

APPENDIX C

BUSH FIRE THREAT ASSESSMENT

by Conacher Travers Pty Ltd

BUSHFIRE THREAT ASSESSMENT

FOR A PROPOSED SIXTEEN (16) LOT SUBDIVISION

OF

**LOT 2 DP 715324 (NO. 11) ORCHARD STREET
WARRIEWOOD,**

**LOT 6 DP 749741 (NO. 13) ORCHARD STREET
WARRIEWOOD**

AND

**LOT 5 DP749741 (N0. 15) ORCHARD STREET
WARRIEWOOD**

**DECEMBER 2002
(REF: 2288)**

BUSHFIRE THREAT ASSESSMENT

FOR A PROPOSED SUBDIVISION

AT

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WARRIEWOOD,**

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AND

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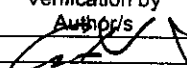
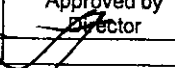
DECEMBER 2002

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| Document No | Prep. date | Description | Issue | Verification by Author/s | Approved by Director |
|-------------|---------------|-------------|---------------|--|---|
| 2288 | December 2002 | Final | December 2002 |  |  |

EXECUTIVE SUMMARY

A Bushfire Threat Assessment Report has been prepared by *Conacher Travers Pty Ltd* at the request of *Ingham Planning* for the subdivision of Lot 2 DP 715324 and Lots 5 & 6 in DP 749741 Orchard Street Warriewood.

The proposed development is classified as a Residential Development within the NSW Rural Fire Service guideline '*Planning for Bushfire Protection 2001*'. Recent changes to the Environmental Planning and Assessment Act and the Rural Fires Act now require all Councils to determine if the application for development conforms with the requirements of '*Planning for Bushfire Protection 2001*' and that all subdivisions and special protection developments be referred to the Rural Fire Service for approval.

This report provides an assessment of the potential bushfire threat to the development, the site-specific mitigation factors and recommends measures, which will address the potential vulnerability of the development to bushfires burning within the adjoining bushland.

It provides recommendations on the provision of Asset Protection Zones, access, water supplies and construction standards to future dwellings within the development.

Therefore, providing these recommendations are implemented and maintained, the proposed development provides reasonable compliance with the requirements of '*Planning for Bushfire Protection 2001*', however it should be noted that the development will need the consent of the Rural Fire Service by way of issue of a 'Commissioner's Bushfire Safety Authority'.

Graham Swain
Project Manager, Fire Planning - *Conacher Travers Pty Ltd*

TABLE OF CONTENTS

| | | |
|-------------------|--|-----------|
| | BUSHFIRE THREAT ASSESSMENT | |
| SECTION 1 | INTRODUCTION | 1 |
| | 1.1 Aims of the Assessment | 1 |
| | 1.2 Planning Relationships | 1 |
| | 1.3 Project Synopsis | 2 |
| | 1.4 Information Collation | 2 |
| | 1.5 Site Description | 3 |
| SECTION 2 | BUSHFIRE PROTECTION ASSESSMENT | 5 |
| | 2.1 Background to Current Planning Guidelines | 5 |
| | 2.2 Bushfire Protection Assessment | 5 |
| | 2.3 Bushfire Attack Assessment | 6 |
| SECTION 3 | ASSESSMENT OF BUSHFIRE THREAT | 9 |
| | 3.1 Bushfire Threat Assessment | 9 |
| | 3.2 Bushfire Threat Conclusion | 12 |
| SECTION 4 | ISSUES ARISING FROM THE THREAT ASSESSMENT IN RELATION TO THE PROPOSED DEVELOPMENT | 13 |
| | 4.1 Fire Protection Measures | 13 |
| | 4.2 Building Protection | 13 |
| | 4.3 Legislative Responsibility to Manage Hazardous Fuels | 13 |
| | 4.4 Evacuation Safety | 14 |
| | 4.5 Availability of Fire Fighting Services | 14 |
| | 4.6 Access for Fire Fighting Operations | 14 |
| | 4.7 Water Supplies | 14 |
| SECTION 5 | CONCLUSION AND RECOMMENDATIONS | 15 |
| | 5.1 Conclusion | 15 |
| | 5.2 Recommendations | 15 |
| | REFERENCES | 17 |
| SCHEDULE 1 | Plan of Bushfire Protection Measures | |
| APPENDIX 1 | Details of Asset (Fire) Protection Zones | |

SECTION 1

INTRODUCTION

Conacher Travers Pty Ltd has been requested by *Ingham Planning* to prepare a Bushfire Threat Assessment for the subdivision of Lot 2 in DP 715324 and Lots 5 & 6 in DP 749324 Orchard Road, Warriewood.

Schedule 1 provides an aerial view of the property and its surrounds.

1.1 AIMS OF THE ASSESSMENT

The aims of the bushfire threat assessment are to:

- Review the overall bushfire threats – hazard, risk and vulnerability;
- Review the capability of the site to provide a safe development;
- Review the potential to carry out hazard management over the landscape;
- Provide advice on mitigation measures including the provision of Asset Protection Zones and Construction Standards;
- Review and provide advice on access and water supply;
- Review the evacuation capability of the area; and
- Advise on specific fire management issues.

1.2 PLANNING RELATIONSHIPS

This report has been prepared having regard to the following legislative and planning requirements.

1.2.1 Legislation

Environmental Planning and Assessment Act (EPA Act)

- Section 79C(1)(c) - in regard to the likely impacts of the development - e.g. natural hazards (bushfire risk); and the suitability of a site for development - e.g. bushfires.
- Section 79 BA requires Councils to be satisfied that developments in bushfire prone areas (other than those dealt with under Section 100B of the RFA) comply with *Planning for Bushfire Protection, 2001* before granting development consent.

Rural Fires Act 1997 (Amended)

- Section 100B provides for the issue by the Commissioner of the NSW Rural Fire Service of bushfire safety authorities for subdivision of bushfire prone land that could lawfully be used for residential or rural residential purposes or for development of bushfire prone land for a special protection purpose (eg. SEPP 5, Hospital, Nursing Home, Schools, etc).
- Sections 63 (1) and 63 (2) require public authorities and owners/occupiers of land to take all practicable steps to prevent the occurrence of bushfires on, and to minimise the danger of the spread of bushfires.

1.2.2 Planning Policies

- Planning for Bushfire Protection - 2001 Rural Fire Service/Planning NSW - This document was prepared by the Rural Fire Service in collaboration with Planning NSW and replaces Circular C10 (1983) and *Planning for Bushfire Protection 1991* prepared by the Department of Bush Fire Services.

The 2001 revision of *Planning for Bushfire Protection* provides guidance on the planning and development control processes in relation to bushfire protection measures for subdivision and residential developments in bushfire prone areas. The document also addresses issues associated with Infill and Special Protection Developments e.g SEPP 5, Schools and Nursing Homes.

