Ingleside South Precinct
Bush Fire Strategic Study

Department of Planning, Industry & Environment

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Template 2.8.1

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Abbreviations

Abbreviations	Description
APZ	Asset Protection Zone
BFSS	Bush Fire Strategic Study
EP&A Act	*Environmental Planning and Assessment Act 1979*
DPIE	Department of Planning, Industry & Environment
ELA	Eco Logical Australia
GEV	Generalised Extreme Value
LEP	Local Environmental Plan
LGA	Local Government Area
NPWS	National Parks and Wildlife Service
NSP	Neighbourhood Safer Place
NSW	New South Wales
OEH	Office of Environment and Heritage
PBP	Planning for Bushfire Protection
RF Act	*Rural Fires Act 1997*
RFS	Rural Fire Service
SFAZ	Strategic Fire Advantage Zone
SFPP	Special Fire Protection Purpose

Executive Summary

The aim of this Study is to review the proposed Ingleside South Precinct Structure Plan under the strategic planning requirements of PBP (RFS 2019) as well as in light of previous bushfire risk studies for the locality. The key objectives are to:

i Undertake a Bush Fire Strategic Study as per the strategic planning principles and assessment considerations outlined in Chapter 4 of PBP; and
ii Assess the proposed Structure Plan against agreed 'benchmarks' established by previous bush fire risk studies and specifically those identified by stakeholders.

In 2016, a Structure Plan was publicly exhibited, detailing proposed development outcomes for the Ingleside Growth Area. Following stakeholder and community consultation, concern was raised about bushfire risk and evacuation. The Department of Planning, Industry & Environment undertook a detailed bushfire risk assessment in 2018, including extensive agency consultation. Following the findings of the 2018 study, the Department decided to withdraw the proposal for the Ingleside Growth Area, due primarily to concerns relating to bushfire risk to life, and particularly in relation to evacuation risk.

Following a bushfire evacuation study (AECOM 2020), it was determined that satisfactory 'unassisted' bushfire evacuation could be afforded by a substantially smaller scale development located south of Mona Vale Road. Detailed assessment of the bushfire risk associated with this smaller scale development (including extensive risk assessment beyond that in the 2018 bushfire study) concluded a development of the Ingleside South Precinct could comply with *Planning for Bushfire Protection* (PBP) and specifically the Strategic Planning requirements of Chapter 4. A new Structure Plan was prepared and it is assessed in this Bush Fire Strategic Study.

The new Structure Plan is substantially different to the 2016 proposal for the entire Growth Area, with a much smaller development outcome (~3400 dwellings down to 980 new dwellings) located on a substantially smaller site and confined to the lowest risk portion of the locality (i.e. all proposed development is south of Mona Vale Road only). This Bush Fire Strategic Study addresses concerns raised about the 2016 wider area Structure Plan, but also focusses on the ability of the new Structure Plan to comply with Chapter 4 of PBP and specific issues raised by key stakeholders.

This Bush Fire Strategic Study has examined whether the Ingleside South Precinct is appropriate in the bush fire hazard context and the strategic implications of future development for bush fire mitigation and management. The new Structure Plan has also been evaluated against the approach and findings in the earlier bushfire risk assessment (Meridian Urban 2018) and previous Stakeholder agreed 'benchmarks' are met by the new Structure Plan.

This Study associated with the new Structure Plan area revealed:

- Areas of elevated bushfire risk exist in the broader landscape, but varies across that landscape;
- The elevated risk areas are beyond and well separated from the Ingleside South Precinct;

- The bushfire hazard context on lands immediately adjoining the Ingleside South Precinct are generally a lower threat type with strategic implications for future development able to be appropriately managed under the Acceptable Solutions within PBP;
- Small internal bushfire hazards exist within the Ingleside South Precinct but are well separated from landscape-wide hazards and/or classified as low hazard under PBP.

Given the lower bushfire risk profile of the Ingleside South Precinct at a Strategic Level and the new Precinct-focussed bushfire evacuation analysis concluding satisfactory 'unassisted' off-site evacuation is feasible, the findings of this Study are:

- The Structure Plan complies with the Strategic Planning Principles of PBP;
- The Structure Plan does not trigger the "inappropriate" development exclusion requirements of PBP;
- That the Acceptable Solution bushfire protection measures within PBP can be met by the future development envisaged by the Structure Plan and it offers opportunity for protection measures beyond the minimum compliance under PBP;
- Compliance with PBP is not reliant on the intervention/response by emergency services or hazard management on adjoining land;
- The proposed development will not adversely impact the bushfire safety of occupants of nearby existing development and wherever possible lower the risk;
- The Structure Plan does not breach safety 'benchmarks' of the previous Study (Meridian Urban 2018);
- 'unassisted' off-site evacuation has been demonstrated to be achieved by the Bushfire Traffic Analysis (PDC Consultants 2020).

These findings conclude that the level of residual risk after inclusion of the bushfire protection measures typically applied under PBP, is appropriate and the Structure Plan meets the PBP strategic planning principles and requirements. Specifically, that the aims and objectives, acceptable solutions and performance requirements of PBP pertaining to risk to life and risk to property can be met or exceeded. Further, there is not a reliance on emergency service response / intervention, nor a reliance on fuel management on adjoining lands to provide the level of bushfire protection and residual risk.

Several recommendations are made, including:

- Ensuring that further bushfire assessment is undertaken when more detailed development designs are available in later stages of the planning pathway, and that these designs maintain the compliance with PBP that the Structure Plan facilitates;
- Explore mechanisms to provide an on-site evacuation building, which will provide additional bushfire protection redundancy;
- Residential subdivision design should provide for perimeter roads for all new development of three or more allotments that abut bushfire hazard as prescribed by PBP;
- Continued consultation with relevant agencies regarding emergency management requirements and infrastructure provision;
- The Department should ensure adequate water supply compliant with PBP can be provided.

The Study also observed that the bushfire risk of existing developments outside the Ingleside South Precinct, warrants mitigation (given the legacy issues) beyond the benefit that the proposed development of the Precinct would provide. Further, that the Strategic Planning requirements of PBP can be improved with clearer Acceptance Criteria (development assessment 'pass marks') for Strategic Planning assessment.

1. Introduction

1.1 Background

This Bush Fire Strategic Study (BFSS) has been prepared to assist with the consideration of a new Structure Plan for the Ingleside South Precinct, located within the Northern Beaches Local Government Area (LGA). The Structure Plan (Figure 1) primarily proposes low and medium density residential development (980 new dwellings, 1110 total assumed dwellings) infrastructure and associated open space. The Study provides assessment of the new Structure Plan for the Ingleside South Precinct in regard to the strategic planning principles outlined in *Planning for Bushfire Protection* (PBP) 2019 and reflects on previous studies carried out for the former Ingleside Structure Plan.

It is understood that the Department of Planning Infrastructure and Environment (DPIE) is preparing a Place Strategy for the new Structure Plan to set a strategic focus, that will inform the development of statutory planning mechanisms. If the DPIE decides to proceed with the new Structure Plan following further stakeholder consultation and exhibition, there would ultimately be a proposal to rezone the land via an amendment to the *Pittwater Local Environmental Plan 2014*.

The Ingleside area has been identified by the Department of Planning, Industry and Environment (DPIE) as a potential growth area and various studies have been undertaken over the past decade to inform the growth opportunities. In 2016, a Structure Plan was publicly exhibited, incorporating a variety of land use zones including residential, environmental conservation, open space and recreation, and water management. Accompanying this submission, a bushfire report was prepared (ELA 2016) that responded to the bushfire planning requirements that were in force at the time. In response to the proposal, public submissions raised various issues related to bushfire safety, traffic and transport, density controls and environmental conservation.

In 2018, DPIE commissioned a bushfire risk assessment (Meridian Urban 2018) to further analyse development suitability (from a bushfire risk perspective) of the 2016 Structure Plan and considering new Strategic Bushfire Planning requirements in the draft *Planning for Bushfire Protection* (PBP) (RFS 2018). This bushfire risk assessment identified the Ingleside area as having elevated bushfire risk exposure and highlighted potential issues with the 2016 Structure Plan, primarily in relation to the ability to safely evacuate the locality in a bushfire. The bushfire risk assessment was based heavily on agency stakeholder consultation and the 2016 Structure Plan was considered “inappropriate” in terms of bushfire risk and under the new PBP (2018) benchmarks. DPIE responded with the decision not to implement the exhibited 2016 Structure Plan.

Following an announcement in 2019 by the Minister for Planning and Public Spaces regarding precinct planning, it was determined that Ingleside would remain a state-led rezoning precinct. DPIE committed to undertake detailed evacuation modelling to better inform strategic planning for the locality. They commissioned a Bushfire Evacuation Study (AECOM 2020), which also included bushfire spread modelling (Ten Rivers 2019) and leveraged previous bushfire risk assessment (Meridian Urban 2018). Further studies into the feasibility of the locality commenced more recently and covered evacuation, bushfire, servicing, riparian, ecology and other matters. Based on this further investigation, a new Structure Plan for the Ingleside South Precinct was prepared (Figure 1) and is the focus of the assessment in this Study.

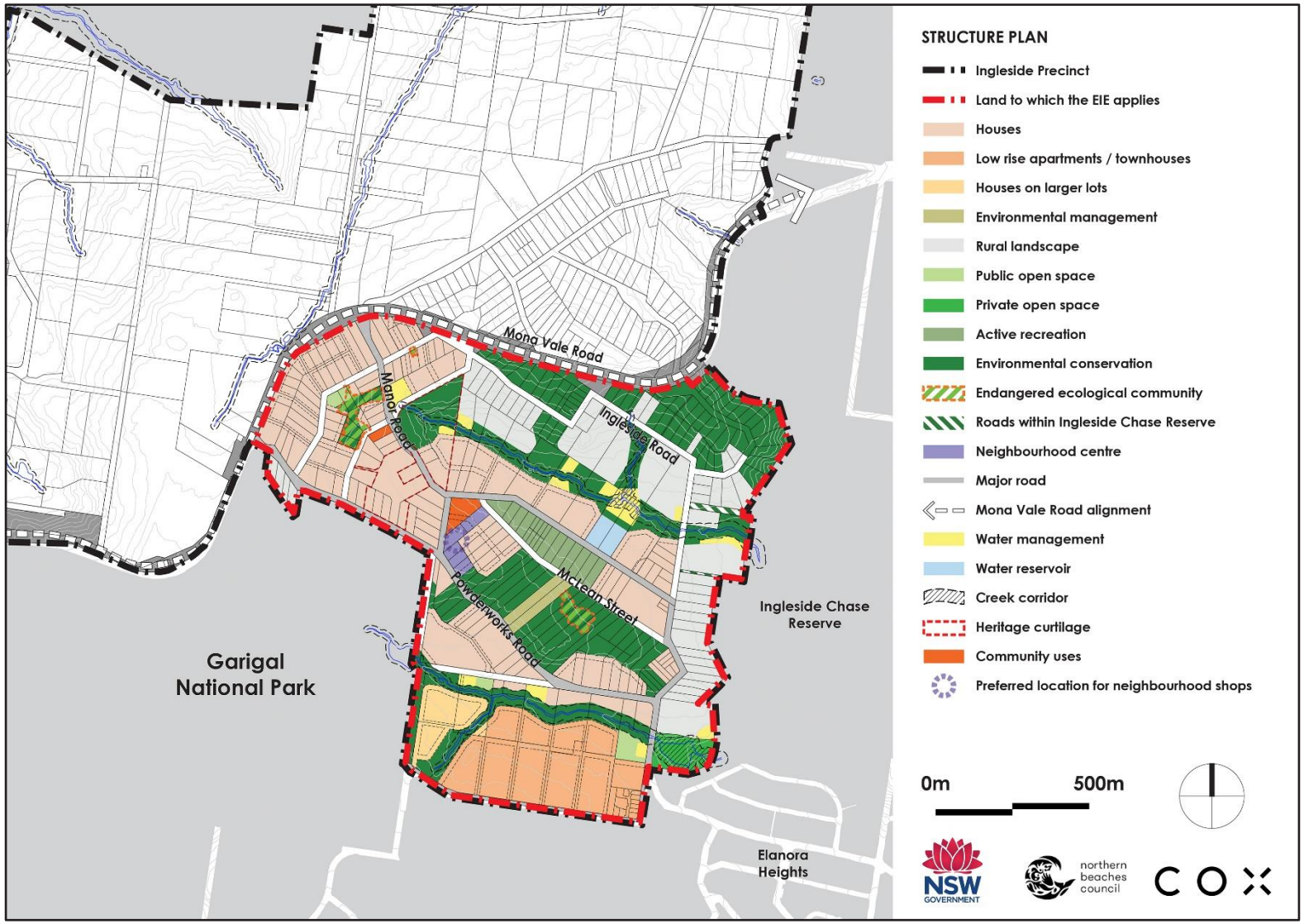

Figure 1: 2021 Structure Plan for the Ingleside South Precinct

1.2 Aims and Objectives

The aim of this Study is to review the proposed Ingleside South Precinct Structure Plan under the strategic planning requirements of PBP (RFS 2019) as well as in light of previous bushfire risk studies for the locality. The key objectives are to:

i Undertake a Bush Fire Strategic Study as per the strategic planning principles and assessment considerations outlined in Chapter 4 of PBP; and

ii Assess the proposed Structure Plan against agreed 'benchmarks' established by previous bush fire risk studies and specifically those identified by stakeholders.

1.3 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 *Environmental Planning and Assessment Act 1979* (EP&A Act) and the *Rural Fires Act 1997* (RF Act). Key aspects of these instruments are outlined below.

1.3.1 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 Bush Fire Prone Land (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 bushfire matters to be addressed when drafting LEPs. This includes:

- Consultation with the Commissioner of the NSW Rural Fire Service (RFS), and consider 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, including:

- 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).
  - 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;
  - 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 outlined in chapter 4 of PBP.

1.3.2 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.

1.4 Assessment Approach

1.4.1 PBP Bush Fire Strategic Planning

A Bush Fire Strategic Study (BFSS) provides the opportunity to assess whether new development is appropriate in the bush fire hazard context. It also provides the ability to assess the strategic implications of future development for bush fire mitigation and management. 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 and assessment considerations required for strategic planning proposals. The strategic planning principles 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 require consideration of bushfire protection measures for development subsequent to the strategic planning stage, and to consider the suitability of future land uses within the broader bushfire hazard 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 bush fire 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 effect 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.

As the Ingleside South Precinct is situated on bush fire prone land (Appendix A) this Study assesses the proposal in the context of the PBP strategic planning principles, exclusion of inappropriate development,

and the study requirements and assessment considerations identified in Table 4.2.1 of PBP, summarised in Table 1 below.

Table 1: Summary of requirements for a Bushfire Strategic Study (RFS 2019)

Issue	Bushfire Strategic Study Requirements
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.

1.4.2 Assessment Framework

Investigation of the suitability for development within the Ingleside South Precinct has involved a complex and large array of bushfire-related issues and concepts. Prioritisation of first principle bushfire risk considerations is critical. The following bushfire assessment framework is relevant to guide the Study.

1.4.2.1 Residual risk

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

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

1.4.2.2 Risk to life versus risk to property

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

1.4.2.3 Life protection and evacuation

An appropriately low residual risk to human life is fundamentally important in bushfire protection. Whilst off-site evacuation potentially offers a safer destination, the risks associated with undertaking an off-site evacuation (travel) pose an additional risk. Also, the logistical challenges of off-site evacuation can be high and should not become an unacceptable burden on emergency services, and in a strategic planning context not adversely impact the demands of the existing emergency service evacuation management.

