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Briefing Note

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cc: Dave Richardson, ACT Land Development Agency
From: Peter Cowper, Umwelt (Australia) Pty. Limited
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Date: 15th October 2013
Subject: Ecological values of the Kama Nature Reserve – Molonglo Stage 3 outer asset protection zone

Purpose

The purpose of this briefing note is to inform the ACT land development agency of the ecological values of the outer asset protection zone for the interface between Kama Nature Reserve and the Molonglo Stage 3 development.

Contents

1.0	Site location	2
2.0	Methods	2
3.0	Findings	2
3.1	Area within Kama Nature Reserve	2
3.2	Area within the Molonglo stage 3 development	4
4.0	Conclusions & Recommendations	6
5.0	Site Photographs	7
6.0	References	9

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1.0 Site location

Based on advice from the ACT Land development Agency, the areas which may be managed as part of the outer asset protection zone may include an area of 200 metres either side of the eastern boundary of Kama Nature Reserve. The location of this area is shown in **Figure 3.1**.

2.0 Methods

While undertaking a broader ecological assessment of Kama Nature Reserve and the Molonglo stage 3 development area on 24 September 2013 as part of the review of the draft Environmental Offsets Calculator (Umwelt 2013)¹, Umwelt ecologists undertook a meandering search to verify the ecological assessment undertaken as part of the Molonglo NES plan. Meandering searches considered general condition, the presence of a native understorey, the potential presence and condition of threatened ecological communities and potential habitat for threatened species.

Additionally, one 20x20 full-floristic quadrat which was assessed as part of subsequent condition assessment undertaken by Eco Logical Australia (2013)² was surveyed in order to validate findings of this report.

Vegetation survey

Meandering search: Unsystematic wandering across the entire block to supplement floristic information from plot assessment, gain an understanding of species distribution, characterise vegetation communities and determine habitat values.

Full-floristic quadrat sampling: Plot survey to recording cover and abundance of each plant within a defined area. To ensure assessment is in line with ACT Government (2013)³, a 20x20 metre (0.04 hectare) plot size was chosen to collect species richness data, with habitat variables and cover variables assessed within a 20x50 metre plot and along a 50 metre line-intersect transect respectively.

3.0 Findings

3.1 Area within Kama Nature Reserve

The ecological condition of the 200 metre area inside the eastern boundary of Kama Nature Reserve is variable, comprised of a mosaic of high condition box-gum woodland, low condition natural temperate grassland and low condition scribbly gum woodland. The ecological condition of each vegetation type is outlined in **Table 3.1** and shown in **Figure 3.1**.

Table 3.1 – Ecological condition of vegetation within the eastern 200 metre strip of Kama Nature Reserve

Vegetation zone	Ecological condition
Natural temperate grassland (VT3)	The natural temperate grassland area is characterised by a high cover of kangaroo grass (<i>Themeda triandra</i>) and tall speargrass (<i>Austrostipa bigeniculata</i>), with few inter-tussock spaces and a low diversity of native forbs. There are few uncommon native species and some disturbance tolerant species in addition to a high cover of the invasive St John's wort (<i>*Hypericum perforatum</i>). The area has been subjected to moderate alteration through historic grazing management. The area was assessed in line with the Botanical Significance Rating (BSR) for natural temperate grassland as defined by the ACT lowland native grassland conservation strategy (ACT Government 2005)⁴. At present, the area is considered to be a mosaic of moderate (BSR 3) and low (BSR 4) condition. With an appropriate level of active

¹ Umwelt (2013a) Review of ACT Environmental Offsets Calculator. Stage 2. Draft July 2013. Prepared by Umwelt (Australia) Pty Limited on behalf of ACT Land Development Agency.

² Eco Logical Australia (2013) Molonglo valley vegetation survey: baseline condition assessment. Prepared for Design & Development, Territory & Municipal Services Directorate (ACT Government), 1 July 2013.

³ ACT Government (2013) Environmental Offsets Calculator Operational Manual. ACT Environment and Sustainable Development Directorate. Version 20130301.

⁴ ACT Government (2005) A vision splendid of the grassy plains extended: ACT lowland native grassland conservation strategy. Action Plan No. 28 (Arts, Heritage and Environment, Canberra).

	management to reduce biomass and maintain inter-tussock spaces, the area is likely to be of moderate (BSR 3) value. The area is considered to be part of the 'natural temperate grassland of the Southern Tablelands of NSW and the Australian Capital Territory' endangered ecological community under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>, and 'natural temperate grassland' endangered ecological community under the ACT <i>Nature Conservation Act 1980</i>. Using condition criteria of ACT Government (2013), this area is in 'moderate/good' condition on the basis that if vegetation is not typified by the presence of paddock trees or native pasture (low condition) then it is in moderate to good condition.
Blakely's red gum - yellow box grassy woodland (box-gum) (partially cleared) (VT1a)	The partially cleared box-gum woodland area is characterised by an open woodland overstorey of Blakely's red gum (<i>Eucalyptus blakelyi</i>) which is likely to be have been historically thinned for grazing or other agricultural and land management purposes. The understorey is a mosaic of a moderate to high cover of tussock grasses as per the natural temperate grassland, with approximately 30-40% of the area dominated by exotic pasture patches including wild oats (<i>Avena</i> spp.), barley grass (<i>Hordeum</i> spp.) and rat's-tail fescue (<i>Vulpia myuros</i>), as well as St John's wort and sweet briar (<i>Rosa rubiginosa</i>). In native areas there are species which indicate high condition such as blue devil (<i>Eryngium ovinum</i>) and early nancy (<i>Wurmbea dioica</i> subsp. <i>dioica</i>). However, the understorey is not as diverse as box-gum remnants in the central and western portions of Kama Nature Reserve. The area was assessed in line with condition categories in the ACT lowland woodland conservation strategy (ACT Government 2004)⁵. The area is considered to be 'moderately modified lowland woodland'. The area is considered to be part of the 'white box-yellow box-Blakely's red gum grassy woodland and derived native grassland' critically endangered ecological community under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>, and 'yellow box – red gum grassy woodland' endangered ecological community under the ACT <i>Nature Conservation Act 1980</i>. Using condition criteria of ACT Government (2013), this area is in 'paddock trees' condition. Native over-storey percent foliage cover is less than 25% of the lower value of the overstorey percent foliage cover benchmark for the relevant vegetation type and less than 50% of ground cover perennial vegetation is indigenous species.
Blakely's red gum - yellow box grassy woodland (box-gum) (VT1)	The box-gum woodland area is characterised by a woodland overstorey of Blakely's red gum and yellow box (<i>E. melliodora</i>). The understorey is considered to be in high condition, with a suite of native grasses such as kangaroo grass (<i>Themeda triandra</i>), wallaby grasses (<i>Rytidosperma</i> spp.) weeping grass (<i>Microlaena stipoides</i> var. <i>stipoides</i>) and <i>Aristida vagans</i>, and forbs including blue devil, early nancy, common sunray (<i>Triptilodiscus pygmaeus</i>), scaly buttons (<i>Leptorhynchus squamatus</i>), and the native small St John's wort (<i>Hypericum gramineum</i>). The area was assessed in line with condition categories in the ACT lowland woodland conservation strategy (ACT Government 2004). The area is considered to be 'partially modified lowland woodland'. As a result of the ground layer vegetation diversity and floristic composition, the area is considered to be relatively good quality example of the 'white box-yellow box-Blakely's red gum grassy woodland and derived native grassland' critically endangered ecological community under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>, and 'yellow box – red gum grassy woodland' endangered ecological community under the ACT <i>Nature Conservation Act 1980</i>. Using condition criteria of ACT Government (2013), this area is in 'moderate/good'

⁵ ACT Government (2004) Woodlands for wildlife: ACT lowland woodland conservation strategy. Action Plan No. 27 (Environment ACT, Canberra).

	condition. If vegetation is not in low condition on the basis that if vegetation is not typified by the presence of paddock trees or native pasture (low condition) then it is in moderate to good condition.
Scribbly gum grassy open forest (partially cleared) (VT2a)	The scribbly gum grassy open forest area is characterised by isolated scribbly gum (<i>Eucalyptus rossii</i>) and less frequently, red stringybark (<i>E. macrorhyncha</i>), broad-leaved peppermint (<i>E. dives</i>) and Blakely's red gum. Like VT2 below, the dominance of scribbly gum is possibly due to reduced fertility and soil depth associated with areas at higher elevations within the reserve. The understorey is highly degraded, and dominated by wild oats (<i>Avena</i> spp.), brome (<i>Bromus</i> spp.) and ryegrass (<i>Lolium</i> spp.). Some patches are dominated by native grasses including tall speargrass, wallaby grasses (<i>Rytidosperma</i> spp.) and red-leg grass (<i>Bothriochloa macra</i>). Exotic forbs such as Paterson's curse (<i>Echium plantagineum</i>) and St John's wort are common. The area was assessed in line with condition categories in the ACT lowland woodland conservation strategy (ACT Government 2004). The area is considered to be 'substantially modified lowland woodland'. Using condition criteria of ACT Government (2013), this area is in 'paddock trees' condition. Native over-storey percent foliage cover is less than 25% of the lower value of the overstorey percent foliage cover benchmark for the relevant vegetation type and less than 50% of ground cover perennial vegetation is indigenous species
Scribbly gum grassy open forest (VT2)	The scribbly gum grassy open forest area is characterised by scribbly gum (<i>Eucalyptus rossii</i>) and occasional Blakely's red gum. The dominance of scribbly gum is possibly due to reduced fertility and soil depth associated with areas at higher elevations within the reserve. The understorey is in reasonable condition and is floristically similar to VT1. Dominant species include rough speargrass (<i>Austrostipa scabra</i> subsp. <i>falcata</i>), short wallaby grass (<i>Rytidosperma carphoides</i>), ringed wallaby grass (<i>R. caespitosum</i>), kangaroo grass and a range of forbs including scaly buttons, stinking pennywort (<i>Hydrocotyle laxiflora</i>), spoon cudweed (<i>Stuartina muelleri</i>), wood sorrel (<i>Oxalis perennans</i>) and Austral stonecrop (<i>Crassula sieberiana</i>). The area was assessed in line with condition categories in the ACT lowland woodland conservation strategy (ACT Government 2004). The area is considered to be 'partially modified lowland woodland'. Using condition criteria of ACT Government (2013), this area is in 'moderate/good' condition. If vegetation is not in low condition (paddock trees or native pasture) then it is in moderate to good condition.

3.2 Area within the Molonglo stage 3 development

The ecological condition of the 300 metre area of the western boundary of Molonglo stage 3 development (adjoining Kama Nature Reserve) is generally low, consisting of degraded exotic pastures, and an area containing scattered Blakely's red gum with an exotic understorey. Vegetation type and condition mapping undertaken by ELA (2013) provides a fair representation of ecological values. As requested in project brief, a full-floristic plot surveyed by ELA (2013) (plot O3-01) was surveyed, confirming that the area is dominated by exotic pasture grasses.

The only feature of ecological significance is the presence of five potential pink-tailed worm lizard (*Aprasia parapulchella*) habitat areas. One of these (location PTWL1) is within a patch of diverse native grasses, whereas the others are of moderate to low value due to a higher abundance of Phalaris (*Phalaris aquatica*) and wild oats (*Avena* spp.) These areas are mapped as moderate habitat quality by Osborne & Wong (2010)⁶.

⁶ Osborne W & Wong D (2010) Extent of potential pink-tailed worm-lizard (*Aprasia parapulchella*) habitat in the Stage 2 Investigation Area – East Molonglo downstream of Coppins Crossing. Report commissioned by ACTPLA.

The location of these potential areas is shown in **Figure 3.1**.



Figure 3.1 - Ecological assets of the outer asset protection zone including potential pink-tailed worm lizard habitat.

Vegetation types within Kama Nature Reserve are as follows (Umwelt 2013b)⁷:

VT1:	Blakely's red gum - yellow box grassy woodland
VT1a:	Derived mixed exotic and native grassland (derived from VT1)
VT2:	Scribbly gum grassy open forest
VT2a:	Scribbly gum grassy open forest (partially cleared)
VT3:	Natural temperate grassland

4.0 Conclusions & Recommendations

- The ecological condition of the eastern 200 metres of Kama Nature Reserve are generally moderate to high within areas of 'box-gum' woodland and natural temperate grassland. While there are patches dominated by exotic flora which are likely to be improved with some active management. Specifically, the natural temperate grassland and box-gum areas could benefit from active St John's wort control both in areas adjacent to the Molonglo stage 3 development, and broadly across the reserve.
- The ecological condition of the scribbly gum woodland is generally low due to a dominance of exotic perennial grasses. It may be difficult to restore these areas to their former value, although supplementary tree planting may assist in a move towards this by reducing the available sunlight to the exotic grasses.
- There are at least five potential pink-tailed worm lizard habitat areas within areas identified as the Molonglo stage 3 outer asset protection zone; there may be additional based on findings by Osborne & Wong (2010). It is recommended that these be considered in the context of the Molonglo Valley NES Plan and associated implications for development in meeting obligations under the approved strategic assessment.

⁷ Umwelt (2013b) Briefing note: vegetation mapping for Kama Nature Reserve, Molonglo. Prepared by Umwelt Pty Limited for Daniel Santosuosso, ACT Land Development Agency. 11 October 2013.

5.0 Site Photographs

Photo 1: Natural temperate grassland in the south-eastern corner of Kama Nature Reserve, with considerable cover of exotic St John's Wort.



Photo 2: Blakely's red gum - yellow box grassy woodland (box-gum) (partially cleared) (VT1a), inside Kama Nature Reserve.



Photo 3: Scribbly gum grassy open forest (partially cleared), with a mosaic of native and perennial exotic grass understorey, inside Kama Nature Reserve.



Photo 4: Exotic Phalaris and wild oats dominated pastures, inside the Molonglo stage 3 development area.



6.0 References

- ACT Government (2004) Woodlands for wildlife: ACT lowland woodland conservation strategy. Action Plan No. 27 (Environment ACT, Canberra).
- ACT Government (2005) A vision splendid of the grassy plains extended: ACT lowland native grassland conservation strategy. Action Plan No. 28 (Arts, Heritage and Environment, Canberra).
- ACT Government (2013) Environmental Offsets Calculator Operational Manual. ACT Environment and Sustainable Development Directorate. Version 20130301.
- Ecological (2013) Molonglo valley vegetation survey: baseline condition assessment. Prepared for Design & Development, Territory & Municipal Services Directorate (ACT Government), 1 July 2013.
- Osborne W & Wong D (2010) Extent of potential pink-tailed worm-lizard (*Aprasia parapulchella*) habitat in the Stage 2 Investigation Area – East Molonglo downstream of Coppins Crossing. Report commissioned by ACTPLA.
- Umwelt (2013a) Review of ACT Environmental Offsets Calculator. Stage 2. Draft July 2013. Prepared by Umwelt (Australia) Pty Limited on behalf of ACT Land Development Agency.
- Umwelt (2013b) Briefing note: vegetation mapping for Kama Nature Reserve, Molonglo. Prepared by Umwelt Pty Limited for Daniel Santosuosso, ACT Land Development Agency. 11 October 2013.



ANALYSIS OF VEGETATION STRUCTURE AND FIRE RISK

West Denman Prospect

FINAL

April 2015



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Prepared by
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on behalf of
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EXECUTIVE SUMMARY

Umwelt (Australia) Pty Limited (Umwelt) was engaged by the ACT Land Development Agency (LDA) to assess the ecological values in areas west of Denman Prospect (the Project Area), and identify practical solutions to meet joint objectives of fuel hazard management and biodiversity conservation.

Information in this report is to accompany a bushfire management plan undertaken by Australian Bushfire Protection Planners Pty Limited (also engaged by the LDA).

Key messages include:

- Much of the vegetation within the Project Area is in a regenerating thicket state from the 2003 wildfires.
- Vegetation in a regenerating thicket state will benefit from active management to promote restoration of the remnant to a state which accelerates the provision of structural diversity important for both fauna and flora diversity. This is demonstrated through discussion of the state and transition model concept.
- Active management of regenerating thicket vegetation will provide greater opportunity for fire management and suppression, reducing the likelihood of a major fire event compromising biodiversity values in the future.
- Research outlined in the report suggests that reducing the density of smaller stems that compete strongly for resources leads to greater structural and floristic diversity and subsequent greater conservation values. The use of hazard reduction burning as a tool to achieve this is unlikely to reduce understorey vegetation diversity provided burn intervals are set at the lower limits by maturity of smaller plants and non-breeding periods of poorly dispersed or rare birds, and at upper limits by the longevity of plants which usually require fire as part of the reproductive cycle.
- Hazard reduction burns in Red Stringybark Dry Sclerophyll Forest within the project area should be initially undertaken in a mosaic every five to 10 years. For Box-Gum Woodland burns should not occur in periods of less than 10 years, and longer should fuel levels remain naturally low or other fuel management techniques be used. Practical implementation of this measure should be done in consultation with ACT Government Conservation Planning and Research officers to determine the most appropriate interval between burns particular to each SFAZ.
- Management should be undertaken with adaptive management principles in mind. This will ensure an iterative process of robust decision making in the face of uncertainty, with uncertainty reduced over time as determined by monitoring.
- Hazard reduction burning should be avoided in areas of known Pink-tailed Worm Lizard habitat; if hazard reduction burning occurs this should happen between late winter and mid spring (preferable August to September).

TABLE OF CONTENTS

1.0	Introduction	1
1.1	Background	1
1.2	Project Scope	1
1.3	Project Area Description.....	2
1.3.1	Location	2
1.3.2	Effect of 2003 Wildfires.....	4
2.0	Literature Review	5
2.1	Benchmark Stem Densities	5
2.1.1	Gibbons <i>et al.</i> (2010)	5
2.1.2	<i>Native Vegetation Regulation 2013</i> (NSW)	6
2.2	Stem Densities and Understorey Vegetation	7
2.3	Hazard Reduction Burning Effects on Vegetation and Habitat	7
2.4	Tree Hollows	10
2.5	Studies within the Project Area.....	10
2.5.1	Bird Diversity	10
2.5.2	Pink-tailed Worm Lizard	11
2.5.3	Vegetation	11
3.0	Stem Densities & Habitat Structure within the Project Area .	14
3.1	Methodology	14
3.1.1	Field Assessment	14
3.1.2	Analysis	16
3.2	Findings	17
3.2.1	Strategic Fire-fighting Advantage Zone 1	18
3.2.2	Strategic Fire-fighting Advantage Zone 2	19
3.2.3	Strategic Fire-fighting Advantage Zone 3	20
3.2.4	Strategic Fire-fighting Advantage Zone 4	21
3.2.5	Strategic Fire-fighting Advantage Zone 5	22
3.2.6	Strategic Fire-fighting Advantage Zone 6	23
3.2.7	Strategic Fire-fighting Advantage Zone 7	24
3.2.8	Strategic Fire-fighting Advantage Zone 8	25
3.2.9	Strategic Fire-fighting Advantage Zone 9	26
3.2.10	Strategic Fire-fighting Advantage Zone 10	27
3.2.11	Other Strategic Fire-Fighting Advantage Zones	28
3.2.12	Additional Values	29
3.2.13	Summary	30
3.2.14	Limitations.....	31
4.0	Habitat Requirements for Listed Threatened Species	33
5.0	State and Transition Model Concept.....	35
5.1	Maintaining Structural Diversity.....	37

6.0	Conclusion.....	38
6.1	Strategic Fire-fighting Advantage Zone Management.....	38
6.2	Outer Asset Protection Zone	39
6.3	Urban Interface	40
6.4	Inner Asset Protection Zone.....	40
6.5	Timing.....	40
6.6	Limitations	40
7.0	References.....	42

FIGURES

1.1	The Project Area.....	3
1.2	Fire Severity Model for the ACT (2000 – 2003).....	4
2.1	Groundcover Species Richness and Stem Density Response to Wildfire....	9
2.2	Mapped Pink-tailed Worm Lizard Habitat	12
2.3	Vegetation of the Project Area (Open Lines 2014)	13
3.1	Strategic Fire-fighting Advantage Zones and Stem Density Plot Locations	15
3.2	Open-Low-High-Close Chart Explanation	17
3.3	Other Strategic Fire-Fighting Advantage Zones	28
3.4	Pink-Tailed Worm Lizard, Rocky Outcrop SFAZ 7	29
3.5	Maximum ‘Overall Fuel Hazard Assessment’ ratings for each SFAZ	32
5.1	Adaptive Management Process	35
5.2	Conceptual State-and-Transition Model.....	36

APPENDICES

1	Box-Gum Woodland Values within the Project Area
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1.0 Introduction

1.1 Background

Umwelt (Australia) Pty Limited (Umwelt) was engaged by the ACT Land Development Agency (LDA) to assess the ecological values in areas west of Denman Prospect (the Project Area), and identify practical solutions to meet joint objectives of fuel hazard management and biodiversity conservation.

As part of this, site assessment within the Project Area was undertaken to determine the current extent and quality of box-gum woodland. Identification of these values as described in Appendix 1 allowed for appreciation of opportunities to manage them within the proposed Outer Asset Protection Zone (OAPZ) and urban interface without adversely impacting conservation values.

A series of three workshops involving staff from the Land Development Agency, Territory and Municipal Services, Emergency Services Agency, ACT Fire and Rescue, the Environment and Planning Directorate and consultant ecologists and a bushfire planner were held regarding fire risk and management in the Molonglo Valley between August and October 2014. These workshops revealed that further consideration to ensure the joint objectives of fuel hazard reduction and biodiversity conservation were considered in the management of the Project Area. As part of the workshops, it was considered that the Project Area would be managed as a Strategic Firefighting Advantage Zone (SFAZ); 13 sub-zones were defined within this as a proposed basis for management of fuel hazard.

While related specifically to matters of national environmental significance (MNES) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the Molonglo Adaptive Management Strategy (ACT Government 2013a¹) sets management objectives for the management of fire. This report aims to provide relevant information in order to satisfy these objectives for all native vegetation within the Project Area. For information on these objectives refer to Section 1.14 of ACT Government (2013a).

1.2 Project Scope

In order to permit fuel hazard reduction planning within the Project Area, a detailed understanding of the vegetation values as they relate to habitat structure and fuel loads was required. This was achieved through the following:

- Field Assessment within each SFAZ as defined by Graham Swain (Australian Bushfire Protection Planners Pty Ltd) to determine:
 - vegetation and habitat structure within representative 50x20 metre plots within each SFAZ, assessed using the ACT draft Environmental Offsets Calculator; and
 - stem densities within different size classes, measured within two (2) representative 20 x 50 metre plots within each SFAZ.
 - current fuel hazard using the 'Overall Fuel Hazard Assessment' method (Hines *et al.* 2010²);

¹ ACT Government (2013a) *Molonglo Adaptive Management Strategy*. Territory and Municipal Services, ACT Government. May 2013.

² Hines F, Tolhurst KG, Wilson AAG & McCarthy GJ (2010) *Overall Fuel Hazard Assessment Guide*. 4th Edition, July 2010. Fire and Adaptive Management Report No. 82. Department of Sustainability and Environment, Victorian Government.

- for areas of box-gum woodland, an assessment of current condition criteria for inclusion as box-gum woodland under the EPBC Act and the ACT *Nature Conservation Act 1980* (NC Act).
- Preparation of a report outlining:
 - The recent fire history of the Project Area, including fire timing, severity and other observational evidence.
 - A catalogue of the current structure of each SFAZ, and comparison to 'benchmark' structure as defined by appropriate references [note that literature review determined a study undertaken by Gibbons *et al.* (2010³) to be the most suitable for comparison].
 - A review of literature regarding habitat requirements for species listed under the EPBC Act and/or NC Act which may occur in the Project Area, including linkages to appropriate vegetation structure.
 - Recommendations for management of vegetation structure for biodiversity with consideration of key concepts such as 'state-and-transition' models, and highlighting synergies with fuel hazard reduction strategies.

The report does not address legislative requirements for any future management of the Project Area.

1.3 Project Area Description

1.3.1 Location

The Project Area (**Figure 1.1**) is a remnant directly west of the proposed suburb of Denman Prospect (part of the Molonglo Stage 2 development south of the Molonglo River in western ACT). It comprises approximately 116 hectares of primarily dry sclerophyll forest, which was severely burnt in the 2003 bushfires. Northern areas as well as a central ridge have been cleared for pastoral development. There is little infrastructure within the Project Area, with a central fire trail accessed off Uriarra Road.

³ Gibbons P, Briggs SV, Murphy DY, Lindenmayer DB, McElhinny C & Brookhouse M (2010) *Benchmark Stem Densities for Forests and Woodlands in South-eastern Australia Under Conditions of Relatively Little Modification by Humans Since European Settlement*. *Forest Ecology and Management* **260**: 2125 – 2133.

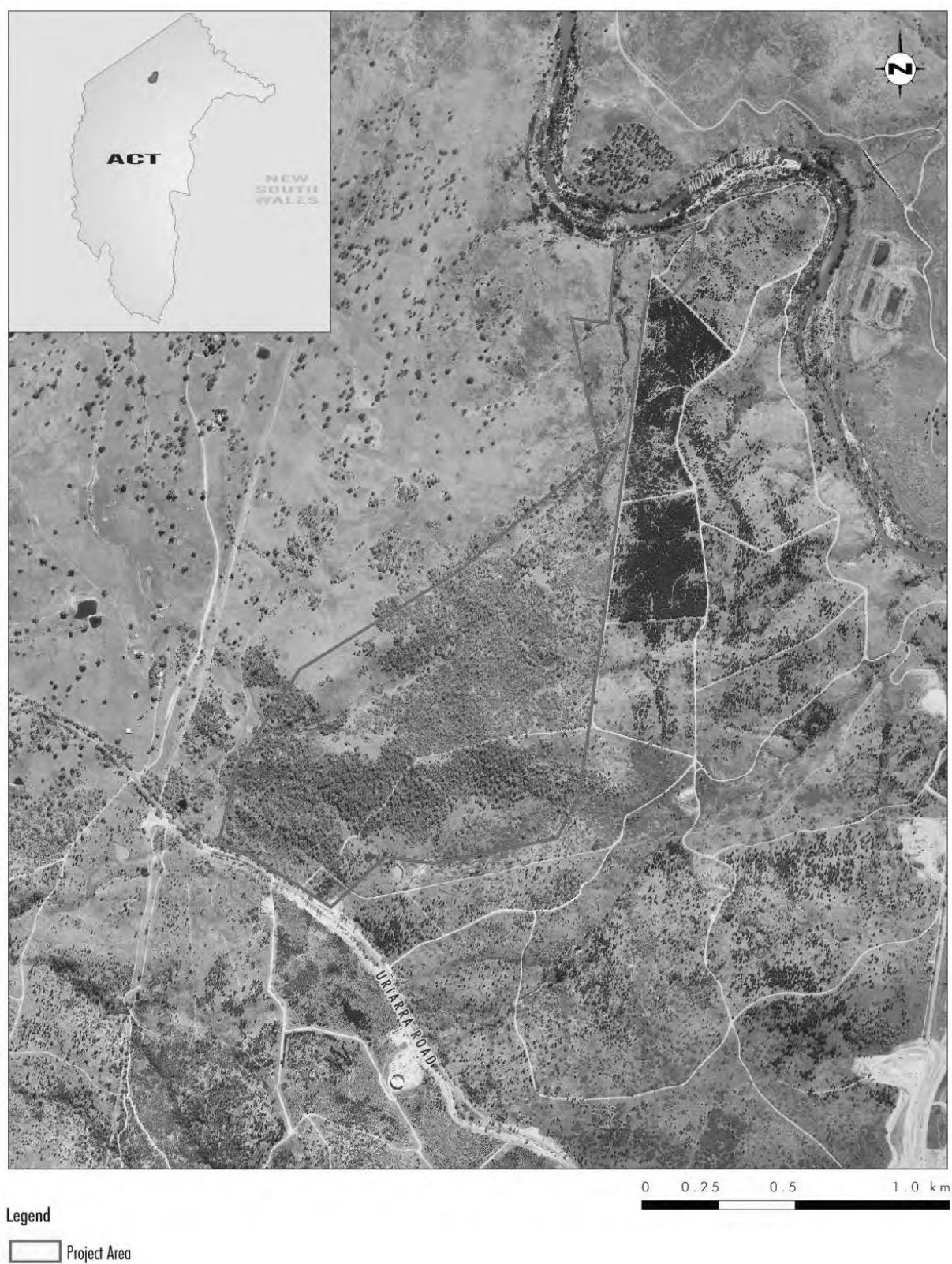
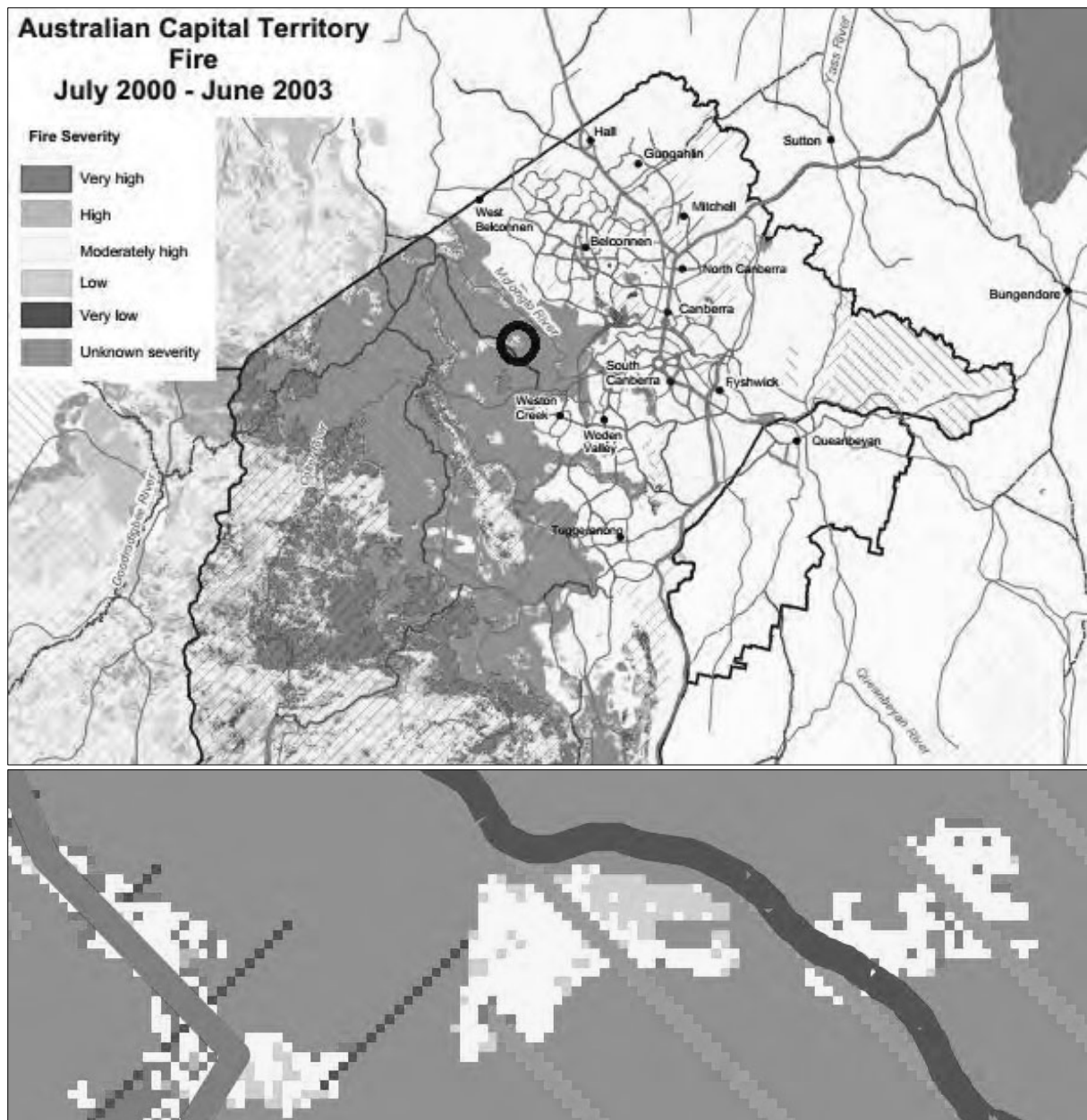


Figure 1.1 – The Project Area

1.3.2 Effect of 2003 Wildfires

While no empirical information on vegetation structure within the Project Area prior to the 2003 fires was available for inclusion in this project, it is apparent from the terminal effect this fire had on large and medium-sized trees that the 2003 fire was very hot in this area. Modelling of fire intensity for July 2000 – June 2003 presented on the Office of the Commissioner for Sustainability and the Environment website (OCSE, 2015⁴) shows that the fire severity within the Project Area ranged from 'Moderately High' to 'Very High' (Figure 1.2).



Top: fire severity model for the ACT; **Bottom:** close-up of the Project Area (right) and vegetation to the west connecting the Project Area to the Murrumbidgee River corridor (Uriarra Road shown as heavy maroon line with Murrumbidgee River in blue).

Source: OCSE (2015)

Figure 1.2 – Fire Severity Model for the ACT (2000 - 2003)

⁴ OCSE (2015) *Map of Fire Extent in 2000 – 2003*. Office of the Commissioner for Sustainability and the Environment [URL Accessed 12/02/2015: <http://www.environmentcommissioner.act.gov.au/publications/soe/2003actreport/indicators03/fire03>].

2.0 Literature Review

The below literature review considers some key principles related to stem density and biodiversity values, the effect of prescribed burning on vegetation values, and existing studies within the project area. It is assumed that studies related to stem densities and biodiversity values are comprehensive, as these studies include consideration of biodiversity values within geographically relevant vegetation.

2.1 Benchmark Stem Densities

2.1.1 Gibbons *et al.* (2010)

Gibbons *et al.* (2010) undertook a study to predict the numbers of trees occurring in each diameter class for several widespread forest and woodland types in south-eastern Australia under conditions of relatively little modification by humans since European settlement. The intent of this study was to provide empirical guidance to forest managers in achieving biodiversity outcomes based on the following premises:

- Tree densities prior to European settlement are likely to better approximate the conditions to which native biota are adapted than stands that have been modified substantially since European settlement;
- Ecological communities are more resilient to perturbations (e.g. fires, windstorms) if managed within their natural range of variation rather than outside this range; and
- The structure of stands prior to modification provides a benchmark against which realistic management objectives for forests can be made.

Rather than undertaking in-depth review of ecological requirements for individual species (which vary significantly), these assumptions are carried throughout this assessment. Patch heterogeneity is an additional consideration that may satisfy individual species needs, and this is mentioned further in **Section 6**.

Stem densities within nine woodland and open forest vegetation alliances from northern Victoria to northern central NSW were measured, including the 'Red Stringybark (*Eucalyptus macrorhyncha*) Alliance' and the 'Yellow Box (*E. melliodora*) Alliance', which includes Blakely's Red Gum (*E. blakelyi*) and is hereafter referred to as 'Box-Gum Woodland'. For these alliances, the study concluded that the abundance of stems within defined size classes in **Table 2.1** reflects the structure expected in remnants of relatively little modification by humans since European settlement.

Table 2.1 – Recommended Number of Stems within Defined Size Classes to Optimise Biodiversity Values for the Red Stringybark Vegetation Alliance

Size (hectares)	Diameter at Breast Height (cm)							
	5-20	21-30	31-40	41-50	51-60	61-70	71-80	>80
Red Stringybark Alliance								
0.1	15.1-34.3	12.9	4.5-6.6	1.6-2.8	1.0-1.7	0.44-0.54	0.28-0.31	0.15-0.62
1	302-686	258	90-132	32-56	20-34	8.8-10.8	5.6-6.2	3-12.4
Box-Gum Woodland								
0.1	12.4-22.8	5.1	1.9-3.5	0.5-1.1	0.3-0.6	0.22-0.26	0.37-0.4	0.37-0.56
1	248-456	102	38-70	10-22	6-12	4.4-5.2	7.4-8	7.4-11.2

Diameter at breast height (DBH) is not defined in the study (some countries measure this at 1.4 metres), nor is whether this measurement is over-bark or under-bark (i.e. DBH minus the thickness of the bark is often used to calculate timber volumes). In the absence of this information, DBH is assumed to be the standard 1.3 metres (Australian standard), with the measurement taken over-bark. Considering upper and lower limits in **Table 2.1**, in a natural state vegetation within the 'Red Stringybark Alliance' may be expected to occur in a pre-European state with between 719 and 1195 stems per hectare, excluding regenerating stems of < 5 centimetres in diameter. Box Gum Woodland' may be expected to occur in a pre-European state with between 423 and 686 stems per hectare, excluding regenerating stems of < 5 centimetres in diameter.

Stems < 5 centimetres DBH were not counted as part of the Gibbons *et al.* (2010) study, and it was noted that the effect of altered fire regimes on stem density is not easily quantified. In this study, 2% of plots had recent fire, 57% had evidence of past fire (identified through scars or charred logs), and 41% had no visible evidence of recent or past fires.

2.1.2 *Native Vegetation Regulation 2013 (NSW)*

While the Project Area is not in NSW, and the land is not managed for agricultural purposes, information within this regulation is included for comparison. The guidance within Clause 40 of the *Native Vegetation Regulation 2013* (NV Regulation) is considered a far coarser than measurements in Gibbons *et al.* (2010), and should not be used as a consideration to maintain biodiversity values. However, the relevant conditions provide guidance as to best management practice to ensure residual values are maintained should a mechanical thinning event occur.

Clause 40 of the NV Regulation declares that thinning of native vegetation on all land in NSW subject to the *Native Vegetation Act 2003* (NV Act) be a routine agricultural management activity (RAMA).

Appendix 1 of Clause 40 outlines vegetation formations suitable for thinning without approval (in NSW) under this clause. Vegetation formations are quite broad, with the majority of vegetation within the Project Area considered to be within the 'Dry Sclerophyll Forest' formation. The benchmark stem density for this formation is 300 stems per hectare, and Clause 40 suggested that a minimum of 75% of benchmark stems (or 225 stems per hectare) should be retained. For Grassy Woodlands, the benchmark density is 225 stems per hectare, with 75% of this being 169 stem per hectare. Stems retained must include the largest stems across each hectare prior to thinning.

Under this clause, the following relevant conditions are noted:

- Thinning on steep and highly erodible, and special category vulnerable land, must only be undertaken by clearing individual trees and woody shrubs with no disturbance to soil and groundcover;
- Thinning must only be undertaken with minimal disturbance to soil and groundcover;
- Incidental damage of non-target plants must be minimised; and
- Thinning must not result in cut stems or debris being stacked around or against retained mature trees or woody shrubs.

Under the NV Regulation, thinning is defined as 'the selective removal of individual trees, or parts of trees, for the purposes of reducing competition between trees, allowing growth of

remaining trees, tree regeneration and groundcover growth and improving or maintaining the structure and composition of native vegetation’.

2.2 Stem Densities and Understorey Vegetation

A recent Victorian study undertaken by Jones *et al.* (in press⁵) researched the effects of stem densities on understorey vegetation in box-ironbark woodlands and forests in central Victoria. These forests are dominated by species including Red Stringybark, Grey Box (*E. microcarpa*), Yellow Box, Red Box (*E. polyanthemos*), Mugga Ironbark (*E. tricarpa*), Yellow Gum (*E. leucoxylon*), Bundy (*E. goniocalyx*) and Blakely's Red. Within 98 100 x 5 metre plots, species identify and size of all woody individuals (trees and shrubs) were recorded, along with species richness of all vascular plants. The Jones *et al.* (in press) study makes regular reference to and is seen as complementary to the Gibbons *et al.* (2010) study.

This study found that dense stands of regeneration suppressed both native and exotic understorey cover and species richness, with thinning increasing native understorey cover and species richness from well below benchmark values to within the benchmark range in less than 10 years. The following points are made:

- Leaving stands at a high density of small stems (e.g. 5-20 centimetres DBH) for long periods may delay the development of desirable understorey attributes even if stem densities eventually decline.
- Ecological thinning may increase the abundance of exotic understorey species, particularly in sites prone to weed invasion.
- Reducing stem density to within or below benchmark levels is required to shift cover to within the corresponding understorey benchmarks.

Numerous other studies have been undertaken on the effects of stem densities on understorey vegetation, most notably in semi-arid and arid areas where ‘woody weeds’ are considered a problem. While substantial, such research is less relevant to the Project Area than that undertaken by Jones *et al.* (in press).

2.3 Hazard Reduction Burning Effects on Vegetation and Habitat

Both ACT and NSW have guidelines for appropriate fire intervals to maintain diversity and manage fire risk (ACT Government 2009⁶, NSW Government 2004⁷). **Table 2.2** outlines the appropriate fire intervals for dry sclerophyll forest and grassy woodlands for these documents.

⁵ Jones CS, Duncan DH, Rumpff L, Thomas FM, Morris WK & Vesl PA (in press) *Empirically Validating a Dense Woody Regrowth ‘Problem’ and ‘Thinning ‘Solution’ for Understorey Vegetation*. *Forest Ecology & Management*: <http://dx.doi.org/10.1016/j.foreco.2014.12.006>.

⁶ ACT Government (2009) *Strategic Bushfire Management Plan for the ACT: Bushfire Policy and Management Framework. Supporting Information: Part Two*. Emergency Services Agency, Publication 09/1289.

⁷ NSW Government (2004) *Guidelines for Ecologically Sustainable Fire Management*. NSW Biodiversity Strategy, July 2004. NSW National Parks and Wildlife Service.

Table 2.2 – Suggested Intervals for Fire Management (ACT/NSW Government Guidelines)

Vegetation	Suggested Fire Interval Limit (years)		Reference
	Lower	Upper	
Red Stringybark Alliance			
Dry Sclerophyll Shrub/Grass Forest	5	50	NSW Government (2004)
Dry Sclerophyll Shrub Forest	7	30	
<i>Eucalyptus macrorhyncha</i> – <i>E. rossii</i> Tableland forest	10	50	ACT Government (2009)
Box-Gum Woodland			
Sclerophyll Grassy Woodland	10*	40	NSW Government (2004)
<i>Eucalyptus melliodora</i> – <i>E. blakelyi</i> Tableland Woodland	10	40+	ACT Government (2009)

* Within the Southern Highlands; a minimum period of five years is suggested for other areas.

Longitudinal research pertaining to response of understorey vegetation to hazard reduction burning within lowland dry sclerophyll forest communities in the ACT was not revealed during this literature review. However, research undertaken by Penman *et al.* (2008⁸), Penman *et al.* (2009⁹) and Penman *et al.* (2011¹⁰) in shrubby dry sclerophyll forests in south-eastern NSW (Yambulla State Forest, south-west of Eden) provides a useful insight into the effects of prescribed burning of understorey plant richness and compositional changes in dry sclerophyll forest over time. While in an area of higher rainfall (c. 900 millimetres per annum), the study was undertaken in the same Vegetation Formation (Dry Sclerophyll Forest; Keith 2006¹¹) and has a large amount of commonality in terms of plant families and genera.

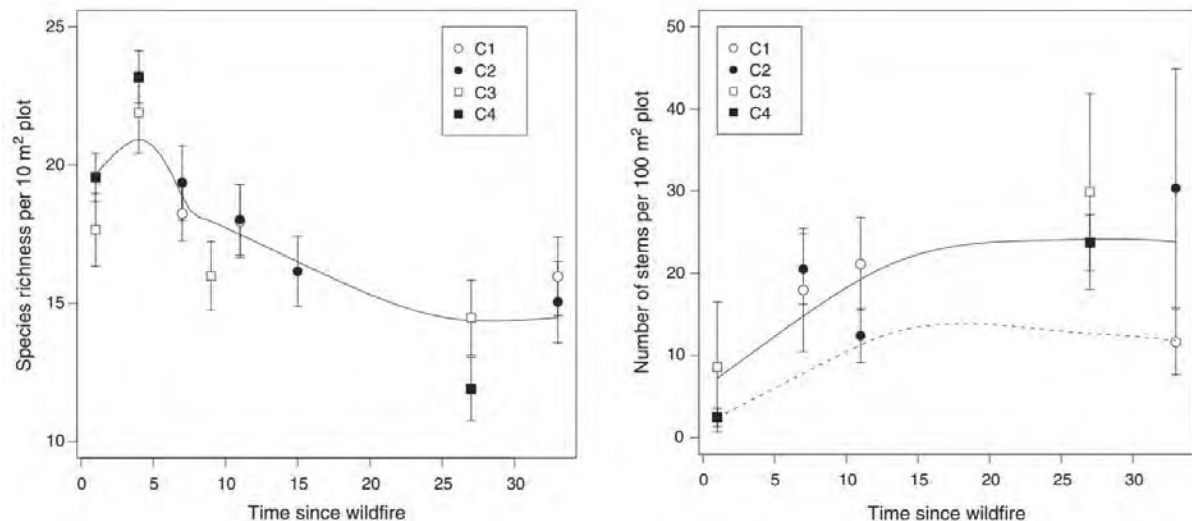
Penman *et al.* (2008) noted that, at a 100 square metre plot level, frequent fire resulted in an increase in species richness for species less than one metre in height (e.g. grasses, forbs and low shrubs), with a decline in richness for larger species which generally take longer to mature. At a remnant level, there was no decline in richness of larger species, possibly owing to the spatial heterogeneity of fire frequency at this scale. At a 10 square metre plot level, understorey species richness peaked approximately five years after fire, declining by almost half after 33 years (**Figure 2.1**); many of these species were maintained *in situ* within the soil seedbank (Penman *et al.* 2009, Penman *et al.* 2011). Tree stem density increased steadily until 10-15 years post fire (the period in which the Project Area is currently after the 2003 fires), remaining stable after this period for the duration of the study (**Figure 2.1**; Penman *et al.* 2009).

⁸ Penman TD, Bins DL, Shiels RJ, Allen RM & Kavanagh RP (2008) *Changes in Understorey Plant Species Richness Following Logging and Prescribed Burning in Shrubby Dry Sclerophyll Forests of South-eastern Australia*. *Austral Ecology* **33**: 197-210.

⁹ Penman TD, Binns DL, Brassil TE, Shiels RJ & Allen RM (2009) *Long-term Changes in Understorey Vegetation in the Absence of Wildfire in South-east Dry Sclerophyll Forests*. *Australian Journal of Botany* **57**: 533-540.

¹⁰ Penman TD, Binns DL, Shiels RJ, Allen RM & Penman SH (2009) *Hidden Effects of Forest Management Practices: Responses of a Soil Stored Seedbank to Logging and Repeated Prescribed Fire*. *Austral Ecology* **36**: 571-580.

¹¹ Keith DA (2006) *Ocean Shores to Desert Dunes: the Native Vegetation of New South Wales and the ACT*. Department of Environment and Conservation, Hurstville.



Groundcover species richness (left); stem density (right). C1, C2, C3 and C4 represent four separate catchments.

Source: Penman *et al.* (2009)

Figure 2.1 – Groundcover Species Richness and Stem Density Response to Wildfire

While the Penman *et al.* (2009) study focuses on response in the absence of wildfire, similar trends in understorey vegetation species richness are shown in response to hazard reduction burning in the same geographic area as part of the Penman *et al.* (2008) study. The above studies do not provide detailed consideration of the effects of fire intensity or seasonality of fire.

