site will be managed as to adhere to defendable space requirements.

It has also been considered that the implementation of a site-specific schedule within the BMO areas may allow corresponding applications to be streamlined through the planning process. These schedules would define required BAL construction standard although this would be reliant on the general development design creating the applicable defendable space. This would potentially eliminate the need for future permits for each subdivision. Alternatively, precincts can be established based on the BMO boundaries so that Bushfire Management Statements cover the required area and are limited in number.

As to ensure bushfire risk on the settlement interface is managed into the future, a planning scheme amendment that enables new development within the settlement interface must note a condition that development cannot be located within the required setback area. This will ensure that buildings cannot be constructed within the setback area and increase the risk to the building itself and the greater settlement area. Planning scheme amendments can also incorporate section 173 agreements if a site-specific amendment is proposed. This ensures that if land within the designated setback area is to be privately owned, there is assurance that the management requirements of the land within the setback are upheld. The use of public open space as a setback such as a public reserve is ideal as it would also ensure a high level of certainty around routine management within the interface.

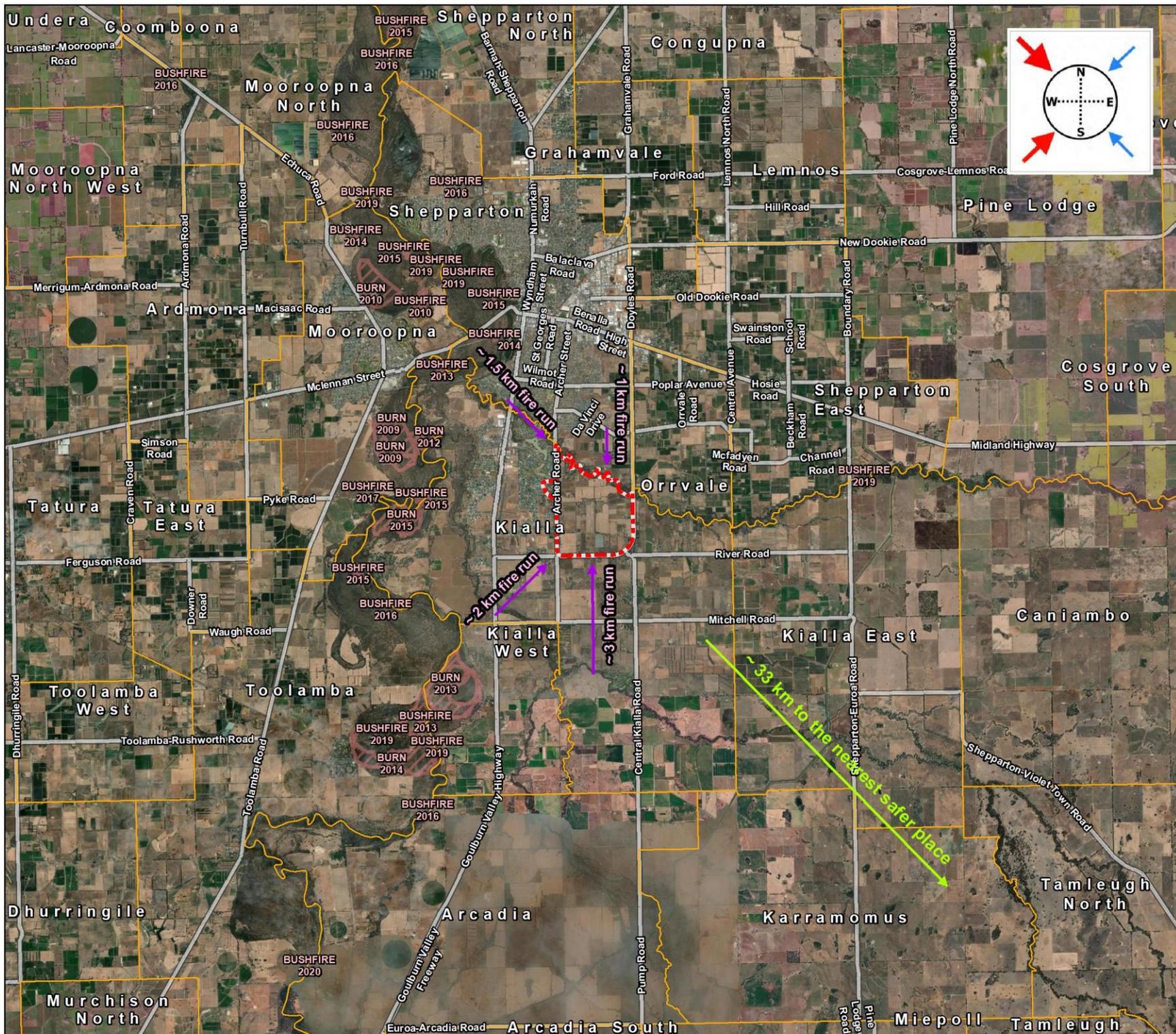
5. REFERENCES

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- CFA (2014a) *Standard Permit Conditions Bushfire Management Overlay*. Country Fire Authority, Victoria.
- CFA (2014b) *Water Supply Requirements (Bushfire Management Overlay)*. Country Fire Authority, Victoria.
- CFA (2014c) *Access Requirements (Bushfire Management Overlay)*. Country Fire Authority, Victoria.
