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Pondicherry Rezoning Proposal Bushfire Strategic Study

Greenfields Development Company No.2

DOCUMENT TRACKING

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Template 2.8.1

Contents

1. Introduction.....	5
1.1 Background	5
1.2 Legislative Framework.....	5
1.2.1 NSW Environmental Planning and Assessment Act (1979)	6
1.2.2 Rural Fires Act 1997 (RF Act).....	7
1.3 Assessment Approach	7
1.3.1 Rural Fires Act 1997 (RF Act)	9
1.4 Aims and Objectives	9
1.5 Study Area.....	9
1.6 Bushfire Prone Land Status	10
2. Bushfire Landscape Risk Assessment	14
2.1 Bushfire Hazard	14
2.1.1 Vegetation	14
2.1.2 Topography and Slope.....	16
2.1.3 Bushfire Weather	16
2.1.4 Potential Fire Behaviour	17
2.2 Bushfire History	18
2.3 Summary of landscape bushfire risk assessment	18
3. Land Use Assessment	27
3.1 Risk profile.....	27
3.2 Summary of land use assessment	27
4. Feasibility of Asset Protection Zones.....	28
5. Access and egress	31
6. Emergency Services.....	31
6.1.1 Evacuation	31
6.1.2 Assessment of Neighbourhood Safer Places (NSPs)	32
7. Infrastructure	33
7.1 Water	33
7.2 Electricity and gas	33
8. Adjoining land.....	33
9. Conclusions	34
References	35
Appendix A Access Specifications	36
Appendix B : Services Specifications	38

Appendix C Bushfire Prone Land Camden LGA 40

List of Figures

Figure 1: Study area	11
Figure 2: South West Growth Area Precincts (DPIE, 2020)	12
Figure 3: Indicative layout plan.....	13
Figure 4: Vegetation formation and overall fuel load	19
Figure 5: Elevation within the Subject Land and Surrounds.....	20
Figure 6: Slope within the study area	21
Figure 7: Predictive fire intensity modelling.....	22
Figure 8: -Predictive fire intensity modelling for N-SE winds	23
Figure 9: Predictive fire intensity modelling for SE-SW winds	24
Figure 10: Predictive fire intensity modelling for SW-N winds.....	25
Figure 11: Wildfire history within the study area over the past 40 years	26
Figure 12: Indicative asset protection zones	30
Figure 13 - Camden Council Bush Fire Prone Land Map.....	40

List of Tables

Table 1 – Summary of assessment considerations for a strategic bushfire study (RFS 2019)	8
Table 2: Vegetation communities and formations within the study area	15
Table 3: FFDI for a 1 in 50-year event.....	17
Table 4: Indicative APZs applicable to the subject land	29
Table 5: Assessment criteria for a Neighbourhood Safer Place (RFS 2017b)	32
Table 6: Principles for Site Identification (RFS 2017b).....	32
Table 7: Performance criteria for access for residential and rural residential subdivisions	36
Table 8: Performance criteria for services provision for residential and rural residential subdivisions	38
Table 9: Water supply requirements for non-reticulated developments or where reticulated water supply cannot be guaranteed (Table 5.3d of PBP)	39

1. Introduction

1.1 Background

Eco Logical Australia Pty Ltd (ELA) was engaged by Greenfields Development Company to undertake a bushfire strategic study to assist with precinct planning and rezoning of the Pondicherry Precinct (Figure 1). The Pondicherry Precinct has been identified by the Department of Planning, Industry and Environment (DPIE) as a priority area for development within the South West Growth Centre (Figure 2). This Draft Strategic Bushfire Study has been prepared to assist with the consideration of a rezoning planning proposal for lands located within the Camden Local Government Area (LGA) and to facilitate precinct planning.

The study provides assessment of the Indicative Layout Plan (ILP) in regard to the strategic planning principles outlined in *Planning for Bushfire Protection* (PBP) 2019. This is the first step in the planning pathway, and finalisation of the planning proposal will be an iterative process, following discussion with key stakeholders and as the proposal progresses to the development application (DA) stage, detailed design will be finalised. The proposal will trigger an amendment to the Camden Local Environmental Plan (LEP) 2019 as it currently applies, with the primary intention to rezone land from RU1 Primary Production to R2 Low Density Residential, with accompanying provisions for conservation, recreation, local centres, schools and other community facilities (Figure 3).

The focus of this study is the Pondicherry Precinct, herein referred to as the subject land and includes the following land parcels:

- Lot B, DP420694;
- Lots 4 and 5 DP1223563;
- Lot 50, DP1232523;
- Lot C, DP391340;
- Lot 11, DP1229416;
- Lots 500, DP1225924; and
- Lot 2, DP1217189.

The subject land is mapped as bush fire prone land (BFPL) on the Camden LGA maps (Error! Reference source not found.) and therefore under the Ministerial Direction 4.4 (Planning for Bushfire Protection) issued under Section 9.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), where a Planning Proposal includes or is in close proximity to BFPL, the relevant planning authority must consult with the Commissioner of the NSW Rural Fire Service (RFS) following receipt of a gateway determination. Therefore, the assessment detailed in this study seeks to outline how the Planning Proposal can adhere to the requirements of PBP (RFS 2019) and is to accompany a Gateway Determination application.

1.2 Legislative Framework

The legislative framework guiding the assessment of bushfire risk and the application of bushfire protection measures at the strategic level are the NSW *EP&A Act* and the *Rural Fires Act 1997* (RF Act). Key aspects of these instruments are outlined below.

1.2.1 NSW Environmental Planning and Assessment Act (1979)

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

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

When investigating the capability of BFPL to be rezoned, consent authorities must have regard to s.9.1 (2) Direction 4.4 – ‘Planning for Bushfire Protection’ of the *EP&A Act*. The objectives of Direction 4.4 are:

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

Direction 4.4 instructs the consent authority on the bushfire matters which need to be addressed when drafting LEPs. This includes:

- Consultation with the Commissioner of the NSW RFS, and take into account any comments so made;
- Draft LEPs shall have regard to PBP; and
- Compliance with numerous bushfire protection provisions where development is proposed.

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

- Section 3.29 of the *EP&A Act* relates to the development of State environmental planning policies (SEPPs) and within these policies, bushfire considerations may apply for example:
 - Codes SEPP (Exempt and Complying Development Codes);
 - Primarily Clause 34 specifies complying development standards that prescribe compliance with PBP and AS3959, with development on BFPL not permitted within BAL-40 and BAL-FZ.
 - Seniors Housing SEPP (Housing for Seniors or People with a Disability);
 - Clause 27 of the SEPP requires PBP compliance and RFS consultation for development on BFPL.
 - Infrastructure SEPP;
 - Clause 16 of the SEPP requires RFS consultation for residential or Special Fire Protection Purpose (SFPP) development on BFPL.
- Section 4.14 relates to infill and other development:
 - Requires that all development on BFPL conforms to the specifications and requirements outlined in PBP, i.e. the specific requirements for residential infill in chapter 7; and
 - The consent authority should be satisfied that the development conforms to PBP, or otherwise consult with the RFS Commissioner.

- Section 4.46 relates to integrated development and triggers the *RF Act* and Clause 44 of the *Rural Fires Regulation 2013*:
 - 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 bush fire safety authority under section 100b of the *RF Act*.
- Section 9.1 relates to strategic or Local planning:
 - Applicable to land use planning that covers large areas and may include a variety of land uses and longer-term development objectives. Specific requirements are outline in chapter 4 of PBP.

1.2.2 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 act are to provide for the:

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

1.3 Assessment Approach

Section 9.1 (2) of the *EP&A Act* triggers consideration of PBP for strategic planning. Chapter 4 of PBP (RFS 2019) contains the broad principles, ‘inappropriate development’ requirements and assessment considerations required for strategic planning proposals. Chapter 4 of PBP prescribes the completion of a Strategic Bushfire Study, which provides the opportunity to assess whether development proposed by land zoning or land use changes, is appropriate in the bushfire risk context. It also provides the ability to assess the strategic implications of future development for bushfire mitigation and management.

The strategic planning principles of PBP are:

- ensuring land is suitable for development in the context of bush fire risk;
- ensuring new development on BFPL will comply with PBP;
- minimising reliance on performance-based solutions;
- providing adequate infrastructure associated with emergency evacuation and firefighting operations; and
- facilitating appropriate ongoing land management practices.

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

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

The objectives are to:

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

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

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

This Study therefore assesses the planning proposal in the context of the PBP strategic planning principles, ‘inappropriate development’ requirements and the assessment considerations identified in Table 4.2.1 of PBP, summarised in Table 1 below.

Table 1 – Summary of assessment considerations for a strategic bushfire study (RFS 2019)

Issue	Summary of Assessment Considerations
Bush fire landscape assessment	A bush fire landscape assessment considers the likelihood of a bush fire, its potential severity and intensity and the potential impact on life and property in the context of the broader surrounding landscape.
Land use assessment	The land use assessment will identify the most appropriate locations within the 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.

1.3.1 Rural Fires Act 1997 (RF Act)

The objects of RF Act are to provide:

“(a) for the prevention, mitigation and suppression of bush and other fires in local government areas (or parts of areas) and other parts of the State constituted as rural fire districts, and
(b) for the co-ordination of bush fire fighting and bush fire prevention throughout the State, and
(c) for the protection of persons from injury or death, and property from damage, arising from fires, and
(c1) for the protection of infrastructure and environmental, economic, cultural, agricultural and community assets from damage arising from fires, and
(d) for the protection of the environment by requiring certain activities referred to in paragraphs (a)-(c1) to be carried out having regard to the principles of ecologically sustainable development described in section 6 (2) of the *Protection of the Environment Administration Act 1991*.”

