Tuggerah Gateway Strategic Bushfire Study

Scentre Group Limited

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1300 646 131
www.ecoaus.com.au

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Project Manager	Deanne Hickey
Prepared by	Deanne Hickey / Kate Mannell
Reviewed by	Nathan Kearnes
Approved by	Nathan Kearnes
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Template 2.8.1

Contents

List of Figures

List of Tables

Executive Summary

When investigating the capability of Bush Fire Prone Land in relation to planning proposals (i.e., rezoning or similar) the NSW Environmental Planning and Assessment Act 1979 prescribes that consent authorities must have regard to s.9.1 (2) Direction 4.4 – 'Planning for Bushfire Protection'. Direction 4.4 prescribes consultation with the NSW Rural Fire Service (RFS); having regard to 'Planning for Bush Fire Protection 2019' (PBP); and compliance with the provision of bushfire protection measures (RFS 2019).

This Strategic Bush Fire Study evaluates the proposal against the strategic planning principles and 'inappropriate development' requirements stated in Chapter 4 Strategic Planning of PBP. The applicable bushfire assessment framework for strategic planning outlined in PBP, was applied to the master plan proposal for the Tuggerah Gateway Site.

The key findings of this study are that the site is not exposed to a 'high' bushfire risk, the land uses proposed are not subject to an unacceptable risk, nor does the proposal provide for 'inappropriate development' outcomes that cannot meet the requirements of PBP. Whilst areas of elevated bushfire risk exist in the broader landscape, the feasibility of bushfire protection measures, the small extent of the internal bushfire hazard and the reduced bushfire risk immediately surrounding the site, means the residual risk can be lowered to an appropriate level, and the planning proposal is considered consistent with the strategic planning principles of PBP in regard to the land use assessment.

A key consideration for the proposed development is the provision of a road network that facilitate adequate emergency access and egress. Therefore, it is recommended that the evacuation capacity of the proposal is reviewed as part of future traffic modelling, to confirm the capacity of the road network is feasible under various bushfire attack and evacuation scenarios.

1. Introduction

This Strategic Bushfire Study has been prepared with consideration to the planning proposal and structure plan prepared by Urbis for the Tuggerah Gateway site. The final report will supplement the gateway determination submission for the subject land. This study provides an assessment of the master plan proposal for the Tuggerah Gateway site in regard to the strategic planning principles outlined in '*Planning for Bushfire Protection*' (PBP) (RFS 2019). This is the first step in the planning pathway, and finalisation of the design will be an iterative process as the proposal progresses to the development application (DA) stage, where detailed design will be finalised.

1.1 Background

The Tuggerah Gateway Site (the subject land) is situated within the Central Coast Local Government Area (LGA) as identified in Table 1. It is located within the Tuggerah Town Centre Development area, which seeks to enhance and develop the surrounding area into a major hub of employment, transport, leisure, health and education (DPIE 2019).

The Tuggerah Gateway site is currently zoned as B4 Mixed Use, RU6 Transition and E2 Environmental Conservation. This study considers the Gateway planning proposal and structure plan for land owned by Scentre Group that seeks to facilitate a variety of land uses (further detailed in Section 2) including:

- Residential dwellings, including detached homes, townhouse/duplex and terrace homes;
- Multi-storey residential dwellings;
- Independent Living units;
- Mixed use residential and retail precincts;
- Conservation areas and riparian corridors;
- Active open spaces;
- Connected road and street network to access the site; and
- Utilities.

Table 1: Subject Land

Lot	DP
3	DP1084221
2	DP1056960
61	DP839561

1.2 Aims and Objectives

The aim of this study is to review the Gateway proposal in relation to the strategic planning requirements of PBP. The key objective is to undertake a Strategic Bushfire Study (SBS) as per the strategic planning principles, 'inappropriate development' exclusions and assessment considerations outlined in PBP.

1.3 Study Area

The Tuggerah Gateway Site (Figure 1) is located approximately 95 km north of the Sydney CBD. The subject land is bordered by the Pacific Motorway to the west and Wyong Road to the north, with Tonkiss Street and Westfield Tuggerah adjacent to the east. Mt Tangy Dangy lies to the south of the site.

Currently the subject land is primarily comprised of rural grassland and used for agriculture, with a small portion of remnant vegetation present.

The subject land is mapped as bushfire prone land (BFPL) on the Central Coast Council (CCC) maps and as published by the DPIE (Figure 2).

Figure 1: Tuggerah Gateway Study Area

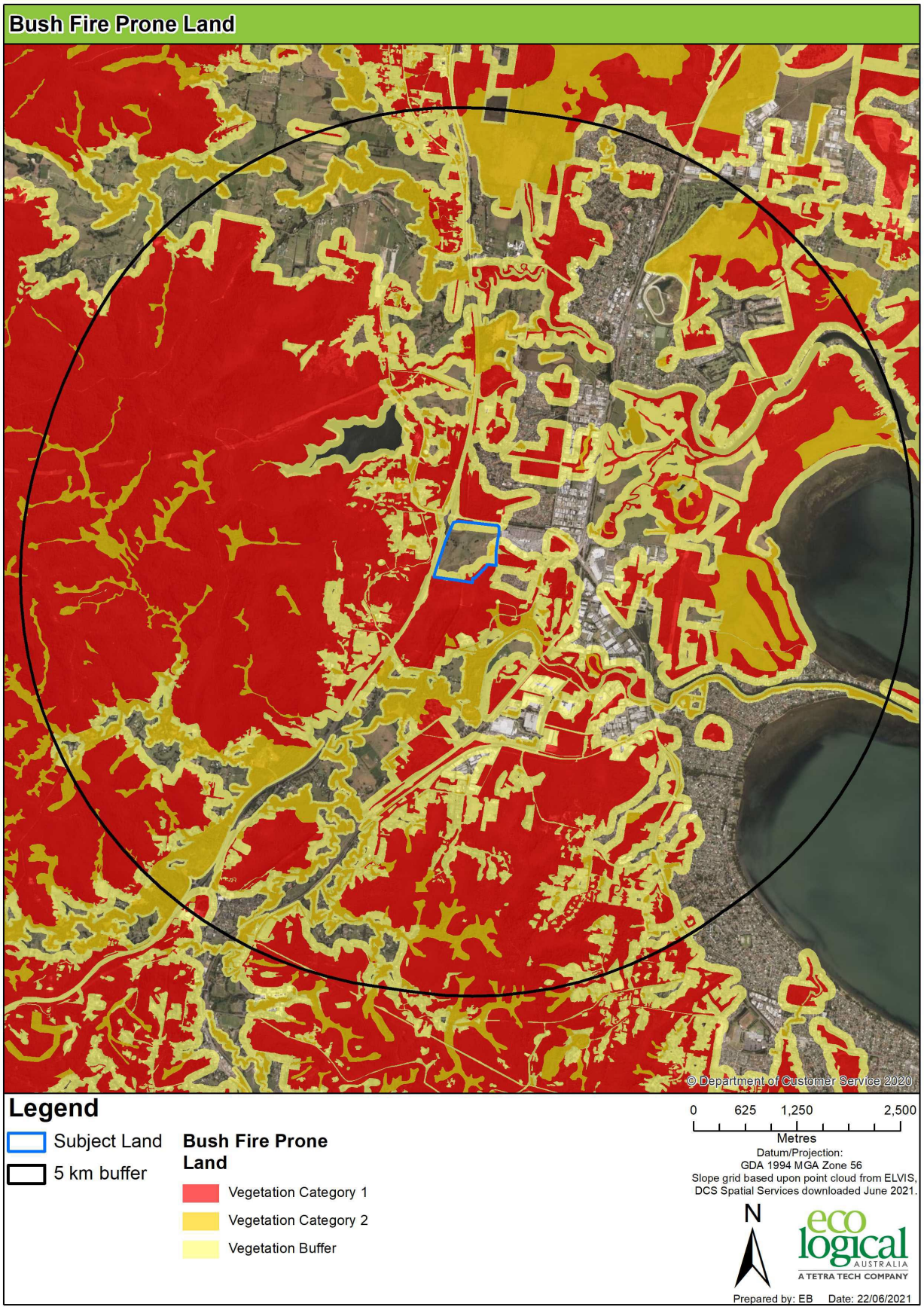

Figure 2: Bushfire Prone Land

1.4 Legislative Framework

Under the Ministerial Direction 4.4 (Planning for Bushfire Protection) issued under Section 9.1 (2) of the *Environmental Planning and Assessment Act 1979* (EP&A Act), where a planning proposal includes or is in close proximity to BFPL, the relevant planning authority must consult with the Commissioner of the NSW Rural Fire Service (RFS) following receipt of a gateway determination. Therefore, the assessment detailed in this study seeks to outline how the proposal can adhere to the requirements of PBP. The legislative framework guiding the assessment of bushfire risk and the application of bushfire protection measures at the strategic level, includes the NSW *EP&A Act* and the *Rural Fires Act 1997* (RF Act). Key aspects of these instruments are outlined below.

1.4.1 NSW Environmental Planning and Assessment Act (1979)

The NSW *EP&A* Act is the principal planning legislation for the state, providing a framework for the overall environmental planning and assessment of development proposals. Various legislation and instruments are integrated with the *EP&A Act*, including the *RF Act*.

Section 10.3 of the *EP&A Act* requires the identification of BFPL and development of BFPL maps, which act as a trigger for bushfire assessment provisions for strategic planning and development.

When investigating the capability of BFPL in relation to a planning proposal, consent authorities must have regard to s.9.1 (2) Direction 4.4 – 'Planning for Bushfire Protection' of the *EP&A Act*. The objectives of Direction 4.4 are:

- To protect life, property and the environment from bushfire hazards, by discouraging the establishment of incompatible land uses in bushfire prone areas; and
- To encourage sound management of bushfire prone areas.

Direction 4.4 instructs the consent authority on the bushfire matters which need to be addressed with respect to master planning. This includes:

- Consultation with the Commissioner of the NSW RFS and consideration to any comments made;
- Regard to requirements of PBP*;* and
- Compliance with numerous bushfire protection provisions where development is proposed.

Further, there are various provisions within the *EP&A Act* that may be applicable to proposals on BFPL, as outlined below:

- Section 3.29 of the *EP&A Act* relates to the development of State Environmental Planning Policies (SEPPs) and within these policies, bushfire considerations may apply for example:
  - Codes SEPP (Exempt and Complying Development Codes)
    - Clause 34 specifies complying development standards that prescribe compliance with PBP and AS3959, with development on BFPL not permitted within BAL-40 and BAL-FZ.
  - Seniors Housing SEPP (Housing for Seniors or People with a Disability)
    - Clause 27 of the SEPP requires PBP compliance and RFS consultation for development on BFPL.
  - Infrastructure SEPP

  - Clause 16 of the SEPP requires RFS consultation for residential or Special Fire Protection Purpose (SFPP) development on BFPL; and
- Section 4.14 relates to infill and other development.
  - Requires that all development on BFPL conforms to the specifications and requirements outlined in PBP, i.e., the specific requirements for residential infill in Chapter 7; and
  - The consent authority should be satisfied that the development conforms to PBP, or otherwise consult with the RFS Commissioner.
- Section 4.46 relates to integrated development and triggers Section 100B of the *RF Act* and Clause 44 of the *Rural Fires Regulation 2013* (RF Reg):
  - Applicable to subdivision, with specific requirements in Chapter 5 of PBP.
  - Applicable to SFPP developments, with specific requirements in Chapter 6 of PBP; and
  - Requires a bushfire safety authority under Section 100b of the *RF Act*.
- Section 9.1 relates to strategic or local planning.
  - Applicable to land use planning that covers large areas and may include a variety of land uses and longer-term development objectives. Specific requirements are outlined in chapter 4 of PBP.

1.4.2 Rural Fires Act 1997 (RF Act)

The *RF Act* is integrated into the *EP&A Act* and triggered by Section 4.46 as outlined above. The key objectives of the RF Act are to provide for the:

- Prevention, mitigation and suppression of bushfires;
- Co-ordination of bush fire fighting and bush fire prevention;
- Protection of persons from injury or death, and property from damage, arising from fires;
- Protection of infrastructure and environmental, economic, cultural, agricultural and community assets from damage arising from fires; and
- Protection of the environment by requiring certain activities have regard to the principles of ecologically sustainable development.

1.5 Assessment Approach

Section 9.1 (2) of the *EP&A Act* triggers consideration of PBP for strategic planning. Chapter 4 of PBP contains strategic planning principles, 'inappropriate development' exclusions and assessment considerations required for strategic planning proposals. Chapter 4 of PBP prescribes the completion of a Strategic Bushfire Study, which provides the opportunity to assess whether proposed land uses associated with master planning are appropriate in the bushfire risk context. It also provides the ability to assess the strategic implications of future development for bushfire mitigation and management.

The strategic planning principles of PBP are:

- *Ensuring land is suitable for development in the context of bush fire risk;*
- *Ensuring new development on BFPL will comply with PBP;*
- *Minimising reliance on performance-based solutions;*
- *Providing adequate infrastructure associated with emergency evacuation and firefighting operations; and*

- *Facilitating appropriate ongoing land management practices.*

These principles trigger the consideration of bushfire protection measures at the strategic planning stage, to provide an opportunity to consider the suitability of future land uses within the broader bushfire risk setting and that future land uses can meet the aim and objectives of PBP outlined below:

> *The aim of PBP is to provide for the protection of human life and minimise impacts on property from the threat of bush fire, while having due regard to development potential, site characteristics and protection of the environment.*
>
> *The objectives are to:*
>
> *i afford buildings and their occupants protection from exposure to a bush fire;*
> *ii provide for a defendable space to be located around buildings;*
> *iii provide appropriate separation between a hazard and buildings which, in combination with other measures, minimises material ignition;*
> *iv ensure that appropriate operational access and egress for emergency service personnel and residents is available;*
> *v provide for ongoing management and maintenance of bush fire protection measures; and*
> *vi ensure that utility services are adequate to meet the needs of firefighters.*

In addition, Chapter 4 of PBP prescribes that strategic planning should exclude 'inappropriate development' in bushfire prone areas, where:

- *the development area is exposed to a high bush fire risk and should be avoided;*
- *the development is likely to be difficult to evacuate during a bush fire due to its siting in the landscape, access limitations, fire history and/or size and scale;*
- *the development will adversely affect other bush fire protection strategies or place existing development at increased risk;*
- *the development is within an area of high bush fire risk where density of existing development may cause evacuation issues for both existing and new occupants; and*
- *the development has environmental constraints to the area which cannot be overcome.*

This study therefore assesses the proposal in the context of the PBP strategic planning principles, 'inappropriate development' exclusions as well as the assessment considerations identified in Table 4.2.1 of PBP, summarised in Table 2 below.

Table 2: Summary of PBP assessment considerations for a Strategic Bushfire Study (RFS 2019)

Issue	Summary of Assessment Considerations
Bush fire landscape assessment	A bush fire landscape assessment considers the likelihood of a bush fire, its potential severity and intensity and the potential impact on life and property in the context of the broader surrounding landscape.
Land use assessment	The land use assessment will identify the most appropriate locations within the master plan area or site layout for the proposed uses.
Access and egress	A study of the existing and proposed road networks both within and external to the planning proposal/master plan area and site layout.
Emergency services	An assessment of the future impact of the new development on emergency services provision.
Infrastructure	An assessment of the issues associated with infrastructure provision.
Adjoining land	The impact of new development on adjoining landowners and their ability to undertake bush fire management.

1.5.1 Assessment Framework

Investigation of the suitability for development within an area of interest, involves a complex and large array of bushfire-related issues and concepts. Prioritisation of first principle bushfire risk considerations is critical. Therefore, the following bushfire assessment framework will guide this study.

1.5.1.1 Residual risk

All BFPL poses a bushfire risk. Complete removal of bushfire risk is not appropriate or possible in many instances, nor is it a policy setting under PBP. Determining whether the level of residual risk (i.e., the level of risk after application of bushfire protection measures) is a key factor in the strategic assessment of whether a development proposal is appropriate.

Provided the risk exposure is appropriately reduced, development can occur with an appropriate level of safety on BFPL. PBP outlines the measures to achieve bushfire risk reduction generally and establishes the NSW policy setting for appropriate bushfire protection. Experience and research have successfully demonstrated appropriate bushfire protection is feasible within a very wide range of bushfire risk situations. Nevertheless, development on BFPL always has a residual bushfire risk e.g., from burning debris or for offsite evacuation, regardless of the initial risk level and risk treatments. This SBS acknowledges that the outcome of any potential development on BFPL resulting from the planning proposal includes a level of residual risk and explores the acceptability of that risk.