Early evacuation is the nationally accepted safest means for protection of life and Stakeholders from the previous Studies (Meridian Urban 2018, AECOM 2020) and in the current Study, required any off-site evacuation to be effective without the assistance of emergency services. Notwithstanding, early unassisted evacuation being a key risk assessment benchmark in the Study; experience and research has demonstrated that it is not fail-safe or always feasible. Research and post incident inquiries have also found that providing evacuees options (and warnings and information) is important to their survival.

Alternatives such as on-site evacuation / refuging are also not fail-safe, but design solutions exist to lower the residual risk to an appropriate level for both on and off-site options and a well-designed combination of the two may achieve the lowest residual risk; even if the on-site evacuation is considered a 'redundancy' in terms of bushfire risk planning (as has occurred in this Study).

1.4.2.4 Emergency service response

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

1.4.2.5 Adjoining lands

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

1.4.3 Evaluation against Meridian Urban Study

Given the importance of the proceeding bushfire studies and particularly their stakeholder input (e.g. Meridian Urban 2018) this Study has adopted the relevant Meridian Urban report findings as part of this Study's benchmarks, and Section 8 assesses whether these 'benchmarks' have been met by the proposed Structure Plan. This approach is consistent with comments from emergency services stakeholders in various consultations in late 2020.

1.4.4 Acceptance Criteria

A clear "pass mark" for an acceptable level of residual risk is important in assessing the appropriateness of a Strategic Planning proposal, however, PBP does not provide a clear "pass mark" for an acceptable level of residual risk or define 'inappropriate' development with measurable criteria. Without this clarity, the potential for errors in assessment increase and it can lead to "expert" opinion based decisions or actions by proponents, stakeholders and assessors that are difficult to justify or reach agreement on.

Even the 'key criteria for risk acceptability and risk tolerance' used in the previous bushfire risk study (Meridian Urban 2018) and within PBP 2019 (Chapter 4) rely on general criteria for the exclusion of 'inappropriate development' that are not clear or measurable e.g. a high bushfire risk is not defined and is a relative term that requires a context to be effective.

To respond to these limitations, the over-arching Acceptance Criteria for this Study are that:

- The aims, objectives and Performance Criteria in PBP for the protection of life and property are achieved;
- The Structure Plan complies with the Strategic Planning Principles of PBP;
- The "inappropriate" development exclusion requirements of PBP are not triggered by the development proposed by the Structure Plan;
- The Acceptable Solution bushfire protection measures within PBP can be met by the future development envisaged by the Structure Plan;
- Compliance with PBP is not reliant on the intervention/response by emergency services or hazard management on adjoining land;
- The proposed development will not adversely impact the bushfire safety of occupants of nearby existing development and wherever possible lower the risk;
- The Structure Plan does not breach safety 'benchmarks' of the previous Study (Meridian Urban 2018); and
- An appropriate level of safety is possible from 'unassisted' off-site evacuation.

2. Bushfire Landscape Risk Assessment

The following sections build on the bushfire risk assessment in the Meridian Urban Study (2018) by considering additional risk assessment data and by specific analysis of all previous and new data specifically applying to the Ingleside South Precinct. Nothing in this Study and analysis fundamentally dismisses the Meridian Urban data, but with the development footprint and design changes to the extent proposed, most, if not all, of the risk assessment outcomes are altered. A fundamentally different bushfire landscape risk is apparent.

2.1 Study Area

The Study Area is comprised of the Subject Site, being the Ingleside South Precinct located in Northern Beaches LGA, west from Narrabeen and Mona Vale (Figure 2) and the adjoining areas. The Subject Site is adjoined by existing developed areas to the west and north, golf courses to the south, and Ingleside Chase Reserve to the East.

2.2 Bushfire Hazard

This bushfire hazard assessment has utilised the most recent vegetation community mapping from the Native Vegetation of the Sydney Metropolitan Area (OEH 2016), refined via desktop assessment using current NearMap Imagery (captured 1/10/2020). Slope was determined using 2m contour data from Land and Property Information.

2.2.1 Vegetation

The Subject Site is situated within a bush fire prone landscape with undeveloped areas dominated by forest and tall heath vegetation, to the north through to the south west as well as east. Ku-ring-gai Chase National Park lies to the west and provides a large area of contiguous bushfire prone vegetation but is separated from the Precinct. Ingleside Chase Reserve presents a narrow consolidated forest hazard to the east but is generally separated from the proposed development areas by retained rural lands.

Notably, the Structure Plan site is separated from the more extensive areas of hazard by existing development, golf courses, roadways and other cleared or fuel reduced settings (Figure 3 & Appendix A). Much of the vegetation that adjoins or within the perimeter of the Subject Site conforms to the low threat vegetation exclusions of PBP (A1.10) or can be classified as low hazard vegetation in accordance with PBP (A1.11).

Within the Subject Site, there are areas proposed for retention for environmental conservation or management (riparian zones). The current and likely future vegetation within these parts of the Structure Plan has been assessed.

2.2.2 Slope

Whilst the slope within the Subject Site generally falls within the PBP slope classes of *upslope* or *0-5° downslope*, further away the landscape contains areas of steeper slopes, generally associated with hydrological features and cliff lines, particularly to the east (Figure 4).

2.2.3 Hazard Assessment

The classification of vegetation and slope in accordance with PBP, is presented in Figure 5.

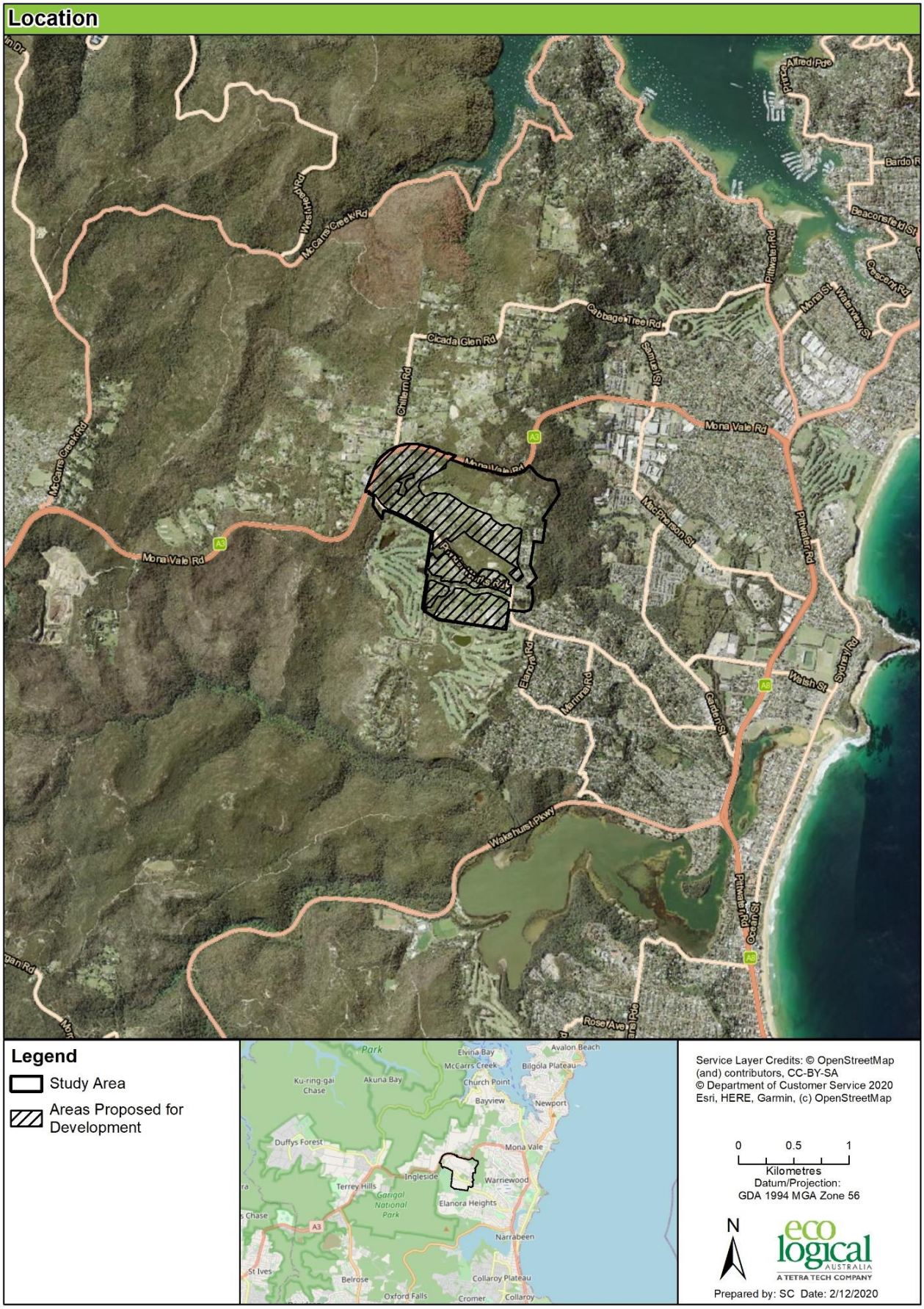

Figure 2: Subject Site and Locality

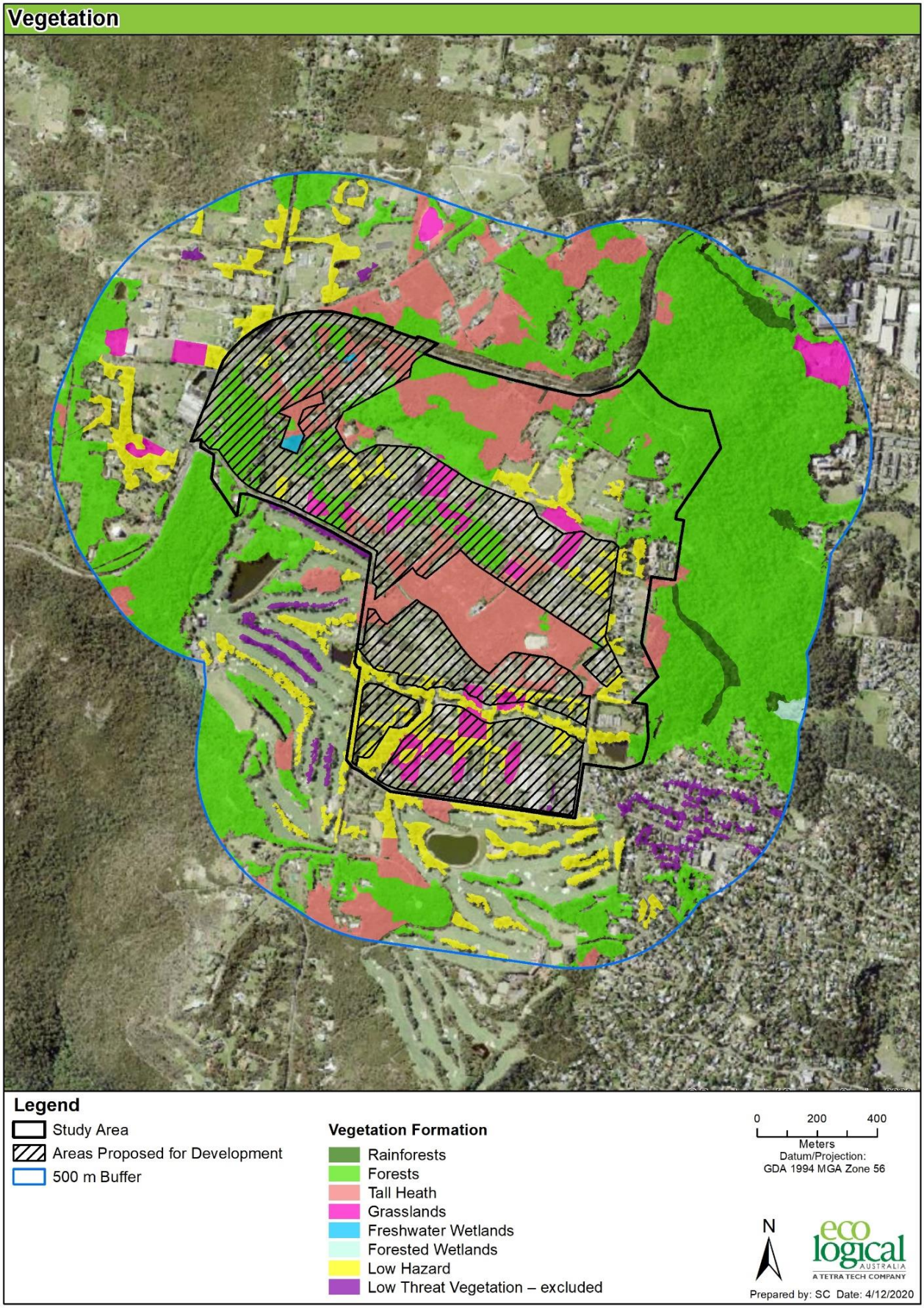

Figure 3: Vegetation within the Subject Site and surrounds (sourced from OEH 2016)

