Orchard Hills Precinct, Strategic Bushfire Study

Department of Planning, Housing and Infrastructure

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Template 2.8.1

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Abbreviations

Abbreviation	Term
AS	Australian Standard
APZ	Asset Protection Zone
BAL	Bushfire Attack Level
BC Act	*Biodiversity Conservation Act 2016*
BFPL	Bush Fire Prone Land
BFRMP	Bush Fire Risk Management Plan
BFRMC	Bush Fire Risk Management Committee
CDC	Complying Development Certificate
DA	Development Application
DPHI	Department of Planning, Housing and Infrastructure
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000*
FDR	Fire Danger Rating
FFDI	Forest Fire Danger Index
GEV	Generalised Extreme Value
GSC	Greater Sydney Commission
LEP	Local Environmental Plan
LGA	Local Government Area
NP	National Park
NSP	Neighbourhood Safer Place
NSW	New South Wales
PBP	Planning for Bushfire Protection (2019)
PP	Precinct Plan
RF Act	Rural Fires Act 1997
RFS	Rural Fire Service
SWS	Static Water Supply

Executive Summary

This study presents an evaluation of the suitability for urban development within the Orchard Hills Precinct with regard to bushfire risk and bushfire protection. Land uses contemplated by Indicative Layout Plan (ILP) drafted by the Department of Planning, Housing and Infrastructure (the Department) (2024) within the potential rezoning area were considered against the bushfire strategic planning requirements of *Planning for Bushfire Protection* (PBP) (NSW RFS 2019). In undertaking this assessment, a Strategic Bushfire Study was prepared to comply with the requirements set out in Chapter 4 (*Strategic Planning*) of PBP. This Strategic Bushfire Study (SBS) examines whether rezoning and the land uses contemplated are appropriate given its bushfire risk exposure context or whether it represents 'inappropriate development' as described by PBP. 'Inappropriate development' exclusion requirements are outlined in Section 1.2.

This report applies to the entire Orchard Hills Precinct. Within the precinct, the Department has further delineated the Stage 1 rezoning area, herein referred to as the Subject Site. The Subject Site is 432 ha in size and further broken down into substages 1A, 1B and 1C. The Department has prepared a draft Stage 1 rezoning area ILP and draft rezoning package for this area, and a broad structure plan which identifies the zoning intent for the entire Orchard Hills Precinct. Rezoning the remaining stages of the Orchard Hills Precinct, will be subject to future discussions and decisions of the Department and Penrith City Council.

The technical assessment compiled for this study considered the broader bushfire landscape and risk profile relevant for the Precinct, along with the feasibility for the provision of compliant bushfire protection measures within the areas identified for development. In consideration of the strategic planning principles of PBP, the landscape risk assessment included an assessment of the broader bushfire landscape, bushfire weather and potential fire behaviour, while the land use evaluation considered the appropriateness of future land uses and the ability for future development to comply with the bushfire protection requirements set out in PBP.

The findings of the study include that low risk development outcomes can be achieved that comply with the strategic planning requirements of PBP. Further, the outcomes of this study indicate that there is potential for bushfire protection measures to be achieved by future development, including the provision of asset protection zones (APZs) and access for evacuation and egress. Therefore, the Stage 1 rezoning area ILP is not considered to present 'inappropriate development' as described by the strategic bushfire planning requirements of Chapter 4 of PBP.

Key recommendations for future planning are identified in Section 8 of this report and include the confirmation from relevant emergency management authorities regarding the provision of emergency services, traffic modelling to ensure capacity of the road network at all stages of Precinct activation, and exploration of strategies to ensure existing or adjoining properties are not encumbered by any elevated bushfire risk.

1. Introduction

This SBS has been prepared in consideration of future urban development for the Orchard Hills Precinct, as proposed by the Department.This study provides an assessment of the Orchard Hills potential rezoning boundary (Precinct Boundary) (and Stage 1 rezoning area (Subject Site)). The landscape bushfire assessment was undertaken within a 5-kilometre buffer (Study Area) of the precinct boundary (Figure 1) with regard to the strategic planning principles outlined in PBP.

1.1 Study Area

The Orchard Hills Precinct is located in Western Sydney (Figure 2), situated in the Penrith Local Government Area. The Precinct is bisected by the Western Motorway (M4), with the southern portion of the precinct (south of the M4) situated between The Northern Road, the residential area of Glenmore Park to the west and Mulgoa Road along with the residential area of St Clair, to the east. To the south is the Orchard Hills Defence Establishment. The northern portion of the precinct (north of the M4) is not subject to the current rezoning and is primarily surrounded by existing urban development, including the urban areas of Caddens and Claremont Meadows. Further, it is understood that within the eastern portion of the precinct, there is existing powerline infrastructure as well as land earmarked for the Outer Sydney Orbital.

The Precinct is currently zoned under the Penrith Local Environment Plan (Penrith LEP) primarily as RU4 (Primary Production Small Lots) (Penrith LEP, 2010). Within the Precinct, the South Creek - Blaxland Creek riparian corridor is situated to the east, zoned C2 (Environmental Conservation) and surrounded by RE1 (Public Recreation) lands. Surrounding the site to the south is C2 (Environmental Conservation) lands, which includes a biodiversity offset area, with remnant vegetation to be retained in perpetuity. This area is also identified on the Biodiversity Values (BV) Map (the Department, 2023), along with further areas of BV external to the site, and smaller areas within. Remnant vegetation within the Precinct has also been identified as ‘avoided lands’ in the Cumberland Plain Conservation Plan (CPCP) (Figure 3).

This report applies to the entire Orchard Hills Precinct. Within the precinct, the Department has further delineated the Stage 1 rezoning area, herein referred to as the Subject Site. The Subject Site is 432 ha in size and is further broken down into substages 1A, 1B and 1C. The Department has prepared a draft Stage 1 rezoning area ILP and draft rezoning package for this area, and a broad structure plan which identifies the zoning intent for the entire Orchard Hills Precinct. Planning for the remaining stages of the Orchard Hills Precinct, will be subject to future discussions and decisions of the Department and Penrith City Council.

It is anticipated that once the ILP is adopted, land use outcomes will then be enabled via amendment to the Penrith LEP and/or Development Control Plan (DCP). Further evaluation of specific development outcomes would then be facilitated via the development application (DA) process and would be subject to the relevant requirements set out in PBP, with further and more detailed assessment.

1.2 Aims and Objectives

The aim of this study is to review the potential development area in relation to the strategic planning requirements of PBP. The key objective is to undertake an SBS as per the strategic planning principles,

'inappropriate development' exclusion requirements and assessment considerations outlined in PBP. The PBP mentions strategic planning should provide for the exclusion of inappropriate development in bushfire prone areas, if the development:

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

The outcomes of this study will assist with further planning of the Precinct, which will include the initial rezoning of the Subject Site, and future planning.

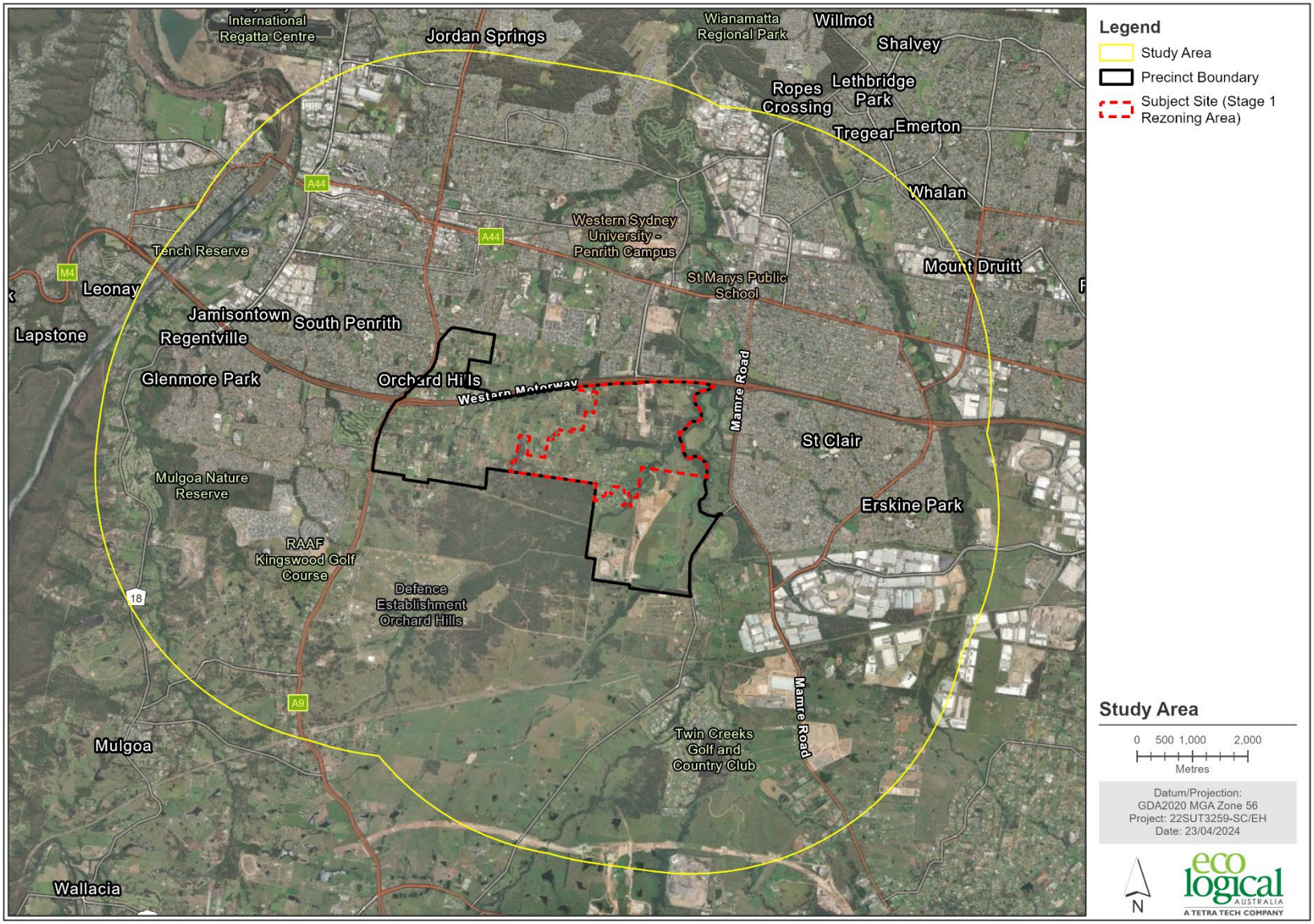

Figure 1: Study Area

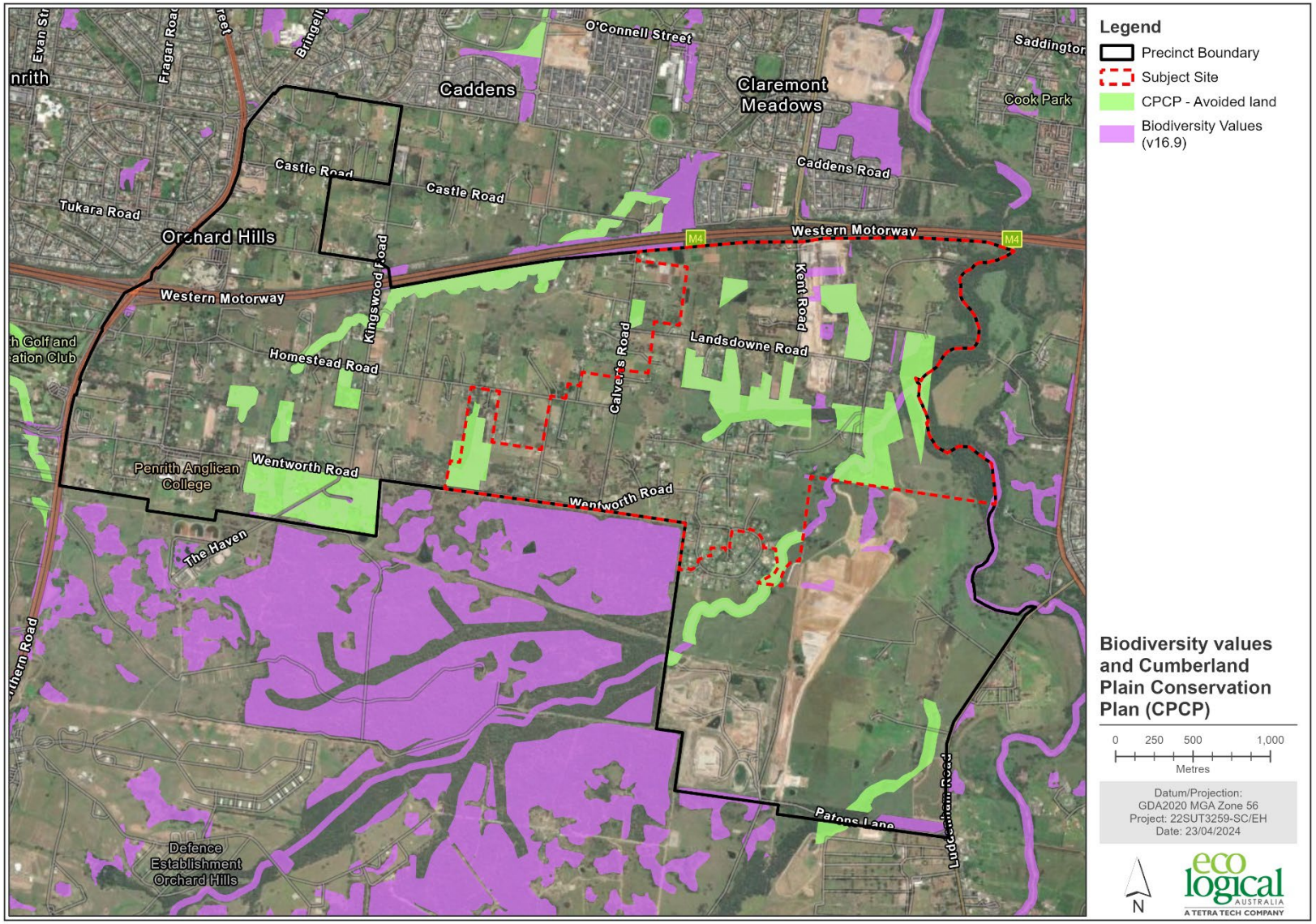

Figure 2: Biodiversity Values Mapping and Cumberland Plain Conservation Plan Avoided Land

Figure 3: The Stage 1 rezoning area ILP (Source the Department, 2024)

2. Legislative Framework

2.1 Legislation

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 proposal includes or is in close proximity to Bush Fire Prone Land (BFPL), the relevant planning authority must consult with the Commissioner of the NSW Rural Fire Service (RFS). Therefore, the assessment detailed in this study seeks to evaluate whether the future rezoning and land uses contemplated 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.

