

Appendix D Weed assessment



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Weed assessment - Jindee

Background

Westminster Estates Pty Ltd entered into an agreement in 2007 with the Western Australian Planning Commission and the City of Wanneroo (the Jindee Innovation Project Agreement) to undertake an innovative residential development on land owned by Westminster or under contract to Westminster, on Lot 9036 and Part Lot 3054 Marmion Avenue, Jindee (the site).

The Project involves the clearing of approximately 35 ha of potential foraging habitat for Carnaby's Cockatoos (Figure 1). The vegetation across the site is predominantly in good to excellent condition; however, areas are degraded and weeds have been introduced by unauthorised access of off-road vehicles.

Strategen was commissioned to undertake a vegetation assessment within the Project area to identify any exotic or weed species of flora occurring within areas of potential Carnaby's Cockatoo foraging habitat to determine if topsoil in these areas can potentially be used for future revegetation activities.

Scope and objectives

The scope of the vegetation assessment was to determine the potential value, if any, of the topsoil in areas of vegetation deemed to be potential Carnaby's Cockatoo foraging habitat for revegetation purposes in accordance with *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) approval 2012/6631.

The objectives of the vegetation assessment were:

- identify the species and density of weeds present in the areas of potential Carnaby's Cockatoo foraging habitat
- analyse results from the survey to determine the likely impact of using topsoil from areas of potential Carnaby's Cockatoo foraging habitat in revegetation works.



Figure 1 Location and extent of potential Carnaby's Cockatoo foraging habitat

Scale 1:15,000 at A4 0 50 100 150 200 250 Coordinate System: GDA 1994 MGA Zone 50 Note that positional errors may occur in some areas Date: 19/12/2013 Author: JCrute Source: Topography: Geoscience Australia 2011.

Legend Site bo



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Methods

The vegetation assessment was undertaken by two experienced ecologists from Strategen on 25 October 2013. Seven 10 m x 10 m vegetation quadrats were assessed within areas of potential Carnaby's Cockatoo foraging habitat inside the site. The site was also traversed by foot to determine if weed species distribution and density was consistent throughout the area.

Weed species recorded in the site assessment were evaluated using weed prioritising lists including the Weeds of National Significance (WoNS) and species declared under the *Biosecurity and Agriculture Management Act 2007* (BAM Act), with additional reference to the Swan Region Environmental Weed List (DEC 2009) and *Western Weeds* (Hussey et al. 2007).

Results

Vegetation condition (Keighery 1994) at each of the seven sites ranged from Good to Very Good (Table 1, Plate 1 to Plate 7). Most sites had some semblance of vegetation structure remaining, however all sites had varying densities of weed species present in the understorey (Table 1 and Table 2).

Weed density at each of the seven sites was quite variable (between 1.80% and 84.80% of groundcover vegetation). The most common weed taxa was **Lysimachia arvensis*, which was recorded at six of the seven sites. Weed species were observed to be present within the entirety of the site with areas close to disturbance having generally higher densities of these species than surrounding vegetation. Plate 8 shows that areas of low weed densities are not necessarily free from infestation, as even slight disturbance to native vegetation can lead to an increased prevalence of weed species. This is indicative of the soil within the Proposal Area containing a high density of exotic seeds/propagative material.

Site	GPS Location (GDA 94)	Vegetation Condition	Weed species density (% cover)
1	376218 6497983	Good	57.01
2	375932 6498186	Good	84.80
3	375310 6498190	Very Good	27.10
4	375355 6498363	Very Good	1.80
5	375336 6498424	Good	30.50
6	375250 6498650	Good	12.40
7	375682 6498410	Good	17.10

 Table 1
 Summary of vegetation assessment

A total of 20 weed species were recorded from the seven sites (Table 2). Site 1 recorded the most weed species (a total of 12 taxa) while Site 4, located on the mid slope of a dune, recorded the least (a total of three taxa). Most of the weeds recorded were from the grass (Poaceae) and daisy (Asteraceae) families, which contained 6 species and 5 species of weeds respectively within the seven sites.



Family	Species		Site								
Family	Species	1	2	3	4	5	6	7			
Asphodelaceae	*Trachyandra divaricata						х				
Aizoaceae	*Carpobrotus edulis					х		х			
Asteraceae	*Hypochaeris glabra					х		х			
	*Sonchus asper						х				
	*Sonchus oleraceus	х		х			х				
	*Ursinia anthemoides	х	х								
	*Wahlenbergia capensis	х									
Brassicaceae	*Brassica tournefortii	х						х			
Euphorbiaceae	*Euphorbia terracina	х	х	х				х			
Fabaceae	*Trifolium arvense	х	х			х		х			
Geraniaceae	*Geranium molle							х			
	*Pelargonium capitatum	х	х	х				х			
Iridaceae	Gladiolus caryophyllaceus	х									
Poaceae	*Aira caryophyllea							х			
	*Avena barbata	х	х					х			
	*Briza maxima	х									
	*Bromus diandrus	х			х	х		х			
	*Ehrharta calycina			х	х	х	х				
	*Lagurus ovatus		х								
Primulaceae	*Lysimachia arvensis	х		х	х	х	х	х			
TOTAL WEED SPE	CIES RECORDED	12	6	5	3	6	5	11			

Table 2 Weed species recorded by site

The status of weed species recorded during the site assessment under the BAM Act (DAF 2013) the WoNS list (AWC 2013) and using the DEC (2009) ranking is presented in Table 3. The life form and comments on relative invasiveness and control methodology are also included in Table 3. None of the weeds found in the site assessment are listed as Weeds of National Significance.