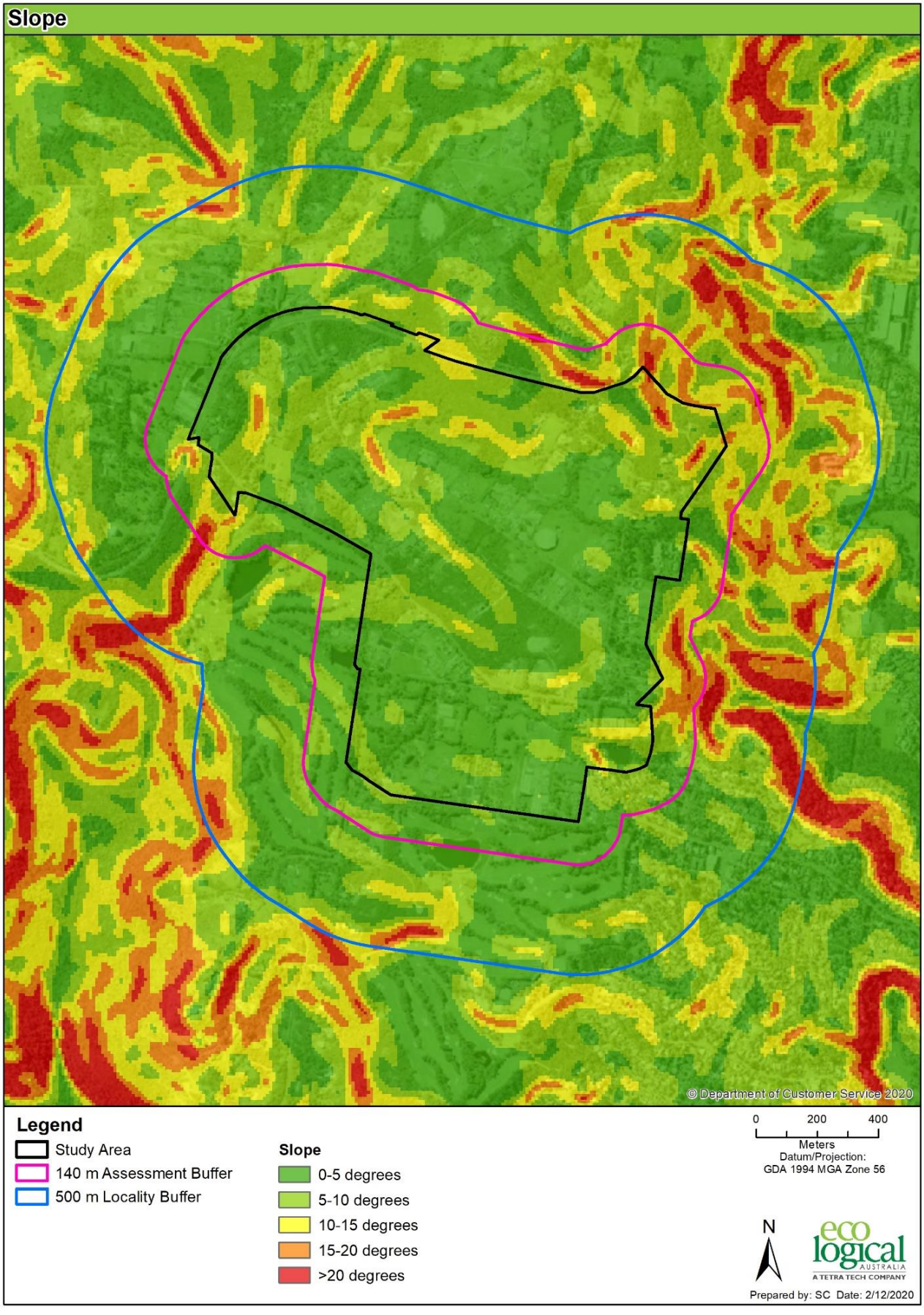

Figure 4: Slope within the Subject Site and surrounds

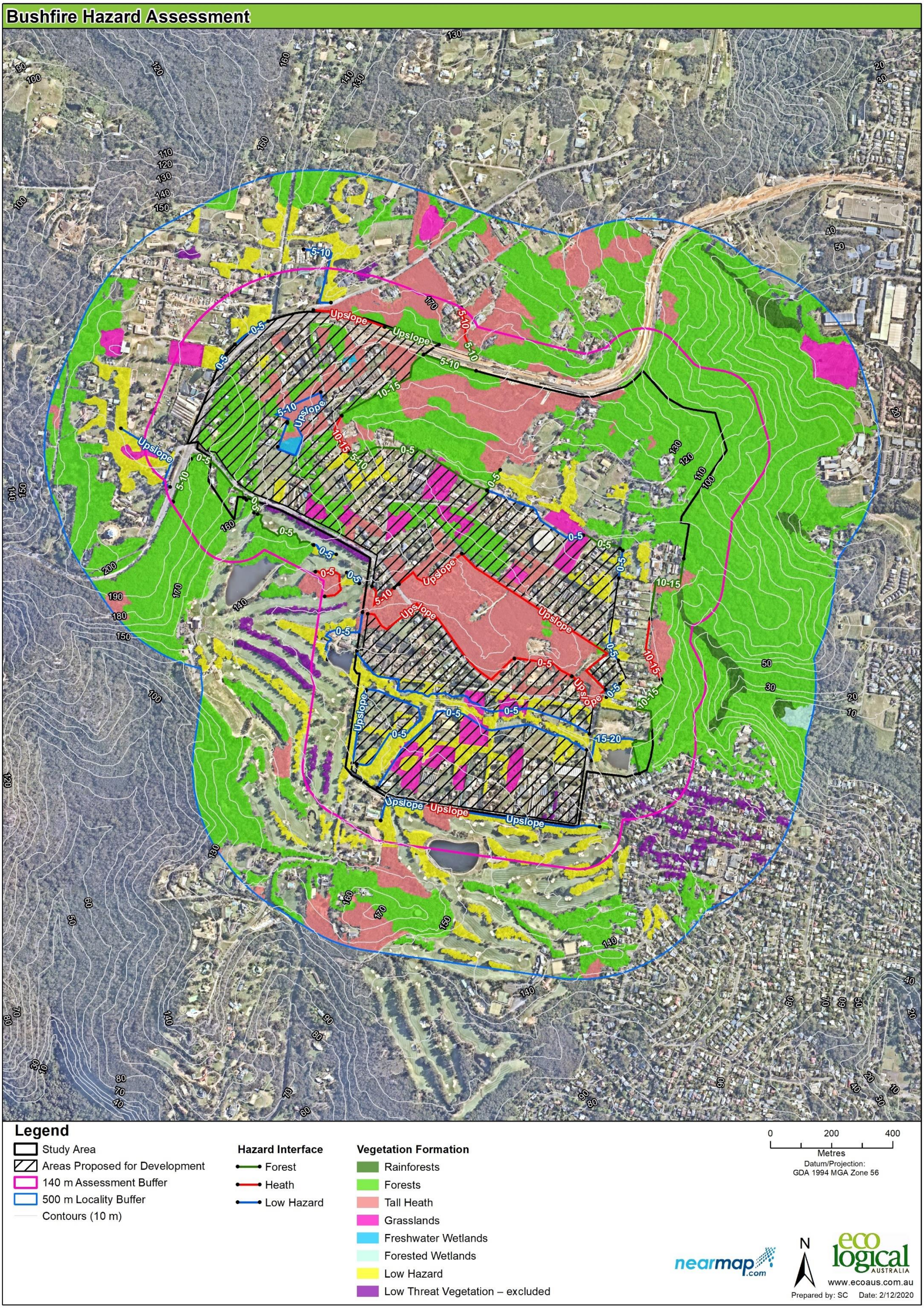

Figure 5: Bushfire Hazard Assessment

2.3 Bushfire Risk Context

2.3.1 Wildfire History and Frequency

Whilst the risk of high intensity bushfire always exists in the landscape adjoining the Subject Site, fire history records indicate that wildfire impacting the site is relatively infrequent and especially in recent decades (Figure 6). Whilst the Warringah Pittwater Bush Fire Risk Management Plan (BFRMP) estimates that on average there are 47 fires per year in the Warringah Pittwater Bush Fire Risk Management Committee (BFRMC) area, major fires are generally only experienced every 5 to 7 years (BFRMC, 2010).

An examination of the wildfire record surrounding the Ingleside South Precinct, shows a very low incidence of wildfire with only 1 in 76 years, and with that fire spreading from the north-west. As the period covered by the records is large and there is no record of bushfire attack from the south-west through south-east to north-east, it is reasonable to assume the wildfire likelihood risk from these directions is lower (Figure 7). The only fire impacting the Subject Site in those 76 years occurred in 1994 and burnt predominantly from NW to SE, meaning the southern and eastern sides of the Subject Site have not been recorded as having been impacted directly by a wind-driven fire front.

The wildfire frequency to the north-west to west suggests a higher risk of wildfire but the Subject Site is buffered from this direction by development within Ingleside North. Historically, most of these fires to the north and west emanated from visitor use areas in Ku-ring-gai Chase National Park prior to 2000 and it appears that this ignition risk from within the National Park has decreased in recent decades. Analysis of the wildfire history data indicates that 37% of the wildfire from the primary ignition risk in the region (Coal and Candle Creek) have been stopped at or prior to McCarrs Creek Road, indicating this road also offers a useful bushfire control line under some fire weather conditions for Ingleside South (along with Mona Vale Road).

At a landscape level the wildfire history data (Figure 6) does not indicate any wildfire pathways with wildfire footprints more likely to have been driven by ignition points and wind direction. From the wildfire history it is clear there is no wildfire pathways posing a risk to the Ingleside South Precinct.

2.3.2 Fire Catchment

An indicative analysis of the potential extent of the fire catchment affecting the Study Area was undertaken (Figure 8). This helps to identify the location and size of potential fire attack scenarios and informs assessment of the risk profile of different parts of the Study Area. Parts of the Study Area that are exposed to a larger fire catchment (longer arrows representing longer fire runs) may have an elevated bushfire risk, however the Precinct is buffered from each of the potential longer fire runs by existing development (north and north-west) and golf courses (south and south-west). The fire catchment analysis supports the wildfire history findings that the Precinct has a lower risk of landscape-wide wildfire attack.

2.3.2.1 Ignition

The main source of wildfire ignition within the Warringah Pittwater BFRMC is suspicious (BFRMC 2010). Intentional ignition is also a key source of wildfire in the neighbouring Hornsby Ku-ring-gai BFRMC area (BFRMC 2016), with the Hornsby Ku-ring-gai BFRMC area contributing to the large wildfire catchment present to the west of the Study Area.

2.3.3 Bushfire Weather

The bushfire weather relevant to the Study Area was identified by Generalised Extreme Value (GEV) analysis of long-term historical weather records (ELA 2018). More recent data up to June 2020 was also analysed and yielded similar, but slightly lower results. As such the higher values of the 2018 analysis were adopted in this Study for conservatism.

Bushfire weather is often described in terms of the Forest Fire Danger Index (FFDI) and this metric has a direct influence on the intensity of a bushfire. The following was identified from the analysis:

- GEV FFDI for wind directions from the north to south-east was 63;
- GEV FFDI for wind directions from the south-east to south-west was 47; and
- GEV FFDI for wind directions from the south-west to north was 116.

This analysis indicates that there is variation in the potential Likelihood and Consequence of bushfire attack from different directions toward the Subject Site (Figure 9). Areas exposed to bushfire attack at higher FFDI are more likely to be impacted by fire as adverse fire weather will occur more often from those directions and a higher fire intensity is more likely as the weather conditions reach higher FFDI values. Areas exposed to bushfire attack at lower FFDI have a lower (but still significant) risk profile.

The bushfire weather data and the proximity of developed areas and other fuel reduced areas (i.e. golf courses) supports other risk findings that the Ingleside South Precinct has a lower likelihood risk of wildfire and a lower likelihood risk of higher intensity wildfire.

The Warringah Pittwater BFRMC indicates the bushfire season runs from October to March each year, when north-westerly winds are predominant, along with higher daytime temperatures and low relative humidity. A north-westerly wind driven fire will directly impact Ingleside North, but not the Ingleside South Precinct.

2.3.4 Fire Intensity

Fire intensity models for the locality and surrounds where prepared by ELA (2018). The models provide an indication of the potential head fire intensity from the direction of attack for the scenario's being modelled. Bushfire intensity is a significant determinant of risk to life and property and the controllability of bushfires and therefore important in the consideration of the bushfire risk context. Three bushfire models from ELA (2018) where considered in this review:

- Bushfire attack from the north to south-east direction (clockwise) at FFDI 63 (Figure 10);
- Bushfire attack from the south-east to south-west direction (clockwise) at FFDI 47 (Figure 11);
- Bushfire attack from the south-west to north direction (clockwise) at FFDI 116 (Figure 12).

All three Figures show that uncontrollable fire intensities can occur from any direction. However, the risk to the Ingleside South Precinct is considerably lower under all three scenarios (note the lack of higher intensity on the boundaries of the Subject Site and compare these to the north-west of Ingleside North, in Figure 12). Notably, under the highest FFDI 116 influence with winds from the south-west – north, the Ingleside South Precinct boundary has some of the lowest wildfire intensity risk in the landscape.

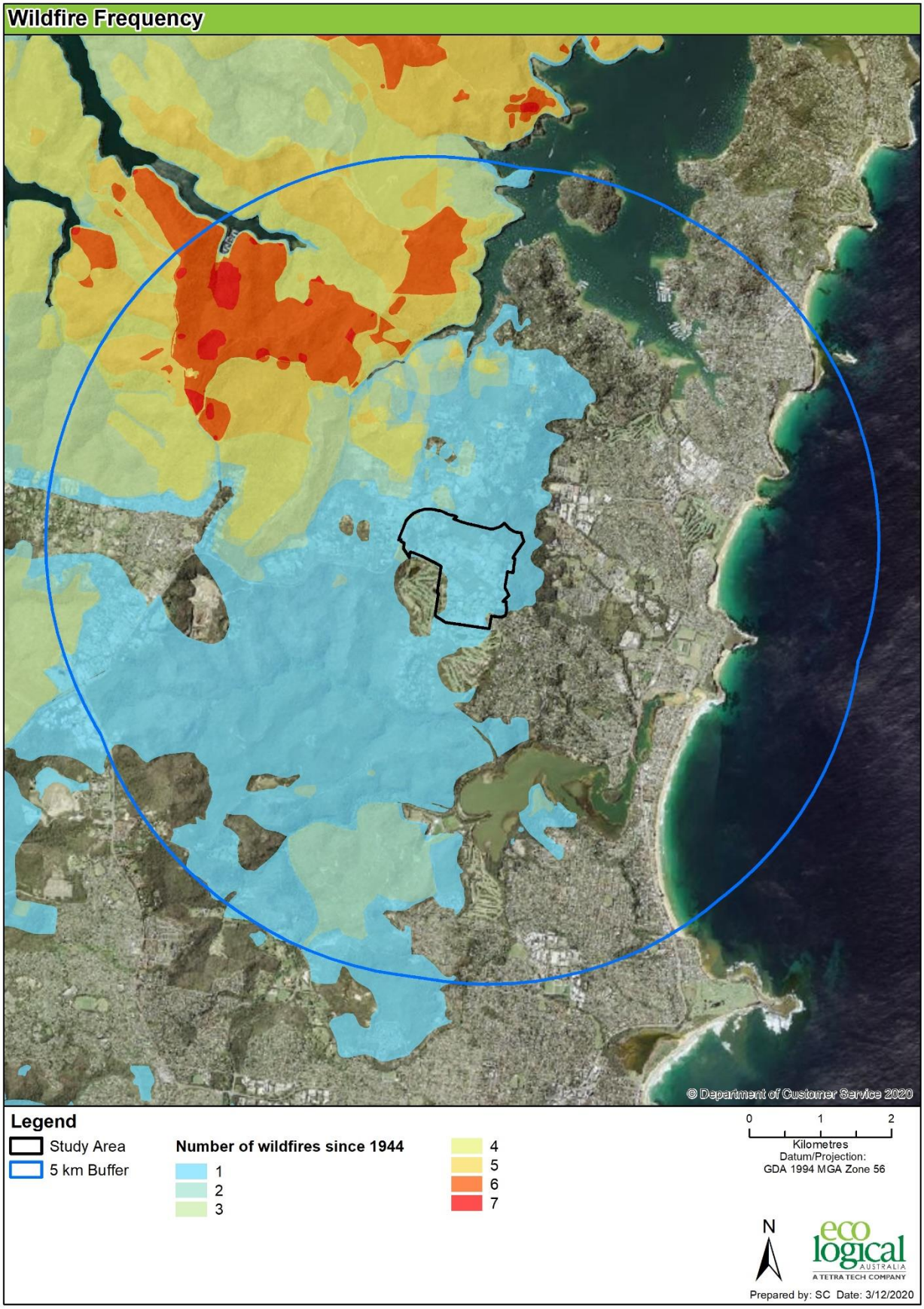

Figure 6: Wildfire frequency within the wider Study Area and surrounds from 1944 onward

