**BUSHFIRE RISK ASSESSMENT REPORT** 

**REDEVELOPMENT OF DEFENCE HOUSING'S** 

ACADEMY CLOSE ESTATE, BLOCK 3, SECTION 65 DISTRICT OF CAMPBELL,

**AUSTRALIAN CAPITAL TERRITORY** 

PREPARED FOR

**DEFENCE HOUSING AUSTRALIA** 

Australian Bushfire Protection Planners Pty Limited.

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**Bushfire Mitigation Consultants** 

**BUSHFIRE RISK ASSESSMENT REPORT** 

# FOR THE

# **REDEVELOPMENT OF THE EXISTING**

DEFENCE HOUSING'S ACADEMY CLOSE ESTATE,

**BLOCK 3, SECTION 65** 

**DISTRICT OF CAMPBELL**,

**DIVISION OF CANBERRA CENTRAL** 

**AUSTRALIAN CAPITAL TERRITORY** 

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**DEFENCE HOUSING AUSTRALIA** 

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# EXECUTIVE SUMMARY

Australian Bushfire Protection Planners Pty Limited has been commissioned by Defence Housing Australia to prepare a Bushfire Risk Assessment that determines the level of bushfire risk and the protection measures required to mitigate the risk to the proposed redevelopment of Defence Housing's 'Academy Close' residential estate on Block 3, Section 65, District of Campbell, Division of Canberra Central.

The advice contained within this report provides the bushfire planning principles to be used in the construction of the proposed redevelopment of the site.

**Section 1** of this report outlines the background to the assessment and describes the site and details desk-top assessment of the site.

**Section 2** of the report provides a description of the site and the precinct [study area] it is contained within. It examines the topography as well as the vegetation both within and external to the site.

**Section 3** determines the bushfire risk to the proposed residential development by examining background information on the:

- Fire history of the area;
- Ignition and fire sources;
- Climate and weather;
- Wind and fire paths;
- Slope;
- Bushfire fuels;
- Assessment of the fuel hazard;
- Likelihood of each fire scenario;
- Description of the Asset Interface Classification;
- Risk statement; and
- Summary of the bushfire risk.

**Section 3** examines the context of bushfire risk within the ACT.

**Section 4** outlines a range of factors influencing bushfire risk and identifies the broad strategies to manage the risk and examines the two elements of risk – *likelihood* which is described as the chances of a bushfire occurring, and *consequence*, the impact of the bushfire when it occurs.

**Section 4** also undertakes an assessment of the potential bushfire risk to the proposed development and determines the level of risk. The details of the bushfire protection measures required to be put in place and fully implemented to reduce the level of risk to the new assets are provided in **Section 5**.

This Section describes the measures for:

- The provision of Asset Protection Zones; access and water supplies; and
- Construction standards to the buildings.

**Section 6** and examines the residual risk once the bushfire protection measures recommended are implemented.

The conclusions to the assessment are outlined in **Section 7** of the report. These include:

- The assessment undertaken in this report has found that the bushfire risk to the proposed redevelopment on the site, prior to the implementation, is extreme/high; and
- If the protection measures recommended in this report are fully implemented, the level of risk will reduce to high/moderate.

Concham Swain

Graham Swain, Managing Director *Australian Bushfire Protection Planners Pty Limited.* 

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# **SECTION 1**

## INTRODUCTION

#### 1.1 Aim of this Report.

Australian Bushfire Protection Planners Pty Limited has been commissioned by Defence Housing Australia to prepare a Bushfire Risk Assessment that determines the level of bushfire risk and the protection measures required to mitigate the risk to the proposed redevelopment of Defence Housing's 'Academy Close' residential estate on Block 3, Section 65, District of Campbell, Division of Canberra Central.

#### **1.2 Objectives of the Report.**

The objectives of the report are to:

- Identify the level of risk to the proposed residential redevelopment in accordance with best practice bushfire risk management, Australian Standard AS/NZS ISO 31000:2009 and the requirements of A.S. 38959 – 2009.
- > Identify how levels of risk can be mitigated.

The Bushfire Risk Assessment will be undertaken to assess the potential bushfire risk and identify those protection measures required to mitigate the risk. This will include specific recommendations on fuel management, the location of Asset Protection Zones and any other measures to deemed necessary to protect the proposed development against the impact of a bushfire event in the vegetation on the land adjacent to the site.

#### 1.3 Scope of Work.

The following is an outline of the scope of work undertaken in the assessment of bushfire risk to the proposed development:

- Identify and describe the study area environment;
- Establish the context of the bushfire risk;
- Identify measures that might assist to reduce bushfire risk;

#### 1.4 Proposed Development.

Defence Housing Australia is proposing to demolish the existing housing stock within the Academy Close estate on Block 3, Section 65 Campbell and construct twenty two [22] single dwellings and eighteen [18] two storey duplex dwellings for Australian Defence Force Employees.

The site contains a total area of 2.72 hectares and is currently used as housing for Australian Defence Force employees.

The site has a frontage of approximately 100 metres to Fairbairn Avenue and 130 metres to Truscott Street located to the south of Fairbairn Avenue and east of Truscott Street and contains existing detached dwellings and an internal road network.

The site is currently occupied by 22 single and double-storey dwellings which face a narrow sealed loop road wholly located within the site. There is a children's play area in the centre of the site.

A high pressure water pipeline is located along the western of the site while the eastern boundary is flanked by twin 132Kv overhead sub-transmission power lines.

Access to the site is via a single entry road off Truscott Street, to the west of the site.

