WYONG SHIRE COUNCIL

LOW DENSITY RESIDENTIAL PLANNING PROPOSAL

FOR PART OF PRECINCT 3A NORTH WYONG SHIRE STRUCTURE PLAN

AT

Part of No 165 (LOT 51 DP 1195704) LOUISIANA ROAD, WADALBA

OWNER: Threshold Development Pty Ltd

January 2016

CPP
CERTIFIED PRACTISING PLANNER

Part Three of Three

OPTIMA DEVELOPMENTS PTY LTD

ABN 75 070 515 883

TOWN PLANNING AND DEVELOPMENT CONSULTANTS

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Planning Proposal for a Low Density Residential rezoning at
Part of No 165 (Lot 51 DP 11995704) Louisiana Road
Wadalba

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Prepared by
Optima Developments Pty Ltd
Town Planning and Development Consultants
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---
12 January 2016

Chris Oliver
Director/Principal Consultant
MPIA CPP 7762

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CPP
CERTIFIED PRACTISING PLANNER

Part Three of Three

Planning Proposal

Part of No 165 (Lot 51 DP 1185704) Louisiana Road Wadalba

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Section 5 Attachments and Supporting Documentation

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The following documentation is provided in support of this Planning Proposal.

Document No Part Two	Title Reference	Page Ref	Attached
1	Plans a. Proposed Draft WLEP 2013 Zoning and Lot Size Maps b. Extract from original WELOG Study Area and draft Zoning map c. Exiting WLEP 2013 Zoning map d. Wadalba Wildlife Corridor plans e. Draft Development Subdivision plan f. Extract of approved dwelling DA/1040/1013 g. Locality aerial photograph h. Ecological survey locations and results i. plan of Bushfire Protection Measures	29 30 31 32 33 34 35 36 37 38	√
2	Assessment against Centres And Housing Actions of CCRS	39	√
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6	Assessment of Section 117 Directions	64	√
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7	Ecological Assessment		√
Document No Part Three	**Title Reference**		**Attached**
8	Aboriginal Heritage Assessment		√
9	Bushfire Assessment		√
10	Traffic Impact Assessment		√
11	Development Contributions Report		√

ATTACHMENT 8

ABORIGINAL HERITAGE ASSESSMENT

AHMS ARCHAEOLOGICAL & HERITAGE MANAGEMENT SOLUTIONS

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Threshold Developments
C/o: Matthew Smith
Everitt & Everitt Consulting Surveyors
Via email: matt@everittsurveyors.com.au

17 October 2013

Re: Lot 2 DP 1154872 165 Louisiana Rd Wadalba, Aboriginal Cultural Heritage Advice

Dear Matt,

We understand that a DA for Lot 2 DP 1154872, 165 Louisiana Rd Wadalba has been refused by Wyong Shire Council for reasons that include concerns over the potential for impact to Aboriginal cultural heritage. We note that it has previously been found unlikely for 'Aboriginal objects' (as defined in the *National Parks and Wildlife Act 1974*) to be present in the area, but that Council has included in their advice regarding the DA refusal that "because of the past history it is important that this matter be examined each time an application is received for assessment in the Wadalba district". Council's advice further includes that "The assessment may be no more than a supplementary letter by a recognised person in Aboriginal affairs updating the information available on the National Parks and Wildlife Record".

The review of previous archaeological assessment at Wadalba appended here has been prepared by AHMS consultant archaeologist, Oliver Brown to meet the requirement specified by Council. Oliver has previously been involved in various stages of Aboriginal cultural heritage assessment at Wadalba Hill, engaged variously by Wyong Shire Council, Threshold Developments and Westminster Homes. This work has included previous detailed archaeological survey of Lot 2 DP.

We have reviewed previous assessments in the area, of which two have specifically addressed Lot 2 DP1154872. In the appended report previous study areas and findings have been overlain on aerial photos of the study area and an updated AHIMS Site Register search has been undertaken to ensure that no new sites have been listed since previous work in 2010.We confirm that it is not likely that Aboriginal objects are present in the proposed subject area.

In addition to meeting the requirements of Council, the review below satisfies the requirements of the OEH *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (See the process outlined DECC2010:10). *The National Parks and Wildlife Act 1974 (NPW Act) provides that a person who exercises due diligence in determining that their actions will not harm Aboriginal objects has a defence against prosecution for the strict liability offence if they later unknowingly harm an object without an AHIP. (DECC2010:2)*

Please contact Oliver Brown at our Sydney office on (02) 9555 4000 if you have any queries.

Yours faithfully,

Susan McIntyre-Tamwoy, Associate Director & Research Co-ordinator.

Background and Previous Studies

This current review has been undertaken by Oliver Brown of Archaeological and Heritage Management Solutions Pty Ltd (AHMS) for Threshold Developments Pty Ltd.

Land around Wadalba Hill, including Lot 2 DP 1154872 165 Louisiana Rd, has been the subject of quite intensive scrutiny in terms of Aboriginal cultural heritage in recent years. Pawel Gorecki and Mary Dallas first conducted a cultural heritage survey of a 2km^2 area of land in relation to potential residential development which included all of the current study area in 2000 for Wyong Shire Council (Gorecki and Dallas 2000a, 2000b) (**Figure 1**). Their survey was undertaken over three days with representatives of the Darkinjung Local Aboriginal land Council (DLALC) and identified four locations of archaeological interest. These comprised the Wadalba Grinding Grooves 1 site subsequently listed by Roger Mehr (DECC (now OEH)) and three scarred tree sites. It was recommended that all of these sites be preserved. All of the sites are to the south of, and not within, the current development proposal area. Two areas of archaeological sensitivity were also identified in the study, neither of which is included in the current study area.

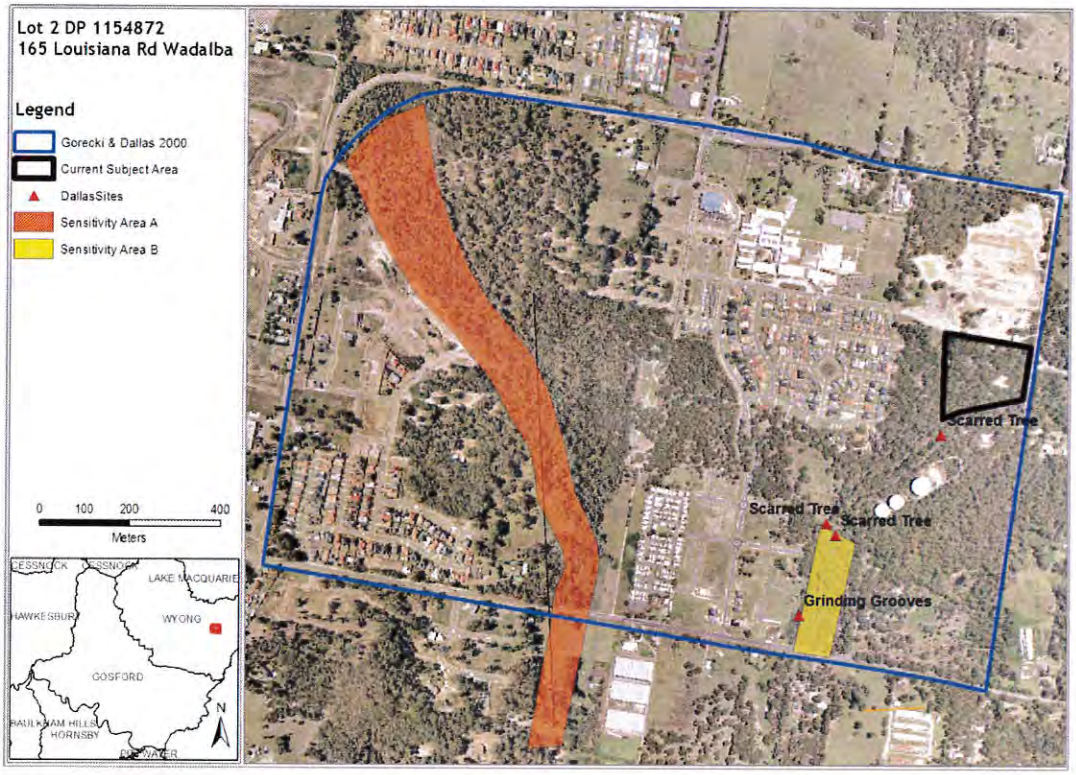


Figure 1: Extent of area reported on in Gorecki and Dallas 2000

Of the four sites identified by Gorecki and Dallas, the three claimed scarred trees have since been challenged, and while they remain listed on the AHIMS Sites Register they are considered to exhibit natural bark loss, or at least scarring that was not caused through traditional Aboriginal resource gathering (see Brown 2009a, 2009b, 2009c, 2010 and specialist aboricultural assessment by Russell Kingdom appended in Brown 2009b). The grinding grooves on a sandstone platform in the drainage line running southwest from Wadalba Hill remains as the single unquestionable and significant site in the area.

The Darkinjung Local Aboriginal Land Council (Taylor 2007) were also subsequently involved in a further assessment in 2007 for land adjoining the current subject area and found that there were no cultural or archaeological sites that served as a constraint to development, stating that:

1. *"It is recommended that the subdivision at Louisiana Road, Wadalba be allowed to proceed on cultural heritage grounds as it is unlikely to disturb any Aboriginal artefacts in the Wyong area;*
2. *It is also recommended that if any Aboriginal artefacts or suspicious [sic] are unearthed during the Development Works at Louisiana Road, Wadalba that all works cease and Darkinjung Aboriginal Land Council be contacted to investigate the find".*

Further assessment that covered the current subject area was undertaken by the current author in 2009 (Brown 2009a). Only one Aboriginal archaeological site was confirmed. This was the grinding groove site to the southwest of Wadalba Hill previously identified by Gorecki and Dallas in 2000 (**Figure 2**). It was concluded that in addition to the grinding grooves themselves representing 'Aboriginal objects' (as defined under the *National Parks and Wildlife Act*), it was likely that additional material in the form of flaked and ground edge artefact fragments be present in surrounding deposits. It was also noted that representatives of Darkinjung LALC and Guringai Tribal Link Aboriginal Corporation considered that the top of Wadalba Hill itself was considered to have cultural value to local Aboriginal people. While a previous archaeological survey of the hill in advance of reservoir construction by Bonhomme and Koettig (1980) with DLALC representatives did not identify such values in 1980, the intervening three decades has seen a significant shift in the recognition of Aboriginal cultural values beyond those that are only archaeological.

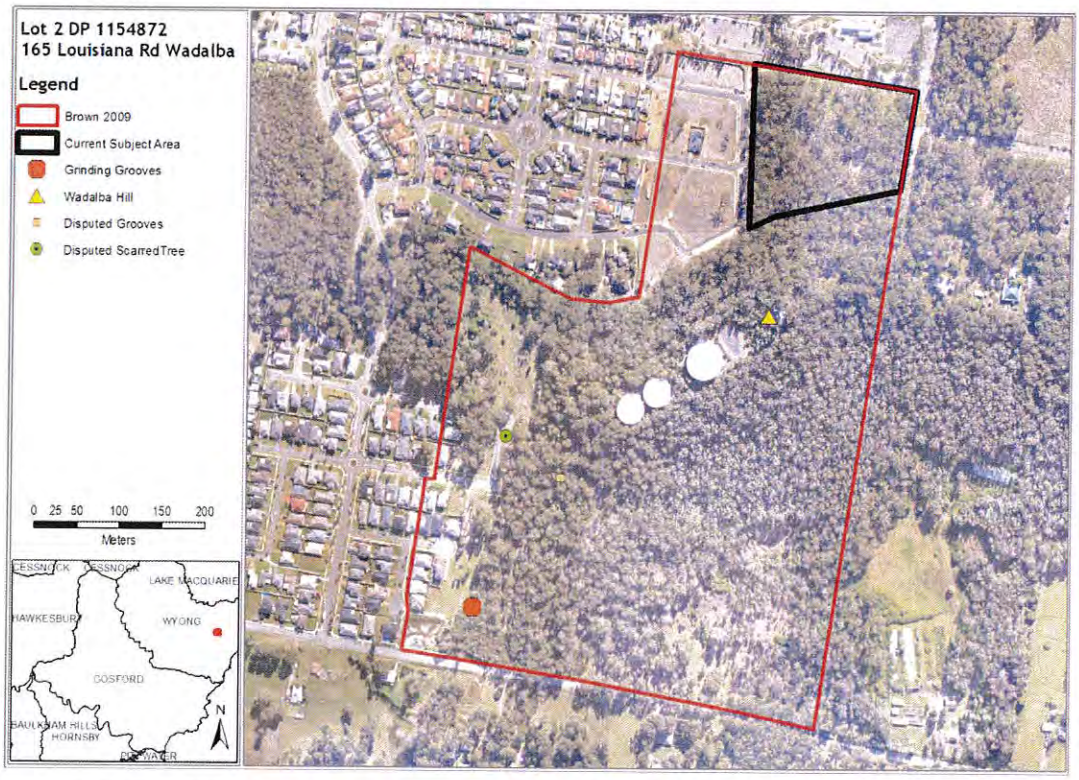


Figure 2: Extent of previous assessment reported in Brown 2009a

All of the 'scarred' trees previously identified by Gorecki and Dallas (2000) and an undocumented survey of the area in 2008 by DECC (now OEH) archaeologist Roger Mehr

were relocated in 2009 (Brown 2009a), however none were considered to show conclusive evidence of being Aboriginal scarred trees - an interpretation that was subsequently supported by independent arboriculture assessment. (Appendix 1 in Brown 2009b).

The Brown 2009a report also addressed a number of claims made by the Wadalba Association and Boris Branwhite that were put forward in opposition to development on the area and outlined in the following documents:

- Appendices to the Wadalba Association submission in response to DA1733/07 Lousiana Road, Kanwal (Lot 311), 27 Lot subdivision (Wadalba Hill);
- Wadalba Wildlife Corridor and Cultural Reports 1- 29a prepared by Boris Branwhite, accessed 18th Dec 2008 online at www.whalecall.org;
- Wadalba Heritage and Environment Report, May 2006 compiled by Boris Branwhite, Whale Call Inc. for Wadalba Association, 'Aboriginal habitation remnants at Wadalba'.

All of the claims of Aboriginal cultural heritage sites made by Branwhite were refuted in the 2009a report and then again in Land and Environment Court Ordered Reports (Brown 2009b, 2009c, Johnston 2009) and in a further review for Wyong Shire Council (Brown 2010). While the areas subject to these assessments were to the south and west of the current subject area, some claims related to the adjoining Lot 3 DP 1154872, 165 Louisiana Road and the current subject are. The conclusion that none of the putative sites were genuine was supported by the archaeologists appointed by both sides in the Land and Environment Court proceedings (Brown 2009c, Johnston 2009) as well as representatives of the Darkinjung Local Aboriginal Land Council.

Updated AHIMS Sites Register Search

A current search is required for this advice to meet the requirements of the Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW so therefore an updated search of the OEH Aboriginal Heritage Information Management System (AHIMS) database was conducted on 16 October 2013. This revealed no recorded sites in the subject area (see **Appendix 1**

Conclusion and Recommendations

- There have been two formal Aboriginal cultural heritage and archaeological assessments (Groecki and Dallas 2000; Brown 2009a) based on detailed survey neither of which located sites within the study area.
- Various other site visits by archaeologists, Aboriginal community groups and development opponents looking for potential cultural sites. These have involved at least five qualified archaeologists and more than half a dozen experienced sites officers representing the two key Aboriginal community representative groups in the area - the Guringai Tribal Link Aboriginal Corporation (which represents the Native Title group with a registered claim over the area) and Darkinjung Local Aboriginal Land Council.

- In the process, no Aboriginal cultural or archaeological sites have been found to exist, and no areas have been identified where undetected (subsurface) sites are thought likely to exist.

- On the basis of the previous work undertaken in the subject area, and the surrounding area, it is not considered that no further assessment.

- It is recommended that a copy of this advice be forwarded to both the Darkinjung Local Aboriginal land Council (email Sharon Hodgetts SHodgetts@dlalc.org.au) and Guringai Tribal Link Aboriginal Corporation (email Tracey Howie tracey@guringai.com.au) for their records and to provide an opportunity to comment.

- Together the advice (and updated AHIMS search) provided in this letter, the previous work commissioned by Threshold Developments (Brown 2009c in references below) constitutes sufficient evidence to represent due diligence in ensuring that the proposed work will not harm an Aboriginal object. Reference should be made to the relevant Code for the statutory context and purpose of such due diligence at: http://www.environment.nsw.gov.au/resources/cultureheritage/ddcop/10798ddcop.pdf

References

Bonhomme, T. & M. Koettig. 1980. Archaeological survey of two proposed reservoir sites at Kariong, near Gosford and at Kanwal, near Wyong. Report to the Public Works Department, Gosford.