1.5.1.2 Risk to life versus risk to property

A lower residual risk is required for the protection of life than that required for the protection of built assets, due to the vulnerability of people exposed to bushfire attack and the pre-eminent value assigned to human life. Assessment of the residual risk has therefore considered life and property risks separately, in the first instance.

1.5.1.3 Life protection and evacuation

An appropriately low residual risk to human life is fundamentally important in bushfire protection. Whilst offsite evacuation potentially offers a safer destination, the risks associated with undertaking offsite evacuation (e.g., travel during an emergency) can pose additional risks. Also, the logistical

challenges of offsite evacuation can be high and should not become an unacceptable burden on emergency services, and in a strategic planning context, should not adversely impact the demands of the existing emergency service evacuation management.

Early offsite evacuation is the nationally accepted safest means for protection of life and for offsite evacuation to be effective, it should not require the assistance of emergency services. Notwithstanding that early unassisted offsite evacuation is a key risk assessment benchmark in this SBS; experience and research has demonstrated that it is not fail-safe or always feasible. Research and post incident inquiries have also found that providing evacuees options (along with warnings and information) is important to their survival.

Alternative options such as onsite refuge and 'shelter-in-place' are also not fail-safe, but design solutions exist in many situations to lower the residual risk to an appropriate level for both onsite and offsite options. A well-designed combination of the two may achieve the lowest residual risk, even if the onsite options are considered a 'redundancy' in terms of bushfire risk planning.

1.5.1.4 Emergency service response

The acceptability of proposed development should not be reliant on emergency service response / intervention. However, an emergency service response is a legitimate risk lowering consideration, that can be viewed as a bushfire protection 'redundancy' in a strategic planning context.

1.5.1.5 Adjoining lands

Whilst fuel management (e.g., hazard reduction burning) lowers bushfire risk under most circumstances, during extreme bushfire attack and with increasing time after a burn, the life and property protection benefit is likely to be minimal. As fuel management programs achieving a satisfactory level of risk reduction cannot be guaranteed, they cannot be relied upon for life and property protection design in a strategic planning context.

1.5.2 Acceptance Criteria

A clear quantification of an acceptable level of residual risk is important in assessing the appropriateness of a strategic planning proposal, however, PBP does not provide a clear quantification of an acceptable level of residual risk or define 'inappropriate' development with measurable criteria. In response to this limitation, the over-arching acceptance criteria for this study are that:

- The aims, objectives and Performance Criteria in PBP for the protection of life and property are achieved;
- The master plan complies with the strategic planning principles of PBP;
- The "inappropriate" development exclusion requirements of PBP are not triggered by the development proposed by the master plan;
- The Acceptable Solution bushfire protection measures within PBP can be met by the future development envisaged by the master plan;
- Compliance with PBP is not reliant on the intervention/response by emergency services or hazard management on adjoining land;
- The proposed development will not adversely impact the bushfire safety of occupants of nearby existing development and wherever possible will lower that risk; and
- An appropriate level of safety is possible from emergency management arrangements, including 'unassisted' offsite evacuation, along with other measures.

2. Summary of Planning Proposal

The proposed master plan will facilitate differing land use activities and future constructions across the site, as shown in Figure 3. It presents a plan that incorporates a variety of dwelling topologies as well as non-residential uses. Future land uses enabled by the planning proposal and structure plan would be subject to various aspects of PBP, when occurring on BFPL. These aspects are summarised in Table 3 below.

Table 3: Relationship of proposed development to Planning for Bushfire Protection

Proposed Land Use	Associated Facilities and/or Activities	Key PBP Considerations for future development
Residential Land Use		
Low and medium density residential; large lot and rural residential	Detached homes (large lots, standard lots), townhouse/ duplex, terrace homes	Chapter 5 of PBP outlines the bushfire protection requirements for this type of development, including performance criteria identified for APZs, access and infrastructure. Increased residential densities such as dual occupancy and second dwellings are subject to additional consideration outlined in Section 8.2.1 (Increased residential densities) of PBP.
Multi-storey residential	Walk-up apartments, mid-rise apartment, mixed use residential and retail	Chapter 5 of PBP outlines the bushfire protection requirements for this type of development, including performance criteria identified for APZs, access and infrastructure. There are also additional considerations outlined in Section 8.2.2 of PBP (Multi-storey residential development).
Special Fire Protection Purpose	Independent living	Chapter 6 of PBP outlines the bushfire protection requirements for this type of development, including performance criteria identified for APZs, access and infrastructure. There are also additional considerations outlined in Section 8.2.2 of PBP (Multi-storey residential development).
Non-Residential Land Use		
Commercial	Retail and specialised retail	Section 8.3.10 of PBP (Commercial and Industrial Development). Relevant protection measures to meet PBP aim and objectives.

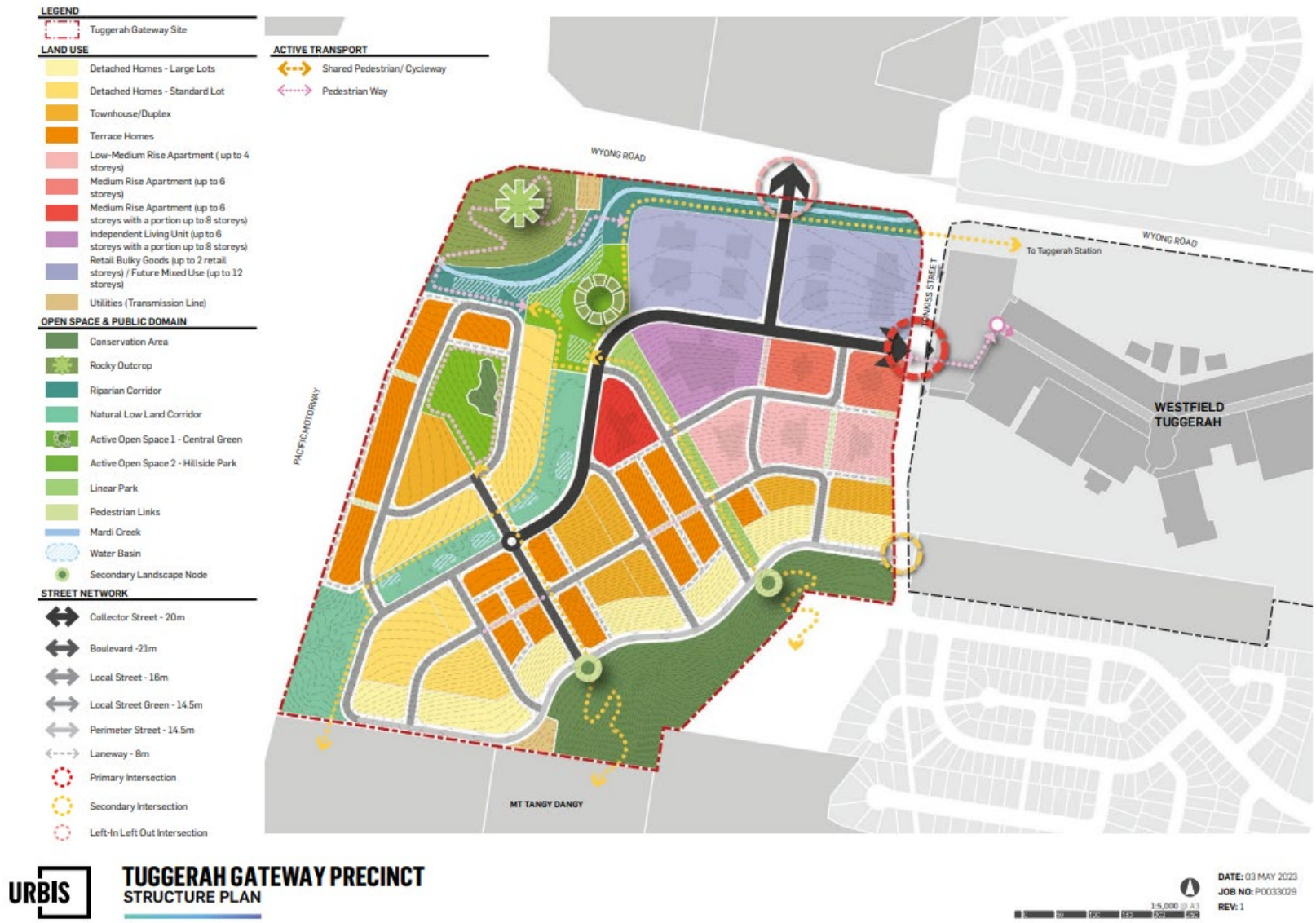

Figure 3: **Final Structure Plan (Source: Urbis)**

3. Bushfire Landscape Risk Assessment

A landscape risk assessment was undertaken for the master plan proposal and includes assessment of bushfire hazard, potential fire behaviour and bushfire history within a 5 km radius of the LGA.

3.1 Bushfire Hazard

The Gateway Site is situated within a broader complex landscape, with increasing residential and commercial development to the north and east, with forest vegetation to the south and west. Rural lands are present to the north-west and to a lesser extent, south-west of the site (Figure 1).

The bushfire hazard has been classified using the methodology prescribed by PBP, through assessment of vegetation, slope and bushfire weather.

3.1.1 Vegetation

Central Coast Council vegetation mapping (2017) was utilised for the broader study area whilst mapping for the subject land was prepared by ELA following site inspection (Figure 4)**.** A summary of the relationship between PBP hazard class vegetation formation within the study area is shown in Table 4.

The broader vegetated landscape is dominated by forest vegetation to the west, which becomes increasingly fragmented to the south-west and south, with rural land and urban development present in these directions. To the north-west, forest vegetation transitions to grassland on rural land. Vegetation in the eastern portion of the study area is highly fragmented, with smaller patches of remnant vegetation situated amongst an urban dominated landscape.

3.1.2 Slope

Slope across the broader study area has been generated from a Digital Elevation Model (DEM) which was established using 2 m contours. The slope raster has been classified into the following slope classes as per PBP: 0° (flat); >0° – 5°; >5° – 10°; >10° – 15°; >15° – 20°; >20°. Figure 6 shows the slope across the broader study area, whilst Figure 7 demonstrates the slope within the subject land and immediate surrounds.

As is evident in Figure 9, the terrain to the west and south of the site is more steeply sloped and variable in comparison to areas to the north and west of the site, which are more gently sloped. Within the subject land, slope increases to the south-west of the site toward Mt Tangy Dangy, which is situated adjacent to the southern boundary of the subject land.

Table 4: PBP hazard class and fuel loads for vegetation types in the study area

PBP Hazard Class	Fuel Load (t/ha)[1]	Keith Formation
Forested Wetlands	15.1	Coastal Floodplain Wetlands
Forests	36.1	Dry Sclerophyll Forests Coastal Swamp Forest Wet Sclerophyll Forests
Rainforest	13.2	Northern Warm Temperate Rainforests
Freshwater Wetlands	4.4	Coastal Freshwater Lagoons Coastal Heath Swamps
Grasslands	6	Unmanaged grasslands Derived Native Grasslands

