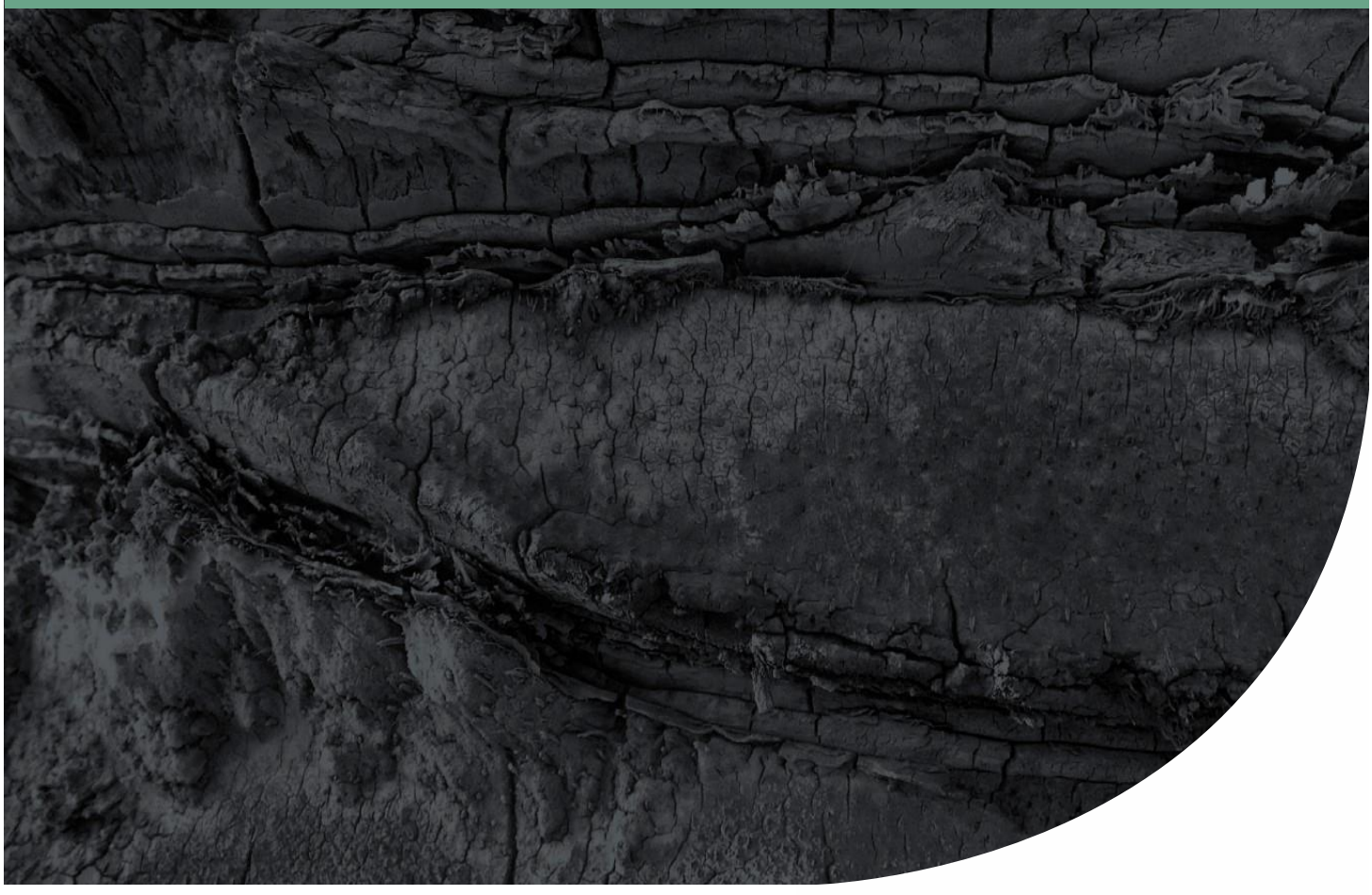
Bushfire Management Plan

North Ellenbrook (East) District Structure Plan

Project No: EP18-018(11)

Prepared for Lendlease Communities (Ellenbrook) Pty Ltd
February 2020



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Executive Summary

This Bushfire Management Plan (BMP) has been prepared on behalf of Lendlease Communities (Ellenbrook) Pty Ltd (Lendlease) (the proponent) to assess the Ellenbrook North (East) District Structure Plan (DSP). The proposed DSP extends across 21 freehold land parcels and a number of existing road reserves, comprising a total area of approximately 501 hectares (ha), herein referred to as 'the site'.

The site includes land identified as a 'bushfire prone area' under the state-wide *Map of Bush Fire Prone Areas* prepared by the Office of Bushfire Risk Management (OBRM 2019). Development proposals within a declared bushfire prone area require consideration of the bushfire risk and suitability of the proposal as assessed by *State Planning Policy 3.7 Planning in Bushfire Prone Areas* (SPP 3.7) (WAPC 2015), the *Guidelines for Planning in Bushfire Prone Areas Version 1.3* (the Guidelines) (WAPC and DFES 2017) and *Australian Standard 3959-2018 Construction of buildings in bushfire-prone areas* (AS 3959) (Standards Australia 2018).

The purpose of SPP 3.7 is to preserve life and reduce the impact of bushfire on property and infrastructure through effective risk-based land-use planning. This BMP examines the likely long-term bushfire risk (following development) and the risk mitigation measures that will ensure the land is suitable for its intended purpose.

The majority of the site supports grassland (Class G) vegetation, composed of native rushes and sedges and non-native pasture grasses. In addition, areas of forest (Class A), shrubland (Class C) and scrub (Class D) vegetation have been identified across the site, associated with areas of remnant vegetation, primarilu in the northern, south-western and south-eastern portions of the site. Forest and grassland vegetation has been identified to the north, east, south and west of the site, whilst a small patch of shrubland vegetation has been identified to the east of the site.

In order to consider the likely bushfire risk applicable to future development at the site, a post-development vegetation classification scenario has been considered in which several areas of classified vegetation within the site will be retained within the MRS Parks and Recreation Reserve and local reserves, whilst the remainder of vegetation within the site will be removed from or managed in a 'low threat' standard. Vegetation outside the site has been assumed to remain the same as the pre-development assessment.

The outcomes of this BMP demonstrate that as development progresses, it will be possible for an acceptable solution to be adopted for each of the applicable bushfire protection criteria outlined in the Guidelines. This includes:

- **Location:** future development can be located in an area that will, on completion, be subject to a low or moderate bushfire hazard. Whilst areas of the site will remain an extreme risk due to the presence of retained vegetation, the site is suitably sized to accommodate the bushfire risk.
- **Siting and Design:** the site is suitably sized to ensure future development will be able to occur in areas subject to BAL-29 or less. There may need to be the provision of setbacks to accommodate separation from bushfire risks, through public roads, public open space or in-lot setbacks, which can be determined as part of future detailed planning.

- **Vehicular Access:** the site is currently bisected by Sawpit Road running north-south, whilst the proposed DSP will connect to the existing public road network, specifically Warbrook Road to the north, Railway Parade to the east and Maralla Road to the south. Northlink is currently under construction to the west of the site, and the proposed DSP will connect to this road, providing further egress options. Egress from the site will be available to the north, east, south and west.
- **Water:** the development will be provided with a permanent and reticulated water supply to support onsite firefighting requirements.

The management/mitigation measures to be implemented as part of the future development of the site have been outlined in this BMP, and demonstrate that the bushfire protection criteria can be satisfied in accordance with SPP 3.7 and the Guidelines. Following approval of the DSP, further detailed planning will need to be undertaken, including the preparation of local structure plans and subsequent subdivision applications. This BMP is intended to not only support the preparation of the DSP, but to also guide future development, and identify the future planning considerations required from a bushfire perspective.

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List of Abbreviations

Table A1: Abbreviations – General terms

General terms	
AHD	Australian Height Datum
AS	Australian Standard
APZ	Asset Protection Zone
BAL	Bushfire Attack Level
BHL	Bushfire Hazard Level
BMP	Bushfire Management Plan
BPAD	Bushfire Planning and Design
CCW	Conservation category wetland
EEP	Emergency Evacuation Plan
ESA	Environmentally Sensitive Area
ESL	Emergency Services Levy
FDI	Fire Danger Index
FZ	Flame Zone
REW	Resource enhancement wetland
TEC	Threatened ecological community

Table A2: Abbreviations – Organisations

Organisations	
BoM	Bureau of Meteorology
DBCA	Department of Biodiversity Conservation and Attractions
DoW	Department of Water (now known as Department of Water and Environment Regulation)
DFES	Department of Fire and Emergency Services
DPLH	Department of Planning, Lands and Heritage
OBRM	Office of Bushfire Risk Management
SES	State Emergency Services
WAPC	Western Australian Planning Commission

Table A3: Abbreviations – Legislation and policies

Legislation	
Guidelines	*Guidelines for Planning in Bushfire Prone Areas version 1.3* (WAPC and DFES 2017)
SPP 3.7	*State Planning Policy 3.7 Planning in Bushfire Prone Areas* (WAPC 2015)

Table A4: Abbreviations – Planning and building terms

Planning and building terms	
AS 3959	Australian Standard 3959-2018 Construction of buildings in bushfire-prone areas
DSP	District Structure Plan
MRS	Metropolitan Regional Scheme
POS	Public Open Space
LPS	Local Planning Scheme

1 Proposal Details

1.1 Background

Lendlease Communities (Ellenbrook) Pty Ltd (the proponent) have prepared the North Ellenbrook District Structure Plan (DSP) over 21 freehold land parcels and a number of existing road reserves, comprising a total area of approximately 501 hectares (ha) (herein referred to as 'the site'), with the proposed DSP provided in **Appendix A**. The site is situated in the City of Swan, approximately 26 km north-east of the Perth Central Business District and is bound by Warbrook Road to the north, a range of rural land uses to the north-east, Railway Road and the Perth-Geraldton freight rail line to the east and Bush Forever Site 300 and existing residential land uses within Ellenbrook, to the south, as shown in **Figure 1**.

The site is currently identified as a 'bushfire prone area' under the state-wide *Map of Bush Fire Prone Areas* prepared by the Office of Bushfire Risk Management (OBRM 2019) and is shown in **Plate 1** below. The identification of a site within a declared bushfire prone area necessitates further assessment of the bushfire risk and suitability of the proposed development to be undertaken in accordance with *State Planning Policy 3.7 Planning in Bushfire Prone Areas* (SPP 3.7) (WAPC 2015) and the *Guidelines for Planning in Bushfire Prone Areas Version 1.3* (the Guidelines) (WAPC and DFES 2017).

