Level 13 420 George Street
Sydney NSW 2000
(02) 9259 3800

30 January 2024

Our ref: 23SUT6785

Western Parkland City Authority
50 Belmont Street
Penrith NSW 2750

Attention: Alexander Nikolic

Dear Alexander,

RE: Bushfire Advice - Bradfield City Centre Stage 2A Review of Environmental Factors and Roads

Eco Logical Australia Pty Ltd (ELA) was engaged by Western Parkland City Authority (WPCA) to provide bushfire related advice regarding the Review of Environmental Factors (REF) being prepared for Stage 2A Enabling Works for the Bradfield City Centre (**Figure 1**).

ELA understands that the scope of works for the REF (WPCA, 2023) include:

- Construction of new roads, and associated stormwater, earthworks and civil works
- Provision of wastewater, potable water, recycled water infrastructure
- Provision of electrical services network and reticulation infrastructure
- Provision of data and telecommunications network infrastructure
- Streetscape landscape works.

In order to perform these works, the following activities will be undertaken;

- Site clearance (including removal of vegetation)
- Provision of service authority utilities within the road corridors
- Street landscaping
- Drainage and stormwater infrastructure (including temporary stormwater basins and stockpiling of excess soil)
- Construction of temporary haul roads during construction (together with the construction of the new roads)
- Road works.

The purpose of this letter is to provide specific advice regarding the proposed construction of new roads and potential compliance of future development with bushfire related specifications for this bushfire protection measures (BPM). This advice is provided with respect to the specifications and requirements within Planning for Bush Fire Protection 2019 (RFS 2019) and Planning for Bush Fire Protection (RFS 2022), collectively referred to as PBP, and the Aerotropolis Development Control Plan (DCP) Phase 2 performance outcomes (**Table 1**).

Provision of all street landscaping and utilities (water, electricity, gas) must meet the PBP requirements and specifications for residential subdivision. These works are not considered a constraint and are therefore not discussed in this letter.

Table 1: Aerotropolis Development Control Plan Phase 2 Performance Outcomes

Numeric Section	Performance outcome	Benchmark solution
PO2	Populations of threatened species are retained, and the condition of suitable habitat improves within areas of the Cumberland subregion most likely to support long-term viability.	7: Locate Asset Protection Zones (APZs) for bushfire protection wholly within certified land. The appropriate APZ distance is determined by Planning for Bush Fire protection 2019 and Rural Fire Service Standards for Asset Protection based on vegetation type, slope and development type.
PO6	Bushfire risk is minimised	1: Ensure appropriate fire management regimes and hazard reduction techniques for native vegetation areas, waterways, and riparian zones.

Access - Assessment and Identified Outcomes

Future development is reliant on the provision of infrastructure, roads, and landscaping that can achieve compliance with PBP. Stage 2A works should be designed and implemented to be consistent with the standards for rural/residential subdivision development identified in PBP (Chapter 5).

Based on review of the Stage 2A REF scope of works (WPCA 2023), Stage 2A plans (**Figure 1**), existing hazards identified in previous reports (ELA 2022) and future hazards (**Figure 2**), it was determined the following roads are considered perimeter roads, whilst the remainder of the road network is treated as non-perimeter roads with regards to residential subdivision bushfire requirements under PBP:

- Road 01 (Innovation East);
- Road 05 (Centre Loop South); and
- Road 06 (Centre Loop West).

An assessment of the proposed road design has been undertaken and summarised as follows:

- **Table 2** documents review of the **Stage 2A perimeter roads** based on the cross-section detail provided. Recommendations have been made to assist in design changes to ensure all perimeter roads are designed to meet the requriements of PBP.
- **Table 3** documents a review of **Stage 2A non-perimeter roads** based on the cross section detail provided. The current road design was determined to meet the required specifications of PBP.

- **Appendix A** provides an extract from PBP identifying the specific access specifcations for residential subdivision as per Table 5.3b of PBP.

Additional Bushfire Protection Measures

To ensure future development can achieve compliance with PBP, the following requirements also apply to additional BPM:

1) Stage 2A works related to the provision of infrastructure such as reticulated water, underground electricity and gas supply should meet the requirements for these aspects as identified in Tables 5.3b and 5.3c of PBP.
2) Stage 2A landscaping works should be compliant with the Inner Protection Area requirements detailed in Appendix 4.1.1 of PBP to meet Asset Protection Zone Requirements of PBP.
3) Stage 2A works are related to the provision of new roads. These should meet the requirements and specifications detailed in Table 5.3b of PBP. This includes perimeter road specifications where development is adjacent to existing, future or temporary hazards.

In addition to the above, the following points should also be considered:

- Existing access roads, including perimeter roads that support adjacent development should not be impacted by Stage 2A works.
- Existing reticulated water supply supporting adjacent development, should not be impacted by Stage 2A works.
- Landscaping should not result in an increased bushfire risk for adjacent properties.

Conclusion

In considering the requirements outlined above, the following is recognised:

1) As reviewed in **Table 2**, proposed perimeter roads dimensions (carriageway widths) vary from the acceptable solutions detailed in Table 5.3b for perimeter roads for roads.
2) As reviewed in **Table 3**, proposed non-perimeter road dimensions (carriageway widths) meet the acceptable solutions detailed in Table 5.3b for non-perimeter roads.
3) Provision of all utilities (water, electricity, gas) are to meet the PBP requirements and specifications for residential subdivision, and is not considered a constraint.
4) Landscaping and provision of Asset Projection Zones (APZ) should meet the requirements detailed in Table 5.3b and 5.3c of PBP, and is not considered a constraint.

Recommendations

Several recommendations for perimeter roads have been outlined in **Table 2**, and are summarised as follows:

- Consultation and secured concurrence with RFS should be sought for performance solutions for all three perimeter roads.
- Road 01: Parking and hydrants to be located outside of the carriageway. Given current plans indicate no parking along this road, no parking signage must be incorporated into the design.
- Road 05 & 06: Design amendment to utilise a 2.5 m parking bay and 4 m one-way carriageway.
- Or alternate design specifications developed in conjunction with a bushfire consultant and RFS.

It is recommended that landscape plans are reviewed for consistency with PBP by an accredited BPAD Assessor. Indicative APZ's have been provided during strategic planning (ELA, 2022) to provide guidance for detailed design. Compliant landscaping is not considered a constraint to the provision of APZ's that meet the requirements specified in Appendix 4.1.1 of PBP.

If additional advice or assessment is required, please feel free to contact me.

Regards,

Deanne Hickey
Principal Bushfire Consultant

Bruce Horkings
Principal Bushfire Consultant and Technical Lead
FPAA BPAD Certified Practitioner No. BPAD29962-L3

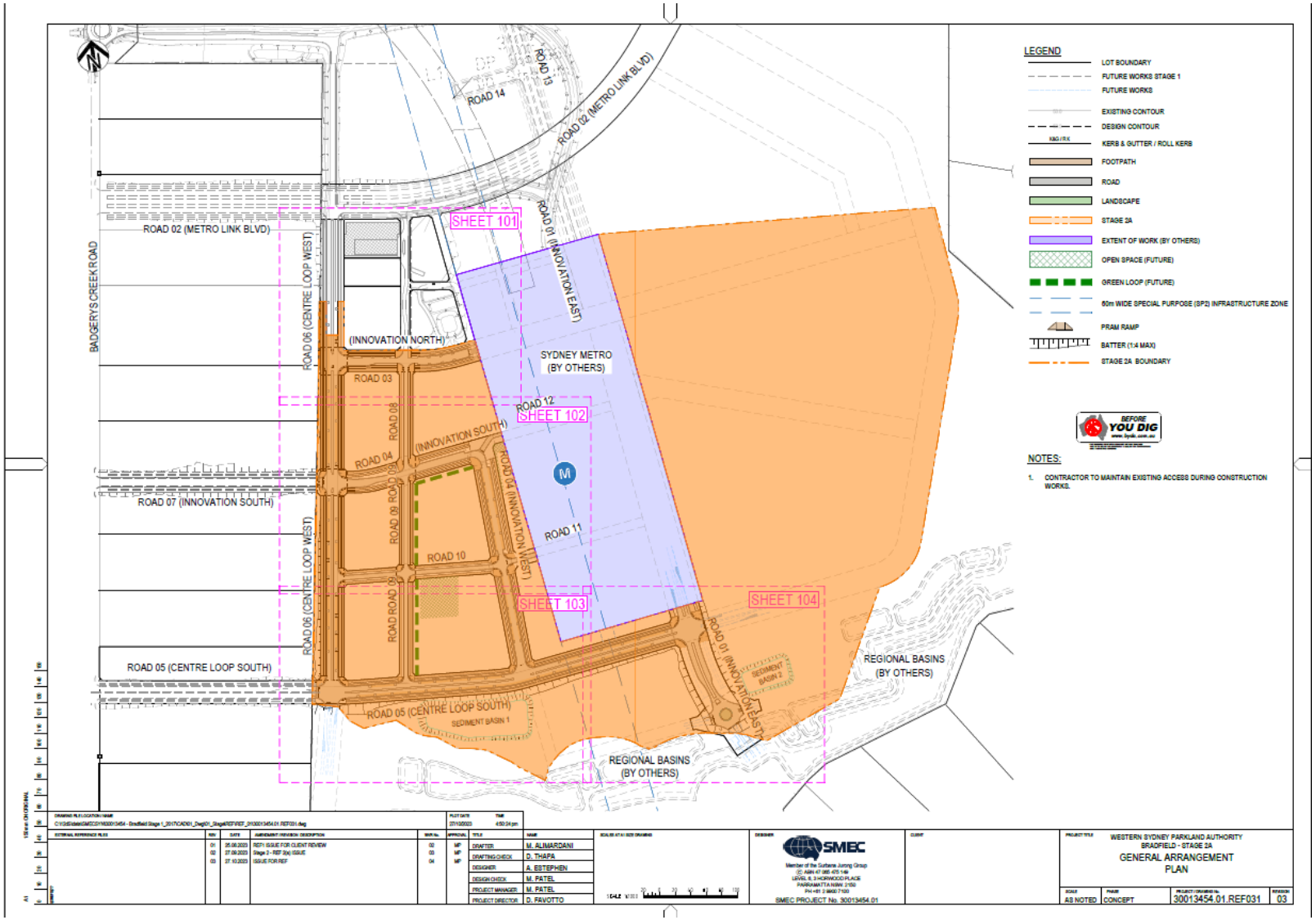
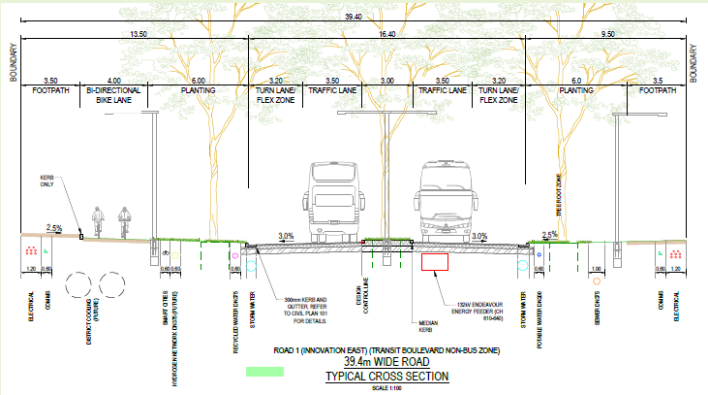
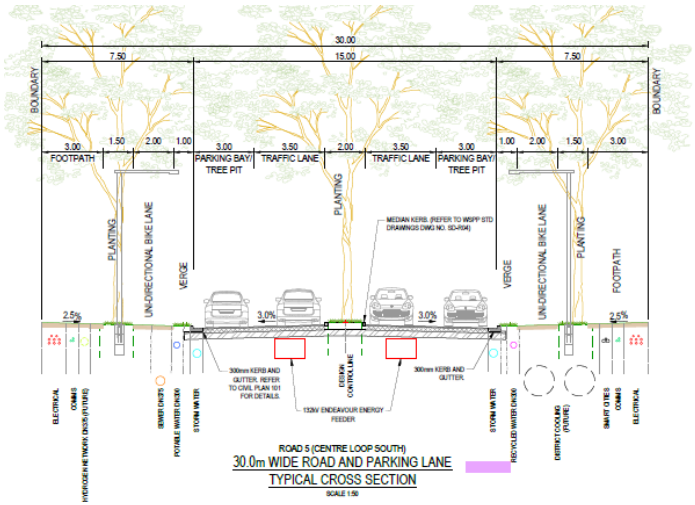


Figure 1: Stage 2A Plan

Figure 2: Bushfire Hazard Assessment (as per ELA 2022). Note temporary grassland hazard identified on map at locations 1, 2 and 3.

Table 2: Review of perimeter roads – Stage 2A

PBP Perimeter Road Requirements	Cross section	Comment
Perimeter roads (Specification as per Table 5.3b of PBP, see Appendix A)		
Road 01 **(Innovation East)** 8 m carriageway requirement		**Requirement(s):** The primary acceptable solution specifications for a perimeter road is (see Appendix A): • Two-way • 8 m kerb to kerb carriageway width • Parking outside of the carriageway width. • Minimum vertical clearance of 4 m • Specific requirements also apply for grade, crossfall and other aspects as detailed in Table 5.3b of PBP (see Appendix A). **Observation:** This design currently presents a variation from the acceptable solutions as detailed in Table 5.3b of PBP. **Comment:** The road corridor offers a four-lane dual carriageway with additional provision of a footpath and bike path. The design has merit to meet the intent of the performance criteria for perimeter roads subject to provision of parking and hydrants outside of the carriageway, and/or no parking signage incorporation into the design. **Recommendation:** Discuss and secure concurrence with RFS for a performance solution.

PBP Perimeter Road Requirements	Cross section	Comment
Road 05 **(Centre Loop South)** 8 m carriageway requirement		**Requirement(s):** The primary acceptable solution specifications for a perimeter road is (see Appendix A): • Two-way • 8 m kerb to kerb carriageway width • Parking outside of the carriageway width. • Minimum vertical clearance of 4 m • Specific requirements also apply for grade, crossfall and other aspects as detailed in Table 5.3b of PBP (see Appendix A). **Observation:** This design currently presents a variation from the acceptable solutions as detailed in Table 5.3b of PBP. **Comment:** The road corridor offers a two-lane dual carriageway, each lane 3.5 m wide with a 3 m parking bay. **Recommendation:** It is recommended the Road 05 design is amended to utilise a 2.5 m parking bay and 4 m one-way carriageway. While a 4 m one-way carriage way is still considered a performance solution under PBP, it can meet the intent of the prescribed 8 m two-way carriageway. Discuss and secure concurrence with RFS for a performance solution.