Key requirements of the RF Act in relation to this project include:

- All landowners to exercise a duty of care to prevent bush fire from spreading on or from their land under section 63 of the RF Act. This involves taking steps to prevent the occurrence of bush fires on, and to minimise the danger of the spread of a bush fire on or from any land vested in or under its control or management. This relates to the appropriate provision and maintenance of Asset Protection Zones (APZs), landscaping and any retained vegetation when developing land (RFS 2006; RFS 2019); and
- Under Section 64 obligations, if a fire is burning at any time during a bush fire danger period, the occupier immediately on becoming aware of the fire must take all possible steps to extinguish the fire, and if unable without assistance to extinguish the fire, inform the appropriate officer (RFS, Fire and Rescue NSW) of the existence and locality of the fire if it is practicable to do so without leaving the fire unattended.

1.4 Aims and Objectives

The study provides an assessment of the landscape bushfire risk and the residual risk for the development proposed by the Planning Proposal following the provision of bushfire protection measures. It includes the following strategic assessment considerations in PBP (RFS 2019):

- Ensuring land is suitable for development in the context of bush fire risk;
- Ensuring future development on BFPL can comply with PBP;
- Minimising reliance on performance-based solutions;
- Providing infrastructure associated with emergency evacuation and firefighting operations; and
- Facilitating appropriate ongoing land management practices.

1.5 Study Area

The Pondicherry precinct (Figure 1) is approximately 60 km south-west of the Sydney CBD, with the Campbelltown CBD located 14 km south-east. The eastern boundary of the precinct borders the South Creek riparian corridor, with The Northern Road adjacent to the western boundary. The precinct is part of the broader South West Growth Area and encompasses the existing Oran Park

Tranche 41 area. The study area is currently dominated by a rural landscape, with grassland primarily modified for pastoral pursuits. Remnant vegetation within the subject land is generally located within the South Creek riparian corridor to the east. The Oran Park Precinct to the south and east is primarily developed, with the South West and Lowes Creek Maryland Precincts to the north and west still at the concept planning stage (Figure 2).

1.6 Bushfire Prone Land Status

BFPL is certified by the RFS in accordance with legislative requirements and published by the DPIE. Categories of mapped BFPL affecting the study area and adjoining areas, are shown in Appendix C. The presence of mapped BFPL on the subject site, including the vegetation buffer, requires that any new development must satisfy the aim and objectives of PBP (RFS 2019). On formally mapped BFPL, an assessment is required to consider the vegetation hazard and effective slope within the site and adjoining areas, in order to determine the required site specific bush fire protection measures in relation to any proposed development.



Figure 1: Study area

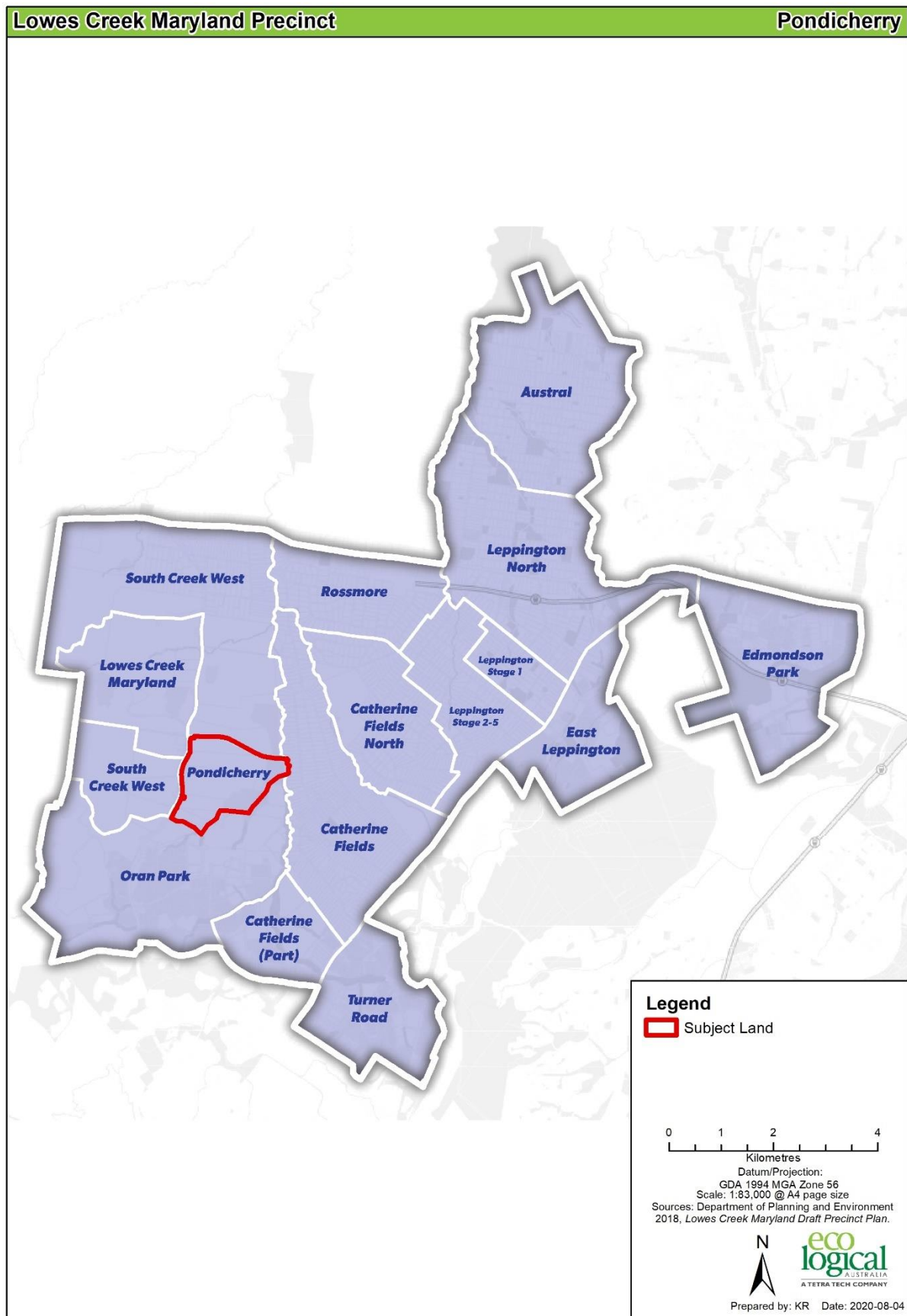


Figure 2: South West Growth Area Precincts (DPIE, 2020)

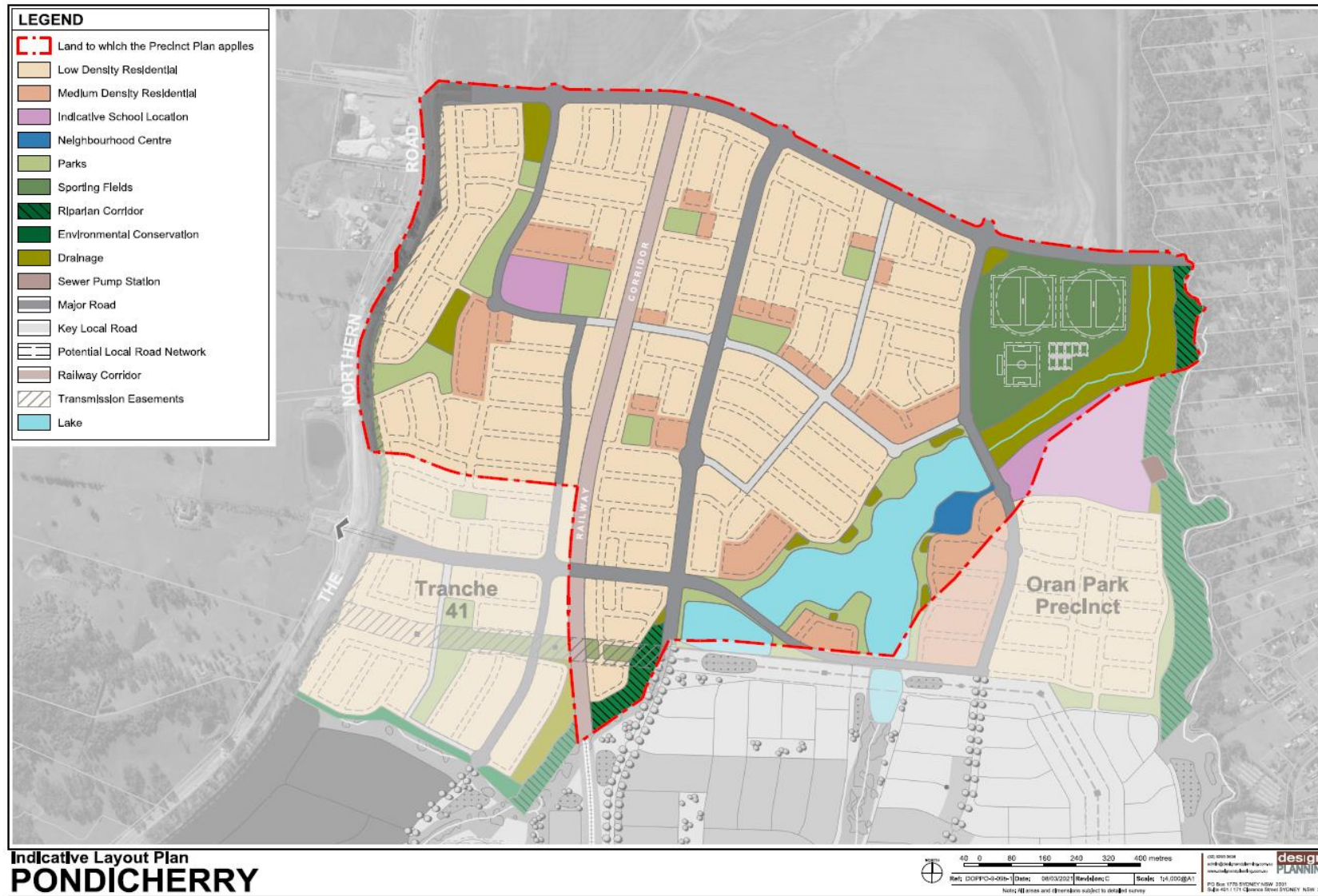


Figure 3: Indicative layout plan

2. Bushfire Landscape Risk Assessment

The landscape bushfire risk includes assessment of bushfire hazard, potential fire behaviour and bushfire history within a 5 km radius of the subject land, herein called the 'study area'.