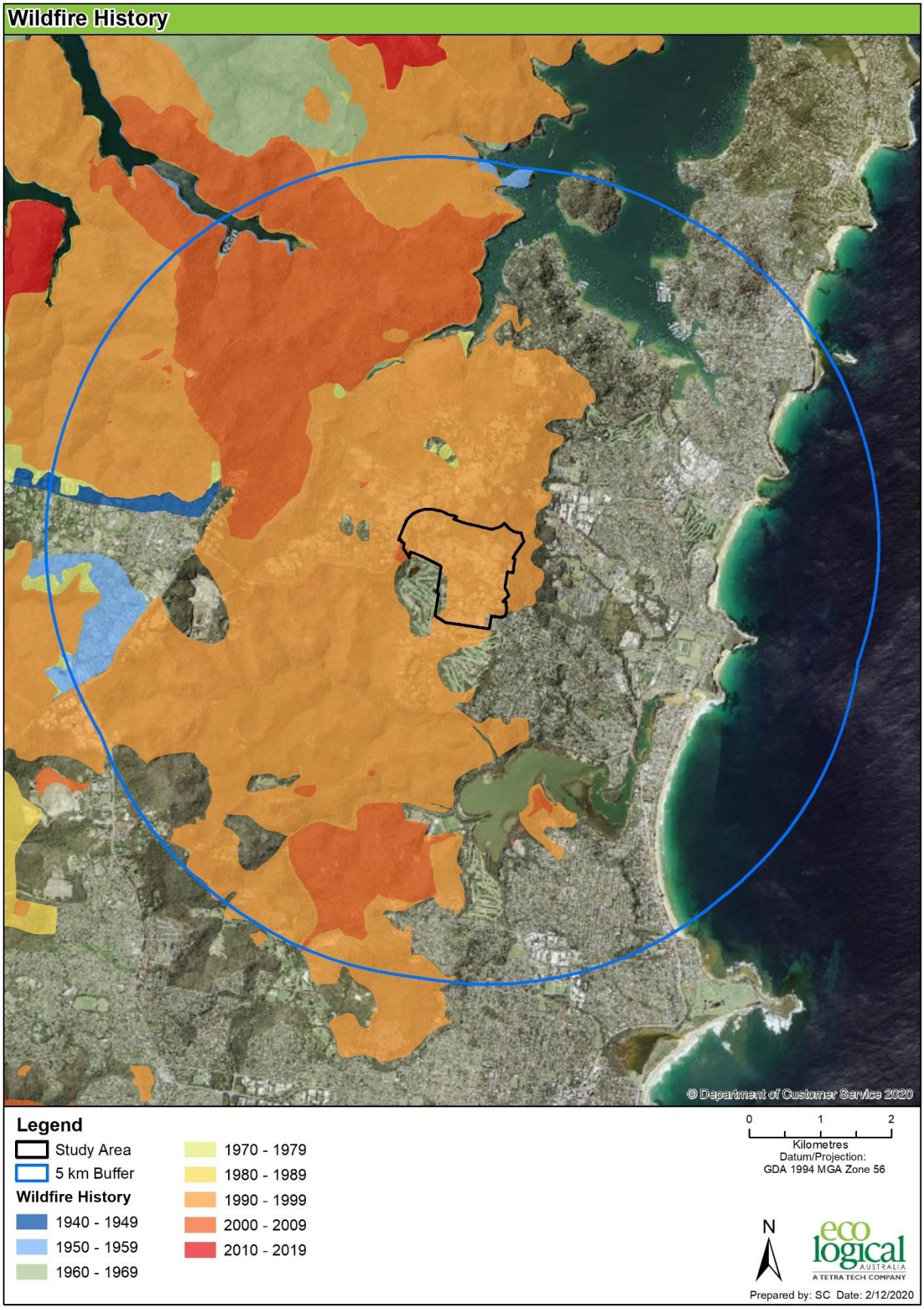

Figure 7: Wildfire history within the wider Study Area and surrounds from 1944 onward

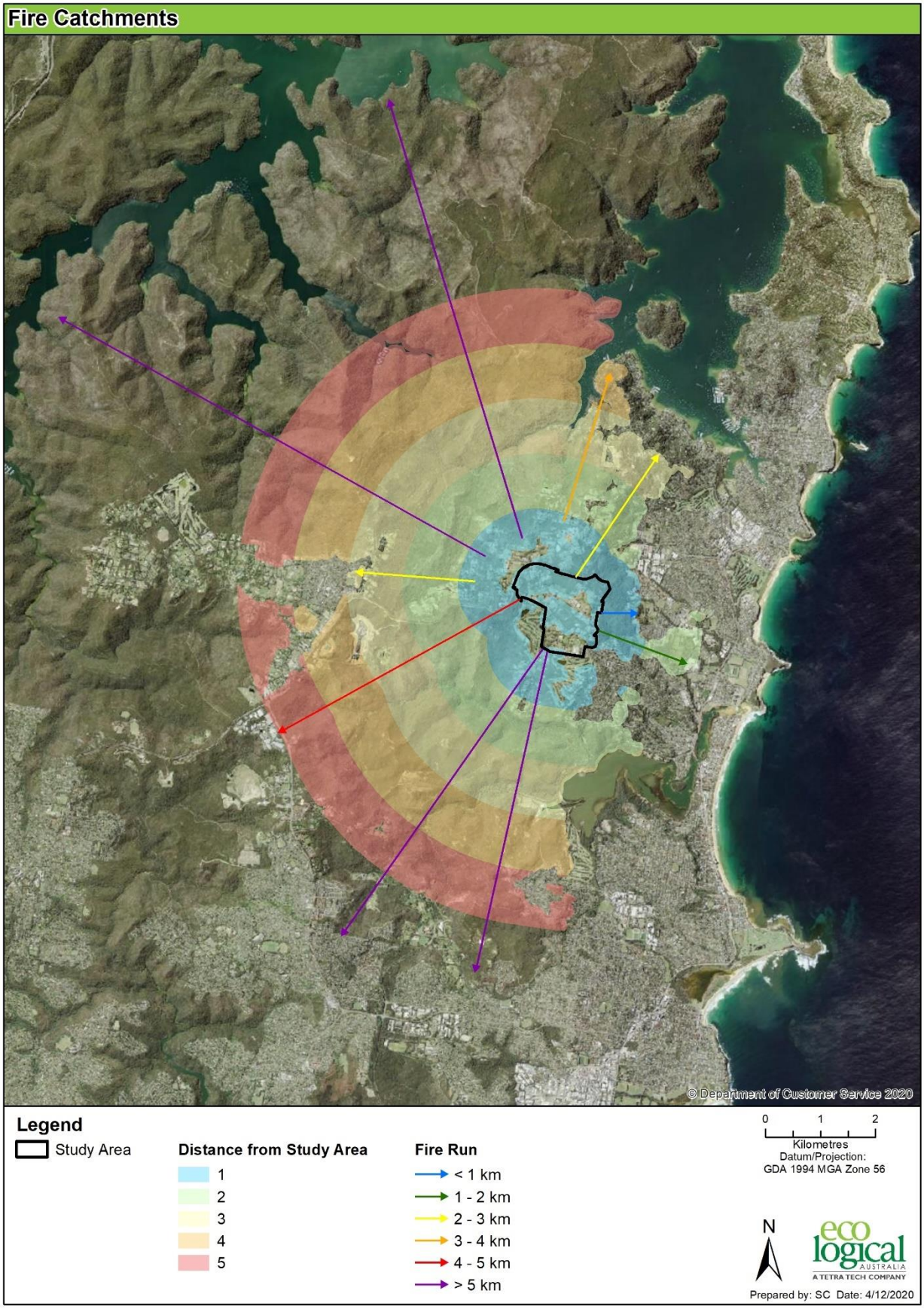

Figure 8: Fire Catchments applicable to the wider Study Area

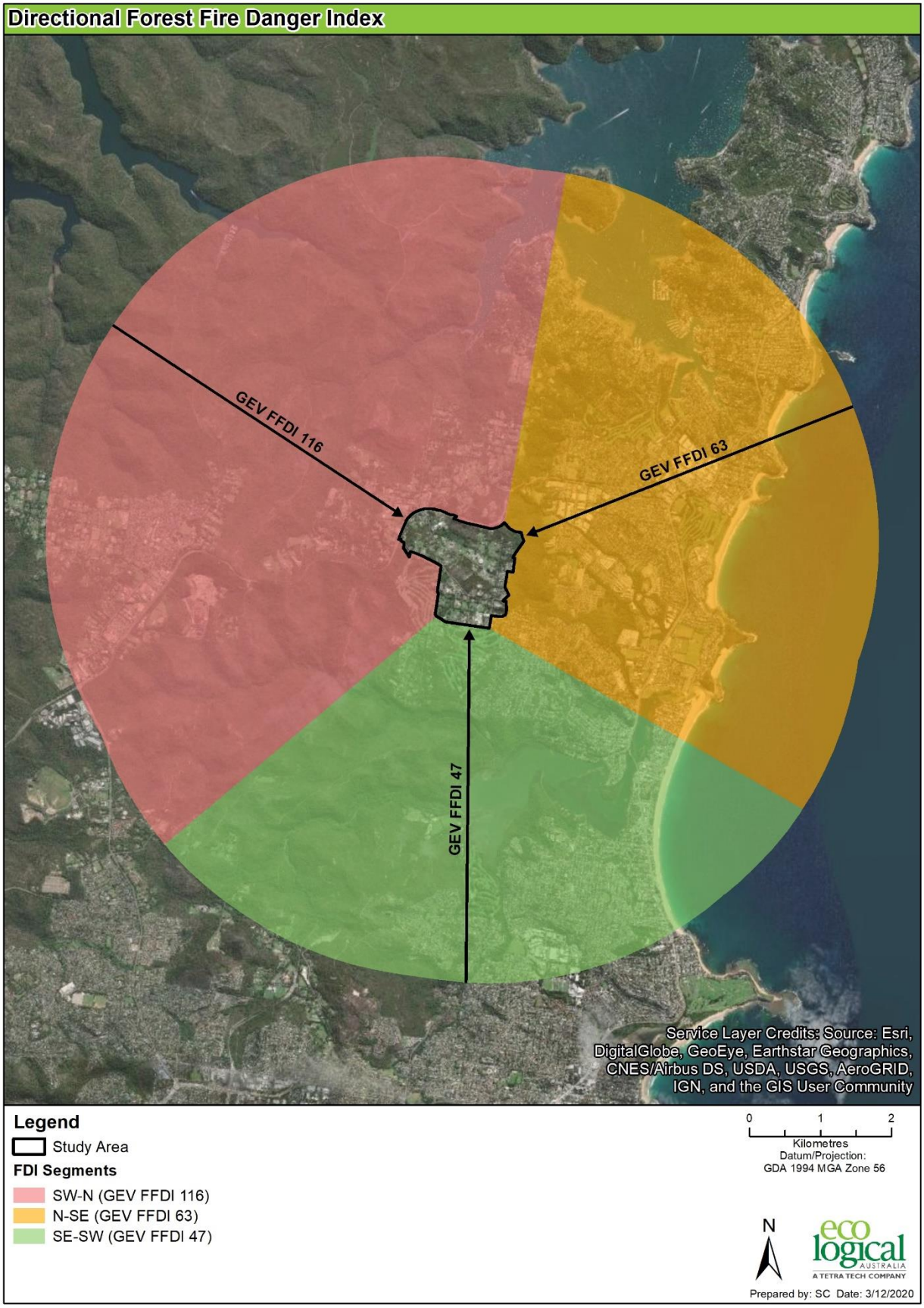

Figure 9: Bushfire Weather and FFDI Sectors for wider Study Area

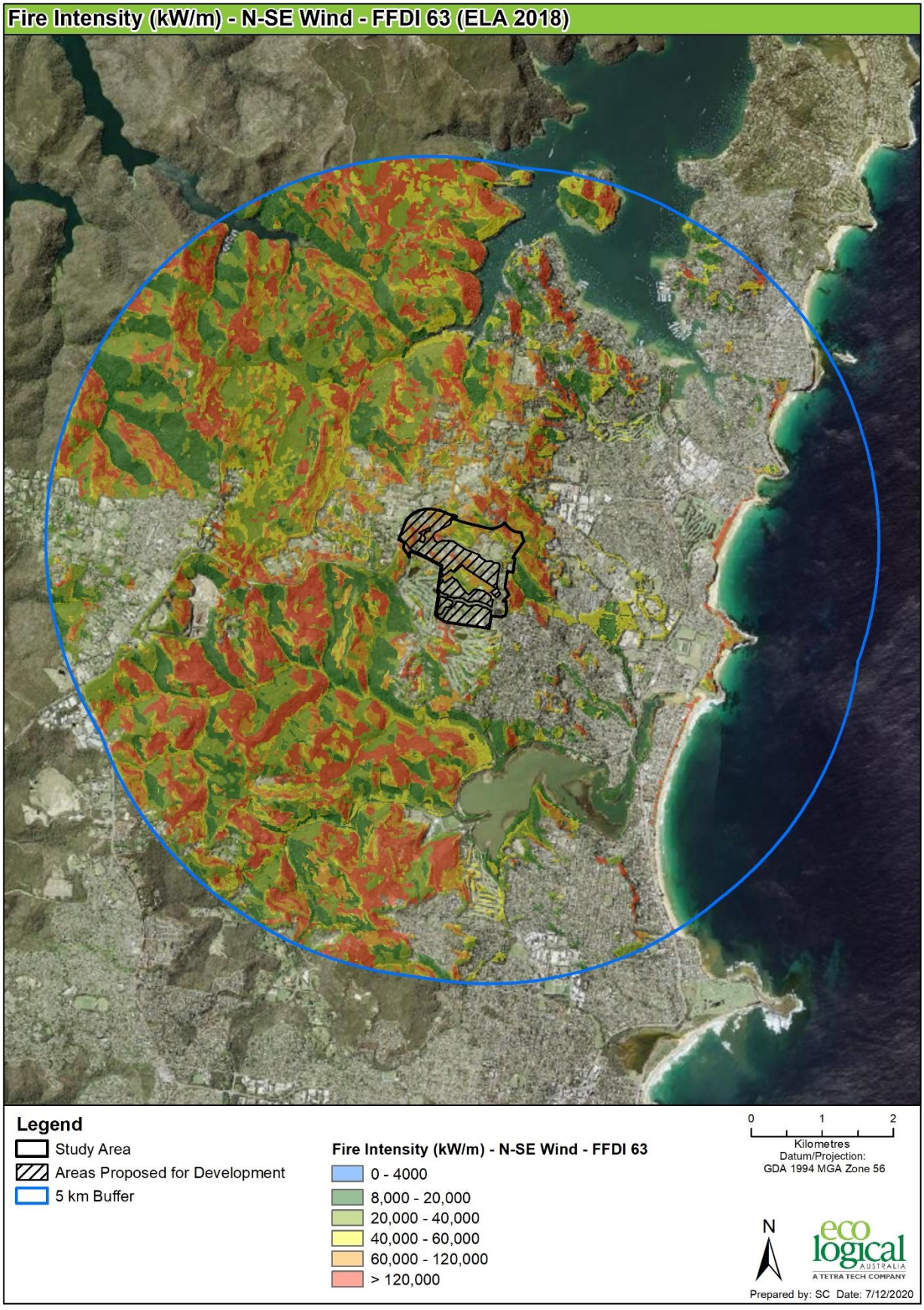

Figure 10: Modelled Fire Intensity (north to south east wind, FDI 63)

Figure 11: Modelled Fire Intensity (south east to south west wind, FDI 47)

