DRAFT Bushfire Management Plan: Northern Gateway and Wianamatta-South Creek Precincts

Western Sydney Planning Partnership

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Abbreviations

Abbreviation	Description
AGB	Agribusiness
APZ	Asset Protection Zone
BFMC	Bush Fire Management Committee
BFPL	Bush Fire Prone Land
BRMP	Bushfire Risk Management Plan
DCP	Development Control Plan
DEF	Deferred
DEM	Digital Elevation Model
ELA	Eco Logical Australia
ENT	Enterprise
ENZ	Environment and Recreation
EP&A Act	*Environmental Planning and Assessment Act 1979*
FFDI	Forest Fire Danger Index
GEV	Generalised Extreme Value
IPA	Inner Protection Area
LGA	Local Government Area
NPWS	National Parks and Wildlife Service
NSP	Neighbourhood Safer Place
NSW	New South Wales
OPA	Outer Protection Area
PBP	Planning for Bushfire Protection
RFS	Rural Fire Service
RF Act	*Rural Fires Act 1997*
t/ha	Tonnes per hectare

Executive Summary

This Bushfire Management Plan has been prepared to inform and assist with the preparation of draft precinct plans for the Northern Gateway and Wianamatta-South Creek precincts as part of Western Sydney Aerotropolis to help implement the vision for Western Parkland City.

The Bushfire Management Plan provides an assessment of the landscape bushfire risk and the residual risk for development following the provision of bushfire protection measures. It includes the following strategic assessment considerations in *Planning for Bushfire Protection 2019.*

The Northern Gateway and Wianamatta-South Creek precincts are classified as bushfire prone land and located within a wider landscape of bushfire prone land. The largest potential fire hazard is the riparian corridors surrounding and within the precincts, including the Wianamatta-South Creek precinct. The predominate vegetation occurs within the land that is planned to be rezoned 'Environmental and Recreation (ENZ)'. This occurs as broad riparian corridors, primarily associated with South Creek and its tributaries. It is expected that revegetation and modification is likely to occur in these areas to reflect the varying uses, indicated as local, district and regional open spaces. Only regional open spaces will be considered as a bushfire hazard.

A large fire in 2001-2002 was the most significant fire in the area for the period, impacting in the west of the precinct. A smaller fire that just impacted the site in 2006-2007 to the south is the only additional fire within the subject land. The most likely bushfire attack scenarios are smaller, lower intensity fires starting either within or outside the Northern Gateway and Wianamatta-South Creek precincts. Should a rapid-fire response be applied and/or they occur under lower Forest Fire Danger Index conditions, then the chance of containment is much higher, and the potential consequence is lower.

Based on the fire history, landscape fire advantages, minimal residential use and the proposed larger allotment size enabling appropriate bushfire protection measures, it is not considered that development in the Northern Gateway precinct would be within an unacceptable bushfire landscape.

Application of the bushfire protection measures described in *Planning for Bushfire Protection 2019* minimise the risks from bushfire. Asset Protection Zone under a Fire Danger Index of 116 to consider the impacts of climate change on fire weather can be provided within the Northern Gateway precinct. Even allowing for increased Asset Protection Zones, ample area exists within the precinct that would no longer be classified as bushfire prone land following development. The Asset Protection Zone dimensions cited in this assessment will be refined for future subdivision as a more detailed assessment of slope, vegetation and bushfire attack is required.

Multi-access points are an essential bushfire protection measure that has been considered in the precinct design. The indicative road layout provides for multiple access routes both east-west and north-south across the site in the event of fires either approaching or within the precincts. The extent of revegetated riparian corridors may have resulted in increased risk to access options being cut off, particularly in the north-western corner of the precinct. However, given the size of the site and number of access options indicated on the precinct plans, the risk of isolation is minimal.

Future development will not be reliant on any off-site bushfire mitigation measures. All buildings and use will be designed to be resilient to bushfire attack in circumstances where no additional fuel management occurs outside of Asset Protection Zones.

Several strategies have been provided in the form of planning controls to reduce the bushfire risk to an appropriate level, which also ensures bushfire protection requirements outlined in *Planning for Bushfire Protection 2019* are satisfied and can be achieved in the precincts. All bushfire protection measures within *Planning for Bushfire Protection 2019* can be accommodated within the large development footprint.

1. Introduction

1.1 Background

This Bushfire Management Plan has been prepared to inform and assist with the preparation of draft precinct plans for the Northern Gateway and Wianamatta-South Creek precincts as part of Western Sydney Aerotropolis (**Figure 1**) to help implement the vision for Western Parkland City.

The Northern Gateway and Wianamatta-South Creek precincts are identified as Bushfire Prone Land. The minimum components of a Bushfire Strategic Study listed in Table 4.2.1 and bushfire protection measures identified in the *Planning for Bushfire Protection* 2019 have been provided in this Bushfire Management Plan with additional information where necessary to detail the combination of measures proposed for the development, and to be included into the precinct plan and Development Control Plan.

The contents of the Bushfire Management Plan provide detail to address all the components, measures and matters requested and show that the proposed development complies with the requirements of *Planning for Bushfire Protection*.

1.2 Aims and Objectives

The Bushfire Management Plan provides an assessment of the landscape bushfire risk and the residual risk for development following the provision of bushfire protection measures. It includes the following strategic assessment considerations in *Planning for Bushfire Protection* (RFS 2019):

- ensuring land is suitable for development in the context of bushfire risk;
- ensuring new development on bushfire prone land will comply with Planning for Bushfire Protection;
- minimising reliance on performance-based solutions;
- providing infrastructure associated with emergency evacuation and firefighting operations; and
- facilitating appropriate ongoing land management practices.

1.3 Precinct Description

The Northern Gateway precinct will be a major airport interface, serving as a key strategic centre within the Western Economic Corridor – linking the Airport with the Western Parkland City Metropolitan Cluster through high-frequency public transport, freight, road and rail connections. To the east, the precinct connects to the Wianamatta-South Creek precinct, which will facilitate conservation of the South Creek riparian corridor. The Northern Gateway will harness existing and emerging economic opportunities catalysed by the Airport and build on the approved Sydney Science Park development to provide a variety of employment generating uses. Residential development will be located close to public transport and outside ANEC/ANEF 20 and above contours to ensure that airport operations are safeguarded, and residents could live in a 30-minute city. The precinct will complement the Aerotropolis Core and will evolve as a centre focused on high technology incorporating health, education, knowledge and research.

1.4 Planning Process

The Western Sydney Aerotropolis State Environmental Planning Policy has rezoned the Northern Gateway to include Mixed Use, Enterprise, and Environment and Recreation to facilitate the provision of a major airport interface with attractive entry points, reflecting the gateway to the Airport, and the first presentation to those leaving the Airport's main entrance/exit point.

The rezoning has occurred under the Aerotropolis State Environmental Planning Policy (**Figure 2**) and the Western Sydney Aerotropolis Development Control Plan Phase 1 will facilitate the proposed land-use changes, allowing the strategic mitigation of bushfire risks during the planning process. This will enable better outcomes to be achieved, which is particularly important given it is anticipated that the precinct will facilitate 19,000 – 21,000 potential employment positions and approximately 8,000 – 10,000 residents. The neighbouring Wianamatta-South Creek will predominantly provide opportunities for environmental conservation, with most of this zone to be rezoned for Environment and Recreation land uses.

This bushfire study aims to undertake a more detailed assessment of the landscape bushfire risk relevant to the Northern Gateway precinct and to detail how an appropriate suite of bushfire protection measures can be provided. The specific objective of this study is to ensure that adequate due diligence is undertaken and that proposed development areas are consistent with the strategic assessment considerations in *Planning for Bushfire Protection 2019*.

To meet these aims and objectives the project approach was to:

1. Assess the landscape bushfire risk relevant to the Northern Gateway and Wianamatta-South Creek precincts;
2. Critically review the Northern Gateway and Wianamatta-South Creek precincts considering the landscape bushfire risk assessment (1) and against the strategic principles in *Planning for Bushfire Protection 2019* to determine whether:
    - there are any proposed land uses or structural elements of the Northern Gateway precinct that pose an inappropriate risk that should be reduced;
    - the Northern Gateway precinct contains information on bushfire threat appropriate to the current stage of planning including strategic guiding principles suitable for the current and future stages of planning;
    - the Wianamatta-South Creek precinct is considered an elevated hazard risk to proposed development in precincts situated to the west; and
    - adequate infrastructure can be provided.