2.1 Bushfire Hazard

The eastern boundary of the subject land falls within the highest category of bush fire prone vegetation (BFPV), vegetation category 1, with vegetation category 3 also present as per the BFPL map (**Error! Reference source not found.** C). The proposed development is located within a wider bushfire landscape containing fragmented BFPV, however it is likely that grassland vegetation to the north would be classified as vegetation category 3 under current BFPL guidelines (BFPL, 2015) once mapping for the area is updated (every 5 years as required by legislation).

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

2.1.1 Vegetation

The broader study area generally presents within a rural pastoral landscape to the north and west, combined with remnant vegetation associated with the South Creek riparian corridor to the east. It is further expected that within the subject land, the South Creek riparian corridor will be revegetated to a forested wetland formation. Land to the south and east of the precinct is developed, as part of the Oran Park and Catherine Fields growth precincts. Immediately adjacent to the southern boundary a small area of grassland is present, however this would be removed once the Oran Park precinct is completed. Overtime, it is expected that the vegetation hazard to the north and west will also be reduced as the surrounding precincts are activated.

Desktop review of existing Vegetation of the Cumberland Plain mapping (OEH, 2013) and internal validation by ELA (2020) demonstrates a fragmented bushfire hazard. External to the site, this is primarily associated with the presence of woodland communities aligned to *Cumberland Plain Woodland* (CPW) and rural grasslands. Within the subject land small remnant patches of CPW are expected to be removed, with the remaining internal hazard related to the revegetation of the South Creek riparian corridor to a *Forested Wetland* formation. The relationship between vegetation community and formation within the study area is summarised in Table 2 and displayed in Figure 4

Table 2: Vegetation communities and formations within the study area

Vegetation Formation	Vegetation Community
Grassland	Rural Pasture
Rainforest	PCT 877: Grey Myrtle dry rainforest of the Sydney Basin Bioregion and South East Corner Bioregion
Forest	Plantations
Forested Wetland	835: Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion
	Riparian Corridor Revegetation (Alluvial Woodland)
Woodland	PCT 830: Forest Red Gum - Grey Box shrubby woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion
	PCT 849: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion
	PCT 850: Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion
	Weeds/Exotics
	Urban Exotic/Native

2.1.2 Topography and Slope

Figure 5 shows that elevation within the broader study area is generally lower in the eastern portion of the study area, associated with presence of drainage features and increases to the west.

Slope has been identified from a Digital Elevation Model (DEM) generated from 2 m contours and classified into the following PBP slope classes (Figure 6):

- Upslope and flat;
- $>0^{\circ} - 5^{\circ}$ downslope;
- $>5^{\circ} - 10^{\circ}$ downslope;
- $>10^{\circ} - 15^{\circ}$ downslope;
- $>15^{\circ} - 20^{\circ}$ downslope; and
- $>20^{\circ}$ downslope.

The central portion of the study area is generally uniform and gently sloped, with steeper landforms present to the west. Within the subject land and immediate surrounds, the slope hazard is generally classified as *0-5° downslope*, increasing toward the south-west corner of the site.

2.1.3 Bushfire Weather

The climate in the Macarthur Bush Fire Management Committee Area (BFMC, 2012) generally exhibits a warm temperate climate with low relative humidity. Rainfall is greatest during the Summer period (January to March), however it is influenced locally by topography and elevation, with the eastern area generally receiving higher rainfall. The warmest months are November to March and the greatest fire danger period generally follows a dry winter and spring, until the onset of summer rain. Conditions during the fire season are elevated by hot, dry north-westerly winds and high temperatures. PBP (RFS 2019) identifies that the Fire Danger Index (FDI) that applies to the subject land is FDI 100.

Days of Very High Fire Danger Rating (FDR) or above occur on average about 10 days per year based on data analysed from the National Bushfire Weather Data set Sydney Airport weather station (station number 066037) (Lucas 2010). Weather data developed by Lucas (2010) under the National Historical Fire Weather Dataset (1972-2015) incorporates the daily Forest Fire Danger Index (FFDI), where suitable inputs are available from over 70 weather stations across Australia. Data from the Sydney Airport weather station (the closest weather station within the National Historical Fire Weather Dataset) was analysed to determine the maximum FFDI for a 1 in 50-year event, being the accepted recurrence period for land use planning (RFS 2006).

The dataset for each site was split into subsets based on wind directions including:

- North to south-east (clockwise);
- South-east to South-west (clockwise); and
- South-west to North (clockwise).

To determine the 1:50 recurrence value, a Generalised Extreme Value (GEV) analysis method was undertaken to calculate the FFDI value within each data subset (Table 3). Although the GEV 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 GEV methodology and its use to analyse bushfire weather data is discussed in a number of papers by Douglas et al (2014; 2016).

Table 3: FFDI for a 1 in 50-year event

Weather Station	Max FFDI	Recorded	N to SE	SE to SW	SW to N
Sydney Airport	116		63	47	116

2.1.4 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, particularly during warmer summer months; and
- In areas where the hazard exhibits greater uniformity.

Bushfire intensity prediction has been used to review potential bushfire runs with the potential head fire intensity modelled using fire intensity formulae of McArthur (for Forest) and Catchpole et al (for Heath). The fire intensity model is predicting likely fire intensities, the probability of these occurring is not considered. Whilst weather conditions that could support uncontrollable fire intensities occur on average many days every year, the likelihood of a fire being ignited upwind of the subject land under those weather conditions may be very infrequent e.g. 50+ years based on analysis of fire history for the area (see Section 2.2).

It is important to note the models also so do not consider extreme fire behaviour / weather, however such behaviour is considered unlikely in the study area due to the arrangement of vegetation, slopes, aspects and predominant winds not typically conducive to such behaviour. Examples of extreme fire behaviour / weather include such phenomena as:

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

Figure 7 shows that very high fire intensities are possible under an FFDI 116 (non-directional) in the northern and western aspects of the Study Area. However, given the majority of these lands are operational pastoral lands, the fuel loads on these lands are in reality likely to be significantly reduced. Therefore, the fire intensity in this area is expected to be lower than predicted, based on a reduced fuel load due to the application of various management practices across these lands (grazing, cropping, irrigation etc).

Figures 8-10 show the predicted fire intensities based on different wind directions using the inputs from **Table 3**. Whilst very high fire intensities are predicted under FDI 116 and accompanying south-west to north winds, all other scenarios generally predict moderate intensities impacting the site as shown in **Figure 8** and **Figure 9**. Given FDIs of 116 are infrequent, the overall potential for landscape fires of very high intensity is reduced.

Assuming the ignition risk is the same throughout the study area the highest likelihood of bushfire attack is therefore situated in the north west and west, where woodland vegetation and elevated slope result in moderate to high fire intensities. It is noted that the South West and Lowes Creek Maryland Precincts to the north and west, though still at the concept planning stage, will be developed in the future and therefore this vegetation will be significantly removed or modified (**Figure 2**).

2.2 Bushfire History

The Macarthur Bush Fire Risk Management Plan (BFRMP) (BFMC 2012) identifies the main sources of ignition in BFMC area to be:

- Arson;
- Misuse of fire (including motor vehicles and structure fires); and
- Escaped private hazard reduction.

According to the BFRMP, there are on average 417 bush and grass fires each year, however approximately only 5 of these progress to major fires. There have been very few larger fires in the BMFC area since 2001, and **Figure 11** shows a very limited fire history throughout the study area over the past 40 years.

2.3 Summary of landscape bushfire risk assessment

The landscape bushfire risk analysis indicates there is generally low potential for a significant bushfire attack of the subject land given the fragmented landscape of BFPV in adjoining areas. The likelihood of potential bushfire attack is increased to the north west where there is greater fuel connectivity, however as this area is somewhat overstated in the output of bushfire intensity mapping given the conservative inclusion of pastoral lands as grassland vegetation, it anticipated fire intensity in this area would be expected to be lower as a result of reduced fuel loads. The eastern portion of the study area is highly fragmented and exhibits potential for moderate fire intensities only. Overall, the landscape bushfire risk is considered manageable given the relatively low fire intensities and fragmented hazard landscape. This is supported by the low wildfire history within the study area.