Plate 1 Site 1



Plate 2 Site 2





Plate 3 Site 3



Plate 4 Site 4





Plate 5 Site 5



Plate 6 Site 6





Plate 7 Site 7



Plate 8 Effect of disturbance – increased density of weed species



Species and			DEC assessment	1	Status	
common name	Life form	Ecological impact	Invasiveness	Feasibility of control	(WoNS, BAM Act)	Comment
* <i>Trachyandra divaricata</i> (Dune Onion weed)	Perennial herb	Moderate	Rapid	Low	Not listed	Major weed of coastal dunes. Seeds dispersed by wind and water.
*Carpobrotus edulis (Hottentot Fig)	Perennial herb	High	Rapid	Moderate	Not listed	Invasive primarily in coastal habitats. Can have strong negative impacts on germination, growth and reproduction of other species. Capable of directly smothering native flora, suppressing regeneration, outcompeting and/or hybridising with native <i>Carpobrotus</i> species.
* <i>Hypochaeris glabra</i> (Smooth Catsear)	Annual or perennial herb	High	Rapid	Low	Not listed	Common wed of lawns, horticultural areas, roadsides and bushland throughout the southwest.
*Sonchus asper (Rough Sowthistle)	Annual or biennial herb	Unknown	Rapid	Low	Not listed	Found on fertile, damp soils in disturbed areas across the southwest. Seeds spread by wind.
*Sonchus oleraceus (Common Sowthistle)	Annual herb	Unknown	Rapid	Low	Not listed	Widespread on roadsides, gardens and wasteland across the State, but most common in the southwest. Seeds spread by wind.
*Ursinia anthemoides (Ursinia)	Annual herb	Unknown	Rapid	Low	Not listed	Common, widespread weed of various habitats throughout the southwest. Seeds spread by wind.
*Wahlenbergia capensis (Cape Bluebell)	Annual herb	Unknown	Rapid	Low	Not listed	Widespread on roadsides, in woodlands and heaths on sandy soils and occasionally in gardens.
*Brassica tournefortii (Mediterranean Turnip)	Annual herb	High	Rapid	Low	Not listed	Aggressive weed of disturbed ground, roadsides, cultivation and seaside.
* <i>Euphorbia terracina</i> (Geraldton Carnation Weed)	Perennial herb	High	Rapid	Moderate	Not listed	Common and serious weed of grazing land, road verges, coastal heath and Tuart woodlands. Produces a very toxic milky sap when cut.
* <i>Trifolium arvense</i> (Haresfoot Clover)	Annual herb	Unknown	Unknown	Low	Not listed	Found in low rainfall areas and is well adapted to low fertility soils. Seed and fruit have no specialised dispersal mechanism.
*Geranium molle (Dove's foot Cranesbill)	Annual or perennial herb	Low	Moderate	Low	Not listed	Common in wasteland, roadsides and occasionally on pastures.
*Pelargonium capitatum (Rose Pelargonium)	Shrub	High	Rapid	Moderate	Not listed	Major weed of <i>Banksia</i> woodland and coastal heathland. Seed dispersed by wind or animal movement.

 Table 3
 Weed species life form, status and comment on invasiveness and spread

Weed assessment - Jindee

Species and		DEC assessment			Status		
common name	Life form	Ecological impact	Invasiveness	Feasibility of control	(WoNS, BAM Act)	Comment	
* <i>Gladiolus caryophyllaceus</i> (Wild Gladiolus)	Perennial herb	High	Rapid	Moderate	Not listed	Increasingly common in urban bushland and Banksia woodlands of the Swan Coastal Plain. Spreads through seeds and corms.	
*Aira caryophyllea (Silvery Hairgrass)	Annual grass	Unknown	Unknown	Low	Not listed	Very common weed of pastures on poor soils and many types of bushland in southern Western Australia.	
* <i>Avena barbata</i> (Bearded Oat)	Annual grass	High	Rapid	High	Not listed	Very common weed of roadsides, wasteland and disturbed bushland across the southwest. Seeds spread by attaching to fur or feet of animals.	
* <i>Briza maxima</i> (Blowfly Grass)	Annual grass	Unknown	Rapid	High	Not listed	Widespread, common weed of wasteland, granite rocks, wetlands and woodlands of the southwest.	
* <i>Bromus diandrus</i> (Brome Grass)	Annual or perennial grass	High	Rapid	High	Not listed	Widespread and serious weed of wetlands, roadsides, crops, pastures and bushland of the southwest.	
*Ehrharta calycina (Perennial Veldt Grass)	Perennial grass	High	Rapid	Moderate	Not listed	Widespread weed of roadsides and bushland on sandy soils in the southwest. One of the most serious bushland weeds of the Swan Coastal Plains and a significant fire hazard.	
* <i>Lagurus ovatus</i> (Hare's Tail Grass)	Annual grass	High	Rapid	Low	Not listed	Common weed of sandy soils in the southwest.	
* <i>Lysimachia arvensis</i> (Pimpernel)	Annual herb	Unknown	Rapid	Low	Not listed	Occasional wed of horticulture, crops and pastures; widespread in gardens, paddocks and disturbed bushland throughout the southwest.	

Sources: AWC 2013, Hussey et al. 2007, DAF 2013, DEC 2009, DPaW 2013

Conclusions

The high density of weeds within the Project area indicates that soil in this area is likely to contain a significant weed seed load. There is a very high probability that any soil transported from these areas will contain seeds, bulbs or corms of a variety of weed species, including the 20 taxa recorded in this assessment. While weed density was quite variable throughout the Project area, it was observed (as can be seen in Plate 8) that any disturbance to native vegetation will lead to an increase in weed density as a result of opportunistic succession. As the Project area is also frequented by native and introduced animals, particularly Kangaroos and cats, it is feasible to assume that propagative material from weed species will have been distributed throughout the site.

References

- Australian Weeds Committee (AWC) 2013 Weeds of National Significance [Online]. Commonwealth of Australia. Available online: http://www.weeds.org.au/WoNS/ [October 2013].
- Hussey BMJ, Keighery GJ, Dodd J, Lloyd SG & Cousens RD 2007 Western Weeds: A guide to the weeds of Western Australia, second edition. The Weeds Society of Western Australia, Victoria Par, Western Australia.
- Department of Agriculture and Food (DAF) 2013 Western Australian Organism List [Online]. Government of Western Australia. Available online: http://www.biosecurity.wa.gov.au/western-australian-organism-list-waol [October 2013].
- Department of Environment and Conservation (DEC) 2009 DEC Swan Region Environmental Weed List, [Online]. Government of Western Australia. Available online: http://www.dec.wa.gov.au/management-and-protection/plants/invasive-plants/invasive-plantprioritisation-process.html?showall=&start=1 [October 2013].
- Department of Parks and Wildlife (DPaW) 2013, *Florabase*, [Online], Government of Western Australia, Available from: http://florabase.dec.wa.gov.au/ [October 2013].
- Keighery B 1994, *Bushland plant survey: a guide to plant community survey for the community*, Wildflower Society of Western Australia, Perth, Western Australia.





Appendix E Fire Hazard Assessment

Town Planning Management Engineering



JINDEE ESTATE Estates Development Company Fire Hazard Assessment



Research, Design & Delivery of Sustainable Development

12135 SEPTEMBER 2012

Project Management Planning Geotechnical Environmental Engineering



Town Planning Management Engineering Pty Ltd.



DOCUMENT CONTROL

Project Number:12135Project Name:Jindee Estate Fire Hazard AssessmentAuthor:Geoffrey LushDate Created:10th September 2012

Disclaimer

The measures contained in this report do not guarantee that a dwelling will not be damaged in a bush fire. The ultimate level of protection will be dependent upon the design and construction of the dwelling and the level of fire preparedness under taken by the landowner. The severity of a bush fire will depend upon the vegetation fuel loadings; the prevailing weather conditions and the implementation of appropriate fire management measures.