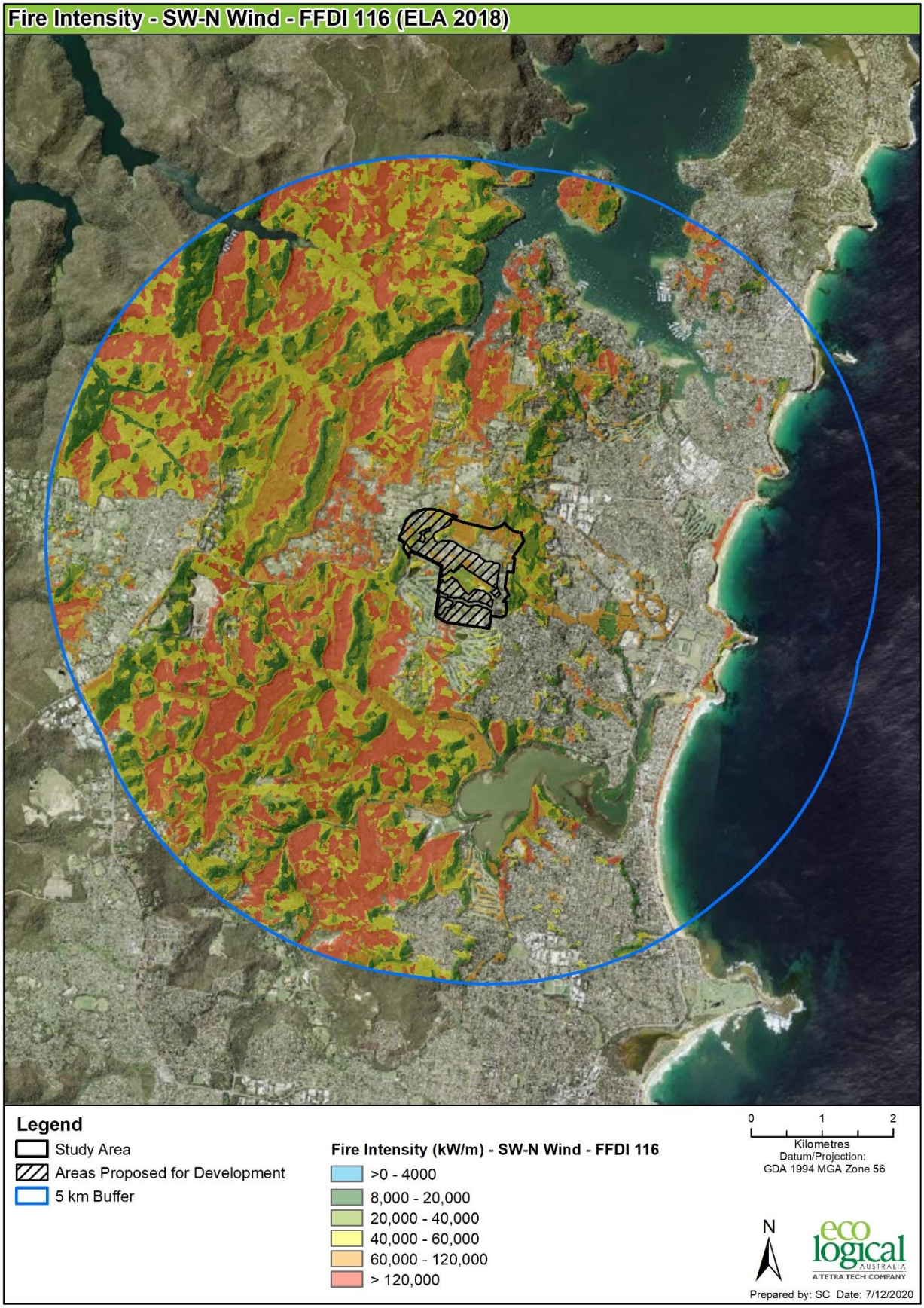

Figure 12: Modelled Fire Intensity (south west to north wind, FDI 116)

2.4 Summary of Landscape Bushfire Risk Assessment

The landscape bushfire risk analysis indicates the potential for bushfire attack of the Ingleside South Precinct is substantially mitigated by a variety of landscape features. Most notable is the 'sheltering' of the Precinct from north to south-westerly approaching wildfires; fires from these directions are most likely to be higher intensity, occur more often and have the greatest impact on life and property.

The existing development at Ingleside North and the local golf courses are assessed as likely to reduce the bushfire attack from north to south-westerly approaching fires to levels that do not constitute "high bushfire risk". The risk from the south is similarly lowered because of the sheltering effects of reduced fuel on the golf courses.

The remaining directions of landscape bushfire risk from the east and north-east are also not considered "high bushfire risk" as they have no exposure to the highest FFDI driven wildfires, and even when Generalised Extreme Value (GEV) FFDI figures from the north – south-east weather data analysis are considered the associated risk is well below that upon which PBP 2019 'benchmark protection measures' for the locality are based i.e. FFDI 100.

This eastern side of the Precinct is not only exposed to lower FFDI, but the fire catchment is relatively small, meaning the likelihood of wildfire and the likelihood of higher intensity fire is reduced. The wildfire history records support this lowered risk and shows no fire front in 76 years having been recorded as impacting this interface of the Precinct (i.e. a fire front driven to this interface by winds from the north-east to southeast). In addition to this context, there are existing developed lands that separate this hazard from the areas proposed for development in the Structure Plan, thus reducing the impact of the potential fire attack from these directions to any future development.

There are no known barriers to fire suppression, which for the Subject Site would be aided by existing development having fragmentated the landscape-wide continuity of fuels, resulting in reduced bushfire behaviour at development interfaces. While nearby vegetation and terrain have the potential to carry higher intensity fires these fires are not considered likely to be beyond the levels upon which the bushfire protection measures within PBP are founded.

There is no part of the landscape bushfire risk analysis that suggests the proposed Ingleside South Precinct should be excluded as inappropriate development under the Strategic Planning Principles or exclusion criteria within PBP.

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 Site is mapped as Bush Fire Prone Land, and it is a primary tool for assessing the bush fire risk appropriateness of future development under the Structure Plan.

Chapter 4 of PBP 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 complies with PBP (under PBP Chapters 5-8).

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:

- Bushfire landscape (see previous Section);
- 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:

- No areas are proposed for development that are deemed inappropriate from the landscape bushfire risk assessment;
- Special Fire Protection Purpose (SFPP) development, if required, can be located well beyond the minimum APZ requirements of PBP;
- Multiple access and egress points and perimeter roads are feasible within the developable area and there is scope to finalise these through design iterations;
- Complementary and consistent risk management through landscape controls and building design is also feasible.
- Development is not proposed in higher risk locations; and
- There is ample opportunity within the Subject Site to provide APZ and other bushfire protection measures to meet the Acceptable Solutions within PBP and to improve the current risk associated with older housing stock and bushfire protection measures at the hazard interfaces;

3.1 Feasibility of Asset Protection Zones

Based on the landscape assessment of vegetation and slope an assessment of the feasibility of APZs that are compliant with the Acceptable Solutions in PBP has occurred. The APZ dimensions listed in Table 2 are the minimum required APZs under the PBP Acceptable Solutions for residential development (i.e. 29 kW/m^2) and SFPP development (i.e. 10 kW/m^2). Figure 13 shows that for both these development types the PBP required APZ can be comfortably achieved.

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

- Vegetation formation in the assessment is based on OEH mapping, updated via desktop assessment;
- Vegetation assessment has assessed the potential future vegetation hazard following any revegetation of environmental conservation or management zones;
- Site assessment may reveal slopes that are slightly (but not significantly) different to those used to plot the APZ;
- All APZs are assumed to be on land less than 18 degrees;
- Additional APZ and/or modification of the APZ in Figure 13 may be required if revegetation occurs beyond the vegetation hazard used to identify the APZ;

In addition to the compliance with provision of APZs, there is no part of the land-use assessment that suggests the proposed Ingleside South Precinct should be excluded as inappropriate development under the Strategic Planning Principles or exclusion criteria within PBP.

Table 2: PBP required Residential and SFPP APZs for varying slopes and vegetation

Vegetation Formation	Slope Class	Residential APZ (BAL-29)[1]	Special Fire Protection Purpose (SFPP) 10 kW/m^2 APZ[2]
Forest	Upslope/Flat	24 m	67 m
	0-5° downslope	29 m	79 m
	5-10° downslope	36 m	93 m
	10-15° downslope	45 m	100 m
	15-20° downslope	56 m	100 m
Tall Heath	Upslope/Flat	16 m	50 m
	0-5° downslope	18 m	56 m
	5 -10° downslope	20 m	61 m
	10-15° downslope	22 m	67 m
	15-20° downslope	25 m	72 m
Woodland	Upslope/Flat	12 m	42 m
	0-5° downslope	16 m	50 m
	5-10° downslope	20 m	60 m
	10-15° downslope	25 m	72 m
	15-20° downslope	32 m	85 m
Low Hazard (Rainforest)	Upslope/Flat	11 m	38 m
	0-5° downslope	14 m	47 m
	5-10° downslope	18 m	57 m
	10-15° downslope	23 m	69 m
	15-20° downslope	30 m	81 m

[1] TABLE A1.12.2 FROM PBP 2019, [2] TABLE A1.12.1 FROM PBP

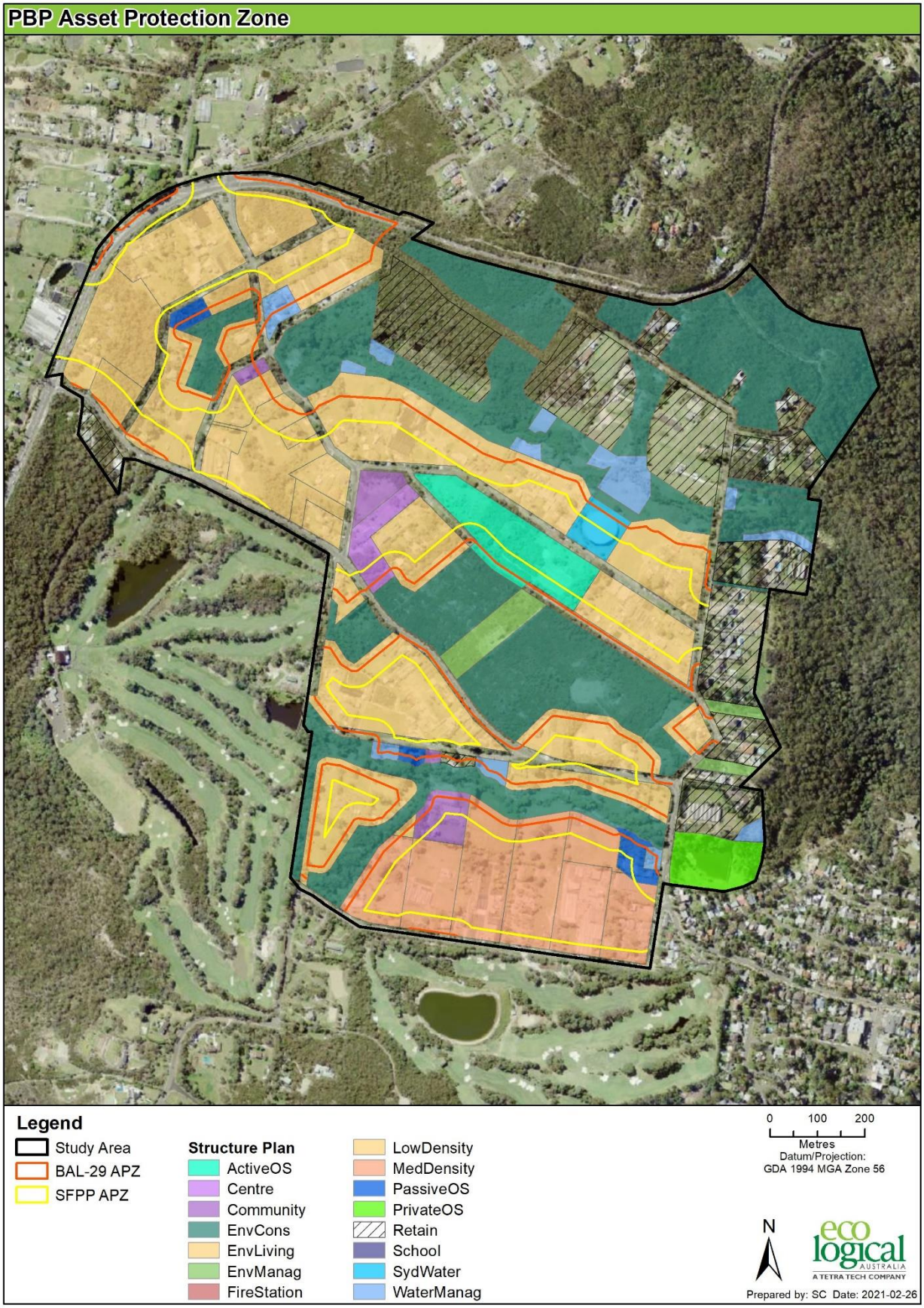

Figure 13: Asset Protection Zone Feasibility Assessment

4. Access and egress

Access to and egress from the Subject Site, is via Mona Vale Road in the north and west, and Powderworks Road in the south and east. There are a range of existing internal and proposed roads, which provide various connections to these main access and egress routes (Figure 14). Additional roads may be identified at subdivision design stages, with this assessment focusing on the feasibility of development in the Ingleside South Precinct overall.

Perimeter roads are critical for separating developed areas from bushfire hazards, and in so doing provide a higher quality of hazard separation for buildings, bushfire control lines for firefighters, and safe access and egress during a bushfire event. All new development, for residential subdivisions of three or more allotments that abut bushfire hazard, should provide perimeter roads. It is noted that there are some existing allotments within the Precinct, that aren't currently afforded perimeter roads. If these allotments are subject to future development of this nature, perimeter access meeting the requirements of PBP (and preferably perimeter roads) will likely be required.

An assessment of the Structure Plan layout (Figure 1) indicates that where potential new roads (and specifically perimeter roads) are proposed, these roads can meet the Acceptable Solutions for residential and rural subdivisions within Table 5.3b of PBP (see Table 11 Appendix B). Similarly, there are no findings within the PDC Consultants (2020) Traffic Analysis that suggest that the Acceptable Solutions within Table 5.3b of PBP cannot be met.

4.1 Evacuation

The safety of emergency responders and people within the Precinct exposed to bushfire attack is paramount. During the November 2020 consultation meetings, Emergency Service Stakeholders clearly indicated that any additional development associated with the Planning Proposal must not rely on emergency service assistance during evacuation.

A detailed Traffic Analysis undertaken for the Precinct by PDC Consultants (2020) concluded that "*those evacuating southwards along Powderworks Road, will likely be able to do so satisfactorily under assumed evacuation conditions*". This assessment is based on the range of conservative assumptions and model parameters extensively workshopped with emergency services agencies during the AECOM (2020) bushfire evacuation study and refined for the Structure Plan. The analysis demonstrates the capacity for full, 'un-assisted' off-site evacuation that is not reliant on emergency services intervention.

Off-site evacuation routes identified by Meridian Urban (2018) are shown in Figure 15, with the 'Primary' route of Powderworks Road (route number 2) evaluated by PDC Consultants (2020). It is understood that analysis of this route was agreed to by emergency management stakeholders. However, every bushfire attack scenario is different, and designing for bushfire safety necessitates the provision of different options. If large landscape scale bushfire attack threatens the area, the evacuation analysis documents that adequate offsite evacuation capacity is provided by Powderworks Road, prior to fire impact (i.e. prior to any vegetation adjacent to Powderworks Road catching alight and presenting an evacuation risk). However, there are alternative evacuation routes in addition to Powderworks Road, such as via Wattle Road and Ingleside Road, which could provide alternative options for off-site evacuation. Conversely, if the Precinct is subjected to more localised bushfire attack, then other

evacuation routes become available to facilitate safe evacuation. For example, if a localised bushfire was burning in the area adjoining Powderworks Road, then alternative evacuation routes to the northeast and southwest along Mona Vale Road or to the southeast using Wattle Road and Ingleside Road could provide alternative options for off-site evacuation. This level of evacuation capacity is consistent with the Strategic Planning requirements and exceeds the Acceptable Solutions of PBP.

The viability of early 'unassisted' off-site evacuation is the Stakeholder agreed benchmark for evacuation associated with the Proposal and this Study has found that this benchmark can be met as described by PDC Consultants (2020). However, an evacuation assessment is considered incomplete unless it also considers the potential effects of the Proposal on those who chose to stay and defend or do not evacuate early; particularly given research (Whittaker *et al.* 2013, Strahan *et al.* 2018, Whittaker 2018, Whittaker 2019) and experience clearly shows that 100% early voluntary evacuation never occurs.

This Study has therefore evaluated the viability of the three bushfire evacuation options and whether the Proposal is likely to exacerbate the risks associated with these options:

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

4.1.1.1 Community refuges

While community refuges are currently not formally recognised or encouraged in the planning of new development in PBP; bushfire evacuation patterns (Whittaker *et al.* 2013, Strahan *et al.* 2018, Whittaker 2018, Whittaker 2019) suggest these should be part of best-practice strategic planning consideration as they add options when early evacuation is not feasible (e.g. rapid on-set bushfires) and potentially increase community safety and resilience in a broader range of bushfire attack scenarios. For these reasons, community refuges are encouraged within the Precinct Structure Plan as a bushfire protection design 'redundancy' i.e. a useful, but non-essential element that increases bushfire safety.