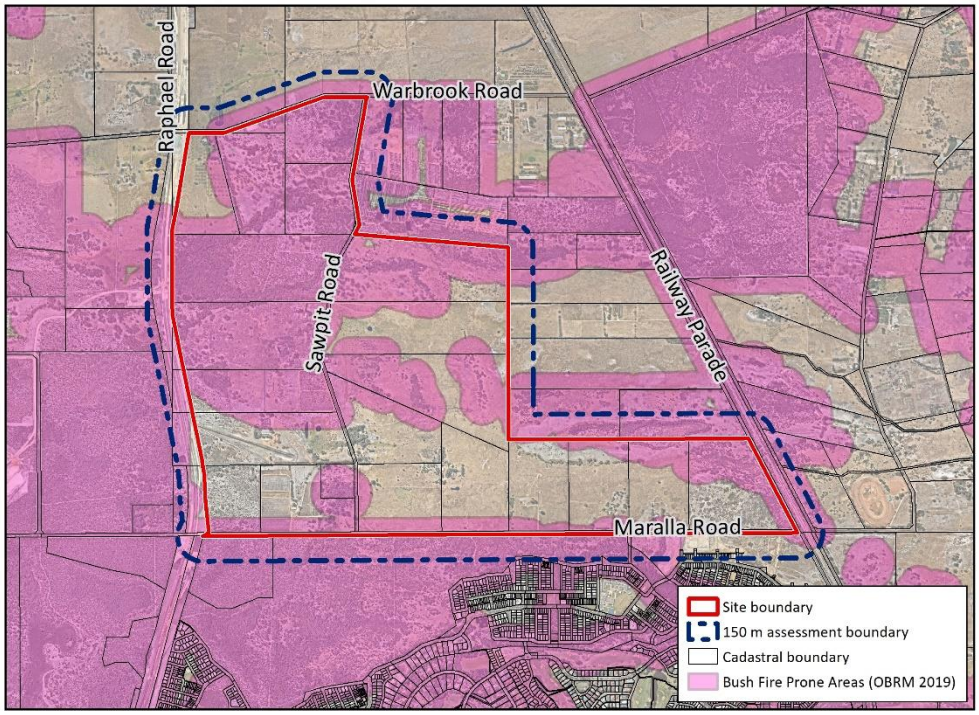

Plate 1: Areas within and surrounding the site identified as 'bushfire prone areas' (as indicated in purple) under the state-wide Map of Bush Fire Prone Areas (OBRM 2019).

1.2 Aim of this report

The aim of this Bushfire Management Plan (BMP) is to assess bushfire hazards within the site and nearby areas and ensure that the threat posed by any identified hazards can be appropriately mitigated and managed, and demonstrate satisfaction of clause 6.11 of SPP 3.7, the precautionary principle. It has been prepared to support the proposed DSP and addresses the requirements of SPP 3.7 (WAPC 2015), the Guidelines (WAPC and DFES 2017) and *Australian Standard 3959:2018 Construction of buildings in bushfire-prone areas* (AS 3959) (Standards Australia 2018). The document provides an assessment of the general bushfire management strategies to be considered as part of the future development within the site and includes:

- An assessment of the existing classified vegetation in the vicinity of the site (within 150 m) and consideration of bushfire hazards that will exist in the post-development scenario (**Section 3**).
- Commentary on how future development of the site can achieve the bushfire protection criteria outlined within the Guidelines (**Section 5**).
- An outline of the roles and responsibilities associated with implementing this BMP (see **Section 6**).

1.3 Statutory policy and framework

The following key legislation, policies and guidelines are relevant to the preparation of a bushfire management plan:

- *Bush Fires Act 1954*
- *Fire and Emergency Services Act 1998*
- *Planning and Development Act 2005* and associated regulations
- *Building Act 2011* and associated regulations
- *State Planning Policy 3.7 Planning in Bushfire Prone Areas* (WAPC 2015)
- *Guidelines for Planning in Bushfire Prone Areas version 1.3* (WAPC and DFES 2017)
- *Australian Standard AS 3959:2018 Construction of buildings in bushfire-prone areas* (Standards Australia 2018)

1.4 Description of the proposed development

The DSP has been prepared for the eastern portion of the North Ellenbrook 'Urban Investigation' area, as identified by the Western Australian Planning Commission (WAPC) and Department of Planning, Lands and Heritage (DPLH) in the *North-East Sub-regional Planning Framework* (DPLH 2018), with the DSP shown in **Appendix A**. The DSP includes a range of land uses within the site including:

- residential land;
- a neighbourhood centre;
- a local centre;
- primary and high schools;
- an interconnected road network;
- district open space; and
- A range of local reserves.

The site is currently zoned 'Rural' under the Metropolitan Region Scheme (MRS), and 'General Rural' under the City of Swan Local Planning Scheme (LPS) No. 17. To facilitate future development in accordance with the DSP, future rezoning of the site from the current 'Rural' zone to 'Urban' under the MRS will need to occur.

1.5 Description of the land characteristics

Publicly available topographical contours (Landgate 2019) indicate that the site slopes to the south-east, with the elevation ranging from 58 m Australian Height Datum (m AHD) in the south-western portion of the site to 26 m AHD in the south-east portion of the site, as shown in **Figure 1.**

A review of historical aerial imagery indicates that the majority of the site was gradually cleared beginning prior to 1965 and continuing until 1974, with smaller localised areas of clearing occurring across since. There are several areas of remnant vegetation that have not been cleared, however the majority of the site has been modified from its original state, with minimal regrowth occuring (Landgate 2019).

The site is located at the interface of rural and urban areas, with urban areas located to the south of the site, and rural areas located to the north, east and west. The urban areas are zoned special use under the LPS. The site is located adjacent to regional reserves to the south and north-east.

2 Environmental Considerations

In accordance with the *Bushfire Management Plan – BAL Contour* template prepared by the Department of Planning, Lands and Heritage (2018), this BMP has considered whether there are any environmental values that may require specific consideration through either protection, retention or revegetation. To support this, a review of publicly available databases and site-specific investigations has been undertaken, with particular reference to the Shared Location Information Platform (SLIP) databases. A summary of the search results has been provided in **Table 1**.

A review of historical aerial imagery indicates that the majority of the site was gradually cleared beginning prior to 1965 and continuing until 1974, with smaller localised areas of clearing occurring across since. There are several areas of remnant vegetation that have not been cleared (Landgate 2019).

Table 1: Summary of potential environmental considerations that may be associated with the site (based on a search of the SLIP databases and site-specific information)

Key environmental feature:	Yes / no / potentially occurring within the site	If yes / potentially, describe value that may be impacted
Conservation category wetlands and buffer (Geomorphic wetlands Swan Coastal Plain) (DBCA-019)	Yes	One conservation category wetland (CCW) (unique feature identifier (UFI)# 8926) has been identified within the north-western portion of the site. This CCW is located within an area identified for retention as part of future development, within the future MRS Parks and Recreation Reserve.
Waterways (DWER-031)	Yes	There are several watercourses identified within the site. The major watercourse (Sawpit Gully) will be retained within a drainage reserve.
RAMSAR wetlands (DBCA-010)	No	Not applicable.
Threatened and priority flora (DBCA-036)	Yes	One threatened flora species has been identified within the south-eastern portion of the site, *Grevillea curviloba* subsp. *curviloba* (PGV Environmental 2019). The species is located within an area identified for retention as part of future development, within a local reserve.
Threatened and priority fauna (DBCA-037)	Potentially	Based on fauna surveys undertaken within the site (BCE 2019; IPE 2019), the site contains fauna habitat for a number of threatened and priority species, including the Carnaby's cockatoo, Baudin's cockatoo, forest red-tailed black cockatoo and the Western Swamp Tortoise. Habitat for these species has been identified for retention in the MRS Parks and Recreation Reserve, in addition to the local reserves.
Threatened Ecological Communities (TECs) (DBCA-038)	Yes	There are two TECs that were identified within the site, the 'Banksia Woodlands of the Swan Coastal Plain' TEC and the 'Forests and woodlands of deep seasonal wetlands of the Swan Coastal Plain' TEC (Emerge Associates 2019; PGV Environmental 2019). The retention of these TECs (and any potential impacts) will be determined as part of the future structure planning process.
Bush Forever areas (DPLH-019)	Yes	Bush Forever Site 13 is located within the north-eastern portion of the site. This Bush Forever site has been identified for retention as part of future development.

Table 1: Summary of potential environmental considerations that may be associated with the site (based on a search of the SLIP databases and site-specific information) (continued)

Key environmental feature:	Yes / no / potentially occurring within the site	If yes / potentially, describe value that may be impacted
Clearing regulations – Environmentally Sensitive Areas (ESAs) (DWER-046)	Yes	Three ESAs are present within the site, which will be considered as part of the future structure planning process.
DBCA controlled lands or waters (DBCA-011)	No	Not applicable. No DBCA controlled lands or waters are identified within the site.
Swan Bioplan Regionally Significant Natural Areas 2010 (DWER-070)	No	Not applicable.
Aboriginal heritage (DAA-001)	Yes	One registered Aboriginal heritage site was identified within the site, Ellen Brook: Upper Swan (Site ID: DPLH 3525). DPLH 3525 extends over a large area outside of the site, associated with the Ellen Brook waterway and its tributaries.
Non-indigenous heritage (DPLH-006)	Yes	One registered non-indigenous heritage site was identified within the site, the Barnard Springs Trough & Wetland.

2.1 Native vegetation – modification and clearing

The extent of future clearing of native vegetation will be determined at the future detailed planning stages when the detailed road and lot layout is known. However, based on the DSP layout, modification and clearing of vegetation within the site will be required to facilitate future residential and commercial development.

There are areas within the north-west of the site that contains remnant vegetation that will be retained as future MRS Park and Recreation Reserve, in addition to local reserves within the central and southern portions of the site which are likely to contain classified vegetation in the post-development scenario. However, the future management of these areas is currently unknown, such as any future clearing, revegetation and/or management, with future detailed planning to determine the detailed management requirements.

All vegetation outside the site is assumed to remain in its existing condition. No areas of native vegetation outside the site are proposed to be modified or cleared by the proponent as part of the proposed development.

2.2 Revegetation and landscape plans

At this strategic level of planning, there are no areas within the site that are intended to be revegetated. As future detailed planning occurs (as part of the structure planning and subsequent subdivision process), if any areas are identified for revegetation, any setbacks required from vegetation will be addressed through spatial provisions in the future layout.

At this strategic level of planning, apart from the area of district open space in the south-western portion of the site, there are no areas within the site that have been identified to be managed to a low threat standard in accordance with Section 2.2.3.2 of AS 3959. As future detailed planning occurs, areas that will be managed to a low threat standard will include public open space, and the exact management of these areas will be determined at these planning stages.

Management of areas of low threat vegetation in the future should include (but not limited to), and will occur as future development occurs:

- Regular mowing/slashing of grass to less than 100 mm in height (where present).
- Irrigation of grass and garden beds (where required).
- Regular removal of weeds and built up dead material (such as fallen branches, leaf litter etc.).
- Low pruning of trees (branches below 2 m in height removed where appropriate/applicable).
- Application of ground/surface covers such as mulch or non-flammable materials as required/applicable.

3 Bushfire Assessment Results

Bushfire risk for the site has been appropriately considered in the specific context of the Guidelines and AS 3959.

Appendix Two of the Guidelines provides a description for undertaking a broad level of hazard assessment using the vegetation classifications from AS 3959. The purpose is to identify at the strategic level the Bushfire Hazard Level (BHL) and the likely impact and intensity of a bushfire attack.

The objective of AS 3959 is to reduce the risk of ignition and loss of a building to bushfire. It provides a consistent method for determining a radiant heat level (radiant heat flux) as a primary consideration of bushfire attack on a building or object. It measures the Bushfire Attack Level as the radiant heat level (kWm^2) over a distance of 100 m.