Refer to Figure 1 – Survey Plan showing location of existing dwellings and contours on Page 7.

Refer to Figure 2 – Academy Close Masterplan on Page 8.



Figure 1 – Survey Plan showing location of existing dwellings and contours

Figure 2 – Academy Close Masterplan



# SECTION 2 DESCRIPTION OF THE BUSHFIRE STUDY AREA

#### 2.1 The Study Area.

For the purpose of examining the potential bushfire risk to the site a study area has been established which includes the land surrounding the site for a distance of 300 metres. Figure 3 below provides a graphical representation of the 'Study Area'.





#### 2.2 Site Assessment.

Graham Swain undertook a desk-top assessment of the study area, including general knowledge of the location of the site and the landscape surrounding the site. This assessment reviewed the general topography and gradients of the land and vegetation classification within the site and study area.

The ACT Bushfire Prone Land Map, aerial photography and contour maps were also reviewed.

#### 2.3 Existing Land Use.

The site is currently occupied by 22 single and two storey dwellings housing Australian Defence Force personnel, internal access roads and landscaping on National Land which is zoned RZ1 - Suburban.

#### 2.4 Adjoining Land Use.

Figure 4 on Page 12 provides an extract from the ACT Territory Plan which identifies that the land to the west of the site is zoned RZ1 – Suburban.

The land to the north of the development site contains the Fairbairn Avenue road corridor, beyond which Mt Ainslie Nature Park extends to the north.

To the east of the site the land contains a narrow corridor of Canberra Nature Park across which runs a power line easement of approximately 40 metre width containing two 132Kv power lines.

The land to the south of the development site forms part of the Canberra Nature Park. Northcott Drive extends along the eastern edge of the Nature Park.

Duntroon Military College occupies the land to the east of Northcott Drive.

Refer to Figure 4 – Copy of ACT Territory Plan on Page 12.

Refer to Figure 5 – Copy of ACT Bushfire Prone Land Map on Page 13.

Refer to Figure 6 – Copy of Aerial Photograph on Page 14.

Figure 4 – Territory Plan.



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Figure 5 – ACT Bushfire Prone Land Map - ESA.

Figure 6 – Aerial Photograph of the development site and adjoining lands.



#### 2.5 Topography.

The site is elevated at its southern end with a fall towards Fairbairn Avenue of approximately 12 metres and a cross-fall from Truscott Street to the eastern boundary of between 0 - 2 metres with the lowest point on the site being in the northeast corner, adjacent to Fairbairn Drive.

The land within the Nature Park to the east of the site falls to the northeast. The land to the south of the site, within the Nature Park, rises to the south.

The land to the northeast of the site, beyond the Fairbairn Drive corridor, falls to the southeast, running along the contours in a north-easterly direction while the land to the north and northwest of the site, beyond the road corridor, rises to the north and northwest across the adjacent Nature Park, towards Mt Ainslie.

Refer to Figure 7 – Contour Plan on Page 15.

Figure 7 – Contour Plan



#### 2.6 Vegetation within the Site.

The vegetation on the development site includes managed gardens and managed lawns within the curtilage to the existing dwellings.

The western portion of the site, within that section of the site which contains the high pressure water main, contains woodland vegetation which is managed.

#### 2.7 Vegetation on land adjoining the Site.

Canberra Nature Park to the northwest, north and northeast of the site [beyond the Fairbairn Drive corridor] contains woodland vegetation.

Similarly, the Nature Park to the east and south of the site contains woodland vegetation.

The Powerline Easement adjoining the eastern boundary of the site contains grassland vegetation which is managed by periodic slashing. The woodland to the south of the site is also managed by periodic slashing of the grassland vegetation.

Refer to Site Photographs below.



Site Photograph 1 – Taken from Fairbairn Drive looking to the southwest showing the managed fire break adjacent to the eastern boundary of the site.



Site Photograph 2 – Taken from Fairbairn Drive looking to the west showing the managed road verge to the northeast of the site.



Site Photograph 3 – Taken from the intersection of Truscott Street and Academy Close showing the managed woodland vegetation on the land within the western portion of the site.



Site Photograph 4 – Taken from the intersection of Truscott Street and Academy Close looking to the northeast showing the managed vegetation on the land within the western portion of the site.



Site Photograph 5 – Taken from Academy Close showing the managed woodland vegetation on the land within the western portion of the site [on right].



Site Photograph 6 – Taken from Academy Close looking to the northeast showing the Powerline Easement to the east of the site.



Site Photograph 7 – Taken from Academy Close looking to the northeast showing the Powerline Easement to the east of the site.

# 2.8 Ecological Constraints found on the land within and external to the site.

Figure 8 below provides a copy of the ACTMAPi Woodland Vegetation Map which identifies that the Nature Park to the east and south of the site contains woodland vegetation.



### Figure 8 – ACTMAPi Woodland Vegetation Map

# **SECTION 3.**

## CONTEXT OF THE BUSHFIRE RISK ASSESSMENT

The ACT Government enacted the *Emergencies Act 2004,* as part of its response to the needs identified by the McLeod Inquiry to replace the *Bushfire Act 1936* and sets the legislative basis for bushfire related planning.

Resulting from the changes in legislation, the ACT Planning & Land Authority prepared *"Planning for Bushfire Risk Mitigation",* a guideline adopted under the Territory Plan, that provides guidance to mitigate adverse impacts from bushfires in the ACT.

The Guideline is one of many documents that informs planning and development in the ACT and is taken into account by the ACT Planning & Land Authority when determining development applications and is complementary to the ACT Emergency Services Authority's *Strategic Bushfire Management Plan,* a strategic document outlining measures for the Prevention, Preparedness, Response and Recovery from bushfire in the ACT.