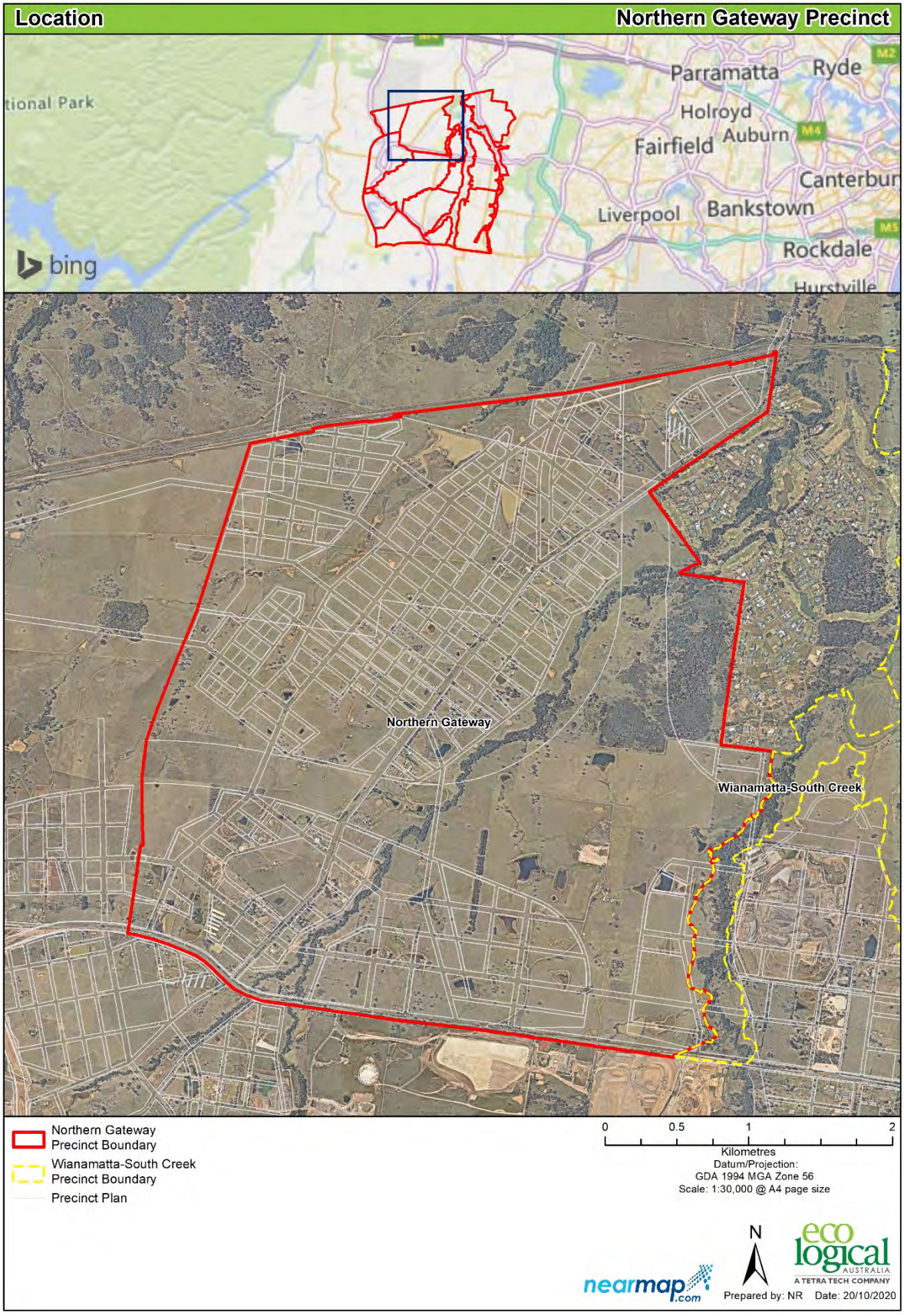

Figure 1: Northern Gateway Precinct Location

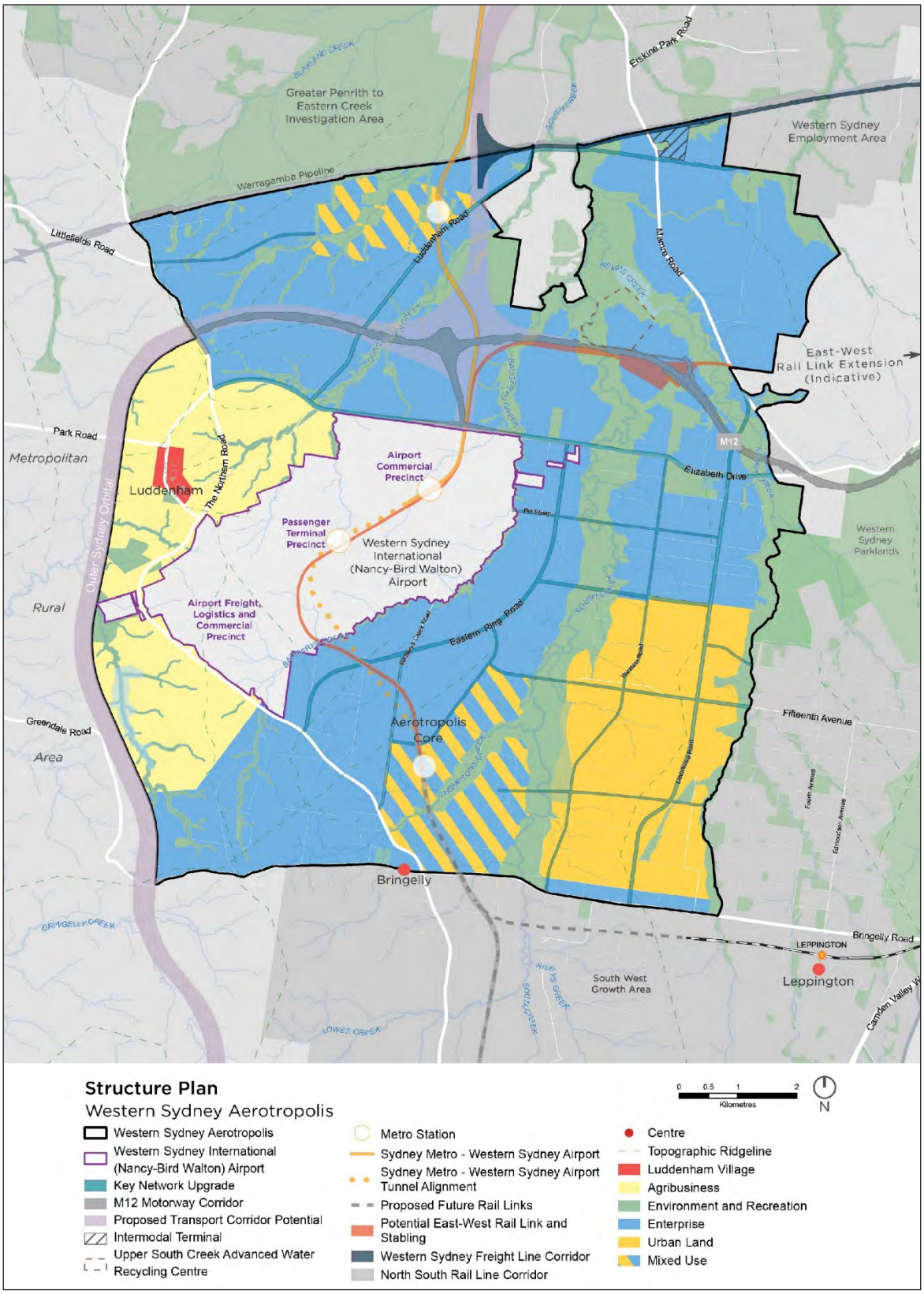

Figure 2: Western Sydney Aerotropolis Proposed Structure Plan (Western Sydney Aerotropolis Plan 2020).

2. Bushfire Landscape Risk Assessment

The landscape bushfire risk includes an assessment of bushfire hazard, potential fire behaviour and bushfire history within the study area.

2.1 Bushfire Hazard

The Northern Gateway and Wianamatta-South Creek precincts are classified as bushfire prone land and located within a wider landscape of bushfire prone land (**Figure 3**), showing the existing mapping. This is expected to change as the precincts are developed, with an indicative future bushfire prone land map based on expected retained vegetation provided as **Figure 4**.

Bushfire prone land mapping is a trigger for the consideration of bushfire protection measures for new developments. Bushfire prone land is separated into three categories based on vegetation type and potential bushfire risk:

1. Vegetation Category 1 (red): Land considered to be the highest risk for bushfire and surrounded by a 100m buffer (buffer is yellow)
2. Vegetation Category 2 (light orange): Land is considered to be a lower bush fire risk than categories 1 and 3. Surrounded by a 30m buffer (buffer is yellow).
3. Vegetation Category 3 (dark orange): Land is considered to be a medium bush fire risk. Surrounded by a 30m buffer (buffer is yellow).

Planning for Bushfire Protection 2019 requires certain protective measures to be met to make a building less likely to suffer damage or destruction from bushfires. It is not the intention of the measures to prevent the development of land in bushfire-prone areas. However, to provide adequate protection from bushfires, it may be necessary to modify the style, construction material or sighting of a building.

The existing bushfire hazard is continuous primarily as grassland hazard and woodland along the north-eastern and northern perimeters of the precinct. A significant network of connected riparian corridors and retained vegetation north-east to south-west and potentially exposes the precinct to multiple bushfire fronts, however, this can be mitigated through the provision of bushfire protection measures. A significant portion of the existing vegetation mapped as bushfire prone land will be removed as a hazard as development is implemented.

The largest potential fire hazard is the grassland to the north and east, and riparian corridors within the precincts, including the Wianamatta-South Creek precinct.

Bushfire hazard has been classified using the *Planning for Bushfire Protection 2019* methodology through assessment of vegetation and slope.