It also prescribes simple construction responses that can resist the determined radiant heat level at a given distance from the fire and is based on six Bushfire Attack Level (BAL) ratings: BAL-LOW, BAL-12.5, BAL-19, BAL-29, BAL-40 and BAL-FZ. Bushfire risk for the site has been appropriately considered in the specific context of the Guidelines and AS 3959.

3.1 Bushfire Hazard Level assessment

To support the proposed DSP, bushfire hazard levels (BHL) within and nearby to the site have been determined in accordance with Appendix Two of the Guidelines and based on the vegetation classification detailed in **Table 2**. The BHL can be used to determine the suitability of the strategic planning proposal for future subdivision and development. In accordance with the Guidelines, a BAL assessment has not been undertaken as part of this BMP, however, can be undertaken as part of future detailed planning, when the future lot layout and internal road layout is known.

Not all vegetation is a classified bushfire risk. Vegetation and ground surfaces that are exempt from classification as a potential hazard are identified as a low threat under Section 2.2.3.2 of AS 3959. Low threat vegetation includes the following:

a) Vegetation of any type that is more than 100 m from the site.
b) Single areas of vegetation less than 1 ha in area and not within 100 m of other areas of vegetation being classified.
c) Multiple areas of vegetation less than 0.25 ha in area and not within 20 m of the site or each other or of other areas of vegetation being classified vegetation.
d) Strips of vegetation less than 20 m wide (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20 m of the site or each other, or other areas of vegetation being classified.
e) Non-vegetated areas, that is, areas permanently cleared of vegetation, including waterways, exposed beaches, roads, footpaths, buildings and rocky outcrops.
f) Vegetation regarded as low threat due to factors such as flammability, moisture content or fuel load. This includes grassland managed in a minimal fuel condition, mangroves and other saline wetlands, maintained lawns, golf courses (such as playing areas and fairways), maintained public reserves and parklands, sporting fields, vineyards, orchards, banana plantations, market gardens (and other non-curing crops), cultivated gardens, commercial nurseries, nature strips and windbreaks.

3.1.1 Assessment inputs

Vegetation within the site and surrounding 150 m was classified in accordance with Table 2.3 of AS 3959. The classification of vegetation is based on an assessment of vegetation structure, which considers the various fuel layers of different vegetation types. For example, fuel layers in a typical forest environment can be broken down into five segments as illustrated in **Plate 2** below. These defined fuel layers are considered when determining the classification of vegetation and associated bushfire hazard levels.

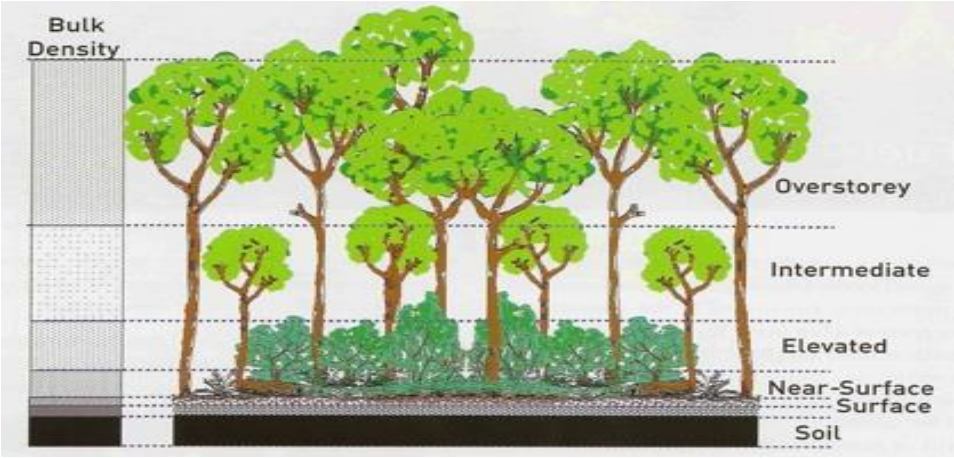

Plate 2: The five fuel layers in a forest environment that could be associated with fire behaviour (Gould et al. 2007)

Multiple site visits have been undertaken at the site, with the most recent assessment of existing vegetation within the site and surrounding 150 m being undertaken on 29 November 2019 in accordance with AS 3959 and the Guidelines.

It is noted that not all lots within the site were accessible due to permission issues, and therefore some areas of vegetation were only visible from publicly accessible roads and/or from lots where permission was granted to access. As part of future planning processes, detailed assessments of all areas of vegetation within the site will be required.

Table 2 below outlines:

- The pre-development AS 3959 vegetation classifications (and associated photo locations) are shown in **Figure 2**.
- The pre-development bushfire hazard level ratings are shown in **Figure 3**.
- The post-development AS 3959 vegetation classifications are shown in **Figure 4**.
- The post-development bushfire hazard level ratings are shown in **Figure 5.**

Table 2: Vegetation classification, bushfire hazard rating and future management

Pre-development (Figure 2 and Figure 3)		Post development (Figure 4 and Figure 5)
AS 3959 classification and bushfire hazard rating	**Site photo/s (location points shown in Figure 2)**	**AS 3959 classification assumptions and effective slope**
AS 3959 classification (Figure 2): Forest (Class A) **Bushfire hazard rating (Figure 3):** Extreme Forest vegetation has been identified in several areas across the site, primarily in the north-western portion, in addition to smaller patches in the south-eastern portion of the site. In addition, forest vegetation has been identified to the south, west, north and east of the site. Forest vegetation within and surrounding the site is characterised by a mixture of native and planted vegetation, including areas of marri and planted non-native *Eucalyptus* spp., growing to a height of > 15 m, whilst wetter areas of the site support *Melaleuca* spp. and native and non-native understorey species. The areas of forest vegetation within and surrounding the site contain surface, near-surface, elevated, intermediate and overstorey fuel loads.	 *Photo location 1: Forest vegetation within the northern portion of the site*  *Photo location 2: Forest vegetation within the northern portion of the site*  *Photo location 3: Forest vegetation within the southern portion of the site*  *Photo location 4: Forest vegetation to the south of the site*	**AS 3959 classification (Figure 4):** Forest (Class A) **Bushfire hazard rating (Figure 5):** Extreme Forest vegetation within the site that is located within the MRS Parks and Recreation Reserve and local reserves is assumed to remain in its existing state as part of future development within the site. In addition, forest vegetation identified outside of the site boundary has been assumed to remain in its current state in the long-term, These areas of vegetation will, therefore, remain a bushfire risk to the site.

Table 2: Vegetation classification, bushfire hazard rating and future management (continued)

Pre-development (Figure 2 and Figure 3)		Post development (Figure 4 and Figure 5)
AS 3959 classification and bushfire hazard rating	**Site photo/s (location points shown in Figure 2)**	**AS 3959 classification assumptions and effective slope**
Continued from above.	 *Photo location 5: Forest vegetation to the south of the site*  *Photo location 6: Forest vegetation within the south-eastern portion of the site*  *Photo location 7: Forest vegetation to the north-east of the site*  *Photo location 8: Forest vegetation within the southern portion of the site*	**AS 3959 classification (Figure 4):** Non-vegetated area (exclusion clause 2.2.3.2(e)) **Bushfire hazard rating (Figure 5):** Low. As required under the Guidelines, any areas within 100 m of moderate or extreme hazards have been shown as moderate, to reflect the potential increased risk. Where forest vegetation within the site will be removed to facilitate the implementation of the proposed development, including future public roads, residential and commercial areas, these areas have been identified as non-vegetated areas (exclusion clause 2.2.3.2 (e)).

Table 2: Vegetation classification, bushfire hazard rating and future management (continued)

Pre-development (Figure 2 and Figure 3)		Post development (Figure 4 and Figure 5)
AS 3959 classification and bushfire hazard rating	**Site photo/s (location points shown in Figure 2)**	**AS 3959 classification assumptions and effective slope**
AS 3959 classification (Figure 2): Shrubland (Class C) **Bushfire hazard rating (Figure 3):** Moderate Areas of shrubland vegetation have been identified in several areas across the site, primarily in the western and northern portions of the site. In addition, a small patch of shrubland vegetation has been identified to the east of the site within a private landholding. Shrubland vegetation is characterised by native vegetation growing to a height of between 1 – 2 m, with surface, near-surface and elevated fuel layers.	 *Photo location 9: Shrubland vegetation within the northern portion of the site*  *Photo location 10: Shrubland vegetation in the south-western portion of the site*  *Photo location 11: Shrubland vegetation in the south-western portion of the site*  *Photo location 12: Shrubland vegetation in the south-western portion of the site*	**AS 3959 classification (Figure 4):** Shrubland (Class C) **Bushfire hazard rating (Figure 5):** Moderate Shrubland vegetation within the site that is located within the MRS Parks and Recreation Reserve and local reserves is assumed to remain in its existing state as part of future development within the site. In addition, shrubland vegetation identified outside of the site boundary has been assumed to remain in its current state in the long-term. These areas of vegetation will, therefore, remain a bushfire risk to the site.

Table 2: Vegetation classification, bushfire hazard rating and future management (continued)

Pre-development (Figure 2 and Figure 3)		Post development (Figure 4 and Figure 5)
AS 3959 classification and bushfire hazard rating	**Site photo/s (location points shown in Figure 2)**	**AS 3959 classification assumptions and effective slope**
Continued from above.	Continued from above.	**AS 3959 classification (Figure 4):** Non-vegetated area (exclusion clause 2.2.3.2(e)) **Bushfire hazard rating (Figure 5):** Low. As required under the Guidelines, any areas within 100 m of moderate or extreme hazards have been shown as moderate, to reflect the potential increased risk. Where shrubland vegetation within the site will be removed to facilitate the implementation of the proposed development, including future public roads, residential and commercial areas, these areas have been identified as non-vegetated areas (exclusion clause 2.2.3.2 (e)).

Table 2: Vegetation classification, bushfire hazard rating and future management (continued)

Pre-development (Figure 2 and Figure 3)		Post development (Figure 4 and Figure 5)
AS 3959 classification and bushfire hazard rating	**Site photo/s (location points shown in Figure 2)**	**AS 3959 classification assumptions and effective slope**
AS 3959 classification (Figure 2): Scrub (Class D) **Bushfire hazard rating (Figure 3):** Extreme Areas of scrub vegetation have been identified in three separate areas across the site, in the northern, south-eastern and south-western portions of the site. Scrub vegetation is characterised by native vegetation, growing to a height of approximately 6 m. This vegetation includes native species including *Banksia* spp. and *Acacia* spp., with native and non-native understorey species. The scrub vegetation contains surface, near-surface, elevated and intermediate fuel layers.	 *Photo location 13: Scrub vegetation (in the rear of the photo) in the south-eastern portion of the site*  *Photo location 14: Scrub vegetation (in the rear of the photo) in the south-eastern portion of the site*  *Photo location 15: Scrub vegetation in the south-western portion of the site*	**AS 3959 classification (Figure 4):** Scrub (Class D) **Bushfire hazard rating (Figure 5):** Extreme Scrub vegetation within the south-eastern portion of the site that is located within the proposed local reserve is assumed to remain in its existing state as part of future development within the site. This vegetation will, therefore, remain a bushfire risk to the site. **AS 3959 classification (Figure 4):** Non-vegetated area (exclusion clause 2.2.3.2(e)) **Bushfire hazard rating (Figure 5):** Low. As required under the Guidelines, any areas within 100 m of moderate or extreme hazards have been shown as moderate, to reflect the potential increased risk. Where scrub vegetation within the site will be removed to facilitate the implementation of the proposed development, including future public roads, residential and commercial areas, these areas have been identified as non-vegetated areas (exclusion clause 2.2.3.2 (e)).