While research from Penman *et al.* (2008) suggests a hazard reduction burn interval of approximately five years is optimal for maintaining understorey diversity, intervals may vary depending on the vegetation type and the response of particular species that a particular species to fire interval and intensity. For example, for legumes in which seed dormancy is broken at 60° Celsius, such a temperature needs to be achieved at depths of 0-3 centimetres within the soil profile to achieve a favourable response (Bradstock & Auld 1995¹²). Some legumes are noted to have seed dormancy broken at 40° Celsius (Santana *et al.* 2010¹³).

As a guide, hazard reduction burn intervals may be determined at the lower limits by maturity of smaller plants and non-breeding periods of poorly dispersed or rare birds, and at upper limits by the longevity of plants which usually require fire as part of the reproductive cycle (Gill & McCarthy 1998¹⁴). The lower and upper limits for fire intervals in **Table 2.2** are likely to be a reasonable reflection of this for vegetation within the Project Area.

The effect of hazard reduction burning on individual species is not considered as part of this report, except to say that slashing and grazing is preferable to burning in Pink-tailed Worm Lizard (*Aprasia parapulchella*) habitat, and if burning must take place it should be restricted to between late winter and mid spring (preferably August to September) (Kitchin & Matthews 2012¹⁵).

¹² Bradstock RA & Auld TD (1995) *Soil Temperature during Experimental Bushfire in Relation to Fire Intensity: Consequence for Legume Germination and fire Management in South-eastern Australia*. *Journal of Applied Ecology* **32**: 76-84.

¹³ Santana VW, Bradstock RA, Ooi MKJ, Denham AJ, Auld TD & Baeza MJ (2010) *Effect of Soil Temperature Regimes After Fire on Seed Dormancy and Germination in Six Australian Fabaceae Species*. *Australian Journal of Botany* **58**: 539-545.

¹⁴ Gill MA & McCarthy MA (1998) *Intervals Between Prescribed Fires in Australia: What Intrinsic Variation Should Apply?* *Biological Conservation* **85**: 161-169.

¹⁵ Kitchin M & Matthews H (2012) *2012-13 Ecological Guidelines for Fuel and Fire Management Operations*. Conservation Planning and Research, Environment and Sustainable Development Directorate, ACT Government. September 2012.

2.4 Tree Hollows

During this literature review it was not apparent that any detailed studies into the development of tree hollows in Red Stringybark or Blakely's Red Gum in the ACT have been undertaken. Beyond the ACT however, Rayner *et al.* (2014¹⁶) assessed the morphological and hollow-bearing characteristics for seven *Eucalyptus* species in the sheep-wheat-belt of central New South Wales, including Blakely's Red Gum.

The probability of hollows forming at different DBH size classes for seven species measured as part of the Rayner *et al.* (2014) study supports the theory that, for these species, hollow occurrence increases significantly with mid-sized trees, with large trees having a very high probability of supporting hollows.

Although eucalypts form hollows at different sizes depending on a number of site factors, Blakely's Red Gum was found to form hollows at between 36 and 101 centimetres DBH, with large hollows starting to form at 49 centimetres DBH. This information was based on the measurement of 29 stems from 20 trees within two sites. Observational evidence suggests that Blakely's Red Gum forms hollows in smaller size classes than Red Stringybark.

2.5 Studies within the Project Area

Sections 2.5.1 to 2.5.3 outline known values within the Project Area. Detailed survey to determine floristic values and broader fauna diversity has not been undertaken.

2.5.1 Bird Diversity

On 11 and 18 December 2012, Umwelt (2013¹⁷) undertook a bird survey across six, two hectare plots within the Project Area, recording 29 bird species. Notable species recorded included scarlet robin (*Petroica boodang*) and satin flycatcher (*Myiagra cyanoleuca*). The former is listed as a threatened species under the NSW *Threatened Species Conservation Act 1995* while the latter is considered to be a migratory species in accordance with the EPBC Act. Given the size and habitat provisions within the Project Area, it is plausible that additional notable or threatened woodland birds may utilise the area.

The Umwelt (2013) report noted that elements of the site considered to represent important habitat features that are likely to be persistent in the medium to long term include extensive areas with standing and fallen dead wood, a mosaic of woodland / forest and grassland communities, and the contribution of the area to a relatively large remnant: the largest remaining patch of continuous non-riparian woodland / forest vegetation in the Molonglo Valley.

The report also notes that, should the area be managed as an asset protection zone (APZ), further consideration should be applied to the effect of management on vegetation structure and habitat complexity, and intensive management of edges required for Inner APZs.

¹⁶ Rayner L, Ellis M & Taylor JE (2014) *Hollow Occurrence and Abundance Varies with Tree Characteristics and Among Species in Temperate Woodland Eucalyptus*. *Austral Ecology* **39**: 145-157.

¹⁷ Umwelt (2013) *Woodland Bird Survey, Registered Rural Block 403, Stromlo ACT and the Western Edge of Molonglo Stage 2*. Final Report Prepared for the ACT Land Development Agency, February 2013.

2.5.2 Pink-tailed Worm Lizard

Habitat for Pink-tailed Worm Lizard, listed as Vulnerable under the EPBC Act and NC Act, is mapped as occurring in rocky outcrops in the west of the Project Area (ACTMAPi 2015¹⁸). Open Lines (2014¹⁹) also notes the presence of 0.4 hectares of habitat for this species. **Figure 2.2** shows the mapped location of habitat for this species as sourced from ACTMAPi (2015).

The original source of the ACTMAPi mapping is unknown, but it appears to map all rocky outcrops within the Project Area. In the ACT, Pink-tailed Worm Lizard has mostly been found in areas of secondary grassland with sparse or no tree cover and a moderate to extensive cover of grass; where it has been found in open forest (e.g. Black Mountain) it has generally been found in more open areas. This is also the case for records within open forest in Victoria (Wong 2013²⁰).

While targeted Pink-tailed Worm Lizard survey was not a requirement of the current Umwelt study, this species was opportunistically recorded within mapped habitat in SFAZ 7 [within the area mapped as habitat by Open Lines (2014) within **Figure 2.3** below]. For further information refer to **Section 4.2.12**.

2.5.3 Vegetation

Open Lines (2014) assessed the vegetation of the Project Area. This study determined that the Project Area contained approximately 77.3 hectares of 'Red Stringybark – Scribbly Gum (*Eucalyptus macrorhyncha* – *E. rossii*) Tableland Forest (including derived grasslands)' and approximately 11.4 hectares of 'Yellow Box – Blakely's Red Gum Grassy Woodland'. The latter was assessed as being suitable for inclusion as a critically endangered ecological community under the EPBC Act and an endangered ecological community under the NC Act.

A small area of 0.4 hectares of 'Black Cypress Pine (*Callitris endlicheri*) Tablelands Open Forest' was recorded on the south-western boundary of the site, with a 1.7 hectare patch of exotic grassland on the cleared hillside in the west of the Project Area.

Areas of 'Red Stringybark – Scribbly Gum Tableland Forest' were noted as being in moderate to good condition, with moderate diversity and a low cover of exotic vegetation. The habitat structure was observed as being typical of regenerating remnants of this forest type from the 2003 fires, with a high density of early regenerating eucalypts.

A small 0.4 hectare patch of Pink-tailed Worm Lizard habitat is mapped in the central-western cleared hill within the Project Area.

Vegetation mapped as per Open Lines (2014) is shown in **Figure 2.3**.

¹⁸ ACT Government (2015) ACTMAPi. *Significant Plants, Animals and Registered Tree Information* [URL Accessed 15/02/15: <http://www.actmap.i.act.gov.au/home.html>].

¹⁹ Open Lines (2014) *Molonglo Stage 2 Vegetation Conservation Assessment*. Prepared for the Land Development Agency by Open Lines Environmental Consulting, February 2014.

²⁰ Wong DTW (2013) *Environmental Factors Effecting the Occurrence and Abundance of the Pink-tailed Worm Lizard (*Aprasia parapulchella*) in the Australian Capital Territory*. Thesis Submitted for the Degree of Doctor of Philosophy at the University of Canberra, May 2013.



Figure 2.2 – Mapped Pink-tailed Worm Lizard Habitat (ACTMAPi)

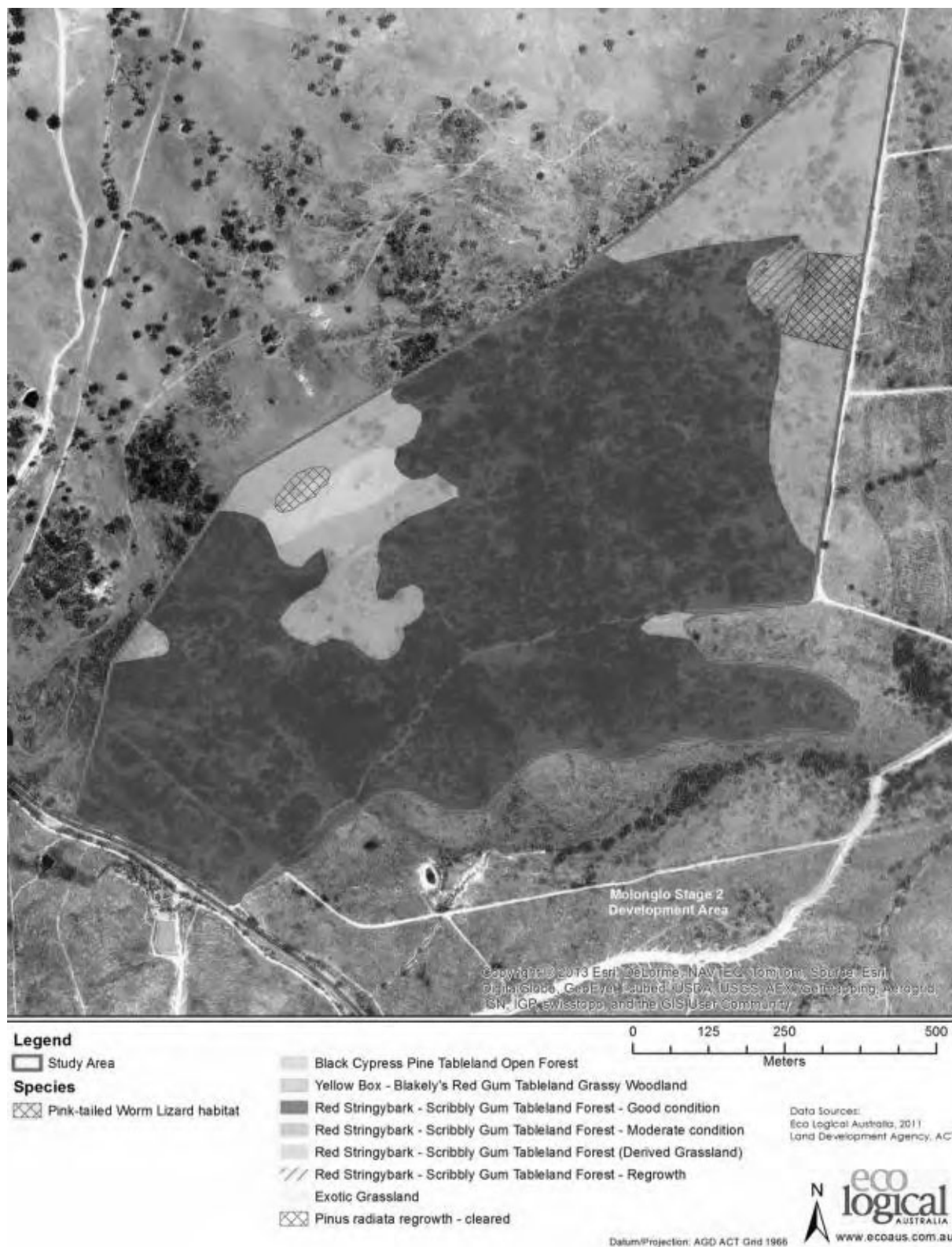


Figure 2.3 – Vegetation of the Project Area (Open Lines 2014)

3.0 Stem Densities & Habitat Structure within the Project Area

3.1 Methodology

3.1.1 Field Assessment

In December 2014 and January/February 2015, survey was undertaken within the Project Area to determine the density of eucalypt stems across a range of size classes, and to explore relationships between this and bushfire hazard as assessed by the 'Overall Bushfire Hazard Assessment Guide' (Hines *et al.* 2010).

The Project Area was broken up into 13 SFAZs as defined by Graham Swain, a bushfire planner engaged by the Land Development Agency to advise on factors relating to fire risk to future property and life in the Molonglo valley urban release area. Of these SFAZ, 10 were considered as part of this assessment based on their landscape position and the high-intensity fire activity in 2003.

Within SFAZs 1 - 10, two 20 x 50 metre (0.1 hectare) plots were assessed to record a range of variables related to stem density, basic floristics, structure and fuel hazard. These variables are outlined in **Table 3.1**. Plot locations were selected based on field observation of typical vegetation structure within each SFAZ; random selection was not feasible due to the level of replication required to ensure field samples will provide a mean result. SFAZs 11, 12 and 13 were not assessed as these are likely to be managed through stock grazing.

Table 3.1 – Values used to Determine Vegetation Structure, Condition, Stem Densities and Overall Fuel Hazard

Category	Information
Used for Analysis	
Stem Size Class/Density	Tally of the number of stems in each size class (<5 cm, 5-10cm, 10-20cm, 20-30cm and >30 cm), and an assessment of overall tree canopy health for trees >30 cm. Note that stems between 5 and 20 centimetres were combine for analysis, and trees above 30 centimetres allocated to size classes as per Gibbons <i>et al.</i> (2010)
Background Information (Contextual)	
Location	General georeference information including AMG grid reference, plot size/orientation, and site identifier.
Basic Floristic/Structure	NVIS level 5 assessment of vegetation structure, including: - Dominant three species in three simple strata; - Cover and abundance of individual species; and - Minimum/maximum/mode height for each stratum
Vegetation Condition	- Assessment of native species richness and native/exotic cover in each stratum for a range of growth forms; - % cover for litter, bare ground and cryptogams; - Number of trees with hollows; - Woody debris; and - Woody regeneration
Fuel hazard	An assessment of bark, elevated fine fuel, near-surface fine fuel, surface fuel and combined surface and near-surface fuel to determine overall fuel hazard as per Hines <i>et al.</i> (2010).

Figure 3.1 shows the location of the SFAZs, as well as individual plot locations within.



Legend

- Project Area
- Outer Asset Protection Zone
- Interface
- Survey Points

Figure 3.1 – Strategic Fire-fighting Advantage Zones and Stem Density Plot Locations

3.1.1.1 Overall Fuel Hazard Assessment

The 'Overall Fuel Hazard Assessment Guide' (Hines *et al.* 2010) enables rapid visual assessment of fuel arrangement. Assessment is made of hazard level relating to bark type, elevated fuel, near-surface fuel and surface fuel, with this composite of this providing an indication of overall fuel hazard. It is applicable to forest vegetation, and also has utility for woodland vegetation types presenting a forest structure due to past disturbance such as wildfire.

Assessment of overall fuel hazard was done at the same time as stem density counts, assessing an area of 20 metres radius within each plot as per the method. The photograph for each plot gives an indication of how a particular fire risk rating area may look, noting that the patchy nature of fuel loads is not captured in its entirety in each photo. This assessment was done in two locations within each SFAZ subzone, and may be used as a guide for fire risk at the time of survey. Further replication is required to give confidence to the level of fire risk.

The method is highly sensitive to subjective assessment of individual fuel components. For example, if the 'Bark Hazard' is deemed 'Very High' or 'Extreme', a patch with 'Low' 'Elevated Fine Fuel Hazard' and Moderate 'Combined Surface and Near-Surface Fine Fuel Hazard' is considered to represent a 'Very High' fuel hazard. If the 'Bark Hazard' is 'High' and the other parameters remain the same, the fuel hazard is considered 'Medium'.

3.1.2 Analysis

Analysis of stem densities within each size class assessed by Gibbons *et al.* (2010) was undertaken to determine the density of stems relative to upper and lower benchmark values for relevant alliances ('Red Stringybark' or 'Box-Gum Woodland', depending on floristic composition) (**Table 2.1**). Areas dominated by Scribbly Gum (*Eucalyptus rossii*) were considered part of the 'Red Stringybark' alliance.

In order to present data for stems in each size class in each SFAZ, raw stem counts were transformed to compare values with upper and lower benchmark counts. A range of transformations were explored; the most effective way to analyse and present data was as a percentage of the upper and lower benchmark value. For example, if a size class contains 50 stems, and the upper benchmark is 10, the stems within that size class form 500% of the recommended upper benchmark to retain biodiversity values.

Data is presented as a percentage of the upper and lower benchmark for each size class within each SFAZ through analysis data across both plots within each SFAZ. This was done using the MS Excel 'Open-Low-High-Close' chart function, a chart function similar to Box and Whisker plots, but lacking display of quartile information.

Where upper and lower values exist based on observations of stems within a size class common across both plots, the 'Open-Low-High-Close' chart displays 'Up-Down' bars to indicate the two median values. Where a stem class occurs only in one of the two plots, these are absent with the comparison with upper and lower benchmark made using 'High-Low' lines only (**Figure 3.2**).

Note that at a 0.1 hectare scale, larger trees often have a benchmark of less than 1 (e.g. 0.28-0.31 trees per 0.1 in the 71-80 centimetre size class; **Table 2.1**). In such instances, observations of one large tree will exceed the benchmark value at this scale. If more than one tree occurs in stem size classes of 51-60 centimetres or greater for SFAZs dominated by the 'Red Stringybark Alliance', this will appear to be above benchmark. Accordingly, focus should be placed on the density of smaller stems (particularly those in the 5 – 20 centimetre class) in comparison to benchmark values.

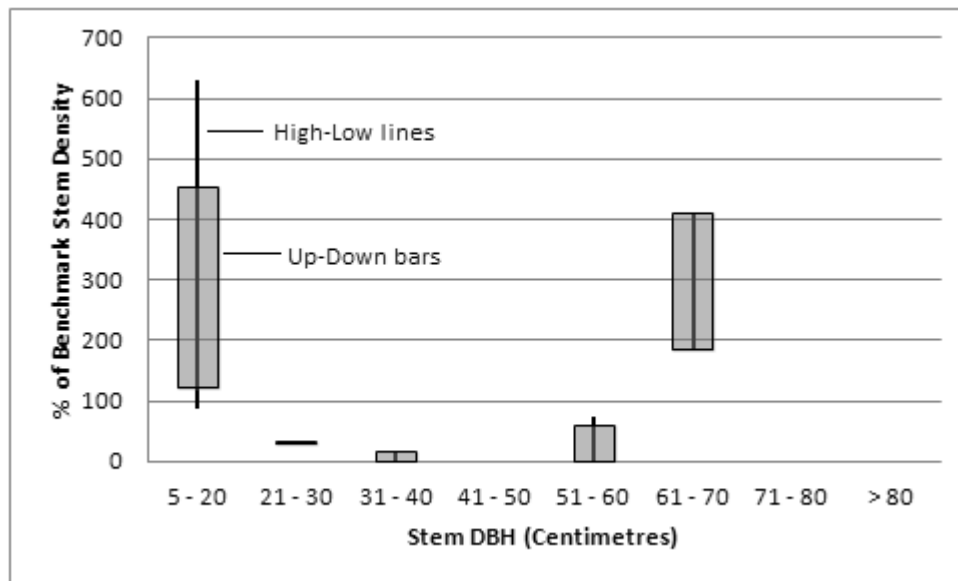


Figure 3.2 – Open-Low-High-Close Chart Explanation

3.2 Findings

Results on the density of stems per size class compared to upper and lower benchmark values (expressed as a percentage) are shown in 'Open-Low-High-Close' chart format in **Section 3.2.1** to **3.2.10**, along with the Overall Fuel Hazard. For each SFAZ, dominant species are listed in order of abundance, and the height and cover range for each stratum is presented.

Values within other SFAZs, as well as general additional fauna values are shown in **Sections 3.2.11** and **3.2.12**. **Section 3.2.13** summarises the above findings further.

Note that as data is collected at a 0.1 hectare scale and replication is low (two samples per SFAZ), there is a large range for some size classes. As indicated in **Section 3.1.1**, sites were selected based on field observation of representative stem density within each SFAZ.

3.2.1 Strategic Fire-fighting Advantage Zone 1



Plot 1-1



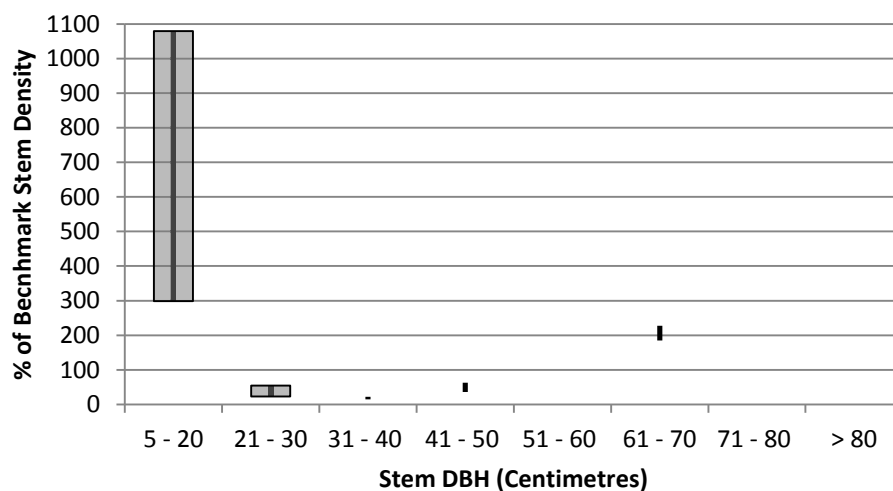
Plot 1-2

Red Stringybark Open Forest (Regenerating)

Upper	<i>Eucalyptus macrorhyncha</i> ; 15-20%, 8-14 (9) metres.
Mid	<i>Monotoca scoparia</i> , <i>Pultenaea procumbens</i> , <i>Cassinia longifolia</i> , <i>E. macrorhyncha</i> ; 25-30%, 0.5-3 (0.8) metres.
Ground	<i>Aira</i> spp., <i>Vulpia myuros</i> , <i>Aristida ramosa</i> , <i>Hibbertia obtusifolia</i> , <i>Brachyloma daphnoides</i> subsp. <i>daphnoides</i> ; 12-20%, 0.1-0.3 (0.15) metres.

Advanced regenerating *E. macrorhyncha* in SFAZ 1 form a distinct canopy, with many of the larger the majority of larger trees killed by the 2003 fires. Larger emergent eucalypts remain, particularly on lower slopes. The midstorey is dominated by *Monotoca scoparia*, with the understorey forming a mosaic of dense low shrubs and open grassy areas, with inter-tussock spaces containing bare earth and a thin layer of leaf litter.

Stem Size Classes (Actual versus Benchmark)



Stems < 5cm DBH: 39 - 43 per 0.1 hectare plot

Overall Fuel Hazard

	Plot 1-1	Plot 1-2	Max
Bark	H	H	M
Elevated Fine Fuel	M	L	
Near-Surface Fine Fuel	M	M	
Surface Fuel	L	L	
Combined Surface / Near-Surface Fuel	M	M	
Overall Fuel Hazard	M	M	

3.2.2 Strategic Fire-fighting Advantage Zone 2



Plot 2-1



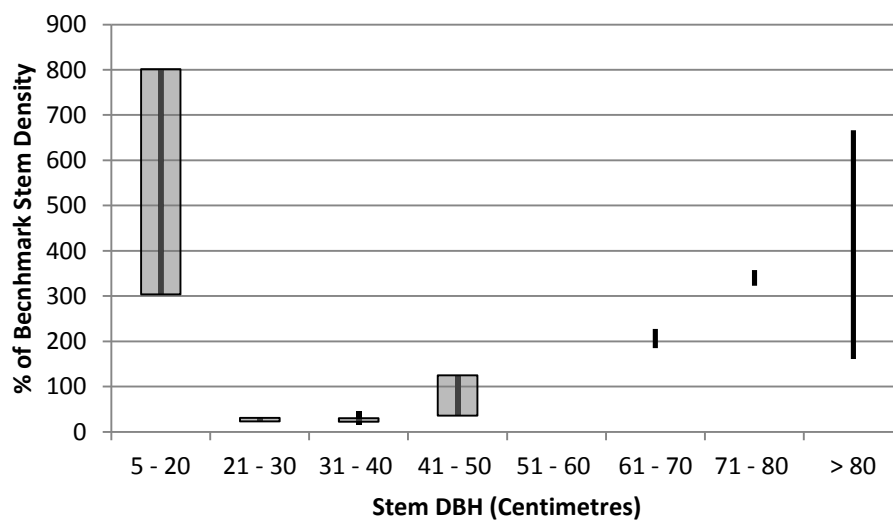
Plot 2-2

Red Stringybark Open Forest (Regenerating)

Upper	<i>Eucalyptus macrorhyncha</i> , <i>E. bridgesiana</i> ; 10-30%, 11-15 (13) metres.
Mid	<i>E. macrorhyncha</i> , <i>Acacia falciformis</i> , <i>Monotoca scoparia</i> , <i>Cassinia longifolia</i> ; 25-35%, 0.8-6 (4) metres.
Ground	<i>Poa sieberiana</i> , <i>Rytidosperma pallidum</i> , <i>Vulpia myuros</i> , <i>Hibbertia obtusifolia</i> ; 12-25%, 0.1-0.4 (0.2) metres.

Regenerating *E. macrorhyncha* in SFAZ 2 form a distinct midstorey, with occasional larger trees ranging from partially to severely burnt in the sparse canopy. The understorey is primarily characterised by sparse native and exotic grasses, with inter-tussock spaces containing a thin layer of leaf litter.

Stem Size Classes (Actual versus Benchmark)



Stems < 5cm DBH: 71 - 160 per 0.1 hectare plot

Overall Fuel Hazard

	Plot 2-1	Plot 2-2	Max
Bark	H	H	M
Elevated Fine Fuel	M	M	
Near-Surface Fine Fuel	H	M	
Surface Fuel	L	M	
Combined Surface / Near-Surface Fuel	M	M	
Overall Fuel Hazard	M	M	

3.2.3 Strategic Fire-fighting Advantage Zone 3



Plot 3-1



Plot 3-2

Scribbly Gum Shrubby Open Forest (Regenerating)

Upper *Eucalyptus rossii*, *E. blakelyi* (lower slope), *E. macrorhyncha*; 5-7%, 10-12 (11) metres.

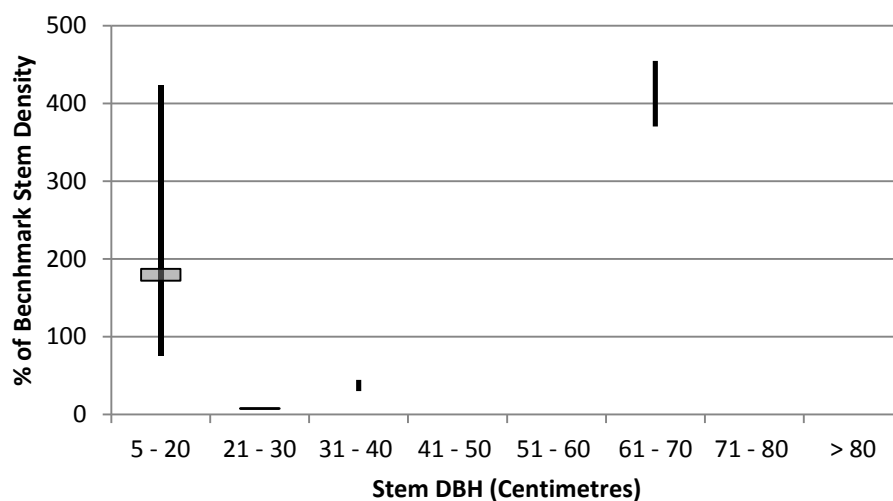
Mid *Kunzea ericoides*, *Brachyloma daphnoides*, *Dillwynia sericea*; 2-65%, 0.5-5 (2) metres.

Ground *Rytidosperma pallidum*, *Aira* spp.; 15-85%, 0.1-0.5 (0.3) metres.

Much of the canopy has been removed, and this zone now forms an open woodland with a mosaic of sclerophyllous shrubs and tussock grasses. No tree hollows and minimal woody debris, with main habitat values associated with the shrubby mosaic. Some moderate sized trees.

At lower elevations, areas with *E. blakelyi* and dry sclerophyll forest affinities may be box-gum woodland (further survey required), however these areas are treated as 'red stringybark alliance' for the purpose of this zone. As indicated in **Section 4.1.2**, *Eucalyptus rossii* is part of this alliance.

Stem Size Classes (Actual versus Benchmark)



Stems < 5cm DBH: 0 - 27 per 0.1 hectare plot

Overall Fuel Hazard

	Plot 3-1	Plot 3-2	Max
<i>Bark</i>	L	M	VH
<i>Elevated Fine Fuel</i>	H	M	
<i>Near-Surface Fine Fuel</i>	E	VH	
<i>Surface Fuel</i>	L	M	
<i>Combined Surface / Near-Surface Fuel</i>	VH	VH	
<i>Overall Fuel Hazard</i>	VH	H	

3.2.4 Strategic Fire-fighting Advantage Zone 4



Plot 4-1



Plot 4-2

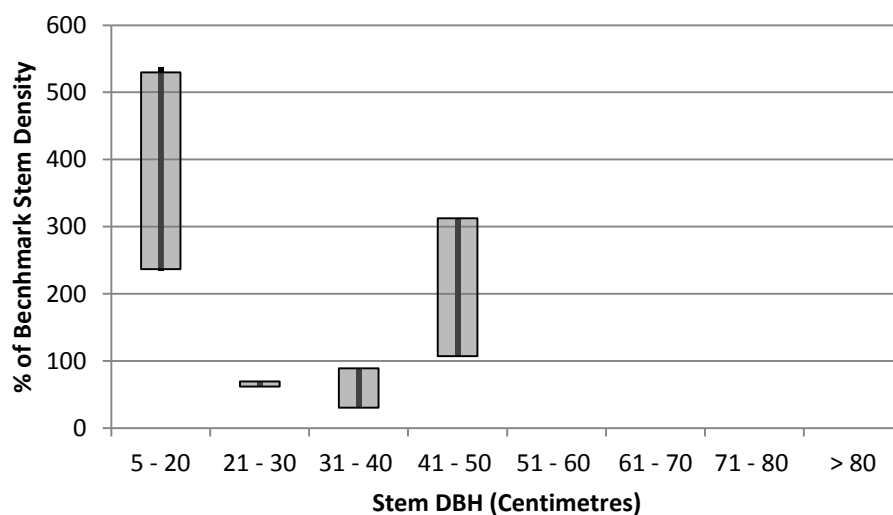
Red Stringybark Open Forest (Regenerating)

Upper	<i>Eucalyptus macrorhyncha</i> , <i>E. rossii</i> ; 15-20%, 8-12 (10) metres.
Mid	<i>E. macrorhyncha</i> , <i>Pultenaea procumbens</i> , <i>Monotoca scoparia</i> , <i>Cassinia longifolia</i> ; 30-40%, 0.5-6 (2.5) metres.
Ground	<i>Rytidosperma pallidum</i> , <i>Poa sieberiana</i> , <i>Pultenaea procumbens</i> , <i>Hibbertia obtusifolia</i> ; 25-45%, 0.1-0.5 (0.25) metres.

Much of this zone has a high level of eucalypt regeneration from the 2003 fires. No tree hollows and moderate woody debris.

While medium-sized trees remain, the 2003 fires were quite hot in this zone, with several large trees dead and the remainder showing evidence of crowning.

Stem Size Classes (Actual versus Benchmark)



Stems < 5cm DBH: 86 - 210 per 0.1 hectare plot

Overall Fuel Hazard

	Plot 4-1	Plot 4-2	Max
Bark	M	H	H
Elevated Fine Fuel	M	M	
Near-Surface Fine Fuel	VH	M	
Surface Fuel	M	M	
Combined Surface / Near-Surface Fuel	VH	M	
Overall Fuel Hazard	H	M	

3.2.5 Strategic Fire-fighting Advantage Zone 5



Plot 5-1



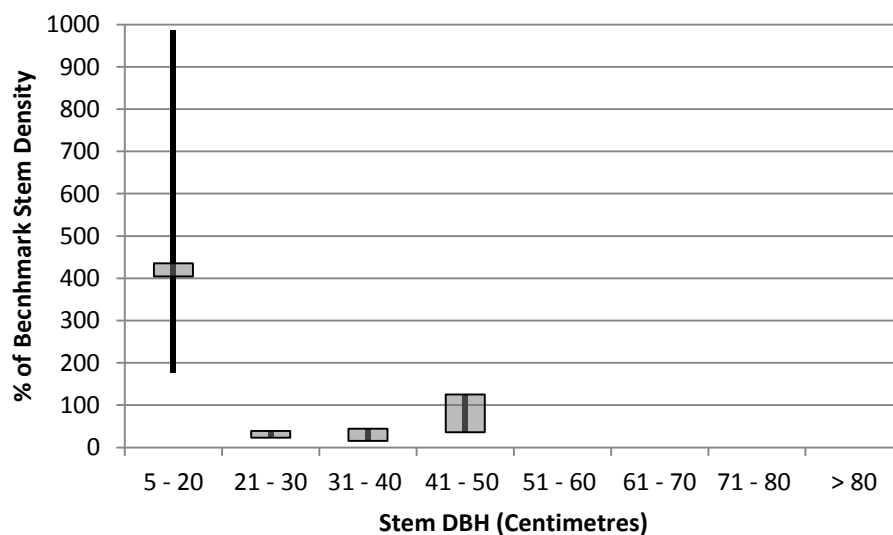
Plot 5-2

Red Stringybark Open Forest (Regenerating)

Upper	<i>Eucalyptus macrorhyncha</i> , <i>E. rossii</i> ; 8-25%, 12-17 (15) metres.
Mid	<i>Dillwynia sericea</i> , <i>E. macrorhyncha</i> , <i>Monotoca scoparia</i> , <i>Pultenaea procumbens</i> , <i>Callitris endlicheri</i> ; 35-50%, 0.5-8 (3) metres.
Ground	<i>Pultenaea procumbens</i> <i>Rytidosperma pallidum</i> , <i>Dillwynia sericea</i> , <i>Goodenia hederacea</i> subsp. <i>hederacea</i> ; 25-60%, 0.1-0.5 (0.4) metres.

The overstorey in this SFAZ is quite open, with much of the eucalypt cover being in the midstorey from the 2003 fires, along with advanced sclerophyllous shrubs. The understorey is dominated by low shrubs and tussock grasses, forming a mosaic with thick leaf litter and bare ground.

Stem Size Classes (Actual versus Benchmark)



Stems < 5cm DBH: 30 - 51 per 0.1 hectare plot

Overall Fuel Hazard

	Plot 5-1	Plot 5-2	Max
Bark	H	H	H
Elevated Fine Fuel	L	L	
Near-Surface Fine Fuel	VH	E	
Surface Fuel	M	M	
Combined Surface / Near-Surface Fuel	VH	E	
Overall Fuel Hazard	H	H	

3.2.6 Strategic Fire-fighting Advantage Zone 6



Plot 6-1



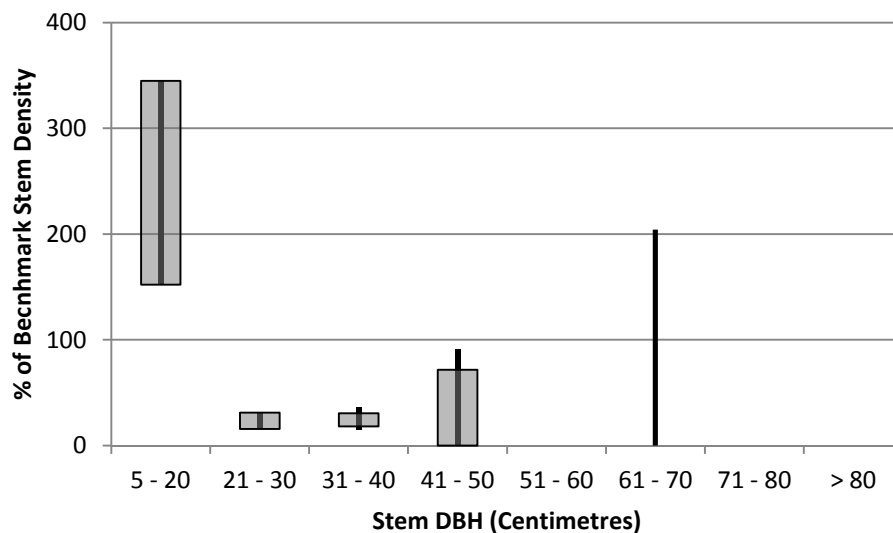
Plot 6-2

Red Stringybark Open Forest (Regenerating)

Upper	<i>E. rossii</i> , <i>Eucalyptus macrorhyncha</i> ; 8-13%, 9-17 (14) metres.
Mid	<i>E. macrorhyncha</i> , <i>Monotoca scoparia</i> , <i>E. rossii</i> , <i>Cassinia longifolia</i> ; 30-35%, 0.5-8 (2.5) metres.
Ground	<i>Pultenaea procumbens</i> <i>Rytidosperma pallidum</i> , <i>Dillwynia sericea</i> , <i>Goodenia hederacea</i> subsp. <i>hederacea</i> ; 25-60%, 0.1-0.5 (0.3) metres.

The overstorey in SFAZ is open, with a large amount of advanced eucalypt regeneration dominating the midstorey. The understorey is also dominated by low sclerophyllous shrubs and tussock grasses; a thin layer of leaf litter covers much of the bare ground.

Stem Size Classes (Actual versus Benchmark)



Stems < 5cm DBH: 385 - 520 per 0.1 hectare plot

Overall Fuel Hazard

	Plot 6-1	Plot 6-2	Max
Bark	H	VH	VH
Elevated Fine Fuel	H	M	
Near-Surface Fine Fuel	H	H	
Surface Fuel	L	L	
Combined Surface / Near-Surface Fuel	M	M	
Overall Fuel Hazard	H	VH	

3.2.7 Strategic Fire-fighting Advantage Zone 7



Plot 7-1



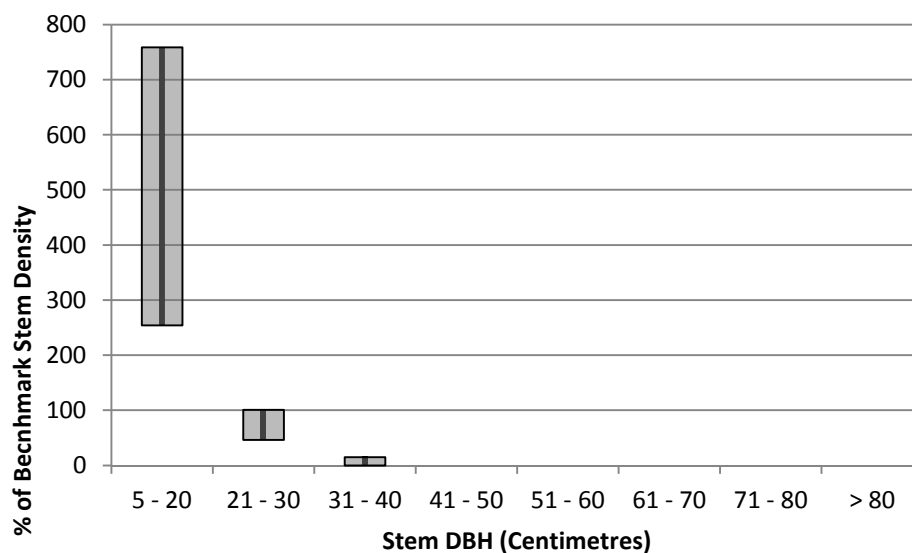
Plot 7-2

Red Stringybark Open Forest (Regenerating)

Upper	<i>Eucalyptus macrorhyncha</i> , <i>E. rossii</i> , <i>E. bridgesiana</i> ; 40-45%, 6-9 (8) metres.
Mid	<i>Monotoca scoparia</i> , <i>E. macrorhyncha</i> , <i>Cassinia longifolia</i> ; 3-20%, 0.6-2 (1.2) metres.
Ground	<i>Leucopogon</i> spp., <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i> , <i>Goodenia hederacea</i> subsp. <i>hederacea</i> , <i>Austrostipa densiflora</i> ; 15-60%, 0.1-0.5 (0.3) metres.

Regenerating eucalypts in SFAZ 7 form a distinct canopy, with the majority of larger trees killed by the 2003 fires. The midstorey is dominated by *Monotoca scoparia*, with the understorey forming a mosaic of dense low shrubs and open grassy areas, with inter-tussock spaces containing a thin layer of leaf litter.

Stem Size Classes (Actual versus Benchmark)



Stems < 5cm DBH: 12 - 46 per 0.1 hectare plot

Overall Fuel Hazard

	Plot 7-1	Plot 7-2	Max
Bark	VH	VH	VH
Elevated Fine Fuel	L	M	
Near-Surface Fine Fuel	H	M	
Surface Fuel	M	M	
Combined Surface / Near-Surface Fuel	VH	M	
Overall Fuel Hazard	VH	VH	

3.2.8 Strategic Fire-fighting Advantage Zone 8



Plot 8-1



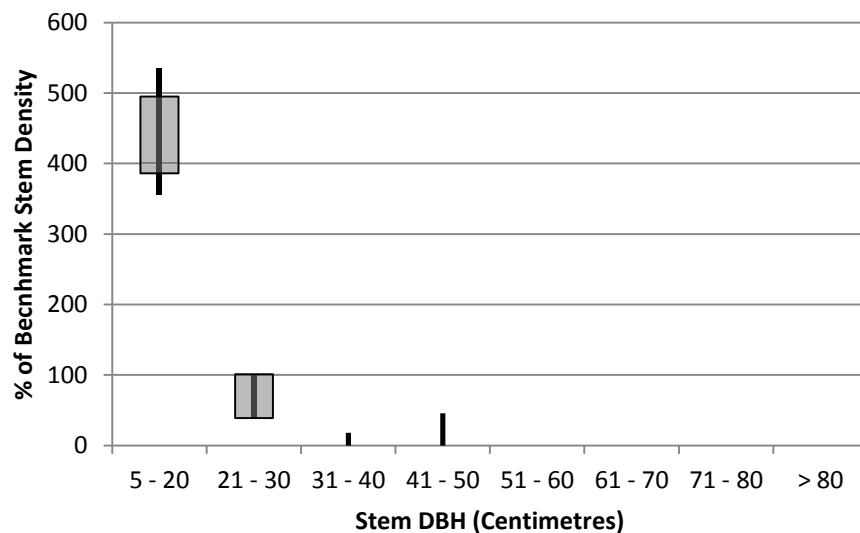
Plot 8-2

Red Stringybark Open Forest (Regenerating)

Upper	<i>Eucalyptus macrorhyncha</i> , <i>E. melliodora</i> ; 30-45%, 6-9 (7.5) metres.
Mid	<i>Monotoca scoparia</i> , <i>Cassinia longifolia</i> , <i>Kunzea ericoides</i> ; 25-30%, 0.5-4 (1) metres.
Ground	<i>Austrostipa</i> spp., <i>Austrostipa densiflora</i> , <i>Vulpia myuros</i> , <i>Lomandra filiformis</i> , <i>Lomandra longifolia</i> ; 25-45%, 0.1-0.5 (0.2) metres.

Like SFAZ 7, regenerating eucalypts in SFAZ 8 form a distinct canopy, with the majority of larger trees killed by the 2003 fires. The midstorey is dominated by patchy *Monotoca scoparia*, with the understorey forming a mosaic of open grassy areas with inter-tussock spaces containing a thin layer of leaf litter.

Stem Size Classes (Actual versus Benchmark)



Stems < 5cm DBH: 57 - 160 per 0.1 hectare plot

Overall Fuel Hazard

	Plot 8-1	Plot 8-2	Max
Bark	H	VH	H
Elevated Fine Fuel	H	M	
Near-Surface Fine Fuel	H	M	
Surface Fuel	L	L	
Combined Surface / Near-Surface Fuel	M	L	
Overall Fuel Hazard	H	M	

3.2.9 Strategic Fire-fighting Advantage Zone 9



Plot 9-1



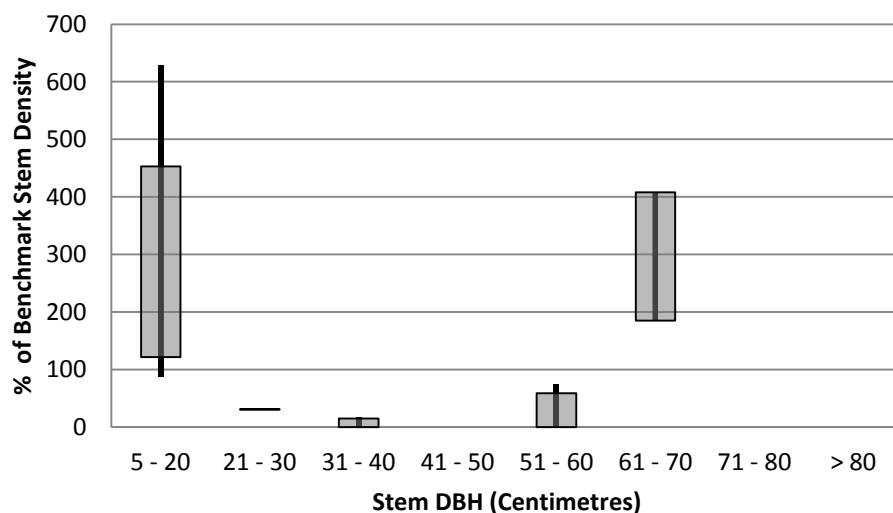
Plot 9-2

Red Stringybark Open Forest (Regenerating); Box-Gum Woodland (Gum Dominated)

Upper	<i>Eucalyptus macrorhyncha</i> , <i>E. blakelyi</i> , <i>E. rossii</i> ; 15-20%, 6-16 (12) metres.
Mid	<i>E. macrorhyncha</i> , <i>Monotoca scoparia</i> , <i>E. blakelyi</i> , <i>Cassinia longifolia</i> ; 10-20%, 0.5-7 (2) metres.
Ground	<i>Aristida ramosa</i> , <i>Rytidosperma</i> spp., <i>Microlaena stipoides</i> var. <i>stipoides</i> ; 30-70%, 0.1-0.5 (0.2) metres.

Upslope, areas dominated by *E. macrorhyncha* forms a low canopy with larger emergent trees killed by the 2003 wildfires. Small areas on the lower slope are considered box-gum woodland, however they have been included in the broader red stringybark alliance in this zone for benchmark comparison due to sampling limitations. In the north, a recently cleared pine plantation occurs.