2.1.1 Vegetation

The subject land is situated within a broader landscape comprised predominantly of grassland and woodland vegetation with narrow corridors of forested wetland vegetation present along extensive riparian corridors. Within the precinct, areas of grassland and woodland vegetation interconnect along numerous riparian corridors as shown in **Figure 6**.

To the south-east and northern parts of the precinct, Grassland is less dominant due to the extent of development in the area with small areas of Woodland and Forested Wetland remaining in segmented along riparian corridors. Forest vegetation occurs throughout the precincts, associated with the riparian corridors.

The predominate vegetation within the precincts occurs within the land that is planned to be re-zoned 'Environmental and Recreation (ENZ)'. This occurs as broad riparian corridors, primarily associated with South Creek and its tributaries.

It is expected that revegetation and modification is likely to occur in these areas to reflect the varying uses, indicated as local, district and regional open spaces. The indicative management and revegetation of these areas are as follows:

- local open space: <2ha and be highly embellished 'park' with playgrounds, paths and require extensive management. These areas were considered to be managed land and not assessed as a bushfire hazard;
- district open space: 2-5ha and be highly embellished. Likely to include sports fields. These areas were considered to be managed land and not assessed as a bushfire hazard; and
- regional open space: typically, 30% of the park will be highly embellished (water features, playgrounds, paths, signage) and 70% retained in its current condition i.e. bushland areas. These areas were assessed as a bushfire hazard;
- remaining riparian areas. These areas were assessed as a bushfire hazard with the hazard extent based on indicative riparian buffers dependent of Strahler stream order;
- where no existing vegetation was present in the riparian corridor, future regeneration was assumed, and these areas were assessed as forested wetland.

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 *Planning for Bushfire Protection* (RFS 2019). **Figure 6** and **Table 1** show the vegetation.

Table 1: Vegetation formation, class and fuel allocation for the Precinct

Vegetation formation	Keith Class	Overall fuel including bark and canopy (t/ha)*
Forest (wet and dry sclerophyll)	Cumberland Dry Sclerophyll forests	36.1
Grassy and Semi-Arid Woodland	Coastal Valley Grassy Woodland	20.2
Forested Wetlands	Coastal Floodplain wetlands	15.1
Rainforest	Littoral Rainforest	13.2
Grassland	Exotic and agricultural grassland	6

*Overall fuel load including Bark and Canopy from Table A1.12.8 from Planning for Bushfire Protection (RFS 2019)

2.1.2 Topography and Slope

The Northern Gateway precinct is located on areas of flat to undulating land, currently utilised for agricultural enterprises. There are changes in elevation along existing riparian corridors and within the riparian areas of the Wianamatta-South Creek precinct. Lower elevations are evident where riparian corridors dominate the landscape.

The slope has been captured from 25cm contours which were then processed into a 2m slope grid. The surrounding 5km area used 1m contours which were processed into 10m grid cell Digital Elevation Model (DEM) classified into the following slope:

- >0° – 5° downslope;
- >5° – 10° downslope;
- >10° – 15° downslope;
- >15° – 20° downslope;
- >20°– 25° downslope;
- >25° downslope.

2.1.3 Bushfire Weather

The subject land is located within the Cumberland and Macarthur Bush Fire Risk Management Zones. The typical/average climate in the Cumberland Zone Bush Fire Management Committee area and the Macarthur Bush Fire Management Committee is generally warm temperate experiencing warm to hot summers and cool to mild winters. Rainfall is more pronounced in Summer/Autumn from January to March with a dry winter and spring, with eastern areas having traditionally higher rainfall patterns when compared to western areas. The bushfire danger period generally runs between October and March each year.

Adverse fire weather conditions associated with the bushfire danger period in these zones are associated with the dry winter with August - September winds providing potential fire conditions for the cured Grassland areas, and the second is the north-westerly winds accompanied by high temperatures and low relative humidity providing weather conditions conducive for large spreading bushfires. Extreme fire danger can occur in these zones in summer where occasional strong winds produce cold fronts. The end of the fire season in most years is characterised by summer rainfall and slightly higher relative humidity.

2.1.3.1 Climate change

Climate change projections (RCP 8.5) by the CSIRO and Bureau of Meteorology (2020) for Richmond forecast late in the century (2090) less rainfall (-11%) and a 4.2°C temperature increase. For the nearer future natural variability is predicted to dominate any projected changes.

Concerning temperature projections, for the near future (2030), the annually averaged warming across all emission scenarios is projected to be around 0.9 to 1.2 °C above the climate of 1986–2005. By late in the century (2090), the projected range of warming is 1.5 to 3°C for an intermediate emissions scenario (RCP 4.5) and 3.0 to 4.5 °C under a high emissions scenario (RCP 8.5) (CSIRO and BoM, 2020).

The projected changes are likely to result in a harsher fire-weather climate linked to rainfall and seasonal variation. Enhanced summer rainfall in some scenarios could moderate the number of severe fire weather days (CSIRO and BoM, 2020).

2.1.4 Bushfire Weather Analysis

A bushfire weather analysis was undertaken to identify the likely bushfire weather conditions that the site could experience from the main bushfire attack sectors. Weather data developed by Lucas (2010) under the National Historical Fire Weather Dataset (1972-2015) incorporates the daily Forest Fire Danger Index, where suitable inputs are available, from over 70 weather stations across Australia. Data from the Sydney Airport and Richmond weather stations (station numbers 66037 and 67033/67105 respectively) was analysed to determine the maximum Forest Fire Danger Index for a 1 in 50-year event, being the accepted recurrence period for land use planning in *Planning for Bushfire Protection 2019*.

The dataset for each weather station was split into subsets based on identified directions of potential bushfire attack, including:

- North to the south-east (clockwise);
- South-east to South-west (clockwise);
- South-west to North (clockwise);
- And a combination of all directions.

To determine the 1:50 recurrence value, a Generalised Extreme Value analysis method was undertaken to calculate the Forest Fire Danger Index value within each data subset (**Table 2**). Although the Generalised Extreme Value model has been used in other disciplines for analysing extreme events (i.e. flooding recurrence values), it is only in recent times to have been considered appropriate for bushfire weather analysis (Douglas 2017). The Generalised Extreme Value methodology and its use to analyse bushfire weather data are discussed in several papers by Douglas et al (2014; 2016).

Table 2: Forest Fire Danger Index for a 1 in 50-year event

Weather Station	Max Recorded FFDI	All directions	N to SE	SE to SW	SW to N
Sydney Airport	116	116	63	47	116
Richmond Airport	96	105	52	45	105

The Forest Fire Danger Index values for Sydney Airport are worse (higher) than those for Richmond Airport, so the former was considered more appropriate for consideration as 'worst case', and thus used in this study.

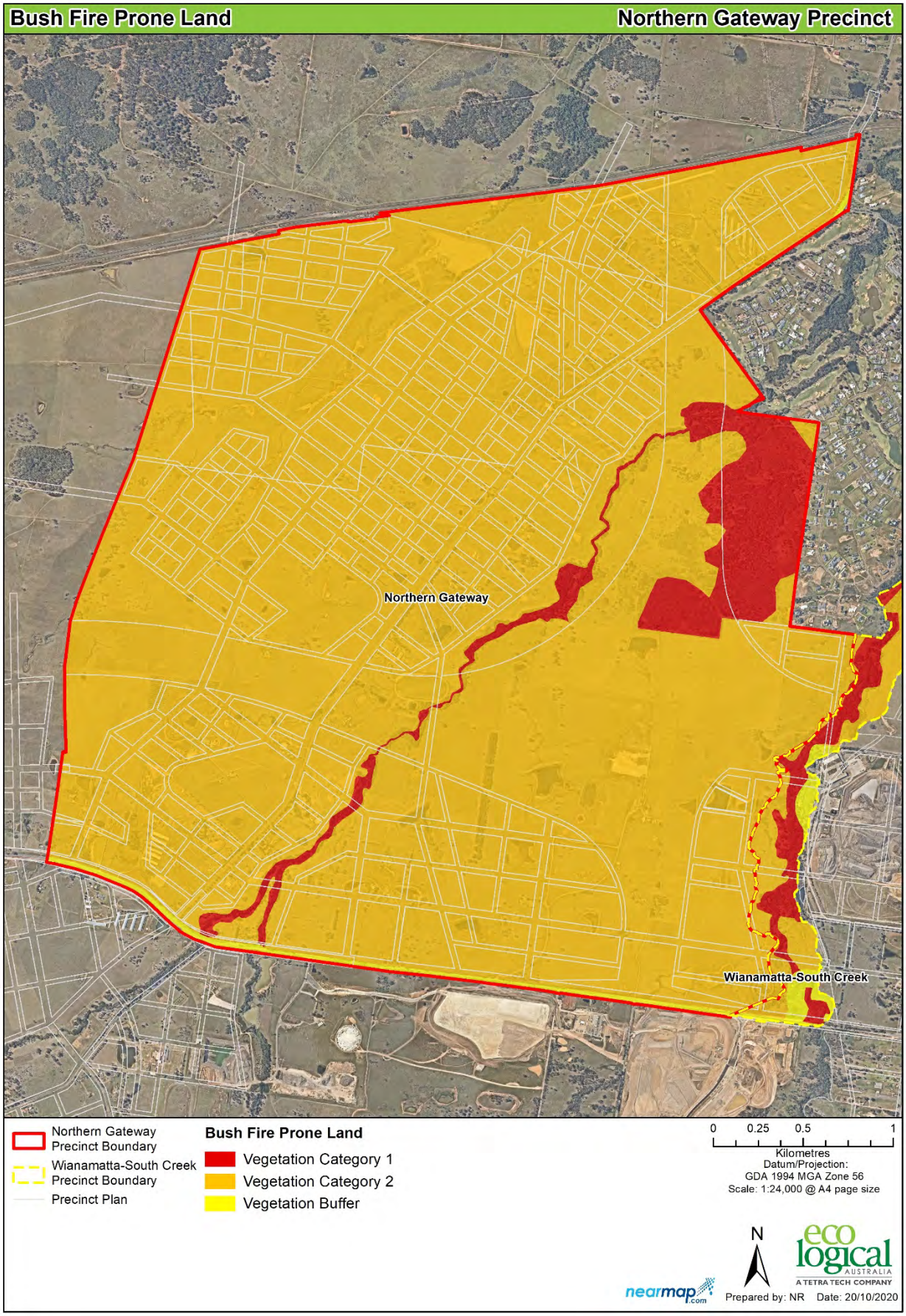

Figure 3: Current Bushfire Prone Land Map for the Northern Gateway and Wianamatta-South Creek Precinct