Table 2: Vegetation classification, bushfire hazard rating and future management (continued)

Pre-development (Figure 2 and Figure 3)		Post development (Figure 4 and Figure 5)
AS 3959 classification and bushfire hazard rating	**Site photo/s (location points shown in Figure 2)**	**AS 3959 classification assumptions and effective slope**
AS 3959 classification (Figure 2): Grassland (Class G) **Bushfire hazard rating (Figure 3):** Moderate The majority of the site has been identified as unmanaged grassland, with the site containing unmanaged pasture grasses as a result of historical clearing, in addition to native grasses and sedges and rushes. In addition, grassland vegetation has been identified to the south, west, north and east of the site. The areas of grassland vegetation within and surrounding the site contain surface and near-surface fuel loads.s	 *Photo location 16: Grassland vegetation located in the central portion of the site*  *Photo location 17: Grassland vegetation located in the south-eastern portion of the site*  *Photo location 18: Grassland vegetation located in the southern portion of the site*  *Photo location 19: Grassland vegetation located in the southern portion of the site*	**AS 3959 classification (Figure 4):** Grassland (Class G) **Bushfire hazard rating (Figure 5):** Moderate Grassland vegetation within the site that is located within the MRS Parks and Recreation Reserve and local reserves is assumed to remain in its existing state as part of future development within the site. In addition, grassland vegetation identified outside of the site boundary has been assumed to remain in its current state in the long-term, These areas of vegetation will, therefore, remain a bushfire risk to the site.

Table 2: Vegetation classification, bushfire hazard rating and future management (continued)

Pre-development (Figure 2 and Figure 3)		Post development (Figure 4 and Figure 5)
AS 3959 classification and bushfire hazard rating	**Site photo/s (location points shown in Figure 2)**	**AS 3959 classification assumptions and effective slope**
Continued from above.	Continued from above.	**AS 3959 classification (Figure 4):** Non-vegetated area (exclusion clause 2.2.3.2(e)) **Bushfire hazard rating (Figure 5):** Low. As required under the Guidelines, any areas within 100 m of moderate or extreme hazards have been shown as moderate, to reflect the potential increased risk. Where grassland vegetation within the site will be removed to facilitate the implementation of the proposed development, including future public roads, residential and commercial areas, these areas have been identified as non-vegetated areas (exclusion clause 2.2.3.2 (e)).
		AS 3959 classification (Figure 4): Low threat vegetation (exclusion clause 2.2.3.2(f)) **Bushfire hazard rating (Figure 5):** Low. As required under the Guidelines, any areas within 100 m of moderate or extreme hazards have been shown as moderate, to reflect the potential increased risk. Grassland vegetation located in the south-western portion of the site will be removed to facilitate the development of district open space. As part of this, vegetation will be managed to a low threat standard in accordance with Section 2.2.3.2 of AS 3959

Table 2: Vegetation classification, bushfire hazard rating and future management (continued)

Pre-development (Figure 2 and Figure 3)		Post development (Figure 4 and Figure 5)
AS 3959 classification and bushfire hazard rating	**Site photo/s (location points shown in Figure 2)**	**AS 3959 classification assumptions and effective slope**
AS 3959 classification (Figure 2): Non-vegetated area (exclusion clause 2.2.3.2(e)) **Bushfire hazard rating (Figure 3):** Low. As required under the Guidelines, any areas within 100 m of moderate or extreme hazards have been shown as moderate, to reflect the potential increased risk. Non-vegetated areas such as existing roads, existing buildings, areas of bare mineral earth, including firebreaks, and waterbodies within and surrounding the site have been excluded in accordance with Clause 2.2.3.2(e) of AS 3959.	 *Photo location 20: Non-vegetated area to the north of the site (Warbrook Road)*  *Photo location 21: Non-vegetated area to the west of the site (Northlink)*	**AS 3959 classification (Figure 4):** Non-vegetated area (exclusion clause 2.2.3.2(e)) **Bushfire hazard rating (Figure 5):** Low. As required under the Guidelines, any areas within 100 m of moderate or extreme hazards have been shown as moderate, to reflect the potential increased risk. It is assumed that the maintenance regimes for all existing non-vegetated areas will continue into the future based on current land uses and management practices and/or will be converted to public roads, residential and commercial areas.

Table 2: Vegetation classification, bushfire hazard rating and future management (continued)

Pre-development (Figure 2 and Figure 3)		Post development (Figure 4 and Figure 5)
AS 3959 classification and bushfire hazard rating	**Site photo/s (location points shown in Figure 2)**	**AS 3959 classification assumptions and effective slope**
AS 3959 classification (Figure 2): Low threat vegetation (exclusion clause 2.2.3.2(f)) **Bushfire hazard rating (Figure 3):** Low. As required under the Guidelines, any areas within 100 m of moderate or extreme hazards have been shown as moderate, to reflect the potential increased risk. Areas of low threat vegetation have been identified to the north-west of the site, associated with a nursery.	 *Photo location 22: Low threat vegetation to the north of the site*  *Photo location 23: Low threat vegetation to the north of the site*  *Photo location 24: Low threat vegetation to the north of the site*	**AS 3959 classification (Figure 4):** Low threat vegetation (exclusion clause 2.2.3.2(f)) **Bushfire hazard rating (Figure 5):** Low. As required under the Guidelines, any areas within 100 m of moderate or extreme hazards have been shown as moderate, to reflect the potential increased risk. It is assumed that the existing maintenance regimes for low threat areas surrounding the site will continue based on existing land practices.

3.1.1.1 Post development assumptions

The following key assumptions have informed this assessment:

- Classified vegetation located within the proposed MRS Parks and Recreation Reserve and local reserves has been assumed to remain in its existing state in the post-development scenario. The management of these areas of vegetation (if any) will be determined as part of future detailed structure planning for the site.
- The majority of the vegetation within the site will be removed to facilitate future development, in order to achieve low threat classification in accordance with Section 2.2.3.2 of AS 3959. The treatment of these areas may include:
  - Clearing of vegetation.
  - Regular maintenance including removal of weeds and dead material.
  - Where remnant trees are retained, these will be low pruned to 2 m from the ground.
  - Application of ground covers such as mulch or non-flammable materials.
  - Where grass/turf is present, this will be regularly cut so that the grass is maintained at or below 100 mm in height.
- Areas outside the site within private landholdings that have been identified as a low threat will continue to be managed and/or considered to achieve low threat (in accordance with Section 2.2.3.2 of AS 3959) based on the existing maintenance regimes.
- All classified vegetation surrounding the site has been assumed to remain in its existing state in the future, and will, therefore, remain a bushfire risk to the site.

3.1.2 Assessment outputs

3.1.2.1 Bushfire hazard assessment

As outlined above, a bushfire hazard level assessment has been prepared for the site and surrounding 150 m based on the existing conditions, with the hazard ratings determined in accordance with Appendix Two of the Guidelines and shown in **Figure 3**.

The outcomes of the assessment indicate that the site is subject to an extreme and moderate hazard based on the identified vegetation classifications. The areas of extreme hazard identified within the site are associated with areas of forest and scrub vegetation, whilst the moderate hazard level is associated with areas of shrubland and grassland.

A post-development bushfire hazard assessment has been undertaken within the site (**Figure 5**), which demonstrates the majority of the site will be subject to a low or moderate bushfire hazard risk in the post-development scenario. Areas of retained vegetation are likely to present an extreme or moderate risk, which will require spatial provisions as part of detailed design planning to ensure development can comply with the bushfire compliance criteria, as set out in Appendix Four of the Guidelines. These spatial provisions may include public roads, managed public open space and/or in-lot setbacks, with the site is suitably sized to accommodate all required spatial provisions.

3.1.2.2 BAL assessment

As per Appendix Five of the Guidelines, a BAL contour plan is not required to support a DSP, and due to the large size of the site, a BAL contour plan has not been undertaken as part of this BMP. However, in order to assist with the future design process, and in particular in locating habitable buildings an appropriate distance from classified vegetation within and outside the site, the minimum setback distances required between the determined classified vegetation and future habitable buildings to achieve a BAL rating of BAL-29 has been provided in **Table 3**. These distances are based on those detailed in Table 2.5 of AS 3959. Slope has been assumed to be either flat/upslope or downslope 0 - 5°, based on the exising contours, however detailed analysis of the slope will be required as part future BMPs to determine the BAL contour plan.

The areas of the site likely to require further consideration are shown in **Figure 6**, with these areas likely to require spatial provisions as part of future development to ensure the bushfire risk is reduced, which may include public roads, managed public open space and/or in-lot setbacks.

Table 3: Setbacks required from classified vegetation in order to achieve BAL-29

Vegetation classification	Effective slope	Minimum setback between classified vegetation and future habitable buildings to achieve BAL-29.
Forest (Class A)	Flat/upslope	21 m
	Downslope 0 - 5°	27 m
Shrubland (Class C)	Flat/upslope	9 m
	Downslope 0 - 5°	10 m
Scrub (Class D)	Flat/upslope	13 m
	Downslope 0 - 5°	15 m
Grassland (Class G)	Flat/upslope	8 m
	Downslope 0 - 5°	9 m

4 Identification of Bushfire Hazard Issues

From a bushfire hazard management perspective, the key issues that are likely to require management and/or consideration as part of the future building permit process include:

- Provision of appropriate separation distance from bushfire hazards located within and surrounding the site (to the north, east, south and west), to ensure a BAL rating of BAL-29 or less can be achieved at future habitable buildings (built form). The minimum setback distances required have been provided in **Table 3**.
- Provision of appropriate vehicular access to ensure that when development within the site is fully constructed, egress to at least two different destinations will be available to residents, visitors, future workers and emergency personnel.
- Provision of appropriate water supply and associated infrastructure.

These issues are considered further in **Section 5**.

5 Assessment against the Bushfire Protection Criteria

This BMP provides an outline of the mitigation strategies that will be considered as part of future development planning stages, to ensure that an acceptable solution and/or performance-based system of control is adopted for each of the bushfire protection criteria identified within Appendix Four of the Guidelines (WAPC and DFES 2017). The bushfire protection criteria identified in the Guidelines and addressed as part of this BMP are:

- Element 1: Location of the development
- Element 2: Siting and design of the development
- Element 3: Vehicular access
- Element 4: Water supply.

As part of future development, it is likely that an 'acceptable solution' will be able to address the intent of all four bushfire protection criteria as part of future urban development within the site (following the future amendment and as part of the subsequent planning process). A summary of how this can be achieved and an associated compliance statement has been provided in **Table 4**.