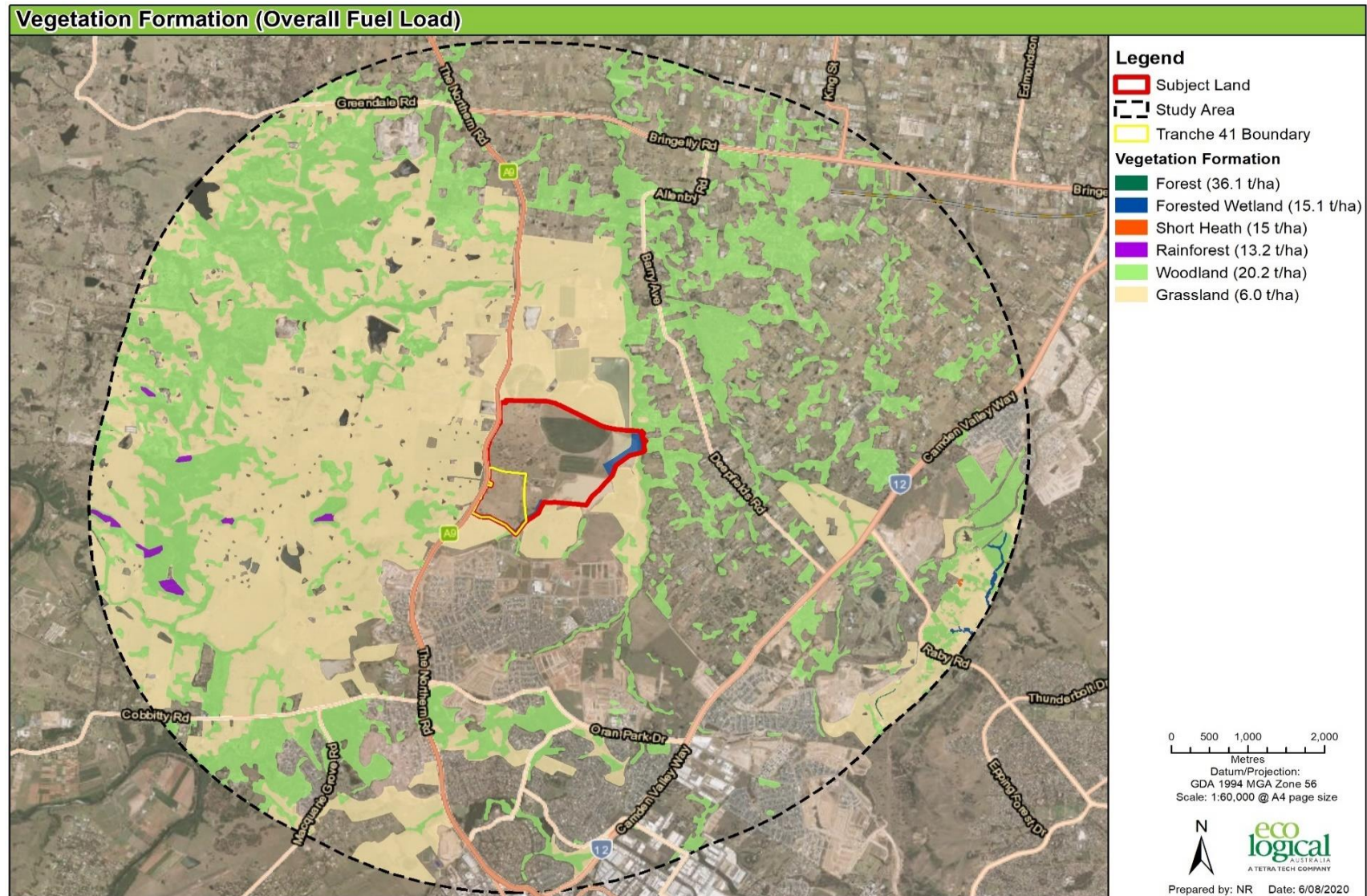


Figure 4: Vegetation formation and overall fuel load

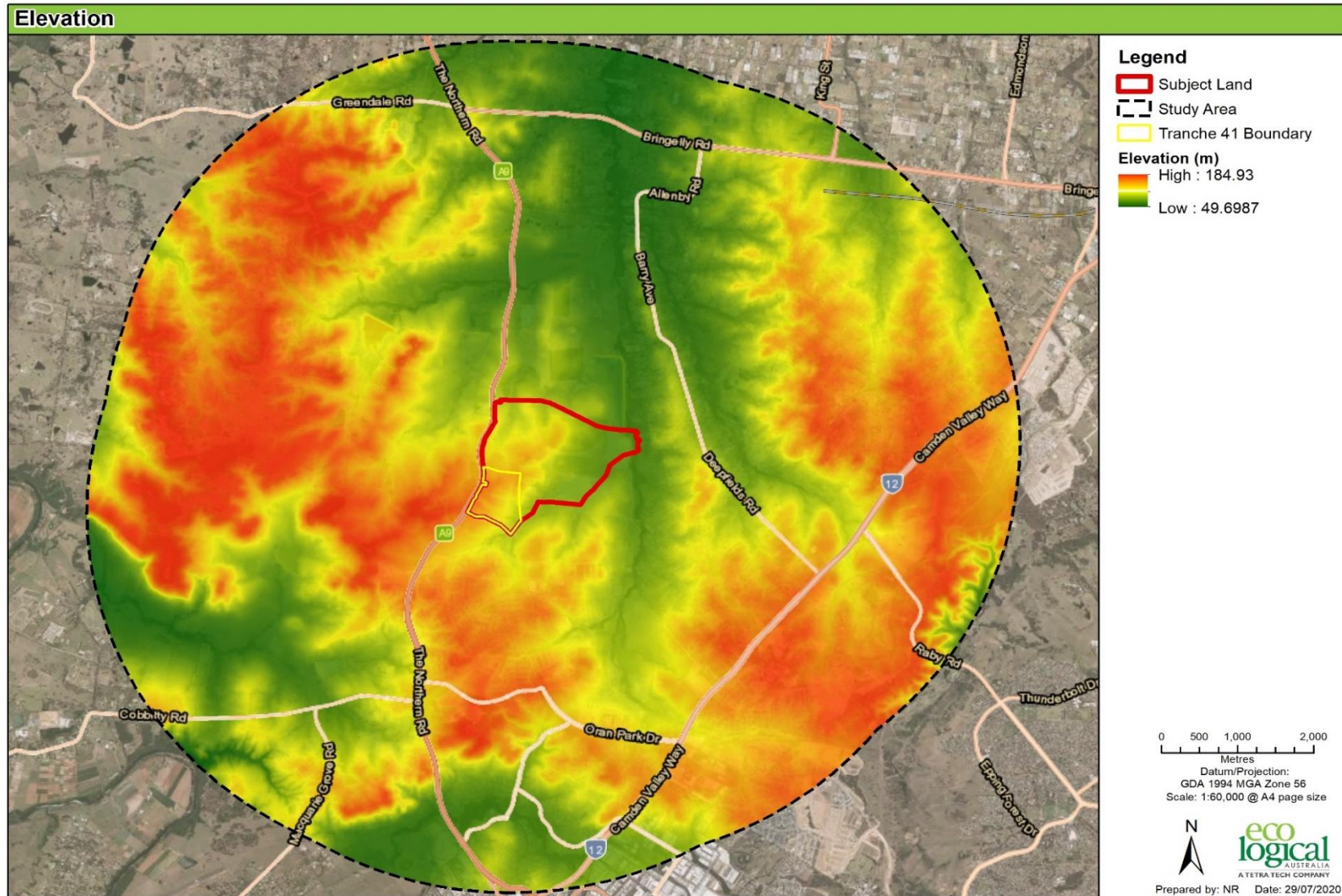


Figure 5: Elevation within the Subject Land and Surrounds

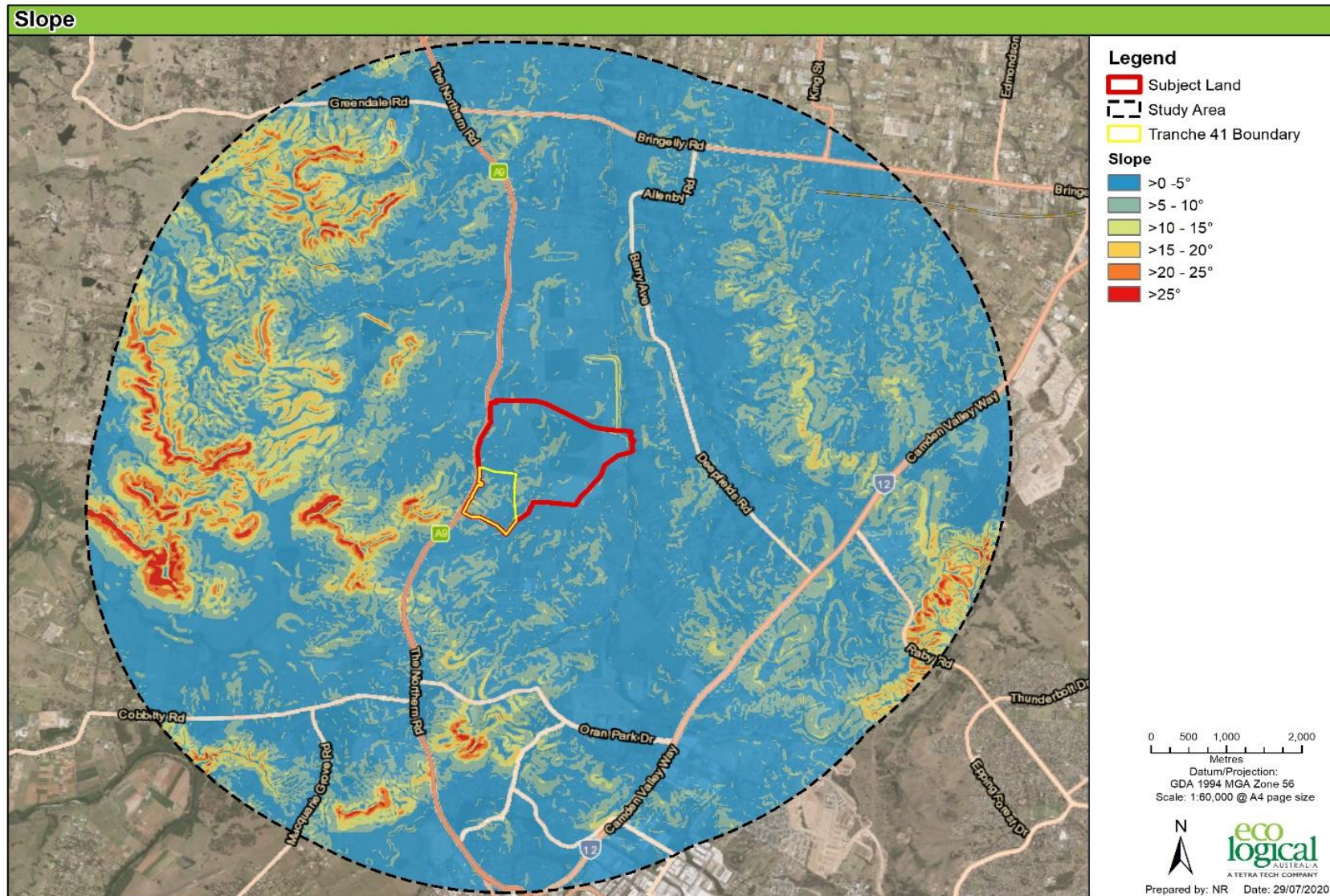


Figure 6: Slope within the study area

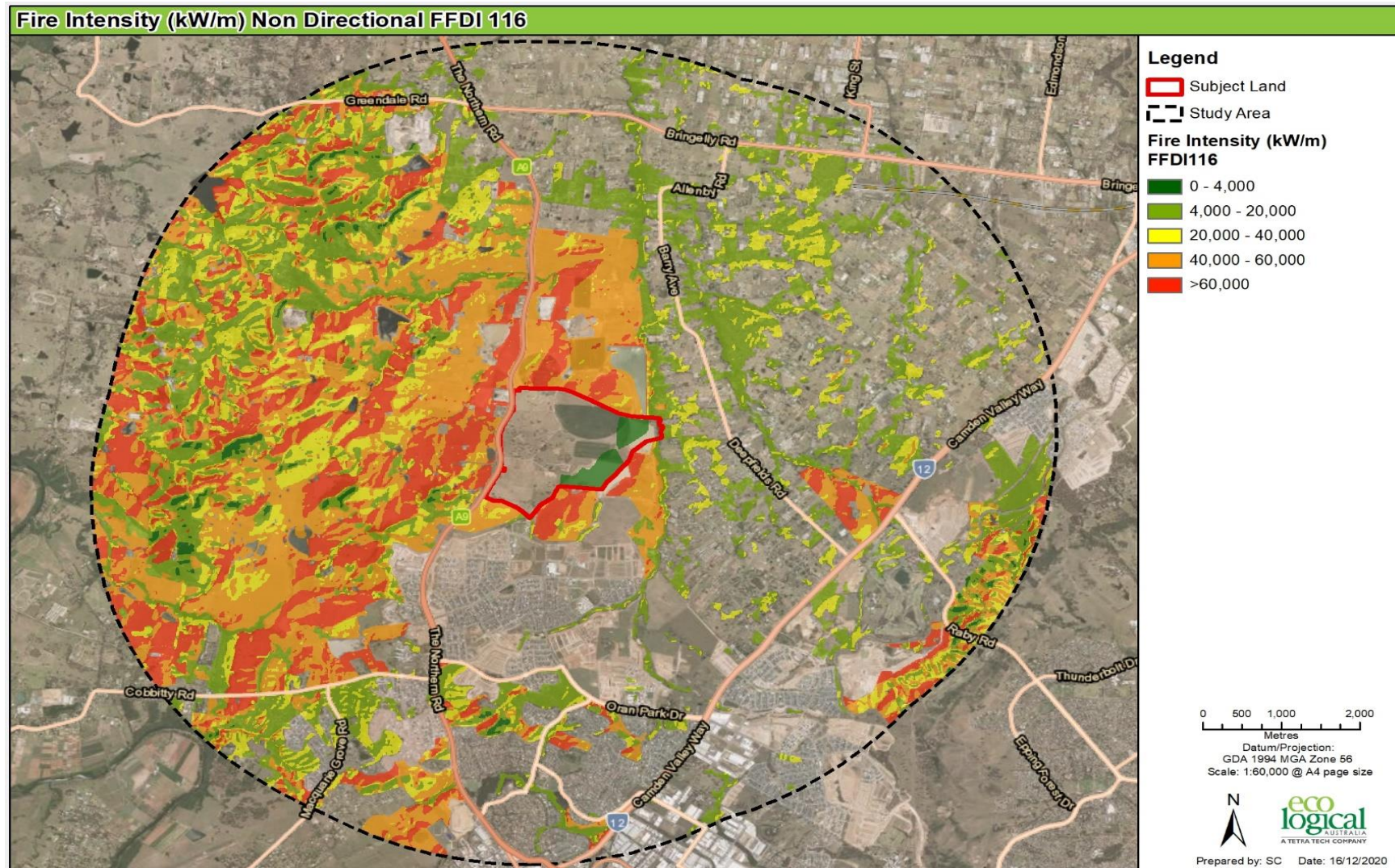


Figure 7: Predictive fire intensity modelling

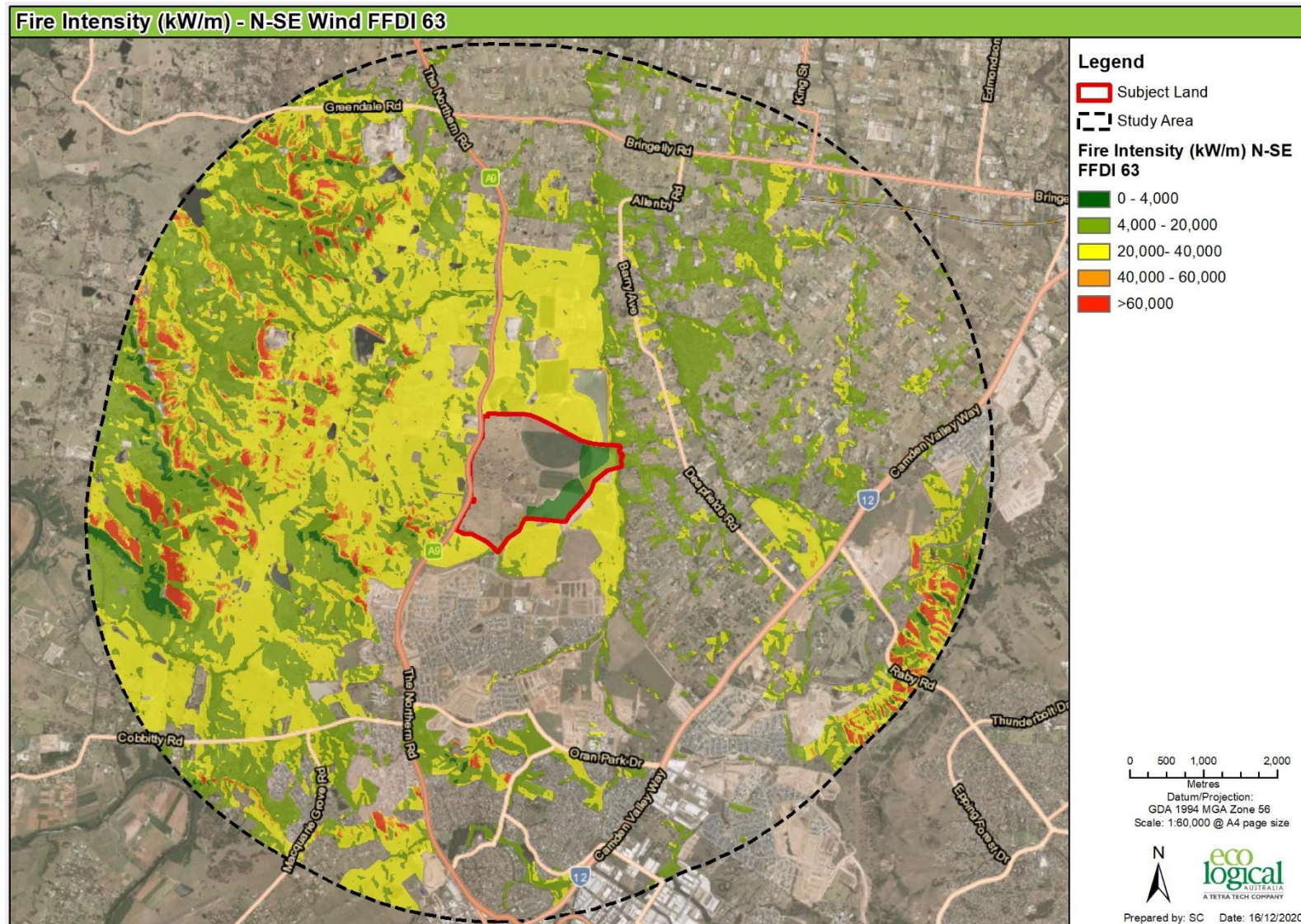


Figure 8: -Predictive fire intensity modelling for N-SE winds

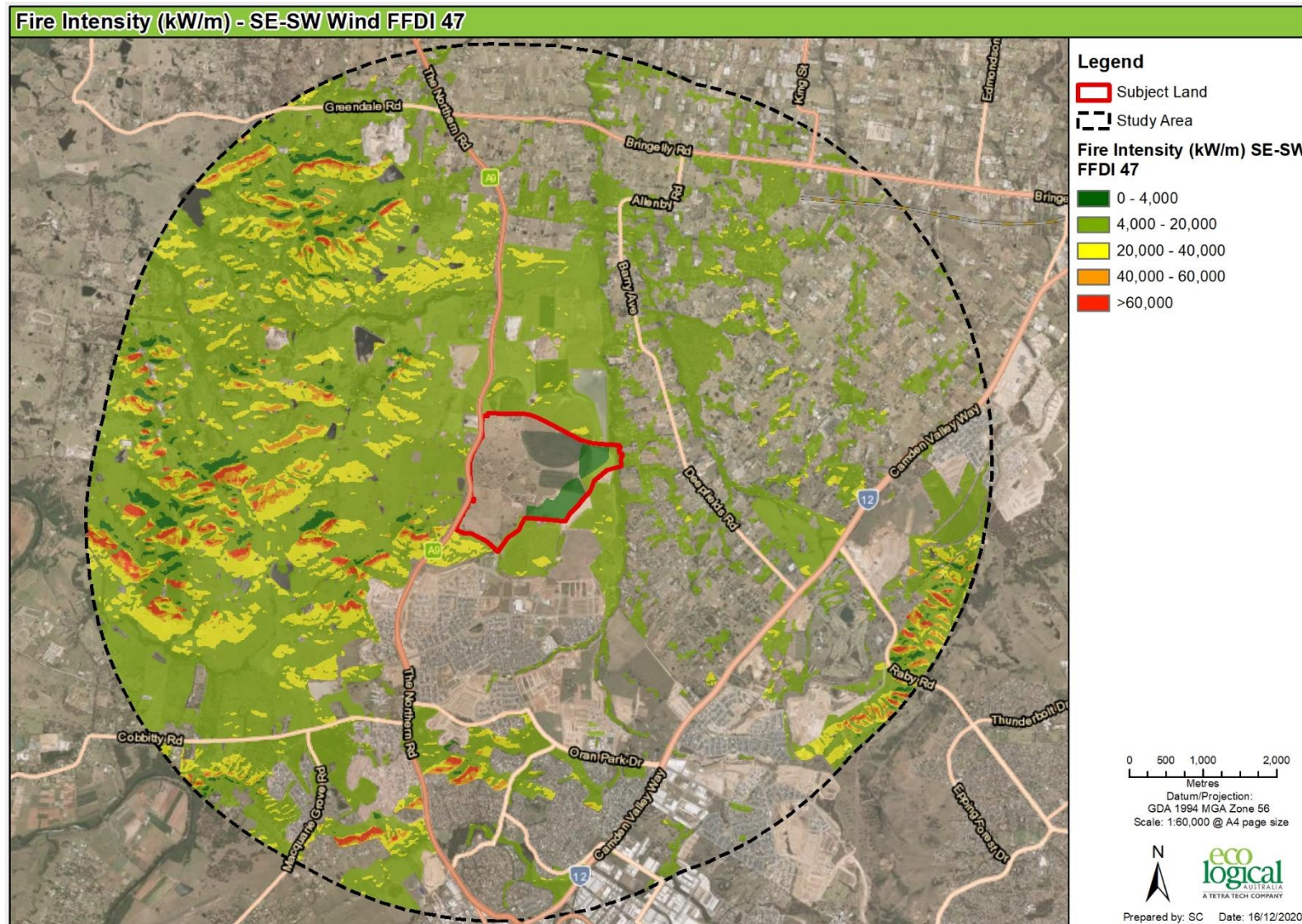


Figure 9: Predictive fire intensity modelling for SE-SW winds

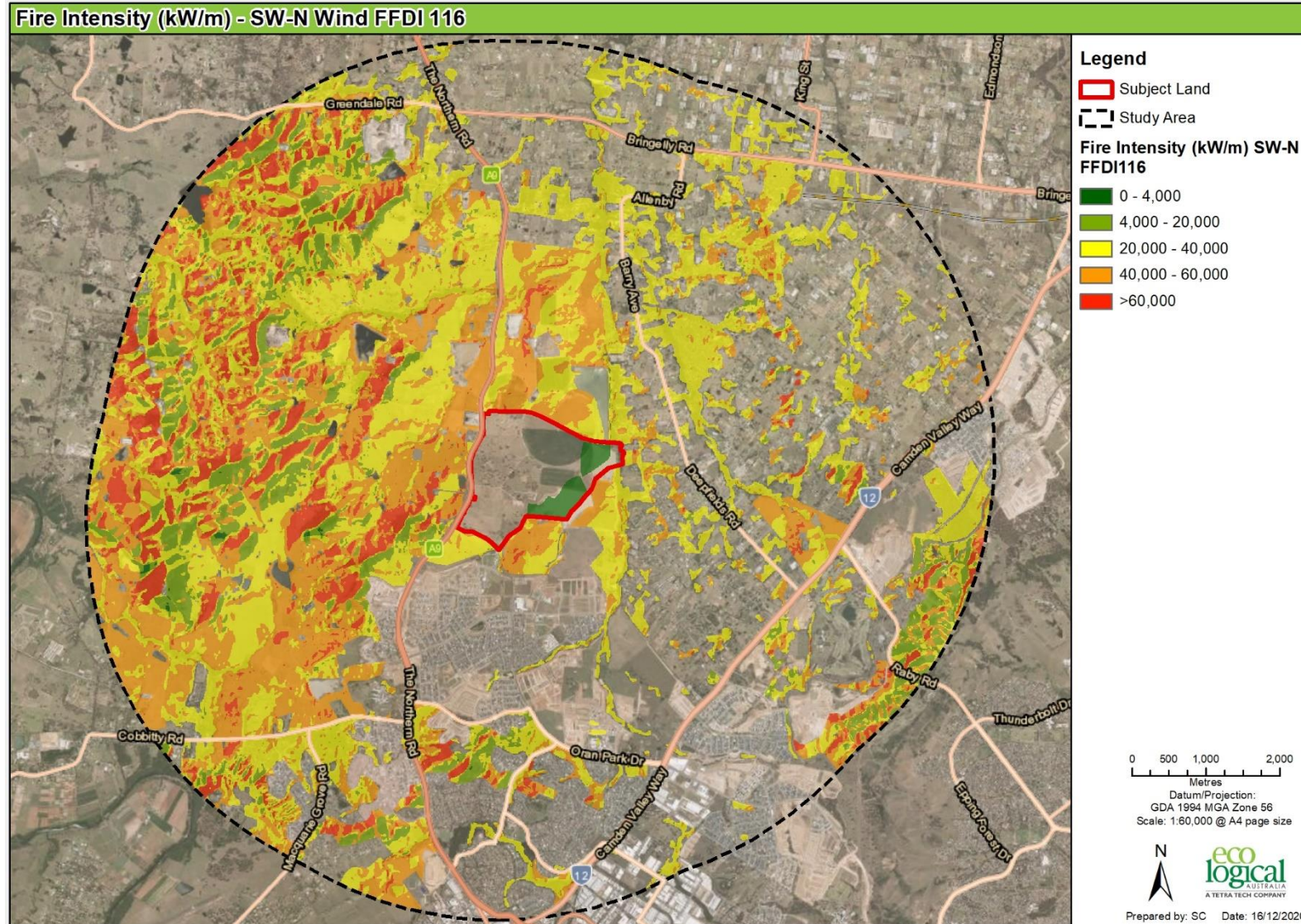


Figure 10: Predictive fire intensity modelling for SW-N winds

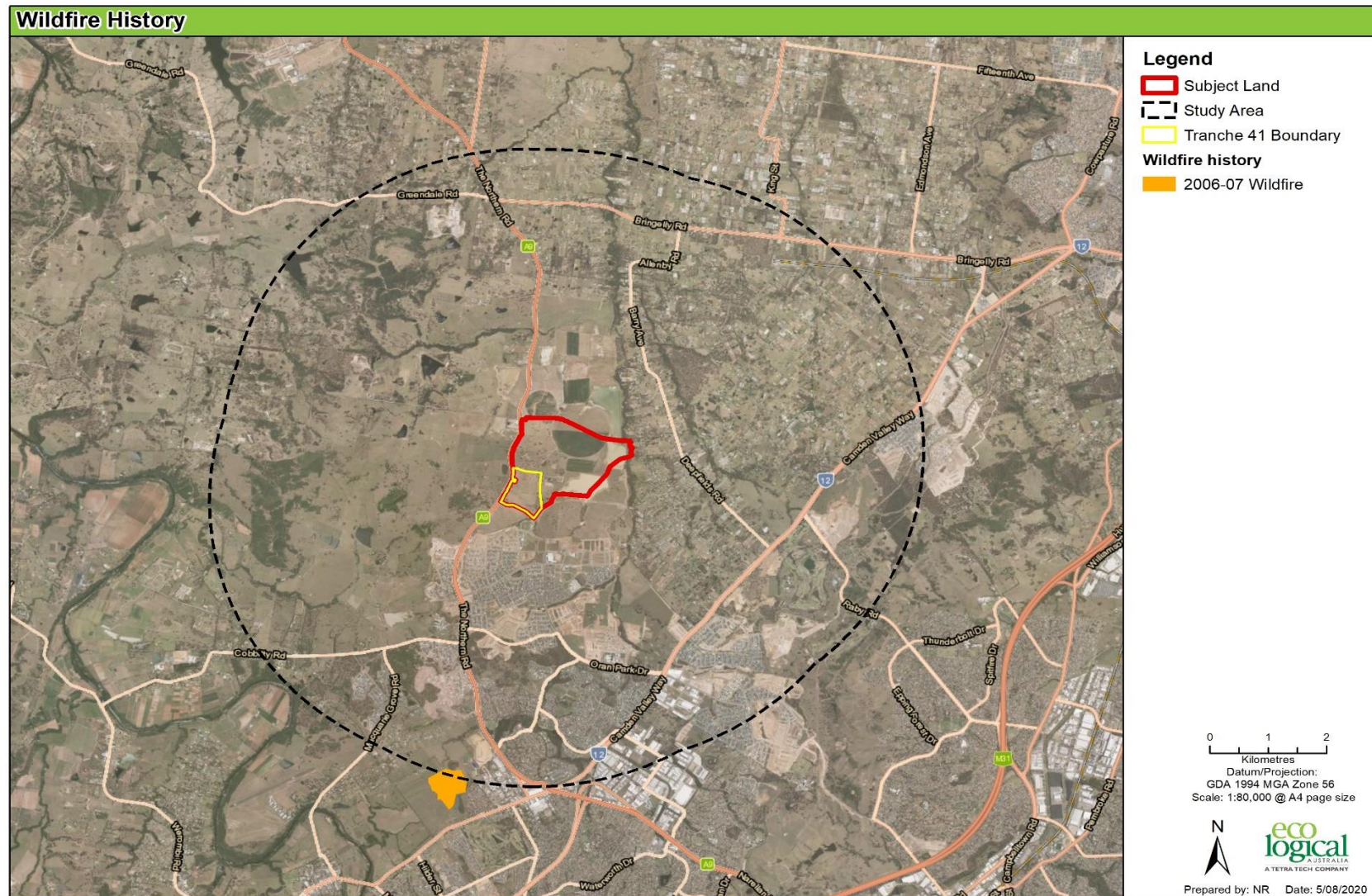


Figure 11: Wildfire history within the study area over the past 40 years

3. Land Use Assessment

The EP&A Act and the RF Act are the primary legislative instruments relevant to bushfire planning for the site. PBP is called up by these Acts as the subject land is mapped as BFPL, and it is a critical guide in assessing the bushfire risk suitability of the proposal.

PBP (RFS 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 PBP (as specified in Chapters 5-8 of PBP 2019).

The aim and objectives of PBP (RFS 2019) as detailed in Section 1.3 provide additional guidance for land use assessment within a Strategic Bushfire Study.

3.1 Risk profile

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

- The bushfire landscape and any need for adjustment of the protection measures given the landscape risks;
- Pattern and potential bushfire resilience of the bushland interface;
- Potential cumulative risk associated with the bushfire 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 in the study:

- There is opportunity within the subject land to locate APZ and other bushfire protection measures to meet the acceptable solutions within PBP;
- Multiple access and egress points and perimeter roads, connecting to the existing road network are feasible within the subject land and there is scope to finalise these through design iterations and in association with future traffic studies; and
- Complementary and consistent risk management through landscape controls and building design is also feasible.

3.2 Summary of land use assessment

The location and type of land uses included in the planning proposal are considered appropriate for the site, given the level of bushfire landscape risk; the nature of the subject land; the characteristics of the land uses proposed which follows broader precinct planning principles; and the ability for bushfire protection measures to be provided. It is assumed that more detailed design work will be undertaken to ensure appropriate staging and implementation, in order to meet or exceed the requirements of PBP.

4. Feasibility of Asset Protection Zones

Based on the landscape assessment of vegetation and slope, preliminary APZs have been determined to indicate the separation distance required between a structure and the vegetation hazard. This analysis considers the existing vegetation within and adjoining the site. APZ dimensions are provided in Table 4 and represent the required minimum setback detailed in PBP (2019). Indicative APZs are identified in Figure 12, including both residential and special fire protection purposes (SFPP) requirements, which are also listed in Table 4. Final APZ dimensions will be determined based on the final design, proposed land use, vegetation configuration and topography. The existing road, The Northern Road, along the western boundary provides the required APZ for the grassland hazard to the west of the site.