2.1.1 Bushfire Prone Land Status

The Precinct is currently mapped as bushfire prone land on the NSW BFPL map as published by the Department on the NSW Planning Portal (the Department, 2022) (Figure 4).

2.1.2 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 proposed development, consent authorities must have regard to 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.*

2.1.3 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 bush and other fires;*
- *Co-ordination of bushfire 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 to be carried out having regard to the principles of ecologically sustainable development.*

2.2 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 any LEP amendment that may arise as planning for future residential settlement in the Precinct is progressed. Chapter 4 of PBP prescribes the completion of an SBS, which provides the opportunity to assess whether proposed land uses 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 bushfire 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.

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 bushfire risk and should be avoided;*
- *the development is likely to be difficult to evacuate during a bushfire due to its siting in the landscape, access limitations, fire history and/or size and scale;*
- *the development will adversely affect other bushfire protection strategies or place existing development at increased risk;*
- *the development is within an area of high bushfire 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 contemplated development areas 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 1 below.

Future development will also need to consider the 2022 Addendum to PBP (RFS, 2022), which prescribes additional bushfire protection measures for specific Class 9 SFPP buildings (including schools, aged care, hospitals) located on BFPL. This aligns with National Construction Code 2022 (NCC; ABCB 2022) provisions (Part G5 and Specification 43) enacted 1 May 2023.

Table 1: Summary of PBP assessment considerations for a Strategic Bushfire Study (RFS 2019)

Issue	Summary of Assessment Considerations
Bushfire landscape assessment	A bushfire landscape assessment considers the likelihood of a bushfire, 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 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 bushfire management.

2.3 Assessment Framework

Land uses contemplated by the ILP, which would be permissible under changes to the LEP / DCP are subject to various aspects of PBP, when occurring on BFPL. Future development on BFPL will need to satisfy the performance criteria identified in PBP for various land uses including:

- Residential and Rural Residential Subdivision;
- Special Fire Protection Purpose (SFPP) Development;
- Multi-storey residential development; and
- Commercial and Industrial Development.

Under the planning pathway identified in PBP and as legislated, the CDC pathway is not possible for subdivision, SFPP development and where the acceptable solutions of PBP cannot be met. Therefore, it is expected that a variety of future land uses will be assessed against the requirements of PBP following the DA pathway.

Chapter 5 of PBP outlines the bushfire protection requirements for residential subdivision, including performance criteria identified for APZs, access and infrastructure. Chapter 7 of PBP outlines the bushfire protection requirements for infill development, including performance criteria identified for APZs, building construction standard, access and infrastructure. Chapter 6 of PBP outlines the bushfire protection requirements for SFPP development, including performance criteria identified for APZs, access and infrastructure. Therefore, along with the requirements of Chapter 4 of PBP, the criteria outlined in Chapter 5, 6 and 7 of PBP have been considered in relation to the ability for future development within the Precinct to comply, in addition to requirements for specific development types outlined in Chapter 8 of PBP.

Investigation of the suitability of future development contemplated, or permissible following LEP amendment, involves evaluation of a complex and large array of bushfire-related issues and concepts. Therefore, prioritisation of first principle bushfire risk considerations is critical. As such, the bushfire assessment framework detailed in Table 2 will guide this study. Any development on BFPL always has a residual bushfire risk regardless of the initial risk level and risk treatments. This study acknowledges that

the outcome of any development on BFPL includes a level of residual risk and explores the acceptability of that level of residual risk.

Table 2: Risk Assessment Framework

Risk Consideration	Context	Required Outcome
Residual 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.	Assessed risk exposure is appropriately reduced, development can occur with an appropriate level of safety on BFPL.
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.
Life Protection and Evacuation	An appropriately low residual risk to human life is fundamentally important in bushfire protection. Early offsite evacuation is the nationally accepted safest means for protection of life. However, logistical challenges of offsite evacuation can be high, and need to be overcome without any additional demand on emergency services. Therefore, multiple life protection options provide the lowest residual risk.	Effective early offsite evacuation that is not reliant on the assistance of emergency services should be provided. Additional refuge options such access to a safer place or refuge should be considered for increased resilience.
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.	Future development or uplift should contribute to the emergency management response rather than provide additional demand on resources.
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 and therefore should not be relied on for the protection of life and property in a strategic planning context.	There should be no reliance on fuel management of adjoining lands. Capacity for perimeter roads and asset protection zones should be provisioned during strategic planning.

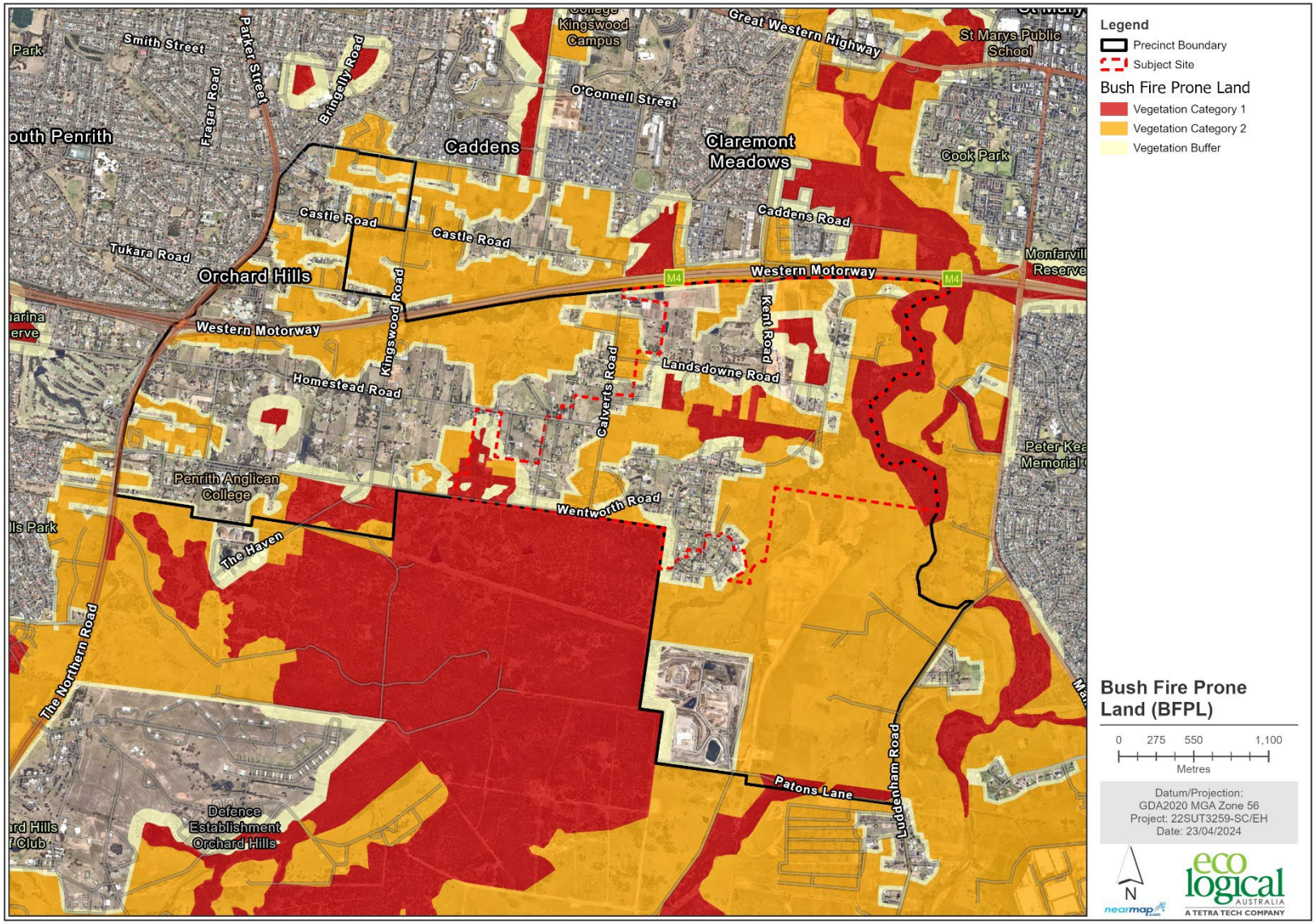

Figure 4: Bushfire Prone Land across the Study Area

3. Bushfire Landscape Risk Assessment

An evaluation of the bushfire hazard within a 5-kilometre assessment area was undertaken for the site, as detailed below. This includes evaluation of the vegetation, slope and bushfire weather pertaining to the broader landscape, and the combined influence on potential fire behaviour, along with the fire history within the broader landscape.

3.1 Bushfire Hazard

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

3.1.1 Vegetation

Vegetation formations within and surrounding the investigation area is shown in Figure 5 based off the State Vegetation Type Mapping (the Department, 2022).

Within the Precinct, the land use typology is currently dominated by rural residential development, with grassland vegetation present in varied levels of management, along with smaller patches of woodland vegetation, and forested wetland along riparian corridors. The CPCP is also applicable to the Precinct, and areas identified in the CPCP as 'avoided land', which cannot be developed for residential purposes, have therefore been identified as woodland hazard for this study. As development is activated, it is expected that rural grasslands within the precinct will transition to managed land and the primary hazard for future development will be areas of forested wetlands within riparian corridors and woodland vegetation within the CPCP 'avoided lands', along with the external hazards identified.

The western boundary of the Stage 1 rezoning area (the Subject Site) consists primarily of rural grasslands, with scattered grassy woodland vegetation (Cumberland Plain Woodland). The vegetation within this area is planned to be developed as part of the later stages of the Precinct Plan. This area has been considered as a temporary hazard in the assessment.

The landscape adjoining the southern boundary of the investigation area is primarily dominated by grassy woodland vegetation (Cumberland Plain Woodland), with portions of forested wetlands within riparian areas. Rural grassland is also present with in the broader assessment area. There is also areas of rural grassland in this direction. To the east of the proposed area earmarked for future development is forested wetland and woodland vegetation associated primarily with the South Creek Riparian Corridor. All other directions are considered managed, with existing urban development.

A summary of the relationship between PBP hazard class, vegetation formation and fuel load within the Study Area and surrounds is shown in Table 3. It is important to note, that rural grassland for agricultural pursuits has conservatively been included as "grassland', however given that much of these areas are undergoing various levels of mixed-management practices, it is expected that the fuel load for these areas would be lower than the PBP prescribed value shown in Table 3, and may be considered managed lands in many instances.

3.1.2 Slope

Slope across the broader Study Area has been generated from a Digital Elevation Model (DEM), established using 2 m contours.

Figure 6 shows the slope across Precinct and broader Study Area, which is generally quite minimal, indicating predominately flat to undulating terrain.