Stem Size Classes (Actual versus Benchmark)



Stems < 5cm DBH: 96 - 260 per 0.1 hectare plot

Overall Fuel Hazard

	Plot 9-1	Plot 9-2	Max
Bark	VH	M	M
Elevated Fine Fuel	M	M	
Near-Surface Fine Fuel	M	H	
Surface Fuel	L	L	
Combined Surface / Near-Surface Fuel	L	M	
Overall Fuel Hazard	M	M	

3.2.10 Strategic Fire-fighting Advantage Zone 10



Plot 10-1



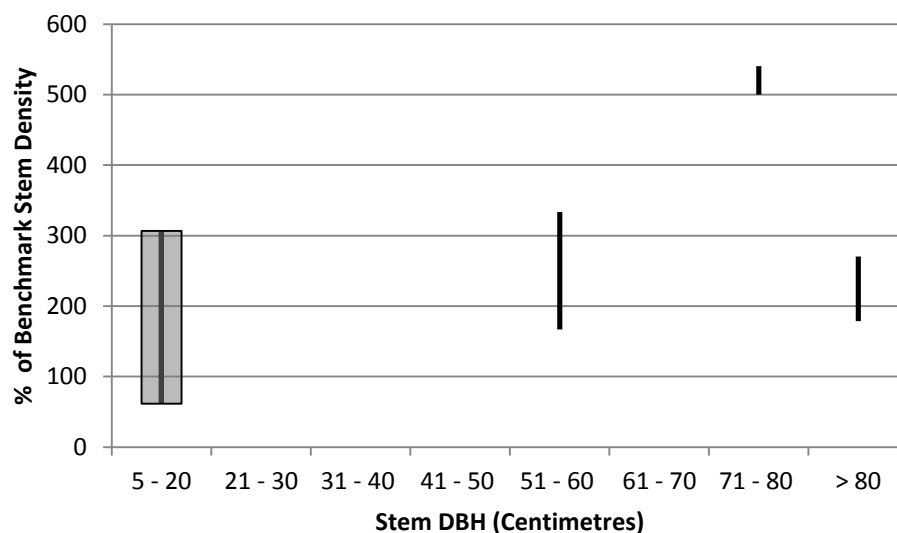
Plot 10-2

Box-Gum Woodland (Gum Dominated)

Upper	<i>Eucalyptus blakelyi</i> ; 10-15%, 16-20 (18) metres.
Mid	<i>E. blakelyi</i> , <i>Rubus fruticosus</i> agg.; 5-30%, 0.5-5 (2) metres.
Ground	<i>Microlaena stipoides</i> var. <i>stipoides</i> , <i>Bromus hordeaceus</i> , <i>Themeda triandra</i> ; 85-90%, 0.1-0.4 (0.2) metres.

SFAZ 10 is largely box-gum woodland: the canopy is open with patches of regeneration being denser in the south (Plot 10-1). The understorey is dense, and characterised by native and exotic grasses. Patches of blackberry (*Rubus fruticosus* agg.) are common.

Stem Size Classes (Actual versus Benchmark)



Stems < 5cm DBH: 7 - 78 per 0.1 hectare plot

Overall Fuel Hazard

	Plot 10-1	Plot 10-2	Max
Bark	M	L	M
Elevated Fine Fuel	M	L	
Near-Surface Fine Fuel	VH	M	
Surface Fuel	L	L	
Combined Surface / Near-Surface Fuel	H	L	
Overall Fuel Hazard	M	L	

3.2.11 Other Strategic Fire-Fighting Advantage Zones

Due to a lack of concern regarding the fuel hazard, SFAZs 11, 12, 13 were not assessed as part of this project; these are shown in **Figure 3.3**. Rapid observation confirmed that a mosaic of native and exotic understorey exists in these zones. These areas may be managed by grazing or slashing should their fuel loads be deemed of a level where grassfire can rapidly spread. Grazing is likely to be the best strategy given the presence of Pink-tailed Worm Lizard.

Figure 3.3 – Other Strategic Fire-Fighting Advantage Zones

SFAZ 11



SFAZ 12



SFAZ 13



3.2.12 Additional Values

As mentioned in **Section 3.1.2**, the Project Area is known to contain notable species including Scarlet Robin and Satin Flycatcher. The former is listed as a threatened species in NSW while the latter is considered to be a migratory species in accordance with the EPBC Act. Given the size and habitat provisions within the Project Area, it is plausible that additional notable or even threatened birds that occupy open forest and woodland may utilise the area.

Extensive habitat for Pink-tailed Worm Lizard is mapped in ACTMAPi (ACT Government 2015). The presence of this species was confirmed as part of this project through observation of a live specimen (**Figure 3.4**) and sloughed skins. As discussed in **Section 2.5.2**, the source of habitat mapping is unknown and requires further verification in forested areas; even though Pink-tailed Worm Lizard have been recorded in rocky outcrops in dry sclerophyll forest, these are generally in more open area than those mapped as habitat in the Project Area.

Figure 3.4 – Pink-Tailed Worm Lizard, Rocky Outcrop SFAZ 7



Photo: [REDACTED]

SFAZs 9 and 10 contain box-gum woodland. These values are discussed further in **Appendix 1**. SFAZ 3 may also contain box-gum woodland, although this has strong affinities with dry sclerophyll forest in this location and requires further assessment.

3.2.13 Summary

3.2.13.1 Stem Density and Vegetation Structure

The 'Open-Low-High-Close' charts demonstrate the abundance of stems in each size class expressed as a percentage of the upper and lower stem benchmark as determined by Gibbons *et al.* (2010). Additional to this, a large abundance of stems < 5 centimetres DHB occurs across much of the project Area. The density of these stems, as well as stems in the 5 – 20 centimetre DBH class, is shown in **Table 3.2**.

Table 3.2 – Stem Densities (Size Classes < 20 centimetres DBH)

SFAZ	Stem Density (Centimetres) ¹					Main species
	< 5	5 - 10	10 - 20	5 - 20	< 20	
1	39 – 43	74 – 86	28 - 77	102 - 163	141 - 206	Red Stringybark
2	71 - 160	83 – 112	9 - 21	104 - 121	175 - 281	Red Stringybark, Apple Box
3	0 - 27	25 - 54	1 - 10	26 – 64	26 – 91	Scribbly Gum, Blakely's Red Gum
4	86 - 210	67 - 70	10 - 14	71 – 80	167 – 290	Red Stringybark, Scribbly Gum
5	30 - 51	45 - 122	16 - 27	61 – 149	91 – 200	Red Stringybark, Scribbly Gum
6	385 - 520	49 - 79	3 - 6	52 – 85	470 – 572	Scribbly Gum, Red Stringybark
7	12 - 46	35 - 161	26 - 52	87 - 187	99 – 233	Red Stringybark, Scribbly Gum
8	57 - 160	74 - 88	34 - 58	122 - 132	179 - 292	Red Stringybark
9	96 - 260	19 - 147	8 - 11	30 - 155	126 – 415	Red Stringybark, Blakely's Red Gum
10	7 - 78	12 - 34	2 - 4	14 - 38	21 - 116	Blakely's Red Gum

¹ per 0.1 Hectares, based on representative plots.

Table 3.2 shows that the majority of SFAZs contain a large density of stems within the < 5 centimetre size cohort. This is particularly pronounced in SFAZ 2, 4, 6, 8 and 9. Based on observations in SFAZs 5 and 7, where stems formerly in this size cohort have progressed to a larger size while retaining a high stem density, it is apparent that, at least at this stage of maturity after the 2003 fire event, tree growth within SFAZs will progress slowly and under intense competition. Such competitive stress among eucalypts is likely to delay the development of a mature canopy, and suppress growth and diversity of groundcover species, and habitat provisions for species relying on larger trees for nesting and foraging opportunities (Jones *et al.* in press).

3.2.13.2 Overall Fuel Hazard

The ultimate fuel hazard rating is highly sensitive to subjective assessment of individual fuel components. For example, if the 'Bark Hazard' is deemed 'Very High' or 'Extreme', a patch with 'Low', 'Elevated Fine Fuel Hazard' and Moderate', 'Combined Surface and Near-Surface Fine Fuel Hazard' is considered to represent a 'Very High' fuel hazard. If the 'Bark Hazard' is 'High' and the other parameters remain the same, the fuel hazard is considered 'Medium'.

The dominance of Red Stringybark throughout much of the Project Area (or, at a minimum, at least 10% of proportional abundance within a given location) elevates the fire risk significantly. For example, using this assessment method if the bark of these trees is completely charred, the 'Bark Hazard' rating is 'Moderate'. Where there are a large amount of trees (including advanced regrowth) with minimal or no charring, the 'Bark Hazard' rating is 'Very High' or 'Extreme'. This is due to the ability of bark on stringybark species to produce

massive quantities of embers and short-distance spotting, rendering fires difficult to suppress (Hines *et al.* 2010).

Using the 'Overall Fuel Hazard Assessment' method, the fuel hazard is considered to range from 'Very High' in areas of un-charred dense advanced regeneration of Red Stringybark with large amounts of elevated fine fuel and/or combined near-surface and surface fuel (SFAZs 3, 6 and 7), through to 'Medium' and 'Low' in an area of open Blakely's Red Gum with a low grassy understorey (SFAZ 10). While the method and assessment is open to subjectivity and results of this assessment should be audited by Territory and Municipal Services fire ecologists, this assessment showed that at least six of the 10 SFAZs assessed within the Project Area are currently considered to range from 'High' to 'Very high' fuel hazard. **Figure 4.5** shows the maximum overall fuel hazard rating recorded in each SFAZ. Note that this is based on the higher of two samples within each SFAZ, and further assessment and mapping may delineate areas on fire risk if appropriate.

3.2.14 Limitations

While this Project demonstrates that there are large areas of dense regeneration and subsequent higher fire risk, the assessment is limited by the following:

- Due to subjectivity in the assessment method, areas with a 'Medium' hazard may in fact be 'High', or tending to 'High' in the near future as stringybark bark matures, stem charring is reduced and leaf litter accumulates.
- Field assessment is based on two plot samples per SFAZ. Statistically, this is not considered adequate in determining the variation within each SFAZ. However, this is partially alleviated through the plot selection process, whereby plots were selected based on representative values determined as part of meandering survey through each SFAZ.
- SFAZs 3 and 9 contained two vegetation types ('Red Stringybark' and 'Box-Gum Woodland' alliances, with one plot surveyed within each (the project scope included survey of two plots per SFAZ). For these zones, stem densities were analysed against benchmarks in Gibbons *et al.* (2010) for the 'Red Stringybark' alliance. While a lower stem density is permissible in the 'Box-Gum' alliance, examples of this alliance within SFAZs 3 and 9 were ecotonal, with understorey characteristics akin to the 'Red Stringybark' alliance. Further, treating these areas as part of the 'Red Stringybark' alliance allows for the retention of a greater number of stems.
- The 'Overall Fuel Hazard Assessment' focuses on a 20 metre circle. Much of the area assessed is not displayed in site photographs, which were taken to demonstrate stem density.
- The 'Overall Fuel Hazard Assessment' focuses on fuel arrangement. While this is more valid than fuel loads, it does not consider the effects of the following:
 - Topographic effects of fire behaviour;
 - The relationship between a site location and prevailing areas of fire run (i.e. if a site is located in a prevailing direction and adjacent to an area of high threat.
 - The flammability of vegetation within the elevated fine-fuel, near-surface and surface layers. It is noted that the sclerophyllous shrubs and tussock grasses within the Project Area are relatively flammable;

While the 'Overall Fuel Hazard Assessment' guides land managers in determining if or when fuel hazard reduction is required, it does not consider the above factors. These factors are critical to fire behaviour within the Project Area.



Note: due to subjectivity in the assessment method, areas with a 'Medium' hazard may in fact be 'High', or tending to 'High' in the near future as stringybark bark matures, stem charring is reduced and leaf litter accumulates.

Figure 4.5 – Maximum 'Overall Fuel Hazard Assessment' ratings for each SFAZ

4.0 Habitat Requirements for Listed Threatened Species

As noted in **Section 3.2.12**, Pink-tailed Worm Lizard is known to occur in rocky habitat in cleared areas within the Project Area. Habitat for this species is mapped broadly across the Project Area (**Figure 2.2**), however the source of the mapping included in ACTMAPi is unknown and appears to map all rocky outcrops in dry sclerophyll forest and open areas. While this species has been recorded in at times in dry sclerophyll forest, it is generally found in more open areas within this vegetation type, and preferentially in derived native grassland (Wong 2013).

The Significant Species Database accompanying the Draft Environmental Offsets Methodology (ACT Government 2013a²¹) was reviewed to consider which threatened flora, fauna and ecological communities may be present within the Project Area, and what habitat provisions are important for their persistence. While the methodology is yet to be formally released, it is assumed that the accompanying database provides current information with respect to the potential values that may be associated with habitats within the Project Area. **Table 4.1** provides an appraisal of key habitat requirements of species predicted to occur in the Project Area.

Apart from Pink-tailed Worm Lizard, Varied Sittella is the only species considered likely to occur. Box-Gum Woodland occurs at lower elevations in SFAZ 9 and 10 (refer to **Appendix 1**).

Unless otherwise indicated, information in **Table 4.1** is sourced from the Significant Species Database.

Table 4.1 – Key Habitat Requirements for Species Predicted to Occur in the Project Area

Name		Status (Act)		Key Habitat Requirements
Common	Scientific	EPBC	NC	
Birds				
Varied Sittella	<i>Daphoenositta chrysoptera</i>	-	V	Moderate to high likelihood of occurrence. Preference for areas containing Red Stringybark (<i>E. macrorhyncha</i>) (ACT Government 2004 ²²) with hollows or dead branches (Birdlife 2015 ²³).
Regent Honeyeater	<i>Anthochaera phrygia</i>	E, M	E	Low likelihood of occurrence. Occasional migrant in Northern ACT, utilising woodlands, open forest and street plantings. In natural areas, they appear to have a preference for Box-Gum Woodland along the lower slopes of Mounts Ainslie and Majura, extending through Mulligan’s Flat Nature Reserve to the Sutton and Lake George areas.

V = Vulnerable; E = Endangered; M = Migratory.

²¹ ACT Government (2013) *Environmental Offsets Assessment Methodology*. ACT Environment and Sustainable Development Directorate. Version 20130301.

²² ACT Government (2004) *Woodlands for Wildlife: ACT Lowland Woodland Conservation Strategy*. Action Plan 27. Environment ACT, Canberra.

²³ Birdlife (2015) *Varied Sittella – Profile* [URL Accessed 29/01/2015: <http://www.birdlife.org.au/bird-profile/varied-sittella>].

Table 4.1 (cont.) – Key Habitat Requirements for Species Predicted to Occur in the Project Area

Name		Status (Act)		Key Habitat Requirements
Common	Scientific	EPBC	NC	
Little Eagle	<i>Hieraaetus morphnoides</i>	-	V	Low likelihood of occurrence. This conspicuous species was recorded as breeding in three locations in the ACT lowlands this spring/summer. This species nests in large mature eucalypts. No large conspicuous raptor nests were observed during surveys undertaken by Umwelt, and suitable nesting provisions are scant based on the 2003 wildfires.
Bats				
Eastern Long-eared Bat	<i>Nyctophilus corbeni</i>	V	-	Low likelihood of occurrence. Prefers a defined canopy and dense cluttered shrub layer (Australian Government, 2015a ²⁴), roosting in tree hollows, bark fissures and branch fissures (Churchill, 1998 ²⁵). Roosting provisions are rare within the Project Area.
Grey-headed Flying Fox	<i>Pteropus poliocephalus</i>	V	-	Low likelihood of occurrence. Occasional summer visitor, which has established a roosting site in Commonwealth Park north of Lake Burley Griffin. This species has a broad foraging range, with a nightly feeding range of 20 to 50 kilometres, and feeds on a variety of eucalypts, figs and fruit trees (Churchill 1998).
Reptiles				
Pink-tailed Worm Lizard	<i>Aprasia parapulchella</i>	V	V	Known to occur. Extensive habitat is mapped (refer to Section 2.5.2). This species was not predicted to occur in habitat within the Project Area by the Significant Species Database.
Plants				
Hoary Sunray	<i>Leucochrysum albicans</i> var. <i>tricolor</i>	E	-	Low likelihood of occurrence. Occurs in a variety of habitats, including open areas within Box-Gum Woodland and Red Stringybark Open Forest. The species is able to be identified year round (PlantNet, 2015 ²⁶). Although targeted survey has not been undertaken, the species has not been recorded opportunistically.
Pale Pomaderris	<i>Pomaderris pallida</i>	V	-	Low likelihood of occurrence. In the ACT, this species is only known from riverbanks (Australian Government 2015b ²⁷).

V = Vulnerable; E = Endangered; M = Migratory.

²⁴ Australian Government (2015a) *Nyctophilus corbeni* – South-eastern long-eared Bat. SPRAT Profile. [URL Accessed 25/02/2015: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=83395]

²⁵ Churchill, S. (1998) *Australian Bats*. New Holland Publishers, Sydney.

²⁶ PlantNet (2015) *Leucochrysum albicans* var. *tricolor* (DC.) Paul G. Wilson [URL Accessed 29/01/2015: <http://plantnet.rbgsyd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&lvl=in&name=Leucochrysum~albicans~var.+tricolor>].

²⁷ Australian Government (2015b) *Pomaderris pallida* – Pale Pomaderris. SPRAT Profile. [URL Accessed 25/02/2015: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=13684].

5.0 State and Transition Model Concept

Considering the over-abundance of stems in a range of size classes compared to pre-European benchmarks predicted by Gibbons *et al.* (2010), it may be appropriate to consider adaptive management of the Project Area to achieve the dual functions of advancing habitat restoration and maintaining a manageable fire risk in a remnant adjacent to the future urban interface at Denman Prospect. Such an approach would allow for management of the site, with frequent monitoring and interpretation of outcomes of management. **Figure 5.1** outlines the adaptive management process as defined in the Molonglo NES Plan (ACT Government 2011²⁸) and the Molonglo Adaptive Management Strategy (ACT Government 2013a).

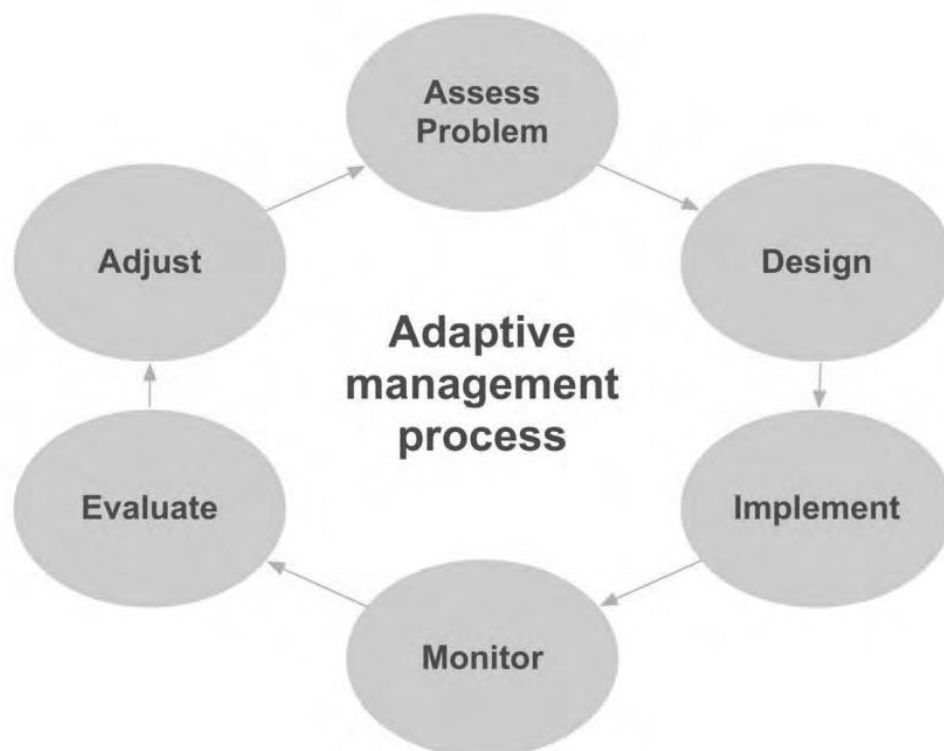


Figure 5.1 – Adaptive Management Process

A conceptual state-and-transition model for adaptive management of native woodlands produced by Rumpff *et al.* (2011²⁹) demonstrates the concept of restoring a landscape to a near natural state (or reference condition). This model, shown in **Figure 5.2**, steps through the process of identifying which state a remnant is in, and the logical transition steps to restore a remnant to a near natural state. While this model has been developed for non-riparian woodlands, it can easily be adapted to reflect open forest benchmarks such as within the red stringybark alliance as defined by Gibbons *et al.* (2010).

²⁸ ACT Government (2011) *Molonglo Valley Plan for the Protection of Matters of National Environmental Significance*. NES Plan September 2011. ACT Planning & Land Authority.

²⁹ Rumpff L, Duncan DH, Vesk PA, Keith DA & Wintle BA (2011) *State-and-Transition Modelling for Adaptive Management of Native Woodlands*. *Biological Conservation* **144**: 1224-1236.

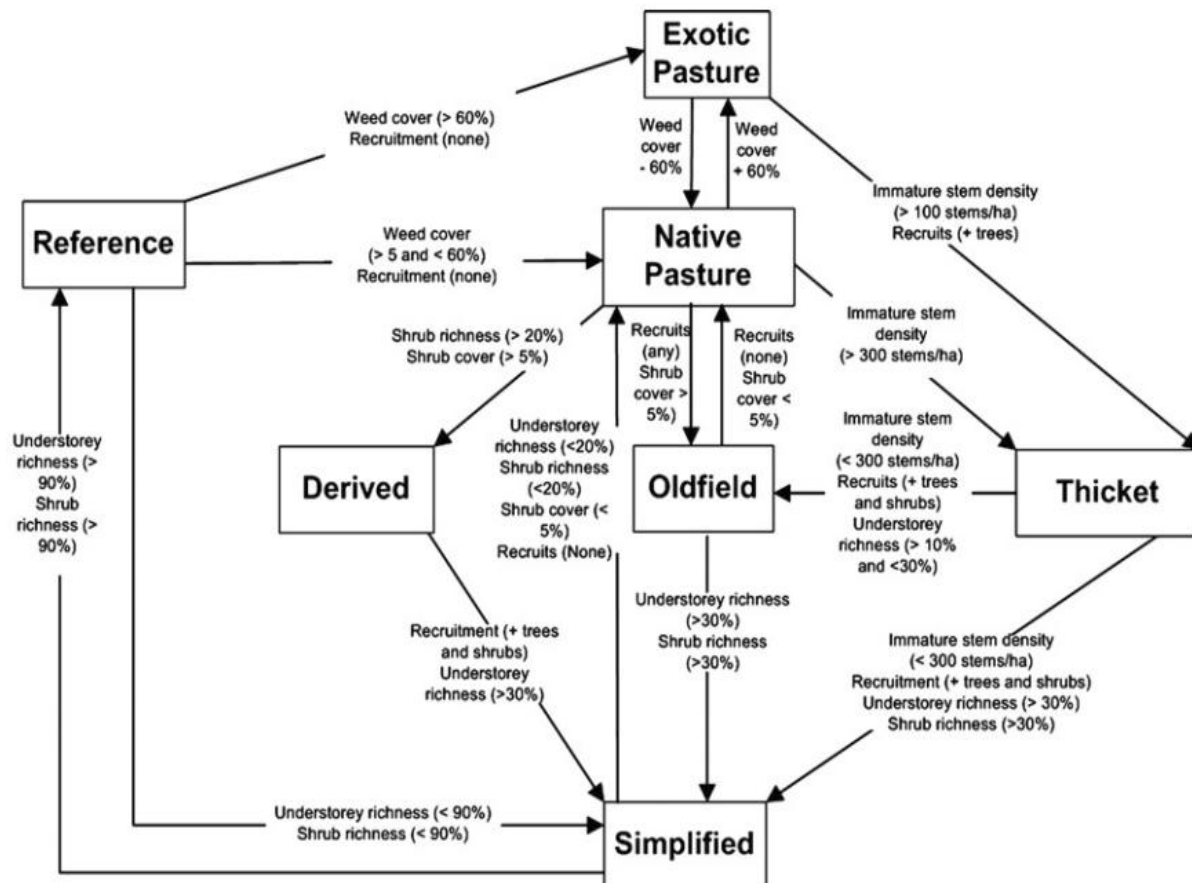


Figure 5.2 – Conceptual State-and-Transition Model

Box 1: Relevant definitions for Figure 5.2

Reference: Sites which are largely intact in terms of structural and species diversity, with a low cover of exotic species. Sites that have been little altered since European settlement fall into this category, but the reference state does not necessarily have to represent pre-European vegetation condition.

Thicket: Sites with a dense regrowth of overstorey species, and a relatively low cover/richness of the understorey and midstorey component. For instance, sites may have had a change in land-use (e.g. removal of grazing or logging) and climatic conditions that were favourable for natural regeneration of woody species.

Simplified: Sites may have a relatively intact understorey, overstorey, or midstorey structure, but one or more of these strata is likely to be simplified. Species richness may be high, but unlikely to reach that of reference levels. An example of this state is vegetation that has been intermittently grazed at low intensity and/or moderately cleared in the past

Native Pasture: Sites with a simplified overstorey, and a low cover and richness of both the midstorey and understorey. The cover of weeds may be low-moderate. Such sites will typically include those that have been cleared and grazed at a high frequency and intensity, but without the addition of fertilizer.

From Rumpff *et al.* (2011)

While the values within this model may not reflect open forest (e.g. stem density values), the concept of state-and-transition still applies. Due to the intense 2003 fire event and subsequent regeneration, the majority of vegetation within the Project Area is in a 'thicket' state. In order to resort to a near natural or reference state, a disturbance event to create a simplified structure is required. Alternatively, natural thinning may occur over time due to stem competition between regenerating eucalypts, but given the fire history of the site there is a significant risk that wildfire events will continue on some level, creating a cyclical state of

native pasture (or remnant sparse mature trees) to 'thicket' (based on subsequent natural regeneration), returning to native pasture when the next wildfire occurs. For this reason, the option of undertaking an environmentally sensitive treatment to return the Project Area to a 'simplified' and ultimately 'reference' structure may be desirable as long as a 'reference' state can be easily managed in a fire-prone landscape.

The above explanation is simplified, and used to demonstrate a concept as to how and why the Project Area may benefit from intervention. By restoring the remnant to a 'reference' state using stem densities as defined by Gibbons *et al.* (2010) and additional benchmarks, biodiversity values should be improved based on increased diversity of habitat provisions. Additionally, assuming that a near natural or 'reference' state provides greater opportunity for fire management and suppression, this may reduce the likelihood of a major fire event reducing biodiversity values.

5.1 Maintaining Structural Diversity

If the conceptual state-and-transition model is considered valid, treatment should be undertaken in stages within the Project Area to ensure that ecological values (particularly fauna) are maintained and able to occupy remaining habitats while recovery from a 'simplified' state is taking place. This is particularly important for woodland bird species that preferentially utilise these 'thicket' habitat provisions.

Fire may be a key management tool in reducing stem thickets. If this is to be applied, mosaics of thickets should be retained within each SFAZ, or at the very least, SFAZ burn schedules be designed to ensure that patch diversity is maintained in adjacent areas during recovery. This is particularly important to maintain bird habitat.

6.0 Conclusion

Information within this report assesses the vegetation structure as it relates to biodiversity values and overall fuel hazard. The report relies on existing ecological information as well as information on stem densities gathered as part of this assessment, and assumes that overarching peer reviewed studies that suggest that biodiversity values are optimised at certain stem densities (e.g. Gibbons *et al.* 2010) and the principles outlined in other research are comprehensive and suitable for consideration in this assessment.

Analysis of stem density data and consideration of benchmark stem densities (Gibbons *et al.* 2010) and the effect of stem densities on understorey vegetation diversity (Jones *et al.* in press) support a reduction in stem densities in the 5-20 centimetre DBH size class. Both of these papers support the need to maintain vegetation structure in a range of size classes in order to optimise biodiversity values. They do not address the issue of an abundance of stems less than 5 centimetres DBH; however while some of these may self-thin over an extended period, others will eventually become part of the 5-20 centimetre DBH cohort.

6.1 Strategic Fire-fighting Advantage Zone Management

In the event of the Project Area being managed as a mosaic of SFAZs, it is likely that this will be done with mosaic burning, silvicultural thinning, or a combination of both. In developing management options, the following should be considered:

Hazard Reduction Burning

1. Controlled hazard reduction burning is likely to be an effective method of reducing stem densities in lower size classes. With controls in place, stem thickets may be retained in strategic locations to ensure that a mosaic of smaller stems is maintained for structural diversity.
2. Ecological guidelines for hazard reduction burning suggest that biodiversity values will be maintained if lower limit fire intervals are set as follows:
 - a. 'Red Stringybark Dry Sclerophyll Forest' - five (NSW Government 2004) to 10 years (ACT Government 2009). Practical implementation of this measure should be done in consultation with ACT Government Conservation Planning and Research officers to determine the most appropriate interval between burns particular to each SFAZ.
 - b. 'Box-Gum Woodland': 10 years (ACT Government 2009, NSW Government 2004). This is acceptable within the Project Area as the stem density and fuel loads are not high and, assuming stem densities and regenerating weeds are managed, are likely to be manageable without a greater frequency of burning in the SFAZ areas.
3. The timeframe for hazard reduction burning should be determined with adaptive management principles in mind, enabling the regime to shift as required to maintain biodiversity values while protecting life and assets.
4. Hazard reduction burns should be designed with consideration of broad habitat mosaics, allowing for sufficient recovery of ecological values and availability of a range of heterogeneous habitat structures within the Project Area at any one time.
5. As the focus of hazard reduction burning is to increase opportunities for control of wildlife through reducing fire intensity within a remnant, any burning regime will need

to ensure that reduced fuel loads are maintained in key areas to protect life and urban infrastructure. As such, SFAZs that are likely to either be ignition points (e.g. SFAZ 3) or produce a high intensity fire (e.g. SFAZ 4 and 6) may need to be managed at a greater frequency than others (refer to point 2a above).

6. Mosaic burning may reduce flammable habitat provisions such as woody debris. This should also be considered in designing a patch burn mosaic.
7. In areas of known Pink-tailed Worm Lizard habitat, if hazard reduction burning occurs this should happen between late winter and mid spring (preferable August to September). As mentioned in **Section 2.5.2**, large areas of mapped habitat within dry sclerophyll forest should be verified; this is important if hazard reduction burning is undertaken outside of the August to September period.

Silvicultural Thinning

Silvicultural thinning is generally a feasible operation as fire management staff can be operational in this task outside of peak fire management periods. As such, silvicultural thinning may be a suitable option in reducing stem densities provided thinned stems are removed.

Combined Approach

A combined hazard reduction burn and silvicultural thinning approach may be considered. At the very least, it will provide greater flexibility for adaptive management of habitat values while working towards the goal of reducing the threat of an uncontrolled wildfire on biodiversity, infrastructure and human life.

Areas Requiring Other Treatment

The Project Area contains SFAZs which contain minimal trees (i.e. SFAZs 11, 12, 13 and part of SFAZ 7). Rocky outcrops within these open areas are known to contain Pink-tailed Worm Lizards. These areas may be preferentially managed by grazing or slashing should their fuel loads be deemed of a level where grassfire can rapidly spread.

6.2 Outer Asset Protection Zone

It is proposed to maintain an OAPZ up to 100 metres within the southern boundary of the Project Area, as well as to the south of SFAZs 1, 2 and 3. Along the eastern boundary, much of the area is Box-Gum Woodland, whereas south of SFAZs 1, 2 and 3 they are understood to be primarily cleared exotic pastures with remnant trees (these areas were not assessed as part of this project).

Hazard Reduction Burning

1. In areas of 'Box-Gum Woodland' along the eastern boundary, hazard reduction burning should not take place more than once every ten years.
2. In the event of the grassy fuel load being above the threshold for OAPZ management [(Overall fuel hazard $\leq$ Moderate and Grassland Fire Hazard $\leq$ 35 when grassland curing $\geq$ 70%; Table 21.5 of ACT Government (2014³⁰)], stock grazing or slashing options should be considered to reduce grassy fuel loads particularly if the lower limit for hazard reduction burns (10 years) has not been reached. However, due to complexities related

³⁰ ACT Government (2014) *Draft ACT Strategic Bushfire Management Plan 2014 (Version 3)*. Emergency Services Agency.

to preparation, infrastructure and impacts, these options should only be considered should hazard reduction burning not meet fuel management objectives. Grazing is preferred to slashing, and may be feasible providing suitable fencing and water infrastructure is installed and access to stock is guaranteed.

Silvicultural Thinning

1. Silvicultural thinning is generally a feasible operation as fire management staff can be operational in this task outside of peak fire management periods. Additionally, it can be undertaken at greater frequencies than hazard reduction burning in sensitive areas such as 'Box-Gum Woodland'.
2. Undertaking silvicultural management will reduce impacts outlined for mosaic burning in sensitive areas; ACT Conservation Planning and Research should advise on the best method of disposal of thinned stems.

6.3 Urban Interface

Along the eastern edge of the Project Area, an urban interface of up to 100 metres has been identified. This area is considered to be a primary fire threat to the proposed Denman Prospect development, and also contains natural assets including 'Box-Gum Woodland' in an advanced regeneration state. In SFAZ 6 and SFAZ 7 this vegetation is likely to regenerate to an open forest structure without management; in SFAZ 10 this is not an issue in its current structure.

In order to protect important values within the 'Box-Gum Woodland' area and to mitigate bushfire risk to the adjacent urban development, it is recommended to use silvicultural thinning to accelerate an open woodland structure as a primary management tool in this area. This treatment is only required for SFAZ 6 and SFAZ 7.

Ongoing management of grassy sward fuel may be required in the event of grassland fire hazard exceeds 35 when grass curing is $\geq 70\%$ (refer to Table 21.5 and Table 21.8 in ACT Government (2014)).

6.4 Inner Asset Protection Zone

It is recommended to maintain a 60 metre wide inner asset protection zone (IAPZ) outside of the Project Area, within Denman Prospect.

6.5 Timing

Should hazard reduction burning be required in the Project Area, treatment should commence prior to the establishment and populating of suburbs. This will enable residents to be familiar with the management regime at an early stage.

6.6 Limitations

While this Project demonstrates that there are large areas of dense regeneration and subsequent higher fire risk, the assessment is limited by the following:

- Field assessment is based on two plot samples per SFAZ. Statistically, this is not considered adequate in determining the variation within each SFAZ. However, this is partially alleviated through the plot selection process, whereby plots were selected based on representative values determined as part of meandering survey through each SFAZ.

- SFAZs 3 and 9 contained two vegetation types ('Red Stringybark' and 'Box-Gum Woodland' alliances, with one plot surveyed within each (the project scope included survey of two plots per SFAZ). For these zones, stem densities were analysed against benchmarks in Gibbons *et al.* (2010) for the 'Red Stringybark' alliance. While a lower stem density is permissible in the 'Box-Gum' alliance, examples of this alliance within SFAZs 3 and 9 were ecotonal, with understorey characteristics akin to the 'Red Stringybark' alliance. Further, treating these areas as part of the 'Red Stringybark' alliance allows for the retention of a greater number of stems.
- The 'Overall Fuel Hazard Assessment' focuses fuel arrangement. While this is more valid than fuel loads, it does not consider the effects of the following:
 - Topographic effects of fire behaviour;
 - The flammability of vegetation within the elevated fine-fuel, near-surface and surface layers. It is noted that the sclerophyllous shrubs and tussock grasses within the Project Area are relatively flammable;
 - The relationship between a site location and prevailing areas of fire run (i.e. if a site is located in a prevailing direction and adjacent to an area of high threat.

While the 'Overall Fuel Hazard Assessment' guides land managers in determining if or when fuel hazard reduction is required, it does not consider the above factors.

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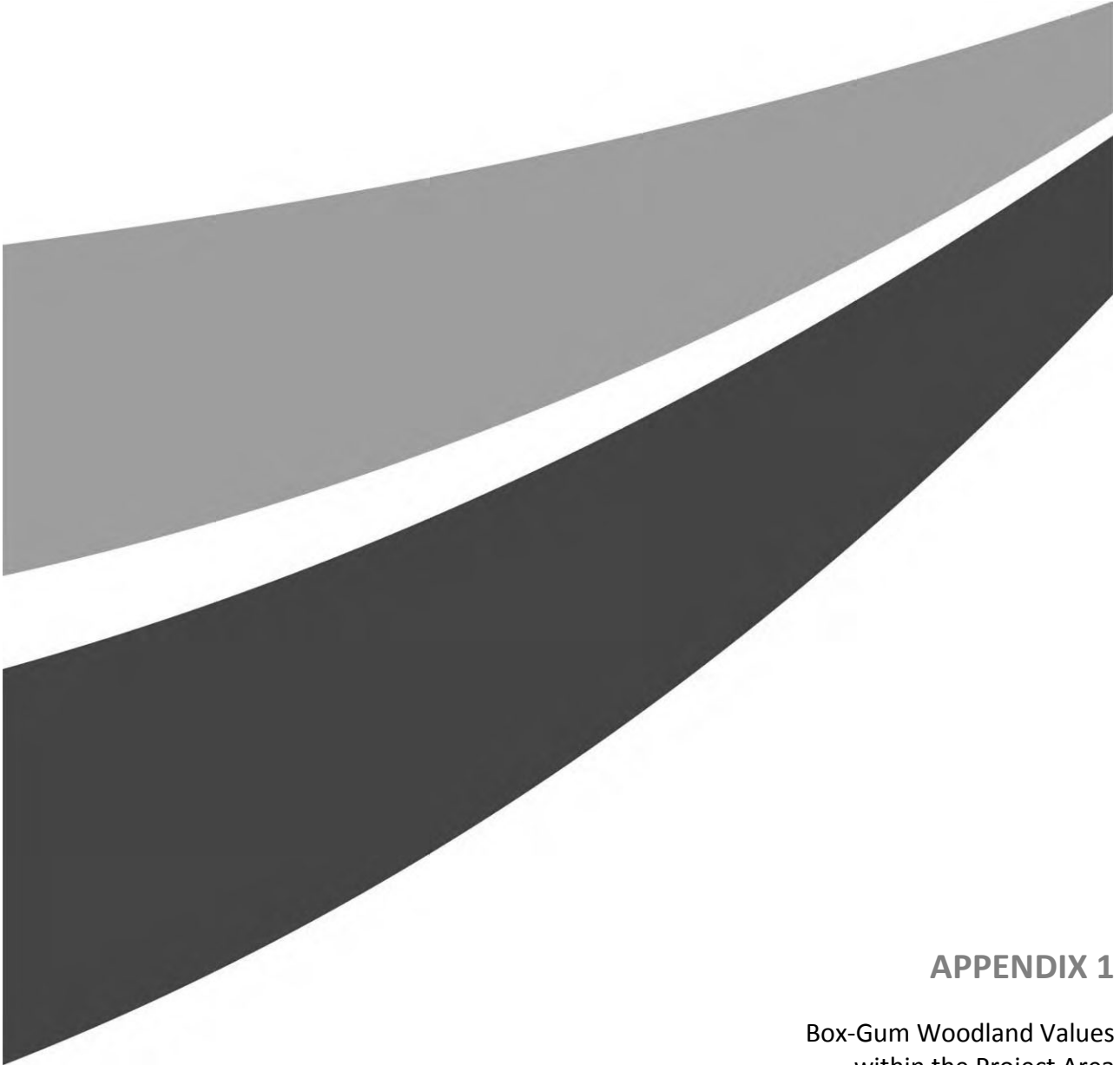
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APPENDIX 1

Box-Gum Woodland Values
within the Project Area

8075 Appendix 1

Within SFAZ 9 and 10, areas of 'White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland' critically endangered ecological community (Box-Gum Woodland) as listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) are present. The location of these remnants is shown in **Figure A1.1**.



Figure A1.1 – Distribution of Box-Gum Woodland within the Project Area

Box-Gum Woodland within SFAZ 9

SFAZ 9 contains approximately 3.1 hectares of box-gum woodland. It satisfied EPBC Act listing advice criteria as it contains:

- At least one of the most common overstorey species is (or was) white box (*Eucalyptus albens*), yellow box (*E. melliodora*) or Blakely's red gum (*E. blakelyi*) (n = 1);
- A predominantly native groundcover;
- Less than 30% shrub cover;
- An area greater than 0.1 hectares in size;
- 12 or more non-grass native understorey species (n = 12); and
- One or more important species (n = 2).

This community is shown in **Figure A1.2**. Further information on floristics and condition of the patch is shown in **Table A1.1**.



Figure A1.2 – Box-Gum Woodland, SFAZ 9

Table A1.1 – ‘SFAZ 9 Box-Gum Woodland Floristics and Condition

Canopy	Blakely's red gum (<i>E. blakelyi</i>). Woodland cover of approximately 20%, with some open areas. Red stringybark (<i>E. macrorhyncha</i>) is present in lower abundance, indicative of this area being ecotonal with red stringybark open forest up slope.
Midstorey	Patches of regenerating Blakely's red gum, long with patches of exotic blackberry (<i>Rubus fruticosus</i> agg.).
Goundlayer	Native grassy understorey dominated by <i>Aristida ramosa</i> , <i>Rytidosperma</i> spp. and <i>Microlaena stipoides</i> var. <i>stipoides</i> , with some annual exotic species present.
Non-grass Native Understorey Species	<i>Acaena ovina</i> , <i>Cheilanthes</i> spp., <i>Chrysocephalum apiculatum</i> , <i>Geranium solanderi</i> var. <i>solanderi</i> , <i>Glycine tabacina</i> , <i>Gonocarpus tetragynus</i> , <i>Lomandra filiformis</i> , <i>Oxalis perennans</i> , <i>Rumex brownii</i> , <i>Xerochrysum viscosum</i> , <i>Wahlenbergia communis</i> and <i>W. luteola</i> .
Important Species	<i>Chrysocephalum apiculatum</i> and <i>Glycine tabacina</i> .

Box-Gum Woodland within SFAZ 10

SFAZ 10 contains 8.29 hectares of box-gum woodland. It satisfied EPBC Act listing advice criteria as it contains:

- At least one of the most common overstorey species is (or was) white box (*Eucalyptus albens*), yellow box (*E. melliodora*) or Blakely's red gum (*E. blakelyi*) (n = 1);
- A predominantly native groundcover;
- Less than 30% shrub cover;
- An area greater than 0.1 hectares in size;
- 12 or more non-grass native understorey species (n = 17); and
- One or more important species (n = 3).

This community is shown in **Figure A1.3**. Further information on floristics and condition of the patch is shown in **Table A1.2**.

Table A1.2 – ‘SFAZ 10 Box-Gum Woodland Floristics and Condition

Canopy	Blakely's red gum (<i>E. blakelyi</i>). Woodland cover varies from approximately 20% to less than 5%.
Midstorey	Patches of regenerating Blakely's red gum, long with patches of exotic blackberry (<i>Rubus fruticosus</i> agg.).
Goundlayer	Native grassy understorey dominated by <i>Themeda triandra</i> and <i>Rytidosperma</i> spp., with and the annual exotic <i>Bromus hordeaceus</i> .
Non-grass Native Understorey Species	<i>Acaena ovina</i> , <i>Carex appressa</i> , <i>Carex inversa</i> , <i>Cheilanthes</i> spp., <i>Convolvulus angustissimus</i> subsp. <i>angustissimus</i> , <i>Chrysocephalum apiculatum</i> , <i>Dichondra repens</i> , <i>Geranium solanderi</i> var. <i>solanderi</i> , <i>Glycine tabacina</i> , <i>Haloragis heterophylla</i> , <i>Hydrocotyle laxiflora</i> , <i>Juncus filicaulis</i> , <i>Lomandra filiformis</i> , <i>Oxalis perennans</i> , <i>Rumex brownii</i> , <i>Schoenus apogon</i> and <i>Tricoryne elatior</i> .
Important Species	<i>Chrysocephalum apiculatum</i> , <i>Glycine tabacina</i> and <i>Tricoryne elatior</i> .



Figure A1.3 – Box-Gum Woodland, SFAZ 10

SETTING UP THE WESTERN EDGE OF MOLONGLO STAGES 2 AND 3 FOR FIRE MITIGATION

Prepared for the Land Development Agency.

31 August 2015

Contents

1	Background.....	4
2	Scope of work.....	6
3	Documentation Reviewed – (Listed in issue date order).....	6
3.1	Summary of standard design information.....	7
3.1.1	Design Standards for Urban Edge Infrastructure, 20 Urban Edge Management Zones. Urban Services. Edition 1 Rev 0.....	7
3.2	Examples of similar Urban Edge treatments	8
3.2.1	Estate Development Code – ESD, 4 October 2013	9
4	The ACT Strategic Bushfire Management Plan, 2014-2019.....	11
4.1	Inner & Outer Asset Protection Zone (IAPZ) & (OAPZ).....	13
4.2	Strategic Fire Advantage Zone (SFAZ)	14
4.3	Landscape Fire Management Zone (LFMZ)	15
4.4	Kama and Denman Prospect Bushfire strategy	15
4.4.1	IAPZ Width - Background.....	15
4.4.2	IAPZ Measurement Breakdown.....	16
5	ABPP findings for Kama and Denman Prospect Stage 2.....	17
5.1.1	North-western edge of Molonglo Stage 3 - Kama	17
5.1.2	North-western/Western edge to Denman Prospect	17
6	Ecological Impacts	18
6.1	Kama Nature Reserve	18
6.2	Denman Prospect	19
7	Typical Cross Sections of Zones at the Urban/Non-Urban Interface	21
7.1	Section 1 – Typical Development Module	23
7.2	Section 2 – 60m IAPZ within Developable Area with 2X Gravel Fire Trail Only	23
7.3	Section 3 – 60m IAPZ within Developable Area with Gravel Fire Trail Only	23
7.4	Section 4 – 60m IAPZ within Developable Area with Edge Road – to Kerb	23
7.5	Section 5 – Proposed, 60m IAPZ within Developable Area with Edge Road – to Property Boundary.....	23
8	Establishment Costs – The following costs are based on the arrangement shown in Typical Cross Section 5. 24	
	Table 8.1 – Kama Urban Edge – Establishment Costs.....	24
	Table 8.2 – Denman Prospect Urban Edge – Establishment Costs	25
9	Recurrent Costs	26
	Table 9.1 – Kama Urban Edge – Recurrent Costs	26
	Table 9.2 – Denman Prospect Urban Edge – Recurrent Costs.....	27
	Table 10.1 – Denman Prospect Fire Trails in SFAZ Costs	28
	Table 10.2 – Denman Prospect SFAZ Recurrent Costs (2 years).....	29
10	Impact on Territory sales revenue.....	31

10.1	Block Premiums	31
11	Summary of findings.....	31
11.1	Establishment.....	31
11.2	Recurrent.....	32
11.3	Overall Costings.....	33

1 Background

Coleman Engineering Services has been engaged by the Land Development Agency (LDA) to undertake a review of the potential extra over costs of developing urban infrastructure adjacent to the Kama Nature Reserve and Denman Prospect Stage 2 located at the western extremities of the Molonglo Stage 3 development area. (Refer Figure 1). **Figure 1 Kama.** – Source: Umwelt



Figure 3.1 - Ecological assets of the outer asset protection zone including potential pink-tailed worm lizard habitat.

Figure 2 Denman Prospect, Stage 2 – Rural Area Adj. – Source: Umwelt



In particular, the cost of seed funding to TaMS for hazard reduction and the establishment of infrastructure to support the Strategic Fire Advantage Zones, thus satisfying the ACT Strategic Bushfire Management Plan Version 3 – 2014, and the ABPP Bush Fire Strategy for Molonglo Stage 3.

CES was requested to prepare a report that identifies the various design criteria and potential establishment and recurrent costs that influence these urban edges. Thus helping to inform the LDA's master planning process in determining the most cost effective and responsible way of maximising these developable areas.

2 Scope of work

- To review the current ACT planning, design and management documents and identify any APZ criterion that has direct and ongoing impact on proposed land development infrastructure.
- To identify and review existing edge treatments, that are similar to that proposed for Kama and Denman Prospect developments. Similar aspect, topography etc.
- To document (typical sections) these edge treatments, for comparison, and identify their “Extra Over” Inner Asset Protection Zone (IAPZ) cost components.
- In conjunction with the relevant authorities, discuss these sections (via meetings) and gain a better appreciation of their ongoing maintenance costs based on their experience.
- Estimate the cost of the “Extra Over” IAPZ establishment costs based on recent LDA development construction costs.
- Estimate the ongoing “Extra Over” IAPZ maintenance costs for these items over a 5-year period.