The subject land is surrounded by fragmented forested wetland, woodland and grassland vegetation with varied management practices. In undertaking this assessment, the following assumptions are made in relation to the proposed APZs:

- Vegetation formation in the assessment is derived from Vegetation of the Cumberland Plain mapping (OEH, 2013);
- All APZ can be contained within the developable area. As precinct development is activated by adjoining and adjacent landowners, it is expected that the APZ requirement may be reduced or removed in some areas of the subject land;
- Proposed schools, neighbourhood centre and any other community facilities will need to meet SFPP APZ requirements. Revegetation and management of the drainage corridor and South Creek riparian area will need to consider these requirements;
- The indicative APZ widths proposed are based on PBP, which requires that residential buildings are subject to a maximum heat exposure of no more than 29 kW/m². Best practice is that all residential subdivisions meet this standard. SFPP APZ requirements are also shown and setbacks detailed in Table 4 and will be assessed as the site design progresses, however there is scope for the required separation distances to be achieved within the developable area. There may need to be temporary APZ for staged developments;
- The addition or rehabilitation of any vegetation within the site (such as for unmanaged public open space and riparian corridors) will influence APZ requirements, if proposed. The final configuration of these aspects at detailed design will need to be assessed for future development applications; and
- Vegetation that is introduced through landscaping or restoration can avoid the need for further APZs if:
 - Individual patches of vegetation within 100 m of properties are <0.25 ha per patch;
 - The perpendicular width of linear strips of vegetation is <20 m when measured perpendicular to structures; and
 - Any vegetation within 100 m of properties meets the definition of 'managed vegetation' under PBP. In general, this means that the vegetation has low flammability, low fuel loads and is structured in a way that avoids the spread of fire.
- Temporary APZs may be required as each stage of the proposed masterplan is activated, however these requirements will be determined once detailed design is finalised. A bushfire protection should be undertaken for each stage and accompany each DA.

- Temporary APZs may also be required along the eastern and south eastern boundary of the site if planned development (see Figure 3) is not undertaken. This will be determined at the DA stage.

Table 4: Indicative APZs applicable to the subject land

Transect	Vegetation Formation ¹	Slope Class	Residential APZ (BAL-29) ²	Special Fire Protection Purpose (SFPP) APZ ²
Transect 1	Grassland	0-5° downslope	12 m	40 m
Transect 2	Grassland	0-5° downslope	12 m	40 m
Transect 3	Forested Wetland	0-5° downslope	12 m	42 m
Transect 4	Forested Wetland	0-5° downslope	12 m	42 m
Transect 5	Forested Wetland	0-5° downslope	12 m	42 m
Transect 6	Forested Wetland	0-5° downslope	12 m	42 m
Transect 7	Woodland	0-5° downslope	16 m	50 m

¹Only vegetation formations relevant to the APZ Assessment are shown.

² Assessment according to Table A1.12.1 (SFPP)/A1.12.2 (residential) of PBP 2019.