- Warringah / Pittwater Bushfire Management Committee, 2001 Bush Fire Risk Management Plan - This document is authorised by the *Rural Fires Act 1997*. This document is a large-scale review of the Warringah / Pittwater Local Government Area (LEP).

1.3 PROJECT SYNOPSIS

This report has been prepared to accompany a rezoning application for land known as Nos. 11, 13 & 15 Orchard Street, Warriewood, which are part of the original Sector 10 in the Warriewood Valley Urban Land Release.

The rezoning proposal provides for the establishment of sixteen (16) new lots.

Lots 1-6 will be zoned 2(f) Urban Purposes – Mixed Residential and created within Lot 5 DP 749741 (No. 15) Orchard Street with the existing dwelling being located on proposed Lot 4.

Lots 7-10 will be zoned 2(f) Urban Purposes – Mixed Residential and created within Lot 6 DP 749741 (No. 13) Orchard Street with the existing dwelling being located on proposed Lot 8.

Lot 11 will be created within Lots 5 and 6 of DP 749741 (No. 15 and 13) Orchard Street and will be zoned 7(b) Conservation and Scenic Protection.

Lots 12-15 will be zoned 2(f) Urban Purposes – Mixed Residential and created within Lot 2 DP 715324 (No. 11) Orchard Street with the existing dwelling being located on proposed Lot 13.

Lot 16 will be created within Lot 2 DP 715324 (No. 11) Orchard Street and will be zoned 7(b) Conservation and Scenic Protection.

Access to all lots will be either directly from the Right of Carriageway off Orchard Street or by Right of Carriageway off the Right of Carriageway.

Schedule 1 provides the development layout.

1.4 INFORMATION COLLATION

To achieve the report aims, a review of information relevant to the property was undertaken prior to the initiation of field surveys. Information sources reviewed include the following:

- Plan of Proposed Subdivision prepared by *Byrne & Associates Pty Ltd* (Plan No. A2-9441P 25.10.2002).
- LPI of NSW 1:25,000 Topographic Map.
- DLWC 1:25,000 Aerial Photograph.

Graham Swain of *Conacher Travers Pty Ltd* visited the site in March 2002. An inspection of the property and adjoining lands was undertaken.

The development area was inspected to assess the topography, slopes, aspect, drainage, vegetation and adjoining land use. The identification of existing bushfire protection advantages and a visual appraisal of bushfire hazard and risk were also undertaken. (Bushfire protection advantages are those landscape features which act to suppress or mitigate a fire eg. escarpments, creeks, road and fire breaks etc.).

1.5 SITE DESCRIPTION

Location and Surrounding Landuse

The three properties (Nos. 11, 13 & 15 Orchard Street) are located to the south west of the western end of Orchard Street, Warriewood.

All three properties have access to Orchard Street via a Right of Carriageway.

Proposed Lots 1-4 are located within the northern part of the development and adjoin an existing Rural Residential development to the north, a bushland reserve to the west, existing Rural Residential development to the east and proposed Lots 5 and 11 to the south.

Proposed Lots 5-11 are located within the central part of the development and adjoin proposed Lots 1-4 to the north, existing Rural Residential development to the east, bushland reserve to the west and proposed Lot 13 and existing No. 11A (Lot 1 DP 715324) to the south.

Proposed Lots 12-16 are located within the southern part of the development and adjoin proposed Lot 10 to the north, existing Rural Residential development to the east, residential development to the south and existing No. 11A (Lot 1 DP 715324) to the west.

The land within the surrounding area contains allotments greater than one hectare which have been used for market gardening, but is being developed for residential and industrial use.

These areas are mostly cleared with the higher ridgeline to the west of the development rising steeply to the west towards Ingleside and is heavily vegetated with Dry Sclerophyll Forest (Group 1 Vegetation).

Topography

Orchard Street extends to the west from Garden Road rising to contour level 30 metres AHD at the north eastern corner of proposed Lot 4.

The Right of Carriageway extends to the south from Orchard Street, falling to contour level 5 metres AHD through proposed Lot 15.

Proposed Lots 1-4 rise above the Right of Carriageway at approximately 32%. Land to the west rises above proposed Lot 1 at approximately 35-40%.

Proposed Lots 5-10 rise above the Right of Carriageway at approximately 24%. Land to the west (Lot 11) rises above proposed Lots 5-10 at approximately 38%.

Proposed Lots 13-15 have been terraced to form level benches whilst Lot 12 contains slopes in the order of 50% within the scarp lines.

Topography within the adjoining land to the west of Lots 12, 14 and 15 (No. 11A Orchard Street) consists of steep scarp lines rising to a level bench on which the dwelling is located.

Land to the east of the development falls generally to the east at approximately 15-20%.

Drainage

Drainage from the development is by overland flow towards the south east into Mullet Creek.

Vegetation Communities

No. 15 Orchard Street

The rear portion of the property has been actively cleared and retained as a fuel free zone. The extent of under scrubbing to create fuel free zones has left a few isolated remnant trees in the area treated as a yard, behind the house.

The property to the west of No. 15 contains largely undisturbed Dry Sclerophyll Forest (Group 1 Vegetation).

No. 13 Orchard Street

This property has the highest retention of Dry Sclerophyll bushland of all three properties within the proposed development. The southern portion of the property, consisting of the area between the existing dwellings of Nos. 13 and 11, supports bushland which provides visual screening between these properties. A grazing paddock adjoins the Right of Carriageway with the rear (Proposed Lot 11) containing undisturbed Dry Sclerophyll Forest (Group 1 Vegetation).

No. 11 Orchard Street

A significant escarpment protrudes through this site cutting the rear north western corner and grading further to the west into the adjoining property (No. 11A Orchard Street).

The surrounds of the house consist of entirely landscaped gardens with the inclusion of occasional remnant trees within defined garden beds. The benches created by the rock outcrops and topography support a cultivated lawn.

The property to the west of No. 11 (11A) has been underscrubbed with the lower bench areas used for grazing. The area adjoining the existing dwelling has been cleared and landscaped.

SECTION 2

BUSHFIRE PROTECTION ASSESSMENT

2.1 BACKGROUND TO CURRENT PLANNING GUIDELINES

The document titled '*Planning for Bushfire Protection*' (Rural Fire Service, 2001) was released in January 2002 by the NSW Rural Fire Service. The new document was prepared by the NSW Rural Fire Service in collaboration with Planning NSW and replaces the previous '*Planning for Bushfire Protection*' guideline originally released by the Department of Bushfire Services in May 1991.