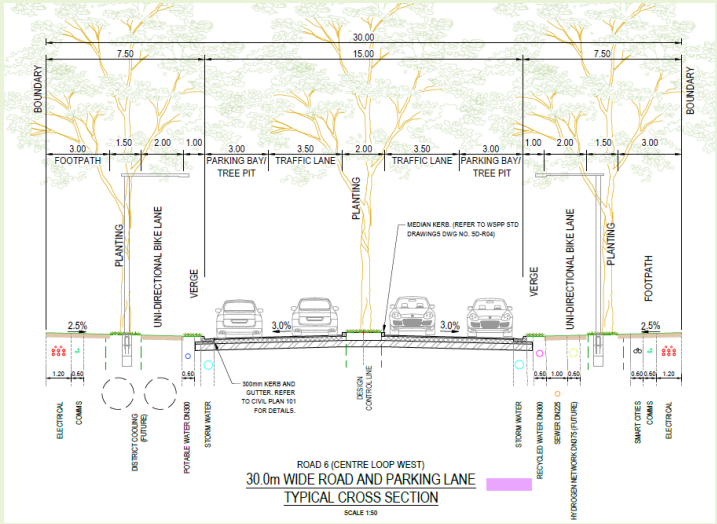
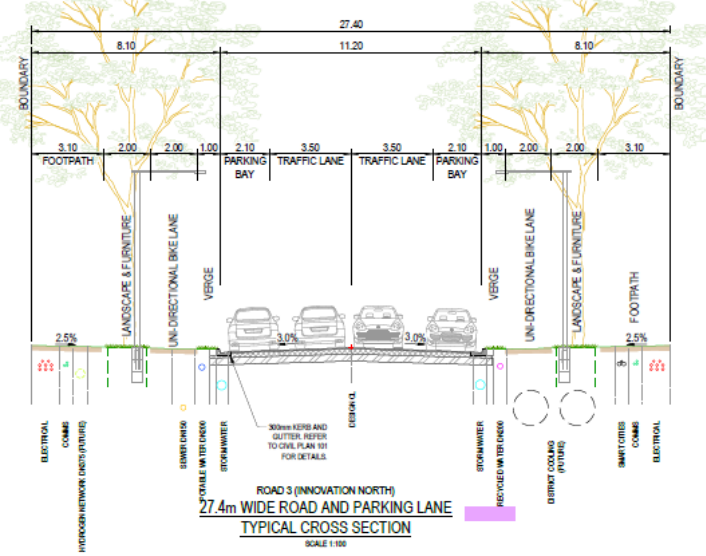
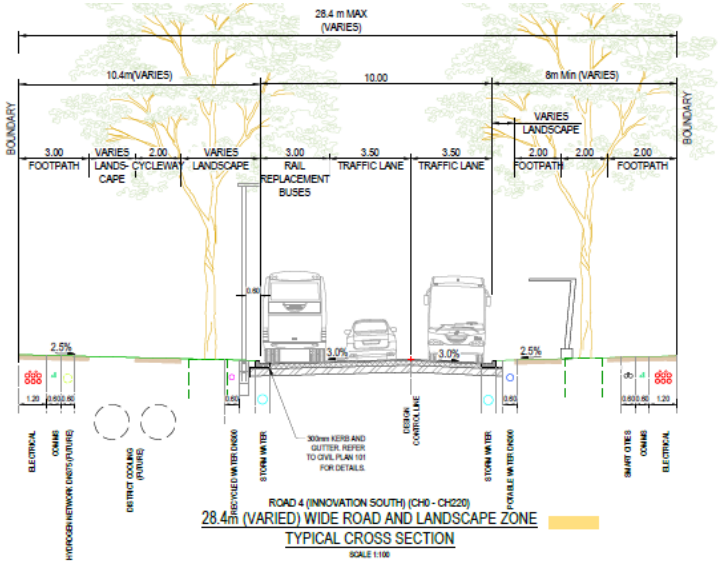
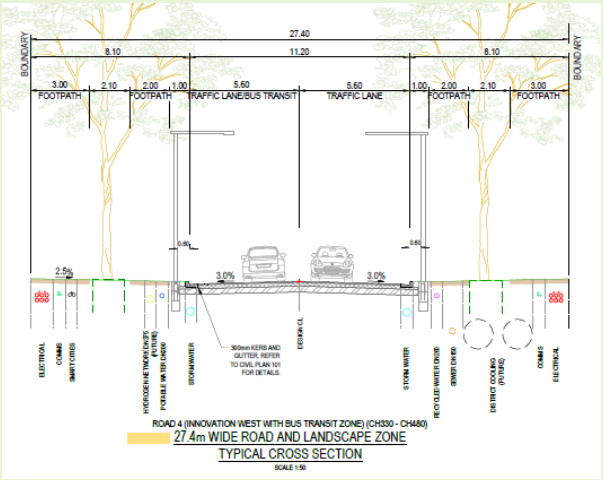
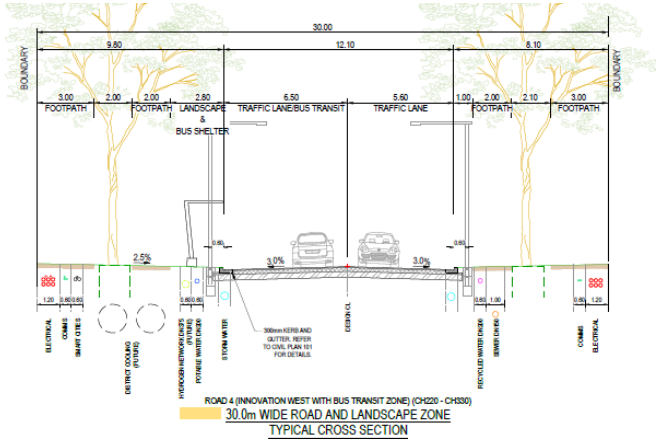
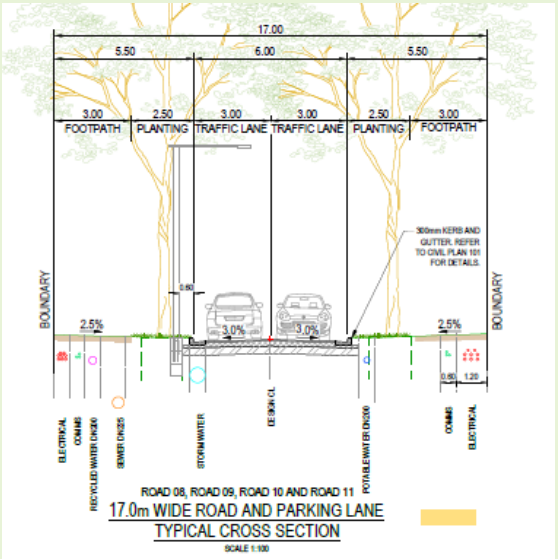
PBP Perimeter Road Requirements	Cross section	Comment
Road 06 **(Centre Loop West)** 8 m carriageway requirement		**Requirement(s):** The primary acceptable solution specifications for a perimeter road is (see Appendix A): • Two-way • 8 m kerb to kerb carriageway width • Parking outside of the carriageway width. • Minimum vertical clearance of 4 m • Specific requirements also apply for grade, crossfall and other aspects as detailed in Table 5.3b of PBP (see Appendix A). **Observation:** This design currently presents a variation from the acceptable solutions as detailed in Table 5.3b of PBP. **Comment:** The road corridor offers a two-lane dual carriageway, each lane 3.5 m wide with a 3 m parking bay. **Recommendation:** It is recommended the Road 06 design is amended to utilise a 2.5 m parking bay and 4 m one-way carriageway. While a 4 m one-way carriage way is still considered a performance solution under PBP, it can meet the intent of the prescribed 8 m two-way carriageway. Discuss and secure concurrence with RFS for a performance solution.

Table 3: Review of non-perimeter roads – Stage 2A

PBP Non-Perimeter Road Requirements	Cross Section	Comment
Non-Perimeter Roads (Specification as per Table 5.3b of PBP, see Appendix A below)		
Road 03 **(Innovation North)** 5.5 m carriageway requirement		Road width dimensions comply with non-perimeter road access requirements, being a minimum of 5.5 m two-way carriageway width with designated parking outside of this area. Refer to Table 5.3b of PBP for full specification.

PBP Non-Perimeter Road Requirements	Cross Section	Comment
Road 04 **(Innovation South)** 5.5 m carriageway requirement		Road width dimensions comply with non-perimeter road access requirements, being 5.5 m two-way carriageway, subject to no parking signage incorporation into the design, as there is no allocated space for parking. Refer to Table 5.3b of PBP for full specifications.
Road 04 **(Innovation West with Bus Transit Zone)** 5.5 m carriageway requirement		Road width dimensions comply with non-perimeter road access requirements, being 5.5 m two-way carriageway, subject to no parking signage incorporation into the design, as there is no allocated space for parking. Refer to Table 5.3b of PBP for full specification.

PBP Non-Perimeter Road Requirements	Cross Section	Comment
Road 04 **(Innovation West with Bus Transit Zone)** 5.5 m carriageway requirement		Road width dimensions comply with non-perimeter road access requirements, being 5.5 m two-way carriageway, subject to no parking signage incorporation into the design, as there is no allocated space for parking. Refer to Table 5.3b of PBP for full specification.
Roads 08 and 11 5.5 m carriageway requirement		Road width dimensions comply with non-perimeter road access requirements, being 5.5 m two-way carriageway, subject to no parking signage incorporation into the design, as there is no allocated space for parking. Refer to Table 5.3b of PBP for full specification.

REFERENCES

Eco Logical Australia (ELA). 2022. Bradfield City Centre Master Plan Application, Bushfire Strategy and Impact Assessment Study. Prepared for Western Parkland City Authority.

NSW Rural Fire Service (RFS). 2019. Planning for Bush Fire Protection: A Guide for Councils, Planners, Fire Authorities, Developers and Homeowners - issued December 2019. NSW RFS, Sydney.

NSW Rural Fire Service (RFS). 2022. Planning for Bush Fire Protection: A Guide for Councils, Planners, Fire Authorities, Developers – Addendum November 2022 - issued November 2022. NSW RFS, Sydney.

Western Parkland City Authority. 2023. BCC Stage 2A REF – Scope of Works – issued September 2023.

Appendix A

Extract of Table 5.3b from PBP - Performance criteria and acceptable solutions for access for residential and rural residential subdivision

	PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS
	The intent may be achieved where:	
ACCESS (GENERAL REQUIREMENTS)	› firefighting vehicles are provided with safe, all-weather access to structures.	› property access roads are two-wheel drive, all-weather roads; › perimeter roads are provided for residential subdivisions of three or more allotments; › subdivisions of three or more allotments have more than one access in and out of the development; › traffic management devices are constructed to not prohibit access by emergency services vehicles; › 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; › all roads are through roads; › dead end roads are not recommended, but if unavoidable, 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; › where kerb and guttering is provided on perimeter roads, roll top kerbing should be used to the hazard side of the road; › where access/egress can only be achieved through forest, woodland and heath vegetation, secondary access shall be provided to an alternate point on the existing public road system; and › one way only public access roads are no less than 3.5 metres wide and have designated parking bays with hydrants located outside of these areas to ensure accessibility to reticulated water for fire suppression.
	› 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 the relevant clauses of AS 2419.1:2005 - *Fire hydrant installations System design, installation and commissioning*; and › there is suitable access for a Category 1 fire appliance to within 4m of the static water supply where no reticulated supply is available.

	PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS
	The intent may be achieved where:	
PERIMETER ROADS	› access roads are designed to allow safe access and egress for 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.	› are two-way sealed roads; › minimum 8m carriageway width kerb to kerb; › parking is provided outside of the carriageway width; › hydrants are located clear of parking areas; › are through roads, and these are linked to the internal road system at an interval of no greater than 500m; › curves of roads have a minimum inner radius of 6m; › the maximum grade road is 15 degrees and average grade of not more than 10 degrees; › the road crossfall does not exceed 3 degrees; and › a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.
NON-PERIMETER ROADS	› access roads are designed to allow safe access and egress for firefighting vehicles while residents are evacuating.	› minimum 5.5m carriageway width kerb to kerb; › parking is provided outside of the carriageway width; › hydrants are located clear of parking areas; › roads are through roads, and these are linked to the internal road system at an interval of no greater than 500m; › curves of roads have a minimum inner radius of 6m; › the road crossfall does not exceed 3 degrees; and › a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.

Western Parkland City Authority

Bradfield City Centre
Master Plan Application

Bushfire Strategy and Impact Assessment Study

Prepared by Eco Logical Australia

September 2023

wpca.sydney

NSW GOVERNMENT

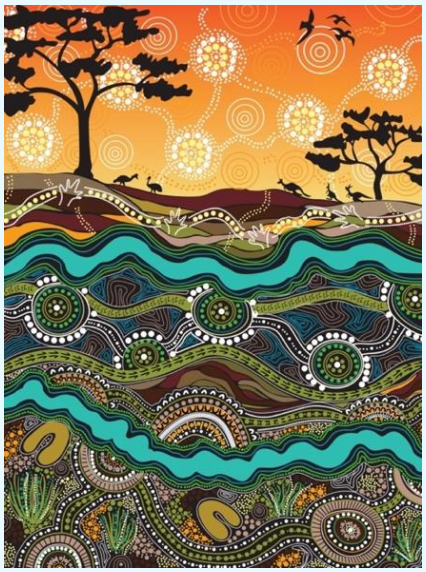
Acknowledgement of Country

Aboriginal people have had a continuous connection with the Country encompassed by the Western Parkland City (the Parkland City) from time immemorial. They have cared for Country and lived in deep alignment with this important landscape, sharing and practicing culture while using it as a space for movement and trade.

We Acknowledge that four groups have primary custodial care obligations for the area: Dharug/Darug, Dharawal/Tharawal, Gundungurra/Gundungara and Darkinjung. We also Acknowledge others who have passed through this Country for trade and care purposes: Coastal Sydney people, Wiradjuri and Yuin.

Western Sydney is home to the highest number of Aboriginal people in any region in Australia. Diverse, strong and connected Aboriginal communities have established their families in this area over generations, even if their connection to Country exists elsewhere. This offers an important opportunity for the future of the Parkland City.

Ensuring that Aboriginal communities, their culture and obligations for Country are considered and promoted will be vital for the future of the Parkland City. A unique opportunity exists to establish a platform for two-way knowledge sharing, to elevate Country and to learn from cultural practices that will create a truly unique and vibrant place for all.



