BUSHFIRE RISK ASSESSMENT REPORT

CANBERRA BRICKWORKS PRECINCT

BLOCK 1, BLOCK 7 & BLOCK 20, SECTION 102

YARRALUMLA,

AUSTRALIAN CAPITAL TERRITORY
BUSHFIRE RISK ASSESSMENT REPORT

CANBERRA BRICKWORKS PRECINCT

BLOCK 1, BLOCK 7 & BLOCK 20, SECTION 102

YARRALUMLA,

AUSTRALIAN CAPITAL TERRITORY

Assessment Number  B142415 - 4
Document Final
Preparation Date 25.11.2013
Issue Date 28.1.2016
Directors Approval G.L. Swain

© Australian Bushfire Protection Planners Pty Limited
Tel. 61 2 43622112 / 61 2 43621184
Email. abpp@bigpond.net.au
EXECUTIVE SUMMARY

Australian Bushfire Protection Planners Pty Limited has been commissioned by the Land Development Agency [LDA] to prepare a Bushfire Risk Assessment that determines the level of bushfire risk, and the protection measures required to mitigate the risk to the future residential development within the Canberra Brickworks precinct within Block 1, Block 7 and Block 20, Section 102 Yarralumla, ACT.

The ACT Government proposes to sell the site ‘as is’ to a developer through a ‘Request for Proposal’ process who will then be responsible for the future subdivision and development of the site.

The site has an area of 16 hectares and is zoned CZ6 – Leisure and Accommodation and RZI Suburban Zone. The Yarralumla Precinct Code allows residential landuse [up to three storeys] on the CZ6 & RZ1 zoned land and Rule 3 states that ‘The minimum setback to the northern and eastern boundary is 20 metres’ [against the existing residential development], although this is not a mandatory requirement.

The ACT Government will be responsible for the design and construction of a new access road from the southern interface of the site connecting into Dudley Street.

LDA seeks to ascertain the bushfire risk and mitigation measures which should be included in the planning of the future development of the site.

Section 1 of this report outlines the background to the assessment and describes the site and details the site inspection carried out on the 12th November 2015.

Section 2 of the report provides a description of the site and the precinct [bushfire 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 site 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 site and determines the level of risk to future development on the site.

The details of the bushfire protection measures required to be put in place and fully implemented to reduce the level of risk to the assets are provided in Section 5.

This Section describes the measures for:

- Bushfire fuel reduction;
- Provision of Asset Protection Zones for future development;
- Construction standards to the buildings;
- Water supply provisions for fire-fighting;
- Access for fire-fighting;
- Evacuation planning; and
- Standards for fire protection zones.

Section 6 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 Canberra Brickworks precinct may occur as a result of a fire in the Pinus Radiata vegetation on the land to the west; the vegetation within the North Curtin Horse Paddock, located to the southwest of Cotter Road and the woodland vegetation in the PRZ2 Zoned land to the southeast and that, prior to the implementation of bushfire protection measures, the risk is high;

and

- If the protection measures recommended in this report are fully implemented, the level of risk will be reduced from high to moderate.

Section 8 provides a graphical depiction of the recommended bushfire protection measures.

Graham Swain,
Managing Director
Australian Bushfire Protection Planners Pty Limited.
# TABLE OF CONTENTS

**EXECUTIVE SUMMARY** ........................................................................................................... 3

**SECTION 1 – INTRODUCTION**
1.1 Background ............................................................................................................................. 6
1.2 Aim of this Report ..................................................................................................................... 9
1.3 Objectives of this Report ......................................................................................................... 9
1.4 Scope of Work .......................................................................................................................... 9

**SECTION 2 – DESCRIPTION OF STUDY AREA**
2.1 Study Area ............................................................................................................................... 10
2.2 Site Inspection ......................................................................................................................... 10
2.3 Existing Land Use .................................................................................................................... 11
2.4 Adjoining Land Use ............................................................................................................... 11
2.5 Topography ............................................................................................................................ 13
2.6 Vegetation ............................................................................................................................... 15
2.7 Site Photographs ..................................................................................................................... 20
2.8 Ecological constraints within the Development Precinct ...................................................... 23
2.9 Ecological constraints on land beyond the Development Precinct ......................................... 25

**SECTION 3 – CONTEXT OF BUSHFIRE RISK ASSESSMENT** ..................................................... 28

**SECTION 4 – BUSHFIRE RISK ASSESSMENT**
4.1 Introduction ............................................................................................................................. 29
4.2 Management Strategies .......................................................................................................... 30
4.3 Risk Assessment ...................................................................................................................... 30
4.4 Fire History ............................................................................................................................. 31
4.5 Ignition/Fire Sources .............................................................................................................. 32
4.6 Climate and Weather .............................................................................................................. 32
4.7 Slope & Fire Paths ................................................................................................................... 34
4.8 Bushfire Fuels .......................................................................................................................... 36
4.9 Assessment of Fuel Hazard ..................................................................................................... 37
4.10 Asset Interface Classification [AIC] ....................................................................................... 39
4.11 Potential Fire Scenarios ......................................................................................................... 40
4.12 Risk Statement ...................................................................................................................... 41
4.13 Summary of Bushfire Risk ..................................................................................................... 42

**SECTION 5 – BUSHFIRE PROTECTION MEASURES**
5.1 Introduction ............................................................................................................................. 43
5.2 Asset Protection Zones .......................................................................................................... 43
5.3 Construction Standards to Buildings .................................................................................... 46
5.4 Provision of Asset Protection Zones to Development Stages .............................................. 47
5.5 Access for Fire-fighting Operations ....................................................................................... 47
5.6 Water Supplies for Fire-fighting Operations ......................................................................... 47
5.7 Management of Pocket Parks and Open Space ..................................................................... 47

**SECTION 6 – RESIDUAL RISK**
6.1 Introduction ............................................................................................................................. 48
6.2 Summary of Residual Bushfire Risk ....................................................................................... 48

**SECTION 7 – CONCLUSION** ................................................................................................... 49

**REFERENCES** .......................................................................................................................... 51
SECTION 1

INTRODUCTION

1.1 Background.
The Territory Plan for the ACT records, as a strategic direction, that "urban
development will be planned in a manner that promotes community vitality
and safety.... Provision will also be made for emergency services
infrastructure necessary to ensure a high standard of safety for residents and
visitors." (Territory Plan, Strategic Directions: 1.22).