- DELWP (2020) *Design Guidelines: Settlement Planning at the Bushfire Interface*. Department of Environment, Land, Water and Planning
- DTPLI (2014) *Practice Note 65: Preparing and Assessing a Planning Application under the Bushfire Provisions in Planning Schemes, July 2014*. Department of Transport, Planning and Local Infrastructure, Government of Victoria, Melbourne.
- Standards Australia (2018) *AS3959–2018 Construction of buildings in bushfire-prone areas (incorporating Amendment Nos 1 and 2)*. Fourth edition (reissued incorporating Amendment 1 June 2019 and reissued incorporating Amendment 2 December 2020) ed. SAI Global, Sydney.

Appendix 1. Fuel load assessment

Assessment ID		1
		Kialla North
Indicative photo		
Canopy		
% cover	50%	
Ave. height top (m)	16	
Ave. height base (m)	4	
Estimated fuel load (t/ha)	10	
Bark fuel		
Stringybark fuel hazard	NP	
Ribbon bark fuel hazard	M	
Other bark fuel hazard	M	
Bark fuel hazard	M	
Estimated fuel load (t/ha)	1	
Elevated fuel		
% cover	50%	
% dead	10%	
Ave. height (m)	1	
Elevated fuel hazard	H	
Estimated fuel load (t/ha)	2	
Near-surface fuel		
% cover	60%	
% dead	<10%	
Ave. height (cm)	5	
Near-surface fuel hazard	VH	
Estimated fuel load (t/ha)	6	
Surface fuel		
% cover	60%	
Ave. depth (mm)	15	
Surface fuel hazard	M	
Estimated fuel load (t/ha)	6	
Combined results		
Combined Surface Fuel Hazard	H	
Estimated surface fuel load (t/ha)	12	
Overall Fuel Hazard	H	
Overall/total estimated fuel load (t/ha)	15/25	

Appendix 2. Maps



**Bushfire Hazard
Landscape Assessment
Kialla North Growth Corridor**

Legend

- Subject Site
- Localities
- Potential fire run
- Neighbourhood Safer Place

Fire History

Bushfire

- Bushfire Pre 1950
- Bushfire 1950-1979
- Bushfire 1980 onwards

Planned Burn

- Planned Burn Pre 1980
- Planned Burn 1980 onwards

Details

Date: 13/10/2021
Version: 1
Aerial photography from Nearmap (Jul 2021).
Base map data Copyright © The State of Victoria.