Table 3: Vegetation formation and fuel loads for vegetation types in the Study Area

Vegetation Formation	Fuel Load (t/ha)[1]	Keith Class[2]
Forest (wet and dry sclerophyll)	36.1	Cumberland Dry Sclerophyll Forests
Forested Wetlands	15.1	Coastal Floodplain Wetlands
Grasslands*	6	Not native vegetation (pasture)
Grassy Woodlands	20.2	Coastal Valley Grassy Woodlands
Rainforests	13.2	Northern Warm Temperate Rainforests

[1]FROM TABLE A1.12.8 OF PBP; [2]BASED ON SVTM (DPHI, 2022)
*GRASSLAND INCLUSION FROM DESKTOP ASSESSMENT

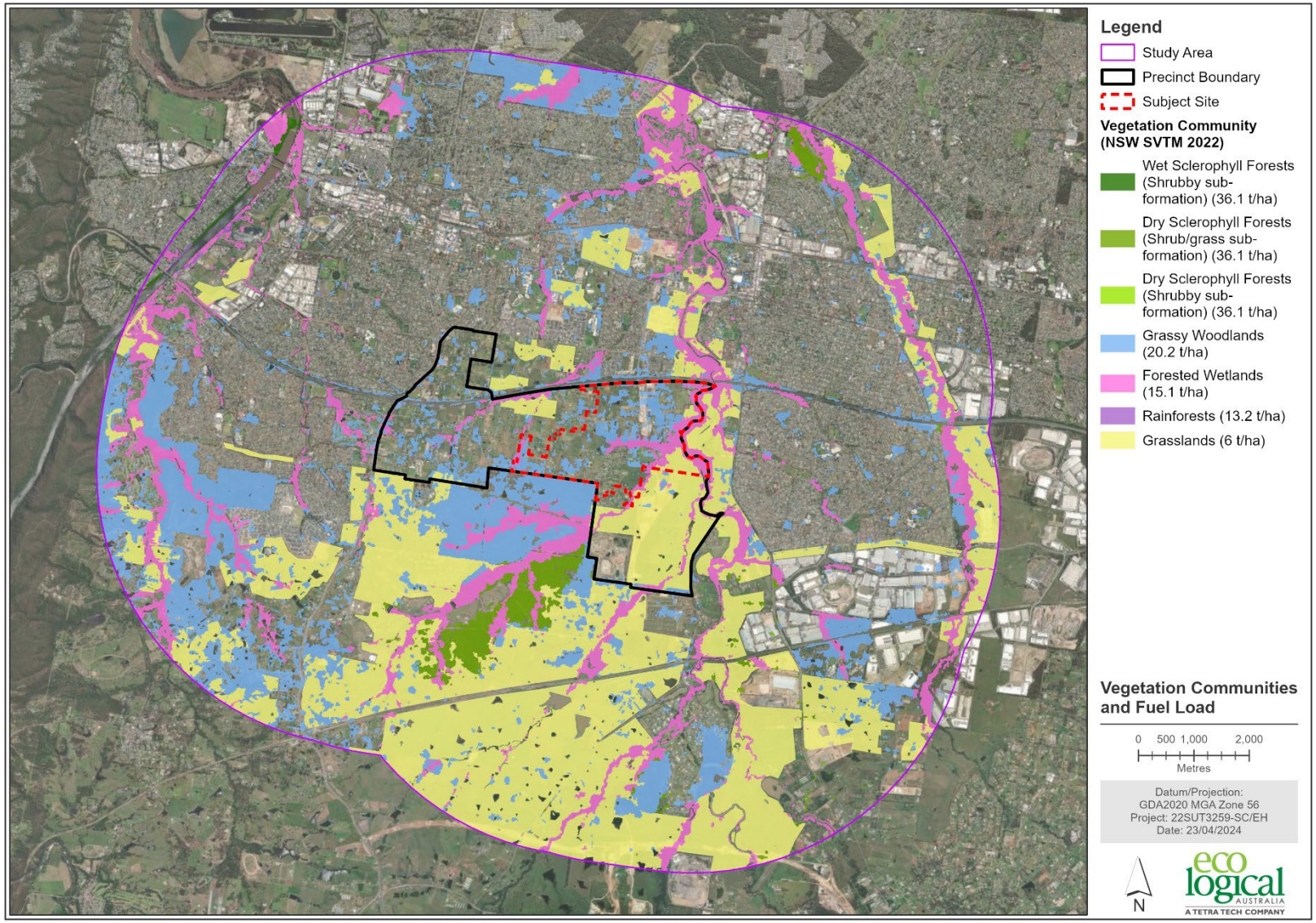

Figure 5: Vegetation formation and fuel load across the Study Area

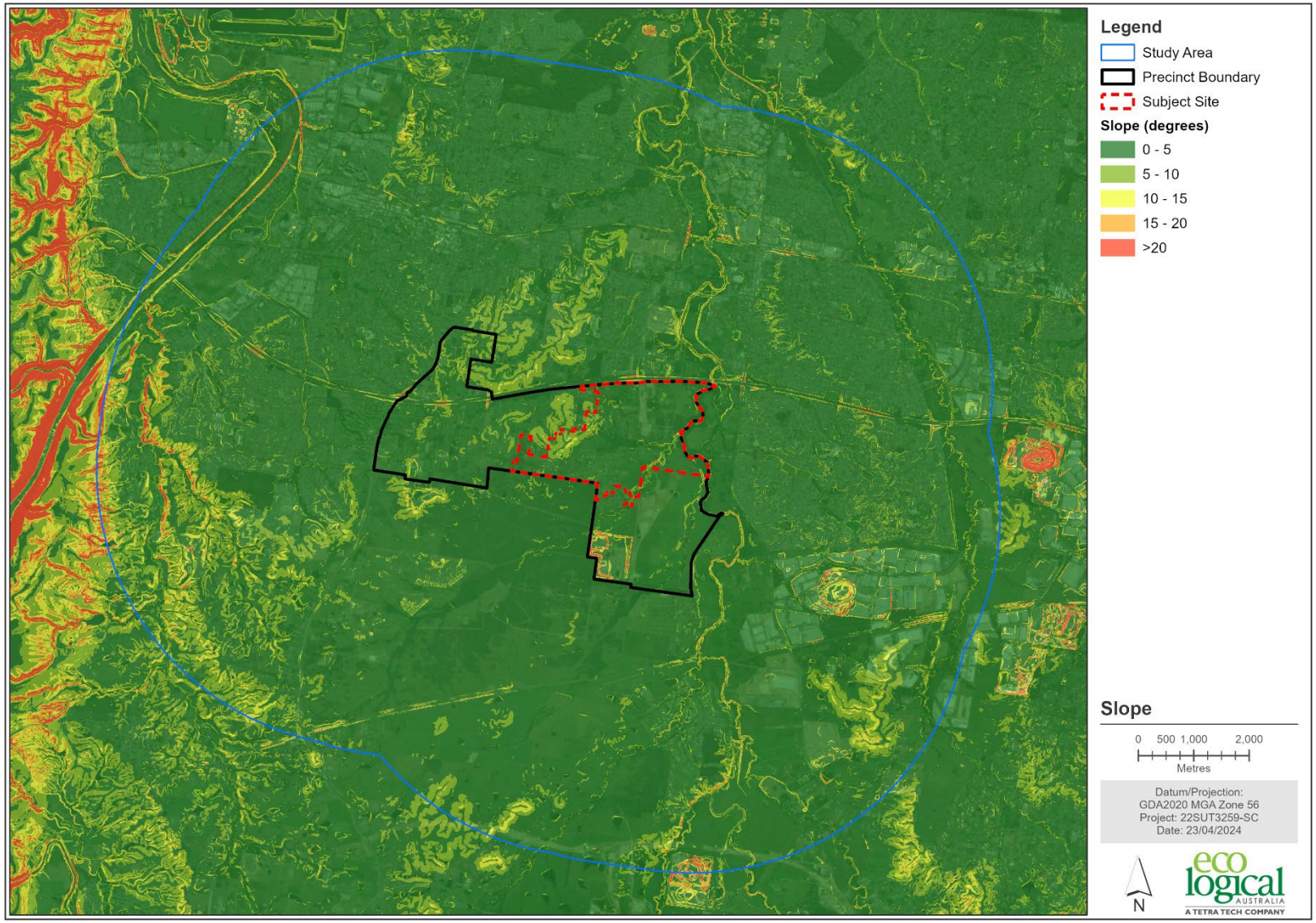

Figure 6: Slope across the Study Area

3.2 Bushfire Risk Considerations

The following sections outline considerations informing the bushfire risk exposure of the investigation areas. This includes analysis of bushfire weather and potential fire behaviour, consideration of fire catchments and potential fire pathways, and fire history.

3.2.1 Bushfire Weather

The Study Area is located within the Cumberland Bush Fire Management Committee (BFMC) area. Within the BFMC area, the climate is warm temperate, characterised by cool to mild winters and warm to hot summers. As per the Cumberland Bush Fire Risk Management Plan (BFRMC, 2020) this area has predominately summer/autumn rainfall and a dry winter and spring. Favourable bushfire weather is generally experienced from October through to March when prevailing dry winter with increased winds transitioning into spring are experienced. North westerly winds accompanied by high temperatures and low relative humidity can elevate the risk from bushfire during the bushfire danger period.

Weather data developed by Lucas (2010) under the National Historical Fire Weather Dataset incorporates the daily Forest Fire Danger Index (FFDI), where suitable inputs are available from over 70 weather stations across Australia. Data from the Richmond Airport weather station (the closest weather station within the National Historical Fire Weather Dataset) was analysed to determine the maximum FFDI for a 1 in 50-year event, being the accepted recurrence period for land use planning (RFS 2019). Days where an FFDI of 50 or higher has been recorded, has occurred on average, about 2 days per year based on data analysed from the National Bushfire Weather Data set for Richmond Airport weather station (station number 067105) (Lucas 2010).

PBP identifies that the applicable FDI for the subject land is FDI 100. The FDI used by PBP influences certain bushfire protection measures including APZ's and construction standards via the assessment of the Bushfire Attack Level (BAL). Utilising the historical data 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 Richmond 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-east to South-east (clockwise); South-east to South-west (clockwise); and South-west to North-east (clockwise). The following directional FFDIs, mapped in Figure 7, were identified through the GEV analysis of the historic weather records (1980 to 2020) for Richmond Airport:

- Maximum FFDI for wind directions from the north-east to south-east (N-SE) was 56;
- Maximum FFDI for wind directions from the south-east to south-west (SE-SW) was 56; and
- Maximum FFDI for wind directions from the south-west to north-east (SW-N) was 106.

This analysis indicates that there is variation in the potential likelihood and consequence of bushfire attack from different directions toward the investigation areas**.** 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. Areas exposed to bushfire attack at lower FFDI have a lower (but still significant) risk profile.

Areas exposed to hazards in the north to south west sector, are more likely to be subject to higher FFDI conditions, whilst areas exposed to other directions are likely be exposed to bushfire attack at lower FFDIs. However, following the provision of bushfire protection measures (APZs, perimeter roads etc.), the opportunity for higher intensity fires occurring without any level of mitigation or moderation is unlikely.

3.2.2 Potential Bushfire Behaviour and Fire Intensity Modelling Outcomes

Every bushfire event is different as fire spreads by responding to changes in fuel, terrain, and weather conditions, however utilising weather analysis, landscape conditions and fire history, potential fire behaviour can be identified. For this study, bushfire intensity prediction has been used to review potential bushfire behaviour with the potential head fire intensity modelled using fire intensity formulae of McArthur (1967) and Cheney *et. al.* 2012). The fire intensity model is predicting potential fire intensities within the study are and surrounds based on the outcomes of the GEV analysis of the historic weather records, along with inputs for fuel load, slope and aspect.

It is important to note that the probability of these occurring is not considered, nor are other factors like fire development, the effects of fuel management, change in weather, or the impact fire suppression activities. While bushfire intensity can be used as a determinant of risk to life and property and the controllability of bushfires, these models also do not consider extreme fire behaviour / weather including phenomena such as spotting/fire storm, fire tornado/whirls, lateral vortices, junction zones (jump fires), eruptive fires, conflagrations, downbursts; or pyro-convective events. Fire intensity models are also likely to overestimate the fuel load for rural grassland vegetation, where a fuel load of 6 t/ha has been applied. Therefore, it is likely that fire intensity outputs for rural grassland present outcomes that are elevated in comparison to conditions likely to be experienced on the ground.

The outcomes of the GEV analysis performed for this study indicates that elevated fire weather is most likely to occur under prevailing south-west to north winds, accompanied by elevated FFDI, with an FFDI of 106 the analysed maximum in the available record. Based on this, directional fire intensity modelling was undertaken for SW-N scenario and using FFDI 106 (Figure 9). Under this scenario, where there are steeper areas exposed to SW-NE conditions, they are more likely to experience higher fire intensities, as evident in Figure 8. Fire transfer would generally occur in an easterly direction under these conditions.

Figure 9and Figure 10 also demonstrate that reduced fire intensities are likely to occur under lower FFDIs.

In summary, it is generally anticipated that a potential fire within the Precinct and surrounds would spread more quickly and have the potential for higher intensities when:

- Burning under the influence of northerly to south-westerly winds
- Moving upslope on steeper vegetated areas
- Burning in areas exhibiting elevated fuel loads.

3.3 Fire History

The available mapped fire history record, from 1977 onwards (NPWS, 2022, RFS, 2023) as displayed in Figure 11, and corresponding analysis of fire frequency (Figure 12) provides insight into the areas that have been subject to broader landscape fires, and those areas subject to repeated fire. The mapped

record demonstrates that the investigation area has generally been subject to a low level of landscape scale fire activity, with only a small area of the southern portion of the Precinct mapped as being affected by one wildfire in the 2001/02 bushfire season. The northern portion of the Precinct has not had a fire mapped, indicating a lack of exposure to large scale wildfire in recent decades.

3.3.1 Bushfire Catchment, Spread and Ignition

The broader study area in which the Orchard Hills Precinct is located is dominated by residential development. The precinct is primarily comprised of rural residential land with grassland vegetation under various levels of management, along with fuel breaks provided by roads and managed land. Fire pathways are primarily limited to remnant areas of woodland vegetation, some of which has been identified in the CPCP, along with future forested wetland within riparian corridors. Internal areas of rural grassland are expected to present only a temporary pathway as these areas removed during activation. To the east, the larger Riparian Corridor is moderated by mixed managed open space, which will be further fragmented by the Future Outer Sydney Orbital.

External to the precinct, the primary fire pathway is situated to the south (Figure 13), where protected woodland vegetation within the Orchard Hills Defence Establishment is present. However, fire management trails with active management along the perimeter which provides separation between the Precinct and adjacent vegetation.

Specific to the Stage 1 rezoning area, there is a temporary grassland hazard immediately adjacent to the west. While this hazard is expected to be removed as the broader precinct is developed, it does currently present a potential fire pathway for the Stage 1 Subject Site.

Potential sources for fire ignition as documented by the Cumberland BFMC Risk Management Plan include both human and natural sources including:

- Lightning strikes during storms, particularly during the warmer months
- Escapes from illegal burns primarily within the rural residential areas
- Arson – car dumping and grass/bushland ignitions.