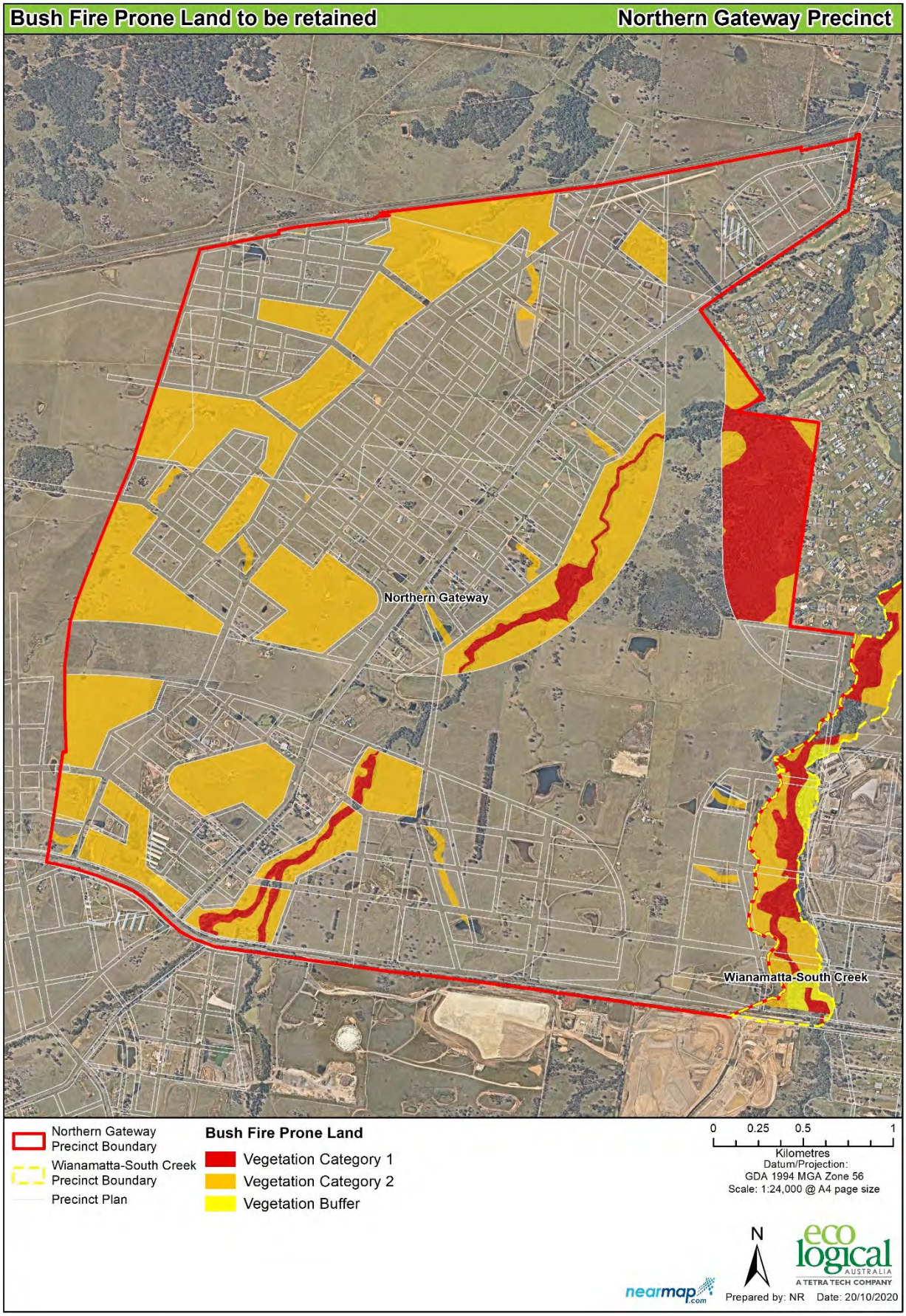

Figure 4: Indicative future Bush Fire Prone Land Map for the Northern Gateway and Wianamatta-South Creek precincts

2.2 Bushfire History

The Cumberland and Macarthur Bush Fire Risk Management Plans 2010 and 2012 respectively) identify that the *main* sources of ignition are:

- Illegal Burning (rural areas);
- Car Dumping (the majority in Castlereagh and Londonderry areas);
- Lightning (summer thunderstorm activity in the southern areas);
- Escaped Backburn (Cataract Fire);
- Powerlines Arching (National Parks and Wildlife Service Reserves)
- Arson (Wilmot / Bidwill, Glenmore Park, Ropes Creek, O'Hares Creek, Woronora and Cataract catchments areas).

Figure 5 shows the fire history for the study area from 1982 – 2017 for both prescribed burns and unplanned fire (wildfire) from the National Parks and Wildlife Service fire history mapping data set. A large fire in 2001-2002 was the most significant fire in the area for the period, impacting in the west of the precinct. This fire burnt predominately west of the Sydney basin, with the fire moving across agricultural areas on the east. A smaller fire in 2006-2007 to the south is the only additional fire within the subject land, just impacting the site.

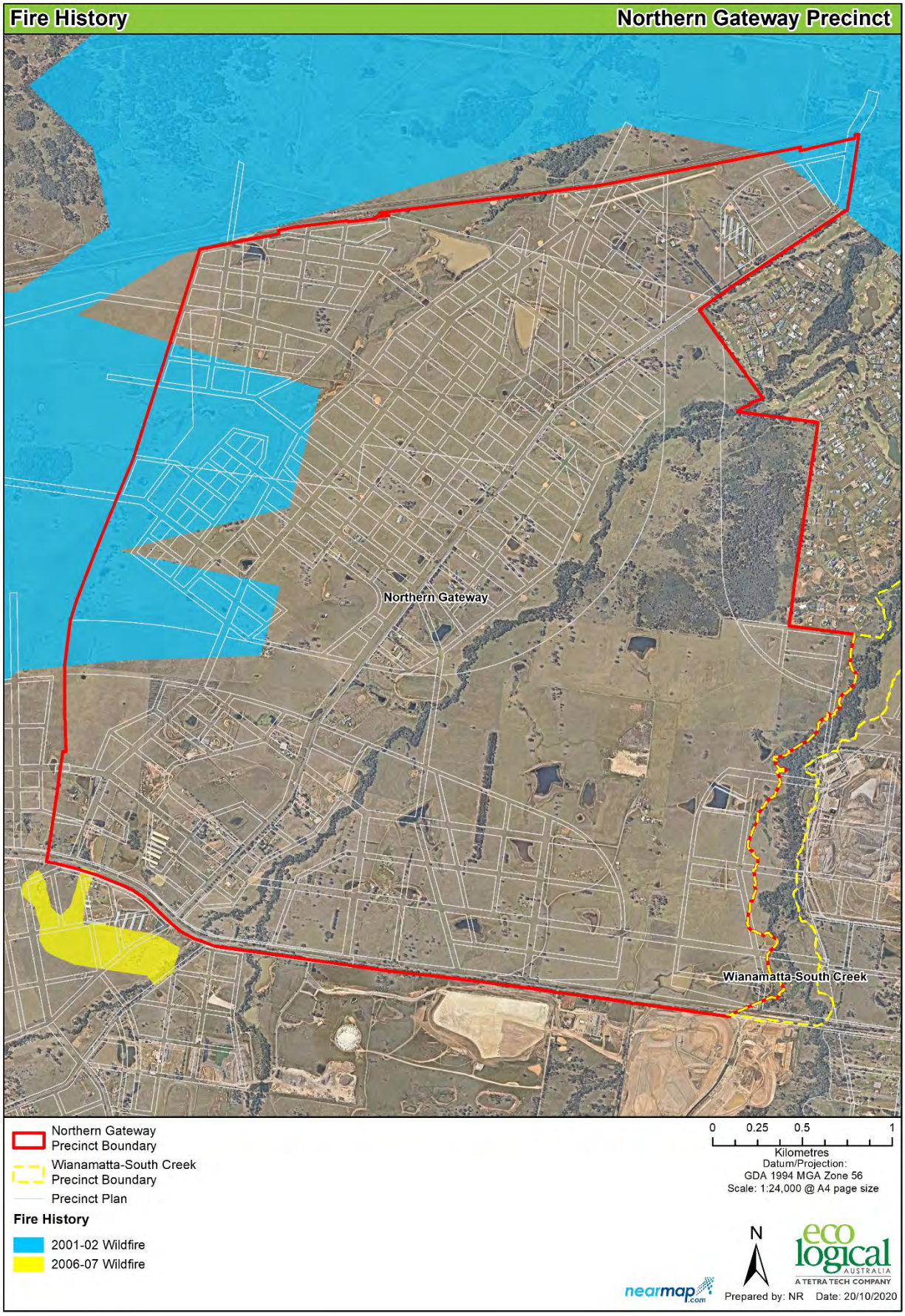

Figure 5: Fire History within the Northern Gateway Precinct 1982 - 2017 (prescribed burns and wildfire)

2.2.1 Key Fire Scenarios

Given the local bushfire history presented above along with the bushfire weather analysis presented in Section 2.1.4, the key bushfire scenarios considered most relevant to the Northern Gateway and Wianamatta-South Creek precincts are outlined in **Table 3**.

