Bushfire Threat Assessment

LES, Killingworth.

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Report No: PR106293
Version/Date: Final/August 2011
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Executive Summary

RPS has been engaged by Lake Macquarie City Council to undertake a Bushfire Threat Assessment (BTA) over the southern portion of the Killingworth township in the Lake Macquarie Local Government Area (LGA).

This BTA is suitable for submission with a Development Application (DA) and provides information on measures that will enable the development to comply with ‘Planning for Bushfire Protection’ (NSW RFS, 2006).

This assessment aims to consider and assess the bushfire hazard and associated potential threats relevant to such a proposal, and to outline the minimum mitigative measures which would be required in accordance with the provisions of the Environmental Planning And Assessment Amendment (Planning for Bushfire Protection) Regulation 2007 and the Rural Fires Amendment Regulation 2007 (RF Amendment Regulation 2007).

Due recognition of Planning for Bushfire Protection 2006 has been considered in the assessment method and consultation with the Rural Fire Service where required.

This assessment aims to consider and assess the bushfire hazard and associated potential threats relevant to the proposal. Recommendations are provided with regard to fuel management, access, provision of emergency services, building protection and construction standards to facilitate an acceptable level of bushfire protection.

If the recommendations contained within this report are duly considered and incorporated, it is considered that the fire hazard present is containable to a level necessary to provide an adequate level of protection to life and property on the site.

In summary, the following is recommended to enable the proposal to meet the relevant legislative requirements:

- APZs are required on the western, eastern and southern boundaries of two separate areas of the project area varying in distances from 20-35m.
- Any future dwelling within the proposed development estates should have due regard to the specific considerations given in the BCA, which makes specific reference to the Australian Standard (AS3959 – 2009) construction of buildings in bushfire prone areas. Refer to Table 6-1 for required Construction Standards for individual lots.
- Any future Gas connections should have due regard to AS 1596-2002.
- Site access will be gained via the existing road network and extensions of such. Any future residential development proposal must comply with the provisions of PBP (2006) and also investigate the opportunity for secondary emergency ingress/egress.
- It is assumed the development is linked to the existing mains pressure water supply and that suitable hydrants be clearly marked and provided for the purposes of bushfire protection. Fire hydrant spacing, sizing and pressure should comply with AS2419.1, 2005.
## Terms & Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
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<tr>
<td>APZ</td>
<td>Asset Protection Zone</td>
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<tr>
<td>AS2419-2005</td>
<td>Australian Standard – Fire Hydrant Installations</td>
</tr>
<tr>
<td>AS3959-2009</td>
<td>Australian Standard – Construction of Buildings in Bush Fire</td>
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<td>BCA</td>
<td>Building Code of Australia</td>
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<td>BPL Map</td>
<td>Bush Fire Prone Land Map</td>
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<td>Bush Fire Protection Measures</td>
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<td><em>NSW Environmental Planning and Assessment Act 1979</em></td>
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<td>FDI</td>
<td>Fire Danger Index</td>
</tr>
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<td>ha</td>
<td>Hectare</td>
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<td>IPA</td>
<td>Inner Protection Area</td>
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<td>Outer Protection Area</td>
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<td>Planning for Bushfire Protection 2006</td>
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<td>Rural Fires Act 1997</td>
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APPENDIX 1

Site Plan
1 Introduction

RPS has been engaged by Lake Macquarie City Council to undertake a Bushfire Threat Assessment (BTA) over the southern portion of the existing Killingworth township (Figure 1-1). It is comprised of three land parcels totalling 25.1 Ha, two of which are currently zoned 10 Investigation (Urban and Conservation) under the Lake Macquarie Local Environmental Plan (2004), having an area of approximately 15.3 Ha. The third land parcel is zoned 6(1) Open Space has an approximate area of 9.8 Ha. The study area is bounded by Park Street to the north, Westcroft Street to the west, and The Trongate to the east. The southern boundary of the study area adjoins native forest vegetation (refer to Figure 3-1). From here onwards the three parcels of land will be refered to as 1a, 1b and 1c (Figure 1-1).

