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Bushfire Development Report

for the Shenstone Park Precinct Structure Plan

Report prepared for
the City of Whittlesea

April 2019

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Cover image: Looking southwest from Donnybrook Road towards the Quarry.

Accountability

Stage	Date completed	Name	Title
Site assessment	2019-02-16	Hamish Allan	Manager, Bushfire Planning and Design
Analysis & report preparation	2019-03-06	Hamish Allan	Manager, Bushfire Planning and Design
Peer review	2019-03-06	Jon Boura	Managing Director

Version Control

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1.0	2019-03-07	Bushfire Development Report (BDR) to client	Hamish Allan
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1 Introduction

This Bushfire Development report has been prepared for the City of Whittlesea on behalf of the Victorian Planning Authority (VPA), to assess how future development in the Shenstone Park Precinct Structure Plan (SPPSP) area can respond to the bushfire risk and the applicable Victorian planning and building controls that relate to bushfire, in particular the objective and applicable strategies of the Planning Policy Framework (PPF) at Clause 13.02 *Bushfire* in the Victoria Planning Provisions (Whittlesea Planning Scheme, 2018a).

The precinct is in a designated Bushfire Prone Area (BPA). BPAs are those areas subject to or likely to be subject to bushfires, as determined by the Minister for Planning. Higher hazard land within a BPA may be subject to extreme bushfire behaviour, is covered by the Bushfire Management Overlay (BMO); however, no part of the precinct or land within 2km of it, is affected by the BMO.

The City of Whittlesea and the Victorian Planning Authority (VPA) are currently preparing the draft SPPSP. The precinct comprises approximately 619ha of land in the northern growth corridor of Melbourne, approximately 2.5km northeast of Craigieburn and immediately southeast of Kalkallo; south of Donnybrook Road between the Hume Freeway and Epping Road (see Figure 1).

To the north and west of the precinct are several other PSP areas with approved PSPs. To the south of the precinct is the Northern Quarries PSP area, for which planning has not yet commenced. East of the Shenstone Park precinct is the proposed Grassy Eucalypt Woodland Conservation Reserve.

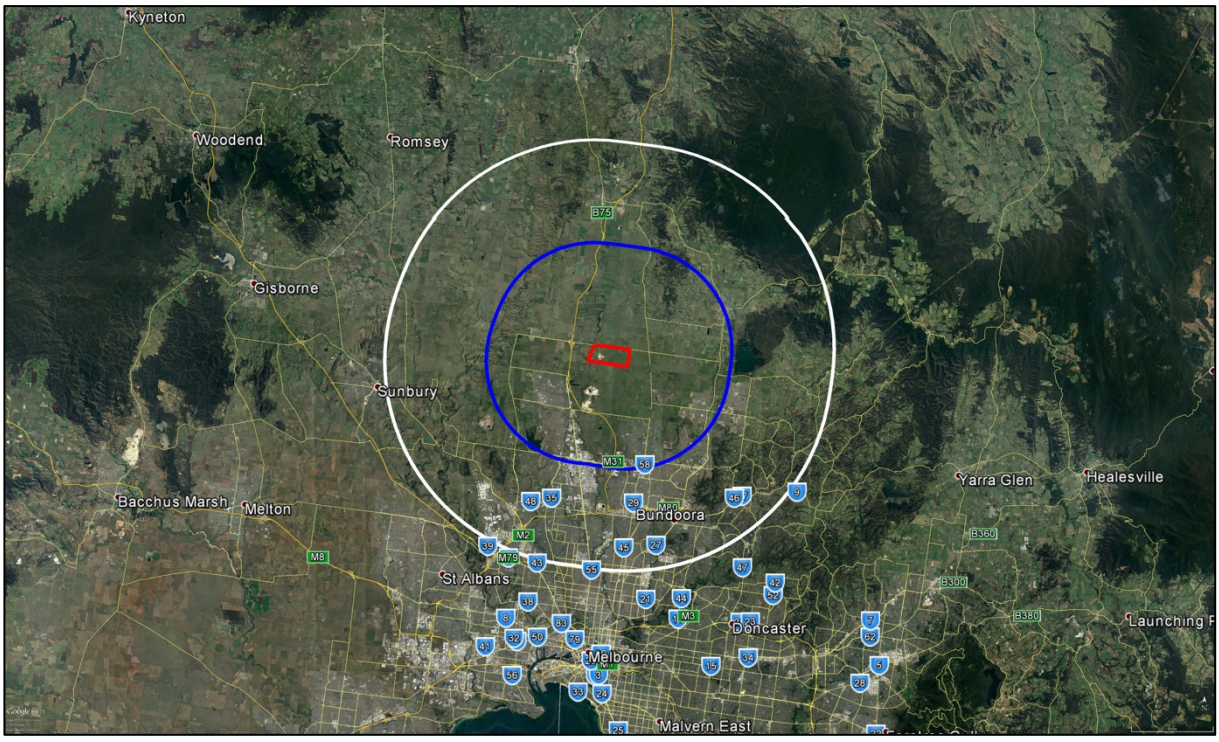


Figure 1 - Shenstone Park PSP area (site in red outline, 10km buffer in blue outline and 20km buffer in white outline) (2018 Google).

The Shenstone Park precinct will accommodate a mix of residential, recreation, community and employment land uses and will be integrated with the Wollert and Donnybrook PSPs to the north (see Figure 2, Figure 3, Map 5 and Map 6) (VPA, 2019a).

This report assesses the bushfire hazard and identifies how development of the precinct can appropriately mitigate any bushfire risk by responding to and complying with the applicable bushfire planning and building controls. It has been prepared in accordance with applicable guidance for the assessment of, and response to, bushfire risk provided in:

- *Bushfire State Planning Policy Amendment VC140*, Planning Advisory Note 68 (DELWP, 2018a);
- *Local planning for bushfire protection*, Planning Practice Note 64 (DELWP, 2015a);
- *Planning Permit Applications Bushfire Management Overlay* Technical Guide[1] (DELWP, 2017a); and
- AS 3959-2018 *Construction of buildings in bushfire prone areas* (Standards Australia, 2018).

[1] Although the SPPSP area and surrounding land is not affected by the BMO, DELWP's BMO technical guide provides useful descriptors and guidance for assessing the bushfire risk at the landscape scale, as discussed in Section 3.4.2.

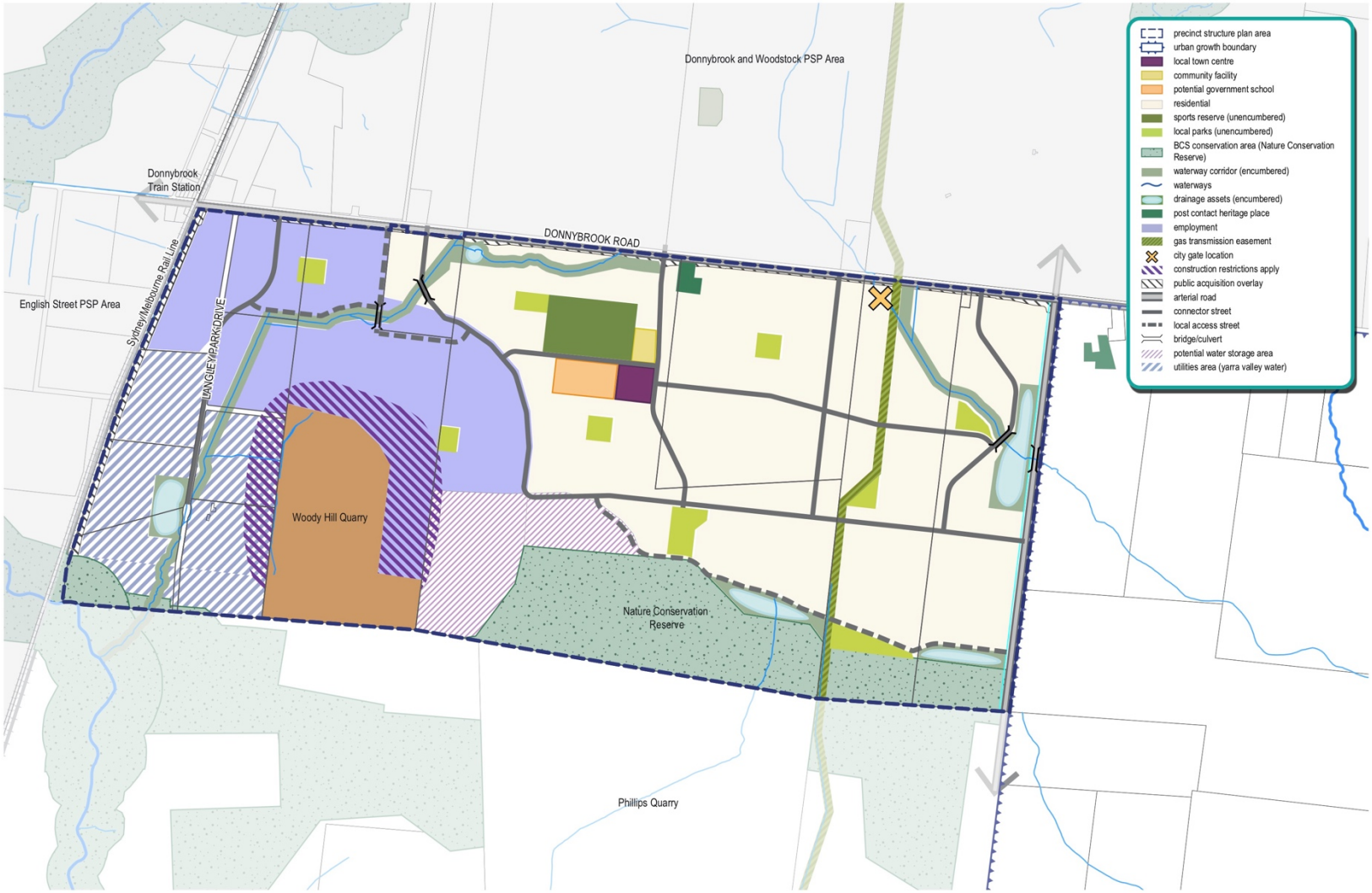


Figure 2 - Shenstone Park PSP proposed future urban structure – Option 1 (VPA, 2019b).

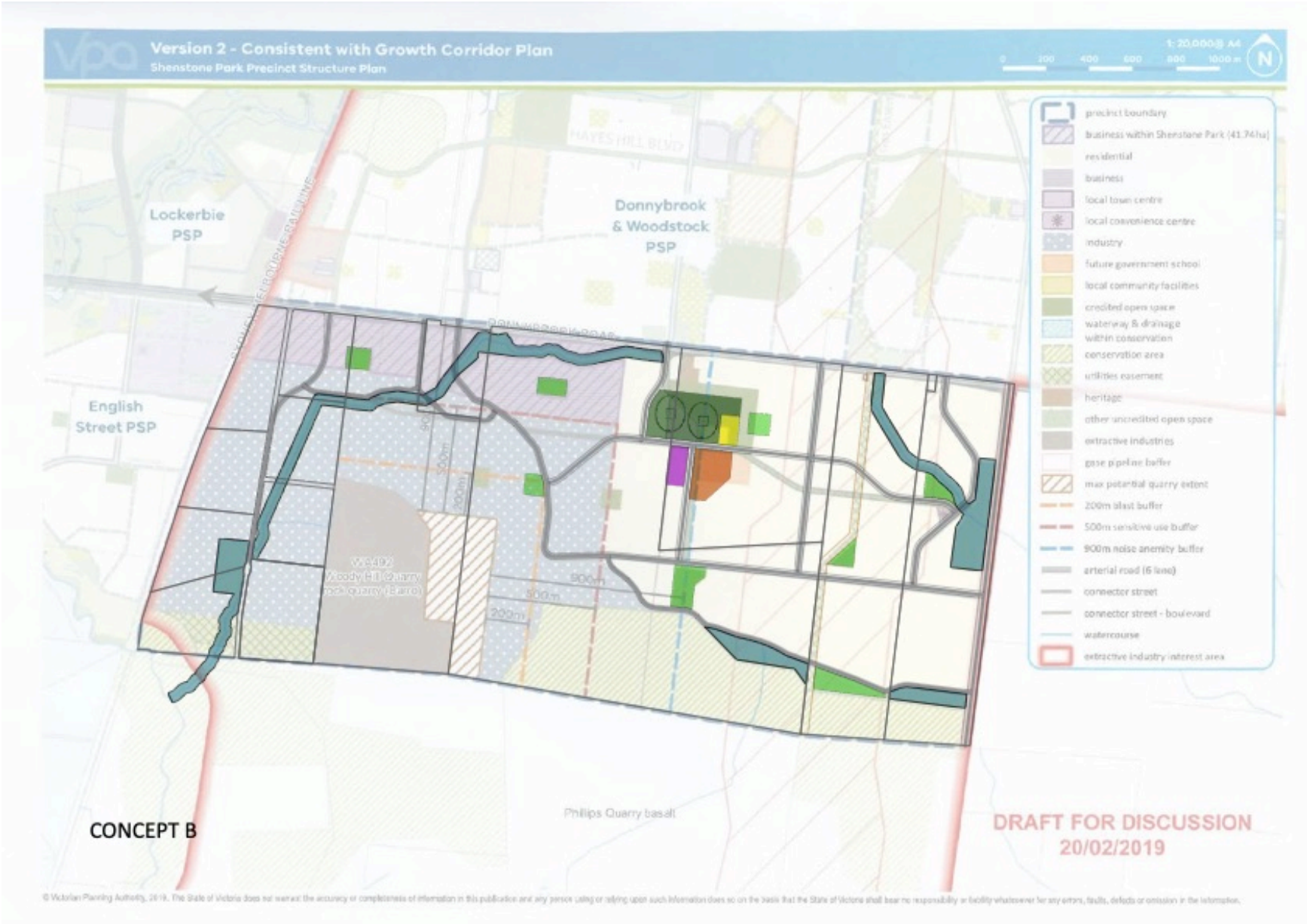


Figure 3 - Shenstone Park PSP proposed future urban structure – Option 2 (VPA, 2019c).