REVISION TABLE

Revision	Date	Purpose Issued For
Α	17 Sept 2012	First draft
В	25 Sept	Text revisions and plan updates

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1.0 Background

1.1 Introduction

TME Town Planning, Management, Engineering Pty Ltd has been engaged by Estates Development Company Pty Ltd to prepare a bush fire hazard assessment for the proposed Jindee Local Structure Plan.

The purpose of this report is to provide a broad hazard assessment of the site and to identify relevant bush fire management issues which need to be addressed in the implementation of the structure plan and subdivision design.

The Jindee Estate is located on Marmion Avenue approximately 37 km north of the Perth Central Business District in the North West Corridor, and 14 km north-west of Joondalup City Centre, as shown in Figure 1.

The subject land has a total area of 112 hectares and is comprised of:

- Lot 9036 DP 70682;
- Part Lot 3054 DP 47953; and
- Reserve 11929.

It has a frontage of approximately 800 metres to the Indian Ocean and 1,412 metres to Marmion Avenue.

The assessment of the bush fire hazard may be undertaken at a number of stages in the planning process including: 1

- a) At the local planning scheme review or structure plan stage over areas in a local planning scheme or structure plan stage where a change to the existing situation is being proposed (eg new development areas);
- b) At a localised level to support an individual rezoning, subdivision or development application; or
- c) At a localised level (at the construction stage) to determine construction standards under AS 3959.

As part of the preparation of the Jindee Local Structure Plan it is necessary to have regard to fire management issues. This will ensure the promotion and integration of fire management as a key element of the subdivision design in balance with environmental, landscape, community and residential objectives.



Figure 1 Location Plan

¹ FESA (2010) *Planning for Bush Fire Protection Guidelines* – Page 4



The project has had a long history which is summarised as:

- 1992 Zoning of Jindee- Land to 'Urban';
- 1996 Enquiry by Design Workshop;
- 2002 Jindee Charrette;
- 2004 Jindee Implementation and Design Workshop;
- 2006 Butler-Jindalee District Structure Plan;
- 2007 Jindee Innovation Agreement; and
- 2011 Metropolitan Region Scheme Amendment 1152/41.

1.2 EPA Assessment

The EPA advice on the Jindalee (Jindee) Foreshore Rationalisation and associated Region Scheme Amendment in May 2008 states that:

Remnant vegetation & fauna

The EPA supports Metropolitan Region Scheme Amendment 11 52/41 on the basis that the two areas of Parks. and Recreation (P&R) reserve are being provided to offset the area of foreshore P&R reserve (Bushforever Site No. 397) proposed to be zoned Urban. The two P&R reserves will be linked with native vegetation retained on private lots. The linkage is to ensure that the ecological function of the eastern portion of P&R is retained. Without the vegetated linkage the EPA does not consider the proposed P&R to be an adequate offset for the reduce foreshore reserve.

The issue of ecological linkage was deferred to ensure that an adequate mechanism is put in place during later stages of planning that will retain and protect the vegetation between the foreshore and inland area of Parks and Recreation. The LSP includes the area that will accommodate this ecological link within the area referred to as the Protected Natural Living Area or southern T2 zone.

Scheme Amendment No. 115 to District Planning Scheme No. 2 introduces provisions for the southern T2 zone to address the EPA's conservation objectives for this ecological link (as set out in MRS Amendment 1152/41). The EPA was satisfied with these provisions and determined that Amendment 115 could proceed to advertising without formal environmental assessment.

The Environmental Assessment report² states that the objective for the protection of southern T2 "Protected Natural Living Area" will be:

To retain a continuous vegetated link through private land between the Trig Point Reserve and the Foreshore Reserve to assist in the maintenance of the ecological function of the Trig Point Reserve.

1.3 Potential Legislative Changes

As a result of the 2011 bush fires in Perth, Toodyay, Lake Clifton and Margaret River, the State Government has formed an Implementation Group which is developing a program to consider and implement the recommendations from the Keelty Report.³

Of relevance to the project is the potential:

- Formal designation of bush fire prone areas by the Western Australian Planning Commission;
- Giving statutory effect to FESA's Planning for Bush Fire Protection Guidelines;
- Reinforcing the application of State Planning Policy 3.4 Natural Hazards.

³ Keelty M (2011) A Shared Responsibility – The Report of the Perth Hills Bushfire February 2011 Review Government Printer Perth



² RPS Environment and Planning Pty Ltd (2012) Environmental Assessment Summary Local Structure Plan Lot 9036 and Part Lot 3054 Marmion Avenue, Jindee Page 23.



The designation of bush fire prone areas is required in order to trigger the application of Australian Standard AS3959 (2009) Construction of Buildings in Bushfire Prone Areas through the Building Code of Australia (BCA) and Western Australian Building Regulations 2012.

It is expected that within the next six months that these matters will be formalised and the drafts released for public comment.

2.0 Description of the Area

2.1 Land Use

The site is vacant with no current active use. It is predominantly covered with remnant vegetation apart from localised areas of clearing associated with tracks and off-road vehicle routes.

Surrounding land uses to the south and east of the site include the residential estates of Quinns Rock, Brighton and Butler. The land to the north is presently being developed for urban purposes as part of the north western metropolitan corridor.

There is a Trig Point in the south east portion of the site on Reserve 11593.

The existing conditions are shown in Figure 2.



Figure 2 Existing Conditions





2.2 Climate

The locality has a Mediterranean climate, which is characterised by hot dry summers and mild wet winters. The mean maximum temperature ranges from 18.C in July to 30.4C in February. The mean minimum temperature ranges from 9.7C in July to 18.6C in February.⁴ There is an annual average rainfall of 719 mm.

The wind direction at 9:00am is generally from the east and between 20 - 30 kph. At 3:00pm the wind direction is generally from the south west and between 20 - 30 kph.

2.3 Topography

The topography of site consists of coastal dunes and undulating limestone ridge terrain. It is dominated by two east west dunal ridges with a central valley between them. The lowest elevation is 13 metres AHD towards the foreshore frontage. The land rises to 56 metres AHD at Trig Point in the south east of the site.

The site's topography is shown in Figure 3.

Slopes on the site are variable and range up to 14 degrees (25 percent).



Figure 3 Topography

⁴ Bureau of Meteorology – Swanbourne Weather Station



2.4 Vegetation

RPS Environment and Planning Pty Ltd have undertaken a flora survey of the site⁵. Twelve vegetation units were identified within the site and these are described as follows and shown in Figure 4.