A *Bushfire Prone Area* for the ACT was declared through the *Building Regulations* and came into effect on the 1<sup>st</sup> September 2004. Under the declaration, all parts of the ACT outside the defined urban area have been designated bushfire prone and the Authority, under Part A (Consideration of Land Use and Development Proposals) of the Territory Plan, can require a site specific bushfire risk assessment to be undertaken during the planning/design process.

This Bushfire Risk Assessment addresses this requirement and has been undertaken using the *Australian Standard for Risk Management* AS/NZS ISO 31000:2009 and A.S. 3959 - 2009.

This assessment determines the level of bushfire risk on the proposed development.

# **SECTION 4**

# BUSHFIRE RISK ASSESSMENT – PROPOSED REDEVLOPMENT OF THE DHA ACADEMY CLOSE RESIDENTIAL ESTATE

#### 4.1 Introduction.

The Australian Standard AS/NZS ISO 31000:2009 and the Emergency Management Australia (EMA) emergency risk management process provide the framework for establishing the context, analysis, evaluation, treatment, monitoring and communication of risk.

Risk has two elements: likelihood, the chances of a bushfire occurring and consequence, the impact of a bushfire when it occurs.

Bushfire risk is defined as the chance of a bushfire occurring that will have harmful consequences to human communities and the environment. Bushfire risk is usually assessed through consideration of the likelihood of ignition and consequences of a bushfire occurring. Risk reduction can be achieved by reducing the likelihood of a bushfire, the opportunity for a bushfire to spread or the consequence of a bushfire (on natural and built assets).

Bushfire management should have a clear objective to reduce both the likelihood of bushfires and reduce the negative impacts of bushfires. It should also consider the costs, inconvenience and dangers of measures taken to reduce the risk of bushfires.

The consequences of bushfire management activities and the failure to implement programs also need to be considered. A range of factors influence bushfire risk – these include:

- The likelihood of human and natural fire ignitions, as influenced by time, space and demographics;
- The potential spread and severity of a bushfire, as determined by fuel, topography and weather conditions;
- The proximity of assets vulnerable to bushfire fuels, and likely bushfire paths; and
- The vulnerability of assets including natural assets, or their capacity to cope with, and recover from bushfire.

#### 4.2 Management Strategies.

Broad strategies to manage bushfire risk include:

- Eliminate the bushfire risk (make the land-use decision first by asking the question about whether development should or should not proceed in a given area);
- Design or substitution (review boundary locations and shape, change the types of land-use policy);
- Engineering controls (infrastructure, building standards and landscaping) and
- Administration and organisation; (community preparedness measures).

#### 4.3 Risk Assessment.

An assessment of bushfire risk must firstly define the problem. This involves the identification of the nature and scope of issues to be addressed and defining the possible boundaries for the assessment (*Emergency Risk Management – Applications Guide.* (*EMA Echo Press, 2000*), and AS/NZS ISO 31000:2009).

For the purpose of analysing fire risks that might emerge in the ACT, a dangerous and damaging fire has the potential to occur when the following conditions prevail:

- Continuous available fuel fuel at moisture content sufficiently low to enable rapid combustion, arising from drought effects or the maturing and drying, of grasslands;
- Exposure of vulnerable assets. The 'catchment' for such fires may be within several hundred metres or many (60-70) kilometres from the asset/s;
- A combination of weather conditions that generate a forest or grass fire danger index of Very High (24) or greater. Typically in the ACT, prevailing adverse fire weather will have a strong northerly, through to south-westerly wind influence;
- A fire in the landscape which is not effectively suppressed.

The preliminary assessment of the risk to the DHA Academy Close residential estate was undertaken during the site assessment and previous site inspections and identified that the facility will be exposed to the risk of:

- A north-westerly/northerly fire path, burning through the woodland vegetation on the Canberra Nature Park that extends to the northwest, north and northeast of the site – beyond the Fairbairn Drive road corridor;
- A north-easterly fire path, burning through the woodland vegetation on the Canberra Nature Park that extends to the northeast of the site – beyond the Fairbairn Drive road corridor;
- A south-easterly fire path, burning through the woodland vegetation on the Canberra Nature Park to the east and south of the site.

The following Risk Assessment and resultant recommendations seek to address the protection of the proposed development from the impact of unplanned fire events identified above by examining:

- Fire History;
- Exposure to possible ignition / fire sources;
- Vegetation type and likely fuel loads and fire hazards arising using the "Overall Fuel Hazard Guide" – Fourth Edition (DSE July 2010);
- The impact of climate and likely fire runs during severe fire danger periods;
- Wind effects; and
- The impact of surrounding land uses and fuel loads.

#### 4.4 Fire History.

The Strategic Bushfire Management Plan for the ACT [version one] states: "The ACT has a history of severe damaging bushfires with large areas burnt in the bushfire seasons of 1919/20; 1925/26; 1938/39; 1951/52; 1978/79; 1982/83; 1984/85; 2000/01 and in 2002/03".

"Intervals between recorded severe fire seasons range from two years to twenty seven years". "Planning to reduce the likelihood and consequence of bushfires in the ACT must take into account the full range from small grass fires to landscape-wide severe fires".

Figure 1 of the *Strategic Bushfire Management Plan for the ACT - 2005* identifies the approximate location of major fires and shows that the site has not been impacted by a major fire event.