The provision of areas or the dedication of sites within the Precinct suitable for the establishment of an Evacuation building will increase the bushfire resilience of the community. Community refuge options such as an Evacuation Centre, Community Fire Refuge (as in Victoria) or Neighbourhood Safer Place (NSPs) require comprehensive design. The following documents offer some guidance on these approaches:

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

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

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

Evacuation Centres offer a potentially valuable means of increasing the bushfire resilience of any new community. Importantly, they require engagement and support of emergency services agencies, typically through the District Bushfire Management Committee and the Local Emergency Management Committee (LEMC). Whilst these Committees normally focus on operational and not planning or development design matters; preliminary discussions with such groups elsewhere in NSW have shown support for the concept of strategically located and designed Evacuation Centres. To be financially viable and of greater value to the community, an Evacuation Centre would need to be multi-purpose e.g. a community centre. Substantial evidence would need to be gathered to justify the survivability and functionality of an onsite Evacuation Centre, but where viable these Centres may lower evacuation risks and increase community bushfire resilience.

Although an Evacuation Centre for the whole Ingleside South Precinct is considered not to be feasible, a combination of community refuge types may be. Neighbourhood Safer Places (NSP) are an option that are suitable as a "refuge of last resort" and, unlike evacuation Centres, do not rely on welfare agencies (under the LEMC) to operate the facility in a bushfire emergency. There are importance differences between an Evacuation Centres, Neighbourhood Safer Places (NSP) and Community Fire Refuges. A NSP is considered a refuge of last resort and defined as:

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

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

This Study identified many potential locations where the minimum radiant heat for a NSP building exist (Figure 16) and the NSP guidelines (RFS, 2017) for the selection of NSP sites could be met. The Study has found that the potential exists for an Evacuation building off Wattle Roads, between Manor Road and Powderworks Road. However, as stated earlier in this Section of the Study, all on-site community refuge options are listed as 'safety assessment redundancies' and are not factors relied upon in assessing the bushfire related viability of the Ingleside South Precinct Structure Plan.

The addition of an Evacuation Building to the Precinct offers the potential to enhance the safety of the existing community.

4.1.1.2 In-situ sheltering

Research has shown that not all people in recent bushfires evacuate early and some chose to stay and defend (Whittaker *et al.* 2013, Strahan *et al.* 2018, Whittaker 2018, Whittaker 2019). If 'stay and defend' practices were to occur relatively safely among existing Ingleside South residents a significant improvement in their bushfire protection measures would likely be required e.g. APZ and building construction improvements. The introduction of newer buildings to the Precinct and particularly in areas

between older housing stock and the hazard offers significant opportunity to provide a more bushfire resilient community and urban bushland interface. This is possible because all new development requires bushfire resilient infrastructure and all new buildings are constructed to contemporary bushfire standards.

The Structure Plan offers opportunity to site the most appropriate and resilient buildings and uses in situations that meet contemporary design standards under PBP but also lower the bushfire risk in the existing community. This improvement in bushfire resilience can also be enhanced by controls over landscaping and building envelopes.

4.1.2 Access and egress findings

There is no part of the Access and Egress or evacuation assessment that suggests the proposed Ingleside South Precinct should be excluded as inappropriate development under the Strategic Planning Principles or exclusion criteria within PBP.

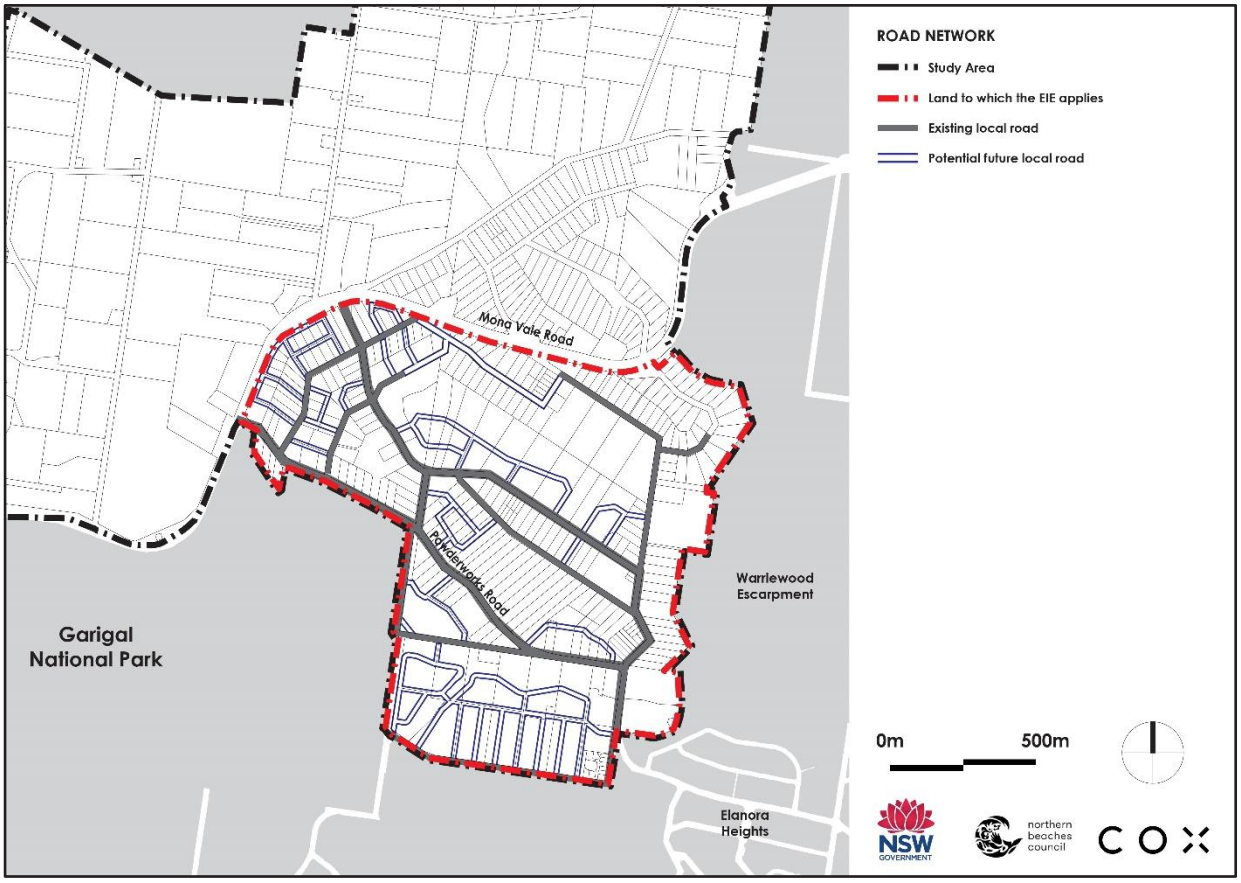

Figure 14: Existing and Proposed Road Network

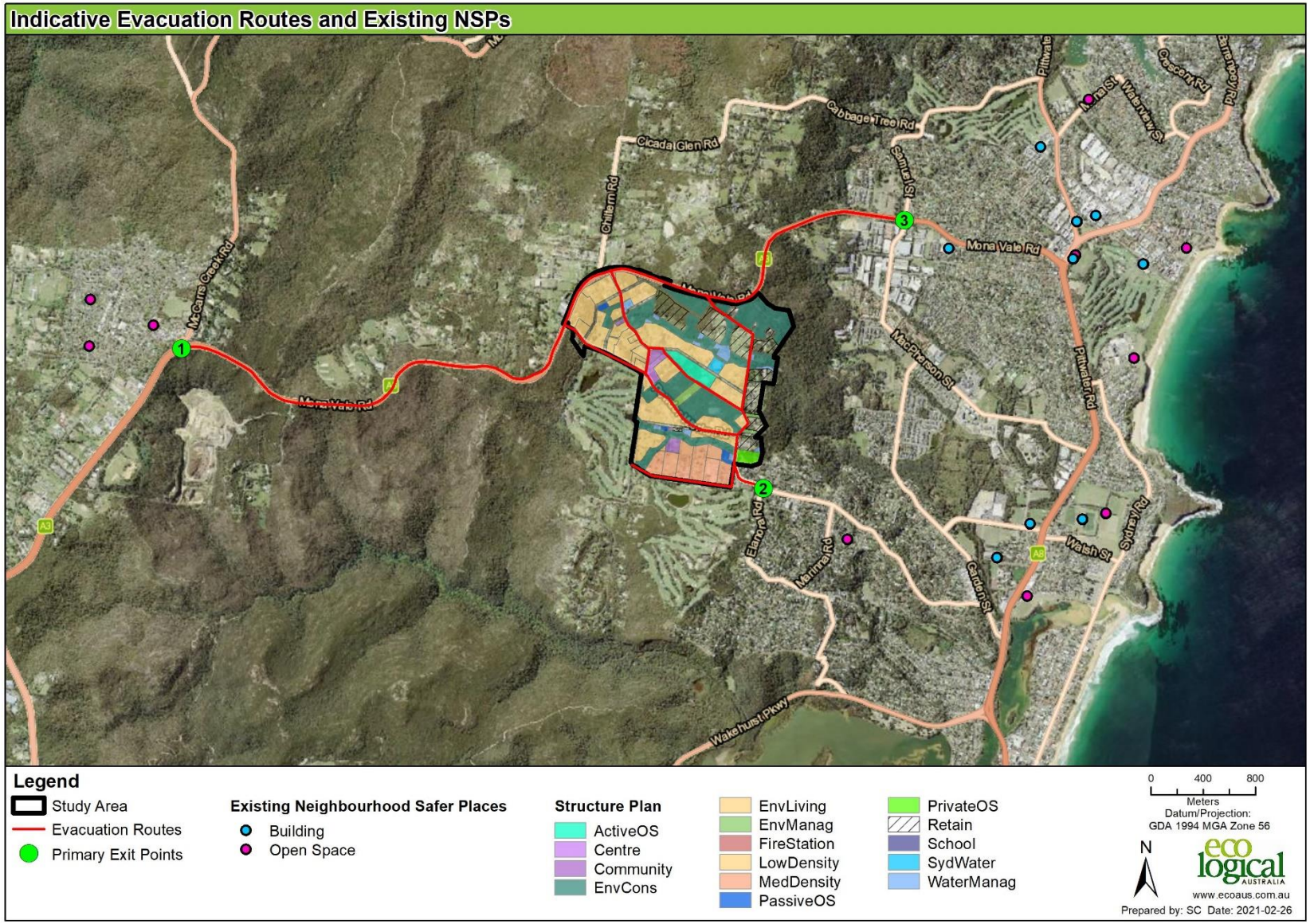

Figure 15: Indicative evacuation routes to existing NSP's

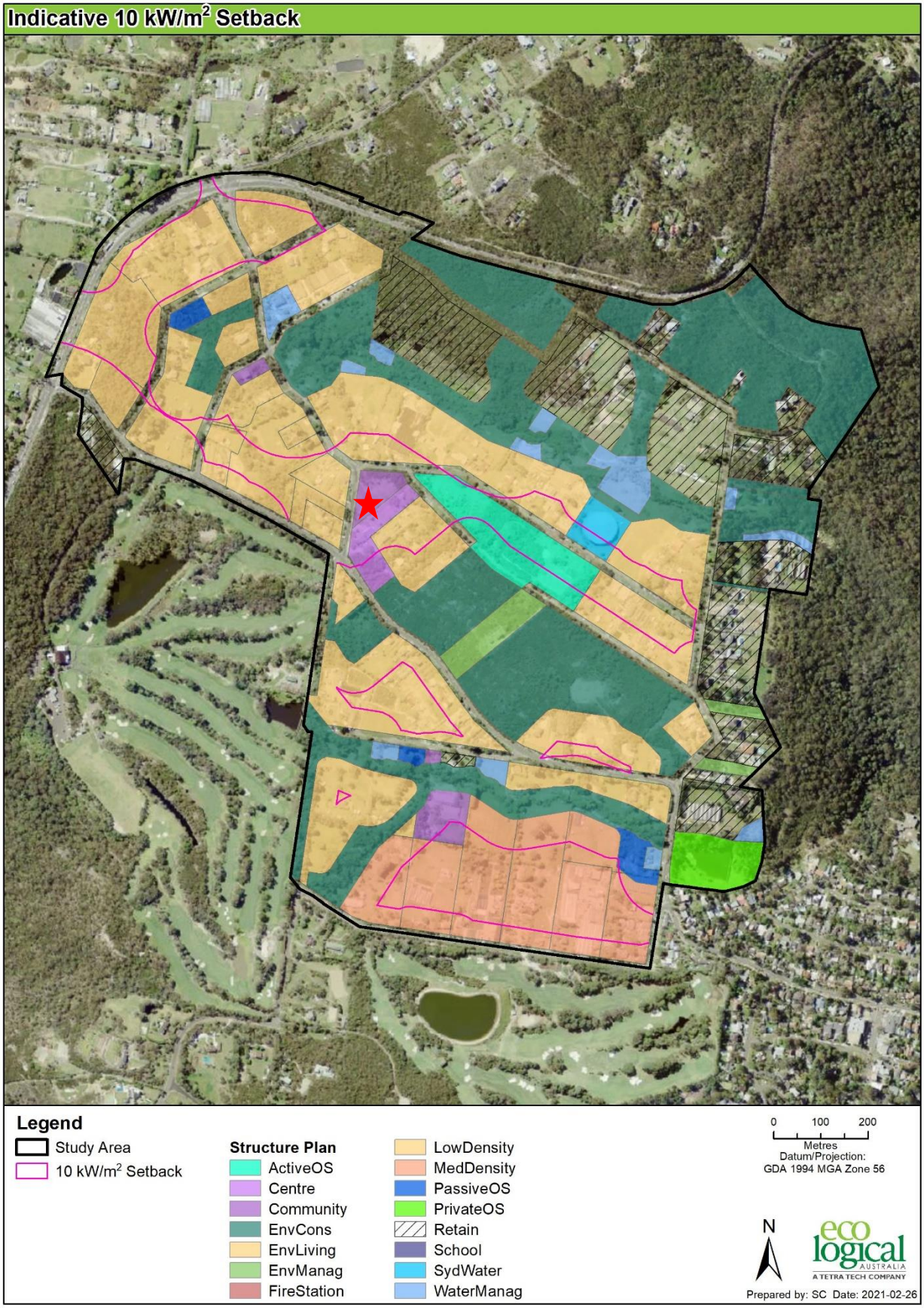

Figure 16: Indicative 10 kW/m² setback

5. Emergency Services

The Study has considered strategic emergency management planning via at least three Emergency Service Stakeholder meetings in November 2020. No specific adverse impacts were raised about emergency service provision, apart from that the proposed development should not be reliant on assisted evacuation, which has been resolved (see Section 4).

The proposed Structure Plan (Figure 1) shows a consolidation of the existing development footprint in Ingleside South. This consolidation and increased development density, especially around the perimeter of the Precinct, has the potential to reduce the penetration of bushfire into the existing developed area. A more bushfire resilient perimeter of buildings around the Precinct will also reduce the risk of house to house (and garden to garden) spread of fire as all new dwellings will have PBP compliant APZ and buildings.

But of most importance for emergency service responders is the provision of perimeter roads from which to fight fires and defend properties. New development for the Precinct as proposed by the Structure Plan can achieve these improvements, to an extent that is impossible for the existing community through piecemeal replacement of individual buildings over time.

As the Structure Plan proposes the addition of 980 new dwellings, there is an increased demand on emergency services for routine fire and bushfire related services. There are several RFS brigades within proximity, which include:

- Ingleside Brigade (located within Subject Site);
- Tumbledown Dick Brigade (2 km west);
- Terry Hills Brigade (6 km west); and
- Warringah Headquarters (7 km south west).