Gorecki, P. & M. Dallas. 2000a. A cultural heritage survey of a proposed residential development at Wadalba (Wyong), NSW. Report to Crown Land Developments.

Gorecki, P. & M. Dallas. 2000b. Aboriginal Archaeological Assessment, Johns Road, Wadalba, NSW. Report to Wyong Shire Council.

Taylor, J. 2007. Letter from Darkinjung Local Aboriginal Land Council to Wyong Shire Council, 8/02/07, Re: Subdivision at Louisiana Road, Wadalba.

Brown, O. (TEC). 2009a. Aboriginal Cultural Heritage Assessment and Management Plan, Wadalba Hill, Wyong Shire. Prepared for Wyong Shire Council.

Brown, O (OBCA). 2009b. Court ordered report: Wadalba Hill, Westminster Development Area, Wadalba, NSW. Report to Land and Environment Court of NSW for Westminster Development.

Brown, O (OBCA). 2009c. Court Ordered Report, Lot 311 DP808521, 165 Louisiana Road, Kanwal, NSW. Report to Land and Environment Court of NSW for Threshold Development.

Johnston, D. (Aboriginal Archaeologists Australia). 2009. Supplementary Court Ordered Report on 5 Possible Aboriginal Sites on Lot 311 DP808521, 165 Louisiana Road, Kanwal. Report to Land and Environment Court of NSW.

Brown O (OBCA). 2010. Lot 3 DP 1154872, 165 Louisiana Road, Kanwal NSW 2259. Review of Aboriginal Cultural Heritage Assessment in relation to DA. Report to Wyong Shire Council.

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : Optima Development

Client Service ID : 206851

Christopher Oliver

11 Alfred Street PO Box 3136
UMINA BEACH New South Wales 2257

Attention: Christopher Oliver

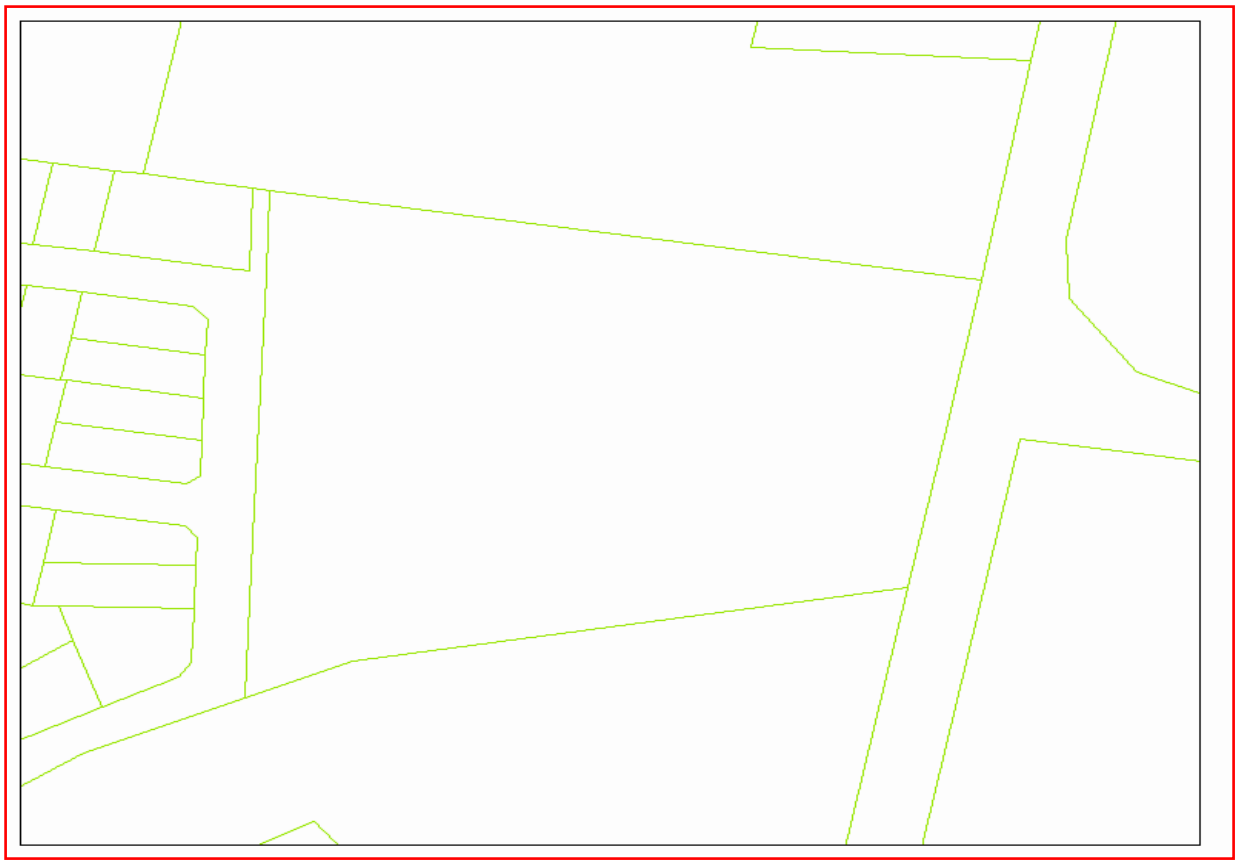
Email: optimapl@bigpond.net.au

Date: 11 January 2016

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lot : 51, DP:DP1195704 with a Buffer of 50 meters, conducted by Christopher Oliver on 11 January 2016.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

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ABN 30 841 387 271
Email: ahims@environment.nsw.gov.au
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ATTACHMENT 9

BUSHFIRE ASSESSMENT

Travers

bushfire & ecology

bushfire protection assessment

Rezoning Application
Part Lot 51 DP1195704
165 Louisiana Road, Wadalba

Under Section 117(2) Direction No 4.4
of the *EP&A Act*

December 2015
(REF: A15026)

Bushfire Protection Assessment

Rezoning Application
Part Lot 51 DP1195704
165 Louisiana Road, Wadalba

Report Authors:	Nicole van Dorst BPAD Level 2 & John Travers BPAD Level 3 15195
Plans prepared:	Trent Matheson & Emma Buxton
Checked by:	John Travers
Date:	22 December 2015
File:	A15026

Disclaimer:

This report has been prepared to provide advice to the client on matters pertaining to the particular and specific development proposal as advised by the client and / or their authorised representatives. This report can be used by the client only for its intended purpose and for that purpose only. Should any other use of the advice be made by any person including the client then this firm advises that the advice should not be relied upon. The report and its attachments should be read as a whole and no individual part of the report or its attachments should be relied upon as meaning it reflects any advice by this firm. The report does not suggest or guarantee that a bush or grass fire will not occur and or impact the development. This report advises on matters published by the *NSW Rural Fire Service* in their guideline *Planning for Bush Fire Protection 2006* and other advice available from that organisation.

The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered surveyor.

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EXECUTIVE SUMMARY

A bushfire protection assessment has been undertaken for the planning proposal to rezone land located at part Lot 51 DP 1195704, 165 Louisiana Road, Wadalba. The proposal is to rezone part of the land from RU6 to R2 Low Density Residential.

This report identifies matters for consideration for the planning proposal and highlights the required bushfire protection measures, including asset protection zones (APZs), for future development under the *Environmental Planning and Assessment Act 1979 (EP&A Act), Section 117 Direction 4.4 and* in accordance *Planning for Bush Fire Protection 2006* (*PBP*) and *Community Resilience Practice Note 2/12 Planning Instruments and Policies*.

The key principle for the proposal is to ensure that future development is capable of complying with *PBP*. Planning principles for the proposal include the provision of adequate access including perimeter roads, establishment of adequate APZs for future housing, specifying minimum lot depths to accommodate APZs and the introduction of controls which avoid placing inappropriate developments in hazardous areas and placement of combustible material in APZs.

Our assessment found that bushfire can potentially affect the site from the forest vegetation located within the narrow corridor to the west (short fire run), forest vegetation located within the Wadalba Wildlife Corridor in the south and the remnant forest located beyond Louisiana Road in the north-east.

The bushfire risk posed to the rezoning proposal however can be mitigated if appropriate bushfire protection measures (including APZs) are put in place and managed in perpetuity. This report has been prepared utilising an alternative solution approach for the narrow vegetation corridor to the west of the site. The fire run potential from this aspect is limited to 55 metres and therefore the short fire run methodology has been used to determine both the required APZ and bushfire attack level (BAL). In addition amended slope and fuel load inputs were used to determine APZ and BAL requirements to the south, east and north-east

The assessment has concluded that future development on site will provide compliance with the planning principles of *PBP* and *Community Resilience Practice Note 2/12 – Planning Instruments and Policies*.

GLOSSARY OF TERMS

AHIMS	Aboriginal Heritage Information System
APZ	Asset protection zone
AS1596	*Australian Standard – The storage and handling of LP Gas*
AS2419	*Australian Standard – Fire hydrant installations*
AS3745	*Australian Standard – Planning for emergencies in facilities*
AS3959	*Australian Standard – Construction of buildings in bushfire-prone areas 2009*
BAL	*Bushfire attack level*
BCA	*Building Code of Australia*
BSA	Bushfire safety authority
EEC	Endangered ecological community
FDI	Fire danger index
IPA	Inner protection area
LEP	*Local environmental plan*
LHCCREMS	*Lower Hunter Central Coast Regional Environmental Management Strategy*
OPA	Outer protection area
PBP	*Planning for bush fire protection 2006*
RFS	NSW Rural Fire Service
SFPP	Special fire protection purpose

TABLE OF CONTENTS

Introduction 1

Travers bushfire & ecology has been requested by *Optima Development Pty Ltd to* undertake a bushfire protection assessment for the proposed planning proposal to rezone part of the land located at part Lot 51 DP 1195704, 165 Louisiana Road, Wadalba.

The proposal is located on land mapped by *Wyong Council* as being bushfire prone. *Direction 4.4, Planning for Bush Fire Protection 2006 (PBP)* identifies matters for consideration for planning proposals that will affect, or are in proximity to land mapped as bushfire prone.

As such, the proposal is subject to the requirements of Section 117(2) of *the Environmental Planning and Assessment Act 1979 (EP&A Act)* which requires Council to consult with the Commissioner of the NSW Rural Fire Service (RFS) and to take into account any comments by the Commissioner.

1.1 Aims of the assessment

The aims of the bushfire protection assessment are to:

- Review the bushfire threat to the landscape
- Undertake a bushfire attack assessment in accordance with *PBP*
- Provide advice on planning principles, including the provision of perimeter roads, asset protection zones (APZs) and other specific fire management issues
- Review the potential to carry out hazard management over the landscape, taking into consideration the proposed retention of trees within the final development plans.

1.2 Project synopsis

The proposal is to rezone the land from RU6 to R2 Low Density Residential. The part of the site zoned E2 will be transferred to Council as part of a previous deed of agreement and will be added to the Wadalba Wildlife Corridor.

A proposed concept plan has been provided (refer Figure 1.1) and as such the bushfire constraints have been highlighted and minimum APZs have been recommended. Recommendations have also been made for future road design, building construction, water supply and utilities.

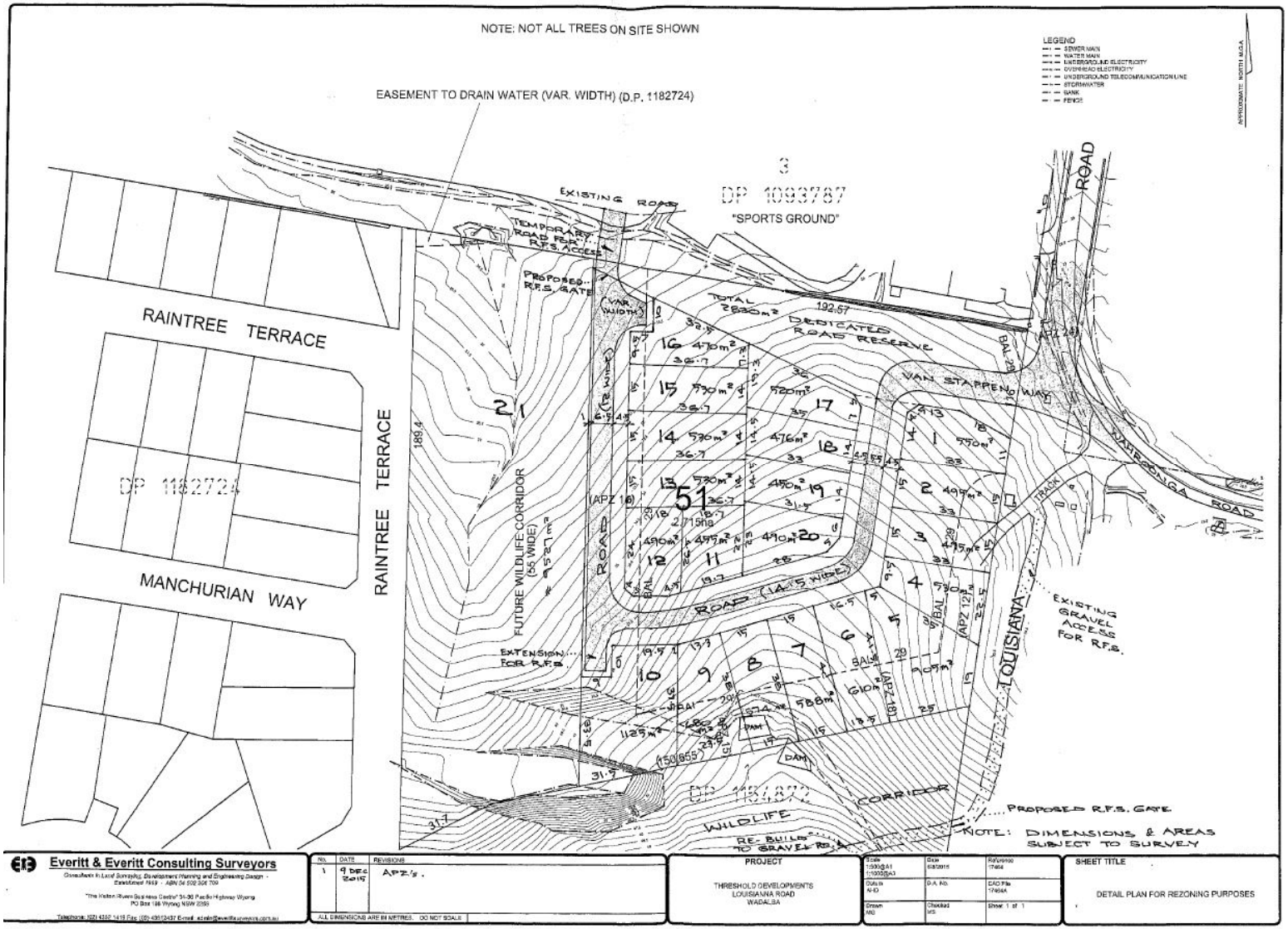


Figure 1.1 – Concept plan

1.3 Information collation

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

- Detail plan for rezoning purposes prepared by *Everitt & Everitt Consulting Surveyors* (amended 09/12/2015)
- Wyong Local Environmental Plan
- *NearMap* aerial photography
- Topographical maps *DLPI of NSW* 1:25,000
- *Australian Standard 3959 Construction of buildings in bushfire-prone areas*
- *Planning for Bush Fire Protection 2006 (PBP)*
- *Community Resilience Practice Notes 2/12 Planning Instruments and Policies.*

An inspection of the proposed development site and surrounds was undertaken by John Travers & Nicole van Dorst in November 2015 to assess the topography, slopes, aspect, drainage, vegetation and adjoining land use. The identification of existing bushfire measures and a visual appraisal of bushfire hazard and risk were also undertaken.

1.4 Site description

The site is located on corner of Louisiana Road & Wahroonga Road, Wadalba in the Local Government Area of Wyong (refer Figure 1.2).

The site is adjoined by the Kanwal – Warnervale Football club to the north, managed residential land to west (beyond he proposed Wadalba Wildlife Corridor extension), Wadalba Wildlife Corridor to the south and managed rural landscape to the east.

Figure 1.2 – Aerial appraisal

1.5 Legislation and planning instruments

1.5.1 Environmental Planning and Assessment Act 1979 (EP&A Act) and bushfire prone land

The *EP&A Act* governs environmental and land use planning and assessment within New South Wales. It provides for the establishment of environmental planning instruments, development controls and the operation of construction controls through the *Building Code of Australia (BCA).* The identification of bushfire prone land is required under Section 146 of the *EP&A Act*.