#### 4.5 Ignition / Fire Sources.

Causes of bushfires, including those in the ACT, are natural or human caused. Fires caused by humans can be categorised as:

- Malicious including arson;
- Careless such as escaped campfires, children and burning off without a permit; and
- Accidental uncommon but includes motor vehicle and industrial accidents.

The only common natural cause of bushfires in the ACT is lightning. The majority of fire ignitions in the ACT are arson, and arson ignitions are correlated to the demographics of the ACT. People are the major source of bushfire ignitions and where people concentrate, bushfires occur most frequently. Most bushfires occur in or near the built-up areas of Canberra.

The largest areas burnt are attributed to lightning ignitions, which are dispersed across the landscape.

The causes of a bushfire that may impact the site are varied.

Accidental or malicious ignition of the vegetation within the Canberra Nature Park to the northwest, north and northeast of Fairbairn Drive and also adjacent to the site is possible as is the ignition of the vegetation along the road verges, the powerline easement during slashing/mowing operations.

#### 4.6 Climate and Weather.

The ACT has a relatively dry, continental climate with warm to hot summers and cool to cold winters. The climate of Canberra is strongly influenced by a band of high pressure systems located around the globe at about 30 - 40S, known as the sub-tropical ridge.

During summer, the sub-tropical ridge is located over southern Australia resulting in warm to hot conditions with winds generally from the east through to northwest.

The average annual rainfall is 629 mm with an average of 108 rain days per year with rainfall reasonably evenly distributed throughout the year with the wettest month being October and the driest being June.

Rainfall tends to be influenced by cold fronts during the winter 6 months and thunderstorm activity during the summer 6 months. While rainfall in most years is reasonably reliable, drier than average years are closely related to ENSO events in the Pacific Ocean and all significant droughts have occurred in El Nino years and these years tend to be significant bushfire seasons as well.

Rainfall across the ACT varies considerably, with much higher rainfall occurring in the ranges to the west and less rainfall to the east.

January is the hottest month with a mean daily maximum temperature of 27°C and an average of 10 days of 30°C or more with 2 days of 35°C or more. Canberra tends to get cooler easterly winds penetrating from the coast during many summer evenings which can sometimes bring cloud in with the moister air.

The highest recorded maximum temperature was  $42.2^{\circ}$ C on February 1<sup>st</sup> 1968 followed closely by  $41.4^{\circ}$ C on the previous day [ $31^{st}$  January 1968]. Relative humidity in Canberra is around 37 - 40% at 3pm in summer.

The fire season in the ACT corresponds with the summer months' high temperatures and low rainfall, and can occur from September to April with a proclaimed bushfire danger period from October to March. There is significant variability from year to year. Fire seasons may be serious in three out of every 15 years, but this can vary considerably.

Extreme and uncontrollable bushfires typically occur when the fire danger rating is over 50, a rating of Extreme. Many of the major house loss events have occurred at fire danger ratings over 70, on a scale of 0 to 100.

Analysis of 1951 – 2004 meteorological records identified 105 days of Extreme fire danger from the Forest Fire Danger Index (FFDI) at Canberra airport. These were broken down into the following FFDI ratings:

- ➢ 61 days 50 59 FFDI;
- ≻ 25 days 60 69 FFDI;
- ➢ 9 days 70 79 FFDI;
- ➤ 4 days 80 89 FFDI; and
- ➤ 6 days 90 100.

Eighteen percent [18%] of January days had Very High FFDI and 2% of January days had Extreme FFDI.

The Very High and Extreme Forest Fire Danger conditions mainly occur between November and March. *[Source SBMP for the ACT].* 

[The (McArthur) Forest Fire Danger Index (FFDI) was developed in the 1960s by CSIRO scientist A.G. McArthur to measure the degree of danger of fire in Australian forests. The index combines a record of dryness, based on rainfall and evaporation, with daily meteorological variables for wind-speed, temperature and humidity. A fire danger rating of between 12 and 25 on the index is considered a "high" degree of danger, while a day having a danger rating of over 50 is considered an "Extreme" fire danger day.

McArthur used the conditions of the Black Friday fires of 1939 as his example of a 100 rating. The FFDI on Black Saturday, 7th of February, 2009, reached as high as 180, the worst fire conditions ever recorded].

Canberra generally is not very windy with, on average, 25 days of strong winds a year. Late Winter/Spring tends to be the windiest time with just over half of these days [13 days] occurring in the four [4] months between August and November.

Wind is an important factor in bushfire behaviour as it influences the rate of spread of the fire front and spreads burning embers / sparks, providing ignition sources for spot fires ahead of the main fire front.

The proposed site is exposed to strong, hot and dry north-northwest and northerly wind influences which cause extreme to catastrophic fire weather conditions.

The site may be exposed to the influence of fires which burn under less intense southeast winds. Such fire events are normally more easily controlled by fire authorities.

#### 4.7 Slope & Fire Paths.

Slope is a critically important factor when assessing fire risk and likely behaviour. The rate of fire propagation doubles up a slope of 10 degrees (18%) and increases almost fourfold up a slope of 20 degrees (40%). The rate of progress downslope tends to slow at a corresponding rate however wind direction in the lee of hills/ridgelines can cause fires to change direction unpredictably.

The topography of the land within the Canberra Nature Park to the northeast of Fairbairn Drive varies between upslope to the northwest to downslope to the northeast.

The topography of the land within Canberra Nature Park adjoining the site falls to the northeast/east and southeast, and rises to the southwest.

Figure 9 on Page 28 provides a diagram of the potential northwest and southeast fire paths.

Figure 10 on Page 29 provides a diagram of the potential northerly and southerly fire path.