Table 4: Summary of bushfire protection criteria and compliance statement

Bushfire protection criteria	Intent	Method of compliance		Proposed bushfire management strategies	Compliance statement
		Acceptable solution	Performance principle		
Element 1: Location	To ensure that strategic planning proposals, subdivision and development applications are located in areas with the least possible risk of bushfire to facilitate the protection of people, property and infrastructure.	A1.1 Development location		Based on the bushfire hazard level assessment (see **Figure 3**), the site is located in an area of extreme and moderate bushfire hazard level. In accordance with the *Position Statement: Planning in bushfire prone areas – Demonstrating Element 1: Location and Element 2: Siting and design* (DPLH 2019), strategic planning proposals are able to demonstrate compliance with the bushfire hazard level if the development can demonstrate suitable separation from bushfire risks within the site, and give consideration to the exposure of the site from bushfire hazards outside of the site. As development occurs within the site and classified vegetation is removed, the bushfire hazard level that future development will be exposed be to will be low or moderate (as shown in **Figure 5**), and separation from areas of extreme bushfire hazard level within and surrounding the site can be accommodated through the location of public roads and public open space. The acceptable solution can be satisfied.	Based on the outlined management measures, future development will be able to comply with and meet the intent of Element 1: Location and the acceptable solution can be satisfied.
		Yes	N/A		
Element 2: Siting and design	To ensure the siting and design of development minimises the level of bushfire impact. Continued from above.	A2.1 Asset Protection Zone		One of the most important bushfire protection criteria measures influencing the safety of people and property is to create an Asset Protection Zone (APZ) around buildings. The APZ is a low fuel area immediately surrounding a building and can include non-flammable features such as irrigated landscapes, gardens, driveways and roads. The site is suitably sized to accommodate the minimum separation distances outlined in **Table 3** required to achieve BAL-29 or less for future habitable buildings from classified vegetation within and surrounding the site. As future detailed design and planning is being undertaken for local structure plans, the requirements for APZs (if any) can be determined. It is noted that there are several areas of vegetation that will be retained within the DSP. As part of future detailed planning, consideration should be given to these areas of vegetation, and the spatial provisions that may be required to provide appropriate setbacks, including the provision of public roads, public open space, and in-lot setbacks (if required). Overall, an acceptable solution can be satisfied. Class 1, 2 and 3 buildings, where located within an area subject to a BAL rating higher than BAL-12.5 will be subject to higher construction standards in accordance with AS 3959.	Based on the outlined management measures, future development will be able to comply with and meet the intent of Element 2: Siting and design and the acceptable solution can be satisfied.
		Yes	N/A		

Table 4: Summary of bushfire protection criteria and compliance statement (continued)

Bushfire protection criteria	Intent	Method of compliance		Proposed bushfire management strategies	Compliance statement
		Acceptable solution	Performance principle		
Element 3: Vehicular access	To ensure vehicular access serving a subdivision/ development is available and safe during a bushfire event.	A3.1 Two access routes		The site is located within an area with an existing road network, with Sawpit Road bisecting the site running north-south, in addition to Warbrook Road to the north, Railway Parade to the east and Maralla Road to the south of the site. In addition, Northlink is currently under construction to the west of the site, which will connect to the site as part of future development. The site will connect with the existing road network to provide egress options to the north, east, south and west of the site, with a number of neighbourhood connector roads identified in the DSP to provide egress options within the site.	Based on the outlined management measures, future development would be able to comply with and meet the intent of Element 3: Vehicular access.
		Yes	N/A		
		A3.2 Public road		Existing public roads within the site and surrounds, as well as proposed new public roads, can and will comply with the minimum standards outlined in Appendix Four of the Guidelines (WAPC and DFES 2017) or as agreed with the City of Swan and includes a minimum 6 m-wide trafficable surface.	
		Yes	N/A		
		A3.3 Cul-de-sac (including dead-end road)		Not applicable. At this stage of planning, it is unknown whether any cul-de-sacs will be constructed within the site as part of future development. Whilst cul-de-sacs should be avoided in bushfire-prone areas, if they are to be constructed, they should meet the minimum standards as outlined in Appendix Four of the Guidelines (WAPC and DFES 2017).	
		N/A	N/A		
		A3.4 Battle-axe		Not applicable. At this stage of planning, it is unknown whether any battle-axe blocks will be constructed within the site as part of future development. Whilst battle-axe blocks should be avoided in bushfire-prone areas, if they are to be constructed, they should meet the minimum standards as outlined in Appendix Four of the Guidelines (WAPC and DFES 2017).	
		N/A	N/A		
		A3.5 Private driveway longer than 50 m		Not applicable. At this stage of planning, it is unknown whether any private driveways longer than 50 m will be constructed within the site as part of future development. Whilst private driveways longer than 50 m should be avoided in bushfire-prone areas, if they are to be constructed, they should meet the minimum standards as outlined in Appendix Four of the Guidelines (WAPC and DFES 2017).	
		N/A	N/A		
		A3.6 Emergency access way		Not applicable. Given the proposed development plan provides for egress to at least two different destinations, emergency access ways are not required as part of the proposed development of the site.	
		N/A	N/A		
		A3.7 Fire service access routes (perimeter roads)		Not applicable. Future development within the site will be provided with appropriate vehicular access, as outlined above, and therefore fire service access routes are not required.	
		N/A	N/A		

Table 4: Summary of bushfire protection criteria and compliance statement (continued)

Bushfire protection criteria	Intent	Method of compliance		Proposed bushfire management strategies	Compliance statement
		Acceptable solution	Performance principle		
Continued from above.	Continued from above.	A3.8 Firebreak width		Future landholders will be required to maintain their landholding in accordance with the City of Swan Firebreak Notice/s (or as specified by the City of Swan in accordance with Section 33 of the *Bush Fires Act 1954*).	Continued from above.
		Yes	N/A		
Element 4: Water	To ensure water is available to the subdivision, development or land use to enable people, property and infrastructure to be defended from bushfire.	A4.1 Reticulated areas		Fire response services require ready access to adequate water supply for fire fighting . The site will connect with a reticulated water supply and will include fire hydrants installed by the developer to meet the specifications of Water Corporation (Design Standard DS 63) (or similar standard, as agreed with the relevant water authority) and DFES. Fire hydrants on land zoned for residential purposes are generally required to be sited at or within 200 m of residential dwellings (Class 1a).	Based on the outlined management measures, future development would be able to comply with and meet the intent of Element 4: Water.
		Yes	N/A		
		A4.2 Non-reticulated areas		Not applicable.	
		N/A	N/A		
		A4.3 Individual lots within non-reticulated areas (only for use if creating 1 additional lot and cannot be applied cumulatively)		Not applicable.	
		N/A	N/A		

5.1 Additional management strategies

5.1.1 Future approvals

This BMP has been prepared for the site based on the DSP to incorporate best management practices to ameliorate the bushfire hazards that would otherwise impact upon its future development. An updated BMP will be required to support each further stage of detailed planning (including for each structure plan and subdivision application), to detail how the proposed development layout has or will address the bushfire protection criteria based on the recommendations outlined within this BMP, as well as to determine the likely BAL ratings applicable to future habitable dwellings.

5.1.2 Landscape Management

5.1.2.1 Within the site

At this strategic level of planning, the areas of vegetation that will undergo management and the areas that will remain in their existing state are currently unknown. However, areas of vegetation within and surrounding the site that may potentially impact future development have been identified within **Figure 6**, to guide future planning, and enable the spatial provision of appropriate separation, whether through public roads, public open space or within future residential lots.

Where vegetation is to be managed to a low threat standard within the site, this should occur in accordance with Section 2.2.3.2 of AS 3959 and the City of Swan Firebreak Notice/s. The areas of vegetation that will undergo management will be determined as part of the future detailed design planning stages.

5.1.2.2 Surrounding the site

The private landholdings surrounding the site are assumed to be managed by the applicable landowners in accordance with the City of Swan Firebreak Notice in perpetuity. All other vegetation will remain in its existing condition for the foreseeable future.

5.1.3 City of Swan Firebreak Notice

The City of Swan releases a Firebreak Notice on an annual basis to provide a framework for bushfire management within the City. The City of Swan is able to enforce this notice in accordance with Section 33 of the *Bush Fires Act 1954*. In addition, Section 33 1(b) also provides the City with additional power to direct landowners to undertake works to remedy conditions conducive to the outbreak or spread of bushfire

Until development is progressed within the site, existing landowners are required to comply with the Firebreak Notice, including the maintenance of minimum 3 m-wide perimeter firebreaks (or as agreed with the City of Swan).

Once development progresses within the site, future landowners should refer to the City of Swan Firebreak Notice, to determine the measures required for compliance.

5.1.4 Vulnerable or high-risk land uses

The site will contain land uses considered to be a 'vulnerable' land use in accordance with the definitions provided in SPP 3.7 and the Guidelines, given there are potentially four schools identified within the site. Policy measure 6.6 of SPP 3.7 does not require any further action at the higher level of planning, however, detailed planning stages (e.g. subdivision or development applications) will require further consideration of the bushfire risk. This may include the preparation of a Bushfire Emergency Evacuation Plan (BEEP) if the future vulnerable land use is exposed to a BAL rating of BAL-12.5 or greater.

5.1.5 Public education and preparedness

Community bushfire safety is a shared responsibility between individuals, the community, government and fire agencies. DFES has an extensive Community Bushfire Education Program including a range of publications, a website and Bushfire Ready Groups. The DFES publication '*Prepare. Act. Survive.'* (DFES 2014) provides excellent advice on preparing for and surviving the bushfire season. Other downloadable brochures are available from http://www.dfes.wa.gov.au/safetyinformation/fire/bushfire/pages/publications.aspx

The City of Swan provides bushfire safety advice to residents available from their website https://www.swan.wa.gov.au/Services-support/Emergency-management/Fire/Fire-breaks-hazard-reduction. Professional, qualified consultants also offer bushfire safety advice and relevant services to residents and businesses in high-risk areas in addition that that provided in this BMP.

Professional, qualified consultants also offer bushfire safety advice and relevant services to residents and businesses in addition to that provided in this BMP.

6 Responsibilities for Implementation and Management of Bushfire Measures

Table 5 outlines the future responsibilities of the landowner/developer and the City of Swan associated with implementing this BMP with reference to ongoing bushfire risk mitigation measures for existing land uses (through compliance with the City of Swan Firebreak Notice) or future mitigation measures to be accommodated as part of the future structure planning process. These responsibilities will need to be considered as part of the subsequent development and implementation process.

Table 5: Responsibilities for the implementation of the BMP

Management action	Timing
Developer/landowner	
Provide a copy of this BMP to the relevant decision-makers to support the proposed DSP	To support the DSP process.
Prepare a new BMP(s) in accordance with SPP 3.7, the Guidelines and AS 3959 to support the future structure planning process, based on the proposed layout and bushfire hazards, existing or proposed.	To support future structure planning.
If the development requires, undertake a BAL Contour Plan for any proposed structure plan(s) and that are designated as bushfire prone within the *Map of Bush Fire Prone Areas*, with assessment results to be included within the updated BMP.	To support future structure planning.
Where applicable and based on the outcomes of the BAL Contour Plan, make spatial provision within any future structure plan(s) layout to accommodate APZs. This may include ensuring lots are of an adequate depth or width to accommodate the relevant setback distance for future buildings to achieve BAL-29 or less (as per **Table 3** in this BMP), or through the provision of public roads and/or managed public open space.	To support future structure planning.
Comply with the City of Swan Firebreak Notice/s as published.	Ongoing, as required
City of Swan	
Monitoring vegetation fuel loads in private landholdings against the requirements of the City's Firebreak Notice and Section 33 1(b) of the *Bush Fires Act 1954* and liaising with relevant stakeholders to maintain fuel loads at minimal/appropriate levels.	Ongoing, as required
Maintain existing public road reserves to appropriate standards where required/applicable.	Ongoing, as required

7 Applicant Declaration

7.1 Accreditation

This BMP has been prepared by Emerge Associates who have been providing bushfire risk management advice for more than six years, undertaking detailed bushfire assessments (and associated approvals) to support the land use development industry.