Garungarung Murri Murri Nuru
(Beautiful Grass Country)
Artwork created by Dalmarri artists Jason Douglas and Trevor Eastwood for the Western Parkland City Authority

Version	Status	Date	Prepared By	Reviewer	Comments
1	Draft	18/2/2022	Kate Mannell / Deanne Hickey	Bruce Horkings FPAA BPAD Certified Practitioner No. BPAD229962-L3	Prepared by Eco Logical Australia
2	Draft	29/03/2022	Kate Mannell / Deanne Hickey	Nathan Kearnes FPAA BPAD Certified Practitioner No. BPAD23575-L3	Prepared by Eco Logical Australia
3	Draft	11/11/2022	Kate Mannell /Robyn Stevens /Deanne Hickey	Nathan Kearnes FPAA BPAD Certified Practitioner No. BPAD23575-L3	Prepared by Eco Logical Australia
4	Issue for TAP only	25/11/2022	Kate Mannell /Robyn Stevens /Deanne Hickey	Nathan Kearnes FPAA BPAD Certified Practitioner No. BPAD23575-L3	Prepared by Eco Logical Australia
5	Final	19/06/2023	Kate Mannell /Robyn Stevens /Deanne Hickey	Bruce Horkings FPAA BPAD Certified Practitioner No. BPAD229962-L3	Prepared by Eco Logical Australia
6	Final	27/06/2023	Kate Mannell /Robyn Stevens /Deanne Hickey	Bruce Horkings FPAA BPAD Certified Practitioner No. BPAD229962-L3	Prepared by Eco Logical Australia
7	Final	03/08/2023	Kate Mannell /Robyn Stevens /Deanne Hickey	Bruce Horkings FPAA BPAD Certified Practitioner No. BPAD229962-L3	Prepared by Eco Logical Australia
8	Final	13/09/2023		H. Gilvear (WPCA)	Amended Table 1

Executive Summary

This study evaluated the Master Plan Application for Bradfield City Centre, on behalf of Western City Parkland Authority (WPCA), against the bushfire strategic planning requirements of *Planning for Bushfire Protection* (PBP). In undertaking this assessment, a Strategic Bushfire Study was compiled to comply with the requirements set out in Chapter 4 (*Strategic Planning*) of PBP.

The technical assessment considered the broader bushfire landscape and risk profile for the study area, along with the feasibility for the provision of bushfire protection measures within the Master Plan, or where appropriate, the feasibility of relevant aspects for future planning stages. The study also reviewed the Master Plan Application against the relevant policies and requirements including Western Sydney Aerotropolis Development Control Plan – Phase 2 (DCP) and considered whether the proposal is consistent with the performance outcomes established for bushfire management in the DCP.

In consideration of the Master Plan with regard to the strategic planning principles of PBP, a landscape risk assessment was undertaken, which included an assessment of the broader bushfire landscape, bushfire weather and potential fire behaviour. A land use evaluation was also conducted to consider the appropriateness of future land uses and the ability for future development to comply with requirements set out in PBP.

The outcomes of this study indicate the residual risk influencing the site is not considered inappropriate for future development and therefore the land uses proposed by the Master Plan are not considered unsuitable with respect to the objectives of PBP, nor are they considered inconsistent with the DCP.

However, key recommendations as planning progresses includes delineation of the final hazard extent and typology particularly within the Thompsons Creek/ Moore Gully corridor and allowance for bushfire protection measures meeting the acceptable solutions of PBP, including provision for compliant perimeter roads adjacent to all bushfire hazards.

Contents

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Glossary of Terms

AS	Australian Standard
Aerotropolis	Western Sydney Aerotropolis
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
CBD	Central Business District
CDC	Complying Development Certificate
CIV	Capital Investment Value
DA	Development Application
DP	Deposited Plan
DPE	Department of Planning and Environment
DTS	Deemed to Satisfy
ENT	Enterprise Land Use Zone
ENV	Existing Native Vegetation
ENZ	Environment and Recreation Land use Zone
EP&A Act	Environmental Planning and Assessment Act 1979
EP&A Regulation	Environmental Planning and Assessment Regulation 2000
FDI	Fire Danger Index
FFDI	Forest Fire Danger Index
GEV	Generalised Extreme Value
LEP	Local Environmental Plan
LGA	Local Government Area

NASH	National Association of Steel-Framed Housing
NSP	Neighbourhood Safer Place
NSW Government	State Government for NSW
PBP	Planning for Bush Fire Protection
RFS	Rural Fire Service
SEPP	State Environmental Planning Policy
SFPP	Special Fire Protection Purpose
WPCA	Western Parkland City Authority

1 Introduction

1.1 Purpose of this report

This report accompanies the Master Plan Application for the Bradfield City Centre submitted to the Department of Planning and Environment (DPE).

All matters were considered to have been adequately addressed within the Master Plan Application or in the accompanying appendices.

1.2 The Western Sydney Aerotropolis

The Western Sydney Aerotropolis is an 11,200-hectare region set to become Sydney's third city (the Western Parkland City), and the gateway and economic powerhouse of Western Sydney.

The Aerotropolis comprises of the new Western Sydney (Nancy-Bird Walton) International Airport surrounded by five initial precincts which include the Aerotropolis Core, Wianamatta– South Creek, Northern Gateway, Agri-business and Badgerys Creek outlined in **Figure 1** below.

The final Aerotropolis planning package, including the Precinct Plan and State Environmental Planning Policy (SEPP) Amendment, was gazetted by DPE in March 2022 and the Development Control Plan Phase 2 was finalised in November 2022. These documents have been used to inform the preparation of the Bradfield City Centre Master Plan.

The proposed Master Plan Application for the site has also been prepared using the Western Sydney Aerotropolis Master Plan Guideline and Master Plan Requirements.

2 Bradfield City Centre

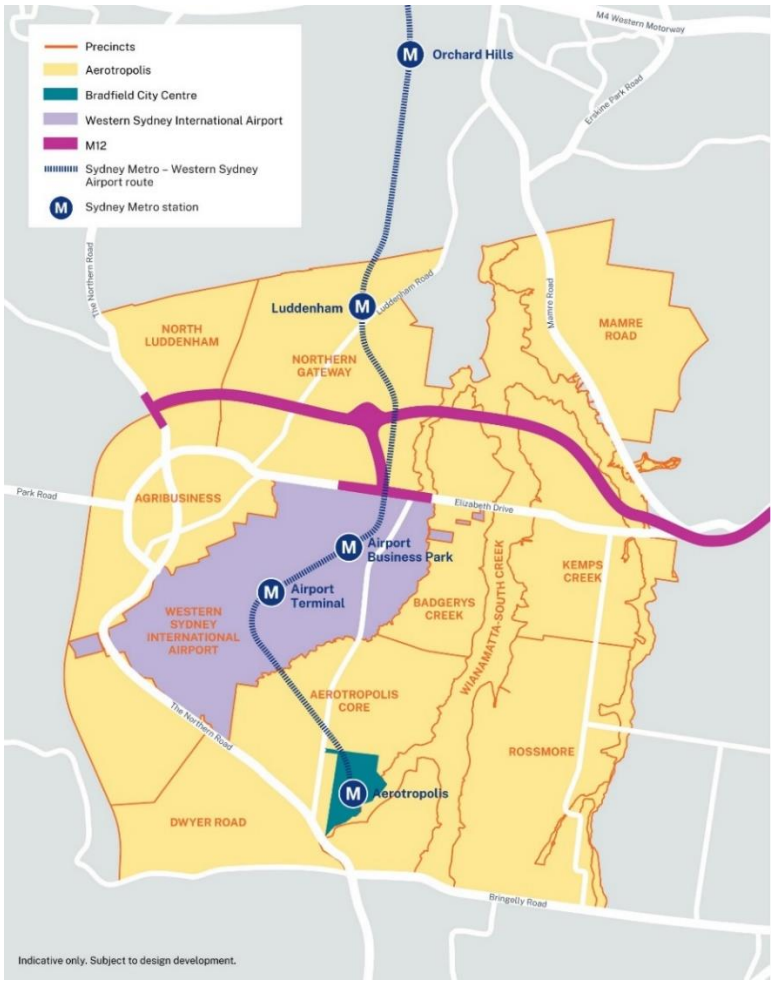
2.1 Strategic Context

The Bradfield City Centre is located to the south-east of the new Western Sydney International (Nancy-Bird Walton) Airport at the intersection of Badgerys Creek Road and The Northern Road (see **Figure 1** below).

The Sydney Metro Western Sydney Airport line runs through the site, providing connections from the key centre of St Marys through to stations at Orchard Hills, Luddenham, Airport Business Park, Airport Terminal and the Aerotropolis which is located within the site.

The site is surrounded by several key roads and infrastructure corridors including Bringelly Road, Badgerys Creek Road, Elizabeth Drive, M12 and The Northern Road.

Figure 1 Strategic Context



Set on natural waterways, Bradfield City Centre presents a rare opportunity to showcase the best urban design and to create a thriving, blue and green, connected City in which Australians will want to live, learn and work. The Bradfield City Centre will be a beautiful and sustainable 22nd Century City. It will foster the innovation, industry and technology needed to sustain the broader Aerotropolis and fast track economic prosperity across the Western Parkland City.

2.2 The Master Plan Site

The street address for Bradfield City Centre is 215 Badgerys Creek Road, Bradfield (the Site) within the Liverpool Council Local Government Area (LGA). The site is legally described as Lot 3101 DP 1282964 and has an area of 114.6 hectares, with road access to Badgerys Creek Road located at the north-western corner. The site spans across the Aerotropolis Core and Wianamatta-South Creek Precinct, within Western Sydney Aerotropolis. The Site is outlined in **Figure 2** below.

The Site is predominantly zoned Mixed Use under the Western Parkland City SEPP, with a small portion of Enterprise zoned land located on the north-western corner of the site. The site also includes Environment and Recreation zoned land mostly along `s Creek.

Figure 2 Master Plan Site

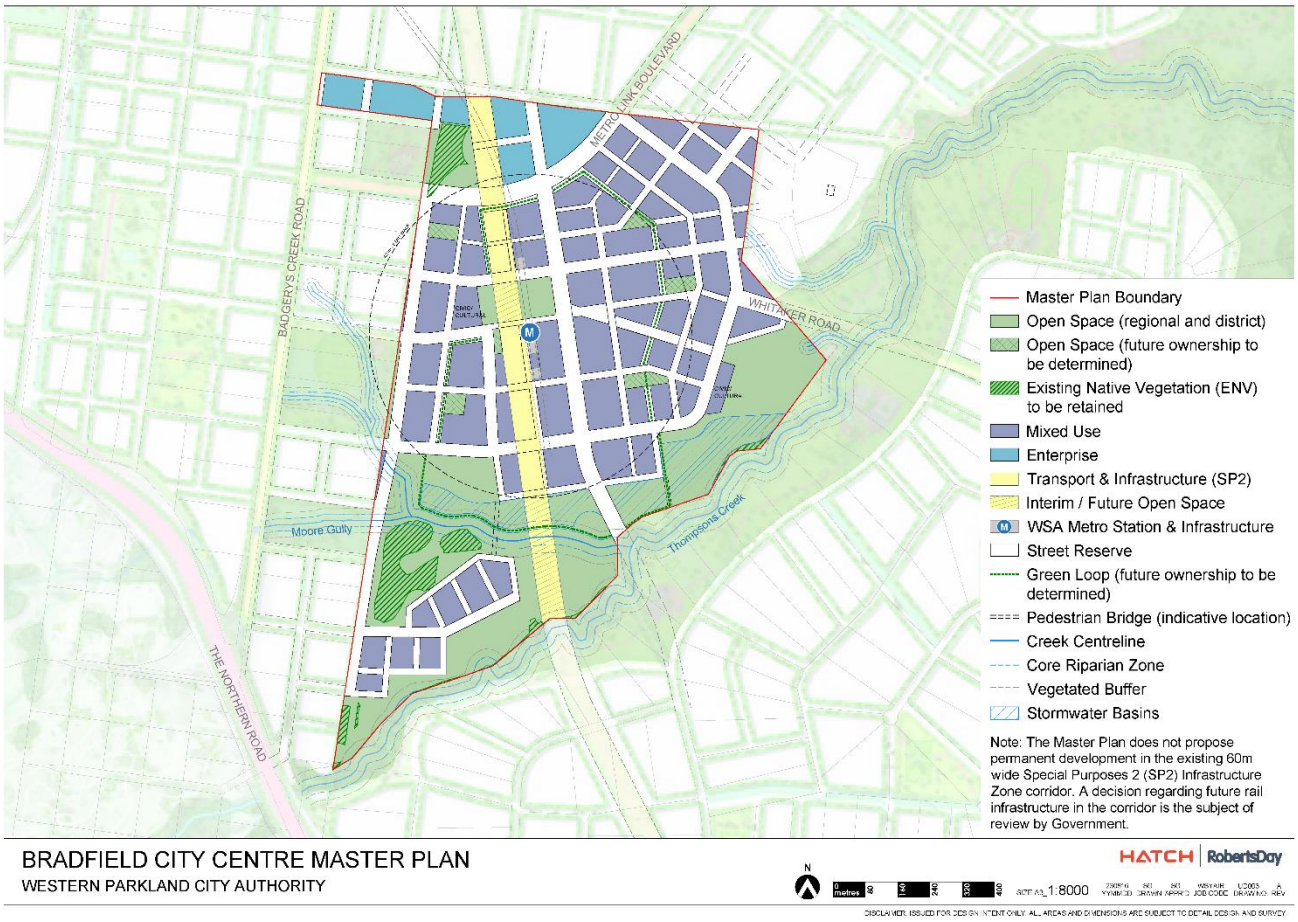
2.3 The Bradfield City Centre Master Plan

The Western Parkland City Authority has prepared a Master Plan (**Figure 3** below) in accordance with the DPE Master Plan Requirements.

The Master Plan sets out a framework for future development within the Bradfield City Centre which includes:

- Road network, key connectors to adjoining land and the regional road network (existing and future)
- Block structure
- Indicative open space network
- Sustainability strategy
- Social and infrastructure strategy
- Arts and culture strategy
- Infrastructure servicing strategy

Figure 3 Master Plan



2.4 The Proposal

The Bradfield City Centre Master Plan is intended to facilitate the growth of the centre over time. The Master Plan has established the following three planning horizons for technical assessments.

Table 1 - Planning & Development Horizons

Phase	Indicative Timeframe	Estimated employment	Estimated residential population	Estimated Gross Floor Area (cumulative)
Immediate	2026	1,000 - 1,200 jobs	0 residents	48,500 sqm
Medium-term	2036	8,000 - 8,300 jobs	3,000 - 3,100 residents	341,000 sqm
Long-term	2056	20,000 – 24,000 jobs	15,000 – 15,200 residents	1,258,000 sqm

Note: The table above is an estimate of the population and employment forecast used for the purposes of modelling only.

The master plan has the capacity to accommodate ~10,000 residential dwellings. In accordance with NSW Government policy a proportion of the residential dwellings will be affordable housing. The timing and delivery of residential dwellings will be subject to market demand and future master plan reviews that consider the impact of additional population on the scope and timing of social and physical infrastructure.

3 Baseline investigations

The Subject Land is currently mapped as bushfire prone land on the Liverpool City Council Bush Fire Prone Land (BFPL) map as published by the Department of Planning and Environment (DPE). However, this is expected to change as the Aero Core Precinct and surrounding precincts (including the Western Sydney Airport north-west of the Site) are activated and developments lead to a change in extent of bushfire prone vegetation.

The Subject Land is primarily zoned Mixed Use (MU), with portions of Environment and Recreation (ENZ), and Enterprise (ENT) under the Western Parkland City SEPP. Historically, the Subject Land has been utilised for agriculture and the current landscape is dominated by vacant agricultural land. External to the site, along the western, eastern and south-eastern boundaries is existing rural residential development.