Figure 11 on Page 30 provides a diagram of the potential northeast fire path.



Figure 9 – Northwest and Southeast Fire Paths

Figure 10 – North and South Fire Paths



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Figure 11 – Northeast Fire Path



#### 4.8 Bushfire Fuels.

Fuel is a critical element in bushfire risk management, as it is the one factor relating to fire behaviour that can be managed.

There are four 'types' of fuel that contribute to bushfire hazard. They relate to the distribution and nature of combustible material within a vegetated environment and are defined by the Overall Fuel Hazard Guide – Fourth Edition (DSE July 2010), as:

- Bark;
- Elevated fuel load;
- Near Surface fine fuels; and
- Surface fine fuels;

Elevated material is defined as shrubs, heath and suspended material greater than 0.5 metres above ground. The level of bushfire hazard depends on fuel continuity, height, amount of dead material, foliage thickness and flammability of live foliage.

Flammability of vegetation is at the highest when composition is fine, it contains a lot of dead material, is dense vertically and horizontally and has low moisture content.

Surface fine fuels are defined as the litter bed and vegetation up to 0.5 metres above the ground. Grasses add to the surface fine fuels and therefore need to be taken into account when assessing the hazard. The risk is higher where greater depth and volume of litter and surface material are present.

Bark has the potential to travel significant distances in a fire situation (spotting) and act as a ladder between surface fuels and the forest crown. Bark contributes to fire hazard when it is loose and fibrous, present in large quantities and in long loose ribbon forms.

## 4.9 Assessment of Bushfire Fuel Hazard.

An overall Fuel Hazard for vegetation within the land adjoining the site can be determined using the DSE Overall Fuel Hazard Guide.

The fuel available to a fire burning on land adjacent to the site is created by the woodland within the Canberra Nature Park.

Therefore, the assessment of fuel hazard will be determined for unmanaged woodland vegetation.

## (1) Woodland Vegetation:

Using the methodology provided within the NRE Overall Fuel Hazard Guide, the following Fuel Hazard observation was determined for the woodland vegetation within the Canberra Nature Park:

#### • Bark Hazard :

The grassy woodland vegetation includes Yellow Box-Red Gum, which has a smooth trunk and long ribbons of bark into the crown of the tree. Therefore this vegetation has a High Bark hazard.

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#### • Elevated Fuel Hazard :

Elevated fuel comprises shrub, heath and suspended material. The level of hazard depends on the fuel continuity (horizontal and vertical), height, and proportion of dead material, thickness of the foliage and twigs and flammability of the live foliage.

The flammability of the elevated fuel is highest when:

- The foliage, twigs and other fuel particles are very fine (e.g. maximum thickness 1-2 mm);
- > The proportion of dead material is high;
- The fuels are arranged with a high level of density and horizontal and vertical continuity that promotes the spread of flame;
- > The live foliage has low, live fuel moisture content.

The vegetation type and time lapse since the most recent fire substantially determines the level of elevated fuel hazard.

An estimated Elevated Fuel Hazard of high was determined woodland vegetation.

#### • Near Surface & Surface Fine Fuel Hazard :

Surface Fine Fuel Hazard is assessed by measuring litter-bed height. Near surface fuels – i.e. grass tussocks, dead bracken, low shrubs or low wiregrass up to 0.5m high – interact with surface litter to increase fire behaviour and therefore need to be considered when assessing Surface Fine Fuel Hazard and the next highest Surface Fine Fuel Hazard rating.

Due to the possible extent of the 'near-surface fuels' component of this vegetation an estimated Surface Fine Fuel Hazard of High was determined for this vegetation.

The Overall Fuel Hazard for the woodland vegetation [without management] is Very High.

#### 4.10 Likely Fire Scenarios.

An assessment of the fire scenarios likely to impact the site has been undertaken, based on the potential fire paths identified on Figures 9, 10 and 11. This assessment assumes that the woodland vegetation within the Canberra Nature Park will not be managed to reduce/remove the fuel hazard.

#### Scenario 1:

A fire starting in the woodland vegetation within the Canberra Nature Park to the northwest and to the north of Fairbairn Drive, spreading under northwesterly/northerly winds towards the northern boundary of the site.

This potential fire impact may occur if the woodland vegetation is not managed and a fire occurs during fire seasons when conditions are such that the grassland vegetation has cured to > 70%, the Fire Danger Index is Extreme (FDI > 50) and the prevailing wind is from the northwest and north.

#### Scenario 2:

A fire starting in the woodland vegetation within the Canberra Nature Park to the northeast of Fairbairn Drive, spreading under north-easterly winds towards the northern boundary of the site.

This potential fire impact may occur if the woodland vegetation is not managed and a fire occurs during fire seasons when conditions are such that the grassland vegetation has cured to > 70%, the Fire Danger Index is Extreme (FDI > 50) and the prevailing wind is from the northeast.

#### Scenario 3:

A fire burning under south-easterly wind influences, spreading through the woodland vegetation in the Nature Park to the east and south of the site.

This potential fire impact may occur if the vegetation in the Canberra Nature Park is not managed and a fire occurs during fire seasons when conditions are such that the grassland vegetation has cured to > 70%, the Fire Danger Index is Extreme (FDI > 50) and the prevailing wind is from the southeast.

#### 4.11 Risk Statement.

Table 4 provides a statement of risk for the potential fire scenarios that may impact the site [prior to the implementation of the recommended mitigation measures being adopted / implemented] and assigns risk levels reflecting identified levels of likelihood and consequences for a fire occurrence which may occur if the vegetation is not managed to reduce the combustible fuels available to burn during severe fire weather conditions.