Australian Bushfire Protection Planners Pty Limited has been commissioned
by the Land Development Agency [LDA] 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 development within the
Canberra Brickworks within Block 1, Block 7 and Block 20 Section 102
Yarralumla, ACT.

The site has an area of 16 hectares and is zoned CZ6 – Leisure and
Accommodation and RZ1 Suburban Zone. The Yarralumla Precinct Code
allows residential landuse [up to three storeys] on the CZ6 & RZ1 zoned land
and Rule 3 states that 'The minimum setback to the northern and eastern
boundary is 20 metres’ [against the existing residential development],
although this is not a mandatory requirement.

The ACT Government will be responsible for the design and construction of a
new access road from the southern interface of the site connecting into
Dudley Street.

Figure 1 on Page 7 provides a copy of the Canberra Brickworks Precinct. This
plan also identifies the landuse zoning.

Figure 2 on Page 8 provides an Aerial Photograph of the Canberra Brickworks
Precinct and the surrounding landuse.
Figure 1 – Canberra Brickworks Precinct.

Source: Land Development Agency
Figure 2 – Aerial Photograph of the Canberra Brickworks Precinct and the surrounding landuse.

Source: Land Development Agency
1.2 **Aim of this Report.**

1.3 **Objectives of the Report.**
The objectives of the updated report are to:

- Identify the level of risk to the future development within the site in accordance with best practice bushfire risk management, the requirements of ‘Planning for Bushfire Risk Mitigation 2009 ACT’, any relevant Australian Standards, the Emergency Services Agency’s Strategic Bushfire Management Plan – Version 3 and any recommendations of the Emergency Services Agency;

- 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 that risk. This will include specific recommendations on future fuel management, the likely location of future Asset Protection Zones and any other measures to provide protection to the proposed development.

1.4 **Scope of Work.**
The following is an outline of the scope of work undertaken in the assessment of bushfire risk to the future development within the Canberra Brickworks within Block 1, Block 7 and Block 20 Section 102 Yarralumla, ACT.

- Identify and describe the study area environment;

- Establish the context of the bushfire risk to the proposed landuse;

- Identify measures that might assist to reduce bushfire risk;

- Identify the location of any bushfire protection measures required to protect the future landuse.
SECTION 2
DESCRIPTION OF STUDY AREA

2.1 The Study Area.
For the purpose of examining the potential bushfire risk to the Canberra Brickworks precinct the study area consists of land within Section 102, 103 & 113 Yarralumla; Sections 123 Curtin; Section 125 & 127 Yarralumla; Section 94 and the North Curtin Horse Paddocks within Section 121 Curtin – refer to Figure 3 below.

Figure 3 – Bushfire Risk Assessment Study Area.

2.2 Site Inspection.
Graham Swain undertook an inspection of the study area on the 12th November 2015 to assess the topography of the land and the classification of the vegetation within and external to the site.

This inspection reviewed the general topography and gradients of the land and vegetation classification.
Adjoining land was also inspected to determine the surrounding landuse / type and adequacy of land management, vegetation communities, topography and whether the land contained vegetation which has the potential to support fire.

Aerial photography and contour maps were reviewed for those areas not physically inspected.

2.3 Existing Land Use.
Except for the former Canberra Brickworks complex on Block 1 Section 102 Yarralumla, the development precinct contains vacant land.

2.4 Adjoining Land Use.
The land to the north, northeast and east of the development precinct contains existing residential development.

The land to the immediate west of the development precinct is vacant land zoned PRZ2 – Restricted Access Recreation. The land further to the west contains the Royal Canberra Golf Club.

The land to the southwest is vacant land zoned PRZ2 – Restricted Access Recreation. The Dunrossil Drive corridor, which leads to Government House, is located beyond the PRZ2 zoned land and is identified as a Designated Area on the ACT Territory Plan.

The land to the southeast and south of the development precinct is vacant land zoned PRZ2 – Restricted Access Recreation – refer to Figure 4 – Territory Plan on Page 12 and Figure 5 – Aerial Photograph on Page 13.

The Legend to the landuse on the Territory Plan is provided below:

- Designated Areas
- Residential - RZ1 - Suburban
- Residential - RZ2 - Suburban Core
- Residential - RZ3 - Urban Residential
- Residential - RZ4 - Medium Density Residential
- Residential - RZ5 - High Density Residential
- Communities Facilities
- Commercial - CZ1 - Core
- Commercial - CZ2 - Business
- Commercial - CZ3 - Services
- Commercial - CZ4 - Local Centre
- Commercial - CZ5 - Mixed Use
- Commercial - CZ6 - Leisure and Accommodation
- Industrial - IZ1 - General Industrial
- Industrial - IZ2 - Industrial Mixed Use
- Urban Parks and Recreation - PRZ1 - Urban Open Space
- Urban Parks and Recreation - PRZ2 - Restricted Access Recreation
- Transport and Services - TSZ1 - Transport
- Transport and Services - TSZ2 - Services
- Non Urban - NUZ1 - Broadacre
Figure 4 – Territory Plan.
2.5 Topography.
The landform within the Canberra Brickworks precinct is gently undulating with a fall to the west and southwest of less than 10%.

The land beyond the precinct falls to the northwest at less than 10% across the Royal Canberra Golf Club and the Dunrossil Drive corridor, rising to the west beyond the Dunrossil Drive corridor. The land within the North Curtin Horse Paddock to the southwest of Cotter Road falls to the south and southwest at less than 10% into Yarralumla Creek – refer to Figure 6 – Contour Plan on Page 14.
Figure 6 – Contour Plan.
2.6 Vegetation.
The vegetation within the Canberra Brickworks precinct was assessed by DSB Architects [refer to Yarralumla Brickworks Precinct Tree Assessment – 25 November 2015]. The report identifies that the predominant specie within the precinct is Pinus Radiata, Pinus ponderosa and Pinus silvestris and Ulmus procera and various tree and weed species.

Within Block 7 the Pines generally are of low quality and the isolated elm trees are subject to elm leaf beetle. Adjacent to Dunrossil Drive, on the south-western edge of Block 7 the vegetation consists of an 8 metre high unmanaged dense thicket of urban weed tree species and other weed species.