[1]FROM A1.12.8 OF PBP

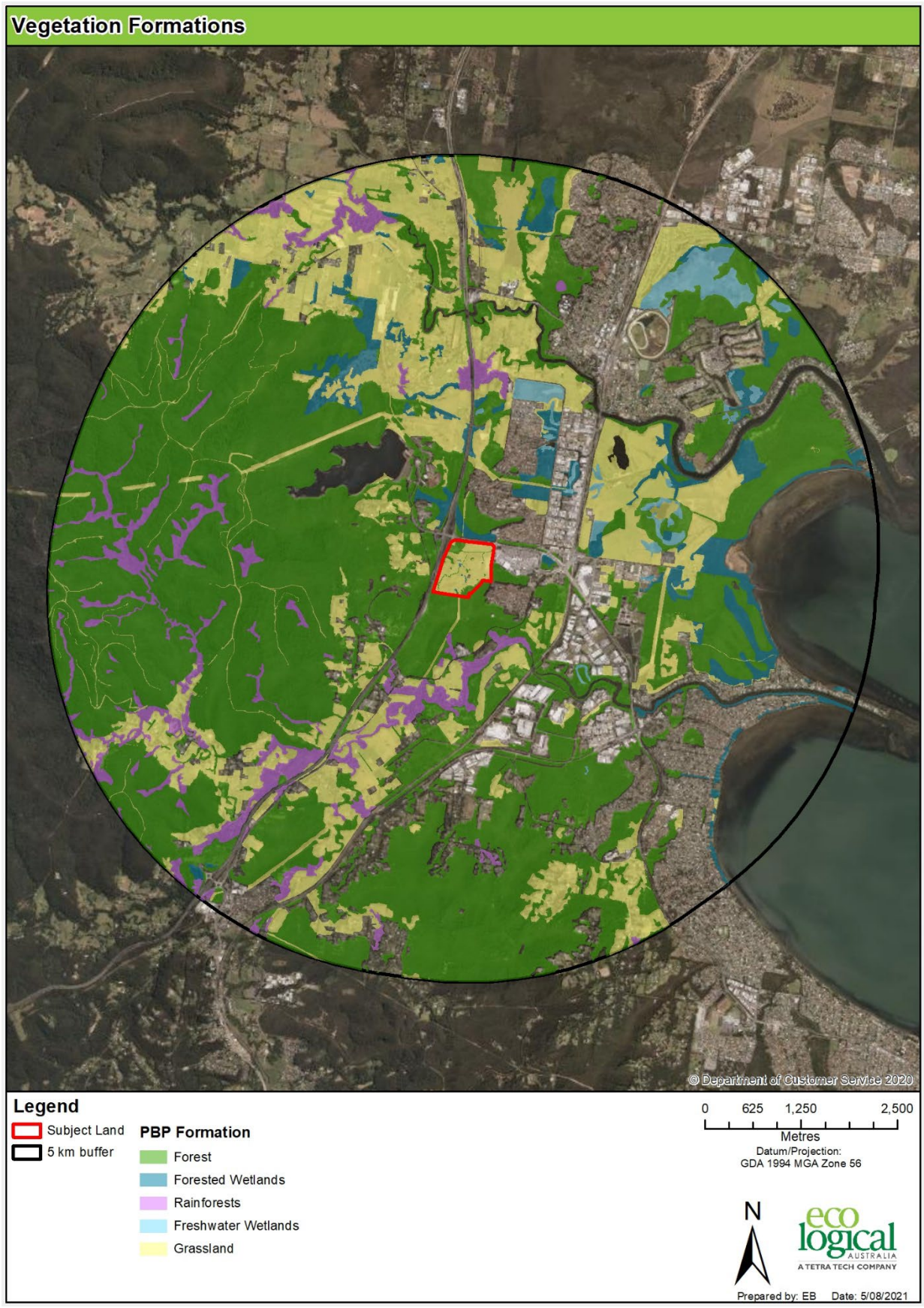

Figure 4: Vegetation communities within the greater Study Area

Figure 5: Vegetation within the Subject Land and surrounds

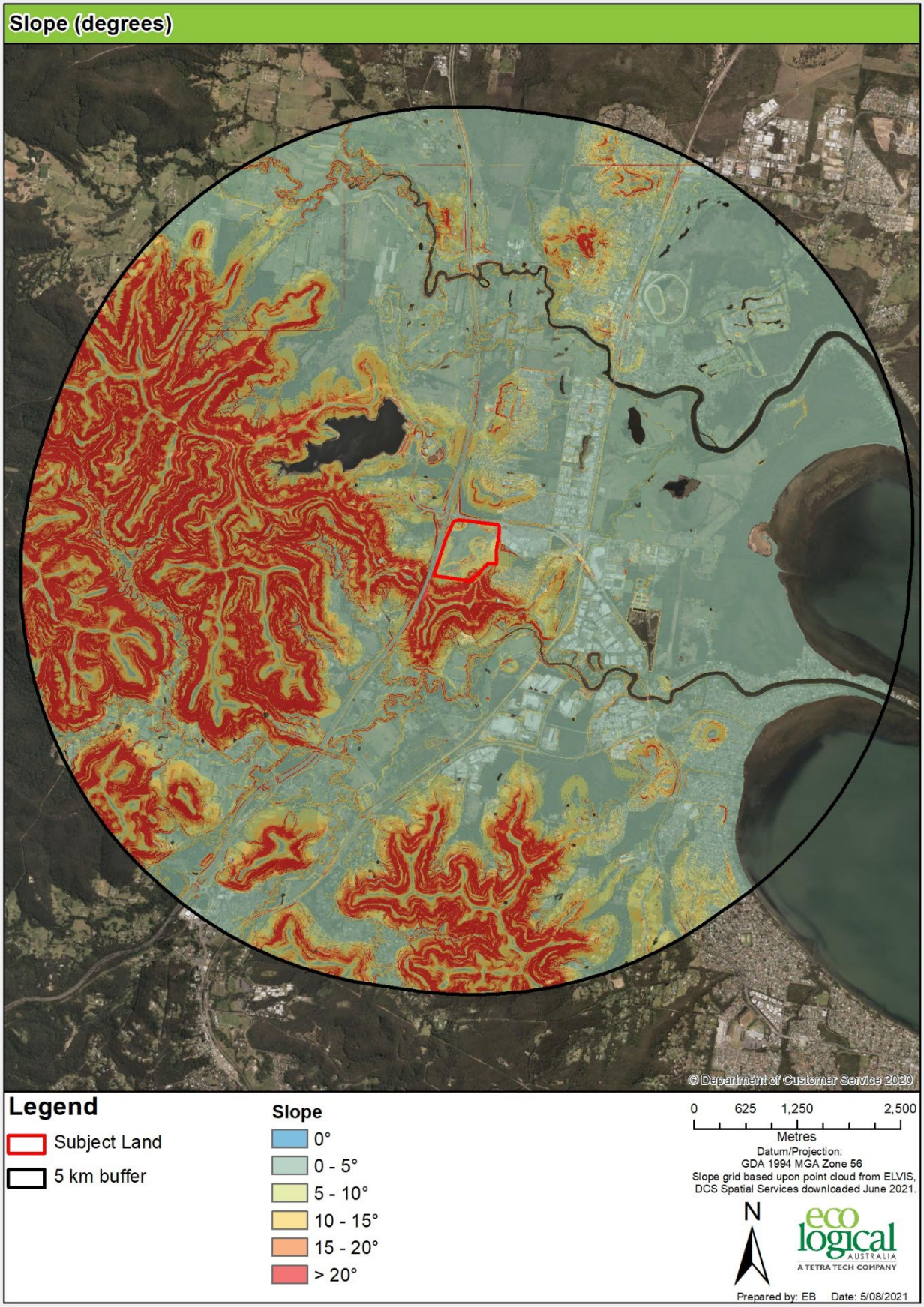

Figure 6: Slope within the Study Area

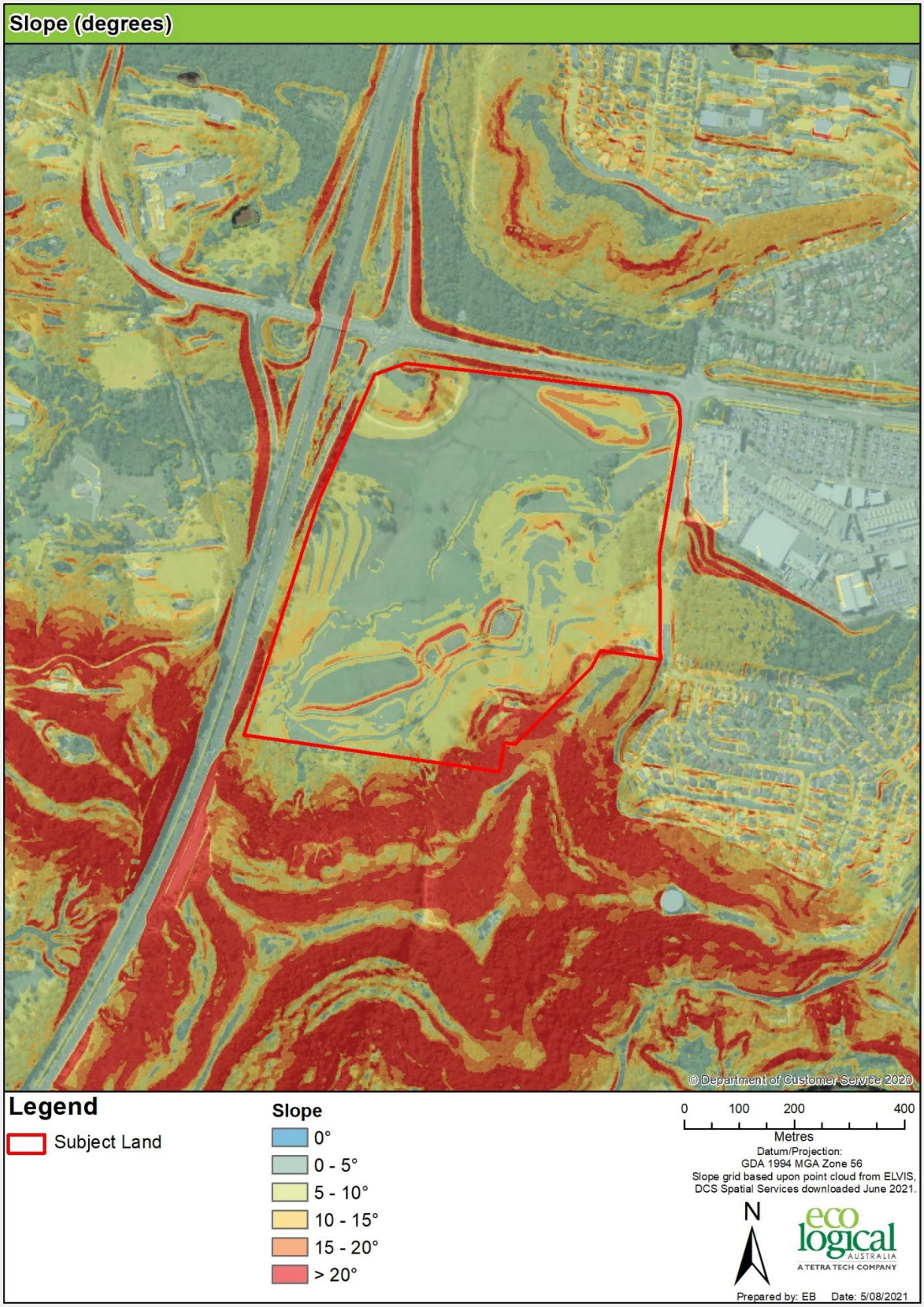

Figure 7: Slope within Subject Land and surrounds

3.1.3 Bushfire Weather

The Tuggerah Gateway site is situated within the Central Coast Bush Fire Risk Management Committee (BFRMC) area. The climate throughout the Committee area is generally cool temperate, with rainfall predominant in Summer. The Subject Land is situated on the periphery of the coastal strip, and therefore is likely to be influenced by both coastal conditions as well as systems influencing the western portion of the study area, which are accompanied by lower humidity and slightly warmer conditions.

Whilst the gazetted bushfire season generally commences in October, as identified in the Central Coast Bush Fire Risk Management Plan (BFRMP), the bushfire season may span from August to March, and conditions include north-westerly winds, high daytime temperatures and low relative humidity. Dry lightning storms may also occur occasionally during the bushfire season (BFRMC, 2020).

Bushfire weather is often described in terms of the Forest Fire Danger Index (FFDI) and this metric has a direct influence on the intensity of bushfire behaviour, with a higher FFDI corresponding to weather conditions with potential for higher intensity fires. Weather data analysed by Lucas (2010) under the National Historical Fire Weather Dataset (1972-2020) incorporates the daily FFDI, where suitable inputs are available, from over 70 weather stations across Australia. Days of Very High Fire Danger Rating (FDR) or above, occur on average about 9 days per year based on data analysed from the National Bushfire Weather Data set for Sydney Airport weather station (station number 066037) which is the closest suitable weather station to the site in the dataset compiled by Lucas (2010).

For the purposes of PBP, the FDI required to be used for development assessment for the site, is 100, as identified for the Greater Sydney Region which includes the Central Coast LGA. The FDI used by PBP influences certain bushfire protection measures including Asset Protection Zones (APZ) and construction standards via the assessment of the Bushfire Attack Level (BAL).

However, utilising historical data from the Sydney Airport weather station from the National Historical Fire Weather Dataset, and applying the maximum FFDI for a 1 in 50-year event (being the accepted recurrence period for land use planning) provides a better understanding of bushfire weather relevant to the Study Area. To analyse the FFDI for a 1 in 50-year event from the Sydney Airport weather station data, a Generalised Extreme Value (GEV) analysis was undertaken using the process documented by Douglas (2017) and Douglas et al (2014; 2016). The dataset was split into subsets based on identified directions of potential bushfire attack relevant to the site, being North to south-east (clockwise); South-east to South-west (clockwise); South-west to North (clockwise). The following directional FFDIs were identified through the GEV analysis of the historic weather records for Sydney Airport:

- Maximum FFDI for wind directions from the north to south-east was 63;
- Maximum FFDI for wind directions from the south-east to south-west was 46; and
- Maximum FFDI for wind directions from the south-west to north was 114.

This analysis indicates that there is variation in the potential likelihood and consequence of bushfire attack from different directions, toward the study area as shown in **Figure 8**. Areas exposed to bushfire attack at higher FFDI are more likely to be impacted by fire as adverse fire weather will occur more often from those directions and a higher fire intensity is more likely as the weather conditions reach higher FFDI values. For the Gateway site, aspects exposed to hazards in the south-west to north are more likely to be subject to these conditions. Areas exposed to bushfire attack at lower FFDI have a lower (but potentially still significant) risk profile.

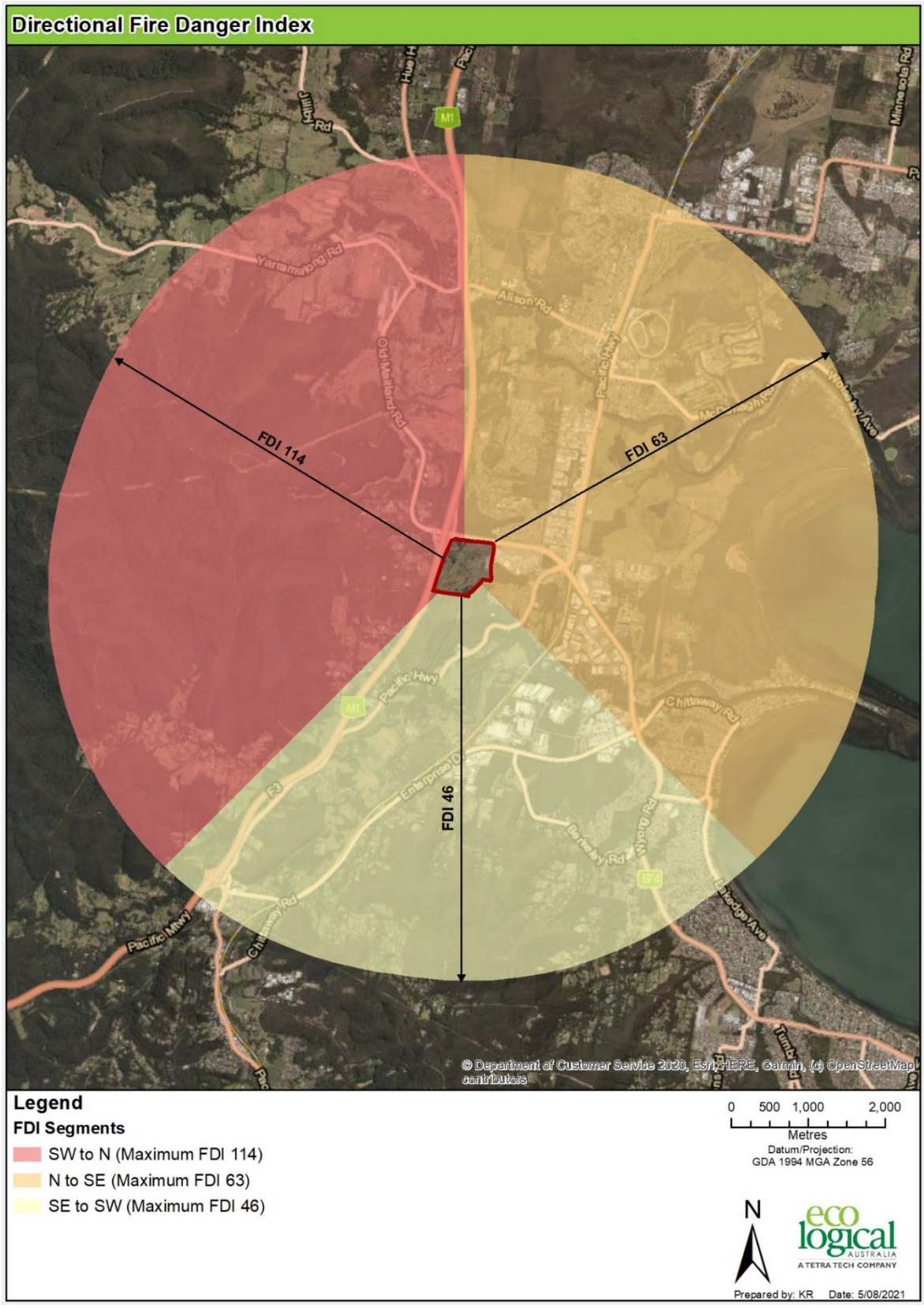

Figure 8: Directional FDI Analysis

3.2 Bushfire Risk Considerations

The following sections outline considerations informing the bushfire risk exposure of the subject land.

3.2.1 Bushfire History

According to the Central Coast BFRMP, there are on average of 843 fire incidents per annum, however only 6 to 8 of these fires progress to major fires.

As mapped in the NPWS fire history mapping dataset (DPIE 2021) since 1957 various fires have occurred within the broader study area, however no fires are mapped as having impacted the subject land during this time (

Figure **9**). The fire history to the west of the site generally includes various smaller fire events, however very few have occurred over the last 10 years. In the east of the study area, fewer wildfires have occurred, and aside from a small spot fire, these fires have not advanced beyond the Tuggerah Industrial area.

Whilst this dataset would not contain all wildfires, it indicates that the frequency of wildfire with the study area is low, with very few areas subject to repeated wildfire, as indicated in Figure 10**.** Further, mixed management of land within proximity to the Gateway Site along with fire mitigation advantages from road infrastructure and urban development have likely contributed to no fires impacting the site or immediate surrounds.

3.2.2 Fire Catchment

High level analysis of the potential fire catchments influencing the study area was undertaken and the results of this analysis are displayed in Figure 11. Delineation of fire catchments helps to identify the location and size of potential fire run and therefore bushfire attack scenarios for different locations within the subject land. This informs assessment of the risk profile across the site, with exposure to larger fire catchments generally resulting in an elevated bushfire risk.

As evident in Figure 11, fire catchments influencing the subject land are more prominent to the west and southwest, with potential fire pathways extending over 5 kilometres. However, the Pacific Motorway provides a significant fire break that somewhat mitigates fire activity from this direction, as does the large water storage body about 2 km north west of the subject land. Fire pathways to the south are less than 2km in length and include conservation lands associated with Mt Tangy Dangy, however the approach of any fire to the site from this direction is downhill, which moderates the potential severity. To the north and east, fire pathways are considerably reduced due to the hazard being fragmented by urban development.

