Bushfire Assessment

for the Wallan South
Precinct Structure Plan

Report prepared for the
Victorian Planning Authority

February 2023

WWW.TERRAMATRIX.COM.AU

Terramatrix project code: VPA-2021-03 Cl13.02_BMO_BDR-Wallan South PSP-Wallan
Cover image: Looking northeast across the precinct from near the southwest corner.

Accountability

Stage	Date completed	Name	Title
Analysis & report preparation	2021-06-27	Hamish Allan	Manager, Bushfire Planning and Design
Peer review of preliminary draft report	2021-06-27	Jon Boura	Managing Director
Peer review of draft report	2022-10-10	John Eastwood	Analyst

Version Control

Version	Date issued	Comments	Issued by
1.0	2021-06-27	Preliminary Assessment to client	Hamish Allan
1.1	2021-07-01	Preliminary Assessment incorporating minor client changes to the CFA and Client	Hamish Allan
2.0	2022-10-10	Draft Assessment Report	Hamish Allan
2.1	2022-10-21	Amended Draft Report incorporating client comments.	Hamish Allan
3.0	2023-01-18	Final report	Hamish Allan
3.1	2023-02-06	Amended report with minor VPA changes	Hamish Allan
3.1	2023-02-07	Amended report with minor VPA changes and additional hazard map.	Hamish Allan

Terramatrix Pty. Ltd.
ACN 129 163 373
ABN 44 129 163 373
PO Box 1391
Collingwood VIC 3066
P: 03 9417 2626
www.terramatrix.com.au

Contents

Index of Maps

Index of Figures

Index of Tables

Glossary

BAL	*Bushfire Attack Level* - A means of measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact, using increments of radiant heat expressed in kilowatts per metre squared, and the basis for establishing the requirements for construction to improve protection of building elements from attack by bushfire e.g. a building constructed to a BAL-12.5 standard is designed to be exposed to radiant heat not exceeding 12.5 kW/m^2.
BMO	*Bushfire Management Overlay* - A planning scheme provision used to guide the development of land in areas of high bushfire hazard. The BMO applies to areas where there is potential for extreme bushfire behaviour, such as a crown fire and extreme ember attack and radiant heat
BPA	*Bushfire Prone Area* - An area that is subject to, or likely to be subject to, bushfire attack as determined by the Minister for Planning.
Bushfire	An unplanned fire burning in vegetation; sometimes referred to as wildfire. A generic term which includes grass fires, forest fires and scrub fires.
Bushfire attack	Attack by wind, burning embers, radiant heat or flame generated by a bushfire.
Bushfire hazard	A specific source of potential damage or harm, typically consisting of three key elements; vegetation, weather and topography.
Bushfire risk	The chance or probability of damage or harm if exposed to a bushfire hazard and the severity of the impact i.e. consideration of the likelihood and consequences of impacts from bushfire.
Classified vegetation	Vegetation deemed to be a bushfire hazard in accordance with the Bushfire Management Overlay (BMO) and/or AS 3959-2018 *Construction of buildings in bushfire prone areas*.
CFA	*Country Fire Authority*
Defendable space	An area of land around a building where vegetation is modified and managed to reduce the effects of flame contact and radiant heat associated with bushfire.
DELWP[1]	*Department of Environment, Land Water and Planning.*
Effective slope	The slope of the land (gradient, measured in degrees) under the classified vegetation which most influences the bushfire attack. The slope is determined on the basis of the fire moving towards the building and the rate of spread of the fire and not solely on the basis of the relative elevation of the vegetation.

[1] Since 1 January 2023 the planning functions of the former govt. dept. DELWP, now reside with the new Department of Transport and Planning. As this report was prepared prior to the change, the DELWP acronym is used throughout the report.

Ember attack	Attack by smouldering or flaming windborne debris that is capable of entering or accumulating around a building, and that may ignite the building or other combustible materials and debris.
EVC	*Ecological Vegetation Class* - The standard unit for classifying vegetation types in Victoria. EVCs are described through a combination of floristics, lifeforms and ecological characteristics, and through an inferred fidelity to particular environmental attributes. Each EVC includes a collection of floristic communities (i.e. lower level in the classification) that occur across a biogeographic range and, although differing in species, have similar habitat and ecological processes operating.
FFDI	*Forest Fire Danger Index* – A numerical index representing the chance of a fire starting, its rate of spread, its intensity and the difficulty of its suppression, according to various combinations of air temperature, relative humidity, wind speed and both the long- and short-term drought effects.
MSC	*Mitchell Shire Council.*
PBP	*Place Based Plan.* Plan showing the extent and location of all proposed land uses across a precinct.
PSP	*Precinct Structure Plan.* PSPs are strategic masterplans for local areas that usually cater for between 5,000 and 30,000 people, 2,000 to 10,000 jobs or a combination of both. They are the 'blueprint' for localised development and investment that will occur over many years and will incorporate any relevant directions already outlined in a higher level Framework Plan.
RHF	*Radiant heat flux* - The heat transfer rate per unit area from thermal (electromagnetic) radiation, expressed as kilowatts per metre squared. Calculated or measured for a specific surface to determine the radiant heat received by that surface from flames associated with a bushfire.
UGB/A	*Urban Growth Boundary/Area*
VPA	*Victorian Planning Authority*

1 Introduction

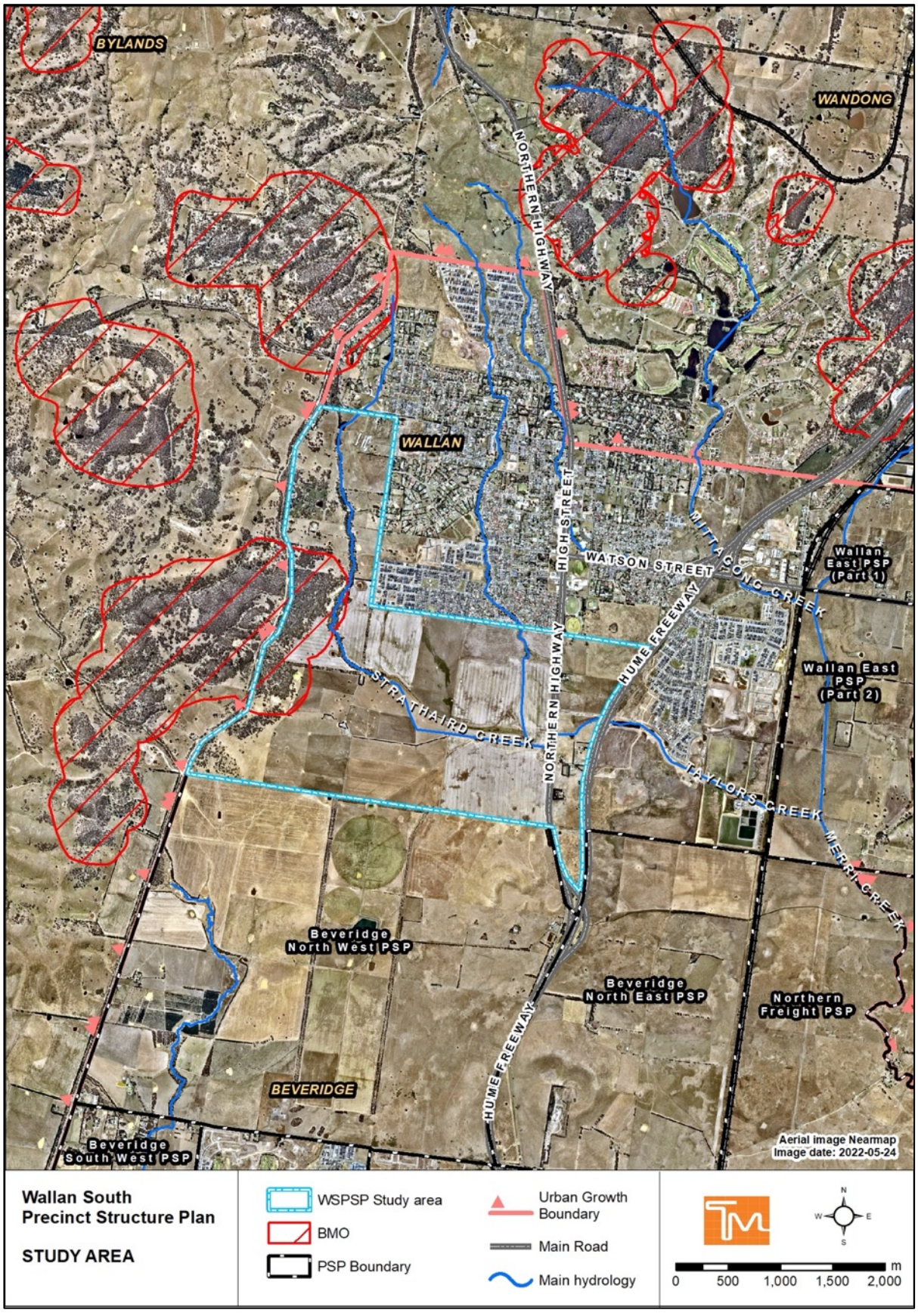
This Bushfire Assessment has been prepared for the Victorian Planning Authority (VPA) as an assessment of the bushfire hazard for the development of the Wallan South Precinct Structure Plan (WSPSP). The main purpose of the report is as a technical background study to inform the development and finalisation of the WSPSP Place Based Plan (PBP), so that future development within the precinct can respond to the bushfire risk and the applicable Victorian planning and building controls that relate to bushfire. In particular, DELWP guidance for settlement planning at the bushfire interface (DELWP, 2020a) and the objective and applicable strategies of Clause 13.02-1S *Bushfire planning* in the Planning Policy Framework (PPF) (Mitchell Planning Scheme, 2018a).

The precinct comprises approximately 806 hectares of land (VPA, 2021) located just to the south and west of the existing Wallan township area, approximately 40km north of the Melbourne CBD (see Figure 1). The precinct is near the northwest corner of Melbourne's northern Urban Growth Area and is bounded by Old Sydney Road to the west, the Hume Freeway to the east, and the Wallan Township to the north (see Map 1).

This report assesses the bushfire hazard in and around the precinct and identifies how planning for the design and layout of the precinct and future development that will occur within it, can appropriately mitigate any bushfire risk; including, 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:

- *Design Guidelines Settlement Planning at the Bushfire Interface* (DELWP, 2020a);
- *Bushfire State Planning Policy Amendment VC140*, Planning Advisory Note 68 (DELWP, 2018);
- *Local planning for bushfire protection*, Planning Practice Note 64 (DELWP, 2015a);
- AS 3959-2018 *Construction of buildings in bushfire prone areas* (Standards Australia, 2020); and
- *Planning Permit Applications Bushfire Management Overlay* Technical Guide (DELWP, 2017).

Figure 1 - Wallan South PSP landscape location (site in red, 20km buffer in white outline and 75km buffer in blue outline) (©Google 2021).



Map 1 - Study area.

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 PSP can respond to and comply with the controls.

2.1 Clause 13 Environmental risks and amenity

This clause in the Planning Policy Framework (PPF) has two key provisions pertinent to bushfire.

2.1.1 Clause 13.01-1S Natural hazards and climate change

The objective of this Clause is to minimise the impacts of natural hazards and adapt to the impacts of climate change through risk-based planning. Specified strategies to achieve the objective are:

- *'Respond to the risks associated with climate change in planning and management decision making processes.*
- *Identify at risk areas using the best available data and climate change science.*
- *Integrate strategic land use planning with emergency management decision making.*
- *Direct population growth and development to low risk locations.*
- *Develop adaptation response strategies for existing settlements in risk areas to accommodate change over time.*
- *Ensure planning controls allow for risk mitigation and climate change adaptation strategies to be implemented.*
- *Site and design development to minimise risk to life, health, property, the natural environment and community infrastructure from natural hazards'* (Mitchell Planning Scheme, 2022*).*

Especially in southern and eastern Australia, since the 1950's there has been an increase in the length of the fire weather season and an increase in extreme fire weather (CSIRO/BOM, 2020). The trend of a longer fire season and increased number of dangerous fire weather days is projected to continue. Climate change is contributing to these changes in fire weather including by affecting temperature, relative humidity and associated changes to the fuel moisture content (CSIRO/BOM, 2020). The Australasian Fire and Emergency Service Authorities Council (AFAC) identify that a failure of building codes and land use planning to adequately adapt to climate change is a significant risk (AFAC, 2018).

The Mitchell Municipal Fire Management Plan also notes the trends associated with climate change, including the fire season starting earlier and becoming longer (Mitchell Shire Council, 2020).

Climate change trends associated with the risk of bushfire, support the adoption of a precautionary and conservative approach in identifying and responding to the risk. Climate change in relation to fire weather is discussed further in the hazard assessment in Section 3.5 of this report.

2.1.2 Clause 13.02-1S Bushfire planning

Clause 13.02-1S has the objective '*To strengthen the resilience of settlements and communities to bushfire through risk based planning that prioritises the protection of human life*' (Mitchell 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 (BPA);
- Subject to a Bushfire Management Overlay (BMO); or
- Proposed to be used or developed in a way that may create a bushfire hazard.

Priority must 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'* (Mitchell Planning Scheme, 2018a).

Key strategies are stipulated that require strategic planning documents, planning scheme amendments and development plan approvals to properly assess bushfire risk and include appropriate bushfire protection measures. In a BPA this also applies to planning applications for uses and developments that are:

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

This study assesses the hazard in accordance with the hazard identification strategies of Clause 13.02-1S and identifies the bushfire protection measures that will be required for future development in the WSPSP area. It is considered that development can appropriately prioritise the protection of human life, and meet the objectives of Clause 13.02-1S, by an appropriate design and layout that amongst other things, ensures higher density and vulnerable development is sited away

from areas of high hazard and future dwellings 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 required in settlement planning as 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] (Mitchell Planning Scheme, 2018a).

The PSP can respond to the strategies in Clause 13.02-1S by an appropriate PBP that responds to the hazard assessment and the DELWP guidelines for settlement planning as detailed in Section 4. A summary response of how the draft WSPSP Place Based Plan responds to all the strategies of Clause 13.02-1S is provided in Section 5 of this report.

2.2 Clause 21.04-5 Bushfire

The Municipal Strategic Statement (MSS) at Clause 21.04-5 *Bushfire*, recognises that extensive areas of the Shire are prone to bushfires and notes that the impacts of a bushfire on life and property are influenced by factors including the subdivision pattern, availability of reticulated water, proximity to vegetation and community capacity. Identified strategies to minimise the risk to life property and the environment are to:

- *'Ensure that the design, siting and layout of subdivision increase protection from fire.*
- *Ensure that use and development include adequate fire protection measures'* (Mitchell Planning Scheme, 2013).

The bushfire hazard to the WSPSP includes some large areas of Forest on steep to undulating topography, which will require a considered design response to adequately mitigate the risk in accordance with the objective and strategies at Clause 21.04-5.

2.3 Clause 44.06 Bushfire Management Overlay (BMO)

The purposes of the BMO, which applies to an area along the western boundary of the precinct (see Map 1), are:

- *'To implement the Municipal Planning Strategy and the Planning Policy Framework.*
- *To ensure that the development of land prioritises the protection of human life and strengthens community resilience to bushfire.*
- *To identify areas where the bushfire hazard warrants bushfire protection measures to be implemented.*
- *To ensure development is only permitted where the risk to life and property from bushfire can be reduced to an acceptable level'* (Mitchell Planning Scheme, 2018b).

[2] AS 3959-2009 has been superseded by AS 3959-2018, which was invoked in the National Construction Code (NCC) in May 2019, therefore all references to AS 3959-2009 should be read as the most recent version of the Standard.

The BMO largely applies to patches of treed vegetation greater than 4ha in size, where head fire intensity has been modelled to be 30,000kW/m or more. It also extends over land 150m around those areas, based on research into house loss from bushfires which has found that 92% of house loss occurs within 150m of the bushfire hazard (DELWP, 2019).

Clause 53.02 *Bushfire Planning* applies to BMO applications and contains:

- ***'Objectives:*** *An objective describes the outcome that must be achieved in a completed development.*
- ***Approved measures (AM):*** *An approved measure meets the objective.*
- ***Alternative measures (AltM):*** *An alternative measure may be considered where the responsible authority is satisfied that the objective can be met. The responsible authority may consider other unspecified alternative measures.*
- ***Decision guidelines:*** *The decision guidelines set out the matters that the responsible authority must consider before deciding on an application, including whether any proposed alternative measure is appropriate'* (Mitchell Planning Scheme, 2018c).

2.4 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 (Mitchell Planning Scheme, 2018d).