'Planning for Bushfire Protection' (Rural Fire Service, 2001) provides concepts for building in bushfire prone areas and guidance on the planning and development control processes in relation to bushfire protection measures and states that 'overall the intention of bushfire protection measures should be to prevent flame contact to a structure, reduce radiant heat to below the ignition thresholds for various elements of a building, to minimise the potential for embers to cause ignition and reduce the effects of smoke on residents and fire fighters'.

The document provides a methodology for determining setback distances (Asset Protection Zones) and Bushfire Attack/Construction Standards required for habitable Class 1, 2 and 3 buildings in development for residential purposes is designated as bushfire-prone.

'This Assessment assumes a worst case scenario where there is no fuel management, fire history and an absence of any other mitigating factors' (Section A2.2(3)).

Section 1.1.4 'Limitations' states:

'The measures recommended in this document are derived from both scientific theory and practical experience. They are not necessarily universally applicable and consideration of individual cases may warrant modifications of the recommendations'.

Section 3 of this report 'Assessment of Bushfire Threat' identifies site specific mitigating factors and provides a methodology for determining Bushfire Threat and the level of vulnerability of the development.

2.2 BUSHFIRE PROTECTION ASSESSMENT

Section A2.3.1 of '*Planning for Bushfire Protection 2001*' provides the following procedure for determining setback distances (Asset Protection Zones).

- (a) Determine vegetation distance, type and class
- (b) Determine the average slope of the land between the predominant vegetation class and the building then
- (c) Consult Tables A2.2-2.4 and determine appropriate setback (Asset Protection Zone)

Table 1 provides a summary of this assessment.

TABLE 1 – Bushfire Protection Assessment

| Aspect | Vegetation within 140m of development | Predominant Vegetation Class (Fig A2.2 and Table A2.1) | Average Slope of Land | Recommended Width of Asset Protection Zone (Table A2.2 and 2.4) | Width of Asset Protection Zone Provided |
|-----------------------|--|--|--|---|---|
| North Lots 1-4 | Rural Residential Mown Grass | N/A | 0.5° | No Bushfire Threat | N/A |
| East Lots 4-15 | Rural Residential / Urban Development | N/A | 0.5° | No Bushfire Threat | N/A |
| South Lots 1-3 | Proposed Reserve Open Forest | Group 3 (less than 1 ha) | Upslope >5° | 20 metres | 20 metres |
| South Lot 15 | Proposed Reserve Open Forest / Cleared | Group 1 / Cleared | Level / upslope | 20 metres | 10 metres * 1 |
| West Lot 1 | Open Forest | Group 1 | Upslope >5° | 20 metres | 20 metres |
| West Lots 5-10 | Open Forest | Group 1 (less than 1 ha) | Upslope >5° | 20 metres plus fire trail | 24 metres |
| West Lots 12, 14 & 15 | Cleared maintained paddock dwelling | Group 3 | Upslope >5° to Lots 12 & 14 Level to Lot 15 | 20 metres | 10 metres * 2 |

Note * 1

Lot 15 is located within the valley floor adjoining vegetation growing in a riparian corridor. Bushfire burning within the adjoining vegetation will either burn upslope away from the proposed dwelling or burn down the downslope toward the proposed dwelling with low intensity.

Note * 2

The property adjoining the western boundary of Lots 12, 14 & 15 contains pockets of highly modified bushland vegetation with the lower areas used for grazing. The bushfire threat to the development on these lots has been significantly reduced due to land management practices within the adjoining property.

2.3 BUSHFIRE ATTACK ASSESSMENT

Section A3.3 of 'Planning for Bushfire Protection 2001' provides the following procedure for determining bushfire attack at construction stage for a building within a designated bushfire prone area.

- (a) Determine vegetation types and classes around the site.
- (b) Determine the separation distance between each vegetation group and the structure in accordance with the following classifications:
 - Less than 20 metres
 - From 20 metres but not greater than 30 metres

- Greater than 30 metres but not greater than 50 metres
- Greater than 50 metres but not greater than 80 metres
- Greater than 80 metres but not greater than 100 metres

(c) Determine the average slope of the ground for each vegetation group.

Five categories of Bushfire Attack are determined. They are:

Low – Insignificant ember attack, radiation no greater than 14.5 KWm^2 or is greater than 100 metres from all woody vegetation.

Medium – Significant ember attack, radiation heat greater than 14.5 KWm^2 and no greater than 16 KWm^2 (Level 1 Construction AS3959-1999).

High – Significant ember attack, possible flame contact, radiation heat greater than 16 KWm^2 and no greater than 21 KWm^2 (Level 2 Construction AS3959-1999).

Extreme – Significant ember attack, possible flame contact, radiation heat greater than 21 KWm^2 and no greater than 31 KWm^2 (Level 3 Construction AS 3959-1999).

Flame Zone – Within the Flame Zone and/or greater than 31 KWm^2 (Construction outside scope of AS3959-1999).

Table 2 provides a summary of Bushfire Attack and resultant construction standards.

TABLE 2 – Bushfire Attack Assessment

| Aspect | Vegetation within 140m of development | Predominant Vegetation Class (Fig A2.2 and Table A2.1) | Average Slope of Land | Separation distance | Level of Bushfire Attack (Table A3.3) | Construction Standard |
|----------------|---|--|------------------------|---------------------|---------------------------------------|----------------------------|
| North Lots 1-4 | Cleared Rural Residential Development Pasture Grasses | N/A | 0-5° | 3 metres | Low | N/A |
| East Lots 4-15 | Rural Residential Development / Urban | N/A | 0-5° | 20 metres | Low | N/A |
| South Lots 1-3 | Open Forest | Group 3 | Upslope >5° | 20 metres | Extreme | Level 3 |
| South Lot 15 | Open Forest / Cleared | Group 1 / Cleared | Level then upslope >5° | 10 metres | Flame Zone | Outside scope of AS3959 *1 |
| West Lot 1 | Open Forest | Group 1 | Upslope >5° | 20 metres | Extreme | Level 3 *2 |
| West Lots 5-10 | Open Forest | Group 1 | Upslope >5° | 24 metres | Extreme | Level 3 *2 |

TABLE 2 – Bushfire Attack Assessment Cont.

| Aspect | Vegetation within 140m of development | Predominant Vegetation Class (Fig A2.2 and Table A2.1) | Average Slope of Land | Separation distance | Level of Bushfire Attack (Table A3.3) | Construction Standard |
|---------------------|---------------------------------------|--|---|---------------------|---------------------------------------|----------------------------|
| West Lots 12,14& 15 | Cleared / maintained bushland | Group 3 | Upslope >5° to Lots 12 & 14 level to Lot 15 | 10 metres | Flame zone | Outside scope of AS3959 *1 |

Note * 1

The future dwellings on proposed Lots 12, 14 and 15 will be sited in the floor of the valley with downhill approach by potential bushfires. The resultant radiant heat impact will not require the imposition of construction standards greater than Level 2 of Australian Standard AS3959.