- MhSp *Melaleuca huegelii, Spyridium globulosum* Closed Heath on shallow limestone.
- McSp *Melaleuca cardiophylla, Acacia rostellifera, Spyridium globulosum, Olearia axillaris, Acacia saligna* Closed Tall Scrub/Closed Heath in swales and lower slopes.
- AsLSg *Acacia saligna, Spyridium globulosum, Olearia axillaris* Shrubland/Open Shrubland over *Pelargonium capitatum, Melaleuca systena* Open Low Heath over *Lomandra maritima* Sedgeland.
- Ef *Eucalyptus foecunda* Closed Shrub Mallee over *Acacia saligna* Shrubland over *Scaevola ?globulifera* Low Shrubland over *Anagallis arvensis* Herbland.
- XpAs Xanthorrhoea preissii, Spyridium globulosum, Acacia saligna Tall Open Scrub/Open Heath over Leucopogon propinquus, Melaleuca systena Open Shrubland over Lomandra maritima, Lepidosperma squamatum Open Sedgeland.
- AhSg *Alygogyne hakeifolia, Scaevola globufifera* Closed Heath/Closed Low Heath over *Conostylis paucifora* Very Open Heath.
- B Banksia attenuata, B. menziesii Low Woodland over Dryandra sessilis, Macrozamia riedlei Scattered Shrubs over Rhagodia baccata, Hibbertia hypericoides, Leucopogon polymorphus Low Open Shrubland. B1 Banksia attenuata, Banksia menziesii Low Woodland over Trachyandra divaricata Closed Herbland.
- D Dryandra sessilis Closed Tall Scrub over Macrozamia riedlei Scattered Shrubs over Hibbertia hypericoides, Jacksonia calcicola Low Shrubland.
- DsSg Dryandra sessilis Shrubland to Tall Closed Scrub over Xanthorrhoea preissii Scattered Shrubs over Jacksonia calcicola, Hibbertia hypericoides, *Pelargonium capitatum Low Open Shrubland over Trachymene pilosa, *Anagallis arvensis, *Arctotheca calendula Herbland.
- Mixed Acacia truncata, A. cochlearis, Spyridium globulosum, Olearia axillaris Closed Shrubland over Lepidosperma gladiatum Sedgeland/Open Sedgeland with lianes of Hardenbergia comptoniana. Contains a variety of shrubs and herbaceous plants.
- P Pyrosere communities, consisting largely of *Dryandra sessilis, Acacia pulchella, Hibbertia hypericoides* Closed Heath/Closed Low Heath.
- Sg *Spyridium globulosum* Closed/Open Heath over **Trachyandra divaricata, Trachymene pilosa, Conostylis pauciflora* ssp. Herbland.

The above vegetation descriptions were defined using the height and estimated foliage cover of dominant species of each stratum based the categories in Table 1.⁶

The vegetation is typical of the coastal environment and it ranges from "Very Open Herbland" to "Closed Tall Scrub" with both native and introduced species. This includes Lomandra sedgeland, Dryandra sessilis (Parrot Bush), Xanthorrhoea preissii (Grass Tree), Melaleuca, Acacia and Banksia.

The vegetation classifications shown in Table 1 are relevant to the assignment of the bush fire hazard rating and also the Bushfire Attack Level.

⁶ Keighery B (1994) *Bushland Plant Survey Wildflower of WA (Inc)* Table 3 Page 35



⁵ RPS Bowman Bishaw Gorham (2006) Lot 10 Jindee Vegetation and Flora Survey



Life form/height		Canopy Cover (percentage)					
class	100 – 70%	70 – 30 %	30 - 10%	10 – 2 %			
Trees over 30m	Tall closed forest	Tall open forest	Tall woodland	Tall open woodland			
Trees 10 – 30m	Closed forest	Open forest	Woodland	Open woodland			
Trees under 10m	Low closed forest	Low open forest	Low woodland	Low open woodland			
Tree Mallee	Closed tree Mallee	Tree Mallee	Open tree Mallee	Very open tree Mallee			
Shrub Mallee	Closed shrub Mallee	Shrub Mallee	Open shrub Mallee	Very open shrub Mallee			
Shrubs over 2m	Closed tall scrub	Tall open scrub	Tall shrubland	Tall open shrubland			
Shrubs 1 – 2m	Closed heath	Open heath	Shrubland	Open shrubland			
Shrubs under 1m	Closed low heath	Open low heath	Low shrubland	Low open shrubland			
Grasses	Closed grassland	Grassland	Open grassland	Very open grassland			
Herbs	Closed herbland	Herbland	Open herbland	Very open herbland			
Sedges	Closed sedgeland	Sedgeland	Open sedgeland	Very open sedgeland			

Table 1 Vegetation Classification

Scrub and shrubland vegetation within the site.









2.5 Access

The primary access to the site is from Marmion Avenue which is a district main road.

Secondary access to the southern boundary is provided by both Roundhouse Parade and Maritime Drive. These are both local subdivision roads.

There are a number of unconstructed tracks within the site which are used by off road vehicles and to gain access to the beach.

2.6 Water Supply

As the site is undeveloped there is no reticulated water supply. A Water Corporation public water supply bore is located within Lot 9036 near Marmion Avenue.







3.0 Policy Framework

3.1 Emergency Management

Emergency management in Western Australia is based upon four principal components prevention, preparedness, response and recovery. The State Emergency Management Plan for Bushfire ⁷, summaries these as follows:

Prevention and Mitigation

Prevention activities eliminate or reduce the probability of occurrence and impact of bushfire.

Preparedness

Preparedness activities focus on essential emergency response capabilities through the development of plans, procedures, organisation and management of resources, training and public education.

Response

Response activities combat and contain the effects of the event, provide emergency assistance for casualties, help reduce further damage and help speed recovery operations. The highest priority in any response activity will be given to the preservation and protection of human life.

Recovery

Recovery activities, support emergency affected communities in reconstruction of the physical infrastructure and restoration of emotional, social, economic and physical wellbeing.

The main elements of the emergency risk management process are to establish the context, identify risks, analyse risks, evaluate risks (including acceptability of residual risk) and treat risks. Underpinning the process is a requirement for communication and consultation, as well as monitoring and review.8 The approaches used to manage risk can include:-

- Risk avoidance by, for example, controlling where development occurs;
- Modifying the risk by, for example, using building design and construction guidelines:
- Spreading the risk by raising community awareness; and
- Managing the environment by, for example, fuel reduction and maintenance programs.

Hence emergency management must address both the physical elements of the subdivision design and the social issues and community preparedness and self reliance.

3.2 SPP 3.4 Natural Hazards and Disasters

Statement of Planning Policy 3.4 Natural Hazards and Disasters applies to the fire management of the proposed development. It will be considered by the Western Australian Planning Commission in the assessment of structure plans, amendments to Town Planning Schemes and subdivision applications.

The policy is based upon the principles contained in the report Planning Safer Communities prepared by Emergency Management Australia.⁹ It applies the principles of emergency risk management to land use planning. Land use planning can play a key part in reducing current and future community risk. This was also a key finding of the National Inquiry on Bushfire Mitigation and Management¹⁰ which stated that:-

"The Inquiry supports the view, expressed in Natural Disasters in Australia, that land use planning that takes into account natural hazard risks is the single most important mitigation measure for preventing future disaster losses (including from bushfires) in areas of new development. Planning and development controls must be effective, to ensure that inappropriate developments do not occur."