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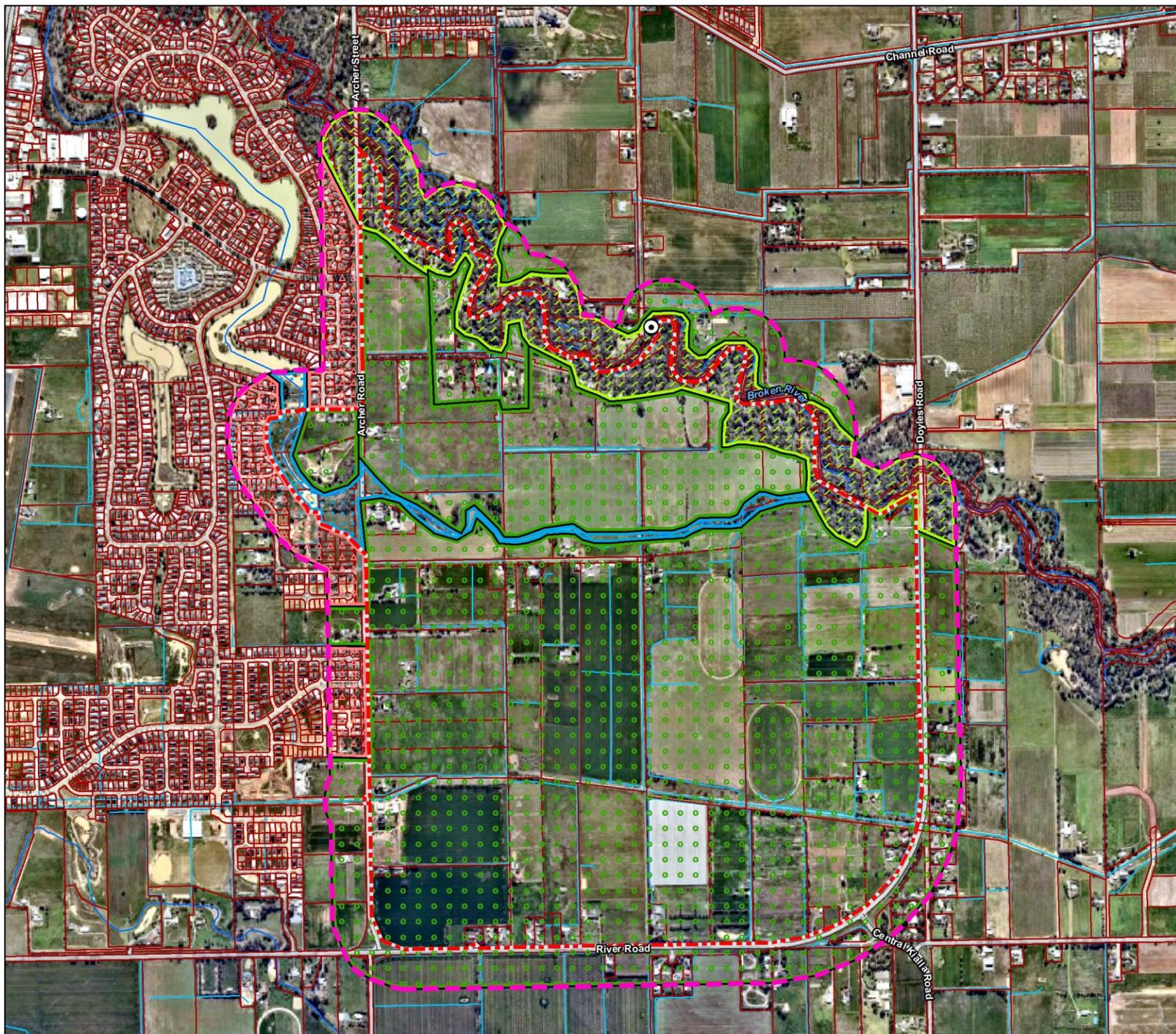
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Disclaimer
Practical Ecology bears no responsibility for the accuracy and completeness of this information and any decisions or actions taken on the basis of the map. While information appears accurate at publication, nature and circumstances are constantly changing.

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Observed bushfire conditions Kialla North Growth Corridor



Legend

- Subject Site
- Assessment Area (150m)
- Parcels
- Contours (10m)
- Constructed watercourse
- Natural watercourse
- Railways
- ⊙ Fuel load assessment

Observed conditions

- Grassland on managed paddocks
- Managed residential and urban areas
- Grassland vegetation within proposed creek reserve
- Forest vegetation

Details

Mapping by: Ali Nia
 Date: 7/02/2022
 Version: 1
 Aerial photography from Nearmap (Jul 2021).
 Base map data Copyright © The State of Victoria.