This BTA is suitable for submission with a Development Application (DA) and provides information on measures that will enable the development to comply with ‘Planning for Bushfire Protection’ (NSW RFS, 2006).

This assessment aims to consider and assess the bushfire hazard and associated potential threats relevant to such a proposal, and to outline the minimum mitigative measures which would be required in accordance with the provisions of the Environmental Planning And Assessment Amendment (Planning for Bushfire Protection) Regulation 2007 and the Rural Fires Amendment Regulation 2007 (RF Amendment Regulation 2007).

1.1 Site Particulars

<table>
<thead>
<tr>
<th>Locality</th>
<th>Killingworth, NSW</th>
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<tbody>
<tr>
<td>LGA</td>
<td>Lake Macquarie</td>
</tr>
<tr>
<td>Bushfire Prone</td>
<td></td>
</tr>
<tr>
<td>Land Map Zoning</td>
<td>Bush Fire Prone land - Vegetation Category 1 apart from the easement crossing the Southeastern corner which is zoned Bush Fire Vegetation Buffer</td>
</tr>
<tr>
<td>Area</td>
<td>25.1ha</td>
</tr>
<tr>
<td>Zoning</td>
<td>Residential</td>
</tr>
<tr>
<td>Boundaries</td>
<td>1a is bordered by vegetation to the west, south and east and the northern boundary is adjacent to existing residential dwellings. 1b will remain as open space and lies between 1a and 1c. 1c is bordered by vegetation to the west and south and partially to the east and the northern boundary is adjacent to to existing residential dwellings. All boundaries for 1a and 1c will include a road post development</td>
</tr>
<tr>
<td>Current Land Use</td>
<td>Vegetation</td>
</tr>
</tbody>
</table>

Bushfire Threat Assessment, Final, August 2011
Climate / Fire

History

The site lies within a geographical area with a Fire Danger Index rating of 100. Extreme bushfire weather is therefore associated with long periods of drought, high temperatures, low humidity and gusty often north-westerly winds.
WARNING
No part of this plan should be used for critical design dimensions. Confirmation of critical positions should be obtained from RPS Newcastle.
1.2 **Description of Proposal**

The proposal is for a residential subdivision on 1a and 1c of the study area. Area 1b will remain undeveloped at this time. Refer to Appendix 1.

1.3 **Objectives of Assessment**

This assessment has been undertaken in accordance with Clause 46 of the RF Regulation 2007. This BTA also addresses the six key Bush Fire Protection Measures (BFRMs) in a development assessment context being:

1. The provision of clear separation of buildings and bushfire hazards, in the form of fuel-reduced Asset Protection Zones (and their components being Inner Protection Areas and Outer Protection Areas);
2. Construction standards and design;
3. Appropriate access standards for residents, fire-fighters, emergency workers and those involved in evacuation;
4. Adequate water supply and pressure;
5. Emergency management arrangements for fire protection and / or evacuation; and
6. Suitable landscaping to limit fire spreading to a building.
2 Methodology

2.1 Vegetation Assessment

Vegetation surveys and vegetation mapping carried out on the site has been undertaken as follows:

- Aerial Photograph Interpretation to map vegetation cover and extent;
- Site inspection; and
- Reference to regional vegetation community mapping.

2.2 Slope Assessment

Slope assessment has been undertaken as follows:

- Aerial Photograph Interpretation in conjunction with analysis of electronic contour maps with a contour interval of 2m and 10m.
3 Vegetation Assessment

In accordance with PBP (RFS 2006), an assessment of the vegetation over a distance of 140m in all directions from the study area was undertaken. Vegetation that may be considered a bushfire hazard was identified in all directions from the respective study area. Refer to Table 3-1, Table 3-2 and Figure 3-3 for vegetation description and location.