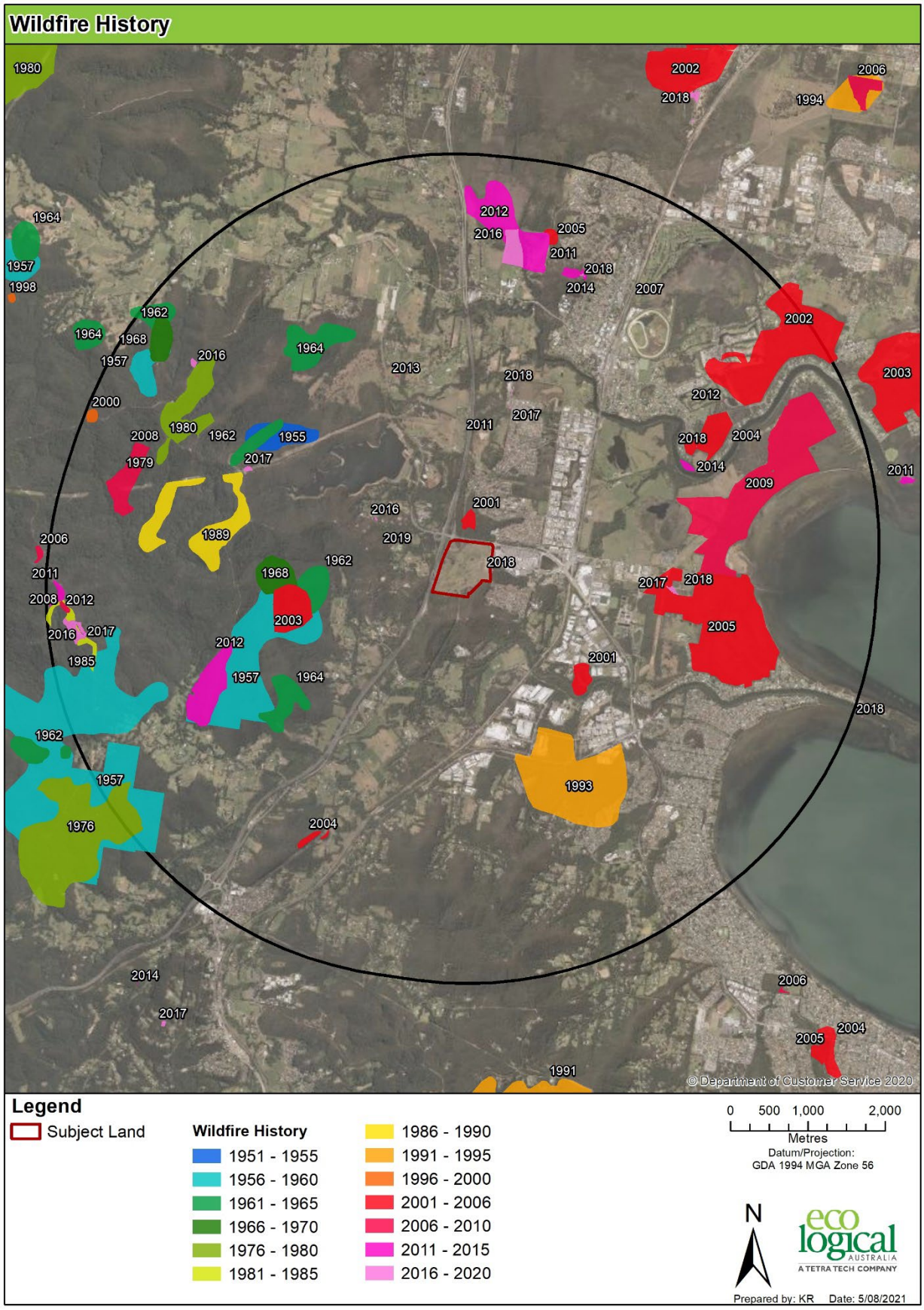

Figure 9: Wildfire history within the study area.

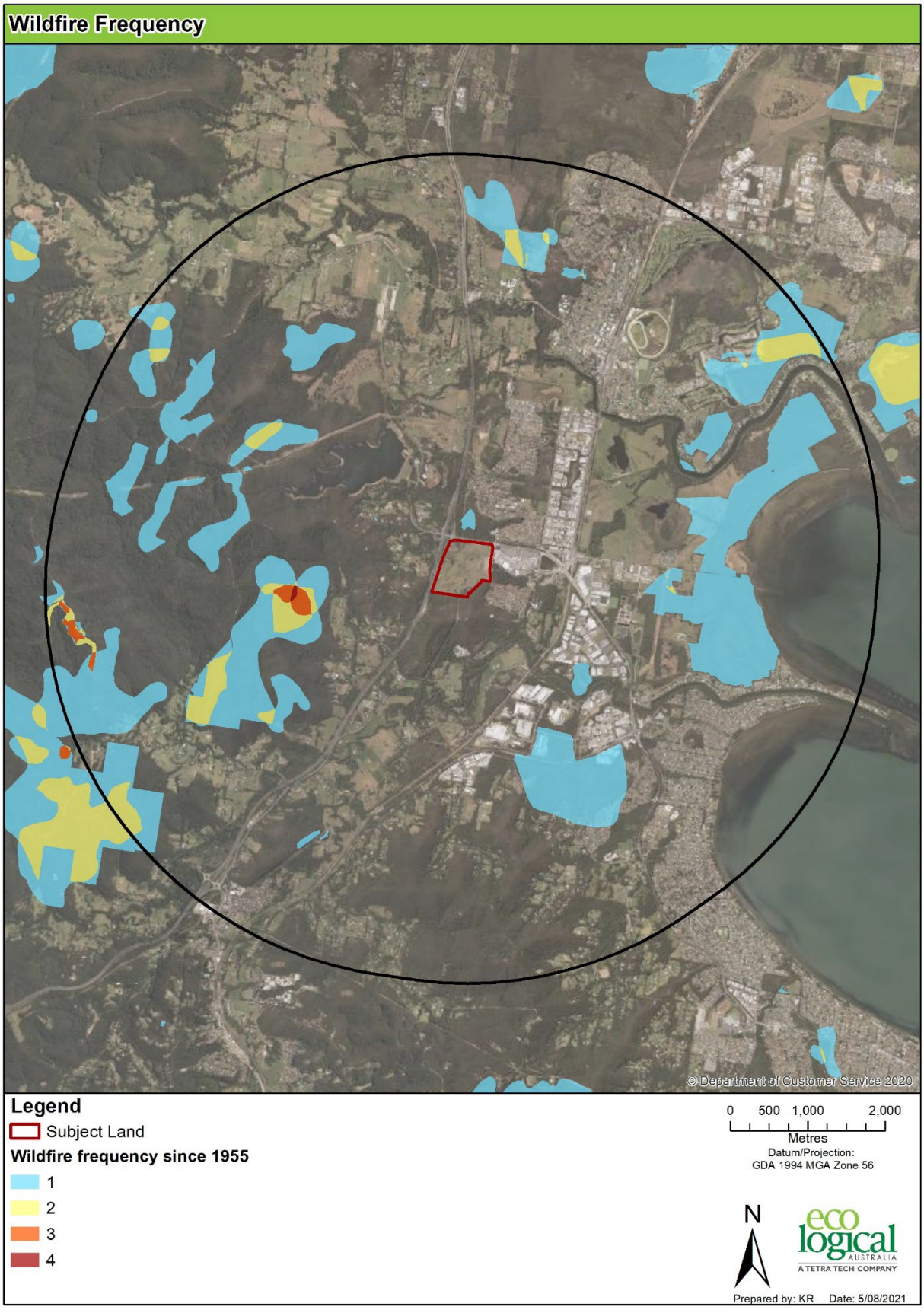

Figure 10: Wildfire frequency since 1955.

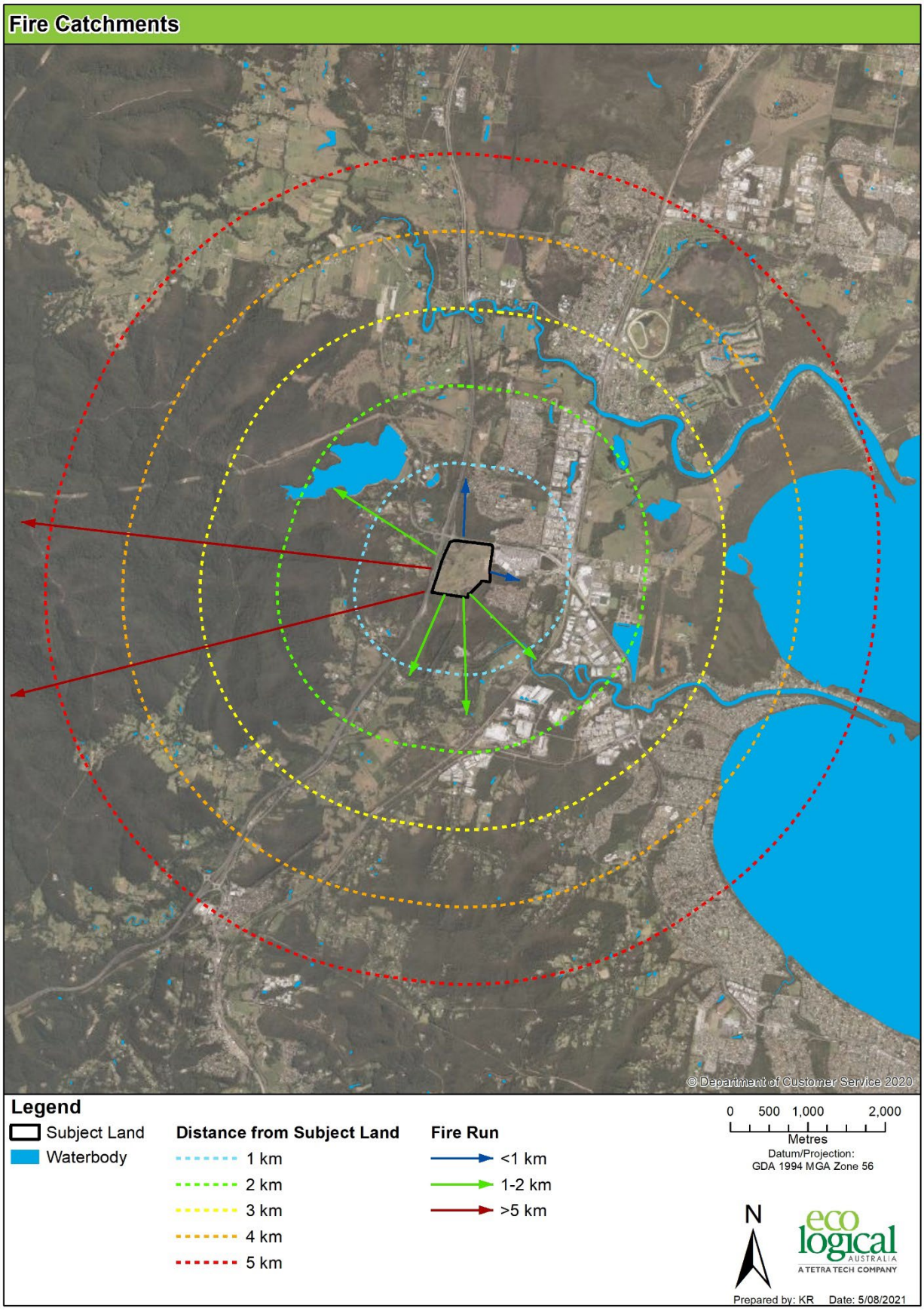

Figure 11: Fire catchments influencing the subject land.

3.2.3 Potential Fire Behaviour

Whilst each bushfire event is different, fire spreads by responding to changes in fuel, terrain, and weather conditions. Therefore, based on weather analysis, landscape conditions and fire history, potential fire behaviour can be determined. It is generally anticipated that a potential fire within the study area and surrounds, would spread more quickly and have the potential for higher intensities when:

- Burning under the influence of north-westerly to westerly winds, particularly during warmer summer months; and/or
  Moving upslope on steeper vegetated areas.

3.2.3.1 Bushfire Intensity

A bushfire intensity model for the study area was prepared by ELA for the primary bushfire attack direction from the west. The model provides an indication of the potential head fire intensity from the direction of attack for the scenario being modelled and uses the baseline hazard data (vegetation type, fuel load and terrain), fire intensity formulae of Cheney *et al.* (2012) and the directional FFDI outputs derived from the weather analysis discussed in Section 3.1. Bushfire intensity is a significant determinant of risk to life and property and the controllability of bushfires and therefore important in the consideration of the bushfire risk context. It should be noted however, that the model calculates instantaneous maximum intensity for each grid cell for the scenario modelled, so in some cases they over represent the severity of potential bushfire behaviour, particularly small, isolated or narrow patches of bushfire hazard. They also don't indicate burn duration / residence time, which for grassland, whilst it can burn at high intensity, the residence time is very short.

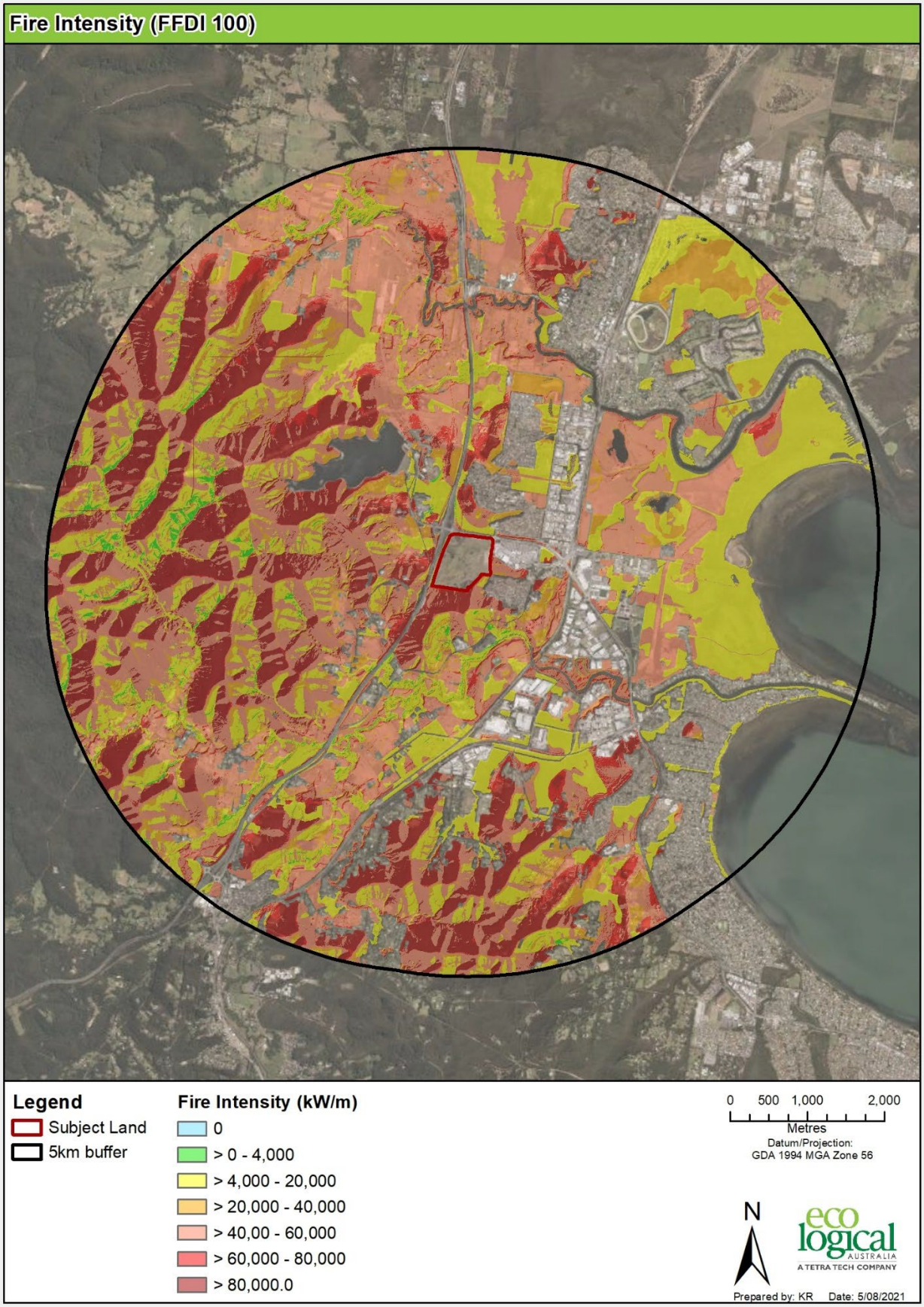
Fire Intensity (FFDI 100)
Legend
Subject Land
5km buffer
Fire Intensity (kW/m)
0
> 0 - 4,000
> 4,000 - 20,000
> 20,000 - 40,000
> 40,00 - 60,000
> 60,000 - 80,000
> 80,000.0
0 500 1,000 2,000
Metres
Datum/Projection:
GDA 1994 MGA Zone 56
N
eco logical AUSTRALIA
A TETRA TECH COMPANY
Prepared by: KR Date: 5/08/2021

Figure 12 shows that very high fire intensities under an FFDI of 100 can occur within the study area, and in proximity to the subject land, predominantly to the west, in association with forest vegetation on steep west facing slopes. There is high fire intensity modelled to the south of the site on Mt Tangy Dangy, however this fire would be moving away from the site and not attack the site at those intensities modelled. Given there is a downhill fire run from the south, bushfire attack on the site from this southerly direction would be significantly less than that modelled, coupled with the expected lower FFDI. It is also expected that fire intensities west of the Pacific Motorway and in the north-west would be lower than predicted due to land management in this area associated with rural residential development.

Despite that the model demonstrates potential for relatively higher bushfire intensities in proximity to the site, bushfire risk mitigation measures can help ensure the severity of attack is lowered to an appropriate level.

3.2.3.2 Potential for Extreme Fire Behaviour

It is important to note the models also so do not consider extreme fire behaviour / weather including phenomena such as:

- Spotting/firestorm;
- Fire tornado/whirls;
- Lateral vortices;
- Junction zones (Jump fires);
- Eruptive fires;
- Conflagrations;
- Downbursts; and
- Pyro-convective events.