Table 3: Analysis of Key Bushfire Scenarios

Ignition Source	Most Probable Locations	Potential Bushfire Spread & Impact Scenarios	Likelihood
Arson and Fire Escapes (Pile Burns etc)	To the north and north-east of the precinct and within the Wianamatta-South Creek precinct	Spread to the south-east under high Forest Fire Danger Index, through a mix of grassland fuels on the undulating land neighbouring precinct, and woodland fuels within the riparian corridors. Potentially impacting the precinct at higher intensity along the riparian corridors.	Moderate

The above is not a complete list of potential bushfire attack scenarios that development within the Northern Gateway and Wianamatta-South Creek precincts could be exposed to. Rather, it is an overview of the most likely relevant scenario, particularly with potential to become large, more intense landscape fires (i.e. those that are difficult to contain and with the potential to impact across large parts of the landscape).

The most likely bushfire attack scenarios are smaller, lower intensity fires starting either within or outside the Northern Gateway precinct. Should a rapid-fire response be applied and/or they occur under lower Forest Fire Danger Index conditions, then the chance of containment is much higher, and the potential consequence is lower.

Regardless of the nature of the bushfire attack scenarios that the Northern Gateway and Wianamatta-South Creek precincts are exposed to, future development within the precincts will need to comply with the bushfire protection measures required by the statutory controls in place at the time of the development (i.e. *Planning for Bushfire Protection* 2019). Whilst it cannot guarantee complete risk removal, *Planning for Bushfire Protection 2019* aims to 'provide for the protection of human life and minimise impacts on property from the threat of bushfire'. As such, the presence of bushfire risk to the precincts will not preclude development, rather it requires the provision of an appropriate suite of bushfire mitigation measures for each development. The ability of the Northern Gateway and Wianamatta-South Creek precincts to provide appropriate bushfire mitigation is the subject of Section 3.

2.2.2 Summary of landscape bushfire risk assessment

The landscape risk analysis indicates that the potential for attack by larger bushfires exists in most years, if not all, due to weather conditions and fuel continuity. It is also reasonably foreseeable that Bushfire Attack Levels under Catastrophic Fire Danger Rated days could occur and therefore assessment of individual allotment risks under the *Planning for Bushfire Protection* 2019 benchmarks are appropriate, with a suite of bushfire protection measures to be implemented to reduce the potential impact of a bushfire.

Bushfire Attack Levels are primarily a predictor of the potential consequence of bushfire attack on a building but do not adequately consider likelihood which can be understood from:

- the likelihood and location of ignitions within the landscape coinciding with adverse fire weather conditions that move a fire toward the proposed development; and
- factors related to wildfire mitigation and suppression such as reduced fuel areas, the timing of fire runs compared to suppression deployment and capability, and the coincidence of these with landscape fire advantages such existing roads and infrastructure (i.e. powerline easement) as well as existing areas of development and land management.

Although fire history indicates the probability of a landscape-wide fire or major fire attack on the Northern Gateway precinct is low, it is feasible that a landscape fire is likely to occur over the next 50 years. The feasibility of such an event results from the extent of the riparian vegetation, particularly within the Wianamatta-South Creek precinct, and the high confidence that climate change will result in a harsher fire-weather climate in the future.

Based on the fire history, landscape fire advantages, minimal residential use and the proposed larger allotment size enabling appropriate bushfire protection measures, it is not considered that development within the Northern gateway precinct would be within an unacceptable bushfire landscape.

The landscape risk analysis indicates a risk level where it is feasible to design and build resilience into the community that matches or exceeds the bushfire risk in the landscape. The total elimination of bushfire risk is not necessary or feasible; this is the situation for any bushfire prone land.

3. Land use assessment

The *Environmental Planning & Assessment Act 1979* and the *Rural Fires Act 1997* are the primary legislative instruments relevant to bushfire planning for the site. *Planning for Bushfire Protection 2019* is called up by these pieces of legislation as the subject land is mapped as bushfire prone land, and it is a critical guide in assessing the bushfire risk suitability of the Northern Gateway precinct.

Planning for Bushfire Protection 2019 outlines broad principles and assessment considerations for strategic planning. It also specifies that bushfire protection measures need to be considered at the strategic planning stage to ensure that the future development can comply with *Planning for Bushfire Protection 2019* (as specified in Chapters 5-8 of *Planning for Bushfire Protection* 2019).

The aim and objectives of *Planning for Bushfire Protection 2019* below provide additional guidance for land use assessment within a Strategic Bushfire Study:

The aim of Planning for Bushfire Protection is to provide for the protection of human life and minimise impacts on property from the threat of bushfire while having due regard to development potential, site characteristics and protection of the environment.

> *The objectives are to:*
>
> *i. afford buildings and their occupant's protection from exposure to a bushfire*
>
> *ii. provide for a defendable space to be located around buildings*
>
> *iii. provide appropriate separation between a hazard and buildings which, in combination with other measures, minimises material ignition*
>
> *iv. ensure that appropriate operational access and egress for emergency service personnel and residents is available*
>
> *v. provide for ongoing management and maintenance of bushfire protection measures*
>
> *vi. ensure that utility services are adequate to meet the needs of firefighters.*

3.1.1 Development Control Plans

Development Control Plans are prepared per the *Environmental Planning & Assessment Act 1979* to help achieve the goals set out in a Local Environmental Plan or State Environmental Planning Policy. A Development Control Plan may provide specific controls for differing developments and as such may influence the provision of bushfire protection measures. *Planning for Bushfire Protection 2019* recommends consultation with the NSW Rural Fire Service, particularly if there is a risk of Development Control Plan amendments in conflict with the requirements of *Planning for Bushfire Protection 2019.* The draft Development Control Plan objectives, performance outcome and benchmark solutions proposed for the Northern Gateway and Wianamatta-South Creek precincts concerning Bushfire Hazard Management are as follows:

O1: Minimise the impacts of development concerning bushfires to protect life, property and community.

5.1	Performance Outcome	Benchmark Solution
PO1	Development that responds appropriately to bushfire risk.	Where a site is identified as being bushfire prone, development is undertaken per the *Rural Fires Act 1997, Planning for Bushfire Protection.* The appropriate Asset protection zone distance is determined in accord with *Planning for Bushfire Protection*, based on vegetation type, slope and the nature of the development and is measured from the edge of the retained habitat
	Retain and enhance native vegetation	Ensure appropriate fire management regimes and hazard reduction techniques for native vegetation areas, waterways and riparian zones. Asset Protection Zones for bushfire protection purposes are to be located wholly within land zoned for urban purposes and not within land zoned Environment and Recreation Zone (E1 National Parks and Nature Reserves, E2 Environmental Conservation) or managed as a reserve.
	Landscaping design in bushfire prone land to assist in preventing the spread of bushfires into buildings	Landscaping in bushfire prone areas will be designed per Appendix 4 of Planning for Bushfire Protection 2019 The landscape plan must identify: • location and species type of all existing and proposed trees and shrubs in the proposed Asset Protection Zones • proposed trees and shrubs to be removed as part of the Asset Protection Zones • how the requirements of Appendix 4 of Planning for Bushfire Protection 2019 are met

3.2 Risk Profile

The feasibility of the Northern Gateway and Wianamatta-South Creek precincts to comply with the bushfire protection measures within *Planning for Bushfire Protection 2019* is a fundamental consideration. Whilst bushfire protection measures and their performance requirements are a benchmark for approval of a development, a strategic level assessment needs also to evaluate these measures within the landscape risk context. This Bushfire Management Plan has therefore considered the:

- Footprint within the bushfire landscape and the need for adjustment of the protection measures given the landscape risks;
- Pattern and potential bushfire resilience of the development bushland interface;
- Potential cumulative risk associated with the protection measures;
- Risk profile of different areas and their appropriate land use; and
- Potential for application of innovative or emerging bushfire protection measures.