Table 3-1: Vegetation Classification of 1a

<table>
<thead>
<tr>
<th>Direction</th>
<th>Vegetation Community</th>
<th>Classification of Vegetation Formations</th>
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</thead>
<tbody>
<tr>
<td>North</td>
<td>Residential Lots</td>
<td>No Hazard</td>
</tr>
<tr>
<td>East</td>
<td>Coastal Plains Smooth-barked Apple Woodland</td>
<td>Hazard – Forest</td>
</tr>
<tr>
<td>South</td>
<td>Coastal Plains Smooth-barked Apple Woodland</td>
<td>Hazard – Forest</td>
</tr>
<tr>
<td>West</td>
<td>Coastal Foothills Spotted Gum-Ironbark Forest</td>
<td>Hazard – Forest</td>
</tr>
</tbody>
</table>

Table 3-2: Vegetation Classification of 1c

<table>
<thead>
<tr>
<th>Direction</th>
<th>Vegetation Community</th>
<th>Classification of Vegetation Formations</th>
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<tr>
<td>North</td>
<td>Residential Lots</td>
<td>No Hazard</td>
</tr>
<tr>
<td>East</td>
<td>Residential lots and some Coastal Plains Scribbly Gum Woodland</td>
<td>Hazard only where vegetation exists</td>
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<tr>
<td>South</td>
<td>Coastal Plains Smooth-barked Apple Woodland</td>
<td>Hazard – Forest</td>
</tr>
<tr>
<td>West</td>
<td>Coastal Plains Smooth-barked Apple Woodland</td>
<td>Hazard – Forest</td>
</tr>
</tbody>
</table>
4 Effective Slope Assessment

In accordance with PBP (RFS 2006), an assessment of the slope affecting the bushfire behaviour was undertaken for a distance of 100m from the edge of the respective study area boundary in the direction of the bushfire hazard.

The slopes leading away from the study area have been evaluated to identify both the average slope and by identifying the maximum slope present. These values help determine the level of gradient which will most significantly influence the fire behaviour of the site.

The slope of vegetation surrounding each development estate to 100m is documented in Table 4-1 and Table 4-2 below.

<table>
<thead>
<tr>
<th>Table 4-1: Slope Assessment of area 1a</th>
</tr>
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<tbody>
<tr>
<td><strong>Direction</strong></td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td>East</td>
</tr>
<tr>
<td>South</td>
</tr>
<tr>
<td>West</td>
</tr>
</tbody>
</table>

* Topographic alterations on the southern boundary will require a variation in the APZ distance along this boundary.

<table>
<thead>
<tr>
<th>Table 4-2: Slope Assessment of area 1c</th>
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<tbody>
<tr>
<td><strong>Direction</strong></td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td>East</td>
</tr>
<tr>
<td>South</td>
</tr>
<tr>
<td>West</td>
</tr>
</tbody>
</table>
5 Determining Appropriate Setbacks

5.1 Asset Protection Zones

An Asset Protection Zone (APZ) is an area surrounding a development that is managed to reduce the bushfire hazard to an acceptable level to mitigate the risk to life and property (refer to Figure 5-1 below). The required width of the APZ varies with slope and the type of hazard. An APZ can consist of both an Inner Protection Area (IPA) and an Outer Protection Area (OPA). An APZ can include the following:

- Lawns;
- Discontinuous gardens;
- Swimming pools;
- Driveways;
- Unattached non-combustible garages with suitable separation from the dwelling;
- Open space / parkland; and
- Car parking.

Figure 5-1: Components of an APZ (PBP 2006)
5.2 **Inner Protection Area**

The IPA extends from the edge of the OPA to the development. The IPA aims to ensure that the presence of fuels which could contribute to a fire event / intensity, are minimized close to the development. The performance of the IPA must be such that:

- There is minimal fine fuel at ground level which could be set alight by a bushfire; and
- Any vegetation in the IPA does not provide a path for the transfer of fire to the development – that is, the fuels are discontinuous.

The presence of a few shrubs or trees in the IPA is acceptable provided that they:

- Do not touch or overhang any buildings;
- Are well spread out and do not form a continuous canopy;
- Are not species that retain dead material or deposit excessive quantities of ground fuel in a short period or in a danger period; and
- Are located far enough away from any dwelling so that they will not ignite the dwelling by direct flame contact or radiant heat emission.