Bushfire prone land maps provide a trigger for the development assessment provisions. The proposed rezoning is located on land that is mapped by *Wyong Council* as being bushfire prone (refer Figure 1.3). Although the land to the east is mapped as bushfire prone, the majority of this landscape (beyond the electrical easement) has been recently cleared therefore reducing the bushfire threat from this aspect.

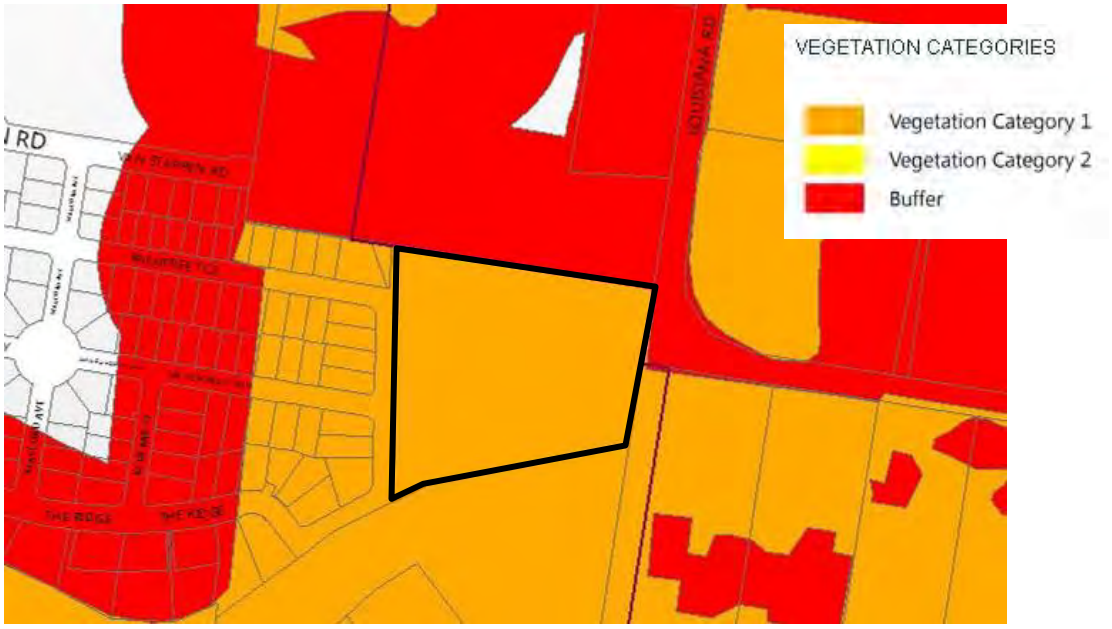


Figure 1.3 – Bushfire prone land map
(Source: Wyong Council)

PBP (pg 4) stipulates that if a proposed amendment to land use zoning or land use affects a designated bushfire prone area then the Section 117(2) Direction No 4.4 of the *EP&A Act* must be applied. This requires Council to consult with the Commissioner of the RFS and to take into account any comments by the Commissioner and to have regard to the planning principles of *PBP* (detailed within Section 1.5.3).

1.5.2 Local Environmental Plan (LEP)

A LEP provides for a range of zonings which list development that is permissible or not permissible, as well as the objectives for development within a zone.

The proposal is to proceed as an amendment to the current *Wyong LEP 2013* as outlined below.

Wyong Local Environmental Plan 2013

The site is zoned under the current *Wyong LEP 2013* as RU6 – Transition & E2 Environmental conservation (refer Figure 1.4). The proposal seeks to amend the LEP to rezone the RU6 portion of the property to R2 – Low Density Residential.

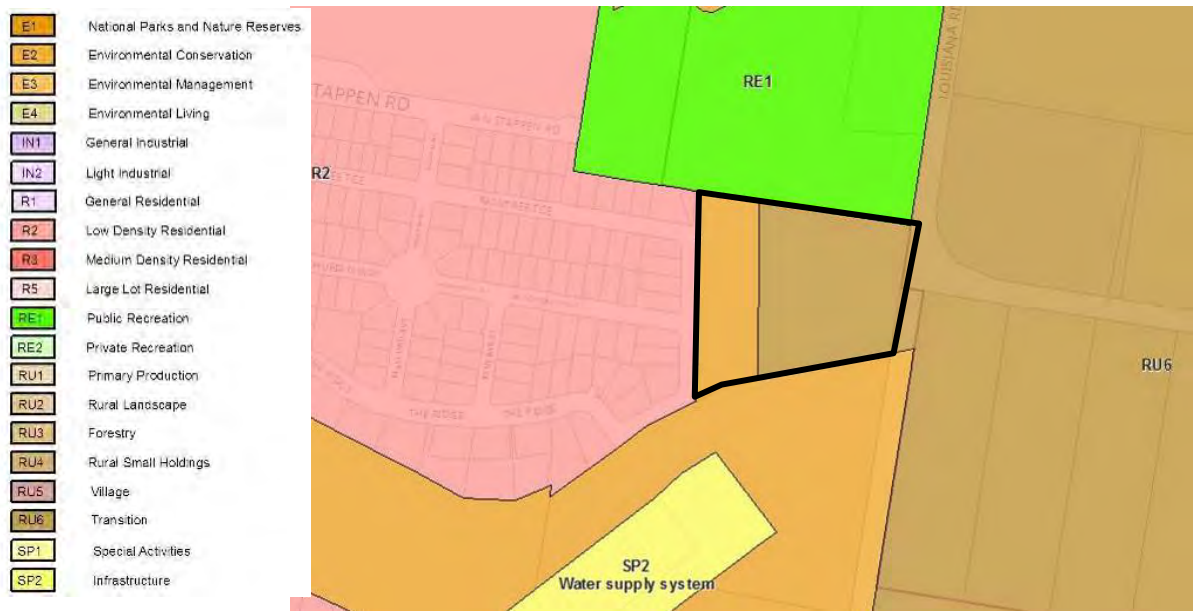


Figure 1.4 – Wyong LEP 2013
(Source: Wyong Shire Council website)

The proposal, including the provision of APZs, would seek to comply with the objectives of the proposed rezoning.

1.5.3 Planning for Bush Fire Protection 2006 (PBP)

Bushfire protection planning requires the consideration of the RFS planning document entitled *PBP. PBP* provides planning principles for rezoning to residential land as well as guidance on effective bushfire protection measures.

The policy aims to provide for the protection of human life (including fire fighters) and to minimise impacts on property and the environment from the threat of bushfire, while having due regard to development potential, on site amenity and protection of the environment.

PBP outlines the following planning principles that must be achieved for all rezoning proposals:

1. Provision of a perimeter road with two way access which delineates the extent of the intended development.

2. Provision, at the urban interface, for the establishment of adequate APZs for future housing.

3. Specifying minimum residential lot depths to accommodate APZs for lots on perimeter roads.

4. Minimising the perimeter of the area of land interfacing the hazard, which may be developed.

5. Introduction of controls which avoid placing inappropriate developments in hazardous areas, and

6. Introduction of controls on the placement of combustible materials in APZs.

In addition to the above, *PBP* outlines the bushfire protection measures required to be assessed for new development in bushfire prone areas.

The proposed rezoning has been assessed in compliance with the following measures to ensure that future development is capable of complying with *PBP*:

- asset protection zones
- building construction and design
- access arrangements
- water supply and utilities
- landscaping
- emergency arrangements

1.5.4 Building Code of Australia (BCA) and the Australian Standard AS3959 Construction in bushfire-prone areas 2009 (AS3959)

The *BCA* is given effect through the *EP&A Act* and forms part of the regulatory environment of construction standards and building controls. The *BCA* outlines objectives, functional statements, performance requirements and deemed to satisfy provisions. For residential dwellings these include Classes 1, 2 and 3 buildings. The construction manual for the deemed to satisfy requirements is *AS3959.*

Although consideration of *AS3959* is not specifically required in a rezoning proposal, this report (Section 3.2) provides the indicative setbacks for each dwelling construction level and can be used in future planning for master plans and / or subdivision proposals.

1.6 Environmental and cultural constraints

1.6.1 Environmental constraints

An ecological assessment for the proposed rezoning was undertaken by Everitt Ecology (8/12/2015). Five (5) threatened fauna species including one (1) bird and four (4) micro-bat species were recorded within or in close proximity to the site. No threatened flora species or endangered ecological communities where identified on site.

The report concluded that the proposal in unlikely to have a significant impact on any threatened species, populations or endangered ecological communities.

1.6.2 Aboriginal heritage constraints

Previous studies prepared by Oliver Brown of *Archaeological and Heritage Management Solutions Pty Ltd* have determined that it is 'not likely that Aboriginal objects are present in the proposed subject area'. The latest report prepared by Oliver Brown states that 'no Aboriginal cultural or archaeological site have been found to exist, and no areas have been identified where undetected (subsurface) sites are thought likely to exist'.

Bushfire Threat Assessment

2

To assess the bushfire threat and to determine the required width of an APZ for a development, a review of the elements that comprise the overall threat needs to be completed.

PBP provides a methodology to determine the size of any APZ that may be required to offset possible bushfire attack. These elements include the potential hazardous landscape that may affect the site and the effective slope within that hazardous vegetation.

2.1 Hazardous fuels

PBP guidelines require the identification of the predominant vegetation formation in accordance with David Keith (2004) to determine APZ distances for subdivision developments.

The hazardous vegetation is calculated for a distance of at least 140m from a proposed site boundary and can be summarised as:

- Forest vegetation located within the Wadalba Wildlife Corridor to the south of the site as well as forest beyond Louisiana / Wahroonga Road in the north-east.

Photo 1 – Forest vegetation beyond Louisiana Road

- Remnant forest adjoining the eastern boundary of the property within the 20m wide road / electrical easement. *PBP* describes remnant vegetation as a parcel of vegetation with a size of less than 1ha or a shape that provides a potential fire run directly towards a building not exceeding 50m. The vegetation to the east exhibits these qualities and therefore the threat posed is considered low and APZ setbacks for this aspect are the same as for the rainforests category outlined in *PBP*. The vegetation to the east of this easement is considered managed (i.e. recently cleared).

Photo 1 – Remnant forest vegetation to the east (note managed land in rural property further east)

- Narrow riparian finger within the Wadalba Wildlife Corridor to the west. In our assessment of the bushfire risk posed by the 55m wide corridor *TBE* have utilised the short fire run methodology. This is an alternative solution approach based on the small size and shape of the bushfire hazard which has less opportunity to support a fully developed bush fire.

  Our assessment detailed within Section 2.3, Appendix 2 & Schedule 1 has assumed the worst case scenario which is a single point of ignition located the furthest point away and burning directly towards the subdivision.

Photo 2 – Narrow corridor to the west (short fire run of 55m)

2.2 Effective slope

The effective slope is assessed for a distance of up to 100m. Effective slope refers to that slope which provides the most effect upon likely fire behaviour. A mean average slope may not in all cases provide sufficient information such that an appropriate assessment can be determined.

The effective slope within the hazardous vegetation is:

- 3^{0D} within the forest vegetation beyond Louisiana Road in the north-east
- 6^{0D} downslope within the remnant vegetation to the east.
- 3^{0U}- 7^{0U} upslope within the forest vegetation to the south
- 5^{0D} within the narrow riparian corridor (short fire run) to the west.

2.3 Bushfire attack assessment

A fire danger index (FDI) of 100 has been used to calculate bushfire behaviour on the site using forest vegetation located within the Greater Sydney region.

Table 2.1 below provides a summary of the bushfire attack assessment and the minimum required APZs in compliance with BAL 29 building construction standards (*AS3959*).

Table 2.1 – Bushfire attack assessment

Aspect	Vegetation formation within 140m of development	Effective slope of land	Minimum APZ required equivalent to BAL 29 (metres) (refer Note 2)
East	Remnant forest (refer Note 1)	6 ^{0D}	12
North-east	Forest	3 ^{0D}	24
South	Forest	3 - 7 ^{0U}	18
West	Forest (short fire run 55m)	5 ^{0D}	16 (refer Note 3)

*Notes: * Slope is either 'U' meaning up slope or 'C' meaning cross slope or 'D' meaning down slope*

Note 1: *PBP* describes remnant vegetation as a parcel of vegetation with a size of less than 1ha or a shape that provides a potential fire run directly towards a building not exceeding 50m. The vegetation to the east exhibits these qualities and therefore the threat posed is considered low and APZ setbacks for this aspect are the same as for the rainforest category outlined in *PBP*.

Note 2: A performance based assessment using Appendix B of *AS3959* was undertaken to determine the required APZ and BAL construction distances based on forest (PBP fuel load 20/25) and remnant forest vegetation (PBP fuel load 8/10) on a slope of 6^{o} & 3^{0} downslope, level and 3^{o} upslope. The results of the assessment, provided within Appendix 2, were prepared using the bushfire attack assessor (BFAA) developed by *Newcastle Bushfire Consulting.*

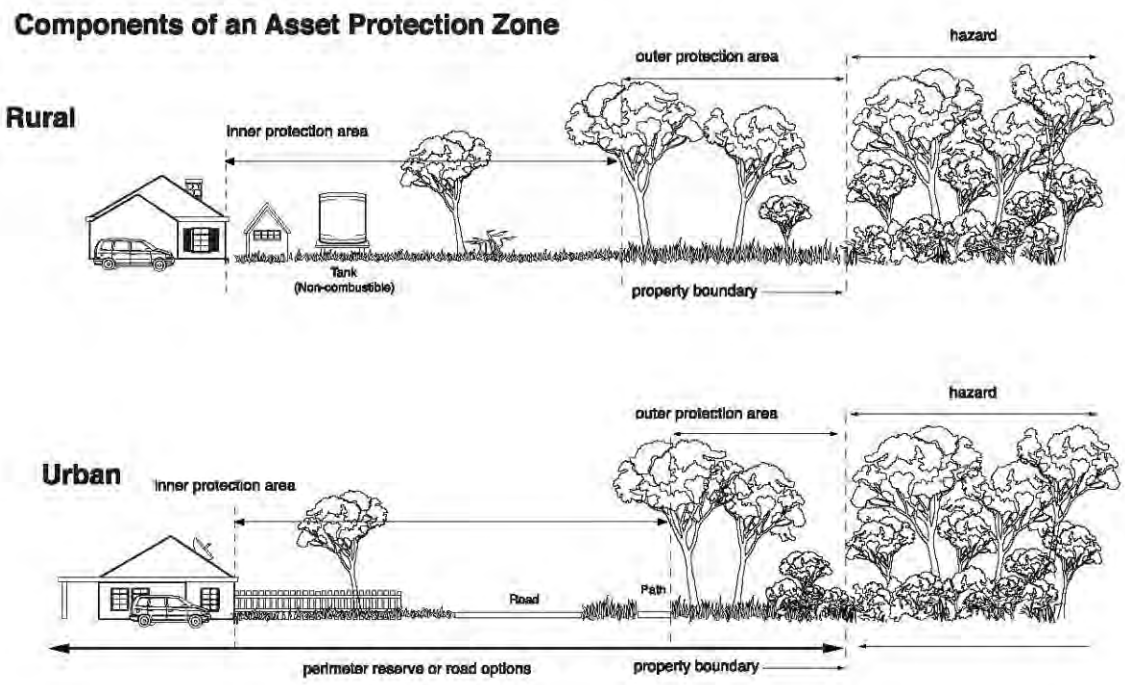
Note 3: A performance based assessment using Appendix B of *AS3959* was undertaken to determine the required APZ and BAL construction distances based on short fire run methodology (55m) on a slope of 5 degrees down. The methodology and results of the short fire run assessment are provided in Appendix 2 along with the bushfire attack assessor results which were prepared using the software developed by *Newcastle Bushfire Consulting*

Specific Protection Issues

3

3.1 Asset protection zones (APZs)

APZs are areas of defendable space separating hazardous vegetation from buildings. The APZ generally consists of two subordinate areas, an inner protection area (IPA) and an outer protection area (OPA). The OPA is closest to the bush and the IPA is closest to the dwellings. The IPA cannot be used for habitable dwellings but can be used for all external non-habitable structures such as pools, sheds, non-attached garages, cabanas, etc. A typical APZ and therefore defendable space is graphically represented below:



APZs and progressive reduction in fuel loads (Source: RFS, 2006)

Note: Vegetation management as shown is for illustrative purposes only. Specific advice is to be sought in regard to vegetation removal and retention from a qualified and experienced expert to ensure APZs comply with the *RFS* performance criteria.