2 Bushfire planning and building controls

This section summarises the applicable planning and building controls that relate to bushfire. Section 4 describes how planning and design for the SPPSP can respond to and comply with the controls.

2.1 Clause 71.02-3 Integrated Decision Making

Clause 71.02-3 states that planning and responsible authorities should endeavour to integrate policies and balance conflicting objectives in favour of net community benefit and sustainable development. However, in bushfire affected areas, the protection of human life must be prioritised over all other policy considerations (Whittlesea Planning Scheme, 2018b).

2.2 Clause 13.02 Bushfire

Clause 13.02 has the objective '*To strengthen the resilience of settlements and communities to bushfire through risk based planning that prioritises the protection of human life*' (Whittlesea Planning Scheme, 2018a). The policy must be applied to all planning and decision making under the Planning and Environment Act 1987, relating to land which is:

- Within a designated Bushfire Prone Area;
- Subject to a Bushfire Management Overlay; or
- Proposed to be used or developed in a way that may create a bushfire hazard.

Clause 13.02 requires priority to be given 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 consideration of bushfire risk in decision-making at all stages of the planning process'* (Whittlesea Planning Scheme, 2018a).

Key strategies are stipulated in Clause 13.02, which require that strategic planning documents, planning scheme amendments and development plan approvals properly assess bushfire risk and include appropriate bushfire protection measures. This also applies to planning permit applications for:

- 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; and
- Any application for development that will result in people congregating in large numbers.

Development should not be approved 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*' (Whittlesea Planning Scheme, 2018a).

This study assesses the hazard and identifies the bushfire protection measures that will be required for future development in the SPPSP area. It is considered that development of the precinct can appropriately prioritise the protection of human life, and meet the objectives of Clause 13.02, largely by ensuring future dwellings and other development will not be exposed to RHF above 12.5kW/m^2, which is commensurate with a BAL-12.5 construction standard.

The maximum 12.5kW/m^2 safety threshold is invoked by Clause 13.02 as a key strategy for settlement planning and the upper limit for acceptable risk. Responsible authorities must '*Not approve 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 3959-2009*[2]*'* (Whittlesea Planning Scheme, 2018a).

A detailed response to the strategies in Clause 13.02 is provided in Section 4.4.

2.3 Local Planning Policy Framework (LPPF[3])

2.3.1 Clause 21.07-4 Bushfire

Clause 21.07-4 in the Whittlesea Municipal Strategic Statement (MSS) identifies the impact of bushfires and grassfires as an environmental risk and a key land management issue. As the hazard to Shenstone Park precinct is confined to Grassland (see Section 3.1), of particular relevance is the recognition in Clause 21-07-4 of grassfire risk:

'Grassland areas also present a fire hazard, particularly at the urban-grassland interface of existing settlements. Residential areas that are bordered by non-urban edges including conservation areas, cleared agricultural land and open space where new development is expected to occur are at a higher risk of grassfire that can spread rapidly and put lives and property in danger' (Whittlesea Planning Scheme, 2018c).

The objectives and strategies identified for bushfire are:

[2] AS 3959-2009 was superseded by AS 3959-2018 in November 2018 and therefore all quoted references in this report to AS-3959-2009 should be read as references to the 2018 version of the standard.

[3] It is noted that the LPPF will be translated into the PPF as the Municipal Planning Strategy, as proposed by VC148 (DELWP, 2018b). However, at the time of preparing this report the LPPF and MSS are components of the Whittlesea Planning Scheme.

'Objective 1	*To ensure that strategic and settlement planning decisions prioritise the protection of human life.*
Strategy 1.1	*Direct growth to areas of lower bushfire risk having regard to the municipal and local context.*
Strategy 1.2	*Avoid locations where bushfire risk cannot be reduced to an acceptable level.*
Objective 2	*To reduce the impact of bushfire risk.*
Strategy 2.1	*Ensure that decision-making considers issues of strategic and settlement planning as a primary consideration, followed by precinct and lot level responses.*
Strategy 2.2	*Consider alternate options for development in areas where required bushfire protection measures may be incompatible with environmental and cultural heritage objectives'* (Whittlesea Planning Scheme, 2018c).

It is considered that the analysis in this report and the implementation of existing planning and building controls that relate to bushfire, will facilitate an appropriate risk mitigation response for the precinct in accordance with these strategies and, therefore, future development will be able to meet the objectives of Clause 21.07-4.

2.3.2 Clause 22.03 Bushfire Management Policy

This policy applies to all land in Whittlesea that is in a designated Bushfire Prone Area (BPA) and which is *not* covered by the BMO (Whittlesea Planning Scheme, 2018d). The policy recognises the prevalence of 'medium-to-high hazard' areas outside the BMO coverage and seeks to '*...strengthen the community's resilience to bushfire and grassfire and ensure that fire risks are carefully considered in the planning and development process*' (Whittlesea Planning Scheme, 2018d).

The policy recognises that Whittlesea has *'...extensive undeveloped areas located at the urban/rural interface of existing settlements. Residential areas that are bordered by non- urban edges including conservation areas, cleared agricultural land and open space where new development is expected to occur are at a higher risk of grassfire that can spread rapidly and put lives and property in danger*' (Whittlesea Planning Scheme, 2018d).

The objectives of the policy are:

- *'To give effect to the relevant objectives and strategies of Clause 13.05 (Bushfire) over all land identified as being at risk of bushfire.*
- *To ensure that land use planning and developments are informed by a broad consideration of bushfire.*
- *To avoid intensifying bushfire risk to life and property through inappropriately located and designed development.*
- *To ensure that appropriate protection measures are in place prior to any development proceeding in areas outside the BMO.*

- *To strengthen community resilience to bushfire by ensuring that bushfire and grassfire protection measures are considered and given effect to in large and/or isolated subdivisions outside the BMO.*
- *To ensure that the threat of grassfire in interface areas is considered at a precinct, sub-precinct, and street level through the provision of appropriate fire breaks and road network arrangements.*
- *To ensure the protection of environmental and cultural values from bushfire and grassfire risks'* (Whittlesea Planning Scheme, 2018d).

The consideration of bushfire risk in this report is consistent with the policy intent, the stated policies and specified guidelines. The recommended mitigation measures in Section 4 will enable the policy objectives to be met. They will also ensure that the subdivision of land outside the BMO, which comprises more than 10 lots:

- *'Considers the need for multiple points of access and egress to the existing and proposed road network.*
- *Considers the need for perimeter roads and hard-edges at the urban- hazard interface (including grassland).*
- *Requires adequate access and egress opportunities for early residents, construction workers and emergency vehicles in emergent developments.*
- *Implements an appropriate fire break (buffer) between grassland and the lot boundary of the residential development to meet the Australian Standard (AS3959: 2011 or as amended), unless a reduced fire break has been determined by a fire management plan approved by the Municipal Fire Prevention Officer, to the satisfaction of the responsible authority. The fire break includes the widths of hard surfaces such as perimeter roads, footpaths, nature strips (non-vegetated) in addition to any closely managed grasslands or vegetation that is under 10cm in length. The fire break should not include land with high ecological values'* (Whittlesea Planning Scheme, 2018d).

2.4 Bushfire Prone Area (BPA)

The entire precinct is in a Bushfire Prone Area (BPA) (see Map 4). BPAs are those areas subject to or likely to be subject to bushfire, as determined by the Minister for Planning.

In a BPA, the Building Act 1993 and associated Building Regulations 2018, through application of the National Construction Code (NCC), require bushfire protection standards for class 1, 2 and 3[4] buildings, 'Specific Use Bushfire Protected Buildings'[5] and associated class 10A buildings[6] or decks. The applicable performance requirement in the NCC is:

[4] Class 1, 2 and 3 buildings are defined in the Building Code of Australia (BCA), and are generally those used for residential accommodation, including houses and other dwellings, apartments, hotels and other buildings with a similar function or use.

[5] Specific Use Bushfire Protected Buildings are defined in the Victorian *Building Regulations 2018,* they generally comprise 'vulnerable' uses and include schools, kindergartens, childcare facilities, aged care facilities and hospitals.

[6] Class 10a buildings are defined in the BCA as non-habitable buildings including sheds, carports, and private garages.

'A building that is constructed in a designated bushfire prone area must, to the degree necessary, be designed and constructed to reduce the risk of ignition from a bushfire, appropriate to the —

(a) potential for ignition caused by burning embers, radiant heat or flame generated by a bushfire; and

(b) intensity of the bushfire attack on the building' (ABCB, 2016).

Compliance with *AS 3959-2018 Construction of buildings in bushfire prone areas* is 'deemed-to-satisfy' the performance requirement (ABCB, 2016).

The Victorian Building Regulations (2018) require that applicable buildings be constructed to a minimum Bushfire Attack Level (BAL)-12.5, or higher as determined by a site assessment or planning scheme requirement. A BAL is a means of measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact. There are six BALs defined in AS 3959-2018, which range from BAL-LOW, which has no bushfire construction requirements to BAL-FZ (Flame Zone) where flame contact with a building is expected (see Appendix 1).

In a BPA, larger developments and certain vulnerable uses (see Section 2.2) are also required by Clause 13.02 *Bushfire* to:

- *'Consider the risk of bushfire to people, property and community infrastructure.*
- *Require the implementation of appropriate bushfire protection measures to address the identified bushfire risk.*
- *Ensure new development can implement bushfire protection measures without unacceptable biodiversity impacts'* (Whittlesea Planning Scheme, 2018a).

There are no significant obstacles to future development in the SPPSP complying with the applicable strategies at Clause 13.02 and the building regulations invoked by the BPA coverage (see Section 4).

Reliably low threat or non-vegetated areas will be created as development progresses, which will likely result in the urbanised parts of the precinct being removed from BPA. DELWP review and excise areas from the BPA approximately every 6 months, particularly in growth areas such as the SPPSP area, where the hazard will be removed as urban development occurs.

Land becomes eligible for excision if it satisfies statewide hazard mapping criteria, including that the land needs to be:

- At least 300m from areas of classified vegetation (except grassland) larger than 4ha in size; and
- At least 150m from areas of classified vegetation (except grassland) 2 to 4ha in size; and
- At least 60m from areas of unmanaged grassland more than 2ha in size (DELWP, 2015b).

For isolated areas of vegetation greater than 1ha but less than 2ha, the shape of the area and connectivity to any other hazardous vegetation is a further consideration (DELWP, 2015b).

The extent of BPA coverage of the surrounding landscape is shown in Map 3 and Map 4.

2.5 Other controls

2.5.1 Zoning

Most of the proposed residential areas in the SPPSP are currently zoned Urban Growth Zone (UGZ), with a small area of Rural Conservation Zone -Schedule 1 (RCZ1) to the south. The existing or potential future zoning does not have any significant bushfire safety implications. Whilst the UGZ, or another urban residential zone, will facilitate more intensive development in a BPA, the existing building and planning controls will be able to appropriately mitigate the relatively low bushfire risk. As identified above, as development progresses, some areas within the precinct will become eligible for excision from the BPA.

It is noted that in many PSP growth areas, a UGZ schedule typically includes a requirement that an application for residential subdivision is to include a Site Management Plan (SMP) that addresses bushfire risk during and, where necessary, after construction.

This applies in the UGZ6 areas of the Donnybrook and Woodstock precincts to the north of the SPPSP area, where a residential subdivision design response must include an SMP to be approved by the Country Fire Authority (CFA), which specifies:

- *'The staging of development and the likely bushfire risks at each stage;*
- *An area of land between the development edge and non-urban areas consistent with the separation distances specified in AS3959-2009, where bushfire risk is managed;*
- *The land management measures to be undertaken by the developer to reduce the risk from fire within any surrounding rural or undeveloped landscape to protect residents and property from the threat of grassfire and bushfire;*
- *Provision of adequate access and egress for early subdivisions to minimise grass and bushfire risks to new residents prior to the full completion of the PSP'* (Whittlesea Planning Scheme, 2018e).

Whilst this requirement helps to ensure that bushfire risk is managed during the construction period, larger subdivisions (i.e. >10 lots) should be able to demonstrate that bushfire risk will be appropriately mitigated in a Clause 13.02 bushfire response/application.