Woodpiles, wooden sheds, combustible material storage areas, large areas / quantities of garden mulch, stacked flammable building materials etc are not permitted in the IPA.

5.3 **Outer Protection Area**

The OPA is located adjacent to the hazard. Within the OPA any trees and shrubs should be maintained in a manner such that the vegetation is not continuous. Fine fuel loadings should be kept to a level where the fire intensity expected will not impact on adjacent developments.

5.4 **Determining the Appropriate Setbacks**

The site lies within the Lake Macquarie LGA and therefore is assessed under an FDI rating of 100. In accordance with Table A2.4 within PBP (RFS, 2006), the appropriate width setbacks have been calculated based on the topography and the vegetation present in and around the site at the time of inspection. Refer to Tables 5-1 and 5-2.

Based on the vegetation and slope assessment on the western, southern and eastern aspects, APZ’s are required within the respective study areas. Along the southern boundary of area 1a the topography changes, consequently requiring a varied APZ width in response to the different slopes (Refer to Figure 5-2).
### Table 5-1: Slope Assessment of area 1a

<table>
<thead>
<tr>
<th>Direction</th>
<th>Vegetation Type</th>
<th>Slope Class</th>
<th>Required APZ</th>
<th>APZ Components</th>
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<tr>
<td>East</td>
<td>Forest</td>
<td>Cross-slope and Upslope</td>
<td>20m</td>
<td>10m IPA 10m OPA</td>
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<td>South</td>
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<td>Downslope 5°-10°</td>
<td>35m</td>
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<td></td>
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<td>Upslope</td>
<td>20m</td>
<td>10m IPA 10m OPA</td>
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<tr>
<td>West</td>
<td>Forest</td>
<td>Cross-slope</td>
<td>20m</td>
<td>10m IPA 10m OPA</td>
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### Table 5-2: Slope Assessment of area 1c

<table>
<thead>
<tr>
<th>Direction</th>
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<th>Slope Class</th>
<th>Required APZ</th>
<th>APZ Components</th>
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<tr>
<td>East</td>
<td>Hazard only where vegetation exists</td>
<td>Cross-slope</td>
<td>20m</td>
<td>10m IPA 10m OPA</td>
</tr>
<tr>
<td>South</td>
<td>Hazard – Forest</td>
<td>Downslope 5°-10°</td>
<td>35m</td>
<td>20m IPA 15m OPA</td>
</tr>
<tr>
<td>West</td>
<td>Hazard – Forest</td>
<td>Cross-slope and Upslope</td>
<td>20m</td>
<td>10m IPA 10m OPA</td>
</tr>
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6 Dwelling Design and Construction

Building design and the materials used for construction of future dwellings should be chosen based on the information contained within AS3959-2009, and accordingly the designer/architect should be made aware of this recommendation. It may be necessary to have dwelling plans checked by the architect involved to ensure that the proposed dwelling meets the relevant Bushfire Attack Level (BAL) as detailed in AS3959-2009.

The determinations of the appropriate BAL are based upon parameters such as weather modelling, fire-line intensity, flame length calculations, as well as vegetation and fuel load analysis. The determination of the construction level is derived by assessing the:

- Relevant FDI = 100
- Flame temperature
- Slope
- Vegetation classification; and
- Building location.

The following BAL, based on heat flux exposure thresholds, are used in the standard:

(a) **BAL – LOW** The risk is considered to be **VERY LOW**

There is insufficient risk to warrant any specific construction requirements but there is still some risks.

(b) **BAL – 12.5** The risk is considered to be **LOW**

There is a risk of ember attack.

The construction elements are expected to be exposed to a heat flux not greater than 12.5 kW/m².

(c) **BAL – 19** The risk is considered to be **MODERATE**

There is a risk of ember attack and burning debris ignited by wind borne embers and a likelihood of exposure to radiant heat.

The construction elements are expected to be exposed to a heat flux not greater than 19 kW/m².