3.2.4 Ignition and Fire Spread Scenarios

The Central Coast BFRMP identifies the main sources of ignition in the BFRMC area are:

- Illegal burning activity
- Escapes from legal burning
- Arson and incendiarism
- Ignition of abandoned/stolen motor vehicles
- Lightning
- Arching electrical power lines

The most prominent fire runs to the west of the site may be triggered by any of the above ignition scenarios, with rural areas and bushland reserves often subject to fires activity resulting from human interference, the Pacific Motorway presents a significant fire break to hinder fire spread to the Gateway Site. Additionally, there are various fire management zones surrounding the subject land which would fragment the fire pathway to the site. As evident in Figure 13, there is fire management occurring in most directions from the site, including the presence of Strategic Fire Advantage Zones (SFAZs), Asset Protection Zones (APZs) and Land Management Zones (LMZs). Additionally, fire spread from the east is highly constrained due to the significant fragmentation of natural areas and heavy urbanisation. Fire

spread from the south is less likely to pose a significant risk to the site given the downhill approach and feasibility of onsite APZs.

While potential ignitions and fire spread scenarios vary in each direction, emergency services are close by to respond quickly to any fire activity. As indicated by the fire record, there has been little fire activity in the immediate surrounds, and no recorded fires have progressed east beyond the Pacific Motorway. Therefore, the above ignition sources and fire spread scenarios are not considered an increased risk for the proposed development.

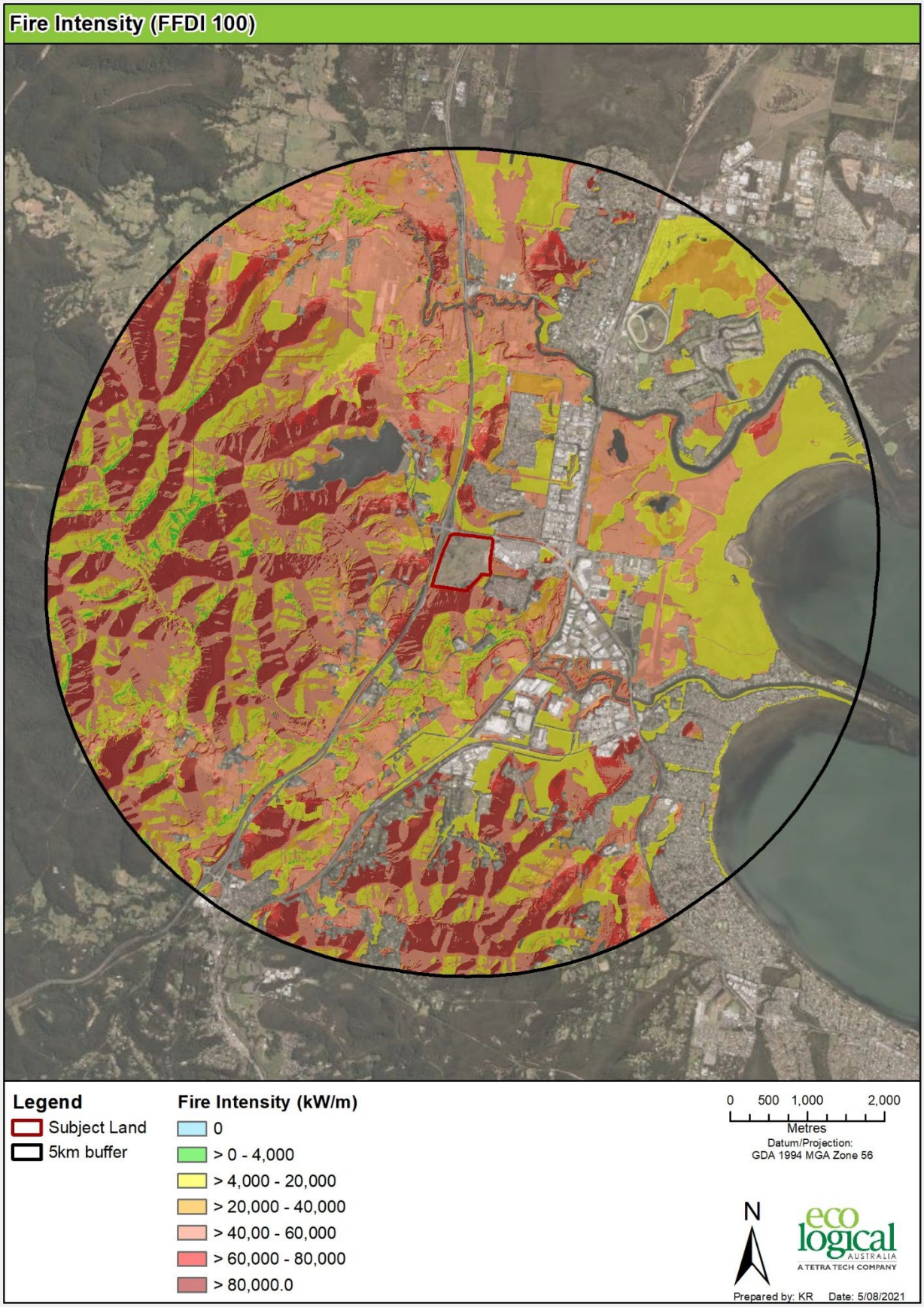

Figure 12: Fire intensity model for the Study Area

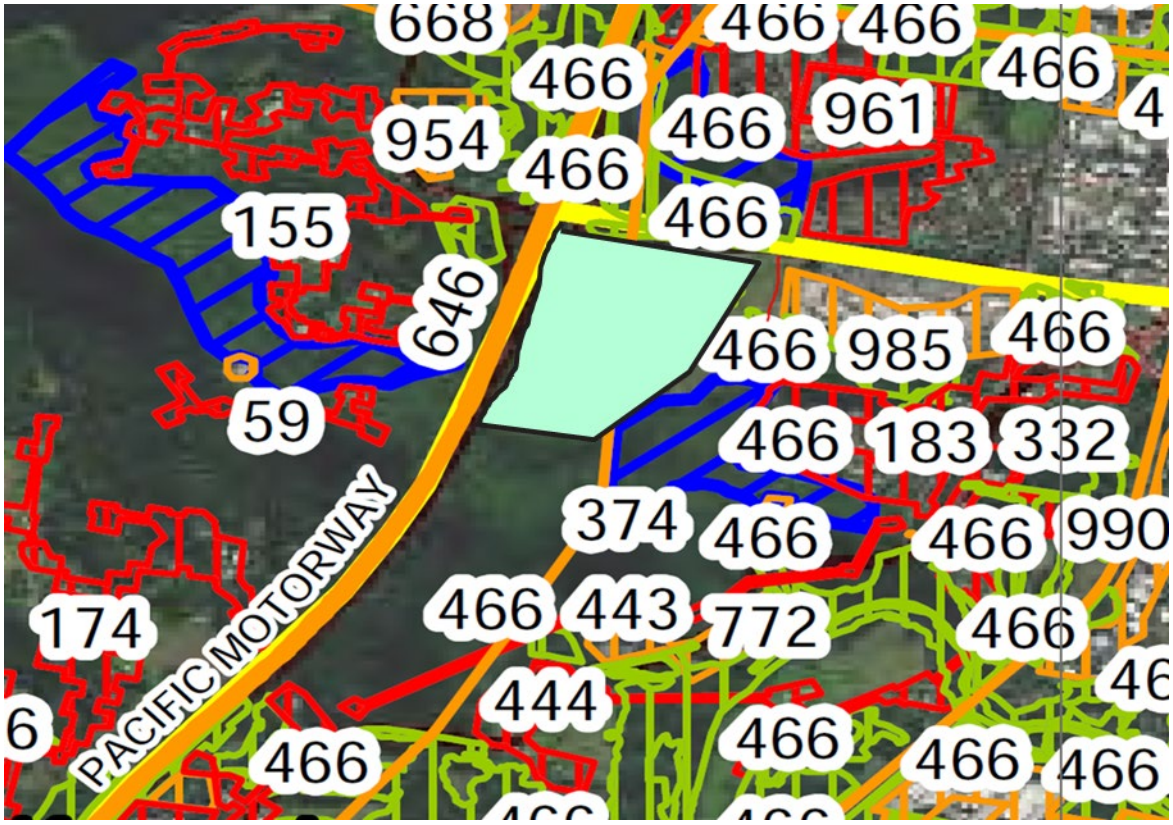

Figure 13: Fire Management Zones Surrounding the Gateway Site (source: Central Coast BFRMC, 2020). The gateway site is indicated in green, with the SFAZ (blue), APZ (orange) and LMZ (olive).

3.3 Summary of Landscape Bushfire Risk Assessment

The landscape bushfire risk assessment for the subject land and surrounds considered the bushfire hazard including analysed bushfire weather conditions, fire history, fire catchments influencing the site, potential fire behaviour and fire spread scenarios.

The location of the subject land is afforded mitigation advantages to reduced fire pathways and intensity, including the Pacific Motorway parallel to the western boundary of the site, and the mixed management of rural lands immediately west of the motorway. Existing fire management activities occurring in close proximity to the site also help to mitigate fire pathways to the site. To the north Wyong Road also provides a fire advantage for potential fires approaching from the north. With increasing development occurring across the region, further reduction in fire intensities and fragmentation of fire pathways is expected, particularly to the north and east.

In evaluating the landscape bushfire risk, the following high-level observations are made:

- The direction of elevated risk from bushfire attack is from the west, due to higher FFDI, historical patterns of bushfire spread and more expanse of bushfire hazard.
- There are significant interruptions to the continuity of bushfire hazard provided by the Pacific Motorway, as well as a large water storage water body to the northwest of the site, which serve to interrupt potential fire pathways from the west and northwest, in combination with the fragmentation of the fire pathways via mixed land management practices of rural lands immediately west of the Pacific Motorway.
- Fire history supports a lower risk of bushfire spread reaching the site from the west (and other directions).
- Bushfire weather analysis indicates that lower maximum FFDI is likely for bushfire scenarios under N-SE and SE-SW winds.
- There is limited connectivity of the site to bushfire prone vegetation to the east and north.
- The bushfire hazard to the south of the subject land has a long downhill run to the subject land, which when combined with the lower maximum FFDI, indicates a moderated bushfire attack on the site from this direction.

4. Land Use Assessment

PBP outlines broad principles and assessment considerations for strategic planning proposals. It also specifies that bushfire protection measures (BPMs) need to be considered at the strategic planning stage, to ensure that the future development can comply with PBP, as per the specified BPMs in Chapters 5-8 of PBP. This land use assessment therefore considers the risk profile of the proposal, the suitability of proposed land uses and the feasibility of APZ requirements.

4.1 Risk profile

The feasibility of the Planning Proposal to comply with the BPMs identified within PBP is a fundamental consideration of the study. While BPMs and their performance criteria are a benchmark for approval of a development, a strategic level study needs also to evaluate these measures within the landscape risk context. This SBS has therefore considered the following:

- The bushfire landscape risk context in consideration of the protection measures for future development and their potential adequacy;
- The type/s of development proposed, and their suitability given the bushfire risk context;
- The pattern and potential bushfire resilience of the bushland interface; and
- Potential cumulative risk associated with proposed development in the locality.

The feasibility of the subject land to provide for APZ, a key bushfire protection measure, is assessed in the following section. This is followed by an evaluation of the proposed land uses.

4.1.1 Feasibility of Asset Protection Zones

Based on the bushfire hazard assessment, including areas of planned revegetation shown on the landscape plan (Appendix A) an assessment of the feasibility of PBP compliant APZs has been undertaken. The APZ dimensions listed in Table 5 are the minimum required APZs under the Acceptable Solutions of PBP for residential development (i.e., 29 kW/m^2) and SFPP development (i.e. 10 kW/m^2). Figure 14 shows that for both development types, the PBP required APZs can be accommodated within the site and design.

The following considerations and assumptions are made in relation to the mapped APZs:

- Vegetation formation in the assessment is based on internal mapping prepared by Eco Logical Australia and external PCT mapping for the Central Coast LGA;
- Vegetation assessment has included potential future vegetation hazard for planned revegetation in conservation areas, riparian corridors and open space, as identified in the landscape plan (Appendix A);
- As detailed design progresses, further site assessment may reveal slopes that are slightly (but not significantly) different to those used to plot the APZ;
- All APZs are assumed to be on land less than 18 degrees;
- Additional APZ and/or modification of the APZs in Figure 14 may be required if revegetation occurs beyond that identified in the Landscape Plan; and

- The APZs shown in Figure 14 can generally be facilitated by the proposal or incorporated into future design iterations as detailed design progresses to the DA stage, this includes the provision of APZs by proposed roads and lot setbacks.
- Based on the indicative staging plan (Appendix A), temporary APZs to support staged development are feasible.

Table 5: PBP APZ requirements

Transect	Slope	Vegetation Formation	Residential APZ (m)[1]	SFPP APZ (m)[2]	Comments
1	<5-10° downslope	Forest	36	93	APZ provided by Tonkiss Street and partially within subject land.
2	Upslope/flat land	Forest	24	67	APZ provided wholly within subject land .
3	Upslope/flat land	Forest	24	67	APZ provided wholly within subject land.
4	Upslope/flat land	Forest	24	67	APZ provided by Pacific Motorway.
5	<5-10° downslope	Forest	36	93	APZ provided by Pacific Motorway.
6	Upslope/flat land	Forest	24	67	APZ provided by Wyong Road.
7	Upslope/flat land	Forest	24	67	APZ provided wholly within subject land.
8	Upslope/flat land	Forest	24	67	APZ provided wholly within subject land.
9	<0-5° downslope	Low Hazard	14	47	APZ provided wholly within subject land
10	<0-5° downslope	Low Hazard	14	47	APZ provided wholly within subject land.
11	<0-5° downslope	Forest	29	79	APZ provided wholly within subject land.
12	<0-5° downslope	Low Hazard	14	47	APZ provided wholly within subject land.
13	Upslope/flat land	Forest	24	67	APZ provided wholly within subject land.
14	Upslope/flat land	Low Hazard	11	38	APZ provided wholly within subject land.
15	<0-5° downslope	Low Hazard	14	47	APZ provided wholly within subject land.

[1] Table A1.12.2 from PBP 2019, [2] Table A1.12.1 from PBP 2019

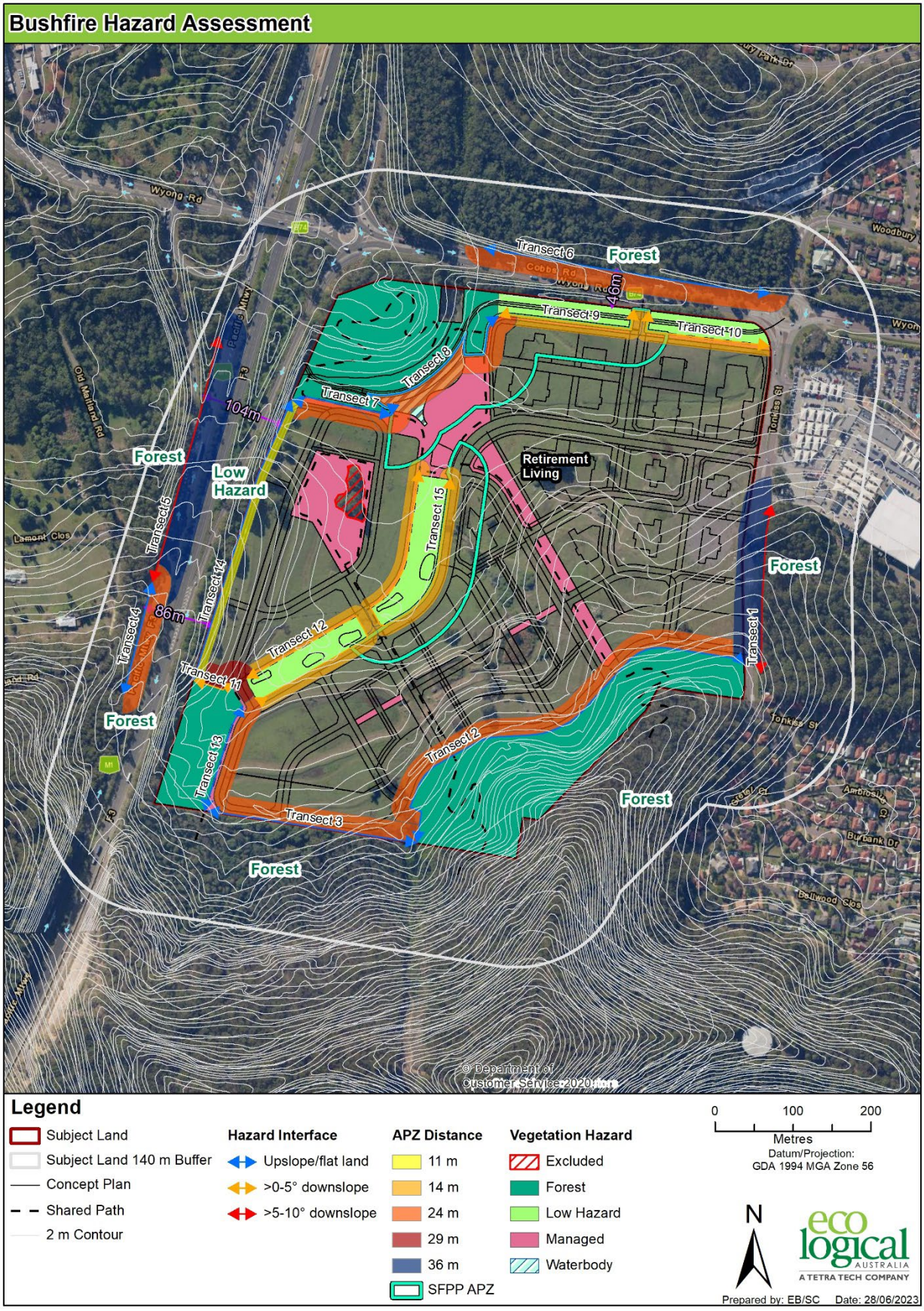

Figure 14: Bushfire Hazard Assessment and APZ requirement

4.1.2 Land use evaluation

The proposed land uses identified in the master plan will trigger various requirements under PBP when occurring on BFPL. Future development on BFPL would therefore need to satisfy the performance criteria identified in PBP for the type of development proposed. At a precinct level, it is expected that master plan design can accommodate the acceptable solutions identified in PBP to minimise reliance on performance solutions at the DA stage. A summary of these requirements is outlined below and evaluated for the structure plan in Table 6.