Along the western edge of the precinct the Pines are at, or approaching, the end of their useful life.

The vegetation within the adjoining residential development to the north, northeast and east of the precinct consists of managed landscaped gardens which do not constitute bushfire prone vegetation.

To the southeast of the Canberra Brickworks precinct, within Block 3, Section 94, [between Cotter Road and Denman Street] the vegetation consists of large copses of planted woodland separated by managed [mown] grassland. This vegetation type also occupies the land between the east and west bound lanes of Cotter Road – within Section 113.

The PRZ2 zoned land to the west and southwest of the development precinct [within Block 1, Section 127] contains mature Pinus Radiata with a dense weed infested understorey. The Royal Canberra Golf Club, to the west and northwest of the Brickworks precinct, contains mown lawns and managed grass [which is irrigated] beneath a canopy of Pinus Radiata trees. This vegetation is not currently deemed to be bushfire prone vegetation.

The vegetation within Dunrossil Drive is currently being upgraded to replace the mature Pinus Radiata trees with a program that provides for the staged removal of the existing trees with the second stage scheduled for 2015/2016.

Tree replanting commences 12 – 18 months after each removal stage and retains the existing central avenue of Elm trees, surrounded by a second avenue of mixed trees [Pine & Oak], with an evergreen tree backdrop formed by creating a third outer avenue using an evergreen species of Oak and then replanting the Pine plantation on the outside of the avenue – refer to Figure 7 – Plan and Section of the Dunrossil Drive planting on Page 16.
The National Capital Bushfire Operations Plan [June 2014] identifies that the vegetation within the Dunrossil Drive corridor will continue to be regularly managed and the Royal Canberra Golf Club Fairways, located to the southwest of the Dunrossil Drive corridor, also contains managed vegetation.

The vegetation within the Dunrossil Drive corridor and the Royal Golf Club Fairways is therefore not deemed to be bushfire prone – refer to Figure 8 - Lady Denman Drive Grasslands and Dunrossil Drive Fire Management Map and Management Program on Page 17.
The North Curtin Horse Paddock, located to the southwest of Cotter Road, contains grazed grassland with scattered woodland shade trees. Figure 9 on Page 18 provides a copy of the TaMS Bushfire Operations Plan for the fuel management of the vegetation within the North Curtin Horse Paddocks and within Block 94, to the southeast of the Brickworks precinct, and the vegetation on the land within the Cotter Road reserve.
Figure 9 – Map 8 of the TaMS 2015/2016 Bushfire Operations Plan [BOP] for the North Curtin Horse Paddocks and the vegetation within Section 94, Section 113 and Section 127 [Cotter Road reserve].
Figure 9 identifies that the management of the vegetation within the North Curtin Horse Paddocks relies on grazing of a portion of the Horse Paddock.

Figure 9 also identifies that the grassland vegetation within the Cotter Road reserve and on Section 94, to the south and southeast of the Brickworks precinct is managed by slashing. The TaMS Bushfire Operations Plan also shows that slashing also extends into the southern portion of the Brickworks precinct.

The review of the National Capital Lady Denman Drive Grasslands and Dunrossil Drive Fire Management Map and Management Program and the TaMS Bushfire Operations Plan for the North Curtin Horse Paddocks and the land to the south and southeast of the Brickworks precinct has identified that the only vegetation which is deemed to present a direct bushfire hazard to the development precinct is the weed infested Pinus Radiata vegetation within the PRZ2 zoned land to the west and southwest and the retained vegetation in the narrow corridor of PRZ2 land to the south [within Block 1, Section 127] and the copse of retained vegetation within Block 3, Section 94, to the southeast of the Brickworks precinct.

An indirect bushfire hazard exists within the un-grazed grassland/woodland on the northern portion of the North Curtin Horse Paddocks.

Based on the current management practices within the Canberra Golf Club, the Dunrossil Avenue corridor, including Block 2, Section 103 this report examines the bushfire risk to the development precinct created by the vegetation within Block 1, Section 127 and Block 3, Section 94 and the grassy woodland within the Horse Paddock precinct - refer to Site Photographs below.
2.7 Site Photographs.

Photograph No. 1 – Taken from Cotter Road looking to the south - across to the Mint Oval and the commercial development within West Deakin.

Photograph No. 2 – Taken from Cotter Road looking to the southwest across the North Curtin Horse Paddock.
Photograph No. 3 – Taken from the Cotter Road/Dunrossil Drive intersection looking to the southwest – Horse Paddock on the left, vegetation within the Dunrossil Drive corridor on the right.

Photograph No. 4 – Taken looking to the southeast from Dunrossil Drive showing managed vegetation.
Photograph No. 5 – Taken looking to the north from Block 1, Section 127 showing the managed, irrigated land within the Royal Canberra Golf Club.

Photograph No. 6 – Taken looking to the southwest from Block 1, Section 127 showing the managed, irrigated land within the Royal Canberra Golf Club.
Photograph No. 7 – Taken from Block 1, Section 127 looking southwest to Dunrossil Drive showing the managed, irrigated land within the Royal Canberra Golf Club.

Photograph No. 8 – Taken from Block 1, Section 127 looking to the west showing the managed, irrigated land within the Royal Canberra Golf Club.
2.8 Ecological Constraints.
An ecological assessment was undertaken in late 2014 within the PRZ2 Area and adjoining land. Figure 10, below, provides the results of this study and identifies that the areas of grassland between the east and west bound lanes of Cotter Road and an area to the southwest and south of Denman Street contains Natural Temperate Grassland.

*Figure 10 – Ecological Constraints Plan – Natural Temperate Grassland.*

Figure 11 on Page 25 provides the results of an ecological assessment to determine the extent of habitat for Golden Sun Moth in the grassland vegetation between the east and west bound lanes of Cotter Road, the area to the southwest and south of Denman Street and in the vegetation to the south of the west bound lane of Cotter Road [within the road verge and adjacent Horse Paddocks].

Figure 9 on Page 18 provides an extract from TaMS North Curtin Horse Paddocks Bushfire Operations Plan which shows the 2015/2016 fuel management works within the Canberra Brickworks precinct and within the North Curtin Horse Paddocks.
Figure 11 – Ecological Constraints Plan – Golden Sun Moth Habitat.