2.5 Bushfire Prone Area (BPA)

All of the precinct, and most of the surrounding land within 1km, is a designated BPA (see Map 7, Map 8 and Figure 21). BPAs are those areas subject to, or likely to be subject to bushfire, as determined by the Minister for Planning. Those areas of highest bushfire risk within the BPA are designated as BMO areas. A portion of land along the central west area of the precinct is covered by the BMO, as are other areas to the west and northwest within the 1km local assessment zone (see Map 1).

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[3] buildings, 'Specific Use Bushfire Protected Buildings'[4] and associated class 10A buildings[5] or decks.

The applicable performance requirement in the NCC is:

[3] Class 1, 2 and 3 buildings are defined in the NCC and are generally those used for residential accommodation, including houses and other dwellings, apartments, hotels and other buildings with a similar function or use.
[4] 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.
[5] Class 10a buildings are defined in the NCC 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, 2020).

Compliance with *AS 3959-2018 Construction of buildings in bushfire prone areas* (Standards Australia, 2020) is 'deemed-to-satisfy' the performance requirement[6]. Applicable buildings in a BPA must 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).

If a bushfire responsive Place Based Plan is developed for the WSPSP, there should be no obstacles to future development complying with the applicable building regulations invoked by the BPA coverage. As development progresses, reliably low threat or non-vegetated areas will be created, which will result in some parts of the precinct being able to be excised from the BPA. DELWP review and excise areas from the BPA approximately every 6 months, particularly in growth areas where the hazard will be removed as urban development occurs.

Land becomes eligible for excision from the BPA 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).

2.6 Other controls

2.6.1 Zoning

Virtually all the precinct is currently zoned Farm Zone (FZ). Much of the lower risk land in the precinct, towards the east of the study area and south of the Wallan Township, is expected to be rezoned to Urban Growth Zone (UGZ) with an associated Schedule to facilitate residential

[6] For Class 1 and associated Class 10a buildings, the *NASH Standard for Steel Framed Construction in Bushfire Areas* is also deemed to satisfy the performance requirement.

development. Whilst the UGZ, or another urban residential zone, will facilitate more intensive development in a BPA, good precinct design and layout and the existing building and planning controls will be able to appropriately mitigate the bushfire risk. Further, as identified above, as development progresses, areas within the precinct will become eligible for excision from the BPA.

It is noted that in many PSP growth areas, UGZ schedules include a requirement that an application for residential subdivision includes a Site Management Plan to be approved by the responsible authority, which addresses bushfire risk during, and where necessary, after construction, including specifying:

- 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 AS 3959-2018, 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; and
- How adequate opportunities for access and egress will be provided for early residents, construction workers and emergency vehicles.

This requirement should be implemented for the WSPSP as it will help to ensure that bushfire risk is managed during the construction phase, when areas of interim hazard may be retained in proximity to new or existing development. It will also support subdivision applications to demonstrate how bushfire risk will be mitigated in a Clause 13.02-1S response/application.

Land identified for 'Conservation' in the preliminary Place Based Plan (PBP) (see Map 10 and Map 11) should be considered for Conservation Reserve(s) and/or Rural Conservation Zoning (RCZ) with a minimum lot size, to discourage more intensive settlement and development in these higher risk parts of the precinct and encourage conservation of identified ecological values. RCZ is preferable to Rural Living Zoning (RLZ) as it will ensure, at least in BMO parts of the precinct, that landscape risk, building design and siting considerations are adequately incorporated in any future BMO applications. It is noted that a small area in the southeast corner of the precinct is currently zoned RCZ.

2.6.2 Overlays

Apart from the BMO, the overlays that currently apply to parts of the precinct are:

- Vegetation Protection Overlay - Schedule 1 (VPO1): along the Old Sydney Road alignment on the western boundary of the precinct;
- Vegetation Protection Overlay - Schedule 2 (VPO2): along the Hume Freeway alignment on the eastern boundary of the precinct;
- Erosion Management Overlay: over approximately half of the western part of the precinct, reflecting the steeper topography in this area;
- Salinity Management Overlay (SMO): one very small area south of the Wallan Township;
- Floodway Overlay (FO): some of the land to the east of the precinct along drainage lines; and

- Land Subject to Inundation Overlay (LSIO): lower lying areas of land in the vicinity of the drainage lines in the east of the precinct.

None of these overlays have any appreciable implications for bushfire safety. It is not known if new overlay controls are proposed, however it is unlikely that any new overlays would have significant bushfire risk implications.

The existing BMO coverage of the precinct should be retained as is (see Map 7).

3 Bushfire hazard assessment

One of the bushfire hazard identification and assessment strategies in Clause 13.02-1S 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'* (Mitchell Planning Scheme, 2018a).

This section includes an assessment of vegetation, topography and climate/weather considerations including, as applicable, at:

- The site scale, for 150m around the precinct to determine areas of likely future classified vegetation, effective slopes and hence, likely future BALs (see Map 3, Map 4 and Map 5);
- The local landscape (1km) and neighbourhood (400m) scales (see Map 7); and
- The broader landscape scale, for at least 5km and up to 20km around the site (see Map 8 and Figure 21).

The BPA, and partial BMO coverage, invokes AS 3959-2018 and requires a site assessment of the vegetation and topography up to 150m around a site or building[7], for the purposes of determining the applicable BAL construction standards and in the BMO, other bushfire protection measures for buildings (Standards Australia, 2020). Clause 13.02-1S also requires application of the AS 3959-2018 assessment method to ensure Radiant Heat Flux (RHF) will not exceed 12.5kW/m^2 in accordance with two key settlement planning strategies (see Section 5.1.3):

- *'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).*
- *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 Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2009)'* (Mitchell Planning Scheme, 2018a).

3.1 Site assessment

Vegetation within a 150m assessment zone around the precinct has been classified in accordance with the BMO/AS 3959 methodology to identify likely BALs and RHF exposure for future buildings in the precinct.

[7] AS 3959 requires a 100m assessment area whilst BMO coverage requires that be extended to a 150m assessment area. For the purposes of this study the more conservative and precautionary 150m assessment area has been uniformly adopted.

Classified vegetation is vegetation that is deemed hazardous from a bushfire perspective. The vegetation classification system is not directly analogous to Ecological Vegetation Classes (EVCs) but uses a generalised description of vegetation based on the Australian Natural Resources Atlas: No. 7 - Native Vegetation (AUSLIG) 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.

3.1.1 Forest

Large areas of remnant treed vegetation in and to the west of the precinct, are considered to best accord with the Forest group of AS 3959-2018. Forest comprises areas with trees to 30m high or taller at maturity, typically dominated by eucalypts, with 30–70% foliage cover (may include understorey ranging from rainforest species and tree ferns to sclerophyllous low trees or shrubs). Includes pine and eucalypt plantations (Standards Australia, 2020). The areas of Forest are generally confined to the western parts of the precinct and the central Strathaird Creek drainage line (see Map 3 and Map 4), except for a small eucalypt plantation near the southeast corner of the precinct (see Map 5).

Some Forest areas arguably currently pose no more than a Woodland fuel hazard, however if grazing were to cease, overstorey recruitment increase and/or revegetation be undertaken, the fuel hazard could increase to more closely align with Forest[8]. As a precaution, for the strategic planning purposes of this study, the conservative approach of uniformly classifying the vegetation as Forest has been adopted. This is broadly supported by analysis of the EVC mapping that was undertaken for the precinct (WSP, 2020), and generally accords with DELWP bioregional benchmark information about the structural attributes of those EVCs[9].

Note that the areas where a lower fuel hazard exists, and which could potentially be classifiable as Woodland, are not able to be clearly delineated from Forest areas at the scale of this study as they intergrade with Forest. However, they generally correlate with the distribution of Grassy Dry Forest on the higher slopes of the precinct. Vegetation on the lower slopes and along Strathaird Creek, which would be closer to future higher density development, accords better with a Forest classification and correlate with the distribution of Herb-rich Foothill Forest and Swampy Riparian Woodland.

<u>EVC 22 Grassy Dry Forest</u>

'This EVC dominated the upper slopes of the large patch of remnant vegetation at the western side of the study area. The total area mapped within the study area is 53.216 ha…. The description of this EVC from the EVC Benchmarks is (DELWP, 2016a): "Occurs on a variety of gradients and altitudes and on a range of geologies. The overstorey is dominated by a low to medium height forest of eucalypts to 20m tall, sometimes resembling an open woodland with a secondary, smaller tree layer including a

[8] The BMO/AS 3959 schema presumes for Forest a total fuel load of 35t/ha and an understorey fuel load of 25t/ha, whilst for Woodland, a total fuel load of 25t/ha and an understorey fuel load of 15t/ha applies (Standards Australia, 2020).

[9] Grassy Dry Forest in its benchmark condition, may more accurately accord with a Woodland classification.

number of Acacia species. The understorey usually consists of a sparse shrub layer of medium height. Grassy Dry Forest is characterised by a ground layer dominated by a high diversity of drought-tolerant grasses and herb, often including a suite of fern species."' (WSP, 2020).

EVC 40 Herb-rich Foothill Forest

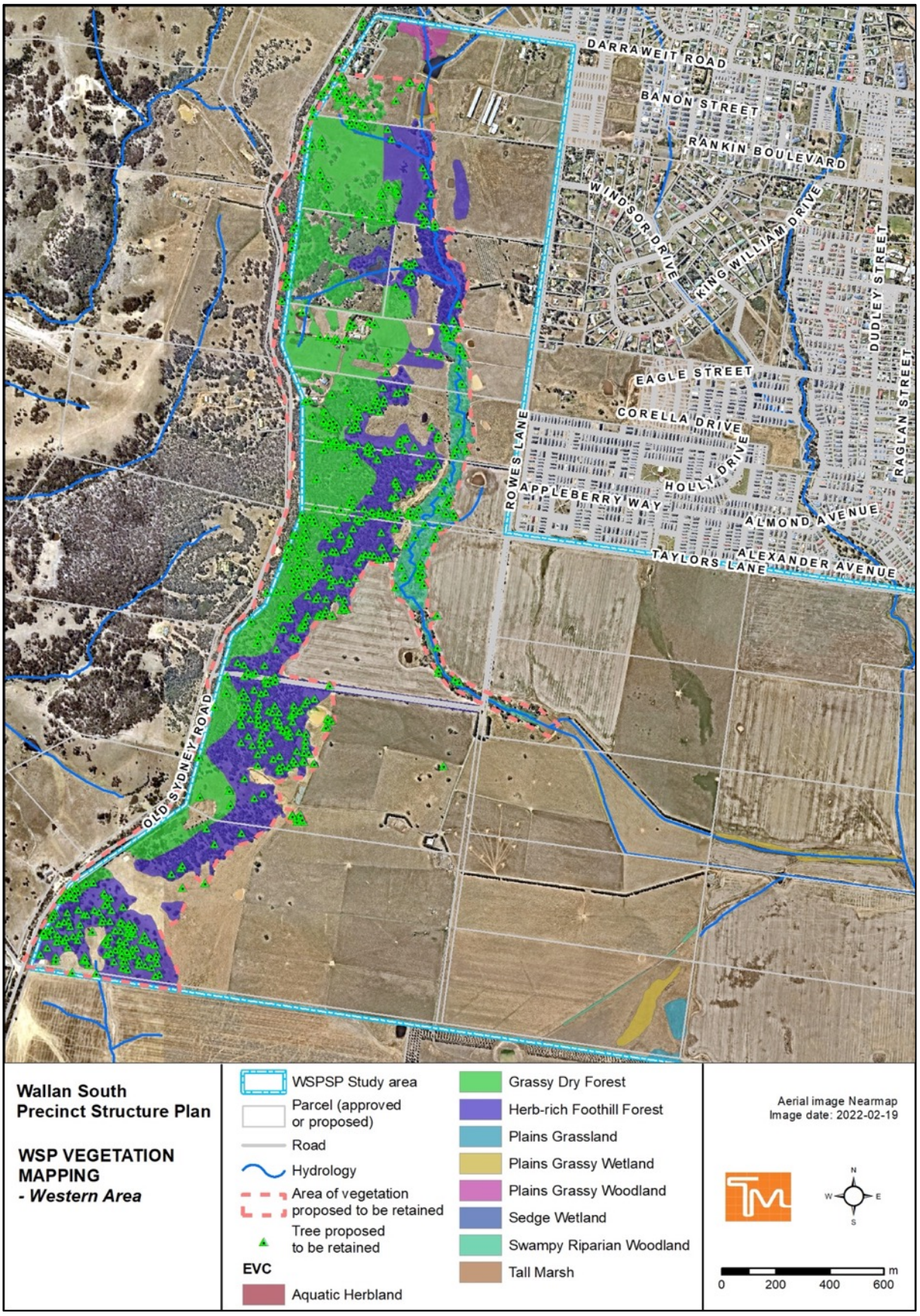
'This EVC was present on the lower slopes of the large remnant patch on the western side of the study area and 70.51 ha of this EVC were mapped… The description from the EVC benchmark is (DELWP, 2016a): "Occurs on relatively fertile, moderately well-drained soils on an extremely wide range of geological types and in areas of moderate to high rainfall. Occupies easterly and southerly aspects mainly on lower slopes and in gullies. A medium to tall open forest or woodland to 25m tall with a small tree layer over a sparse to dense shrub layer. A high cover and diversity of herbs and grasses in the ground layer characterise this EVC."' (WSP, 2020).

EVC 11 Swampy Riparian Woodland

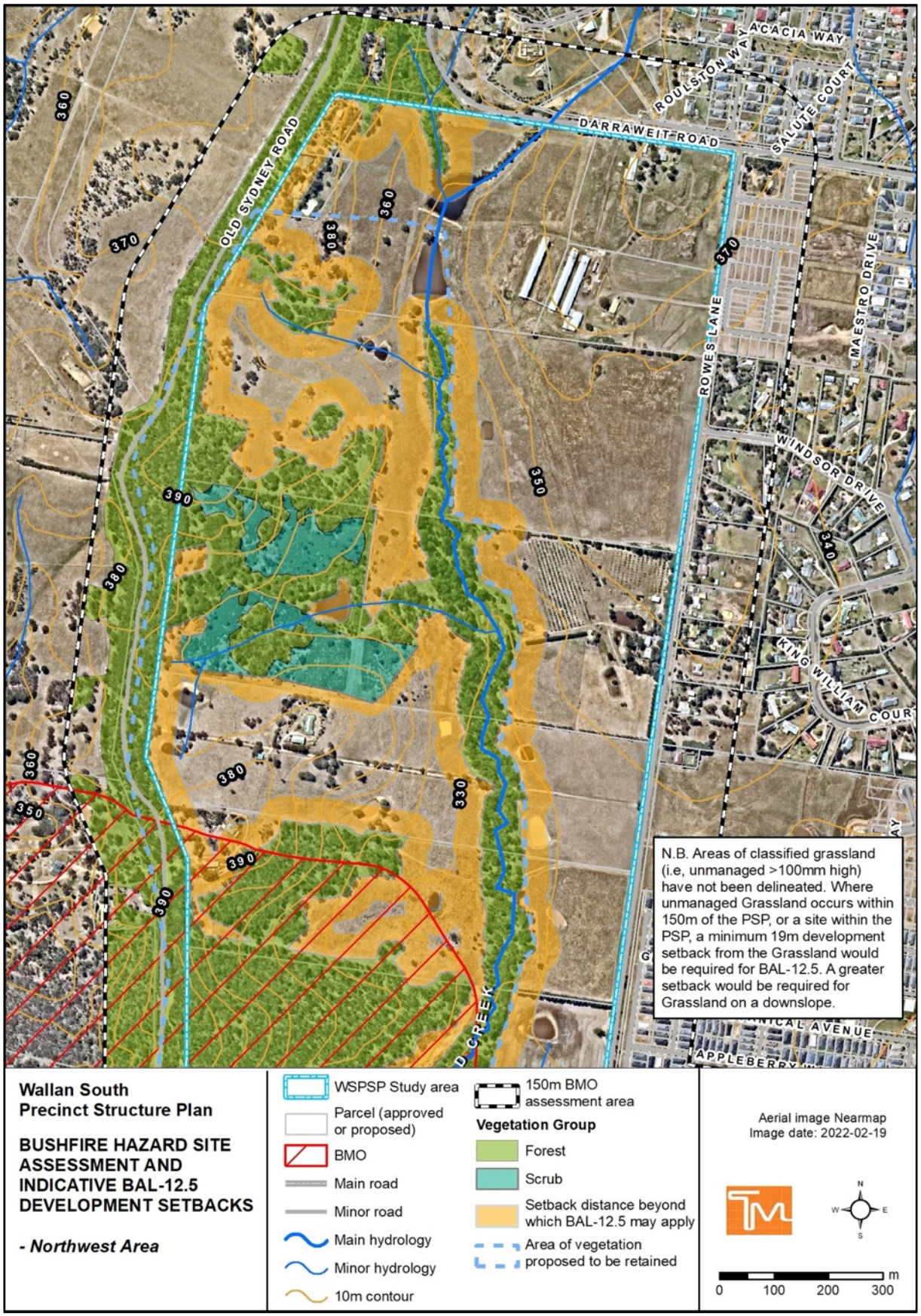
'Eleven patches of Swampy Riparian Woodland were recorded across the study area with a total area of 4.438 ha... It is described in the benchmarks as (DELWP, 2016a): "Woodland to 15 m tall generally occupying low energy streams of the foothills and plains. The lower strata are variously locally dominated by a range of large and medium shrub species on the stream levees in combination with large tussock grasses and sedges in the ground layer."' (WSP, 2020).