The main elements of the emergency risk management process are to establish the context, identify risks, analyse risks, evaluate risks (including acceptability of residual risk) and treat risks.

¹⁰ Ellis, S, Kanowski, P & Whelan, (2004) Op.cit - Page 92.



⁷ State Emergency Management Committee (2010) Op.cit- Page 11

⁸ Emergency Management Australia (2002) Planning Safer Communities – Land Use Planning for Natural Hazards Canberra, Emergency Management Australia Page 16

⁹ Emergency Management Australia (2002) Op.Cit



In relation to Bush Fires the statement of planning policy incorporates by reference the provisions and requirements contained in the Planning for Bush Fire Protection guidelines (2010).

3.3 **Planning for Bush Fire Protection**

Planning for Bush Fire Protection (FESA & WAPC - 2010) is the principal reference document in Western Australia for fire management in subdivisions and related development in rural and in urban/rural communities.

Planning for Bush Fire Protection promotes five key principles which are summarised below:

- Principle 1 Bush fire hazards must be considered in planning decisions at all stages of the planning process to avoid increased fire risk to life and property through inappropriately located or designed land use and development.
- Principle 2 Local governments are to identify bush fire hazard levels in their structure plans, local planning strategies and local planning schemes, based on the bush fire hazard assessment methodology in the guidelines.
- Principle 3 Subdivision and development in areas with an extreme bush fire hazard level or a bush fire attack level between BAL- 40 and BAL- FZ, is to be avoided unless specific fire protection requirements can be implemented to the satisfaction of the WAPC, FESA and/or the local government.
- Principle 4 In areas with an extreme bush fire hazard level where more intensive subdivision/development is considered unavoidable, permanent hazard reduction measures need to be implemented to reduce the hazard level to low or moderate or bush fire attack levels between BAL- Low and BAL- 29.
- Principle 5 Structure plans, subdivision and development in areas with a moderate to extreme bush fire hazard level needs to be supported by an assessment of the bush fire risk and compliance with the performance criteria and acceptable solutions set out in these guidelines.

The guidelines contain a set of performance criteria and acceptable solutions that new subdivision and developments are required to meet in bush fire prone areas. The main elements relate to:

- 1.0 Location
- Hazard rating 2.0
 - Vehicular Access
 - Two access routes
 - Public road design
 - **Cul-de-sacs**
 - **Battleaxes**
 - **Private driveways**
 - **Emergency accessways**
 - Fire access routes
 - Gates
 - **Firebreaks**
 - Signs

- 3.0 Water Supply
 - **Reticulated areas**
 - Non reticulated areas
 - Dams
- Siting of Development 4.0
 - Hazard separation zones
 - **AS3959 construction standards**
 - **Building protection zones**
 - Shielding
- **Design of Development** 5.0
 - **Compliant development**
 - Non compliant development





3.4 Australian Standard AS3959 (2009)

AS3959 Construction of Dwellings in Bush Fire Prone Areas¹¹ contains the principles used in the formulation of FESA's Planning for Bush Fire Protection. The Standard provides a framework for balancing the risks associated with the ember attack, radiant heat and flame attack with the standard of construction required. The lower the separation from bushfire prone vegetation, the higher the standard required for design and materials.

The revised AS3959 was approved nationally in March 2009 and the Building Code of Australia (BCA) was modified in 2010. In order for the standard to be applied via the BCA it requires the land to be in a designated bushfire prone area.

Designated bushfire prone area means land:

- (a) that has been designated under legislation as being subject to bushfires;
- (b) that has been identified as being subject to bushfires under a planning scheme or development approval, or
- (c) is in an area that the State or Territory administration or municipal council considers may be subject to bushfire attack.

The revised standard provides for:-

- Construction requirements designed to maximize the performance of buildings when subjected to bushfire attack; and
- Requirements for the construction of buildings in bushfire-prone areas in order to improve their performance when they are subjected to burning debris, radiant heat and flame contact.

The construction requirements relate to:-

- Subfloor Supports;
- Floor;
- External Walls;
- External Elements and Doors
- Roofs;
- Verandas, Decks, Steps; and
- Water and gas pipes.

The six categories of Bushfire Attack Levels (BAL) are:

- BAL Low The risk is considered to be very low and does not warrant any specific construction requirements.
- BAL 12.5 The risk is considered to be low but there is still a risk of ember attack.
- BAL 19 The risk is considered to be moderate. There is risk of ember attack and burning debris by wind borne embers and a likelihood of exposure to radiant heat.
- BAL 29 The risk is considered to be high. There is an increased risk of ember attack and burning debris by wind borne embers and a likelihood of exposure to an increased level of radiant heat.
- BAL 40 The risk is considered to be very high. There is a much increased risk of ember attack and burning debris ignited by wind borne embers and a likelihood of exposure to a high level of radiant heat and some likelihood of direct exposure to flames.
- BAL FZ The risk is considered to be extreme. There is an extremely high risk of ember attack and burning debris ignited by wind borne embers and a likelihood of exposure to an extreme level of radiant heat and direct exposure to flames.

FESA does not recommend BAL 40 and BAL FZ as being suitable for Western Australia as these allow dwellings to be constructed in very close proximity to the vegetation hazard.

¹¹ Standards Australia (2009) AS 3959 – Construction of Buildings in Bush Fire Prone Areas. Sydney. Standards Australia International Ltd.





3.5 City of Wanneroo Fire Break Notice

The principal method for implementing fire measures on developed land is through Council's annual Fire Break Notice. This Order is made pursuant to Section 33 of the Bush Fires Act 1954 and it requires the occupiers of all land to undertake fire prevention work as set out in the notice.

Council's annual firebreak notice requires that:

1. Land having an area of 2,000m² or more

A firebreak not less than 3 metres wide and 3 metres high immediately inside and around all external boundaries of the land must be cleared.

2. Land having an area of less than 2,000m2

A firebreak not less than 2 metres wide and 2 metres high immediately inside and around all external boundaries of the land must be cleared

Where it is impractical to comply with these provisions, a landowner can apply to Council for alternative measures to be approved.





4.0 Proposed Development

The shared vision for Jindee is to promote the creation of a community lifestyle and village which promotes the surrounding beach and underlying landscape values as an alternative to the conventional subdivision pattern contributing to the urban sprawl prevalent along the Perth coastline.

The project will ultimately yield approximately a minimum of 1,300 dwellings for approximately 2,600 residents. It will include a Coastal Village commercial centre; primary school; 6 hectares of Regional Open Space and 10 hectares of Local Open Space.