Figure 9 – TaMS North Curtin Horse Paddocks BOP on Page 18 identifies that most of the area nominated on Figure 11 [above] as containing potential Sun Moth Habitat and Natural Temperate grassland is maintained by slashing for Amenity & Urban Roads and Fire & Rural fuel management purposes.

Figure 9 also identifies the area of the Curtin Horse Paddock which is managed by grazing to reduce the bushfire fuels. This area does not constitute the entire Horse Paddock precinct with the central and north-eastern portion not managed by grazing or by slashing.

### 2.9 Ecological Constraints found on the land beyond the Canberra Brickworks precinct.

The northern portion of the North Curtin Horse Paddock was not studied as part of the most recent ecological surveys.

However, the presence of potential Sun Moth habitat within the Horse Paddock is shown on the ACTmap Significant Plants Map – refer to Figure 12 on Page 25.
Figure 12 – ACTmap Significant Plants Map.

Golden Sun Moth (Synemosyna plana)

Figure 13 on Page 27 is an extract from the National Capital Authority Yarralumla and North Curtin Study Area Environmental Constraints plan, dated 8.2.2010.
Figure 13 – Ecological Constraints Plan – National Capital Authority Yarralumla & North Curtin Study Area.
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 1st 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 AS 3959 - 2009.

This assessment determines the level of bushfire risk on the proposed development within the Canberra Brickworks precinct from a fire which may occur in the vegetation on the North Curtin Horse Paddock to the southwest, a fire in the retained vegetation on Block 1, Section 127 and a fire in the unmanaged vegetation on Block 3, Section 94 and provides recommendations on measures required to mitigate the effects of such fire events.
SECTION 4

BUSFIRE RISK ASSESSMENT – CANBERRA BRICKWORKS PRECINCT

4.1 Introduction.

The Australian Standard AS/NZS ISO 31000:2009, the ACT Government Enterprise-wide risk management framework 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).

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 Canberra Brickworks precinct was undertaken during the site inspection and identified that the retained vegetation within the PRZ2 zoned land to the west, southwest and south, within Block 1 Section 127 and to the southeast, within Block 3 Section may present a moderate risk to the future development within the Canberra Brickworks precinct, if it remains unmanaged.
The identified level of risk is predicated on the continued management of the vegetation within the Canberra Golf Club land and the Dunrossil Avenue corridor.

At a broader scale the bushfire prone vegetation within the North Curtin Horse Paddock, located to the southwest of Cotter Road, presents a risk to the southwestern and southern edges of the development precinct, within potential fire extension, if embers, across the managed land within the Cotter Road and Dunrossil Avenue corridors.

The following Risk Assessment and resultant recommendations seek to address the protection of the Canberra Brickworks precinct from the impact of unplanned fire events as described 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.

“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 - 2009 identifies the approximate location of major fires and shows that the Brickworks precinct and the North Curtin Horse Paddock have not been impacted directly by large scale fires, however the 2001 & 2003 bushfires came within 1klm of the precinct.
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 likely cause of a bushfire which may occur within study area to the Canberra Brickworks precinct is varied. Accidental or malicious ignition of the vegetation within the Molonglo River corridor, to the west, is a potential source and ignition of the vegetation within the Equestrian Park, spreading to the east under westerly winds, turning upslope out of the Yarralumla Creek corridor towards the south-western edge of the Cotter Road corridor. Arson may result in the ignition of the vegetation within the PRZ2 zoned land [Block 1, Section 127 and Block 3, Section 94].

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°C on February 1st 1968 followed closely by 41.4°C on the previous day [31st 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 Canberra Brickworks precinct has an exposure to strong, hot and dry north-northwest, westerly and south-westerly wind influences. These winds can spread burning embers from both small and large fires over long distances and ignite cured fuels ahead of the main fire front.

Fires that occur in the unmanaged vegetation within the PRZ2 zoned land adjoining the site have the potential to rapidly spread towards the site under the influence of westerly/south-westerly winds.

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 land within the North Curtin Horse Paddock falls to the southwest into the Yarralumla Creek corridor, providing an upslope fire path from the southwest – Refer to Figure 14 on Page 35.
The PRZ2 – Restricted Access zoned land, within Block 1, Section 127, contains a narrow corridor of unmanaged vegetation to the west and southwest of the development precinct. This vegetation is on level land with a short fire path as shown on Figure 14, below.

The PRZ2 – Restricted Access zoned land, within Block 3, Section 94, to the southeast of the southern portion of the development precinct provides a larger area of vegetation which may be subject to bushfire – refer to the fire path diagram shown on Figure 14, below.

The North Curtin Horse Paddock falls to the southwest into the Yarralumla Creek corridor, providing an upslope fire path from the southwest – Refer to Figure 14, below.

Figure 14 – Potential Fire Paths
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.

The Canberra Brickworks precinct is exposed to the direct risk of a fire occurring in the Pinus Radiata vegetation in the PRZ2 zoned land along the western and south-western edge of the precinct, within Block 1, Section 127. This vegetation has a dense understorey of weed species with a build-up of pine needles.

The precinct is also exposed to the direct risk of a fire occurring in the unmanaged woodland vegetation within the PRZ2 zoned land to the southeast, within Block 3, Section 94 and the indirect risk from a fire that occurs in the grassy woodland vegetation on the North Curtin Horse Paddock, located to the south and southwest of the Cotter Road corridor.

The Bushfire Operations Plan [BOP] for the North Curtin Horse Paddocks identifies that fuel management by grazing will only occur within the southern portion of the Horse Paddock precinct, leaving the remainder of the precinct unmanaged for fuel reduction, during the period 2015/2016.

Figure 12 on Page 26 identifies the possibility that the northern portion of the Horse Paddock precinct and the land to the south and east of the development precinct may contain suitable Sun Moth habitat.

Whilst the presence of potential or actual Sun Moth Habitat does not exclude management of the grassland vegetation to reduce the fuel hazard, it does restrict the potential for management of the vegetation to provide a low level of bushfire hazard.

In addition, there always remains the likelihood that circumstances may prevail when the grassy woodland vegetation within the Horse Paddocks has not or cannot be managed to mitigate the bushfire risk. This section therefore examines the Overall Fuel Hazard for the Pinus Radiata vegetation within Block 1, Section 127; the grassy woodland on the Horse Paddock land to the south and southwest of the Cotter Road corridor and the PRZ2 zoned land, within Block 3, Section 94, to the southeast of the development precinct.