The mapped distribution of these EVCs, as well as trees proposed to be retained[10], are shown in Map 2. The mapping of classified vegetation is partially based on the EVC mapping and is shown in Map 3, Map 4 and Map 5. The mapping also shows indicative minimum setbacks from areas of classified vegetation for future buildings to be constructed to BAL-12.5, based on the 'All upslopes and flat land' slope class.

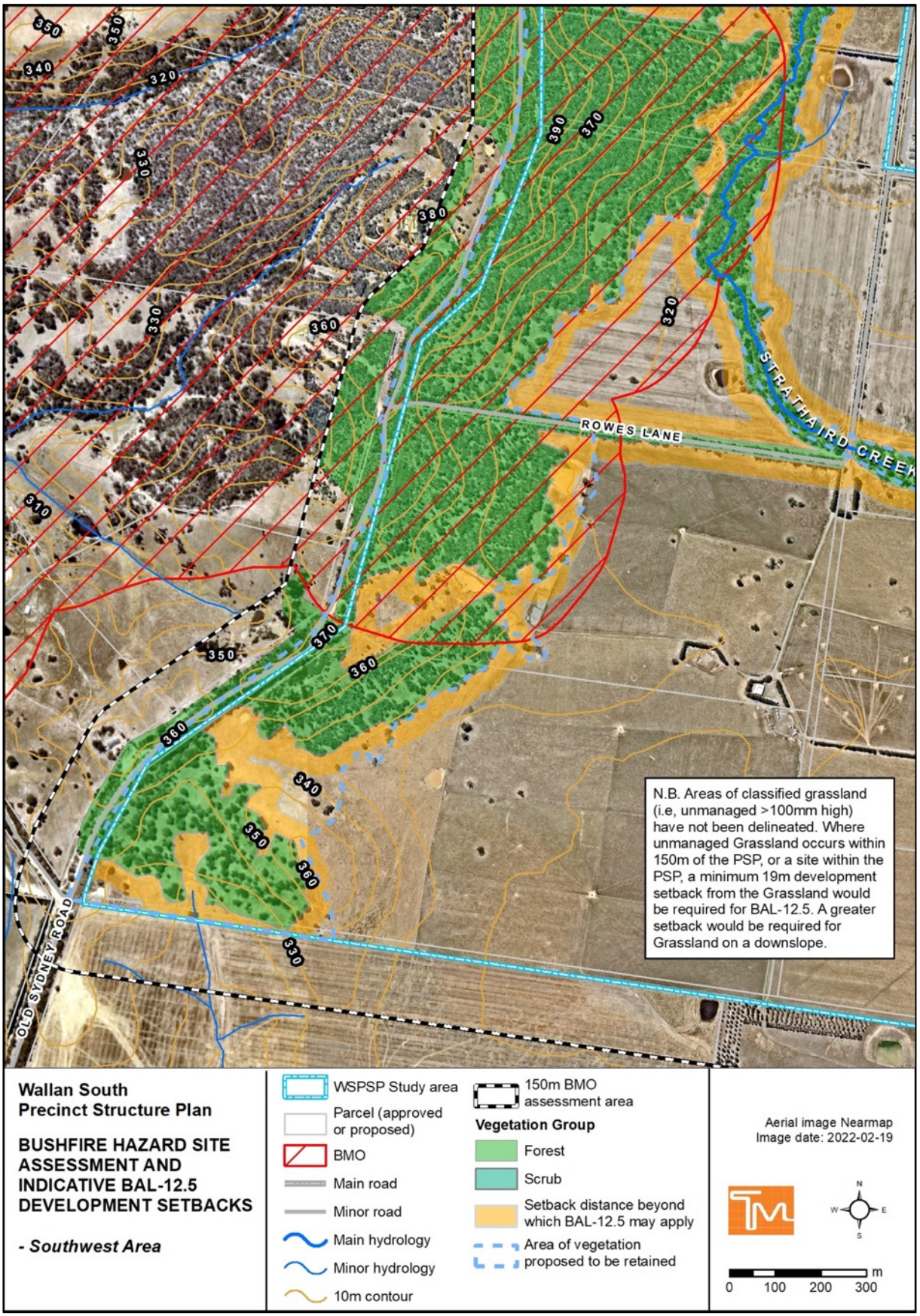
[10] As per data provided to Terramatrix by the VPA.



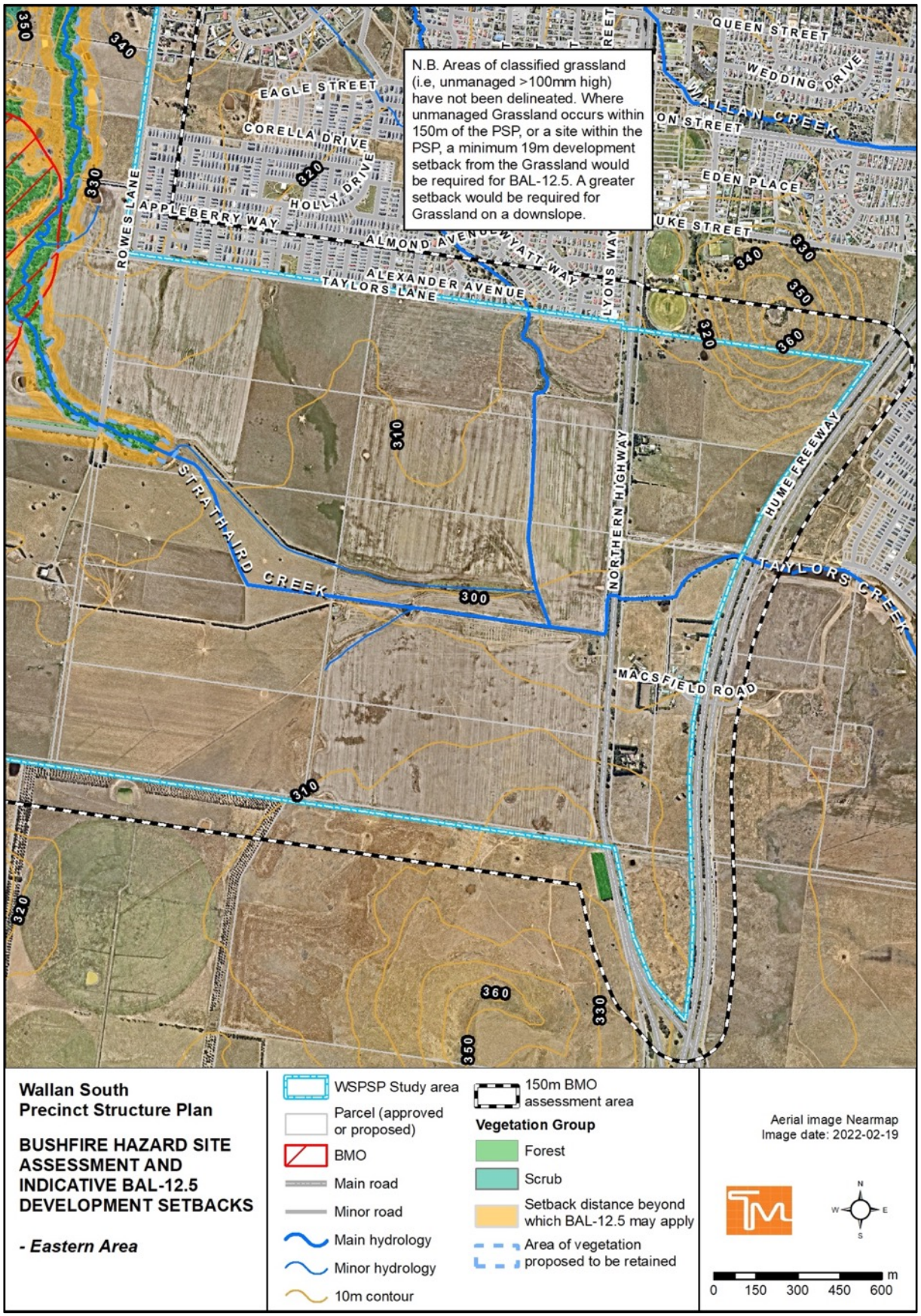
Map 2 - Vegetation mapping for the western part of the precinct (source: WSP, 2020).



Map 3 - Bushfire Hazard Site Assessment and indicative BAL-12.5 setbacks - Northwest.



Map 4 - Bushfire Hazard Site Assessment and indicative BAL-12.5 setbacks - Southwest.



Map 5 - Bushfire Hazard Site Assessment and indicative BAL-12.5 setbacks - East.

Figure 2 - Forest near the western boundary in the BMO part of the precinct below (east of) Old Sydney Road.

Figure 3 – Looking northwest at Forest, west of the precinct east of Old Sydney Road.

Figure 4 – Looking north along Old Sydney Road showing Forest either side

Figure 5 – Some areas mapped as Forest arguably better match a Woodland classification due to the grassy understorey and lesser elevated fuel hazard. However, fuel loads may increase over time if grazing is stopped and, therefore, as a precaution for strategic planning purposes, a Forest classification has been uniformly adopted.

Figure 6 – Looking north along Strathaird Creek at vegetation classified as Forest, near the centre of the precinct, west of Rowes Lane.

Figure 7 – Looking east along Strathaird Creek from Rowes Lane.

Figure 8 - Existing lesser hazard Woodland/Forest area that may or may not increase in fuel load if grazing pressure was to reduce or cease.

Figure 9 - Looking northeast over the precinct towards Wallan, from near the southwest corner of the precinct.

3.1.2 Scrub

Several relatively small areas of Scrub have been classified near the western part of the precinct, north of the BMO affected area. The Scrub largely comprises patches of Blackberries *Rubus spp*. and Gorse *Ulex europaeus.* In places this vegetation is low enough that it may be classifiable as Shrubland but for strategic planning the more conservative Scrub classification has been applied.

Figure 10 – Several relatively small areas of Scrub have been classified.

3.1.3 Grassland

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, 2020).

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, 2020). Grassland areas are 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.

Grassland occurs where tree cover is less than 10% and for simplicity these areas have not been delineated in the Bushfire Hazard Site Assessment Maps but can be inferred from the aerial photography and where the vegetation has not been classified as Forest or Scrub.

Grassland mainly comprises pastures in and around the precinct, especially in the south. Grassland to the south beyond the precinct boundary is likely just a short- to medium-term hazard until the precincts abutting the southern site boundary are developed.

Figure 11 – Extensive areas of Grassland in the southern section and south of the precinct.

Figure 12 - Grassland to the west of the precinct, west of Old Sydney Road.

Figure 13 - Looking southwest from Rowes Lane across Grassland in the north of the precinct, towards Forest on the hills in the western part of the precinct.

Figure 14 - Looking south of Macsfield Road along the eastern boundary of the precinct formed by the Hume Freeway Reserve (in left of picture).

Figure 15 – Looking north across the eastern part of the precinct between the Northern Highway and the Hume Freeway.

3.2 Other areas within the precinct

3.2.1 Strathaird Creek Corridor

Vegetation along Strathaird Creek currently comprises relatively narrow bands of remnant trees and shrubs that are considered a Forest hazard. The future vegetated state of the Creek and adjacent land should be confirmed as part of the preparation of the PSP. Based on it comprising Forest that will be retained and potentially enhanced by revegetation and/or natural recruitment over time, BAL-12.5 setbacks commensurate with Forest are shown in Map 3, Map 4 and Map 5.

However, if its structure and fuel hazard is modified, and/or vegetation is restricted to narrow remnants (e.g. less than 20m wide and more than 20m from future buildings), reduced setbacks may be justified. For example, from a fuel hazard and fire behaviour perspective, the vegetation along the corridor may be more akin to 6m-8m high 'Tall Scrub' if it comprises only a relatively narrow strip of vegetation that will not sustain a fully developed forest fire driven by surface fuels. If it were to dry out and ignite, fire behaviour may be more similar to a scrub fire, with commensurate flame heights resulting from the height and depth (width) of the vegetation, and the moisture content and horizontal and vertical continuity of the surface, near-surface and elevated fuels.

The Forest setbacks shown for BAL-12.5 are 48m for Forest in the 'All upslopes and flat land' slope class. For Scrub with an average height of 7m, in the 'All upslopes and flat land' slope class, a 33m setback is required to ensure radiant heat flux (RHF) will not exceed 12.5kW/m^2 and, therefore, a

BAL-12.5 outcome is possible. This setback is the same as that for Woodland (see BAL setbacks in Table 3 in Section 4.2.1.

Note that, as for the vegetation along roadsides, vegetation along the creek corridors may be able to be deemed 'low threat' as per one of the criteria for low threat vegetation in Section 2.2.3.2 of AS 3959-2018, which allows narrow strips of vegetation to be excluded from classification as low threat, non-hazardous vegetation, if they are no more than 20m wide and are separated by at least 20m from future buildings and any other narrow strips or other areas of classified vegetation. The applicable exclusion is:
'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' (Standards Australia, 2020).

3.2.2 Other Drainage Reserves

Similarly, the future vegetated state of other proposed drainage reserves and any wetlands, or water sensitive urban design (WSUD) features within them, may comprise hazardous Grassland (or higher hazard vegetation) if they are not managed in a minimal fuel condition. If this is the case, these areas would need to be sufficiently separated (setback) from future dwellings or other buildings requiring a BAL to enable BAL-12.5 ratings (e.g. in response to flat or upslope Grassland, a 19m setback is required). The land within the setback must be low threat vegetation or non-vegetated area. If natural recruitment over time, and/or active revegetation, occurs within reserves, they may comprise higher hazard Scrub, Woodland or Forest vegetation for which a greater setback of development would be required.

The future vegetated state of all the drainage reserves will need to be confirmed to identify what hazard they may pose to future development, and what setbacks may be required. As part of a precautionary approach, it is likely that drainage reserves will comprise Grassland and therefore grassland setbacks are identified.

Potential exclusion criteria that could be applied to ensure classified vegetation does not occur in proximity to buildings, are the AS 3959 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.

WSUD features with reliably open water or wet areas and little or no vegetation, may be deemed non-vegetated or low threat. However, large, seasonally inundated wetlands or WSUD features that may be dry and vegetated during the fire danger period could comprise classifiable Grassland (or

Scrub or Shrubland). Note that the applicable BAL-12.5 setbacks for Shrubland are the same as for Grassland for most slopes.

It is reasonable to assume that all other open space reserves, local parks and roadsides within the precinct, will comprise low threat vegetation that can be excluded from classification (see Section 4).

3.2.3 Road reserves

It is assumed that the Old Sydney Road reserve will remain vegetated in a hazardous state. Similarly, it is assumed that vegetation along Rowes Lane will remain and this has conservatively been classified as Forest, requiring the full 48m BAL-12.5 setback for future dwellings. It is possible, however, that vegetation along Rowes Lane may be able to satisfy the 'narrow strips' criterion for non-hazardous vegetation, if the vegetation is less than 20m wide, not connected with any other area of classifiable vegetation, and is at least 20m from future dwellings (see exclusion criteria in Section 3.3).

3.2.4 Grassland within the precinct

The extensive areas of Grassland that currently occur within the precinct are likely to be a short to medium-term hazard, as it is anticipated that they will be transformed into low threat vegetation (i.e. domestic gardens, local parks and streetscapes) or will become non-vegetated land as the precinct is developed. Any areas of unmanaged Grassland within 100m of buildings (150m in BMO parts of the precinct) will be classifiable if they do not meet one or more of the exclusion criteria under which land can be deemed to be non-hazardous (see criteria in Section 3.3).

Setbacks from Grassland within the precinct will need to be provided during the development process, potentially addressed through the Site Management Plan suggested as part of a Schedule to the UGZ (see Section 2.6.2).