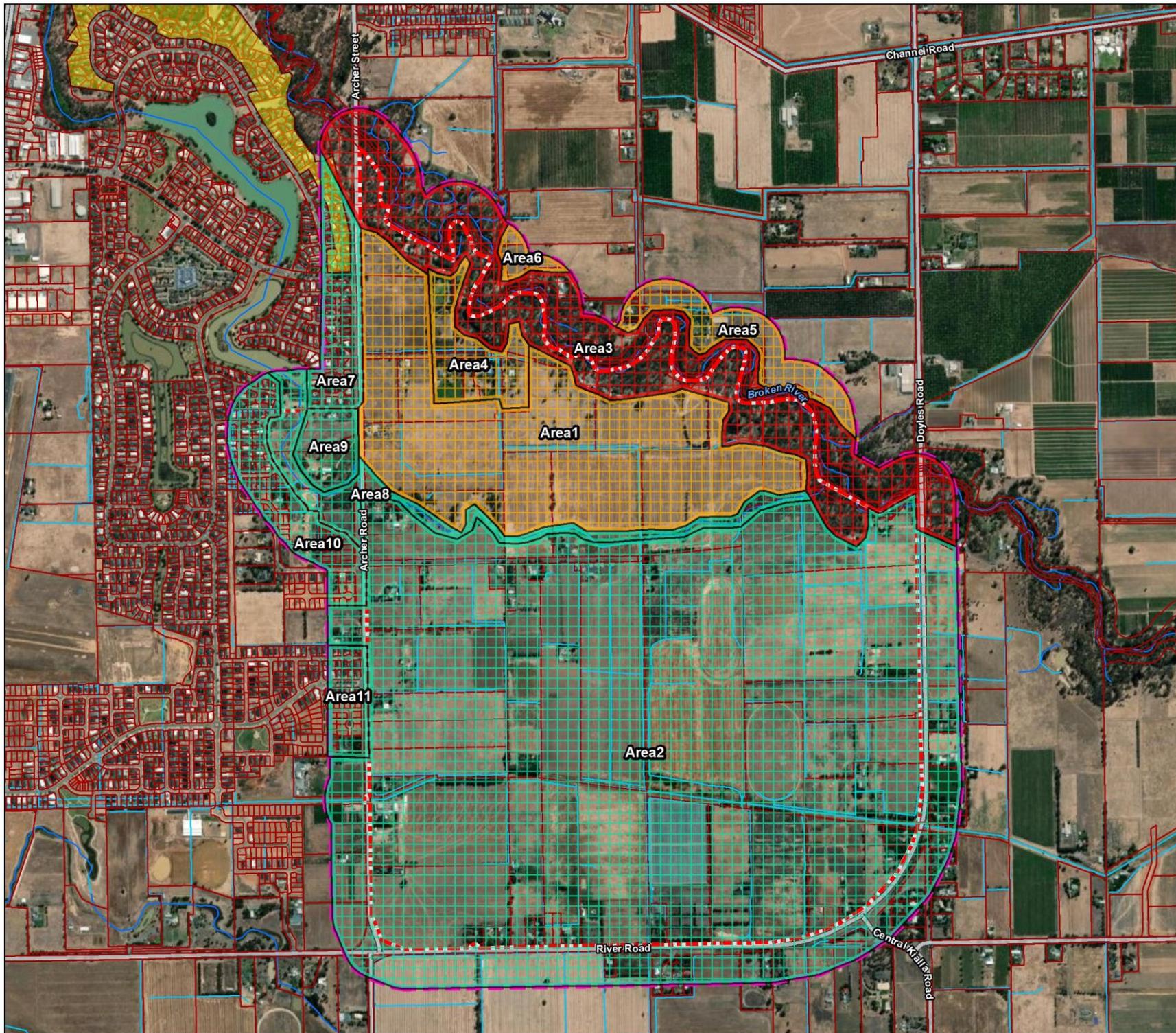
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Bushfire risk
Kialla North Growth Corridor



Legend

- Subject Site
- Assessment Area (150m)
- Parcels
- Contours (10m)
- Constructed watercourse
- Natural watercourse

Risk rating

- Low
- Moderate
- High

VFRR risk rating

- Low
- Medium
- High
- Very High
- Extreme

Details

Date: 18/10/2021
Version: 1
Aerial photography from Nearmap (Jul 2021).
Base map data Copyright © The State of Victoria.