Note *2

The future dwellings on proposed Lot 1 and Lots 5-10 will be sited downslope of vegetation within the existing / proposed reserve lands. Radiant heat impact will not require the imposition of construction standards greater than Level 2 of Australian Standard AS3959.

SECTION 3

ASSESSMENT OF BUSHFIRE THREAT

3.1 BUSHFIRE THREAT ASSESSMENT

'Planning for Bushfire Protection' is a guideline and is not required to be used as a prescriptive determination for all localities. Modifications to these guidelines can be made where individual cases warrant such modification (RFS, 2001 BPP, page 3).

In these cases any departure from the guidelines should only occur in the presence of reasoned assessment and a holistic approach to the bushfire protection proposed at any such site / locality. Hence a bushfire threat assessment needs to be undertaken to adequately review all the factors that contribute to effective bushfire safety.

Such an assessment needs to analyse the actual bushfire 'threat'. The bushfire threat is normally considered to be the 'measure of potential' to cause damage to dwellings or an injury to person/s.

Developing in bushfire prone areas requires consideration of the overall threat upon a site and the way occupants of a site and or dwelling are able to cope in the event of a fire. The bushfire assessment process requires a breakdown of the issues relevant to bushfire threat assessment. This is achieved by a review of three prime 'cause & effect' factors i.e. hazard, risk and vulnerability and assesses the benefits of any naturally occurring mitigation factors.

The following provides the review of the three prime causes and effect factors:

3.1.1 Hazard Assessment

The hazard is the potential severity of a fire. Usually measured in terms of intensity (Kw/m), the factors that influence a bushfire hazard include climate and weather patterns, vegetation (fuel quantity, distribution and moisture) and slope (Planning for Bushfire Protection 2001).

In the assessment of hazard only the areas peripheral to the proposed development zone are normally assessed for a hazard rating. This is because it could be assumed that all fuel within the development areas would be removed or at least modified as part of living in a locality or occupying a site. We understand that the development proposal will maintain this status.

The bushfire hazard is assessed on information involving the type of vegetation (and how well it burns during a bushfire) and the slope of the land within the property. This information is then applied to Table 3, derived from the Bushfire Risk Management Plan.

The property is adjoined by Open Forest (Dry Sclerophyll Forest) vegetation to the immediate west on slopes that rise steeply above the proposed subdivision and future dwellings.

Table 3 does not provide a methodology for determining the hazards from bushfires burning within vegetation located upslope (i.e. above) of the development.

TABLE 3 – Fire Hazard Calculation

Methodology for Calculation of Hazard Rating using Vegetation and Slope Parameters

| Vegetation Type | ROS (km/h) | Fuel Load (t/ha) | Burn out time (s) | Normalised Fire Hazard | | |
|------------------------|------------|------------------|-------------------|------------------------------|--------------------------------|-----------------------------|
| | | | | Level Terrain (0-5°) (0-10%) | Hilly Terrain (5-15°) (11-28%) | Steep Terrain (>15°) (>28%) |
| Grazed Pasture | 9.3 | 3 | 5 | 1.0 | 2.0 | 4.0 |
| Tall Grass | 11.0 | 6 | 10 | 4.7 | 9.5 | 18.9 |
| Grassy Woodland | 5.5 | 7 | 20 | 6.2 | 12.4 | 24.8 |
| Rainforest | 1.0 | 10 | 120 | 9.7 | 19.4 | 38.7 |
| Grassy Forest | 3.5 | 12 | 40 | 13.5 | 27.1 | 54.2 |
| Mallee/Spinifex | 4.5 | 8 | 60 | 17.4 | 34.8 | 69.7 |
| Short Heath | 3.0 | 15 | 80 | 29.0 | 58.1 | 116.1 |
| Tall Heath | 4.0 | 25 | 100 | 80.6 | 161.3 | 322.6 |
| Dry Sclerophyll Forest | 3.0 | 25 | 200 | 121.0 | 241.9 | 483.9 |
| Wet Sclerophyll Forest | 3.0 | 50 | 300 | 362.9 | 725.8 | 1451.6 |

TABLE 4 – Relative Hazard Classes

| Hazard Rating | Hazard Description |
|--------------------|---|
| 0 - 24 LOW | These combinations of vegetation and slope present a lower relative hazard to suppression forces trying to protect property and assets at an FDI of 60. Areas with a low relative hazard score still present a bushfire problem |
| 24.1 – 96 MODERATE | These combinations of vegetation and slope present an intermediate hazard. |
| > 96 HIGH | These combinations of vegetation and slope present the greatest hazard to suppression forces trying to protect property and assets at an FDI of 60. |

(Based on Rural Fire Service Bush Fire Risk Management Plan)

Assessment of Hazard:

Due to the downhill approach of fire to the future dwellings the bushfire hazard has been determined, using Table 1 of Circular C10 which provides a hazard rating for fires burning downslope to an asset, as having a hazard score which equates to Moderate.

3.1.2 Risk Assessment

Bushfire risk is the chance of a bushfire igniting, spreading and causing damage to assets of value to the community and is related to the vulnerability of the asset ('Planning for Bushfire Protection 2001').

Fire History - The impact of the 1994 bushfires are evident on the property with back burning operations undertaken from the rear of the existing dwellings.

Point of fire origin - Fire events that have impacted the area previously have been from bushland areas to the west within the adjoining bushland and reserve. The 1994 bushfire event resulted in the advance of wildfire, by ember spotting, from an initial ignition at

Cottage Point. The fire which impacted this property was from spot fires ahead of the main fire.

It is most likely that accidental escapes from fires within the rural residential development to the west / north west of the property and also ember attack from remote fires will be the primary source of ignition of the adjoining bushland.

Likely ignition sources - It is most likely that accidental escapes from deliberately lit (arson) fires within the bushland/Recreational Reserve will be the primary ignition source. Spot fire ignition from remote fires may also contribute to the ignition source of fire within the existing/future bushland reserves.

Potential Fire Frequency - There is potential for a regular fire regime of between 20-80 year rotation (+ or - 20 years) for moderate to high intensity fires and between 5-20 year rotation for localised small fire incidents.

Type of Risk - These factors mean that there is a moderate risk of fire starting, spreading and impacting on both the general area and the proposed development.

Assessment of Risk

Moderate.

3.1.3 Assessment of Vulnerability

The vulnerability is the exposure of a site to severe fire behaviour such as excessive flame height and severe radiant heat flux, and the proximity of that site, to or from, safe areas. (The latter being as a result of a site being isolated, and if evacuation is required, then that may necessitate a route through potentially burning bushland).

Potential Impact Direction – West.

Exposure of Proposed Development - The property is located adjacent to a Recreation Reserve which contains Open Forest (Group 1) vegetation which adjoins the western boundary.