2.5.2 Overlays

Neither existing, nor anticipated future, overlay controls have any appreciable implications for bushfire safety. It should be noted that no land in, or within 2km around, the precinct is affected by the BMO. BMO areas within 5km of the precinct are confined to two small areas, which reflects the lack of higher hazard vegetation round the SPPSP area, and the relatively low bushfire risk to the precinct (see Section 3.4 and Map 3).

3 Bushfire hazard assessment

One of the bushfire hazard identification and assessment strategies in Clause 13.02 is to use the best available science to identify the hazard posed by vegetation, topographic and climatic conditions. The basis for the hazard assessment should be:

- *'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'* (Whittlesea Planning Scheme, 2018b).

This section includes a bushfire assessment at:

- The wider landscape scale, for at least 20km around the site (see Figure 1 and Map 3);
- The local landscape scale extending up to 1km from the site and the neighbourhood scale up to 400m around the precinct boundary, to identify any risk arising around the site beyond the BAL assessment zone (see Map 4); and
- The site scale, for 100m around the precinct and future residential areas, to determine likely future BALs (see Map 5 and Map 6).

Note that the BPA coverage invokes AS 3959-2018, which requires a site assessment of the vegetation and topography up to 100m around a building (see site assessment are shown in Maps 7 and 8), for the purposes of determining the applicable BAL construction standard for that building (Standards Australia, 2018).

3.1 Vegetation

Vegetation within a 100m BAL assessment zone around the site has been classified in accordance with the AS 3959-2018 methodology. Classified vegetation is vegetation that is deemed hazardous from a bushfire perspective.

The classification system is not directly analogous to Ecological Vegetation Classes (EVCs) but uses a generalised description of vegetation based on the AUSLIG (Australian Natural Resources Atlas: No. 7 - Native Vegetation) classification system. The classification is largely based on the structural characteristics of the vegetation at maturity, but the key determinant should be the likely fire behaviour that it will generate.

The classification is based on the current and likely future state of the vegetation according to the proposed future urban structure.

3.1.1 Grassland

The dominant vegetation hazard is Grassland within and around the precinct. Grassland is defined as all forms of vegetation (except Tussock Moorlands) including situations with shrubs and trees, if overstorey foliage cover is less than 10% (includes pasture and cropland) (Standards Australia, 2018). Grassland is considered hazardous, and therefore classifiable, when it is not managed in a minimal fuel condition. Minimal fuel condition means there is insufficient fuel available to significantly increase the severity of the bushfire attack (e.g. short-cropped grass, to a nominal height of 100 mm) (Standards Australia, 2018). Grassland areas should be assumed to be unmanaged and classifiable unless there is 'reasonable assurance' that they will be managed in perpetuity, in a low threat state, no more than 100mm high.

The areas of Grassland that currently occur around the precinct to the north and west, are a short to medium term hazard, as the abutting land in these directions is being developed in accordance with the PSPs that apply (see Map 4). Land to the north, across Donnybrook Road, and to the east, is in the early stages of being transformed by residential development into non-vegetated areas or areas of low threat vegetation (see Figure 10).

Vegetation in the conservation reserve associated with the Merri Creek corridor may continue to comprise Grassland, or potentially a more hazardous vegetation type if revegetation or natural regeneration results in shrub and tree cover exceeding 10% overall foliage cover. It is noted that one of the key purposes of the creek corridor reserve is to protect Growling Grass Frog habitat (Alluvium, 2018). Management and enhancement of areas to create or improve Growling Grass Frog habitat is likely to pose no more than a Grassland hazard, based on the Growling Grass Frog Habitat Design Standards (DELWP, 2017c). Except to the southwest of the precinct, the creek reserve will be distant enough from future development not to pose a significant hazard or influence BALs for future buildings (see Map 5 and Map 6). Additionally, as development in surrounding PSP areas occurs, hazardous vegetation in the creek corridor will be relatively isolated and likely not be able to sustain a large and intense fire.

Most, if not all, land in directions associated with the worst fire weather risk will, in the longer term, become developed and be in a low threat or non-vegetated state.

As the plans for the Northern Quarries area and proposed sewerage treatment plant to the south have not yet been finalised, the grassland hazard in this direction is likely to remain for a longer timeframe. Land to the east of the precinct is beyond the UGB and in the proposed Grassy Eucalypt Woodland Conservation Reserve. It is, therefore, likely to remain classified Grassland permanently (see discussion in Section 3.1.2 following). However, prevailing winds (a key driver of grassland fire behavior) associated with severe or higher fire weather conditions, are not typically from the east or south (Long, 2016).

Any areas of unmanaged Grassland within the precinct will also be hazardous and classifiable if they do not meet one or more of the exclusion criteria under which land and vegetation can be deemed to be non-hazardous (see Section 3.1.4). This will likely include most, or all, of the proposed

Conservation Reserve in the south of the precinct. Such areas will need to be sufficiently separated (setback) from future development by low threat or non-vegetated land, i.e. by 19m for BAL-12.5 construction of future buildings (see Section 4.1). It should be note that most of the proposed Conservation Reserve will be beyond the 100m BAL assessment zone around future residential areas (see Map 5 and Map 6).

Figure 4 - Looking southwest across Grassland in the Shenstone Park Precinct, from Donnybrook Road towards the Quarry.

Figure 5 - Looking southeast across Grassland towards the Grassy Eucalypt Woodland investigation area.

Figure 6 – Grassy Eucalypt Woodland to the southeast of the precinct is classifiable as Grassland if overstorey foliage cover does not exceed 10% and the understorey fuel hazard does not increase significantly as a result of natural recruitment or revegetation.

3.1.2 Grassy Eucalypt Woodland

The proposed Conservation Reserve within and to the south of the precinct, and the proposed Grassy Eucalypt Woodland Reserve (1,200ha investigation area) to the east (see Map 4) are unlikely to pose a greater hazard than classified Grassland. The vegetation assessments for the proposed Conservation Reserve (Conservation Area 28 - Summerhill Rd (East) Wollert) identifies that remnant vegetation present is largely 'Degraded Grassy Eucalypt Woodland' (DELWP, 2017c; Alluvium, 2018). Scattered trees and several small patches are identified as comprising the following Ecological Vegetation Classes (EVCs):

- EVC 55 Plains Grassy Woodland
- EVC 125 Plains Grassy Wetland
- EVC 132 Plains Grassland
- EVC 649 Stony Knoll Shrubland

In its benchmark state, Plains Grassy Woodland is an open woodland with a River Red Gum (*Eucalyptus camaldulensis*) dominated canopy cover of up to 10% (DSE, 2004a). The understorey is dominated by grasses, other graminoids and herbs. The benchmark descriptor for EVC 55-61 Plains Grassy Woodland is:

> *'An open, eucalypt woodland to 15 m tall. Occupies poorly drained, fertile soils on flat or gently undulating plains at low elevations. The understorey consists of a few sparse shrubs over a species-rich grassy and herbaceous ground layer. This variant occupies areas receiving approximately 500 – 700 mm annual rainfall'* (DSE, 2004a).

Occurrences of Stony Knoll Shrubland may comprise a shrubland to 3m tall or a low woodland to 8m (DSE, 2004b), however these are confined to localised low stony or rocky rises and are not considered to be a significant contributor to fire behaviour beyond relatively small and localised increases in flame heights and fire intensity.

Figure 7 - Plains Grassy Woodland near the south of the precinct.

If foliage cover in large areas was to exceed the 10% threshold and a more extensive shrubby understory develop, there may be an argument to re-classify these areas from Grassland to Woodland or Open Woodland.

The AS 3959 methodology considers that Woodland is a greater threat to development than Grassland. Woodland is presumed to have a relatively high default fuel load (15 t/ha understorey fuel and 25 t/ha total fuel load) whereas unmanaged grassland has a presumed fuel load of 4.5 t/ha (Standards Australia, 2018). Different equations are used to calculate rates of spread, flame lengths and resultant radiant heat impacts from fires burning in these vegetation types. A greater setback for buildings (defendable space distance) is required from Woodland than from unmanaged Grassland.

The assumptions about the increased hazard of treed vegetation on or around the Shenstone Park precinct are considered less valid. River Red Gums are few and scattered, they contribute very little bark fuel hazard and any increase in surface fuel due to litter fall is restricted to their immediate vicinity. There is no elevated fuel layer, and the density of grass and other near-surface fuel appears to be broadly consistent regardless of the overstorey.

Note that trees may in fact contribute to a reduction in the speed of the wind reaching the flame front of a fire burning through grass, and hence actually serve to moderate fire behaviour in respect to forward rate of spread and intensity. The relatively low fuel load, paucity of ladder fuels (e.g. shrubs and bark) and large gaps in the tree canopy will preclude crown fire. Cheney and Sullivan (2008) state that fire behaviour in woodland and open forests with a grassy understorey is similar to that of a grass fire but with the rate of spread approximately half to one third of that in open grassland due to the trees reducing the speed of the wind reaching the flames.

Luke and McArthur (1978) also state that the McArthur Forest Fire Danger Meter used for predicting fire behaviour should not be used in woodland communities where the ground cover consists of

grasses and herbs and instead recommend application of the Grassland meter adjusted to account for a lower wind speed relationship (in Yeo *et al.*, 2014).

It is also important to note that AS 3959-2018 allocates Open Woodland and Low Open Woodland (as well as Open Shrubland and Low Open Shrubland) vegetation types to the Grassland group classification (Standards Australia, 2018).

It is also noted in relation to the 1,200ha Grassy Eucalypt Woodland investigation area to the east, that the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listing advice for Grassy Eucalypt Woodland identifies that *'The structure of the Grassy Eucalypt Woodland of the Victorian Volcanic Plain is an open eucalypt woodland with a predominantly grassy understorey...*' (Threatened Species Scientific Committee, 2008).

Whilst mass germination and the occurrence of dense, regenerating tree saplings may result from cessation of grazing, fire or other disturbance, and temporarily increase tree cover and elevated fuels, if the future management strategy for the Conservation Reserves is to manage the vegetation in accordance with the EVC benchmark and Grassy Eucalypt Woodland vegetation type, then the Grassland classification will remain valid.

Figure 8 - Looking west along Donnybrook Road.

Figure 9 - Looking west from Langley Park Drive towards the English Street Precinct that is west of the rail line. Note recent grassfire in the precinct.

3.1.3 Wetlands and Drainage Reserves

The proposed drainage reserves and water storage area may comprise classifiable Grassland if grass greater than 100mm tall is allowed to persist, or Woodland or Shrubland if areas of planted vegetation are created through natural recruitment or revegetation. Potentially applicable exclusion criteria that could be applied to ensure such areas do not affect the BAL of future buildings, are the small patch criteria for:

- Single areas of vegetation less than 1 ha in area and not within 100m of other areas of classified vegetation;
- Multiple areas of vegetation less than 0.25ha in area and not within 20m of the site/building, or each other, or of other areas of classified vegetation; and
- Strips of vegetation less than 20m in width (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20m of the site/building or each other, or other areas of classified vegetation.

The proposed wetland ponds or other drainage features shown in the future urban structure plan (see Map 5 and Map 6) may be deemed non-vegetated or low threat if they have reliably open water or wet areas and little or no vegetation. Large, seasonally inundated wetlands or WSUD features that may be dry and vegetated during the fire danger period could, however, comprise classifiable Grassland or Shrubland. Note that the applicable BAL-12.5 setbacks for Shrubland are the same as for Grassland.

3.1.4 Excluded vegetation and non-vegetated areas

Areas of low threat vegetation and non-vegetated areas can be excluded from classification in accordance with Section 2.2.3.2 of AS 3959-2018, if they meet one or more of the following criteria:

a) 'Vegetation of any type that is more than 100m from the site (or a building).

b) *Single areas of vegetation less than 1 ha in area and not within 100m of other areas of vegetation being classified vegetation.*
c) *Multiple areas of vegetation less than 0.25ha in area and not within 20m of the site, or each other, or of other areas of vegetation being classified vegetation.*
d) *Strips of vegetation less than 20m in width (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20m of the site or each other, or other areas of vegetation being classified vegetation.*
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'* (Standards Australia, 2018).

It is reasonable to assume that the proposed residential, employment and other urban areas in the precinct will comprise non-vegetated land or low threat vegetation including maintained lawns and cultivated gardens. Similarly, it is likely that the proposed open space reserves and gas easement shown in the draft future urban structure will be low threat.

It is not known what the management of the quarry land, surrounding buffer, or utilities area will be, but if not excludable, it is unlikely to comprise more of a hazard than Grassland.

Figure 10 – Looking at development underway to the north of the SPPSP area, which will comprise low threat and non-vegetated land.