3 Documentation Reviewed – (Listed in issue date order)

- Design Standards for Urban Edge Infrastructure, 20 Urban Edge Management Zones. Urban Services Edition 1 Rev 0.
- Inquiry into Operational Response to the January 2003 Bushfires in the ACT – Ron Mcleod, August 2003
- NES Plan – Molonglo Valley Plan for the Protection of Matters of National Environmental Significance – ACTPLA, September 2011
- Estate Development Code – ESD, 4 October 2013
- The ACT Strategic Bushfire Management Plan, 2014-2019
- ACT Bushfire Management Standards, 2014
- Draft Molonglo Development Fire Management Strategy – Version 3. TaMS, 2014
- Analysis of Vegetation Structure and Fire Risk – West Denman Prospect. – Umwelt, April 2015
- Bushfire Risk Strategy Molonglo Stage 3; Denman Prospect & the Molonglo River Corridor – ABPP, May 2015

3.1 Summary of standard design information

3.1.1 Design Standards for Urban Edge Infrastructure, 20 Urban Edge Management Zones. Urban Services. Edition 1 Rev 0.

City management has several requirements that directly influence the urban edge, such as:

The inclusion of a fire management zone 60-100m on Flat Land, reducing on land that slopes up or down in the direction of the prevailing wind.

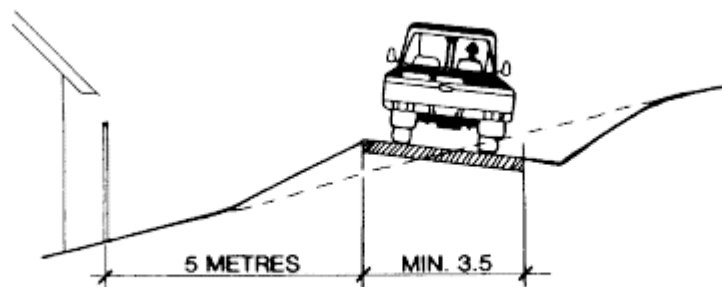
Within the fire management zone the following infrastructure may also be included:

- Slash Grassed Area, including gravel fire trail. Grassed areas not to exceed 1in4.
- Catch and cut off drains (preferably integrated with the gravel fire trail)
- Service Easements, Electricity, stormwater, water, gas, and communication.
- Equestrian Trails

Access points to the track from the Urban Road network must be provided at intervals of not more than 500m

Access from the gravel fire trail to the adjacent publicly managed land must be provided at intervals of not more than 300m. These can be formed by tracks or simply by laying batters back at no more than 1in5 to form ramps.

Figure 2. – Source: 20 Urban Edge Management Zone p20.3



Typical cross-section through a combined maintenance track and cut off drain

Fencing is also required to secure nature reserves and rural land from unauthorised activities, Vehicles, trail bikes, etc.

3.2 Examples of similar Urban Edge treatments

Two examples of urban edges utilising both formal and in-formal tracks only.



Photo 1 – Source Amber Ridge, Gordon, July 2015

The area behind residential properties are often used as temporary storage areas and general dumping. These can become bush fire fuel hazards and impose additional removal costs to the territory.

Vandalism is often experienced in these areas, Fence damage, graffiti etc.

Photo 2 – Source Kambah, July 2015

Informal track also used by local equestrians

The Bicentennial National Trail (BNT) also runs north/south to the west of Kambah, which allows connection from this local equestrian track to the BNT.



3.2.1 Estate Development Code – ESD, 4 October 2013

The following extracts from the Estate Development Code outline the design and planning requirements for the urban Edge adjacent to bushfire prone areas.

Table 1. Estate Development Code – ESD, 4 October 2013 (page 8)

3.5 Design of streets in bushfire prone areas	
R21 Edge streets are provided within or adjacent to a <i>bushfire prone area</i> on the long-term urban edge or conservation area.	C21 Edge treatments on the long term urban edge provide all of the following: a) reasonable protection to people and property from bush fire b) reasonable access for emergency vehicles.
R22 Street trees and vegetation within the verge of edge streets referred to in the previous rule comply with the asset protection zone requirements in the Planning for Bushfire Risk Mitigation General Code. Note: Fire hydrants are required in accordance with the requirements of ESA – see part D.	This is a mandatory requirement. There is no applicable criterion.

Table 2. Estate Development Code – ESD, 4 October 2013 (page 21)

11.4 Bushfire prone blocks	
R71 Blocks assessed as requiring buildings to be constructed to a specified bushfire construction level in accordance with Australian Standards <i>AS3959- Construction of buildings in bushfire prone areas</i> are to be nominated on a planning control plan as part of the <i>estate development plan</i> .	This is a mandatory requirement. There is no applicable criterion.

Table 3. Estate Development Code – ESD, 4 October 2013 (page 33)

14.7 Edge treatments in bushfire prone areas	
R112 Edge streets within or adjacent to a <i>bushfire prone area</i> on the long-term urban edge or conservation areas are to be endorsed by TAMS. Note: TAMS will endorse such edge streets if they have a 7.5m wide carriageway.	This is a mandatory requirement. There is no applicable criterion.

Table 3 Cont. Estate Development Code – ESD, 4 October 2013 (page 34)

Rules	Criteria
TAMS may consider departures. In making its assessment TAMS will consider whether other treatments, including fire trails will offer suitable protection.	
R113 Edge streets within or adjacent to a <i>bushfire prone area</i> on the long-term urban edge or conservation areas are to be endorsed by ESA. Note: ESA may endorse an edge street of this sort after considering all of the following: a) the provision of fire hydrants b) whether intersection and kerb returns are sufficient to accommodate emergency services vehicles c) whether roadside embankments allow vehicular access to surrounding areas (maximum embankment gradients are 1 vertical to 4 horizontal).	This is a mandatory requirement. There is no applicable criterion.

3.2.1.1 Street Networks Requirements

It is reasonable to expect an edge road would fall under the category for an Access Roads (Refer **Table 4** below), traffic volume of 0-300 vpd's. Normal this will require a carriageway width 5.5m if double width driveways have been used for the adjoining dwellings. However, an edge road would require a 7.5m wide carriageway with indented parking to allow ease of movement for emergency service vehicles in each direction simultaneously, such that they are not impeded by any parked vehicles.

Photo 3. Casey Estate, Mick Shann Terrace, July 2015



Table 4. Estate Development Code – ESD, 4 October 2013 (page 41)

Table 2A: Street network requirements – all estates except in industrial zones						
Facility Type	Rear lane ⁽²⁾	Shared use access street 'Woonerf' style	Access street A	Access street B	Minor collector	Major collector
Traffic volume range (vpd) ⁽¹⁾	0-160 ⁽³⁾	0-40	0-300	301 –1000	1001-3000	3001-6000
Design speed (km/h)	30	30	60	60	60	70
Minimum carriageway width (m) ⁽²⁾	5.5 (5.0 where the lane is less than 60m in length)	3.5-3.7 (single lane)	5.5	7	10	10
Verge width (m)	minimum 1.5m	5.0	5.5	6.25	6.25	6.25

Edge roads would normal fall in the category of Access Street A.

4 The ACT Strategic Bushfire Management Plan, 2014-2019

The Strategic Bushfire Management Plan (SBMP) is a requirement of the Emergencies Act 2004. An overarching document which directs all levels of bushfire planning throughout the ACT.

As a direct response to the recommendations from the “Inquiry into the Operation Response to the January 2003 Bushfires in the ACT”, (Ron McLeaod AM). A revised fuel management regime has been adopted. Included as part of these measures are such items as:

- Slashing,
- Grazing
- Rural Road Slashing
- Urban Road Slashing
- Physical Removal
- Prescribed Burning

The management of these various zones can be referred to in the ACT Bushfire Management Standards, 2014.

Specifically in relation to the Kama and Denman Prospect Stage 2 the following tables outline the minimum widths required by the current standards.

Tables 5.2 & 5.3, Source: Tables 2 & 3 ACT Bushfire Management Standards, 2014

Asset Protection Zones

APZ defined under this section relate to fuel managed areas on government managed lands. They may contribute to the requirement for APZ's under AS 3959.

Tables 2 and 3 establish APZ requirements. Table three provides requirements where no Outer APZ is implemented. These are minimum standards only and variations may be applied, for example where slope may significantly affect fire behaviour or to meet minimum requirements for AS 3959 assessments in Bushfire Prone Areas. Application of these zones shall be approved by the ESA

Table 2 - Widths for Inner and Outer Asset Protection Zones (APZs)

Vegetation type	Asset Interface Classification (as mapped)	Inner APZ	Outer APZ
		Width (m)	Width (m)
Forest and woodland	Primary	30	Target 300; minimum 200
	Secondary	20	100
	Lee	10	0
Grass and open woodland	Primary	30	100
	Secondary	20	0
	Lee	10	0

Table 3 - Width for Inner APZs (with no Outer APZ)

Vegetation type	Asset Interface Classification (as mapped)	Inner APZ	Outer APZ
		Width (m)	Minimum Width (m)
Forest and woodland	Primary	60	0
	Secondary	40	0
	Lee	20	0
Grass and open woodland	Primary	40	0
	Secondary	20	0
	Lee	10	0

From the above Tables it can be deduced that a minimum 60m to a maximum of 230m is required for the APZ;s located at the North West edge of Kama, adjacent to the Kama Nature Reserve as well as to the west of Denman Prospect . The Molonglo Stage 3 Bushfire Strategy (ABPP) suggest that the minimum 60m is suitable.

4.1 Inner & Outer Asset Protection Zone (IAPZ) & (OAPZ)

Tables 6, Source: Table 4 & 3 ACT Bushfire Management Standards, 2014

APZ Type	Vegetation type	Fuel management standards
Inner		
Default standards to be applied across at least 80% of the zones as mapped. Where default standards cannot be achieved, the responsible land manager may identify alternative treatments to meet the overall objectives for the zone. Any significant variation on the default standards shall be approved by the ESA.	Forest and woodland	Maintained at an overall fuel hazard ≤ low 3–5 m canopy separation or fuel gap to crown, > 3 m maintained
	Grass and open woodland	Grassland maintained at ≤200 mm height when grassland curing ≥70%.
Outer		
Default standards to be applied across at least 70% of the zones as mapped. Where default standards cannot be achieved, the responsible land manager may identify alternative treatments to meet the overall objectives for the zone. Any significant variation on the default standards shall be approved by the ESA.	Forest and woodland	Overall fuel hazard ≤ moderate
	Grass and open woodland	Grassland fire hazard ^a ≤35 when grassland curing ≥70%

ESA = ACT Emergency Services Agency

^a The grassland fire hazard is a score deriving from the height of grass (m) and the amount of cover (%). See Section 21.2.1, 'Explanatory notes'.

4.2 Strategic Fire Advantage Zone (SFAZ)

Tables 7, Source: Table 5 ACT Bushfire Management Standards, 2014

SFAZ Type	Vegetation or break type	Fuel management standards
Broad area treatment		
Application of broad area hazard reduction burning that aims to reduce fuel across multiple landscape elements (ridges, side slopes, gullies) and treat at least 70% of the area identified. Where default standards cannot be achieved, the responsible land manager may identify alternative treatments to meet the overall objectives for the zone. Any significant variation on the default standards shall be approved by the ESA.	Forest and shrubland	Overall fuel hazard S high
	Grass and open Woodland	Grassland fire hazard S30 when grassland curing 70%.
	Identified arterial roads, rural roads and easements	Grassland fire hazard S35 when grassland curing 70%.
Linear breaks		
Standards to be applied across at least 70% of the zones as mapped. Where default standards cannot be achieved, the responsible land manager may identify alternative treatments to meet the overall objectives for the zone.	Identified arterial roads, rural roads and easements	Grass and fire hazard S35 when grassland curing 70%.
	Forest greenbreaks	Overall fuel hazard S high
Ridgetop burning treatments		
Application of broad-area hazard reduction burning that aims to reduce fuel, primarily along ridgelines and side slopes aiming to treat in the order of 30-50% of the gross area identified as ridgetop burns.	n/a	Overall fuel hazard S high
Plantations		
	Immature stands (<15 years old):	Pruned to 2.0 m and thinned to 650 sph nominally at Year 8-10. Debris from thinning and pruning to be <1 m high. In areas immediately adjacent to potential ignition sources or built assets consider mechanical crushing of thinning and pruning debris or burning as soon as practicable without damaging the residual stand.
	Mature stands (>15 years old)	Mature stands (>15 years old). Schedule harvesting to reduce contiguous areas of untreated slash during the fire season. Remove the outside row of trees (adjacent to fire trails) during first commercial thinning operation to improve access on fire trucks. Maintain strategic fuel breaks through the maintenance of road pavements and verges, and edge pruning and thinning.

4.3 Landscape Fire Management Zone (LFMZ).

Tables 8, Source: Table 6 ACT Bushfire Management Standards, 2014

Zone	Treatment standards
Landscape Fire Management Zone	Fuel management standards not applied.
Agricultural Fire Management Zone	Requirements will be defined in bushfire operational plans, developed through the Farm Firewise program.

4.4 Kama and Denman Prospect Bushfire strategy.

4.4.1 IAPZ Width - Background

Before going any further, we should briefly discuss the source of the width adopted for IAPZ's as shown in Tables 5.2 & 5.3 of this report.

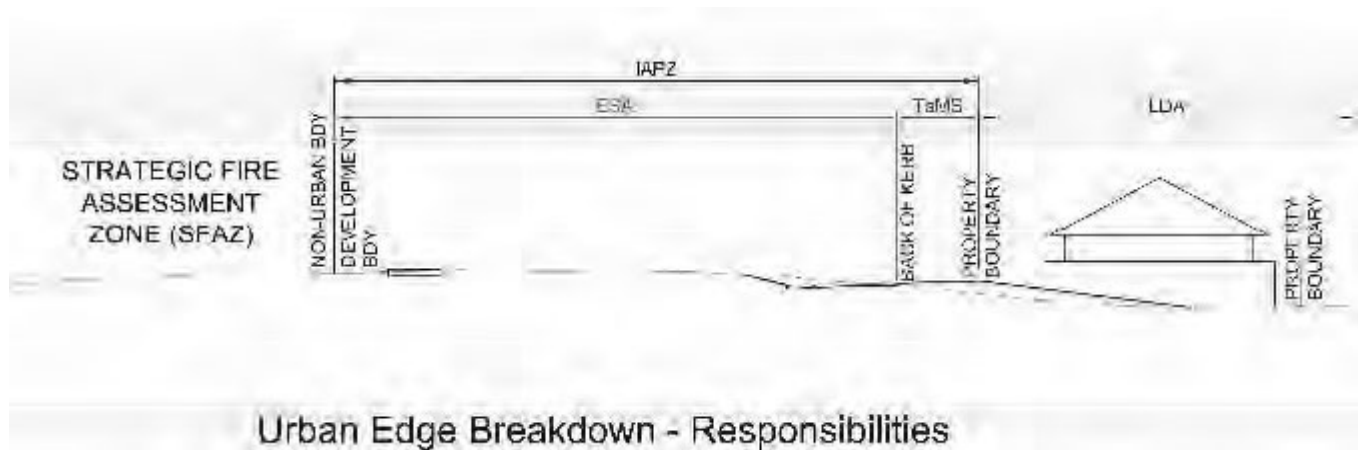
The ignition and subsequent destruction of a building in a bushfire event mainly result from one or more of the following three attack modes: embers, radiant heat and flame contact. To mitigate the effects of these bushfire attacks on a building, the provision of a separation distance together with the use of other bushfire protection measures has been proved an effective means and widely accepted by Fire Authorities in Australia.

The determination of such bushfire factors as Rate of Spread, Flame length and Radiation all help to determine the minimum width of APZ's. In recent years, these factors have been computer modelled with many inputs and allowances to be considered, such as:

- Vegetation Class
- Effective Slope
- Separation distance between fire and front of building
- Flame angle
- Elevation of receiver
- Site Slope
- Flame temperature
- Flame emissivity
- Flame width
- Surface fuel load
- Overall Fuel load
- Vegetation height
- Fire Danger Index
- Wind Speed
- Ambient Temperature
- Relative humidity
- Heat of combustion
- Radiation of bushfire attack.

Therefore, we can say the IAPZ is based on sound empirical and scientific data and that any effort to try to reduce the 60m would lead to an increase in significant risk to both emergency personnel and the neighbouring assets.

4.4.2 IAPZ Measurement Breakdown.
The responsibilities of the IAPZ is as follows.



However, TaMS does not consider the road verge, on block side, to be part of their management responsibility.

The following is taken from the TaMS Website 19 August 2015
(http://www.tams.act.gov.au/city-services/public_land_use#who_looks)

Who looks after my nature strip?

It is accepted practice in the ACT that maintenance of nature strips, including rain gardens, is undertaken by the resident or lessee of the adjoining leased land. This includes residential properties, single unit dwellings or, in the case of a units plan, the corporate bodies and commercial premises. Street trees on your verge are maintained by the ACT Government.

If you feel that you are unable to maintain your nature strip due to health reasons, organisations such as a Home Help Services ACT may be able to provide assistance. For further information call Access Canberra on 13 22 81.

Note that lessees are **not** responsible for road verge or public or unleased territory land. Hence an IAPZ of 60m(When OAPZ=zero) and where the entire width is managed by ESA would results in the actual developable land being – 67-70m away from the developable boundary.

However, the LDA, through the working group for the Kama and Denman Prospect Bushfire strategy, have support from ESA that the IAPZ, where adjacent to a SFAZ, can be 50m to the back of kerb. Thus resulting in the 57.5-60m identified in this document, as the IAPZ. Measured to the front of the block boundary.

5 ABPP findings for Kama and Denman Prospect Stage 2

As outlined in the Bushfire Risk Strategy Molonglo Stage 3; Denman Prospect & the Molonglo River Corridor – ABPP, May 2015. The following is the currently agreed approach for Kama and Denman Prospect.

5.1.1 North-western edge of Molonglo Stage 3 - Kama

- 1) There shall be established and maintained a minimum 60 metre wide Inner Asset Protection Zone to the north-western edge of the urban development, managed to the prescriptions as detailed in the ACT Strategic Fire Management Plan 2014 – Version 3. This zone shall contain an edge road and also a gravel fire trail located adjacent to the eastern boundary of Kama and shall include stormwater treatment ponds, cycleway/pedestrian access and electrical power lines, as required.
- 2) There shall be established and maintained, over the whole of Kama Nature Reserve, a Strategic Fire Advantage Zone, cyclically managed to the prescriptions as detailed in the ACT Strategic Fire Management Plan 2014 – Version 3;
- 3) There shall be established and maintained a six [6] metre wide fire break located inside the eastern boundary of Kama Nature Reserve;
- 4) The existing access/fire trails within Kama Nature Reserve shall be upgraded and maintained to provide access for management works and fire-fighting operations.

5.1.2 North-western/Western edge to Denman Prospect:

- 1) There shall be established and maintained a minimum 60 metre wide Inner Asset Protection Zone to the north-western and western edge of the urban development within Denman Prospect, managed to the prescriptions as detailed in the ACT Strategic Fire Management Plan 2014 – Version 3. This zone shall include an edge road and where provided, stormwater treatment ponds and shall also include cycleway/pedestrian access as required – *refer to Denman Prospect Figure 7 on Page 25.*
- 2) There shall be established and maintained, to the location as shown on the Denman Prospect *Figure 7 on Page 25*, an Outer Asset Protection Zone of varying widths, managed to the prescriptions as detailed in the ACT Strategic Fire Management Plan 2014 – Version 3;
- 3) There shall be established and maintained, to the area as shown on Denman Prospect *Figure 7 on Page 25*, a series of Strategic Fire Advantage Zones, cyclically managed to the prescriptions as detailed in the ACT Strategic Fire Management Plan 2014 – Version 3 and in accordance with the recommendations contained in the Analysis of Vegetation Structure and Fire Risk report prepared by Umwelt - 2015;
- 4) There shall be established a series of Fire Trails, generally as located as shown on *Figure 5 on Page 18* – also refer to the Analysis of Vegetation Structure and Fire Risk report prepared by Umwelt - 2015. These trails shall be maintained to provide access for management works and fire-fighting operations.

6 Ecological Impacts –

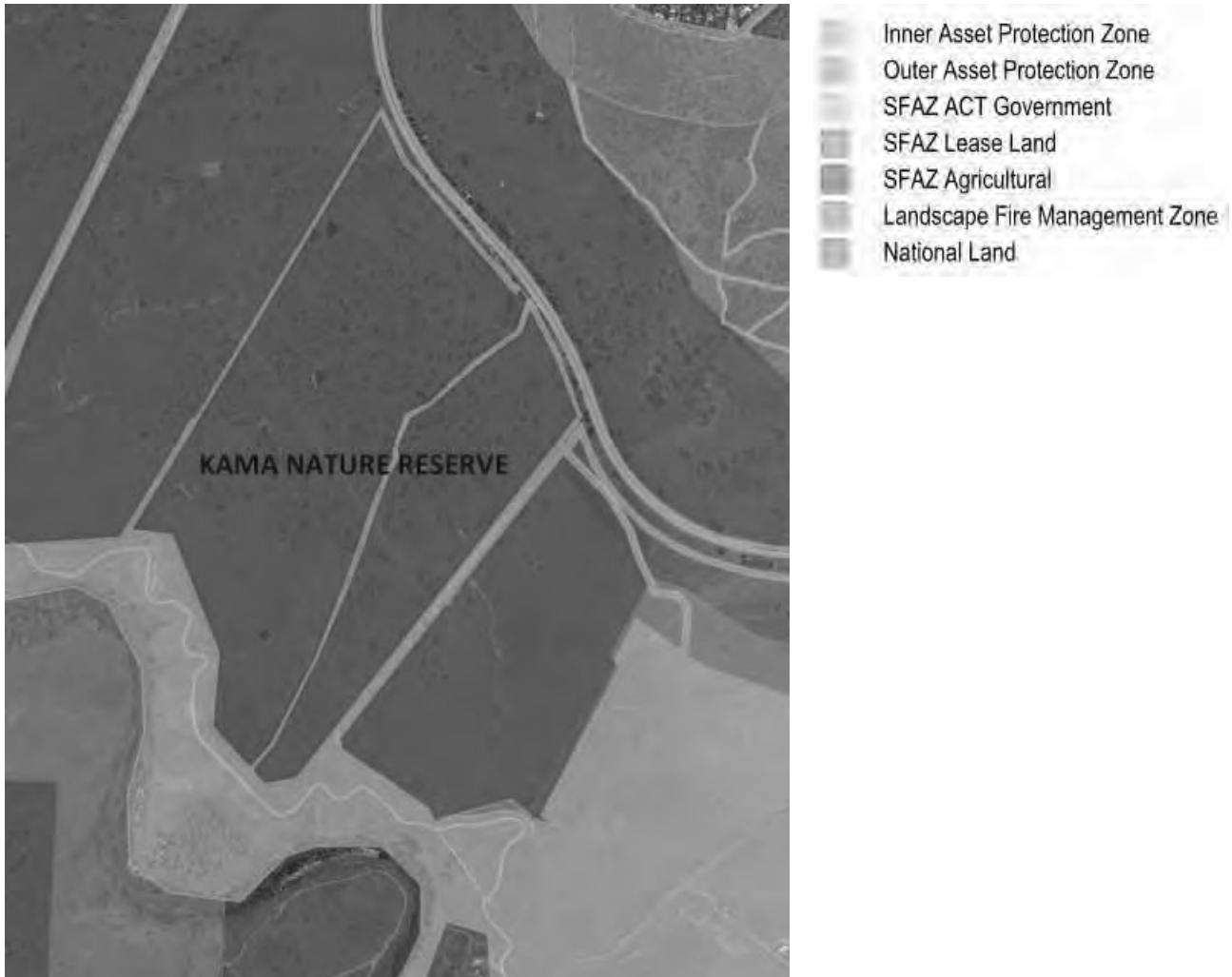
6.1 Kama Nature Reserve

The recognition of the Kama Reserve within the NES Plan (Molonglo Valley Plan for the Protection of Matters of National Environmental Significance) as an offset site, severely limits opportunities to include Outer Asset Protection Zones within the Kama Reserve.

However, as stated in the ABPP Bush Fire strategy for the Molonglo Valley, discussion between ABPP and TaMS (Adam Leavesley) and in direct reference to the Umwelt report outlined that a SFAZ can be established within the Kama Nature Reserve, as defined in the SBMP V3 whilst still maintaining ecological biodiversity.

Currently the Kama Nature Reserve is identified and managed as a SFAZ Agricultural. Refer Figure 3 below.

Figure 3, Molonglo Bushfire Management. Source: ACTMapi August 2015



6.2 Denman Prospect

Using a combination of OAPZ and SPAZ along the Denman Prospect north-western and western borders allows an IAPZ of 60m to be adopted similar to the Kama interface.

Figure 4, Source: NES Plan, Page 14

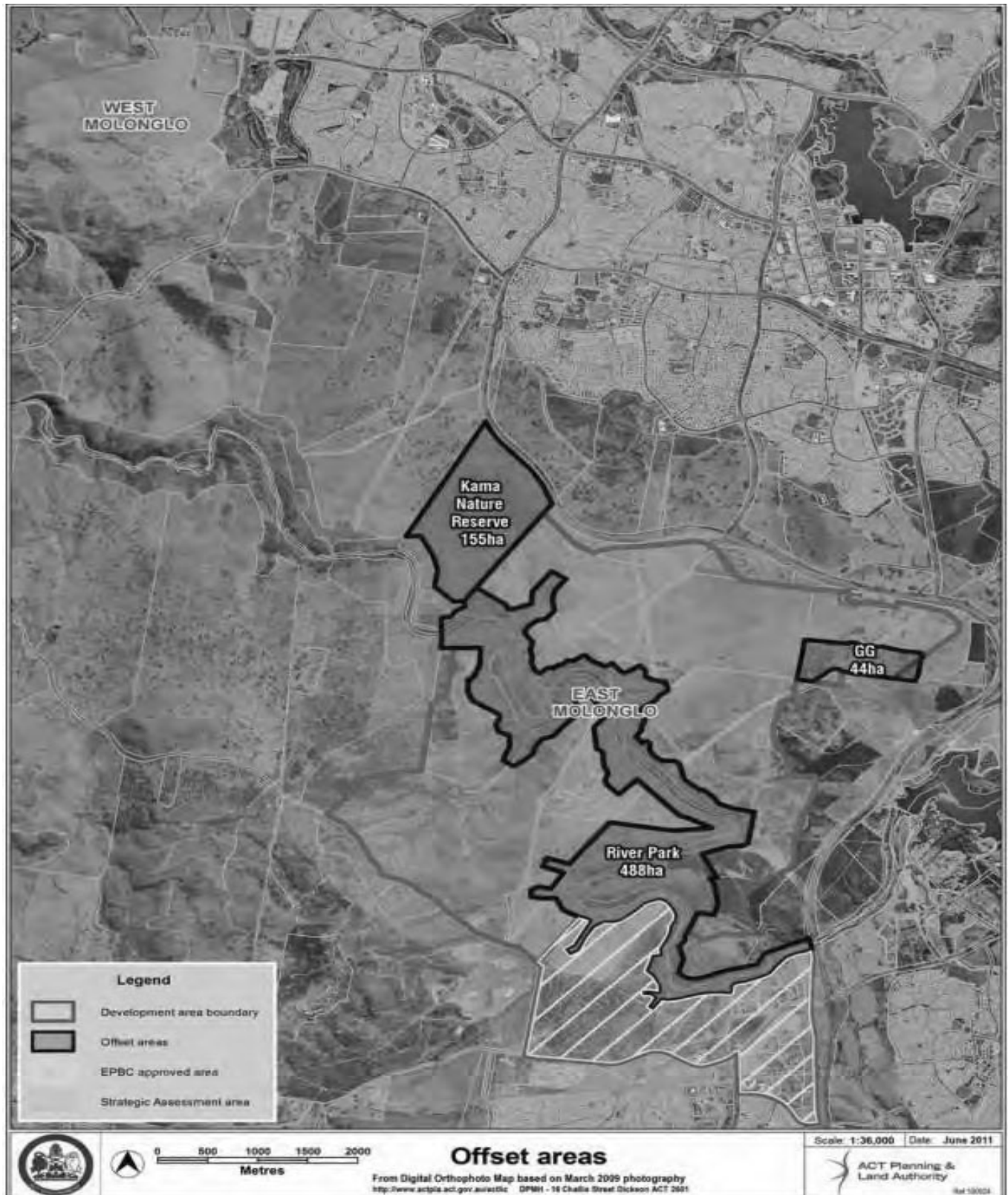
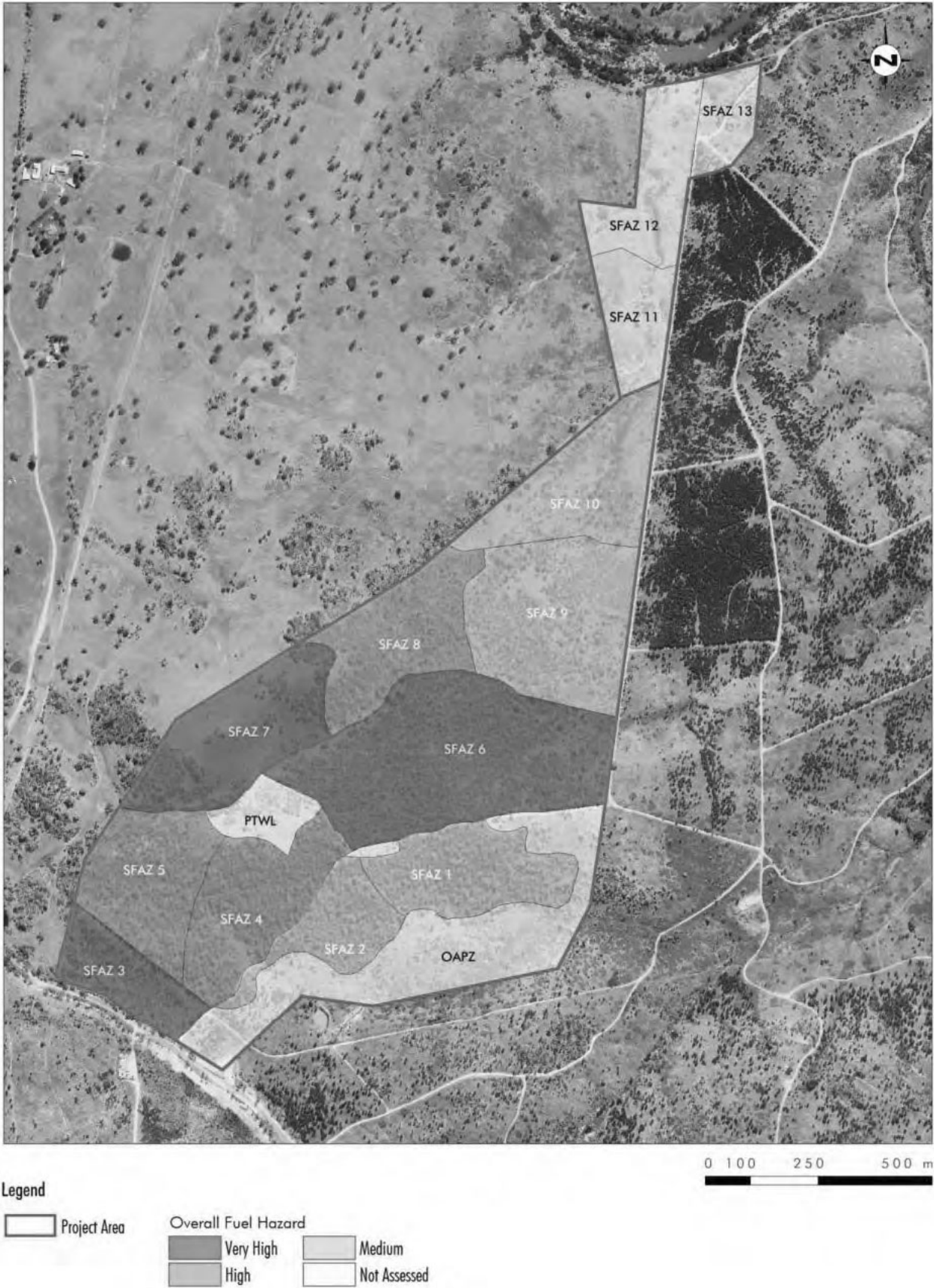
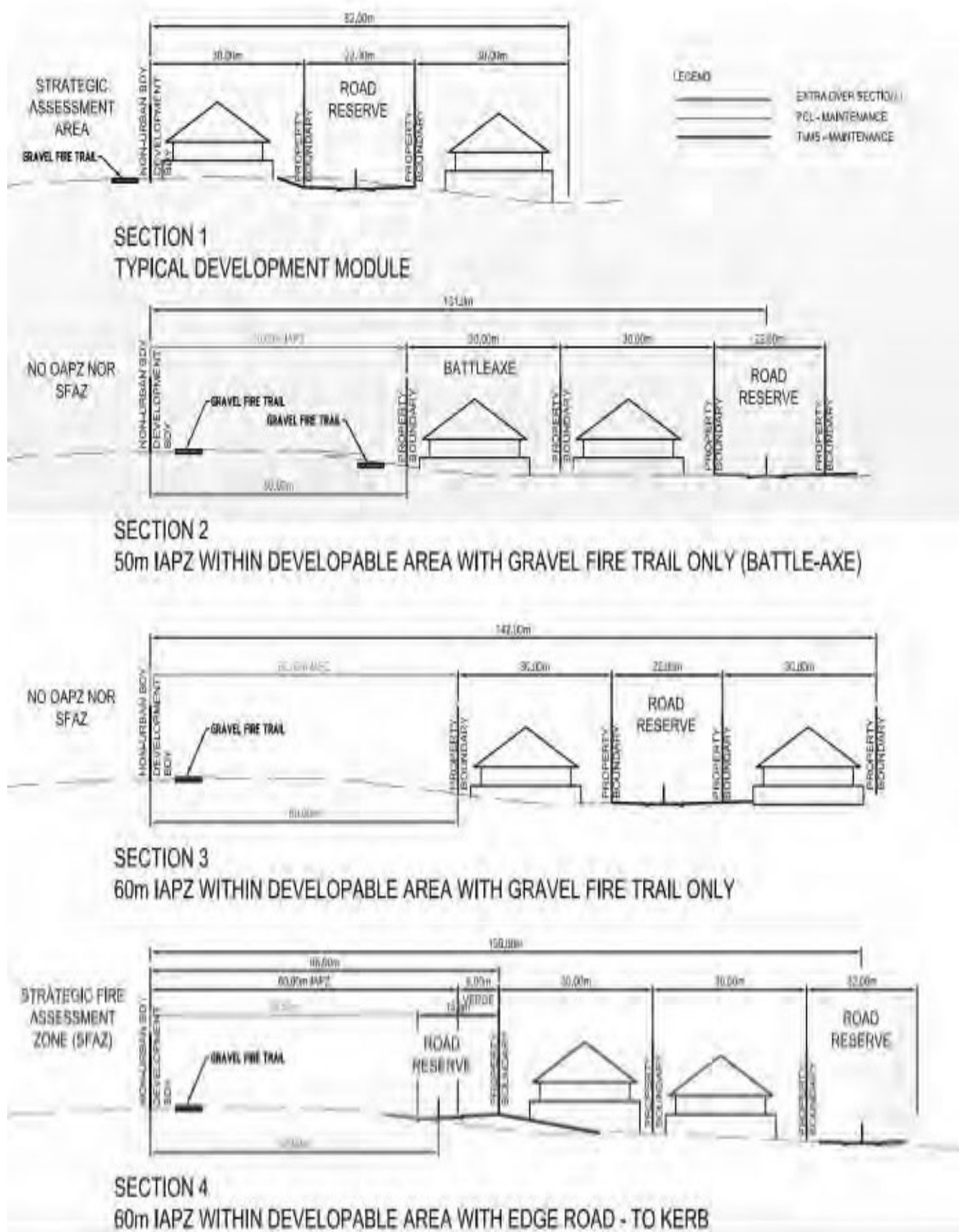


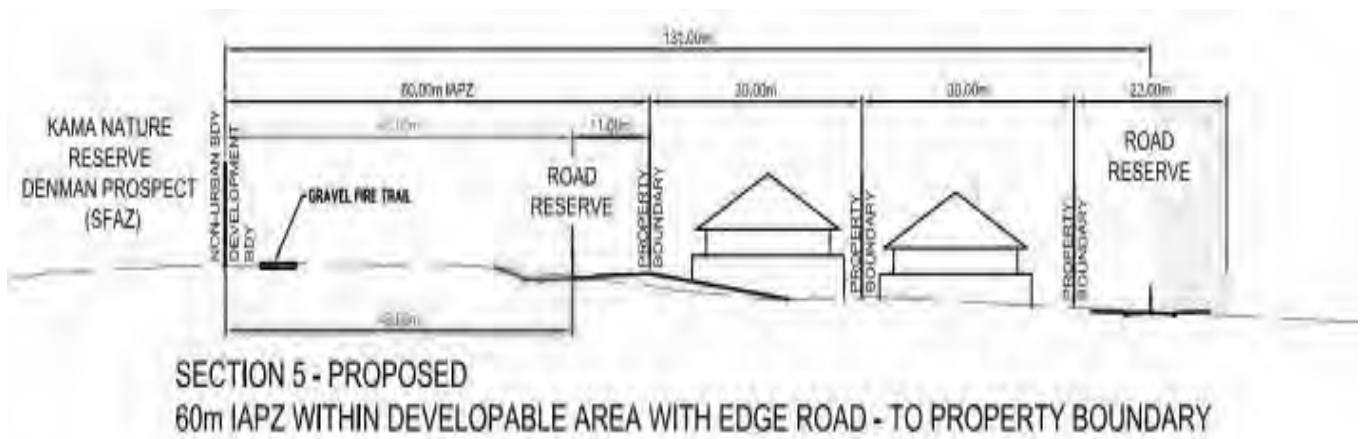
Figure 5 Maximum 'Overall Fuel Hazard Assessment', Source: Umwelt, page 32.



7 Typical Cross Sections of Zones at the Urban/Non-Urban Interface.

Figure 6: Typical Cross Sections.





Assumptions:

Each block requires a minimum amount of area to be allocated for its infrastructure. E.g. Road, services, verge etc. Therefore, the minimum actual developable area required for a single block should also include at least 50% of its Road Reserve width for the full frontage of the block. Based on the full road reserve servicing at least two blocks.

Open space areas such as common reserves, parks etc have been discounted for simplicity. In many cases, these could be located within the APZ's thus helping to release developable land elsewhere in the estate while providing good fuel load buffers.

Standard Block Depth is 30m.

The minimum Road Reserve is 22m. In recent LDA developments, it has been shown that an edge road can be accommodated within a road reserve of approx. 19m. Access roads can be accommodated within a 21.6m road reserve. For ease of comparison, we have adopted a standard road reserve width of 22m for both the Edge Road and Access Road.

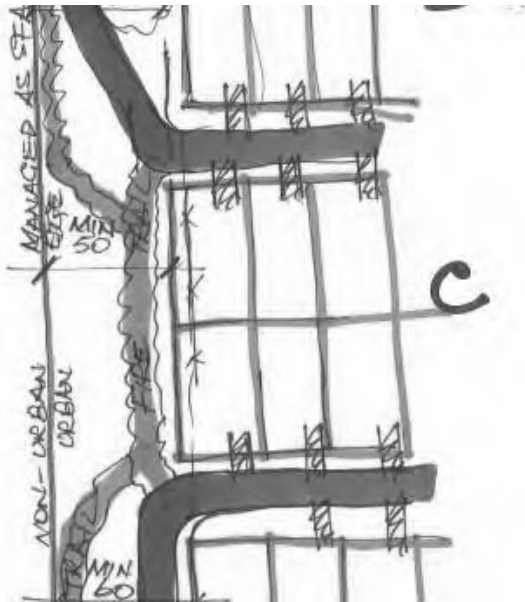
Gravel fire trails are required regardless. These can be formal or informal tracks as long as they can support water tankers. Gravel fire trails will be constructed as part of the development and subsequently maintained by PCL. However until these are handed over, they will be maintained by LDA as part of the construction of the adjoining residential development components.

7.1 Section 1 – Typical Development Module

Obviously, the most efficient when reviewing developable land use within the Estate boundary. Section 1 shows that for a 2-block module, a width of 82m is required. This is the same result if you take the distance to be between road centrelines. However, under current legislation this module is unachievable and will not be supported by the relevant ACT statutory approving authorities.

7.2 Section 2 – 60m IAPZ within Developable Area with 2X Gravel Fire Trail Only.

Figure 7: Section 2 Plan



An alternative arrangement utilising battle Axe and Side loaded blocks. Here there is no edge road but it may have a fire trail joining parts of the edge road the argument is that this should reflect the IAPZ and not be set back a further 7.5 or 10 metres. So instead of having 60m to front of blocks in A and B, we have 50m to edges of blocks. This is still to be confirmed as an acceptable option.

7.3 Section 3 – 60m IAPZ within Developable Area with Gravel Fire Trail Only.

Locating the IAPZ within the developable boundary pushes the 2 block module out by 60m and relocates the IAPZ gravel fire trail within the estate to allow easier access.

Edge Roads may be omitted if the Gravel fire trail is of a suitable standard. Refer ESD Code Section 14.7 (R112).

7.4 Section 4 – 60m IAPZ within Developable Area with Edge Road – to Kerb

Utilising an edge road within the IAPZ allows a proportion of the required infrastructure to be located within the IAPZ. Currently ESA prefers the IAPZ to be at the back of kerb as they are unable to influence fuel management loading in the verge due to it not being effectively managed by TaMS and the adj householder.

There is additional infrastructure required, over and above Section 1. Shown in red, an extra half road and road reserve is required (11m) beyond the standard two block module. This is similar to Section 4

The ESA maintenance requirement is reduced to a width of 52.5m from 60m.

7.5 Section 5 – Proposed, 60m IAPZ within Developable Area with Edge Road – to Property Boundary

Utilising an edge road within the IAPZ allows the entire edge road infrastructure to be located within the IAPZ. Currently ESA prefer the 60m to be at the back of kerb as they are unable to influence fuel management loading in the verge due to it not being effectively managed by TaMS and the adj householder.

However, if dispensation can be given such that the IAPZ can be measured to the front property boundary, a further 8m of developable area can be gained, when compared to Section 4. Along with a comparable reduction in ESA maintenance responsibilities (49m).

There is additional infrastructure required, over and above Section 1. Shown in red, an extra half road and road reserve is required (11m) above the standard two block module. This is similar to Section 4.

It is important to realise that the proposed Section 5 incorporates the full 60m IAPZ requirement, which is specified when there is no OAPZ present (refer Table 5.3, p11). In the case of both Kama and Denman Prospect Stage 2 we have an additional Strategic Fire Assessment Zones to the west which further reduces any impact from risks associated with bush fires.

