From:	Casey Farrell on behalf of DPE PS Education SEPP Mailbox
To:	Kane Rowley
Cc:	Felicity Greenway; Helen Barrie
Subject:	FW: Submission Educational Establishment & Childcare Facilities
Date:	Tuesday, 11 April 2017 3:13:08 PM
Attachments:	Appendix A.pdf Appendix B.pdf Appendix C Bushfire_Prone_Land_Map_and_Bushfire_Evacuation_Risk_Map_02012008 (1).pdf Appendix D.pdf Appendix E Draft KLEP.pdf

Casey Farrell
Senior Planning Policy Officer
Planning Policy | Policy and Strategy
Level 22, 320 Pitt Street | GPO Box 39 Sydney NSW 2001
T 02 9274 6577 E casey.farrell@planning.nsw.gov.au


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From: Robert Martin [redacted]
Sent: Tuesday, 11 April 2017 3:10 PM
To: DPE PS Education SEPP Mailbox <education.sepp@planning.nsw.gov.au>
Subject: Submission Educational Establishment & Childcare Facilities

SUBMISSION: PLANNING NSW

DRAFT EDUCATIONAL ESTABLISHMENTS AND CHILD CARE FACILITIES SEPP

My submission concerns relate to Home Based Child Care and the intent to alter the current provisions as they relate to Home Based Child Care on Bushfire Prone Land.

I will list my concerns under the following headings:-

1. PLANNING FOR BUSHFIRE PROTECTION IS A GOVERNMENT DEPARTMENT OF PLANNING NSW PLANNING DOCUMENT.

2. HOME BASED CHILDCARE EXCLUDED FROM FLAME ZONE AND BAL 40.

3. RELEVANT PLANNING CONTROLS WITHIN THE RURAL FIRES ACT S 100B SPECIAL FIRE PROTECTION PURPOSE.

4. DUTY OF CARE TO THE VULNERABLE IN SOCIETY

5. HOME BASED CHILD CARE PURSUANT TO RURAL FIRES ACT, AS 3959 AND PLANNING FOR BUSHFIRE PROTECTION 2006

6. SPECIFIC OBJECTIVES FOR SPECIAL FIRE PROTECTION PURPOSE DEVELOPMENT

7. PROVISION OF SAFE EMERGENCY EVACUATION PROCEDURES: INCREASED RISK FOR EMERGENCY WORKERS

8. ASSESSMENT OF BAL FZ AND BAL40 BY AMATEURS DANGEROUS PRECEDENCE.

9. LAW OF NEGLIGENCE

10. BUSHFIRE EMERGENCY MANAGEMENT PLAN

11. AREAS WITH GAZETTED COMBINED BUSHFIRE HAZARD AND COMBINED EVACUATION RISK

THE PUBLISHED INTENT OF THE DRAFT SEPP

Exempt Development

It is proposed that certain low impact child care developments may be permitted as exempt development under the proposed SEPP and an amendment to the Codes SEPP:

- *Home based child care,*
- *School based childcare, as long as no works are required,*
- *Mobile child care, and*
- *Emergency or temporary relocation of child care facilities.*

Home Based Child Care on bushfire prone land:

Home based child care is to be defined as:

a) *A family day care residence (within the meaning of the Children (Education and Care Services) National Law (NSW), or*

b) *A dwelling used for the purposes of a home based education and care service (within the meaning of the Children (Education and Care Services) Supplementary Provisions Act 2011.*

Home based childcare is currently exempt development under the Codes SEPP except on bushfire prone land.

The proposed SEPP will amend the Codes SEPP by introducing development standards which will allow home based childcare on bushfire prone land as exempt development where certain standards are met.

The proposed standards are designed to ensure occupants safety in the event of bushfires and include:

- *Provision of an asset protection zone around the dwelling:*
- *Preparation of a Bush Fire Emergency Management and Evacuation Plan; and*
- *The dwelling in which the care is provided must not be located in bushfire attack level 40 (BAL 40) or the flame zone (BAL FZ)*

Prior to operating the home based childcare service, a Service Approval must be obtained from the Department of Education to ensure the safety of children cared for in the dwelling.

PLANNING FOR BUSHFIRE PROTECTION 2006 IS DEPARTMENT PLANNING'S OWN DOCUMENT

The foreword to *Planning for Bushfire Protection 2006*, written by the Minister Planning in 2006, hailed the said document as, and I quote the Minister:-

> "a *milestone in the NSW Government's efforts to work jointly with local government and the private sector to link responsible planning and development control with the protection of life, property and the environment. "*

The Review Panel for Planning for Bushfire Protection operated for the best part of 3 years from 2003 to 2006. At least 2 planners sometimes more, sat at every meeting and had planning input.
The document is co- owned by Planning NSW.
The NSW Government gazetted *Planning for Bushfire Protection 2006* in December 2006.

HOME BASED CHILDCARE NOT TO BE LOCATED IN FLAME ZONE OR BAL 40

The following are references to the BAL and influencing factors such as radiant heat flux, direct flame impingement, piloted and non- piloted ignition of building fabrics etc. How it is arrived at are freely available in:-

> *Planning for Bushfire Protection 2006 on page 11 Table 4* – FDI 100.
>
> *Planning for Bushfire Protection 2006 on page 14* - Heat Flux exposure AS 3959
>
> *Planning for Bushfire Protection 2001 on page 29 Table 5.1 - radiant heat Flux and effects on buildings and people for a forest fire on flat ground of 80,000kW/sqm intensity and flame lengths of 15 metres (Haddad CSIRO 2000)*

Planning for Bushfire Protection 2001 page 29 Table 5.1 lists different but just as accurate

statistical facts: It should be noted PfBP 2001 provided bushfire attack conditions based on flat ground at a lower FDI. The measurements and estimated times will be higher and shorter for a higher FDI of 100, and increased slopes as outlined in PfBP 2006.

I have amalgamated the specific conditions outlined in both PfBP 2001 and 2006 in the interests of accuracy and in order to provide a fuller picture for the information of decision makers determining, as indicated in the SEPP, the intention to allow Home based Child Care to be located as close as 26 metres from the hazard. Only the Flame Zone and BAL 40 zone will be exempt locations.

If it is highly likely at 25 metres [BAL 40] for conditions to be fatal, why would anyone feel free to locate childcare at 26 metres of the hazard? Does anyone in their wildest imagination think an extra (1) metre guarantees protection, or ensures the safety of children in the childcare facility? The distances are not set in concrete they prove flexible depending on the specific circumstances of individual locations, which is why experts require to inspect each and every application to operate a childcare facility on bushfire prone land. Separation distances from the hazard logically require to be greater not achieved by SEPP Code - standards- exempt. It is dangerous to make the development activity exempt and the consequences may well prove fatal.

For example: Flame Zone - 0 -19 metres from the Hazard: Radiant heat levels of 40 to 110 kW/sqm : impact on exposure to humans is instantly fatal. Dwelling guaranteed to be unprotected as firefighters have no means of operating within the Flame Zone during bushfire attack. The dwelling will suffer the full impact of direct flame impingement, fatal levels of radiant heat flux and heavy ember attack.

BAL 40 - 19 to 25 metres from the hazard : Fatal Radiant heat levels up to 40kWsqm. There will be significant risk of direct flame impingement and subsequent threat to building integrity and a significant threat to occupants who are unlikely to be adequately protected.

These levels of bushfire attack have understandably been considered as unsuitable to locate home based child care because conditions are considered too dangerous and exposure to radiant heat levels fatal after seconds of exposure. Fully clad fire firefighters cannot operate so close to the front while bushfire passes through or immediately after the passage of the bushfire front until the fatal radiant heat levels subside.

So how will the infants fare at other levels of bushfire attack, when under forced evacuation orders in a worst case scenario emergency? It will take some time to load up to seven infants into a vehicle given the poor visibility , choking smoke, heavy ember attack and probably strong gale force winds which the carer will be likely to encounter in less than BAL 40 conditions.

Firstly let's look at the distances from hazard and then we'll look at the conditions, particularly the radiant heat levels present in terms of the distances from the fire front. These lesser BAL's are judged by Planning NSW as suitable for home based child care facilities with small lightly clad children present, after all if it's the Summer Bushfire Period the infants are hardly likely to be clad in heavy protective woollen clothing :

BAL 29 - 25 to 35 metres separation from the hazard.

BAL 19 - 35 to 48 metres separation from the hazard.