Given the increase in the number of dwellings on Bush Fire Prone Land an improvement to the capacity of the existing RFS brigade at Ingleside is desirable and has been expressed by the RFS at Stakeholder meetings. An improvement in the capacity of the Ingleside brigade requires specific and detailed design discussions, and this Study suggests that the provision of an upgrade or new Brigade Station in Ingleside may be an appropriate level of contribution to an increase in the capacity/performance of the Ingleside RFS Brigade.

Additional NSW Fire and Rescue resources stationed at Mona Vale and Narrabeen would also attend any fire related emergency, located approximately 6.5 km north-east and 4km south-east, respectively. Fire and Rescue resources are also located at Avalon north-east of the Subject Site.

There is no part of the assessment of the future impact of new development on Emergency Services that suggests the proposed Ingleside South Precinct should be excluded as inappropriate development under the Strategic Planning Principles or exclusion criteria within PBP. However, further discussions are required with emergency services stakeholders to finalise an appropriate response to the increase in demand for bushfire related emergency services.

6. Infrastructure

6.1 Water

An adequate water supply that meets the requirements of PBP must be afforded future development. There has been no evidence found in the Study that the water requirements within PBP cannot be met by the Structure Plan which will include a reticulated system potentially augmented by static water supplies (SWS) where appropriate. Cardno (2020) has assessed the delivery of infrastructure to the Ingleside South Precinct and with regard to water supply, concludes "*The South Ingleside Sub-Precinct can be adequately serviced with potable water*".

It is feasible within the Precinct for the location, number and sizing of hydrants to be determined using fire engineering principles and it is assumed compliance with AS 2419.1 – 2005 is also feasible. A test report of the water pressures anticipated by the relevant water supply authority will be required by the RFS. Fire hydrants should not be located within any road carriageway and all above ground water service are to be metal.

6.2 Electricity and gas

The future electricity supply to the new parts of the Precinct will be underground and compliant with PBP. It is also assumed that where any existing or future electrical transmission lines are above ground, it is feasible for no part of a tree is to be closer than 0.5 m to powerline conductors.

It is assumed by the Study that reticulated or bottled gas can 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 is feasible. Metal piping must be used in all above ground gas services.

There is no part of the assessment of the future impact of new development on electricity and gas supplies that suggests the proposed Ingleside South Precinct should be excluded as inappropriate development under the Strategic Planning Principles or exclusion criteria within PBP. However, further discussions are required with supply authorities to confirm the requirements of PBP can be met.

7. Adjoining land

This Study has demonstrated that adequate bushfire protection measures can be afforded to the development proposed by the Structure Plan for the Ingleside South Precinct, such that the land management of adjoining lands will not be adversely impacted (e.g. through prescribed burning or other fire management measures). All new development will be designed to meet the standards of PBP which achieve an appropriate level of bushfire resilience without any reliance on fuel reduction measures on adjoining lands.

There is no part of the assessment of the bushfire related impacts on adjoining land, landowners and managers that suggests the proposed Ingleside South Precinct should be excluded as inappropriate development under the Strategic Planning Principles or exclusion criteria within PBP.

8. Evaluation of Suitability

8.1 Assessment against PBP Bushfire Strategic Planning Requirements

This Section evaluates the Structure Plan for the Ingleside South Precinct, against the bush fire strategic planning requirements of PBP (detailed in Section 1.4.1) based upon the assessment findings in the preceding sections of this Study to determine whether:

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

The evaluation is based upon PBP Chapter 4 and stakeholder advice collated within the Meridian Urban (2018) report and the Assessment Framework of this Study (Section 1.4.2) and is summarised in Table 7, Table 8 and Table 9. In addition to evaluating the Proposal against these matters, the evaluation specifically considers:

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

Table 3: Evaluation of the Structure Plan against the Strategic Planning Principles of PBP (RFS 2019)

PBP Strategic Planning Principle	Evaluation	Compliance

ensuring land is suitable for development in the context of bush fire risk	The risk profile of the Ingleside locality is not uniform. The Meridian Urban report (2018) presented a Bushfire Risk Assessment for the broader Ingleside locality and identified that there are areas with elevated bushfire risk. Section 2 and Section 3 of this Study evaluates the specific bushfire risk of the Ingleside South Precinct. Key findings include:
	• There are areas of elevated bushfire risk beyond the Ingleside South Precinct that are generally associated with:
	  ○ wooded vegetation (i.e. forest and heath) on or near steeper slopes;
	  ○ connectivity to a larger fire catchment, which exist in the north west, west and south west;
	  ○ exposure to the most problematic directions of bushfire attack (i.e. the north through to the southwest sector based on FFDI bushfire weather analysis); and
	  ○ areas where there is the potential exposure to larger fire fronts or extensive fire footprints, which typically exacerbate the risk. The fire history data indicates that the north west to westerly sector are the areas with the greatest potential of landscape fire attack.
	• The areas of elevated bushfire risk in the broader locality are outside and well separated from the Ingleside South Precinct;
	• The bushfire hazards on lands immediately adjoining the Ingleside South Precinct are generally of a lower threat type, being:
	  ○ Wooded vegetation that is disconnected from more extensive areas;
	  ○ Wooded vegetation that is of reduced size and/or width, that would restrict bushfire intensity and impact likelihood;
	  ○ Low hazard vegetation, such as rows of trees with a partially managed understorey between golf course fairways;
	  ○ Grassland, often with a level of ongoing management (i.e. grazed or mow/slashed);
	  ○ Vegetation that meets the “low threat” prescriptions of PBP due to fuel management (i.e. mapped trees in backyards) and can therefore be excluded as per PBP;
	• The bushfire hazards within the Ingleside South Precinct are generally:
	  ○ Disconnected from bushfire hazard outside the Precinct; and/or
	  ○ Low hazard vegetation (i.e. narrow areas set aside for riparian vegetation).
	
	This Study has identified that the locations proposed for future development are confined to the lower risk portions of the broader Ingleside locality, and that these locations have a bushfire risk context that supports their suitability for development, considering:
	• Removal of proposed development from locations with elevated bushfire risk;
	• Proposed development areas are significantly separated from locations with elevated bushfire risk, with separation provided by managed lands, fuel reduced areas and low hazard vegetation including grassland. This separation is in all directions, but especially in the primary risk directions of the north through to the south-west;
		Compliant

PBP Strategic Planning Principle	Evaluation	Compliance
	• Clustering of development in lower risk settings (i.e. south of Mona Vale Road, adjoining existing developed areas and not adjoining areas of significant bushfire hazard); • Ability of 'unassisted evacuation'; • The size and location of proposed land uses permits the application of bushfire protection measures that meet or can exceed the Acceptable Solutions of PBP, thus allowing the level of residual risk to be reduced to an acceptable level.	
ensuring new development on BFPL will comply with PBP	The Structure Plan proposes land uses of a type, size or location that complies with PBP and this can be effectively managed in future development designs, at subsequent stages in the planning and development process.	Compliant
minimising reliance on performance-based solutions	The Structure Plan is not reliant on any bushfire performance-based solutions under PBP.	Compliant
providing adequate infrastructure associated with emergency evacuation and firefighting operations	Traffic analysis of the bushfire evacuation capacity of the Ingleside South Precinct by PDC Consultants (2020) concludes that "*those evacuating southwards along Powderworks Road, will likely be able to do so satisfactorily under assumed evacuation conditions*". This assessment is based on the range of conservative assumptions and model parameters extensively workshopped with emergency services agencies during the AECOM (2020) bushfire evacuation study and refined for the Structure Plan. The analysis demonstrates the capacity for full, 'un-assisted' off-site evacuation that is not reliant on emergency services intervention. Furthermore, there are additional secondary evacuation routes that may be suitable for use and provide additional redundancy, depending on the bushfire attack scenario faced. In addition, on-site evacuation options are also available and offer useful redundancy to reduce the level of evacuation risk. Infrastructure for firefighting operations will include the road network, including perimeter roads and a reticulated water supply. The Ingleside Rural Fire Brigade Station is located within the Precinct and it is understood that the Department will continue to consult with emergency service agencies regarding whether any further physical infrastructure is required for the proposed development.	Compliant
facilitating appropriate ongoing land management practices	The Structure Plan does not restrict appropriate ongoing land management practices, nor is it reliant on bushfire management of adjoining lands to support its bushfire protection.	Compliant

Table 4: Evaluation of the Structure Plan against the "inappropriate development" exclusion requirements of PBP (RFS 2019)

Inappropriate Development	Evaluation	Compliance
the development area is exposed to a high bush fire risk and should be avoided	The bushfire risk profile varies across the broader Ingleside locality. The Ingleside South Precinct and the development proposed by the Structure Plan, is situated in the lowest bushfire risk location within the locality. The subject location has a level of bushfire	Compliant

Inappropriate Development	Evaluation	Compliance
	risk exposure that can be reduced to an appropriate level, through the application of bushfire protection measures in accordance with and exceeding PBP requirements.	
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	Traffic analysis of the bushfire evacuation capacity of the Ingleside South Precinct by PDC Consultants (2020) concludes that "*those evacuating southwards along Powderworks Road, will likely be able to do so satisfactorily under assumed evacuation conditions*". This assessment is based on the range of conservative assumptions and model parameters extensively workshopped with emergency services agencies during the AECOM (2020) bushfire evacuation study and refined for the new Structure Plan. The analysis demonstrates the capacity for full, 'un-assisted' off-site evacuation that is not reliant on emergency services intervention. Furthermore, there are additional secondary evacuation routes that may be suitable for use and provide additional redundancy, depending on the bushfire attack scenario faced. In addition, on-site evacuation options are also available and offer useful redundancy to reduce the level of evacuation risk.	Compliant
the development will adversely effect other bush fire protection strategies or place existing development at increased risk	The proposed development will not adversely affect other bushfire protection strategies or place existing development at increased risk. Rather, it will benefit existing development, both within and outside of the Ingleside South Precinct, particularly in consideration of: • Reduction in the distance and travel time for occupants of existing off-site developed areas (e.g. North Ingleside and Wirreanda Valley) to reach developed areas as a result of the evacuation proposed by the Structure Plan; • Reduction of the risk to off-site evacuation for existing development, by removal of some of the bushfire hazards that adjoin the primary evacuation route, through the development of lands proposed by the Structure Plan that currently contain bushfire hazard; • The on-site evacuation options available within the Ingleside South Precinct also reduce the level of evacuation risk to existing developments but are evaluated as risk design redundancy in this Study; • An improvement to emergency services capacity (e.g. provision of a new or upgraded Brigade Station) benefits existing residents.	Compliant
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	Analysis of bushfire evacuation by AECOM (2020) considered the existing population catchment within the wider Ingleside locality, and the evacuation demand from occupants of existing development. The more recent evacuation analysis (PDC Consultants 2020) has leveraged the previous work, assumptions and model parameters, and determined that the development proposed by the Structure Plan will not adversely affect occupants of existing development within Ingleside.	Compliant
the development has environmental constraints to the area which cannot be overcome	The environmental constraints are assessed by specialist reports. It is understood that the Structure Plan responds favourably to the environmental constraints within Ingleside South Precinct.	Compliant

Table 5: Evaluation of the Structure Plan against the Strategic Planning Assessment Considerations of PBP (RFS 2019)

Issue	Detail	Evaluation	Compliance
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	The Meridian Urban (2018) report presents a bushfire risk assessment for the broader Ingleside locality. The bushfire landscape risk relevant to the Ingleside South Precinct, is presented in Section 2 of this report. It details the bushfire hazard, potential bushfire behaviour and the bushfire risk setting of the Precinct, including: recorded bushfire history and frequency, fire catchment characteristics, and potential bushfire attack scenarios. The bushfire landscape risk context is outlined in Table 7 and is summarised below. • There are areas of elevated bushfire risk in the broader locality. • The areas of elevated risk in the locality are outside and well separated from the Ingleside South Precinct; • The bushfire hazards on lands immediately adjoining the Ingleside South Precinct are generally of a lower threat type; • The bushfire hazards within the Ingleside South Precinct are generally disconnected from external hazard and/or classified as low hazard vegetation.	Compliant
Land use assessment	The land use assessment will identify the most appropriate locations within the masterplan area or site layout for the proposed land uses	The bushfire risk profile varies across Ingleside. This Study has identified that the locations proposed for future development are confined to the lower risk portions of the Ingleside locality south of Mona Vale Road, and that these locations have a bushfire risk context that renders them suitable for development, considering: • Removal of proposed development from locations with elevated bushfire risk; • Proposed development areas are significantly separated from locations with elevated bushfire risk, with separation provided by managed lands, fuel reduced areas and low hazard vegetation including grassland. This separation is in all directions, but especially in the primary risk directions of the north through to the south-west; • Clustering of development in lower risk settings (i.e. south of Mona Vale Road, adjoining existing developed areas and not adjoining areas of significant bushfire hazard); • Ability of 'unassisted evacuation'; • The size and location of proposed land uses permits the application of bushfire protection measures that meet or can exceed the Acceptable Solutions of PBP, thus allowing the level of residual risk to be reduced to a suitable level. Whilst the Ingleside South Precinct will retain a level of residual risk post-development (as do all areas proximal to bushfire hazard) the level of this residual risk is not unacceptable, such that the proposed land uses should be excluded, provided those land uses are afforded with an adequate combination of bushfire protection measures (i.e. Asset Protection Zones, building construction standards, an adequate road network and water supply etc.). Analysis of the Structure Plan (Sections 3 to 7) indicates that an appropriate and PBP compliant combination of bushfire protection measures can be provided to the future development. ***Recommendation*:** Planning provisions and subsequent more detailed development design for the Ingleside South Precinct should ensure that the bushfire protection measures are afforded to future development, in accordance with PBP requirements.	Compliant

Issue	Detail	Evaluation	Compliance
Access and egress	A study of the existing and proposed road networks both within and external to the masterplan area or site layout	There has been extensive analysis of the existing and proposed road networks both within and external to the Ingleside South Precinct (AECOM 2020, PDC Consultants 2020, Meridian Urban 2018). This analysis has included extensive stakeholder consultation with emergency services agencies and other experts to identify appropriate assumptions, model parameters and acceptance criteria. The analysis has determined: • The evacuation route options to off-site safer places; • The priority evacuation routes based on potential bushfire attack scenarios and hazards proximal to the evacuation routes; • That the capacity for the existing and proposed road network to deal with evacuating residents and responding emergency services, based on the existing and proposed community profile, is satisfactory (PDC Consultants 2020) The traffic analysis of the primary evacuation option (PDC Consultants 2020) demonstrates the capacity for full, 'un-assisted' off-site evacuation that is not reliant on emergency services intervention. Furthermore, there are additional secondary evacuation routes that may be suitable for use and provide additional redundancy, depending on the bushfire attack scenario faced. In addition, on-site evacuation options are available and offer useful redundancy to reduce the level of evacuation risk. ***Recommendation*:** The provision of an on-site evacuation building is recommended to be further explored (Section 5) to provide bushfire protection design redundancy. There are a range of existing internal and proposed roads, which provide various connections to the main access and egress routes. Additional roads may be identified at subdivision design stages. Assessment of the Structure Plan indicates that where potential new roads (and specifically perimeter roads) are proposed these roads can meet the Acceptable Solutions for residential and rural subdivisions. ***Recommendation*:** Residential subdivision design should provide for perimeter roads for all new development of three or more allotments that abut bushfire hazard.	Compliant
Emergency services	An assessment of the future impact of new development on emergency services provision	The Structure Plan proposes development of up to 980 new dwellings. This change may influence the demand on emergency services. The Department has engaged with emergency services organisations to identify what their future needs may be. This may involve relocating existing rural fire service brigade stations and/or upgrade. The development proposed by the Structure Plan will not adversely impact on the ability of emergency services to carry out fire suppression in a bushfire emergency. Rather it will support it by formalisation of the hazard interface, provision of perimeter roads and water supply.	Compliant