8 Establishment Costs — The following costs are based on the arrangement shown in Typical Cross Section 5.

Table 8.1 – Kama Urban Edge – Establishment Costs

KAMIA		Establishment		Length of IAPZ and Edge Road approx (m)		1300		July 2017		July 2017	
Section 5											
Establishment Item	Description	Unit	Rate EST July 2015 (1)	Rate EST July 2017 (2)	Edge Road Quantity (3)	Fire Trail Quantity (4)	Total Edge Road (3.75m - half width)	Total IAPZ (60m) includes Gravel Fire Trail			
Clearing and Grubbing		Ha	\$1,500.00	\$1,575.94	1.43	6.37	\$2,254	\$10,039			
Earthworks											
	Removal and stockpiling topsoil (assumed 100mm topsoil)	m2	\$5.00	\$5.25	14300	63700	\$75,120	\$334,624			
	General Earthworks (Cut to Fill - stripped to boxing)	m3	\$8.00	\$8.41	11000	5000	\$88,000	\$42,025			
	Subgrade preparation (Cut) Assume 50%	m2	\$4.50	\$4.73	2438	3250	\$10,969	\$15,365			
Kerbs											
Subsoils	Kerb and Gutter	m	\$50.00	\$52.53	1300		\$65,000				
	Subsoils	m	\$90.00	\$94.56	1300		\$117,000				
Road Pavement											
comprising of											
	DGS40 - 300 thk	m2	\$27.00	\$28.37	4875		\$131,625				
	DSB20 - 100 thk	m2	\$11.00	\$11.56	4875		\$53,625				
	FGG-A - 25mm Thick	m2	\$17.00	\$17.86	4875		\$82,875				
Fire Trail											
DGS40 - 300 thk		m2	\$27.00			4550	\$122,850				
Potable Water Landscape											
	Hydrants inc thrust block (Extra over due to F5)	No.	\$1,300.00	\$1,365.81	6		\$7,800				
	Spread Topsoil	m2	\$11.00	\$11.56	58500		\$643,500				
	Grassing	m2	\$3.00	\$3.15	58500		\$175,500				
CPI	Boundary Fencing	m	\$12 50	\$13.13	1300		\$16,250				
	2.50%										
(1) - Rates have been taken from land development projects just outside of the ACT in lieu of Awarded Throsby Tender Values.					Contingency	10%	\$634,267	\$1,360,153			
(2) - An assumed 2.5% CPI has been added for 2 years. Estimated Tender award of July 2017							\$63,427	\$136,015			
(3) - Extra over quantities for half edge road, 7.5m wide. Refer Section 4							\$697,694	\$1,496,168			
(4) - Fire trail and IAPZ cost separate to the general civil infrastructure costs.											
(5) - Yellow boxes signify possibly not extra costs TBC											

Table 8.2 – Denman Prospect Urban Edge – Establishment Costs

Denman Prospect St2 - Establishment

Section 5		Length of IAPZ and Edge Road approx (m)		2700		July 2017		July 2017	
Establishment Item	Description	Unit	Rate EST July 2015 (1)	Rate EST July 2017 (2)	Edge Road Quantity (3)	Fire Trail Quantity (4)	Total Edge Road (3.75m - half width)	Total IAPZ (60m) includes Gravel	Fire Trail
Clearing and Grubbing	Clearing and Grubbing 49m x length of IAPZ	Ha	\$1,500.00	\$1,575.94	2.97	13.23	\$4,681		\$20,850
Earthworks									
Kerbs Subsoils	Removal and stockpiling topsoil (assumed 100mm topsoil)	m2	\$5.00	\$5.25	29700	132300	\$156,018		\$694,988
	General Earthworks (Cut to Fill - stripped to boxing)	m3	\$8.00	\$8.41	22000	10000	\$176,000		\$84,050
	Subgrade preparation (Cut) Assume 50%	m2	\$4.50	\$4.73	5063	6750	\$22,781		\$31,913
Road Pavement	Kerb and Gutter	m	\$50.00	\$52.53	2700		\$135,000		
	Subsoils	m	\$90.00	\$94.56	2700		\$243,000		
	Edge Road (Half width - Extra Over)								
comprising of	DGS40 - 300 thk	m2	\$27.00	\$28.37	10125		\$273,375		
	DSB20 - 100 thk	m2	\$11.00	\$11.56	10125		\$111,375		
	FGG-A - 25mmThick	m2	\$17.00	\$17.86	10125		\$172,125		
Fire Trail	DGS40 - 300 thk	m2	\$27.00			9450			\$255,150
Potable Water Landscape	Hydrants inc thrust block (Extra over due to F5)	No.	\$1,300.00	\$1,365.81	15		\$19,500		
	Spread Topsoil	m2	\$11.00	\$11.56	121500				\$1,336,500
	Grassing	m2	\$3.00	\$3.15	121500				\$364,500
CPI	Boundary Fencing	m	\$12.50	\$13.13	2700				\$33,750
2.50%									
(1) - Rates have been taken from land development projects just outside of the ACT in lieu of Awarded Throsby Tender Values. Contingency									
(2) - An assumed 2.5% CPI has been added for 2 years. Estimated Tender award of July 2017									
(3) - Extra over quantities for half edge road, 7.5m wide. Refer Section 4									
(4) - Fire trail and IAPZ cost separate to the general civil infrastructure costs.									
(5) -Yellow boxes signify possibly not extra costs TBC									
							\$1,313,855	\$2,821,701	
							\$131,385	\$282,170	
							\$1,445,240	\$3,103,871	

9 Recurrent Costs

Table 9.1 – Kama Urban Edge – Recurrent Costs

KAMA		Recurrent		Length of IAPZ and Edge Road approx. (m)		1300	
Section 5							
Recurrent Item	Description	Unit	Frequency Annually	Quantity Km/Ha	Annual Rate EST July 2015 (1)	Annual Rate EST July 2017 (2)	July 2017 Total IAPZ (49m)
Fire Trail	Re-grading - Blade only	Km	1	1.3	\$1,500	\$1,576	\$1,576
	Re-grading - Rip, Water, Steel Roller	Km	Once in every 5 yrs	1.3	\$3,000	\$3,152	\$3,152
IAPZ - CPI	Slashing and Burning 2.50%	Ha	2	6.37	\$2,000	\$2,101	\$13,385

Estimated Maintenance Costs for 5yr 2017-2022 (3)		
	IAPZ	Fire Trail
2018	\$13,385	\$1,576
2019	\$13,720	\$1,615
2020	\$14,063	\$4,139
2021	\$14,414	\$1,697
2022	\$14,774	\$1,740
Total	\$70,356	\$10,767

- (1) - Rates have been taken from information received from PCL and CES Enquiries
- (2) - An assumed 2.5% CPI has been added for 2 years. Estimated Tender award of July 2017
- (3) - An assumed 2.5% CPI per year has been added

Table 9.2 – Denman Prospect Urban Edge – Recurrent Costs

Denman Prospect Stage 2 Recurrent

Section 5 Length of IAPZ and Edge Road approx. (m) 2500

Recurrent Item	Description	Unit	Frequency Annually	Quantity Km/Ha	Annual Rate EST July 2015 (1)	Rate EST July 2017 (2)	July 2017 Total IAPZ (49m)
Fire Trail	Re-grading - Blade only	Km	1	2.5	\$2,000	\$2,101	\$2,101
	Re-grading - Rip, Water, Steel Roller	Km	Once in every 5 yrs	2.5	\$7,500	\$7,880	\$7,880
IAPZ - CPI	Slashing and Burning 2.50%	Ha	2	13.23	\$2,000	\$2,101	\$27,800

Estimated Maintenance Costs for 5yr 2017-2022 (3)		
	IAPZ	Fire Trail
2018	\$27,800	\$2,101
2019	\$28,495	\$2,154
2020	\$29,207	\$10,348
2021	\$29,937	\$2,263
2022	\$30,685	\$2,319
Total	\$146,124	\$19,185

- (1) - Rates have been taken from information received from PCL and CES Enquiries
(2) - An assumed 2.5% CPI has been added for 2 years. Estimated Tender award of July 2017
(3) - An assumed 2.5% CPI per year has been added

Table 10.1 – Denman Prospect Fire Trails in SFAZ Costs

Denman Prospect Stage 2

Fire Trails in SFAZ

Item	Description	Unit	Quantity	Rate EST July 2015 (1)	July 2015 Total (2)	July 2017 Total (2)
Establishment	Fire Trail - New	Km	11			
Clearing and Grubbing	Clearing and Grubbing 10m x length of Fire Trail	Ha	11	\$1,500	\$165,000	\$173,353
Earthworks						
Fire Trail Width (4m) 4	Removal and stockpiling topsoil (assumed 100mm topsoil)	m2	44000	\$5.00	\$220,000	\$231,138
	General Earthworks (Cut to Fill - stripped to boxing)	m3	44000	\$8.00	\$352,000	\$369,820
	Subgrade preparation (Cut) Assume 50%	m2	22000	\$4.50	\$99,000	\$104,012
	Total				Sub Total	\$878,323
Landscape						
	Spread Topsoil (all topsoil lost on site)	m2	44000	\$11.00	\$484,000	\$508,503
	Grassing (Assuming frassing of all topsoil)	m2	44000	\$3.00	\$132,000	\$138,683
					Sub Total	\$647,185
					Total	\$1,525,508
				Contingency	20%	\$305,102
					Total	\$1,830,609
Recurrent Fire Trail		Frequency				
		Annually				
	Re-grading - Blade only	Km	0	\$1,500	\$16,500	\$17,335
CPI	Re-grading - Rip,Water,Steel Roller	Km	Once in every 5 yrs	\$3,000	\$33,000	\$34,671
	2.50%					
Estimated Maintenance Costs for 5yr 2017-2022 (3)						
			Fire Trail			
			2018	\$17,335		
			2019	\$17,769		
			2020	\$45,532		
			2021	\$18,668		
			2022	\$19,135		
			Total		\$118,439	
(1) - Rates have been taken from information received from PCL and CES Enquiries						
(2) - An assumed 2.5% CPI has been added for 2 years. Estimated Tender award of July 2017						
(3) - An assumed 2.5% CPI per year has been added						

(1) - Rates have been taken from information received from PCL and CES Enquiries
(2) - An assumed 2.5% CPI has been added for 2 years. Estimated Tender award of July 2017
(3) - An assumed 2.5% CPI per year has been added

Table 10.2 – Denman Prospect SFAZ Recurrent Costs (2 years).

Denman Prospect Stage 2		SFAZ Maintenance		Rate		EST July 2017		Total July 2018	
Item		Quantity	Unit	Establishment	Recurrent	2015 (1)	Establishment	(2)	Total (2)
Zone		\$/Ha	\$/Ha						
OAPZ	\$92,000		\$9,334	13.6		\$1,255,303	\$1,318,853		\$137,151
SFAZ 1	\$3,000		\$6,417	7.7		\$23,124	\$24,295		\$53,265
SFAZ 2	\$3,000		\$6,417	5.7		\$16,971	\$17,830		\$39,091
SFAZ 3	\$3,000		\$6,417	4.1		\$12,428	\$13,057		\$28,628
SFAZ 4	\$3,000		\$6,417	7.1		\$21,259	\$22,335		\$48,970
SFAZ 5	\$3,000		\$6,417	8.4		\$25,132	\$26,404		\$57,891
SFAZ 6	\$3,000		\$6,417	17.2		\$51,638	\$54,253		\$118,947
SFAZ 7	\$3,000		\$6,417	12.5		\$37,402	\$39,296		\$86,155
SFAZ 8	\$3,000		\$6,417	8.7		\$26,100	\$27,422		\$60,121
SFAZ 9	\$3,000		\$6,417	9.3		\$28,050	\$29,470		\$64,612
SFAZ 10	\$3,000		\$6,417	8.2		\$24,529	\$25,771		\$56,502
SFAZ 11	\$3,000		\$6,417	4.1		\$12,287	\$12,909		\$28,303
SFAZ 12	\$3,000		\$6,417	5.9		\$17,803	\$18,704		\$41,008
SFAZ 13	\$3,000		\$6,417	1.4		\$4,272	\$4,489		\$9,841
Total						\$1,556,299	\$1,635,087		\$830,486
CPI		2.50%	Contingency	10%		\$155,630	\$163,508.65		\$83,048.57
Total						\$1,711,929	\$1,798,595		\$913,534

(1) - Rates have been taken from information received from PCL- ALT2

(2) - An assumed 2.5% CPI has been added for 2 years. Estimated Tender award of July 2017

(3) - Refer Figure 5 Umwelt Plan for locations of Zones.

(4) - All figures are exclusive of establishment and maintenance of fire trails

Table 10.3 – Asset Zone Maintenance Costs.

Asset Zone Maintenance Costs				
Establishment				
IAPZ	\$/Ha	Frequency per year	Annual \$/Ha	
Annual Tractor Slash	\$1,000	2	\$2,000	
			Total \$/Ha	\$2,000
OAPZ	\$/Ha	Frequency per year	Annual \$/Ha	
Fencing/Water	\$1,000	1	\$1,000	
Habitat Restoration	\$19,000	1	\$19,000	
Rock Pick/ Smoothing	\$35,000	1	\$35,000	
Thinning/ Pruning/ Rock Pick/ Smoothing	\$37,000	1	\$37,000	
			Total \$/Ha	\$92,000
SFAZ				
Fencing/Water	\$1,000	1	\$1,000	
Thinning/ Pruning	\$2,000	1	\$2,000	
			Total \$/Ha	\$3,000

Note:

All rates are non GST Exclusive.

Recurrent				
IAPZ	\$/Ha	Frequency per year	Annual \$/Ha	
Annual Tractor Slash	\$1,000	2	\$2,000	
			Total \$/Ha	\$2,000
OAPZ (1)	\$/Ha	Frequency per year	Annual \$/Ha	
Annual brushcut	\$5,000	1	\$5,000	
Annual slashing	\$1,000	1	\$1,000	
Burn 1-2 years	\$2,500	1	\$2,500	
Burn 5-7 years	\$417	1	\$417	
Burn 6+ years	\$417	1	\$417	
			Total \$/Ha	\$9,334
SFAZ (1)				
Annual Brushcut	\$5,000	1	\$5,000	
Burn 4-6 years	\$500	1	\$500	
Burn 5-7 years	\$417	1	\$417	
Burn 8-10 years	\$250	1	\$250	
Thinning/Pruning 8+ Years	\$250	1	\$250	
			Total \$/Ha	\$6,417
(1) [Burn Periods ?-?years] Denote type of Burn treatment applied. Not the expected time period between.				

10 Impact on Territory sales revenue.

10.1 Block Premiums

The loss of developable land along the urban edge is therefore, the difference between Section 2 (131m) and Section 5 (131m). A zero loss along the urban edge. The actual physical area lost is harder to determine, as it is very much reliant on the common infrastructure such as intersecting roads open spaces etc.

Another aspect of the any difference in lost opportunity costs due to the IAPZ being within the defined developable land is the increase in possible sale value these edge blocks may now have.

According to sales advice received from the LDA. Blocks adjacent to edge roads and open space can be sold at a premium if the blocks are over 550m² also:

- 5% would be added if there is an edge road and the blocks face the edge road and the IAPZ.
- + a further 5% if there is no edge road with blocks facing outwards to the IAPZ.
- + a further 5% if they are backing on to the IAPZ with no roads.

This “premium” also applies to any open space “frontage” within a suburb such as an oval or other open space etc.

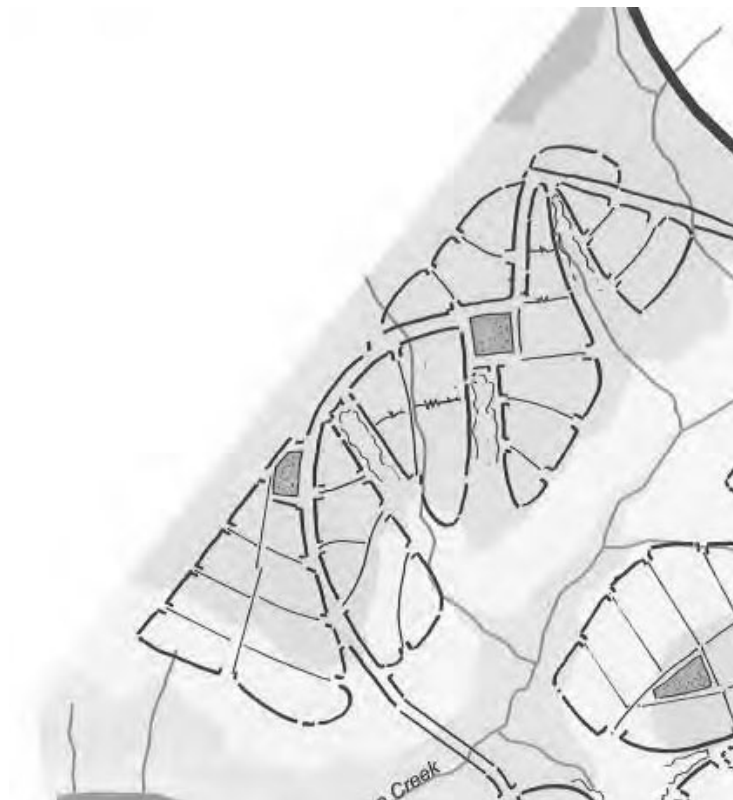
11 Summary of findings

11.1 Establishment

Clearing and Grubbing, whilst included in the cost estimate can be argued that this would need to be undertaken regardless of the IAPZ.

Removal and stockpiling of topsoil whilst is a significant cost and would need to be completed even if the IAPZ area adjacent was outside of the development boundary.

Figure 8: Kama - Molonglo 3 Concept Sketch 3 by Roberts Day



General Earthworks cover only the extra over area of the Edge Road and the fire trail. We have split these figures, as it is unclear if the fire trail would be included in the development costs if the Section 1 option were available. We have undertaken a preliminary design for the fire trail and edge road for Kama and have used these result to determine the likely volumes for Denman Prospect St2 as there is currently no preliminary layout available.

In both cases, we have assumed the fire trail and edge road will run the entire length of the IAPZ. This seems to be nearly achievable given Figure 5, The Molonglo 3 Concept Sketch 3 by Roberts Day.

No extra stormwater has been included, as the edge road will only require it on one side. Which would be required regardless of options.

Whilst the fire trail needs only to be a gravel track, it may require some to stabilisation with a 2 coat seal where the longitudinal grades are excessive >12%. On having reviewed our Kama Fire trail grading we believe this can be kept to a minimum therefore, we have not included an allowance for a stabilising seal in this assessment.

If at detail design stage a stabilisation seal were required there would be a reduction in the recurrent maintenance costs. However, this saving does not offset the cost of including it in any initial establishment.

Additional Fire hydrants have been included to satisfy the F5 category. Standard spacing would be approx. 90m for F6 where 60m is required for F5 normal conditions.

Extra Over costs for landscaping the IAPZ, topsoiling and dryland grassing is also questionable given blocks would require similar treatments.

Boundary fences too, whilst included could be argued are required irrespective.

All rates are assumed not to include a GST component.

A contingency of 10% has been added to the establishment sub totals

11.2 Recurrent

Fire Trail – Once constructed the on-going maintenance costs comprise of running a grader over the track at least once a year to remove deformations and failures due to use and erosion. Currently PCL manage this process via an ongoing contract based on day/hourly rates. Subsequently this is hard to extrapolate into a direct cost comparison. We have, after discussion with contractors, adopted a realistic rate of hiring a machine and operator based on a day rates.

One day of grader and operator hire would cost between \$1,500 to \$2,000 a day. And is capable of completing from 1km to 2.5km a day depending on the terrain.

Once every five years an allowance has been included for complete re-grading of the fire trail. Which includes the use of a grader, water tank and steel roller. The costs is approx. \$3,000 per km. These figures are very preliminary and depend on factors such as availability of useable water, damage to track etc.

Fuel management treatment. – IAPZ, OPAZ & SFAZ. All treatments and costings are taken from Molonglo Development Fire Strategy V3 – Alternative 2. And Adam Leavesley of PCL.

OPAZ & SFAZ First Year Costs. Once established the recurrent cost should be applied immediately, that is the first year would include both Establishment and Recurrent Costs.

Kama Nature Reserve – SFAZ Maintenance has not been costed as part of this report as TaMS currently maintains these areas as SFAZ Agricultural. It is expected to continue doing so regardless of any adj development.

CPI Allowance – A general CPI allowance of 2.5%pa has been added to the current rates to estimate the possible rates in July 2017. An assumed RFT date for both estates.

11.3 Overall Costings.

It is the author's opinion that the figures used in these costings are generous and that there are many opportunities for potential costs savings.

Possible Savings may include:

- Limiting stripping and re-placement of topsoil to those areas directly affected by development.
- Construction of Fire Trails in Denman Prospect SFAZ areas.
Costing have been developed based on full construction required. This is unlikely, if the existing track alignments were stable, clear, and suitable for maintenance vehicle use, further infrastructure would be unwarranted. It is advised that these works should be fully scoped at detail design stage.

The rates shown in Table 10.3 – Asset Zone Maintenance Costs (2 years), include all possible treatments that may be required over the entire study areas in any single year. Whilst this approach could be seen as excessive, it does yield a budgetary figure that should be able to accommodate all possible scenarios. Obviously, when minimum treatments are applied the overall costs should be reduced.

These figures should be used for preliminary budgetary estimates only.

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MEMBER

Aloisi, Angelina

From: Rob Armstrong [REDACTED]
Sent: Tuesday, 3 June 2014 10:50 AM
To: Richardson, Dave
Cc: Browning, Kerry; Santosuosso, Daniel; Peter Cowper
Subject: Kama Nature Reserve veg map endorsement

Hi Dave,

As discussed, CPR did not wish to undertake a site visit, the issues with the existing mapping are well known. Note that the BN does not consider areas directly adjacent to Molonglo 3 to be EEC at the time of survey, but with a focus on recovery they will be – something for the Kama plan of management no doubt.

Greg Baines has provided a written endorsement of our Kama vegetation map in the below email, including key recommendations of the BN:

- The updated vegetation map should be adopted as the current description of vegetation communities within Kama Nature Reserve.
- The updated information should be considered when determining advanced offsets for the Molonglo Stage 3 development as the previous mapping products are not a sufficiently accurate representation of vegetation condition or distribution within Kama Nature Reserve.

Please let me know if we should consult wider in ESDD or TaMS at this stage.

Cheers
Rob

Rob Armstrong
Senior Ecologist

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From: Baines, Greg [mailto:Greg.Baines@act.gov.au]
Sent: Tuesday, 3 June 2014 10:32 AM
To: Rob Armstrong

Cc: Bootes, Trish; Mulvaney, Michael

Subject: RE: Take 2: Kama Nature Reserve veg map

Hi Rob,

Thank you for referring report on vegetation mapping at Kama Nature Reserve, the report is comprehensive and I endorse the results and recommendations made within.

Regards

Greg Baines | Senior Ecologist

Phone 02 6207 2116 |

Conservation Research and Planning | Environment and Sustainable Development | **ACT Government**

Building 38, Gungahlin Homestead, Bellenden St, Crace | GPO Box 158 Canberra ACT 2601 | www.environment.act.gov.au

From: Mulvaney, Michael

Sent: Tuesday, 3 June 2014 9:14 AM

To: Baines, Greg

Cc: Bootes, Trish

Subject: FW: Take 2: Kama Nature Reserve veg map

Greg

Rob was after an endorsement of this mapping prepared for the LDA – I'm happy to provide it – but is more appropriate and meaningful if it comes from you – are you able to do this – or do you want me to respond?

Cheers Michael Mulvaney

Phone 02 62059964 |

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From: Rob Armstrong [REDACTED]

Sent: Monday, 2 June 2014 4:39 PM

To: Mulvaney, Michael

Subject: Take 2: Kama Nature Reserve veg map

Hi Michael,

Kama NR Reserve veg map briefing note attached (this time!). Areas were mapped as per condition classes in the draft ACT Enviro Offsets Calculator (the primary objective of the mapping), with links provided to legislation. Based on your knowledge of the area, can you please provide comment on the accuracy and extent of box-gum? I can appreciate the moving nature of this where box-gum species are in the canopy.

At the time of survey (Spring 2013) the following findings were of interest:

- Areas of scribbly gum (VT2 and VT2a – polygons 5, 6, 7, and 8), which were ID'd as brittle gum and included as box-gum in the NES plan
- Areas mapped as VT1a (polygons 2, 3, and 4) not considered box-gum under EPBC based on exotic understorey – but contain some native grasses and I suspect can be recovered to be EPBC box-gum as part of the larger patch.

Thanks

Rob

Rob Armstrong
Senior Ecologist

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**1 October, 2014, 1:30pm Level 8 Meeting Room
Macarthur House
DRAFT Minutes and Action Items**

Attendance: Chair, Daniel Iglesias (DI) TAMS, Nick Lhuede (NL) ESA, Steven Gianakis (SG) EPD, Michaela Watts (MW) EPD, Trish Bootes (TB) EPD, Greg Baines (GB), EPD, Julian Seddon (JS) EPD, Richard Milner (RM), TAMS, Adam Leavesley (AL) TAMS, Dave Richardson (DR) LDA, Adam Carmody (AC) LDA, Santosuosso, Daniel (DS) LDA, Stuart Jeffress (SJ) TAMS, Ros Ransome (RR) TAMS.

Apologies

Helen McKeown, Conservator Liaison EPD, Kitchin, Margaret, EPD (CPR), Patrick Paynter, EDD, Ivo Matesic LDA, Stuart Mackenzie EPD, Michael Mulvaney & Tony Corrigan EPD

Background

- NES plan commitments regarding Kama Nature Reserve as follows:

NES Plan action 7 states “Establish a buffer outside the Kama Nature Reserve between the reserve and the proposed development area, and allow for appropriate uses consistent with nature conservation uses of the reserve. The buffer will be developed to ensure that **fire management is undertaken outside of the Kama Nature Reserve** and will provide **protection against urban edge effects**”.

- The NES Plan states the extent of the buffer will be determined by EPD as part of the final Planning and Design Framework (PDF) for Molonglo Stage 3. Currently EDD and EPD are jointly undertaking forward planning for Molonglo 3 which will contribute to the Molonglo 3 PDF. The PDF will outline broad-scale planning, roads, open space, schools and densities and is subject to public consultation and reviewed by Government agencies including the Conservator. Finalisation of the Molonglo 3 PDF is scheduled for June 2015. The PDF is then subject to a DA.
- First land release in Molonglo 3 is scheduled for 2017-18.
- The extent of the required asset protection zones is subject to ESA endorsement.
- On 26 September 2014, the Strategic Bushfire Management Plan Version 3 became effective as a disallowable instrument of the Emergencies Act 2004. The SBMP initiated changes to the requirement of Outer Asset Protection Zones (OAPZ) in Nature Reserves. In particular the SBMP recognises that in some circumstances zoning requirements cannot be achieved and established new Inner APZ requirements where no Outer APZ can be implemented. This has positive outcomes for land management issues in Molonglo given the OAPZ and PTWL habitat management requirements are sometime incompatible.
- Draft Molonglo Fire Management Strategy v2 (developed by TAMS Fire Management Unit and currently with ESA for review) proposes a 230m buffer zone along the eastern edge of Kama Nature Reserve, given current NES Plan restriction on fire management activities in Kama. (requires amendment now SBMPv3 is passed)
- Under the Emergencies Act, fire suppression is permitted in a nature reserve.
- Kama Nature Reserve is a registered site under the *Heritage Act 2004*
- A meeting was held on 18/09/14 where ED PACS, endorsed the following actions:
 1. A joint approach would be made to the Commonwealth on the Kama fire management issue and any other NES plan conditions where clarification is required of the intended outcome, or where a variation is sought.
 2. The list will be finalised by the next coordination meeting and confirmed at that meeting. (MW)
 3. EDD, TAMS and EPD will meet with the C’wealth to discuss the list.

4. Once we have an understanding of their response EDD can formally write to seek clarification or a deviation. At that point in time we can decide on how we can communicate this to key stakeholders.

No.	Item	Action and date	Due Date
	Meeting opened at 1:30 am, Apologies received, as above		
1.0	<u>Previous Minutes</u>		
	Chair outlined that this meeting was convened to advance actions agreed during the previous meeting regarding Kama Nature Reserve chaired by Fay Steward on 18 September 2014. Chair noted that it was unprecedented to exclude fire management activities from a nature reserve in the ACT and that he fully supported seeking a deviation from the NES Plan to allow fire management activities consistent with other values and regulated by the ESA, to resume in Kama Nature Reserve.		
2.0	EDD NES Plan Coordinator comments		
	GS (EPD) and MW (EDD), noted that the process required to vary the NES plan would be to advise the Commonwealth that the ACT Government intended to deviate from the approved NES Plan agreement. Other options would include offsetting what is already an offset.	1. EDD (MW) to advise group on process and consequences of seeking from the Commonwealth, a deviation from the NES Plan. (Refer below Attachment A)	1. ASAP, and circulate – complete
3.0	Discussion Fire Management		
	NL (ESA) noted that previous discussions with EDD had concluded that given the proposed changes to the SBMPv3, the minimum protection zone required for public safety along the eastern boundary of Kama is a 60m LAPZ provided several (up to 3) areas within Kama are managed as Strategic Fire Fighting Advantage Zones (SFFAZ). These areas may vary in future. JS (EPD) noted that it is unclear how consistent fire management is with the conservation objectives for Kama. Future requirements may increase the need for more intense fire management, if the zone is set at its minimum there will be no room for expansion of the zone in future other than into the reserve. CPR is not comfortable with this arrangement as fire risk may increase in future years. NL (ESA) agreed that we don't know what it will look like in future years and if the risk increases then we may need to re-assess the situation.		

	JS (EPD) noted that ecological burning regimes should follow 10 year intervals for woodland and 4 year intervals for grassland. A burn mosaic could be considered with appropriate time intervals. Dependent on the conservation objective we may wish to increase the shrub layer and tree canopy to improve habitat for woodland birds. All this is unlikely to be consistent with the requirements of a SFFAZ. DI (Chair) instructed that we must overlay a burn strategy which matches the ecological thresholds. TB (EPD) noted that CPR would need to be sure that it can be done, and reminded the group that Minister Barr had stood up in the Legislative Assembly and stated that there will be no fire management in Kama. NL (ESA) noted that the draft PoM, (and Operational Plan) allowing ecological burns in Kama was currently inconsistent with the NES Plan Action 7.		
4.0	Actions on Fire Management Issue - TAMS noted that fire trail maintenance and ecological burns in Kama is currently permissible under the draft Plan of Management given these activities are consistent with the conservation objectives of Action 7 of the NES Plan. - TAMS noted that the recently completed Operational Plan for Kama, endorsed by CPR, includes biomass management through planned ecological burns, strategic grazing and selective slashing. Burns will be undertaken according to <i>Ecological Guidelines for Fuel and Fire Management Operations</i> and comprise no more frequently than ten years apart in woodland, three to five years apart in grassland and five years in Pink-tailed Worm-lizard habitat. This approach is considered necessary for the maintenance and enhancement of the ecological condition of BGW and NTG within the reserve (in accordance with NES Plan Action 5 and 25)	2. TAMS to circulate Kama Operational Plan 3. AL (TAMS) to prepare a mosaic burn plan for Kama which matches ecological thresholds and based on the current Kama Operational Plan. 4. ESA to consider whether the provisions in the Operational Plan for Kama are sufficient to provide for Kama as a Strategic Fire Fighting Advantage Zone or recommend any further actions. 5. CPR to review any revisions proposed by ESA to the Kama Operational Plan. TAMS to coordinate any changes. 6. Once the Operational Plan is agreed by ESA, CPR and TAMS, the Plan will be sent to EDD as the supporting reasons for deviation to the NES Plan on the fire management issue.	2. 2/10/14 complete 3. 24/10/14 4. 31/10/14 5. 07/11/14 6. Resolution of issues to be table at Molonglo Coordination Group Meeting on 12 November
5.0	Discussion & Actions Urban Edge Effects on MNES		

	Group noted that the NES Plan Action 7 had two objectives. The second objective is protection of the MNES at Kama from urban edge effects through the provision of a buffer zone. • TB (EPD) noted that the Superb Parrot Action Plan recommends a 100m buffer zone • RR (TAMS) noted that the Draft Strategic Assessment Report for Molonglo Valley, prepared by Ecological in 2010 had specified a 200m buffer for the eastern edge of Kama to protect MNES. This draft was publically released for comment. Submission from COG commented that 200m was inadequate and the buffer should include the area to Deep Creek, ACT Conservation Council agreed, and Friends of Grasslands recommended at least 300m. • DR (LDA) noted that LDA was seeking to maximise development yield at Molonglo 3 and that a 60 IAPZ was an acceptable compromise. The first dwellings for Molonglo 3 were planned for 2017-18. • NL (ESA) noted that the 60m IAPZ must be a slashed zone. • DS (LDA) noted that the proposed 60m IAPZ would potentially accommodate an edge road, sewer vent stacks and the re-routed transmission lines, housing would be located outside the IAPZ. • TAMS & CPR noted that although it was an admirably efficient use of the IAPZ that would potentially save Government maintenance costs, the proposed 60m asset protection zone (incl. edge road) cannot be considered an ecological buffer for protection against urban edge effects (Action 7). The 20m PTWL buffer was discussed as an example of an ecological buffer where infrastructure was not permitted. • AC (LDA) suggested that a cost benefits analysis would be beneficial in determining the merits of various options in particular a middle ground position.	7. RR (TAMS) to prepare summary of prior commitments regarding Kama and the Urban edge. 8. TAMS and CPR to investigate whether any research has been done on urban edge effects and what is considered the minimum width for a suitable urban edge buffer zone. 9. TAMS and CPR to consider an agreed approach and what would be suitable for Kama's eastern urban boundary given the NES Plan conservation objectives and Government's objective to maximise urban development yield.	8. ASAP, and circulate – complete
6.0	Governance		
	Prior to finalising letter to Commonwealth group agreed Ministers should be advised that there may be considerable community back-lash to deviate from the NES Plan in particular minimising the urban edge effects buffer to maximise urban development yield. <u>Next Meeting</u> The meeting closed at 14:30 pm	10. EDD to prepare brief for Minister Corbell and Minister Gentleman, TAMS to prepare brief to Minister Rattenbury.	12 November for consideration at Molonglo Coordination meeting.
7.0		Item to be brought to next Molonglo River Park Co-ord Meeting, 12 November 2014.	

Deviation from NES Plan Action 7 – Process

- ACT Government decides to deviate from the endorsed NES Plan, (for example: Action 7 which does not allow fire management in the Kama Nature Reserve.)
- ACT Government must demonstrate that taking this action is not likely to have a significant impact on Matters of National Environmental Significance (MNES).
- Supportive evidence to be provided that demonstrates that the ACT Government is acting in accordance with the conservation outcomes of the NES, and that activities are unlikely to have significance adverse impact on MNES. Evidence such as the Kama Operational Plan, supported by Government ecologists, should be provided.
- A letter is prepared to the Commonwealth advising that the ACT Government intends to deviate from the endorsed NES Plan. The letter should outline the reasons and justification why the deviation will not impact on MNES and that the MNES in Kama will continue to be maintained and enhanced as agreed under the NES Plan.
- The Commonwealth after review advises that either:
 - deviation / non-compliance is minor or trivial and no further action is required; or
 - deviation / non-compliance requires corrective action.
- Corrective action may include:
 - Cessation of development until the matter is resolved
 - Independent peer review of evidence provided to support the ACT position
 - Re-making of the NES Plan decision by the delegate which would involve revoking the decision (making the NES Plan invalid) and repeating later stages of the assessment process before a new NES Plan is endorsed
 - A requirement for an additional approval process under parts 7,8 and 9 of the EPBC Act which would consider the deviation as a new development/impact.

If the commonwealth advises that the deviation is significant and cannot be considered acceptable, , a compromise position could be agreed or the ACT Government may decide to lodge a further EPBC referral under Part 7 of the EPBC Act for the development area west of Deep Creek. This effectively over-rides the strategic Assessment agreement for this area (NES Plan) and starts the process of referral over again, including public consultation required.

Aloisi, Angelina

From: Richardson, Dave
Sent: Wednesday, 1 October 2014 2:40 PM
To: Iglesias, Daniel
Cc: Lhuede, Nick; Leavesley, Adam; Santosuosso, Daniel; Watts, Michaela; Gianakis, Steven
Subject: Kama Nature Reserve - Umwelt Report and Sign Off by CPR
Attachments: 8039_R03_V1_KamaVeg_bn.pdf; Kama Nature Reserve veg map endorsement

Hi Daniel,

Thank you for the meeting this afternoon and agree with you on the way forward.

I've attached for your information the Umwelt report on the Kama veg we initiated in 2013 and also the agreement by Greg Baines (email) with Michael Mulvaney that the report was comprehensive and they endorsed the results and recommendations made in the report. We have used this as a starting point in our western edge bushfire risk assessment work that Nick was alluding to at the meeting for Molonglo Stages 2 and 3 where he described the use of a SFFAZ inside Kama in conjunction with a 60m IAPZ adjacent in the urban area.

Walking back from the meeting Michaela made an excellent suggestion regarding how to minimise the "buffer" to coincide with the suggested 60m IAPZ along the eastern edge of Kama. The suggestion was to erect a man proof/predator proof fence along the Kama boundary which would ensure the IAPZ did its job at 60m in width. Certainly in any discussion on buffer widths, this should rate highly as a solution. There could be other options to restrict access to Kama that are not so plainly obvious.

Look forward to your investigation on management in Kama.



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Dedicated Team.
Quality Outcomes.

Briefing Note

To: Daniel Santosuosso, ACT Land Development Agency
cc: Dave Richardson, ACT Land Development Agency
From: Peter Cowper, Umwelt (Australia) Pty. Limited
Author: Rob Armstrong, Umwelt (Australia) Pty. Limited
Date: 11 October 2013
Subject: Vegetation Mapping for Kama Nature Reserve, Molonglo

Purpose

Accurate vegetation mapping is required to determine values within Kama Nature Reserve for use as an advanced offset for the Molonglo stage 3 development. The purpose of this briefing note is to update the ACT Land Development Agency on the extent and spatial distribution of vegetation communities within Kama Nature Reserve.

Contents

1.0 Existing vegetation maps	2
2.0 Updated vegetation information	3
3.0 Conclusions and Recommendations	6
References	6

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1.0 Existing vegetation maps

There are at least four existing vegetation maps for Kama Nature Reserve, being:

- Vegetation mapping as part of the Molonglo Valley NES plan (ACT Government 2011);
- Box-gum and natural temperate grassland mapping on ACTMAPI (ACT Government 2012a);
- Lowland woodland extent in the ACT Lowland Woodland Conservation Strategy (Action Plan No. 27) and Natural temperate grassland extent in the ACT Lowland Native Grassland Conservation strategy (Action Plan No. 28) (ACT Government 2004, 2005; considered as one product); and
- Vegetation mapping as part of the Kama 'Heritage (Decision about Registration of Kama Woodland/Grassland, Belconnen) Notice 2012' (ACT Government 2012b).

All four map products were assessed in the field through rapid map validation. This involved meandering searches through each map polygon to determine the spatial of mapped boundaries, and the thematic (vegetation type) accuracy within each polygon. Comments of the review of each map are in Table 1.

Table 1 – Review of Existing Vegetation Map Products

Map product	Comments
Molonglo NES Plan	Large areas dominated by scribbly gum (<i>Eucalyptus rossii</i>) are mapped as Box-Gum woodland in high and low condition. These areas are not consistent with the 'white box-yellow box-Blakely's red gum grassy woodland and derived native grassland' critically endangered ecological community definition as per the community's listing advice. Perhaps due to scale issues, this product does not appear to be a suitable base for determining reserve offset values.
ACTMAPI (Box-Gum and NTG)	Similar to the Molonglo NES plan, however the Box-Gum woodland polygon extends into the natural temperate grassland in the south-west of the reserve. This product is not considered a suitable base for determining reserve offset values.
ACT Lowland Woodland / Native Grassland Conservation Strategies	Mapping within the hard copy reports are of a coarse scale, and it is difficult to determine accuracy. GIS layers linked to the report revealed that much of the Box-Gum woodland area is mapped as partially modified lowland woodland and moderately modified lowland woodland. The typology of the mapping is not consistent with Commonwealth and ACT legislation, as 'lowland woodland' includes vegetation types dominated by other lowland species including those not characteristic of 'white box-yellow box-Blakely's red gum grassy woodland and derived native grassland' critically endangered ecological community. The natural temperate grassland area is not mapped in Action Plan No. 28. These products are not considered a suitable base for determining reserve offset values.
Kama Heritage Notice 2012	The mapping is available as hard copy, and includes areas of mapped scribbly gum woodland. There are areas mapped as dominated by Blakely's red gum (<i>Eucalyptus blakelyi</i>) which are either co-dominated or exclusively dominated by scribbly gum in the north-east of the reserve. This product is not considered a suitable base for determining reserve offset values. However, given that the majority of the mapping in the Kama Heritage Notice 2012 is, for the most part, spatially and thematically accurate, it is considered the best starting point for refinement. As it is not available digitally, it is desirable to map the area with consideration of this product as well as up to date reconnaissance information.

The 'vegetation mapping as part of the Kama 'Heritage (Decision about Registration of Kama Woodland/Grassland, Belconnen) Notice 2012' was considered the best existing product, however it required refinement to accurately reflect vegetation distribution in some areas.

2.0 Updated vegetation information

Table 2 summarises the vegetation of Kama Nature Reserve. This information has been adapted from the 'Kama Heritage Notice 2012', with new polygons created and floristic information updated as required. An updated vegetation map, based on the 'Kama Heritage Notice 2012' and field surveys undertaken by Umwelt as part of this investigation is shown in **Figure 1**.

Table 2 – Updated vegetation descriptions for Kama Nature Reserve

Polygon	Area description	Vegetation Community	Area (ha)	Correspondence with legislation	Vegetation Condition (ACT Government 2013)
VT1	Woodland dominated by Blakely's red gum (<i>Eucalyptus blakelyi</i>) and yellow box (<i>E. melliodora</i>), with infrequent red stringybark (<i>E. macrorhyncha</i>), broad-leaved peppermint (<i>E. dives</i>) and scribbly gum (<i>E. rossii</i>) on a south-easterly to south-westerly hillslope. The mid-layer is comprised of sparsely distributed patches of Blakely's red gum saplings and seedlings, and sweet bursaria (<i>Bursaria lasiophylla</i>). The ground layer is dominated by kangaroo grass (<i>Themeda triandra</i>), wallaby grasses (<i>Rytidosperma</i> spp.) and tall speargrass (<i>Austrostipa bigeniculata</i>). There is a high diversity of native forbs present, including uncommon species. Pest plants of concern include a serious infestation of St. John's wort (<i>Hypericum perforatum</i>).	Blakely's red gum - yellow box grassy woodland	58.68	<u>Environment Protection and Biodiversity Conservation Act 1999</u> Consistent with high quality 'white box-yellow box-Blakely's red gum grassy woodland and derived native grassland' critically endangered ecological community. <u>Nature Conservation Act 1980</u> Consistent with partially modified lowland woodland as part of the 'yellow box – red gum grassy woodland' endangered ecological community (Action Plan No. 27).	Moderate/good. If vegetation is not in low condition (paddock trees or native pasture) then it is in moderate to good condition.
VT1a	Partially cleared version of VT1. The understorey is a mosaic native grasses including tall speargrass and wallaby grasses, along with large areas dominated by exotic pasture including wild oats (<i>Avena</i> spp.), barley grass (<i>Hordeum</i> spp.) and rat's-tail fescue (<i>Vulpia myuros</i>). Weeds of concern include St. John's wort and sweet briar (<i>Rosa rubiginosa</i>). It is estimated that approximately 30-40% of patches are dominated by exotic pastures.	Derived mixed exotic and native grassland	28.33	<u>Environment Protection and Biodiversity Conservation Act 1999</u> Not considered part of the 'white box-yellow box-Blakely's red gum grassy woodland and derived native grassland' critically endangered ecological community due to large areas of the understorey being dominated by perennial exotic pasture grasses. <u>Nature Conservation Act 1980</u> Consistent with moderately modified lowland woodland as part of the 'yellow box – red gum grassy woodland' endangered ecological community (Action Plan No. 27).	Paddock trees. Native over-storey percent foliage cover is less than 25% of the lower value of the overstorey percent foliage cover benchmark for the relevant vegetation type and less than 50% of ground cover perennial vegetation is indigenous species.

Polygon	Area description	Vegetation Community	Area (ha)	Correspondence with legislation	Vegetation Condition (ACT Government 2013)
VT2	Forest dominated by scribbly gum with some Blakely's red gum and broad-leaved peppermint on a hill slope with a westerly aspect. The patchy mid layer is comprised of Blakely's red gum, scribbly gum and broad-leaved peppermint saplings and small amounts of sweet bursaria. Exotic sweet briar and blackberry (<i>Rubus fruticosus</i> agg.) are present. The ground layer is dominated by speargrasses, wallaby grasses, redleg grass (<i>Bothriochloa macra</i>) and introduced annual pasture and weed species. Pest plants of concern include Paterson's curse (<i>Echium plantagineum</i>), St. John's wort and blackberry.	Scribbly gum grassy open forest	15.48	<u>Environment Protection and Biodiversity Conservation Act 1999</u> Nil. <u>Nature Conservation Act 1980</u> Nil.	Moderate/good. If vegetation is not in low condition (paddock trees or native pasture) then it is in moderate to good condition
VT2a	Partially cleared version of VT2. Open woodland dominated by scribbly gum, with occasional patches of Blakely's red gum, and broad-leaved peppermint on a north-easterly aspect. The ground layer is a mosaic of native grasses including tall speargrass, wallaby grasses and red-leg grass, and exotic grasses including wild oats, brome (<i>Bromus</i> spp.) and ryegrasses (<i>Lolium</i> spp.). Pest plants of concern include Paterson's curse, St. John's wort and blackberry.	Scribbly gum grassy open forest (partially cleared)	7.71	<u>Environment Protection and Biodiversity Conservation Act 1999</u> Nil. <u>Nature Conservation Act 1980</u> Nil.	Paddock trees Native over-storey percent foliage cover is less than 25% of the lower value of the overstorey percent foliage cover benchmark for the relevant vegetation type and less than 50% of ground cover perennial vegetation is indigenous species.
VT3	Southerly foot-slope containing natural temperate grassland, with isolated red stringybark and broad-leaved peppermint (as per ACT Government 2005, <10% projected foliage cover). The ground layer is dominated by kangaroo grass, wallaby grasses, speargrasses and common everlasting (<i>Chryscephalum apiculatum</i>). Several uncommon forbs are present including blue devil (<i>Eryngium ovinum</i>). Common exotic species include rat's tail fescue, St. John's wort and wild oats. Other pest plants in lower abundance include saffron thistle (<i>Carthamus lanatus</i>) and spear thistles (<i>Cirsium vulgare</i>), Paterson's curse and sweet briar.	Natural temperate grassland	44.58	<u>Environment Protection and Biodiversity Conservation Act 1999</u> Natural temperate grassland of the Southern Tablelands of NSW and the Australian Capital Territory, a mosaic of high (Botanical Significance Rating 2) to low (BSR 4) significance (Action Plan No. 28). <u>Nature Conservation Act 1980</u> Natural temperate grassland endangered ecological community, a mosaic of high (BSR 2) to low (BSR 4) significance (Action Plan No. 28).	Moderate/good If vegetation is not in low condition (paddock trees or native pasture) then it is in moderate to good condition. Note that for natural temperate grassland communities this is relevant while it is technically native pasture, it is in a structurally natural condition.

Cattle grazing appears to be part of the management strategy for Kama Nature Reserve as at the time of survey (10 September 2013), with moderate grazing observed in paddocks in the north-west and south-east of the reserve. This disturbance is not likely to affect the outcomes of the vegetation condition component of this study.

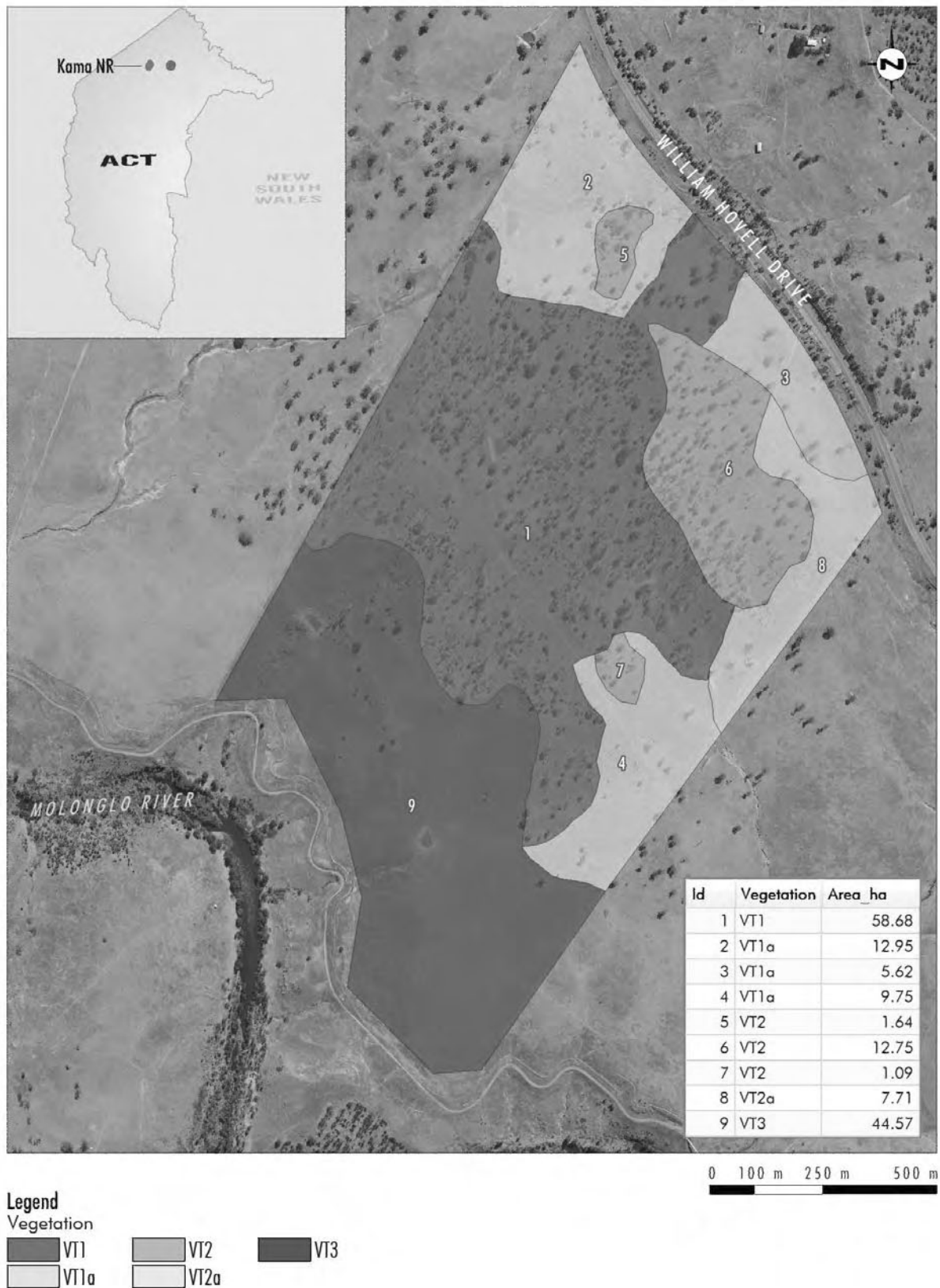


Figure 1 – Updated vegetation mapping for Kama Nature Reserve.