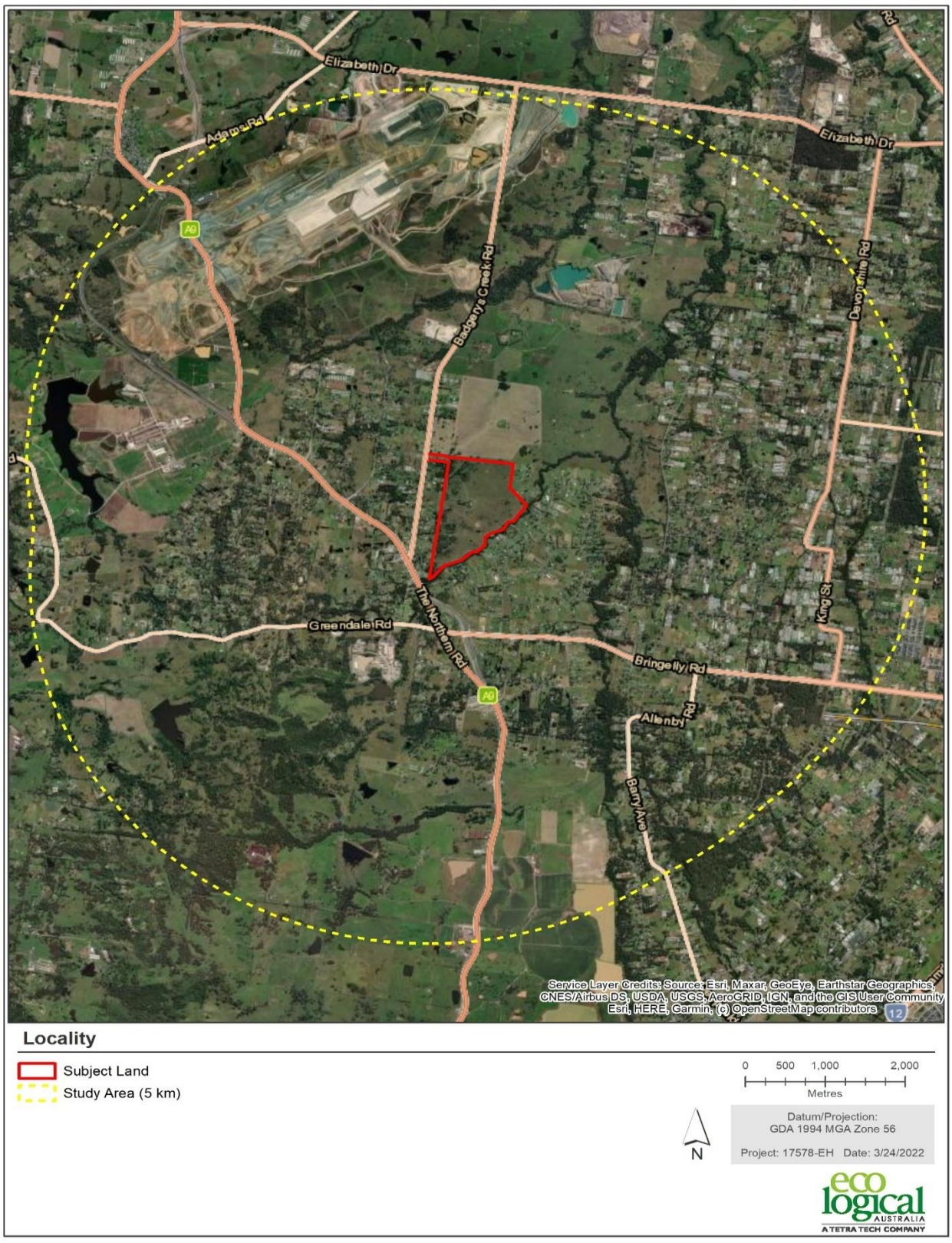
3.1 Technical baseline site consideration

This study seeks to review the Master Plan application in relation to the requirements of *Planning for Bush Fire Protection* (PBP) (RFS 2019). In meeting this objective, the study will consider the bushfire landscape risk, land uses, access and egress, emergency services, infrastructure and adjoining land.

3.2 Area of Focus

This study considers the land for which the Master Plan Application for the Bradfield City Centre applies (Subject Land), (**Figure 4**)

Figure 4 Study Area for Strategic Bushfire Assessment



4 Assessment Requirements and Policy Context

4.1 Master Plan Requirements

The DPE have issued Master Plan Requirements (MPRs) to the Authority for the preparation of a Master Plan for Bradfield City Centre. This report has been prepared to address the following MPRs in relation to bushfire as summarised in Table 2.

Table 2 - Master Plan Requirements

Reference	Master Plan Requirement	Where addressed
23. Bushfire	The draft master plan must consider bush fire prone land and detail proposed bush fire protection measures, demonstrating compliance with Planning for Bush Fire Protection, and any requirements of the *Rural Fires Act 1997*.	Sections 4 and 5 outline assessment requirements and technical approach. Master Plan technical investigation is detailed in Section 6 and Impacts and mitigation assessment detailed in Section 7.
9. Complying Development Controls	The master plan must contain development controls applying to complying development, in accordance with clause 43 of the Aerotropolis SEPP, if complying development is proposed.	Section 0 discusses CDC constraints regarding bushfire

4.2 State Government Plans/Policies

4.2.1 NSW Environmental Planning and Assessment Act (1979)

The NSW Environmental Planning and Assessment Act (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 NSW Rural Fires Act 1997 (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 proposal, consent authorities must have regard to

Section 9.1 (2) Direction 4.3 – 'Planning for Bushfire Protection' of the EP&A Act.

The objectives of Direction 4.3 are to:

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

Direction 4.3 instructs the consent authority on the bushfire matters which need to be addressed and includes:

- Consultation with the Commissioner of the NSW RFS and consideration to any comments made;
- Regard to requirements of Planning for Bushfire Protection; 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, additional bushfire considerations may apply.
- 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 3.1 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 bushfire requirements are outlined in chapter 4 of PBP.

4.2.2 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 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.

4.3 Western Sydney Aerotropolis

The Master Plan will facilitate development in the Western Sydney Aerotropolis in accordance with the objectives and principles of the Western Sydney Aerotropolis Plan, with consideration to:

- Relevant legislation (e.g., EP&A Act)
- Western Parkland City SEPP (including proposed amendments)
- Other relevant SEPPs including:
  - 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.
- Relevant Technical Reports including:
  - Urban Design Report (Hatch Roberts Day, June 2023)
  - Vegetation mapping undertaken for the Precinct (Biosis, June 2023)
  - Bushfire studies undertaken for the Western Sydney Aerotropolis (ELA 2020a) and Aero Core Precinct (ELA 2020b) on behalf of the Western Sydney Planning Partnership
- Western Sydney Aerotropolis Development Control Plan Phase 2 (NSW DPE, November 2022).
- Western Sydney Aerotropolis Master Plan Guidelines and Supplementary Guidance document (NSW DPIE, December 2021).

The Aerotropolis Development Control Plan Phase 2 (DCP) contains two key performance outcomes relevant to bushfire. Table 3 outlines the sections of this study where aspects of the benchmark solutions have been considered, along with relevant comment.

Table 3 - Policy Requirements

Numeric Section	Performance outcome	Benchmark solution	Master Plan consideration and comment
PO2	Populations of threatened species are retained, and the condition of suitable habitat improves within areas of the Cumberland subregion most likely to support long-term viability.	7: Locate Asset Protection Zones (APZs) for bushfire protection wholly within certified land. The appropriate APZ distance is determined by Planning for Bush Fire protection 2019 and Rural Fire Service Standards for Asset Protection based on vegetation type, slope and development type.	Indicative APZ's are achievable within the developable area or within planned managed open space areas. The final location and dimension of APZs is to be confirmed once the hazard extent is finalised, pending detailed design of riparian corridors and vegetation retention and management plans.
PO6	Bushfire risk is minimised	1: Ensure appropriate fire management regimes and hazard reduction techniques for native	The masterplan is consistent with the performance outcome through adherence to

Numeric Section	Performance outcome	Benchmark solution	Master Plan consideration and comment
		vegetation areas, waterways, and riparian zones.	requirements of PBP. The masterplan does not impede appropriate fire management regimes in line with the benchmark solution

4.4 Other Relevant Technical Standards

4.4.1 Planning for Bush Fire Protection

Chapter 4 of PBP outlines the broad principles and assessment considerations required for strategic planning. The strategic planning principles are summarised as:

- *Ensuring land is suitable for future development in the context of bush fire risk;*
- *Ensuring new development on Bush Fire Prone Land (BFPL) will comply with PBP;*
- *Minimising reliance on performance-based solutions;*
- *Providing adequate infrastructure associated with emergency evacuation and firefighting operations; and*
- *Facilitating appropriate land management practices.*

PBP also prescribes the exclusion of inappropriate development during strategic planning, based on:

- *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.*

To assist in evaluating the appropriateness of future development of an area, with regard to the assessment principles outlined above, PBP documents a set of assessment considerations, identified in Table 4.2.1 of PBP and summarised in Table 4 below. As per the strategic planning requirements outlined in Chapter 4 of PBP, assessment of these aspects is necessary for strategic planning at state, regional and local government levels, including LEP or DCP amendment, regional planning, precinct planning and master planning. This ensures, that at the development assessment phase, future development on land that is identified as being BFPL can comply with PBP.

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.

4.5 Summary of Key Implications for Master Plan

Following review of relevant legislative requirements, applicable planning controls and guidelines, Section 6 considers the technical framework to be implemented to meet the strategic planning principles of PBP, whilst Section 7 presents the technical assessment addressing the specific requirements for a Strategic Bushfire Study as required by PBP.

Also considered in subsequent sections, is the temporal scale at which the Master Plan will be implemented, with Stage 1 commencing 2023, through to the longer-term activation to 2056 and beyond.

Table 4 - Summary of assessment considerations for a strategic bush fire study (adapted from Table 4.2.1 of PBP)

Issue	Summary of Assessment Considerations
Bush fire landscape assessment	A bushfire 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 masterplan 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 masterplan 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.

4.6 Future Development Assessment Pathway

Some types of future development on BFPL may be undertaken as either Exempt or Complying Development under the Codes SEPP. Complying development can generally be undertaken on lower risk BFPL up to and including Bushfire Attack Level (BAL)-29 where the appropriate construction requirements and all other relevant development standards have been met. For higher risk BFPL settings, certain land uses, or where complying development cannot be achieved, the Development Application process would apply, with approval from the consent authority required.

The Western Sydney Aerotropolis Master Plan Guidelines states that complying development controls should consider the following matters:

- *Development types (uses), locations, staging (if any), building class to be carried out as complying development;*

- *Locations not suitable for complying development which may be due to prohibitions, planning constraints or exclusions in the Aerotropolis SEPP; and*
- *Key development controls and parameters for each complying development type/building/zone, which may include (but not limited to), three dimensional design controls for building height, floor space ratio, site coverage, any key building design principles (setbacks, articulation, separation, general design language, street activation), deep soil zones, landscaping and planting, traffic and parking strategy, stormwater, and servicing strategy and/or capability.*

Reviewing these considerations in relation to bushfire, Table 5 highlights key aspects to be evaluated for future development in regard to the suitability of the Complying Development Certificate (CDC) pathway.

Table 5 - CDC considerations for bushfire compliance

CDC Consideration	Restrictions to CDC pathway
Future Development Types	Subdivision, SFPP development, multi-storey development, Class 9 buildings to which section 8.3.11 of PBP (Public Assembly Buildings) is applicable, or any other development type that requires approval by the consent authority and /or referral to the RFS.
Locations	Prohibited CDC locations due to planning exclusions, or where the situation of future development is subject to BAL-40 or BAL-FZ
Staging	Staging of future development that inhibits feasibility (even if temporary) to comply with acceptable solution of PBP or achieve BAL-29 or lower.
Development controls	Design controls/capabilities (e.g. setbacks, landscaping and planting, traffic and parking strategy, servicing strategy) are inconsistent with acceptable solutions of PBP.
Planning Constraints	Eligible future development does not comply with all required acceptable solutions of PBP; or development to which the Codes SEPP does not apply

As development is activated, it is recommended that Bush Fire Prone Land mapping is updated in accordance with the RFS guideline, current at the time of development. All future development on BFPL will need to meet the requirements of Planning for Bush Fire Protection, and a BAL certificate can be issued by a suitably qualified consultant (e.g. BPAD accredited assessor) recognised by the NSW RFS may be required.

5 Technical Approach/ Framework

5.1 Master Plan Considerations

The Master Plan is the first step in the planning process to facilitate differing land use activities and future development across the site, as shown in **Figure 3**. It presents a plan that enables a variety of topologies facilitating a mixture of-residential uses, commercial and enterprise development, infrastructure, open space, public recreation, and conservation.

Future land uses considered by the Master Plan would be subject to various aspects of PBP, when occurring on BFPL. **Table 6** below outlines key PBP considerations for a variety of land uses and associated facilities that future development may be subject to.

Table 6 - PBP Considerations for future land uses

Future Land Use	Associated Facilities and/or Activities	Key PBP Considerations for future development
Residential Land Use		
Medium density & multi-storey residential	Walk-up apartments, mid-rise apartment, mixed use residential and retail	Chapter 5 of PBP outlines the bushfire protection requirements for residential subdivision, 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) for residential buildings exceeding three storeys.
Special Fire Protection Purpose	Independent Living and Aged Care Childcare facilities, Hospitals Education facilities	Chapter 6 of PBP outlines the bushfire protection requirements for this type of development, including performance criteria identified for APZs, access and infrastructure.
Non-Residential Land Use		
Commercial	Retail and specialised retail including food services	Section 8.3.10 of PBP (Commercial and Industrial Development) applies to this type of development. Relevant protection measures to meet the aim and objectives of PBP.

Future Land Use	Associated Facilities and/or Activities	Key PBP Considerations for future development
Industrial	High tech industrial and enterprise development	Section 8.3.10 of PBP (Commercial and Industrial Development) applies to this type of development. Relevant protection measures to meet the aim and objectives of PBP.
Public Assembly Buildings	Buildings used for public assembly with a floor space area of greater than 500m^2	Section 8.3.11 (Public Assembly Buildings) applies to this type of development. Relevant developments will be treated as SFPP

In investigating the suitability of future development within an area of interest, a complex and large array of bushfire-related issues and concepts will be explored. Foremost however, this investigation is underpinned by the prioritisation of first principal bushfire risk considerations. As such, the bushfire assessment framework outlined below will guide this assessment.

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 or proposed land use 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 strategic bushfire study acknowledges that the outcome of any potential development on BFPL resulting from the proposal includes a level of residual risk and considers the acceptability of that risk.

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.

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 this, early unassisted offsite evacuation is a key risk assessment benchmark in this study; 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.