4.1.2.1 Chapter 5 of PBP – Residential and Rural Residential Subdivision

Much of the master plan area is planned for residential development and therefore will be subject to the requirements outlined in Chapter 5 of PBP. At the DA stage, to demonstrate the suitability of the proposed subdivision, the following provisions will need to be considered:

- Provision of compliant APZs;
- Access and egress within the developable land and along the adjoining public road system shall include safety provisions for attending emergency service vehicles and evacuating residents;
- Subdivision design shall include perimeter roads separating developable lots from hazardous bushland areas;
- Access is to be ensured for maintenance of APZ and other fire mitigation activities;
- Firefighting water supply and associated firefighting equipment (i.e., pump and hose) for each dwelling in addition to any reticulated water supplies; and
- Provision of access and infrastructure requirements according to Table 5.3b of PBP.

4.1.2.2 Chapter 6 of PBP – SFPP Development

Special Fire Protection Purpose (SFPP) provisions will be applicable to schools within the proposed development, along with Independent Seniors Living, childcare centres, tourist accommodation and any other development specified as SFPP under s.100B (6) of the RF Act or Section 46 of the RF Reg. These developments would need to meet the criteria outlined in Section 6 of PBP including:

- Increased APZ setbacks;
- Provision of a Bush Fire Emergency Management and Evacuation Plan; and
- Provision of suitable access and utilities according to Tables 6.8a-c of PBP.

4.1.2.3 Section 8.3.1 of PBP - Buildings of Class 5 to 8 under the NCC /Section 8.3.10 Commercial and Industrial Development

As per the NCC building classification system, buildings such as offices, shops, factories, warehouses, and other commercial or industrial facilities on BFPL have no specific bushfire requirements, and as such Australian Standard AS 3959-2018 and the National Association of Steel-framed Housing (NASH) Standard '*Steel Framed Construction in Bushfire Areas 2014*' are not deemed to satisfy (DTS) provisions. However, such developments still need to meet the aims and objectives of PBP and consider the following:

- Provision of appropriate APZ / defendable space;
- Provision of safe access to/from the public road system for egress and evacuation;
- Provision of suitable emergency and evacuation arrangements for occupants;
- Provision of adequate water supply to protect the building, and the location of gas and electricity supplies so as they do not contribute to the bushfire risk; and

- Provision for the storage of hazardous materials away from any hazards.

In meeting the objectives of PBP, best practice is for such developments to meet the requirements of BAL-29 in regard to APZ dimensions. At BALs of BAL-29 and below, no specific BAL requirements are usually placed on such development and general ember protection measures are usually the only recommendations from the RFS in relation to buildings of this development type. However, where such development is placed in areas of BAL-40 or BAL-FZ, the RFS do apply the relevant BAL requirements of AS 3959-2018 or the NASH Standard. General access and infrastructure requirements listed in Table 7.4a of PBP should also be considered.

4.1.2.4 Section 8.3.11 – Public Assembly Buildings

Where a public building has a floor space greater than 500m^2 it is considered an assembly building, and due to the evacuation of a large number of people, this type of development is generally treated as SFPP. This could include future facilities in the planned Neighbourhood Centre such as a community centre. To meet SFPP requirements, future developments of this nature on BFPL would need provisions for APZs that meet a maximum Radiant Heat Flux (RHF) of 10Kw/m^2 and a construction standard of BAL-12.5, along with other requirements as per Section 4.1.2.2.

4.1.2.5 Section 8.2.2 Multi-storey residential development

Buildings exceeding three storeys in height are considered to be multi-storey buildings by PBP and are required to comply with the performance criteria within Chapter 5, including the requirement for an APZ which meets a threshold of 29kW/m^2. In addition, the following issues need to be considered as per Table 8.2.2 of PBP.

- Higher residential densities for evacuation
- Location of high rise buildings in higher elevations or on ridge tops;
- Increased demand on road infrastructure during evacuation;
- Higher external façade exposed to bushfire attack;
- Additional fuel loading from car and storage facilities;
- Potential for balconies and external features to trap embers and ignite combustible materials;
- Increased exposure to convective heat due to height.

Table 6: Land use evaluation

Development Type	Assessment Considerations	Suitability
Residential Subdivision	The land use assessment identifies the most appropriate locations within the masterplan area for the proposed land uses with consideration to: • The risk profile of different areas of the development layout	Consideration has been given to the placement of different residential typologies and can comply with PBP
SFPP Development		Requirements for SFPP development have been considered and suitable areas are feasible in the Final Structure Plan

Development Type	Assessment Considerations	Suitability
Buildings of Class 5 to 8 under the NCC /Section 8.3.10 Commercial and Industrial Development	• Proposed land use zones and permitted uses • The most appropriate siting for different land uses based on the risk profile • The impact of the siting of these uses on APZ provision	No specific requirements apply however the aims and objectives of PBP can be achieved for future land uses. Where ground floor retail occurs in conjunction with residential development, then PBP requirements for residential development should apply.
Public Assembly Buildings		Requirements for SFPP development have been considered and suitable areas are feasible in the Final Structure Plan
Multi-storey residential development		Location of multi storey buildings is not in an area of higher elevation, and APZs are achievable. Design aspect and material can be considered at detailed design in relation to features such as balconies, shutters etc.

5. Access and Egress

The proposed master plan for the Gateway proposal includes provision for perimeter roads adjacent to key hazards including the conservation area in the south and the primary riparian corridor (Figure 14). Public roads external to the subject land, being Wyong Road and Tonkiss Street, also facilitate perimeter access and includes the provision of multiple access points for evacuation and responding emergency services.

As shown in Figure 15, the master plan provides the following access points:

- A primary intersection for the development on Tonkiss Street;
- A secondary intersection on Tonkiss street to provide access to the southern portion of the development; and
- A left in and left out intersection onto Wyong Road.

Preliminary traffic studies undertaken for the proposal by Ason Group (2021) indicate that transport infrastructure for the proposal has capacity to provide for the development, based on:

- Future year growth, trip rates, distributions and modal share goal for the precinct, determined in consultation with Transport for NSW.
- Reasonable scope in terms of intersection capacity upgrades to readily capture the full yields and extents of the development, including:
    - Signalisation at the intersection of Wyong Road and Tonkiss Street
    - Signalised access onto Tonkiss Street.

Additional recommendations from the Tuggerah to Wyong Economic Corridor Strategy (GTA Consultants, 2019) includes upgrade of:

- Pacific Motorway bypass of Wyong Town Centre;
- The Wyong/F3 interchange and;
- Wyong Road/Enterprise Drive roundabout to a signalised intersection.

5.1 Evaluation of Access and Egress

In evaluating access and egress in the current proposal as per the assessment considerations outlined in PBP, the existing and proposed road networks both within and external to the masterplan area should facilitate:

- The capacity of the proposed road network to deal with evacuating residents and responding emergency community profile;
- The location of key access routes and direction of travel;
- The potential for development to become isolated in the event of a bushfire.

Regarding the first assessment consideration, it is understood that preliminary traffic studies indicate the transport infrastructure for the proposal provides capacity to support development, with consideration to the movement and place objectives outlined in Table 9 of the Ason Group study (2021). It is recommended that as design progresses for the current proposal, the objectives of further traffic

studies include to assess the capacity of the road network under various bushfire attack scenarios to ensure offsite evacuation remains feasible, particularly as the site is planned to be activated in stages.

In review of the second assessment consideration, the location of access points and direction of travel is considered appropriate, with multiple access points and the direction avoiding areas of elevated risk i.e., to the west of the site. The potential for development to become isolated during a bushfire is not considered to be a key constraint for the proposal, with access routes in three directions, including Wyong Road to the north, Tonkiss street to the east and south-east.

Future development applications will need to address access requirements in more detail as per PBP 2019 (see **Appendix B**) and achieve:

- a road design that facilitates the safe access and egress for residents and emergency service personnel, including multiple access/egress options for each area; and
- a road design with adequate capacity to facilitate satisfactory emergency evacuation.

Review of the preliminary road design indicates compliance with the acceptable solutions of PBP is achievable. However, a key aspect as the planning proposal progresses is assessment of the road capacity for emergency egress, particularly with the proposed staging of the development. Further traffic studies should assess the capacity for evacuation and that available collector roads and sub-arterial roads are sufficient to facilitate adequate access and egress during early and intermediate stages of development. The indicative staging plan (Appendix A) indicates that all three proposed access points will be operational from stage 1a, and therefore staging is not considered a constraint to access under the current plan.

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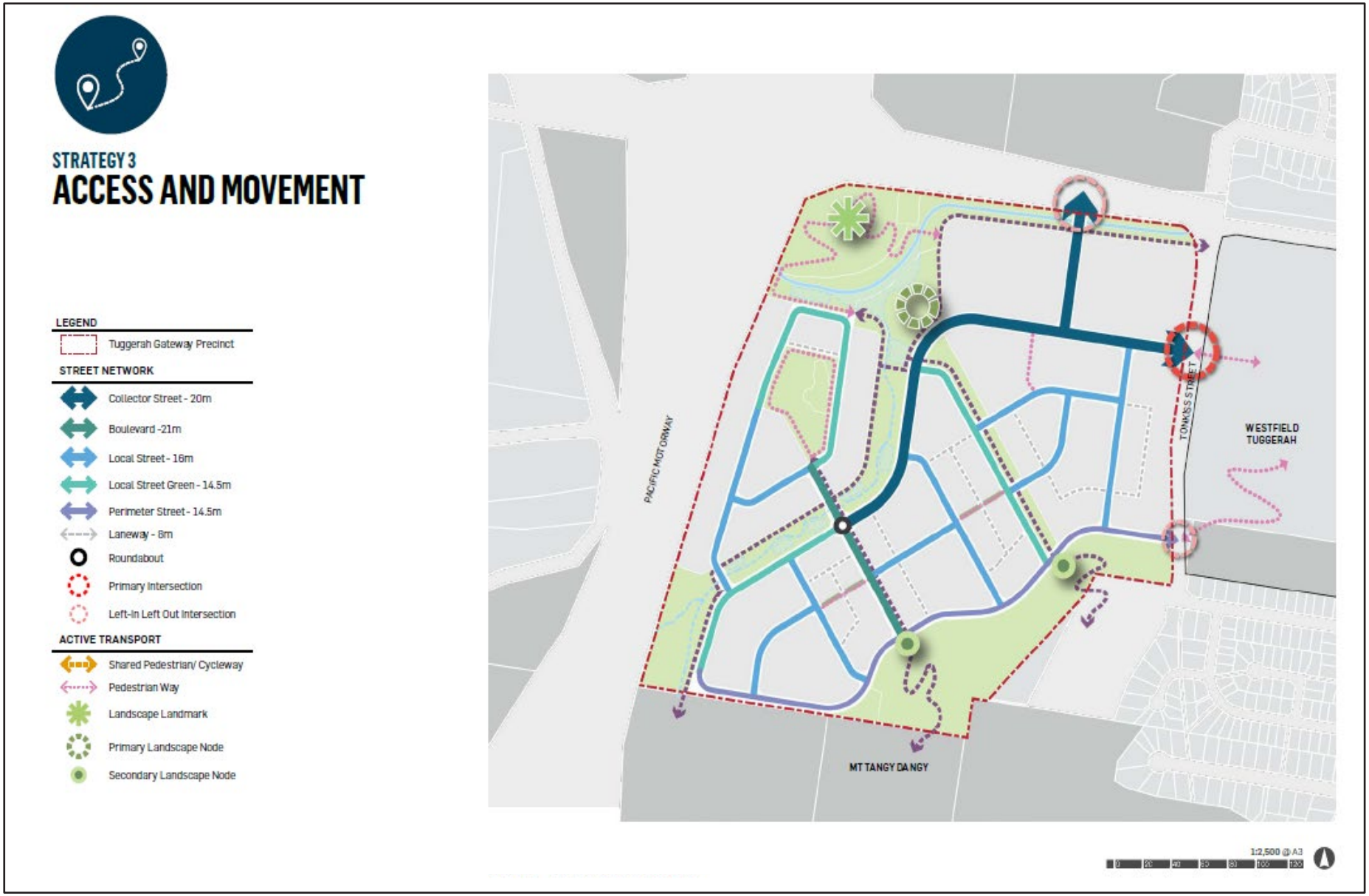

Figure 15: Access and Movement Strategy (source: Urbis)

5.2 Evacuation

The safety of emergency responders and occupants/users of the site exposed to potential bushfire attack is paramount. Therefore, this study has evaluated the viability of the three bushfire evacuation options and whether the Proposal is likely to exacerbate the risks associated with these options:

a. Early off-site evacuation (evaluated above);
b. On-site community refuges; and
c. In-situ sheltering (including a decision to stay and defend).

As discussed in section 5.1, a traffic analysis can provide a detailed assessment on the capacity for full, 'un-assisted' off-site evacuation at all stages of the development, however it is clear from the access and egress study outlined above that there are multiple internal and external access routes to facilitate safe, early off-site evacuation. Additionally, with the primary fire risk to the west, should the Wyong Road connection to the Pacific Motorway be subject to road closure during a fire event, offsite egress via two access points to the east via Tonkiss street provide alternate options. Therefore, offsite evacuation is not considered a constraint to the development, provided the existing public road capacity is sufficient following implementation of recommended upgrades, and during staging.

While on-site community refuges are currently not formally recognised or encouraged in the planning of new development in PBP; bushfire evacuation patterns (Whittaker *et al.* 2013, Strahan *et al.* 2018, Whittaker 2018, Whittaker 2019) suggest these should be part of best-practice strategic planning consideration as they add options when early evacuation is not feasible (e.g. rapid on-set bushfires) and potentially increase community safety and resilience in a broader range of bushfire attack scenarios. Early evacuation is not considered a constraint to this development, therefore on-site community refuge is not considered necessary to increase the resilience of the proposed development.

However, given the proximity of the development to Westfield Tuggerah (owned by the proponent), and planned transport connections to the shopping centre, the shopping centre can provide resilience in lieu of a purpose-built community refuge on site. The provision of areas or the dedication of sites within the proposed masterplan suitable for the establishment of a refuge building will increase the bushfire resilience of the community. Community refuge options such as an Evacuation Centre, Community Fire Refuge (as in Victoria) or Neighbourhood Safer Place (NSP) require comprehensive design. The following documents offer some guidance on these approaches:

- Bushfire Coordinating Committee Policy No. 1/2012 Community Safety and Coordinated Evacuations; and
- State Emergency Management Plan Evacuation Management Guidelines, March 2014
- *Neighbourhood Safer Places guidelines for the identification and inspection of neighbourhood safer places in NSW* (RFS, 2017). NSPs can be provided as Open Space or Building NSPs and must be sighted to have a radiant heat exposure of less than 2 kW/m^2 and 10 kW/m^2 respectively.

All three refuge types are acknowledged in the RFS NSP guideline document, but no standards have been established for Evacuation Centres and Community Refuges in NSW. Victoria is the only jurisdiction with a standard for Community Refuges and has already established four Community Refuges in higher bushfire-risk locations. Whilst Evacuation Centres and Community Refuges have not yet been approved

in NSW, and processes/standards for these not yet developed, there are compelling reasons for them after the Black Summer bushfire experience.