PBP dictates that the subsequent extent of bushfire attack that can potentially emanate from a bushfire must not exceed a radiant heat flux of 29*kW/m*^{2} for residential subdivision developments. This rating assists in determining the size of the APZ in compliance with *PBP* to provide the necessary defendable space between hazardous vegetation and a building. Table 3.1 outlines the proposals compliance with the performance criteria for APZs.

Table 3.1 – Performance criteria for asset protection zones (*PBP* guidelines pg. 19)

Performance criteria	Acceptable solutions	Complies
Radiant heat levels at any point on a proposed building will not exceed 29kW/m^2.	APZs are provided in accordance with Appendix 2. APZs are wholly within the boundary of the development site.	Yes – A performance based assessment has been undertaken refer Table 2.1.
APZs are managed and maintained to prevent the spread of fire towards the building.	In accordance with the requirements of *Standards for Asset Protection Zones* (*NSW RFS* 2005).	Yes - to be made a condition of consent.
APZ maintenance is practical, soil stability is not compromised and the potential for crown fires is negated.	The APZ is located on lands with a slope of less than 18^o.	Yes - Slopes are less than 18^o.

3.2 Building protection

The construction of buildings in bushfire prone areas is subject to stringent rules pertinent to the building envelope being located on the non-hazardous side of the APZ. The role of the APZ is to provide a safe space to separate the hazard from the building.

In terms of future subdivision approval, the minimum APZ must be provided in accordance with Appendix 2 of *PBP.* The APZs provided in Table 2.1 (Section 2.3) of this report comply with these requirements, whilst also considering the final building setbacks as per *AS3959*.

Although not required in terms of rezoning, the following advice in relation to building construction levels can be used for future planning and subdivision design.

The construction classification system is based on five (5) bushfire attack levels (BAL). These are BAL – Flame Zone (FZ), BAL 40, BAL 29, BAL 19 and BAL 12.5 AS3959 – *Construction of buildings in bushfire-prone areas*. The lowest level, BAL 12.5, has the longest APZ distance while BAL – FZ has the shortest APZ distance. These allow for varying levels of building design and use of appropriate materials.

Indicative building construction standards have been depicted within Schedule 1 to identify developable land, so future purchasers have an idea regarding which construction level they can build to.

Please note that the BAL levels depicted are based on an alternative solution approach and therefore if using these BAL levels a further bushfire report will be required under Section 79BA of the *EP&A Act.* Alternatively a future occupant may wish to proceed in accordance with the Code's SEPP (i.e. complying development). If proceeding as complying development a higher BAL level may be applicable.

3.3 Hazard management

Should the development be approved, the owner or occupier of each lot will be required to manage the APZ to the specifications of Council's approval.

In terms of implementing and / or maintaining APZs, there is no physical reason that would constrain hazard management from being successfully carried out by normal means (e.g. mowing / slashing).

The APZs are to be managed in accordance with the RFS guidelines *Standards for Asset Protection Zones (RFS, 2005),* with landscaping to comply with Appendix 5 of *PBP.*

A summary of the guidelines for managing APZs is attached as Appendix 1 to this report.

3.4 Access for fire fighting operations

Future residential development within the site will access Louisiana Road to the east and ultimately Van Stappen Road in the north. The land within the northern portion of the site is a dedicated road reserve with the extension and formalisation of Van Stappen Road proposed to provide a link to Louisiana Road in the future.

The current immediate proposal (prior to the extension of Van Stappen Road) is to provide for a single dead end road with through road connection to Van Stappen Road in the north via fire trail and gate (as highlighted in Schedule 1 attached).

Two (2) turning heads / parking opportunities are provided for fire vehicles along the western perimeter road. In addition it is recommended that the current access track to the water tower (within Wadalba Wildlife Corridor) is upgraded to the standards required for a fire trail.

Table 3.3 outlines the performance criteria and acceptable solutions for future public roads within future subdivision design.

Table 3.3 – Performance criteria for public roads (*PBP* guidelines pg. 20)

Performance criteria	Acceptable solutions	Compliance
Fire fighters are provided with safe all weather access to structures (thus allowing more efficient use of fire fighting resources).	Public roads are two-wheel drive, all weather roads.	Yes
Public road widths and design that allow safe access for fire fighters while residents are evacuating an area.	Urban perimeter roads are two way, that is, at least two traffic lane widths (carriageway 8m minimum kerb to kerb) allowing traffic to pass in opposite directions. Non perimeter roads comply with Table 3.4 below. Perimeter road is linked with the internal road system at an interval of no greater than 500m in urban areas. Traffic management devices are constructed to facilitate access by emergency services. Public roads have a cross fall not exceeding 3^{o}. All roads are through roads. If unavoidable, dead end roads are not more than 200m in length, incorporate a minimum 12m outer radius turning circle, sign posted dead end and direct traffic away from the hazard. Curves of roads (other than perimeter) have a minimum inner radius of 6m and are minimal in number to allow for rapid access and egress. The minimum distance between inner and outer curves is 6m.	The perimeter road to the west is limited to 6.5m with the provision of a 1 & 4.5m verge. Given the low bushfire risk the requirement for an 8m wide perimeter road along the western boundary is considered excessive. It is recommended that firefighting access is upgraded to the forest in the south via an existing trail that should be upgraded to the standards of a fire trail as part for the development approval. The dead end public road is provided with through connection to Van Stappen Road via a fire trail and locked gate. This is considered adequate until such time as Van Stappen Road is upgraded and extended to provide through connection to Louisiana Road in the east. Yes Yes

Performance criteria	Acceptable solutions	Compliance
	Maximum grades for sealed roads do not exceed 15^{o} and an average grade of not more than 10^{o}. Minimum vertical clearance of 4m above the road at all times.	Yes Yes
The capacity of road surfaces and bridges is sufficient to carry fully loaded fire fighting vehicles	The capacity of road surfaces and bridges is sufficient to carry fully loaded fire fighting vehicles (15 tonnes for reticulated water and 28 tonnes for all other areas). Bridges clearly indicate load rating.	Yes
Roads that are clearly sign posted (with easily distinguishable names) and buildings / properties that are clearly numbered.	Public roads >6.5m wide to locate hydrants outside of parking reserves to ensure accessibility to reticulated water. Public roads 6.5-8m wide are No Parking on one side with the hydrant located on this side to ensure accessibility to reticulated water. Public roads <6.5m wide provide parking within parking bays and locate services outside of parking bays to ensure accessibility to reticulated water. One way only public access are no less than 3.5m wide and provide parking within parking bays and locate services outside of parking bays to ensure accessibility to reticulated water.	Yes can be a condition of consent
There is clear access to reticulated water supply. Parking does not obstruct the minimum paved width	Parking bays are a minimum of 2.6m wide from kerb edge to road pavement. No services or hydrants are located within parking bays. Public roads directly interfacing the bushfire hazard are to provide roll top kerbing to the hazard side of the road.	Yes can be a condition of consent

Table 3.4 – Minimum widths for public roads that are not perimeter roads

Curve radius (inside edge) (metres width)	Swept path (metres width)	Single lane (metres width)	Two way (metres width)
<40	3.5	4.5	8.0
40-69	3.0	3.9	7.5
70-100	2.7	3.6	6.9
>100	2.5	3.5	6.5

3.5 Water supplies

Town reticulated water supply is available to the property in the form of an underground reticulated water system.

Table 3.5 outlines the performance criteria and acceptable solutions for reticulated water supply.

Table 3.5 – Performance criteria for reticulated water supplies (*PBP* guidelines pg. 27)

Performance criteria	Acceptable solutions
Water supplies are easily accessible and located at regular intervals.	Reticulated water supply to urban subdivision uses a ring main system for areas with perimeter roads. Fire hydrant spacing, sizing and pressures comply with AS2419.1 - 2005. Where this cannot be met, the RFS will require a test report of the water pressures anticipated by the relevant water supply authority. In such cases, the location, number and sizing of hydrants shall be determined using fire engineering principles. Hydrants are not placed within any road carriageway. All above ground water and gas pipes external to the building are metal, including and up to taps. The provisions of parking on public roads are met.

3.6 Gas

Table 3.6 outlines the required performance criteria for the gas supply.

Table 3.6 – Performance criteria for reticulated water supplies (*PBP* guidelines pg. 27)

Performance criteria	Acceptable solutions
Location of gas services will not lead to the ignition of surrounding bushland land or the fabric of buildings	Reticulated or bottled gas bottles are to be installed and maintained in accordance with AS1596 (2002) and the requirements of relevant authorities. Metal piping is to be used. All fixed gas cylinders are to be kept clear of flammable materials to a distance of 10m and shielded on the hazard side of the installation. If gas cylinders are to be kept close to the building the release valves must be directed away from the building and at least 2m away from any combustible material, so that they do not act as a catalyst to combustion. Connections to and from gas cylinders are metal. Polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not to be used.

3.7 Electricity

Table 3.7 outlines the required performance criteria for electricity supply.

Table 3.7 – Performance criteria for electricity services (*PBP* guidelines pg. 27)

Performance criteria	Acceptable solutions
Location of electricity services limit the possibility of ignition of surrounding bushland or the fabric of buildings Regular inspection of lines in undertaken to ensure they are not fouled by branches.	Where practicable, electrical transmission lines are underground Where overhead electrical transmission lines are proposed: • Lines are installed with short pole spacing (30m), unless crossing gullies, gorges or riparian areas: and • No part of a tree is closer to a power line than the distance set out in accordance with the specification in *Vegetation Safety Clearances* issued by *Energy Australia* (NS179, April 2002).

Conclusion & Recommendations

4

4.1 Conclusion

A bushfire protection assessment has been undertaken for the planning proposal to rezone part of the land located at part Lot 51 DP 1195704, 165 Louisiana Road, Wadalba

Our assessment found that bushfire can potentially affect the site from the forest vegetation located within the narrow corridor to the west (short fire run), forest vegetation located within the Wadalba Wildlife Corridor in the south and the remnant forest located beyond Louisiana Road in the north-east.

The bushfire risk posed to the rezoning proposal can be mitigated if appropriate bushfire protection measures (including APZs) are put in place and managed in perpetuity. This report has been prepared utilising an alternative solution approach for the narrow vegetation corridor to the west of the site. The fire run potential from this aspect is limited to 55 metres and therefore the short fire run methodology has been used to determine both the required APZ and bushfire attack level (BAL). In addition amended slope and fuel load inputs were used to determine APZ and BAL requirements to the south, east and north-east

Future development on site is to comply with the following planning principles.

Table 4.1 – Planning principles

Planning principles	Recommendations
Provision of a perimeter road with two way access which delineates the extent of the intended development.	Given the low bushfire risk the requirement for an 8m wide perimeter road along the western boundaries is not necessary. This road is provided with a width of 6.5m and is considered adequate. It is recommended that firefighting access is upgraded to the forest in the south via an existing trail that should be upgraded as part for the development approval.
Provision, at the urban interface, for the establishment of adequate APZs for future housing.	APZs have been recommended in compliance with BAL 29 (AS3959, 2009).
Specifying minimum residential lot depths to accommodate APZs for lots on perimeter roads.	Future subdivision design is to allow for the minimum APZs as recommended within Table 2.1 and as depicted within Schedule 1 attached.
Minimising the perimeter of the area of land interfacing the hazard, which may be developed.	Compliant.
Introduction of controls which avoid placing inappropriate developments in hazardous areas.	Future development consists of residential dwellings and is appropriate for the level of bushfire risk.
Introduction of controls on the placement of combustible materials in APZs.	Compliant – can be made a condition of consent.

The following recommendations are provided to ensure that future residential development is in accordance with, or greater than, the requirements of *PBP.*

4.2 Recommendations

Recommendation 1 - APZs are to be provided to the future residential development. APZs are to be measured from the exposed wall of any dwelling toward the hazardous vegetation. The minimum APZ must be achievable within all lots fronting the bushfire hazard as nominated in Table 2.1 and also as generally depicted in Schedule 1.

Recommendation 2 - Fuel management within the APZs is to be maintained by regular maintenance of the landscaped areas, mowing of lawns in accordance with the guidelines provided in Appendix 1, and as advised by the RFS in their publications.

Recommendation 3 - Building construction standards are to be applied for future residential dwellings in accordance with *Australian Standard AS3959 Construction of buildings in bushfire-prone areas (2009)* with additional construction requirements as listed within Section A3.7 of Addendum Appendix 3 of *PBP.*

Recommendation 4 – Public access roads are to comply with the performance criteria within Section 4.1.3 of *PBP* (refer Section 3.4 of this report). Given the low bushfire risk and reduced width of the corridor in the west, the requirement for a perimeter road along the boundaries is not necessary.

It is however recommended that fire fighting access is provided to the forest in the south via the upgrade of the existing trail to the standards required for a fire trail (costs to be worn by the development).

The current immediate proposal (prior to the extension of Van Stappen Road) is to provide for a single dead end road. Through road connection to Van Stappen Road is to be provided via a fire trail and gate (as highlighted in Schedule 1 attached).

Recommendation 5 – Water, electricity and gas supply is to comply with the acceptable solutions as provided within Section 4.1.3 of *PBP* (refer Sections 3.5, 3.6 and 3.7 of this report).

REFERENCES

Australian Building Codes Board (2010) – *Building Code of Australia*, Class 1 and Class 10 Buildings Housing Provisions Volume 2.

Chan, K.W. (2001) – *The suitability of the use of various treated timbers for building constructions in bushfire prone areas*. Warrington Fire Research.

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Keith, David (2004) – *Ocean Shores to Desert Dunes – The Native Vegetation of New South Wales and the ACT*. The Department of Environment and Climate Change.

Rural Fire Service (2006) - *Planning for bushfire protection– a guide for councils, planners, fire authorities and developers*. NSW Rural Fire Service.

Rural Fire Service (2006) - Bushfire Attack Software on RFS Web site.

Tan, B., Midgley, S., Douglas, G. and Short (2004) - *A methodology for assessing bushfire attack.* RFS Development Control Service.

Plan of Bushfire Protection Measures

S1

Legend

- Lot Boundary
- Wadalba Wildlife Corridor Boundary
- Existing Managed Land
- Electrical easement
- Firetrail
- Locked gate
- Asset Protection Zone (APZ)

Bushfire Construction Standards

AS3959 (2009)*

- BAL 12.5
- BAL 19
- BAL 29

* Please refer to additional construction requirements for BAL levels which are contained in Addendum Appendix 3 of *'Planning for Bushfire Protection'* (2006).

Aerial source: Nearmaps 19.03.2015

0 30 60 m

Disclaimer: The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered surveyor.

PROJECT & MXD REFERENCE
165 Louisiana Road, Wadalba
A15026_BF001

DATE & ISSUE NUMBER
22/12/2015
Issue 1

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TITLE

Schedule 1 - Bushfire Protection Measures

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Travers bushfire & ecology
www.traversecology.com.au

Management of Asset Protection Zones

A1

The RFS advises that when living in a bushfire prone environment APZs are required to be provided between hazardous fuels and a dwelling.

The RFS provides basic advice in respect of managing APZs in several documents namely *Planning for Bush Fire Protection 2006 (PBP)* and *Standards for Asset Protection Zones* (undated but circa 2006).

APZs provide a level of defendable space between the hazard and a habitable dwelling or similar structure. These zones are usually shown on plans adjacent to either cultural or natural assets (e.g. dwelling). They act to significantly lessen the impact of intense fire. 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.