3.4 Summary of Landscape Bushfire Risk Assessment

The assessment identified there is potential for bushfire attack to occur, primarily from the south and east, however these pathways do not present extended fire runs, or unimpeded fire paths. To the east, potential fire spread from the South Creek corridor is moderated by mixed management of the open space area, and future road infrastructure, while to the south, existing fire management provides disruption from an extended pathway to the Precinct.

There are further fire advantages that assist in lowering the risk to a level more favourable for fire management and response, as well as the land uses contemplated. This is due to several factors including:

- Bushfire weather analysis that demonstrates lower FDIs in the SE-SW and NE-SE direction, thus lessening the risk profile of lands primarily exposed to fire attack from these directions (e.g. in the eastern areas).

- Demonstrated low intrusion of past landscape scale fires to investigation areas, which along with continuing development and removal or modification of hazard, indicate a lessening likelihood of bushfire attack.

Although the landscape context is highly moderated, the level of uplift should be supported by evacuation capacity and adequate emergency management, along with ensuring local infrastructure, such as water supply and road infrastructure is in place before planning changes are made.

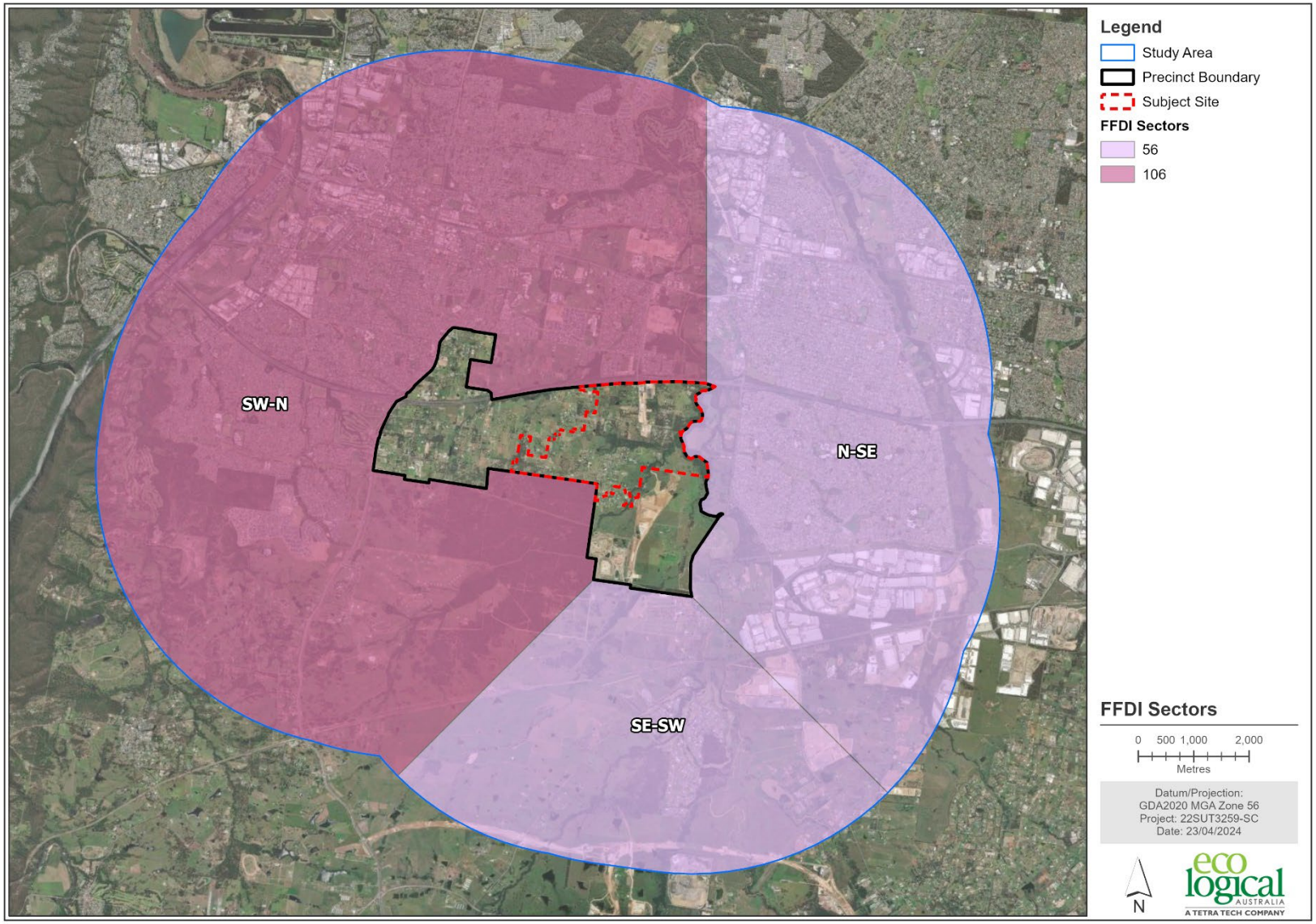

Figure 7: FFDI Sectors

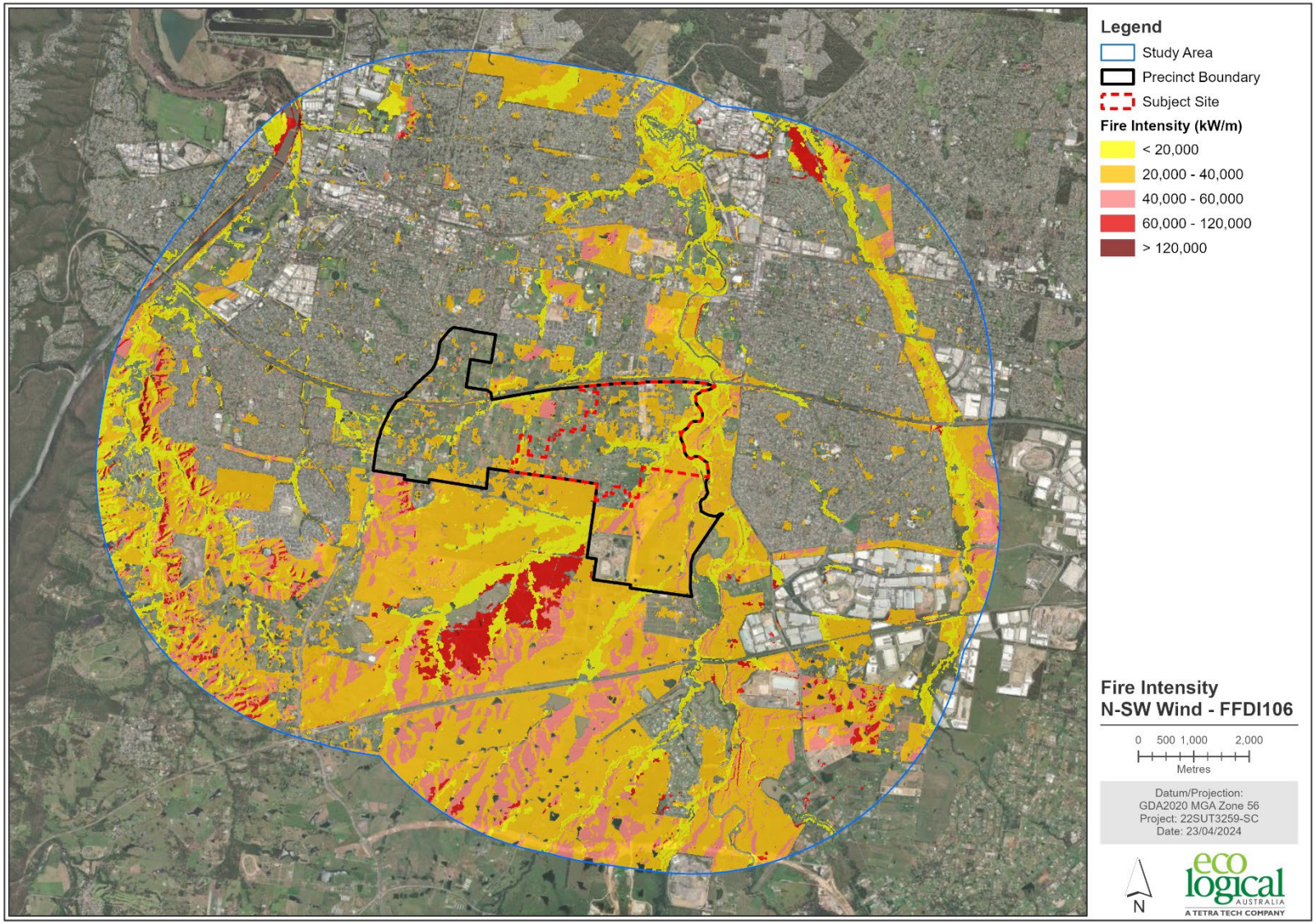

Figure 8: Directional Fire intensity modelling based on FFDI 106, South-west to North winds

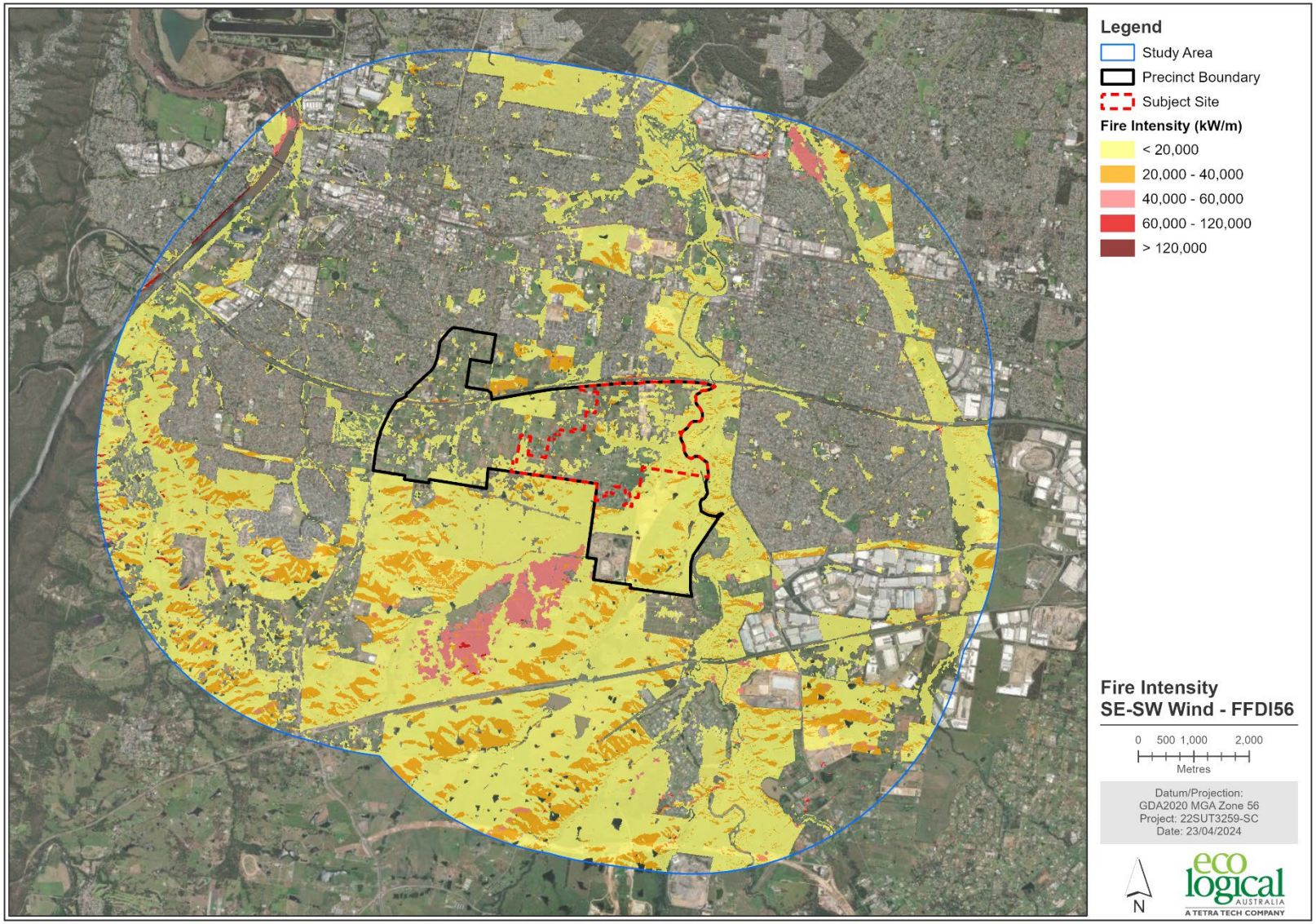

Figure 9: Directional Fire intensity modelling based on FFDI 56, South-east to South-west winds