3.2 Topography

AS 3959 requires that the 'effective slope' be identified to determine the BAL and applicable vegetation setback distances. This is the slope of the land under the classified vegetation[7] that will most significantly influence the bushfire attack on a building. Two broad types apply:

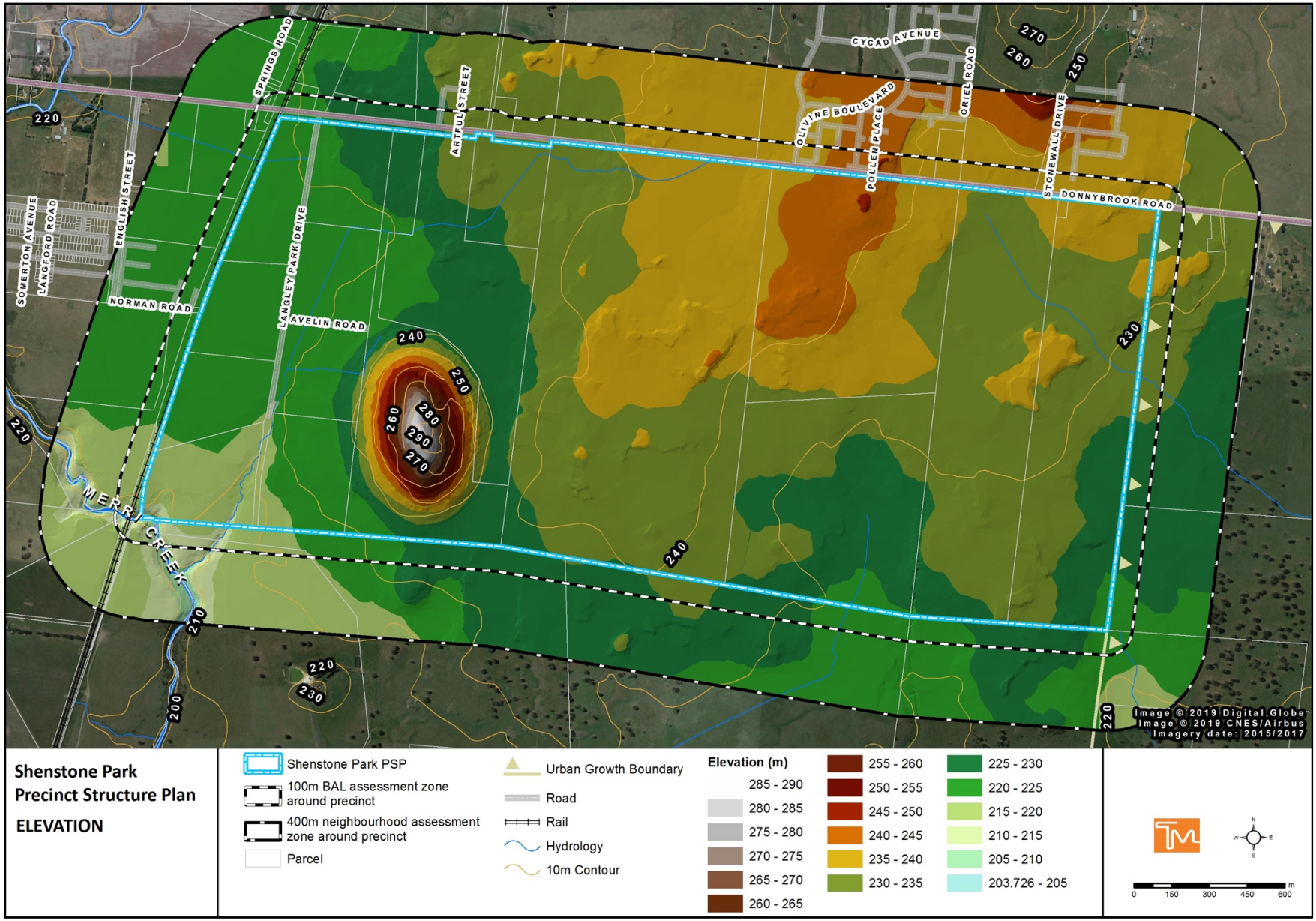
- Flat and/or Upslope - land that is flat or on which a bushfire will be burning downhill in relation to the development. Fires burning downhill (i.e. on an upslope) will generally be moving more slowly with a reduced intensity.
- Downslope - land under the classified vegetation on which a bushfire will be burning uphill in relation to the development. As the rate of spread of a bushfire burning on a downslope (i.e. burning uphill towards a development) is significantly influenced by increases in slope, downslopes are grouped into five classes in 5˚ increments from 0˚ up to 20˚.

The topography was analysed by site assessment and by creating an elevation model for the site and the land 400m around it, using a GIS TIN (Triangulated Irregular Network) generated from publicly available 1m contour data (see Map 1).

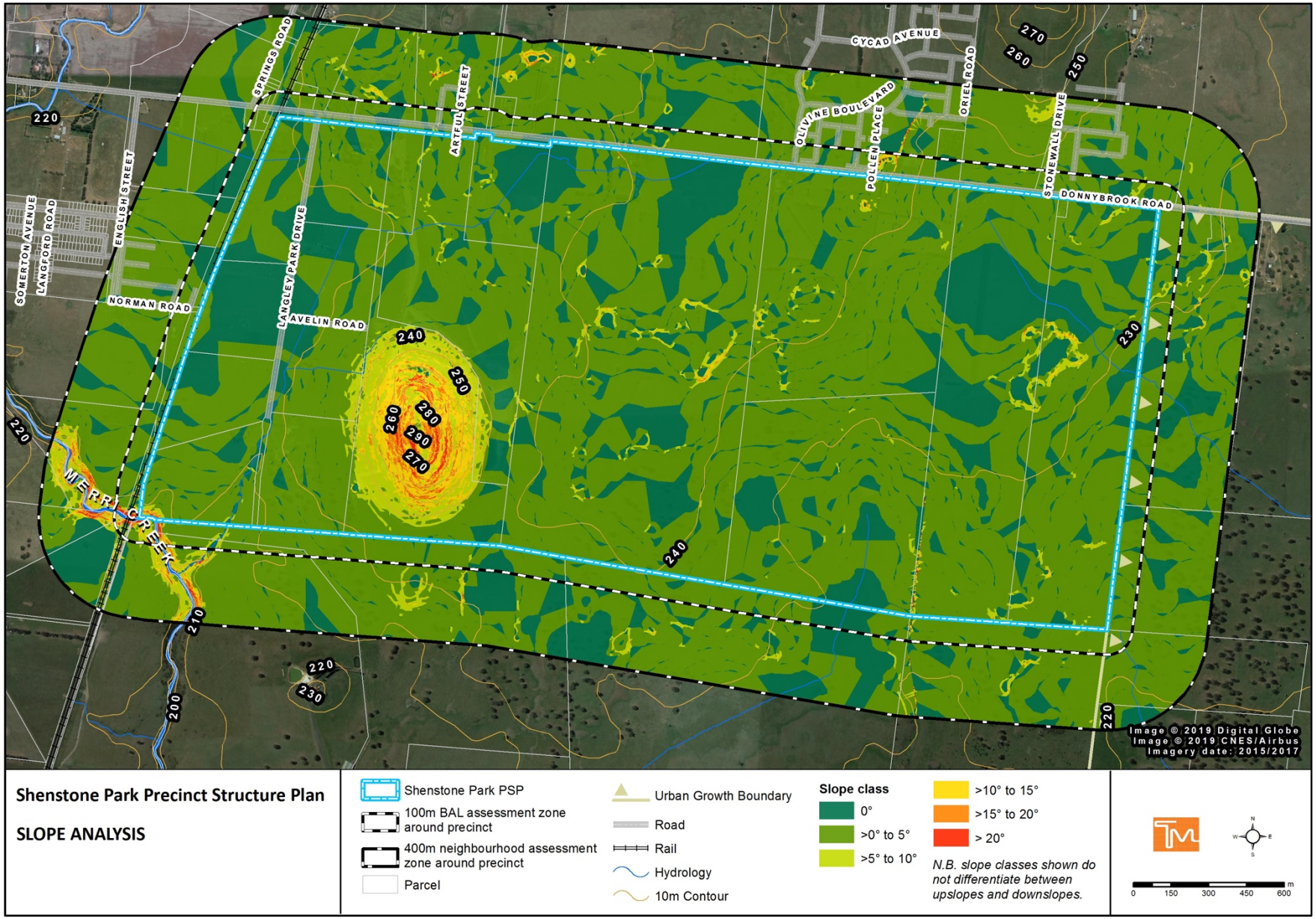
The terrain on the site and in the surrounding landscape is relatively benign from a bushfire perspective, being predominantly flat or only gently sloping (see Map 2). There are some exceptions including the quarry land, but this is upslope of future development areas; and whilst there are steeper embankments associated with the Merri Creek and other tributaries, these slopes are relatively short and not likely to be an appreciable influence on bushfire behaviour, at least for the purposes of determining future BAL construction standards.

Aside from the quarry land, overall the land slopes gently up from the southwest and the southeast. In relation to the proposed residential or other urban areas, the terrain that may influence bushfire behaviour is the land in the Conservation Reserve to the south and the Grassy Eucalypt Woodland investigation area to the east. In those parts of the 100m BAL assessment zone (see Map 5 and Map 6) that extends over these areas, the effective slope does not exceed a 1˚ downslope. It is considered that for the purposes of determining BALs and vegetation setback distances for future buildings, the land can be deemed more or less flat, and therefore the most applicable slope class is 'All upslopes and flat land'.

[7] The slope of the land between the classified vegetation and the building is called the site slope, which in the Method 1 procedure of AS 3959-2018, is assumed to be the same as the effective slope.



Map 1 - Elevation map of the precinct and surrounding 400m neighbourhood assessment zone.



Map 2 - Slope map of the precinct and surrounding 400m neighbourhood assessment zone.

3.3 Fire weather

The Forest Fire Danger Index (FFDI) and the Grassland Fire Danger Index (GFDI) represent the level of bushfire threat based on weather (and fuel) conditions. An FFDI 100/GFDI 130 is applied in non-alpine areas of Victoria by the building system, to establish building setback distances from classified vegetation in accordance with AS 3959-2018.

The indices are also used for predicting fire behaviour including the difficulty of suppression, forecasting Fire Danger Ratings (FDRs) and determining an appropriate level of preparedness for emergency services. Table 1 displays the FDRs, their FFDI/GFDI range[8] and the description of conditions for each FDR.

Note that the benchmark of an FFDI 100/GFDI 130 represents a 'one size fits all' model of extreme fire weather conditions for the state, but which has been exceeded during some significant fire events, including at some locations in Victoria on 'Black Saturday' 2009. Therefore, it is important to note that this is not necessarily the *worst-case* conditions for any particular location, including the SPPSP area.

It should also be noted that under various climate change scenarios, the frequency and severity of elevated fire danger days across south-east Australia is forecast to increase (Lucas *et al.*, 2007). Especially in eastern and southern Australia, there has been an increase in the length of the fire weather season and a greater number of higher risk days (CSIRO/BOM, 2018). There is a 'high confidence' that climate change will result in a harsher fire weather climate for the Southern Slopes Victoria West sub-region that the SPPSP area is in; with a 'low confidence' in the magnitude of the expected change (CSIRO/BOM, 2019).

CFA and DELWP have no published policy on FFDI/GFDI recurrence intervals. There is, therefore, no compelling reason to apply a different FFDI/GFDI from the FFDI 100/GFDI 130 threshold used throughout non-Alpine areas of Victoria in the planning and building system[9].

[8] The GFDI ranges for each FDR in Table 1 may vary in some jurisdictions.

[9] In alpine areas of Victoria an FFDI 50 applies for determining BALs using Method 1 of AS 3959-2018.

Table 1 - Fire Danger Ratings (Source: AFAC, 2017; CFA 2017).

Forest Fire Danger Index	Grassland Fire Danger Index	Fire Danger Rating (FDR)	Description of conditions
100+	150+	Code Red	The worst conditions for a bush or grass fire. Homes are not designed or constructed to withstand fires in these conditions. The safest place to be is away from high risk bushfire areas.
75-99	100-149	Extreme	Expect extremely hot, dry and windy conditions. Fires will be uncontrollable, unpredictable and fast moving. Spot fires will start, move quickly and will come from many directions. Homes that are situated and constructed or modified to withstand a bushfire, that are well prepared and actively defended, may provide safety. You must be physically and mentally prepared to defend in these conditions.
50-74	50-99	Severe	Expect hot, dry and possibly windy conditions. If a fire starts and takes hold, it may be uncontrollable. Well prepared homes that are actively defended can provide safety. You must be physically and mentally prepared to defend in these conditions.
25-49		Very High	If a fire starts, it can most likely be controlled in these conditions and homes can provide safety. Be aware of how fires can start and minimise the risk. Controlled burning off may occur in these conditions if it is safe – check to see if permits apply.
12-24		High	
0-11		Low – Moderate	

3.4 Landscape assessment

3.4.1 Location description and context

Shenstone Park is located in the northern metropolitan growth area, approximately 30km north of the Melbourne CBD. The precinct is 2.5km to the northeast of the large urban suburb of Craigieburn on the outskirts of Melbourne and 1km southeast of the residential area of Kalkallo (see Figure 1 and Map 3).

Donnybrook Road forms the northern boundary of the precinct, beyond which is the Donnybrook PSP and, to the northeast, the Woodstock PSP area, both of which have completed and approved PSPs (VPA, 2019d). To the south of the precinct is the Northern Quarries investigation area and a future Sewerage Treatment Plant (VPA, 2019a).

The Sydney-Melbourne rail line forms the western boundary of the SPPSP area, beyond which is the English Street PSP area and, further to the west, the Craigieburn North Employment Area, that also have completed and approved structure plans (VPA, 2019d). The Urban Growth Boundary (UGB) forms the eastern SPPSP boundary, to the east of which is the 1,200ha Grassy Eucalypt Woodland Conservation Reserve investigation area (Alluvium, 2018).