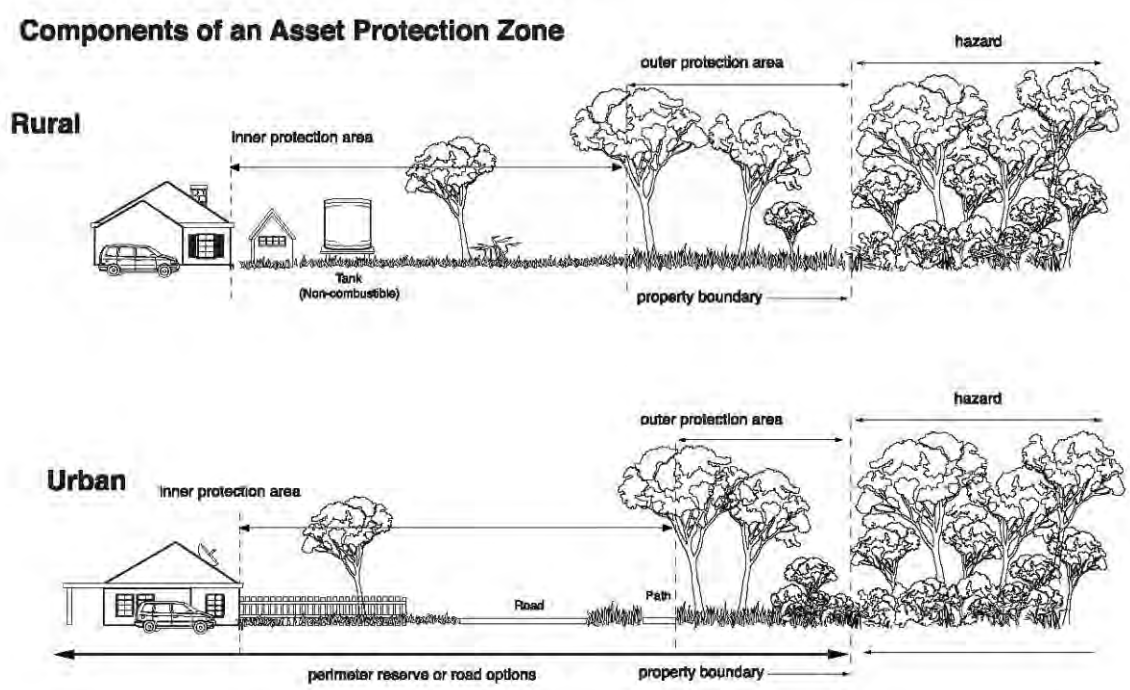
When considering bushfire fuel it is important to understand that it occurs in our native bushland in three vertical layers – see Table 1.

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	0-200mm	Litter layer (leaves & twigs)
Aerial fuels	200-3,000mm	Shrubs and grasses
Canopy fuels	>3,000mm	Tree canopy

The APZ can be further classified into two sub-zones with each having a specific role. These sub-zone areas are called the inner protection area (IPA) and the outer protection area (OPA) – see figure below.

The IPA is managed as a fuel free zone while the OPA is managed as a fuel reduced zone. This means that the fuel free zone has little fuel available to be consumed in the event of a fire whilst the fuel reduced zones has less than normal fuel levels that could be consumed in the event of a fire.



APZs and progressive reduction in fuel loads (Source: RFS, 2006)

Inner protection area (IPA)

This area is almost free of all fuels and usually takes the form of grassy areas, car parks, roads, concrete areas, tracks or trails. It does not imply or require the wholesale removal of every tree and or shrub.

This zone is intended to stop the transmission of flame and reduce the transmission of radiant heat by the elimination of available fuel. This area also allows airborne embers to fall safely without igniting further outbreaks.

This zone also provides a safe fire fighting position and is operationally important for implementation of clear fire control lines.

Grasses may occur within an IPA if they are generally no higher than 50-75mm. Above this height, fuel weights tend to increase exponentially and consequentially cause greater flame heights and therefore fire intensity

Shrubs may occur within an IPA in the form of clumping amidst open grassy areas. The design of the clumping will be dependent on species selection and spatial density. For example, the larger the shrubs the less clumping may occur in a given area.

As a general rule, trees are allowed within an IPA but only where those trees are at least 5m away from a dwelling.

A recommended performance standard for the fuel load of an IPA is between 0-4t/ha. Shrubs may occur within an IPA commensurate with a spatial distribution of 15-20%. For example an area of 100m^2 (10mx10m) can have up to 20% of this area composed of shrubs.

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 IPA 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 *Allocasuarina*) 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 20m in height the canopy is separated from the land surface by some distance. In an open woodland the low canopy height (usually <5m) merges with the shrubland layer.

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

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 IPA 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 an IPA 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 5m	No trees	No trees
Between 5-10m	One tree per 100m^2	2 trees per 100m^2
Between 10-20m	<10 tree per 400m^2	<10 trees per 400m^2

Outer protection area (OPA)

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

The OPA assumes all trees will remain but with either a modified shrub / grass layer or regular removal of the litter layer. In some sparse vegetation communities the shrub layer may not require modification.

The fire fighting advantage will manifest in 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.

In most cases, the removal of 85% of the litter layer will achieve a satisfactory OPA. A recommended performance standard for the fuel load of an OPA is between 4-6t/ha.

Managing the APZ

Fuel management within the APZs should be maintained by regular maintenance such as:

- Mowing grasses regularly - grass needs to be kept short and, where possible, green.

- Raking or manual removal of fine fuels - ground fuels such as fallen leaves, twigs (less than 6mm diameter) and bark should be removed on a regular basis. This is fuel that burns quickly and increases the intensity of a fire. Fine fuels can be removed by hand or with tools such as rakes, hoes and shovels.

- Removal or pruning of trees, shrubs and understorey - the control of existing vegetation involves both selective fuel reduction (removal, thinning and pruning) and the retention of vegetation. Prune or remove trees so that you do not have a continuous tree canopy leading from the hazard to the asset. Separate tree crowns by 2-5m. A canopy should not overhang within 2-5m of a dwelling. Native trees and shrubs should be retained as clumps or islands and should maintain a covering of no more than 20% of the area.
- Trees or tall shrubs may require pruning upon dwelling completion in line with *PBP.* Notwithstanding this, the presence of shrubs and trees close to a dwelling in a bushfire prone landscape requires specific attention to day to day management and owners and or occupier should be made aware that whilst landscaping can contribute to a way of life and environmental amenity the accumulated.

In addition, the following general APZ planning advice should be followed:

- Ensure that vegetation does not provide a continuous path to the house.

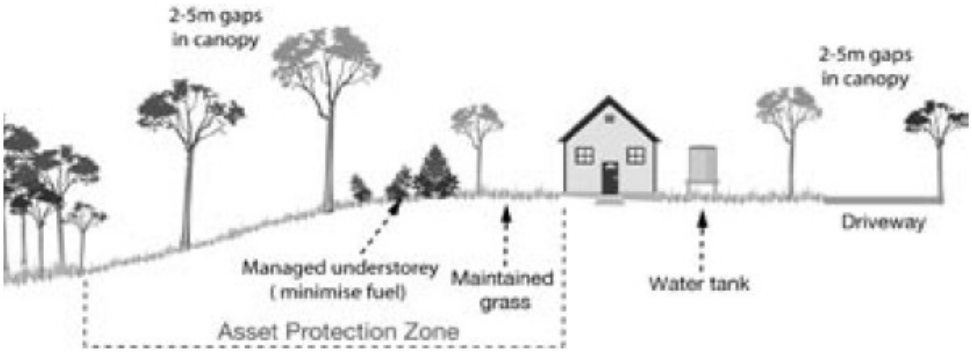
- Plant or clear vegetation into clumps rather than continuous rows.

- Prune low branches 2m from the ground to prevent a ground fire from spreading into trees.

- Locate vegetation far enough away from the asset so that plants will not ignite the asset by direct flame contact or radiant heat emission.

- Ensure that shrubs and other plants do not directly abut the dwelling. Where this does occur, gardens should contain low flammability plants and non flammable ground cover such as pebbles and crushed tile; and

- The following RFS illustrative diagram depicts one version of an ideal situation. Specific advice is to be sought from qualified experts to ensure that the implemented APZs meet the performance criteria of APZs.



Figures courtesy of NSW RFS 2006.

Performance based assessment

A2

SHORT FIRE RUN METHODOLOGY

TBE have undertaken an assessment of the APZ required for the western aspect of the development using short fire run methodology (based on 55m)

Aspect	Vegetation formation within 140m of development	Effective slope of land	APZ required (to ensure <BAL 29 (metres)
West	Forest (short fire run 55m)	5 Degrees	16

The vegetation to this aspect poses a reduced bushfire risk to the site due to its narrow fire run length (i.e. 55m) and reduced opportunity to support a fully developed bushfire (refer Schedule 1 attached). As a result the following short fire run (SFR) methodology has been used due the reduction in the linear length which has resulted in a reduction of head width of the SFR (instead of assuming a head width of 100m).

This methodology is based on research undertaken by EA Catchpole, ME Alexander, AM Gill, KE Tolhurst, P Cheney and AG McArthur and relies on a number of prerequisites to calculate a length/breadth ratio of a bushfire burning in forest vegetation which allows the calculation of an approximate width of the head fire.
Assumptions used in the methodology include:

- Wind speed will be constant (30 kph) and will not significantly increase or change direction
- The length of the fire run will not develop a head width greater than 100m before the available fuels have been consumed for that fire run.
- Fuel load is distributed equally
- The shape of the fire is based on a uniform slope
- Flame contact and multiple embers from bush fire burning in close proximity have been considered but disregarded.
- Flame length is not taken into account due to the lower inherent risk associated with SFR's. The flame angle is locked at 90 degrees.
- The SRF is measured for a maximum length, perpendicular to the contours from the assumed point of ignition to the limit of vegetation closest to the asset

The following model has been used by calculating the shape of bush fire growth by determining the Forward Rate of Spread (FROS). In calculating the Length/Breadth (L/B) ratio of the ellipse the model can then provide an approximate measurement for the head width of the fire. This reduced head width was then used to determine APZs and BAL levels by inputting the detail in *Bushfire Attack Assessor V2.1 developed by Newcastle Bushfire Consulting.*

ASSESSMENT USING **55M** SHORT FIRE RUN (SFR) METHODOLOGY

Forward and Flank Rate of Spread

STEP 1 - Site specific inputs include:

Effective Slope	5 degrees
FFDI	100
Surface and elevated Fuel Load	35 tonnes
Wind Speed	30kph

STEP 2 – Rate of Spread = (0.0012*FDI (100)*Fuel Load (25)* EXP (0.069* SLOPE (18))) *1000 metres per hour to calculate the FROS. ANSWER: FROS = **5930.357**

STEP 3 – Calculate the Length/Breadth (L/B) ratio; L/B ratio = 1.0 + 0.00120 $W^{2.154}$
Where W equals wind speed (30 kph). ANSWER: Length/Breadth Ratio - **2.82**

STEP 4 - Calculate the Back Fire (BF) Head Fire (HF) spread ratio = Head Fire / Back Fire (H/B) spread ratio. H/B = [(L/B) + $\sqrt{(L/B)^2-1}$ / (L/B) - $\sqrt{(L/B)^2-1}$]. ANSWER: **29.85**

STEP 5 - Divide the BF by HF spread ratio by the forward ROS (FROS). ANSWER: **198.641**

STEP 6 Add BF distance + FROS = full spread. ANSWER: **6128.99**

STEP 7 - Divide ellipse length for unit of time by L/B ratio = Breadth. ANSWER: **2170.727**

Calculated Head Width – **2170.727**

Corrected Short Fire Run Head Width Calculations

STEP 8 – Measure the short fire run and enter the input. The short fire run has been determined as 55m.

STEP 9 – Divide FROS by 60 to identify meters per minute. ANSWER: **98.8**

STEP 10 – Measured length of SFR. ANSWER: **55m**

STEP 11 – Time taken to travel SFR distance ANSWER: **0:34.36 minutes**

STEP 12 – Multiply FROS by 60 and divide result by 1000 to provide speed in kph.
ANSWER: **5.9kph**

STEP 13 – Calculate the Length/Breadth (L/B) ratio; L/B ratio =1.0 + 0.00120 W2.154
where W equals wind speed. ANSWER: **2.82**

STEP 14 – Calculate the Back Fire (BF) Head Fire (HF) spread ratio Head Fire / Back Fire (H/B) spread ratio. H/B = [(L/B) + √(L/B) 2-1 / (L/B) - √(L/B) 2-1] ANSWER: **29.85**

STEP 15 – Total Ellipse length in metres for one minute. ANSWER: **102.15**

STEP 16 – Add BF distance + FROS = ellipse length for unit of time. ANSWER: **58.909**

STEP 17 – Divide ellipse length for unit of time by L/B ratio = Breadth.
ANSWER **20.86** Normal Flank depth in metres = **10.42**

Calculated SFR Head Width – **21 metres**

Radiant Heat Calculation

The above calculations where inputted into the Bushfire Attack Assessor produced by Newcastle Bushfire Consulting (refer detail). These inputs and radiant heat results are summarised in the table below:

Specific Input	
Vegetation	Forest
Fuel Load	25 / 35
Separation Distance	16m
Flame Angle	90^0. This stands up the flame to remove flame contact and identify only the radiant heat flux.
Site & vegetation slope	5^0
Flame width	21m
Flame temperature	1090
FDI	100
Wind speed	30kph
RESULT	**28.04 kW/m^2**

Run Description:	G West - Short Fire Run BAL 29		
Vegetation Information			
Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	5 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	25	**Overall Fuel Load(t/ha):**	35
Site Information			
Site Slope	5 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	16
Fire Inputs			
Veg./Flame Width(m):	21	**Flame Temp(K)**	1090
Calculation Parameters			
Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100
Program Outputs			
Category of Attack:	FLAME ZONE	**Peak Elevation of Receiver(m):**	14.47
Level of Construction:	BAL FZ	**Fire Intensity(kW/m):**	76600
Radiant Heat(kW/m2):	28.04	**Flame Angle (degrees):**	90
Flame Length(m):	31.73	**Maximum View Factor:**	0.437
Rate Of Spread (km/h):	4.24	**Inner Protection Area(m):**	16
Transmissivity:	0.843	**Outer Protection Area(m):**	0

Run Description:	H West - Short Fire Run BAL 19		
Vegetation Information			
Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	5 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	25	**Overall Fuel Load(t/ha):**	35
Site Information			
Site Slope	5 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	22
Fire Inputs			
Veg./Flame Width(m):	21	**Flame Temp(K)**	1090
Calculation Parameters			
Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100
Program Outputs			
Category of Attack:	FLAME ZONE	**Peak Elevation of Receiver(m):**	13.94
Level of Construction:	BAL FZ	**Fire Intensity(kW/m):**	76600
Radiant Heat(kW/m2):	18.56	**Flame Angle (degrees):**	90
Flame Length(m):	31.73	**Maximum View Factor:**	0.296
Rate Of Spread (km/h):	4.24	**Inner Protection Area(m):**	22
Transmissivity:	0.825	**Outer Protection Area(m):**	0
Run Description:	I West - Short Fire Run BAL 12.5		
Vegetation Information			
Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	5 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	25	**Overall Fuel Load(t/ha):**	35
Site Information			
Site Slope	5 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	29
Fire Inputs			
Veg./Flame Width(m):	21	**Flame Temp(K)**	1090
Calculation Parameters			
Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100
Program Outputs			
Category of Attack:	FLAME ZONE	**Peak Elevation of Receiver(m):**	13.33
Level of Construction:	BAL FZ	**Fire Intensity(kW/m):**	76600
Radiant Heat(kW/m2):	12.09	**Flame Angle (degrees):**	90
Flame Length(m):	31.73	**Maximum View Factor:**	0.197
Rate Of Spread (km/h):	4.24	**Inner Protection Area(m):**	29
Transmissivity:	0.807	**Outer Protection Area(m):**	0

PERFORMANCE BASED ASSESSMENT FOR SOUTHERN, EASTERN AND NORTH-EASTERN

Eastern Aspect –Remnant Forest

NBC Bushfire Attack Assessment Report V2.1

AS3959 (2009) Appendix B - Detailed Method 2

Printed: 9/12/2015 **Assessment Date:** 7/12/2015

Site Street Address:	Louisiana Road, Wadalba		
Assessor:	Mr Admin; admin		
Local Government Area:	Wyong	**Alpine Area:**	No

Equations Used

Transmissivity: Fuss and Hammins, 2002
Flame Length: RFS PBP, 2001
Rate of Fire Spread: Noble et al., 1980
Radiant Heat: Drysdale, 1985; Sullivan et al., 2003; Tan et al., 2005
Peak Elevation of Receiver: Tan et al., 2005
Peak Flame Angle: Tan et al., 2005

Run Description: A East - BAL 29

Vegetation Information

Vegetation Type:	Remnant Vegetation	**Vegetation Group:**	Remnant Vegetation
Vegetation Slope:	6 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	8	**Overall Fuel Load(t/ha):**	10

Site Information

Site Slope	6 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	12

Fire Inputs

Veg./Flame Width(m):	100	**Flame Temp(K)**	1090

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100

Program Outputs

Category of Attack:	HIGH	**Peak Elevation of Receiver(m):**	3.74
Level of Construction:	BAL 29	**Fire Intensity(kW/m):**	7504
Radiant Heat(kW/m2):	27.93	**Flame Angle (degrees):**	70
Flame Length(m):	10.64	**Maximum View Factor:**	0.425
Rate Of Spread (km/h):	1.45	**Inner Protection Area(m):**	12
Transmissivity:	0.863	**Outer Protection Area(m):**	0