3.0 Conclusions and Recommendations

Through conduct of the study as described in this briefing note, it was apparent that varying degrees of inconsistency and inaccuracy occurs within the existing vegetation map products that relate to Kama Nature Reserve. In part, this could be attributable to temporal variation where ground layer vegetation is influenced by season and prevailing weather and others may be attributable to mapping scale wherein smaller patches are not separated. This investigation has sought to apply current identification guidelines and associated mapping scales to delineate structurally and floristically distinct areas and correlate those to vegetation communities defined under existing Territory and Commonwealth legislation. Given the outcomes of this process, the following recommendations are provided:

- The updated vegetation map should be adopted as the current description of vegetation communities within Kama Nature Reserve.
- The updated information should be considered when determining advanced offsets for the Molonglo Stage 3 development as the previous mapping products are not a sufficiently accurate representation of vegetation condition or distribution within Kama Nature Reserve.
- Umwelt was required to map the vegetation of Kama Nature Reserve as part of a broader project which included additional floristic sampling to finalise the review of the draft Environmental Offsets Calculator (Umwelt 2013; ACT Government 2013). As the mapping of Kama Nature Reserve has delineated the reserve into vegetation types and condition classes, this study has revealed that an additional five plots are required to complete the assessment if the draft Environmental Offsets Calculator (in its current form) is to be used as the basis for offset calculation.

References

- ACT Government (2004) Woodlands for Wildlife: ACT Lowlands Woodland Conservation strategy. Action Plan No. 27. Environment ACT, Canberra.
- ACT Government (2005) A Vision Splendid of the Grassy Plains Extended: ACT Lowland Native Grassland Conservation Strategy. Action Plan No. 28. Arts, Heritage and Environment, Canberra.
- ACT Government (2011) Molonglo Valley Plan for the Protection of Matters of National Environmental Significance. NES Plan, September 2011.
- ACT Government (2012a) *ACTMAPi Online interactive maps*, Environment and Sustainable Development Directorate, Canberra. Accessed online (11/09/13): www.actmap.i.act.gov.au.
- ACT Government (2012b) Heritage (Decision about Registration of Kama Woodland/Grassland, Belconnen) Notice 2012. Notifiable Instrument NI2012-541.
- ACT Government (2013) Environmental Offsets Calculator Operational Manual. ACT Environment and Sustainable Development Directorate. Version 20130301.
- Umwelt (2013) Review of ACT Environmental Offsets Calculator. Stage 2. Draft July 2013. Prepared by Umwelt (Australia) Pty Limited on behalf of ACT Land Development Agency.

Aloisi, Angelina

From: Santosuosso, Daniel
Sent: Tuesday, 20 January 2015 4:02 PM
To: Richardson, Dave
Subject: FW: Molonglo Development Fire Management Strategy
Attachments: 20140626164309746.pdf; 292347-C-86-90-BMP-05-1.PDF; BUSHFIREMANAGE-201120676-S165C-05.PDF

Daniel Santosuosso | Senior Project Manager
Land Development Agency

Level 7 TransACT House, 470 Northbourne Avenue, Dickson ACT 2602
Phone: 02 6207 7212 | Fax: 02 62076110 | Web: www.lda.gov.au

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From: Carmody, Adam
Sent: Thursday, 26 June 2014 5:17 PM
To: Kendall, Dylan; Santosuosso, Daniel
Cc: Richardson, Dave; Browning, Kerry
Subject: RE: Molonglo Development Fire Management Strategy

Dylan – I appreciate the complexity of the issues and recognise that this document is a big step forward in understand the 'big picture' of fire management in this area.

There are four key areas that the LDA is interested in better defining the boundaries (and getting to a 'Whole of Government' accepted position in balancing the three competing objectives of environment, fire protection and yield), and my comments are based on looking at Map 3 on page 10 of the MDFMS and as shown in the attached scan:

1. Western edge of Denman Prospect – my key interest at this stage, and the plans in the MDFMS look to be 'worst case' to me with regards yield, so hopefully we can work out a higher yield option and balance environment and fire protection (and cost!) – this is part of the work Graham Swain and Umwelt are currently doing for us.
2. River Corridor – another area of specific interest for me, and the plans in the MDFMS are the clearest and best I have seen as regards the likely outcomes in this area –subject to environmental approval and final endorsement by CPR/ESA. Given the comments about the MDFMS in the Plan of Management for the River Corridor, if Map 3 is accepted, this will be a clear step forward in defining the river corridor boundary and fire management requirements. Hopefully there is scope to discuss innovative and cost effective ways of delivering the required fire protection in the areas shown as OAPZs, noting your comments on the cost and public acceptance of some of the options.
3. Western Edge of Molonglo 3/Karma – An area Dave Richardson and Dan Santosuosso are heavily involved in, and an area that I know there is a lot of discussion around in terms of balancing environment, fire protection and yield outcomes – again an area that Graham Swain is providing advice on.
4. The tip of Coombs - the map doesn't reflect the proposed future development of this area (which was changed due to a Planning appeal). This area is 'future development, but any resubmission of a DA for development here is dependent on the outcomes of the Molonglo River Plan of Management and clarity on the treatment of OAPZs in the river Corridor with overlapping of PTWL habitat. The attached plans show the current (approved) extent and the initial designed extent (file: 292347-C-86-90-BMP-05-1) in this area.

Areas 1 and 3 (which are the areas you identify as having no ready solution) are the key areas for the current design work of the LDA with regards balancing environment, fire protection and yield, and we would be keen to progress your work on the MDFMS in line with the work Graham Swain is doing for us.

Area 2, the river corridor, is something we have been keen to see some clarification on, so the maps in the MDFMS are a big step forward in this regard.

Area 4 we would prefer to reflect the future extent of development to allow the anticipated resubmission of a DA for this area, particularly given the status of the MDFMS in the Plan of Management, as establishing the extent of bushfire management in the river corridor – it needs to show the full extent of Coombs.

We are keen to keeping working collaboratively on the solutions in Area 1 and 2, and I understand will be in a position to sit down with yourself in the next few weeks to review the outcomes of Graham Swains and Umwelts work.

Cheers,

Adam Carmody / Land Development Agency



/ 02 6207 5016 / Web : www.lda.act.gov.au

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From: Kendall, Dylan
Sent: Thursday, 26 June 2014 3:47 PM
To: Carmody, Adam; Santosuosso, Daniel
Cc: Richardson, Dave; Browning, Kerry
Subject: RE: Molonglo Development Fire Management Strategy

Adam,

I worked with the boundaries of the urban footprint I was given except for in the Kama area where I could find no solution to simultaneously meeting the objectives of Environment, Housing Yield and Fire Protection and hence in this area I identified one possible solution which did involve moving the boundaries of the urban footprint back – this however is just one possible alternative – an alternative that meets the Environment and Fire Protection objectives but does not meet the Housing Yield objective. There are other possible alternatives in this area but none of them will simultaneously meet the three objectives of Environment, Fire Protection and Housing Yield – one of these three is going to have to give – I believe we just need to get the players who are empowered to make such a decision in the one room at the one time and get them to make a decision which one is going to give.

Are there other boundaries that also look wrong to you ???

The other place where I could find no solution that meets all three objectives is the western edge south of the Molonglo River and again I just suggested one possible alternative but there are other alternatives.

Everywhere else I could find a solution that meets all three objectives – it just costs a lot of money.

The plan I put together has no official standing at the moment but Conservation Planning and Research are generally happy (with the exception of the two areas I couldn't find a solution to) and ESA are currently looking at it.

Thanks,

DK

From: Carmody, Adam
Sent: Thursday, 26 June 2014 3:21 PM
To: Kendall, Dylan; Santosuosso, Daniel

Cc: Richardson, Dave; Browning, Kerry
Subject: RE: Molonglo Development Fire Management Strategy

Thanks for sending that through Dylan – a solid piece of work that will unify some previously disparate conversations on this issue for the Whole of the Valley.

Some of the maps raised a few eyebrows internally, in terms of predicted urban boundaries, but I understand you have since had a chat to Dan about these being draft and for discussion, especially pending the outcomes of the work Graham Swain and Umwelt are doing for the LDA on the western edge (north and south of the river).

Hopefully we can resolve these soon, as they are some of the bigger unknowns in terms of planning the rest of this area!

Cheers,

Adam Carmody / Land Development Agency

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From: Kendall, Dylan
Sent: Tuesday, 24 June 2014 10:03 AM
To: Carmody, Adam
Cc: Richardson, Dave; Browning, Kerry
Subject: RE: Molonglo Development Fire Management Strategy

Adam,

Can do but it is too big to email so I will copy onto a memory stick and send to you via internal mail.

Thanks,

DK

From: Carmody, Adam
Sent: Monday, 23 June 2014 12:32 PM
To: Kendall, Dylan
Cc: Richardson, Dave; Browning, Kerry
Subject: Molonglo Development Fire Management Strategy

Dylan – I am currently looking at the Molonglo River Reserve Draft Plan of Management, and it places a heavy emphasis on the 'Molonglo Development Fire Management Strategy' with regards how fire risk will be managed in the urban area of the River Corridor. It also notes that the strategy is with ESA for approval. You have mentioned that you are preparing this as part of defining the 'whole of Molonglo Valley' approach to fire management.

Is there a chance you can send us a copy for us to get a sense of what is proposed – noting that it is subject to change etc as it is assessed by ESA?

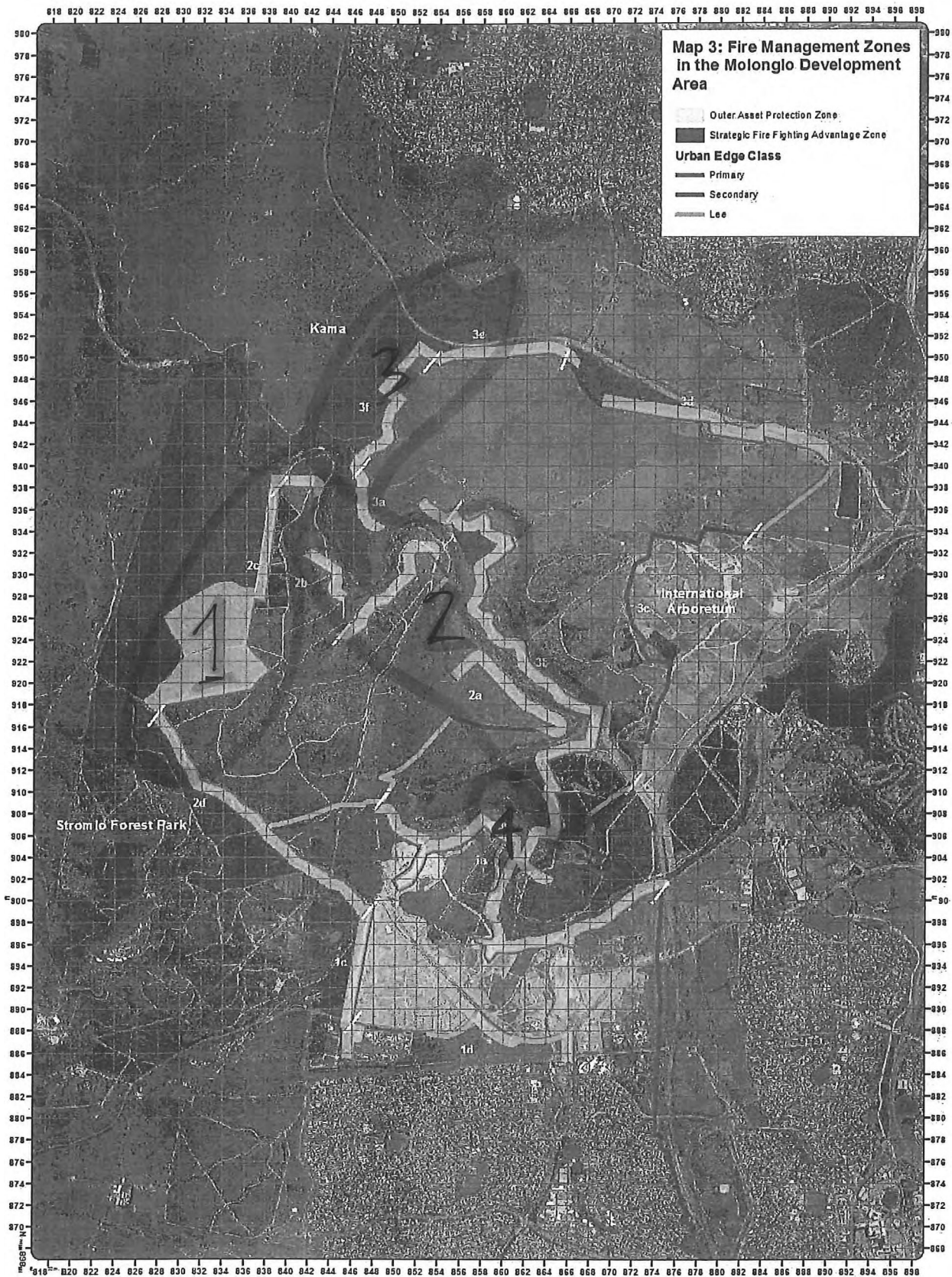
Thanks,

Adam Carmody / Land Development Agency

Level 7 TransACT House, 470 Northbourne Avenue, Dickson ACT 2602

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LEGEND

PRELIMINARY BLOCK NUMBER

PRELIMINARY SECTION NUMBER

INNER ASSET PROTECTION ZONE (IAPZ)

OUTER ASSET PROTECTION ZONE (OAPZ)

HAPZ - CONSTRUCTION TO BAL 29 453955-2009

HAPZ - CONSTRUCTION TO BAL 19 453959-2009

HAPZ - CONSTRUCTION TO BAL 05 453955-2009

VEGETATED AREAS INCLUDING WIDENED LANDSCAPE ROAD RESERVE

MEDIUM AND HIGH QUALITY APPRAISED HABITAT WITH 20M BUFFER EPBC REQUIREMENT

NOTES

1. THE IAPZ AND OAPZ WILL BE IMPLEMENTED IN STAGES THAT RELATE TO BLOCK SETTLEMENTS. THE NORTHERN SIDE OF THE RIVER WILL RETAIN EXISTING VEGETATION TO PROVIDE HABITAT FOR ANIMALS PER THE INTENT OF MOLONGLO RIPARIAN STRATEGY FIGURE 11 (ZONE 7 AND 3)



1:1500-A1 1:3000-A3

DRAWING PRACTICE TO AS 1100

LAND DEVELOPMENT AGENCY

COOMBS RESIDENTIAL ESTATE ESTATE DEVELOPMENT PLAN

EDP SUBMISSION

Date	21/01/2011	Scale	1:1500	Size	A1
Drawing Number	29234.7-C-BMP-05	Page No	90	Revision	1

Drawn	MJ	Date	MAR 2011
Checked	C	Date	MAR 2011
Designed	GZ	Date	MAR 2011
Verified	RC	Date	MAR 2011
Approved	GL	Date	MAR 2011

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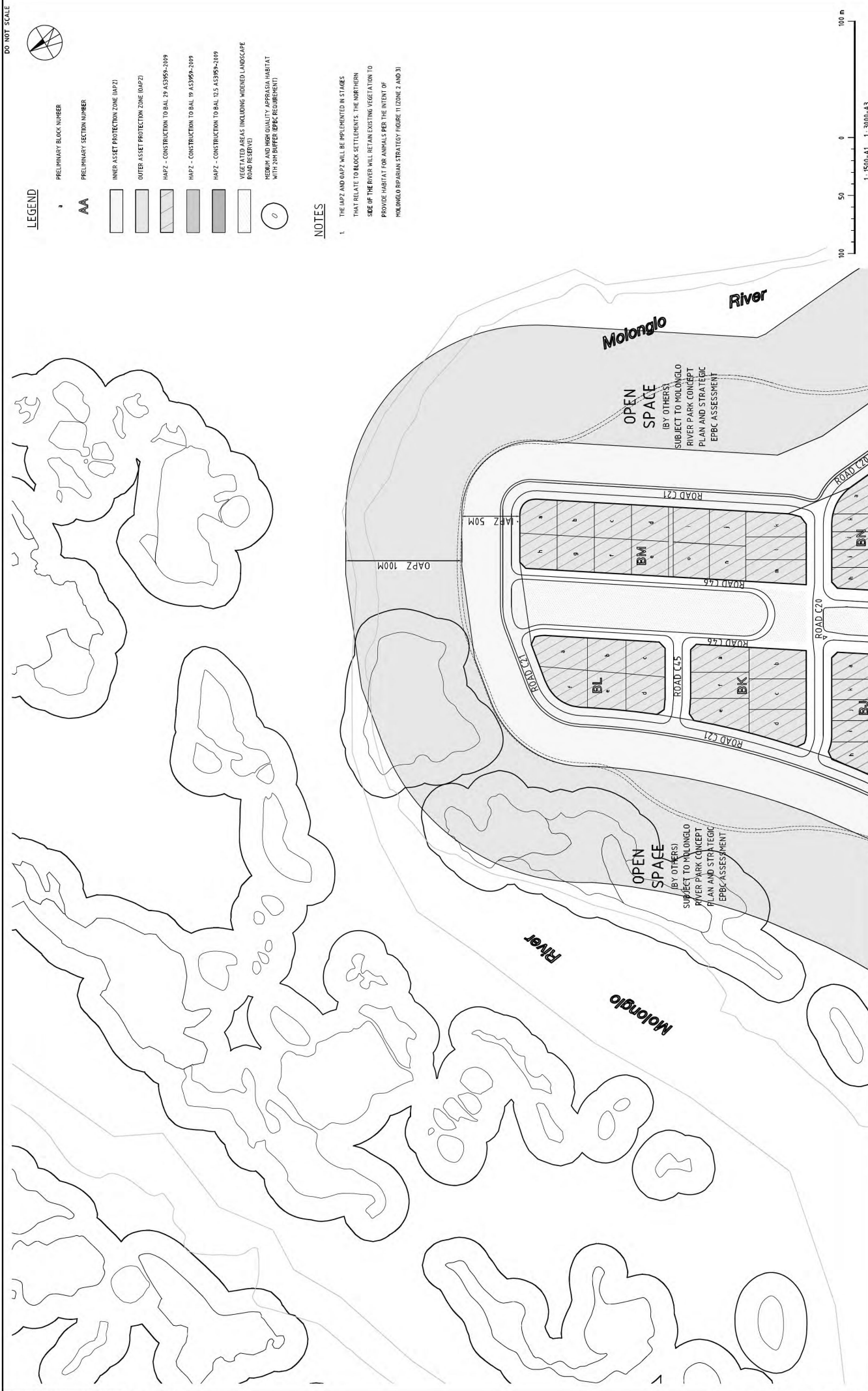
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Land Development Agency
CANBERRA FIRST

SHEET 5	SHEET 2	SHEET 1
SHEET 4	SHEET 3	SHEET 1

Rev	Date	Description
1	14/03/2011	FOR EDP APPROVAL

Rev	Date	Description
1	14/03/2011	FOR EDP APPROVAL



Aloisi, Angelina

From: Richardson, Dave
Sent: Wednesday, 4 February 2015 3:27 PM
To: Teasdale, Jonathan
Cc: Santosuosso, Daniel
Subject: Emailing: Molonglo Valley Stages 2 and 3 Western Edge Bushfire Risk Assessment - Summary
Attachments: Molonglo Valley Stages 2 and 3 Western Edge Bushfire Risk Assessment - Summary.doc

Jonathan,

Have a look at the attachment to see if it is what you are after. I have more detail but I didn't think the Bushfire Council would want to get into that. Feel free to use as you see fit.

Regards

Dave

Your message is ready to be sent with the following file or link attachments:

Molonglo Valley Stages 2 and 3 Western Edge Bushfire Risk Assessment - Summary

Note: To protect against computer viruses, e-mail programs may prevent sending or receiving certain types of file attachments. Check your e-mail security settings to determine how attachments are handled.

Molonglo Valley Stages 2 and 3 Western Edge Bushfire Risk Assessment

Bushfire risk and the associated mitigation measures can have a significant impact on ecological, economic and social parameters. Since the 2003 Canberra bushfire, there has been a significant increase in the awareness and the delivery of bushfire mitigation measures across Government.

This commenced immediately after the bushfire with changes to subdivision design and the introduction of edge roads and specific controls within asset protection zones both within the urban area and outside it. This has led to revisions of standards, guidelines, expectations and responsibilities both public and private. It has also increased the responsibility of TaMS to manage a large proportion of the asset protection zones possibly to higher standards than was necessary before the bushfire.

Since the bushfire, the Territory has put in place and revised the Strategic Bushfire Management Plan (SBMP) together with the ACT Bushfire Management Standards which set out clear objectives, strategic directions and standards to reduce the risk of bushfires in the ACT. These are augmented by individual bushfire risk assessments on a case-by-case basis taking into account fire runs, topography, vegetation and land uses and other factors.

The resultant typical cross section at the urban/non-urban interface today includes:

- House asset protection zone – extending from the front of the residential block boundary into the suburb for distances up to 100m or more depending on risk and mitigating against ember attack. This requires housing design and construction (and landscaping) to meet specific Bushfire Attack Levels (BALs) under the Australian Standard. Management of this area lies partly with TaMS (public open space and roads including verges) and individual block owners.
- Inner asset protection zone – extends from the front of the residential block boundary to the edge of the urban/non-urban interface. Distances vary depending on risk and management requirements. A usual width would be a minimum of 30 to 40m and include significant infrastructure such as subdivision edge road, fire trail, stock proof fencing at the urban/non-urban interface, stormwater cut-off drains, hydraulic services for fire fighting, street trees on the block side of the edge road. Management includes control of fuel loads by slashing. Management of this area lies with TaMS.
- Outer asset protection zone or Strategic fire fighting advantage zone – extends into the non-urban area for some distance depending on risk and management requirements. These could be 100m to around 300m in width and contain fire trails to aid management. Management methods depend on fuel loads and may include thinning of existing inappropriate vegetation, weed management, grazing or other ecological controls that ensures fuel loads are not exceeded during the fire season. Management of this area lies with TaMS and may be on a private lease.

Work is progressing on the Molonglo Valley Stages 2 and 3 western edge bushfire risk assessment under the guidance of the SBMP through the Land Development Agency (LDA) in CMTEDD. It is looking at the western edges of Molonglo Stage 2 (Denman Prospect) and Molonglo Stage 3 to the north as well as the fire risk associated with the Molonglo River Corridor through the urban area.

This work is taking into account existing Commonwealth environmental approvals and other planning and management considerations in developing a whole-of-government agreed protection and mitigation strategy. The LDA is working closely with expert consultants, TaMS, EPD and the Emergency Services Authority (ESA) to develop a protection strategy that can be implemented.

It will involve Treasury going forward to gain support to short and long term funding regimes to ensure mitigation implementation is guaranteed after the initial commencement of the agreed outcome.

Formal support from the ESA is required at the end of this project.

Aloisi, Angelina

From: ABPP <abpp@bigpond.net.au>
Sent: Monday, 9 March 2015 10:15 PM
To: Richardson, Dave
Cc: david.envplanning@bigpond.com
Attachments: B132154 - Molonglo Bushfire Management Strategy - 9.3.pdf

Hi Dave – copy of the report attached. It is fairly basic at this stage but I hope it provides a message that a lot of people have committed a lot of time to get this sorted and to resolve the issues so that we achieve a consensus on what is required to provide adequate protection to the north-western urban edge,

Regards

Graham
Australian Bushfire Protection Planners Pty Limited
RMB 3411 Dog Trap Road, SOMERSBY, NSW, 2250
Mob: 0427 622204 Ph: (02) 43622112 Fax: (02) 43622204

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BUSHFIRE MANAGEMENT STRATEGY

MOLOGLO STAGE 3;

DENMAN PROSPECT &

THE MOLOGLO RIVER CORRIDOR

**AUSTRALIAN CAPITAL TERRITORY
PREPARED FOR THE**

LAND DEVELOPMENT AGENCY

Australian Bushfire Protection Planners Pty Limited

Bushfire Consultants

ACN 083 085 474

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BUSHFIRE MANAGEMENT STRATEGY

MOLOGLO STAGE 3;

DENMAN PROSPECT &

THE MOLOGLO RIVER CORRIDOR

AUSTRALIAN CAPITAL TERRITORY

PREPARED FOR THE

LAND DEVELOPMENT AGENCY

Report Number	Document	Preparation Date	Issue Date	Directors Approval
B132154	Draft	6.3.2015	9.3.2015	<i>G.L.Swain</i>

2

BACKGROUND

Australian Bushfire Protection Planners Pty Limited was commissioned to undertake a study of bushfire risk for the preparation of the Molonglo Structure Plan and produced a Bushfire Risk Assessment, dated 19.07.2005, for the ACT Planning Authority [ACTPLA].

An extract from this report states under 'Summary of Bushfire Risk' – [Page 28]:

"Major bushfires have occurred in the Molonglo Valley in 1926, 1939, 1952, 1991, 1994, 2001 and 2003.

The topography and landform of the valley predisposes the valley to impacts of fires burning under north-westerly and westerly wind influences and to a slightly lesser extent, south-westerly wind influences.

The slope of the valley to the north-west and the ridgelines/ gullies will influence the spread of fire from the northwest, west and south west and result in sporadic fire runs.

Fuel loads within the retained Habitat Corridors and Parklands, Nature Reserves and Lease Holdings, unless managed, will promulgate future bushfires up to the urban edge and into the vegetated corridors within the urban precinct.

Whilst the Overall Fuel Hazard for the vegetation within the valley is Very High there is, due to the fire history, topography, aspect, wind influence and climatic conditions within the valley, an extreme risk of damaging bushfires impacting the north western, western and south western edges of the West 1 and West 2 Precincts, the north western edge of the East Precinct and a high risk of damaging bushfires impacting the south western edge of the East Precinct".

Under Section 6.1 Management of the Vegetation beyond the Urban Interface the ABPP report states:

"The Strategic Bushfire Management Plan for the ACT (Version1) states:

"Under the Emergencies Act 2004 the ESA has declared an area of the ACT to be a Bushfire Abatement Zone. The purpose of the Bushfire Abatement Zone is to reduce the impact of bushfires on the built up areas within the ACT.

Bushfire preparation within the BAZ requires collaborative development of fuel management guidelines and the provision of advice to land managers consistent with land use. Guidelines for bushfire management must achieve a reasonable balance between the increasing community demands on ACT lands for recreation and existing use for farming, forestry and conservation".

*"Bushfire fuel hazard is the only factor of bushfire behaviour that can be influenced by land managers and residents. However, fuel management alone is not the panacea for bushfire protection and it **will not eliminate future severe bushfires.***

"The use of fire in land management requires land managers to make decisions about complex balances and trade-offs between bushfire protection and often-divergent social, environmental and economic requirements".

Heavy emphasis has been placed on the effectiveness of hazard reduction burning as the most cost effective means of management within the Abatement – Zone, however the Strategic Bushfire Management Plan states :

"The opportunity to schedule and implement prescribed burning within a desirable window of favourable conditions is relatively limited".

"Land managers and owners must take into account the potentially limited number of days and the possible interaction with air quality guidelines in the development, costing and implementation of prescribed burning programs".

Therefore the viability of maintaining the urban edge protection by hazard reduction burning and / or mechanical means needs to be established to guarantee the integrity of the Molonglo and Western Broadacre urban edge against damaging fire impact.

Under 6.2 – Shape of the Development Precincts [Page 32] the ABPP reports states:

East Precinct.

"The long exposure of the north-western edge of the precinct to uphill burning fires, influenced by hot, dry, strong north-westerly winds, will result in significant fire impact either directly or indirectly from ember attack, depending on the level of protection provided by active management of the fuels within the river corridor.

Similar impacts may also occur to the western / south western edge from westerly and south-westerly wind-driven fires and the influence of wind turbulence in the Mount Stromlo area.

The northern edge will be impacted by fires burning within the habitat corridor, north of William Hovell Drive.

The Molonglo River Corridor will separate the eastern development node from the western development node and therefore provide a direct fire path into the suburbs adjoining the corridor and to the International Arboretum to the south east".

Under Section 6.4 – Habitat Corridors – Gazetted Nature Parks the ABPP report states:

“The Landscape and Environmental Analysis Plan in the Molonglo Valley Suitability Study identifies habitat connectivity for wildlife movement corridors from The Pinnacle to the north-west and alternate and /or additional Habitat Corridors between the three development precincts.

If the Habitat Corridor identified extending to the north-west of The Pinnacle remains it will allow fire to enter the West 1 Precinct and expose the adjoining urban development to fire impact.

The alternative Habitat Corridors will allow fires to penetrate between the development precincts. Management of these corridors for Habitat Protection and ecological protection will conflict with the need to provide active management of fuel hazards within the abatement zones to the perimeters of the urban precincts.

The Lower Molonglo River Nature Reserve will provide a direct northwest fire path for future bushfires to impact the central portion of the north western edge of the East Precinct and the return edges to the north east and south west of the Reserve”.

Section 10.1 – Conclusion – Molonglo Valley [Page 43] of the ABPP report states:

“The orientation of the Molonglo Valley and the ability for northwest, west and south-west wind-driven fires to impact the proposed development edge will continue the extreme level of risk to any development proposed in the valley with the potential to cause major damage to buildings and infrastructure.

Whilst the McLeod Report recommendation was for implementation of an Abatement Zone to the west and south-west of the City, the extent of the zone and the management abilities of those responsible for the fuel maintenance measures recommended, may not provide a level of defence which will remove the risk of devastating fires impacting to the north-western edge of the Molonglo East Precinct and the north-western, western and south-western edge of the Molonglo West 1 and West 2 Precincts”.

It is therefore recommended that for development to proceed, the primary protection against the impact of fires to the north-western edge of Molonglo East and the north-western, western and south-western edge of Molonglo West 1 should be provided by the provision of a land use that creates a Critical Management Zone which is permanently fuel-managed by the nature of the land use. (i.e. vineyards / sporting grounds).

“The Molonglo River Corridor through the East Precinct should be actively managed as a Village Park to prevent fire extension into the precinct”.

Subsequent to the preparation of the original Bushfire Risk Assessment Report [19.7.2005] an updated report was prepared by ABPP, dated 26.4.2006. The Executive Summary of this report states:

*The Molonglo Stage 2 Bushfire Risk Assessment quantifies the current level of risk to future development within the Molonglo Valley, prior to the implementation of mitigation measures as **Extreme**.*

Mitigation measures which have been identified within the report as necessary to reduce the level of potential risk to future development include the creation and permanent management of a Critical Management Zone to the north-western edge of the East Molonglo Precinct and to the western and south-western edge of the Central Molonglo Precinct.

The provision of the Critical Management Zone (CMZ) replaces the Outer Asset Protection Zone, as defined in the Strategic Bushfire Management Plan for the ACT and the management of this zone, in accordance with the performance standards defined in this report, are considered to be a mandatory requirement in the reduction of the bushfire risk to the future development within the Molonglo Valley.

In addition to the provision of a Critical Management Zone to the north-western edge of East Molonglo Precinct, this report recommends, due to the risk of fire over-run along the Molonglo River corridor and into the future suburb, the damming of the Molonglo River below Coppins Crossing and the creation of Lake Molonglo”.

The recommendation contained within the latter report that damming of the Molonglo River below Coppins Crossing should occur to remove the bushfire risk along the river corridor was originally implemented in the Strategic Planning process, however is now not included in the Territory Plan.

The comments about the level of risk to the north-western edge and the risk posed by the retention of vegetation within the river corridor therefore defaults back to the original Bushfire Risk Assessment [19.7.2005] which recommended the implementation and management of a Critical Management Zone of at least 300 metres to the north-western edge of the new suburb and that the “Molonglo River Corridor through the East Precinct should be actively managed as a Village Park to prevent fire extension into the precinct”.

A review of the Molonglo Valley Plan for Protection of Matters of National Environmental Significance – NES Plan – September 2011 prepared by ACT Planning & Land Authority has identified that the aim of this document is to enhance the areas of Box Gum Woodland not only within the Molonglo River corridor but also within the Kama Nature Reserve and pockets of retained vegetation within the Molonglo Stage 3 precinct. The document provides, under Section 2.3 – Bushfire Management Framework a ‘motherhood’ statement about bushfire management which reads:

“Within the strategic assessment area fire management will be aimed at protection of both built assets and MNES values. This will be achieved through the identification of appropriate asset protection zones and application of hazard reduction techniques that will both:

- *Ensure that the standards for fuel loads in the SBMP are met; and*
- *Protection MNES values through the use of sympathetic management techniques”.*

The aim of this document does not address the recommendation that the river corridor be managed as a ‘*Village Park*’ or the land to the west of Molonglo 3 be managed to mitigate the impact of fire on the north-western edge of Molonglo 3 and from a fire spreading along the river corridor.

In addition to the NES Plan various studies have been undertaken or proposed, including the Molonglo River Park – Concept Plan prepared by Hassall [September 2011]. The NES Plan recommends that the following reports be prepared:

1. ‘Molonglo River Park Concept Plan’;
2. Kama Management Plan;
3. Management Plan for Patch GG; and
4. Management Plans for High and Moderate PTWL habitat.

Additional bushfire risk assessments have been undertaken, including for the Molonglo Stage 2 Group Centre [ABPP 23.12.2012] and the north-western edge of Denman Prospect [Aurecon Australia Pty Ltd – 25.2.2014].

In late 2013 the Land Development Agency [LDA] identified the need to bring together a working group to examine the outstanding issues relating to the bushfire risk to the north-western edge of Molonglo 3; Denman Prospect and the Molonglo River Corridor.

Initially this group consisted of representatives of LDA, ABPP and Umwelt.

A workshop was held on the 28th May 2014 with the aim to establish initial understanding of ecological values and management requirements and development of feasible options to manage bushfire risk. Attendees were:

- ❖ Dave Richardson [LDA];
- ❖ Kerry Browning [LDA];
- ❖ Adam Carmody [LDA];
- ❖ Dylan Kendall [TaMS];
- ❖ Peter Cowper Armstrong [Umwelt];
- ❖ Rob Armstrong [Umwelt]; and
- ❖ Graham Swain [ABPP].

Umwelt were commissioned by LDA to review the existing reports/studies and undertake field surveys and investigation into the vegetation and ecological values in Kama.

The results of these studies are contained in separate documents however, initial findings on the extent of the ecological value of the vegetation within Kama varied from the previous studies.

A second workshop was held on the 29th July 2014 with the aim to undertake a wider consultation with key fire planners within TaMS and ESA; establish a broader understanding of ecological values and management requirements and further development of feasible options to manage fire risk. Attendees were:

- ❖ Dave Richardson [LDA];
- ❖ Daniel Santosuosso [LDA];
- ❖ Adam Carmody [LDA];
- ❖ Dylan Kendall [TaMS];
- ❖ Adam Leavesley [TaMS];
- ❖ Nick Lhuede, Greg Potts, Conrad Barr [ESA];
- ❖ Peter Cowper [Umwelt];
- ❖ Rob Armstrong [Umwelt]; and
- ❖ Graham Swain [ABPP].

Various suggestions were considered in the methods of providing protection to the north-western edge of Molonglo 3. Nick Lhuede supported the provision of an Asset Protection Zone within Molonglo 3 with the vegetation within Kama managed as a Strategic Fire Advantage Zone [SFAZ], provided that adequate on-going funding was available to support the management works in perpetuity.

Following discussions on the protection measures for Denman Prospect, Umwelt were commissioned by LDA to review the existing reports/studies and undertake field surveys and investigation into the vegetation and ecological values of the vegetation within the north-western portion of Denman Prospect and the adjoining land to the northwest.

A third workshop was held on the 21st October 2014 with the aim of confirming the proposed management of the north-western edge of Molonglo 3 and examining options for fire management of the western edge to Denman Prospect and the Molonglo River Corridor.

Attendees were:

- ❖ Dave Richardson [LDA];
- ❖ Daniel Santosuosso [LDA];
- ❖ Adam Carmody [LDA];
- ❖ Adam Leavesley [TaMS];
- ❖ Greg Potts [ACT RFS] & Conrad Barr [Acting Chief Officer ACT Fire & Rescue];
- ❖ Peter Cowper & Rob Armstrong [Umwelt];
- ❖ Ros Ransome [TaMS]; and
- ❖ Graham Swain [ABPP].

Apologies/Non attendees:

- ❖ Steven Gianakis;
- ❖ Nick Lhuede;
- ❖ Daniel Iglesias;
- ❖ Tony Corrigan;
- ❖ Stuart McKenzie

At this meeting it was agreed that to the north-western edge of Molonglo 3 the proposed fire management zones would consist of:

1. A 60 metre wide Inner Asset Protection Zone, located inside the western edge to the Molonglo Stage 3 precinct;
2. A Fire Trail would be constructed along the boundary with Kama – inside the Molonglo Stage 3 precinct;
3. A managed fire break would be provided in Kama, adjacent to the boundary with Molonglo Stage 3;
4. That the vegetation within Kama would be managed in a series of Strategic Fire Advantage Zones, in accordance with the prescriptions provided by the *Strategic Bushfire Management Plan for the ACT – 2009* – refer to Appendix A – Sketch of proposed Fire Management Strategies – Molonglo 3 Western Edge. Existing access trails would be maintained and managed to provide edges to the Strategic Fire Advantage Zones – refer to Attachment A – Draft Plan of Fire Protection Zones – Kama/Molonglo 3 western edge.
5. The proposed management strategies were supported by ESA, provided adequate on-going funding was available to support the works in perpetuity.

The meeting also resolved to examine the fire management options for Denman Prospect provided by ABPP and resolved to inspect these options in the field.

It was also agreed to inspect the line of the Asset Protection Zone to the north of the river corridor, as determined with Roz Ransome [TaMS]. This meeting was attended by Dave Richardson; Nick Lhuede; Adam Leavesley and Daniel Santosuosso.

An inspection of the western edge of Denman Prospect and adjoining land to the northwest was undertaken on the 28th November 2014. Attendees were:

- ❖ Dave Richardson [LDA];
- ❖ Daniel Santosuosso [LDA];
- ❖ Adam Leavesley [TaMS];
- ❖ Nick Lhuede [ESA],
- ❖ Greg Potts [ACT RFS];
- ❖ Conrad Barr [ESA][Acting Chief Officer ACT Fire & Rescue],

- ❖ Andrew Starke – Commissioner ACT Rural Fire Service;
- ❖ Rob Armstrong [Umwelt]; and
- ❖ Graham Swain [ABPP].

General consensus was reached on the location of the proposed protection measures with a minor adjustment of the location of the urban edge and the north-western corner of Denman Prospect and the possibility of changing the Outer Asset Protection Zone adjacent to the north-western boundary to a Strategic Fire Advantage Zone – refer to Attachment B – Draft Fire Protection Zones to Denman Prospect.

Whilst this consensus was broadly spread across the group concern was raised by Nick Lhuede over the Strategic Fire Advantage Zone extending beyond the boundary of the Denman Prospect precinct and that this issue needed to be addressed before the final support of ESA would be considered.

Another issue raised related to the environmental consequences of the management of the proposed SFAZs and the cost of the ongoing management and the long term funding of the management program.

To address the matter of environmental consequences of the management of the proposed SFAZs, LDA commissioned Umwelt to undertake further studies to determine the location of vegetation communities, threatened species and the viability of management of the vegetation to achieve the fuel loads required in a SFAZ.

The results of these studies are contained in separate documents. However, the Draft Report identifies an increase in the extent of Box Woodland; confirmed the location of Pink Tailed Worm Lizard habitat and confirms that the management of the SFAZs by hazard reduction burning is ecologically sustainable.

The Draft Umwelt report has been reviewed by Adam Leavesley [TaMS].

The matter of the funding for the fire management works has been examined by the Land Development Agency and Attachment C is a paper which provides funding scenarios which are being considered.

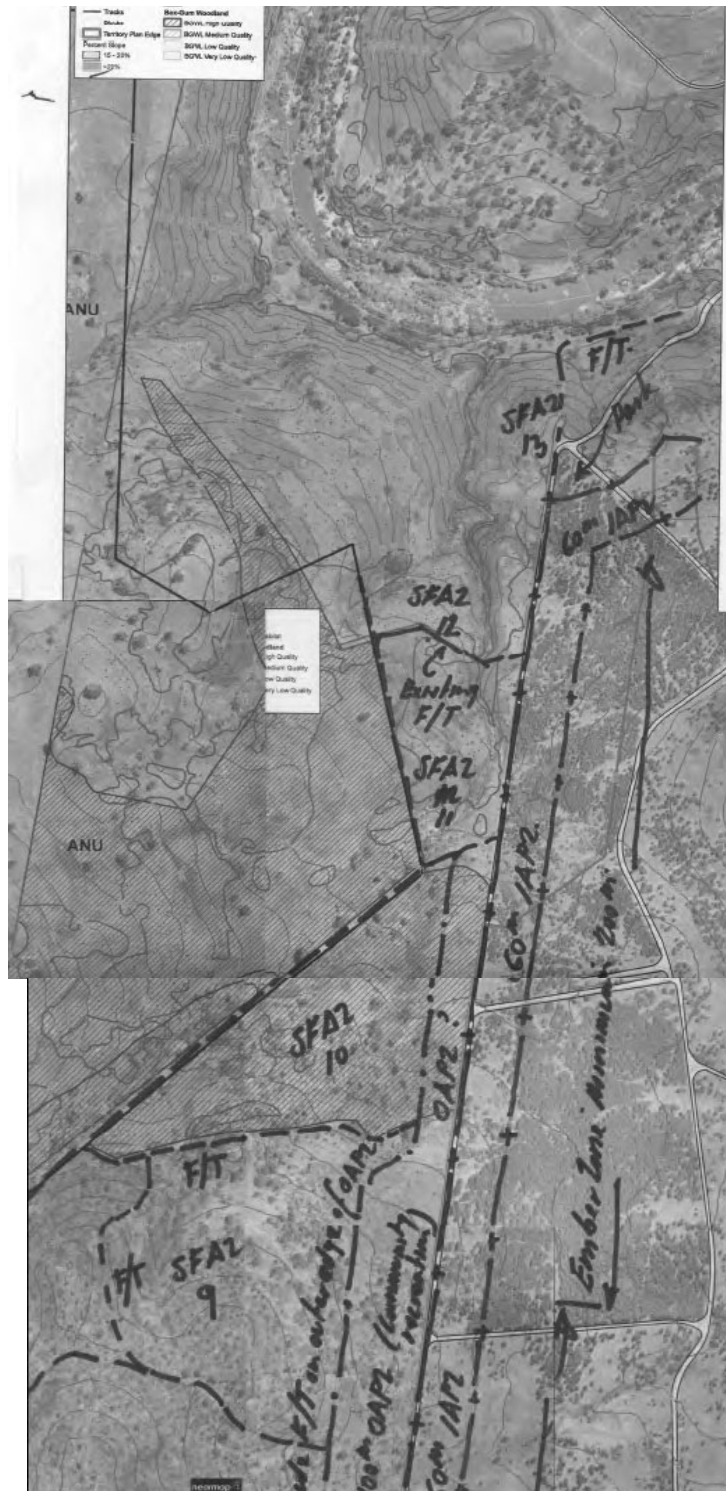
The resolution of the fire management of the Molonglo River corridor is yet to be examined and resolved by the working group.



Graham Swain
Managing Director,
Australian Bushfire Protection Planners Pty Limited

ATTACHMENT A – DRAFT PLAN OF FIRE PROTECTION MEASURES – KAMA – MOLONGLO 3 WESTERN EDGE.





Aloisi, Angelina

From: Santosuosso, Daniel
Sent: Friday, 1 May 2015 4:01 PM
To: Gianakis, Steven; Ransome, Ros; Matesic, Ivo; Watts, Michaela; Richardson, Dave; Leavesley, Adam
Subject: FW: Draft Fire Management Strategy - Molonglo Valley
Attachments: Scan1.pdf

Hi Ros,

Thanks for sending through your draft fire management strategy for the Molonglo Valley. And, sorry I was away when it came through hence these late comments as per my email late yesterday. I'm working from home this afternoon, hence from Dan!

I'm not going to go through your material point for point so will deal with the general approach. It has come a long way but feel it is still too detailed especially the plans your forwarded over. The EDD/LDA bushfire risk assessment is under preparation as you know and I've attached a preliminary copy of the plans. We will have a more up to date version for you early next week. These plans are being used as the bottom line to complete our assessment. Remember that our assessment is aimed at gaining ESA approval together with Treasury support, and providing the Bushfire Risk Assessment to accompany the EDPs as they are prepared, circulated and then approved for construction. As you would be aware, we are after a comprehensive approach that takes into account all the various parameters, guidelines and past approvals and provides some funding guidelines.

I think I speak for Steve Gianakis when I say both our Directorates are confident that we can deliver the urban edge of Molonglo Stage 3 up against the edge of Kama NR taking into account the supported fire management of SFAZs in Kama and in parts of the river corridor and all the parameters regarding IAPZs and HAPZs such that the proposed IAPZ width will satisfy all concerned. Also, the treatment of Deep Creek is recommended as an IAPZ taking into account the need for WSUD treatments (on-line and off-line), the possibility of retaining some of the PTWL habitat in the urban area and road and hydraulic infrastructure requirements.

Such as area is between the river and the future Group Centre south of the river. We have supported the temporary positioning of fencing to allow TaMS to manage that area in the short term before development in the Centre commences. The final location of the boundary between the river corridor and the urban edge is still a little way off and I'd take advice from Ivo on that one.

The western edge of Denman Prospect in our bushfire risk assessment has been addressed by Adam and Rob Armstrong and should be manageable in the short and long term. That is a good result and shows that the application of SBMP v3 can produce a result. One small issue that may be a concern if development in Denman Prospect is pulled back to the south because of servicing issues, it may open up the neck of the river as a "fire-wick" but this should be able to be addressed.

I see you've mentioned the Coombs peninsula in your points below. Do your plans and the PoM allow Ivo to proceed with the development of that part of Coombs without any further constraints?

I mentioned above that the proposed EDD/LDA bushfire risk assessment plans are attached. These give a comprehensive understanding of the main edges in Molonglo 2 and 3 and reflect the discussions and earlier agreement regarding the river corridor approach especially on the northern side. On the northern side, the river side of the MVIS access track is still our preferred location for the Urban/River Corridor interface which allows a minimum of 60m IAPZ before the block boundaries. In some areas along the corridor that distance will be greater than 60m taking into account topography, the actual MVIS location, other required infrastructure, the edge road configuration and any fire jump out of the river. An example of this is towards the bend in the river close to where the East-West arterial will pass before joining with the Tuggeranong Parkway.

Other comments include:

- the need for the edge to include urban open space as IAPZ rather than SFAZ with additional IAPZ requirements.
- the importance of the river corridor being zoned a SFAZ. This does not mean that the whole corridor will be managed. It provides the flexibility to undertake a mosaic of management through the whole corridor to protect life, property and the environment.
- Bulk watermain and the 132kV powerline easements could be fully managed as IAPZs and provide greater protection on the eastern edges of Molonglo 2 and 3.
- the East-West arterial road reserve should be treated as a IAPZ as it is likely to be wider than 30m.

We have a good working understanding of the ecology, and the likely fire behaviour from both studies and the work and effort that Adam and yourself has put into both is much appreciated. I think the results are getting closer together but some work still needs to be done. My recommendation is that this should be done before the PoM is finalised to ensure we all have an agreed understanding of what happens where.