The landscape is generally a pastoral one dominated by farmsteads and rural residential properties, with the exception of the Mountain View quarry within the precinct. Urban-residential development is underway to the north and west of the precinct.

3.4.2 Landscape risk

To assist in assessing landscape risk, four 'broader landscape types', representing different landscape risk levels, are described in the DELWP technical guide *Planning Applications Bushfire Management Overlay*. These are intended to streamline decision-making and support more consistent decisions based on the landscape risk (DELWP, 2017a).

The four types range from low risk landscapes where there is little hazardous vegetation beyond 150m of a site and extreme bushfire behaviour is not credible, to extreme risk landscapes with limited or no evacuation options, and where fire behaviour could exceed AS 3959 assumptions (see Table 2).

Table 2 - Landscape risk typologies (from DELWP, 2017a).

Broader Landscape Type 1	Broader Landscape Type 2	Broader Landscape Type 3	Broader Landscape Type 4
• *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.*	• *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.*	• *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.*	• *The broader landscape presents an extreme risk.* • *Fires have hours or days to grow and develop before impacting.* • *Evacuation options are limited or not available.*
I N C R E A S I N G R I S K →			

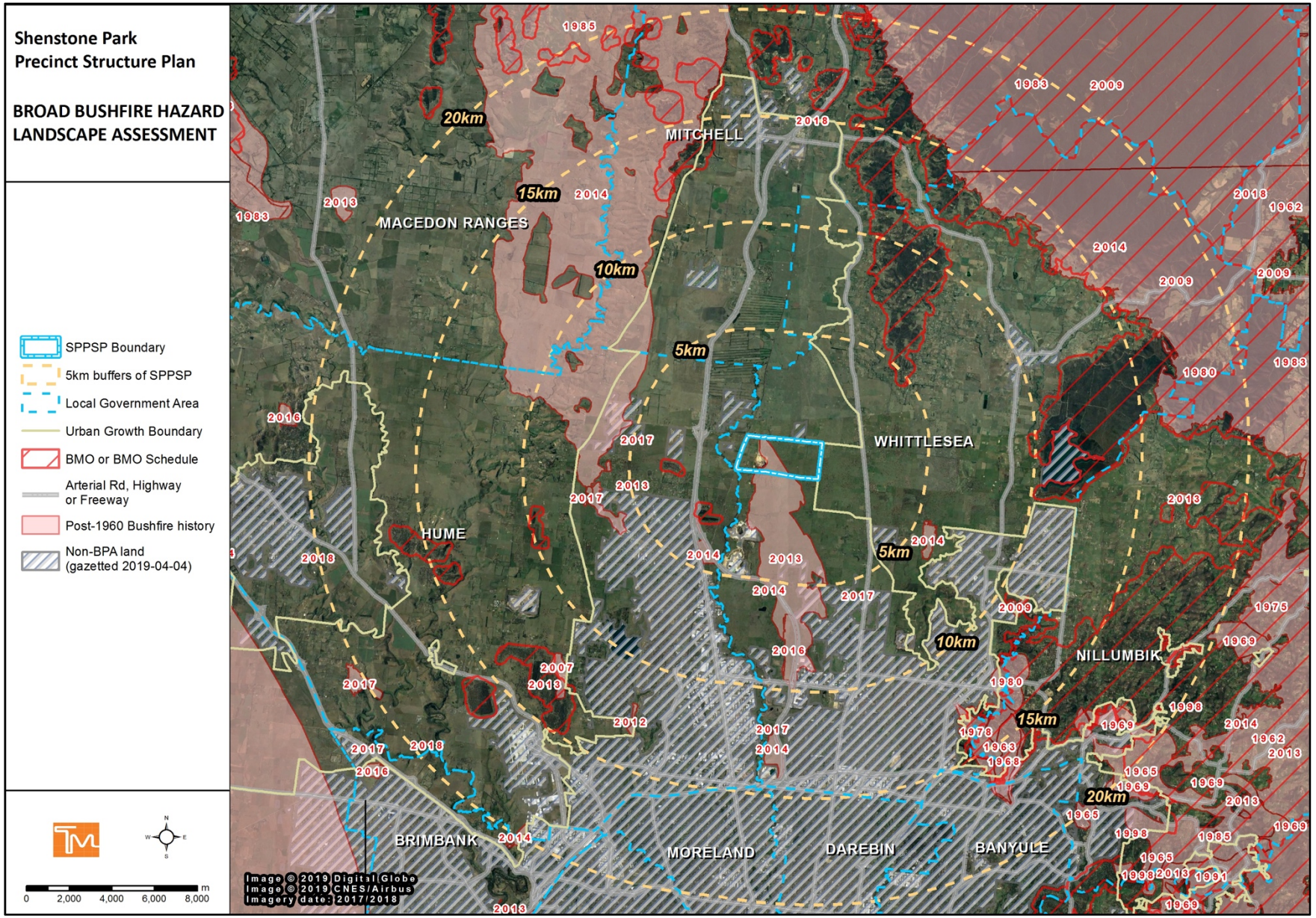
As development of the precinct and surrounding land occurs, the landscape will have characteristics of Landscape Type 1 and 2. However, due the potential for a large grassfire from more than one direction, the current landscape best accords with Landscape Type 3. A large fire as envisaged in the AS 3959 model could impact the precinct; and has occurred relatively recently. Approximately 5km

to the west an extensive grassfire burnt a large north-south swathe in 2014 and in 2013 a large grassfire burnt through the centre of the precinct (see Map 3).

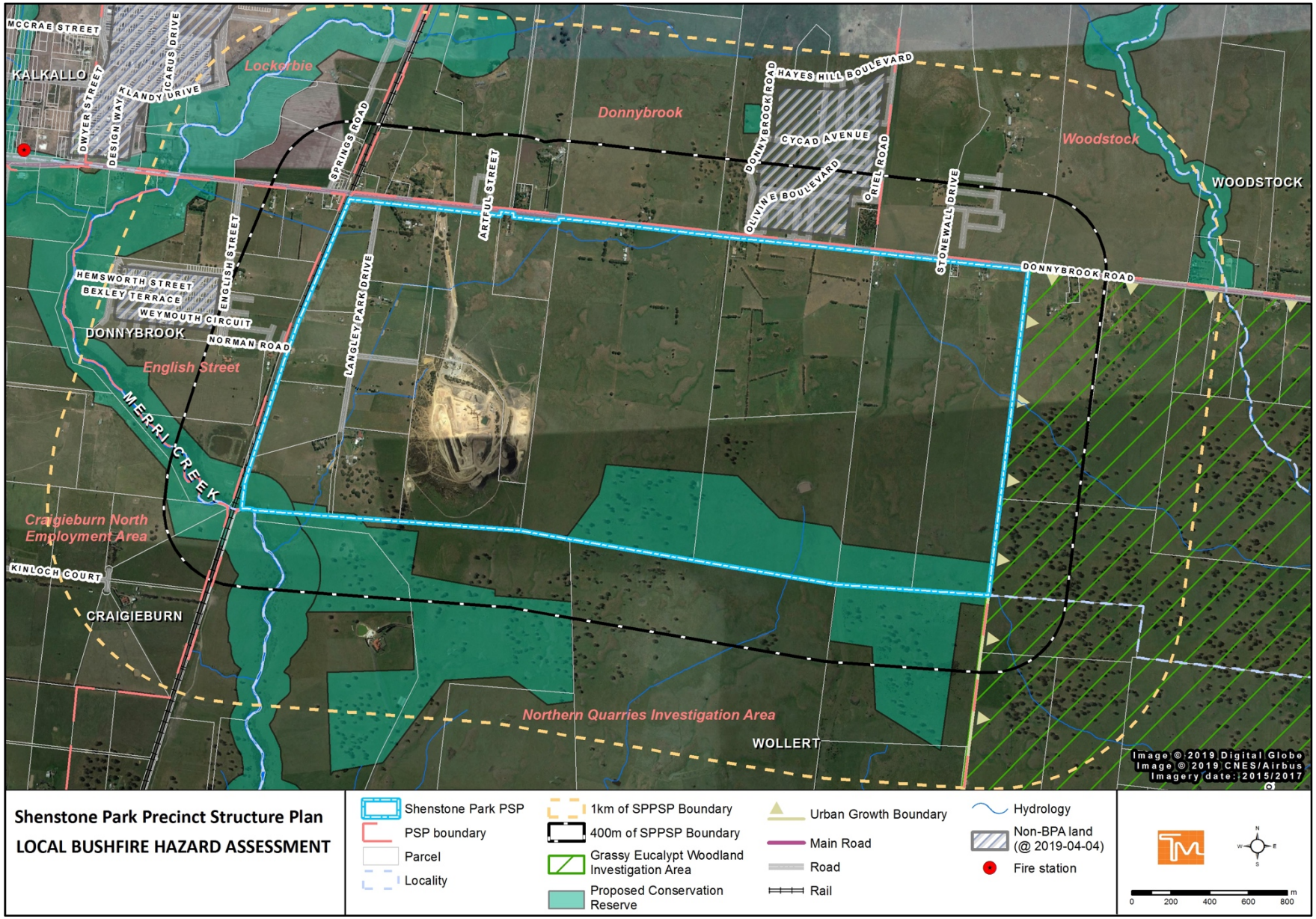
A large grassfire could be fast moving and unpredictable. However, as development proceeds to the north and west, and the landscape becomes increasingly urbanised, the risk will lessen considerably due to the elimination of the hazard and establishment of easy access to reliably low threat areas.

Areas of BAL-LOW land (i.e. land not in the designated BPA) occur just to the north, west and northwest of the precinct (see Map 4). These low threat areas will increase in size as the land is developed and excised from the BPA, and the landscape will evolve to the least threat Landscape Type 1.

If development is setback adequately from Grassland areas within or adjacent to the precinct, acceptable safety commensurate with a BAL-12.5 construction standard can be achieved (see Section 4.1.).



Map 3 - Bushfire hazard assessment plan - broader landscape.



Map 4 - Bushfire hazard assessment plan - local and neighbourhood landscape.

3.4.3 Regional bushfire risk assessments and plans

Northern and Western Metropolitan Regional Strategic Fire Management Plan (RSFMP) 2015-2025

Regional Fire Management Planning committees have prepared ten-year Regional Strategic Fire Management Plans, which were developed around the concept of resilience, and have a strategic focus on preventing and minimising the impact of bushfire. The plans identify broad fire management risks across the eight regions covering Victoria and identify strategies for addressing the issues.

The Whittlesea LGA is in the Northern and Western Metropolitan region. The RSFMP for the region notes in relation to grassfire risk, that:
'While grass fires may have lower flame heights and intensity than forest fires, the combination of open ground and fine fuels can produce very fast moving destructive fires. This speed can catch people and stock in the open without protection from the fire' (Northern and Western Metropolitan Regional Strategic Fire Management Planning Committee, 2015). The RSFMP also recognises that Whittlesea (in addition to several other LGAs) is a designated growth area.

Regional Bushfire Planning Assessment (RBPA) Melbourne Metropolitan Region

As part of the response to the 2009 Victorian Bushfires Royal Commission, Regional Bushfire Planning Assessments (RBPAs) were undertaken across six regions that covered the whole of Victoria. The RBPAs provide information about 'identified areas' where a range of land use planning matters intersect with a bushfire hazard to influence the level of risk to life and property from bushfire. The RBPAs state that '*This information should be addressed as part of strategic land use and settlement planning at the regional, municipal and local levels'* (DPCD, 2012).

The *Regional Bushfire Planning Assessment – Melbourne Metropolitan Region* covers the Whittlesea City Council local government area. No specific matters for consideration are identified for the SPPSP area or surrounding landscape. The RBPA also notes that Whittlesea is one of metropolitan Melbourne's designated growth areas.

Whittlesea Municipal Fire Management Plan (WMFMP) 2016-2019

The WMFMP aligns with the RSFMP and notes the extensive fire history in the Whittlesea LGA.
'Whittlesea has a history of significant grass fires. High intensity and fast running grass fires can be expected from January to April influenced by the steep topography to the north. Moderate fuel loads with a mixture of grass and forest may cause a change in rates of spread. In forested areas, crowning is likely with heavy spotting. Fires in Whittlesea occur on days of severe or extreme fire danger, with fire travelling from northwest to southeast usually under a strong north-westerly wind' (City of Whittlesea, 2012).

The WMFMP identifies that Donnybrook Road is a 'Fire Priority Road', which are key roads that provide the basis for a control line to gain control of a fire. They form a main part of the primary fire breaks in the municipality. These breaks are slashed to a height of 100mm, fence to fence (where practicable), including the road reserves.

4 Planning and design response

This section identifies how future development can respond to the bushfire risk, including the requirements of Clause 13.02, published CFA guidance and the building regulations applicable to construction in a BPA.

4.1 BAL construction standards

To satisfy key settlement planning strategies of Clause 13.02, the future dwellings in the precinct, and any other buildings requiring a BAL (see Section 2.4), should be sufficiently setback from classified vegetation to enable a BAL-12.5 construction standard. In maps 5-8 following, it is assumed that the only buildings likely to be a classification that requires a BAL, will be the dwellings, associated outbuildings and any special fire protection buildings, that will be within the proposed residential areas.