Anthony Rowe is a Fire Protection Association of Australia (FPAA) Level 3 Bushfire Planning and Design (BPAD) accredited practitioner (BPAD no. 36690) with over nine years' experience and is supported by a number of team members who have undertaken BPAD Level 1 and Level 2 training and are in the processing of gaining formal accreditation.

7.2 Declaration

I declare that the information provided is true and correct to the best of my knowledge.

Signature:

Name: Anthony Rowe

Company: Emerge Associates

Date: 18 December 2019

BPAD Accreditation: BPAD no. 36690

8 References

8.1 General references

The references listed below have been considered as part of preparing this document.

Bamford Consulting Ecologists (BCE) 2019, Fauna Assessment - Various Lots, Bullsbrook.

Department of Fire and Emergency Services (DFES) 2014, Prepare. Act. Survive., Perth. August 2014.

Department of Planning Lands and Heritage (DPLH) 2018, North-East Sub-regional Planning Framework, Western Australian Planning Commission, Perth.

Department of Planning, Lands and Heritage (DPLH) 2019, Position Statement: Planning in bushfire prone areas - Demonstrating Element 1: Location and Element 2: Siting and design, Western Australian Planning Commission.

Emerge Associates 2019, Flora and Vegetation Assessment - Various Lots North Ellenbrook, EP18-018(04)--014.

Gould, J., McCaw, W., Cheney, N., Ellis, P. and Matthews, S. 2007, Field Guide: Fuel Assessment and Fire Behaviour Prediction in Dry Eucalypt Forest, CSIRO and Department of Environment and Conservation, Perth, Western Australia.

Indo-Pacific Environmental (IPE) 2019, Preliminary Assessment of Listed Aquatic Fauna within Various Lots, North Ellenbrook. Revision 0.

PGV Environmental 2019, Flora and Vegetation Survey – Lots 29 & 30 Maralla Road, North Ellenbrook, Version 3.

Standards Australia 2018, AS 3959-2018 Construction of buildings in bushfire-prone areas, Sydney.

Western Australian Planning Commission (WAPC) 2015, State Planning Policy 3.7 Planning in Bushfire Prone Areas, Perth.

Western Australian Planning Commission and Department of Fire and Emergency Services (WAPC and DFES) 2017, Guidelines for Planning in Bushfire Prone Areas Version 1.3, Western Australia. December 2017.

8.2 Online references

Landgate 2019, *Map Viewer*, viewed December 2019, https://www0.landgate.wa.gov.au/maps-and-imagery/interactive-maps/map-viewer

Office of Bushfire Risk Management (OBRM) 2019, *Map of Bush Fire Prone Areas*, viewed December 2019, https://maps.slip.wa.gov.au/landgate/bushfireprone/

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Figures

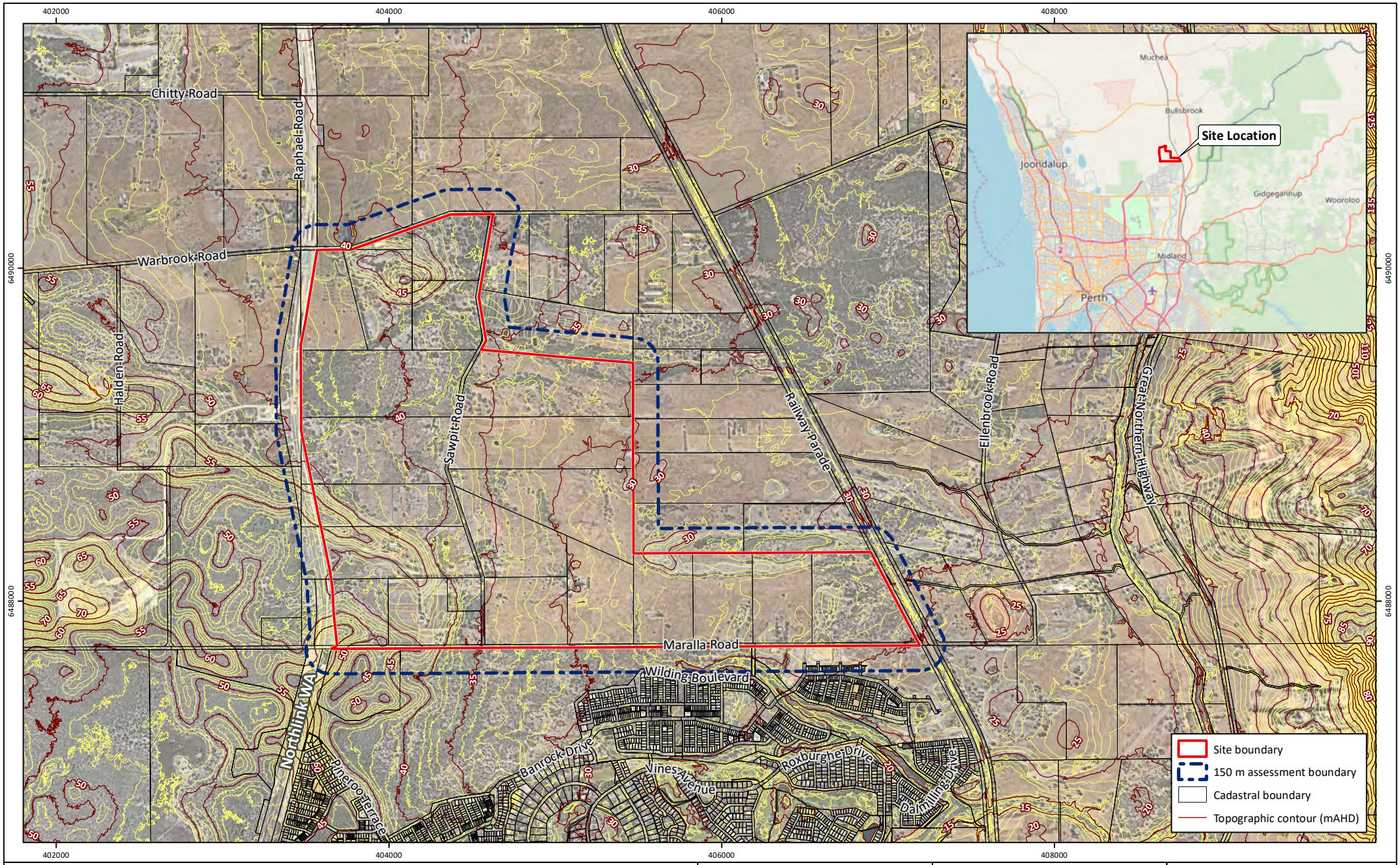

Figure 1: Site Location

Project:	Bushfire Management Plan North Ellenbrook (East) District Structure Plan
Client:	Lendlease Communities (Ellenbrook) Pty Ltd

Plan Number:
EP18-018(11)--F102

Drawn:	KNM
Date:	18/12/2019
Checked:	SCM
Approved:	AJR
Date:	18/12/2019

N

0 500 1,000
Metres

Scale: 1:30,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

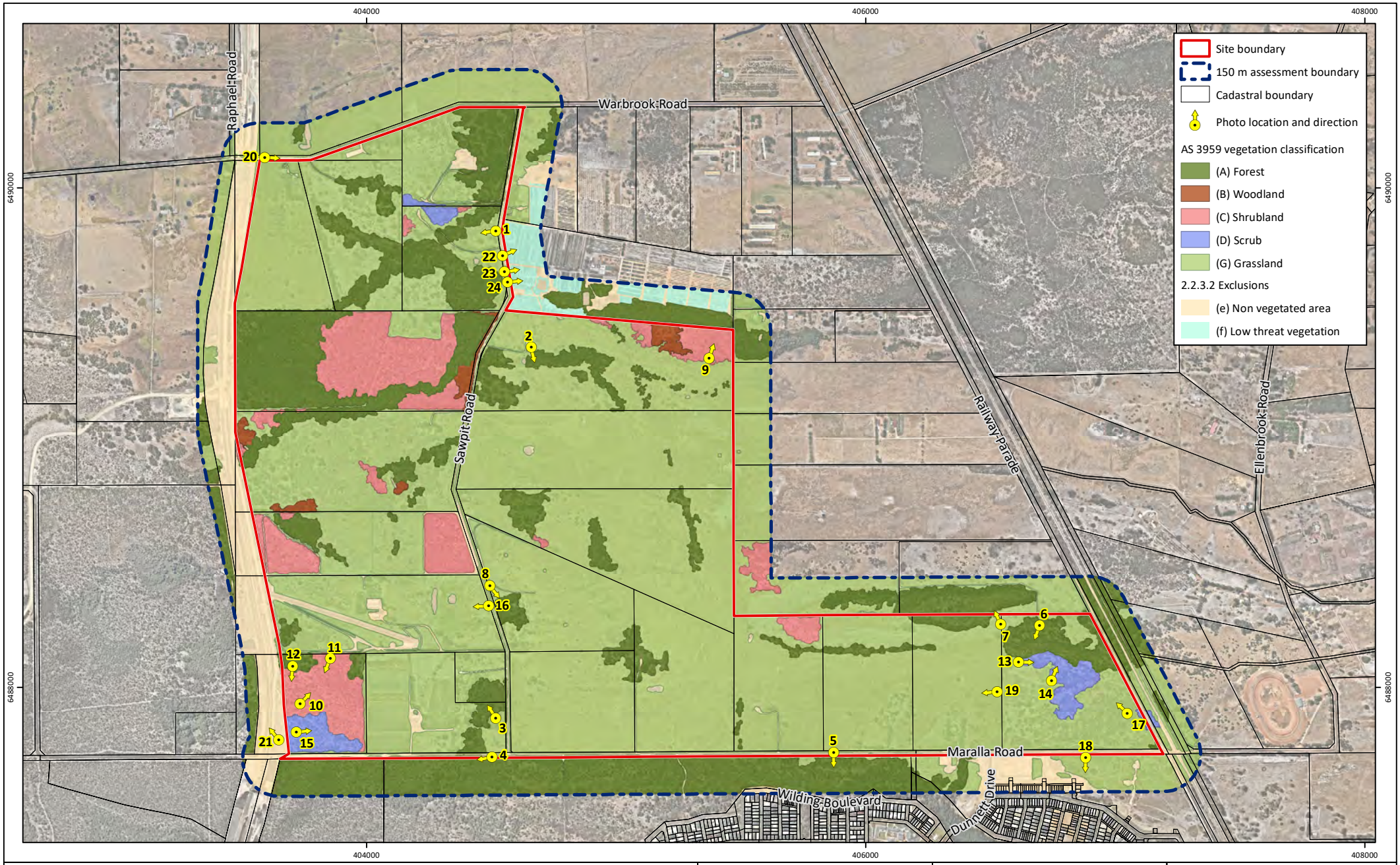

Figure 2: Existing Conditions – AS 3959 Vegetation Classifications

Project: Bushfire Management Plan
North Ellenbrook (East) District Structure Plan
Client: Lendlease Communities (Ellenbrook) Pty Ltd