Neighbourhood Safer Places (NSP) are an option that are suitable as a "refuge of last resort" and, unlike evacuation Centres, do not rely on welfare agencies (under the LEMC) to operate the facility in a bushfire emergency. There are important differences between Evacuation Centres, Neighbourhood Safer Places (NSP) and Community Fire Refuges. A NSP is considered a refuge of last resort and defined as:

> "*a building or a space within the community that has been designated as such by the Commissioner of the Rural Fire Service. It provides for improved protection of human life during the onset and passage of a bush fire. It is a location where people facing an immediate threat to their personal safety or property can gather and seek shelter from the impact of a bush fire*."

Historically, NSP have been applied to existing communities, but in a Condition of Consent issued by the Independent Planning Commission was applied to a new subdivision in 2020; a precedent that encourages this level of forward thinking and design for new communities on Bush Fire Prone Land.

There are currently only a few Neighbourhood Safer Places (NSPs) located within close proximity to the Tuggerah Gateway Site (Table 7) and just one within 10km of the Subject Land (Figure 16). However, as discussed above, the provision of refuge on site is not considered minimum requirement or a constraint to the proposal with Westfield Tuggerah, situated to the east of the subject land providing a viable option for refuge or an NSP, subject to meeting the NSP criteria. In addition, Wyong Town Centre is situated in close proximity to the north of the site and provides an easy to reach safer location for evacuation, along with other low risk locations to the east.

Research has shown that not all people in recent bushfires evacuate early and some chose to stay and defend (Whittaker *et al.* 2013, Strahan *et al.* 2018, Whittaker 2018, Whittaker 2019), and the Structure Plan for the Tuggerah Gateway site illustrates there is opportunity to provide a bushfire resilient community and lower risk urban bushland interface through contemporary design standards under PBP bushfire protection measures and bushfire resilient infrastructure, particularly in relation to proposed location of retirement living land use, which is situated in the least bushfire vulnerable area of the site.

Table 7: Existing NSPs in vicinity of study area

Neighbourhood Safer Place[1]	Location	Suburb	LGA	Type	Distance (km)	Approx. Travel Time (min)[2]
Kurraba Oval	Kurraba Parade, Berkeley Vale	Berkeley Vale	Central Coast	Open Space	7.1	10
Mt. Penang Parklands Village Green	Village Green 1, Corner Carinya St and Parklands Road, Kariong	Kariong	Central Coast	Open Space	22.1	16
Charmhaven Foreshore	Intersection of Panorama Avenue and Restlea Avenue, Charmhaven	Charmhaven	Central Coast	Open Space	21.3	19
The Springs Golf Club	Peats Ridge Road, Peats Ridge	Peats Ridge	Central Coast	Building	24.8	19
Buff Point Foreshore Reserve	Buff Point Avenue, Buff Point	Buff Point	Central Coast	Open Space	25.4	20

[1] accessed from https://www.rfs.nsw.gov.au/plan-and-prepare/neighbourhood-safer-places; [2] estimate using Google Maps

Table 8: Assessment criteria for an NSP (RFS 2017)

Factor	Performance Criteria	Acceptable Solution
Radiant Heat	Building is located and constructed to enhance the chance for survival for humans in attendance from the radiant heat of a bush fire.	Building is situated to prevent direct flame contact, material ignition and radiant heat level of 10kW/m²; or Provide 139 metres separation distance from a bush fire hazard.
	Open Space is located to enhance the chance for survival for humans in attendance from the radiant heat of a bush fire.	Open Space is situated and maintained to prevent direct flame contact, material ignition and radiant heat levels of 2kW/m²; or Provide 310 metres separation distance from a bush fire hazard.
Maintenance of the Site and the Land Adjacent	Area between bush fire hazard and the site is maintained to a level that ensures the radiant heat levels at the Building/Open Space meet the Performance Criteria for Radiant Heat.	The site and land adjacent to the site between the Building/Open Space and the bush fire hazard is managed land or maintained in accordance with NSW RFS document Standards for Asset Protection Zones.

Table 9: Principles for NSP site identification (RFS 2017)

Consideration	Principles
Site Selection	An NSP should provide a safer place for the community.
	The community should be moving away from the bush fire hazard to access the NSP over short distances where possible.
	NSP locations should reflect community need and bush fire risk.
Moving to an NSP	An NSP should not be isolated from the community.
	The community should not be impeded from reaching the NSP area in a bush fire situation.
Capacity	Additional NSPs should be sought where it is likely current or potential NSPs cannot accommodate those likely to use it.
	Demand for use of an NSP reflect a community's level of bush fire preparedness.

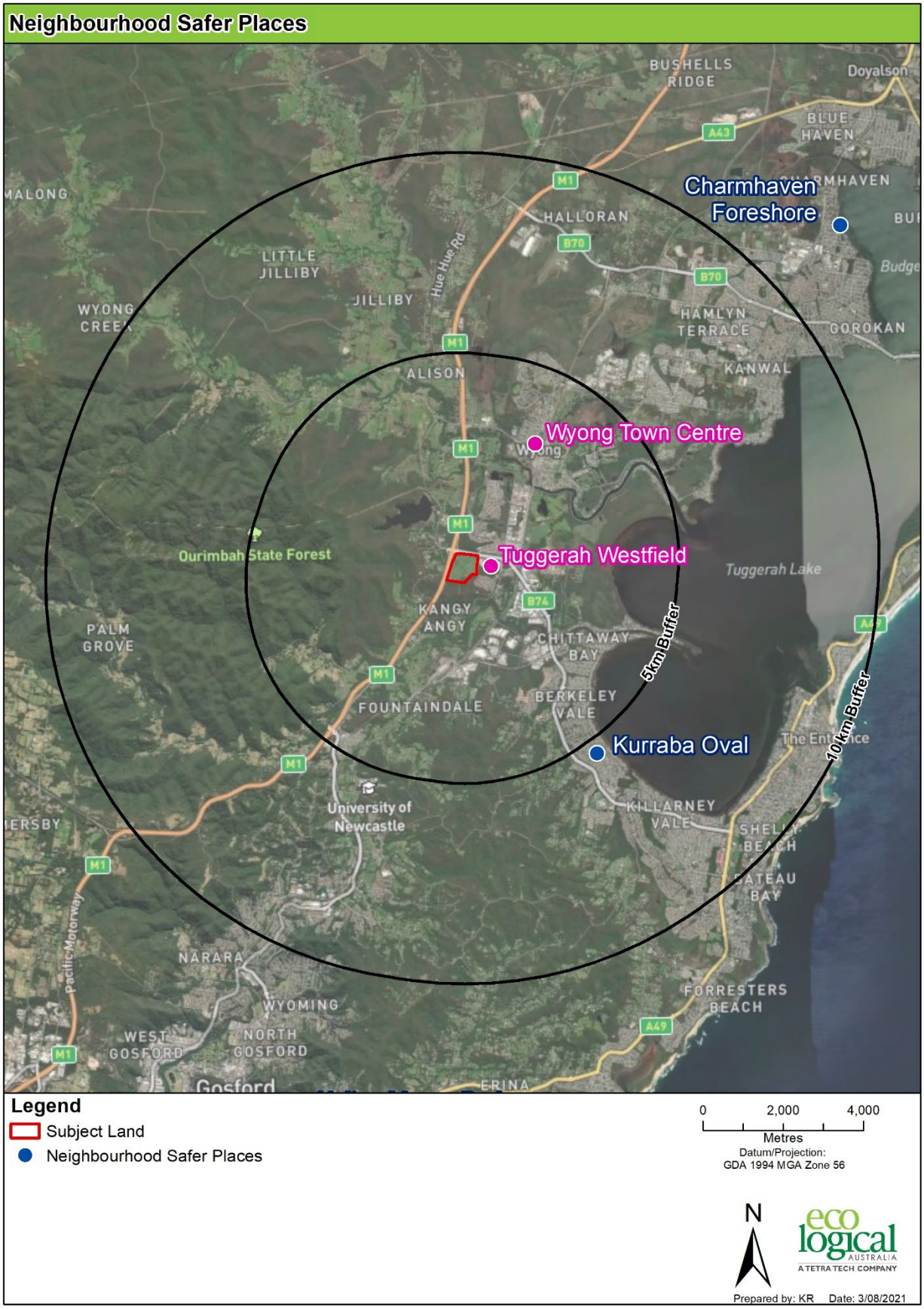

Figure 16: Existing Declared Neighbourhood Safer Places

6. Emergency Services

To gauge the proposals' ability to meet the objectives and strategic planning principles of PBP relating to emergency management, the following aspects were reviewed:

a. Consideration of the increase in demand for emergency services responding to a bushfire emergency including the need for new stations / brigades; and
b. Impact on the ability of emergency services to carry out the suppression in a bushfire emergency.

Regarding the demand for emergency services, ELA has reviewed the quantity of existing emergency services in proximity to the site and notes that there are three RFS Brigades close by as shown in Figure 17 and detailed in Table 10**10**. Additional Fire and Rescue NSW (FRNSW) resources are also stationed in proximity at Wyong and Berkeley Vale. As such, the subject lands are considered well-resourced and the proposal unlikely to require new stations or brigades.

Table 10: Fire Stations within proximity to the site

Station	RFS/ NSW FR	Distance Km	Time	Direction
Berkeley Fire Station	FRNSW	4.2	7 min	South-east
Tuggerah RFS	RFS	3.2	5 min	South-east
Wyong Fire Station	FRNSW	4.3	8 min	North
Berkeley Vale RFS	RFS	6.1	9 min	South- east
Ourimbah RFS	RFS	15	15 min	South-west

Regarding the impact of the proposed development on the ability of emergency services to carry out fire suppression in a bushfire emergency, the proposal allows for PBP compliant access, including perimeter roads, and water supply and hydrant access will need to comply with PBP at development assessment stage.

As such, there is no part of the assessment of the future impact on Emergency Services that suggests the proposed development should be excluded as inappropriate development under the Strategic Planning Principles or exclusion criteria within PBP.

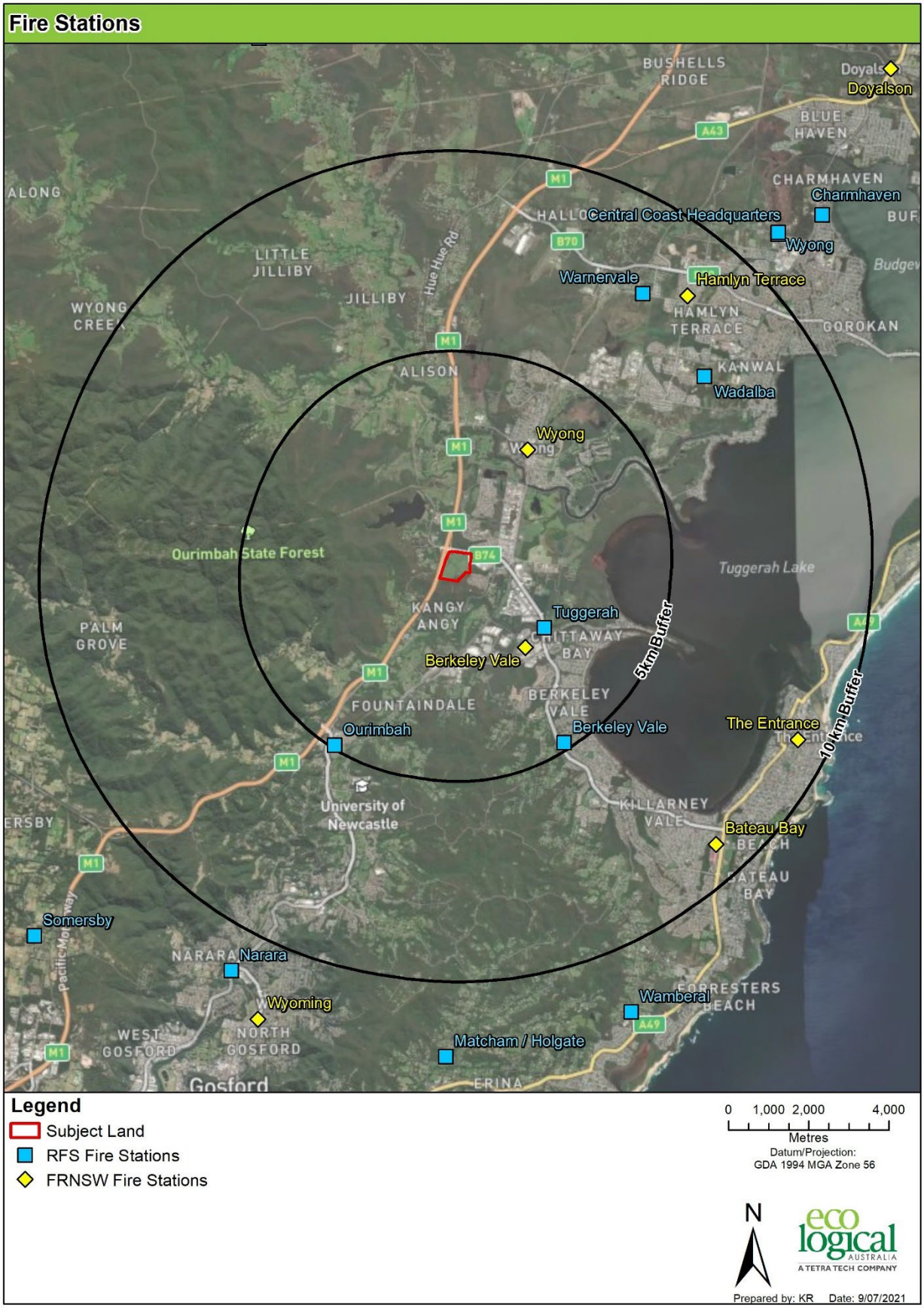

Figure 17: Fire Stations in close proximity to the site

7. Infrastructure

Future development on the subject land will need to meet the applicable requirements of PBP relating to infrastructure provision. The general requirements for development are discussed below and are considered achievable for this site. Specific requirements for SFPP developments and subdivision are detailed in PBP.

Strategic planning requirements for seek to identify issues associated with infrastructure and utilities. Key considerations on suitability of infrastructure to meet the requirements of PBP include the ability of the reticulated water system to deal with a major bush fire event in terms of pressures, flows, and spacing of hydrants and life safety issues associated with fire and proximity to high voltage power lines, natural gas supply lines, etc. These aspects are explored below and summarised in Appendix C. Table 5.3 and Table 6.8 of PBP detail the acceptable solution requirements.

7.1 Water

To comply with PBP, future development should be serviced by a reticulated water supply. Fire hydrant spacing, sizing and pressures should comply with AS 2419.1 – 2005 'Fire hydrant installations – Part 1: System design, installation and commissioning (SA 2005). Where this cannot be met, the RFS will require a test report of the water pressures anticipated by the relevant water supply authority. In such cases, the location, number and sizing of hydrants shall be determined using fire engineering principles. Fire hydrants should not be located within any road carriageway. All above ground water and gas service pipes external to any buildings are to be metal, including and up to any taps. Where reticulated water cannot be provided a static water supply for firefighting purposes is required on site for each occupied building in accord with the capacities outlined in PBP.

Further detail regarding water supply requirements is detailed in PBP and acceptable solution requirements for water supply are expected to be achievable for future development within the Gateway Site.

7.2 Electricity and gas

It is expected that future electricity supply to the subject land will be underground where possible and compliant with PBP. If existing or future electrical transmission lines to the subject land are above ground, the following requirements apply:

- Lines are installed with short pole spacing (30m), unless crossing gullies, gorges or riparian areas; and
- No part of a tree is closer to a line than the distance set out in accordance with the specifications in ISSC3 'Guide for the Management of Vegetation in the Vicinity of Electricity Assets' (ISSC3 2016).

Reticulated or bottled gas is to be installed and maintained in accordance with Australian Standard AS/NZS 1596:2014 'The storage and handling of LP Gas' (SA 2014) and the requirements of relevant authorities (metal piping must be used).

Further detail regarding electricity and gas requirements detailed in PBP. The acceptable solution requirements for these services are expected to be achievable for the future development within the study area contemplated by the Planning Proposal.

8. Adjoining Land

The future development contemplated by the Planning Proposal should not compromise any offsite bushfire management works. Given the adherence to PBP that is required, any future development should also not require a change to the bushfire management practices for retained and/or adjoining bushfire prone vegetation. Additionally, there is capacity for all APZ's to be wholly within subject lands or provided by public roads. Therefore, there are no concerns regarding the impact of this proposal on adjoining land.