Issue	Detail	Evaluation	Compliance
		***Recommendation*:** The Department should continue to consult with relevant emergency services organisations to ascertain potential future needs. The Department should also review and implement mechanisms such as DCP prescriptions, development contributions or the like, in-order to facilitate the future provision of emergency services infrastructure.	
Infrastructure	An assessment of the issues associated with infrastructure provision	Cardno (2020) has assessed the delivery of infrastructure to the Ingleside South Precinct and with regard to water supply, concludes "*The South Ingleside Sub-Precinct can be adequately serviced with potable water. The South Ingleside Sub-Precinct can be serviced via new trunk mains from the Elanora Heights Reservoir combined with a booster to service the high elevation areas. Sydney Water has also advised that additional lead-in water mains would be required to meet the forecast demands of the development*". The reticulated water supply system for future land uses will need to be designed for adequate flow and pressure in compliance with PBP and relevant industry standards. Any development proposing non-reticulated water supply, will need to provide a static water and hydrant supply in compliance with PBP. ***Recommendation*:** The Department should continue to consult with Sydney Water and/or hydraulic specialists to identify any capacity issues with the water supply regarding its use during a major bushfire event and any design of infrastructure needs. There are no known life safety issues related to high voltage power lines, natural gas supply lines or other hazardous infrastructure that would preclude the development proposed by the Structure Plan. Potential life safety issues associated with bushfire, proximal to high voltage power lines and natural gas supply lines, will need to be further considered during future planning phases. ***Recommendation:*** Future development planning should account for potential life safety issues associated with high voltage powerlines and natural gas supply, both of which are preferably underground.	Compliant
Adjoining land	The impact of new development on adjoining landowners and their ability to undertake bush fire management	Future development as proposed by the Structure Plan, is not be reliant on any off-site bushfire management measures such as hazard reduction burning or other fuel management. Further, the proposed land uses will not have a deleterious impact on the ability for bushfire management activities to be undertaken on adjoining land. Given the adherence to PBP 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, rather the development proposed by the Structure Plan would result in a reduction in bushfire hazard. Further, given the provision of well-designed road networks for future development, the future land uses and infrastructure should help facilitate effective bushfire management operations.	Compliant

8.2 Assessment against Meridian Urban report findings

Although Acceptance Criteria were mentioned in the Meridian Urban report, they were not listed in a form that is replicable. Further, the final outcomes of the Meridian Urban study were directly related to the consensus position reached by the agency stakeholder group, specifically on the suitability of the 2016 Structure Plan.

Section 7.4 of the Meridian Urban report states that the strategic planning principles and assessment criteria from PBP were adopted for the purposes of benchmarking the assessment. Section 11.2 of the Meridian Urban report reinforces this position and reiterates the focus on assessment for the exclusion of "inappropriate" development, as per PBP. Assessment of these matters is addressed in Section 8.1 above.

However, key 'risk mitigation' assessment statements from Section 11.3 and elsewhere in the report have been applied to the current proposal (summarised in Table 10) to assess the Structure Plan against the approach and findings utilised in the Meridian Urban report. Notably, the Meridian Urban report and the associated extensive stakeholder engagement assessed a large increase in dwellings, located in areas with elevated bushfire and evacuation risk. While conclusions and stakeholder comments on the previous 2016 Structure Plan do not directly apply to the current proposal (due to its substantial difference); the analysis, assessment and stakeholder requirements of that report have been respected, and used to evaluate the suitability of the new Structure Plan.

Table 6: Assessment of the Structure Plan against the Meridian Urban report

Meridian Urban report reference	'Benchmark' assessment or finding	Evaluation of Assessment in this BFSS	Consistency
S 7.4	**Defining 'acceptable' land use planning risk**		
S. 7.4 (final para.)	PBP 2018 Chapter 4 used to 'benchmark' the assessment	Chapter 4 in the current version of PBP (RFS 2019) has been used to 'benchmark' the SBFS assessment. Recent correspondence from Meridian Urban is provided in Appendix D which reinforces this evaluation.	Consistent
S. 7.4.1	"The key determinant of 'acceptable' risk is life safety risk, and the bottom line is whether the proposed land use rationale, density and settlement pattern supports and enables life safety, including safe evacuation"	Safety of life, including safe evacuation, remains the key determinant of risk acceptability.	Consistent
S. 11.3	**Summary of mitigation testing analysis**		
	"… there was no clear mitigation pathway identified by the key stakeholder group to reduce risk to an acceptable level"	The current proposal is a substantially different and new Structure Plan. A mitigation pathway has been identified in the November 2020 emergency service stakeholder meetings. This is a result of a much smaller development (3400 down to 980 new dwellings) located on a substantially smaller site and confined to the lower risk portion of the locality (i.e. all proposed development is south of Mona Vale Road only). A primary risk mitigation requirement from the November 2020 stakeholder meetings was the viability of "unassisted bushfire evacuation". An acceptable level of risk is also required from an assessment via a Strategic Bush Fire Study (PBP 2019 Chapter 4) specifically addressing the new proposal. Both matters are addressed in this BFSS.	Consistent
	"… the risk profile of Ingleside is such that a revised draft Structure Plan cannot be prepared to effectively mitigate life and property risk to a tolerable level"	The proposal is not a revised Structure Plan; it is substantially different and considered a different development proposal (as indicated above). The risk profile of the Ingleside locality is not uniform (acknowledge in recent correspondence from Meridian Urban, provided in Appendix D), and sites exist within it that present acceptable risk levels e.g. those distant from significant hazard, with 'unassisted evacuation' and minimal exposure to landscape-wide fires. The lowest risk profile sites in Ingleside have been selected as the footprint of the new Structure Plan.	Consistent
	"The capacity of the road network and the potential 'single point of a failure' reliance upon it remains a fundamental	When data from the previous Evacuation Study is used to assess the new Structure Plan, with its smaller number of dwellings and footprint, the analysis demonstrates that unassisted off-site evacuation is viable. A conservative evacuation assessment	Consistent

Meridian Urban report reference	'Benchmark' assessment or finding	Evaluation of Assessment in this BFSS	Consistency
	issue for the Ingleside Precinct, which is compounded by a complex range of associated cascading risk issues."	methodology has been applied. The previous "compounding range of complex and cascading risk issues" are no longer relevant due to >70% reduction of dwellings, located in a lower risk setting, with 'unassisted off-site evacuation' options away from the direction of primary bushfire threat, along with additional risk mitigation options.	
		On-site evacuation options are also available and offer useful redundancy to reduce the level of evacuation risk.	Consistent
	"…the risk to life posed by further development/ population within the Ingleside Planned Precinct is unable to be satisfactorily mitigated without some form of substantial change to the current context which is beyond the scope of this assessment."	The substantial change alluded to (at left) has occurred (see above) and therefore as stated within the concluding portion of the Meridian Urban report, the proposal has moved beyond the scope of the Meridian Urban report. This position has been recently re-confirmed by Meridian Urban (email dated 26/11/2020).	Consistent
	"Overall and having regard to the 'inappropriate' development benchmarks of PBP 2018, the scale and complexity of the competing, compounding and cascading risks to life and property, supported by the quantified and qualified evidence base presented by this risk assessment, determines that current available mitigation measures are unable to reduce the risk profile to a level which is universally acceptable to DPE, NSWRFS or Northern Beaches Council insofar as the current draft Structure Plan relates."	The new Structure Plan is substantially different and has a significantly different bushfire risk profile. The Bush Fire Strategic Study for the new Structure Plan (this report) concludes that an 'inappropriate' development benchmark under PBP 2019 is not exceeded (see section 8.1).	Consistent
		Initial review of the new Structure Plan by stakeholders has not identified a failure to meet appropriate development benchmarks. Notably, the critical requirement for 'unassisted off-site evacuation' identified by the Meridian Urban study has been determined as viable for the new Structure Plan.	Consistent

9. Conclusion

This Bush Fire Strategic Study has examined the bushfire hazard affecting the Ingleside South Precinct and to assess the strategic implications of future development for bush fire mitigation and management. The evaluation of suitability has included assessment against the strategic planning principles, "inappropriate" development requirements and the assessment considerations of PBP. It has been evaluated against the approach and findings in the Meridian Urban report to assesses whether the Stakeholder agreed 'benchmarks' are met by the new Structure Plan.

Given the lower bushfire risk profile of the Ingleside South Precinct at a Strategic Level and the new Precinct-focussed bushfire evacuation analysis concluding 'unassisted' off-site evacuation is feasible, the findings of this Study are:

- The Structure Plan complies with the Strategic Planning Principles of PBP;
- The Structure Plan does not trigger the "inappropriate" development exclusion requirements of PBP;
- That the Acceptable Solution bushfire protection measures within PBP can be met by the future development envisaged by the Structure Plan and it offers opportunity for protection measures beyond the minimum compliance under PBP;
- Compliance with PBP is not reliant on the intervention/response by emergency services or hazard management on adjoining land;
- The proposed development will not adversely impact the bushfire safety of occupants of nearby existing development and wherever possible lower the risk;
- The Structure Plan does not breach safety 'benchmarks' of the previous Study (Meridian Urban 2018); and
- 'unassisted' off-site evacuation has been demonstrated to be achieved by the Bushfire Traffic Analysis (PDC Consultants 2020).

Further, the Study has found that there is no part of the proposed Ingleside South Precinct Structure Plan that suggests it should be excluded as inappropriate development under the Strategic Planning Principles or exclusion criteria within PBP. In addition, that the Structure Plan can meet the objectives of Direction 4.4 (s9,1(2) of the *EP&A Act*, specifically with regard to the protection of life, property and the environment from bushfire.

Recommendations from the Study, include:

- Ensuring that further bushfire assessment is undertaken when more detailed development designs are available in later stages of the planning pathway, and that these designs maintain the compliance with PBP that the Structure Plan facilitates;
- Mechanisms are explored to provide an on-site evacuation building(s), which will provide additional bushfire protection redundancy;
- Residential subdivision design should provide for perimeter roads for all new development of three or more allotments that abut bushfire hazard as prescribed by PBP;
- Continued consultation with relevant agencies regarding emergency management requirements and infrastructure provision; and

- The Department should ensure adequate water supply compliant with PBP can be provided.

The Study also observed that:

- The bushfire risk for existing developed areas in Ingleside, outside the Ingleside South Precinct, warrant further mitigation (given the legacy issues) beyond the benefit that the proposed development of the Precinct would provide; and
- the Strategic Planning requirements of PBP can be improved with clearer Acceptance Criteria (development assessment 'pass marks') for Strategic Planning assessment.

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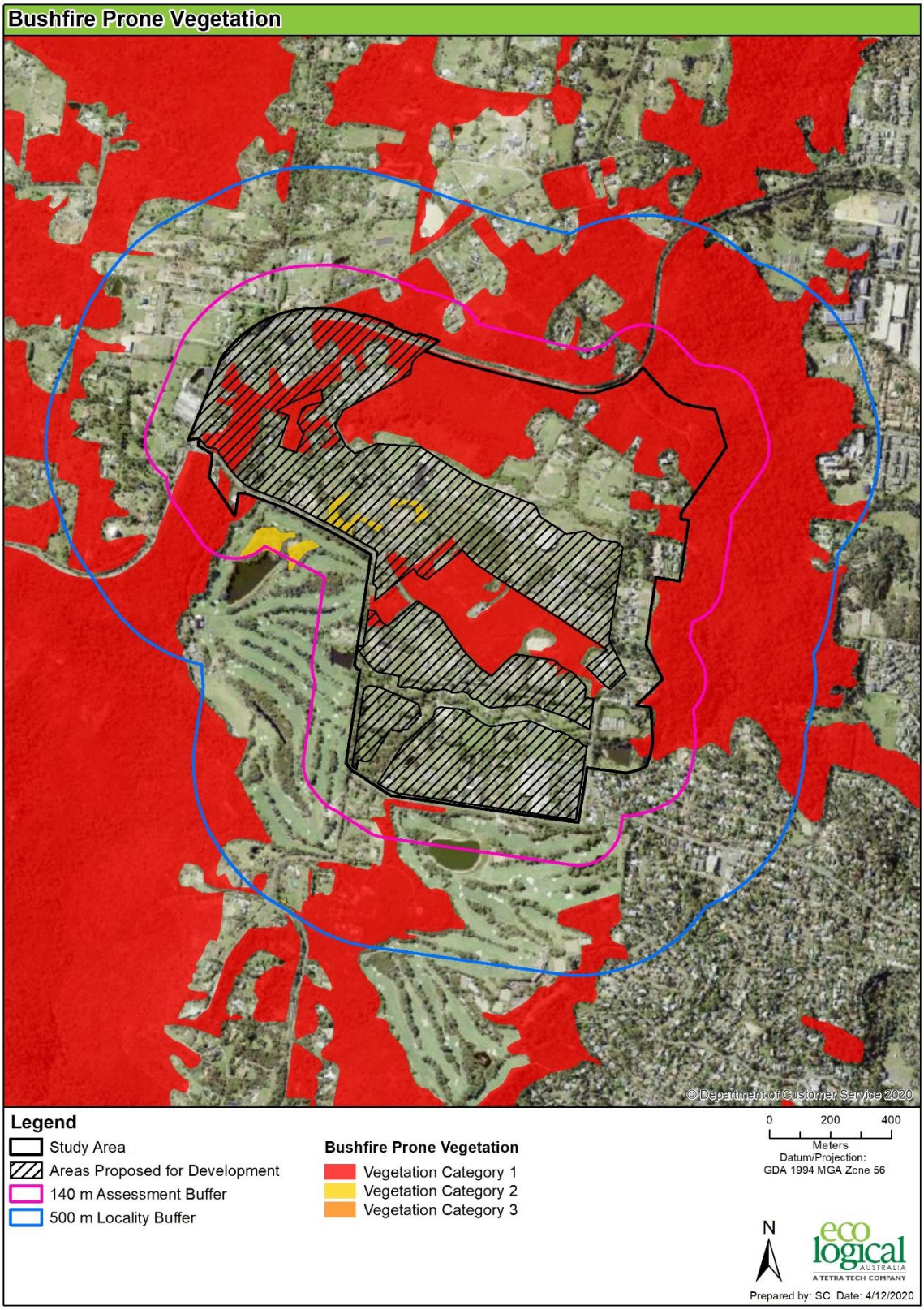
Appendix A Bush Fire Prone Vegetation Status



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

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

Appendix C Services Specifications

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

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

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

Table 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 (<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

Appendix D Meridian Urban Correspondence

From: Laura Gannon <laura.gannon@meridianurban.com>
Sent: Thursday, 26 November 2020 2:07 PM
To: Lauren Templeman <Lauren.Templeman@planning.nsw.gov.au>
Subject: RE: Ingleside State-led Precinct

Hi Lauren

Thank you for your email. As discussed earlier this week, the 2018 Ingleside strategic bushfire risk assessment was a specific assessment of draft Structure Plan, as prepared at that time. As you are aware, the risk assessment determined (with stakeholder input) the draft Structure Plan could not demonstrate significant risk to life was not present. The NSW Government thus withdrew Draft Structure Plan.

I am aware a new Draft Structure Plan is in the process of being prepared, and this should be the subject of a new Strategic Bush Fire Risk Study as per Part 4 of PBP 2019. It will need to assess the specific aspects of the new Draft Structure Plan.

To this end, we see the only relevant aspects of the 2018 risk assessment perhaps relate the assessment of existing risk, which Ecological should be contemplating. You mention below that Ecological are 'drawing a clear line of sight' back to the 2018 report which is ideal. However, we see this new Structure Plan as requiring its own merits-based assessment given the divergence between the former and new structure plans and the differences in the risk profiles.

Many thanks Lauren

Meridian Urban

Laura Gannon
Principal

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