There are three inter-related tiers of provisions and controls which will be applied to the development being:

- Jindee related District Planning Scheme provisions;
- Local Structure Plan; and
- Detailed Area Plans.

The draft structure plan is shown in Figure 5 (over page) and the land use categories are described as follows:

- <u>T1 Natural Reserve</u> contains Metropolitan Region Scheme Parks and Recreation reservations.
- <u>T2 Natural Living</u> consists of lots between 600 3,000sqm, designed to enable the retention of the natural features such as vegetation or topography. These areas are more 'natural' in character' than 'sub-urban' or 'urban' and will predominantly be detached dwellings.
- <u>T3 Sub-Urban</u> sub-urban in character, consisting of low density residential areas, adjacent to higher zones that contain some mixed use. Medium to larger sized lots accommodating dwellings and landscaped gardens.
- <u>T4 General Urban</u> consists of medium-density residential and a wide range of building types including terraces, detached dwellings and apartments. Has a more formal character including reduced setbacks, raised kerbs and regular planting. Development will be a mixture of building types: including detached dwellings, terraces and mixed use buildings
- <u>T5 Urban Centre -</u> urban in character, consisting of higher density mixed use buildings set close to wide footpaths and a tight network of streets. Development will be predominantly apartments and mixed use buildings.
- <u>T6 Urban Core</u> consists of the highest density and height, with the greatest variety of uses and civic buildings of regional importance. It has larger blocks and buildings are set close to streets. Development will predominantly be multi story apartments, commercial buildings and mixed used buildings.

The proposed lot sizes are as follows:

	T2 Natural Living	T3 Sub Urban	T4 General	T5 Urban	T6 Urban
	_		Urban	Centre	Core
Lot Area	600m ² min.	180m ² min.	180m ² min.	180m ² min.	180m ² min.
	$3,000m^2$ max.	1,500m ² max.	1,200m ² max.		
Lot	Defined building	75% max.	90% max.	90% max.	95% max.
Coverage	envelopes in DAP				







The structure plan design provides for a nature reserve at the high point on the site. This will be linked to the coastal parkland by larger residential lots which retain remnant vegetation. This linkage is referred to as the southern T2 Natural Living area and it occupies approximately 12.5 hectares.

The Amendment will introduce Schedule 16 into the Scheme and this schedule contains the smart growth community zone provisions. Clause 1.2 of Schedule 16 states that in order to protect the landform and vegetation within the Protected Natural Living Area, the following environmental requirements shall apply:

- (a) The two Metropolitan Region Scheme Parks and Recreation reservations will be linked with native vegetation retained on private land.
- (b) Building envelopes and building zones for residential development will be established in the applicable Detailed Areas Plan.
- (c) The total area occupied by all building envelopes shall not comprise more than 30% of the total land area of the Protected Natural Living Area. The 'land area' shall be defined as the Protected Natural Living Area less thoroughfare reserves and civic spaces.
- (d) No development shall occur in the Protected Natural Living Area unless there is an approved Detailed Area Plan for the area being developed or a Development Approval.
- (e) Development can only occur within the agreed building envelopes, building zones, thoroughfares and civic spaces.
- (f) For the avoidance of doubt, clearing or disturbance of native vegetation can only occur within the agreed building envelopes, building zones, thoroughfares and civic spaces.
- (g) All services and access to the principal building and/or outbuilding will be undertaken within the nominated building zone only and involve minimum native vegetation clearing.
- (h) Any areas of native vegetation outside the building zone and building envelope that are damaged during construction will be rehabilitated to the satisfaction of the Council after installation of services or construction as the case may be.
- (i) Appropriate fencing will be detailed as part of the applicable Detailed Area Plan and shall allow, as far as practical, a corridor to assist the free passage of reptiles between the two regional reserves.

As provided for in the Part 1 provisions, the fire management plan will be prepared and approved prior to a DAP or subdivision being approved for land abutting the Parks and Recreation reserves or for lots within the southern T2 Natural Living area. It is necessary to defer the preparation of the fire management plan until this time, as bushfire hazard levels will be dependent on the characteristics of vegetation retained within the southern T2 Natural Living area.





5.0 Bush Fire Hazard Assessment

5.1 Undeveloped Land

The classification of the bush fire hazard in Planning for Bushfire Protection is based upon the existing vegetation in the undeveloped site. It classifies the existing vegetation based on tree height and the percentage of canopy cover.

The characteristics ¹² of the different hazard categories are:-

1 Low hazard areas will generally be:

- areas devoid of standing native vegetation (less than 0.25 ha cumulative area);
- areas which due to climatic or vegetation (eg rainforest) conditions, do not experience bush fires;
- inner urban or suburban areas with maintained gardens and very limited native standing vegetation (less than 0.25 ha cumulative area); or
- pasture or cropping areas with very limited native standing vegetation that is a shrubland, woodland or forest.

2 Moderate hazard areas will generally be:

- areas containing pasture or cropping areas with slopes in excess of 10°;
- open woodlands;
- open shrublands;
- low shrubs with slopes of less than 10° or flat land; or
- suburban areas with some native tree cover.

3 Extreme hazard areas will generally be forests; woodlands or tall shrubs.

Figure 6 shows the fire hazard rating for the subject land based upon the above classifications and in summary:

- The cleared areas and existing residential development are classified as having a low fire hazard rating;
- The semi cleared area as having a moderate fire hazard rating; and
- The vegetated areas of the site and surrounding areas are classified as having a moderate to extreme fire hazard rating.

The general principles within the Planning for Bush Fire Protection Guidelines contain a presumption against development in areas with an "extreme" bush fire hazard rating.

Guidance Statement A3 stipulates that in areas with an extreme bush fire hazard level that developments which are considered unavoidable will only be approved where it can be demonstrated that acceptable, permanent hazard reduction measures can be implemented to reduce the hazard to an acceptable level. This should include appropriate building protection zone, hazard separation zone and construction of dwellings to an appropriate standard as specified in AS3959.

While the hazard assessment relates to the undeveloped land and the final fire management measures must have regard to the proposed development and its relationship to the surrounding location.

¹² FESA (2010) Op.cit. Page 18 Appendix 1: Methodology for Determining Bush Fire Hazard Level.





AREAS, CONTOURS AND DIMENSIONS SHOWN ARE SUBJECT TO SURVEY



5.2 Developed Land

The bush fire hazard in the completed development relates to the existing vegetation and the planting of new vegetation.

The developed site (see Figure 5) will retain areas of remnant vegetation both within the MRS Parks and Recreation reservations and the southern T2 Natural Living area. The local Public open Spaces areas will also be subject to landscaping. The southern T2 Natural Living area will be the subject to the preparation of an Environmental Management Plan.