Bal 12.5 - 48 to 100 metres separation from the hazard

BAL Low - considered as non- threatening in PfBP but not entirely without contention.

There may be grounds to add identified extra levels of BAL between distances of 48 -100 metres.

At a distance of 140 metres from the hazard, radiant heat will still register as 2.1 kW/sqm. An unprotected person will suffer pain after 1minute but it is not considered fatal.

At a distance of 100 metres 3 kW/sqm of radiant heat will be experienced and a firefighter in protective equipment will feel pain in 90 seconds. Occupants evacuating will experience possible fatalities after longer exposures, perhaps 5 minutes of exposure to that level of

radiant heat. Hazardous conditions. Firefighters can only operate for short periods of 10 minutes at a time.

At a distance of 70 metres, 4.7 kW/sqm of radiant heat will be experienced. Extreme conditions exist, fully clad firefighters in protective gear will experience pain after 60 seconds exposure. After longer exposure of people in ordinary light clothing, life threatening conditions will exist.

At 55 metres from the hazard front 7 kW/sqm of radiant heat will be experienced. It is likely that exposure of unprotected people in ordinary clothing after several minutes to this level of radiant heat will be **fatal**

At 45 metres with an expected 10 kW/sqm of radiant heat, **critical** conditions exist. Firefighters are not expected to operate in these conditions, although they may be encountered. These (conditions) are considered to be **life threatening under 1 minute in full protective gear, less to occupants not wearing that protective clothing.** Fabrics inside the building may spontaneously ignite after exposure of the dwelling to external levels of radiant heat. **These properties faced with full on bushfire attack are on their own.** Firefighters and emergency workers are unable to physically sustain a presence at this level of RHF to render any protection or assistance.

At a distance of 40 metres, 13kW/sqm through 14 -16 kW/sqm of radiant heat will be experienced, timber will ignite (piloted) standard glass unscreened windows will fail after approximately 2 minutes, exposing building fabric to radiant heat and exposure of the occupants to radiant heat will be **FATAL after I minute**. Again these properties face bushfire attack minus the expectation of any protection and assistance from firefighters and emergency workers. It is not physically possible even in protective clothing to be present this close to fire front.

At a distance of 30 metres 21 kW/sqm radiant heat will mean that screened windows will fail in approximately 2 minutes. It will be 100% FATAL after a short period.

At a distance of 27 metres from the fire front the radiant heat level will be 19kW/sqm. Screened float glass could fail during the passage of the fire front. Once the windows fail, the embers are guaranteed entry and very little will prevent the house burning to the ground. It will clearly be 100% fatal in an even shorter time of exposure.

The draft SEPP Educational Establishments and Childcare Facilities proposes without any provision of standards in the SEPP Codes applying to locate home based childcare on bushfire prone land separated by as little as **26 metres from the fire front / hazard.**

Government apparently chooses to ignore the content of PfBP 2001 & 2006 **a document co-owned, co-authored, co funded BY Planning NSW and gazetted by Government.**

Home based child care on bushfire prone land with small infants and children in day care can be identified as at unacceptable risk where the residential development converted for child care purposes itself, is at risk from the impacts of radiant heat, ember attack and direct flame impingement during a full on bushfire attack. It should be refused in any proposed location where the experts state in a gazetted document that these elements will impact.

The radiant heat effects are shocking enough but the primary objection to placing home based childcare in these dangerous conditions **must be** that at distances from the fire front where 10kWsqm exist and thereafter increase, **no possible protection will exist** for either property or human life. As a direct consequence lives and property loss will be the dire consequence of this SEPP. This fails the Pub Test.

The SEPP should cater for worst case scenario an uncontrollable wildfire with a short lead time, or risk failing the Public Interest Test.

PLANNING CONTROLS OF THE RELEVANT RURAL FIRES ACT 1997 SPECIAL FIRE PROTECTION PURPOSES.

Planning Controls for Special Fire Protection Purpose [SFPP] development are provided

within the Rural Fire Act section 100B.

Such developments are also designated as 'integrated development' within the EP&A Act section 91.

SEPP Exempt and Complying Development: Exempt Development Code 2.45 currently states Homebased Childcare is exempt development except where it is on bushfire prone land.

Standards to be complied with **none**. SEPP Codes 2.46 standards = **none**.

The mapped, certified and gazetted bushfire areas appear to have been determined by possible political interference apparently with development opportunities prioritised over public safety, as opposed to scientific accuracy, reduced to a designated 100 metres from a fire front, when the categorical evidence from modelling suggests the risks from bushfire attack can occur out as far as 700 metres and special clustering of lost property burnt to the ground occurs most heavily between the fire front and the first 50 metres and thereafter moderately reducing up to 250 metres from the hazard. *See attached report from Risk Frontiers, Natural Hazard Research Centre, Macquarie University.*

DUTY OF CARE TO THE VULNERABLE IN SOCIETY

This initiative from the Minister Planning in his SEPP will not provide the slightest jot of safety for defenceless infants and small children. Unfortunately the opposite appears to apply. They have absolutely NO place in areas of potential high risk. Placed by their unsuspecting parents in these areas, in the first place where it is well known and recorded in gazetted documentation that there is a calculated risk from bushfire to human life. The parents are entitled to rely that the NSW Government, who co-own *Planning for Bushfire Protection*, fully briefed by fire Experts, and with the latest bushfire science [usually funded by Government at both Federal and State level] at their disposal would not sanction such an appalling breach of the Duty of Care owed by Government towards their children. This is a defenceless vulnerable section of society with the prospect of full and long lives ahead of them.

It speaks volumes about NSW Government that apparent grave dereliction of Duty of Care appears to apply in this instance. The SEPP appears to the wider informed community to deliberately set out to undermine, undercut safety provisions for communities [including their children] that previously [and still does] applied through the Rural Fires Act and compliance, such as it was, with their gazetted guidelines *Planning for Bushfire Protection*.

If the Minister was genuinely desirous of public safety, he should strengthen the "guidelines" by giving the document teeth and make compliance with *Planning for Bushfire Protection 2006* **mandatory** for residents and developers alike. Zero tolerance for non-compliance given the possible fatal results when bushfires occur, would encourage community confidence in Government. In short the Government's priority should be preservation of life first and foremost an aim hardly compatible by creating jobs in areas incompatible with bushfire safety. The Party's mandate appears not to support community or public safety as is evident in their catch cry, - *Jobs and growth, jobs and growth*. Jobs and growth will not control catastrophic wildfire, Fire is stone deaf and radiant heat more than any other fire element can impact with fatal consequences for human life.

I am no lawyer or planner, but it seems to me, just an average housewife in the suburbs, that it is not a smart move to "make bad law " and have 2 legal instruments, the Ministerial SEPP versus The Rural Fires Act 1997 with gazetted *Planning for Bushfire Protection* in direct conflict with provisions that are apparent polar opposites . How is that legal nightmare envisaged to work?

HOME BASED CHILD CARE PURSUANT TO THE RURAL FIRES ACT 1997, AS 3959 AND PURSUANT TO PLANNING FOR BUSHFIRE PROTECTION 2006.

Child Care is identified as Special Fire Protection Purpose pursuant to the Rural Fire Act 1979 section 100B.

Child Care of all types is identified as Special Fire Protection Purpose. 4.2.2 (b). Types of Special Fire Protection Purpose Developments in *Planning for Bushfire Protection 2006* page 28.

The nature of all SFPP developments means that there must be more reliance on space around buildings (as defendable space as well as Asset Protection Zones for fuel load control. The provision for road access and provision of water supply and other services apply as much if not more to SFPP developments as they do to ordinary residential development.

For existing older development where bushfire protection was not incorporated into the construction phase it may not be possible to achieve an Asset Protection Zone [APZ] at all. Or the required width of separation from the bushfire hazard. This poses some difficulty for preserving lives and the obvious difficulty is not assisted by simply ignoring the risk to life by making the control standards in SEPP Codes – none. The proposal in the DRAFT SEPP to grant a Service Approval on the safety of children should be made by the Department of Education alone is wrong. It should be assessed and made by the RFS because of fire safety issues. Given the dangerous environment for children that has been proven by the latest Royal Commission to exist in NSW, probably both for differing reasons should apply.