Table 1 provides a list of qualitative measures of consequence [or impact] whilst Table 2 provides a list of qualitative measures of likelihood – used to determine the level of risk in Table 4.

Table 3 provides a qualitative risk analysis matrix – used to determine the level of risk in Table 4.

## Table 1 – Qualitative Measures of Consequence [or Impact]

Level	Descriptor	Detail Description
1	Insignificant	No public safety injuries or impact to buildings
2	Minor	No public safety injuries – minor impact to buildings
3	Moderate	Burns and Respiratory problems – moderate damage to buildings
4	Major	Death of people exposed to radiant heat & major property damage
5	Catastrophic	Death of people exposed to radiant heat and total destruction of
		buildings

#### Table 2 – Qualitative Measures of Likelihood

Level	Descriptor	Detail Description
Α	Almost Certain	Is expected to occur during severe fire danger periods
В	Likely	Will probably occur during severe fire danger periods
С	Possible	May occur during severe fire danger periods
D	Unlikely	Unlikely to occur during severe fire danger periods
E	Rare	Will rarely occur during severe fire danger periods

# Table 3 – Qualitative risk analysis matrix – used to determine the level of risk in Table 4

			Risk Rati	ng				
	Consequences							
Likelihood	Insignificant	nsignificant Minor Moderate Ma		Major	Catastrophic			
	1	2	3	4	5			
A – almost certain	High	High	Extreme	Extreme	Extreme			
B – likely	Moderate	High	High	Extreme	Extreme			
C – possible	Low	Moderate	High	Extreme	Extreme			
D – unlikely	Low	Low	Moderate	High	Extreme			
E – rare	Low	Low	Moderate	High	High			

Table 4 – Bushfire Risk Register – Severe/Catastrophic Bushfire Event – if high levels of combustible fuels / unmanaged vegetation exist in the landscape adjoining the site.

The Risk What can happen?	The consequences & likelihood of an event happening		Consequence Rating	Likelihood Rating	Level of Risk
	Consequences	Likelihood			
(1) Fire burning in the woodland vegetation in the Canberra Nature Park to the northwest & northwest of the site, spreading across the landscape under N.W and northerly winds	Major	Possible	4	С	Extreme
(2) Fire burning in the woodland vegetation in the Canberra Nature Park to the N.E. of the site, spreading across the landscape northeast winds	Major	Possible	4	С	Extreme
(3) Fire burning in the woodland vegetation in the Canberra Nature Park to the east and southeast of the site, spreading across the landscape under south-easterly/southerly winds	Moderate	Possible	3	С	High

#### 4.12 Summary of Bushfire Risk.

No major bushfire has recently impacted the site however the risk remains that a significant fire event in the Canberra Nature Park burning under adverse fire weather conditions will present as an extreme level of risk to the site.

A fire in the Nature Park to the southeast and south of the site has the potential to spread rapidly to the northwest, under strong south-easterly winds.

Section 5 of this report examines the bushfire protection measures, derived from the ACT Strategic Fire Management Plan [Version 3] and A.S. 3959 – 2009.

#### 4.13 Asset Interface Classification [AIC].

The ACT ESA & Rural Fire Service have developed a methodology for determining the classification of potential exposure of the urban edge to severe bushfires and introduces Asset Interface Classification [AIC], which is defined as the boundary between an asset and the bushfire paths that approach it. It is determined by an assessment of:

- The maximum fire size an asset may be subject to;
- The part of the fire [head, flank, back] an asset maybe subject to recognizing the major fire threat from the north and west;
- The fire run length criteria and the length of fire run.

The following table provides an Asset Interface Classification [AIC], at a broader scale for the urban edge of Canberra;

	Length of Fire Run to Asset Interface (through unmanaged vegetation)				
Aspect of Fire Run	<100	100 – 350	>350		
Ν	Secondary	Primary	Primary		
NW	Secondary	Primary	Primary		
W	Secondary	Primary	Primary		
SW	Lee	Secondary	Primary		
S	Lee	Secondary	Secondary		
SE	Lee	Lee	Lee		
E	Lee	Lee	Secondary		
NE	Lee	Lee	Secondary		

#### Table 5: Asset Interface Classification

An examination of the Asset Interface Classification at a precinct level for the site identifies the following results:

#### Table 6: Asset Interface Classification – DHA Academy Close Site.

	Length of Fire Run to Asset Interface (through unmanaged vegetation)		
Aspect of Fire Run	<100m	100 – 350m	>350m
Northwest & North:			
Unmanaged woodland vegetation			Primary
Northeast:			
Unmanaged woodland vegetation			Primary
East:			
Unmanaged woodland vegetation	Lee		
Southeast:			
Unmanaged woodland vegetation		Lee	
South:			
Unmanaged woodland vegetation		Secondary	

# **SECTION 5**

# PROTECTION MEASURES TO BE IMPLEMENTED TO REDUCE THE BUSHFIRE RISK TO THE PROPOSED RESIDENTIAL DEVELOPMENT

#### 5.1 Provision of Asset Protection Zones [APZs].

Table 7 identifies the widths of the Asset Protection Zones required to comply with the *Strategic Bushfire Management Plan for the ACT* – *Version 3* – 2014 and are based on the assumption that buildings [assets] are constructed to a standard which meets the specifications of A.S. 3959 - 2009 - Construction of Buildings in Bushfire Prone Areas.

# Table 7 – Inner & Outer Asset Protection Zones to Assets - Strategic Bushfire Management Plan for the ACT – Version 3 – 2014.