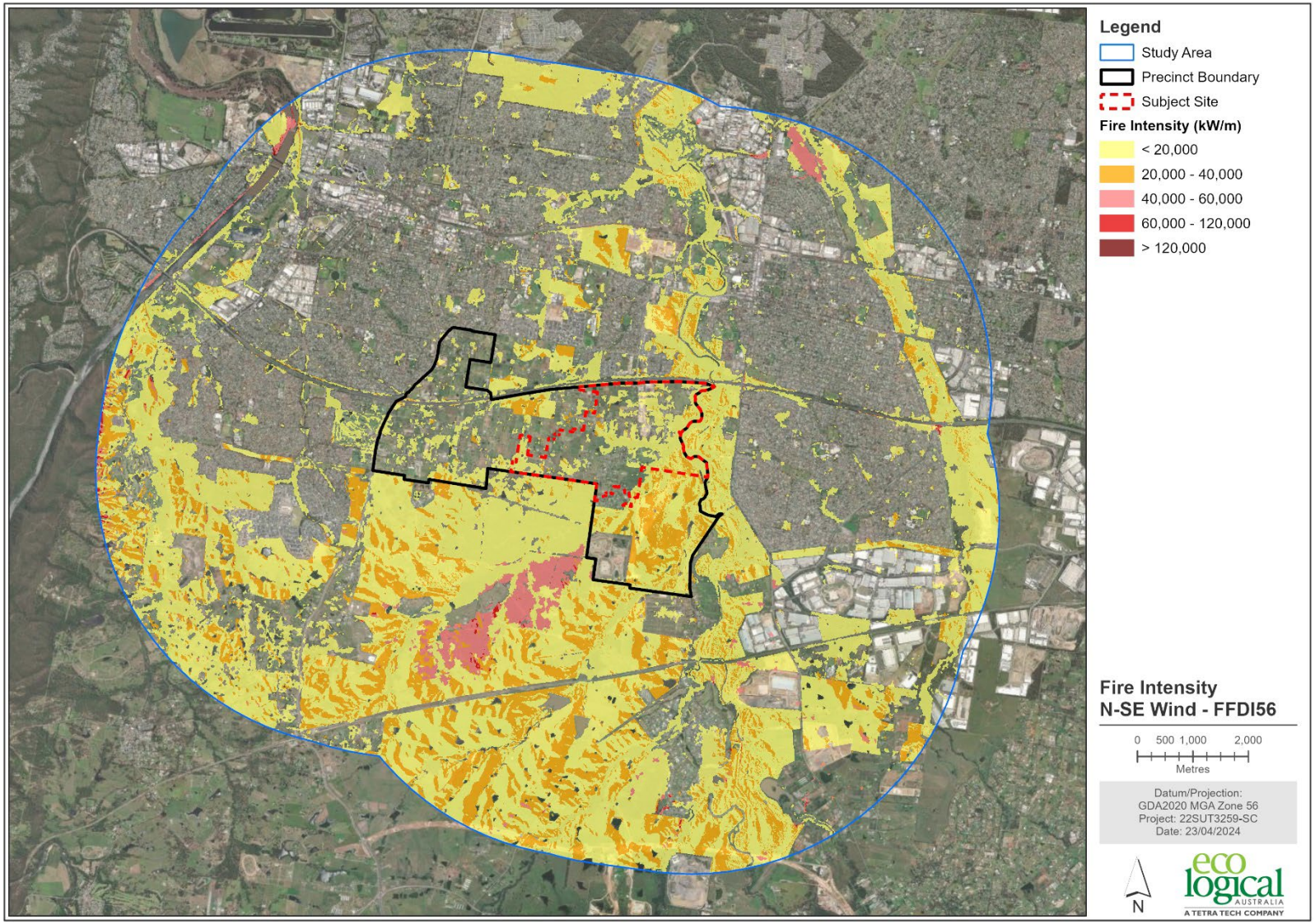

Figure 10: Directional Fire intensity modelling based on FFDI 56, North to South-east winds

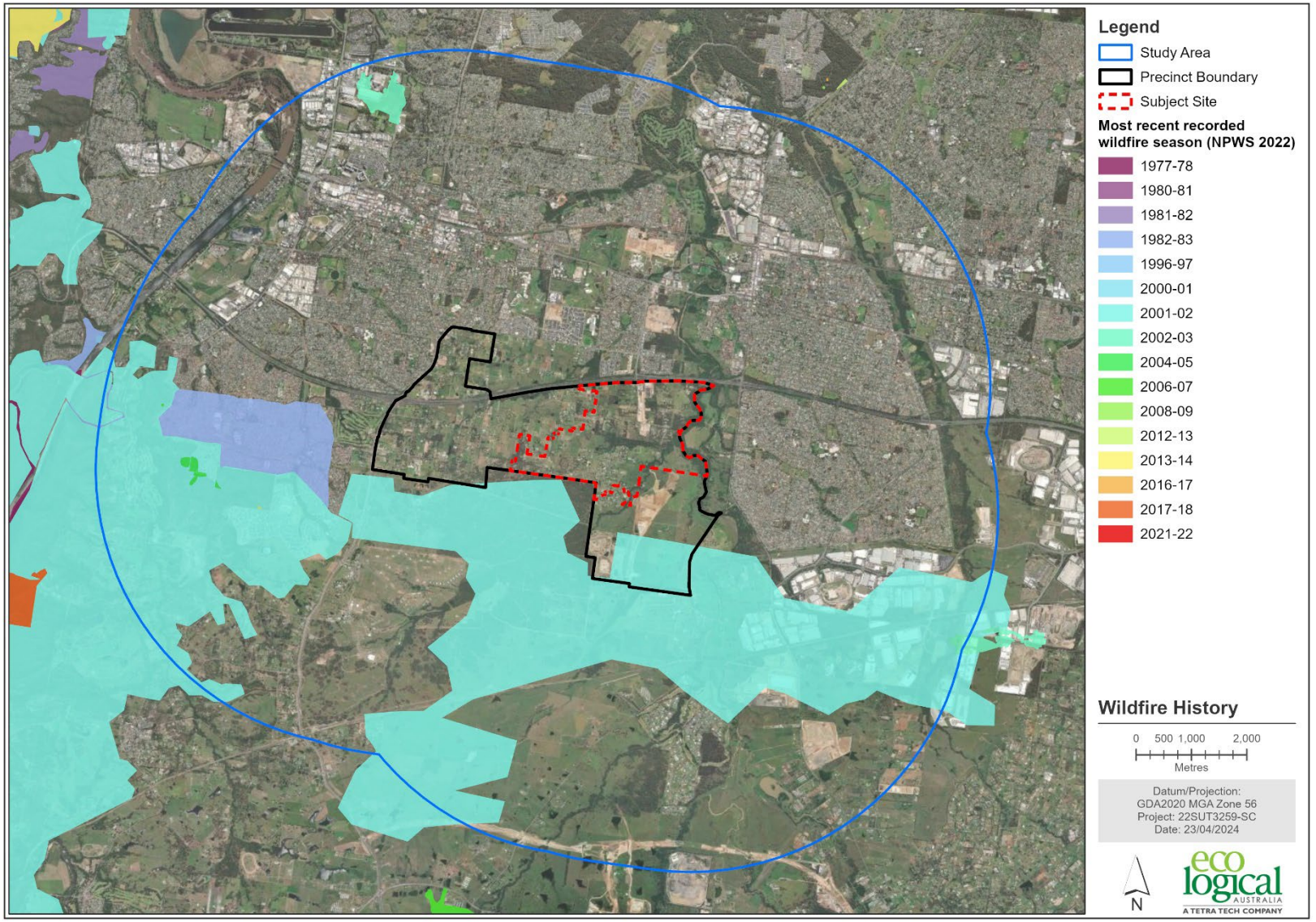

Figure 11: Mapped wildfire history within the Study Area (Source: NPWS)

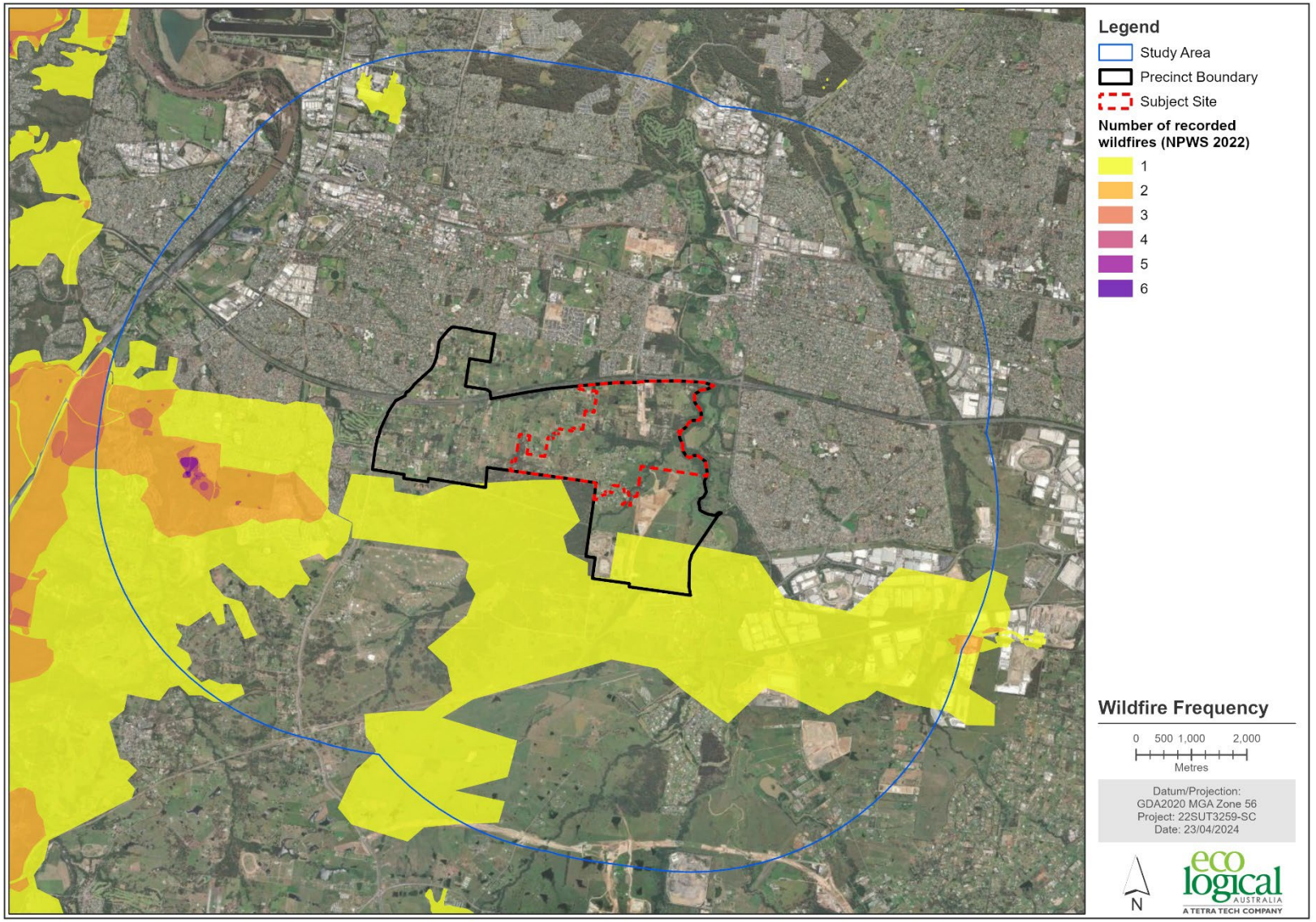

Figure 12: Fire frequency within the Study Area – 1964/1965 fire season to 2022/2023 season

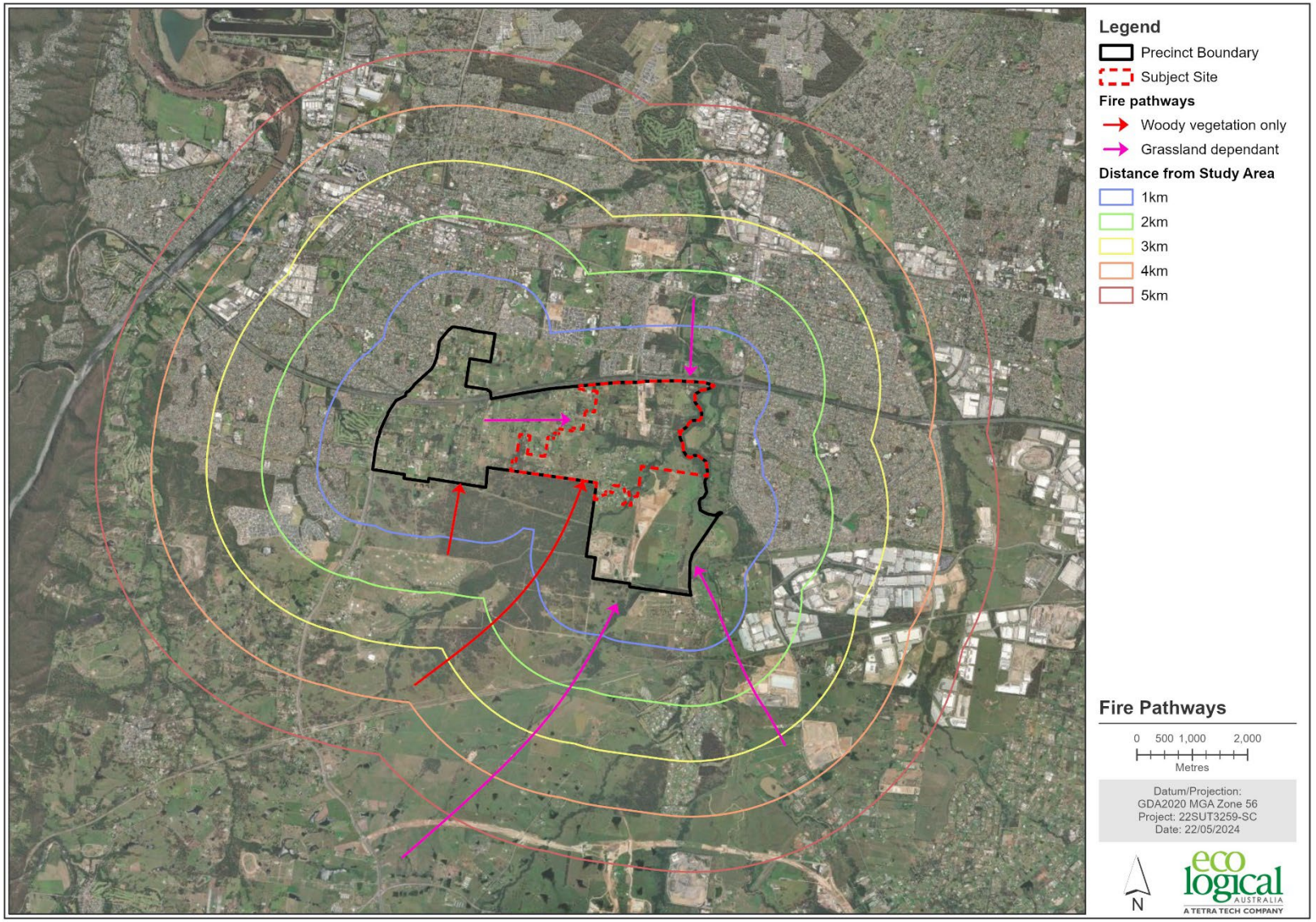

Figure 13: Fire pathways in the Study Area

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 prescribed BPMs in Chapters 5-8 of PBP. This land use assessment therefore considers the risk profile for each investigation area and the suitability for the contemplated land uses, along with the feasibility to meet APZ requirements.