There may also be situations where a combination of poor access, rugged topography, older dwellings judged to be of poor bushfire protection purpose, remote locations, inadequate water supplies and or pressure, evacuation problems and an inability to provide an adequate APZ would pose unacceptable levels of bushfire risk and there must exist strong arguments for refusal. That argument has not been negated or invalidated by simply classifying Home Based Childcare developments on Bushfire Prone Land as exempt development. That will not be judged by the man on the Clapham omnibus as at all in the Public Interest.

I see no provision addressing any of the above factors or acknowledgement of the above in the DRAFT SEPP proposed intention to make an identified SFPP development exempt pursuant to the Codes SEPP and the standards provided within the SEPP Code to apply to all Home Based Child care as **none** – non- existent.

SPECIFIC OBJECTIVES FOR SPECIAL FIRE PROTECTION PURPOSE DEVELOPMENT

- The specific objectives for SFPP are to provide for the special characteristics and needs of the occupants, in this case defenceless infants and small children and their carer.

- Unlike residential sub-divisions which can be built to a construction standard to withstand bushfire attack enabling occupants and fire fighters to provide property protection after the passing of the fire front, occupants of SFPP developments may not, and would be highly unlikely to in the specific circumstances of home based child care, be physically able (5 children under 5 years and 2 more above 5 years in the care of one minder) to assist in property protection**. They would also be more adversely affected to smoke and heat while evacuating**. *Planning for Bushfire Protection* 2006 page 28

- Operators of SFPP developments such as Home based childcare may not be educated sufficiently in relation to bushfire impacts; and

- They may have reduced capacity (after all the carer has five under- fives and two over- fives in her care) and may not, being involved with their care, be able to adequately evaluate the risk and therefore be unable to respond satisfactorily to the bushfire threat ; and

- Having a logistically onerous number of little ones (7) to evacuate may very likely present organisational difficulties for safe evacuation and management of a potentially fatal environment ; and

- Children and carer may be more vulnerable through stress and anxiety to the effect of toxic bushfire smoke and the bushfire threat itself; and

- Obviously given the age of the majority of children there may be a communication barrier to complicate evacuation risks; and

- Supervision given the proximity to the Fire front with the inherent risks, and supervision of so many children exposed to that risk may be difficult; and

- Logistically arrangements for so many children in the care of one minder, may be complicated in terms of transportation of so many little ones and keeping them all hydrated while preventing the effects of smoke and fine ember attack and the nigh on impossible task of trying to keep the environment in a closed car, no air conditioning operating possible as it sucks in smoke and embers from outside, from over - heating during the evacuation itself. *Planning for Bushfire Protection 2006* page 28 with some additional material added by the writer, a non- practising registered nurse.

PROVISION OF SAFE EMERGENCY EVACUATION PROCEDURES

- To provide safe emergency evacuation procedures for SFPP developments, such as Child Care in identified areas of bushfire hazard, will be highly dependent on suitable emergency evacuation arrangements which require **greater separation from the bushfire threat.** *Planning for Bushfire Protection* 2006 page 28 **not locating closer to the fire front** as permitted or legalised by the provisions of this SEPP.

- It is a requirement of SFPP developments that the greater separation distance from the fire front does not increase the Radiant Heat Flux to be in excess of 10 kW/sqm. More than 10kW of radiant heat flux greatly increases the likelihood of fatalities to occupants, firefighters and emergency workers. *Planning for Bushfire Protection 2006 page 32.*

- "Radiant heat levels of more than 10kW/sqm must **not** be experienced by emergency services workers aiding residents with a Special Fire Protection Purpose development – a Home based childcare facility- . Where ember protection is not feasible then setbacks should be **greater** than 100 metres." *PfBP* page32. No mention here of possibly advancing the facility towards the fire front and locating permissible childcare facilities closer to the fire front where they will experience heavy ember attack, just outside the BAL 40 set- back and with no standards required from the development.

This SEPP for childcare facilities appears to indicate that the Minister (and Government) may appear to think that up to seven small defenceless children in the care of one minder are to be located on bushfire prone land closer to, i.e. within approximately 26 metres of the fire front and where no SEPP Codes standards need to apply in order to provide any measures of bushfire safety**.** This thinking defies logic.

This is unacceptable, when Planning NSW own gazetted document states clearly that at 100 metres from the fire front Hazardous conditions apply.

At 70 metres Extreme conditions exist and after moderate exposure can be life threatening. and

At 55 metres from the front conditions can have the potential be fatal. and

At 45 metres from the front Critical life threatening conditions exist and

At 40 metres life threatening conditions means that it can be FATAL after more than 1 minutes exposure and

At 30 metres it can be FATAL under 1 minutes exposure, and at 27 metres from the fire front it will be FATAL in even shorter period of time.

Planning for Bushfire Protection 2006 ***is jointly*** owned and produced by Planning NSW and the Rural Fire Service. It was gazetted by Government in December 2006.The Government cannot claim ignorance of its contents or of the potential for injury and fatalities from bushfire attack.

The proposed changes do not recognise that SFPP development and specifically home based childcare, may present their own individual peculiar difficulties in times of emergency. This lack of foresight poses increased safety issues with possibly fatal accumulated risk consequences for emergency workers. Particularly if the emergency involves uncontrollable wild fire with little to no lead time given. **See the attachment above titled Australasian Fire Authorities Council; Position paper on Bushfires and Community Safety, 28 November 2005.**

ASSESSMENT OF BAL FZ AND BAL 40 BY AMATEURS DANGEROUS PRECEDENCE. DANGEROUS IN THE EXTREME

I estimate roughly speaking, that the flame zone comprises up to 20 metres from the fire front and BAL 40 an extra 5 metres. I say roughly because set measures for assessing the extent of the Flame Zone and BAL 40 will rely on a diversity of certain factors such as the

FDI – [Greater Sydney Basin is rated FDI 100], variations with the degree of slope and different types of vegetation Class, including the degree of slope existing under the vegetation hazard. This method of assessment to determine the distance from the fire front applies across the board to all Bushfire attack levels within the 100 metres of designated bushfire hazard.

Best illustrated in *Figure 3.1 page 60 Planning for Bushfire Protection 2006*

- It's complicated and as such should not be assessed by amateurs, but left to the independent professionals, the Rural Fire Service. Because of the Government's liability and Duty of Care to such small vulnerable people and their parents I suggest that the professional advice is legally provided by the RFS in preference to alternative sources, farmed out for paid advice from another sector. Most decidedly not assessed by amateurs with little to no experience in fire matters. In particular amateurs with a personal or financial (commercial) interest.

- Another lawful requirement for SFPP developments, *Planning for Bushfire Protection 2006 page 28* recognises the risk during an emergency to firefighters and other emergency personnel. The risk to emergency personnel can be high through prolonged exposure to levels of radiant heat and smoke where door knocking and general evacuation control is happening and exposure to the fire front is imminent.

  As outlined above, Emergency workers at risk should not have to go closer to and are physically unable to do so where radiant heat levels of 10 kW/sqm and higher exist. The risks to emergency service personnel occurs not only in BAL FZ and BAL 40 but across ALL other levels of bushfire attack. If grown personnel are to be considered as at accumulated risk *–Planning for Bushfire Protection page 28.*

  Why would Government and the Minister think it acceptable to place infants closer to the fire front, where **no professional protection or assistance will be forthcoming**, and make that "closer location" an exempt activity under the SEPP Codes?

  Why would it be thought that emergency workers should be put at risk simply in order to create and increase job opportunities in the area? Such thought lacks moral fibre and indicates that Government know the price of everything but the value of nothing. Ordinary people with ordinary values, with this evidence in their face can only come to the apparent conclusion that people who volunteer service to the community are of no value and therefore are dispensable. Radiant heat kills. Make no mistake, emergency workers and volunteer fire fighters would be at terrible risk so close to the fire front and obviously so would the children and carer. The Fire makes no moral exception because these are defenceless infants in its path. With respect, neither should the Minister or Government.

- The argument advanced by some supporting the intent to allow home based childcare within the designated100 metres from the hazard is, that families with children cannot be prevented from acquiring homes within that 100 metres and living with their children at risk of bushfire attack. So what's the difference in allowing childcare? With respect there is a huge difference. These children, separated for the day from their parents will have been **placed** in homebased childcare, in a permitted by Government SEPP location against all recorded expert written and gazetted bushfire advice and licenced by Government in an area known to involve considerable established risk to life and property. At insufficient

safe separation distance from the hazard, where Government agencies have recorded the nature of that risk and Government have gazetted their findings. This difference evokes a considerable Duty of Care from Government with increased liability to the children and parents and to firefighters and emergency workers.