Run Description:	B - East - BAL 19		
Vegetation Information			
Vegetation Type:	Remnant Vegetation	Vegetation Group:	Remnant Vegetation
Vegetation Slope:	6 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	8	Overall Fuel Load(t/ha):	10
Site Information			
Site Slope	6 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m)	Default	APZ/Separation(m):	18
Fire Inputs			
Veg./Flame Width(m):	100	Flame Temp(K)	1090
Calculation Parameters			
Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	100
Program Outputs			
Category of Attack:	MODERATE	Peak Elevation of Receiver(m):	3.31
Level of Construction:	BAL 19	Fire Intensity(kW/m):	7504
Radiant Heat(kW/m2):	18.15	Flame Angle (degrees):	78
Flame Length(m):	10.64	Maximum View Factor:	0.284
Rate Of Spread (km/h):	1.45	Inner Protection Area(m):	18
Transmissivity:	0.84	Outer Protection Area(m):	0

Run Description:	C - East - BAL 12.5		
Vegetation Information			
Vegetation Type:	Remnant Vegetation	Vegetation Group:	Remnant Vegetation
Vegetation Slope:	6 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	8	Overall Fuel Load(t/ha):	10
Site Information			
Site Slope	6 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m)	Default	APZ/Separation(m):	26
Fire Inputs			
Veg./Flame Width(m):	100	Flame Temp(K)	1090
Calculation Parameters			
Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	100
Program Outputs			
Category of Attack:	LOW	Peak Elevation of Receiver(m):	2.55
Level of Construction:	BAL 12.5	Fire Intensity(kW/m):	7504
Radiant Heat(kW/m2):	11.97	Flame Angle (degrees):	83
Flame Length(m):	10.64	Maximum View Factor:	0.193
Rate Of Spread (km/h):	1.45	Inner Protection Area(m):	26
Transmissivity:	0.816	Outer Protection Area(m):	0

North-eastern aspect – Forest

Run Description:	D - North-east BAL 29		
Vegetation Information			
Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	3 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	20	**Overall Fuel Load(t/ha):**	25
Site Information			
Site Slope	3 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	24
Fire Inputs			
Veg./Flame Width(m):	100	**Flame Temp(K)**	1090
Calculation Parameters			
Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100
Program Outputs			
Category of Attack:	HIGH	**Peak Elevation of Receiver(m):**	8.71
Level of Construction:	BAL 29	**Fire Intensity(kW/m):**	38129
Radiant Heat(kW/m2):	28.05	**Flame Angle (degrees):**	64
Flame Length(m):	22.19	**Maximum View Factor:**	0.443
Rate Of Spread (km/h):	2.95	**Inner Protection Area(m):**	24
Transmissivity:	0.834	**Outer Protection Area(m):**	0
Run Description:	E - North-east BAL 19		
Vegetation Information			
Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	3 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	20	**Overall Fuel Load(t/ha):**	25
Site Information			
Site Slope	3 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	34
Fire Inputs			
Veg./Flame Width(m):	100	**Flame Temp(K)**	1090
Calculation Parameters			
Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100
Program Outputs			
Category of Attack:	MODERATE	**Peak Elevation of Receiver(m):**	8.71
Level of Construction:	BAL 19	**Fire Intensity(kW/m):**	38129
Radiant Heat(kW/m2):	18.29	**Flame Angle (degrees):**	71
Flame Length(m):	22.19	**Maximum View Factor:**	0.299
Rate Of Spread (km/h):	2.95	**Inner Protection Area(m):**	34
Transmissivity:	0.804	**Outer Protection Area(m):**	0

Run Description:	F - North-east BAL12.5		
Vegetation Information			
Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	3 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	20	**Overall Fuel Load(t/ha):**	25
Site Information			
Site Slope	3 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	45
Fire Inputs			
Veg./Flame Width(m):	100	**Flame Temp(K)**	1090
Calculation Parameters			
Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100
Program Outputs			
Category of Attack:	LOW	**Peak Elevation of Receiver(m):**	8.31
Level of Construction:	BAL 12.5	**Fire Intensity(kW/m):**	38129
Radiant Heat(kW/m2):	12.5	**Flame Angle (degrees):**	74
Flame Length(m):	22.19	**Maximum View Factor:**	0.21
Rate Of Spread (km/h):	2.95	**Inner Protection Area(m):**	45
Transmissivity:	0.781	**Outer Protection Area(m):**	0

North-eastern aspect – Forest

Run Description:	J South-west BAL 29		
Vegetation Information			
Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	0 Degrees	**Vegetation Slope Type:**	Level
Surface Fuel Load(t/ha):	20	**Overall Fuel Load(t/ha):**	25
Site Information			
Site Slope	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	21
Fire Inputs			
Veg./Flame Width(m):	100	**Flame Temp(K)**	1090
Calculation Parameters			
Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100
Program Outputs			
Category of Attack:	HIGH	**Peak Elevation of Receiver(m):**	8.29
Level of Construction:	BAL 29	**Fire Intensity(kW/m):**	31000
Radiant Heat(kW/m2):	27.87	**Flame Angle (degrees):**	63
Flame Length(m):	18.6	**Maximum View Factor:**	0.436
Rate Of Spread (km/h):	2.4	**Inner Protection Area(m):**	21
Transmissivity:	0.841	**Outer Protection Area(m):**	0

Run Description:	K South-west BAL 19		
Vegetation Information			
Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	0 Degrees	**Vegetation Slope Type:**	Level
Surface Fuel Load(t/ha):	20	**Overall Fuel Load(t/ha):**	25
Site Information			
Site Slope	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	29
Fire Inputs			
Veg./Flame Width(m):	100	**Flame Temp(K)**	1090
Calculation Parameters			
Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100
Program Outputs			
Category of Attack:	MODERATE	**Peak Elevation of Receiver(m):**	8.68
Level of Construction:	BAL 19	**Fire Intensity(kW/m):**	31000
Radiant Heat(kW/m2):	18.97	**Flame Angle (degrees):**	69
Flame Length(m):	18.6	**Maximum View Factor:**	0.306
Rate Of Spread (km/h):	2.4	**Inner Protection Area(m):**	29
Transmissivity:	0.815	**Outer Protection Area(m):**	0

Run Description:	L South-west BAL 12.5		
Vegetation Information			
Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	0 Degrees	**Vegetation Slope Type:**	Level
Surface Fuel Load(t/ha):	20	**Overall Fuel Load(t/ha):**	25
Site Information			
Site Slope	0 Degrees	**Site Slope Type:**	Level
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	40
Fire Inputs			
Veg./Flame Width(m):	100	**Flame Temp(K)**	1090
Calculation Parameters			
Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100
Program Outputs			
Category of Attack:	LOW	**Peak Elevation of Receiver(m):**	8.89
Level of Construction:	BAL 12.5	**Fire Intensity(kW/m):**	31000
Radiant Heat(kW/m2):	12.47	**Flame Angle (degrees):**	73
Flame Length(m):	18.6	**Maximum View Factor:**	0.208
Rate Of Spread (km/h):	2.4	**Inner Protection Area(m):**	40
Transmissivity:	0.789	**Outer Protection Area(m):**	0

Southern aspect – Forest

Run Description:	M South BAL 29		
Vegetation Information			
Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	3 Degrees	**Vegetation Slope Type:**	Upslope
Surface Fuel Load(t/ha):	20	**Overall Fuel Load(t/ha):**	25
Site Information			
Site Slope	3 Degrees	**Site Slope Type:**	Upslope
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	18
Fire Inputs			
Veg./Flame Width(m):	100	**Flame Temp(K)**	1090
Calculation Parameters			
Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100
Program Outputs			
Category of Attack:	HIGH	**Peak Elevation of Receiver(m):**	7.73
Level of Construction:	BAL 29	**Fire Intensity(kW/m):**	25204
Radiant Heat(kW/m2):	28.47	**Flame Angle (degrees):**	60
Flame Length(m):	15.68	**Maximum View Factor:**	0.441
Rate Of Spread (km/h):	1.95	**Inner Protection Area(m):**	18
Transmissivity:	0.85	**Outer Protection Area(m):**	0

Run Description:	N South BAL 19		
Vegetation Information			
Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	3 Degrees	**Vegetation Slope Type:**	Upslope
Surface Fuel Load(t/ha):	20	**Overall Fuel Load(t/ha):**	25
Site Information			
Site Slope	3 Degrees	**Site Slope Type:**	Upslope
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	26
Fire Inputs			
Veg./Flame Width(m):	100	**Flame Temp(K)**	1090
Calculation Parameters			
Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100
Program Outputs			
Category of Attack:	MODERATE	**Peak Elevation of Receiver(m):**	8.63
Level of Construction:	BAL 19	**Fire Intensity(kW/m):**	25204
Radiant Heat(kW/m2):	18.5	**Flame Angle (degrees):**	68
Flame Length(m):	15.68	**Maximum View Factor:**	0.296
Rate Of Spread (km/h):	1.95	**Inner Protection Area(m):**	26
Transmissivity:	0.822	**Outer Protection Area(m):**	0

Run Description:	O South BAL 12.5		
Vegetation Information			
Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	3 Degrees	**Vegetation Slope Type:**	Upslope
Surface Fuel Load(t/ha):	20	**Overall Fuel Load(t/ha):**	25
Site Information			
Site Slope	3 Degrees	**Site Slope Type:**	Upslope
Elevation of Receiver(m)	Default	**APZ/Separation(m):**	36
Fire Inputs			
Veg./Flame Width(m):	100	**Flame Temp(K)**	1090
Calculation Parameters			
Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100
Program Outputs			
Category of Attack:	LOW	**Peak Elevation of Receiver(m):**	9.34
Level of Construction:	BAL 12.5	**Fire Intensity(kW/m):**	25204
Radiant Heat(kW/m2):	12.24	**Flame Angle (degrees):**	72
Flame Length(m):	15.68	**Maximum View Factor:**	0.202
Rate Of Spread (km/h):	1.95	**Inner Protection Area(m):**	36
Transmissivity:	0.797	**Outer Protection Area(m):**	0

ATTACHMENT 10

TRAFFIC IMPACT ASSESSMENT

DOBINSON & ASSOCIATES Pty Ltd
A.B.N. 40 050 042 021

Consultants in Management, Transport Planning
Traffic Safety & Management and Infrastructure Development.

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Cherrybrook NSW 2126
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Proposed Rezoning of part Lot 51 DP 1195704, 165 Louisiana Road, Wadalba for Residential Subdivision

TRAFFIC ASSESSMENT

for

Threshold Development

Report Purpose

This report is to accompany an application to Wyong Shire Council to rezone part of Lot 51, DP 1195704, known as 165 Louisiana Road, Wadalba for a residential subdivision. The site location is shown on the map below.

The report is based on information provided by consultants, Optima Developments Pty Ltd and a site inspection and on that information only.

The Proposal

The proposal is to subdivide the eastern portion of Lot 51 fronting Louisiana Road into 20 lots to accommodate 20 dwelling houses.

The western portion of the lot will be set aside for a future wildlife corridor and the northern portion of the Lot is to set aside as public road for extension of Van Stappen Way to join with Wahroonga Road at a new roundabout planned at the intersection of Louisiana Road and Wahroonga Road.

Lot 51 DP 1195704 is shown on the survey plan below. It has a frontage of 116 metres to Louisiana Road and a depth of about 193 metres with an area of 2.715 ha.

The proposed subdivision is shown in the Drawing below. This drawing shows the future wildlife corridor and the land to be set aside as road reserve for extension of Van Stappen Way.

The planned construction of Van Stappen Way across the Lot is shown in the Drawing below prepared by CardnoYoung.

TRAFFIC ASSESSMENT

Louisiana Road runs straight south from the Pacific Highway to meet with Wahroonga Road running directly east from their junction at the north eastern corner of the proposed subdivision, which junction forms a sweeping curve of the order of 60 metres radius. This shows in the map below.

Louisiana Road has a pavement width of 11.2 metres between kerbs in approach to curve between the roads while Wahroonga Road has a sealed pavement varying from 6.1 to 6.8 metres wide with grass shoulders and no kerbs in approach to the curve. The curve joining the two roads has a new sealed pavement 8.2 metre wide with gravel shoulders.

Both roads are local roads; local roads carry a speed limit of 50 km/hr. The road carries about 1600 vehicles per day past the site of the proposed subdivision (based on a count some 10 years ago increased at 2% per annum), yielding a weekday peak hour flow of the order of 160 vehicles per hour (vph). Thus this road currently operates within the environmental goal for a residential street of 200 vph (RMS Guide)

The access to the proposed subdivision is to be located on the outside of the curve joining Louisiana and Wahroonga Road at about the midpoint of that curve. This access will form a portion of the future Van Stappen Way. The remainder of the road for the subdivision takes off from this access road portion. This is shown on the drawing of the proposed subdivision below.

Clear sight of the proposed access road to the subdivision in excess of 100 metres is available on approach along both Louisiana and Wahroonga Roads. This may be compared with the minimum distance of 45 metres and desirable of 69 metres for approach speeds of 50 km/hr shown in AS/NZS 2890.1 (2004) and of 65 metres minimum and 83 metres desirably for 60 km/hr accepting that vehicles using this road may travel at higher speeds due to the straight approaches to the intersecting curve where the access is proposed.

The Roads & Maritime Services (RMS) Guide to Traffic Generating Developments[1] indicates trip generation rates for residential dwelling houses as:

- Daily vehicle trips – 9.0 per dwelling
- Weekday peak hour vehicle trips – 0.85 per dwelling.

From the RMS Guide the proposed residential subdivision would generate -

- Daily - 20 dwellings x 9.0 vehicle trips per dwelling = 180 vehicle trips per day (vtpd)
- Weekday peak hour – 2 dwellings x 0.85 vehicle trips per dwelling = 17 vehicle trips per hour (vtph), 2 arriving, 15 departing in the a.m. peak and the reverse in the p.m.

This assessment indicates that there will be only a slight increase in flow on Louisiana/Wahroonga roads past the site from the proposed 20 lot residential subdivision, from 160 vph to 177 vph maximum during weekday peak hours.

This will have minimal impact on traffic operation and traffic safety on this road and the road will continue to operate within the environmental goal of a residential street.

While traffic along Louisiana Road between the proposed subdivision site and the Pacific Highway is heavier at weekends due to traffic generated by the ovals along this section of road, generation from the residential subdivision is less at weekends and hence should make no significant impact on operation of the road adjacent.

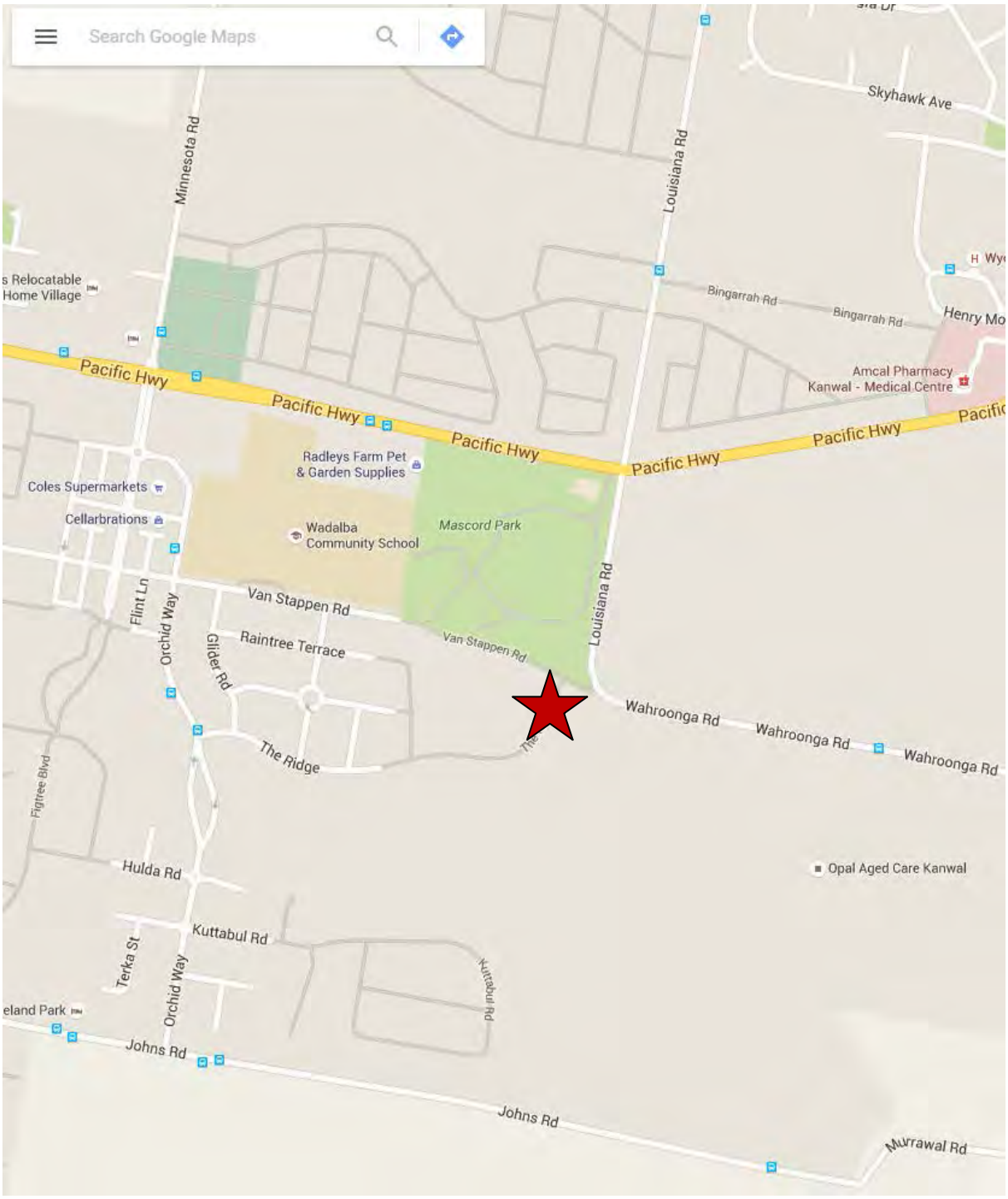
In summary, the proposed 20 lot residential subdivision will have no significant impact on traffic operation or traffic safety of the adjacent Louisiana/Wahroonga Road.