The proposed future dwellings will be exposed to downhill burning bushfires with resultant low intensity.

Nature of Potential Impact - It is possible that fires will ignite within the surrounding bushland within the reserve to the west. Potential impact from fires burning within this bushland will be radiant heat and ember attack however this impact is reduced by the proposed fire trail to the rear of the development and the proposed Asset Protection Zone to the west.

Assessment of Vulnerability

Moderate.

3.2 BUSHFIRE THREAT CONCLUSION

The assessment of the bushfire hazard has identified that the Hazard rating is Moderate. An assessment of risk and vulnerability has assessed the development as having a Moderate Risk and Moderate Vulnerability. The overall Bushfire Threat is therefore considered to be **MODERATE**.

This rating reflects the site specific bushfire mitigating factors provided by the location of the proposed development at the bottom of an east facing slope which rises steeply above the future dwellings and the protection provided by the existing Rural Residential and Residential development to the north, east and partly to the west of the development.

SECTION 4

ISSUES ARISING FROM THE THREAT ASSESSMENT IN RELATION TO THE PROPOSED DEVELOPMENT

4.1 FIRE PROTECTION MEASURES

'Planning for Bushfire Protection 2001' provides a methodology for determining the setback requirements (Asset Protection Zones) and construction standards for habitable buildings in developments for residential purposes that are located within a designated bushfire prone area.

Whilst the guideline recognises that 'assessment assumes a worst case scenario where there is no fuel management, fire history and an absence of any other mitigating factors' it does not provide a methodology for assessing and quantifying these mitigating factors.

The Bushfire Threat Assessment (Section 3) provides a methodology for assessing these mitigating factors and for determining which level of potential vulnerability that a development may have from bushfires burning within the adjoining bushland.

The assessment has identified that the development will be exposed to a Moderate Bushfire Threat and a Moderate level of vulnerability, however the 20 metre Asset Protection Zone from the western boundary, and the proposed fire trail will provide a level of protection which will reduce the vulnerability of the residents/fire fighters against the potential impact of bushfires.

4.2 BUILDING PROTECTION

Section 2.3 'Bushfire Attack Assessment' of this report has determined that the potential bushfire attack ranges from Low to Flame Zone. These ratings do not provide for the site specific mitigating efforts of the location of the development, downslope of the higher ridgeline to the west. The resultant radiant heat impact will be less than that required by 'Planning for Bushfire Protection' therefore Conacher Travers recommends that the elevations of the dwellings which face the bushland interface should be constructed to comply with Level 2 Construction in accordance with AS3959. In addition, gutters and valleys to all future dwellings should be fitted with leaf protection to prevent the build up of leaf and other debris within the gutters and valleys.

These measures provide additional protection against the potential bushfire threat

4.3 LEGISLATIVE RESPONSIBILITY TO MANAGE HAZARDOUS FUELS

Section 63(2) of the Rural Fires Act requires that 'it is the duty of the owner or occupier (including Councils) of land to take the notified steps (if any) and any other practicable steps to prevent the occurrence of fires on, and to minimise the danger of the spread of fires on or from that land'.

In the case where owners do not carry out their required fuel management of hazardous land the Council has the right to enter and clear lands and later bill the owner (Section 66).

The private ownership of the land means that the owners will have an ongoing liability to manage those lands for the protection of themselves and their neighbours.

There is no physical reason that could constrain hazard management from being successfully carried out by normal means e.g. mowing / slashing / hand brush cutting within these zones.

4.4 EVACUATION SAFETY

The need to consider evacuation of the development is based on the 1994-1996 Coroner's Inquiry into the 1994 bushfires in NSW. The Coroner recommended that in the assessment of a development for urban areas, due consideration should be given to access for fire fighters and egress for residents during bushfire events.

Safe access / egress can be provided directly from the future dwellings onto Orchard Street thence east onto Garden Street.

4.5 AVAILABILITY OF FIRE FIGHTING SERVICES

There is a Rural Fire Brigade located at Ingleside approximately 6.25 kilometres (by road) from the proposed development in a westerly direction. Ingleside Rural Fire Brigade would have a response time of approximately 15-20 minutes to service the development if they are not assisting elsewhere.

A NSW Fire Brigade Station is located at Mona Vale approximately 4.6km (by road) to the north of the development. The NSW Fire Brigade would have a response time of approximately 10-15 minutes to service the development.

4.6 ACCESS FOR FIRE FIGHTING OPERATIONS

Vehicular access for fire management operations has been provided via a 4 metre wide fire trail which extends off Orchard Street between Lots 5 and 6 turning to extend in a southerly direction along the rear of Lots 5-10 exiting onto the existing formed driveway servicing the dwelling on Lot 1 DP 715324 (No 11A). The fire trail will be constructed within a 6 metre wide x 6 metre high corridor clear of all vegetation with a pavement strength capable of withstanding a vehicle of 14 tonne G.V.M.

A locked gate should be provided at the intersection of the trail with the driveway to Lot 1 DP 715324 (No 11A).

4.7 WATER SUPPLIES

It is understood that reticulated water will be available to the proposed development. No further water supply is required.

Water supply hydrants should be provided in accordance with AS2419.1-1994

SECTION 5

CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

In the assessment of bushfire prone lands the fundamental question is whether or not an area is safe for the occupation of people in residential dwellings. The proposed development is within a bushfire prone area therefore the requirements of '*Planning for Bushfire Protection 2001*' apply. However a bushfire threat assessment has revealed that mitigating factors will reduce the potential bushfire impact to the development.

Therefore, in accordance with the potential bushfire threat and Section 1.1.4 'Limitations' of '*Planning for Bushfire Protection 2001*' the following recommendations provide reasonable compliance with '*Planning for Bushfire Protection 2001*'.

5.2 RECOMMENDATIONS

Recommendation 1 - The future dwellings should be sited within the preferred building zone nominated on Schedule 1 'Plan of Bushfire Protection Measures'.

Recommendation 2 - Asset Protection Zones should be provided to the future dwellings. They shall take the form of Inner Protection Areas, measured from the extremities of the dwellings. The Asset Protection Zones shall be as nominated below and also as depicted in Schedule 1.

TABLE 5 – Asset Protection Zones

| ASPECT | INNER PROTECTION AREA (FUEL FREE) | TOTAL ASSET PROTECTION ZONE |
|--------------------------|---|--------------------------------|
| North to Lots 1-4 | Nil | Nil |
| East to Lots 4-10 | Nil | Nil |
| South to Lots 1-3 | 20 metres | 20 metres |
| South to Lot 15 | 10 metres | 10 metres |
| East to Lot 15 | 10 metres | 10 metres |
| West to Lots 1 & 5-10 | 20 metres plus fire trail (5-10) 20 m to Lot 1 | 24 metres to Lots 5-10 |
| West to Lots 12, 14 & 15 | 10 metres | 10 metres |

Recommendation 3 - Fuel management within the Asset Protection Zone should be maintained by regular slashing / mowing in accordance with the guidelines provided in Appendix 1.