Building setbacks are measured from the edge of the classified vegetation to the external wall of a building, excluding eaves, roof overhangs and some other building appurtenances[10] (Standards Australia, 2018) (see Figure 11).

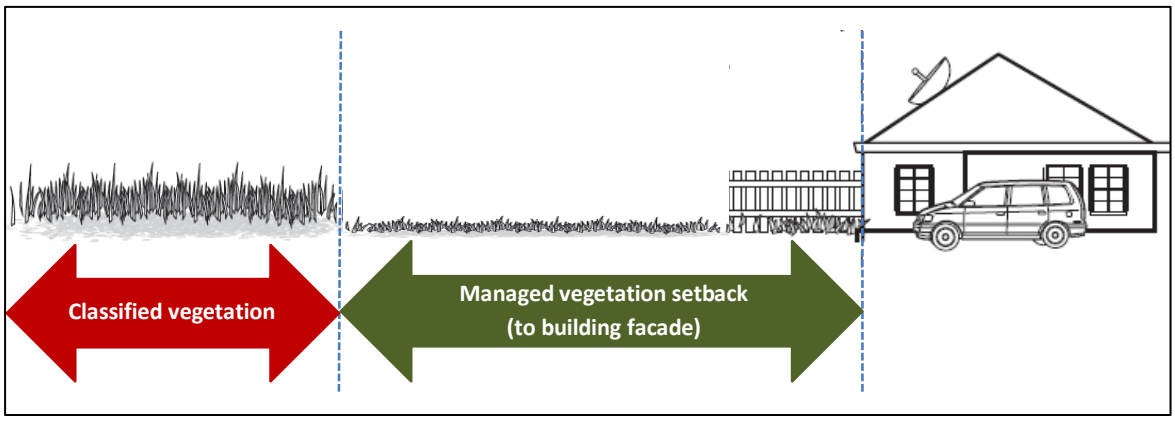


Figure 11 - Example of building-classified vegetation setback (adapted from CFA, 2013).

The setbacks required in response to Grassland, based on the hazard assessment in Section 3 and determined using the simple Method 1 procedure of AS 3959-2018, are shown in Table 3 below.

[10] The setback distance is measured from the edge of the classified vegetation to the external wall of the building, or for parts of the building that do not have external walls (including carports, verandas, decks, landings, steps and ramps), to the supporting posts or columns. The following parts of a building are excluded:

a) Eaves and roof overhangs.
b) Rainwater and domestic fuel tanks.
c) Chimneys, pipes, cooling or heating appliances or other services.
d) Unroofed pergolas.
e) Sun blinds (Standards Australia, 2018).

Table 3 - Building setbacks for BAL-12.5.

Slope class	Vegetation	Vegetation setback distance (defendable space)
All upslopes and flat land	Grassland	19m

The key areas where the minimum 19m setback should be provided, are from the Grassy Eucalypt Woodland to the east of the precinct, the Conservation Reserve in the south of the precinct, and any conservation reserve associated with the Merri Creek to the southwest or Grassland to the south of the precinct. Note that no setbacks will be needed from areas of unmanaged vegetation that meet one or more of the exclusion criteria for low threat vegetation (see Section 3.1.4). Maps 7 and 8 assume the only areas of classifiable Grassland will be the conservation reserves to the east and south of the precinct.

The 19m setbacks shown are a minimum, and increased setbacks should be considered if possible, incorporating perimeter roads (see Section 4.3 below).

4.2 Wetlands and drainage reserves

The proposed drainage reserves and water storage area may comprise classifiable Grassland if grass greater than 100mm tall is allowed to persist, or Woodland or Shrubland if areas of planted vegetation are created through natural recruitment or revegetation. Potentially applicable exclusion criteria that could be applied to ensure such areas do not create hazardous vegetation in proximity to buildings, are the small patch criteria for:

- Single areas of vegetation less than 1 ha in area and not within 100m of a building or other area of classified vegetation;
- Multiple areas of vegetation less than 0.25ha in area and not within 20m of a site/building, or each other, or of other areas of classified vegetation; and
- Strips of vegetation less than 20m in width (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20m of a site/building or each other, or other areas of classified vegetation.

The proposed wetland ponds or other drainage features shown in the future urban structure plan (see Map 5 and Map 6) may be deemed non-vegetated or low threat if they have reliably open water or wet areas and little or no vegetation. Large, seasonally inundated wetlands or WSUD features that may be dry and vegetated during the fire danger period could, however, comprise classifiable Grassland or Shrubland. Note that the applicable BAL-12.5 setbacks for Shrubland are the same as for Grassland.

4.3 Perimeter roads

Perimeter roads are a highly desirable design feature; to achieve, or contribute to BAL setbacks, separate future development from hazardous vegetation with a ‘hard’ non-vegetated edge, facilitate access/egress and for property protection and fire fighting (see Figure 12).

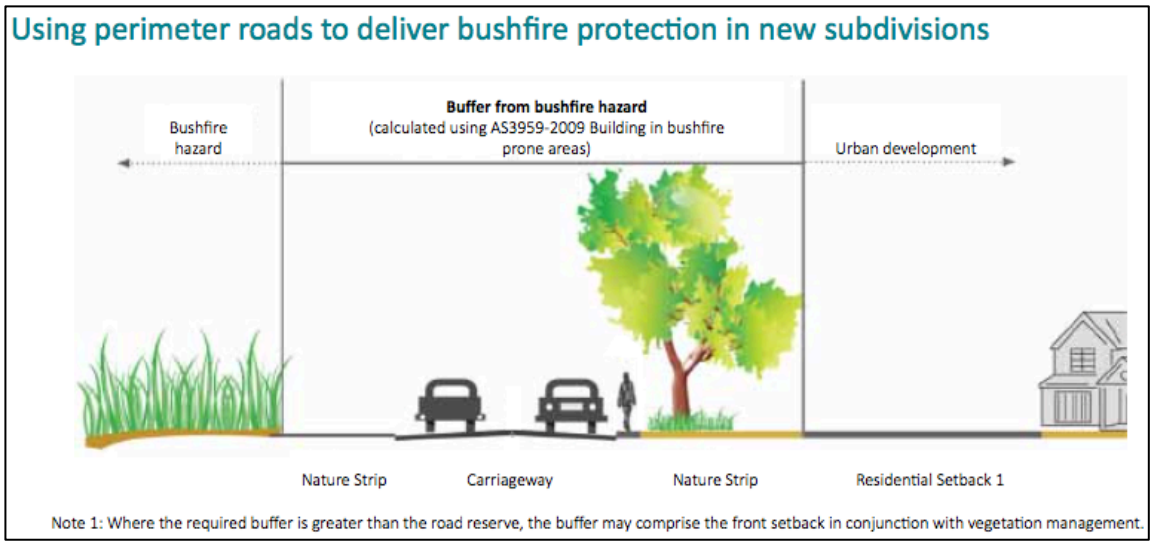
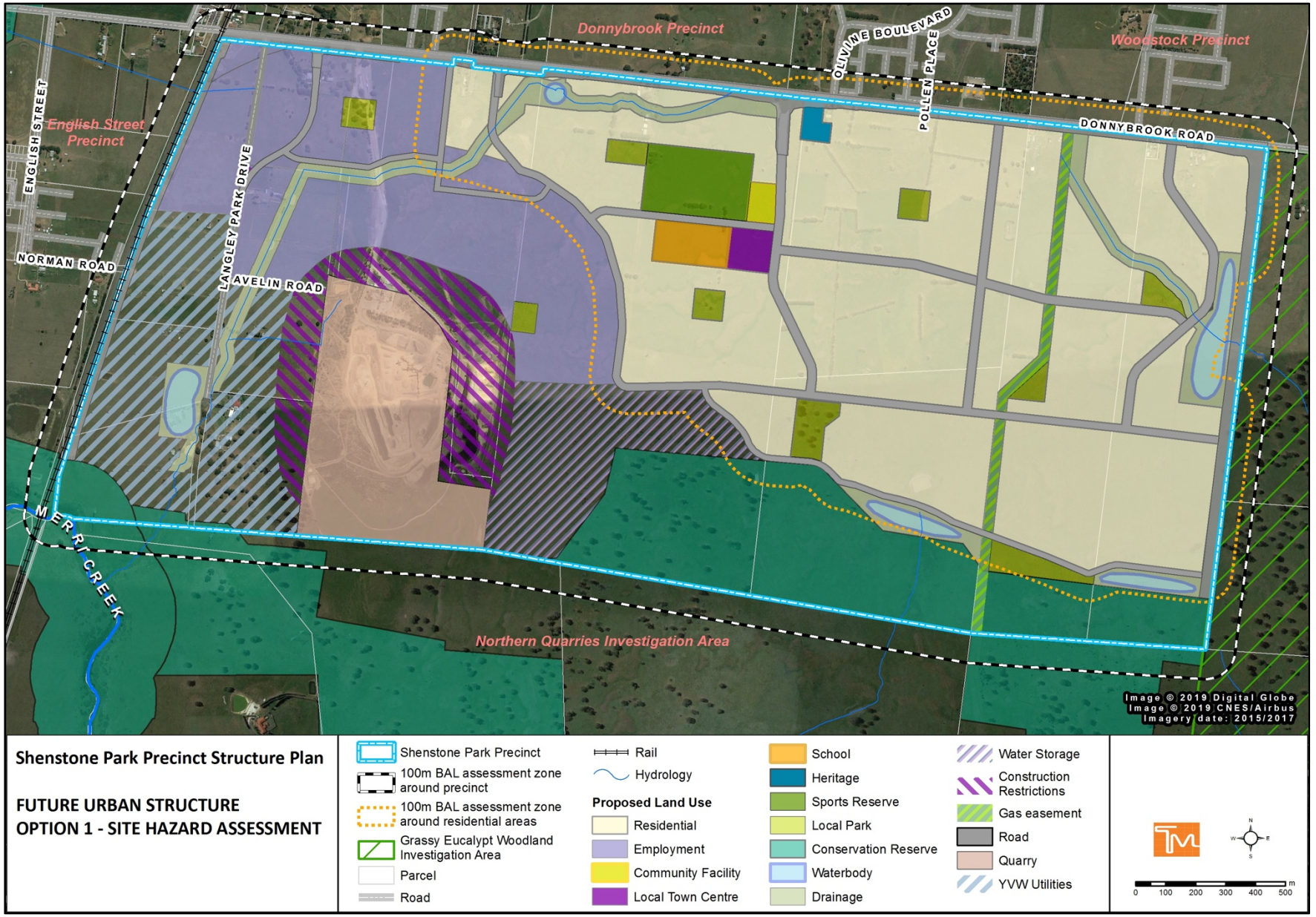
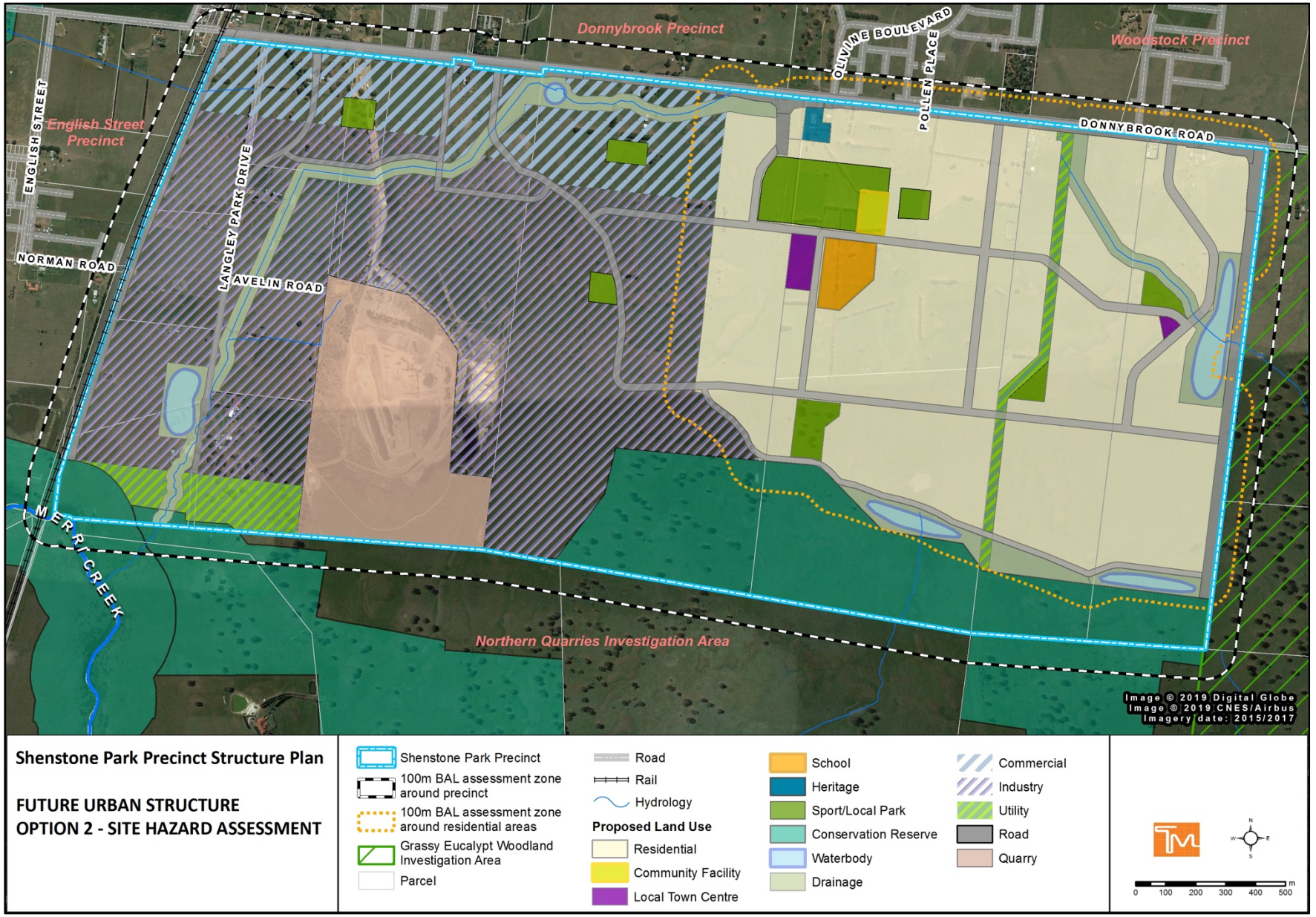


Figure 12 - Illustration of a perimeter road to provide required development setbacks (DELWP, 2015a).