While options such as 'within precinct' evacuation and onsite refuge are not fail-safe, enabling these options, increases the resilience the city, and should be considered as planning progresses. This would assist in lowering the residual risk to an appropriate level, with a well-designed combination of onsite and offsite evacuation achieving the lowest residual risk, even if the onsite options are considered a 'redundancy' in terms of bushfire risk planning.

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. However, it is noted within this report that planned activation of additional services should be scheduled with the relevant agencies to ensure service capacity is appropriate to the level of uplift.

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.

6 Technical Assessment

The technical assessment detailed in this section includes six key subsections, followed by an evaluation of the assessment against the strategic planning principles outlined in PBP, and relevant commentary in relation to the Development Control Plan or Master Plan requirements.

6.1 Landscape risk assessment

A landscape risk assessment was undertaken for the Master Plan Application for the Bradfield City Centre and includes assessment of bushfire hazard, potential fire behaviour and bushfire history within the Subject Land and surrounds (Study Area).

6.1.1 Bushfire Hazard

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

The Study Area is situated within a broader landscape comprised predominantly of grassland vegetation, with patches of woodland and narrow corridors of forested wetland vegetation present along the riparian corridors. However, it is expected that revegetation and modification is likely to occur throughout the Master Plan area to reflect proposed land uses. While the Open Space Strategy has been applied to guide this assessment, as planning for riparian areas, conservation areas and open space progresses, these areas should be revaluated.

Vegetation has been classified into Keith Formations and Keith Class (Keith 2004) and assigned a potential total fuel load (tonnes/hectare) using Table A1.12.8 from PBP. **Figure 5** and **Table 7** show vegetation formation as mapped in the Remnant Vegetation of the western Cumberland subregion mapping (OEH, 2013 VIS_ID 4207). Unmanaged rural land is also likely to fall into the PBP grassland hazard class and has therefore been included in **Table 7** below.

Slope was interpolated from 25 cm and 2 m contours and is displayed in Figure 6. The Subject Land is generally flat to undulating, primarily falling within the PBP slope class of >0-5° downslope, with narrow bands of steeper areas associated along the south-eastern boundary, and with the Thompson's Creek riparian corridor. Within the broader Study Area, it is predominately flat to undulating, however there are some isolated steeper lands present to the west of the Subject Land.

Table 7 - Vegetation formation, class and fuel allocation for the Study Area

PBP Hazard Class	Keith Class	Overall Fuel Load (t/ha)[1]
Forest (dry sclerophyll)	Cumberland Dry Sclerophyll forests	36.1
Grassy Woodland	Coastal Valley Grassy Woodland	20.2
Forested Wetland	Coastal Floodplain wetlands	15.1

PBP Hazard Class	Keith Class	Overall Fuel Load (t/ha)[1]
Rainforest	Littoral Rainforest	13.2
Grassland	Exotic and agricultural grassland	6

[1]*From A1.12.8 of PBP*

Figure 5 Vegetation formation derived from OEH Vegetation mapping (OEH, 2013)

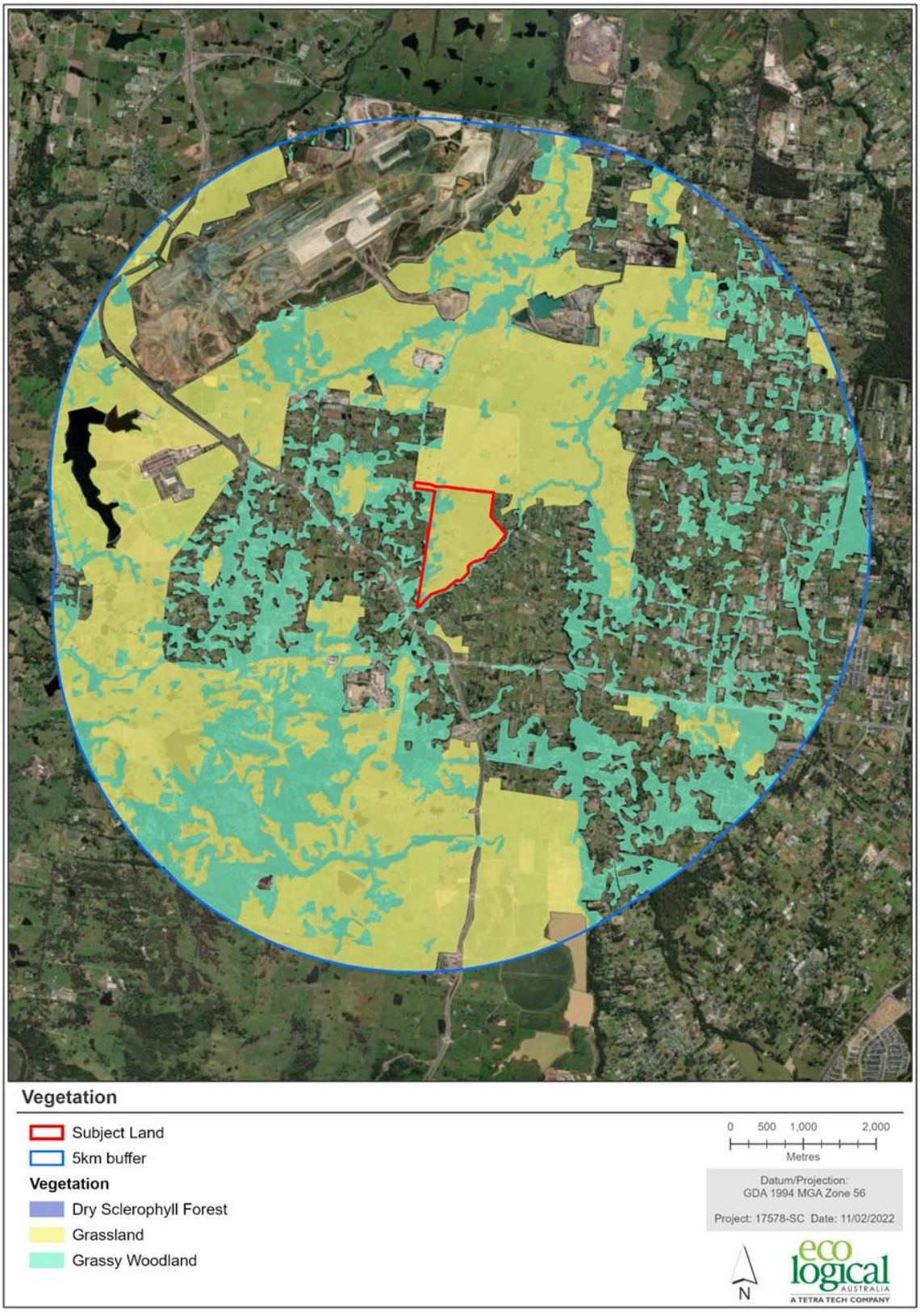
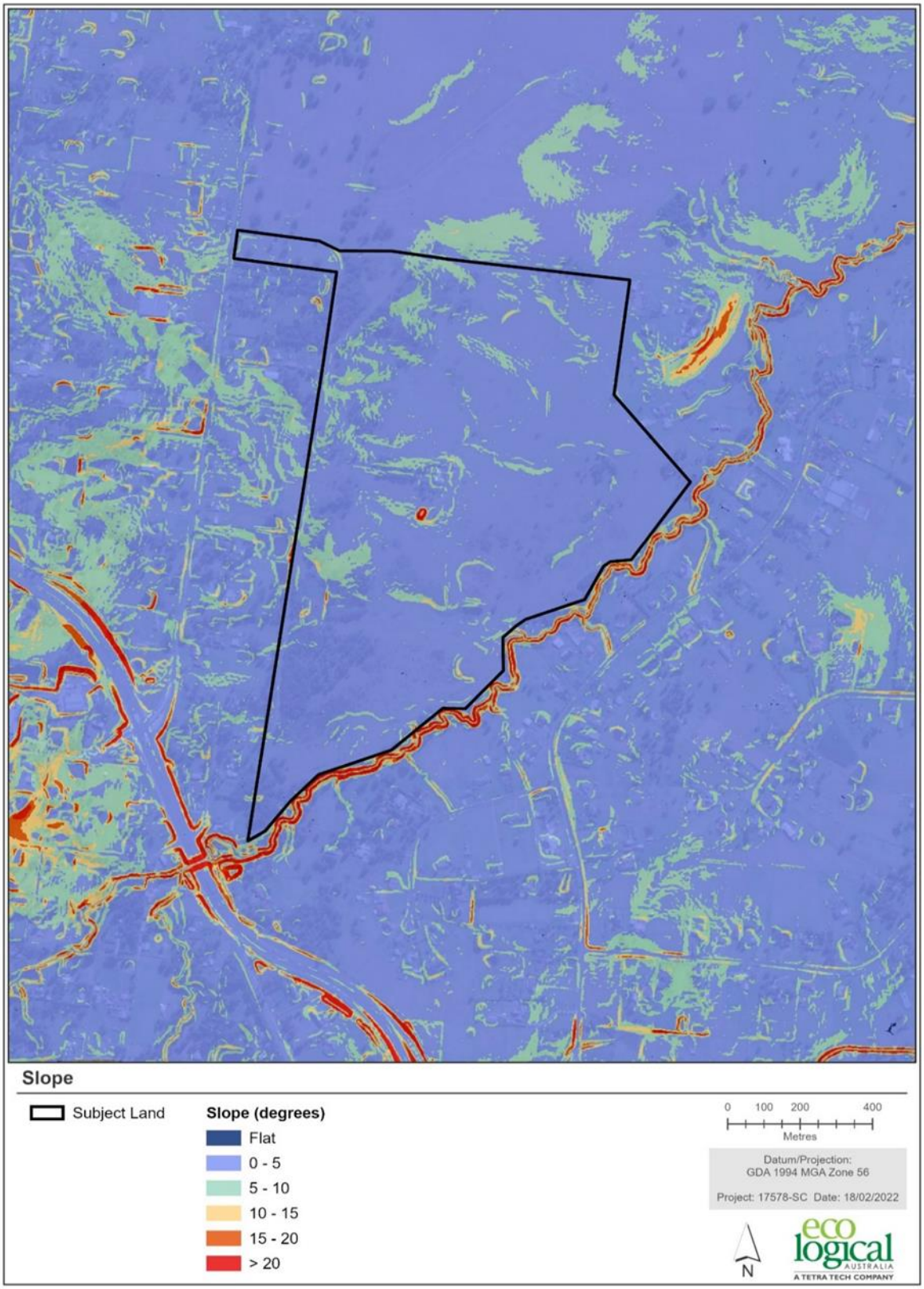


Figure 6 Interpolated slope for the subject land and surrounds derived from 2m contours



6.1.2 Bushfire Weather

The Subject Land is situated within the Macarthur Bush Fire Risk Management Committee (MBFRMC) area. The climate is warm temperate, with higher rainfall generally between January and March (BFMRC, 2012). Relative humidity is generally low throughout the year. Fire danger is greatest in the period following a dry winter and before the onset of summer rain. The gazetted bushfire season generally spans from October to March and conditions during these months include predominant north-westerly winds, high daytime temperatures and low relative humidity. Changing conditions, with strong southerly winds and lightning dominated storms with little rain can also heighten fire conditions.

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).

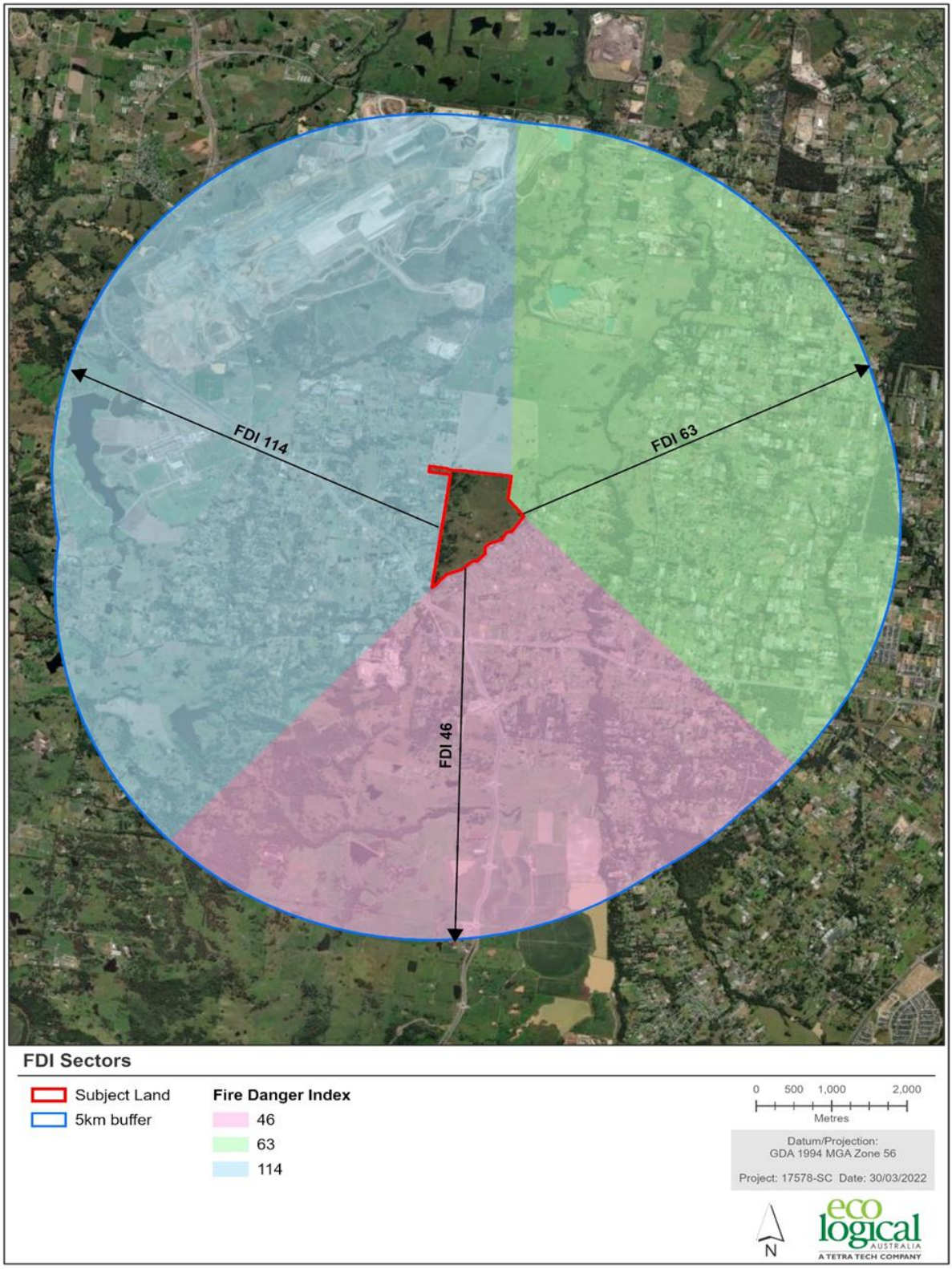
For the purposes of PBP, the FFDI required to be used for development assessment for the site, is 100, as identified for the Greater Sydney Region and Liverpool LGA. The FFDI used by PBP influences certain bushfire protection measures including Asset Protection Zones (APZ) and construction standards 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 (1972 to 2020) 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 Subject Land as shown in **Figure 7**. 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 Master Plan area, aspects exposed to hazards in the south-west to north are more likely to be subject higher FFDI conditions whilst other directions are likely be exposed to bushfire attack at lower FFDIs. However, given the reduced opportunity for extended fire runs from the west given small or fragmented fire catchments, and the ability for the Master Plan and future planning to facilitate bushfire protection measures (APZs, perimeter roads etc), it is considered that there is considerable opportunity to mitigate the exposure of future development to higher fire intensities. Furthermore, as the broader precinct is activated, fire pathways to the subject land from the north and north-west will be removed, and therefore potential exposure to elevated fire intensities in this direction will be reduced or removed.