Recommendation 4 - The application of the Australian Standard AS3959 '*Construction of Buildings in Bush Fire Prone Areas*', in accordance with Part 2.3.4 of the '*Building Code of Australia*' should apply to the future dwellings on Lots 1-3, 5-10, 12, 14 & 15. The elevations of the dwellings which face the bushland interface should be constructed to conform to Level 2 construction standards of AS3959 – 1999 (Amended).

Recommendation 5 - Roof gutters and valleys to all future dwellings should be leaf proofed by the installation of an external gutter protection shroud or a gutter system that denies all leaves from entering the gutter and building up on that gutter. Any material used

in such a system should have a flammability index of no greater than 5 (as measured against AS 1530.2).

Recommendation 6 - Fire hydrants should be installed in accordance with AS2419.1-1994.

Recommendation 7 – A fire trail gate should be installed behind proposed Lot 10 complete with a Rural Fire Service padlock.

Recommendation 8 - A Fuel Management Plan should be prepared for the management of the proposed Public Reserves (Lots 11 & 16).

REFERENCES:

NSW Rural Fire Service (2001)- *'Planning for Bush Fire Protection - A Guide for Councils, Planners, Fire Authorities, Developers and Home Owners*. NSW Rural Fire Service

Travers, J (1994) Hazard and Threat Assessment Training Module. JTA.

Walker, J. (1984) Fuel Dynamics in Australian Vegetation. In "Fire and the Australian Biota" Australian Academy of Science.

McArthur, (1967). A.G. Leaflet 107 Fire Behaviour in Eucalypt Forest A.G.McArthur, Canberra. Commonwealth of Australia Department of National Development. Forestry and Timber Bureau. (and reprinted later by) CSIRO Div. Forestry - Bush Fire Research Unit.1967.

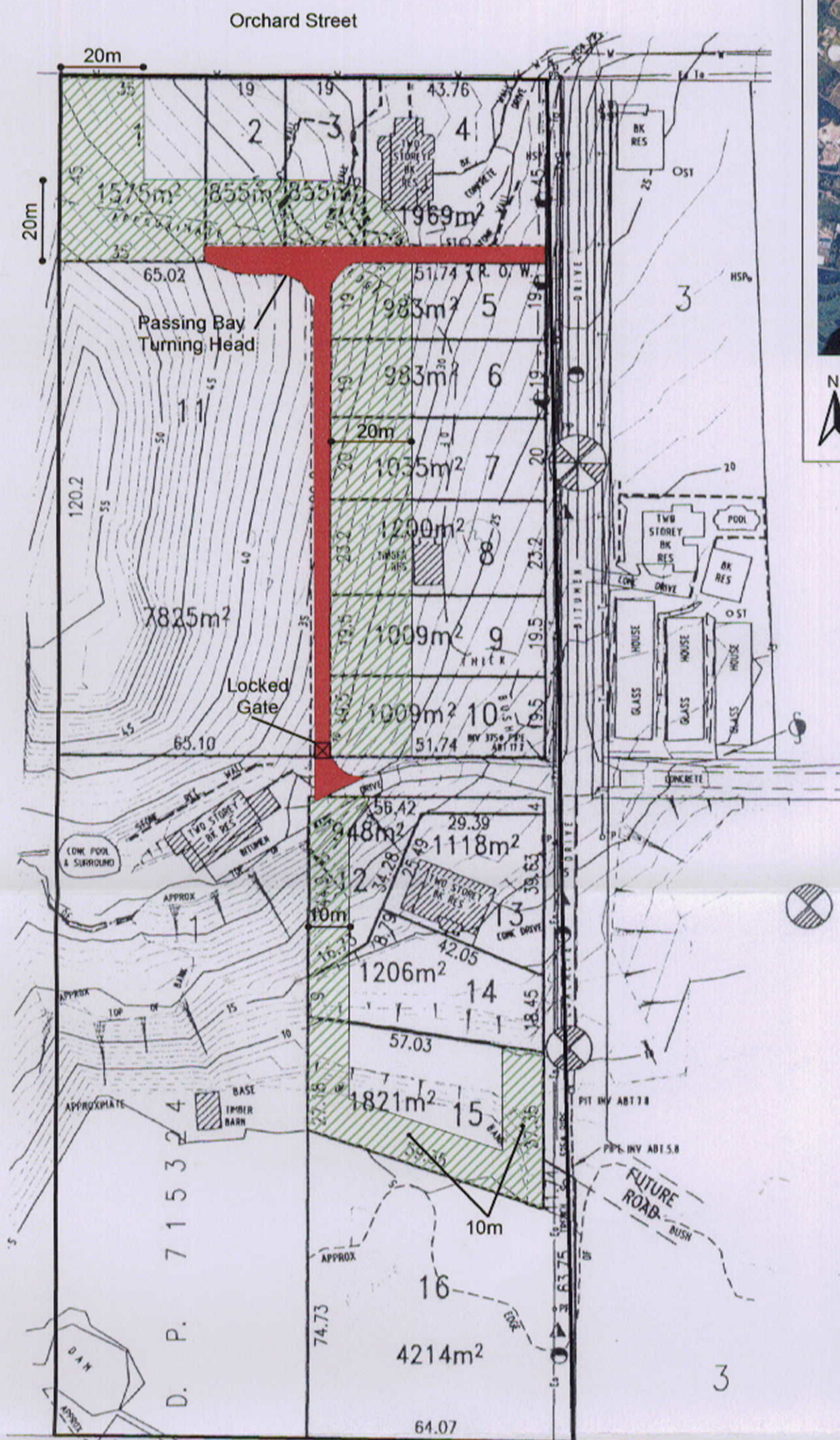
Australian Building Codes Board (1996) – Building Code of Australia, Class 1 and Class 10 Buildings Housing Provisions Volume 2.

Councils of Standards Australia AS3959 (1999) – Australian Standard 'Construction of buildings in bush fire-prone areas'.

Warringah / Pittwater Bushfire Risk Management Plan (2001).

SCHEDULE 1

PLAN OF BUSHFIRE PROTECTION MEASURES



*Property boundary subject to final survey
Source: DLWC 1:25,000 Aerial Photograph



Aerial photograph of property and surrounding area

Legend

- Property Boundary
- Fuel Free Asset Protection Zone
- Fire Trail Access Road
- Locked Gate

25 0 25 50 metres

Scale 1:1250



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Schedule 1 - Bushfire Protection Measures

Ver. BS1
30/12/02
Ref No. 2288

Source: Ingham Planning

APPENDIX 1

DETAILS OF ASSET (FIRE) PROTECTION ZONES

APPENDIX 1 – DETAILS OF ASSET (FIRE) PROTECTION ZONES

1.0 INTRODUCTION

The major mitigating factor that limits the effects of wildfire is the amount of fuel available to burn. By reducing the amount of fuel there will be a reduction in the intensity of the fire.