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 fuels; and
• Surface fine fuels.

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.

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.

Elevated fuels are defined as shrubs, heath and suspended material greater than 0.5 metres above ground. Elevated fuels influence the flame height and rate of spread of a fire.

Near Surface Fuels are defined as live and dead fuels effectively in touch with the ground but not lying on it. Near surface fuels influence the rate of spread and flame height of a fire.

Surface fine fuels are defined as the litter bed including leaves, twigs, bark and other fine fuel lying on the ground. Surface fine fuel influences the rate of spread of a fire.

4.9 Assessment of Bushfire Fuel Hazard.
An overall Fuel Hazard for vegetation which presents a hazard to the development precinct can be determined using the DSE Overall Fuel Hazard Guide. The predominant vegetation groups are the grassy woodland within the Horse Paddock and the woodland within the PRZ2 zoned land within Block 3, Section 94 to the southeast and the Pinus Radiata vegetation on the PRZ2 zoned land within Block 1, Section 127, to the west, southwest and south of the development precinct.

1. Grassland woodland vegetation within the Horse Paddock.
Whilst the vegetation within the Horse Paddock has some level of management implemented by grazing, the success of this management practice can vary depending on the amount of rainfall in the spring period, producing abundant growth of grasses, the stock loading and their ability to crop the grasses to levels which will mitigate the intensity of fires that may occur in the cured grass.
Therefore, the assessment of fuel hazard will be determined for unmanaged grassy woodland vegetation to the southwest of the development precinct.

Using the methodology provided within the DSE Overall Fuel Hazard Guide - 2010, the following Fuel Hazard observation was determined.

(a) Bark Hazard: **High**.

(b) Elevated Fuel Hazard: **High – Very High**.

(c) Near Surface Fine Fuel Hazard: **High**

(d) Surface Fine Fuel Hazard: **High**

The Overall Fuel Hazard for unmanaged grassy woodland vegetation within the North Curtin Horse Paddock has been assessed as being **Very High**.

2. **Woodland vegetation within the PRZ2 zoned land within Block 3, Section 94 to the southeast.**

(a) Bark Hazard: **High**.

(b) Elevated Fuel Hazard: **High**.

(c) Near Surface Fine Fuel Hazard: **Very High**

(d) Surface Fine Fuel Hazard: **Very High**

The Overall Fuel Hazard for unmanaged woodland vegetation within the PRZ2 zoned land within Block 3, Section 94 has been assessed as being **Very High**.

3. **Pinus Radiata Forest within the PRZ2 zoned land within Block 1, Section 127, to the west, southwest & south.**

(a) Bark Hazard: **High**.

(b) Elevated Fuel Hazard: **High**.

(c) Near Surface Fine Fuel Hazard: **Very High**

(d) Surface Fine Fuel Hazard: **Very High**

The Overall Fuel Hazard for unmanaged woodland vegetation within the PRZ2 zoned land within Block 1, Section 127 has been assessed as being **Very High**.
4.10 Asset Interface Classification [AIC].
The ACT ESA & Rural Fire Service have developed a methodology for determining the classification of potential exposure [risk] of an asset 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 may be 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 assets exposed to a bushfire threat. The classification system does not identify bushfire mitigating factors such as topography, vegetation types and vegetation management and assumes the ‘worst case’ for bushfire attack on an asset.

Table 1: Asset Interface Classification

<table>
<thead>
<tr>
<th>Aspect of Fire Run</th>
<th>Length of Fire Run to Asset Interface (through unmanaged vegetation)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;100</td>
</tr>
<tr>
<td>N</td>
<td>Secondary</td>
</tr>
<tr>
<td>NW</td>
<td>Secondary</td>
</tr>
<tr>
<td>W</td>
<td>Secondary</td>
</tr>
<tr>
<td>SW</td>
<td>Lee</td>
</tr>
<tr>
<td>S</td>
<td>Lee</td>
</tr>
<tr>
<td>SE</td>
<td>Lee</td>
</tr>
<tr>
<td>E</td>
<td>Lee</td>
</tr>
<tr>
<td>NE</td>
<td>Lee</td>
</tr>
</tbody>
</table>

Table 2 examinations the Asset Interface Classification at a precinct level.

Table 2: Asset Interface Classification – Canberra Brickworks Precinct.

<table>
<thead>
<tr>
<th>Aspect of Fire Run</th>
<th>Length of Fire Run to Asset Interface (through unmanaged vegetation)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;100m</td>
</tr>
<tr>
<td>West – Pinus Radiata vegetation</td>
<td>Secondary</td>
</tr>
<tr>
<td>Southwest – Grassy Woodland within Horse Paddock</td>
<td>Primary</td>
</tr>
<tr>
<td>Southeast – Woodland vegetation</td>
<td>Lee</td>
</tr>
</tbody>
</table>
4.11 Potential Fire Scenarios.
An assessment of the fire scenarios that may impact on the Canberra Brickworks precinct has been undertaken, based on the potential fire paths identified in Figure 14 on Page 35.

Scenario 1:
A fire event that occurs in the Pinus Radiata vegetation on the PRZ2 zoned land, within Block 1, Section 127 to the west, southwest and south of the Canberra Brickworks precinct spreading under westerly/south-westerly winds toward the western edge of the Canberra Brickworks development precinct.

This potential fire impact will remain if the vegetation within the PRZ2 zoned land within Block 1, Section 127 is not managed. However, the level of risk is mitigated due to the limited length of fire run which varies from 15/20 metres to the southwest up to 45 metres to the west.

Scenario 2:
A fire event that occurs in unmanaged grassy woodland on the North Curtin Horse Paddock to the southwest of the Cotter Road corridor, spreading embers across the road corridor, with a resultant impact on the southern edge of the Canberra Brickworks development precinct.

This fire event may occur during fire seasons when conditions are such that the grassland vegetation has cured to > 70% and has not been managed to remove the fuel hazard, the Fire Danger Index is Extreme (FDI > 50) and the prevailing wind is from the west/southwest and an ignition occurs either within the North Curtin Horse Paddock or within the Equestrian Park located to the west of Cotter Road.