- Of particular concern is where buildings such as dwellings are proposed to be used for SFPP purpose and converted to child care (as in the case of home based childcare) as existing housing stock is unlikely to meet basic ember protection or any construction standards set by AS 3959 to meet enhanced protection from radiant heat flux, and direct flame impingement caused by lengthening flames increased by slope and strong winds, which could still occur under wildfire conditions of attack in BAL's less than BAL 40 in gazetted bushfire areas.

The intent proposed by the Minister in this SEPP provides no requirement to meet AS 3959 provisions or to meet enhanced construction standards pursuant to *Planning for Bushfire Protection 2006.* The SEPP sets out that standards required are – none.

LAW OF NEGLIGENCE

The Planning for Bushfire Protection document gazetted December 2006 is co- owned by the Rural Fire Service and Planning NSW. Past Governments of NSW have gazetted legislation to cover and control and reduce the effects of known risks in the past. Now we appear to have a Government with an entirely different focus, centred on jobs and growth and profit for business. If Government transfers that apparent focus to fragile areas such as exist in areas of Bushfire Hazard it will come at the highest possible price, human loss of life. This focus in previously protected areas should not be encouraged as the price of that growth and profit is too high in terms of property loss and the preventable loss of lives.

Because this must surely increase any future claims for Pure Economic Loss pursuant to Negligence Law if fatalities or damages are endured by these small defenceless persons and their families I have taken precautionary steps to archive all recent submissions outside the bushfire areas of hazard, with Groups with strong links to both Community and the Law. With respect, the Government, the Minister Planning and those within the Department of Planning cannot claim ignorance of:

- Bushfire Areas mapped [Council's], certified [RFS Commissioner] and gazetted by Government pursuant to EP&A Act section 146 (2) and

- The Rural Fires Act 1997, and any amending legislation gazetted by Government August1 2002 and

- The Environmental Planning and Assessment Act amended by Government in August 1 2002 to enhance bushfire protection and

- Through section 91 EP&A Act (in combination with the RF Act) the Government requirement for a section 100B Bush Fire Safety Authority classifying the following SFPP Special Fire Protection Purposes [Home based Child Care] as Integrated Development and

- *Planning for Bushfire Protection 2006* gazetted by Government December 2006 and

- Rural Fires and Environmental Assessment Legislation Amendment Act 2002 gazetted by Government and

- Rural Fires Regulation 2002 and the requirement cl. 46B Additional SFPP for which a Bushfire Safety Authority is required, gazetted by Government. Also additionally Clause 46 requires RF Act section 100B matters and section 91 integrated development to provide a Bush Fire Assessment Report submitted to the RFS.

- AS 3959 and the associated and amended provisions of The Building Code of Australia 2002 by Government and

- In summary, if a development site is on bushfire prone land, the requirements of *Planning for Bushfire Protection 2006* will apply and all SFPP developments and integrated development will require an Integrated DA approval from the RFS.

  The SEPP proposal appears to be an attempt to override the lawful requirements and inbuilt protection of the Rural Fires Act and Integrated Development such as provided to Child Care - a SFPP development.

- It appears to create conflict between two instruments of law, an Act and a SEPP. Opposing requirements in two instruments, creates nothing other than confusion for all concerned and cannot be regarded as "good" law.

BUSH FIRE EMERGENCY MANAGEMENT PLAN

The SEPP will require the Childcare Service to prepare a Bushfire Emergency Management Plan.

The plan must minimise the risks to emergency personnel by locating exits away from the hazard side/s of the building, which may be an impossibility in already existing residential development applying for Home based Childcare, namely a SFPP development identified by RF Act section 100 (b). It is for this precise reason that setbacks from the hazard are expected to be greater for SFPP developments than for normal residential development. The accumulated radiant heat exposure will be far greater for emergency workers than for the occupants sheltering within the dwelling. In all cases the Bushfire Protective Measures BPM must satisfy the intent and performance criteria, per section 4.2.7 of Planning for Bushfire Protection 2006.

This SEPP poses something of a challenge to prevent fatalities and injury to emergency workers and occupants of a Special Fire Protection Purpose development, such as a home based childcare facility with seven children in the care of a single minder. A challenge enough on its own for most of us, let alone throwing wildfire, fatal levels of radiant heat flux, toxic choking smoke, poor to nil visibility and heavy ember attack with cyclonic winds possible into the mix and faced with ordered evacuation a logistical nightmare in itself.

These little people should not be here in the first place. It defies common sense and

human decency.

AREAS WITH COMBINED GAZETTED BUSHFIRE HAZARD AND BUSHFIRE EVACUATION RISK

The 13 deferred areas in the municipality of Ku-ring-gai which are gazetted Bushfire Hazard, mapped and certified by the Commissioner Rural Fire Service are also separately gazetted by Government and mapped as Emergency Risk in the SEPP Senior Living .

These 13 areas were in total all added to the Bushfire Maps certified by the Commissioner RFS by around 2008 and gazetted by Government. Bushfire Map attached above.

Ku-ring-gai Council deferred the 13 areas from their LEP 2015 because of the public interests and the public safety considerations of residents in these problematic areas, with historical records of bushfire attacks, limited to no water supply available in the13 areas and well documented Evacuation Risks existing in these areas, as documented by the Ku-ring-gai Bushfire Brigade in 2002. In that document some comments on evacuation difficulties in the 13 deferred areas were to the effect **"that some people may not get out. "**

Wildfire events in Ku-ring-gai occurred in 1976, 1979, 1984, 1987, 1990, 1994 and 2002. Some would say another could be well overdue.

Pre-schools and day care centres in Ku-ring-gai are identified in DISPLAN as particularly vulnerable communities under the Plan. Communications between Council and the LEMC AND State Emergency Management Committee. See attachment above.

There is currently a Draft proposal to add the13 deferred areas to the KLEP. This remains to go forward for consideration by Ku-ring-gai Councillors as at this date.

I attach my submission to the Draft KLEP above and since it addresses Child Care and specifically Home Based Child Care within the submission, I commend it to your scrutiny.

There is absolutely no rational argument possible to contend that increased development in these areas, taking into consideration their fire history and no water supply or pressure available during a bushfire and dire evacuation risks, will not exacerbate survival prospects of many residents, firefighters and emergency workers in the gazetted 13 areas. Government intentionally allowing the Council KLEP proposal to potentially double the housing stock and provide for uncapped population increase and uncapped vehicle increase will potentially increase the risk to lives of residents, police, fire fighters and emergency workers across the community.

In conclusion, this DRAFT SEPP Educational Establishments and Child Care Facilities proposal to allow Home based Child Care on Bushfire Prone Land with no standards to apply under Exempt Development is **wrong**.

To permit childcare in areas of hazard and life threatening conditions, where no protection of life or property is available or physically possible, is **very wrong.**

To apparently lessen separation distance from the fire front, when the opposite is held to apply by experts, is **wrong**.

To imagine that the owner operator of a Home Based Childcare facility will have so much spare time on her hands while caring full time for up to seven small children, five of them under five years, that she will have enough time available to maintain an Asset Protection Zone is **wrong**.

Raking and clearing in order to maintain a clear space around the dwelling that will provide both the mandatory APZ and IPA is part and parcel of landscaping and property maintenance in bushfire areas and is likely to not take place. These time consuming activities are necessary to not only provide a level of preparedness against bushfire attack,

but also provide safe conditions for emergency workers to defend the property and the lives of the occupants. In bushfire areas this onerous job in itself is a full time occupation during the fire season and comes as the price one pays for the privilege of living by choice, so close to the fire environment. The presumption this task will always take place given the full on preoccupation of providing a childcare service is absolutely **delusional** as well as **wrong**.

To propose that total amateurs with a financial interest assess fire zones and make appropriate Bushfire Management and Evacuation Plans is **wrong**.

The **wrongs** could all, either individually or in combination, involve foreseeable serious consequences, including injuries and potential fatalities.

Children are not a disposable commercial commodity and their safety, while not in the care of their parents, is in fact a Government Duty of Care. Children's Safety should be prioritised accordingly.