The area in which the fuel reduction occurs is referred to as an Asset Protection Zone. Asset Protection Zones are areas that are usually shown on 'plans' adjacent to either cultural or natural assets (eg. dwelling, rainforest). They act to significantly lessen the impact of intense fire. The Asset Protection Zone can be further identified by two sub-zones.

Each has a specific role to play within an asset protection zone. These sub-zone areas are called the Inner Protection Area (Fuel Free Zone) and the Outer Protection Area (Fuel Reduced Zone). The sub-zones characterise the physical appearance of the landscape and in particular the way the combustible fuels shall appear after they are modified. (See Photos 1 - 6).

The Inner Protection Area is always located immediately adjacent to the asset/value at risk. The Outer Protection Area is located between the Inner Protection Area and the bushland.

When considering bush fire fuel it is important to understand that it occurs in our native bushland in three vertical layers – see Table 1.

Table 1 – Fuel Layers

| Fuel Layer Name | Location of Layer in vertical Column | Type of Fuel |
|-----------------|--------------------------------------|-------------------------------------|
| Ground Fuels | Below ground level | Peatmoss (always below the surface) |
| Surface Fuels | 0-200 mm | Litter layer (leaves & twigs) |
| Aerial Fuels | 200 – 3000 mm | Shrubs and grasses |
| Canopy Fuels | > 3000 mm | Tree canopy |

2.0 INNER PROTECTION AREA (I.P.A)

This area is *almost free* of all fuels, it usually takes the form of grassy areas, car parks, roads, concrete areas, track or trails. It does not imply the wholesale removal of all or every tree - see Table 2 for guidelines on the extent of trees that can occur within this zone.

Rationale: By its very nature this zone is intended to stop the transmission of flame and reduce the transmission of radiated heat by the elimination of available fuel. Thus its Inner Protection Area name. This area also allows airborne embers to fall safely thus stopping further outbreaks of fire to begin.

Fire Fighting Advantage: This zone allows safe fire fighting operations to occur and clear fire control lines to be implemented by fire fighters.

Measurability: A fuel free Inner Protection Area is measured in two ways. The weight of the fuel and the width of the zone. Practitioners measure fuel load in *tonnes per hectare*. It is assessed by measuring the weight of fuel in a small quadrat eg. 300mm by 300mm and equating that to a hectare. The width of the zone is the separating distance between an asset and the bushland.

Performance Standard: A safe load is between 0-3 t/Ha.

Photographic Montage Depicting Inner Protection Area

PHOTO - 5



Site Description: The site is a grassed Inner Protection Area with large smooth barked tree 5 metres clear of the dwelling. The grass height is maintained to provide < 3 tonnes per hectare.

Fire Behaviour: This area, if maintained regularly, would exhibit flame height not above 300mm.

Maintenance: This Inner Protection Area is managed by mowing, raking and removal of the litter layer.

Fuel Weight: < 3 tonnes/hectare

PHOTO - 6



Site Description: This site shows a grassed Inner Protection Area with rock and landscaped areas constituting approximately 15% of the Inner Protection Area. Tree more than 5 metres from dwelling with no canopy connection to adjoining trees.

Fire Behaviour: This area, if maintained regularly, would exhibit flame height not above 300mm.

Maintenance: This Inner Protection Area is managed by mowing, raking and removal of the litter layer.

Fuel Weight: < 3 tonnes/hectare to grass areas landscaped areas 3-4 tonnes/hectare.

PHOTO - 7



Site Description: This site shows an Inner Protection Area which includes a paved Access/Fire Trail. Smooth barked trees < 5 metres from fire aspect of dwelling. Fuel loading to trail zero with grassed areas displaying approximately 3 tonnes/hectare.

Fire Behaviour: Fires impacting the bushland to the left of the Access/Fire Trail would lose intensity with the provision of the Inner Protection Area.

Maintenance: This Inner Protection Area is managed by mowing, raking and removal of the litter layer.

Fuel Weight: Nil to Access/Fire Trail. 3 tonnes/hectare to grassed area.

Photographic Montage Depicting Inner Protection Area

PHOTO - 1



Site Description: The site is a paved roadway. It separates two areas of bushland and is normally called in this instance a fire break.

Fire Behaviour: No fire could occur on this fire break but the narrow nature of the break would allow fire to pass between the two bushland areas without difficulty.

Maintenance: None required due to paved surface. Do not allow shrubs to grow.

Fuel Weight: Zero

PHOTO - 2



Site Description: The site is mineral earth. There is no fuel on this narrow strip. The narrow strip forms a narrow fire break between two areas of unmanaged bushland.

Fire Behaviour: No fire could occur on this mineral earth but the narrow nature of the fire break would allow fire to pass between the two bushland areas without difficulty.

Maintenance: Regular raking and removal of litter layer. Do not allow shrubs to grow.

Fuel Weight: Zero

PHOTO - 3



Site Description: This is a grassed fire trail on level land adjacent to unmanaged bushland. The grass height on the level lands is 20-50 mm.

Fire Behaviour: This area, if mowed regularly, would exhibit flame heights not above 300 mm (12 inches). Note: The grass in the bushland zone is approx 400-500mm in height and would achieve flame heights approximate to 750 -1200mm (depending on fuel loadings and Fire Danger Index).

Maintenance: This fuel free zone is able to be managed by normal mowing means. Raking and removal of litter layer; and/or mowing of grasses; and raking and/or mowing. Fuel Weight in photo 4: < 2 T/Ha.

Fuel Weight: < 2 T/Ha.

PHOTO - 4



Site Description: This is a grassed Inner Protection Area with scattered trees, no shrub larger and minimal understorey. The grass height is maintained to provide < 3 tonnes per hectare.

Fire Behaviour: This area, if maintained regularly, would exhibit flame height not above 300mm.

Maintenance: This Inner Protection Area is managed by mowing, raking and removal of the litter layer.

Fuel Weight: < 3 tonnes/hectare.

Knowing the relationship between the shrub layer and the tree canopy allows fire managers to design safer areas in the asset protection zones. It is for this reason that vegetation such as Forest Oaks are usually excluded from an Inner Protection Area.

Similarly in 'open forests' the height of the forest is sufficiently removed from the shrub layer. As a general rule trees are allowed within an Inner Protection Area where the density of those trees is commensurate with Table 2 below and located on slopes up to 20% with a Westerly aspect.

In respect of trees that can be located in a Inner Protection Area Table 2 provides guidelines.