4.1 Land Use Requirements

Future development on BFPL will need to satisfy the relevant performance criteria identified in PBP for the contemplated land uses. It is expected that future land uses enabled via rezoning and amendment to the Penrith LEP can accommodate the acceptable solutions identified in PBP and therefore reliance on performance solutions at the DA stage is minimised. A summary of these requirements is outlined Table 4 below.

Table 4: PBP Land Use Requirements

PBP Requirement	Land Use Activities	Provisions to be considered
Chapter 5 Residential and Rural Residential Subdivision	Low and medium density residential subdivision	Chapter 5 of PBP outlines the bushfire protection requirements for residential subdivision, including performance criteria identified for APZs, access and infrastructure. Compliance with the requirements as set out in Table 5.3 of PBP is required for all future subdivisions on BFPL.
Chapter 7 of PBP - Residential Infill Development	Infill low density residential development	Chapter 7 of PBP outlines the bushfire protection requirements for infill development. Provision of access and infrastructure requirements according to Table 7.3b of PBP is required for all future infill development on BFPL, along with building construction in response to the bushfire attack level.
Chapter 6 of PBP – SFPP Development	Vulnerable development as defined in PBP including School, Aged Care, Child Care, Hospitals etc.	Chapter 6 of PBP outlines the bushfire protection requirements for Special Fire Protection Purpose (SFPP) development. Provision of APZs, access, infrastructure and other requirements according to Table 6.8 of PBP is required for all SFPP on BFPL. This includes provision of a Bush Fire Emergency Management and Evacuation Plan is prepared as per Table 6.8d of PBP.
Section 8.3.1 of PBP - Buildings of Class 5 to 8 under the NCC /Section 8.3.10 Commercial and Industrial Development	Commercial and industrial development including offices, retail, warehouses etc.	Requirements for Commercial and Industrial development include: • 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 services to protect the building, and the location of

PBP Requirement	Land Use Activities	Provisions to be considered
		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.
Section 8.3.11 Public Assembly Buildings	Class 9b buildings greater than 500m^2	Where a public building has a floor space greater than 500 m^2 it may be considered a public assembly building, and due to the evacuation of a large number of people, this type of development is treated as SFPP. This could include future facilities in the planned Neighbourhood Centre such as a community centre. To meet SFPP requirements, future development on BFPL developments of this nature would need provisions for APZs that meet maximum RHF of 10 kW/m^2.and construction standards that meet minimum BAL-12.5. Emergency management planning will also need to be considered.
Section 8.2.2 Multi-storey residential development	Shop top housing and residential apartments greater than 3 storeys	Shop top housing and residential apartments exceeding three storeys in height are considered to be multi-storey buildings (by PBP) and are required to not only comply with the performance criteria within Chapter 5, but in addition the following issues need to be considered as per Table 8.2.2 of PBP. • Higher resident 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 bush fire attack; • Additional fuel loading from car and storage facilities; • Potential for balconies and external features to trap embers and ignite combustible materials; and • Increased exposure to convective heat due to height.

4.2 Risk Profile

The feasibility for future development to comply with the Bushfire Protection Measures (BPMs) identified within PBP is a fundamental consideration in determining the residual risk profile. While BPMs and their performance criteria are a benchmark for approval of a development, a strategic bushfire study needs also to evaluate these measures within the landscape risk context. This strategic bushfire study 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.

Consideration of BPMs for the purpose of this study has included review of the capacity for APZs, Access, Water Supply and Utilities, and Emergency Management. Specifically addressed in this section is the feasibility of the subject land to provide for APZ, a key bushfire protection measure, evaluated for the contemplated land uses.

4.2.1 Feasibility of Asset Protection Zones

Based on the bushfire hazard assessment, an assessment of the feasibility of PBP compliant APZs has been undertaken. The indicative APZ requirements are shown in Figure 14. Table 5 includes the minimum dimensions required by the Acceptable Solutions of PBP, where if implemented, the indicative APZs will provide a maximum exposure of Bushfire Attack Level (BAL)-29 for residential and BAL-12.5 for Special Fire Protection Purpose (SFPP).

Asset protection zones will need to be managed in perpetuity and it is recommended where an APZ is to be positioned in open space zones, a management plan is established to ensure ongoing APZ maintenance can be achieved. A vegetation management plan will also assist in hazard management along the hazard / APZ interface. Future legislative provisions to achieve management of open space areas should be considered, including the requirement of community title where Council will not be the managing authority.

To the west of the Stage 1 area there is a predominantly grassland hazard, with some smaller patches of woodland. This area presents as a temporary hazard until the broader precinct is developed. Until development occurs, the resulting APZ from these temporary hazards will need to be provided as shown in Figure 14. Alternatively, there may be opportunity for management of the temporary hazard to occur, which can be resolved in subsequent planning stages.

Future development contemplated will need to meet the applicable APZ dimensions for vegetation type and slope combinations (Figure 14and Table 5). The following considerations also apply for any future development:

- For any revegetation, PBP allows for vegetation to be classified as ‘Low Hazard’ and excluded from assessment based on patch size (i.e. <1 ha), width (i.e. <20 m) and proximity. Importantly, the separation distance between these patches needs to meet or exceed the distances detailed in A1.10 of PBP (see below). If assessed as a low threat exclusion, the provision of bushfire protection measures such as an Asset Protection Zone (APZ) setback is not required.
- Vegetation within required Asset Protection Zones should be managed as either an inner protection area (see A4.1.1 of PBP), or where applicable pending the outcome of assessment of required APZs, an outer protection area (see A4.1.2 of PBP).

Table 5: APZ dimensions for residential development

Vegetation Formation	Slope Class	Residential APZ (BAL-29)[1]	Special Fire Protection Purpose (SFPP) APZ[1]
Grassland	All upslope and flat	10 m	36 m
	>0-5° downslope	12 m	40 m
	>5-10° downslope	13 m	45 m
	>10-15° downslope	15 m	50 m
	>15-20° downslope	17 m	55 m
Forested Wetland	All upslope and flat	10 m	34 m
	>0-5° downslope	12 m	42 m
	>5-10° downslope	16 m	51 m
	>10-15° downslope	20 m	62 m
	>15-20° downslope	26 m	73 m
Woodland	All upslope and flat	12 m	42 m
	>0-5° downslope	16 m	50 m
	>5-10° downslope	20 m	60 m
	>10-15° downslope	25 m	72 m
	>15-20° downslope	32 m	85 m

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

4.3 Land Use Evaluation

The location and type of land uses proposed is generally considered consistent with the strategic planning principles, with regard to the ability for bushfire protection measures to be provided.

Table 6 below provides a summary of the land use evaluation for the differing development types contemplated. The land use evaluation has considered potential for development with consideration to:

- The risk profile of the site
- The potential for compliant bushfire protection measures.

Table 6: Land Use Evaluation for the site

Land Use	Capacity for Bushfire Protection
Low and Medium Density Residential / Large Lot	It is anticipated that different residential typologies can comply with PBP including the provision of APZ's, as indicatively shown in Figure 14/ Table 5 Where development is activated via subdivision, the provision of perimeter roads is not considered a constraint. Where development is activated via the infill development provision, consideration to DCP mechanisms to ensure perimeter roads around all hazards may be required.

Land Use	Capacity for Bushfire Protection
Multi-storey residential	Future development is feasible outside of the 29kW/m^2 APZ or greater and other relevant considerations can likely be addressed in design, therefore future multi-storey development is achievable. Future development will need to consider design aspect and material at detailed design to comply with the requirements in section 8.2.2 of PBP.
SFPP Development	Requirements for SFPP development have been considered and suitable areas are feasible within the precinct, with suitable areas outside of the SFPP APZ. It is recommended that these sites are developed to accommodate future SFPP buildings located 100m or greater from bushfire hazard to ensure additional considerations beyond PBP are not triggered, including those under the National Construction Code (NCC, 2022).
Commercial / Industrial	No specific requirements apply for this development type however the aims and objectives of PBP should be considered. These are considered achievable for future land uses, with the provision of residential APZ. Where ground floor retail occurs in conjunction with residential development, then PBP requirements for residential development should apply
Community Facilities	Requirements for SFPP development have been considered and there are suitable areas outside of the required SFPP APZ. It is also recommended that these sites can accommodate future buildings located 100m or greater from bushfire hazard to ensure additional considerations beyond PBP are not triggered, including those under the National Construction Code (NCC, 2022). Where facilities are not classed as public assembly buildings, then development should meet the aims and objectives of PBP.
Recreation	No specific requirements apply however the aims and objectives of PBP can be achieved for future land uses.

For future development, compliant APZ's must be provided at CDC /DA stage. However, the implementation of compliant APZs within the Precinct based on the ILP is not considered a limitation, as shown in Figure 14. Nor is there any part of the land-use assessment that suggests proposed development areas comprise 'inappropriate development' under the Strategic Planning Principles or exclusion criteria within PBP in relation to the feasibility of APZs. It is also important that where revegetation is to occur (e.g. riparian corridors), that APZ requirements for existing development on adjoining land are afforded and the bushfire risk to existing properties is not elevated.

The strategic placement of managed open space and perimeter roads in these areas is one planning strategy that has been incorporated into the Stage 1 design to mitigate this risk of future non-compliant APZ's. Where these are currently not afforded, it is expected that compliant APZ's and perimeter access will be accommodated within any future re-development and confirmed at the DA stage.

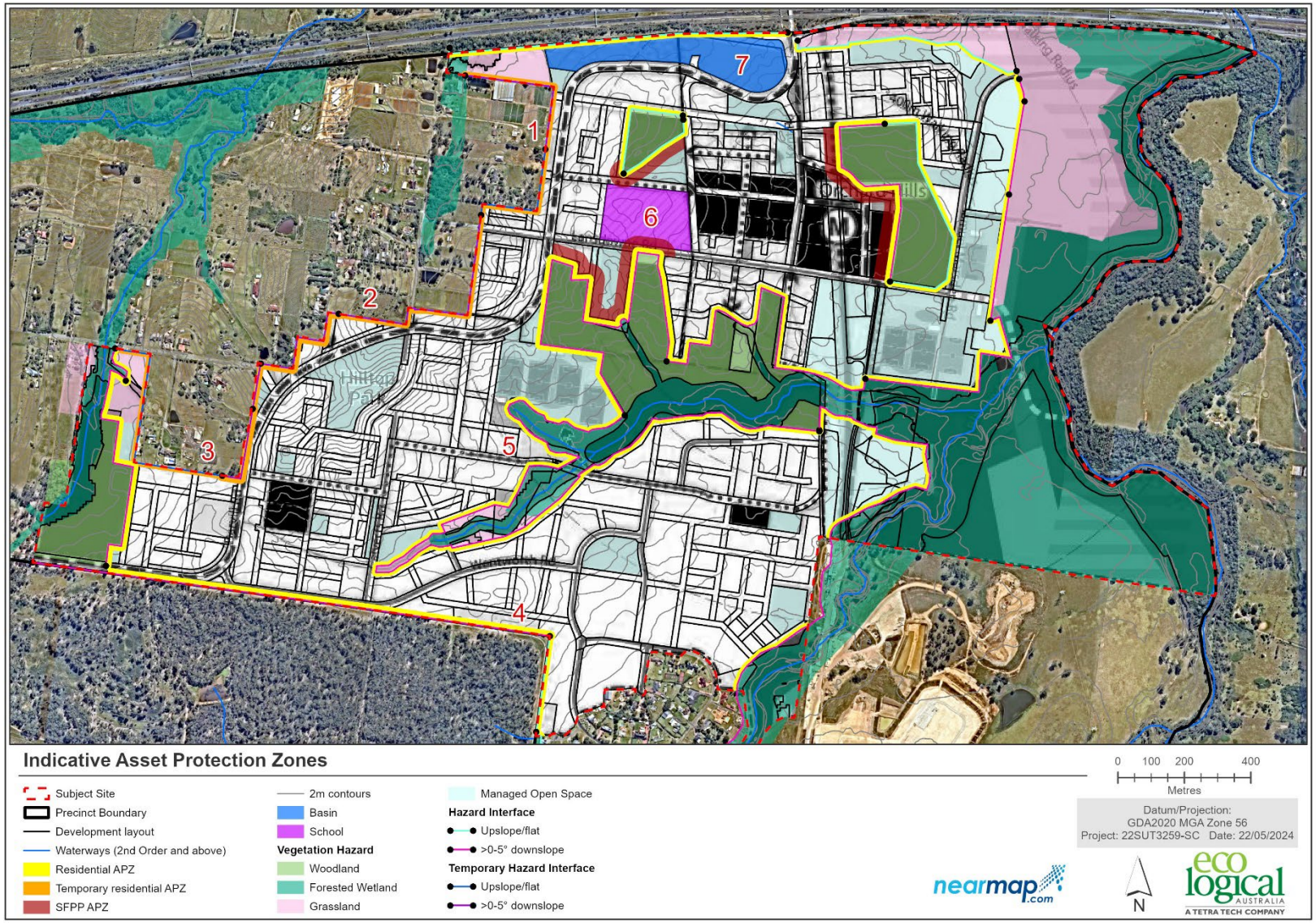

Figure 14: Indicative Asset Protection Zones

5. Access, Egress and Evacuation

As outlined in Chapter 4 of PBP, consideration to the provision of adequate infrastructure for emergency evacuation and firefighting operations is required. This includes:

- Capacity of the proposed road network for evacuating residents and responding emergency services, based on the existing and proposed community profile;
- The location of key access routes and direction of travel; and
- The potential for development to be isolated in the event of a bushfire.