Figure 16 - Looking west-southwest along the Taylors Lane northern interface with residential areas in the Wallan township.

Figure 17 - Looking west at vegetation classified as Forest, along Rowes Lane.

Figure 18 - Looking north along Rowes Lane, from where it crosses Strathaird Creek.

Figure 19 - Looking south-southeast down the Rowes Lane precinct boundary, from near the northern precinct boundary, showing development in the Wallan Township to the left, and scattered trees and grassland in the precinct to the right of image.

3.3 Excluded vegetation and non-vegetated areas

Areas of low threat vegetation and non-vegetated areas can be excluded from classification and deemed non-hazardous 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.*
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, 2020).

It is reasonable to assume that conventional density residential and other developed areas in the precinct will comprise low threat vegetation with landscaping, maintained lawns and cultivated gardens. Non-vegetated areas will include the roads, driveways and structures.

Any other areas, where vegetation may be retained that could be a potential bushfire hazard (i.e. that will not meet one or more of the exclusion criteria above), should be identified in the PBP and appropriate development setbacks adopted.

3.4 Topography

The BMO and AS 3959-2018 methodologies require that the 'effective slope' be identified to determine BALs and commensurate defendable space/development setback distances. The effective slope is the slope of the land under the classified vegetation[11] that will most significantly influence the bushfire attack on a site or 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 development. Fires burning downhill (i.e. on an upslope) will generally be moving more slowly with lesser flame lengths and intensities than fires burning uphill (i.e. on a downslope).
- Downslope - land under the classified vegetation on which a bushfire will be burning uphill in relation to development. As the rate of spread of a bushfire burning on a downslope (i.e.

[11] 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.

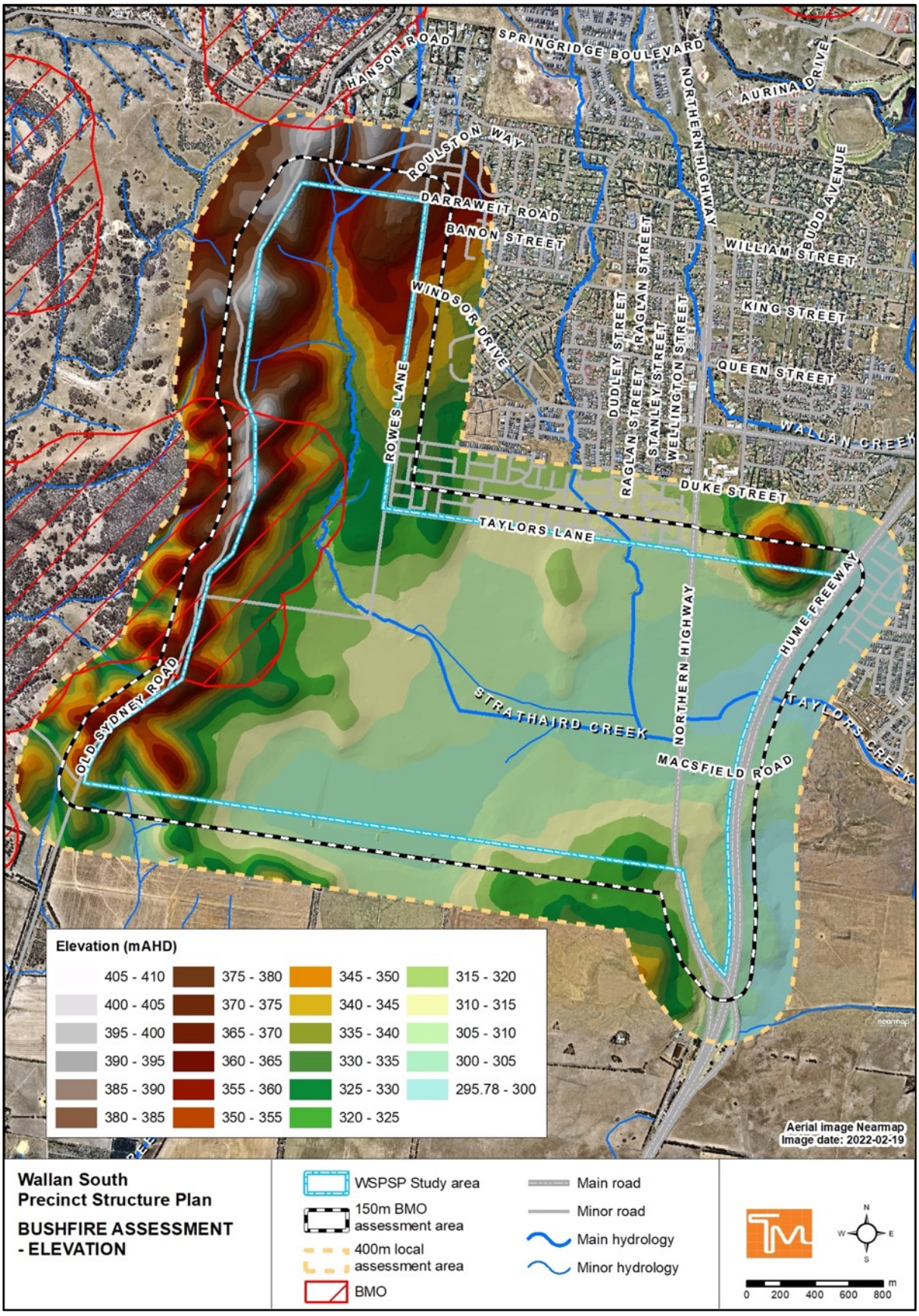
burning uphill towards a development) is significantly influenced by increases in slope, downslopes are grouped into five classes in 5˚ increments from 0˚ up to 20˚.

The topography was analysed by site assessment, publicly available 10m contour data, and by creating an elevation model for the site and surrounding land using a GIS TIN (Triangulated Irregular Network) generated from 1m contour data (see Map 6).

The terrain in the western portion of the precinct (and further west beyond Old Sydney Road) is undulating to steeply dissected. Old Sydney Road follows a ridgeline along the western precinct boundary, falling from 410m AHD in the northwest of the 400m neighbourhood assessment area down to 320m AHD in the southwest. The land slopes, often steeply, down from Old Sydney Road in the west to the relatively flat or gently sloping grasslands east and south of Strathaird Creek, which along with Taylors Creek, forms a central creek line through the precinct from the northwest and north respectively, to the east. Green Hill comprises a small hilltop at the northeast corner of the precinct and Spring Hill is a similar feature just beyond the southeast corner.

Figure 20 provides a slope analysis of the precinct and the land around it. Some areas to the west are classed as very steep, with a 15-20% or 9˚-11˚ slope, to extremely steep with a >20% or >11˚ slope. Within the precinct these gradients are mainly all upslopes, as development will mostly be to the east of, and below, the steeper land in the western portion of the precinct. Accordingly, for the purposes of determining future BALs and vegetation setback distances for buildings at this strategic planning stage, the slope class applied is 'All upslopes and flat land'.

However, it should be noted that any development adjacent to Old Sydney Road or in the western portion of the precinct could be exposed to steep downslopes that occur west of Old Sydney Road and potentially some downslopes within the precinct. Short and steep downslopes associated with the Strathaird Creek (or Taylors Creek) embankments are likely to be too short to be an appreciable influence on rate of spread and therefore are not likely to contribute to the effective slope or be an influence on BALs.



Map 6 - Elevation map of the precinct and 400m local assessment area.

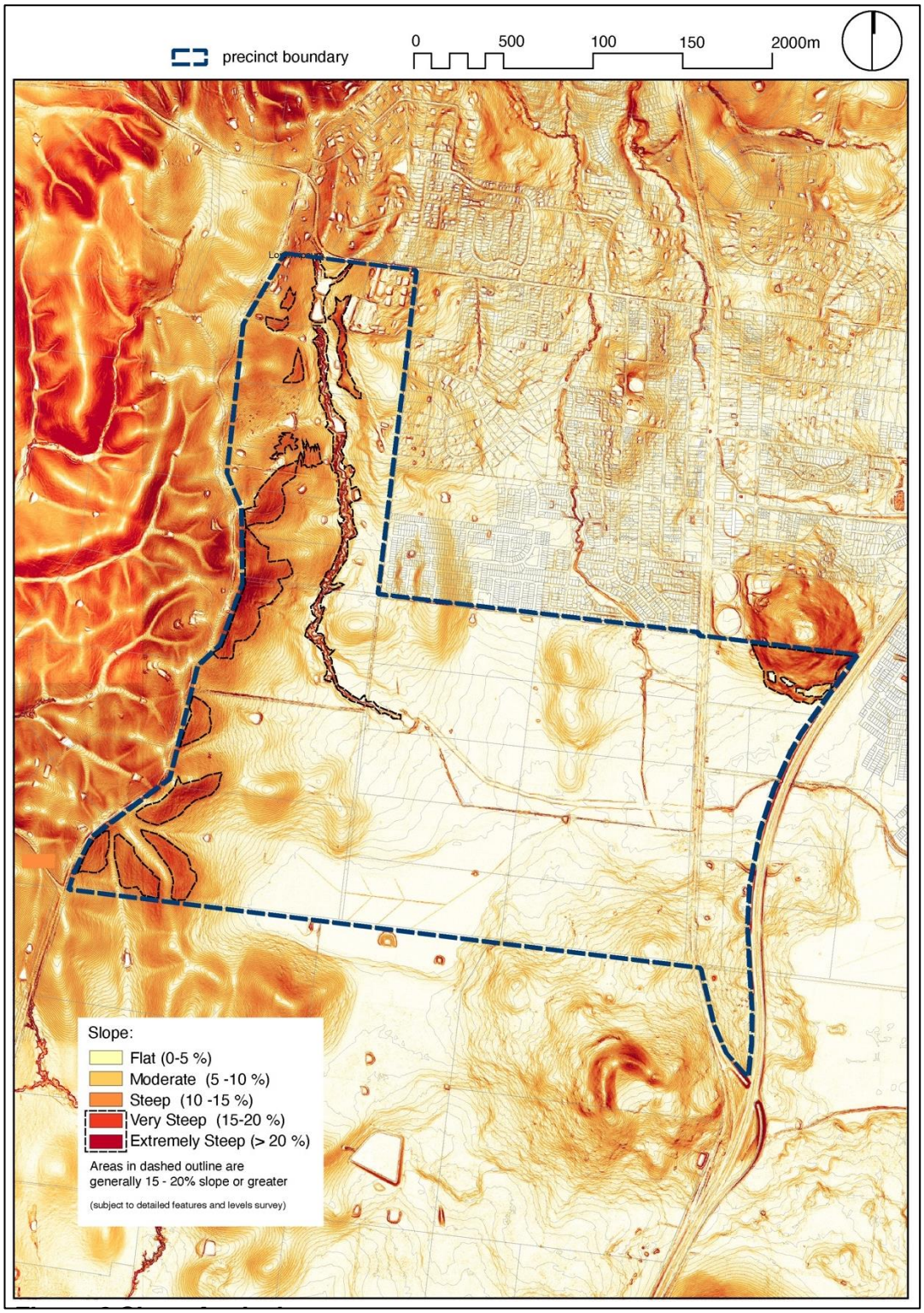


Figure 20 - Slope analysis (reproduced from Frank Hanson Urban Design, 2021).

3.5 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, as an input for calculating building setback distances from classified vegetation for BALs in accordance with AS 3959-2018.

The FFDI and GFDI indices were 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. However, since September 2022 the FFDI/GFDI have been replaced by the Fire Behaviour Index (FBI) as a new Australian Fire Danger Rating System (AFDRS) for determining FDRs in all jurisdictions. Table 1 displays the new FDRs, their FBI range, the anticipated fire behaviour and recommended actions for each FDR.

Note that the new AFDRS and FBIs do not correlate directly with the FFDI/GFFDI indices applied in the planning and building system. However, the benchmark FFDI 100 used to represent a 'one size fits all' model of extreme fire weather conditions (and the threshold for the previous 'Code Red' FDR), can be considered analogous to the new FBI 100 'Catastrophic' FDR. Note that these extreme conditions have been exceeded during significant fire events, including at some locations in Victoria on 'Black Saturday' 2009. Therefore, it is important to note that this FDR threshold is not necessarily the *worst-case* conditions for any particular location, including the WSPSP area.

Additionally, as noted in Section 2.1.1, especially in southern Australia, since the 1950s there has been an increase in the length of the fire weather season and an increase in extreme fire weather. It is projected that there will be further increase in the number of dangerous fire weather days and a longer fire season for southern and eastern Australia (CSIRO/BOM, 2020).

There is a 'high confidence' that climate change will result in a harsher fire weather climate for the Southern Slopes (Victoria West) sub-cluster region that the precinct is in; with a 'very high confidence' that average temperatures will continue to increase in all seasons. Generally, less rainfall in the cool season (winter and spring) is projected with' high confidence'. Changes to summer and autumn rainfall are possible but less certain. The magnitude of the change depends on the rainfall projection and its seasonal variation. Enhanced summer rainfall projected in some scenarios could moderate the number of severe fire weather days (CSIRO/BOM, 2021).

The Hum Bushfire Management Strategy also states that in Victoria climate change is forecast to extend the length of the fire danger period, make bushfires larger, more severe and frequent, and increase the frequency of days of elevated fire danger (DELWP, 2020b).

Climate change trends associated with the risk of bushfire, support the adoption of a precautionary and conservative approach in identifying and responding to the risk. However, currently neither the CFA or DELWP have a published policy or guidance on applying an FFDI or FBI value for strategic planning purposes. There is, therefore, no compelling rationale for applying a different FFDI/GFDI

from the 'default' FFDI 100/GFDI 130 threshold used throughout non-Alpine areas of Victoria in the planning and building system[12].

Table 1 - Fire Danger Ratings (Victoria State Government, 2022; BOM 2022).

Forest Behaviour Index	Fire Danger Rating (FDR)	Fire Behaviour	Action
>=100	Catastrophic	If a fire starts and takes hold, lives are likely to be lost.	• These are the most dangerous conditions for a fire. • Your life may depend on the decisions on you make, even before there is a fire. • For your survival, do not be in bushfire risk areas. • Stay safe by going to a safer location early in the morning or the night before. • If a fire starts and takes hold, lives and properties are likely to be lost. • Homes cannot withstand fires in these conditions. You may not be able to leave and help may not be available.
50-99	Extreme	Fires will spread quickly and be extremely dangerous.	• These are dangerous fire conditions. • Check your bushfire plan and that your property is fire ready. • If a fire starts, take immediate action. If you and your property are not prepared to the highest level, go to a safer location well before the fire impacts. • Reconsider travel through bushfire risk areas. • Expect hot, dry and windy conditions. • Leaving bushfire risk areas early in the day is your safest option.
24-49	High	Fires can be dangerous.	• There is a heightened risk. Be alert for fires in your area. • Decide what you will do if a fire starts. • If a fire starts, your life and property may be at risk. The safest option is to avoid bushfire risk areas.
12-23	Moderate	Most fires can be controlled.	• Stay up to date and be ready to act if there is a fire.

[12] In alpine areas of Victoria an FFDI 50 applies for determining BAL setback distances using Method 1 of AS 3959-2018.

3.6 Local and broader landscape risk considerations

3.6.1 BMO Landscape risk typologies

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 useful descriptors of bushfire risk at the neighbourhood, local and broader landscape scales, and are intended to streamline decision-making and support more consistent decisions based on the landscape risk (DELWP, 2017).

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 BMO/AS 3959 assumptions (see Table 2).

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

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 →			

It is considered that overall the precinct is best characterised as being in a Landscape Type 2, although due to the proposed retention of large areas of native vegetation in the west of the precinct and the potential for fire to approach from the northwest, west, or southwest (and potentially, but less likely, the south or east), it also some attributes of Landscape Type 3 along the western interface.

The topography and vegetation to the west and northwest is hazardous, with the potential for large landscape fires and significant fire behaviour. This could include significant ember attack into the precinct, associated with the stringybark eucalypts, if a fire crested Old Sydney Road. The BMO coverage to the west and northwest is evidence of the hazard. The directions of highest risk are to the northwest, west and southwest, which are those directions typically associated with severe or higher fire weather in Victoria (Long, 2006). In these directions, long fire runs are possible, however the landscape is generally devoid of large contiguous areas of high fuel forest, and the dominant hazard is Grassland with relatively small patches of remnant tree and shrub vegetation.

The precinct is somewhat protected from bushfire attack or 'buffered' to the north and northeast by the Wallan Township area and associated non-BPA land in these directions (see Map 7 and Map 8).