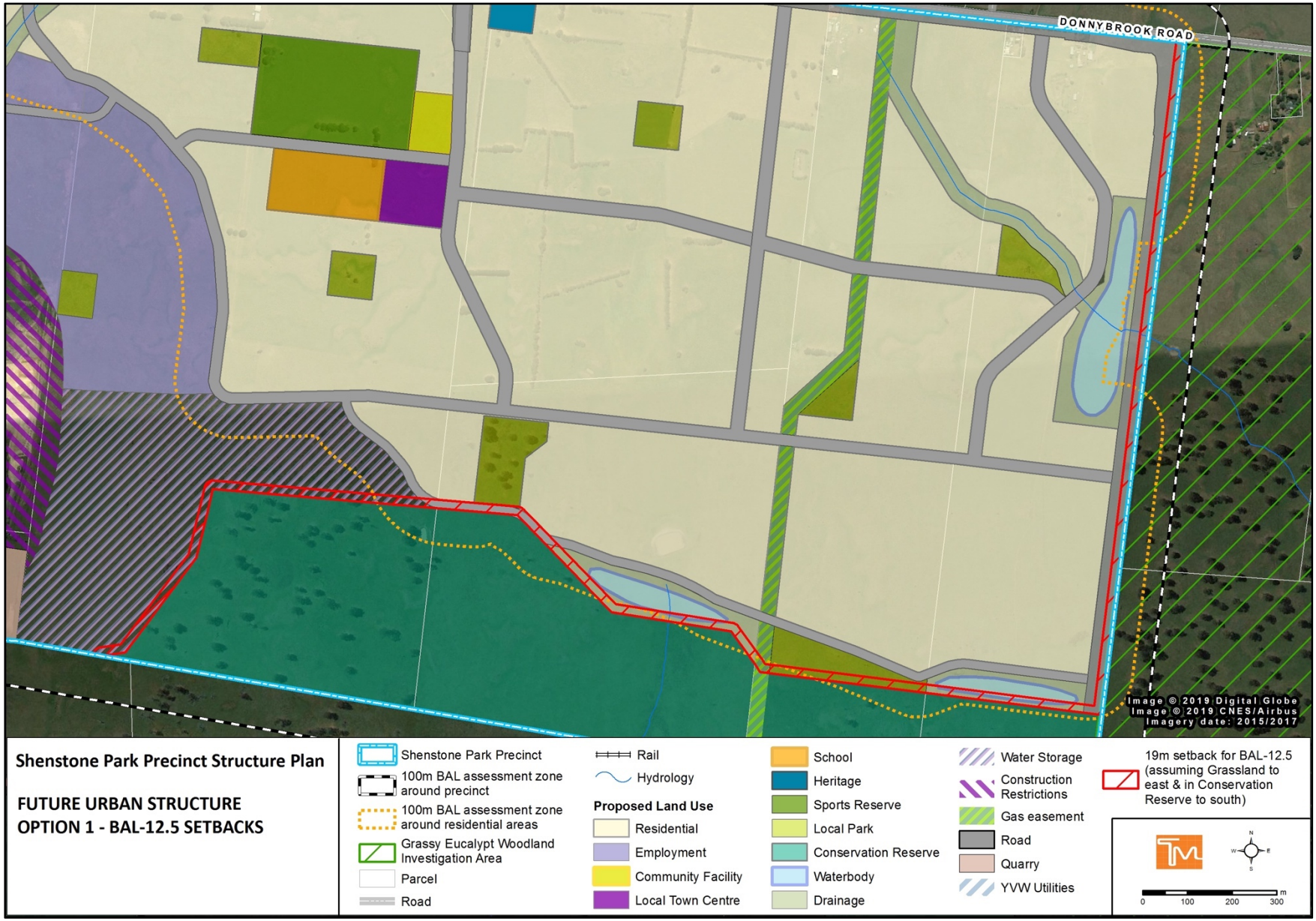
A perimeter road should be provided between future development and any Conservation Reserves within or adjacent to the precinct. This appears to be achieved for both proposed future urban structure options (see Map 5 and Map 6) and the roads appear to provide the minimum 19m setback required for BAL-12.5 development (see Map 7 and Map 8). The road network should aim to provide two ways in and out in directions away from a hazard.



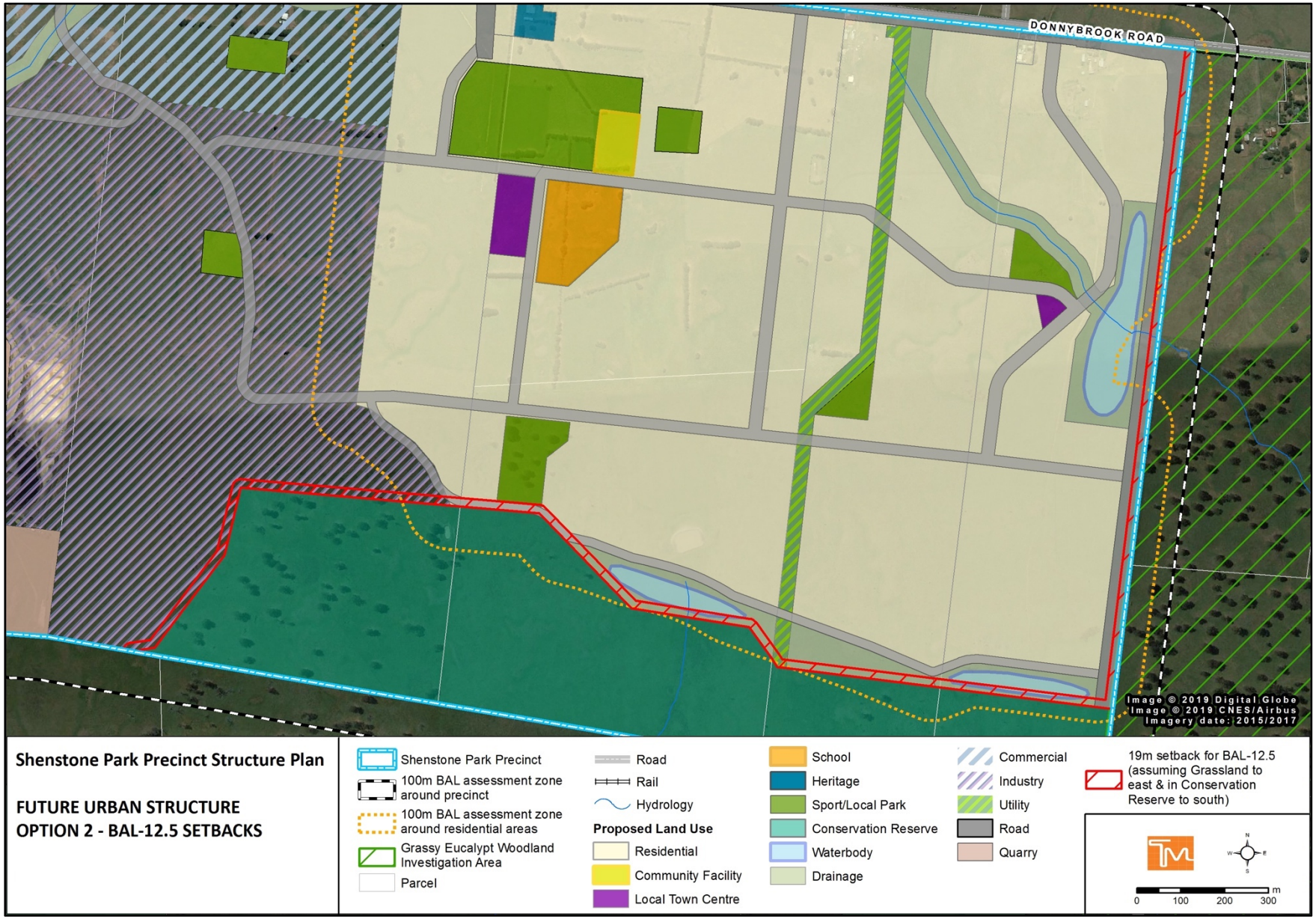
Map 5 - Proposed future urban structure - Option 1, showing BAL assessment zone around future residential areas.



Map 6 - Proposed future urban structure - Option 2, showing potential BAL assessment zone around future residential areas.



Map 7 - Proposed future urban structure - Option 1, showing BAL-12.5 setbacks from presumed Grassland areas.



Map 8 - Proposed future urban structure - Option 1, showing BAL-12.5 setbacks from presumed Grassland areas.

4.4 Summary response to Clause 13.02 Bushfire

The applicable strategies stipulated in Clause 13.02 are detailed in the following sub-sections, and a summary response is provided about how the SPPSP can respond to the strategies.

4.4.1 Protection of human life strategies

Priority must be given to the protection of human life.

Prioritising the protection of human life over all other policy considerations

The precinct is in a relatively low-moderate bushfire risk location. The risk will lessen as development in and around the precinct occurs. Accordingly, the protection of human life can be prioritised by adopting the measures recommended in this report and through application of the existing building regulations for construction in a BPA, including ensuring future dwellings and other applicable buildings, are located where a BAL-12.5 construction standard can be achieved (i.e. achieving setbacks for future buildings from unmanaged vegetation, such that radiant heat can be expected to be below 12.5kW/m^2).

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.

As identified in Section 3.4, the precinct is in a lesser risk landscape. Therefore, if future buildings are setback sufficiently from any hazardous vegetation such that they achieve a BAL no higher than BAL-12.5, the risk can be deemed to be acceptable.

The nearest *lowest* risk locations are considered to be the nearby urban-residential and township areas that are not in the BPA. These are the Kalkallo residential area 1km to the northwest, and two relatively small areas of new development within 400m of the precinct, immediately to the north and west (see Map 4).

Once development in the precinct has occurred or commenced, reliably low threat areas within the precinct will become eligible for excision from the BPA if they satisfy the exclusion criteria (see Section 2.4).

Reducing the vulnerability of communities to bushfire through consideration of bushfire risk in decision-making at all stages of the planning process

This report provides the basis for incorporating bushfire risk into decision making associated with planning development in the precinct.

The CFA consider that community resilience to bushfire will be strengthened (and hence, presumably, vulnerability to bushfire will be reduced) when a strategic planning proposal demonstrates that Clause 13.02 strategies have been applied, and where a proposal takes

advantage of existing settlement patterns so that new development will not expose the community to increased risk from bushfire.

The CFA provide principles to respond to Clause 13.02 including that settlement planning decisions should;

- *'Direct development to locations of lower bushfire risk.*
- *Carefully consider development in locations where there is significant bushfire risk that cannot be avoided.*
- *Avoid development in locations of extreme bushfire risk.*
- *Avoid development in areas where planned bushfire protection measures may be incompatible with other environmental objectives'* (CFA, 2015).

It is considered that development of the precinct can appropriately implement the strategies in Clause 13.02 that aim to prioritise protection of human life and will, therefore, meet the CFA strategic planning principles for bushfire.

4.4.2 Bushfire hazard identification and assessment strategies

The bushfire hazard must be identified and an appropriate risk assessment be undertaken.

Applying the best available science to identify vegetation, topographic and climatic conditions that create a bushfire hazard.

This report identifies the hazard in accordance with the commonly accepted methodologies of AS 3959-2018 and, as appropriate, additional guidance provided in *Planning Practice Note 64 Local planning for bushfire protection* (DEWLP, 2015a), *Planning Advisory Note 68 Bushfire State Planning Policy Amendment VC140* (DEWLP, 2018a) and *Planning Permit Applications Bushfire Management Overlay Technical Guide*[11] (DELWP, 2017a).