The following land use risk profile has been identified:

- The Northern Gateway precinct is large; up to approximately 4 km wide by 4 km long, providing significant area into which bushfire resilience can be incorporated;
- Over 80% of future development will be located within Bushfire Attack Level LOW i.e. large internal areas no longer classified as bushfire prone land. This provides the potential for a high bushfire resilience;
- The perimeter to area ratio of the development is low compared to most development proposed on bushfire prone land in NSW as a direct result of the large scale of the development. A low perimeter to area ratio reduces bushfire risk and helps increase community resilience. There is also the capacity to manage the hazard extent through the implementation of a vegetation management plan where lower fuel loads can be maintained along with the hazard interface;
- The Wianamatta-South Creek precinct is predominantly a riparian corridor that will be retained for conservation purposes. It is expected that regeneration of the corridor will occur, and a vegetation management plan will assist in managing fuel loads and the broader landscape risk.
- There is ample area to locate Asset Protection Zones and other bushfire protection measures to meet the acceptable solutions within *Planning for Bushfire Protection* 2019;
- There is ample area to locate any Special Fire Protection Purpose Development that may be proposed within the precinct (such as childcare facilities) well away from the hazard; and
- No unusual cumulative risks have been identified. Complementary and consistent risk management through the landscape and building design, and community programs are also feasible.

3.3 Risk response - Bushfire Protection Measures

The following bushfire protection measures are proposed by the development in response to the strategic level risks identified in **Section 2**. Bushfire protection measures are required to improve the community resilience to bushfire attack and improve property protection.

Application of the bushfire protection measures described in *Planning for Bushfire Protection 2019* minimise the risks from bushfire and ensure that the aims and objectives of *Planning for Bushfire Protection 2019* are met. This approach has been applied for the subject site.

The following key bushfire protection measures are addressed in this assessment:

- Asset Protection Zones;
- Water supplies;
- Infrastructure (including access road provisions and other services);
- Evacuation and emergency management (including emergency access/egress arrangements); and
- Landscape management and garden design principles.

3.4 Asset Protection Zones

3.4.1 The current requirement under Planning for Bushfire Protection 2019

Table 4 provides the Asset Protection Zone dimensions applied in line with Table A1.12.5 of *Planning for Bushfire Protection 2019*. Asset Protection Zones are typically refined further along the planning process at the subdivision stage, with the structure plan developed at this current re-zoning phase ensuring the Asset Protection Zone dimensions required at subdivision can be achieved. The Asset Protection Zone dimensions cited in this assessment will be refined for future subdivision as a more detailed assessment of slope, vegetation and bushfire attack is required. The required Asset Protection Zones must be located within the urban footprint, and specifically on land that is certified under the Cumberland Plain Conservation Plan.

Asset Protection Zones are areas located between bushfire hazards and development to provide a defendable space in which to undertake emergency operations and to provide a buffer from direct flame contact, and the impacts of radiant heat, smoke and embers and should be wholly contained within the proposed lot or subject land for which they are benefitting or protecting. However, in some circumstances, Asset Protection Zones may consist of managed areas outside an allotment e.g. managed open space, managed service easements and roads. Perimeter roads form part of the Asset Protection Zones throughout the site.

The width of Asset Protection Zone s is based on a combination of:

- Predominant vegetation (using structural classification);
- Effective slope (i.e. slope most affecting fire behaviour adjacent to the interface); and
- Fire Danger Index of 100 (a catastrophic fire weather day).

Figure 6 shows the proposed Asset Protection Zones for the Norther Gateway precinct, determined in size by vegetation and slope. Development in the Wianamatta-South Creek precinct is related to the provision of infrastructure including roads and rail, with Asset Protection Zones are typically not required of this type of development. **Table 4** identifies the slope and vegetation type used to determine the Asset Protection Zones.

3.4.2 Assessment of impacts of climate change on Asset Protection Zones

Using the results from the weather analysis in Section 2.1.4, modelling was undertaken to determine the potential increase in Asset Protection Zone required to account for an increase in the Fire Danger Index for the Northern Gateway precinct, noting that the Asset Protection Zone required under *Planning for Bushfire Protection* 2019 is based on a Fire Danger Index of 100. The modelling uses a Fire Danger Index of 116 and is consistent with the weather analysis undertaken for the overall Aerotropolis Bushfire Risk Assessment. Recent research by Douglas and He (2019) indicates that the values used in this analysis represent a reasonable estimate of potential future fire weather conditions under climate change. The results of the modelling are provided in **Table 5** and **Figure 7**.

3.4.3 Asset Protection Zones for Special Fire Protection Purpose Development

Asset Protection Zones for Special Fire Protection Purposes development or sensitive uses are larger than those for applied other land uses due to the increased vulnerability of the occupants and the increased emergency management needs. Special Fire Protection Purposes developments are required

to provide a managed Asset Protection Zone that ensures radiant heat levels of greater than 10kW/ m² (calculated at 1200K) will not be experienced on any part of the building.

The following development is identified as Special Fire Protection Purposes development under section 100(b)(6) of the Rural Fires Act:

- (a) a school,
- (b) a childcare centre,
- (c) a hospital (including a hospital for the mentally ill or mentally disordered),
- (d) a hotel, motel or other tourist accommodation,
- (e) a building wholly or principally used as a home or other establishment for mentally incapacitated persons,
- (f) seniors housing within the meaning of State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004,
- (g) a group home within the meaning of State Environmental Planning Policy No 9—Group Homes,
- (h) a retirement village,
- (i) any other purpose prescribed by the regulations.

Concerning point (i) above, the Rural Fires Regulations define the following as prescribed purposes:

*For the purposes of paragraph (i) of the definition of **special fire protection purpose** in section 100B (6) of the Act, the following purposes are prescribed:*

- (a) a manufactured home estate (within the meaning of State Environmental Planning Policy No 36—Manufactured Home Estates), comprising two or more caravans or manufactured homes, used for the purpose of casual or permanent accommodation (but not tourist accommodation),
- (b) a sheltered workshop, or other workplace, established solely for the purpose of employing persons with disabilities,
- (c) a respite care centre, or similar centre, that accommodates persons with a physical or mental disability or provides respite for carers of such persons,
- (d) student or staff accommodation associated with a school, university or other educational establishment,
- (e) a community bushfire refuge approved by the Commissioner.

Further, specific tourism uses including caravan parks, camping, primitive camping, bed and breakfast, farm stay accommodation, holiday lets and ecotourism as well as residential based SFPP including manufactured home estates, home-based childcare and tertiary institutions have specific requirements in *Planning for Bushfire Protection 2019*.

Special Fire Protection Purposes developments (education facilities) are proposed as part of future development, and the above requirements will need to apply where such facilities are located. The dimensions required are indicated in **Table 4**. The required Asset Protection Zones must be located within the urban footprint, and specifically on land that is certified under the Cumberland Plain Conservation Plan.

3.4.4 Asset Protection Zones for Non-Residential Development Types

It is recommended that development associated with employment lands, such as commercial and industrial development, be treated as a residential development for the purpose of strategic planning. While non-habitable development of this kind has the opportunity to have an Asset Protection Zone less than that required for residential subdivision, this flexibility relies on the known use of the building, its design and construction standard, and can only be determined at the development application stage. Therefore, it is considered appropriate to assess residential-sized Asset Protection Zones for such development at this stage in the planning process. The required Asset Protection Zones must be located within the urban footprint, and specifically on land that is certified under the Cumberland Plain Conservation Plan.

3.5 Landscaping

Planning for Bushfire Protection Planning for Bushfire Protection (Table 5.3a RFS 2019) specifies the following concerning landscaping:

> *Landscaping is designed and managed to minimise flame contact and radiant heat to buildings, and the potential for wind-driven embers to cause ignitions*

The 'acceptable solution' for landscaping is according to Appendix 4 of *Planning for Bushfire Protection 2019* which prescribes the standards for Asset Protection Zones.

This matter is not relevant at the strategic planning phase of land use planning however will need to be considered during future development application stages.

4. Feasibility of Asset Protection Zones

Figure 6 and **Figure 7** show the vegetation formation used to assess the Asset Protection Zone requirements for the site and the resultant Asset Protection Zones under a Fire Danger Index of 100 and 116 (for current requirements and a projected Asset Protection Zone increase resulting from climate change respectively). **Table 4** and **Table 5** identify the slope and vegetation type used to determine these Asset Protection Zones.

It is concluded that the required Asset Protection Zone (Bushfire Attack Level 29 for >29kW/m² radiant heat) under a Fire Danger Index of 116 to consider the impacts of climate change of fire weather can be provided within the Northern Gateway precinct. Even allowing for increased Asset Protection Zone, ample area exists within the site that would no longer be classified as bushfire prone land following development. It is noted that the assessment was high-level and thus a conservative approach was taken. Further, it is important to note that the Asset Protection Zone calculations quoted in this assessment are indicative only and have been determined at a landscape scale. This level of detail is suitable for strategic planning but will need to be re-assessed at a finer scale during the later stages of the planning process. This provides the potential for a high bushfire resilience. It also shows these can be achieved without the need for alternate solutions.