Good precinct design that responds to the bushfire risk should appropriately mitigate the risk. This should include avoiding intensive development in the higher risk western and north-western parts of the precinct, the provision of BAL-12.5 setbacks, the application of the building controls for development in a BPA (and BMO controls in BMO parts of the precinct), an urban residential road network with good connectivity to the east and south, and a reliable water supply for fire fighting. However, careful consideration of layout and siting of land uses and the future precinct structure is required along the western interface of the precinct where enhanced protection measures should be considered (see further discussion in Sections 4 and 4.1.1).

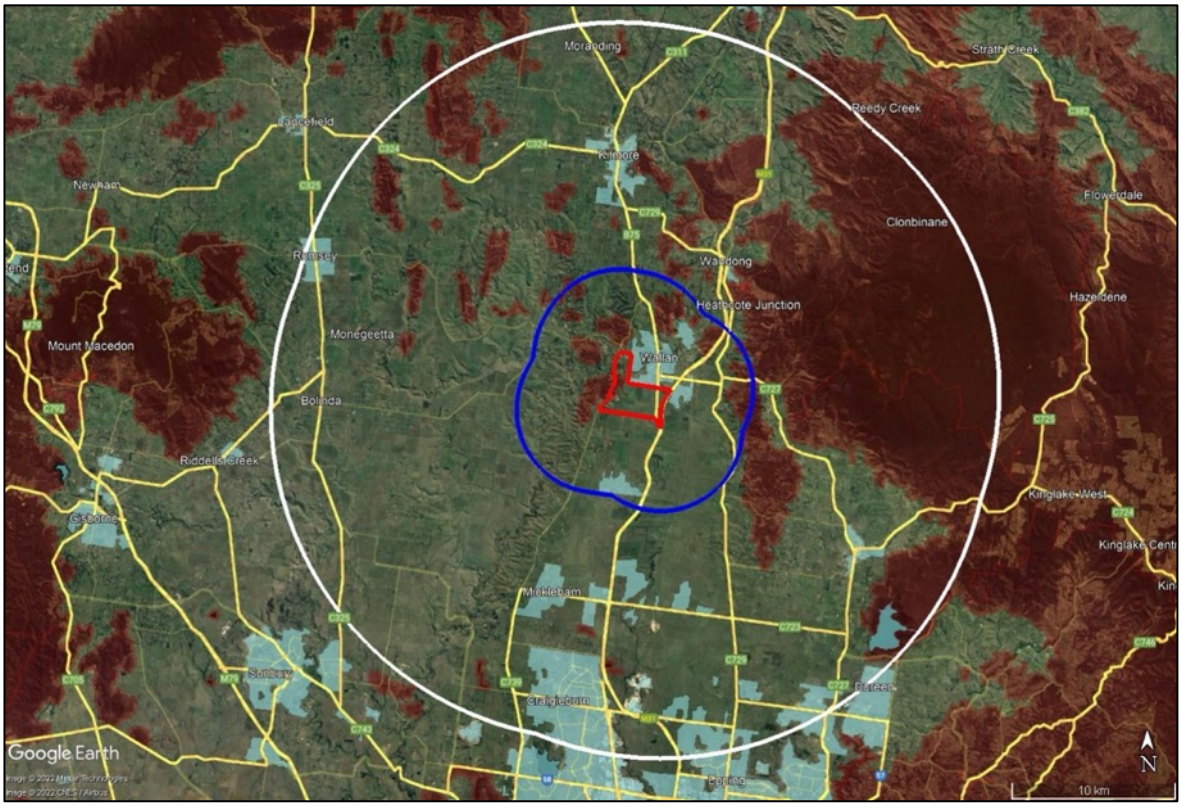
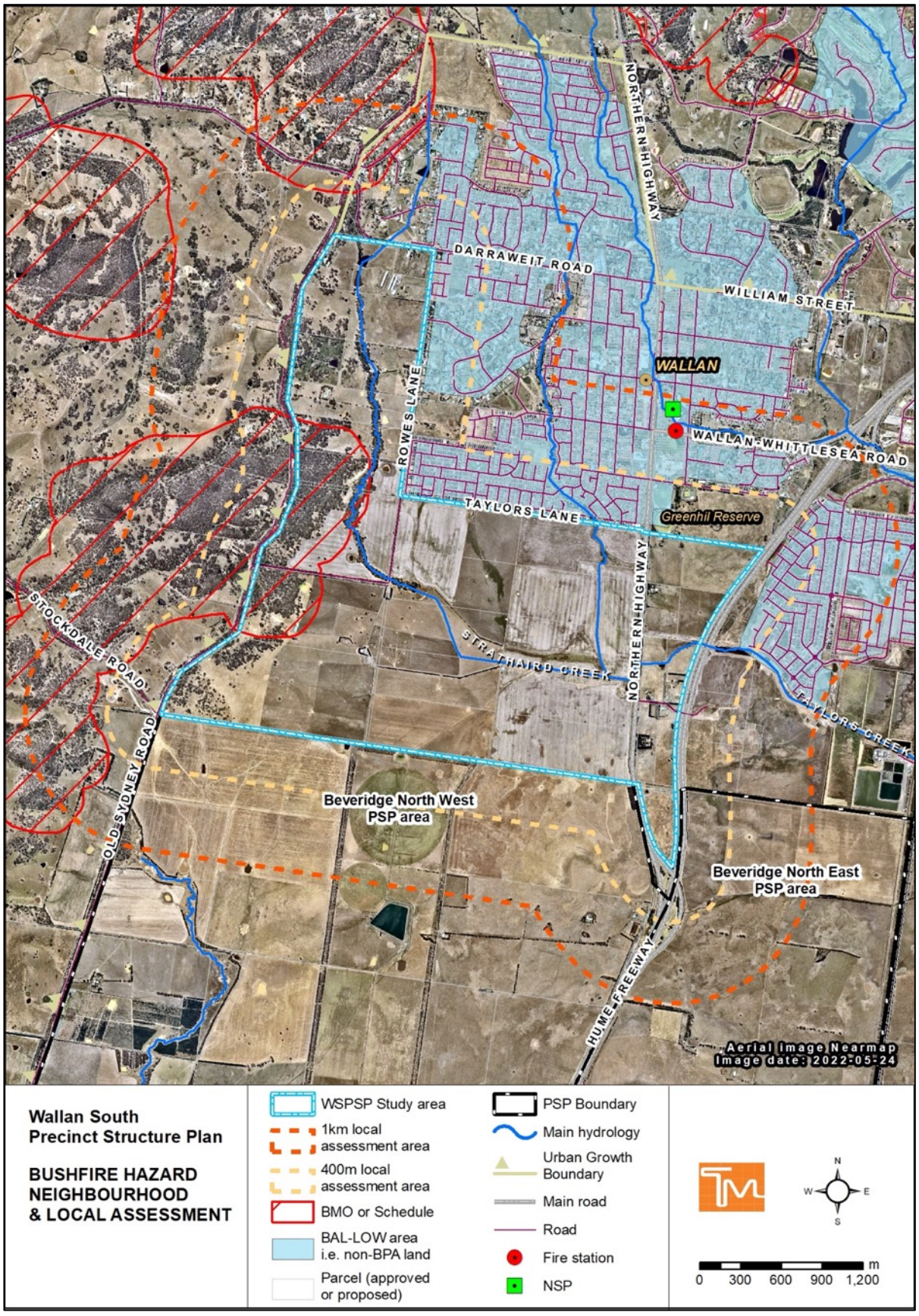
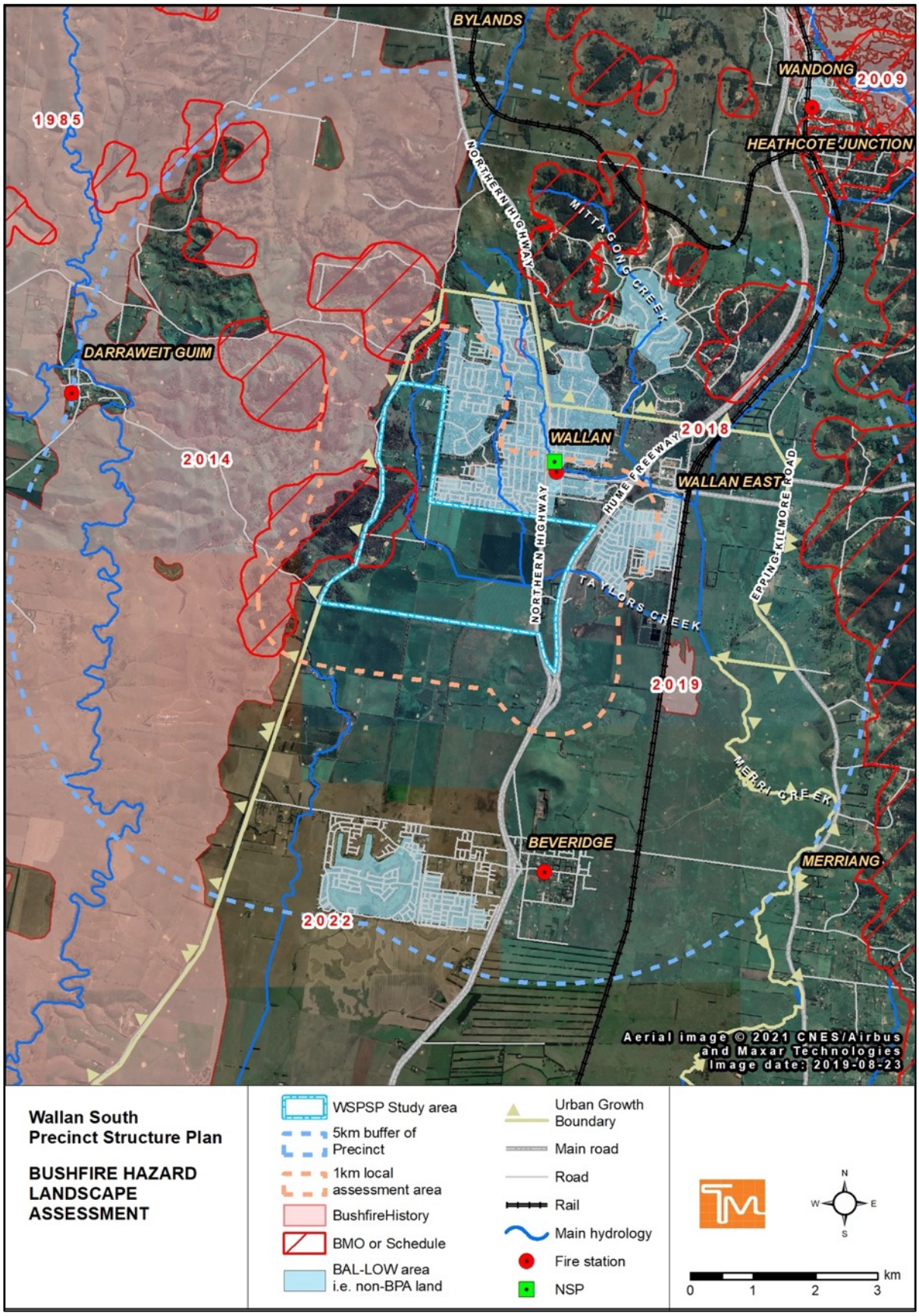


Figure 21 - Broader landscape context of the study area (in red outline) showing BAL-LOW areas (i.e. non-BPA land) in semi-transparent light blue and BMO/BMO schedule areas in semi-transparent red. A 5km buffer of the site is shown in blue outline and a 20km buffer of the site is shown in white outline.



Map 7 - Bushfire Hazard Local and Neighbourhood Assessment Map.



Map 8 - Bushfire Hazard Landscape Assessment Map.

3.6.2 Regional Bushfire Planning Assessment (RBPA) Hume Region

As part of the response to the 2009 Victorian Bushfires Royal Commission, Regional Bushfire Planning Assessments (RBPAs) were undertaken across six regions that cover 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 – Hume Region* includes the Mitchell Shire Council LGA. It identified that land to the south of the precinct (Beveridge North West PSP area) is located within the UGB and is zoned for future urban growth. It also identifies an area of '*local knowledge*', comprising land within, and west of, the western part of the WSPSP area, with the description '*Open grasslands are a known bushfire hazard on the western and north-western boundary of land in the Urban Growth Boundary, as well as to the western side of Wallan*' (DPCD, 2012).

3.6.3 Hume Bushfire Management Strategy 2020

Strategic bushfire management planning in Victoria is jointly delivered by Forest Fire Management Victoria (FFMVic), Country Fire Authority (CFA), Emergency Management Victoria (EMV) and local governments. A key output is a Bushfire Management Strategy for each of the six planning regions. Each strategy informs more detailed operational-level planning, including municipal fire prevention planning, the CFA and FFMVic joint fuel management program, and readiness and response planning.

The WSPSP area is in the region covered by the Hume Bushfire Management Strategy. No specific mention is made pertaining to the precinct. Notably however, bushfire behaviour and house loss modelling shows that parts of the precinct are rated as having the highest (top 5%) and higher (top 10%) risk comparatively, for potential house loss across the region (DELWP, 2020b).

4 Planning and design response

This section identifies how the Place Based Plan and PSP can be designed so that future development in the precinct responds appropriately to the bushfire risk, including the requirements of Clause 13.02-1S, published CFA and DELWP guidance and the planning and building regulations applicable to construction in the BPA or BMO. The section structure follows DELWPs *Design Guidelines for Settlement Planning at the Bushfire Interface* (DELWP, 2020a).

4.1 Settlement form and structure

4.1.1 Considering the bushfire hazard in directing growth

Situated as it is within Melbourne's UGB, the WSPSP area is identified in the Metropolitan Planning Strategy as a growth area for Melbourne (DELWP, 2021). This is reflected in Mitchell Shire Council's MSS, which identifies Wallan as a Major Activity Centre and a primary town for urban growth, noting that the township is anticipated to grow from 10,000 to 50,000 people (Mitchell Planning Scheme, 2019).

Clause 13.02-1S stipulates that settlement planning must identify the bushfire hazard, assess the risk and direct growth to low risk areas (Mitchell Planning Scheme, 2018a).

Due to the precinct's location on the northwest boundary of Melbourne's northern growth corridor, the study area is in a higher risk landscape than more centrally or southerly located growth precincts, as it has exposure to potentially long fire runs from the northwest, west or southwest. However, as noted above, the landscape is generally devoid of large contiguous areas of high fuel forest, and the dominant hazard is generally Grassland with relatively small patches of remnant tree and shrub vegetation. High hazard forested landscapes do occur to the northeast and east, including the Wandong Regional Park and Mount Disappointment State Forest, however these are over 8km away in a direction of lesser risk, as severe fire weather conditions are not typically associated with easterly or north-easterly winds.

Additionally, the precinct is protected from bushfire attack or 'buffered' to the north and northeast by the Wallan Township area and associated non-BPA land in these directions (see Map 7 and Map 8).

There are areas of Forest near and within the western parts of the precinct that pose a threat from radiant heat and potentially flame contact if development is not sufficiently distant from them, and which, may generate significant ember attack into and around the precinct if a large landscape fire eventuated from the west-northwest direction. The higher hazard associated with the vegetation is generally reflected by the BMO coverage. Accordingly, intensive and vulnerable development in the western parts of the precinct should be avoided and development directed to the lesser risk eastern parts of the precinct, which are those areas generally east of Strathaird Creek and south-southeast of Taylors Lane and Rowes Lane.

To the south and southeast, beyond the precinct boundary, the hazard is largely only Grassland (see Map 8). In these directions land will become largely urbanised and low threat as the Beveridge PSPs are implemented.

The hazard and resultant bushfire risk are not considered significant enough to preclude development in the lesser risk parts of the precinct; and the existing planning and building controls are adequate to mitigate the risk. If the development layout responds to the bushfire risk and future buildings are setback sufficiently from hazardous vegetation with good egress to places of relative safety, it is considered the risk can be deemed to be acceptable.

As land is developed in and around the precinct it will result in areas of the precinct becoming eligible for exclusion from the BPA if they are sufficiently distant from hazardous vegetation around and within it (see the criteria for excision in Section 2.5).