The type and extent of (hazardous) vegetation within, and up to 400m around, the precinct has been identified and classified into AS 3959-2018 vegetation groups. Classification was based on the anticipated long-term state of the vegetation, EVC mapping, aerial imagery, site assessment, published guidance on vegetation assessment for bushfire purposes and experience with the fuel hazard posed by the vegetation types that occur within the region.

GIS analysis of publicly available 1m contour data for the area was undertaken, including creating a Digital Elevation Model (DEM) of the topography (see Map 1) and determining slopes, extending to 400m around the precinct (see Map 2).

[11] Although the SPPSP area and surrounding land is not affected by the BMO, DELWP's BMO technical guide provides useful descriptors and guidance for assessing the bushfire risk at the landscape scale, as discussed in Section 3.4.

In relation to climatic conditions and fire weather, the AS 3959 default FFDI 100/GFDI 130 benchmark used in the Victorian planning and building system, has been applied as discussed in Section 3.3.

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.

The extent of BPA coverage has been considered (see Section 2.4) and is shown in Map 3 and Map 4. This is based on the most recent BPA mapping for the area, which was gazetted 4th April 2019.

Applying the Bushfire Management Overlay in planning schemes to areas where the extent of vegetation can create an extreme bushfire hazard.

As identified in Section 2.5.2, no part of the SPPSP area is covered by the BMO. Only small areas of BMO occur within the 5km around the precinct (see Map 3) and the nearest of these is over 2km away. This is considered appropriate and reflects relatively recent statewide BMO mapping introduced into the Whittlesea Planning Scheme by amendment GC13, which was gazetted on 3rd October 2017.

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.***

The hazard has been assessed and described at the site, neighbourhood and local scale (see Section 3 and Map 4).

At the site scale, the assessment follows the AS 3959-2018 methodology applied in a BPA, of classifying vegetation and topography within 100m of a building, and for this study, extending 100m around the precinct (see Map 5 and Map 6).

At the broader landscape scale a 20km, 10km and 5km radius of the site has been applied (see Section 3.4, Figure 1 and Map 3) in accordance with guidance about assessing risk for planning scheme amendments in Planning Advisory Note 68 (DEWLP, 2018a) and Planning Practice Note 64 (DELWP, 2015a).

Consulting with emergency management agencies and the relevant fire authority early in the process to receive their recommendations and implement appropriate bushfire protection measures.

The CFA have been involved in preliminary discussions regarding the SPPSP, however they will provide formal comment as part of statutory exhibition of the SPPSP.

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.

DELWP advisory and practice notes, Clause 13.02, and the building regulations invoked by the BPA coverage, specify the general requirements and standards for assessing the risk, and the bushfire hazard landscape assessment has been considered. The guidance and requirements have been applied in this report as appropriate and bushfire protection measures have been identified commensurate with the risk.

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.

If the objectives and strategies of Clause 13.02 are successfully implemented, as discussed in this report, and the building regulations for construction in a BPA are complied with, then the risk can be deemed to be acceptably mitigated such that development can proceed.

The CFA specify that areas where development should not proceed could include:

- *'Isolated settlements where the size and/or configuration of the settlements will be insufficient to modify fire behaviour and provide protection from a bushfire.*
- *Where bushfire protection measures will not reduce the risk to an acceptable level.*
- *Where evacuation (access) is severely restricted.*
- *Where the extent and potential impact of required bushfire protection measures may be incompatible with other environmental objectives or issues, e.g. vegetation protection, land subject to erosion or landslip'* (CFA, 2015).

None of these criteria or characteristics are applicable to the SPPSP area.

It is anticipated that a UGZ schedule will be applied to the majority of the precinct, or at least the residential parts of it, which could require that a permit for subdivision contains a condition for a site management plan that addresses bushfire risk arising during and, where necessary, after construction. This would be consistent with the UGZ6 areas of the Donnybrook and Woodstock precincts to the north of the SPPSP area.

4.4.3 Settlement planning strategies

Settlement planning must strengthen the resilience of settlements and communities and prioritise protection of human life.

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 3959-2009 Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2009).

The applicable distances for dwellings and other buildings requiring a BAL, to be setback from classifiable vegetation, such that RHF is calculated to be below 12.5kW/m^2, and BAL 12.5 could potentially apply, are provided in Table 4 and shown in Maps 7 and 8. Taking into consideration the assessment of landscape risk, the implementation of these setbacks and BAL-12.5 construction of new buildings in the BPA, can be deemed to acceptably mitigate the risk.

Table 4 – Applicable building setback distances for BAL-12.5 construction.

Vegetation	Slope class	Building setback distance
Grassland	All upslopes and flat land	19m

See also the exclusion criteria and setback distances in Section 3.1.4 for small patches or strips of vegetation to be deemed low threat.

Ensuring the availability of, and safe access to, areas assessed as a BAL-LOW rating under AS 3959-2009 Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2009) where human life can be better protected from the effects of bushfire.

The nearest *lowest* risk locations are considered to be the nearby urban-residential and township areas that are not in the BPA. These are the Kalkallo residential area 1km to the northwest, and two relatively small areas of new development within 400m of the precinct, immediately to the north and west (see Map 4).

Once development in the precinct has occurred or commenced, reliably low threat areas within the precinct will become eligible for excision from the BPA if they satisfy the exclusion criteria (see Section 2.4)

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.

There will be no increase in risk to existing residents or community infrastructure if:

- Development can achieve vegetation setbacks from hazardous vegetation to enable BAL-12.5 construction, provide an appropriate water supply for fire-

fighting via a conventional reticulated hydrant system, and appropriate access/egress for emergency vehicles and residents via a conventional residential road network.

- It is ensured that any hazardous vegetation retained or re-established, does not create an increase in the hazard exposure for existing residents.

The risk to existing residents will in fact be reduced by the development of additional urban residential areas and associated low threat or non-vegetated land. As identified above, this will eventually create BAL-LOW areas with the potential to be excised from the BPA, if they are sufficiently distant from any hazardous vegetation.

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.

This report appropriately assesses and addresses the risk at a range of scales.

Assessing alternative low risk locations for settlement growth on a regional, municipal, settlement, local and neighbourhood basis.

No alternative low risk development locations have been identified or assessed as part of this study.

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 3959-2009'

If the vegetation setback distances from any hazardous vegetation, as identified in this report are implemented, then construction can achieve a BAL not exceeding BAL-12.5. Future development and excision from the BPA of some parts of the precinct, would enable BAL-LOW.

4.4.4 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

As for all growth areas, the Melbourne Strategic Assessment (DSE, 2009) and the Biodiversity Conservation strategy for Melbourne's Growth Corridors (DEPI, 2013) identified areas of high biodiversity value and proposed Conservation Reserves to protect areas of significance.

The Arboricultural Assessment for the precinct (Treetec, 2017), vegetation assessments for the proposed Conservation Reserve (Conservation Area 28 - Summerhill Rd (East) Wollert) (DELWP, 2017c) and the precinct (Alluvium, 2018), identify that remnant vegetation present is largely 'Degraded Grassy Eucalypt Woodland' and propose to

protect or offset significant areas and native trees. There are no apparent additional biodiversity impacts associated with the findings of this bushfire assessment.

4.4.5 Use and development control in a Bushfire Prone Area

Clause 13.02 requires that '*In a bushfire prone area designated in accordance with regulations made under the Building Act 1993, bushfire risk should be considered when assessing planning applications for the following uses and development:*

- *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'* (Whittlesea Planning Scheme, 2018a).

It further states that:
'When assessing a planning permit application for the above uses and development:

- *Consider the risk of bushfire to people, property and community infrastructure.*
- *Require the implementation of appropriate bushfire protection measures to address the identified bushfire risk.*
- *Ensure new development can implement bushfire protection measures without unacceptable biodiversity impacts'* (Whittlesea Planning Scheme, 2018a).

Future development applications should be able to respond to this strategy and achieve acceptable safety if:

- Appropriate setbacks for future development from classified vegetation are achieved to enable BAL-12.5 construction in the BPA;
- Adequate access and egress for emergency management vehicles is provided by a residential road network with a perimeter road where possible to assist property defence and fire-fighting; and
- A reliable water supply for fire-fighting is provided, via a conventional reticulated hydrant system, in accordance with the hydrant objective for residential subdivision at Clause 56.09-3.

5 Conclusion

This report has assessed the bushfire hazard in and around the Shenstone Park Precinct Structure Plan area, in accordance with Clause 13.02 in the Whittlesea Planning Scheme, the AS 3959-2018 methodology invoked by the Victorian building regulations, and additional guidance, as appropriate, provided in *Planning Practice Note 64 Local planning for bushfire protection* (DEWLP, 2015a), *Planning Advisory Note 68 Bushfire State Planning Policy Amendment VC140* (DEWLP, 2018a) and, in relation to the landscape hazard assessment, the DELWP technical guide *Planning Permit Applications Bushfire Management Overlay* (DELWP, 2017a).

It is considered that this assessment fulfills the requirements of *Ministerial Direction 11 Strategic Assessment of Amendments,* which requires that a planning scheme amendment addresses any relevant bushfire risk (Direction No. 11, 2013).

All of the precinct is currently a designated BPA; however, no part of the precinct, or land within 2km around it, is covered by the BMO.

The landscape is one of low to moderate bushfire risk, which will lessen as development in and to the north and west of the precinct occurs in accordance with the PSPs that apply. The hazard is restricted to Grassland, and bushfire behaviour can reasonably be expected to be within AS 3959-2018 presumptions and design parameters. Accordingly, it is considered that the risk can be mitigated to an acceptable level and that future development of the Shenstone Park precinct is appropriate, if dwellings (and any other buildings that require a BAL) are separated from hazardous vegetation to allow BAL-12.5 construction, in accordance with the building regulations and key settlement planning strategies in Clause 13.02. Any areas excised from the BPA may achieve BAL-LOW.

The type and extent of (hazardous) vegetation within, and up to 100m around the precinct, has been identified and classified into AS 3959-2018 vegetation groups, based on DELWP extant EVC mapping, aerial imagery and site investigation. The classification is based on the current and likely future state of the vegetation and identifies that the hazard is primarily Grassland, which will eventually be restricted to the south and east of the precinct as land in other directions is developed.

The terrain in the precinct and the surrounding landscape is relatively benign from a bushfire perspective, being predominantly flat or gently sloping. For the purposes of determining BALs and vegetation setback distances for future buildings, the applicable slope class is likely to be 'All upslopes and flat land'.

It is considered that development can appropriately prioritise the protection of human life and meet the objectives of Clause 13.02, largely by ensuring future applicable buildings will not be exposed to RHF above 12.5kW/m^2, which is commensurate with a BAL-12.5 construction standard. This would require a minimum 19m setback from areas of classified Grassland.

Good access and egress for emergency management vehicles and residents, in the event of a bushfire, can be achieved via a conventional urban-residential road network. A perimeter road should be provided between future development and the Conservation Reserves to the south, and the Grassy Woodland investigation area to the east.

A reliable water supply for fire-fighting can be provided via a conventional reticulated hydrant system in accordance with the hydrant objective for residential subdivision.

The risk to existing residents will be reduced by the development of additional urban residential areas and associated low threat or non-vegetated land. This will eventually create BAL-LOW areas with the potential to be excised from the BPA if they are sufficiently distant from hazardous vegetation.

6 Appendix - BALs explained

Bushfire Attack Level (BAL)	Risk Level	Construction elements are expected to be exposed to…	Comment
BAL-LOW	VERY LOW: There is insufficient risk to warrant any specific construction requirements but there is still some risk.	No specification.	At 4kW/m^2 pain to humans after 10 to 20 seconds exposure. Critical conditions at 10kW/m^2 and pain to humans after 3 seconds. Considered to be life threatening within 1 minute exposure in protective equipment.
BAL-12.5	LOW: There is risk of ember attack.	A radiant heat flux not greater than 12.5 kW/m^2	At 12.5kW/m^2 standard float glass could fail and some timbers can ignite with prolonged exposure and piloted ignition.
BAL-19	MODERATE: There is a risk of ember attack and burning debris ignited by windborne embers and a likelihood of exposure to radiant heat.	A radiant heat flux not greater than 19 kW/m^2	At 19kW/m^2 screened float glass could fail.
BAL-29	HIGH: There is an increased risk of ember attack and burning debris ignited by windborne embers and a likelihood of exposure to an increased level of radiant heat.	A radiant heat flux not greater than 29 kW/m^2	At 29kW/m^2 ignition of most timbers without piloted ignition after 3 minutes exposure. Toughened glass could fail.
BAL-40	VERY HIGH: There is a much increased risk of ember attack and burning debris ignited by windborne embers, a likelihood of exposure to a high level of radiant heat and some likelihood of direct exposure to flames from the fire front.	A radiant heat flux not greater than 40 kW/m^2	At 42kW/m^2 ignition of cotton fabric after 5 seconds exposure (without piloted ignition).
BAL- FZ (i.e. Flame Zone)	EXTREME: There is an extremely high risk of ember attack and a likelihood of exposure to an extreme level of radiant heat and direct exposure to flames from the fire front.	A radiant heat flux greater than 40 kW/m^2	At 45kW/m^2 ignition of timber in 20 seconds (without piloted ignition).

Source: derived from AS 3959-2018 (Standards Australia, 2018).

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