List of Attachments provided with this Submission

Appendix

A. AUSTRALASIAN FIRE AUTHORITIES COUNCIL: POSITION PAPER ON BUSHFIRES AND COMMUNITY SAFETY.

B. QUANTIFYING BUSHFIRE PENETRATION INTO URBAN AREAS IN AUSTRALIA: RISK FRONTIERS-NATURAL HAZARDS RESEARCH CENTRE MACQUARIE UNIVERSITY.

C. BUSHFIRE PRONE LAND AND BUSHFIRE EVACUATION RISK MAP.

D. DOCUMENTATION BETWEEN KU-RING-GAI COUNCIL, LOCAL EMERGENCY MANAGEMENT COMMITTEE & STATE EMERGENCY MANAGEMENT COMMITTEE ON EVACUATION RISK.

E. DRAFT KLEP SUBMISSION

Thank you for allowing me the extension time to make this submission. It is much appreciated.

Yours sincerely

Mrs Freddi Martin

[redacted]

East Killara 2071

[redacted]

AUSTRALASIAN FIRE AUTHORITIES COUNCIL

POSITION PAPER ON BUSHFIRES AND COMMUNITY SAFETY

Issue Date: 28th November 2005

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Level 5, 340 Albert Street
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Telephone: `03 9419 2388
Facsimile: `03 9419 2389
Email: afac@afac.com.au
Internet: http://www.afac.com.au

AUSTRALASIAN FIRE AUTHORITIES COUNCIL

POSITION ON BUSHFIRES AND COMMUNITY SAFETY

PREAMBLE

This paper expresses the Australasian Fire Authorities Council's (AFAC's) position on the safety of residents and their homes during bushfire events. The paper includes principles for national application by member agencies in all Australian states and territories, subject to relevant local legislation and local refinement.

The paper provides guidance on good practice for managing community safety in bushfires, and is supported by sub-papers that expand on key points.

This position is based on available evidence and experience, and may change following further research, including research conducted by the Bushfire Cooperative Research Centre.

PURPOSE

The purpose of this paper is to articulate a national position that provides the doctrine and describes good practice in relation to creating and maintaining bushfire-safe communities throughout Australia.

POSITION

Bushfires are a common and normal occurrence

Fire is a normal part of Australia's natural environment, and bushfires are a common occurrence during drier periods of the year in most places. The frequency and intensity of fires varies throughout the landscape under natural regimes. Various land uses and land management practices have modified, and continue to modify, natural fire regimes.

Bushfires can cause death and injury to people and animals, and damage to property, the natural environment and other community assets

Bushfires can be dangerous events that threaten life and property. Bushfires that occur on hot, dry and windy days frequently cause significant damage to built assets and occasionally cause loss of life.

While fire is important to maintain many natural ecosystems, fire of inappropriate frequency and/or intensity can cause damage to natural ecosystems. Inappropriate fire regimes are a threat to biodiversity, water catchments, air quality and landscape values. Both too much and too little fire can damage ecosystems.

Losses can be reduced, not all will be saved

Loss can be reduced or avoided in some cases, but cannot be entirely prevented. It is theoretically possible to prevent all loss by bushfire through the total removal of all bushfire fuels across the landscape. Such a measure is not possible in practical terms and is unacceptable to the community. A balance must be struck between measures taken to reduce or avoid loss due to bushfire and the protection of other values.

This compromise involves acceptance of the inevitability of some loss. Governments can assist the community to determine what level of risk it is prepared to accept. Fire agencies can inform governments and communities about these risks. The risk management approach adopted should be consistent with planning for other natural hazards.

Losses can be reduced if buildings are designed, constructed and maintained to resist bushfire. Totally bushfire-resistant buildings could be designed and built, at significant expense. However, other measures such as appropriate building siting and the management of site fuels can provide high levels of protection to less fire-resistant structures.

Appropriately prepared and constructed buildings offer protection to people during bushfires, reducing the likelihood of bushfire-related injury and fatality.

Managing risk and reducing loss is a shared responsibility between government, householders and land managers

Fire agencies and some land management agencies have statutory responsibilities for managing bushfires. However, the steps that householders take to prepare for bushfires are crucial to the protection of their life and property. Fire fighting agencies will provide support and assistance during bushfires when and where possible, but their effectiveness will be compromised if people or properties are not adequately prepared for bushfire.

Householders need to be allowed and encouraged to take responsibility for their own preparedness and safety in bushfires. Fire agencies should support and assist the community to manage and prepare for bushfire, and encourage people to understand fire and to take actions necessary for their own protection and safety.

Education of the community should foster a sense of partnership between residents, neighbours, land-owners and managers, fire agencies and government in terms of bushfire risk management and response. Householders should be provided with knowledge and skills to enable them to prepare themselves and their property adequately to survive a bushfire, and to enable them to decide whether or not they will remain with their property if a bushfire threatens.

Fire fighting resources cannot always protect every property

In most circumstances fire agencies will be able to provide sufficient fire-fighting resources to defend threatened properties when bushfire occurs. However, there will be circumstances, such as on days of very high or extreme fire danger, when fire agencies are unable to provide fire-fighting resources in sufficient time and strength to prevent all loss of life and damage to property. Therefore people planning to defend their properties must be prepared to be self-sufficient.

In a bushfire, fire fighting resources are likely to be allocated where they will be most effective, not necessarily where losses are most likely.

People need to prepare, then stay and defend their property, or leave early

With proper preparation, most buildings can be successfully defended from bushfire. People need to prepare their properties so that they can be defended when bushfire threatens. They need to plan to stay and defend them, or plan to leave early.

It must be recognised that in limited cases, some buildings, due to their construction methods, construction materials, the site they are located on or their proximity to high and unmanageable fuel loads, cannot for all practical purposes be defended against high intensity bushfires. In these circumstances, householders should be encouraged to relocate early if the intensity of an approaching bushfire is likely to make conditions unsafe.

Prepare:

The most important aspect of preparation for people and their property is the creation and maintenance of a space within which a building can be defended against bushfire embers and radiant heat. Within this defendable space, bushfire fuels must be reduced to prevent or significantly reduce the ability of a fire to burn (and consequently spread to buildings). Other preparatory measures should be taken to minimise the chance of buildings igniting.

Properties should be prepared so that they provide a safe refuge: sheltering from radiant heat and ember attack in a properly prepared building should be the first choice of residents when a bushfire threatens.

Properties should be prepared for bushfire regardless of whether the occupants intend to stay and defend their property or relocate to a place where they feel safer. Proper preparation will improve the safety of firefighters and their ability to defend a building successfully even if the occupants are absent when a bushfire threatens. Well-prepared properties are also more likely to survive in the event that neither residents nor firefighters are available to protect them.

An unprepared property is not only at risk itself, but may also endanger neighbouring properties if it contributes to a bushfire's intensity. Fire fighters may not defend unprepared properties.

Stay and defend:

Buildings are more likely to survive a bushfire if someone is there to protect them.

While fire agencies will strive to provide firefighting crews to protect properties during a bushfire, in some circumstances the fire agency may have insufficient resources to assign a crew to every threatened property. It is particularly during these times that well prepared people can take action to save their properties.

Most buildings lost in bushfires ignite from small fires caused by sparks and embers. These ignitions often occur immediately before, during, or up to several hours after, the passage of the main fire. By extinguishing small initial ignitions, people of adequate mental, emotional and physical fitness, equipped with appropriate skills and basic resources can save a building that would otherwise be lost in a fire.

If people remain to defend adequately prepared homes, losses and community disruption can be reduced.

Education of the community should include providing residents with the skills, knowledge and confidence they need to remain and protect their homes when a bushfire threatens.

Go early:

People should decide well in advance of a bushfire whether they will stay with their homes to defend them or leave if a bushfire threatens. They need to be provided with sufficient information to enable them to competently make this decision. Key factors to be considered include:

- whether the home is adequately constructed, maintained and prepared to withstand the impact of a fire at its expected intensity;
- contingency plans in case a fire is more intense than expected, or if the building catches fire and cannot be extinguished;
- and the physical, mental and emotional fitness of the people to cope with the impact of a bushfire.

If planning to leave early, people must decide where they will go, how they will get there, and what trigger they will use to initiate their plan (for example, vulnerable family members may be relocated to a safer place on days of high or extreme fire danger, even if no fire is burning in the locality).

People who plan to leave early must recognise that on days of very high or extreme fire danger, bushfires may break out nearby and spread at a rate that provides very little time to relocate.

- It needs to be emphasised that people do not necessarily have to go far to be safe – a neighbouring property may be capable of providing a safe refuge.