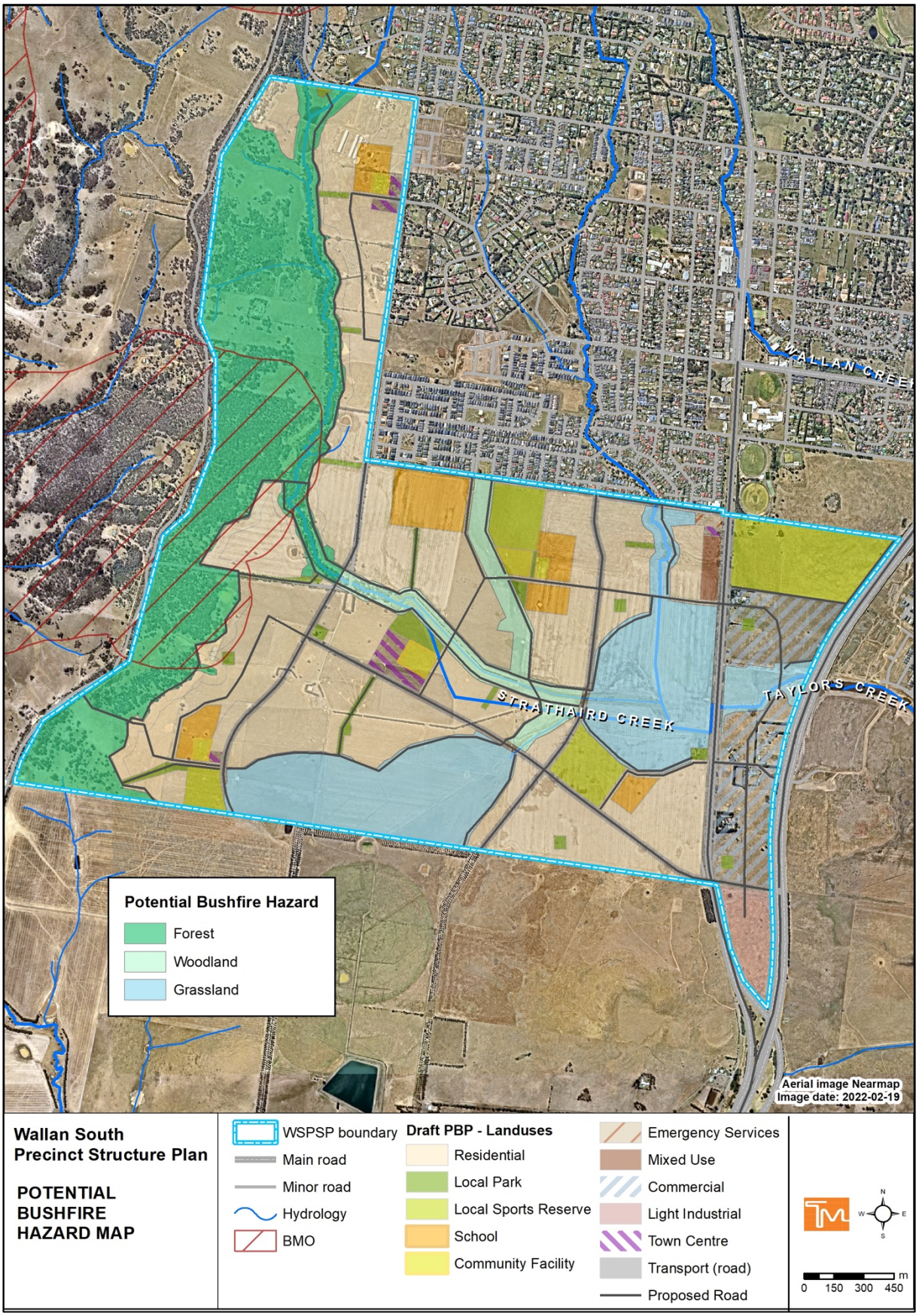
4.1.2 The distribution of land uses in the settlement

The land uses proposed in the draft Place Based Plan are shown in Map 10 and Map 11, along with indicative BAL-12.5 setback distances for development, as identified in the Bushfire Hazard Site Assessment in Section 3.1.

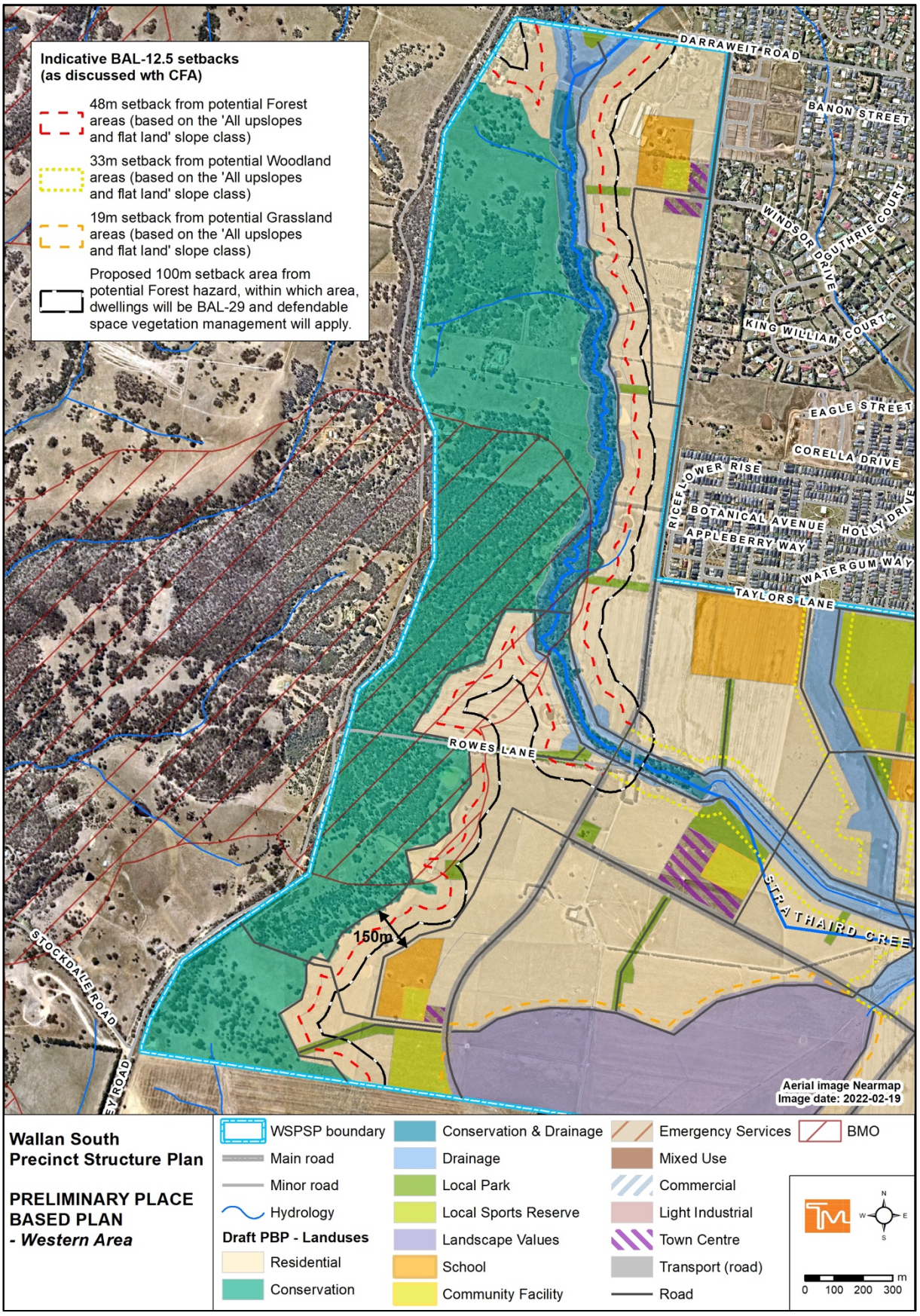
Due to the identified hazard associated with western portion of the precinct, intensified development in this area should be avoided. A rezoning to RCZ for the 'Conservation' land use area, or Public Conservation and Resource Zone (PCRZ) if reserves are proposed, would be appropriate with a minimum subdivision size to restrict intensive settlement and facilitate only incremental change. Similarly, instead of the residential development proposed in the northwesternmost corner of the precinct, local open space, commercial or mixed use could be considered. Alternatively, lower density residential lots could be proposed for this area (see below). Medium and higher density residential development is more suited to the lesser risk eastern parts of the precinct, being those areas generally east of Strathaird Creek and south of Taylors Lane and Rowes Lane. It is noted that a lower density 'residential transition' area is proposed within 100m of the conservation area. This transition area is proposed to have an average of 10 dwellings/ha (VPA, 2023).

The distribution of the rest of the proposed land uses is generally supported, as more vulnerable uses such as schools, are sited in the lower risk parts of the precinct. It is noted that whilst a government school is proposed in the higher hazard western part of the precinct, it is a minimum 150m from the conservation area, as discussed and agreed with the CFA.

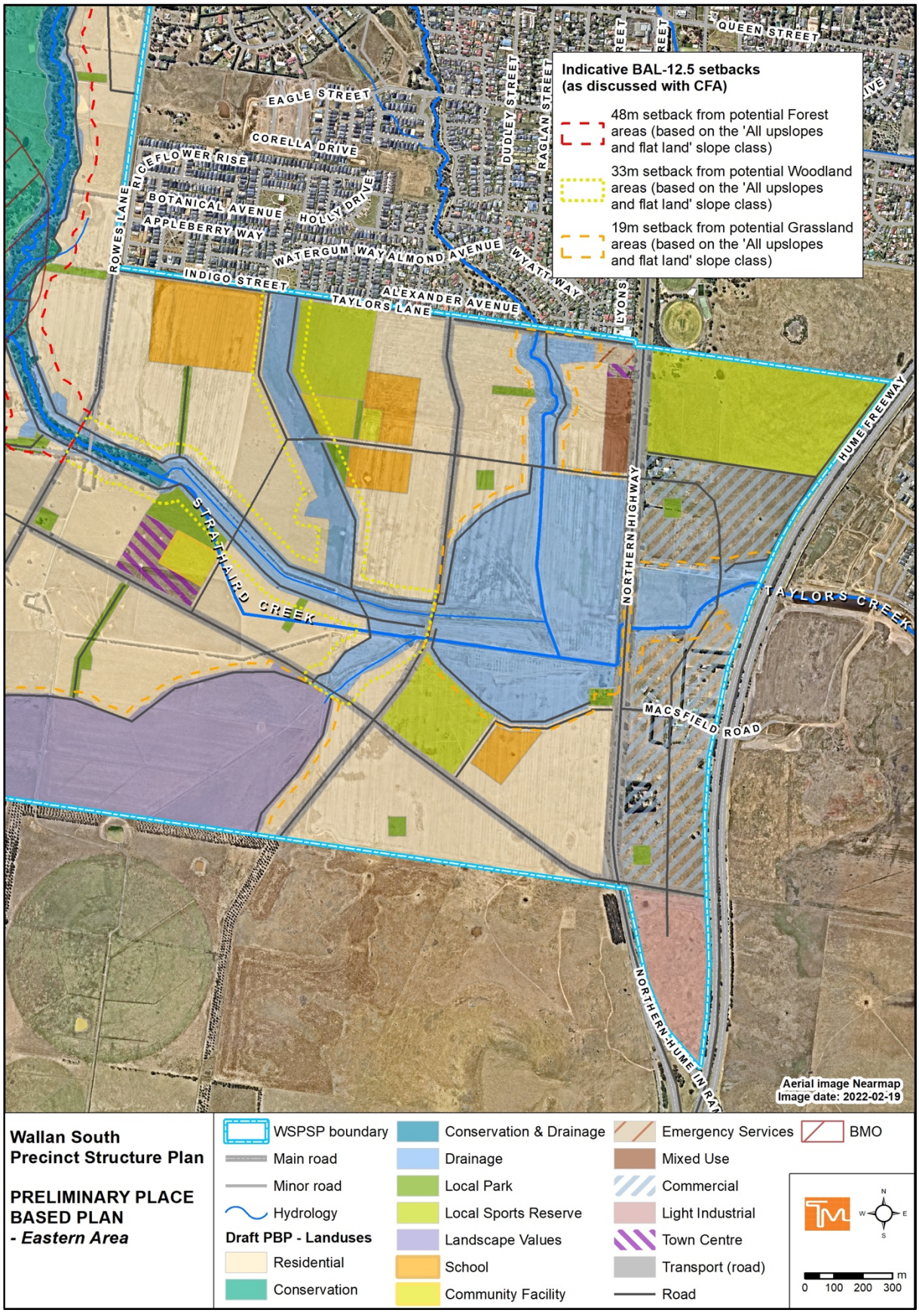
It is important to ensure the interface with the 'Conservation' land use area maximises setbacks of development from hazardous vegetation, achieving at least BAL-12.5 defendable space setbacks with appropriate lot sizes, provides good access and egress away from the hazard to safer locations to the east, and facilitates fire fighting and property defence; see comments following about these issues.



Map 9 - Potential Bushfire Hazard Map.



Map 10 - Preliminary Place Based Plan (Western area) and *indicative* BAL-12.5 setbacks based on the draft Place Based Plan.



Map 11 - Preliminary Place Based Plan (Eastern area) and *indicative* BAL-12.5 setbacks based on the draft Place Based Plan.

4.1.3 Lot sizes in settlement layout

Smaller lot sizes can offer bushfire safety advantages if the lot size is small enough that it creates a 'dense' urban area that contains only low threat vegetation and non-vegetated areas, with a resultant limited potential for bushfire to spread through it. March *et al*. (2011) found that lot size influenced both the level of bushfire penetration into the urban fringe at Bendigo on Black Saturday 2009, and the likelihood of house loss[13]:

- Semi-rural (>4,000m^2) lots – 95% area burnt and 35% houses destroyed;
- Large residential (800-3999m^2) lots – 47% area burnt and 23% houses destroyed;
- Residential (<799m^2) lots – 16% area burnt and 5% houses destroyed (March *et al.*, 2011).

March *et al*. (2011) concluded that the small residential lots acted as a barrier to fire penetration as there was much greater fragmentation of bushfire fuels by non- or low-flammability features, such as domestic use areas, driveways, paths, roads, cultivated gardens etc. The semi-rural (>4,000m^2) lots offered no such advantage, and the performance of the large residential (800-3,999m^2) lots was closer to the semi-rural than to the residential lots. Site coverage was also a significant influence on outcomes in that study. Lots unaffected by fire penetration had an average site coverage of 37 %, while those with property damage had 24% average site coverage, and lots where dwellings were destroyed had an average site coverage of 19% (March *et al.*, 2011).

Conversely, studies have found a correlation between house loss in a bushfire and proximity to other houses, due to the potential for heavy 'urban' fuels to increase flame, radiant heat and ember attack on adjacent or nearby dwellings (Price and Bradstock, 2013; Blanchi and Leonard, 2005).

DELWP guidelines consider that in interface areas lot sizes between 800m^2 and 1,200m^2 provide a good balance between the risk of larger lots retaining more vegetation within a residential area, and smaller lots providing an increased risk of house-to-house ignitions or increased house losses from ember attack due to the higher housing density (DELWP, 2020a).

To this end, lower density residential areas should be considered in the northwest of the precinct west of Strathaird Creek and along the western interface with the Conservation area, in accordance with the DELWP guidelines and to provide separation between dwellings (a minimum 10m separation is recommended). It is noted that a lower density 'residential transition' area is proposed within 100m of the conservation area. This transition area is proposed to have an average of 10 dwellings/ha, which equates to an average lot size of 1,000m^2 (VPA, *pers. comm.* Oct 2022).

It is also desirable to consider the need for vegetation controls or guidelines to be applied to areas with an interface with a higher bushfire hazard, to ensure vegetation on larger lots is maintained as low threat. To this end it is noted that a requirement in the draft PSP specifies that vegetation within 100m of a Forest fire hazard be managed in accordance with the defendable space requirements of Table 6 to Clause 53.02-5 (VPA, *pers. comm.* Oct 2022). This measure is supported, as it will assist to minimise the risk for fire spread into and within the precinct.

[13] A total of 58 dwellings were destroyed.

4.1.4 Vegetated areas within a settlement

Vegetated areas within the settlement that may pose a hazard should be identified in the Place Based Plan and setbacks from them defined to enable BAL-12.5 development. Note that some vegetated areas may be able to be designed to meet one or more of the small patch or narrow strips criteria for exclusion as non-hazardous vegetation, and therefore be deemed 'low threat' with no need for a development setback, or where a lesser development setback can apply (see Section 3.3).

It is recognised, however, that at the strategic and settlement planning stage it may be difficult to define the future vegetated state. In this case, statutory controls should be put in place to ensure, at the subdivision design and approval stage, that any areas of hazardous vegetation are identified and commensurate development setbacks incorporated, with appropriate certainty about ongoing management of vegetation within a setback area.