Scenario 3:
A fire event that occurs in the unmanaged woodland vegetation on the PRZ2 zoned land within Block 3, Section 94, to the southeast of the Canberra Brickworks precinct, spreading under south-easterly winds toward the south-eastern edge of the Canberra Brickworks development precinct.

However, the level of risk is mitigated due to the limited length of fire run through unmanaged woodland vegetation and the current land management measures undertaken by TaMS – refer to Figure 9 – Map 8 of the TaMS 2015/2016 Bushfire Operations Plan [BOP] for the North Curtin Horse Paddocks and the vegetation within Section 94, Section 113 and Section 123 [Cotter Road reserve].
4.12 Risk Statement.
Table 6 provides a statement of risk for the potential fire scenario that may impact the Canberra Brickworks precinct [prior to mitigation measures being adopted / implemented] and assigns risk levels reflecting identified levels of likelihood and consequences for a ‘catastrophic’ 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 3 provides a list of qualitative measures of consequence [or impact] whilst Table 4 provides a list of qualitative measures of likelihood – used to determine the level of risk in Table 6. Table 5 provides a qualitative risk analysis matrix – used to determine the level of risk in Table 6.

Table 3 – Qualitative Measures of Consequence [or Impact]

<table>
<thead>
<tr>
<th>Level</th>
<th>Descriptor</th>
<th>Detail Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Insignificant</td>
<td>No public safety injuries, low financial loss</td>
</tr>
<tr>
<td>2</td>
<td>Minor</td>
<td>No public safety injuries – minor impact to buildings</td>
</tr>
<tr>
<td>3</td>
<td>Moderate</td>
<td>Burns and Respiratory problems – moderate damage to buildings</td>
</tr>
<tr>
<td>4</td>
<td>Major</td>
<td>Death of people exposed to radiant heat &amp; major property damage</td>
</tr>
<tr>
<td>5</td>
<td>Catastrophic</td>
<td>Death of people exposed to radiant heat and total destruction of buildings</td>
</tr>
</tbody>
</table>

Table 4 – Qualitative Measures of Likelihood

<table>
<thead>
<tr>
<th>Level</th>
<th>Descriptor</th>
<th>Detail Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Almost Certain</td>
<td>Is expected to occur during high, extreme &amp; catastrophic fire danger periods</td>
</tr>
<tr>
<td>B</td>
<td>Likely</td>
<td>Will probably occur during high, extreme &amp; catastrophic fire danger periods</td>
</tr>
<tr>
<td>C</td>
<td>Possible</td>
<td>May occur during high, extreme &amp; catastrophic fire danger periods</td>
</tr>
<tr>
<td>D</td>
<td>Unlikely</td>
<td>Unlikely to occur during high, extreme &amp; catastrophic fire danger periods</td>
</tr>
<tr>
<td>E</td>
<td>Rare</td>
<td>Will rarely occur during high, extreme &amp; catastrophic fire danger periods</td>
</tr>
</tbody>
</table>

Table 5 – Qualitative risk analysis matrix – used to determine the level of risk in Table 6

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Risk Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consequences</td>
<td>Insignificant</td>
</tr>
<tr>
<td>A – almost certain</td>
<td>High</td>
</tr>
<tr>
<td>B – likely</td>
<td>Moderate</td>
</tr>
<tr>
<td>C – possible</td>
<td>Low</td>
</tr>
<tr>
<td>D – unlikely</td>
<td>Low</td>
</tr>
<tr>
<td>E – rare</td>
<td>Low</td>
</tr>
</tbody>
</table>
Table 6 – Bushfire Risk Register – Severe Bushfire Event – if high levels of combustible fuels / unmanaged vegetation exist in the landscape within the Canberra Brickworks Study Area.

<table>
<thead>
<tr>
<th>The Risk What can happen?</th>
<th>The consequences &amp; likelihood of an event happening</th>
<th>Consequence Rating</th>
<th>Likelihood Rating</th>
<th>Level of Risk</th>
<th>Risk Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire burning in the Pinus Radiata vegetation to the west of the development precinct, spreading under west &amp; southwest winds</td>
<td>Minor  Unlikely</td>
<td>2</td>
<td>D</td>
<td>Low</td>
<td>2</td>
</tr>
<tr>
<td>Fire burning in the grassy woodland vegetation on the North Curtin Horse Paddocks to the southwest of the Cotter Road corridor, spreading under southwest winds</td>
<td>Moderate  Possible - May occur during severe fire danger periods</td>
<td>3</td>
<td>C</td>
<td>High</td>
<td>1</td>
</tr>
<tr>
<td>Fire burning in the grassland/woodland vegetation to the east of the development precinct, spreading under southeast winds</td>
<td>Minor  Possible - May occur during severe fire danger periods</td>
<td>3</td>
<td>C</td>
<td>Moderate</td>
<td>2</td>
</tr>
</tbody>
</table>

4.13 Summary of Bushfire Risk.
The last major bushfire which came close to impacting the Canberra Brickworks precinct occurred in 2001 and again in 2003, during the bushfires that burnt through the pine forests in the Molonglo Valley. These fires did not directly impact on the precinct, however smoke and ember impact occurred.

A similar large scale fire event is not likely to occur due to the development of the Molonglo urban release area. However, a severe local fire may still occur if the prevailing weather conditions are such to support ignition of the vegetation within the North Curtin Horse Paddock.

An example of this event would be ember ignition of the vegetation in the Tuggeranong Parkway corridor, from remote fires located to the west and northwest of the Molonglo urban release area, with the fire extending into the Horse Paddock / Equestrian / Riding School precincts located between the Tuggeranong Parkway corridor and Cotter Road thence into the North Curtin Horse Paddock, spreading upslope across the landscape towards the south-western edge of the Cotter Road corridor, creating ember attack on the development precinct.
SECTION 5

PROTECTION MEASURES TO BE IMPLEMENTED TO REDUCE THE BUSHFIRE RISK TO THE PROPOSED DEVELOPMENT.

5.1 Introduction.
The following sections of this report provide recommendations on the measures required to address the bushfire risk and the requirements of Planning for Bushfire Risk Mitigation 2009 and the Strategic Bushfire Management Plan for the ACT – 2009.