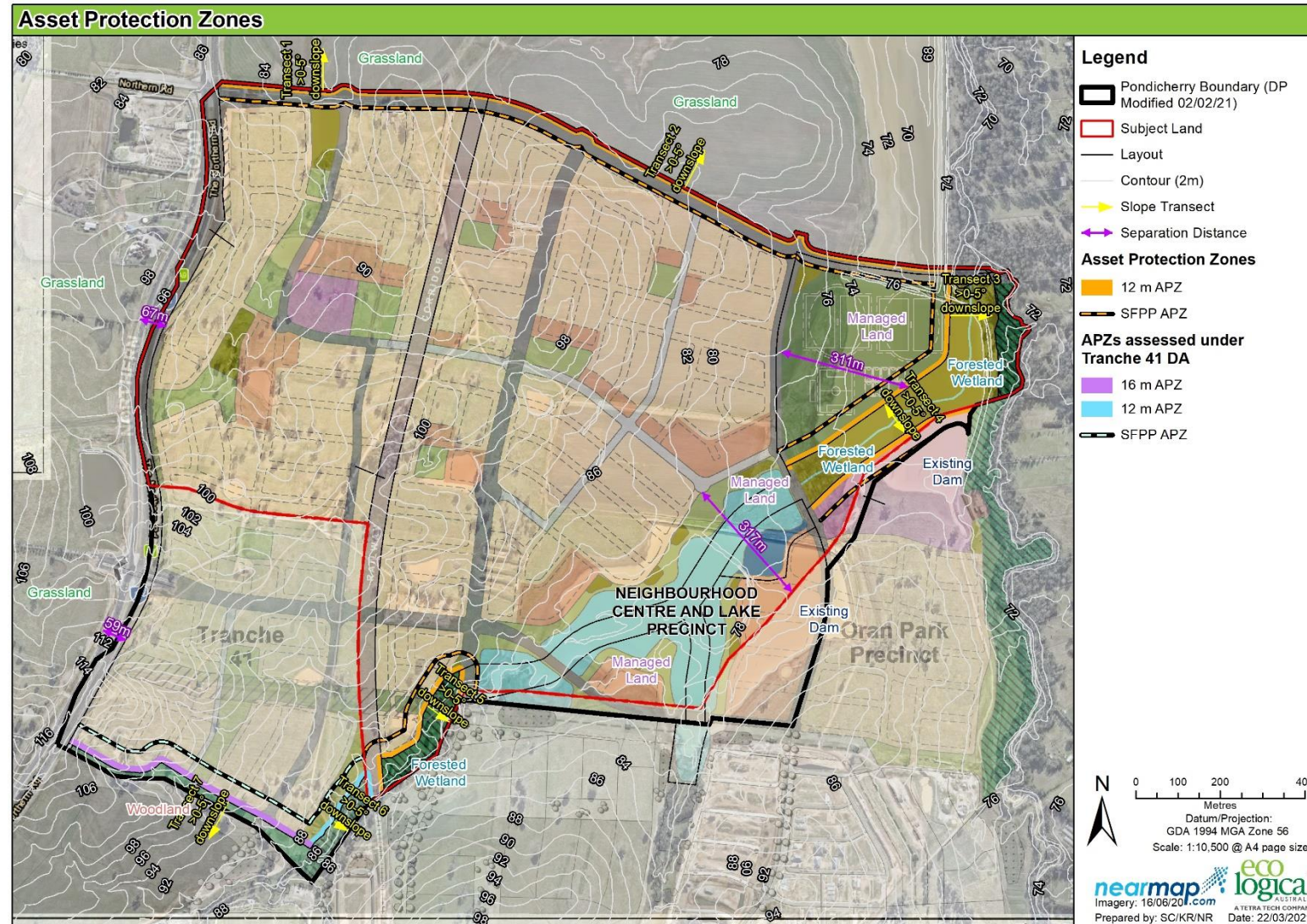


Figure 12: Indicative asset protection zones

5. Access and egress

Pondicherry is a precinct planned growth area (Figure 2) which will have provision for various collector roads, sub-arterial roads and public transport corridors. There is additional scope for design iterations to facilitate perimeter roads and these will be further assessed once the Indicative Land use Plan (ILP) has been finalised.

Future development applications will need to address access requirements in more detail as per PBP (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; and
- a road design with adequate capacity to facilitate satisfactory emergency evacuation.

A key consideration for future iterations is the staging of the precinct development to ensure adequate collector roads and sub-arterial roads to support the proposed perimeter roads, to facilitate access and egress.

6. Emergency Services

The following is recommended for strategic land use planning to achieve the objectives and strategic planning principles of PBP 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; and
- b. Evacuation adequacy assessment.

There are several RFS brigades within close proximity and as the south west growth area is activated, travel distances from the brigades to the subject land are likely to be reduced with upgrades to the existing road network. Nearby brigades include:

- Catherine Field Brigade (7 km east);
- Narellan Brigade (7 km east)
- Cobbitty Brigade (7 km west)
- Leppington (12 km north east);

Additional NSW Fire and Rescue resources stationed at Narellan would also attend any emergency and is located approximately 7 km south. Further Fire and Rescue resources are located Campbelltown (south-east) and Camden (south-west).

Given the precinct is in an increasingly urbanised setting, with a low wildfire history, current resources are considered sufficient.

6.1.1 Evacuation

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

- An analysis of the most relevant bushfire attack scenarios (i.e. fire from the north west);
- Identification of evacuation and refuge locations (Section 6.1.2); and
- An evaluation of evacuation adequacy and option for the shortcomings identified.

6.1.2 Assessment of Neighbourhood Safer Places (NSPs)

The closest existing NSP in proximity to the subject land is located at Harrington Park, 8 km south of the subject land. There is further opportunity for planned community spaces within Pondicherry Precinct to facilitate a NSP.

The criteria and principles for NSPs are documented in RFS (2017b) and shown in Table 5 and Table 6 RFS (2017b) defines an NSP as follows:

An NSP is a building or an open space that may provide for improved protection of human life during the onset and passage of a bush fire. It is a location where people facing an immediate threat to their personal safety can gather and seek shelter from the impact of a bush fire. Their function is to provide a place of last resort for a person to seek shelter at during the passage of the bush fire front.

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

Table 5: Assessment criteria for a Neighbourhood Safer Place (RFS 2017b)

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

Table 6: Principles for Site Identification (RFS 2017b)

Consideration	Principles
Site Selection	An NSP should provide a safer place for the community.
	The community should be moving away from the bush fire hazard to access the NSP over short distances where possible.
	NSP locations should reflect community need and bush fire risk.
Moving to a NSP	An NSP should not be isolated from the community.
	The community should not be impeded from reaching the NSP area in a bush fire situation.

Consideration	Principles
Capacity	Additional NSPs should be sought where it is likely current or potential NSPs cannot accommodate those likely to use it.
	Demand for use of an NSP reflect a community's level of bush fire preparedness.

7. Infrastructure

7.1 Water

To comply with PBP, the subject site should be serviced by reticulated water. Fire hydrant spacing, sizing and pressures should comply with AS 2419.1 – 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 the building are to be metal, including and up to any taps.

Table 8 identifies the acceptable solution requirements of Section 5.3.4 of PBP, while Table 9 identifies the requirements for lots that may require a static water supply (i.e. if >70 m from hydrant points).

The PBP acceptable solution requirements for water is achievable.

7.2 Electricity and gas

It is expected that future electricity supply to the subject land will be underground electricity supply and compliant with PBP. If existing or future electrical transmission lines to the subject land are above ground, no part of a tree is to be closer than 0.5 m to the powerline conductors.

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


Details for compliance with PBP are provided in Table 8.

8. Adjoining land

Future development should not be reliant on any off-site bushfire mitigation measures. The proposed land uses should not have a deleterious impact on the ability for bushfire management activities to be undertaken on adjoining land. Given the adherence to PBP and other land use planning requirements, the proposed land uses should not increase bushfire management needs for retained and/or adjoining bushfire prone vegetation, rather the proposed development would result in a reduction in bushfire hazard.

9. Conclusions

This strategic study represents an assessment of a ILP design that has been guided by DPIE and GDC. The study has assessed the bushfire risk to the panning proposal and the ability for appropriate bushfire protection measures to be provided. It has found that the planning proposal meets the general strategic planning principles outlined in PBP and that there is scope for future development to achieve the required APZs and implement other bushfire mitigation measures. Whilst the general planning proposal is consistent with Ministerial Direction 4.4 (Planning for Bushfire Protection) issued under section 9.1(2) of the EP&A Act and the requirements of PBP, a more detailed assessment will need to accompany future Development Applications (DAs) and evaluate final designs for each development stage.



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Appendix A Access Specifications

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

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

Table 7: 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	<p>property access roads are two-wheel drive, all-weather roads, and</p> <p>perimeter roads are provided for residential subdivisions of three or more allotments; and</p> <p>subdivisions of three or more allotments have more than one access in and out of the development; and</p> <p>traffic management devices are constructed to not prohibit access by emergency services vehicles; and</p> <p>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</p> <p>all roads are through roads. Dead end roads are not recommended, but if unavoidable, dead ends are not more than 200 metres in length, incorporate a minimum 12 metres outer radius turning circle, and are clearly sign posted as a dead end; and</p> <p>where kerb and guttering is provided on perimeter roads, roll top kerbing should be used to the hazard side of the road; and</p> <p>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.</p>
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	<p>hydrants are located outside of parking reserves and road carriageways to ensure accessibility to reticulated water for fire suppression;</p> <p>hydrants are provided in accordance with AS 2419.1:2005;</p> <p>there is suitable access for a Category 1 fire appliance to within 4m of the static water supply where no reticulated supply is available.</p>
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	<p>perimeter roads are two-way sealed roads; and</p> <p>8m carriageway width kerb to kerb; and</p> <p>parking is provided outside of the carriageway width; and</p> <p>hydrants are located clear of parking areas; and</p> <p>there are through roads, and these are linked to the internal road system at an interval of no greater than 500m; and</p> <p>curves of roads have a minimum inner radius of 6m; and</p> <p>the maximum grade road is 15° and average grade is 10°; and</p> <p>the road crossfall does not exceed 3°; and</p>

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

Appendix B : Services Specifications

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

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

Table 8: Performance criteria for services provision for residential and rural residential subdivisions

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

Table 9: Water supply requirements for non-reticulated developments or where reticulated water supply cannot be guaranteed (Table 5.3d of PBP)

Development Type	Water Requirements
Residential lots (<1000m ²)	5000L/lot
Rural-residential lots (1000-10,000m ²)	10,000L/lot
Large rural/lifestyle lots (>10,000m ²)	20,000L/lot
Multi-dwelling housing (including dual occupancies)	5000L/dwelling

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