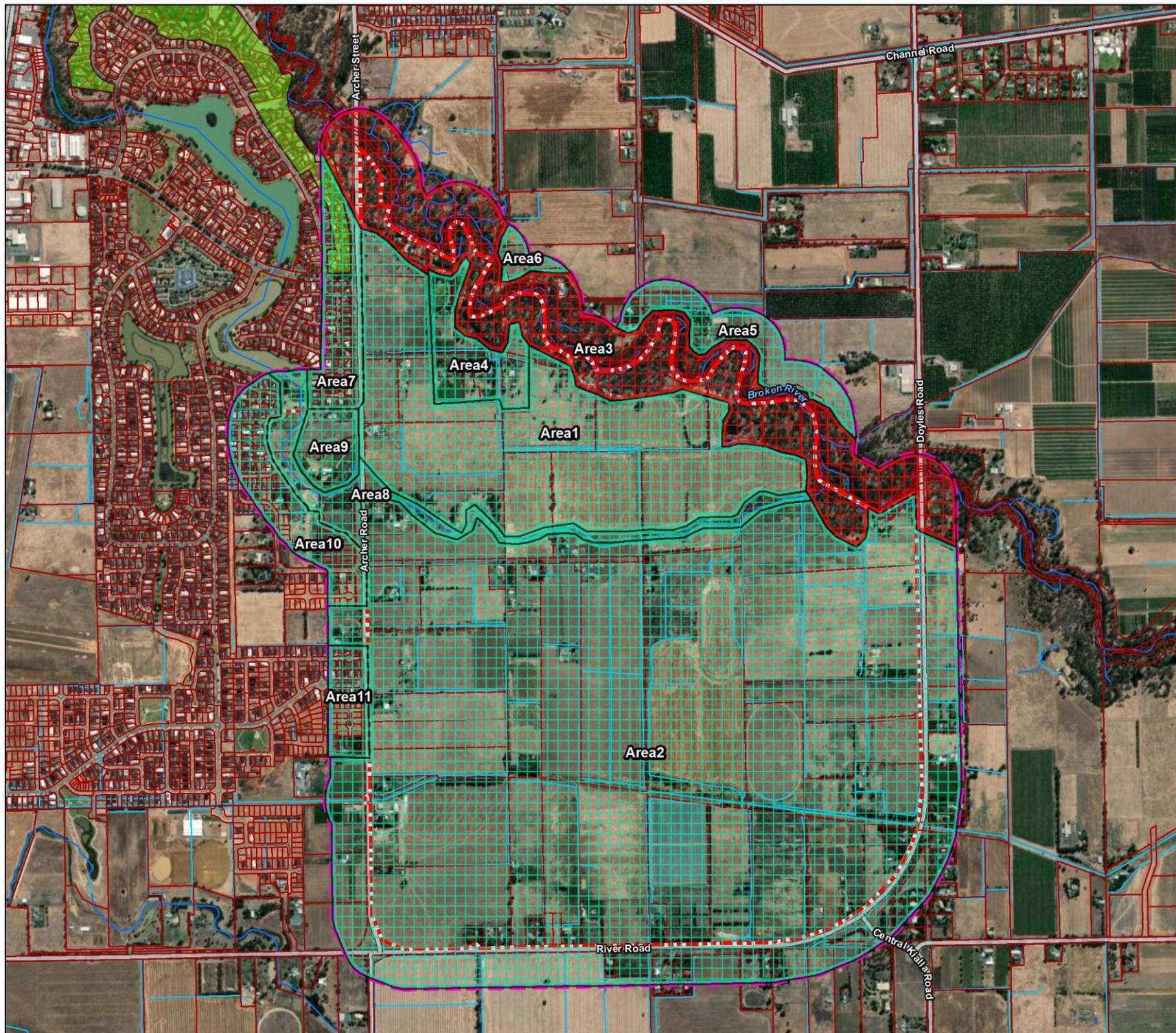
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Bushfire hazards
 Kialla North Growth Corridor



Legend

- Subject Site
- Assessment Area (150m)
- Parcels
- Contours (10m)
- Constructed watercourse
- Natural watercourse

Hazard rating

- Low
- High

VFRR threat rating

- Medium
- High
- Very High

Details

Date: 18/10/2021
 Version: 1
 Aerial photography from Nearmap (Jul 2021).
 Base map data Copyright © The State of Victoria.

0 200 400 m

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