Aspect of Fire Run	Length	n of Fire Run to Interface	Required Asset Protection Zones		
	(through	unmanaged ve	getation)		
	<100m	100 – 350m	>350m	IAPZ	OAPZ
Northwest & North: Unmanaged woodland vegetation			Primary AIC	30m	Minimum 200m
Northeast: Unmanaged woodland vegetation			Primary AIC	30m	Minimum 200m
East: Unmanaged woodland vegetation	Lee AIC			10m	Nil
Southeast: Unmanaged woodland vegetation		Lee AIC		10m	Nil
South: Unmanaged woodland vegetation		Secondary AIC		20m	100m

The Strategic Bushfire Management Plan for the ACT – Version 3 – 2014 also provides recommendations on the provision of Asset Protection Zones to development utilising only an Inner Asset Protection Zone [IAPZ].

Table 8 identifies the widths of the Inner Asset Protection Zones to the site, without the application of an Outer Asset Protection Zone [OAPZ].

 Table 8 – Inner Asset Protection Zones to Assets - Strategic Bushfire

 Management Plan for the ACT – Version 3 – 2014.

Aspect of Fire Run	Length of Fire Run to Asset Interface (through unmanaged vegetation)			Required Inner Asset Protection Zones
	<100m	100 – 350m	>350m	IAPZ
Northwest & North: Unmanaged woodland vegetation			Primary AIC	60m
Northeast: Unmanaged woodland vegetation			Primary AIC	60m
East: Unmanaged woodland vegetation	Lee AIC			20m
Southeast: Unmanaged woodland vegetation		Lee AIC		20m
South: Unmanaged woodland vegetation		Secondary AIC		40m

## 5.2 Review of Asset Protection Zones [APZs].

A review of the Masterplan confirms that the building setback to the Fairbairn Drive boundary is nominated as 10 metres and the building setback to the eastern boundary is 14.25 metres with a 4.00 metre setback to the southern boundary.

A review of the available Asset Protection Zone to the northwest of the site confirms that the managed width of the Fairbairn Drive road corridor is 80 metres to the site boundary, plus the 10 metre wide building setback, as shown of the Masterplan. This satisfies the Inner Protection Zone width of Table 8, without the need for the provision of an Outer Asset Protection Zone.

Note: The provision of the 80 metre wide managed road corridor removes the need for a building setback of 10 metres to proposed Lots 1 - 5.

The width of the Asset Protection Zone to the north and northeast of the site is 70 metres, provided by the managed width of the Fairbairn Drive road corridor. This satisfies the Inner Protection Zone width of Table 8, without the need from the provision of an Outer Asset Protection Zone.

The setback to the proposed buildings to the eastern boundary is 14.25 metres – satisfying the Inner Asset Protection Zone as defined by Table 7. It is noted that the management of the Power Line Easement provides an additional 20 metre zone managed as an Outer Asset Protection Zone.

A review of the Master Plan identifies that the lots adjoining the southern boundary of the site have a 4.0 metre wide building setback and reliance on the land currently containing dwellings located on Canberra Nature Park providing the additional fire protection zone to this aspect. This zone has a width of 20 metres, plus the setback to the future dwellings of 4.0 metres.

Table 8 establishes that an Inner Asset Protection Zone of minimum 20 metres is requirement to the southern aspect of the site, plus the provision of a 100 metre wide managed Outer Asset Protection Zone – within Canberra Nature Park.

The alternative approach to the provision of an IAPZ/OAPZ is to provide a 40 metre wide Inner Asset Protection Zone that complies with Table 9. This would comprise the 20 metre area occupied by the existing dwellings plus a 4.0 metre wide building setback inside the southern boundary of the site plus and additional 15 metre wide managed Inner Asset Protection Zone within the Canberra Nature Park.

This will avoid managing the existing woodland vegetation in the Canberra Nature Park as an Outer Asset Protection Zone.

### Figure 12 – Asset Protection Zone Plan



#### 5.3 Construction Standards to Buildings:

The width of the Asset Protection Zones to the northwest, north and northeast of the site [Lots 1 - 5] reduce the radiant heat exposure on the future dwellings erected on the perimeter northern lots to not more than 12.5kW/m<sup>2</sup>.

The width of the Inner Asset Protection Zone [14.25m] plus the managed Outer Asset Protection Zone [20m] in the Power Line Easement reduces the radiant heat exposure on the future dwellings erected on the perimeter northern lots [Lots 13 - 17 & Lots 26 & 27] to not more than 19kW/m<sup>2</sup>.

The width of the recommended Inner Asset Protection Zone [40m] to the south of the future dwellings erected on the Lots 27 - 31, adjoining the southern boundary of the site, reduces the radiant heat exposure on the future dwellings erected on the perimeter northern lots to not more than 12.5kW/m<sup>2</sup>.

Therefore, for consistency, the level of construction to the future dwellings erected on the perimeter lots shall be BAL 19 pursuant to the specifications of A.S. 3959 – 2009 – 'Construction of Buildings in Bushfire Prone Areas'. [Alternatively construction to NASH Standard 'Steel framed construction in Bushfire Prone Areas' is an acceptable solution for construction pursuant to the BCA – 2015].

The remaining dwellings shall be constructed to comply with BAL 12.5 pursuant to the specifications of A.S. 3959 – 2009 – 'Construction of Buildings in Bushfire Prone Areas'. [Alternatively construction to NASH Standard 'Steel framed construction in Bushfire Prone Areas' is an acceptable solution for construction pursuant to the BCA – 2015'].