Sight is adequate of the proposed access to the subdivision for traffic approaching from both Louisiana and Wahroonga Roads.

The subdivision preserves and facilitates the extension of Van Stappen Way across Lot 51.

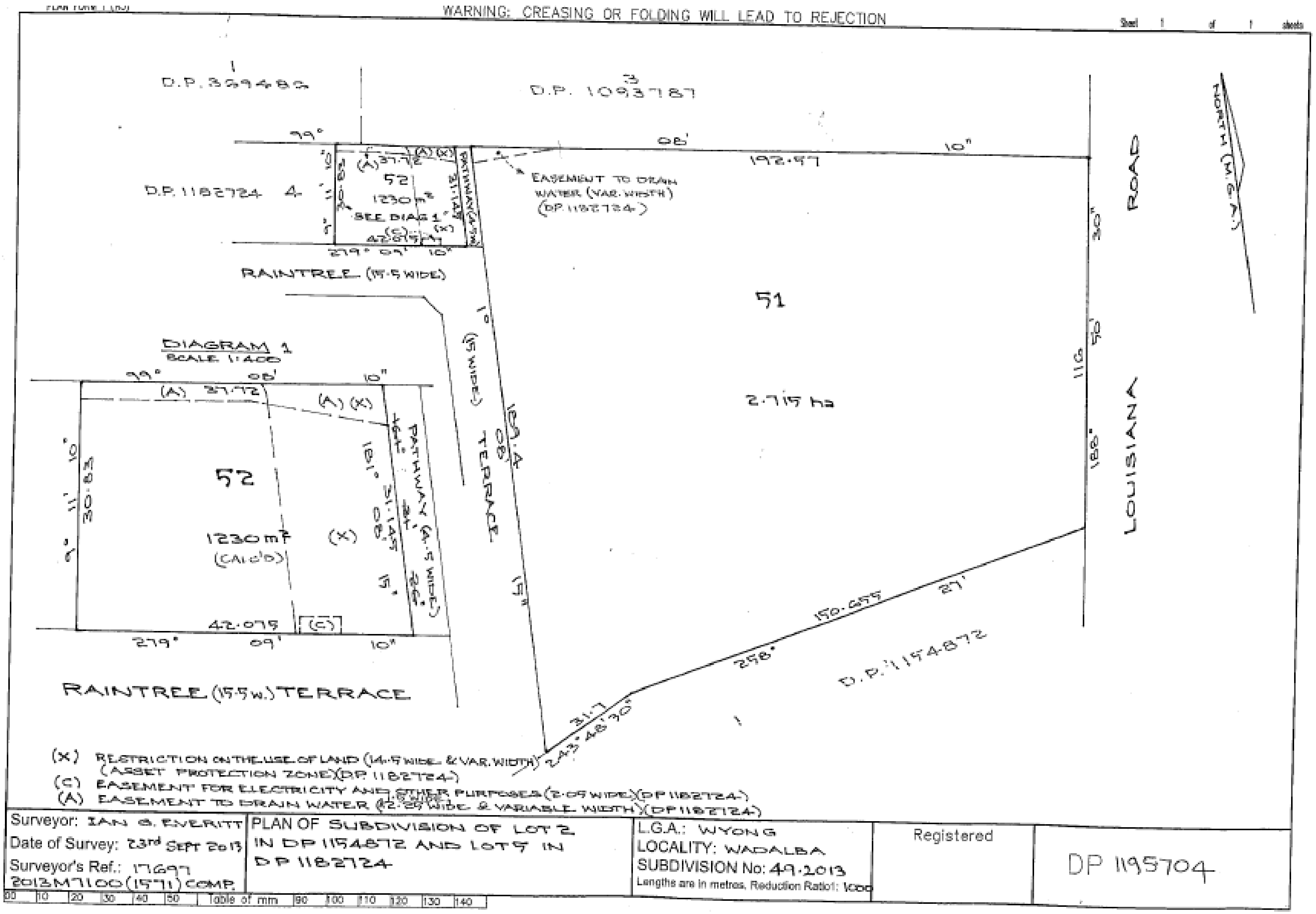
Ken Dobinson
19th December 2015

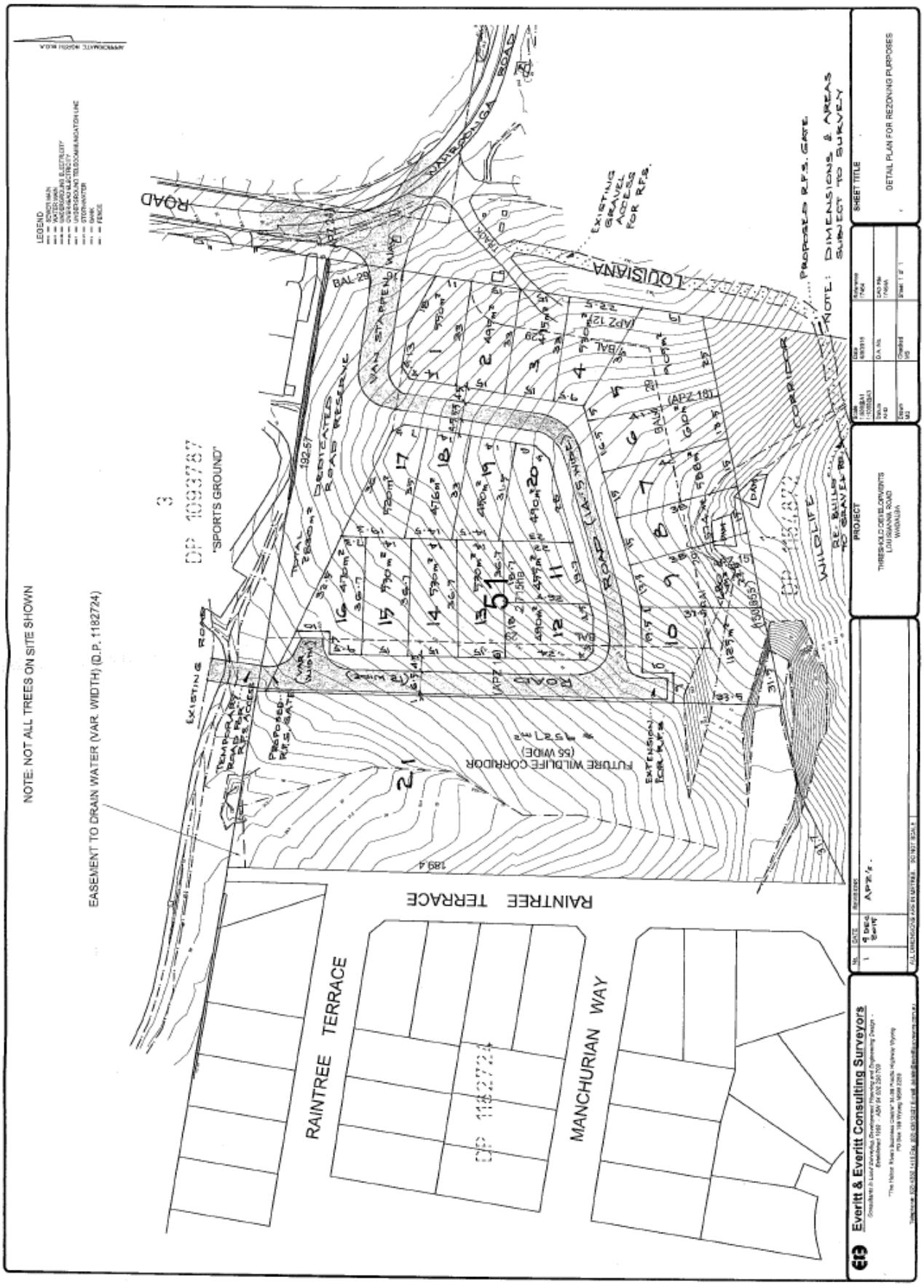
[1] Guide to Traffic Generating Developments. Version 2.2, RMS (formerlyRTA), October 2002



Site Location

Survey Plan


WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION
D.P. 1093787
D.P. 1182724
51
2·715 ha
52
1230 m²
DIAGRAM 1
SCALE 1:400
RAINTREE (15·5 WIDE)
RAINTREE (15·5 w.) TERRACE
LOUISIANA ROAD
NORTH (M.G.A.)
EASEMENT TO DRAIN WATER (VAR. WIDTH) (DP 1182724)
D.P. 1154872
(X) RESTRICTION ON THE USE OF LAND (14·5 WIDE & VAR. WIDTH) (ASSET PROTECTION ZONE) (DP 1182724)
(C) EASEMENT FOR ELECTRICITY AND OTHER PURPOSES (2·09 WIDE) (DP 1182724)
(A) EASEMENT TO DRAIN WATER (2·5 WIDE & VARIABLE WIDTH) (DP 1182724)
Surveyor: IAN G. EVERITT
Date of Survey: 23rd SEPT 2013
Surveyor's Ref.: 17697 2013M7100 (1571) COMP.
PLAN OF SUBDIVISION OF LOT 2 IN DP 1154872 AND LOT 5 IN DP 1182724
L.G.A.: WYONG
LOCALITY: WADALBA
SUBDIVISION No: 49.2013
Lengths are in metres. Reduction Ratio 1: 1000
Registered
DP 1195704



Proposed Residential Subdivision

Proposed Extension of Van Stappen Way across Lot 51

ATTACHMENT 11

DEVELOPMENT CONTRIBUTIONS REPORT

Progressive Property Solutions

Development Contributions Report

165 Louisiana Rd Wadalba

December 2015

CONTENTS

Introduction

The following report has been prepared by Progressive Property Solutions (PPS) for Threshold Developments, the owner of the subject property. The report provides details of the Section 94 development contributions applicable to the future development of the land. It is noted that any development will also be subject to water and sewer contributions under Section 306 of the Water Management Act 2000.

The brief to PPS for this project was as follows:

- Review the proposed subdivision layout for the subject land.
- Assess the proposed subdivision against the current Contributions Plan for the area and report on the likely development contributions applicable to the future subdivision and also any development contributions credits that may apply.

The Site

House No.	Lot	DP	Street	Area (m^2)
165	51	1195704	Louisiana Rd	1.7182

The Proposal

A Planning Proposal is currently being prepared to rezone part of the subject land from RU6 Transition to R2 Low Density Residential. The remaining part of the property is currently zoned E2 Environmental Conservation and is subject to a separate agreement which provides for its transfer to Council. A residential subdivision comprising 20 residential lots as per the plan prepared by Everitt & Everitt Consulting Surveyors – Reference: 17464 (dated 9/12/15) has also been prepared which provides an indicative future development scenario. The proposed development also includes the dedication of a 2,830m^2 parcel of land for the future extension of Van Stappen Way. The size of each of the proposed lots is shown in the table below:

Proposed Lot No.	Area (m^2)	Proposed Lot No.	Area (m^2)
1	550	12	490
2	495	13	530
3	495	14	530
4	530	15	530
5	905	16	470
6	610	17	520
7	588	18	476
8	574	19	450
9	680	20	490
10	1125		
11	455	Road Reserve	2,830
Total NDA (area of residential lots only)			11,493

Shirewide Infrastructure, Services and Facilities Development Contributions Plan

The Shirewide contributions plan would apply to any development of the subject site. The content of this Plan or its applicability to the development of the land is not included in the brief for this report and as such there is no further discussion on this plan.

Warnervale District Contributions Plan

The Warnervale District Contributions Plan was adopted by Council on 25 March 2015. The Contributions Plan covers a very broad area from Wallarah Creek in the north down to Warner Ave in the south. The subject land is included in a number of different schemes/catchments as follows:

Table 1: Contribution Catchment/Type

Contribution Type	Catchment	Figure/Page No.
Open Space & Community Facilities	Wadalba, Woongarrah and Hamlyn Terrace	Figure 4, Page 116
Roads	Wadalba, Woongarrah and Hamlyn Terrace	Figure 5, Page 117
Drainage & Water Quality	D1	Figure 6, Page 118
Studies	Wadalba, Woongarrah and Hamlyn Terrace	Figure 7, Page 119
Wadalba Environmental Corridor	Wadalba Environmental Corridor Contributions Catchment	Figure 8, Page 120
Addition to Wadalba Environmental Corridor	Addition to Wadalba Environmental Corridor Catchment	Figure 9, Page 121

Based on the above, the development contributions applicable to a subdivision of the subject land are shown in Table 2 below. Please note that each of the contributions schemes is discussed in detail below and the figures contained in Table 2 are not the final contribution amounts that we believe would apply. The table is purely provided for completeness:

Table 2: Contribution Amounts as per the Current Contributions Plan

Contribution Type	Contribution Amount $/Lot
Shire Wide Plan	
Shire Wide Admin	$80.56
Shire Wide Cycleway	$371.89
Shire Wide Open Space	$181.28
Shire Wide Arts	$419.63
Sub Total	$1,053.36
Warnervale District Plan	
Open Space Land	$2,924.47

Open Space Works	$4,775.14
Community Facilities Land	$153.56
Community Facilities Works	$3,008.87
Roadworks	$9,243.20
Drainage Land	$1,465.29
Drainage Works	$2,523.83
Water Quality Works	$1,107.36
Wadalba Corridor Land	$0
Wadalba Corridor Works	$0
Addition to Wadalba Corridor	$0
Studies	$175.92
Administration	$388.44
Sub Total	$25,766.08
Grand Total	$26,819.44

Source: WSC website 7 December 2015.

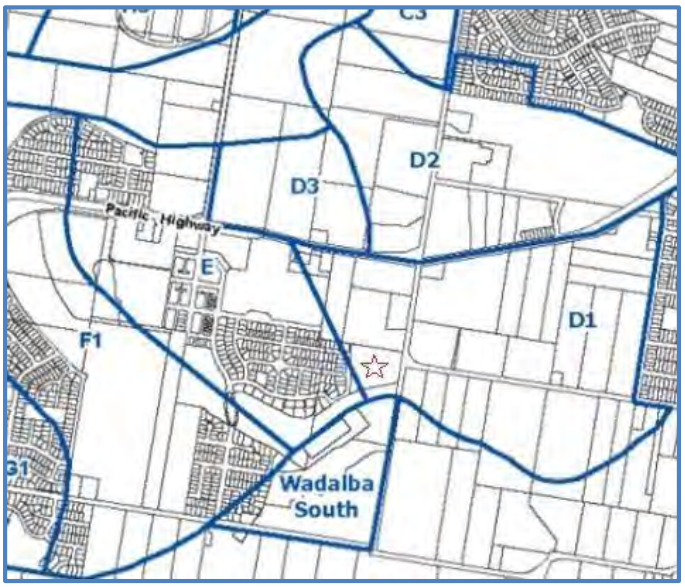
There is a discrepancy in the current Contributions Plan in how it identifies and deals with the subject property. The main problem is that whilst the Catchment Maps in Section 5 of the current plan generally show the property to be within the catchment known as the Wadalba, Woongarrah and Hamlyn Terrace (WWAHT) precinct, the Land Budget in Section 3 of the plan has not included the property in any of the projections.