The vegetation/landscaped areas within a development can be generally classified as follows:

1 Conservation Bushland	This is typically remnant vegetation with potentially high fuel loads and ground litter. There may be little vegetation management and the area can become infested with weeds. There is unlikely to be open spaces and the level of maintenance will vary.
2 Managed Bushland	Remnant bushland with a modified understorey. There may be periodic vegetation management including fuel reduction. The management will mean that there is generally greater public access with some clearings to create passive and active open spaces
3 Exotic Landscape	The native vegetation has been largely cleared and replaced with low flammability or imported species, deciduous trees, lawns and open spaces.
4 Parklands	Highly managed landscape which may contain native plantings. Will contain open spaces, pathways and playgrounds. Understory vegetation is likely to be replaced by other ground treatments including xeriscape techniques or plantings in selected locations.

Figure 7 shows the indicative hazard rating of the developed land. The key issues arising from this are:

- 1. The majority of the site will have a low fire hazard as the existing hazard will be permanently removed as the land will is cleared for development;
- 2. The MRS Parks and Recreation reservations are likely to remain as a moderate to extreme bush fire hazard;
- 3. Development within 100m of the MRS Parks and Recreation reserves will potentially need to be constructed in accordance with Australian Standard AS3959;
- 4. The southern T2 southern Natural Living area is likely to a moderate bush fire hazard because of the management of the land and the fragmentation due to roads, driveways, building sites, fences and services;
- 5. The subdivision design within the southern T2 Natural Living area will have to comply with the provisions of the Planning for Bush Fire Protection Guidelines;
- 6. Development within southern T2 Natural Living area will need to be constructed in accordance with Australian Standard AS3959; and
- 7. The major Public Open Space reserves will need to be subject to further assessment of the landscaping design in order to determine if there will be any associated bush fire hazard.





FIGURE 7 INDICATIVE FIRE HAZARD DEVELOPED SITE

THIS PLAN HAS BEEN PREPARED FOR PLANNING PURPOSES AREAS, CONTOURS AND DIMENSIONS SHOWN ARE SUBJECT TO SURVEY

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6.0 Planning for Bush Fire Protection Guidelines

The Planning for Bush Fire Protection Guidelines require that applications for rezoning, subdivision and related development should reflect the level of risk identified for the area and address the compliance of the proposal with the relevant performance criteria and acceptable solutions, as specified in the guidelines.

The Guidelines state (page 2) that they are not intended to be enforced retrospectively on existing development in established urban areas, existing townsites or existing subdivisions. The subject land is within an existing townsite boundary and will be developed as an urban area as will the surrounding land. As indicated in Section 1.1 the subject land has been zoned for residential development since 1992.

The Guidelines also indicate that there is a duty of care on decision making authorities to have regard to the provisions in the Guidelines recommend in the exercise of statutory planning discretions, on land that has a moderate or extreme bush fire hazard level.

Given the above it can be argued that the Guidelines should not be applied to Jindee as rigorously as they would for rural residential subdivision on the urban fringe. Estates Development Company Pty Ltd is taking a proactive position by ensuring that bush fire management principles are incorporated into the design of the subdivision and subsequent development.

In relation to the main elements of the Guidelines the following comments are provided in respect to the proposed Local Structure Plan.

Element 1: Location

The Acceptable Solution is that the subdivision/development is located on land that is not subject to either an extreme bush fire hazard land classification or requires construction standards to BAL-40 or BAL-FZ. The stated objective is to ensure that development/intensification of land use is located in areas where the bush fire hazard does not present an unreasonable level of risk to life and property.

As the majority of the site is being cleared for the development, the above objective will be complied with.

The southern T2 Natural Living area will still contain vegetation and may be classified as a moderate fire hazard. This classification will have to be determined as part of the preparation of any Detailed Area Plan and Environmental Management Plan prepared for this land.

Element 2: Vehicular Access

The Acceptable Solutions are:-

- 1. That there are at least two different vehicular access routes, both of which connect to the public road network, are available to all residents/the public at all times;
- 2. That public roads, cul-de-sacs, battle axe legs, driveways, emergency accessways meet the prescribed standards;
- 3. That gates and signs be provided for emergency accessways; and
- 4. That firebreaks be provided on lots greater than 0.5 hectares.

The prescribed standards for roads relate to the width; horizontal and vertical clearances; maximum gradients and minimum curve radius.

Similar standards are also prescribed in the Local Government Subdivisional Guidelines.¹³

The Jindee Design Code is formulating specific standards for thoroughfares. These standards will need to be reviewed particularly in the southern T2 Natural Living area which seek to retain the existing landform.

Element 3: Water Supply

The Acceptable Solution is that the development is provided with a reticulated water supply and fire hydrants as specified. Normally within a residential development these are required every 200 metres.

¹³ Institution of Public Works Engineering Australia (WA Division Inc) Subdivisional Guidelines Edition No.2 July 2009





The baseline criteria for development is the approval of the water reticulation design and provisions of hydrants in accordance with the Water Corporation's Water Reticulation Standard No 63.

Element 4: Siting of Development The Acceptable Solutions are:-

- 1. In areas with a moderate to extreme hazard rating, buildings are to be sited a minimum of 100m from classified vegetation;
- 2. In areas with a moderate to low hazard rating buildings are to be sited a minimum of 20m from classified vegetation;
- 3. That a 20m building protection zone is provided;
- 4. That a 80m hazard separation zone is provided and
- 5. That the Bushfire Attack Level can be reduced for a building due to shielding.

The separation distance to classified vegetation can be reduced provided that the building is constructed in accordance with the assigned Bushfire Attack Level under Australian Standard AS3959.

Element 5: Design of Development

The Acceptable Solution states that for development that does not comply with acceptable solutions A4.1, A4.2, A4.3 and A4.4 there is no acceptable solution. All such proposals must be assessed under Performance Criterion P5.

Performance Criterion P5 states that the design of the development is appropriate to the level of bush fire hazard that applies to the development site.

It is submitted that the design of the development is appropriate to the level of bush fire hazard that applies to the development site as:

- The site is being developed predominantly for urban purposes;
- Dwellings within 100m of the MRS Parks and Recreation reservations will be constructed in accordance with the assigned Bushfire Attack Level under Australian Standard AS3959;
- Dwellings in the southern T2 Natural Living area will be constructed in accordance with the assigned Bushfire Attack Level under Australian Standard AS3959; and
- A fire management plan will be prepared for the subdivision which will document specific fire management measures.





7.0 Conclusion

FESA's Planning for Bush Fire Protection Guidelines are the principal reference document in Western Australia for fire management in subdivisions and related development in rural and in urban/rural communities. It promotes five key principles including that bush fire hazards must be considered in planning decisions at all stages of the planning process to avoid increased fire risk to life and property through inappropriately located or designed land use and development.