These aspects are addressed below with regard to the ILP for the precinct.

5.1 Access

The Study area will be supported by multiple access routes. Kent Road serves as the primary north-south connection to suburbs to the north and access to the M4. Wentworth Road is the primary connection east-west within the stage, however additional east-west connecting roads have been placed to allow connections into later stages of the precinct plan.

Future development applications, including for the remaining stages within the ILP, will need to address access requirements as per PBP 2019 (Table 5.3b) including the provision of:

- 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.

Consideration of access as planning progresses is required, to ensure all future hazards are supported by the provision of compliant perimeter roads, including future hazards, abutting adjoining land. It is expected that the planned future development will be activated primarily via subdivision and therefore subject to the requirements of Chapter 5 of PBP, including the inclusion of perimeter roads. However, given the conglomerate of land ownership within the Precinct, additional planning mechanisms may be required to ensure the provision of effective perimeter roads are not compromised by staggered development, increased residential density, or development activated via the infill development provisions outlined in Chapter 7 of PBP.

A review of access options proposed in the Master Plan has been undertaken and key points (as labelled on Figure 14) for consideration are:

- Map ID ‘1’: It is recommended that temporary perimeter access is provided at point 1. Given the residential development adjoins temporary bushfire hazard, access for firefighting purposes and mitigation is recommended.
- Map ID ‘2’: It is recommended that temporary perimeter access is provided at point 2. Given the residential development adjoins temporary bushfire hazard, access for firefighting purposes and mitigation is recommended.

- Map ID '3': It is recommended that temporary perimeter access is provided at point 3. Given the residential development adjoins temporary bushfire hazard, access for firefighting purposes and mitigation is recommended.
- Map ID '4': While perimeter access is currently provided on defence land to the south by way of a fire trail. Provision of a perimeter road meeting the requirements of Table 5.3b of PBP will be required by future development.
- Map ID '5': It is recommended that perimeter access is provided at point 4. Given the residential development adjoins bushfire hazard within the riparian corridor, access for firefighting purposes and mitigation is recommended.

5.2 Evacuation

While the risk of a significant bushfire necessitating the need for complete evacuation is low for the investigation area, it is an important consideration for strategic planning. Key considerations in relation to evacuation are provision for:

- Early offsite evacuation with multiple options;
- Safe on-site refuge capacity;
- Low risk development outcomes.

5.2.1 Early Offsite Evacuation

Evacuation is a necessary component of bushfire planning for the protection of life. Strategic planning should include adequate provision to support offsite evacuation. Within the Subject Site there are two current east-west connections, with three additional connections through future stages of the precinct plan. These connections will provide access to later stages of the ILP, Orchard Hills, and alternate access points onto the M4. Within the Stage 1 rezoning area ILP there is one north-south connection providing access to the M4, and continuing north to Claremont Meadows and Werrington. Key considerations for offsite evacuation are:

- Early offsite evacuation is critical, with late evacuation considered unsafe
- Evacuation should occur away from (or across) the path of a fire, but not towards it
- Roads that could be cut by fire during the evacuation period are not suitable for use during the passage for bushfire
- The road must be suitable to use in an emergency situation
- Intervention by emergency services should not be relied on for road control or other activities.

5.2.2 Access to Safer Places

Whilst early evacuation will always be the safest option, research into past bushfire incidents reveals that best practice is the provision of multiple and varying evacuation and refuge options for the community. Provision of access to safer place options is particularly important to support community resilience under rapid onset bushfire attack scenarios, where offsite evacuation is not achievable or not able to be undertaken prior to impact.

Consideration of Neighbourhood Safer Places (NSPs) provides one mechanism for increasing accessibility to safer places, whilst acknowledged as being a place of 'last resort'. Typically, NSPs provide a temporary refuge and include a building or an open space that may provide for improved protection of human life during the onset and passage of a bushfire (RFS 2017).

NSPs are approved by the NSW RFS and inspected by the regional Bush Fire Management Committee (BFMC). To ensure ongoing suitability and management, NSPs are included on the asset list in the regional Bush Fire Risk Management Plan (BFRMP). The criteria and principles for NSPs are documented in RFS (2017) and included in Appendix B. There are existing NSPs within the Penrith LGA, as detailed in Table 7 and shown in Figure 15.

Additionally, as shown in Figure 17, there is also considerable opportunity for the establishment of built NSPs within the majority of the developed area, and some capacity within the school site (RFS, 2015), further highlighting the resilience of the Precinct and capacity for future in Precinct refuge opportunities. Further opportunities for NSPs could be developed as the planning progresses through NSP modelling.

Table 7: Existing NSPs in close proximity to the Precinct

Neighbourhood Safer Place	Suburb	Type
Blue Hills Reserve	Glenmore Park	Open Space
Ridgetop Drive Reserve	Glenmore Park	Open Space
Jim Anderson Park	Werrington Downs	Open Space
John Batman Reserve	Penrith	Open Space

^ Accessed from https://www.rfs.nsw.gov.au/plan-and-prepare/neighbourhood-safer-places

5.2.3 Low Risk Development Outcomes

In combination with early off-site evacuation and capacity for safe on-site refuge, the risk level of the potential development outcomes across the Precinct warrants consideration with respect to evacuation demand. It is likely that the majority of residential allotments facilitated through subdivision will no longer be bush fire prone (i.e. greater than 100 m from remaining hazards) and therefore future development in these areas would have a low bushfire risk. Low risk development outcomes are also likely in the villages, pending the minimum lot size planned for these areas, and the management of retained / opens space land.

5.3 Evaluation of Access, Egress and Evacuation

Table 8: Evaluation of Access, Egress, and Evacuation

Considerations	Assessment	Evaluation
Early offsite evacuation	Multiple evacuation routes for evacuation	Early off-site evacuation is indicatively achievable via multiple access points. As planning progresses, network capacity should align with anticipated development activation and population numbers, demonstrated via traffic modelling. The need for entire stage evacuation is lessened by the bushfire risk profile, within Precinct refuge options and low risk development outcomes.
Onsite capacity for safe refuge	Capacity for provision of neighbourhood safer places (NSP)	There is good opportunity for planned community spaces within the Stage 1 area to comply with built NSP requirements (Figure 17), which if

Considerations	Assessment	Evaluation
		adopted provide additional emergency options, specifically safe in Precinct refuge. Such an opportunity provides the Precinct with additional bushfire resilience beyond the minimum requirements of PBP.
Low risk development outcomes	Figure 18 of the Precinct Study maps a 100 m buffer from the bushfire hazard interface, with 100 m being the statutory distance that bushfire protection measures are applied to development within PBP and AS 3959 (i.e. bushfire prone property).	There is widespread opportunity for low risk development outcomes, in land greater than 100 m from the closest bushfire hazard and thus not considered bushfire prone. As a result, future developments and occupants are not expected to be exposed to significant bushfire attack. As such, these areas will have a low risk from bushfire, which diminishes with distance from the hazard. Therefore, the evacuation or refuge need is primarily considered to be those occupants within 100 m of the hazard interface.

5.4 Emergency Services

The following is recommended for strategic land use planning to achieve the objectives and strategic planning principles of PBP 2019 relating to emergency management. Strategic emergency management planning is undertaken in collaboration with emergency service organisations within the strategic land use planning process, to establish preferred future outcomes (i.e., emergency evacuation) that have implications for land use planning, including:

a. Consideration of the increase in demand for emergency services;
b. Emergency evacuation planning; and
c. Evacuation adequacy assessment.

In regard to the demand for emergency services, Eco Logical Australia reviewed existing emergency services in proximity to the Precinct and note that there is an existing RFS brigade close by as shown in Figure 16, In addition, as shown in Table 9, additional Fire and Rescue NSW (FRNSW) resources are also stationed at St Marys. Despite this, further resources may be required, and this should be further discussed with emergency services and other relevant stakeholders as planning progresses. It is further anticipated that there would be a transition from RFS to FRNSW as urban development is activated. Therefore it is important to review any proposed increased residential densities based on the outcome of any advice from relevant emergency management authorities.