(d) **BAL-29** The risk is considered to be **HIGH**

There is an increased risk of ember attack and burning debris ignited by windborne embers and a likelihood of exposure to an increased level of radiant heat.
The construction elements are expected to be exposed to a heat flux no greater than 29 kW/m².

(e) BAL-40 The risk is considered to be VERV HIGH

There is much increased risk of ember attack and burning debris ignited by windborne embers, a likelihood of exposure to a high level of radiant heat and some likelihood of direct exposure to flames from the fire front.

The construction elements are expected to be exposed to a heat flux no greater than 40 kW/m².

(f) BAL-FZ The risk is considered to be EXTREME

There is a extremely high risk of ember attack and burning debris ignited by windborne embers, a likelihood of exposure to an extreme level of radiant heat and direct exposure to flames from the fire front.

The construction elements are expected to be exposed to a heat flux greater than 40 kW/m².

6.1 Bushfire Attack Level for the Proposed Dwelling

Using the Addendum: Appendix 3 (NSW Rural Fire Service, 2010), the information relating to vegetation, slope as presented within this report and according to Table 2.4.2 of AS3959-2009 the BAL for the site was calculated. Table 6-1 details the required BAL and Figure 6-1 illustrates the same.
### Table 6-1: BAL for the future Development Area 1a

<table>
<thead>
<tr>
<th>Direction</th>
<th>Vegetation Type</th>
<th>Average Slope of Land (degrees)</th>
<th>Separation Distance</th>
<th>Bushfire Attack Level (BAL)</th>
<th>Construction Section</th>
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<tr>
<td>West</td>
<td>Forest</td>
<td>Upslope</td>
<td>20-&lt;25m</td>
<td>BAL-40</td>
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<td>25-&lt;35m</td>
<td>BAL-29</td>
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<td>35-&lt;48m</td>
<td>BAL-19</td>
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<td>BAL-12.5</td>
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<td>BAL-12.5</td>
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<td>Forest</td>
<td>Downslope 5-10°</td>
<td>35-39m</td>
<td>BAL-40</td>
<td>Sect 5 to 8 of AS3959-2009 and Sect A3.7 of PBP Addendum Appendix 3</td>
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<td></td>
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<td>39-53m</td>
<td>BAL-29</td>
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<td>BAL-12.5</td>
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<td></td>
<td>35-48m</td>
<td>BAL-19</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>48-&lt;100m</td>
<td>BAL-12.5</td>
<td></td>
</tr>
</tbody>
</table>

### Table 6-2: BAL for the future Development Area 1c

<table>
<thead>
<tr>
<th>Direction</th>
<th>Vegetation Type</th>
<th>Average Slope of Land (degrees)</th>
<th>Separation Distance</th>
<th>Bushfire Attack Level (BAL)</th>
<th>Construction Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>West</td>
<td>Forest</td>
<td>Upslope 0°</td>
<td>20-25m</td>
<td>BAL-40</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>25-35m</td>
<td>BAL-29</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>35-48m</td>
<td>BAL-19</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>48-&lt;100m</td>
<td>BAL-12.5</td>
<td></td>
</tr>
<tr>
<td>South</td>
<td>Forest</td>
<td>Downslope &gt;5-10°</td>
<td>35-39m</td>
<td>BAL-40</td>
<td>Sect 5 to 8 of AS3959-2009 and Sect A3.7 of PBP Addendum Appendix 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>39-53m</td>
<td>BAL-29</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>53-69m</td>
<td>BAL-19</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>69-&lt;100m</td>
<td>BAL-12.5</td>
<td></td>
</tr>
<tr>
<td>East</td>
<td>Forest</td>
<td>Upslope 0°</td>
<td>20-25m</td>
<td>BAL-40</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>25-35m</td>
<td>BAL-29</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>35-48m</td>
<td>BAL-19</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>48-&lt;100m</td>
<td>BAL-12.5</td>
<td></td>
</tr>
</tbody>
</table>
To Note: The construction requirements for the next lower BAL than that determined for the site may be applied to an elevation of the building where the elevation is not exposed to the source of bushfire attack. An elevation is deemed to be not exposed to the source of bushfire attack if all straight lines between that elevation and the source of bushfire attack are obstructed by another part of the building.
7 Access

Access to the study area will be gained via an extension of the existing road and streetscape network. Specifically, site access will be off The Boulevarde for area 1a and Throckmorton Street for 1c. The primary ingress/egress to the suburb of Killingworth is via a single entry point known as The Broadway.