Table 2 – Tree Density in Inner Protection Area

| Distance from dwelling wall | Trees permitted on the exposed side of a dwelling | Trees permitted on the non exposed side of a dwelling |
|-----------------------------|---|---|
| within 5 metres | No trees | No trees |
| between 5-10 metres | One tree per 100 m ² | 2 trees per 100 m ² |
| Between 10-20 metres | >10 tree per 400 m ² | >10 trees per 400 m ² |

There are variations to Table 2.

- Trees vary in height and tree crown width /depth. Some trees have canopies that extend close to the ground (eg < 5 metres from the ground) whilst other trees have canopies that area high off the ground (> 15 metres off the ground). In some cases these tall trees do not have canopies that are affected by undergrowth / tall shrubs that could cause fire to burn into the canopy. Therefore if trees are isolated they do not form a significant risk.
- Similarly smooth barked trees are less of a hazard than heavily barked trees. The latter can cause fire to run up into the canopy and if there is sufficient wind the resulting fire can be of high intensity.
- Similar to the above, the number of trees per 100 m^2 depends on an individual assessment being undertaken to determine the 'type / size of tree', and its resultant potential impact upon a dwelling.
- The exposed side of a dwelling is the side that is directly affected by a moving fire particularly when fanned by wind. The non-exposed side of a dwelling is the side where fire is unlikely to come from either from a lack of wind, slope or other factors such as a lack of hazardous fuel.

3.0 OUTER PROTECTION AREA (O.P.A)

Rationale: This zone is designed to stop the development of 'intense' fires and the transmission of 'severe' radiated heat.

Physical Appearance: This area assumes all trees will remain but with a modified shrub / grass and litter layer. In some sparse vegetation communities the shrub layer may not require modification.

Fire Fighting Advantage: Reduced fire intensity. It achieves this by denying fire a significant proportion of the fuel to feed upon. Fuels containing small (or fine) leaves such as *Forest Oaks* (or similar) are targeted for removal due to the capacity to burn quickly and therefore feed fire up into adjacent trees.

Measurability: Practitioners measure fuel load in *tonnes per hectare*. It is assessed by way of measuring the load in a given small quadrat eg. 300mm by 300mm and equating that to a hectare.

Performance Standard: A safe load is between 4-6 T/Ha.

Note: An experienced / qualified bush fire protection practitioner should undertake an individual assessment of a site to determine the requirements within an Asset Protection Zone.

PRESENCE OF SHRUBS IN AN INNER PROTECTION AREA

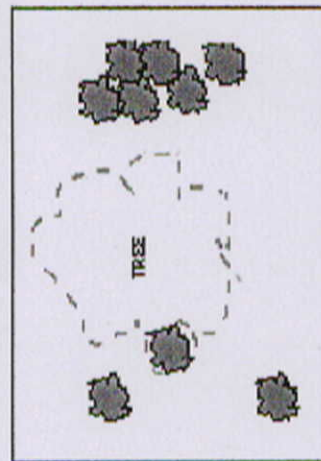
Shrubs may occur within an Inner Protection Area, but only where it is recommended by an experienced bush fire protection manager.

Thus landscaping works within the Inner Protection Area may occur in some instances. Where it is approved to occur, some 10-15 % and in some cases up to 30% of the Inner Protection Area may be able to be landscaped but always away from glass in buildings.

The design of the Inner Protection Area will be dependent on species selection and spatial arrangement.

Note: eg. 10 % means that for every 100 square metres (eg. 10 metres x 10 metres) only 10 % of that area may have a shrub component. The remainder would be free of shrubs see Figure 1. A 10 % landscaped shrub layer would add a further 1.5 tonnes of fuel to the overall hazard weight. To maintain the aggregate below 3 t/ha the ground fuels must be mown grass, or similar.

Figure 1 – Example of Spatial Arrangement in a Inner Protection Area



If a shrub layer is present the following table shows the additional fuel weights that should be added to the calculated surface fuels.

| Shrub cover | Fuel Weight |
|-------------|-----------------|
| 10-30 % | 2.5 tonnes / ha |
| 35-50 % | 5.0 tonnes / ha |
| 55-75% | 7.5 tonnes / ha |

PRESENCE OF TREES WITHIN AN INNER PROTECTION AREA

A tree may occur within an Inner Protection Area if the canopy does not form a link with shrubs. The reason is to lessen any chance for 'vegetation linking' and the capability for fire to extend into the canopy.

It is a basic premise in fire behaviour understanding that fire cannot occur in the canopy unless surface fuels such as grasses or shrubs are burning. This merging creates opportunity for fire to link with the canopy and therefore increase fire intensity by some significant amount.

Trees that have a canopy beginning near the ground (such as Forest Oaks *Allocausarina*) form a continuous link with the tree canopy and shrubs. A forest canopy cannot therefore burn without fuel to feed that fire. In a 'tall open forest' where the trees are generally above 20 metres in height the canopy is separated from the land surface by some distance. In an 'open woodland' the low canopy height (usually < 5 metres) merges with the shrubland layer.

Photographic Montage Depicting Outer Protection Area

PHOTO - 1



Site Description: This area has a low tree and shrub density but a high presence of native grasses. Almost no litter layer present.

Fire Behaviour: The lack of shrubs means that fire behaviour will be less but the presence of the sloping lands and the heavy presence of grass means that fire can burn quickly up the slope with flame heights between 1200-1800mm.

Maintenance: Maintain the grass height. Shrubs can grow to what is pictured in Photo 6.

Fuel Weight: 2-3 T/Ha

PHOTO - 2



Site Description: This area has increased shrub density and the beginnings of those shrubs linking with the tree canopy. Litter layer is present, but less than 3 T/Ha. The shrub layer is approx 3 T/Ha.

Fire Behaviour: The increase in shrubs means that fire behaviour will be high. Flame heights would be expected to be between 2000mm - 6000mm (depending on fuel loadings and Fire Danger Index).

Maintenance: Maintain the grass height and current density of shrubs.

Fuel Weight: 6 T/Ha.

PHOTO - 3



Site Description: This area has a low tree and shrub density but a high presence of native grasses.

Fire Behaviour: The heavy presence of native grass means that fire can burn quickly through the outer protection area with flame heights of between 1200-3m.

Maintenance: Remove and maintain grass layer/leaf litter by slashing/hand removal.

Fuel Weight: 6-8 tonnes/hectare

PHOTO - 4



Site Description: Outer Protection Area above dwelling showing large rock outcrops, low shrub and tree density.

Fire Behaviour: Fires impacting this area would burn down slope to the dwelling. Flame heights in the order of 1-2 metres.

Maintenance: Management of this area by slashing/hand removal/burning to maintain fuel loading to < 8 tonnes/hectare.

Fuel Weight: < 6 tonnes/hectare
Nil on rock ledges.