Potentially hazardous areas to be considered in the WSPSP area include the Strathaird and Taylors Creek alignments and any other drainage and waterway reserves, including WSUD features. If vegetation along the creeks or other areas comprises classifiable Forest, Scrub or Woodland vegetation, and does not meet one of the exclusion criteria for low threat vegetation (see Section 3.3), then development setbacks from the vegetation will be required (see Table 3 in Section 4.2.1)

It is presumed that the local parks and sports reserves will comprise only managed grassland and low threat landscaped areas from which no setbacks will be required. It is noted that a guideline in the draft PSP is that landscape design and plant selection in open spaces, including waterways and drainage corridors, should not increase bushfire risk. Another proposed guideline states that all vegetation outside of a bushfire hazard area should be managed to ensure a low risk of bushfire. (VPA, 2022). It is recommended that this be define more clearly as "*…low threat vegetation in accordance with AS 3959-2018…*".

4.2 The settlement interface

4.2.1 Applying the required development setbacks

To satisfy key settlement planning strategies of Clause 13.02-1S, future dwellings and other buildings requiring a BAL (see Section 2.5), should be sufficiently setback[14] from classified vegetation to enable a BAL-12.5 construction standard. These strategies aim to strengthen the resilience of settlements and communities and prioritise protection of human life, including by:

[14] 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, 2020).

- *'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*[15] *under AS 3959-2009 Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2009).*
- *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 Construction of Buildings in Bushfire-prone Areas (Standards Australia, 2009)'* (Mitchell Planning Scheme, 2018a).

The BAL-12.5 setbacks potentially required in response to Grassland, Scrub, Woodland and Forest, 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.

Table 3 – Potentially applicable building-vegetation setbacks for BAL-12.5.

Vegetation	Slope class	Vegetation setback distance (defendable space)
Grassland	All upslopes and flat land	19m
Scrub		27m
Woodland		33m
Forest		48m

Map 10 and Map 11 show the BAL-12.5 setbacks that would be required for future dwellings within the precinct from Forest and Grassland vegetation based on proposed future land uses and as identified in the hazard assessment in Section 3.1. Note that the proposed road alignment along the southern boundary should aim to provide, or contribute to, a 19m setback from Grassland to the south of the precinct.

[15] Note that the first strategy is to ensure RHF is less than 12.5kW/m^2 (author's emphasis). The second strategy stipulates a maximum BAL-12.5 construction standard (which requires that RHF not exceed 12.5kW/m^2). It is assumed the intent of both strategies to ensure that BAL-12.5 is a maximum construction standard for settlement planning, which is consistent with the wording of the latter strategy and the criteria and setback distances for BAL-12.5 in AS 3959-2018.

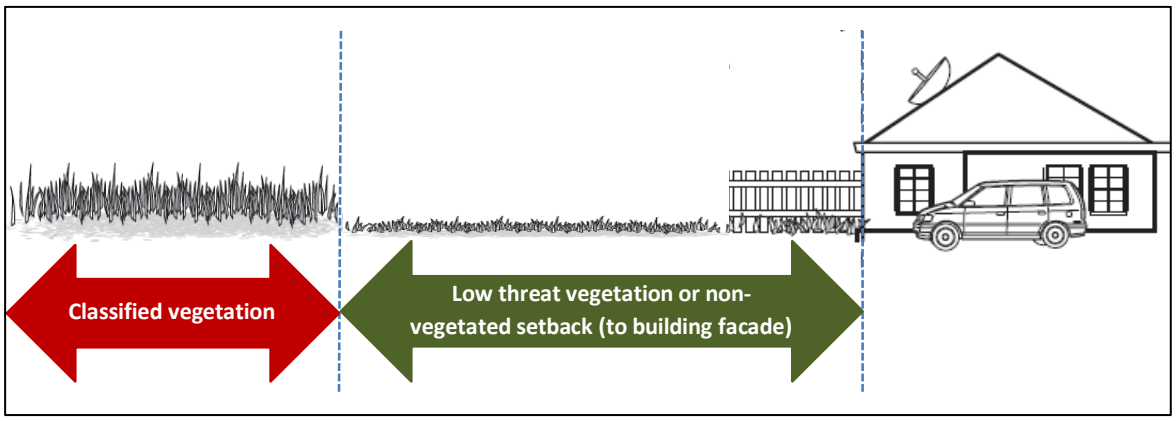


Figure 22 - Example of building-classified vegetation setback (adapted from CFA, 2013). Roads, pathways and shared trails should be sited within the setback.

The setbacks shown are indicative, because at this stage in the precinct planning process the final location, size and future state of vegetation within the precinct, has not been definitively determined. Similarly, the location of some development sites may expose them to downslopes that would require increased setbacks e.g. development on higher elevations in the west of the precinct.

Note that the small patch of Forest comprising a eucalypt plantation near the southeast corner of the precinct requires a 48m setback of dwellings from it, for those dwellings to be constructed to a BAL-12.5 standard. This appears to be achieved mainly by the Northern Highway road reserve and the proposed road along the southern precinct boundary.

4.2.2 Designing the settlement interface

As identified above, it is recommended that instead of the residential development proposed in the northwesternmost corner of the precinct, local open space, commercial or mixed use be considered. Alternatively, lower density residential lots could be proposed for this area, as discussed in Section 4.1.3 above.

Similarly, the interface between the Conservation area and residential development is important and should aim to maximise setbacks from the hazard, achieve at least BAL-12.5 defendable space setbacks with appropriate lot sizes, provide good access and egress away from the hazard to safer locations to the east and north-east, and facilitate fire fighting and property defence. There are draft requirements and guidelines in the draft PSP that aim to achieve these outcomes. Further, a proposed guideline states that lot design adjoining forest fire hazard areas should allow for the provision of a static water supply of 2,500 litres for personal firefighting where practical (VPA, 2022).

A scaled, illustrative design cross section for areas that interface a hazard, should be prepared to show the interface layout with development setbacks, including any proposed roads and landscaping.

4.2.3 Designing access and egress

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 and facilitate property protection and fire fighting (see Figure 23).

Perimeter roads should be incorporated along the boundaries of any areas of hazardous vegetation to provide separation from adjacent residential areas, this is especially important along the interface with the Conservation area (see Section 4.2.3). The draft PBP shows perimeter roads adjacent to areas of likely hazard (see Map 10 and Map 11). Additionally, a requirement of the draft PSP is that where a forest fire hazard area is identified, offroad paths and local access roads must form an interface between development and the fire hazard area (VPA, 2022).

To the north, south and east, the precinct boundaries have the advantage of roads that will provide a hard edge for development and separate it from any hazardous vegetation beyond the precinct. To the west of the precinct, Old Sydney Road is not likely to fulfil the function of a perimeter road, due to the remnant vegetation retained in the road reserve and east of the road within the precinct. A perimeter road should therefore be incorporated along the eastern edge of the Conservation area as is shown in the draft PBP Map 10 and Map 11.

There should be no obstacles to future subdivision providing appropriate access/egress for emergency vehicles and residents via a conventional residential road network in accordance with the requirements for roads in a residential subdivision at Clause 56.06. Road layouts should provide at least two access and egress routes to the Wallan township area to the east. It is noted that a guideline in the draft PSP is that subdivisions should include a network of streets that provide multiple evacuation routes away from bushfire risks and areas of bushfire hazard (VPA, 2022).

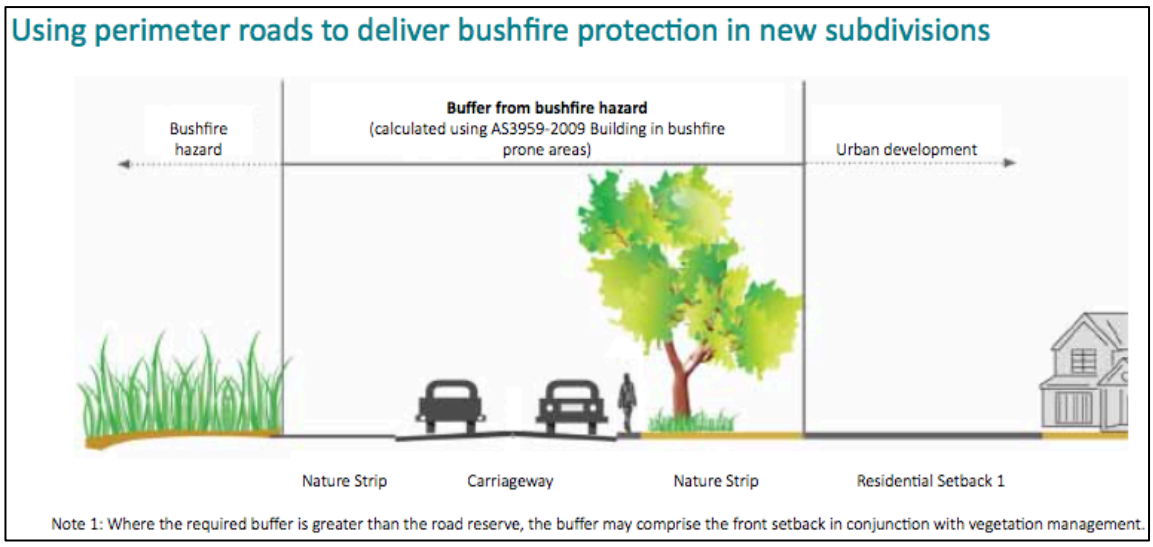


Figure 23 - Illustration of a perimeter road to provide required development setbacks (DELWP, 2015a).

4.3 Bushfire protection measures across a settlement

4.3.1 Vegetation management

Roadsides, narrow waterway and drainage reserves or other parks that could pose a Grassland hazard or contain potentially more hazardous patches of vegetation, could be excluded from classification as low threat, non-hazardous vegetation if they meet the AS 3959 exclusion criteria for small patches:

- Single areas of vegetation less than 1ha 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 20 m 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.

All landscaping of road reserves, communal areas and other managed open space should be low threat and therefore excludable. Additionally, locating any low threat open space areas at the periphery of the development, between dwellings and any hazardous vegetation, can contribute to development setbacks.

If management plans are being developed for any new reserves that may contain potentially hazardous vegetation, such as in the Conservation land use area; or for setback areas that new development is reliant upon to achieve a BAL-12.5 rating, they should specify the appropriate vegetation maintenance standards for those areas to provide assurance they will be managed in a low threat state in perpetuity. Alternatively, adequate setbacks for development from these reserves would need to be provided outside of the reserve.

The Municipal Fire Management Plan (MFMP), or other appropriate plan, could specify ongoing management standards for any other areas, such as road reserves, that are required to be maintained in a low threat state. Any review and future version of the MFMP should note any other bushfire protection measures that are implemented for the study area if they require ongoing maintenance.

Any retarding basins or WSUD features, within the drainage reserves or elsewhere in the precinct, may be non-vegetated or low threat if they will have open water or reliably wet areas with little or no vegetation. However, larger, seasonally inundated wetlands or WSUD features that may be dry and vegetated during the fire danger period, could comprise classifiable Grassland (or higher hazard vegetation if they have shrubs and/or trees).

It is noted that a guideline in the draft PSP is that landscape design and plant selection in open spaces, including waterways and drainage corridors, should not increase bushfire risk. Another proposed guideline states that all vegetation outside of a bushfire hazard area should be managed to

ensure a low risk of bushfire. (VPA, 2022). As stated earlier, it is recommended that these guidelines be defined more clearly as "*…low threat vegetation in accordance with AS 3959-2018…*".

4.3.2 Building construction standards

The precinct should be designed with setbacks from hazardous vegetation based on the minimum BAL-12.5 that applies in a BPA. The development setbacks required for BAL-12.5 in response to the Grassland, Forest, Scrub (and Woodland) identified in the hazard assessment in Section 3, were determined using the simple Method 1 procedure of AS 3959-2018, and are provided in Table 3 above.

Note that, as identified above, one of the key settlement planning strategies of Clause 13.02-1S is that strategic plans and policies, planning scheme amendments and settlement planning must not facilitate development exceeding a BAL-12.5 standard.

It is noted that a draft PSP requirement is that within a 100m setback from a Forest fire hazard area, all buildings (that require a BAL) within that setback area must be designed and constructed to BAL-29 standard (VPA, 2023). This will enhance the bushfire resilience of dwellings on the higher hazard western interface area.

4.3.3 Fences and other localised fuel sources

In higher risk areas it is desirable to discourage, restrict or prohibit the use of combustible fences such as non-bushfire resistant timber fences and brush fences, especially in the western interface parts of the precinct.

It is noted that a guideline in the draft PSP is that all fencing adjoining fire hazard areas should be made from non-combustible materials (VPA, 2022).

5 Clause 13.02-1S Bushfire planning

The applicable strategies stipulated in Clause 13.02-1S are identified below. Based on the draft PSP and Place Based Plan, a response to each of them is provided in the following sections, summarising how the WSPSP responds to the specified strategies.

5.1.1 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

As identified in the landscape hazard assessment in Section 3.6, the WSPSP area overall is best characterised as a low-moderate risk Landscape Type 2, although due to the precinct's location on the northwest boundary of Melbourne's northern growth corridor and proposed retention of large areas of native vegetation in the west of the precinct it has some attributes of the higher risk Landscape Type 3, along the western interface.

Accordingly, the precinct is in a higher risk landscape than more centrally or southerly located growth precincts, as it has exposure to potentially long fire runs from the northwest, west or southwest. However, as identified in this report the landscape is generally devoid of large contiguous areas of high fuel forest, and the dominant hazard is generally Grassland with relatively small patches of remnant tree and shrub vegetation.

The protection of human life can be prioritised by bushfire resilient design and layout of development as identified in this report and the draft PBP and PSP. A preliminary version of this draft assessment has informed the development of the draft PSP. Additionally, the CFA has been consulted on multiple occasions during the development of the draft PSP to inform the draft PBP and the proposed requirements and guidelines in the draft PSP.

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.

Whilst the western interface of this PSP has an elevated risk compared to other typical growth areas, careful design has ensured that future development can be setback sufficiently from any hazardous vegetation such that it will not be exposed to RHF above 12.5kW/m^2 and, therefore, the risk will be mitigated to an acceptably low level.

The nearest locations where human life can be better protected from the effects of bushfire are the existing urban areas immediately adjacent to the precinct, including many that are not in the BPA.

Once developed with reliably low threat and non-vegetated areas, large areas of the precinct will meet the criteria for future excision from the BPA, creating areas of relative safety from bushfire attack for future residents.

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

This report has provided the basis for incorporating bushfire risk into decision making associated with planning for development in the precinct. DELWPs settlement planning guidance for bushfire interface areas has informed the draft PBP and PSP as identified in Section 4. Additionally, the CFA has been consulted to inform the draft PBP and the proposed requirements and guidelines in the draft PSP.

5.1.2 Bushfire hazard identification and assessment strategies

Clause 13.02-1S-1 requires that the bushfire hazard be identified, and 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 potential hazards 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* (DELWP, 2015a), *Planning Advisory Note 68 Bushfire State Planning Policy Amendment VC140* (DELWP, 2018) and *Planning Permit Applications – Bushfire Management Overlay,* Technical Guide (DELWP, 2017).

The type and extent of potentially hazardous vegetation within and around the precinct has been identified. Classification is based on the anticipated long-term state of the vegetation, 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.

Publicly available 1m contour data for the area was accessed, which along with the site assessment, determined the topography and potentially applicable slope classes (see Map 6 and Figure 20).

In relation to climatic conditions and fire weather, the AS 3959-2018 default FFDI 100/GFDI 130 benchmark used in the Victorian planning and building system, has been applied as discussed in Section 3.5.

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 2.5) and is shown in Figure 21, Map 7 and Map 8. This is based on the most recent BPA mapping for the Mitchell Shire LGA, which was gazetted 17th August 2022.

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

BMO coverage reflects current mapping in the Mitchell Planning Scheme. An area in the central west of the precinct is affected by the BMO (see Map 7 and Map 8). The BMO coverage is not proposed to be changed and there are no obstacles to future development in these parts of the precinct complying with the objectives and measures of the BMO and accompanying Clause 53.02 *Bushfire Planning*.

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 broader landscape, local, neighbourhood and site scales (see Sections 3.1 and 3.6).

The characteristics in the landscape between 1km and out to at least 20km around the site have been considered in accordance with guidance about assessing risk for planning scheme amendments provided in the Planning Advisory Note 68 (DELWP, 2018) and Planning Practice Note 64 (DELWP, 2015a) (see Figure 21 and Map 8).

Local and neighbourhood conditions have been assessed at distances of 1km and 400m around the precinct respectively (see Map 7).

At the site scale, a 150m assessment area has been applied around the precinct boundary. The site assessment follows the BMO and AS 3959-2018 methodology for classifying vegetation and topography (see Maps 3-5).