Clause 3.2 of the plan includes the current and expected development levels for the Plan area and states for the WWAHT precinct, the total population under the plan is 18,100. Table 14 of the Plan then provides details of the existing and future dwelling units within the WWAHT. The table splits the WWAHT into drainage catchments and most notably, the table does not include Drainage Catchment D1 (which the subject property falls within). In fact, the subject property is not included in any of the tables within this section of the Plan. See an extract of the catchment maps below which show the subject property as being part of drainage catchment D1 and also the WWAHT.

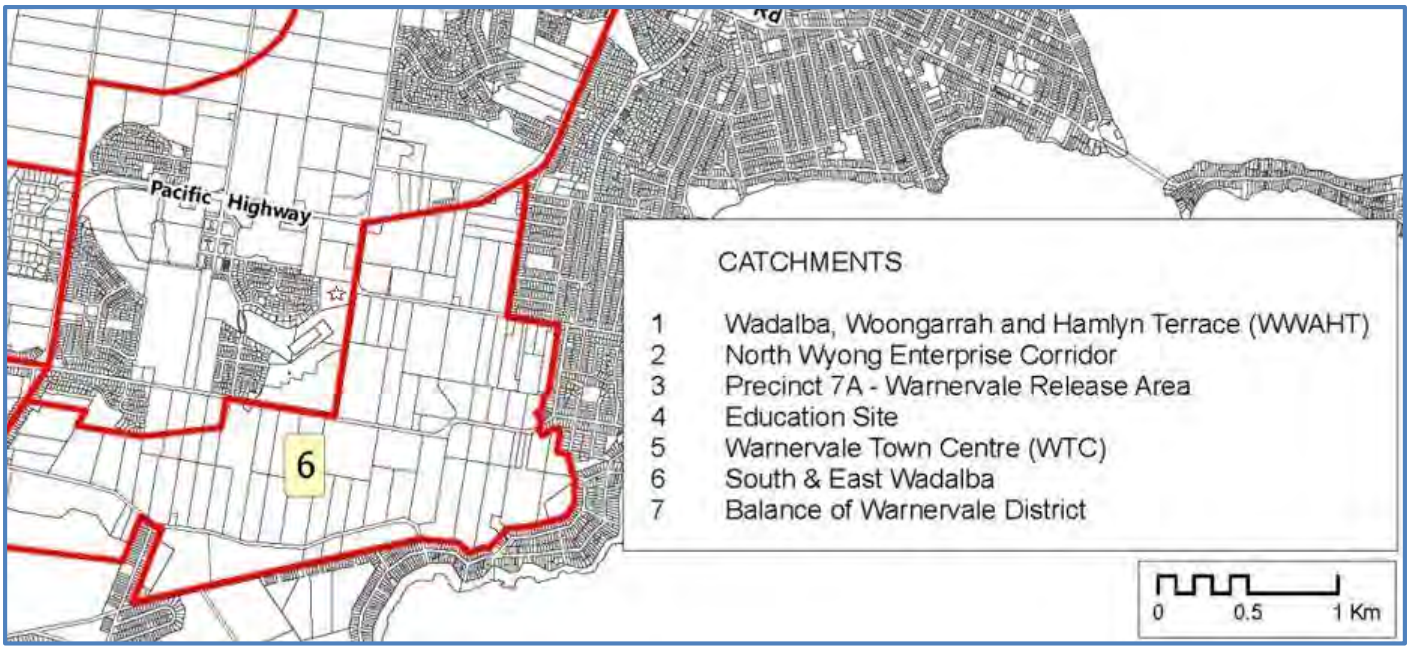
Table 14 Land Budget, Dwelling Units and Population Projections for Wadalba, Woongarrah & Hamlyn Terrace

Drainage Catchment	Zoning	Developed NDA January 2013	Undeveloped NDA January 2013	TOTAL NDA	Existing Dwelling Units per ha	Existing Dwelling Units	Projected Dwelling Units per ha for Undeveloped Land	Projected Dwelling Units for Undeveloped Land	Total Projected Dwelling Units	Projected Population Assumed persons per Dwelling Unit
		(ha)	(ha)	(ha)	DU / Ha	DU	DU / Ha	DU	Total DU	3.00
A	R2	28.36	0.00	28.36	14.67	416	14.7	0	416	1,248
B1	R2	20.63	0.00	20.63	15.75	325	15.8	0	325	975
B2	R3	27.58	9.08	36.65	17.26	476	17.3	157	633	1,898
B3	R4	27.82	0.00	27.82	15.79	439	15.8	0	439	1,318
B4	R5	15.14	2.19	17.33	15.64	237	15.6	34	271	813
C1	R6	13.91	0.00	13.91	14.70	205	14.7	0	205	614
C2	R7	55.13	20.86	75.98	17.73	977	17.7	370	1,347	4,042
C3	R8	0.00	6.88	6.88	n/a	0	18.0	124	124	371
D2	R2	3.19	11.68	14.87	17.28	55	18.0	210	265	796
D3	R1	0.00	10.33	10.33	n/a	0	18.0	186	186	558
E	R2	19.81	10.13	29.94	18.04	357	18.0	183	540	1,620
F1	R2	26.46	17.85	44.31	17.65	467	17.7	315	782	2,346
G1	R2	14.09	1.48	15.57	17.14	242	17.1	25	267	801
H1	R2	6.26	0.00	6.26	17.00	106	17.0	0	106	319
South Wadalba	R2	1.11	5.98	7.09	18.77	21	17.0	102	122	367
TOTAL		259.47	96.44	355.91		4,323		1,705	6,028	18,085

Table 14 from the Plan showing that the land within Catchment D1 is not included in the WWAHT



Extract of Figure 5 showing the property as being part of Catchment D1



Extract from Figure 4 showing the subject property as being part of the WWAHT.

Further, the land is also not included in Table 20 on Page 59 of the Plan as being part of the Precinct known as South & East Wadalba. Figure 4 (above) & Figure 5 of the Plan clearly show the boundaries of the South & East Wadalba Precinct and the subject property is not included in that precinct.

Table 20 Population & Dwelling Unit Projections for Balance of Warnervale District

	NDA Ha	Dwelling Density Lots/Ha	Lots /DUs	Populaiton 3
South & East Wadalba (SEW)	111	18	1,994	5,981
BRUCE CRESCENT Residential	23	18	416	1,247
TOTAL	134		2,409	7,227

Given that the Plan does not include the subject land in its population and dwelling unit projections for the WWAHT, there is no ability for the Plan to authorise the levying of contributions for certain schemes on any future development on the land. The schemes that are affected by this discrepancy are:

- Open Space Land
- Open Space Works
- Community Facilities Land
- Community Facilities Works
- Road works
- Studies

To overcome this anomaly, it is proposed that Council and the applicant enter into a Voluntary Planning Agreement to include a contribution towards these schemes.

Discussion of Each Contributions Scheme

Open Space & Community Facilities

The Plan seeks to levy open space and community facilities contributions across 4 different precincts being the WWAHT, Warnervale Town Centre, Precinct 7A and the Balance of Warnervale District. As per the above discussion, Table 14 of the Contributions Plan identifies the catchments that form the WWAHT and the subject property is not included.

The Plan also seeks to levy a contribution across an area known as the Balance of Warnervale District comprising 2,400 DU but as can be seen from the above discussion regarding Table 20 of the plan, the subject property is not included in this area.

As the subject property is also not part of the WWAHT, Warnervale Town Centre, Precinct 7A or Balance of the Warnervale District, no open space or community facilities contributions are currently authorised by the Plan.

Further, given the abundance of existing local open space and community facilities in the area, it would be difficult for Council to establish a nexus between the proposed development and these facilities (remembering that these existing facilities have already been largely fully funded from existing development).

A more justifiable approach is to seek a contribution from the future development on the subject land towards "District" level facilities such as:

- Hill Top Park
- Existing Playing Fields
- District Playing Fields

In Table 25, 26 and 27 of the Plan, Council apportions the cost of these district facilities across the projected population of the WWAHT, WTC and Precinct 7A. We suggest that it may be appropriate for the subject property to be included in these tables for the purpose of establishing a reasonable contributions amount. In the case of the subject property, this would mean that the costs would need to be apportioned over an addition 60 people (20 lots X 3.0 persons/lot). If that were the case, the cost apportionment would be as follows:

Hill Top Park (based on table 25)

Precinct	Population	%	Cost
WWAHT	18,100	65.4%	$2,697,997
WTC	3,100	11.2%	$462,088
Precinct 7A	6,400	23.1%	$953,988
Lot 51	60	0.2%	$8,944
Total	**27,660**		**$4,123,017**

Existing Playing Fields (based on table 26)

Precinct	Population	%	Land Cost	Works Cost
WWAHT	18,100	65.4%	$6,929,649	$13,592,378
WTC	3,100	11.2%	$1,186,846	$2,327,976
Precinct 7A	6,400	23.1%	$2,450,263	$4,806,145
Lot 51	60	0.2%	$22,971	$45,058
Total	27,660		$10,589,729	$20,771,557

District Playing Fields (based on table 27)

Precinct	Population	%	Land Cost	Works Cost
WWAHT	18,100	65.4%	$3,510,894	$6,331,873
WTC	3,100	11.2%	$601,313	$1,084,464
Precinct 7A	6,400	23.1%	$1,241,421	$2,238,894
Lot 51	60	0.2%	$11,638	$20,989
Total	27,660		$5,365,266	$9,676,221

In regard to the Land contribution for the District Playing Fields, Council is yet to nominate a location for these facilities. Therefore, we do not believe that a contribution towards this element is valid – Council may locate the fields on land it already owns or in a location so remote from the subject land that the nexus test is not passed. For this reason, we have excluded any land acquisition component of the contribution until such time as Council is able to nominate a suitable site. The above figures would translate to an open space contribution per lot for the subject land as follows:

Item	Contribution /Lot		Total
	Land	Works	
Hill Top Park		$426	$426
Existing Playing Fields	$0	$2,146	$2,146
District Playing Fields	$0	$1,000	$1,000
Total	$0	$3,571	$3,571
Indexed Amounts	$0	$3,631.18	$3,631.18

A similar approach should be taken with the community facilities contribution. The Plan identifies the following items as being a "District" facility.

- Warnervale Community Hub
- Warnervale Recreation Centre

Using the same methodology as with the District Open Space contribution above, we have calculated the following contribution amounts:

Warnervale Community Hub (based on table 31)

Precinct	Population	%	Works Cost
WWAHT	18100	51.9%	$10,502,397
WTC	3100	8.9%	$1,798,753
Precinct 7A	6400	18.4%	$3,713,555
Future Development Areas	7200	20.7%	$4,177,749
Lot 51	60	0.2%	$34,815
Total	34860		$20,227,268

Warnervale Recreation Centre (based on table 33)

Precinct	Population	%	Land Costs	Works Cost
WWAHT	18100	51.9%	$1,083,159	$7,340,873
WTC	3100	8.9%	$185,513	$1,257,277
Precinct 7A	6400	18.4%	$382,995	$2,595,668
Future Development Areas	7200	20.7%	$430,870	$2,920,126
Lot 51	60	0.2%	$3,591	$24,334
Total	34860		$2,086,128	$14,138,279

In regard to the Land contribution for the Warnervale Recreation Centre, Council is yet to nominate a location for these facilities. Therefore, we do not believe that a contribution towards this element is valid – Council may locate the Centre on land it already owns. As with the land acquisition component for open space, we have excluded this component until such time as Council nominates a suitable location. The above figures translate to a community facilities contribution per lot for the subject land as follows:

Item	Contribution /Lot		Total
	Land	Works	
Warnervale Community Hub		$1,658	$1,658
Warnervale Recreation Centre	$0	$1,159	$1,159
Total	$0	$2,817	$2,817
Indexed Amounts	$0	$2,864.09	$2,864.09

Roadworks

As with the open space and community facilities schemes above, the current contributions plan assumes the subject property to be part of the WWAHT. However, Table 14 of the plan specifically excludes drainage catchment D1 from the WWAHT. Therefore, no contribution towards roadworks is authorised by the plan.

As with the open space and community facilities contribution, it may be appropriate to apply a similar "District" approach to the road works. Unfortunately, the Plan does not provide sufficient detail to allow for this to occur. We suggest that the most suitable alternative is to adopt the contribution rate applicable to the remainder of the WWAHT, which is currently $9,243.20 per lot.

Drainage & Water Quality

Even though there is a typographical error in this section of the contributions plan – a reference to Figure 5 on Page 91 instead of Figure 6, it is clear that the contributions plan seeks to levy contributions towards drainage and water quality facilities and land. It is difficult to categorically state that the proposed 20 lots have been included in the apportionment of costs but Figure 6 clearly shows the subject land to be part of catchment D1. Therefore, we believe that the Plan does authorise the levying of contributions Drainage Land & Works and Water Quality Works.

Wadalba Environmental Corridor

The current contribution plan (Table 51 on page 104) authorises contribution towards the Wadalba Environmental Corridor to be levied on developments within catchments E, F G and South Wadalba. The subject Property is not within any of these catchments. Therefore no contribution is applicable.

Additions to Wadalba Corridor

The current Planning Proposal seeks to rezone that part of the subject property currently zoned RU6 Transition. The balance of the property which is zoned E2 Environmental Conservation (9,527m^2) is subject to a separate agreement between Threshold Developments and Council as outlined in Council's letter dated 22 August 2014 and 9 October 2015.

PPS Contribution Calculation

Based on the above discussion and the content of the current contributions plan, we believe that the following contributions should apply to any future development of the subject land:

Table 3: Contribution Rates at the Time of Consent

Contribution Type	Contribution Amount $/Lot
Shire Wide Plan	
Shire Wide Admin	$80.56
Shire Wide Cycleway	$371.89
Shire Wide Open Space	$181.28
Shire Wide Arts	$419.63
Sub Total	**$1,053.36**
Warnervale Plan	
Open Space Land	$0
Open Space Works	$3,631.18
Community Facilities Land	$0
Community Facilities Works	$2,864.09
Roadworks	$9,243.20*
Drainage Land	$1,465.29
Drainage Works	$2,523.83
Water Quality Works	$1,107.36

Wadalba Corridor Land	$0
Wadalba Corridor Works	$0
Addition to Wadalba Corridor	$0
Studies	$0
Administration	$388.44
Sub Total	$21,223.39
Grand Total	**$22,276.75**

* The contributions towards roadworks is subject to a credit for works and land dedication associated with the extension to Van Stappen Way – see discussion below.

Contribution Credit for Road Widening

The current contributions plan does provide a credit for the construction of Van Stappen Way including a 22m road reserve. The figures in the current Plan for these works are:

- Additional Road Pavement (7m – 11m) = $673,632
- 22m Road Reserve = $175,271

Unfortunately, the Plan does not provide a length for the road so it is difficult to provide a lineal rate to the above figures.

We suggest the following alternative approach to calculating the appropriate contributions credit for the future road reserve that will accommodate the extension to Van Stappen Way.

- The total additional area of land proposed to be transferred to Council for the extension of Van Stappen Way has an area of 2,830m^2
- Assuming a normal road reserve width for the extension of the road through this land would require approximately 1,400m^2 of land.
- This would leave a balance of 1,430m^2 for widening the road to accommodate the additional road width of Van Stappen Way.
- This balance of land area is equivalent to say 3 residential allotments.
- Applying an englobo acquisition rate of $100,000/allotment to this figure results in a total credit of **$300,000.**

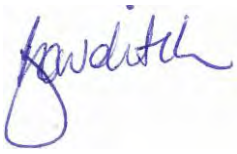
Given the above credit amount (subject to agreement between the two parties) is likely to exceed the "Roadworks" credit applicable to the future subdivision of the land, it is recommended that this be dealt with in the proposed Voluntary Planning Agreement. Threshold Developments should request that all of its contributions be "pooled" to accommodate this land credit. This will ensure that it receives the full credit for the land transfer at the time of the subdivision certificate being released rather than waiting for Council to collect contributions from surrounding development as it occurs.

Conclusion

It is recommended that Threshold Developments commence discussions around establishing a Voluntary Planning Agreement to include contributions for the future development of the land. We have provided what we believe to be a reasonable approach to determining the appropriate contribution amounts to be included in such an agreement and this is considered to be good point to commence discussions with Council. This approach would result in the following contributions/credits being applicable to the future development of the land:

- 20 lots X $22,276.75 = $445,535
- Less road widening credit $445,535-$300,000 = $145,535
- This would equate to a nett contribution amount per lot of $7,276.75

We would be happy to be involved in the discussions/preparation of a Voluntary Planning Agreement between the two parties. Please contact the undersigned if you would like to discuss any aspect of the above report.



Paul Bowditch

Director

Progressive Property Solutions