Table 4: Indicative Asset Protection Zones for subject land for residential and Special Fire Protection Purposes

Slope[1]	Vegetation[2]	Residential Asset Protection Zones (PBP 2019)[3]	Special Fire Protection Purpose Asset Protection Zones (PBP 2019)[4]	Comments
Downslope >0 to 5 degrees	Grassland	12 m	40 m	Asset Protection Zones provided between hazard and development. Where practical the Asset Protection Zones can be provided by the road network or as an Inner Protection Area.
Downslope >5 to 10 degrees	Grassland	13 m	45 m	As above
Downslope >10 to 15 degrees	Grassland	15 m	50 m	As above
Downslope >15 to 20 degrees	Grassland	17 m	55 m	As above
Downslope >0 to 5 degrees	Forested Wetland	12 m	42 m	As above.
Downslope >5 to 10 degrees	Forested Wetland	16 m	51 m	As above
Downslope >10 to 15 degrees	Forested Wetland	20 m	62 m	As above
Downslope >15 to 20 degrees	Forested Wetland	26 m	73 m	As above
All upslope and flat land	Woodland	12 m	42 m	As above
Downslope >0 to 5 degrees	Woodland	16 m	50 m	As above
Downslope >5 to 10 degrees	Woodland	20 m	60 m	As above
Downslope >10 to 15 degrees	Woodland	25 m	72 m	As above

Slope[1]	Vegetation[2]	Residential Asset Protection Zones (PBP 2019)[3]	Special Fire Protection Purpose Asset Protection Zones (PBP 2019)[4]	Comments
Downslope >15 to 20 degrees	Woodland	32 m	85 m	As above
Downslope >0 to 5 degrees	Forest	29 m	79 m	As above
Downslope >5 to 10 degrees	Forest	36 m	93 m	As above
Downslope >10 to 15 degrees	Forest	45 m	100 m	As above
Downslope >15 to 20 degrees	Forest	56 m	100 m	As above

[1] Slope most significantly influencing the fire behaviour of the site having regard to vegetation found as per Planning for Bushfire Protection.

[2] Predominant vegetation is identified, according to Planning for Bushfire Protection.

[3] Assessment according to Table A1.12.2 of Planning for Bushfire Protection 2019.

[4] Assessment according to Table A1.12.1 of Planning for Bushfire Protection 2019.

Table 5. Modelled Asset Protection Zone requirements for increased Fire Danger Index resulting from climate change

Vegetation type	Slope category																			
	Upslope/flat				>0-5° downslope				>5-10° downslope				>10-15° downslope				>15-20° downslope			
	DtS (m)	Model (m)	% change	Adjusted APZ (m)	DtS (m)	Model (m)	% change	Adjusted APZ (m)	DtS (m)	Model (m)	% change	Adjusted APZ (m)	DtS (m)	Model (m)	% change	Adjusted APZ (m)	DtS (m)	Model (m)	% change	Adjusted APZ (m)
Forest	24	24.9	4%	25	29	31.3	8%	32	36	39.4	9%	40	45	49.8	11%	50	56	63.5	13%	64
Grassy Woodland	12	13.4	12%	14	16	17.5	9%	18	20	22.5	13%	23	25	28.8	15%	29	32	36.8	15%	37
Forested Wetland	10	10.1	1%	11	12	13.8	15 %	14	16	18.2	14%	19	20	23.7	19%	24	26	30.4	17%	31
Grassland	10	10.6	6%	11	12	12.8	7%	13	13	15.1	16%	16	15	17.7	18%	18	17	20.5	21%	21

Figure 6: Asset Protection Zones for residential and other non-Special Fire Protection Purposes development (Planning for Bushfire Protection 2019)

Figure 7: Asset Protection Zones for residential and other non-Special Fire Protection Purposes development based on climate change

5. Access and Egress

Safe access, egress and defendable spaces are required for emergency services. Proposed road corridors (**Figure 1**) provide a connection for multiple access routes both east-west and north-south across the site. The connections provide redundancy in the event of one major egress being restricted during a bushfire attack, and with the proposed secondary and perimeter roads, the options for evacuation routes are expected to be adequate for any foreseeable bushfire attack contingency for the Northern Gateway precinct. Emergency management arrangements are also required such as procedures and routines for evacuation and consideration of safer places.

The Northern Gateway precinct can comply with the *Planning for Bushfire Protection 2019* acceptable solutions and are also expected to provide a major linked network to facilitate access throughout the precinct and enable road connections to the international airport to the west. Lower intensity fire may enter green spaces; however, the precinct design provides perimeter roads to these spaces that will minimise fire spread and any potential restriction of localised traffic movement.

Multi-access points are an essential bushfire protection measure that have been considered in the precinct design. The indicative road layout provides for multiple access routes both east-west and north-south across the site in the event of fires either approaching or within the study area. The extent of revegetated riparian corridors may have resulted in increased risk to access options being cut off, particularly in the north-western corner of the precinct. However, given the size of the site and number of access options indicated on the precinct plan, the risk of isolation is minimal. Further, access from the east, via the Wianamatta-South Creek precinct would be feasible with the vegetation hazard surrounding access routes managed under a Vegetation Management Plan

The precinct plan as shown in **Figure 1** provides public roads that can readily incorporate access requirements of *Planning for Bushfire Protection 2019* (see Appendix A) and achieve:

- a road design that facilitates the safe access and egress for residents and emergency service personnel, including multiple access/egress options for each area;
- access that meets the acceptable solutions detailed in *Planning for Bushfire Protection 2019* (where relevant), especially the provision of perimeter roads (of enough width and capacity) separating developed land from bushfire-prone vegetation and the provision of alternative access; and
- road design with adequate capacity to facilitate a satisfactory emergency evacuation.

6. Emergency Services

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

a. Emergency evacuation planning;
b. Evacuation adequacy assessment.

Currently, there are limited emergency services in proximity to the precinct. Given the overarching development of the Western Sydney Airport site, it is expected further services will provide an adequate emergency response within the vicinity of the subject land. There are currently four Rural Fire Service brigades within 10 minutes travel time of the Northern Gateway precinct:

- Luddenham Rural Fire Brigade (to the west of the precinct)
- Middleton Rural Fire Brigade (to the east of the precinct);
- Horsley Park Rural Fire Brigade (to the northeast of the precinct); and
- Leppington Rural Fire Brigade (to the south of the precinct).

It is recommended that any future development be consistent with Cumberland & Macarthur Bush Fire Risk Management Plan.

7. Evacuation

Initial assessment of emergency evacuation has occurred and includes the following:

- An analysis of the most relevant bushfire attack scenario;
- Identification of evacuation and refuge locations (**Section7.1**); and
- An evaluation of evacuation adequacy and option for the shortcomings identified.

7.1 Assessment of Neighbourhood Safer Places

Off-site evacuation is time-consuming, causes a range of significant community disruptions and are resource-demanding for emergency services. This study has found that localised evacuation to Neighbourhood Safer Place is both feasible and highly desirable.

The potential for Neighbourhood Safer Place was assessed per the criteria and principles documented in RFS 2017 and shown in **Table 6** and **Table 7**.

RFS (2017) defines a Neighbourhood Safer Place as follows:

> *A Neighbourhood Safer Place is a building or an open space that may provide for improved protection of human life during the onset and passage of a bushfire. It is a location where people facing an immediate threat to their personal safety can gather and seek shelter*

from the impact of a bushfire. Their function is to provide a place of last resort for a person to seek shelter at during the passage of the bushfire front.

Neighbourhood Safer Places are not to be confused with Fire Refuges, Recovery Centres, Assembly Areas, Evacuation Centres or Informal Places of Shelter

Table 6: Assessment Criteria for a Neighbourhood Safer Place (RFS 2017)

Factor	Performance Criteria	Acceptable Solution	Comment
Radiant Heat	The building is located and constructed to enhance the chance for survival for humans in attendance from the radiant heat of a bushfire.	The building is situated to prevent direct flame contact, material ignition and radiant heat level of 10kW/m²; or Provide 139 metres separation distance from a bushfire hazard.	All areas outside of the Special Fire Protection Purpose required asset protection zone meet the acceptable solution requirement for radiant heat level.
	Open Space is located to enhance the chance for survival for humans in attendance from the radiant heat of a bushfire.	Open Space is situated and maintained to prevent direct flame contact, material ignition and radiant heat levels of 2kW/m²; or Provide 310 metres separation distance from a bushfire hazard	A substantial proportion of the development footprint available to provide for a maximum radiant heat level of 2kW/m² to meet these criteria.
Maintenance of the Site and the Land Adjacent	The area between bushfire hazard and the site is maintained to a level that ensures the radiant heat levels at the Building/Open Space meet the Performance Criteria for Radiant Heat.	The site and land adjacent to the site between the Building/Open Space and the bushfire hazard is managed land or maintained per NSW Rural Fire Service Document *Standards for Asset Protection Zones*	Landscape management practices will be determined at later stages in the development process; however, all internal areas will meet the required standards for asset protection zones or be managed land.

Table 7: Principles for Site Identification (RFS 2017)

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

There are several existing Neighbourhood Safer Places within or close to the subject land which exists as open space based on the nature of the surrounding landscape. These include:

- Luddenham Showground, Open Space, Luddenham;
- Bringelly Park, Open Space, Bringelly; and
- Wallacia Gold course Carpark, Open Space, Wallacia.

Egress to each of these Neighbourhood Safer Places is dependent on access options remaining open, as discussed in **Section 5**.