- Relocation to an adequately prepared place within the immediate vicinity often involves less disruption than travel to a more distant location, allows people to return quickly to their own property, and can be less distressing for those involved.

People who cannot cope with bushfire should relocate well before the fire impacts their location

Due to physical, mental or emotional incapacity to cope with the circumstances, some people would be safer well away rather than attempting to remain with their homes if threatened by fire.

Particular attention needs to be paid to providing for vulnerable residents who may need or wish to be relocated ahead of a bushfire. Plans need to be made well in advance to cope with the expected numbers and special needs of vulnerable populations. Particular consideration must be given to the needs of people who are relatively immobile due to age, disability, injury or illness, who have special medical needs (eg respirators, dialysis) or require the care of others (eg people with mental disabilities).

Vulnerable people living in areas where warning times may be very short should consider relocating permanently.

Last minute evacuations are dangerous

Evacuation at the last minute ahead of a bushfire is dangerous. Smoke, noise, heat, flames, fire-fighting vehicles and panic all make fleeing in a vehicle or on foot dangerous. The risk of being overrun by fire is very real and has resulted in numerous fatalities. People caught in the open are likely to face severe and often fatal levels of radiant heat. All things being equal, people are safer in houses than in cars in a bushfire, and safer in cars than in the open.

It is much safer for people to remain in buildings than flee in the face of an approaching fire. Education of the community must focus on encouraging people to prepare and stay in their homes as a fire approaches, rather than to flee at the last minute.

Mass evacuation is not the favoured option

Provided that adequate preparations have been made, it is better for people to remain with their homes than to be relocated to an evacuation point.

Large scale, mass evacuations of entire suburbs or communities require significant lead times, which are often unavailable. They are difficult to organise and execute efficiently, and involve significant disruption to people and communities. Large scale evacuations demand intensive management of issues such as shelter, feeding, transport, safety, communications, hygiene, medical needs, housing of pets and personal belongings. Mass evacuations can increase the tendency to panic.

Notwithstanding, it is recognised that there may be limited occasions where selective early relocation of vulnerable people may be appropriate. Any such relocation should be planned for and carried out well ahead of the fire. Planned and orderly relocation well ahead of the fire is always preferable to last minute emergency evacuation.

The decision whether to order evacuation should be made by the lead fire combat authority

Ideally, people should make the decision of whether to stay or go for themselves. However, there will be cases where ordered evacuation will be considered by the authorities, overriding individual choice in the interests of public safety. The lead fire combat authority is the best placed to decide whether evacuations should be ordered. Where legislation confers on the police service the power to order evacuation, a formal agreement should be developed between fire agencies and police to specify procedures for consultation should ordered evacuation be contemplated.

Adequately prepared and resourced people should not be forcibly removed from adequately prepared properties.

Forcible evacuation of residents who resist should not be pursued at the cost of missing out on notifying others, or where this would unreasonably endanger the lives of police officers or others.

Road access must be carefully managed during fire events

Roads can be very dangerous during bushfires due to smoke reducing visibility, fallen trees and power lines, panicked drivers and the risk of fire overrun. Road use should be carefully managed to ensure safety and unimpeded access for fire fighting vehicles. As far as possible, access should be maintained for residents and landowners, and denied to sightseers. Access to roads should only be limited while conditions are unsafe, and access reinstated as soon as possible to allow people to return to their properties, and infrastructure providers to restore essential services.

Access should be managed by police on the advice of the fire agency. Safety is the overriding concern, but every effort should be made to allow residents and landowners to reach their properties before the fire impacts and as soon as possible after the fire has passed.

It is essential for people in threatened communities to have ready access to accurate information to assist in decision making

Access to accurate and timely information during periods of high fire danger and fire events is crucial to enable people to make appropriate decisions concerning their safety.

Information for threatened communities should be gathered by the fire agency and distributed through a variety of media appropriate to the situation, such as radio, television, newspapers/magazines, local newsletters, internet sites, recorded/staffed telephone messages, direct contact, and leaflet drop. Fire agencies need to provide the media and the community with information that is accurate, relevant, adequate, consistent, useful and timely. Sufficient information should be provided to allow householders to make an informed choice as to whether to stay and defend their properties or relocate elsewhere.

As the print and electronic media are a primary means of providing information to the community, and media organisations have a legitimate right to information regarding fire events, fire agencies should facilitate their access to relevant information and fire events. Fire agencies should manage media access to firegrounds to provide for the safety of media crews.

Fire emergency plans should be developed for all areas with a bushfire risk

Fire plans and strategies to provide for community safety should be developed for all areas with a bushfire risk. Fire agencies, local government, land managers and other stakeholders should collaborate to ensure appropriate and effective plans are in place well in advance of the bushfire season. People do not necessarily make logical or rational decisions in times of stress; plans will help ensure rational decisions are made. Plans must provide contingencies for a range of possible outcomes.

Land use planning should be used to enhance community resilience to bushfire

Bushfire considerations should be incorporated into every phase of land development from land use zoning and subdivision design, to building siting and design, access provisions and landscaping.

Planning for protection from bushfire should happen at all levels – there should be a continuum of planning from the national, state and local levels through to householders. Planning, particularly at the community and individual scale, can have significant benefits for community safety. The use of relevant legislation to facilitate such planning and preparation is supported.

Fire agencies should support community recovery

Planning for effective community recovery from bushfires is an essential component of bushfire management. Fire agencies should facilitate and support the recovery of communities and infrastructure. Establishment of a sense of partnership between the community and fire-fighting agencies is essential for successful recovery after bushfire events.

Quantifying bushfire penetration into urban areas in Australia

Keping Chen and John McAneney

Risk Frontiers–Natural Hazards Research Centre, Macquarie University, North Ryde, New South Wales, Australia

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[1] The extent and trajectory of bushfire penetration at the bushland-urban interface are quantified using data from major historical fires in Australia. We find that the maximum distance at which homes are destroyed is typically less than 700 m. The probability of home destruction emerges as a simple linear and decreasing function of distance from the bushland-urban boundary but with a variable slope that presumably depends upon fire regime and human intervention. The collective data suggest that the probability of home destruction at the forest edge is around 60%. Spatial patterns of destroyed homes display significant neighbourhood clustering. Our results provide revealing spatial evidence for estimating fire risk to properties and suggest an ember-attack model. *INDEX TERMS:* 1640 Global Change: Remote sensing; 3210 Mathematical Geophysics: Modeling; 6334 Policy Sciences: Regional planning; 9330 Information Related to Geographic Region: Australia. **Citation:** Chen, K., and J. McAneney (2004), Quantifying bushfire penetration into urban areas in Australia, *Geophys. Res. Lett.*, *31*, L12212, doi:10.1029/2004GL020244.

1. Introduction

[2] In 2003, bushfires (or wildland fires) caused devastating property losses in many parts of the world including Australia, southern Europe and California [*Munich Re*, 2004]. Bushfire risk assessment is a complex issue: on the one hand, fire occurrence is subject to a wide range of environmental and human factors [e.g., *Cary et al.*, 2003; *Pastor et al.*, 2003], and, on the other, house survival depends on a multitude of variables including proximity to the firefront, building material, action of emergency services and occupant behaviour [*Wilson and Ferguson*, 1986; *Ramsay et al.*, 1996; *Cohen*, 2000]. To date, research on forest fires has largely focused on understanding their physical attributes and landscape-scale influences [*Malamud et al.*, 1998; *Johnson and Miyanishi*, 2001; *Cochrane*, 2003], while the spatial characteristics of their impact on vulnerable properties at the bushland-urban interface have been largely ignored. In this study we develop a set of distance-based statistics to quantify fire penetration and damage into urban areas. This information is important to stakeholders ranging from property owners to emergency services, local government and the insurance industry.

2. Study Areas and Data

[3] Bushfire is endemic to the Australian continent especially during the Southern Hemisphere summer – December through February [*Luke and McArthur*, 1978; *Cheney*, 1995] and large bushfires have in the past caused substantial property losses [*Leonard and McArthur*, 1999]. Here we mainly explore data from three major historical fires – the 18 January 2003 Canberra bushfires (~500 completely destroyed homes) [*McLeod*, 2003], the 7–8 January 1994 Sydney bushfires (~200 destroyed homes) [*Ramsay et al.*, 1996; *Gill and Moore*, 1998], and the 16 February 1983 "Ash Wednesday" bushfires (~2500 destroyed homes) [*Oliver et al.*, 1984; *Ramsay et al.*, 1996].