Plan Number:
EP18-018(11)--F103
Drawn: KNM
Date: 18/12/2019
Checked: SCM
Approved: AJR
Date: 18/12/2019

N

0 200 400 600
Metres
Scale: 1:20,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

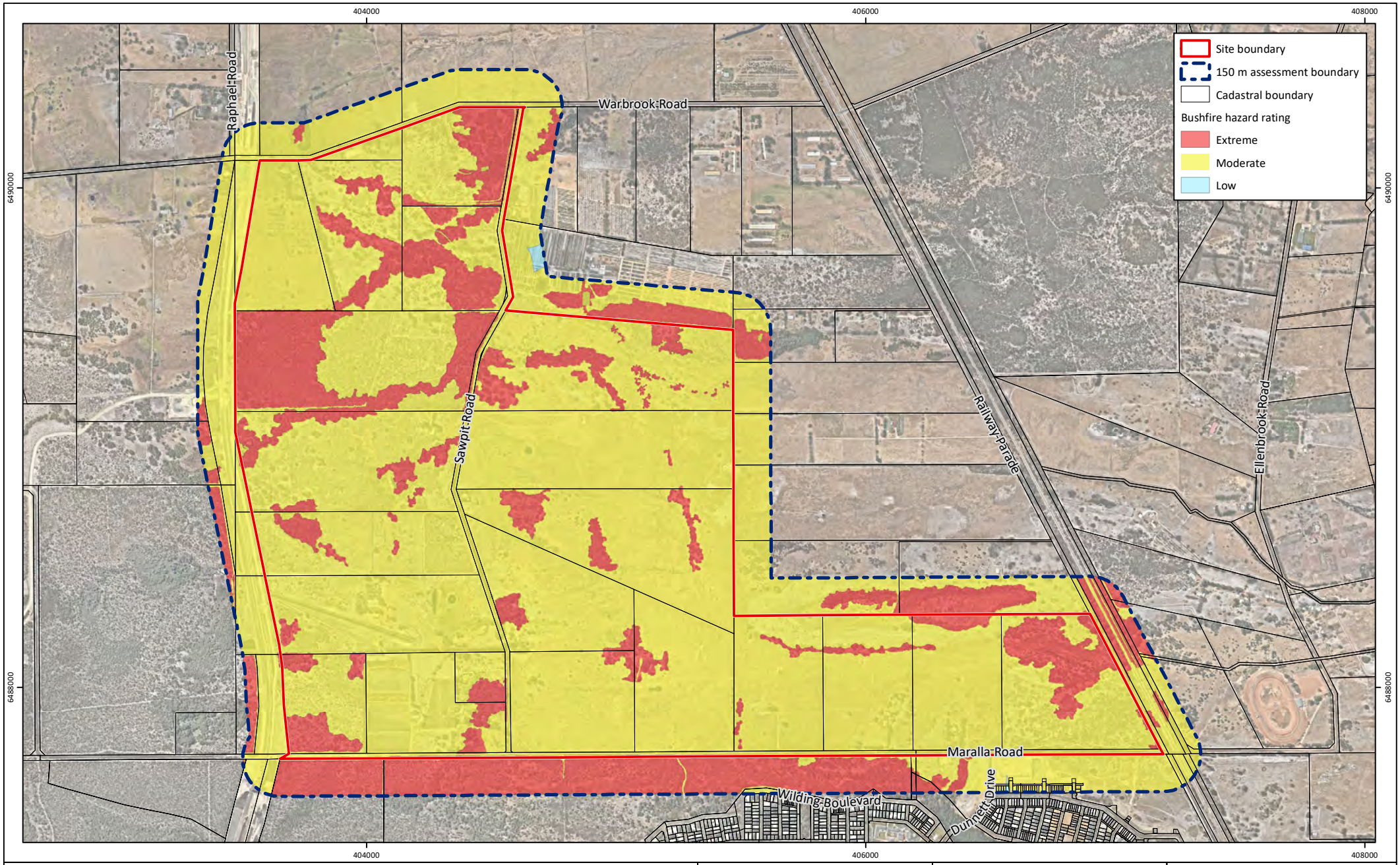

Figure 3: Existing Conditions – Bushfire Hazard Level

Project: Bushfire Management Plan
North Ellenbrook (East) District Structure Plan
Client: Lendlease Communities (Ellenbrook) Pty Ltd

Plan Number:
EP18-018(11)--F104
Drawn: GAR
Date: 18/12/2019
Checked: SCM
Approved: AJR
Date: 18/12/2019

N

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Metres
Scale: 1:20,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

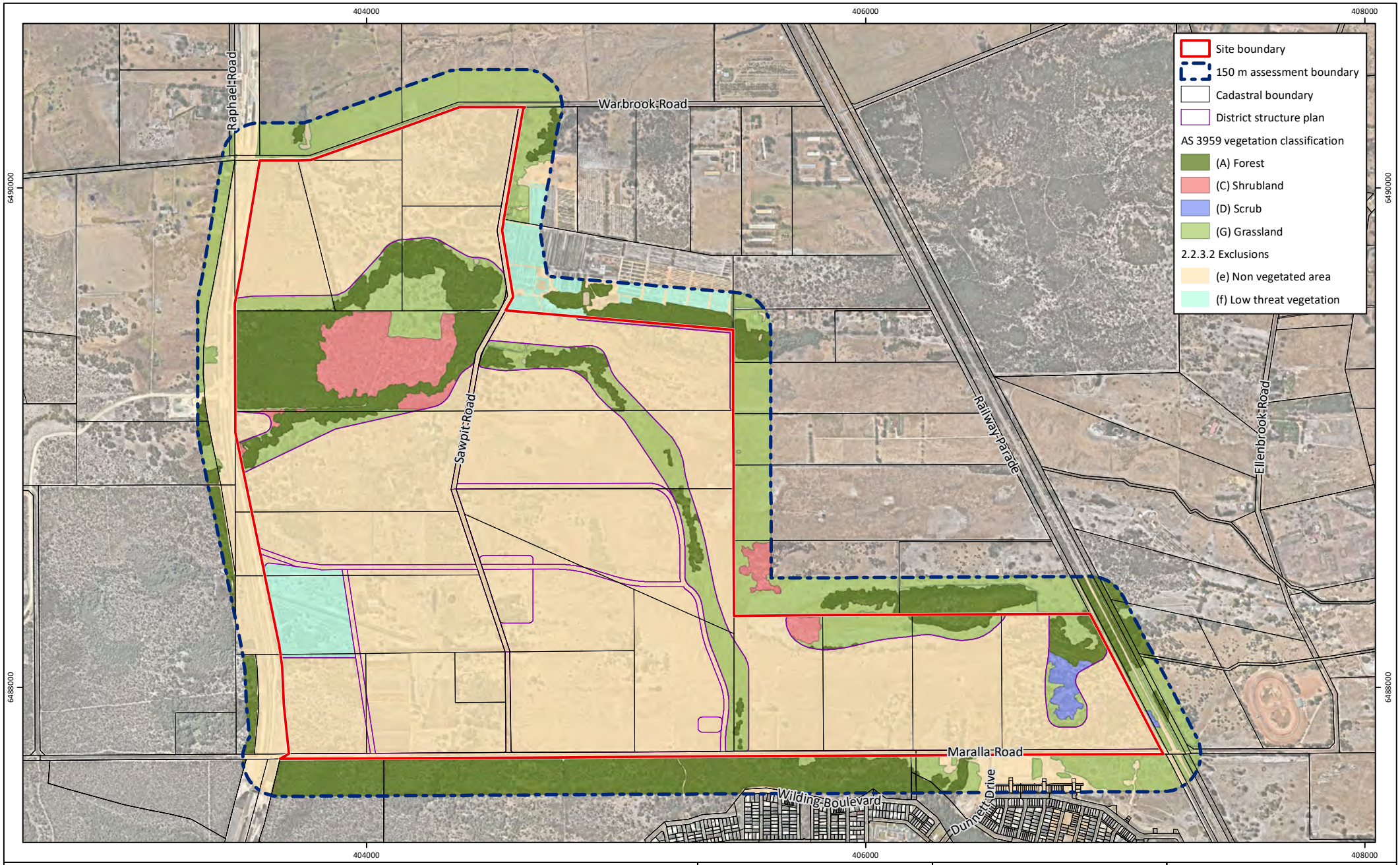


Figure 4: **Post Development Conditions – AS 3959 Vegetation Classifications**

Project: Bushfire Management Plan
North Ellenbrook (East) District Structure Plan
Client: Lendlease Communities (Ellenbrook) Pty Ltd

Plan Number:
EP18-018(11)--F105
Drawn: GAR
Date: 18/12/2019
Checked: SCM
Approved: AJR
Date: 18/12/2019

N

0 200 400 600
Metres
Scale: 1:20,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