Regards

Dave

Begin forwarded message:

From: "Richardson, Dave" <Dave.Richardson@act.gov.au>

Date: 1 May 2015 9:19:37 AM

To: David Richardson <david.envplanning@bigpond.com>

Subject: FW: Draft Fire Management Strategy - Molonglo Valley

From: Ransome, Ros

Sent: Wednesday, 22 April 2015 1:19 PM

To: McKeown, Helen; Bootes, Trish; Mulvaney, Michael; Kitchin, Margaret,, Steven; Matesic, Ivo; Carmody, Adam; Richardson, Dave; Santosuosso, Daniel; Lhuede, Nick; Watts, Michaela; Paynter, Patrick; Cousins, Meagan

Cc: Leavesley, Adam; Iglesias, Daniel; Sarah Ryan; Milner, Richard; Clement, SophieJ; Cooper, Neil

Subject: Draft Fire Management Strategy - Molonglo Valley
Importance: High

Dear All

Please refer to the attached maps showing the overall Molonglo Valley fire management strategy and a detail of the urban section.

To note:

1. The fire management zoning is based on Dylan Kendall's original Strategy revised to be in alignment with SBMP v3 2014, Dave Richardson's work on the northern boundary at Molonglo 3, and the Bushfire Operational Plan for Lower Molonglo.
2. The strategy has been developed through consultation with Government stakeholders including the Molonglo Co-ordination Group.
3. The fire management zoning will remain **indicative** in the PoM , and will guide the *Regional Fire Management Plan* and subsequent *Bushfire Operational Plans*.
4. The fire management zoning at Coombs Peninsula has been revised in line with the new SBMP v3 Guidelines which removes the overlap of the OAPZ with PTWL habitat.
5. The fire management zoning which was implemented in 2013 at Coombs, remains as -20m IAPZ and 100m OAPZ.
6. Likewise the fire management zoning along the Molonglo 2/ Patch K edge, remains as - 30m IAPZ and 100m OAPZ. This allows the considerable work undertaken by EDD through the Urban Edge Master Plan and the Concept Plan of the Molonglo Commercial Centre undertaken by EPD to remain relevant along this edge. In addition research into the development of an ecologically sympathetic fuel management and restoration technique for PTWL habitat has revealed good results and further restoration is currently being implemented to address the high fuel areas of Patch K.
7. The fire management regime for Kama remains consistent with the NES Plan Action 7. The Buffer zone (IAPZ) along the eastern edge of Kama and the western edge of Denman Prospect will be determined through future work to be undertaken by LDA and the Planning and Design Framework for Molonglo 3 to be undertaken by EPD.
8. As defined in the SBMP v3 2014, the following definitions prevail:
Landscape Management Zone – *Areas on government-managed lands where planned fire is applied for ecological and catchment requirements, recognising that in some communities, no planned fire will be applied. p.79*
Strategic Fire Fighting Advantage Zone – *Corridors established to break up major fire runs in instances where conditions permit. These zones are strategically located to slow the spread of unplanned fires and reduce fire intensity and spotting. p.80*
9. The guiding principles of the draft strategy will be explained in the Plan of Management.

Please review the maps carefully and provide comment by COB, Thursday 30 April.

Grateful your consideration,
Regards
Ros

Ros Ransome | Senior Environmental Planner

Phone 02 6205 9775 | Mobile [REDACTED]

Parks & Public Places | Capital Works Design and Delivery | Infrastructure Roads & Public Transport |
Territory and Municipal Services |

Macarthur House, 12 Wattle Street, Lyneham | GPO Box 158 Canberra ACT 2601 |

www.TAMS.act.gov.au

<image001.png>

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Legend

-  Project Area
-  Outer Asset Protection Zone
-  Interface

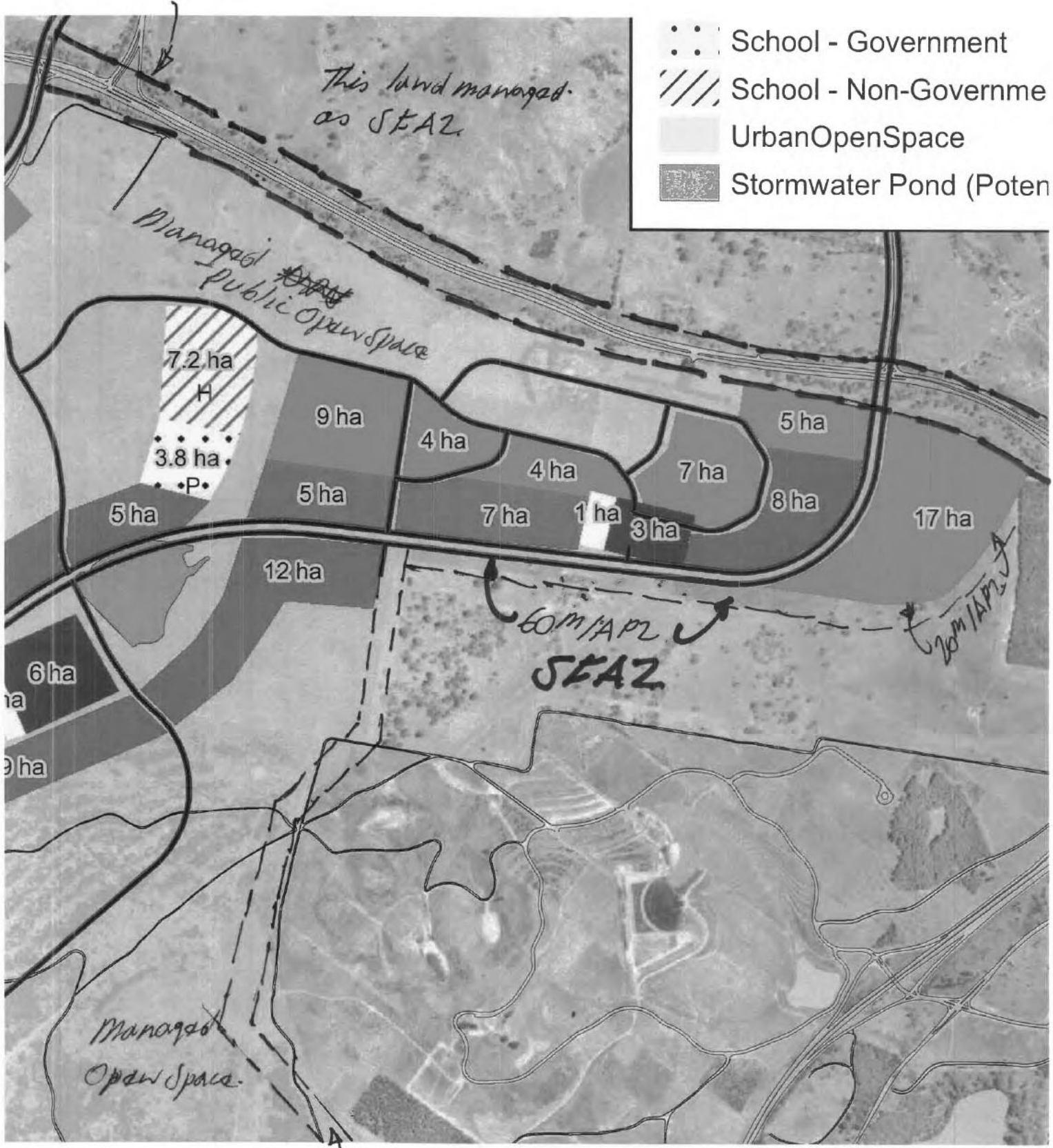
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Landscape Management Zone (LMZ) along River

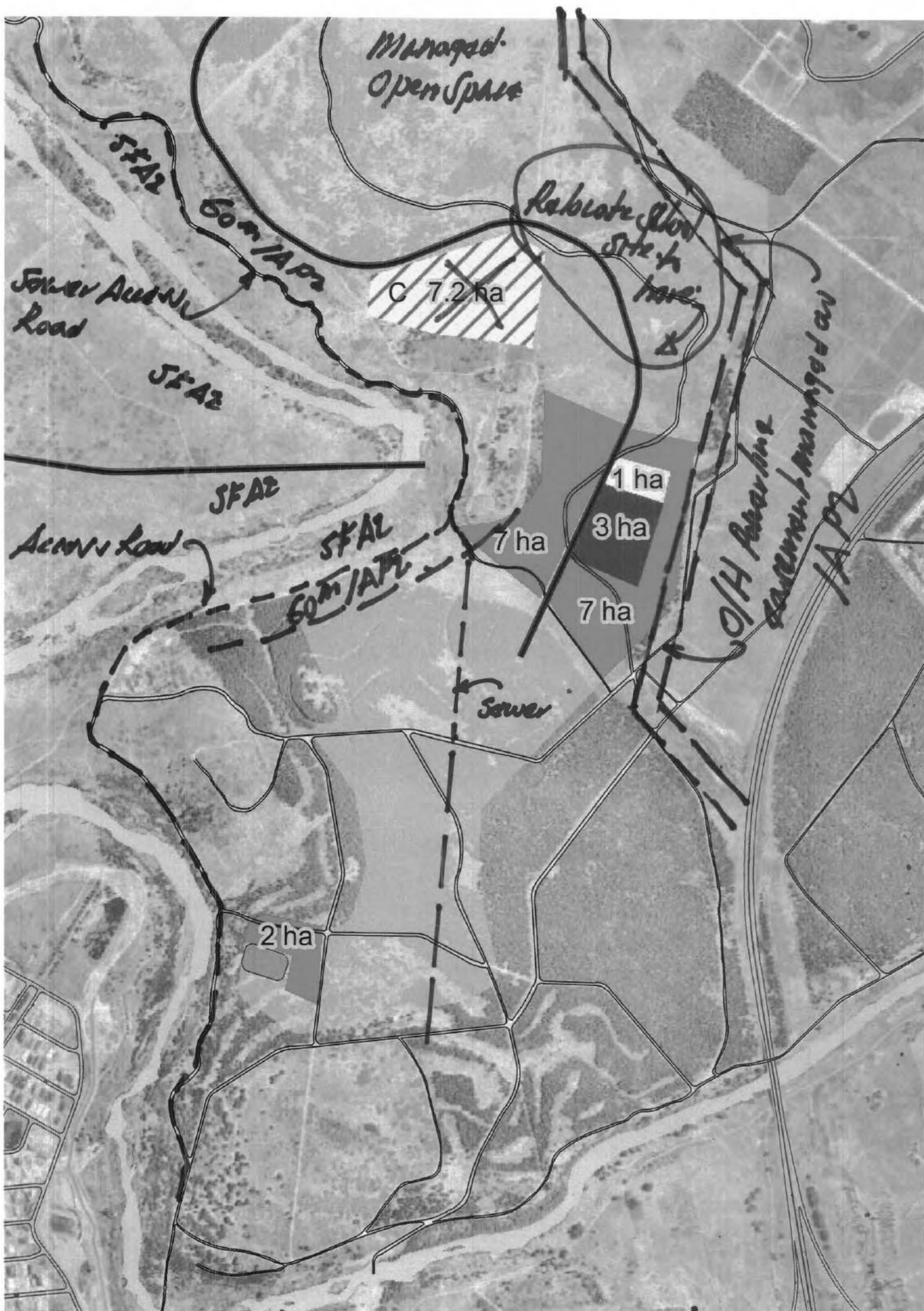
Mokongto Stage 3. Perimeter

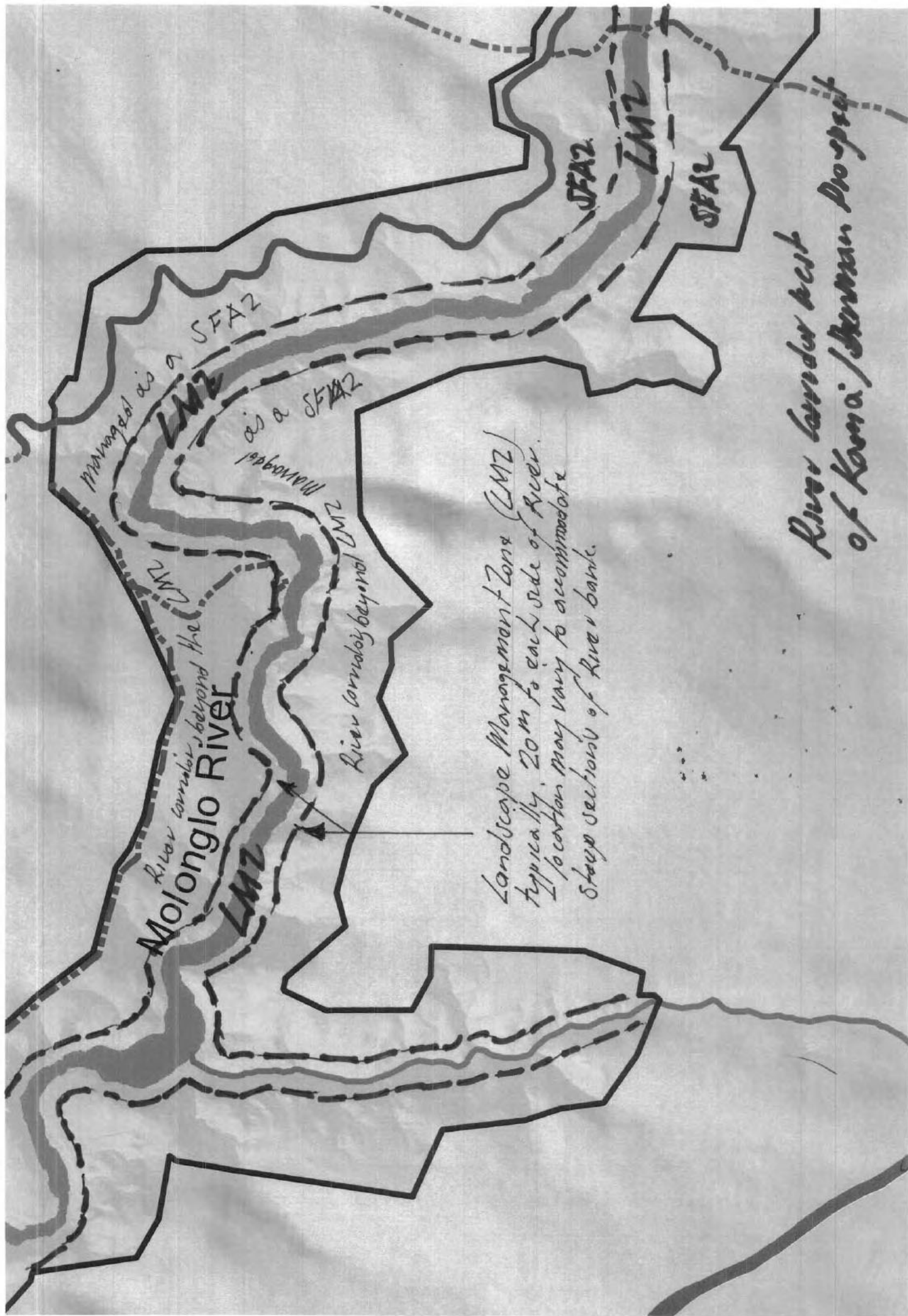
Road corridor (minimum 60m)
 managed as LAPZ



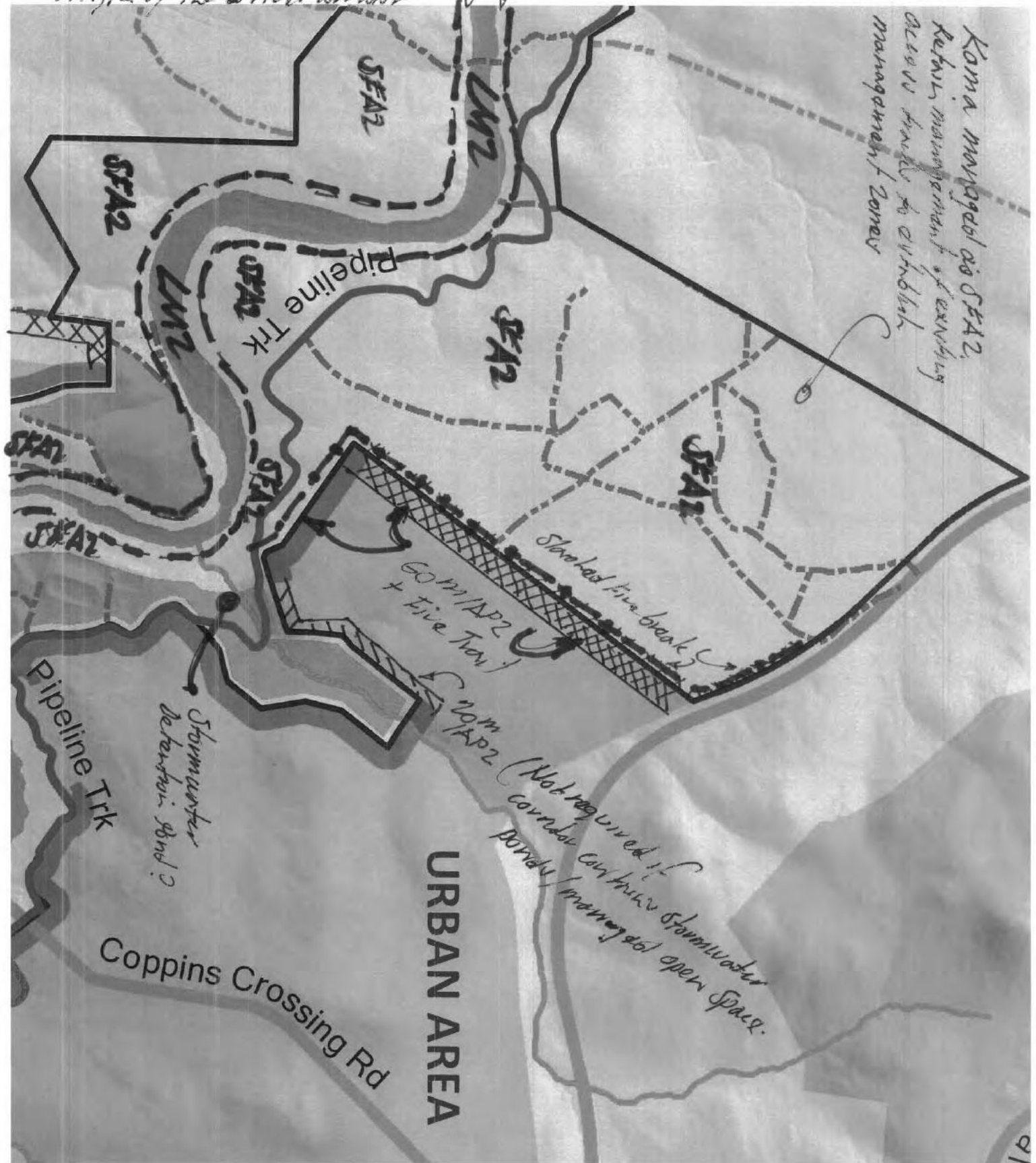
O/H Power line easement
 managed to full width of
 as LAPZ

Molonglo Stage 3. Precinct 2

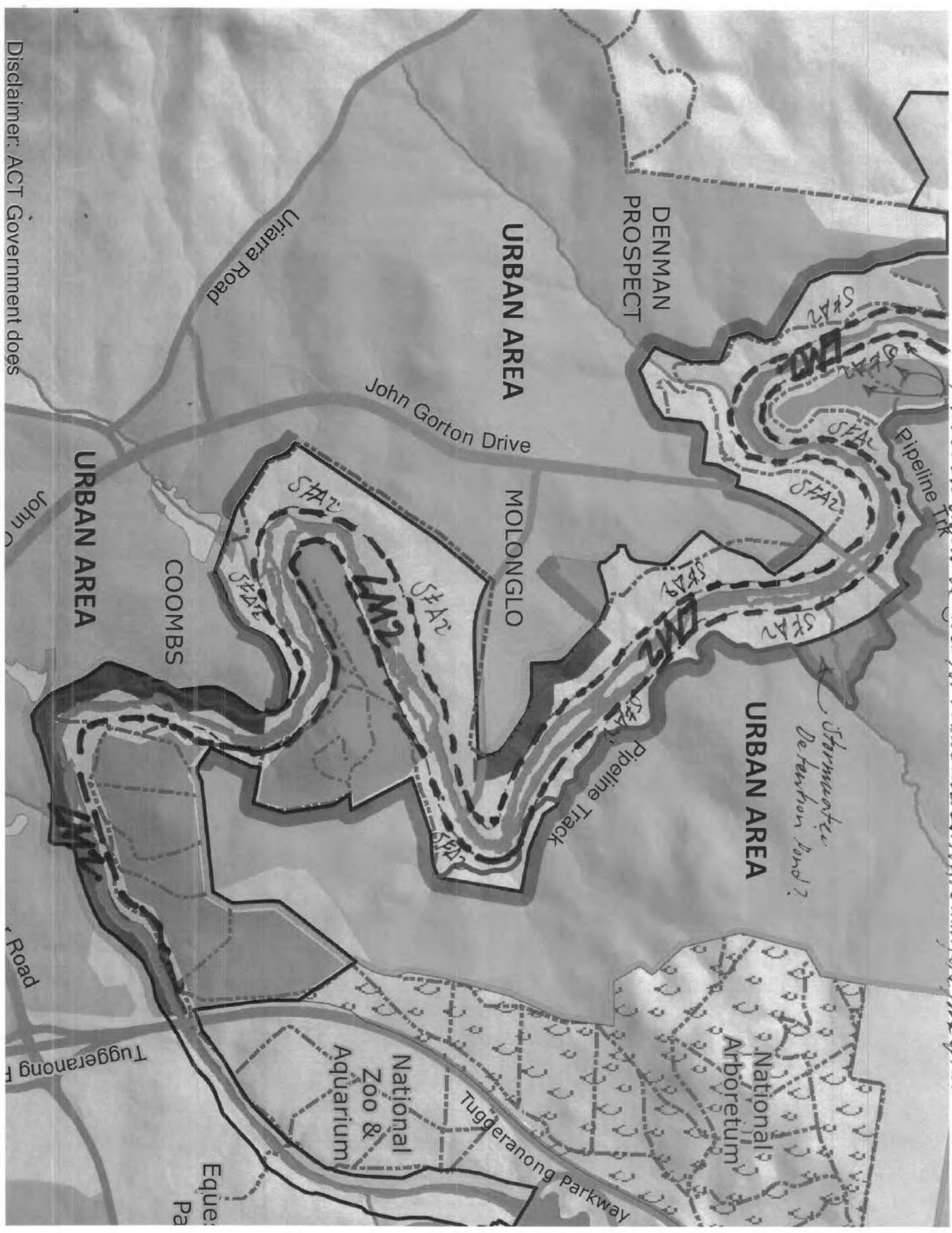




Land Management Zone (LMZ) typically
 20m to each side of River (measured from top of bank)
 Location may vary to accommodate steep sections of River bank
 This zone should occur to the full
 length of the river corridor



Koma / River Corridor



This area should be used for Public Recreation to mitigate fire spread

River Corridor - East

Aloisi, Angelina

From: ABPP <abpp@bigpond.net.au>
Sent: Thursday, 7 May 2015 3:29 PM
To: Richardson, Dave; Santosuosso, Daniel; Browning, Kerry
Subject: Molonglo
Attachments: Copy of B132154 - 1B - Molonglo Bushfire Management Strategy - 6.5.pdf

Hi Dave, can you please let me know if you have received the first part of the report – it was 10MB and I am not sure what your limit is - thanks

Regards

Graham

Australian Bushfire Protection Planners Pty Limited

RMB 3411 Dog Trap Road, SOMERSBY, NSW, 2250

Mob: 0427 622204 Ph: (02) 43622112 Fax: (02) 43622204

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BUSHFIRE MANAGEMENT STRATEGY

MOLOGLO STAGE 3;

DENMAN PROSPECT &

THE MOLOGLO RIVER CORRIDOR

**AUSTRALIAN CAPITAL TERRITORY
PREPARED FOR THE**

LAND DEVELOPMENT AGENCY

Australian Bushfire Protection Planners Pty Limited

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BUSHFIRE MANAGEMENT STRATEGY

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LAND DEVELOPMENT AGENCY

Report Number	Document	Preparation Date	Issue Date	Directors Approval
B132154 - 2	Draft	6.3.2015	7.5.2015	<i>G.L.Swain</i>

2

BACKGROUND

Australian Bushfire Protection Planners Pty Limited was commissioned to undertake a study of bushfire risk for the preparation of the Molonglo Structure Plan and produced a Bushfire Risk Assessment, dated 19.07.2005, for the ACT Planning Authority [ACTPLA].

An extract from this report states under 'Summary of Bushfire Risk' – [Page 28]:

"Major bushfires have occurred in the Molonglo Valley in 1926, 1939, 1952, 1991, 1994, 2001 and 2003.

The topography and landform of the valley predisposes the valley to impacts of fires burning under north-westerly and westerly wind influences and to a slightly lesser extent, south-westerly wind influences.

The slope of the valley to the north-west and the ridgelines/ gullies will influence the spread of fire from the northwest, west and south west and result in sporadic fire runs.

Fuel loads within the retained Habitat Corridors and Parklands, Nature Reserves and Lease Holdings, unless managed, will promulgate future bushfires up to the urban edge and into the vegetated corridors within the urban precinct.

Whilst the Overall Fuel Hazard for the vegetation within the valley is Very High there is, due to the fire history, topography, aspect, wind influence and climatic conditions within the valley, an extreme risk of damaging bushfires impacting the north western, western and south western edges of the West 1 and West 2 Precincts, the north western edge of the East Precinct and a high risk of damaging bushfires impacting the south western edge of the East Precinct".

Figure 1 on Page 4 provides an extract from the Molonglo Concept Plan Bushfire Risk Assessment Report 2005 identifying the Study Area;

Figure 2 on Page 5 provides an extract from the Molonglo Concept Plan Bushfire Risk Assessment Report 2005 identifying the potential north-westerly fire path;

Figure 3 on Page 6 provides an extract from the Molonglo Concept Plan Bushfire Risk Assessment Report 2005 identifying the potential westerly fire path; and

Figure 1 – Extract from the Molonglo River Structure Plan Bushfire Risk Assessment Report 2005 showing the study areas

Figure 2 – Extract from the Molonglo River Structure Plan Bushfire Risk Assessment Report 2005 showing the Diagrammatic Northwest fire run

Figure 3 – Extract from the Molonglo River Structure Plan Bushfire Risk Assessment Report 2005 showing the Diagrammatic West fire run

Under Section 6.1 Management of the Vegetation beyond the Urban Interface the ABPP report states:

“The Strategic Bushfire Management Plan for the ACT (Version1) states:

“Under the Emergencies Act 2004 the ESA has declared an area of the ACT to be a Bushfire Abatement Zone. The purpose of the Bushfire Abatement Zone is to reduce the impact of bushfires on the built up areas within the ACT.

Bushfire preparation within the BAZ requires collaborative development of fuel management guidelines and the provision of advice to land managers consistent with land use. Guidelines for bushfire management must achieve a reasonable balance between the increasing community demands on ACT lands for recreation and existing use for farming, forestry and conservation”.

*“Bushfire fuel hazard is the only factor of bushfire behaviour that can be influenced by land managers and residents. However, fuel management alone is not the panacea for bushfire protection and it **will not eliminate future severe bushfires.***

“The use of fire in land management requires land managers to make decisions about complex balances and trade-offs between bushfire protection and often-divergent social, environmental and economic requirements”.

Heavy emphasis has been placed on the effectiveness of hazard reduction burning as the most cost effective means of management within the Abatement – Zone, however the Strategic Bushfire Management Plan states :

“The opportunity to schedule and implement prescribed burning within a desirable window of favourable conditions is relatively limited”.

“Land managers and owners must take into account the potentially limited number of days and the possible interaction with air quality guidelines in the development, costing and implementation of prescribed burning programs”.

Therefore the viability of maintaining the urban edge protection by hazard reduction burning and / or mechanical means needs to be established to guarantee the integrity of the Molonglo and Western Broadacre urban edge against damaging fire impact.

Under 6.2 – Shape of the Development Precincts [Page 32] the ABPP reports states:

East Precinct.

“The long exposure of the north-western edge of the precinct to uphill burning fires, influenced by hot, dry, strong north-westerly winds, will result in significant fire impact either directly or indirectly from ember attack, depending on the level of protection provided by active management of the fuels within the river corridor.

Similar impacts may also occur to the western / south western edge from westerly and south-westerly wind-driven fires and the influence of wind turbulence in the Mount Stromlo area.

The northern edge will be impacted by fires burning within the habitat corridor, north of William Hovell Drive.

The Molonglo River Corridor will separate the eastern development node from the western development node and therefore provide a direct fire path into the suburbs adjoining the corridor and to the International Arboretum to the south east”.

Under Section 6.4 – Habitat Corridors – Gazetted Nature Parks the ABPP report states:

“The Landscape and Environmental Analysis Plan in the Molonglo Valley Suitability Study identifies habitat connectivity for wildlife movement corridors from The Pinnacle to the north-west and alternate and /or additional Habitat Corridors between the three development precincts.

If the Habitat Corridor identified extending to the north-west of The Pinnacle remains it will allow fire to enter the West 1 Precinct and expose the adjoining urban development to fire impact.

The alternative Habitat Corridors will allow fires to penetrate between the development precincts. Management of these corridors for Habitat Protection and ecological protection will conflict with the need to provide active management of fuel hazards within the abatement zones to the perimeters of the urban precincts.

The Lower Molonglo River Nature Reserve will provide a direct northwest fire path for future bushfires to impact the central portion of the north western edge of the East Precinct and the return edges to the north east and south west of the Reserve”.

Section 10.1 – Conclusion – Molonglo Valley [Page 43] of the ABPP report states:

“The orientation of the Molonglo Valley and the ability for northwest, west and south-west wind-driven fires to impact the proposed development edge will continue the extreme level of risk to any development proposed in the valley with the potential to cause major damage to buildings and infrastructure.

Whilst the McLeod Report recommendation was for implementation of an Abatement Zone to the west and south-west of the City, the extent of the zone and the management abilities of those responsible for the fuel maintenance measures recommended, may not provide a level of defence which will remove the risk of devastating fires impacting to the north-western edge of the Molonglo East Precinct and the north-western, western and south-western edge of the Molonglo West 1 and West 2 Precincts”.

It is therefore recommended that for development to proceed, the primary protection against the impact of fires to the north-western edge of Molonglo East and the north-western, western and south-western edge of Molonglo West 1 should be provided by the provision of a land use that creates a Critical Management Zone which is permanently fuel-managed by the nature of the land use. (i.e. vineyards / sporting grounds).

“The Molonglo River Corridor through the East Precinct should be actively managed as a Village Park to prevent fire extension into the precinct”.

Figure 4 on Page 10 provides an extract from the Molonglo Concept Plan Bushfire Risk Assessment Report 2005 identifying the recommended bushfire protection measures.

Subsequent to the preparation of the original Bushfire Risk Assessment Report [19.7.2005] an updated report was prepared by ABPP, dated 26.4.2006. The Executive Summary of this report states:

*The Molonglo Stage 2 Bushfire Risk Assessment quantifies the current level of risk to future development within the Molonglo Valley, prior to the implementation of mitigation measures as **Extreme**.*

Mitigation measures which have been identified within the report as necessary to reduce the level of potential risk to future development include the creation and permanent management of a Critical Management Zone to the north-western edge of the East Molonglo Precinct and to the western and south-western edge of the Central Molonglo Precinct.

The provision of the Critical Management Zone (CMZ) replaces the Outer Asset Protection Zone, as defined in the Strategic Bushfire Management Plan for the ACT and the management of this zone, in accordance with the performance standards defined in this report, are considered to be a mandatory requirement in the reduction of the bushfire risk to the future development within the Molonglo Valley.

In addition to the provision of a Critical Management Zone to the north-western edge of East Molonglo Precinct, this report recommends, due to the risk of fire over-run along the Molonglo River corridor and into the future suburb, the damming of the Molonglo River below Coppins Crossing and the creation of Lake Molonglo”.

Figure 4 – Extract from the Molonglo River Structure Plan Bushfire Risk Assessment Report 2005 showing the recommended Bushfire Protection Strategies

Figure 5 – Extract from the Molonglo River Structure Plan Bushfire Risk Assessment Report Stage 2 - 2006 showing the recommended Bushfire Protection Strategies

The recommendation contained within the latter report that damming of the Molonglo River below Coppins Crossing should occur to remove the bushfire risk along the river corridor was originally implemented in the Strategic Planning process, however is now not included in the Territory Plan.

The comments about the level of risk to the north-western edge and the risk posed by the retention of vegetation within the river corridor therefore defaults back to the original Bushfire Risk Assessment [19.7.2005] [refer to Figure 4 on Page 10] which recommended the implementation and management of a Critical Management Zone of at least 300 metres to the north-western edge of the new suburb and that the “Molonglo River Corridor through the East Precinct should be actively managed as a Village Park to prevent fire extension into the precinct”.

A review of the Molonglo Valley Plan for Protection of Matters of National Environmental Significance – NES Plan – September 2011 prepared by ACT Planning & Land Authority has identified that the aim of this document is to enhance the areas of Box Gum Woodland not only within the Molonglo River corridor but also within the Kama Nature Reserve and pockets of retained vegetation within the Molonglo Stage 3 precinct. The document provides, under Section 2.3 – Bushfire Management Framework a ‘motherhood’ statement about bushfire management which reads:

“Within the strategic assessment area fire management will be aimed at protection of both built assets and MNES values. This will be achieved through the identification of appropriate asset protection zones and application of hazard reduction techniques that will both:

- *Ensure that the standards for fuel loads in the SBMP are met; and*
- *Protection MNES values through the use of sympathetic management techniques”.*

The aim of this document does not address the recommendation that the river corridor is managed as a ‘Village Park’ or the land to the west of Molonglo 3 and Denman Prospect is managed to mitigate the impact of fire on the north-western edge of the future urban development and from a fire spreading along the river corridor.

The NES Plan recommends that the following reports be prepared:

1. ‘Molonglo River Park Concept Plan’;
2. Kama Management Plan;
3. Management Plan for Patch GG; and
4. Management Plans for High and Moderate PTWL habitat.

In addition to the NES Plan various studies have been undertaken or proposed, including the Molonglo River Park – Concept Plan prepared by Hassall [September 2011].

This document states that one of the primary objectives of the Concept Plan is to manage bushfire risk and details the need to provide Inner and Outer Asset Protection Zones as required by the *Strategic Bushfire Management Plan for the ACT 2009* with the Inner Asset Protection Zone located within the urban envelope and the Outer Asset Protection Zone and Strategic Fire Advantage Zone [SFAZ] located within the park.

Section 3 – Investigation Summary of the Concept Plan states:

“Risk assessments completed for Coombs and Stage 2 urban development areas identified a high to extreme bushfire risk for future urban areas. The most significant risk is that of a fire moving from the west or northwest, from which it would not only threaten the peripheral urban development in these areas but also potentially penetrate deeper onto the development area by moving up the Molonglo River corridor”.

Under ‘Additional Strategies’ the report suggests that relevant group(s) further investigate the establishment of a 300 metre wide ‘Critical Management Zone’ to the northwest of the site – extending in a downstream direction from the north west limit of the park.

The table on Page 14 is an extract from the Concept Plan identifying the Fire Management Objectives and Strategies.

Figure 6 on Page 15 shows the Molonglo River Park Illustrative Concept Plan prepared by Hassell.

Figure 7 on Page 16 shows the Molonglo River Park Illustrative Landscape setting Plan prepared by Hassell.

Figure 8 on Page 17 shows the Molonglo River Park Fire Management Plan concept prepared by Hassell.

Objectives and strategies

Objectives of fire management	Strategies
Mitigate bush fire hazard.	Active management of fuels associated with vegetation within the park.
Mitigate the potential for the riparian area to have a 'wicking' effect that could carry a fire deep into the urban area.	Creation of a mosaic landscape in which the potential for long runs of fire fuels are minimised.
Afford the occupants of the urban areas adjacent to the park protection from exposure to a bushfire.	Development and maintenance of an outer APZ that complies with ACT Emergency Services Agency (ESA) standards. (ACT SBMP)
Provide defensible space and adequate separation to minimise the chance of direct flame contact and material ignition, for any assets that could be vulnerable to a fire, which would be located within the park lands.	
Provide for the ongoing maintenance of fuel loads and vegetation continuity within the outer APZ and parklands.	
Ensure that emergency service personnel and parkland users have access to adequate access and egress in the event of a bush fire.	Development and maintenance of a network of roads and fire trails that meet emergency services access requirements.
Ensure that utility services, particularly water supplies, are adequate to meet the needs of fire fighters.	Provide water supplies suitable for use during fire and fuel management exercises.

The Molonglo River Park Concept Plan Report's focus of the 'Fire Management Theme' is on strategies for the control of vegetative fuels within the following specific areas:

- Critical Management Zone [CMZ] to the west of the park;
- Strategic discontinuity zones within the riparian corridor which aim to reduce the ability of a fire to move continuously up the corridor and into the urban areas, and provide access for defence and fuel management;
- Outer APZ adjacent to the urban interface [Inner APZ within the statutory urban area, not in the riparian parkland].

The Molonglo River Park Concept Plan Report states that the Critical Management Zone forms a key component of the overall strategy to reduce the potential for a fire to move up the riparian parkland and into the urban areas.

"The Critical Management Zone is a 300 metre wide zone extending from the western boundary of the proposed urban areas and the riparian parkland, in a downstream direction. This area would be managed to provide a strategic fire break or control line to reduce the impact of a fire moving from the west/northwest, towards the urban areas".

The report continues with advice on the strategic discontinuity zones and states that these zones “would be located at intervals within the parkland to reduce the potential for a fire to move continuously along the riparian corridor and potentially fuel an intense fire that could have catastrophic effects on the adjacent urban areas”.

“The development of strategic discontinuities within the riparian parkland responds to the significant hazard potentially affecting this area, which is located on the north-west fringe of Canberra and is therefore directly exposed to extreme fire weather and the potential fire hazard associated”.

“This strategy also responds to the potential of the riparian corridor itself to act as a ‘wick’, funneling a fire, driven by hot, dry, north-westerly winds, onto the heart of the urban area. This risk is a function of the physical location and the orientation of the river corridor itself”.

“The discontinuity areas would be located:

- At the northwest extreme of the riparian area;
- Around, and to the west of Coppins Crossing, from the proposed sewer line crossing to the proposed extension of John Gordon Drive crossing the river;
- At Misery Point.

These areas would be characterised by more concentrated vehicle access and intense location of recreational facilities such as playing fields, parking areas, irrigated gardens and picnic areas. Alternatively, they would comprise open woodland/grassland habitat”.

“Vegetation in the recreation areas would have the following characteristics:

- Large areas of groomed grassland maintained to a height of less than 100mm;
- Scattered tree planting;
- Formal parks and gardens with irrigated plantings.

“Generally fuels in these areas would be maintained by mechanical mowing/slashing. Where areas of PTWL habitat occur, fuels would be managed in accordance with the *TAMS Pinked Tail Worm Lizard Fuel & Fire Suppression Guidelines [TAMS 2011]*”.

“Outer Asset Protection Zones would be developed in accordance with ESA standards and the following OAPZ are required: Primary asset interface classification – 100m; Secondary asset interface classification – 0 metres.

All vegetation within the riparian zone would be maintained as grassland or open woodland.

Figure 6 – Molonglo River Park Illustrative Concept Plan – Hassell.

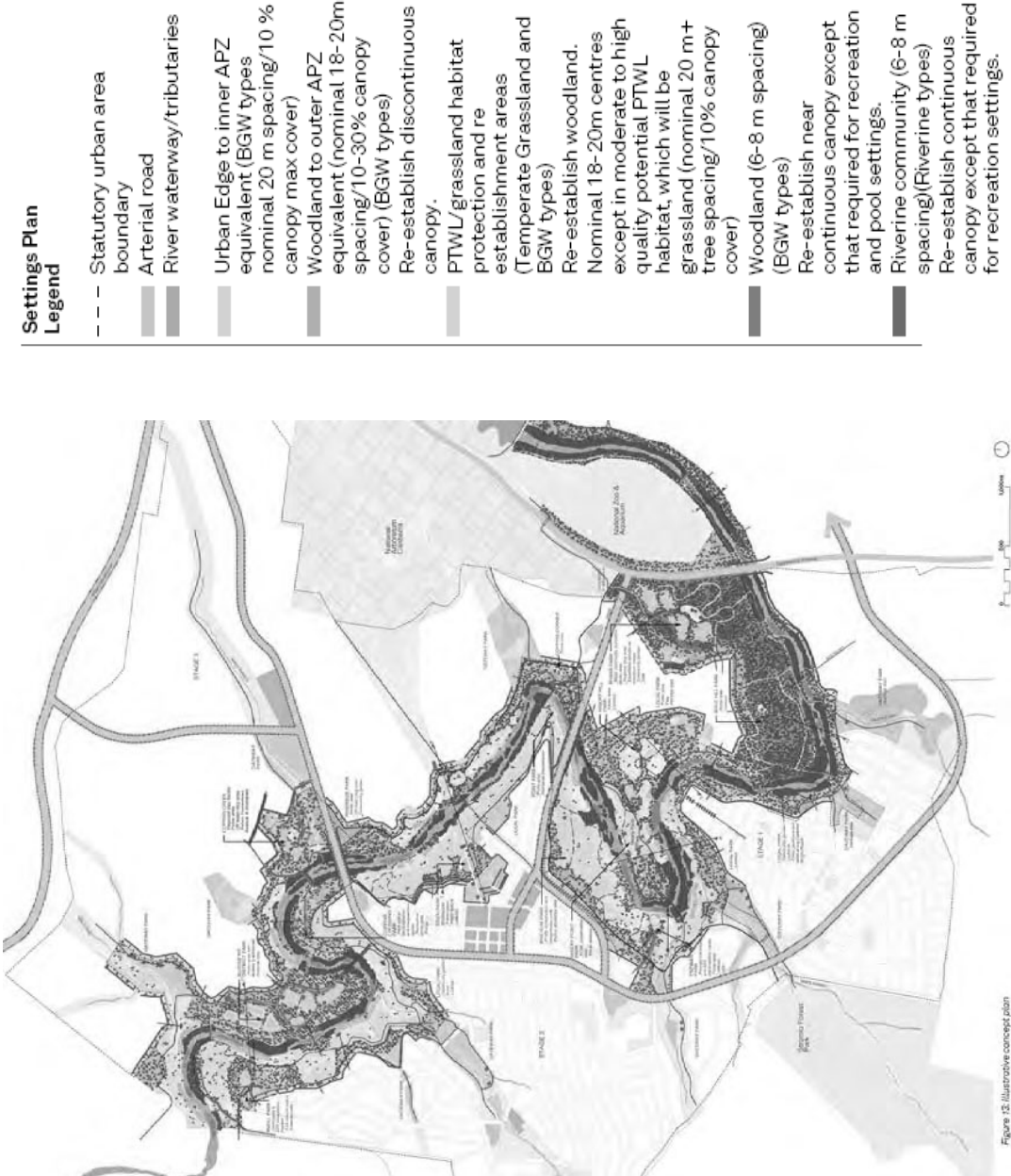


Figure 7 – Molonglo River Park Illustrative Landscape settings Plan – Hassell.

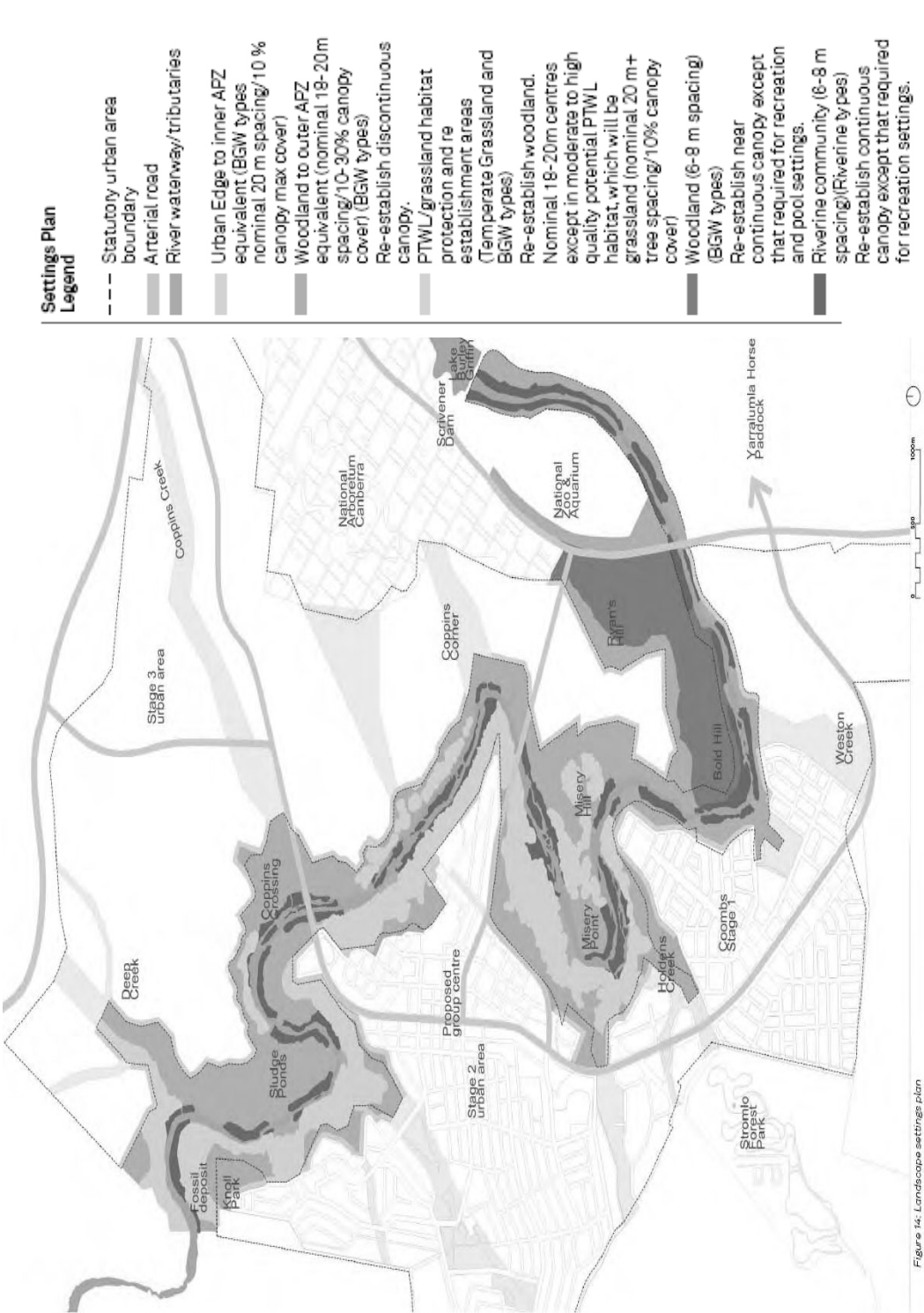


Figure 14: Landscape settings plan

Figure 8 – Molonglo River Park Fire Management Plan Concept – Hassell.