Figure 7 Directional fire danger index (FDI) analysis



6.1.3 Bushfire Risk Considerations

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

6.1.3.1 Bushfire History

According to the Macarthur Bush Fire Risk Management Plan (BFRMP), there are on average 417 fire incidents per annum, however it is only an average of 5 of these fires that progress to major fires (Macarthur BFRMC, 2012).

Exploration of the mapped NPWS fire history and Rural Fire Service fire history mapping datasets since 1970 (DPIE 2021) few wildfires have occurred within the Subject Land and broader Study Area. The fire history shows a historic large wildfire in the north-west of the Study Area, occurring in 2001-02 fire season, part of this fire extent is now under construction for Western Sydney Airport. A bushfire in the 2013 fire season was also recorded within the Thompson's Creek Corridor and surrounding grassland.

Whilst this data may not contain all bushfire, the spatial mapping of fire events indicates that the frequency of large wildfire within the Study area is low, with very few areas subject to repeated wildfire, as evident in Figure 8. Management of the surrounding land along with fire mitigation advantages from infrastructure, existing development and mixed management of rural lands is likely to contribute to the low frequency fire history.

6.1.3.2 Fire Catchment

Delineation of fire catchments helps to identify the location and size of potential fire runs 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.

High level analysis of the potential fire catchments influencing the study area was undertaken and as evident in Figure 9, opportunities for consolidated fire pathways extending beyond 2 km is limited due to mixed management of land to the east, south and west, associated with rural residential typologies, Western Sydney Airport construction to the north-west, and industry to the north in Badgerys Creek. Consequently, the primary fire catchments influencing the Subject Land, is the relatively narrow Thompson's Creek corridor to the south and south-east, and grassland to the north and north-east. However, opportunities for these fire pathways will reduce as the broader Aero Core Precinct is activated north of the Bradfield City Masterplan Area, and also to the south-east of Thompson's Creek.

Figure 8 Fire frequency within subject land and surrounding study area

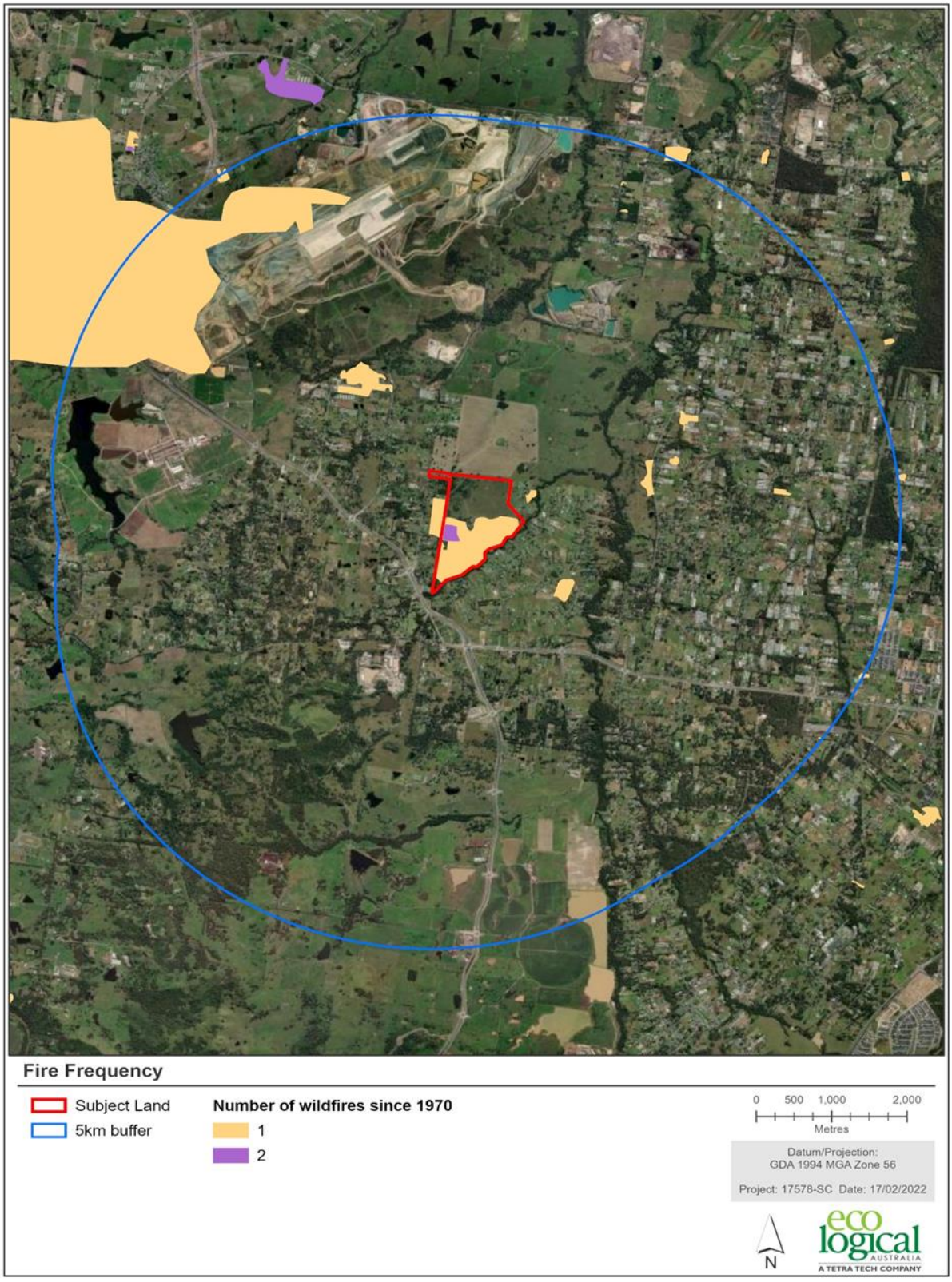


Figure 9 Fire catchments influencing the subject land

6.1.3.3 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 winds, during warmer summer months; and/or
- Moving upslope through vegetated areas, such as the Thompsons Creek corridor in the south-east; and
- Burning within unmanaged grasslands.

Fires burning under strong southerly conditions may also have the potential to spread across the Study Area. However, when considering the Open Space Strategy and plan to activate the Thompsons Creek corridor for open space and public recreation, and accompanying management of these areas, at least in part, the mitigated risk in regard to potential fire behaviour is reduced.

6.1.3.4 Bushfire Intensity

Fire intensity across the Study Area is expected to vary based on the hazard (vegetation type, fuel load and terrain) and the directional FFDI outputs derived from the weather analysis discussed in Section 7.1.1 and existing analysis (ELA 2020a; ELA 2020b). 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, however other factors such as burn duration / residence time and fire size are also important considerations.

Whilst higher fire intensities may occur on steeper slopes and grassland vegetation as highlighted in the existing studies, fire mitigation advantages such as waterways, roads and existing management of rural lands would assist in reducing fire intensity. Coupled with ongoing precinct activation, the direct exposure of future development within the Subject Land to a high intensity bushfire beyond a level that can be planned for is unlikely.

6.1.3.5 Ignition and Fire Spread Scenarios

The Macarthur BFRMP identifies the main sources of ignition in the committee area are misuse of fire and arson related activities (BFMRC, 2012). Other fire ignition sources could include accidental anthropogenic sources such as motor vehicles and escaped backed burning, lightning strikes or arcing of powerlines. Fire activity in the Study Area may be initiated by any of the above sources, with deliberate ignition a consideration for vegetated areas along the urban interface, however as development within the master plan area is activated, opportunities for arson are expected to reduce with changing land use typologies.

Fire management, coupled with the fragmentation of fire paths, means direct fire spread to the Subject Land is considerably mitigated, particularly as the feasibility of onsite Asset Protection Zones (APZs) will increase the currently available setback. Further, while fire spread scenarios vary in each direction, with limited fire activity within and surrounding the Subject Land, the above ignition sources and potential fire pathways are not considered an increased risk for the proposed development that cannot be reduced by mitigation.

6.1.3.6 Changing Climate

Currently, there is no provision in Chapter 4 of PBP prompting consideration of climate change in Bushfire Strategic Studies, nor are there requirements more broadly in PBP. However, it is recognised that

Recommendation 27 of the NSW Bushfire Inquiry 2020 (Resilience NSW, 2022) identifies:

> *"That Government commit to shifting to a strategic approach to planning for bush fire and develop a new NSW Bush Fire Policy similar to the NSW Flood Prone Land Policy in order to accommodate changing climate conditions and the increasing likelihood of catastrophic bush fire conditions; to build greater resilience into both existing and future communities; and to decrease costs associated with recovery and rebuilding".*

While the actions directed by this recommendation are in progress (anticipated target date of quarter 1, 2024 (Resilience NSW, 2022)), this study cannot pre-empt how the outcomes of Recommendation 27 are enacted via PBP, or other regulatory framework. Changing climate conditions have previously been addressed within the existing analysis undertaken for the broader Aerotropolis area (ELA 2020a; ELA 2020b). The analysis considered potential setback distances required under a higher Fire Danger Index (FDI) to achieve a Bushfire Attack Level of BAL-29 (<29 kW/m^2). The result of this analysis indicates that the increase in APZ dimensions varies considerably between vegetation types. For example, woodland and grassland communities, predominant in the Aerotropolis area, an increase in the APZ dimension could range from 1 to 2 metres on gently sloped land, to 4 to 5 metres on steeply sloped land.

While the outcomes of recommendation are in progress, it is recommended that increased setbacks between the hazard and future development are considered as detailed design progresses beyond master planning. This will provide a buffer, should the outcomes of Recommendation 27 result in increased APZ's at the Subdivision /DA stage.

6.1.4 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 ignition scenarios.

The location of the Subject Land is afforded mitigation advantages to reduced fire pathways and intensity, which is expected to provide further advantage as future development occurs, meaning much of current bushfire hazard and wildfire risk influencing the site will likely not be present at all or will be reduced in extent and connectivity as development of surrounding lands occurs. In evaluating the landscape bushfire risk, the following high-level observations are made:

- There is risk from bushfire attack from the north-west, due to higher FFDI, and historical patterns of bushfire, coupled with predominant north-westerly winds during days of elevated bushfire weather. However, the construction of the Western Sydney Airport, provides a considerable mitigation advantage in this direction, meaning fires initiating further afield in this direction have limited opportunity to impact the site, resulting in a reduced fire pathway.
- There is opportunity for fires to initiate in rural grasslands to the north and north-east, however based on FFDI analysis, it is likely to be of reduced fire intensity. Also, current and future development is expected to fragment the fire catchment, minimising risk.
- There is opportunity for bushfire attack from the south-east within the Thompson's Creek corridor, however based on FFDI analysis, it is likely to be of reduced fire intensity. Additionally master planning of corridor land uses can assist in mitigating this risk.
- There are significant interruptions to the continuity of bushfire hazard in all other directions and fragmentation of the bushfire hazard is expected to increase as the precinct is developed.
- Fire history mapping supports a lower risk of bushfire impacting the master plan area.

6.2 Land Use Assessment

PBP outlines broad principles and assessment considerations for the Master Plan Application for the Bradfield City Centre. It also specifies that bushfire protection measures (BPMs) need to be considered during master 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.

The assessment has considered the future landscape of the Master Plan area, based on the preliminary structure in the preliminary Open Space Strategy and proposed land uses. During detailed design, and as planning progresses it will also be necessary to consider any temporary hazards that may remain, and temporary bushfire protection measures implemented where necessary. This is not unusual for large scale developments where activation occurs across various stages, and it is expected that any changes to the risk profile considered in this assessment would be mitigated by appropriate bushfire protection measures.

6.2.1 Risk profile

The feasibility of the 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 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 BPM for the purpose of this study has included review of the capacity for:

- Asset Protection Zones (APZs), 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), discussed in Section 6.2.1.1 below;
- Access – discussed in Section 6.3;
- Water Supply and Utilities – discussed in Section 6.5;
- Landscaping – to be detailed at future stages;
- Building Construction and design – to be detailed at future stages; and
- Emergency management – discussed in Section 6.4.

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. It is expected that compliance with BPM as per the requirements of PBP will be achievable for future development.

6.2.1.1 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 residential APZ requirements are shown in **Figure 10**. **Table 8** includes the minimum dimensions required by the Acceptable Solutions of PBP for residential development (i.e., 29 kW/m^2) and SFPP development (i.e. 10 kW/m^2). The placement of future SFPP development (e.g., schools, hospitals, child care

centres) or public assembly buildings >500 m^2 will need to ensure the extended APZ requirements specified in Table A1.12.1 of PBP can be implemented.

All APZs will need to be managed in perpetuity, and whilst they are feasible within the developable area, there is opportunity for managed open space to be utilised for APZs and also offer increased hazard setback, particularly where future land uses can achieve APZ requirements without encumbering authorities with considerable management, (e.g., active transport links, paved plaza areas, planned managed lawns etc.).

Where APZs are positioned in open space zones, a management plan can be established to ensure APZs are maintained in perpetuity and to the appropriate standard as per the requirements of PBP. Additionally, 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 or WCPA will not be the managing authority. The following considerations and assumptions are made in relation to the mapped APZs:

- Vegetation formation in the assessment is based on existing mapping by (OEH 2013) and Biosis (June, 2023).
    - On review of the OEH Vegetation Identification System (VIS), *Swamp Oak open forest on river flats of the Cumberland Plain and Hunter valley* as mapped by Biosis was not found to be an active Plant Community Type (PCT) and therefore for the purpose of this assessment, ELA has assumed this vegetation meet the PBP vegetation classification of forested wetland (excluding Coastal Swamp Forest).
- Preliminary assumptions in this assessment regarding the future bushfire hazard are based on the Open Space Strategy and likely vegetation management or revegetation. Further details are provided in Table 9.
- All APZs are assumed to be on land less than 18 degrees.
- Additional revegetation within the subject land may result in changes to the hazard assessment and APZ requirements.
- Changes to topography resulting from earthworks have not been considered and may alter the slope assessment, and there APZ outcome.
- Transect 1 is based on a temporary external grassland hazard, and therefore the APZ requirement can be removed when the remaining hazard is removed. All other external hazards, aside from planned conservation areas as shown in Figure 10 as woodland, are assumed to be managed.
- The bushfire hazard and APZ requirement should be re-evaluated as planning progresses.
- The open space area in the southeast of the precinct has conservatively been considered woodlands for the purpose of this study. As planning progresses, confirmation of the vegetation structure in this area is required to determine whether this area constitutes grassland.
- Confirmation of stormwater basins will also be required.