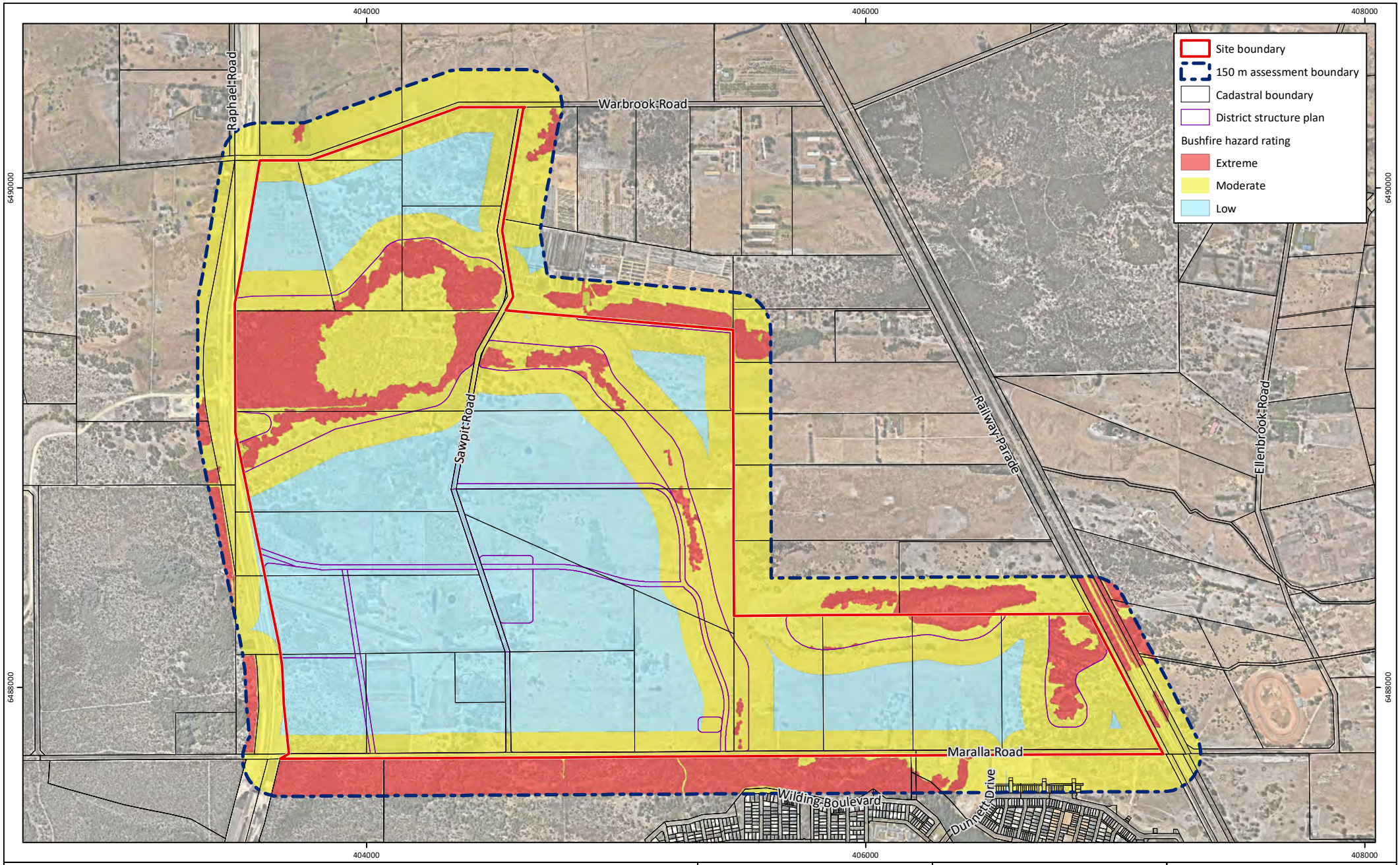


Figure 5: Post Development Conditions – Bushfire Hazard Level

Project: Bushfire Management Plan
North Ellenbrook (East) District Structure Plan

Client: Lendlease Communities (Ellenbrook) Pty Ltd

Plan Number:
EP18-018(11)--F106

Drawn:	GAR
Date:	18/12/2019
Checked:	SCM
Approved:	AJR
Date:	18/12/2019

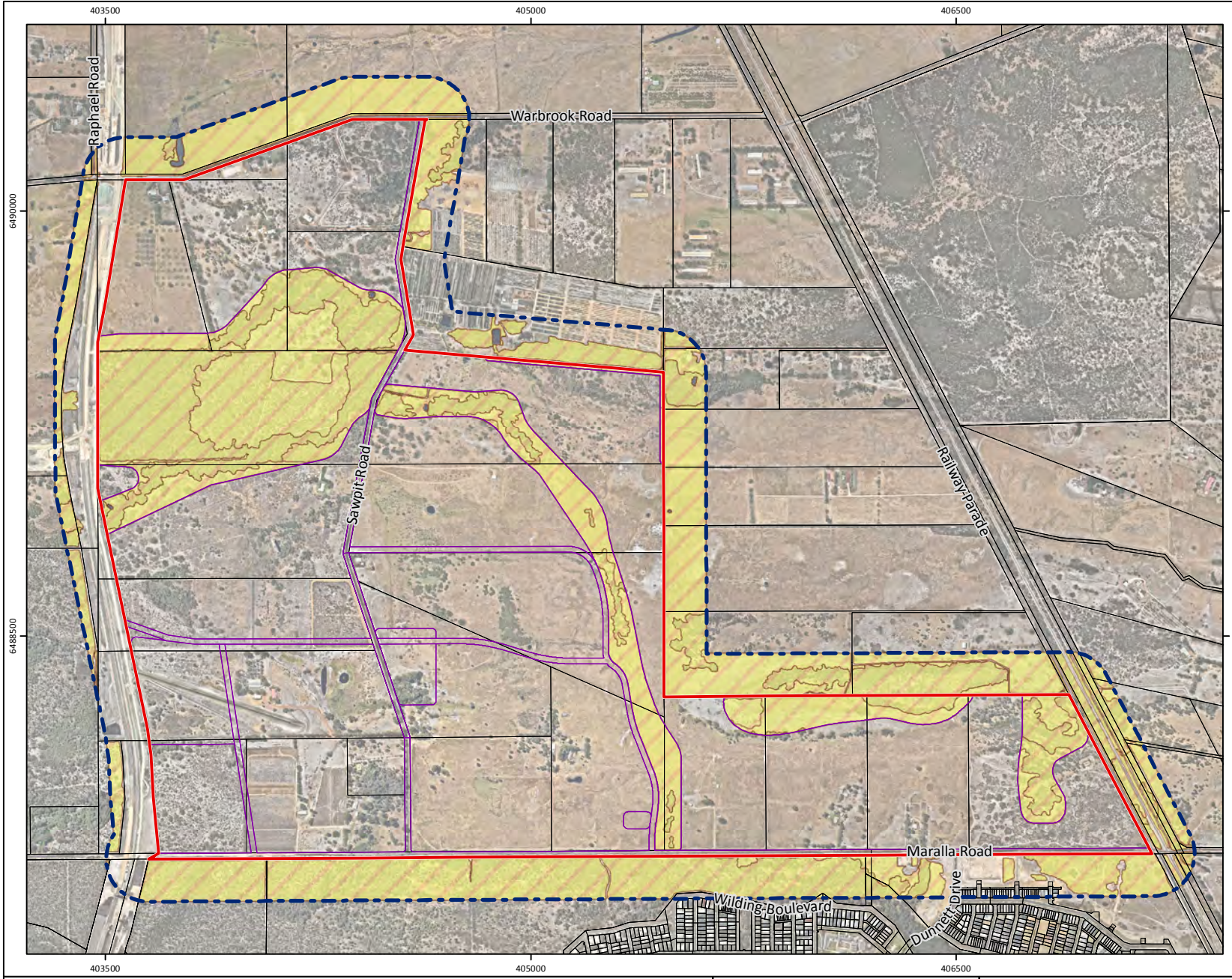
N

0 200 400 600
Metres

Scale: 1:20,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES



Bushfire Considerations

Areas that are shaded yellow represent vegetation that will be present within and surrounding the site in the post development scenario.

Future detailed structure planning and subdivision design will determine the spatial provisions required to accommodate setbacks from this vegetation as part of future development, in order to achieve BAL-29 at future built-form.

Setback distances from classified vegetation are provided in Table 3 of the BMP.

- Site boundary
- 150 m assessment boundary
- Cadastral boundary
- District structure plan
- Bushfire hazard

Figure 6: Spatial Representation of Bushfire Considerations for Future Development

Project: Bushfire Management Plan
North Ellenbrook (East) District Structure Plan
Client: Lendlease Communities (Ellenbrook) Pty Ltd

Plan Number:
EP18-018(11)--F107
Drawn: GAR
Date: 18/12/2019
Checked: SCM
Approved: AJR
Date: 18/12/2019

N

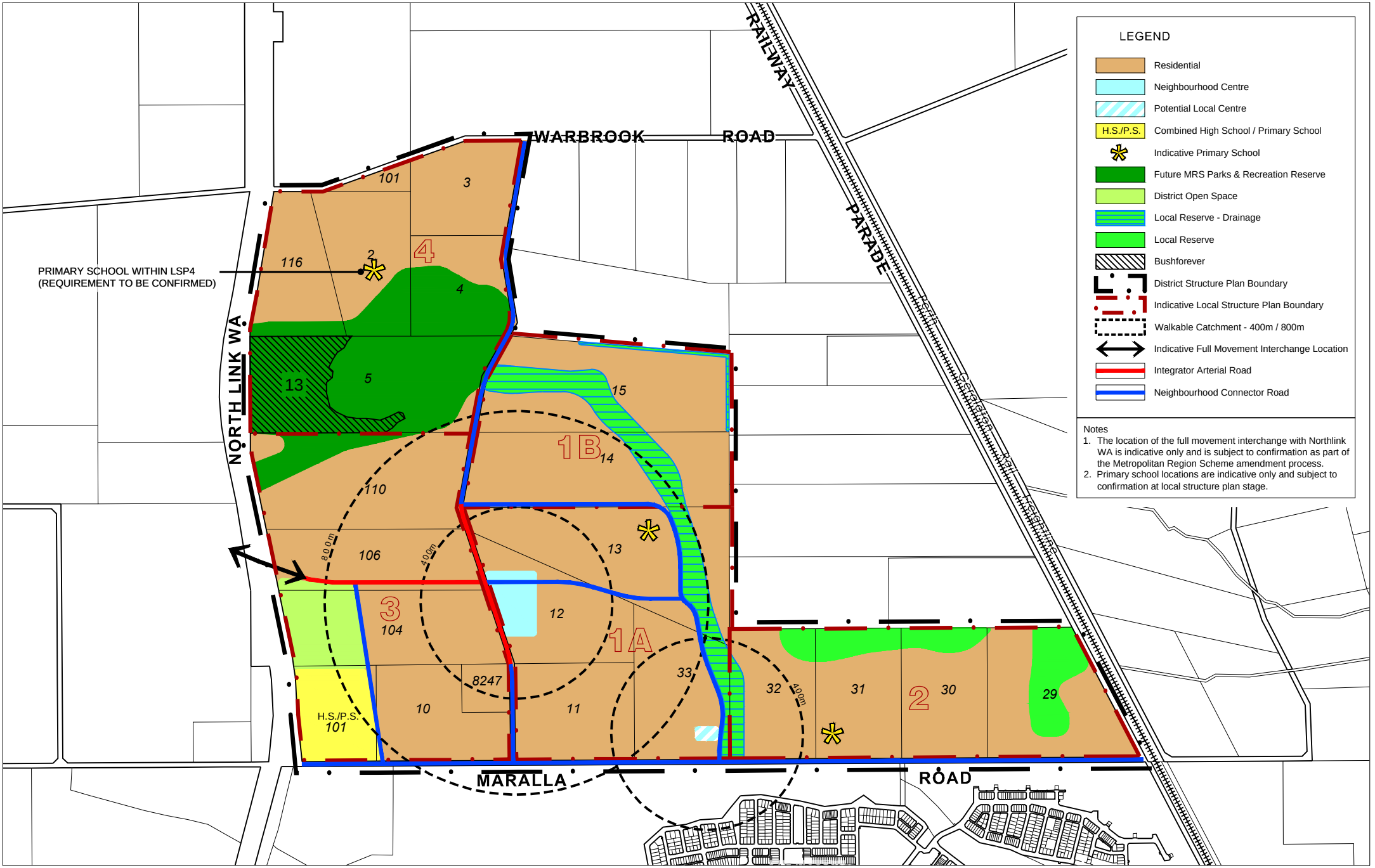
0 200 400 600
Metres
Scale: 1:20,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

Appendix A

North Ellenbrook (East) District Structure Plan (CLE 2019)

Prepared by CLE (2019)



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DISTRICT STRUCTURE PLAN MAP

North Ellenbrook (east)

plan no: **3138-57B-01**
date: 19 December 2019
scale: 1:20,000 @ A4