9. Assessment of Strategic Planning Requirements

This section evaluates the Structure Plan for the Tuggerah Gateway Precinct, against the bushfire strategic planning requirements of PBP (detailed in Section 1.6) and based upon the assessment findings in the preceding sections, to determine whether:

- The Structure Plan poses an unacceptable risk or provides for inappropriate development;
- The Structure Plan adequately responds to the bushfire threat, appropriate to the current stage of planning; and
- Adequate bushfire protection measures can be provided to reduce the residual risk to an appropriate level.

The evaluation is based upon PBP Chapter 4 and the Assessment Framework of this Study (Section 1.6) and is summarised in Table 11. In addition to evaluating the Proposal against these matters, the evaluation specifically considers:

- Residual risk - the level of residual risk after the application of bushfire protection measures is a key determinant in the strategic assessment of whether proposed development is appropriate;
- Risk to life - an appropriately low residual risk to human life is fundamental;
- Risk to property – the residual risk to property should meet the Acceptable Solutions within PBP;
- Emergency service response - the acceptability of proposed development should not be reliant on emergency service response / intervention;
- Adjoining lands – the proposed development should not be reliant on fuel management on adjoining lands or effect those landowners' ability to undertake such works.

Table 11: Evaluation of the Structure Plan against the Strategic Planning Principles of PBP (RFS 2019)

PBP Strategic Planning Principle	Evaluation

Ensuring land is suitable for development in the context of bush fire risk	The risk profile of study area is not uniform. Key findings include:
	• There are areas of elevated bushfire risk beyond the Subject Land that are generally associated with:
	  ○ Wooded vegetation (i.e., forest);
	  ○ Connectivity to a larger fire catchment, exists in the west; and
	  ○ Exposure to the most problematic directions of bushfire attack (i.e., the north through to the southwest sector based on FFDI bushfire weather analysis);
	• The areas of elevated bushfire risk in the broader locality are outside and well separated from the Subject Land;
	• The bushfire hazards immediately adjoining the site are generally of a lower threat type, being:
	  ○ Wooded vegetation that is disconnected from the site by significant public road infrastructure and APZs;
	• The bushfire hazards within the Subject Land are generally:
	  ○ Disconnected from external bushfire hazards; and/or
	  ○ Low hazard vegetation (i.e., narrow areas set aside for riparian vegetation); or
	  ○ Vegetation that meets the "low threat" prescriptions of PBP and can therefore be excluded as per PBP; or
	  ○ Lower threat hazard (i.e., upslope) that can be mitigated through the provision of APZs
	This Study has identified that the proposed development is suitable given the bushfire risk context, considering:
	• The lower residual landscape risk exposure of the site;
	• The disconnection of the site from extensive bushfire hazards;
	• Proposed development areas being significantly separated from locations with elevated bushfire risk, with separation from adjoining hazards provided by significant public infrastructure, and mixed management practices.
	• Positioning of SFPP development away from locations of bushfire hazard;
	• The size and location of proposed land uses permits the application of bushfire protection measures that meet or can exceed the Acceptable Solutions of PBP, thus allowing the level of residual risk to be reduced to an acceptable level.
	• Feasible evacuation options to be confirmed by traffic modelling.
	• That none of the 'inappropriate development exclusions' specified in PBP, are triggered by the proposed development

Ensuring new development on BFPL will comply with PBP	The Structure Plan proposes land uses of a type, size and location that complies with PBP and this can be effectively managed in future development designs, at subsequent stages in the planning and development assessment process.

PBP Strategic Planning Principle	Evaluation
Minimising reliance on performance-based solutions	The compliance of the indicative structure plan to PBP requirements, does not rely on performance-based solutions.
Providing adequate infrastructure associated with emergency evacuation and firefighting operations	There are multiple egress points from the site to the existing public road network, providing for off-site evacuation, including two exit points away from the most likely fire pathway from the west. In addition, on-site refuge options are feasible and would offer useful redundancy to reduce the level of evacuation risk. Infrastructure for firefighting operations will include the road network, including perimeter roads and a reticulated water supply, to comply with PBP requirements. Multiple Rural Fire Service and Fire and Rescue Brigades are located within proximity to the Precinct.
Facilitating appropriate ongoing land management practices	The Structure Plan does not restrict appropriate ongoing land management practices, nor is it reliant on bushfire management of adjoining lands to support its bushfire protection.

10. Conclusion & Recommendations

In evaluating the Tuggerah Gateway proposal against the bushfire strategic planning requirements of PBP, the following observations are made:

- The future development proposed will not pose or be subjected to an unacceptable risk; or provide for 'inappropriate development' outcomes;
- The future development proposed is consistent with the strategic planning principles of PBP;
- Adequate bushfire protection measures can be provided to reduce the residual risk to an appropriate level; and
- The future development proposed will not adversely affect existing development or adjoining landowners and their ability to undertake bushfire management.

In considering these aspects, our assessment of landscape risk demonstrates that the residual bushfire risk influencing the master plan is not unacceptable, and therefore, in combination with the strategic planning principles of PBP being satisfied, the proposed development outcomes are not considered inappropriate. Thus, the strategic planning requirements of PBP are complied with for the proposed development.

Key recommendations include:

- That the evacuation capacity of the proposal is reviewed as part of future traffic modelling, to confirm the capacity of the road network is feasible under various bushfire attack and evacuation scenarios;
- That staging plans are developed to ensure the level of residual bushfire risk of early stages is not greater than that assessed in this study (i.e., they are afforded temporary bushfire protection measures e.g., APZs and access);
- That future design iterations (including revegetation and landscape plans) are undertaken with consideration to bushfire and meet the requirements of PBP.

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Appendix A – Additional Site Plans

Figure 18: Landscape Plan (Source: Urbis)

STRATEGY 3
CONNECTED & WALKABLE

Convenient, safe and prioritised active and public transport connections will underpin Tuggerah's success as a multi-nodal town centre. A connected network of permeable streets integrate the site into the surrounding movement network while new and upgraded pedestrian and cycle connections induce more active transport journeys to local destinations including Westfield Tuggerah, Tuggerah Train Station and Tuggerah Town Centre.

The key outcomes of this strategy include:

ACTIVE TRANSPORT

Shared Pedestrian/ Cycleway

Establish three primary shared pedestrian / cycleway routes connecting the neighbourhood to the surrounding key places being:

- Along the Mardi Creek Riparian Corridor and WSUD Green Corridor connecting to Mt. Tangy Dangy and Wyong Road.
- Along the linear park connecting Rocky Outcrop Adventure Park, Central Green Park and Mt. Tangy Dangy.
- Along the green boulevard connecting Hillside Park and Mt Tangy Dangy.

Priority Pedestrian Connections

Provide a permeable and priority pedestrian network within The Site that includes:

- A new, safe and prioritised pedestrian crossing at the southern side of the intersection at Tonkiss Street connecting the Site to Westfield Tuggerah western entrance at the level 1.
- Shaded, connected and safe footpaths within the streetscape network.
- Additional pedestrian connections via Pedestrian Through Site Links.

STREET NETWORK

Create a legible inter-connected and integrated street network with different characters and functions to balance movement and place outcomes including:

Collector Street - 20m: Primary access routes from Wyong Road and Tonkiss Street throughout the development.

Green Boulevard -21m: Local street with wider verge and shared path

Local Street - 16m: Local street with residential dwellings interface on both sides

Local Street Green - 14.5m: Local street with open space interface on one side

Perimeter Street - 14.5m: Local street along the conservation zone to the south as part of Asset Protection Zone (APZ)

Laneway - 8m: Laneway access to the terrace homes driveways

Signalised Intersection: New all movements signalised intersection at Tonkiss Street and Wyong Road

Signalised / Roundabout Intersection: Primary vehicular and pedestrian access point to The Site with Tonkiss Street providing a prioritised and safe pedestrian crossing to the Westfield Tuggerah

Left-In Left Out Intersection: VPA approved left-in left-out intersection from Wyong Road as part of previous mixed-use rezoning.

Non-signalised Intersection: Secondary access point to The Site from Tonkiss Street

44 Tuggerah Gateway Precinct Urban Design Report

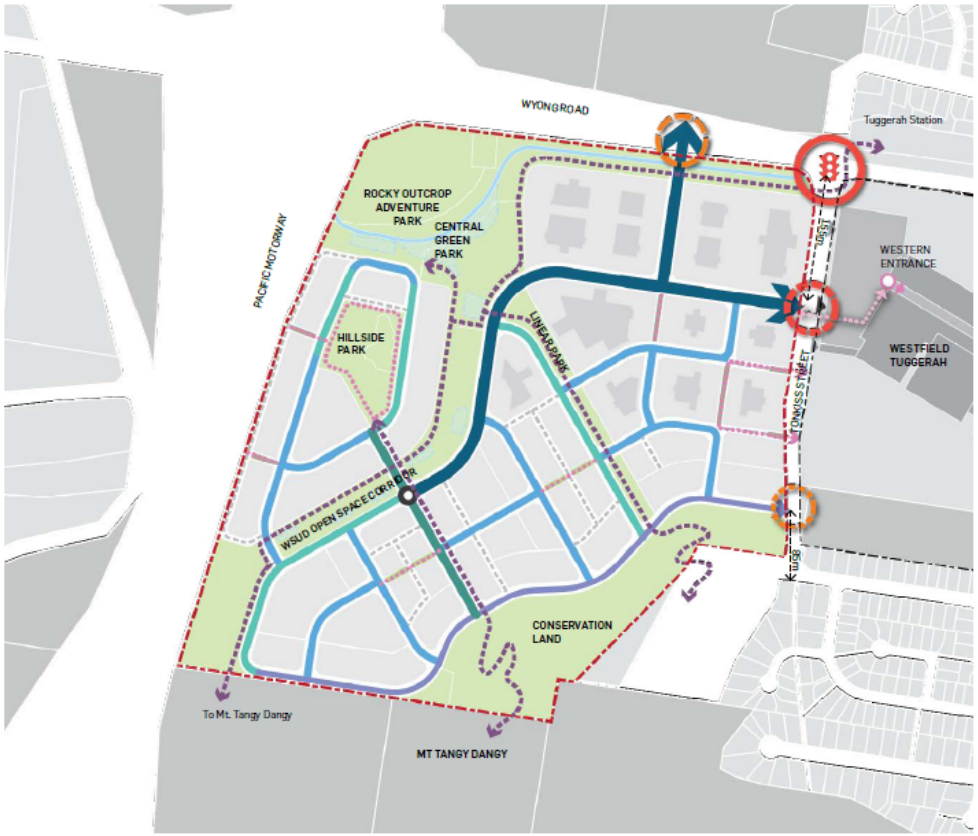

Figure 23 Access and Movement Strategy

Figure 19: Connected and Walkable Plan (Source: Urbis)

Appendix B – PBP Specifications: Subdivision and SFPP Development

The following access specifications are reproduced from PBP (RFS 2019).

Intent of measures: To provide safe operational access to structures and water supply for emergency services while residents are evacuating an area.

Table 12: Performance criteria for access for residential and rural residential subdivisions

Performance Criteria	Acceptable Solutions
The intent may be achieved where:	
firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation	property access roads are two-wheel drive, all-weather roads, and perimeter roads are provided for residential subdivisions of three or more allotments; and subdivisions of three or more allotments have more than one access in and out of the development; and traffic management devices are constructed to not prohibit access by emergency services vehicles; and maximum grades for sealed roads do not exceed 15 degrees and an average grade of not more than 10 degrees or other gradient specified by road design standards, whichever is the lesser gradient; and all roads are through roads. Dead end roads are not recommended, but if unavoidable, dead ends are not more than 200 metres in length, incorporate a minimum 12 metres outer radius turning circle, and are clearly sign posted as a dead end; and where kerb and guttering is provided on perimeter roads, roll top kerbing should be used to the hazard side of the road; and where access/egress can only be achieved through forest, woodland or heath vegetation, secondary access shall be provided to an alternate point on the existing public road system.
the capacity of access roads is adequate for firefighting vehicles	the capacity of perimeter and non-perimeter road surfaces and any bridges/causeways is sufficient to carry fully loaded firefighting vehicles (up to 23 tonnes); bridges/causeways are to clearly indicate load rating.
there is appropriate access to water supply	hydrants are located outside of parking reserves and road carriageways to ensure accessibility to reticulated water for fire suppression; hydrants are provided in accordance with AS 2419.1:2005; there is suitable access for a Category 1 fire appliance to within 4m of the static water supply where no reticulated supply is available.
access roads are designed to allow safe access and egress for medium rigid firefighting vehicles while residents are evacuating as well as providing a safe operational environment for emergency service personnel during firefighting and emergency management on the interface	perimeter roads are two-way sealed roads; and 8m carriageway width kerb to kerb; and parking is provided outside of the carriageway width; and hydrants are located clear of parking areas; and there are through roads, and these are linked to the internal road system at an interval of no greater than 500m; and curves of roads have a minimum inner radius of 6m; and the maximum grade road is 15° and average grade is 10°; and the road crossfall does not exceed 3°; and

Performance Criteria	Acceptable Solutions
	a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.
access roads are designed to allow safe access and egress for medium rigid firefighting vehicles while residents are evacuating	minimum 5.5m width kerb to kerb; and parking is provided outside of the carriageway width; and hydrants are located clear of parking areas; and roads are through roads, and these are linked to the internal road system at an interval of no greater than 500m; and curves of roads have a minimum inner radius of 6m; and the road crossfall does not exceed 3°; and a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.
firefighting vehicles can access the dwelling and exit safely	No specific access requirements apply in an urban area where a 70 metre unobstructed path can be demonstrated between the most distant external part of the proposed dwelling and the nearest part of the public access road (where the road speed limit is not greater than 70kph) that supports the operational use of emergency firefighting vehicles (i.e. a hydrant or water supply). In circumstances where this cannot occur, the following requirements apply: minimum carriageway width of 4m; in forest, woodland and heath situations, rural property access roads have passing bays every 200m that are 20m long by 2m wide, making a minimum trafficable width of 6m at the passing bay; and a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches; and provide a suitable turning area in accordance with Appendix 3; and curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress; and the minimum distance between inner and outer curves is 6m; and the crossfall is not more than 10°; and maximum grades for sealed roads do not exceed 15° and not more than 10° for unsealed roads; and a development comprising more than three dwellings has formalised access by dedication of a road and not by right of way. Note: Some short constrictions in the access may be accepted where they are not less than the minimum (3.5m), extend for no more than 30m and where the obstruction cannot be reasonably avoided or removed. the gradients applicable to public roads also apply to community style development property access roads in addition to the above.

Appendix C - Services Specifications

The following services specifications (provision of water, gas and electricity) are reproduced from PBP (RFS 2019).

Intent of measures: provide adequate services of water for the protection of buildings during and after the passage of a bush fire, and to locate gas and electricity so as not to contribute to the risk of fire to a building.

Table 13: Performance criteria for services provision for residential and rural residential subdivisions

Performance Criteria	Acceptable Solutions
The intent may be achieved where:	
a water supply is provided for firefighting purposes	reticulated water is to be provided to the development, where available; a static water supply is provided where no reticulated water is available.
water supplies are located at regular intervals the water supply is accessible and reliable for firefighting operations	fire hydrant spacing, design and sizing comply with the Australian Standard AS 2419.1:2005; hydrants are not located within any road carriageway; reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads.
flows and pressure are appropriate	fire hydrant flows and pressures comply with AS 2419.1:2005.
the integrity of the water supply is maintained	all above-ground water service pipes external to the building are metal, including and up to any taps.
location of electricity services limits the possibility of ignition of surrounding bush land or the fabric of buildings	where practicable, electrical transmission lines are underground; where overhead, electrical transmission lines are proposed as follows: lines are installed with short pole spacing (30m), unless crossing gullies, gorges or riparian areas; no part of a tree is closer to a power line than the distance set out in accordance with the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines.
location and design of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.	reticulated or bottled gas is installed and maintained in accordance with AS/NZS 1596:2014 and the requirements of relevant authorities, and metal piping is used; all fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side; connections to and from gas cylinders are metal; polymer-sheathed flexible gas supply lines to gas meters adjacent to buildings are not used; above-ground gas service pipes are metal, including and up to any outlets.

Table 14: Water supply requirements for non-reticulated developments or where reticulated water supply cannot be guaranteed (Table 5.3d of PBP)

Development Type	Water Requirements
Residential lots (<1000m²)	5000L/lot
Rural-residential lots (1000-10,000m²)	10,000L/lot
Large rural/lifestyle lots (>10,000m²)	20,000L/lot
Multi-dwelling housing (including dual occupancies)	5000L/dwelling

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