Table 8 - Indicative Asset Protection Zones for residential and Special Fire Protection Purposes

Transect #	Vegetation[1]	Slope[2]	Residential APZ (PBP)[3]	SFPP APZ (PBP)[4]
1	Grassland	0-5 downslope	12m	40m
2	Forested Wetland	0-5 downslope	12m	42m
3	Forested Wetland	0-5 downslope	12m	42m
4	Woodland	0-5 downslope	16m	50m
5	Woodland	0-5 downslope	16m	50m
6	Woodland	0-5 downslope	16m	50m
7	Woodland	0-5 downslope	16m	50m
8	Woodland	0-5 downslope	12m	50m
9	Grassland	0-5 downslope	12m	40m
10	Forested Wetland	0-5 downslope	12m	42m
11	Forested Wetland	0-5 downslope	12m	42m
12	Forested Wetland	0-5 downslope	16m	42m
13	Woodland	Upslopes/flat land	12m	50m
14	Woodland	0-5 downslope	16m	50m

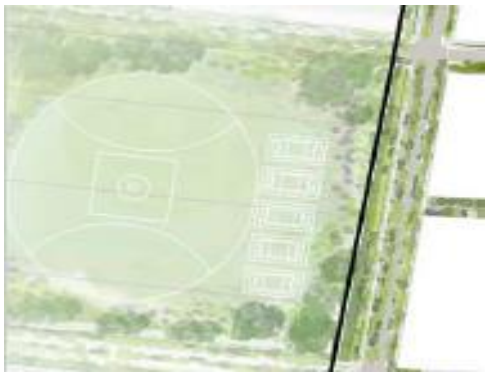
[1] *Predominant vegetation is identified, according to PBP.*

[2] *Slope most significantly influencing the fire behaviour of the site having regard to vegetation found as per PBP.*

[3] *Assessment according to Table A1.12.2 of PBP.*

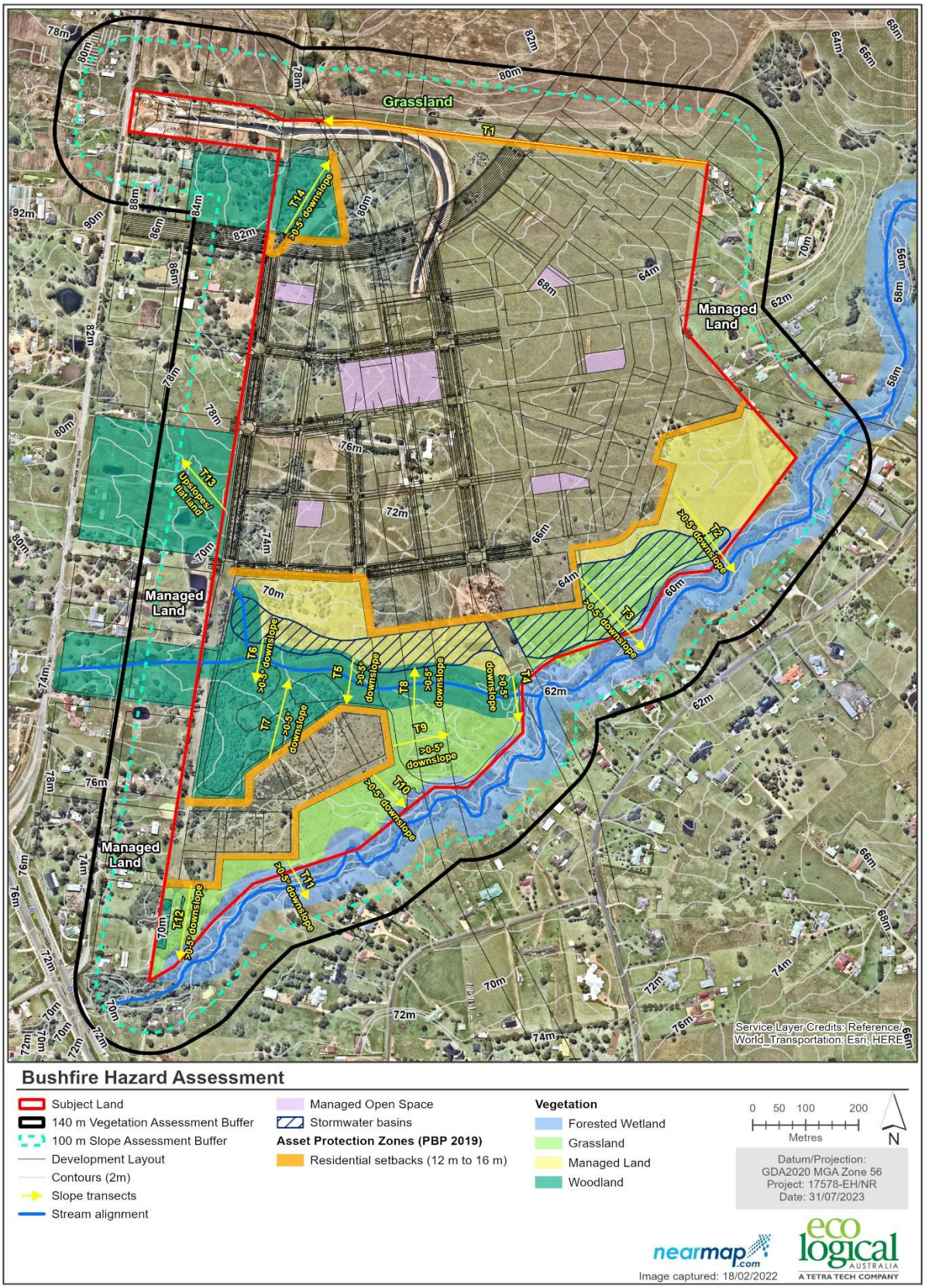
[4] *Assessment according to Table A1.12.1 of PBP.*

Table 9 - Evaluation of landscape structure identified in the preliminary Open Space Strategy

Area	Open Space Strategy	Assessment Comment
Ridge Park		Retained existing native vegetation (woodland) and high amenity space and useable open space. Area assessed as woodland.
Central Park		Outdoor areas for meetings, socialising and collaboration. Area considered managed land.
Sports Field		Assessed as woodland (presenting worst case scenario). Assumed Woodland around perimeter of sports field for canopy/shade. It is noted that the sports field earmarked by the Precinct Plan is primarily located outside of the subject site.
City Walk and Green Loop	 	Area considered managed land with functional walkways and areas for activities.

Local Parks	 	Local Parks considered managed lands with functional land uses activities associated without recreation. Managed open space
The Parklands	 	Existing native vegetation (env) area and riparian corridors considered a hazard and assessed as woodland /forested wetland. Areas outside of these areas considered managed land, including the event space in the parklands east and water promenade and swimming area in the parklands west.

Figure 10 Indicative bushfire hazard assessment based on preliminary Open Space Strategy



6.2.2 Land use evaluation

Future development on BFPL will need to satisfy the performance criteria identified in PBP for various land uses. At master planning, it is expected that future land uses enabled by the proposal 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 master plan in Table 10.

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.

6.2.2.1 Chapter 5 of PBP – Residential and Rural Residential Subdivision

Mixed use residential development is envisaged for much of the master plan, and therefore it is anticipated that future residential land uses will be subject to the requirements outlined in Chapter 5 of PBP. Following master plan approval and as part of the DA process, future development will need 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;
- Future 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
- Provision of access and infrastructure requirements according to Table 5.3b of PBP.

6.2.2.2 Chapter 6 of PBP – SFPP Development

Special Fire Protection Purpose (SFPP) provisions will be applicable to future uses such as childcare centres, tourist accommodation, education facilities, hospitals, seniors living, 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 (as per Table 8 above);
- 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.

These provisions are applicable when seeking the above land uses and will be addressed at future DA stage.

6.2.2.3 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 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, these developments can apply the APZ requirements for residential. General access and infrastructure requirements listed in Table 7.4a of PBP should also be considered. Where future mixed-use development includes residential development, the bushfire protection measures requirements outlined in Chapter 5 of PBP (for subdivision) or Chapter 7 of PBP (for infill development) will apply. Where future mixed-use development includes SFPP uses, bushfire protection measures should be consistent with the provisions outlined in Chapter 6 of PBP.

6.2.2.4 Section 8.3.11 – Public Assembly Buildings

Where a public building has a floor space greater than 500 m^2 it may be 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 community and recreation facilities. 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 10 kW/m^2 and a construction standard of BAL-12.5, along with other requirements as per Section 4.1.2.2.

6.2.2.5 Section 8.2.2 Multi-storey residential development

Residential buildings exceeding three storeys in height are considered 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 29 kW/m^2. In addition, the following issues need to be considered as per Table 8.2.2 of PBP.

- Higher residential densities for evacuation and increased demand on road infrastructure during evacuation;
- Avoiding locating high rise buildings in higher elevations or on ridge tops;
- 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; and
- Increased exposure to convective heat due to height.

A performance based solution including a bushfire design brief may be required for Development Applications pertaining to multi-storey residential developments on bushfire prone land.

6.2.3 Summary of land use evaluation

Table 10 below provides a summary of the land use evaluation for differing development types.

Table 10 - Future land use evaluation

Development Type	Assessment Considerations	Suitability
Residential Subdivision	The land use evaluation has considered potential land uses enabled by the rezoning and with consideration to: • The risk profile of the site • 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	It is anticipated that different residential typologies can comply with PBP. Perimeter roads will need to be demonstrated once final hazard extent determined, particularly along the southern riparian corridor.
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. Perimeter roads will need to be demonstrated once final hazard extent determined, particularly along the southern riparian corridor.
Buildings of Class 5 to 8 under the NCC /Section 8.3.10 Commercial and Industrial Development		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 there are suitable areas outside of the required SFPP APZ.
Multi-storey residential development		Future development is feasible outside of the 29 kW/m^2 APZ or greater and other relevant considerations can be addressed at site selection stage and subsequently at detailed design phase, 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. Perimeter roads will need to be demonstrated once final hazard extent determined, particularly along the southern riparian corridor.

6.3 Access and Egress

As this assessment is for the Master Plan Application for the Bradfield City Centre, a detailed assessment of proposed roads is not possible. However, it is anticipated that access roads, including perimeter roads, will be provided and compliant with the requirements of PBP as per Table 5.3b and Table 6.8b. Perimeter roads are generally identified in the masterplan (**Figure 3**). Pending the final typology of the open space adjacent to the proposed 'Civic Cultural' area, perimeter access should be provided either within the developable area, or within the Open Space where there should be opportunity.

It is understood that during early activation, commercial development is the key focus, with no residential development planned prior to 2026. Early stages of residential development will facilitate low capacities, with only 3000 residents anticipated by 2036, and in the longer term, up to 15,000 residents which will align with the planned establishment of the broader road network as detailed in Table 9 of the Transport Management Accessibility Plan (TMAP) (AECOM, 2023).

Furthermore, as the developable area will primarily be unencumbered by bushfire prone land (due to ongoing development removing any 'bushfire hazard'), and not subject to the requirements of PBP, the focus of this review is to ensure there are multiple access routes away from the hazard to facilitate evacuation of development adjacent to the hazard interface, and to make recommendations around access provisions for evacuation and emergency services.

6.3.1 Evaluation of Access and Egress

Strategic planning considerations as outlined in Chapter 4 of PBP require the following assessment considerations:

- Capacity of the proposed road network to deal with 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.

The Master Plan provides fluid opportunities for land uses, and as demonstrated in the masterplan, there is opportunity to accommodate perimeter roads within the developable area adjacent to final bushfire hazards, or by adapting the current open space interface for the provision of perimeter roads should the hazard extent and/or typology change as detailed design is finalised.

The proposed road network, as per the current Master Plan (Figure 3) and Open Space Strategy, provides perimeter arterial and sub-arterial road access to the west north and east, along with a southern connection (Figure 3), which would provide egress options for future occupants as well as ingress for emergency services, and enable provision for APZs in these areas.

In regard to the location of key routes and direction of travel, ingress and egress to the Subject Land will primarily occur via Badgerys Creek Road in the west, primary arterial road (rapid bus) in the north, Whittaker Road in the east, and a future southern connection across Thompsons Creek. This enables opportunity for egress in multiple directions, although once the Bradfield City Centre is active, it is expected that egress will be primarily via proposed internal roads to the town centre.

Perimeter access meeting the requirements set out in Table 5.3b of PBP should be finalised as detailed design progresses. This is likely to include revision of the open space / development interface in the south, particularly the south-west corner of the Master Plan area. However, as these areas form part of the latter stages of precinct activation, the current high level access network is not considered an impediment to the feasibility and activation of early stages. It is noted that the TMAP (AECOM, 2023) identifies a hierarchy for

road user space which prioritises active transport modes, along with public transport. While this is supported in principle, it is paramount that road widths and traffic calming strategies do not impede the capacity for perimeter roads to meet the requirements of PBP, nor impede the requirements for emergency service access. In addition, as planning progresses, potential for vehicle use on key evacuation routes must not be compromised within future areas of the precinct that will be encumbered by bushfire prone land.

6.3.2 Evacuation

The need for off-site evacuation for the proposal is not considered high, given the lower bushfire risk setting, particularly as precinct activation progresses. However, if off-site evacuation was necessary during varying stages of activation, it is expected that the existing and proposed arterial and sub-arterial roads will be available to provide multiple route options including out of precinct city centres during early precinct activation, or new evacuation points such as the Bradfield CBD, or nearby Neighbourhood Safer Place's (NSPs) or future NSP's, should these be considered appropriate by RFS.

Whilst there are currently limited NSPs located within close proximity to the Subject Land (**Table 11**) (**Figure 11**), it is expected that the Bradfield City Centre will provide suitable options for future evacuation points that are situated well outside of future bush fire prone land. Indeed, managed open space, shopping centres and community greater than 300-700m from the hazard interface, would provide future suitable evacuation options. The feasibility of the developable area to meet such requirements, given the scale of the master plan and planned nature of the city, along with staged activation supported by the future road network, suitable evacuation is not considered unachievable.