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

As identified above, the CFA has been consulted on multiple occasions during the development of the draft PSP to inform the draft PBP and the proposed requirements and guidelines in the draft PSP. This has included in-principle agreement about the siting of the proposed school and applying enhanced construction in Conservation interface areas.

Further consultation will occur with all agencies when they are referred this report and comments and feedback received will inform the final PBP and bushfire content in the PSP document.

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 13.02-1S and the planning and building regulations invoked by the BMO and BPA coverage, specify the general requirements and standards for assessing the risk. These have been used in this report as appropriate and bushfire protection measures have been identified commensurate with the risk. Relevant regional bushfire plans and strategies have been identified, reviewed and incorporated into this assessment (see Section 3.6).

Further to the bushfire protection measures invoked by the BMO and BPA coverage, appropriate additional bushfire requirements and guidelines are proposed in the draft PSP (VPA, 2022).

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.

The risk can be deemed to be acceptably mitigated such that development can proceed if the objective and strategies of Clause 13.02-1S, the DELWP settlement planning guidelines, and compliance with BPA and BMO measures are successfully implemented as identified in this report. These are enhanced with the proposed bushfire requirements and guidelines in the draft PSP.

5.1.3 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).

Applicable distances for dwellings and other development to be setback from classifiable vegetation, such that RHF is calculated to not exceed 12.5kW/m^2 and where, therefore, BAL 12.5 buildings could potentially be sited, have been identified (see Maps 3-5, 9 and 10 and Table 3).

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 locations where human life can be better protected from the effects of bushfire are the existing developed areas immediately adjacent to the precinct, including large areas that are not in the BPA (see Map 7). There will be ready access to these areas from the WSPSP area.

Once developed with reliably low threat and non-vegetated areas, large areas of the precinct will meet the criteria for future excision from the BPA, creating more easily accessible areas of relative safety from bushfire attack for future residents.

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.

The development will not result in an increase in risk to existing or future residents, their property or community infrastructure. The risk to existing residents will be reduced by the development of additional low threat or non-vegetated land that would accompany development of the precinct.

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.

As identified previously, 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.

Assessment of multiple low risk alternative locations is beyond the scope of this report, so other potential alternative development sites have not been considered as part of the 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 setback distances from hazardous vegetation, as identified in this report, are implemented, then development will be able to achieve BAL setbacks commensurate with BAL-12.5 construction.

It is noted however, that a draft PSP requirement is that within a 100m setback from a Forest fire hazard area, all buildings (that require a BAL) within that setback area must be designed and constructed to BAL-29 standard (VPA, 2023). This will enhance the bushfire resilience of dwellings on the higher hazard western interface area.

5.1.4 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.

WSP Australia Pty Limited (WSP) conducted an ecological assessment of the precinct, consisting of a desktop and site assessment, in 2019 (see Map 2). The aim of this assessment was to determine the ecological values present, and to support the development of a native vegetation precinct plan (NVPP). An assessment had also previously been completed by Biosis in 2017 (Biosis, 2017) for most of the study area under earlier assessment guidelines (WSP, 2020).

Terramatrix understands the results of these assessments are reflected in the proposal to retain areas of native vegetation to avoid unacceptable biodiversity impacts.

5.1.5 Use and development control in a Bushfire Prone Area

Clause 13.02-1S 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'* (Mitchell 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'* (Mitchell Planning Scheme, 2018a).

Future development can achieve acceptable bushfire safety if the measures identified in this report are implemented including BMO and BPA compliance and satisfying the draft PSP requirements and guidelines that relate to bushfire.

There are no apparent significant barriers to this being achievable for future development applications that trigger this use and development control strategy.

6 Conclusion

This report has assessed the bushfire hazard in and around the Wallan South precinct in accordance with the hazard identification strategies of Clause 13.02-1S *Bushfire Planning* and the assessment methodologies of AS 3959-2018 *Construction of buildings in bushfire prone areas* and the BMO. The report identifies how planning for the design and layout of the precinct and future development that will occur within it, can appropriately mitigate any bushfire risk, including compliance with the applicable bushfire planning and building controls.

However, it is noted that since the 1950's there has been an increase in the length of the fire weather season and an increase in extreme fire weather, a trend which is projected to continue. Climate change trends associated with the risk of bushfire, support the adoption of a precautionary and conservative approach in identifying and responding to the risk.

All of the precinct is a designated BPA and an area in the central west of the precinct is affected by the BMO. However, as development progresses, reliably low threat or non-vegetated areas will be created that will result in large areas of the precinct being able to be excised from the BPA.

Vegetation within a 150m assessment zone around the precinct was classified to identify likely BAL setback distances and RHF exposure for future buildings in the precinct. The vegetation classification is based on the current and anticipated likely future long-term state of the vegetation. This necessarily involves making assumptions about the future vegetated land within the precinct, in particular the proposed reserves.

The main hazard within the 150m assessment area is Forest and Woodland vegetation to the west of the precinct and along the western boundary within the precinct. Grassland comprises mainly pastures on the site and to the south in Beveridge PSP areas. Over the long term, when land to the south is developed, the Grassland hazard in this direction will likely be removed or at least significantly reduced.

The proposed Conservation area has been conservatively classified as Forest, and a 48m setback from this area is indicatively shown for BAL-12.5 development. Remnant vegetation along Strathaird Creek and some roadsides, such as Rowes Lane where it runs east to west through the precinct, currently comprises narrow bands or patches of Forest. It has been assumed that the future vegetated state of the Creek and its riparian corridor adjacent the Conservation Area, will continue to comprise classified Forest from which development may also need to be setback 48m for BAL-12.5 construction. CFA has in other areas agreed 33m Woodland setbacks are likely appropriate e.g. for drainage reserves.

The future vegetated state of the drainage reserves and any proposed wetlands or WSUD features within them, may comprise Grassland (or a higher hazard) if they are not managed in a minimal fuel condition. If so, these areas will need to be sufficiently separated (setback) from future dwellings or other buildings requiring a BAL, by 19m of low threat or non-vegetated land. If natural recruitment

over time, and/or active revegetation, occurs, they may also comprise higher hazard Scrub or Woodland vegetation with commensurate greater setbacks (Woodland requires 33m setback as shown in Map 10 and Map 11).

Potential exclusion criteria that could be applied to ensure areas of classified vegetation within the precinct do not occur 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 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 terrain in the western portion of the precinct (and further west beyond Old Sydney Road) is undulating to steeply dissected. The land slopes, often steeply, down from Old Sydney Road in the west to the relatively flat or gently sloping grasslands east and south of Strathaird Creek. Some areas to the west are classed as very to extremely steep. Within the precinct these gradients are mainly all upslopes, as development will mostly be to the east of and below the steeper land in the western portion of the precinct. Accordingly, for the purposes of determining future BALs and vegetation setback distances for buildings at this strategic planning stage, the slope class applied is 'All upslopes and flat land'.

However, it should be noted that any development adjacent to Old Sydney Road or in the western portion of the precinct could be exposed to steep downslopes that occur west of Old Sydney Road and potentially some downslopes within the precinct. Short and steep downslopes associated with the Strathaird Creek (or Taylors Creek) embankments are likely to be too short to be an appreciable influence on rate of spread and therefore are not likely to contribute to the effective slope or be an influence on BALs.

The topography and vegetation to the west and northwest is hazardous, with the potential for large landscape-scale bushfires and significant fire behaviour that could impact the precinct. This could include considerable ember attack from the stringybark eucalypts, if a fire crested Old Sydney Road. The directions of highest risk are to the northwest, west, and southwest, which are those directions typically associated with severe or higher fire weather in Victoria. In these directions long fire runs are possible, however the landscape is generally devoid of large contiguous areas of high fuel forest, and the dominant hazard is Grassland with relatively small patches of remnant tree and shrub vegetation.

The precinct is somewhat protected from bushfire attack from the north and northeast by the Wallan Township area and associated non-BPA land in these directions.

Good precinct design that responds to the bushfire risk, including avoiding intensive and vulnerable development in the highest risk western parts of the precinct, the provision of BAL-12.5 setbacks, the

application of the building controls for development in a BPA (and BMO controls in BMO parts of the precinct), an urban residential road network with good connectivity to the east and south, and a reliable water supply for fire fighting, should be able to appropriately mitigate the risk.

Careful consideration of layout and siting of land uses, and additional protection measures are recommended along the western interface area of the precinct e.g. perimeter roads between hazard areas and residential development, to contribute to development setbacks and facilitate fire fighting and property protection, a static water supply for fire fighting, consideration of a higher BAL-29 construction standard for buildings requiring a BAL, and vegetation controls to manage vegetation in a low threat state.

Due to the higher risk associated with western portion of the precinct, intensified development in this area should be avoided. The 'Conservation' land use area could be rezoned to RCZ with a minimum subdivision size to restrict intensive settlement and facilitate only incremental change; or to PCRZ if reserves are proposed. Similarly, instead of the residential development proposed in the northwesternmost corner of the precinct, local open space, commercial or mixed use could be considered. Alternatively, lower density residential lots could be proposed for this area. Lot sizes between 800m^2 and 1,200m^2 would be appropriate. Medium and higher density residential development is more suited to the lesser risk more eastern and southern parts of the precinct, being those areas generally east of Strathaird Creek and south of Taylors Lane and Rowes Lane.

Overall, it is considered that development can appropriately prioritise the protection of human life, and meet the objectives of Clause 13.02-1S, by an appropriate design and layout that, amongst other things, ensures future dwellings will not be exposed to RHF above 12.5kW/m^2, which is commensurate with a Bushfire Attack Level (BAL)-12.5 construction standard. The maximum 12.5kW/m^2 safety threshold is required in settlement planning as the upper limit for acceptable risk.

Careful consideration of the western interface is required, including the possibility of locating low threat open space abutting the interface, providing perimeter roads, maximising setbacks of dwellings including through use of larger lots, considering enhanced construction and vegetation management controls.

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, 2020).

7 References

ABCB (2020) *Building Code of Australia, Volumes 1 and 2 of the National Construction Code (NCC) Incorporating Amendment No. 1,* Australian Building Codes Board (ABCB). Available at <http://abcb.gov.au/ncc-online/>.

AFAC (2018) Discussion paper on Climate Change and the Emergency Management Sector. Australasian Fire and Emergency Service Authorities Council, Melbourne.

Blanchi, R and Leonard, J (2005) *Investigation of Bushfire Attack Mechanisms Resulting in House Loss in the ACT Bushfire 2003*. Bushfire Co-operative Research Centre, East Melbourne.

BOM (2022) *AFDRS Fire Danger Ratings Table* Bureau of Meteorology product guide. Downloaded from National Council for Fire and Emergency Management Services (AFAC) website, September 2022 at <https://www.afac.com.au/initiative/afdrs/article/bom-product-guides>.

CFA (2013) *Grassland Interface Project*. Northern and Western Metropolitan Region, Version 1.4. Country Fire Authority, East Burwood.

CSIRO/BOM (2020) *State of the Climate 2020* CSIRO and Bureau of Meteorology (BOM), Commonwealth of Australia. Available at <https://www.csiro.au/en/Showcase/state-of-the-climate>.

CSIRO/BOM (2021) *Climate Change in Australia Projections for Australia's NRM Regions,* Viewed April 2021 at <https://www.climatechangeinaustralia.gov.au/en/projections-tools/regional-climate-change-explorer/sub-clusters/>.

DELWP (2015a) *Local planning for bushfire protection,* Planning Practice Note 64. Department of Environment, Land, Water and Planning, Melbourne. Available at <https://www.planning.vic.gov.au/resource-library/planning-practice-notes>.

DELWP (2015b) *Bushfire Prone Area Mapping Criteria*. Department of Environment, Land, Water and Planning, Melbourne. Available at <https://www.planning.vic.gov.au/policy-and-strategy/bushfire-protection/building-in-bushfire-prone-areas>.

DELWP (2017) *Planning Permit Applications Bushfire Management Overlay* Technical Guide. Department of Environment, Land, Water and Planning, Melbourne. Available at <https://www.planning.vic.gov.au/policy-and-strategy/bushfire-protection/bushfire-planning>.

DELWP (2018) *Bushfire State Planning Policy Amendment VC140,* Planning Advisory Note 68, Department of Environment, Land, Water and Planning, Melbourne. Available at <https://www.planning.vic.gov.au/resource-library/planning-advisory-notes>.

DELWP (2019) *Bushfire Mapping Methodology and Criteria*, Fact Sheet, December. Department of Environment, Land, Water and Planning. Available at <https://www.planning.vic.gov.au/policy-and-strategy/bushfire/your-property/bmo-mapping-and-reviews>.

DELWP (2020a) *Design Guidelines, Settlement Planning at the Bushfire Interface* Department of Environment, Land, Water and Planning, Melbourne, July. Available at <https://www.planning.vic.gov.au/policy-and-strategy/bushfire>.

DELWP (2020b) *Hume Bushfire Management Strategy* Department of Environment, Land, Water and Planning, Melbourne. Available at <https://www.safertogether.vic.gov.au/strategic-bushfire-management-planning>.

DELWP (2021) *Metropolitan Planning Strategy, Plan Melbourne 2017-2050* Department of Environment, Land, Water and Planning, Victorian State Government. Available at <https://www.planmelbourne.vic.gov.au/home>.

DPCD (2012) *Regional Bushfire Planning Assessment – Hume Region*. Department of Planning and Community Development, Melbourne.

Frank Hanson Urban Design (2021) *Wallan South PSP Landscape, Visual and Connectivity Assessment,* Final Report for the Victorian Planning Authority, May 7.

Long M (2006) A climatology of extreme fire weather days in Victoria. *Australian Meteorological Magazine*, **55**, 3-18.

March A, Holland M and Harwood A (2011) Planning for bushfire resilient urban design. *Proceedings of 5th State of Australian Cities National Conference*, 29 November – 2 December 2011, Melbourne.

Mitchell Planning Scheme (2013) *Clause 21.04-5 Bushfire*. Available at <https://www.planning.vic.gov.au/schemes-and-amendments/browse-planning-schemes>.

Mitchell Planning Scheme (2018a) *Clause 13.02-1S Bushfire Planning*. Available at <https://www.planning.vic.gov.au/schemes-and-amendments/browse-planning-schemes>.

Mitchell Planning Scheme (2018b) *Clause 44.06 Bushfire Management Overlay*. Available at <https://www.planning.vic.gov.au/schemes-and-amendments/browse-planning-schemes>.

Mitchell Planning Scheme (2018c) *Clause 53.02 Bushfire Planning*. Available at <https://www.planning.vic.gov.au/schemes-and-amendments/browse-planning-schemes>.

Mitchell Planning Scheme (2018d) *Clause 71.02-3 Integrated Decision Making*. Available at <https://www.planning.vic.gov.au/schemes-and-amendments/browse-planning-schemes>.

Mitchell Planning Scheme (2019) *Clause 21.01 Mitchell Shire*. Available at <https://www.planning.vic.gov.au/schemes-and-amendments/browse-planning-schemes>.

Mitchell Planning Scheme (2022) *Clause 13.01-1S Natural hazards and climate change*. Available at <https://www.planning.vic.gov.au/schemes-and-amendments/browse-planning-schemes>.

Mitchell Shire Council (2020) *Mitchell Shire Municipal Fire Management Plan 2020-2023* Compiled by Terramatrix with the Mitchell Shire Municipal Fire Management Planning Committee, Mitchell Shire Council. Available at <https://www.mitchellshire.vic.gov.au/about-council/council-documents/council-strategies-and-plans#emergency-management-plans>.

Price O and Bradstock R (2013) 'Landscape scale influences of forest area and housing density on house loss in the 2009 Victorian bushfires'. *PLOS ONE* **8(8)**.

Standards Australia (2020) *AS 3959-2018 Construction of buildings in bushfire-prone areas*. Incorporating Amendment No.2, Standards Australia, North Sydney, New South Wales.

Victoria State Government (2022) *Australian Fire Danger Rating System* Downloaded from VicEmergency website September 2022 at <https://www.emergency.vic.gov.au/prepare/#fire/afdrs>.

VPA (2021) *Wallan South Precinct Structure Plan,* VPA website viewed June 2021 at <https://vpa.vic.gov.au/project/wallan-south/>.

VPA (2022) *Wallan South PSP Agency Validation* Preliminary Draft PSP document provided to Terramatrix by the VPA, September.

VPA (2023) pers. comm. to the author in client comments on draft Bushfire Assessment Report.

WSP (2020) *Victorian Planning Authority Flora and Fauna Assessment Wallan South Precinct,* WSP, August.