[4] We first concentrate on the suburbs of Duffy (206 destroyed homes) in the Canberra fire and Como-Jannali (76 destroyed homes) from the Sydney fire, two extensive residential suburbs each possessing one or two flanks that experienced rampant fire penetration as well as having reasonably large samples of destroyed homes. Fine spatial resolution pre- and post-fire satellite images (QuickBird and IKONOS-2), aerial photographs and photos taken during site inspections were used to manually identify locations (centroids) of destroyed homes and bushland boundaries. Images taken all within 11 days after the fire proved extremely useful. In what follows we first briefly describe these two fires.

[5] Duffy is a leafy suburb that before the fire was bordered by a densely planted commercial pine plantation (average tree height of ~20 m) on its western and northern boundaries. The suburb slopes up towards the forest fringe. During 2002–2003 and as a consequence of prolonged drought, the forest had accumulated high volumes of dry fuel [*McLeod*, 2003]. The fire had been burning for some days in rugged terrain to the west and southwest of Canberra before, driven by strong westerly and northwesterly winds (over 65 km h^{-1}), it fell upon Duffy. The Forest Fire Danger Index (FFDI) - a nominal scale of 1–100 and for which 50 is considered extreme [*Luke and McArthur*, 1978] - peaked at 105 [*McLeod*, 2003]. Fire intensity has been estimated as 50,000 kW m^{-1} (J. Gould, CSIRO, personal communication, 2003).

[6] The fire in Como-Jannali, by contrast, was relatively small [*Gill and Moore*, 1998]. It was initially ignited by the spotting firebrands across the Woronora River and propagated to the Glen Bushland Reserve only about 200 m away from western edge of the suburb. With gusty westerly winds and a FFDI of around 50, properties at the top of the hill were showered by embers from burning bushland on the steep slopes (ca. 30 degrees).

3. Results

[7] Figure 1 shows the distribution of destroyed homes as a function of the shortest distance to adjacent continuous bushlands along the dominant wind and fire propagation direction. The data are presented in cumulative form for easy comparison with other published results [*Ahern and*

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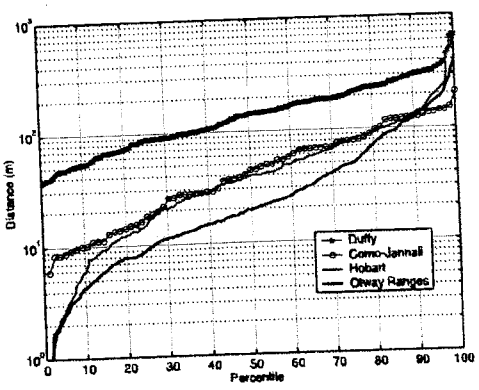

Figure 1. Cumulative distribution of homes destroyed in major bushfires in Australia in relation to distance from nearby bushland. The Otway Ranges curve (648 samples) from the "Ash Wednesday" fires and the Hobart curve (370 samples) from the 7 February 1967 Hobart (Tasmania) fires reported by *Ahern and Chladil* [1999] are also shown.

Chladil, 1999]. While the Como-Jannali curve shows reasonable agreement with previous fires – the Otway Ranges and Hobart fires, the destruction in Duffy is clearly different. The median distance (50 percentile) for Duffy is about three times that of the Como-Jannali fire (145 m versus 45 m) with respective 90 percentile distances being 305 m and 135 m. All this attests to the extreme damage experience in Duffy in part due to enforced home evacuation leaving most homes undefended. Numerous studies have found that suppression activity by residents during and immediately after fires is important in saving homes [e.g., *Wilson and Ferguson*, 1986; *Ramsay et al.*, 1996]. It may also be critical that the conflagration in Duffy was related to adjoining pine forests, whereas the other fires have been mainly associated with Australian eucalypt bushland.

[8] In Duffy and Como-Jannali, the majority of homes were destroyed beyond a separation distance of 40 m, suggesting the main cause of home ignition was airborne embers rather than direct flame contact or radiant heat. In Duffy, no homes lay closer than 37 m to the nearest edge of the forest owing to the presence of two major roads (Eucumbene Drive and Warragamba Avenue) that separated the pine plantation from residential areas. By comparison, homes or small hamlets scattered amongst extensive bushlands, a situation typical of many of the "Ash Wednesday" fires and also the February 1967 Hobart fires, mean that a high number of homes in these fires were destroyed at only small distances from the forest.

[9] There was more consistency in the maximum extent of damage. For Duffy, this distance was 674 m. While the maximum distance of fire spotting can be up to many kilometers [*Luke and McArthur*, 1978], the maximum distance resulting in home destruction for all fires considered here is less than 700 m.

[10] Figure 1 only considers populations of destroyed homes. A more useful statistic is the probability that houses will burn down. Figure 2 shows the probability of destruction, again as a function of distance from adjacent bushland. In Duffy, nearly 60% of all homes within the first 50 m were laid waste whereas at a distance of 300–400 m, only about 10% were destroyed. Distances beyond 400 m were not considered due to very small sample numbers. Neither the linearity nor its slope is sensitive to plausible changes in dominant wind direction.

[11] Losses for Como-Jannali also show a similar linear relationship, although the decline with distance from bushland is more rapid. Here some 57% of homes were destroyed within the first 50 m. If we extrapolate either relationship in Figure 2, the percentage of destruction at zero distance from the forest boundary is about 60%, a value that agrees closely with the average of 63% for four heavily wooded and severely damaged suburbs in the "Ash Wednesday" fires: Fairhaven (71%, n = 127 homes), Aireys Inlet (61%, n = 98), Macedon (57%, n = 97) and Mount Macedon (62%, n = 122). Thus although the environmental settings of these homes may have varied, the percentage destroyed within the first 50 m seems remarkably stable. This statistic may have wide utility for estimating bushfire risk to homes constructed immediately adjacent to bushlands.

[12] It is also revealing to examine patterns of burned urban vegetation. While damage to homes appears discrete, almost binary in nature, i.e., either totally destroyed or relatively unscathed, the spatial distribution of burned vegetation is more continuous, more closely reflecting the trajectory of fire penetration. This can be seen most clearly from false-color or Normalized Difference Vegetation Index (NDVI) images for Duffy in which burned or scorched vegetation can be easily distinguished from healthy trees and grasses (Figure 3). The overall locational correspondence between destroyed homes and burned vegetation is obvious.

[13] Pre- and post-fire healthy urban vegetation in Duffy was classified by using NDVI thresholds and the proportional changes with distance from the forest boundary are shown in Figure 4a. Both curves converge at a distance range of 800–850 m suggesting the limit of fire impact. This range exceeds, yet is of the same order as the maximum extent of home destruction (674 m). For distances less than 400 m, the percentage of vegetated area burned is highly correlated with that of homes destroyed (r^2 =

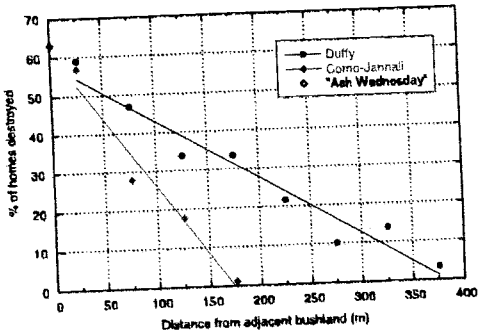

Figure 2. Percentage of homes destroyed at different distance ranges (interval = 50 m). In four suburbs (Fairhaven, Aireys Inlet, Macedon and Mount Macedon) devastated by the "Ash Wednesday" fires, the intermixing of homes and extensive bushlands made the delineation of bushland boundaries difficult and so post-fire aerial photographs were used to estimate percentages of homes destroyed for areas immediately adjacent to bushlands.

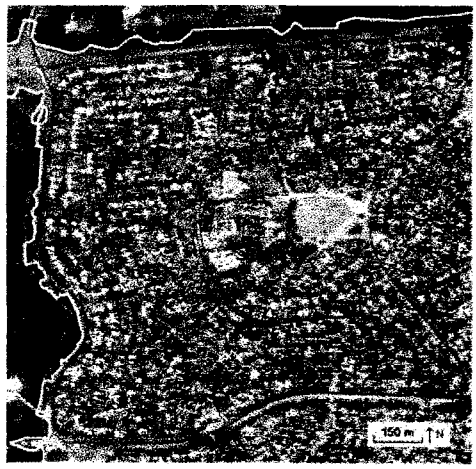

Figure 3. A false-color QuickBird image (with near infrared, green and blue bands) for Duffy. Healthy vegetation is shown in red, whereas burnt vegetation in the west and north appears as grey. White curves indicate bushland boundaries.