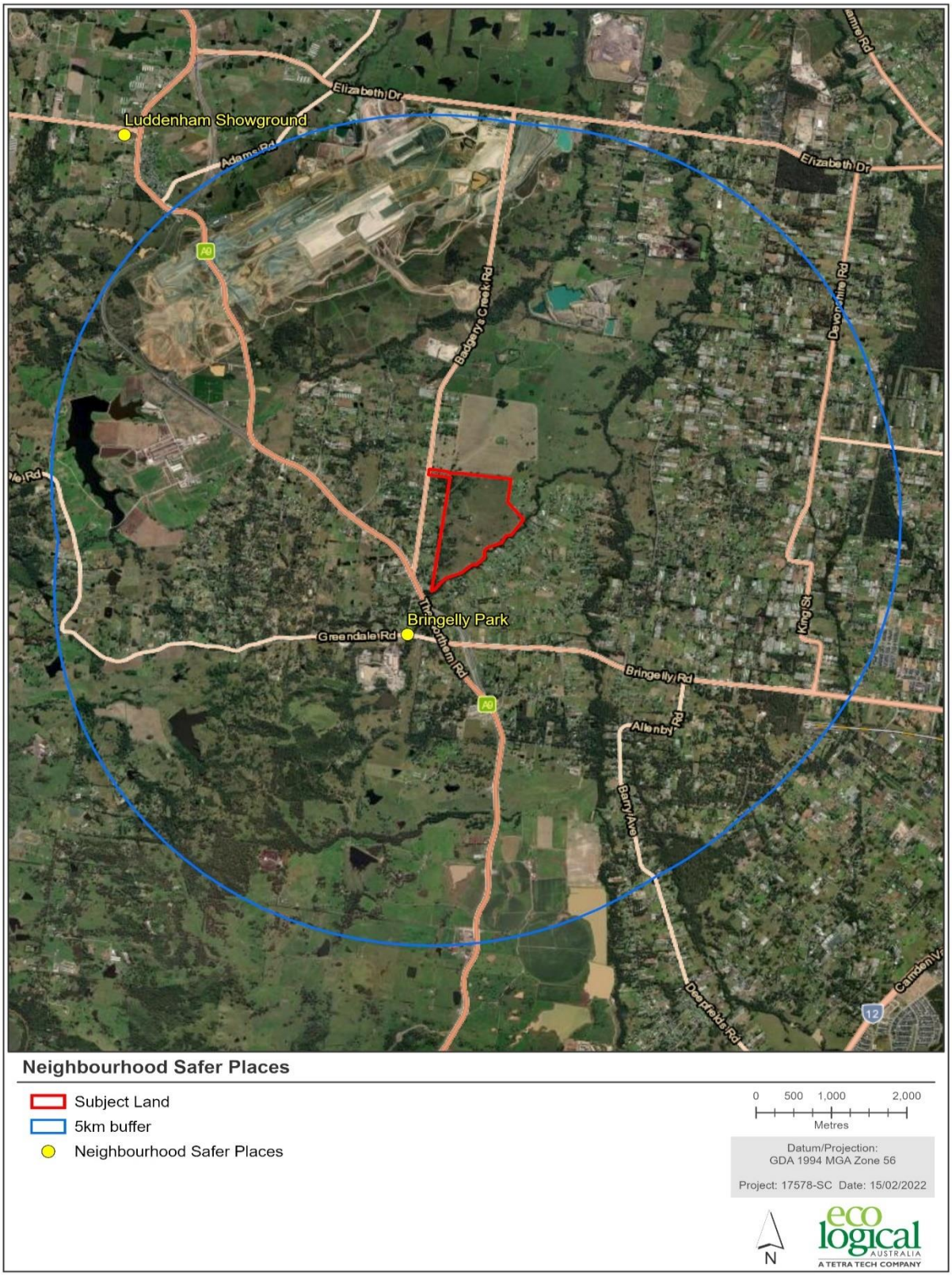
Further, the outcomes of traffic modelling (AECOM, 2023) undertaken to date indicate that the level of service (LoS) of the Bradfield City Street network in 2036 can met the general acceptable target LoS for new intersection performance. While it is noted that by 2056, the road network is nearing capacity, as much of the precinct will be unincumbered by bushfire once fully activated, the need for offsite evacuation will be reduced, and increasing onsite evacuation opportunities will be presented. As such it is considered that the masterplan offers a high level of bushfire resilience and evacuation is not considered a constraint to the proposal. It is however recommended, that as precinct planning progresses to staging, that specific traffic studies are undertaken to ensure primary evacuation routes provide a level of capacity to compliment the level of occupation.

Table 11 - Existing NSPs in vicinity of study area

NSP	Suburb	LGA	Type	Travel Distance (km)	Travel Time (min)
Luddenham Showground	Luddenham	Penrith	Open space	9.7	9
Bringelly Park	Bringelly	Liverpool	Open space	2.8	3

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

Figure 11 Existing Neighbourhood Safer Places (NSPs)



6.4 Emergency Services

The Master Plan Application facilitates future development of the Bradfield City Centre within the Western Sydney Aerotropolis. Therefore, the suitability of the proposal with regard to emergency management and meeting the objectives and strategic planning principles of PBP, was reviewed with consideration to the future ability to meet:

a. 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.

It is expected that requirements for additional resources for the region will also be assessed as part of broader emergency management planning for the Western City Aerotropolis, and therefore any projected increase in demand facilitated by precinct development is expected to be accounted for in broader planning and development contributions. It is recommended that discussions with the relevant emergency service agencies are undertaken to determine funding and resource requirements for the provision of additional services. It is also important that staged activation of the master plan considers the adequacy of emergency services available at each stage.

Currently, there are four RFS stations within 10 minutes travel time (**Table 13**, **Figure 12**). It is expected that as planned road networks are activated, travel time for nearby stations will reduce. Additionally, as the broader precinct is activated, it is anticipated that a transition from RFS to Fire and Rescue (FRNSW) support will occur, and broader planning has considered the capacity and future requirement for emergency services as activation progresses (GHD, 2022). Therefore, it is expected that the current FRNSW capacity will increase in personnel and infrastructure, and it is recommended that a timeline for this transition is discussed with the relevant stakeholders.

Regarding the impact of future development on the ability of emergency services to carry out fire suppression in a bushfire emergency, as the Master Plan area is just one component of broader regional planning, no key constraints for future development for emergency services are anticipated, however, it is noted within this report that planned activation of additional services should be scheduled with the relevant stakeholders and authorities.

The compliance of these aspects will be assessed for each future development against the requirements of PBP. As such, the Master Plan Application is not deemed to facilitate inappropriate development in regard to the adequacy of emergency services.

It is recommended that key ingress routes are identified for emergency services are prioritised for this purpose in the TMAP as planning progresses.

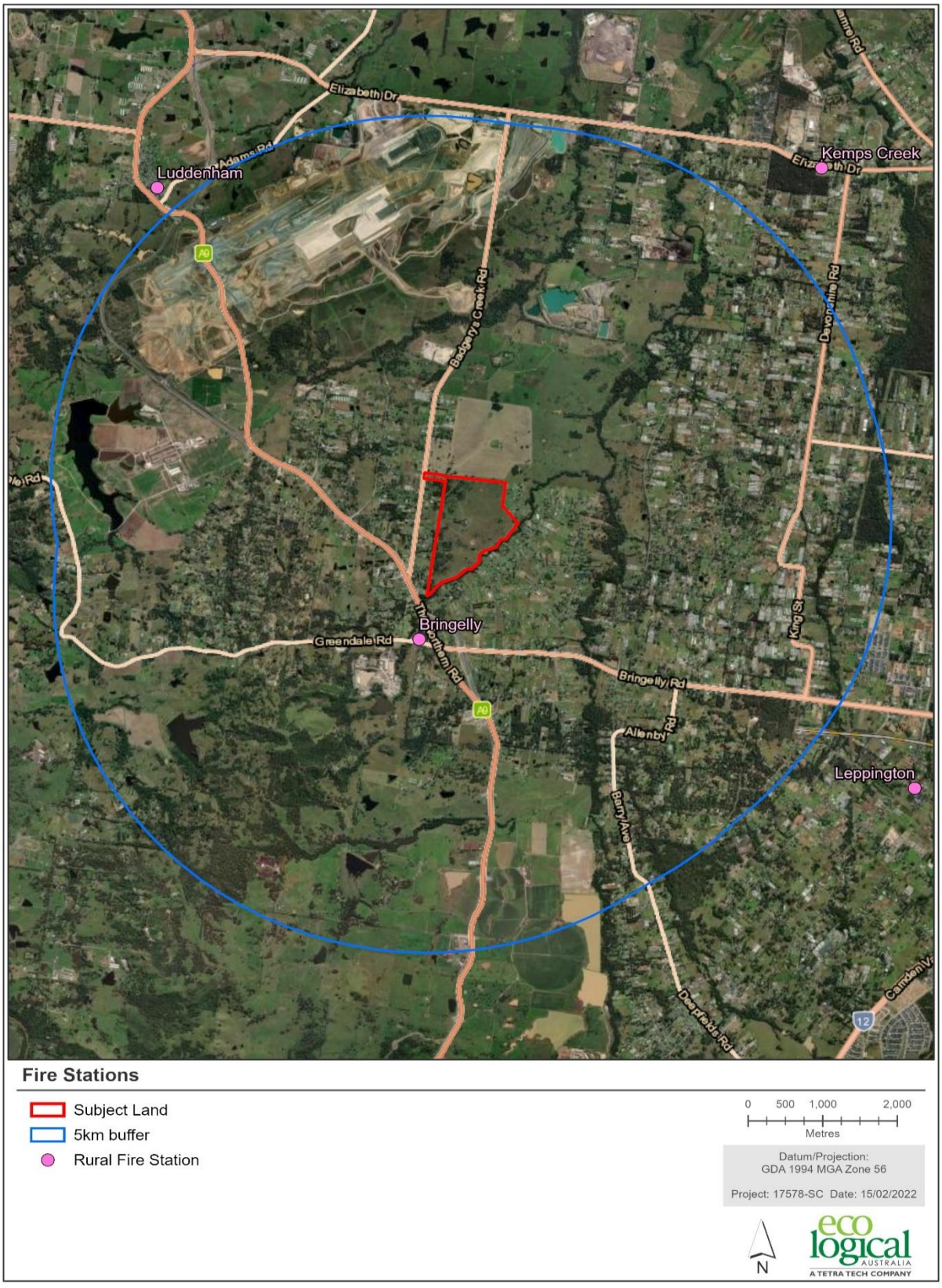
Table 12 - Fire Stations within proximity to the site

Type	Station	Distance (km)	Travel time (min)*
RFS	Bringelly	2.7	3
RFS	Luddenham	9.1	9
RFS	Kemps Creek	9.5	10
RFS	Leppington	9.9	10
RFS	Catherine Field	11.9	12
RFS	Wallacia	14.3	13

Type	Station	Distance (km)	Travel time (min)*
FRNSW	Horsingsea Park	12.7	14
RFS	Cobbitty	15.7	15
RFS	Middleton	13.5	16
RFS	Theresa Park	20.5	20
RFS	Horsley Park	20	20
FRNSW	St Andrews	21	22
RFS	Mulgoa	25.7	23

**Travel time from Google Maps*

Figure 12 Existing Rural Fire Stations



6.5 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 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. These aspects are explored below, and the acceptable solution requirements are detailed in Table 5.3 and Table 6.8 of PBP.

6.5.1 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 subject land.

6.5.2 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).

If required, 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 Master Plan Application.

6.6 Adjoining Land

Future development contemplated by the Master Plan Application 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 the Subject Lands or provided by public roads. Therefore, there are no concerns regarding the impact of the proposal on adjoining land.

7 Recommendations

7.1 Assessment of Strategic Planning Requirements

This section evaluates the proposal, 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 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, as summarised in Table 9. 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; and
- Adjoining lands – future development 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 Master Plan against the strategic requirements is provided in **Table 13**, and a summary of Master Plan recommendations and/or future considerations for detailed design is included in **Table 14**.

Table 13 Evaluation of Master Plan against strategic requirements of PBP

PBP Strategic Planning Principle	Evaluation
Ensuring land is suitable for development in the context of bushfire risk	The bushfire risk assessment for the Master Plan area demonstrates that the residual bushfire risk context is not considered inappropriate following evaluation against the strategic principles of PBP.
Ensuring new development on BFPL will comply with PBP	New development on BFPL can meet the requirements of PBP. In addition, once activated, only a small proportion of the Master Plan Area will remain incumbered by BFPL.

PBP Strategic Planning Principle	Evaluation
Minimising reliance on performance-based solutions	The acceptable solutions of PBP by way of provision of APZ, access, infrastructure and water supply, can be accommodated for in detailed design.
Providing adequate infrastructure associated with emergency evacuation and firefighting operations	The Master Plan area is encompassed by broader regional planning mechanisms associated with the Western Sydney Aerotropolis and therefore the provision of adequate infrastructure for emergency management has been considered as a component of broader planning.
Facilitating appropriate ongoing land management practices	It is recommended that future hazards are managed under a vegetation plan and APZ management within public spaces is guided by a maintenance plan.

Table 14 - Recommendations

Ref	Recommendation	Timeframe	Responsible
Access			
1	Compliant access to be demonstrated in future submissions seeking development consent, including provision of perimeter roads adjacent to all hazards. Identification of key evacuation routes and ingress for emergency services as planning progresses to ensure these routes are prioritised in the TMAP.	Prior to relevant Planning Approval (SSDA/DA/CDC)	Applicant responsible for inclusion. Consent Authority to approve
Asset Protection Zones			
2.	Capability for compliant APZ's to be demonstrated in future submissions seeking development consent, adjacent to all hazards	Prior to relevant Planning Approval (SSDA/DA/CDC)	Applicant responsible for inclusion. Consent Authority to approve
APZ Management			
3.	Achievable management of APZ's in perpetuity to be demonstrated in future submissions seeking development consent. This is likely to include a vegetation maintenance plan for the management of open space.	Prior to relevant Planning Approval (SSDA/DA/CDC)	Applicant responsible for inclusion. Consent Authority to approve
Recommendation 27			

Ref	Recommendation	Timeframe	Responsible
4.	The outcomes of recommendation 27 are incorporated into future planning; once these have been provisioned and enacted.	Subject to Recommendation 27 being enacted	Applicant responsible for inclusion. Consent Authority to approve

8 Conclusion

In evaluating the Master Plan Application against the bushfire strategic planning requirements of PBP, the Master Plan will facilitate development that can meet these requirements and therefore the proposal is not considered to provide for future inappropriate development. Bushfire protection measures are generally achievable within the current Master Plan or can be accommodated into further design iterations as planning progresses. Key to this will be precise delineation of the hazard extent along Thompsons Creek/ Moore Gully at detailed design, and allowance for bushfire protection measures meeting the acceptable solutions of PBP in these areas, particularly the provision of compliant perimeter roads.

Reviewing the Master Plan against the relevant policies and requirements, the proposal is not considered to be inconsistent with these controls, noting that further planning will need to address the acceptable solutions of PBP in relation to bushfire protection measure requirements, including the provision of compliant APZ's and perimeter roads.

From a bushfire strategic planning perspective, and in consideration of the strategic planning principles of PBP, the landscape risk assessment and land use evaluation undertaken in this study has demonstrated that the Master Plan area is situated in a lower risk setting, and that following mitigation, the remaining residual risk is not considered inappropriate for the futured land uses proposed under the Master Plan. In addition, it is expected that as activation of the broader Precinct occurs, the residual risk will further be reduced. Therefore, the proposal is not considered to promote inappropriate development, or result in a residual risk to life or property that is unacceptable.

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