Table 9: Fire stations within proximity to investigation area

Station
Rural Fire Service

Station
Orchard Hills Rural Fire Brigade
Fire and Rescue NSW
St Marys FRNSW

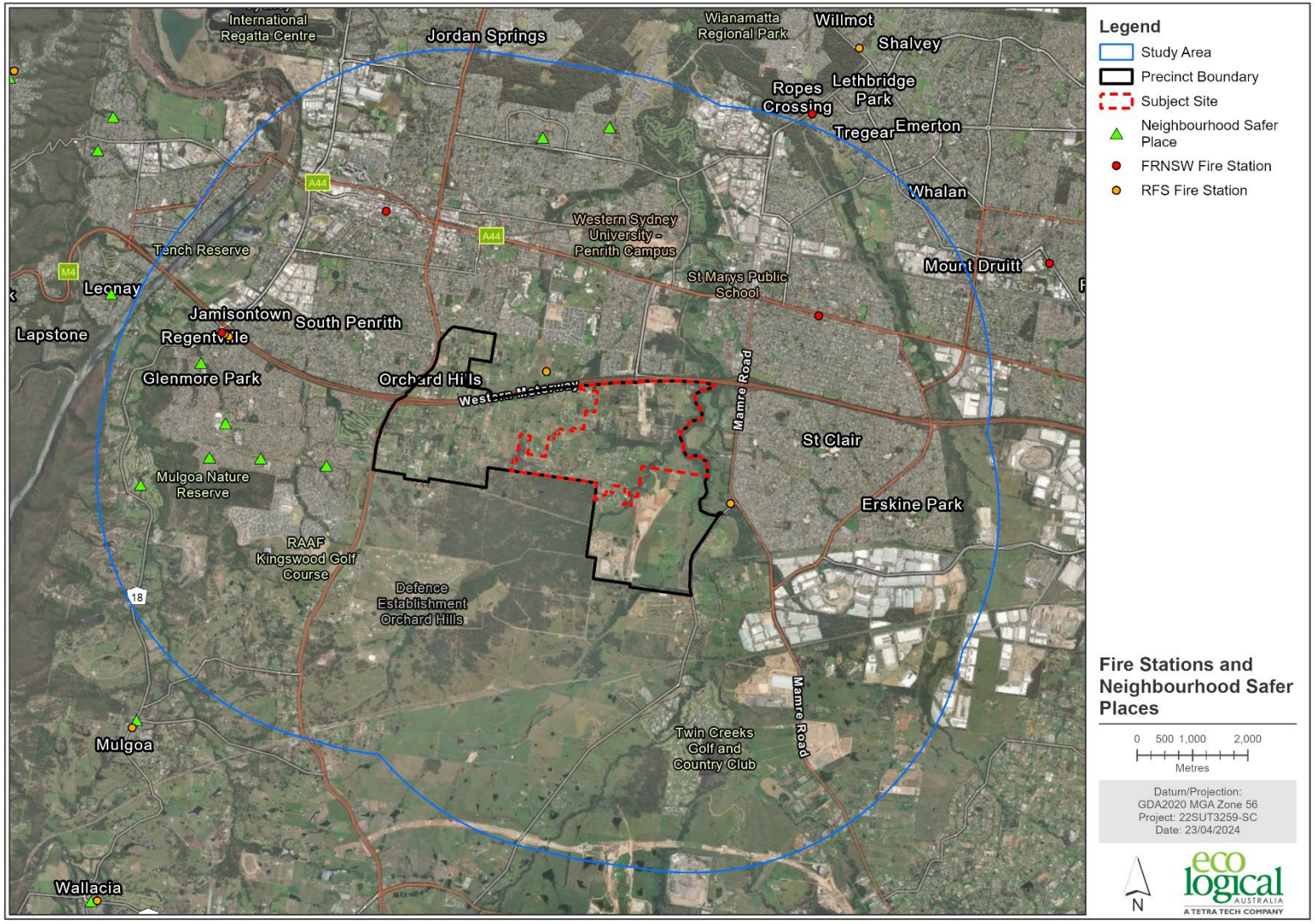

Figure 15: Fire Stations and Neighbourhood Safer Places

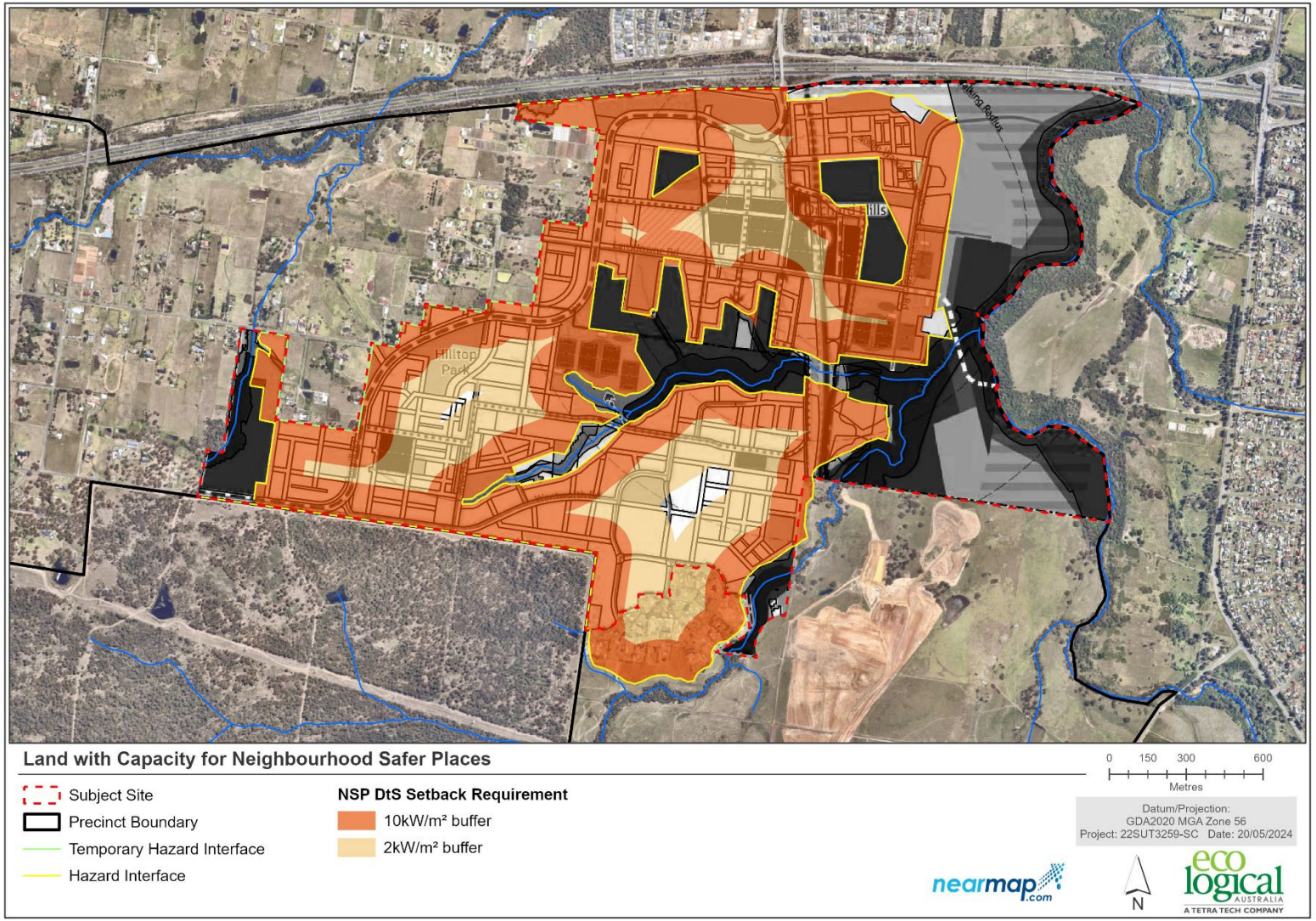

Figure 16: Capacity for NSP's

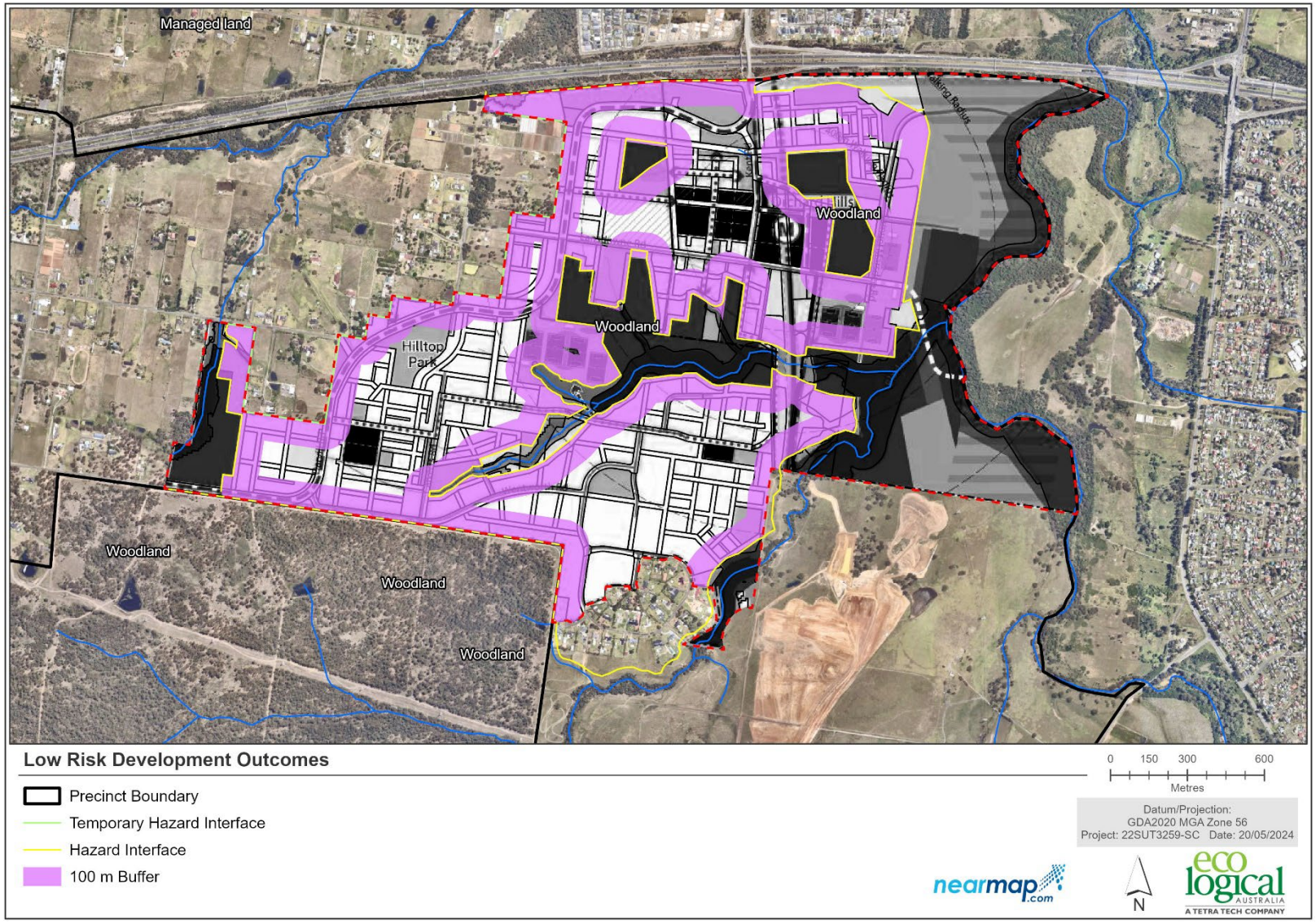

Figure 17: Low Risk Development Outcomes

6. Infrastructure and Adjoining Land

Strategic planning requirements seek to identify any potential 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 bushfire 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. Table 5.3 and Table 6.8 of PBP detail the acceptable solution requirements for these aspects.

6.1 Water

To comply with PBP, future development should ideally 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. Where future development is not supplied by reticulated water, a static water supply for firefighting purposes is required for each occupied building in accordance with the capacities outlined in PBP.

6.2 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 are detailed in PBP. The acceptable solution requirements for these services are expected to be achievable for future development within the investigation areas.

6.3 Adjoining Land

For any future development, compliance with PBP BPMs is required and should not require changes to existing bushfire management practices on adjoining land. This includes the provision of APZ's wholly within the Subject Land or provided by public roads. Consideration as planning progresses is the provision of any additional bushfire protection measures necessary, including APZs and perimeter access, to ensure areas of revegetation (e.g. riparian corridors) do not increase the bushfire risk existing properties are subject to. The provision of perimeter roads and managed open space adjoining these areas is one strategy that has been incorporated in the Stage 1 rezoning area ILP to mitigate this concern.

However, there are some areas where the provision of APZ's and perimeter access (including temporary measures) may need to be provisioned within the subject land of future development to avoid any increased bushfire risk on adjoining land.

7. Evaluation

This section evaluates the contemplated development against the bushfire strategic planning requirements of PBP and based upon the assessment findings in the preceding sections, to determine whether:

- The proposal poses an unacceptable risk or provides for inappropriate development;
- Future development can adequately respond to the bushfire threat; and
- Future development can provide adequate bushfire protection measures to reduce the residual risk to an appropriate level.

The evaluation is based upon Chapter 4 of PBP and the Assessment Framework of this Study and is summarised in Table 1. 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 – future development including the future staged Precinct Plan should not be reliant on fuel management on adjoining lands or effect those landowners' ability to undertake such works

A summary of the evaluation of the proposal against the strategic requirements is provided in Table 10.

Table 10: Evaluation of proposal against strategic planning requirements of PBP

Strategic Principle	Summary of Suitability	Evaluation
Ensuring land is suitable for development	Moderated risk profile by existing residential land to the east, west and north and mixed management of the open space area to the east, and active management along the perimeter of the defence establishment to the south. Further to this, there is limited woody vegetation to carry fires of elevated intensity into the Precinct. Provision of bushfire protection measures for future development considered feasible. Access/Egress is not considered a constraint to future urban development, with multiple access points provided. Perimeter Infrastructure, including the provision of reticulated water not considered a constraint to residential development.	Not considered inappropriate subject to the provision of bushfire protection measures compliant with PBP.
Ensuring new development on BFPL will comply with PBP	Low risk development outcomes achievable, along with provision of bushfire protection measures.	Not considered inappropriate subject to the provision of bushfire protection measures compliant with PBP. However, as planning progresses, consideration should be given to the temporary APZs and provision of the perimeter roads discussed in this report.
Minimising reliance on performance based solutions	Low risk development outcomes achievable, along with provision of bushfire protection measures. Construction requirements with future development not considered unachievable.	Not considered inappropriate subject to the provision of bushfire protection measures compliant with PBP. It is noted that for the avoidance of performance solutions, further design refinement should include the provision of perimeter roads for all hazards as noted in this report.
Providing adequate infrastructure associated with emergency evacuation and firefighting operations	Multiple access points contemplated, along with access between the norther and southern portions of the Precinct. Regional capacity of existing emergency services will need to be considered as part of broader planning to ensure uplift and activation is complimented by any uplift in the provision of services.	Not considered inappropriate, however further consultation required.
Facilitating appropriate ongoing land management practices	Areas of revegetation within the Precinct require bushfire protection measures and additional strategies to ensure adjoining land is not encumbered by any increased	Not considered inappropriate subject to mitigation strategies.

Strategic Principle	Summary of Suitability	Evaluation
	bushfire risk. Areas of revegetation and open space recommended to be managed under a plan of management.	

8. Conclusion and Recommendations

In evaluating the ILP for the Stage 1 area, contemplated for development against the bushfire strategic planning requirements of PBP, the assessment considered the development within the context of current and future residual risk with consideration to the broader Orchid Hills Precinct and the surrounding study area. The evaluation considers the merits for future development and potential for consistency with the strategic planning principles of PBP, with consideration to the following aspects:

- Future development will not pose or be subjected to an unacceptable risk; or provide for 'inappropriate development' outcomes;
- Adequate bushfire protection measures can be provided to reduce the residual risk to an appropriate level;
- Planning mechanisms to ensure future development will not adversely affect existing development such as the staged Precinct Plan or adjoining landowners and their ability to undertake bushfire management; and
- Planning mechanisms to ensure the potential for staggered or non-uniform activation of future development is mitigated given the complexity of land ownership within the precinct to ensure the provision of an effective road network, including perimeter roads is not compromised.

Based on the outcomes of this assessment, it is considered that the development contemplated has the potential to comply with the strategic bushfire planning requirements of Chapter 4 of PBP, subject to the following recommendations for Stage 1:

- Compliance with the acceptable solutions of PBP as planning progresses, including the provision of APZs and perimeter roads adjacent to all hazards, existing and proposed. Where this is not afforded in the ILP by the provision of managed open space and perimeter roads, it is expected that these can be accommodated within the subject land of future development.
- Additional perimeter roads should be considered along the riparian hazard, and provision of a perimeter road adjacent to defence land.
- Provision and management of temporary APZ and temporary access roads to ensure compliance with PBP.
- Further consideration to the capacity of evacuation routes and confirmation via traffic modelling that identified routes can support increased population density.
- Discussion with emergency service organisations regarding further resources required within the district resulting from Precinct development.
- Strategies to mitigate any potential impacts on adjoining land resulting from planned revegetation, through the provision of adequate bushfire protection measures including APZs and perimeter access.
- Strategies to mitigate non-uniform activation of development within the precinct to ensure the provision of bushfire protection measures are not compromised.

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