Refer to Figure 13 – Plan of Bushfire Construction Standards on Page 41.

Note: The use of timber fencing is not recommended. If this type of fencing is required to be used the material should be similar to 'Ezy-Slat' metal fencing manufactured by Stratco.



Figure 13 – Plan of Bushfire Construction Standards.

#### 5.4 Access for Fire-fighting Operations.

Access to the site is from Truscott Street via a private internal loop road network which provides a pavement width of 5.5 metres.

Table 10 of the ACT Strategic Bushfire Management Plan – Version 3 – 2014 provides 'Access Standards for Public Roads for New Estate Development'. The document does not provide specifications for internal private road access to residential estates.

The proposed width of the internal road accommodates two-way traffic for fire appliances however it is recommended that the design principles of Table 10 be applied and that parking be provided in designated parking bays, clear of the pavement width.

A permanent fire trail, constructed to a formed width of 4.00 metres shall be provided on the outer edge of the Inner Asset Protection Zone to the south of the site, with connection to the existing access track within the pipeline easement [to the west] and Power Line Easement [to the east]

#### 5.5 Water Supplies for Fire Fighting Operations.

A fire-fighting water supply shall be installed to comply with F6 and the standards agreed by ACTEW and ACT Fire & Rescue.

#### 5.6 Fuel Management Protocols:

The management of the Inner Asset Protection Zones [IAPZ], where recommended in this report, shall comply with the management protocols as provided in Part 2 – Table 4 – Fuel Management Standards for Asset Protection Zones of the 'Strategic Bushfire Management Plan for the ACT – Version 3 - 2014'.

*Note:* Access to hydrants, other water supplies and services must not be impeded by trees, street furniture or landscaping. Minimum height clearance for ACTF&R appliance is 4.5 metres.

Street trees and landscape planting shall be selected for low bark flammability characteristics.

Mature tree crown separation shall be 3 - 5 metres with > 3 metre fuel [vertical] gap to the crown. A small clump of trees is acceptable provided that a 5 metre wide crown separation is provided to adjacent single trees.

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# **SECTION 6**

### **RESIDUAL RISK.**

#### 6.1 Introduction.

Table 9 evaluates the residual bushfire risk to the site, following the implementation of the recommended bushfire protection measures, and determines the vulnerability of the proposed development, the possible consequences and residual bushfire risk.

# Table 9 – Bushfire Risk Register & Action Treatment Plan - post implementation of the recommended protection measures.

The Risk What can happen?	The consequences and likelihood of an event happening Consequences Likelihood		Risk before mitigation	Strategy to reduce the risk	Consequence s & Likelihood	Residual Level of Risk
(1) Fire burning in the woodland vegetation in the Canberra Nature Park to the northwest & northwest of the site, spreading across the landscape under N.W and northerly winds	Major	Possible	Extreme	Provision of APZs & construction standards to buildings	Moderate/ Possible	High
(2) Fire burning in the woodland vegetation in the Canberra Nature Park to the N.E. of the site, spreading across the landscape northeast winds	Major	Possible	Extreme	Provision of APZs & construction standards to buildings	Moderate/ Possible	High
(3) Fire burning in the woodland vegetation in the Canberra Nature Park to the east and southeast of the site, spreading across the landscape under south- easterly/southerly winds	Moderate	Possible	High	Provision of APZs & construction standards to buildings	Minor/ Possible	Moderate

#### 6.2 Summary of Residual Bushfire Risk.

Table 9 provides an assessment of the residual level of risk to the proposed residential development and has been determined on the basis that the recommended bushfire construction standards have been implemented in the design and construction of the buildings.

The residual risk is deemed to be an acceptable outcome for the redevelopment of the site.

# **SECTION 7**

## CONCLUSION

This risk assessment examines the potential bushfire risk to the proposed redevelopment of the residential landuse within the DHA Academy Close Estate within Block 3, Section 65, District of Campbell; Division of Canberra Central, ACT.

This report has examined the topography, vegetation and the fire-paths which are likely to present a threat to the proposed residential development and determined the level of risk prior to and the residual risk after the implementation of the recommended bushfire protection measures.

The level of residual risk to the development has been determined having regard to the assumption that the recommended bushfire protection measures are fully implemented, including the provision of a 40 metre wide Inner Asset Protection Zone to the south of the future dwellings located adjacent to the southern boundary of the site.

The 40 metre wide Inner Asset Protection Zone shall consist of a minimum 5 metre wide setback to the buildings from the southern boundary and the management of a 35 metre wide zone within the Canberra Nature Park with this zone containing the 20 metre wide encroachment within the Nature Park.

There shall also be provided a fire access track on the outer edge of the Inner Asset Protection Zone.

The Inner Asset Protection Zone shall be maintained to the specifications provided in the *Strategic Bushfire Management Plan for the ACT 2009.* 

It is therefore concluded that the provision and maintenance of the recommended Asset Protection zones, fire-fighting access, water supplies and construction standards to the proposed buildings reduces the existing extreme level of bushfire risk to a high level of risk.

Concham Juan

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## **REFERENCES:**

- Strategic Bushfire Management Plan for the ACT Version 3 2014;
- > The Canberra Spatial Plan ACT Planning & Land Authority March 2004;
- Australian Standard for Risk Management A.S./N.Z.S. ISO 31000:2009 and A.S. 3959 - 2009;
- Emergency Risk Management Applications Guide. (EMA) 2000);
- > Overall Fuel Hazard Guide Fourth Edition DSE. July 2010;
- National Capital Authority Development Control Plan 12 01, March 2012 [Superseded].