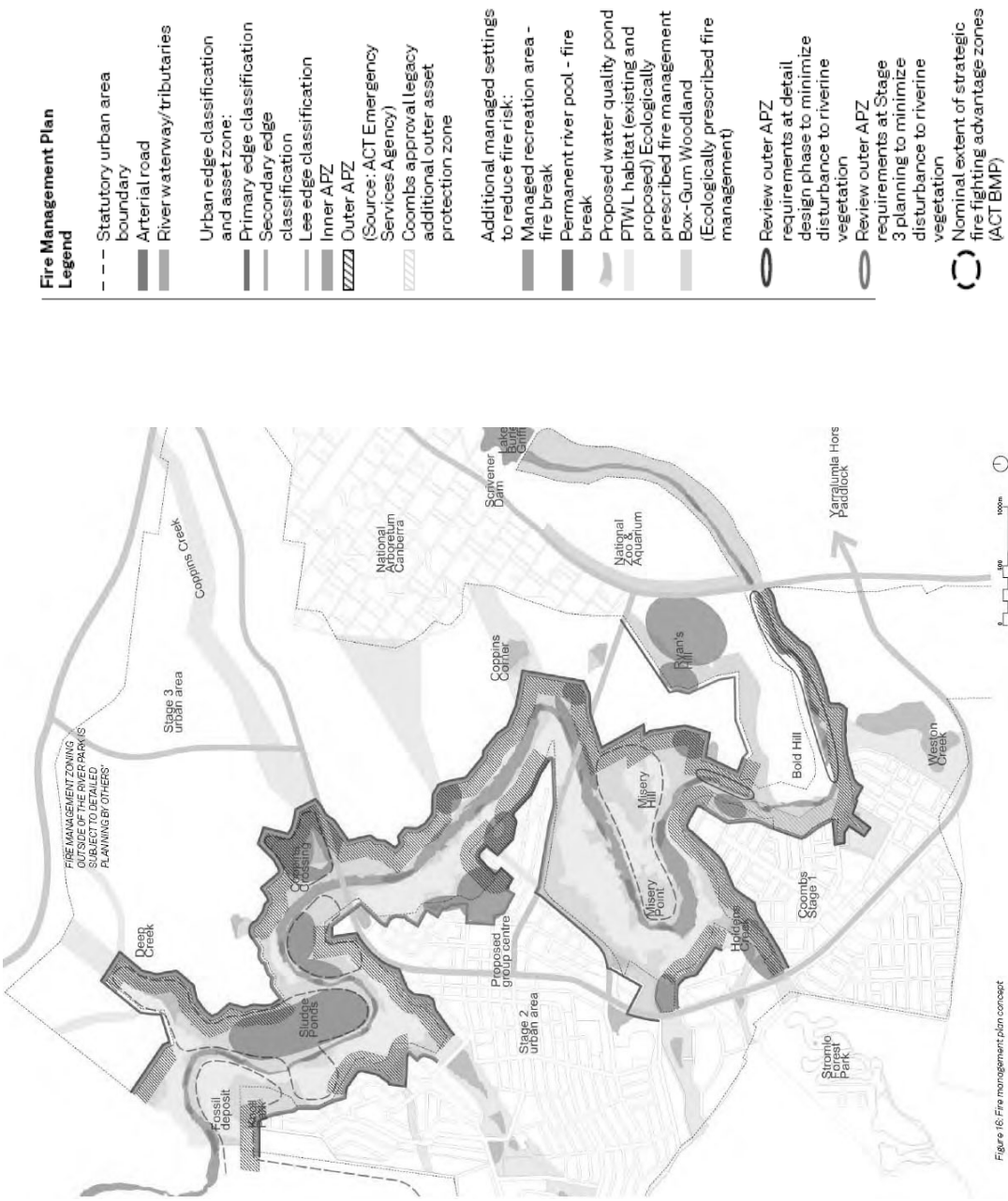


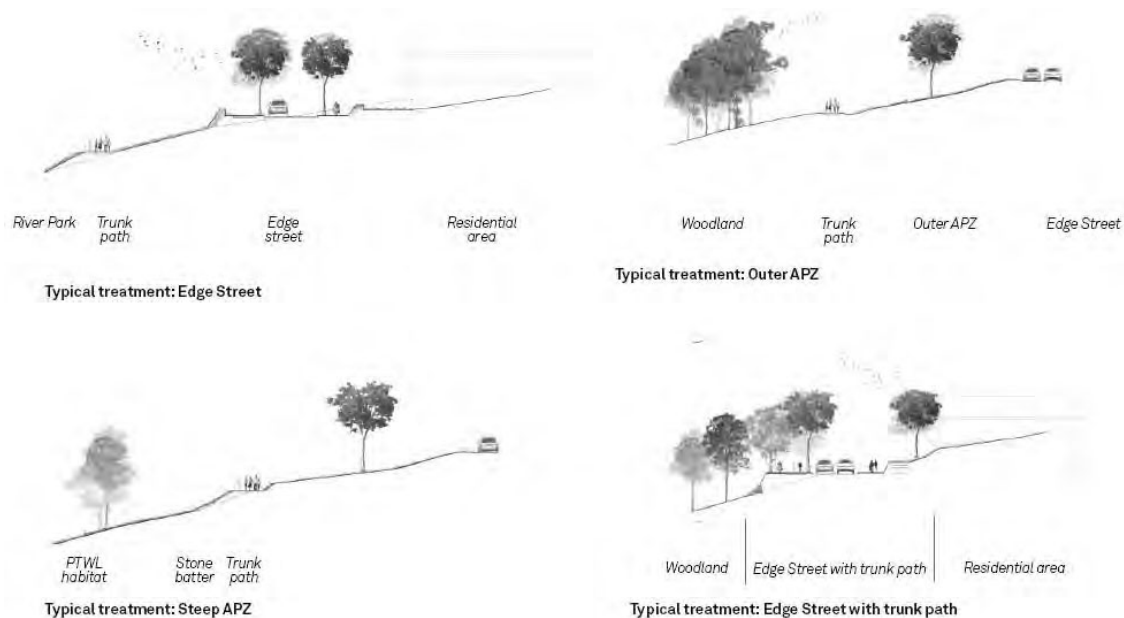
Figure 16: Fire management plan concept

Section 7 of the Concept Plan also provides recommendations on the provision of access and egress and states:

‘In addition to recreational access, where required within the park area, access and egress would be provided for emergency purposes and the maintenance of fire protection infrastructure. Road and trail standards would be designed in consultation with local emergency services to enable the traffic of emergency service vehicles and their access to adjacent, more natural areas of vegetation”.

Figure 9 below provides sectional details of the location of Trunk Paths/Emergency Service access.

Figure 9 – Molonglo River Park – access – Hassell.



Section 7 – Concept Plan – Fire Management Theme states:

“Under the ACT Strategic Bushfire Management Plan, a Fire Management Plan would be developed for the Molonglo Valley in accordance with Emergency Services Agency [ESA] standards. The plan would take into account consideration of the recommendations of the existing bushfire hazard assessments for the proposed adjacent urban areas. The Molonglo Valley Fire Management Plan would provide the basis for the development of an overarching Plan of Management for the riparian area and annual Operations Plan [BOP]”.

Additional bushfire risk assessments have also been undertaken, including for the Molonglo Stage 2 Group Centre [ABPP 23.12.2012] and the north-western edge of Denman Prospect [Aurecon Australia Pty Ltd – 25.2.2014].

Figure 10, below, is a copy of the 'Indicative Fire Management Strategy – Urban Area prepared by TaMS.

Figure 10 – Indicative Fire Management Strategy – Urban Area [TaMS 2015]

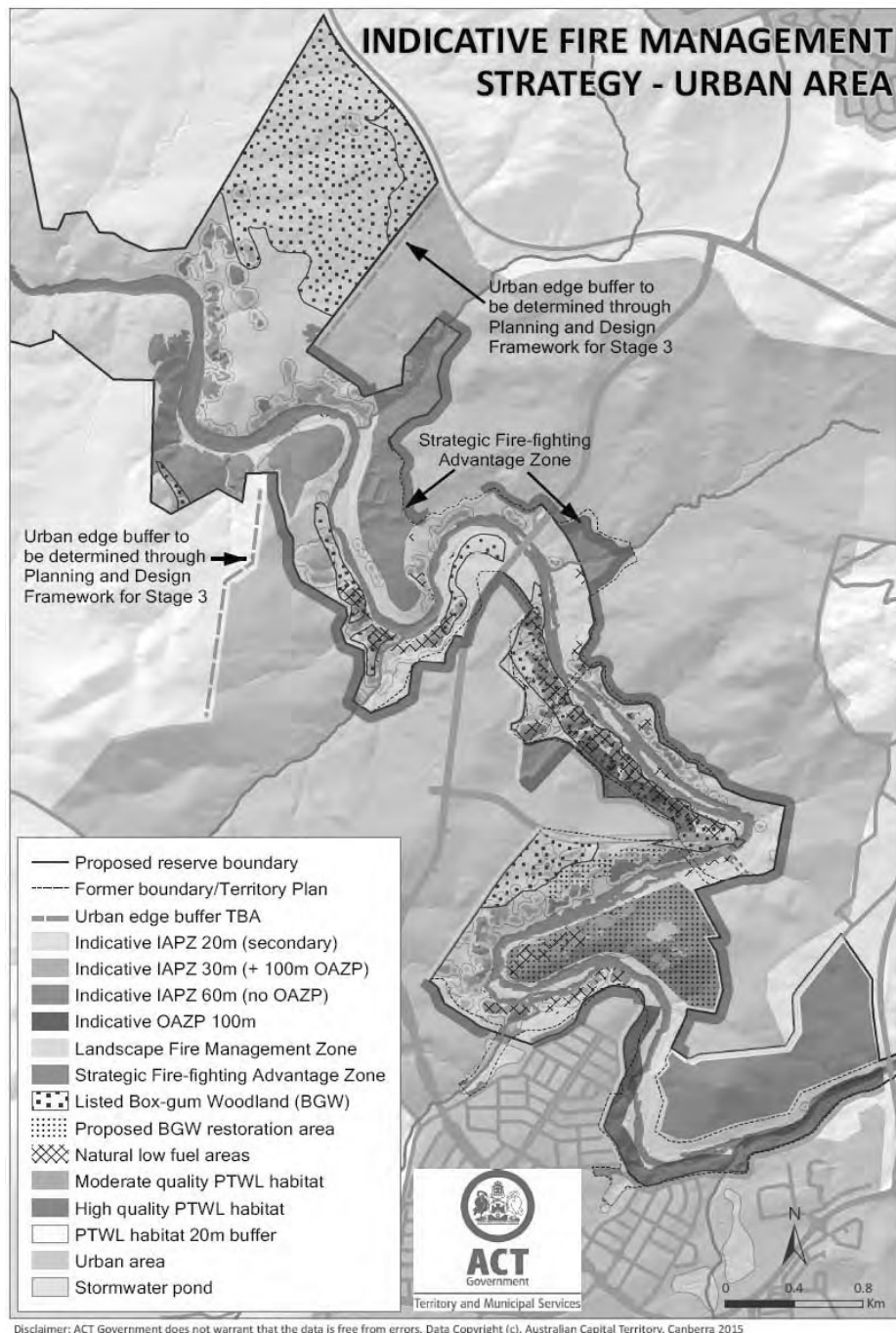
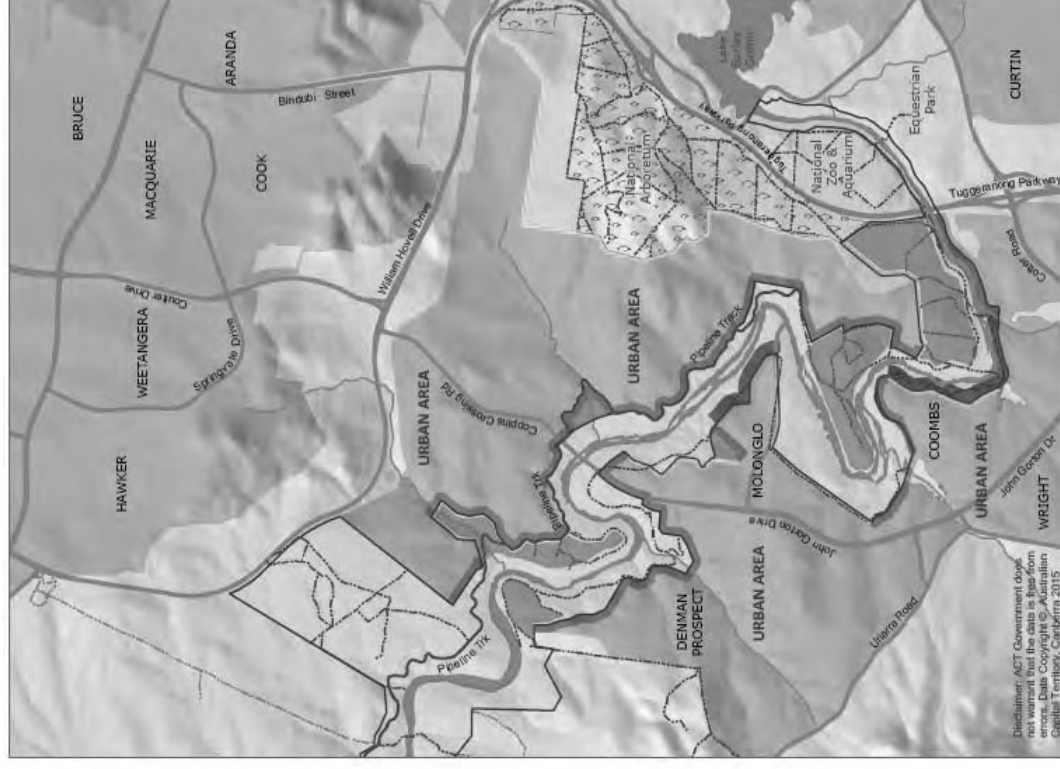
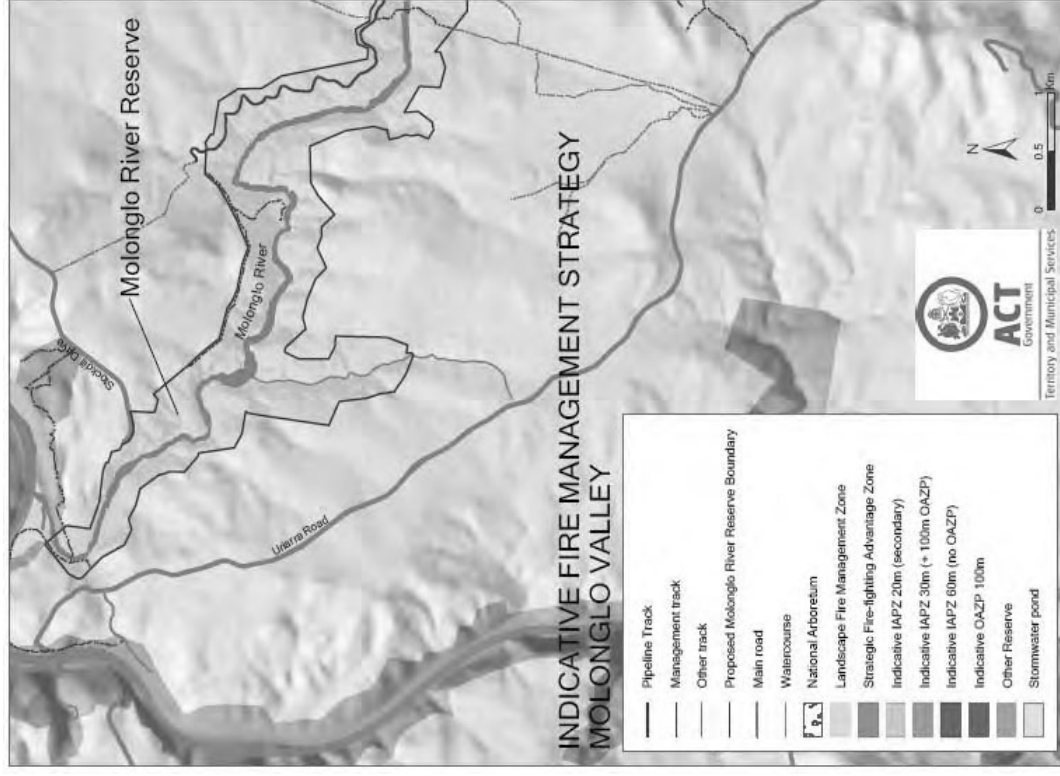


Figure 11 on Page 21 provides a copy of the Indicative Fire Management Strategy – Molonglo Valley prepared by TaMS.

Figure 11 – Indicative Fire Management Strategy – Molonglo Valley [TaMS 2015]



A review of the Indicative Fire Management Strategy – Urban Area and the Indicative Fire Management Strategy – Molonglo Valley [Figure 10 and Figure 11] has found that few of the recommended bushfire management strategies contained within the Molonglo River Concept Plan has been incorporated into the management strategies proposed by Tams.

The recommendation provided in the Australian Bushfire Protection Planners reports and the Molonglo River Concept Plan that a 'Critical Management Zone [CMZ] be provided to the northwest of the urban development [and river park] has been ignored in favour of ecological and habitat values. Similarly, the Molonglo River Concept Plan's recommendation that the river corridor be broken into precincts to prevent the 'wick' effect and in particular the management of the western entrance to the river park and the area around the sludge ponds to mitigate the passage of fire along the river has been ignored.

These items are critical to the prevention of fire spread and should be reinstated or at least given some consideration.

In addition, none of the more recent studies, including the TaMS Indicative Fire Management Strategies, investigate the 'whole of site' bushfire protection measures required to mitigate the extreme bushfire risk to the western and north-western edge and from the River Park [Molonglo River Corridor].

WORKING GROUP

In late 2013 the Land Development Agency [LDA] identified the need to bring together a working group to examine the outstanding issues relating to the bushfire risk to the north-western edge of Molonglo 3; Denman Prospect and the Molonglo River Corridor.

The brief of the Working Group was to bring together all Government Agencies involved in the development of the Molonglo East precinct to enable examination of previous studies, undertake site inspections and consider all options available so as to develop a report that establishes the principles, processes and funding required to address the bushfire risk.

Representatives of Government Agencies included:

- ❖ Dave Richardson [LDA];
- ❖ Kerry Browning [LDA];
- ❖ Adam Carmody [LDA];
- ❖ Dylan Kendall [TaMS];
- ❖ Adam Leavesley [TaMS];
- ❖ Nick Lhuede [ESA];
- ❖ Greg Potts [ACT RFS];
- ❖ Conrad Barr [Acting Chief Officer] ACT Fire & Rescue;
- ❖ Andrew Starke – Commissioner ACT Rural Fire Service;

- ❖ Ros Ransome [TaMS];
- ❖ Steven Gianakis;
- ❖ Daniel Iglesias;
- ❖ Tony Corrigan;
- ❖ Stuart McKenzie

Two external companies were commissioned to provide assistance to the Working Group, Umwelt to undertake a peer review of the previous ecological studies and additional ecological investigations and ABPP to provide advice on bushfire risk, fire protection strategies and the preparation of a Bushfire Mitigation Strategy Report.

These companies were represented by;

- ❖ Peter Cowper Armstrong [Umwelt];
- ❖ Rob Armstrong [Umwelt]; and
- ❖ Graham Swain [ABPP].

Initially the Working Group consisted of representatives of LDA, ABPP and Umwelt.

A workshop was held on the 28th May 2014 with the aim to establish initial understanding of ecological values and management requirements and development of feasible options to manage bushfire risk. Attendees were:

- ❖ Dave Richardson [LDA];
- ❖ Kerry Browning [LDA];
- ❖ Adam Carmody [LDA];
- ❖ Dylan Kendall [TaMS];
- ❖ Peter Cowper Armstrong [Umwelt];
- ❖ Rob Armstrong [Umwelt]; and
- ❖ Graham Swain [ABPP].

Umwelt were commissioned to review the existing reports/studies and undertake field surveys and investigation into the vegetation and ecological values in Kama.

The results of these studies are contained in the separate document attached as Appendix A.

Initial findings on the extent of the ecological value of the vegetation within Kama varied from the previous studies.

A second workshop was held on the 29th July 2014 with the aim to undertake a wider consultation with key fire planners within TaMS and ESA; establish a broader understanding of ecological values and management requirements and further development of feasible options to manage fire risk. Attendees were:

- ❖ Dave Richardson [LDA];
- ❖ Daniel Santosuosso [LDA];
- ❖ Adam Carmody [LDA];
- ❖ Dylan Kendall [TaMS];
- ❖ Adam Leavesley [TaMS];
- ❖ Nick Lhuede [ESA];
- ❖ Greg Potts [ACT RFS];
- ❖ Conrad Barr [Acting Chief Officer] ACT Fire & Rescue;
- ❖ Peter Cowper [Umwelt];
- ❖ Rob Armstrong [Umwelt]; and
- ❖ Graham Swain [ABPP].

Various options were considered in the methods of providing protection to the north-western edge of Molonglo 3 including support for the provision of an Asset Protection Zone within Molonglo 3 with the vegetation within Kama managed as a Strategic Fire Advantage Zone [SFAZ], provided that adequate on-going funding was available to support the management works in perpetuity.

Following discussions on the protection measures for Denman Prospect, Umwelt were commissioned to review the existing reports/studies and undertake field surveys and investigation into the vegetation and ecological values of the vegetation within the north-western portion of Denman Prospect and the adjoining land to the northwest.

A third workshop was held on the 21st October 2014 with the aim of confirming the proposed management of the north-western edge of Molonglo 3 and examining options for fire management of the western edge to Denman Prospect and the Molonglo River Corridor.

Attendees were:

- ❖ Dave Richardson [LDA];
- ❖ Daniel Santosuosso [LDA];
- ❖ Adam Carmody [LDA];
- ❖ Adam Leavesley [TaMS];
- ❖ Greg Potts [ACT RFS] & Conrad Barr [Acting Chief Officer ACT Fire & Rescue];
- ❖ Peter Cowper & Rob Armstrong [Umwelt];
- ❖ Ros Ransome [TaMS]; and
- ❖ Graham Swain [ABPP].

At this meeting it was agreed that to the north-western edge of Molonglo 3 the proposed fire management zones would consist of:

1. A 60 metre wide Inner Asset Protection Zone, located inside the western edge to the Molonglo Stage 3 precinct;
2. A Fire Trail would be constructed along the boundary with Kama – inside the Molonglo Stage 3 precinct;
3. A managed fire break would be provided in Kama, adjacent to the boundary with Molonglo Stage 3;
4. That the vegetation within Kama would be managed in a series of Strategic Fire Advantage Zones, in accordance with the prescriptions provided by the *Strategic Bushfire Management Plan for the ACT – 2009* – refer to Attachment A – Plan of proposed Bushfire Management Strategies – Kama/Molonglo 3 Western Edge.

Existing access trails would be maintained and managed to provide edges to the Strategic Fire Advantage Zones – refer to Attachment A – Plan of proposed Bushfire Management Strategies – Kama/Molonglo 3 western edge.

5. The proposed management strategies were supported by ESA provided adequate on-going funding was available to support the works in perpetuity.

The meeting also resolved to examine the fire management options for Denman Prospect provided by ABPP and resolved to assess these options in the field.

It was also agreed to inspect the line of the Asset Protection Zone to the north of the river corridor, as determined with [TaMS]. This meeting was attended by Dave Richardson; Nick Lhuede; Adam Leavesley and Daniel Santosuosso and agreement reached that a 60 metre wide Inner Asset Protection Zone [IAPZ] be provided to the full length of the river corridor, measured from the outside of the existing Sewer Access Track.

Where stormwater management ponds occurred, the IAPZ will include these facilities.

The acceptance by ESA of the 60 metre wide IAPZ was predicated on the vegetation within the river corridor being managed as a Strategic Fire Advantage Zone which is to be maintained to the standards prescribed by the *Strategic Bushfire Management Plan for the ACT – 2014 – Version 3*.

An inspection of the western edge of Denman Prospect and adjoining land to the northwest was undertaken on the 28th November 2014. Attendees were:

- ❖ Dave Richardson [LDA];
- ❖ Daniel Santosuosso [LDA];
- ❖ Adam Leavesley [TaMS];
- ❖ Nick Lhuede [ESA];
- ❖ Greg Potts [ACT RFS];

- ❖ Conrad Barr [ESA][Acting Chief Officer ACT Fire & Rescue],
- ❖ Andrew Starke – Commissioner ACT Rural Fire Service;
- ❖ Rob Armstrong [Umwelt]; and
- ❖ Graham Swain [ABPP].

General consensus was reached on the location of the proposed fire protection measures which include the provision of a 60 metre wide IAPZ to the full length of the urban edge; management of a varying width Outer Asset Protection Zone [OAPZ] between the IAPZ and the retained forest vegetation and the management of the Territory Land to the northwest and west of the fire protection zones as a Strategic Fire Advantage Zone/s.

Whilst this consensus was broadly spread across the group concern was raised by ESA over the Strategic Fire Advantage Zone extending beyond the boundary of the Denman Prospect precinct and that this issue needed to be addressed before the final support of ESA would be considered.

Another matter raised by ESA related to the environmental consequences of the management of the proposed Outer Asset Protection Zones SFAZs and the cost of the ongoing management and the long term funding of the management program.

To address the matter of possible environmental consequences of the management of the proposed SFAZs, Umwelt were commissioned to undertake further studies to determine the location of vegetation communities, threatened species and the viability of management of the vegetation to achieve the fuel loads required in a SFAZ.

The results of the study are contained in the Umwelt Report attached as Appendix A.

The report identifies an increase in the extent of Box Woodland, confirms the location of Pink Tailed Worm Lizard habitat and also confirms that the management of the SFAZs by hazard reduction burning is ecologically sustainable.

The Umwelt report has been reviewed by Adam Leavesley [TaMS].

An inspection of the southern side of the Molonglo River corridor was undertaken on the 19th March 2015. Attendees were:

- ❖ Dave Richardson [LDA];
- ❖ Daniel Santosuosso [LDA];
- ❖ Adam Leavesley [TaMS];
- ❖ Rob Armstrong [Umwelt]; and
- ❖ Graham Swain [ABPP].

This inspection examined the bushfire risk to the western edge of the Molonglo River Park and the fire paths/vegetation along the river corridor to the bend in the river, east of the Group Centre precinct.

Consensus was reached that the fire protection principle developed for the northern edge of the corridor [60 metre wide IAPZ within the urban development and management of the river corridor as a SFAZ] would be applied along the southern edge of river corridor.

FINDINGS OF THE WORKING GROUP

The consultative process established by the Working Group enabled constructive dialogue between the Government Agencies, resulting in an approach that has established ecological and bushfire management principles to guide future urban development whilst retaining ecological values.

These principles have been guided by the 'alternate solutions' methodology introduced in the updated *Strategic Bushfire Management Plan for the ACT – 2014 – Version 3*, in particular the *ACT Bushfire Management Standards* which allow for the application of an increased width of Inner Asset Protection Zone without the need to provide an Outer Asset Protection Zone.

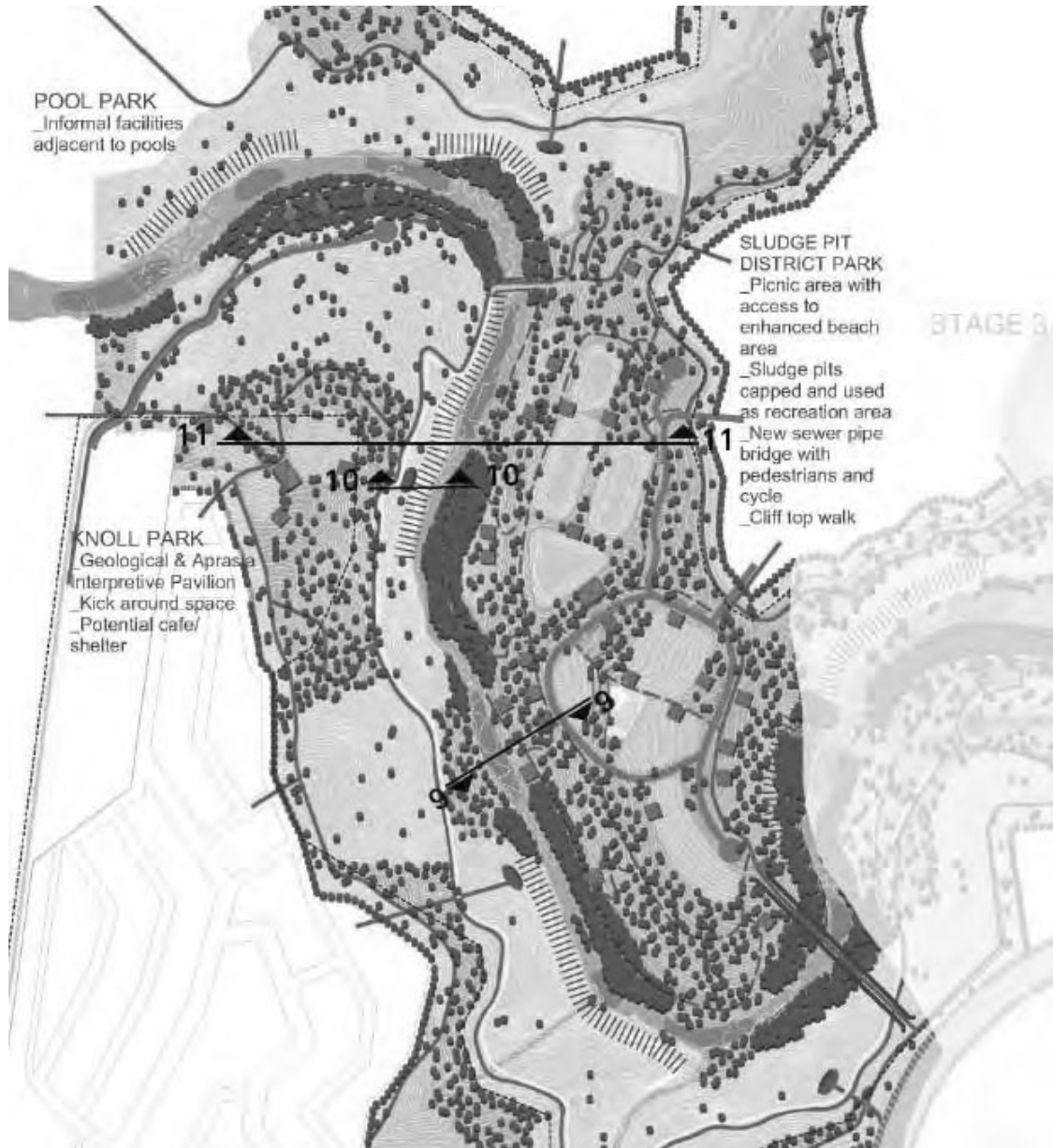
However, whilst this has been the overarching principle, due to the extreme level of risk of a catastrophic fire event impacting on the western, north-western edge and the river corridor, the ESA have sought to achieve an increased level of protection with the management of the vegetation on the land adjacent to the Inner Asset Protection Zone – i.e. Kama to the northwest of Molonglo Stage 3; the land to the west and northwest of Denman Prospect and the vegetation within the Molonglo River Park – as a Strategic Fire Advantage Zone [SFAZ] – refer to Attachments A - C – Plans of Bushfire Management Strategies.

The principle of applying the 60 metre wide Inner Asset Protection Zone and Strategic Fire Advantage Zone should also be applied to the Group Centre interface with the River Park.

The attached plans provide the Strategic Fire Advantage Zone [SFAZ] management zones within Kama and on the land to the west and northwest of Denman Prospect. This report does not establish similar management zones for the Strategic Fire Advantage Zones within the Molonglo River Park as these will be determined by TaMS, using natural features and public access links to the Molonglo River.

It is also recommended that the mitigation features contained in the Molonglo River Park Concept which apply to the future use of the Sludge Pits and adjoining land and also the western end of the River Park be implanted – i.e. higher intensity public recreation rather than as shown on the Indicative Fire Management Strategy prepared by TaMS – refer Figure 12 on Page 28 which provides an extract from the Molonglo River Park Concept Plan detailing the recommended landuse at the western [Gorge] end of the River Park and the Sludge Pits District Park precinct.

Figure 12 – Western Gorge and Sludge Pits District Park concept plan – Molonglo River Park Concept Plan – Hassell



The Working Group did not review the bushfire protection requirements for the northern and eastern edges of the Molonglo Stage 3. For completeness the attached plans also provide advice on the recommended protection measures to these edges of the Molonglo Stage 3 precinct – refer to Attachments D & E – Plans of Bushfire Management Strategies – Molonglo 3 Northern and Eastern edges.

Access for maintenance and fire-fighting operations has been considered and recommendations provided for the maintenance of the existing fire trails within Kama; the establishment of new trails and maintenance of the existing trails on the land to the west and northwest of Denman Prospect.

The decision taken to establish the Inner Asset Protection Zone from the outer edge of the existing sewer main access road to the Molonglo 3 precinct provides a management and fire-fighting access along the northern side of the Molonglo River corridor.

The existing access tracks along the southern side of the Molonglo River shall also be maintained with a new access track provided along the Group Centre precinct – refer to Attachment C – Plan of Bushfire Management Strategies - River Corridor.

FUNDING FOR THE ESTABLISHMENT AND MAINTENANCE OF BUSHFIRE PROTECTION MEASURES

ESA has advised that their support for the bushfire protection measures that have been established by the Working Group is contingent on the measures being environmentally acceptable and that funding is available for the establishment and long term [in perpetuity] maintenance of the protection measures.

Funding, and the ability to undertake the bushfire protection measures within the Molonglo East Precinct and in fact across the ACT, is fundamental to the life safety of residents and emergency service personnel with the western edge of the City identified as being exposed to catastrophic bushfire events similar to the 2003 Canberra Bushfires.

Currently TaMS are working on the Molonglo River Corridor Plan of Management which attempts to set land use boundaries between the urban area and adjacent ecological values – refer to Figures 10 & 11 on Pages 20 & 21.

The LDA/EDD are undertaking due diligence assessment investigations based on the approved Molonglo Valley Structure Plan and other documentation across a range of significant issues in Molonglo Stages 2 and 3 including but not limited to ecological, contamination, infrastructure provision, UXO and bushfire risk. These assessments, especially bushfire, can materially influence the location of land use boundaries due to impacts and responsibilities for cost efficient land management.

Interrogation of past documentation on reflection has left question marks and holes in data accuracy, boundary locations assumptions and the identification and costing of the full impacts and efficient land management.

Multiple directorates/agencies are involved with overseeing different parts of the puzzle sometimes giving little regard for the overall outcome. It could be argued that this has led to less than adequate decision-making and a lack of understanding of past and present processes and Government expectations. This in turn leads to developing less than a whole-of-Government position to achieve the perceived outcomes.

For example, one of the parameters that the LDA operates under is to maximise revenue to Government while minimising residual risk to Government. The LDA provides a significant source of revenue to Government through land sales. Other directorates however may have other parameters to meet while including the need to implement Government policies.

TaMS has a management parameter to manage all the Government's assets. This includes managing the ever increasing asset base such as new roads, urban open space with Greenfield development.

Bushfire risk and the associated mitigation measures can have a significant impact on ecological, economic and social parameters. Since the 2003 Canberra bushfire, there has been a significant increase in the awareness and the delivery of bushfire mitigation measures across Government. This commenced immediately after the bushfire with changes to subdivision design and the introduction of edge roads and specific controls within asset protection zones both within the urban area and outside it. This has led to revisions of standards, guidelines, expectations and responsibilities both public and private.

It has also increased the responsibility of TaMS to manage a large proportion of the asset protection zones possibly to higher standards than was necessary before the bushfire.

TaMS has advised that the current system works on a process of seeking funding from Treasury for the implementation of the Bushfire Operations Plans [BOP] for all bushfire management works within the ACT.

A typical cross section at the urban/non-urban interface today would include:

- House asset protection zone – extending from the front of the residential block boundary into the suburb for distances up to 100m or more depending on risk and mitigating against ember attack. This requires housing design and construction (and landscaping) to meet specific Bushfire Attack Levels (BALs) under the Australian Standard A.S. 3959 – 2009 – ‘*Construction of Buildings in Bushfire Prone Areas*’ Management of this area lies partly with TaMS (public open space and roads including verges) and individual block owners.
- Inner asset protection zone – extends from the front of the residential block boundary to the edge of the urban/non-urban interface. Distances vary depending on risk and management requirements. A usual width would be a minimum of 30 to 40m and include significant infrastructure such as subdivision edge road, fire trail, stock proof fencing at the urban/non-urban interface, stormwater cut-off drains, hydraulic services for fire-fighting and street trees on the block side of the edge road. Management includes control of fuel loads by mechanical and hand slashing.

Management of this area lies with TaMS.

- Outer Asset Protection Zone [OAPZ] or Strategic Fire Advantage Zone [SFAZ] – extends into the non-urban area for some distance depending on risk and management requirements. These could be 100m to around 300m in width and contain fire trails to aid management.

In the case of the Molonglo River Park the Strategic Fire Advantage Zone includes most of the river corridor and covers an area of more than zzzzz hectares. The management of Kama and the land to the west and northwest of Denman Prospect adds zzzzz hectares of Strategic Fire Advantage Zone to the north-western edge of the Molonglo East precinct.

Management methods depend on fuel loads and may include slashing, hazard reduction burning, thinning of existing inappropriate vegetation, weed management, grazing or other ecological controls that ensures fuel loads are not exceeded during the fire season.

Management of this area lies with TaMS and may be on a private lease.

The development/management process that transforms rural land to urban land is typically set out below:

- Rural land and Canberra Nature Parks including Nature Reserves are managed by TaMS as the land custodian.
- LDA/EDD undertakes due diligence assessments to gain necessary approvals to clear the way to proceed to preparation of individual Estate Development Plans (EDPs) and gain budget approvals for the delivery of infrastructure associated with land delivery.
- LDA/EDD prepares EDP and capital works program. Note capital works may have started ahead of the EDP preparation by as much as a couple of years but may not be required to deliver some items for years after land development and block occupation is complete – i.e. staged infrastructure.
- Land custodianship transferred from TaMS to LDA usually prior to lodging EDP for approval.
- EDP lodged for final circulation and approval as a DA. Note EDP usually contains site specific Bushfire risk assessment. Note however that in the case of Molonglo Stages 2 and 3, the western edge and river corridor bushfire risk assessment is designed to cover the whole of the remaining development. In the meantime detailed design has commenced and readied for submitting to TaMS for design approval.
- DA approved by EPD followed by design approval by TaMS.

- Construction commences and includes the provision of bushfire mitigation measures.
- Blocks sold by the LDA but settlement is delayed until after consolidation is complete.
- Construction finishes and consolidation period commences.
- Consolidation period ends.
- Blocks in private ownership after settlement.
- Other areas handed back to Government (usually TaMS) for continuation of approved management including bushfire risk mitigation measures and management of public open space, roads and other land.
- TaMS prepares budget bids to maintain management on a year-by-year basis within the constraints of the ACT Government budget parameters.

There are a significant number of issues with the current process. In the case of development in the Molonglo Valley, these include:

- Lack of whole-of-Government approach to the expected outcomes for Molonglo Stages 2 and 3.
- Earlier NES Plan and Adaptive Management Strategy, while agreed with the Commonwealth, was not “road tested” to prove data or feasibility of implementation ahead of submitting to the Commonwealth.
- Difficult to get agreement on whole-of-Government outcome when part of TaMS is fast tracking the identification and protection of the river corridor and Kama Nature Reserve whilst imposing significant impacts and loss of developable land on EDD/LDA and consequently a loss of revenue to Government.
- Competing budget bids delaying or diluting funding for management of assets including bushfire mitigation obligations including the provision of resources.
- Diversion of budget funding to other competing priorities at both Treasury and TaMS levels.
- A partial solution could be that initial funding be provided by the LDA or a private developer for a period associated with construction timing for the implementation of management regimes but with a sunset clause on when TaMS would be required to take over responsibility, including funding of the bushfire protection measures.

For example, LDA or a private developer could construct and implement bushfire mitigation management regimes while land development is proceeding generally adjacent to the non-urban edge.

The issue is how long a time period would LDA or a private developer be practically required to fund and manage such an arrangement and when TaMS would be expected to take over. While this could be a set period of time, there is an issue when or if there is a slowdown in the private sector development or there is a reduction in the demand for new housing. This could mean that the LDA or a private developer would need to be involved for a longer period of time.

However, there is evidence that TaMS are not undertaking the necessary agreed management to estates. Crace has been in the public arena (Canberra Chronicle on 20 January 2015) with a heading “*Residents forced to weed median strips*”. In the article a TaMS spokeswoman is quoted as saying the directorate was assessing the maintenance of public open space in Crace to determine how to achieve a sustainable landscape that could be provided within the available budget. This has clear implications for on-going management issues across Canberra even after landscape designs are approved and the hand-over of assets to TaMS has been achieved.

- The issue of requiring bushfire mitigation management measures is not restricted to the Molonglo Valley – it encompasses on-going management at the edges of all development areas at the interface with the rural land use zone in Canberra. As the urban area expands so too does the bushfire mitigation management issue requiring increases in funding.

There are a number of funding options available to achieve the overall strategies and objectives of Government. These range from:

- **Maintaining the existing funding arrangements based on annual budget bids to Treasury** and competing against other bids/priorities within the directorates and then within Treasury and Government. This leaves Treasury in final control of management of bushfire mitigation measures and dependent on dividing up the Budget according to the policies and objectives of Government on a year by year basis. It does not allow the guarantee of prioritising critical management to protect residents and assets from bushfire risk.

Even when yearly funding is made available to directorates with management responsibilities, there is no guarantee in return to Treasury that all the available funding will be used against bushfire mitigation purposes. If this funding arrangement was to work satisfactorily, there would have to be a mechanism where Treasury would require a “cast iron” guarantee that the funding would be used for the allocated purpose.

This system of funding does not guarantee sufficient funding and resources are available to maintain fire protection measures to a level which reduces the risk to the public and emergency services and therefore exposes Government to future litigation.

- **Putting in place a funding arrangement where Treasury guarantees annual payments to undertake bushfire mitigation measures**, irrespective of other bids by directorates and Government.

Where the allocated guaranteed funding was not all used (because perhaps a lessening of bushfire risk did not require as much management work to be undertaken) any excess would be expected to be returned to Treasury.

However, there is a distinct risk that the subsequent year or years may require extra funding which would have to be guaranteed by Treasury regardless.

As part of the guarantee mentioned above, Treasury would be expected to demand, as a minimum, an agreed rolling bushfire mitigation management document for say a 5 year period to plan ahead for Budget predictions. This could be “signed off” by the responsible directorate after agreement at Directors-General level and possibly higher – Treasury and Chief Minister level agreement.

- **Setting up an environmental trust to manage the western edge and the river corridor in perpetuity** is a further model that warrants consideration.

The emergence of similar Trust arrangements both in Australia and overseas where commercial opportunities are married with land management priorities to support long-term conservation gains and cover reserve running costs, shows the level of community support for such an arrangement. This is being developed for use in the West Belconnen development in relation to the Murrumbidgee River Corridor.

There is already the Capital Woodlands and Wetlands Conservation Trust supporting management of 2 reserves in the ACT. Others include the Sky Rail Rainforest Foundation in Cairns and the Lake Cowal Foundation at Lake Cowal in NSW. There are other examples from New Zealand dealing with the Fiordland Conservation Trust and the Kea Conservation Trust.

The proposed West Belconnen Trust has as its pre-eminent objectives the conservation of natural values and bushfire fuel management. Other objectives include education, research, recreation, tourism and community involvement.

The West Belconnen Trust intends administration to be by a company, with a skills based board comprising Government, community and other relevant stakeholder representatives through a suitable committee structure. It will also deliver a staged approach to capital works within the corridor and earn annual income for its operations from, in the case of the ACT land, an annual contribution from the Government equal to those costs of managing the ACT portion of the corridor.

In a paper prepared for the West Belconnen development, the case to support an environmental trust draws on a number of common elements across government and/or private land. Those elements thought appropriate in the case of Molonglo western edge include:

- Formal protection in a state or territory managed conservation estate (eg 'National Park')
- Protection within state or territory owned lands primarily managed for other asset values (eg water catchments, state forests)
- Dedication to local government or similar authority for incorporation into an open space network (eg local reserves, recreation areas).

The paper argues that public land management agencies are continuously pressed and express public concern that they are expected to do more with fewer resources with no increase in funding.

A framework is needed that not only unifies corridor management (across the border in the case of West Belconnen) but also ensures its ongoing protection given that public agencies may be reluctant to shoulder the responsibility.

As pointed out in the paper, the ubiquitous and often-stated challenge in each of these models is securing funding for the long-term, 'in perpetuity' costs to maintain and in some cases enhance the biodiversity values for which the asset was originally protected.

The only secure way for the ACT Government to achieve the funding resource for the long-term, 'in perpetuity' cost to maintain bushfire protection to the community and enhance the biodiversity value is to introduce a 'bushfire management levy' on all blocks within existing, new and proposed suburbs which are exposed to a bushfire hazard.

This bushfire management levy should also be applied to blocks within suburbs that contain, or are adjacent to the Canberra Nature Parks.

The levy amount would be determined from a study which is tasked to investigate the costs involved in the provision of annual bushfire management works across the ACT with the funds raised held in trust by Treasury. The study should also investigate the resources required to undertake the annual management program and whether a separate management agency should be established.

The management of the Trust and fund distribution to Government Agencies [or separate management agency] shall be through the establishment of a Trust Board consisting of Treasury and senior members of the agencies with responsibility for the carriage of fire prevention, protection and management.

These agencies shall include but not limited to:

- Treasury;
- ESDD;
- LDA;
- ESA;
- TaMS;
- ACT RFS;
- Fire & Rescue ACT

For Molonglo 3, Denman Prospect and the Molonglo River corridor, the initial establishment of the recommended fire protection measures shall be funded by the developer of the land – i.e. LDA or private developer or joint venture partners with LDA.

The initial funding shall be made available for the construction and maintenance of fire trails and fire breaks, the provision of fencing and access gates and initial clearing and establishment of the Inner Asset Protection Zones.

LDA or the private developer shall provide initial funding to TaMS for hazard reduction and land management activities such as the establishment of the Strategic Fire Advantage Zones and Pink Trailed Worm habitats. Longer term funding of these works shall be provided from the Trust.

The ACT Government is ultimately responsible for the life safety of residents and emergency service personnel, irrespective of how the funding and management of the risk is achieved.



Graham Swain
Managing Director,
Australian Bushfire Protection Planners Pty Limited

**ATTACHMENT A – PLAN OF BUSHFIRE MANAGEMENT
STRATEGIES – KAMA– MOLONGLO 3 WESTERN EDGE.**

**ATTACHMENT B – PLAN OF BUSHFIRE MANAGEMENT STRATEGIES – DENMAN PROSPECT –
NORTH- WESTERN EDGE.**

ATTACHMENT C – PLAN OF BUSHFIRE MANAGEMENT STRATEGIES – RIVER CORRIDOR.

ATTACHMENT D – PLAN OF BUSHFIRE MANAGEMENT STRATEGIES – NORTHERN EDGE TO MOLONGLO 3.

ATTACHMENT E – PLAN OF BUSHFIRE MANAGEMENT STRATEGIES – EASTERN EDGE TO MOLONGLO 3.

APPENDIX A

**ANALYSIS OF VEGETATION
STRUCTURE & FIRE RISK**

WEST DENMEN PROSPECT

UMWELT

APRIL 2015

Aloisi, Angelina

From: ABPP <abpp@bigpond.net.au>
Sent: Tuesday, 19 May 2015 12:39 PM
To: Richardson, Dave; Santosuosso, Daniel
Attachments: B132154 - A - Molonglo Stage 3; Denman Prospect & Molonglo River Corridor ACT - LDA - 19.5.2015 - Section D.pdf; B132154 - A - Molonglo Stage 3; Denman Prospect & Molonglo River Corridor ACT - LDA - 19.5.2015 - Section A.pdf

Hi Dave/Dan – copy of the reformatted report attached. Two more separate sections to come,

Regards

Graham

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