As noted, given the overarching size and development of the Northern Gateway precinct, it is expected further services and Neighbourhood Safer Places will be provided within the vicinity of the precinct.

8. Infrastructure

8.1 Water

The Northern Gateway precinct is serviced by a reticulated water supply that will be extended across the precincts as part of future development works. **Table 9** identifies the acceptable solution requirements of Section 5.3.3 of *Planning for Bushfire Protection 2019*.

The *Planning for Bushfire Protection 2019* acceptable solution requirements for water is achievable.

8.2 Electricity and Gas

It is preferable that electrical transmission lines are underground where practical to reduce the risk of ignition. An existing network of powerlines is located across the development area and is managed and will continue to be managed per the *Guide for the Management of Vegetation in the Vicinity of Electricity Supply Infrastructure* (ISSC3 2016).

Several the existing feeder lines will become part of the development footprint within managed open spaces. These open spaces will be of a design that will potentially lower the existing low ignition risk and will pose no risk bushfire impact on the power supply. Details for compliance with *Planning for Bushfire Protection 2019* are provided in **Table 9**.

9. Adjoining Land

Future development will not be reliant on any off-site bushfire mitigation measures. All buildings and use will be designed to be resilient to bushfire attack in circumstances where no additional fuel management occurs outside of Asset Protection Zones etc.

Local Bushfire Management Committees will be updated annually of the bushfire protection measures in-built and proposed for the development.

The Northern Gateway precinct should not harm the ability for bushfire management activities to be undertaken on adjoining land. Given the adherence to *Planning for Bushfire Protection 2019* and other land use planning requirements, the proposed land uses should not increase bushfire management needs for retained and/or adjoining bushfire-prone vegetation.

10. Conclusions

Several strategies have been provided in the form of planning controls to reduce the bushfire risk to an appropriate level. These planning controls are consistent with *deemed to satisfy* bushfire protection requirements outlined in *Planning for Bushfire Protection 2019,* and this report shows that all bushfire protection requirements can be achieved.

The Northern Gateway and Wianamatta-South Creek precincts have been assessed concerning the feasibility of bushfire protection measures. The required bushfire protection measures in accord with *Planning for Bushfire Protection 2019* are achievable within the subject land and reduce the bushfire risk associated with the proposed development.

Notable elements of the Study supporting this conclusion are:

- All *Planning for Bushfire Protection 2019* required bushfire protection measures can be accommodated within the large development footprint, including increased Asset Protection Zone setbacks to allow for climate change increasing the Fire Danger Index for the region.
- Capacity exists to enhance the bushfire protection measures through the staged implementation of development.
- The large development footprint can ensure the more vulnerable in the community are in the safest bushfire locations, while the proposed use of the precinct with limited residential components provided to opportunity to restrict the number of occupants within the precinct on days of extreme or catastrophic fire danger ratings compared to residential development.
- The large development footprint enables major egress roads to be located where there is no risk of impact by bushfire. Most secondary roads are also located on future non-bushfire prone land, though there is potential for exposure to several roads within the north-west of the precinct to fire fronts from western, northern and eastern aspects. However, this would likely occur under lower Fire Danger Indexes associated with southerly or northerly winds.
- Landscape design controls across the development footprint will further reduce the bushfire attack potential, particularly from burning debris.
- Underground electricity and gas services.
- Compliant water supplies.
- Emergency response planning.

More detailed bushfire assessment to accurately prescribe setbacks, roading and landscaping are required as plans are finalised, however, this initial assessment and plan will be used to inform this more detailed designed to occur smoothly and achieve the deemed to satisfy standards within NSW.

11. References

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Appendix A – Access Specifications

The following access specifications are reproduced from *Planning for Bushfire Protection* (RFS 2019).

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

Table 8: Performance criteria for access for residential and rural residential subdivisions

Performance Criteria	Acceptable Solutions
The intent may be achieved where:	
• **firefighting vehicles are provided with safe, all-weather access to structures and hazard vegetation**	• property access roads are two-wheel drive, all-weather roads, and • perimeter roads are provided for residential subdivisions of three or more allotments; and • subdivisions of three or more allotments have more than one access in and out of the development; and • traffic management devices are constructed to not prohibit access by emergency services vehicles; and • maximum grades for sealed roads do not exceed 15 degrees and an average grade of not more than 10 degrees or other gradient specified by road design standards, whichever is the lesser gradient; and • all roads are through roads; • Dead end roads are not recommended, but if unavoidable, dead ends are not more than 200 metres in length, incorporate a minimum 12 metres outer radius turning circle, and are clearly signposted as a dead end; and • where kerb and guttering are provided on perimeter roads, roll-top kerbing should be used to the hazard side of the road; and • where access/egress can only be achieved through forest, woodland or heath vegetation, secondary access shall be provided to an alternate point on the existing public road system. • 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 enough 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 per AS 2419.1:2005 *Fire hydrant installations system design, installation and commissioning;* • 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
• **access roads are designed to allow safe access and egress for medium rigid firefighting vehicles while residents are evacuating as well as providing a safe operational environment for emergency service personnel during firefighting and emergency management on the interface**	• perimeter roads are two-way sealed roads; and • 8m carriageway width kerb to kerb; and • parking is provided outside of the carriageway width; and • hydrants are located clear of parking areas; and • there are through roads, and these are linked to the internal road system at an interval of no greater than 500m; and • curves of roads have a minimum inner radius of 6m; and • the maximum grade road is 15° and the average grade is 10°; and • the road cross fall does not exceed 3°; and • a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.
• **access roads are designed to allow safe access and egress for medium rigid firefighting vehicles while residents are evacuating**	• minimum 5.5m width kerb to kerb; and • parking is provided outside of the carriageway width; and • hydrants are located clear of parking areas; and • roads are through roads, and these are linked to the internal road system at an interval of no greater than 500m; and • curves of roads have a minimum inner radius of 6m; and • the road crossfall does not exceed 3°; and • a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches, is provided.
• **firefighting vehicles can access the dwelling and exit safely**	There are no specific access requirements in an urban area where an unobstructed path (no greater than 70 m) is provided with the most distant external part of the proposed dwelling and the nearest part of the public access road (where the road speed limit is not greater than 70kph) that supports the operational use of emergency firefighting vehicles (i.e. a hydrant or water supply). In circumstances where this cannot occur, the following requirements apply: • minimum carriageway width of 4m; • in a forest, woodland and heath situations, rural property access roads have passing bays every 200m that is 20m long by 2m wide, making a minimum trafficable width of 6m at the passing bay; and • a minimum vertical clearance of 4m to any overhanging obstructions, including tree branches; and • provide a suitable turning area per Appendix 3; and • curves have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress; and • the minimum distance between inner and outer curves is 6m; and • the crossfall is not more than 10°; and • maximum grades for sealed roads do not exceed 15° and not more than 10° for unsealed roads; and • a development comprising more than three dwellings has formalised access by the dedication of a road and not by right of way. Note: Some short constrictions in the access may be accepted where they are not less than the minimum (3.5m), extend for no more than 30m and where the obstruction cannot be reasonably avoided or removed. the gradients applicable to public roads also apply to community-style development property access roads in addition to the above.

Appendix B – Service specifications

The following services specifications (provision of water, gas and electricity) are reproduced from *Planning for Bushfire Protection* (RFS 2019).

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

Table 9: Performance criteria for services provision for residential and rural residential subdivisions

Performance Criteria	Acceptable Solutions
The intent may be achieved where:	
• **water supply is provided for firefighting purposes**	• reticulated water is to be provided to the development, where available; • static water and hydrant supply are provided for non-reticulated developments or where reticulated water supply cannot be guaranteed; and • static water supplies shall comply with (**Table 5.3d**)
• **water supplies are located at regular intervals** • **the water supply is accessible and reliable for firefighting operations**	• fire hydrant spacing, design and sizing complies with relevant clauses of the Australian Standard AS 2419.1:2005; • hydrants are not located within any road carriageway; • reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads.
• **flows and pressure are appropriate**	• fire hydrant flows and pressures comply with the relevant clauses of AS 2419.1:2005.
• **the integrity of the water supply is maintained**	• all above-ground water service pipes are metal, including and up to any taps. • Above-ground water storage tanks shall be of concrete or metal.

• **location of electricity services limits the possibility of ignition of surrounding bushland or the fabric of buildings**	• where practicable, electrical transmission lines are underground;
	• where overhead, electrical transmission lines are proposed as follows:
	  ◦ lines are installed with short pole spacing (30m), unless crossing gullies, gorges or riparian areas;
	  ◦ no part of a tree is closer to a power line than the distance set out per the specifications in ISSC3 Guideline for Managing Vegetation Near Power Lines.

• **location and design of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.**	• reticulated or bottled gas is installed and maintained per AS/NZS 1596:2014 and the requirements of relevant authorities and metal piping are used; • all fixed gas cylinders are kept clear of all flammable materials to a distance of 10m and shielded on the hazard side; • connections to and from gas cylinders are metal; • polymer-sheathed flexible gas supply lines to gas meters adjacent to buildings are not used; • above-ground gas service pipes are metal, including and up to any outlets.

Table 10: Water supply requirements for non-reticulated developments or where reticulated water supply cannot be guaranteed (Table 5.3d of *Planning for Bushfire Protection*)

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

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