0.805, $P = 0.0025$; Figure 4b). The results are insensitive to the NDVI thresholds used to classify healthy vegetation.

[14] Destroyed homes show strong clustering. This is revealed by point pattern profiles calculated with Ripley's *K*-function [*Ripley*, 1981] or its related statistic $\hat{L}(d)(\hat{L}(d) = \sqrt{\hat{K}(d)/\pi} - d)$; edge effects were corrected by prescribing a common polygon containing all pre-fire homes within 400 m of the bushland [*Martinez and Martinez*, 2002]. Pre-

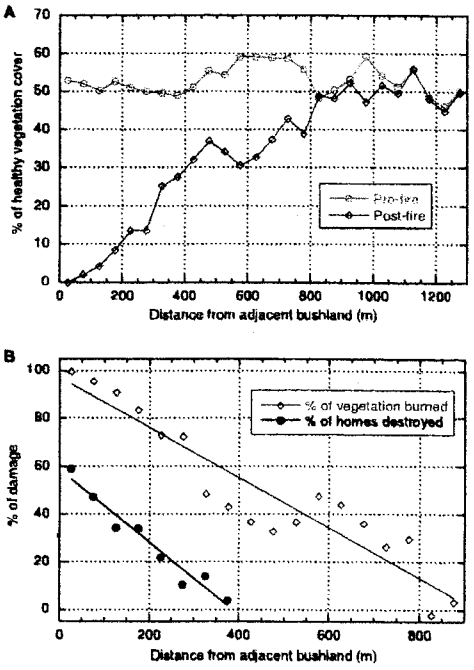

Figure 4. Changes of pre- and post-fire urban vegetation in Duffy. (a) Areal proportions of pre- and post-fire healthy vegetation at different distance ranges (interval = 50 m). (b) Percentage of burned vegetation and probability of home destruction versus distance from the bushland edge.

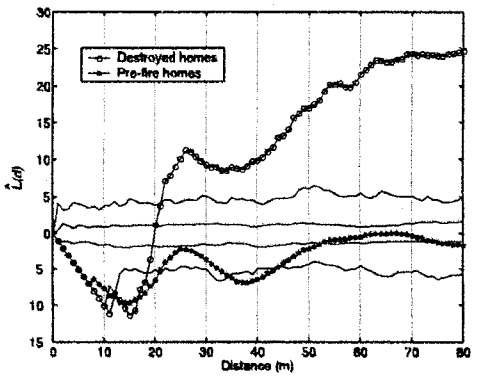

Figure 5. Ripley's *K*-Function expressed as $\hat{L}(d)$ for destroyed and pre-fire homes in Duffy. The dotted line ($\hat{L}(d) = 0$) indicates the expectation of complete spatial randomness following a homogeneous Poisson point process. If $\hat{L}(d) > 0$, the distribution of homes suggests clustering while negative values indicate spatial regularity. Two solid red curves delimit the upper and lower simulation envelopes for destroyed homes at the 1% level of statistical significance; two blue curves pre-fire homes.

fire homes in Duffy display only overall spatial regularity, whereas destroyed homes exhibit significant clustering at circular radii of 22 m and beyond (Figure 5). The first maximum is reached at a distance of 26 m while for distances beyond 35 m a coarser level of clustering exists. These radii are closely related to the spacing of homes – the average size of housing blocks in Duffy is about 24 m by 35 m. (There is no significance at radii less than 11 m – the minimum separation of centroids of destroyed homes.) Destroyed homes in Como-Jannali similarly show significant clustering. The clustering suggests that many houses were destroyed by contagious property-to-property burning as in urban fires.

4. Discussion

[15] The overall linear nature of the relationship (Figures 2 and 4b) is intriguing especially considering the number of variables involved. One simple mechanistic explanation is to imagine large amounts of burning material transported by the wind to a fixed distance in front of the advancing firefront (i.e., ember spotting) and this source of embers is arrested at the bushland-urban boundary. Dimensional arguments for a line buoyancy source perpendicular to the mean wind direction – a plausible idealization of bushfires – suggest updraught velocities of the order of 60 to 70 km h^{-1} for fire intensities similar to that experienced in Canberra; when coupled with similar strength ambient wind speeds, such updrafts undoubtedly provide a suitable ember transport mechanism [*Raupach*, 1990]. Given this mechanism, it can be easily shown that the accumulation of potential fire sources in urban areas decreases linearly downwind from the forest edge. At a local scale, secondary ember sources from nearby burning elements (e.g., garden vegetation, wood piles and other homes) also contribute to this trend.

[16] Evoking embers as a primary cause of subsequent home destruction is hardly new [e.g., *Cheney*, 1995; *Gill and Moore*, 1998]. However, the realization that the accumulation of fire sources might exhibit a simple linear

function of distance downwind from the forest edge is. In the two-level ember-attack model, the probability of home destruction per ember 'hit' is low relative to that of vegetation. Collectively, three features of the pattern of house losses – the overall linearity, clustering at neighbourhoods, and binary outcomes observed at an individual level – comprise a fire impact model for at-risk homes.

[17] Detailed observational data of historical fires are often limited in terms of numbers and quality, but the increasing availability of fine-resolution geospatial data now facilitates in-depth analysis [*Gollberg et al.*, 2001; *Chen et al.*, 2003; *Chuvieco*, 2003]. Our approach has emphasized physical evidence from historical fires in Australia and the distinctive relationships that emerge can help characterize the complex fire penetration process. A clear-cut answer to the true probability of survival for an individual dwelling may never exist; a more immediate goal is to establish ensemble average risks for populations of similarly exposed structures. The distance-based penetration statistics reported here lay the basis for a practical insurance underwriting tool and have implications for defining rational planning regulations dictating distance between settlements and adjacent bushlands.

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K. Chen and J. McAneney, Risk Frontiers–Natural Hazards Research Centre, Macquarie University, North Ryde, New South Wales 2109, Australia. (kchen@els.mq.edu.au)

Ku-ring-gai Council

NORTH WAHROONGA
NORTH TURRAMURRA
ST IVES CHASE
WAHROONGA
WARRAWEE
TURRAMURRA
ST IVES
PYMBLE
SOUTH TURRAMURRA
GORDON
EAST KILLARA
WEST PYMBLE
KILLARA
EAST LINDFIELD
ROSEVILLE CHASE
LINDFIELD
ROSEVILLE

NOTE: This map was printed by Ku-ring-gai Council and is a copy of the Bush Fire Prone Land Map and Bush Fire Evacuatuion Risk Map certified by the Commissioner of NSW Rural Fire Service on 2 January 2008 relating to the Ku-ring-gai Local Government Area.

Bush Fire Prone Land Map and Bush Fire Evacuation Risk Map

Legend

- BUSH FIRE PRONE VEGETATION CATEGORY 1
- BUSH FIRE PRONE VEGETATION CATEGORY 2
- BUSH FIRE PRONE VEGETATION BUFFER 100m and 30m
- SEPP5 EXCLUSION AREA
  (As shown on STATE ENVIRONMENTAL PLANNING POLICY No5 Housing for Older People or People with Disability (Amendment No 6) Bush Fire Evacuation Risk Map)

Data supplied by various Stakeholders undr ANZLIC* Guidelines.

The information contained herein has been provided in good faith. Effort has been made to ensure its accuracy and completeness.

The stakeholders take no responsibility for errors and omissions nor any loss or damage that may result from the use of this information.

* Australia New Zealand Land Information Council.

Production date: 16 Jan 2008 - 11:30pm

CERTIFICATION

For the purposes of Section 146(2) of the *Environmental Planning and Assessment Act 1979*, this map is hereby certified as being a Bush Fire Prone Land Map for the Local Government Area of Ku-ring-gai in NSW

Shane Fitzsimmons AFSM
Commissioner
NSW Rural Fire Service

Date: 2-01-2008

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1:15000

SEPP Exclusion Areas
Gazetted by Department of Planning
on 12 October 2007

NSW RURAL FIRE SERVICE

GRID NORTH

Ku-ring-gai Council