It is assumed that the existing road network complies with the aims and intent of PBP (2006), however all future roads must comply with the performance criteria of PBP (2006). Furthermore, a perimeter road is recommended for the future development areas of the study area to provide defendable space and aid in ingress/egress in a bushfire event. An alternate secondary point of emergency ingress/egress should be investigated in the form of fire trails.

8 Water

It is assumed that main supply water will be extended into the study area to cater for future development has been established with due reference to the provisions of PBP (2006) and the Australian Standard relating to the establishment of fire hydrants.

9 Gas

Any reticulated or bottled gas should be installed and maintained according to the requirements of the relevant authorities and AS 1596 – 2002. It is expected that the location of gas services will not lead to ignition of surrounding bushland or the fabric of buildings.

10 Fire Fighting Capability

To facilitate quick and efficient action by the Fire Brigade / Rural Fire Service upon arrival, it is recommended that all necessary connections be clearly marked and visible, and in good working order.
II Landscaping

Landscaping should be designed and managed to minimise flame contact and radiant heat to buildings and the potential for wind driven embers to cause ignitions.

In choosing plants for landscaping consideration should be given to plants that possess properties, which help to protect buildings. If the plants themselves can be prevented from ignition, they can improve the defence of buildings by:

- filtering out wind-driven burning debris and embers;
- acting as a barrier against radiation and flame; and
- reducing wind forces.

Consequently landscaping of the site should consider the following:

- meet the specifications of an IPA detailed in PBP 2006;
- priority given to retaining or planting species which have a low flammability and high moisture content;
- priority given to retaining or planting species which do not drop much litter in the bushfire season and which do not drop litter that persists as ground fuel in the bushfire season; and
- create discontinuous or gaps in the vegetation to slow down or break the progress of fire towards the dwellings.
12 Conclusion and Recommendations

It is clear from this investigation and assessment that the site, in part constitutes BFPL. Therefore the proposed residential development will have to be carried out in accordance with the specifications contained within PBP (RFS 2006) as assessed and presented within this report.

If the recommendations contained within this report are duly considered and incorporated, it is considered that the fire hazard present is containable to a level necessary to provide an adequate level of protection to life and property on the site.

In summary, the following is recommended to enable the proposal to meet the relevant legislative requirements:

- A 20m APZ is required on the western boundary of 1a
- A 20m and 35m APZ is required on the south boundary of 1a.
- A 20m APZ is required on the eastern boundary of 1a.
- A 20m APZ is required on the western boundary of 1c.
- A 35m APZ is required on the south boundary of 1c.
- A 20m APZ is required on the lower portion of the eastern boundary.
- Any future dwelling within the proposed development estates should have due regard to the specific considerations given in the BCA, which makes specific reference to the Australian Standard (AS3959 – 2009) construction of buildings in bushfire prone areas. Refer to Table 6-1 for required Construction Standards for individual lots.
- Any future Gas connections should have due regard to AS 1596-2002.
- Site access will be gained via the existing road network and extensions of such. Any future residential development proposal must comply with the provisions of PBP (2006) and also investigate the opportunity for secondary emergency ingress/egress.
- It is assumed the development is linked to the existing mains pressure water supply and that suitable hydrants be clearly marked and provided for the purposes of bushfire protection. Fire hydrant spacing, sizing and pressure should comply with AS2419.1, 2005.
13 **Bibliography**

Department of Bush Fire Services (undated). *Bush Fire Readiness Checklist.*


*Rural Fires and Environmental Assessment Legislation Amendment Act 2002.*

Appendix I

Site Plan