The Guidelines states that development in areas with extreme bush fire hazard levels will only be approved where it can be demonstrated that permanent hazard reduction measures can be implemented to reduce the hazard level to an acceptable level, and that the development can be undertaken in accordance with the general principles and building construction standards that underpin the Guidelines.

The subject land in its undeveloped state generally has a moderate to extreme bush hazard rating.

The development will result in the vast majority of this land being cleared i.e. it will permanently remove the fire hazard. Vegetation will be retained within the existing Regional Open Space reserves and in the southern T2 southern Natural Living area.

This recognises the increasing desire for people to live in closer contact with natural landscape. The integration of vegetation into the urban landscape creates a number of challenges for the design; for the long term maintenance of that vegetation and for community awareness of potential fire issues.

The main bush fire management issues associated with the structure plan are:

- 1. The treatment of the interface between the development and the MRS Parks and Recreation reservations; and
- 2. The design of the subdivision and development with the southern T2 Natural Living area.

With the possible exception of the southern T2 Natural Living area, the structure plan design at the broad scale, appears to generally comply with the requirements of a Planning for Bush Fire Protection.

The southern T2 Natural Living area requires further examination through the preparation of the Detailed Area Plan. The Environmental Assessment Report (Page 23) stipulates that in order to support the movement of small reptiles through the vegetated link between the Trig Point Reserve and Coastal Reserve that the following features need to be maintained within the T2 corridor:

- a good density of ground cover for refuge and camouflage;
- minimise the distance of open ground to be traversed, primarily roads;
- rehabilitation of degraded areas;
- retention of vegetation on private lots outside of defined building envelopes; and
- preparation of a vegetation protection plan".

The provisions for maintenance, planting density and type of vegetation in the southern Natural Living area need to be considered as part of the DAP design and will be addressed through an Environmental Management Plan.

It is submitted that the design of the structure plan is appropriate to the level of bush fire hazard that will apply to the developed site as:

- i. The site is being developed predominantly for urban purposes;
- ii. Dwellings within 100m of the MRS Parks and Recreation reservations can be constructed in accordance with the assigned Bushfire Attack Level under Australian Standard AS3959;
- iii. Dwellings in the southern T2 Natural Living area will be constructed in accordance with the assigned Bushfire Attack Level under Australian Standard AS3959; and
- iv. A fire management plan will be prepared for the subdivision which will document specific fire management measures.





Recommendations

- 1 That a fire management plan should be submitted in conjunction with any subdivision application so as to ensure that the design complies with the requirements of the Planning for Bush Fire Protection Guidelines. This plan should also address:
 - a) The extent of earth working (cut and fill with proposed finished surface levels) and vegetation clearing for that stage;
 - b) The interface treatment between the development and any classified bush fire hazard;
 - c) Any interim fire management measures which are required for staging of the subdivision;
 - d) Where AS3959 construction standards will be required; and
 - e) A Bushfire Attack Level (BAL) classification plan for those nominated areas.
- 2 That the preparation of the Environmental Management Plan for the southern T2 Natural Living area should consider:
 - a) The minimum height of vegetation required;
 - b) The degree of "openness" of the foliage;
 - c) The specific density of groundcover;
 - d) The ability to remove dead material and maintain leaf litter;
 - e) The need to include appropriate BAL setbacks;
 - f) How the continuity of the corridor will be affected by three metre wide driveways and any associated earthen shoulders/embankments;
 - g) How the continuity of the corridor will be affected by boundary firebreaks up to 6m wide i.e. 3m either side of the boundary on lots of more than 2,000sqm.
- 3 That the preparation of the Detailed Area Plan for the southern T2 Natural Living area should consider:
 - a) The vegetation rehabilitation and management requirements;
 - b) The application of AS3959 construction standards including the required BAL setbacks;
 - c) The management of vegetation within the BAL setbacks;
 - d) A potential variation of the City of Wanneroo Firebreak Notice to remove the requirement for boundary firebreaks.





8.0 Bibliography

Council of Australian Governments (2011) National Strategy for Disaster Resilience Canberra

Country Fire Authority of Victoria (2003) Municipal Fire Prevention Planning Guidelines Mt Waverley. CFA

Country Fire Authority of Victoria (2008) Living with Fire Melbourne

- Ellis, S, Kanowski, P & Whelan, R (2004), National Inquiry on Bushfire Mitigation and Management, Canberra. Council of Australian Governments.
- Emergency Management Australia (2002) Manual No 7 Planning Safer Communities Land Use Planning for Natural Hazards Commonwealth Attorney General's Department

FESA & DPI (2010) Planning for Bush Fire Protection. Perth. Western Australian Planning Commission.

- FESA (2005) Western Australian Emergency Risk Management Guide FESA Perth
- FESA (2007) Visual Fuel Load Guide. Perth. Fire & Emergency Services Authority of Western Australia.

Handmer J. & Haynes K. (Eds).(2008). Community Bushfire Safety. Collingwood CSIRO Publishing.

- Keelty M (2011) A Shared Responsibility The Report of the Perth Hills Bushfire February 2011 Review Government Printer Perth
- Keelty M (2012) Appreciating the Risk Report of the Special Inquiry into the November 2011 Margaret River Bushfire Government Printer Perth
- Keighery B (1994) Bushland Plant Survey Wildflower of WA (Inc)

Leading Emergency Services (2011) Major Incident Review, Lake Clifton, Roleystone and Red Hills Fires

- Middelmann, M. H. (Editor) (2007) *Natural Hazards in Australia: Identifying Risk Analysis Requirements.* Geoscience Australia, Canberra
- Ramsay C. & Rudolp L. (2006) *Landscape and Building Design for Bushfire Areas.* Collingwood CSIRO Publishing.
- Ramsay. GC & Dawkins D (1993) SAA HB36-1993 Buildings in Bushfire Prone Areas Information and Advice. Sydney. Standards Australia International Ltd.
- RPS Environment and Planning Pty Ltd (2012) *Environmental Assessment Summary Local Structure Plan* Lot 9036 and Part Lot 3054 Marmion Avenue, Jindee
- RPS Bowman Bishaw Gorham (2006) Lot 10 Jindee Vegetation and Flora Survey
- Schauble J. (2004) The Australian Bushfire Safety Guide. Harper Collins. Sydney
- Standards Australia (2004) AS/NZS 4360 Risk Management. Sydney. Standards Australia International Ltd.
- Standards Australia (2009) AS 3959 Construction of Buildings in Bush Fire Prone Areas. Sydney. Standards Australia International Ltd.
- State Emergency Management Committee (2005) Westplan State Bushfire Emergency Management Plan. FESA Perth
- Victorian Bushfires Royal Commission (2010) Final Report Government Printer Melbourne
- WAPC (2006) *Designing Out Crime Planning Guidelines*. Perth. Western Australian Planning Commission.

WAPC (2006) State Planning Policy 3.4 – Natural Hazards and Disasters





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