5.2 Asset Protection Zones.
Planning for Bushfire Risk Mitigation 2009 and the Strategic Bushfire Management Plan for the ACT 2014 provide recommendations on the provision of Asset Protection Zones to development located in a bushfire prone area and which is likely to be subject to bushfire attack. These provisions are detailed below:

**Outer Asset Protection Zone:**

<table>
<thead>
<tr>
<th>Vegetation Type</th>
<th>AIC</th>
<th>OAPZ Width</th>
</tr>
</thead>
</table>
| West
Narrow corridor of Pinus Radiata Forest within the PRZ2 zoned land [Block 1, Section 127] along the western and south-western boundary of the development precinct – less than 50m wide | Secondary | Refer to Note 1 |
| **Southwest**
Unmanaged open grassy woodland vegetation within the North Curtin Horse Paddock > 350m wide fire spread | Primary | Minimum 100 metres
Refer to Note 2 |
| **Southeast**
Unmanaged woodland vegetation within the PRZ2 zoned land [Block 3, Section 94] to the southeast of the development precinct: < 100 metre fire spread | Lee | Nil |

**Inner Asset Protection Zone:**

<table>
<thead>
<tr>
<th>Vegetation Type</th>
<th>AIC</th>
<th>IAPZ Width</th>
</tr>
</thead>
</table>
| West
Narrow corridor of Pinus Radiata Forest within the PRZ2 zoned land [Block 1, Section 127] along the western and south-western boundary of the development precinct – less than 50m wide | Secondary | Refer to Note 1 |
| **Southwest**
Unmanaged grassy woodland vegetation within the North Curtin Horse Paddock > 350m wide fire spread | Primary | 30 metres
Refer to Note 3 |
| **Southeast**
Unmanaged woodland vegetation within the PRZ2 zoned land [Block 3, Section 94] to the southeast of the development precinct: < 100 metre fire spread | Lee | 10 metres |
**Note 1:**
The vegetation to the west and southwest of the development precinct, within Block 1, Section 127 consists of a narrow band [20 – 45 metres wide] of poor quality Pinus Radiata trees which have been assessed as nearing their natural life. The Pines have an understorey of dense weeds with the Tree Assessment Report recommending removal and replacement with ‘Landscape Species’.

Should this occur and the PRZ2 zoned land be managed as ‘parkland’ and the adjoining Canberra Golf Club and Dunrossil Avenue continue to be managed as described in this report, no Asset Protection Zone will be required to the western and south-western aspects of the Brickworks precinct.

Should the revegetation of the PRZ2 land within Block 1, Section 127 maintain the current bushfire hazard to the west and south-west of the Brickworks precinct, there shall be provided, inside the Lease Boundary, a minimum 20 metre wide Inner Asset Protection Zone.

**Note 2:**
The management of the Cotter Road and Dunrossil Drive corridors, as described in the National Capital Bushfire Operations Plan [BOP] for the Dunrossil Avenue corridor and the TaMS Bushfire Operations Plan [BOP] for the Cotter Road corridor, provides a managed Outer Asset Protection Zone to the south and southwest of Block 1, Section 127 and the Brickworks precinct.

The National Capital Bushfire Operations Plan [BOP] identifies that the Dunrossil Avenue corridor, including the replanted Pines within Block 2, Section 103, will be slashed at 6 – 8 week intervals – satisfying the prescriptions of an Outer Asset Protection Zone.

The TaMS Bushfire Operations Plan [BOP] identifies the grassland vegetation within the Cotter Road corridor, including the grassland vegetation within Block 3, Section 94 is slashed. The site inspection confirmed that the current management practices maintain this area to the standards of an Outer Asset Protection Zone – i.e. maintain a Grassland fire hazard rating of < 35 when grassland curing reaches > 70%.

**Note 3:**
The provision of the 30 metre wide Inner Asset Protection Zone to the southwest and southern aspect of the development precinct is a mandatory requirement of the Strategic Bushfire Management Plan for the ACT 2014 and shall be provided inside the lease boundary.
Foot Note:

1. The recommended widths of Inner Asset Protection Zone are based on the assumption that the vegetation within the Canberra Golf Club and the Dunrossil Avenue/Cotter Road corridors are maintained to mitigate the bushfire risk to the Brickworks precinct. Should the management practices change – e.g. the Canberra Golf Club cease to manage the land beneath the Pine trees to the west of the vegetation within Block 1, Section 127 – reassessment of the Asset Protection Zones will be required.

2. The current management of the land adjoining the south-western and southern boundaries of the Brickworks precinct, in accordance with the National Capital and TaMS Bushfire Operations Plans [BOPs], may satisfy the prescriptions of an Inner Asset Protection Zone [IAPZ].

The purchaser/Developer shall satisfy itself/themselves that the provision and management of the Inner Asset Protection Zone, in perpetuity, can be achieved on land beyond the Lease Boundary.
5.3 Construction Standards to Buildings.

Planning for Bushfire Risk Mitigation 2009 and the Strategic Bushfire Risk Management Plan for the ACT 2009 required the provision of an ‘Ember Zone’ for 200 metres which required buildings to be constructed to comply with Australian Standard A.S. 3959 – 2009.
The *Strategic Bushfire Risk Management Plan for the ACT 2014* removes this requirement with the assessment being undertaken using the criteria within Australian Standard A.S. 3959 – 2009.

An examination of A.S. 3959 – 2009 requires all buildings located within 100 metres of the outer edge of the Inner Asset Protection Zone shall be constructed to comply with BAL 12.5, pursuant to A.S. 3959 – 2009 – ‘Construction of Buildings in Bushfire Prone Areas’.

### 5.4 Asset Protection Zones to the Development Stages.

The development of the Canberra Brickworks precinct is likely to be undertaken in stages. The staging of the development will require the management of the residual land to maintain a low level of hazard on the land adjoining the new development precinct/s.

It is recommended that a Bushfire Operations Plan [BOP] be prepared for each stage, identifying the measures required to maintain a low level of overall bushfire hazard to the vegetation on the residual land created by each development stage.

### 5.5 Access for Fire-fighting Operations.

The provision of an edge road is a mandatory requirement of the *Strategic Bushfire Risk Management Plan for the ACT 2014*. Therefore, if the bushfire hazard remains, a complying edge road shall be provided along the south-western, southern and eastern edge of the development precinct.

The internal road network shall be designed and constructed to ACT Fire Brigade [Fire & Rescue ACT] standards so as to allow heavy emergency service vehicles to manoeuvre quickly and efficiently in both response and normal operating modes.

### 5.6 Water Supplies for Fire Fighting Operations.

Hydrants for fire-fighting operations are to be provided along the perimeter road to the satisfaction of the ACT Fire Brigade [Fire & Rescue ACT].”

The hydrant supply shall be installed to comply with the agreed standards for water supply and require type F5 standard 45 l/s single standard hydrants at 60 metre intervals to the hazard interface.

### 5.7 Management of Pocket Parks and Open Space Areas.

The pocket parks within the development precinct shall be maintained to the prescriptions of an Inner Asset Protection Zone as defined by the *ACT Strategic Bushfire Management Plan - 2014*. Management shall also comply with the ‘Low Threat Vegetation’ as defined by Section 2.2.3.2 of Australian Standard A.S. 3959 – 2009 – ‘Construction of Buildings in Bushfire Prone Areas’.
SECTION 6
RESIDUAL RISK.

6.1 Introduction.
Table 7 evaluates the residual bushfire risk to the proposed development following the implementation of the recommended bushfire protection measures, and determines the vulnerability of the proposed development, the possible consequences and residual bushfire risk during extreme to catastrophic fire danger periods.

Table 7 – Bushfire Risk Register & Action Treatment Plan – catastrophic bushfire events, post implementation of the recommended protection measures.

<table>
<thead>
<tr>
<th>The Risk What can happen?</th>
<th>The consequences and likelihood of an event happening</th>
<th>Risk before mitigation</th>
<th>Strategy to reduce the risk</th>
<th>Consequences &amp; Likelihood after mitigation</th>
<th>Residual Level of Risk</th>
<th>Risk Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire burning in the Pinus Radiata vegetation to the west of the development precinct, spreading under west &amp; southwest winds</td>
<td>Minor</td>
<td>Unlikely</td>
<td>Low</td>
<td>Manage vegetation</td>
<td>Minor/ Unlikely</td>
<td>Low</td>
</tr>
<tr>
<td>Fire burning in the grassy woodland vegetation on the North Curtin Horse Paddocks to the southwest of the Cotter Road corridor, spreading under southwest winds</td>
<td>Moderate</td>
<td>Possible - May occur during severe fire danger periods</td>
<td>High</td>
<td>Provision of Asset Protection Zones &amp; construction standards to buildings</td>
<td>Minor/Possible</td>
<td>Moderate</td>
</tr>
<tr>
<td>Fire burning in the grassland/woodland vegetation to the east of the development precinct, spreading under southeast winds</td>
<td>Minor</td>
<td>Possible - May occur during severe fire danger periods</td>
<td>Moderate</td>
<td>Provision of Asset Protection Zones &amp; construction standards to buildings</td>
<td>Minor/Unlikely</td>
<td>Low</td>
</tr>
</tbody>
</table>

6.2 Summary of Residual Bushfire Risk.
Table 7 provides a review of the residual level of risk to the assets within the Canberra Brickworks precinct and has been determined on the basis that the recommended bushfire mitigation measures are implemented and maintained over the life of the development.
SECTION 7

CONCLUSION

This assessment examines the potential bushfire risk to the proposed Canberra Brickworks precinct within Block 1, Block 7 and Block 20, Section 102 Yarralumla, ACT.

The report has examined the topography and vegetation on the land adjoining the development precinct, identified the fire-paths which may present a threat to the future development, determined the level of risk prior to and the residual risk after the implementation of the recommended bushfire protection measures.

The examination of the potential risk has identified that the Pinus Radiata forest vegetation on Block 1, Section 127 to the west; the grassy open woodland on the North Curtin Horse Paddocks to the southwest and south and the woodland vegetation on Block 3, Section 94, to the southeast, may present a hazard to the proposed development.

The management of the vegetation within Block 1, Section 127 to the west and southwest of the development precinct will mitigate the potential risk however if this vegetation is not managed there will be a need to provide an Inner Asset Protection Zone inside the Lease Boundary.

The ACT Strategic Bushfire Management Plan 2014 requires the provision of an Outer and Inner Asset Protection Zone to the south-western and southern edge of the Brickworks precinct. The management of the Dunrossil Avenue and Cotter Road corridors provides a satisfy Outer Asset Protection Zone – provided that the current management practices remain in place.

The provision of the Inner Asset Protection Zone, inside the Lease Boundary, is a mandatory requirement of the ACT Strategic Bushfire Management Plan 2014. However some scope may exist for part of the Inner Asset Protection Zone to be located in the managed Dunrossil Avenue and Cotter Road corridors. The purchaser/developer shall satisfy its-self/themselves of the practicality of the placement of the IAPZ beyond the Lease Boundary.

The ACT Strategic Bushfire Management Plan 2014 requires the establishment of a 10 metre wide Inner Asset Protection Zone to the south-eastern aspect of the Brickworks precinct, located inside the Lease Boundary, Irrespective of the location of the IAPZ, the construction of buildings located within the 100 metre wide setback to unmanaged bushfire prone vegetation shall comply with BAL 12.5 standards, pursuant to A.S.3959 – 2009.
It is concluded that the provision and maintenance of the recommended fire protection measures reduces the potential bushfire risk to the proposed development from high, prior to implementation of the protection measures, to moderate after the implementation of those measures.

Graham Swain
Managing Director - *Australian Bushfire Protection Planners Pty Limited*
REFERENCES:

- ACT Planning Strategy – 2012;
- Emergency Risk Management – Applications Guide. (EMA) 2000);
- Planning for Bushfire Risk Mitigation 2006 & update 2009;
- TaMS Bushfire Operations Plan [BOP] – North Curtin Horse Paddocks and Brickworks Precinct;
- Yarralumla & North Curtin Environmental Constraints Mapping;
- ACTmap – Significant Plants, Animals & Registered Trees Map - Yarralumla & North Curtin;
- ACTmap – Natural Temperate Woodland Mapping – Yarralumla & North Curtin; and
- ACTmap – Sun Moth Habitat Mapping – Yarralumla & North Curtin;
- DSB Tree Assessment;