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BCA Check Pty Ltd trading as Bushfire Certifiers

BUSH FIRE ASSESSMENT REPORT

Lot 5 DP 1239938

Montwood Drive Lennox Head

Proposed 145-lot residential use and concept

Prepared for: Clarence Property Corporation Limited

Prepared by:

Peter Thornton
BPAD-L3 ACCREDITED PRACTITIONER

Date: 16 August 2018

Ref: 18/273

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BPAD-L3 Accredited Practitioner No. 14867
Building Surveyor MAIBS

DOCUMENT CONTROL

Revision No.	Date	Description	Prepared	Checked	Authorised
A	16.08.2018	Final	Peter Thornton	SJT	Peter Thornton

Table of Contents

1.0 EXECUTIVE SUMMARY

This report has been prepared for the proposed 145-lot residential subdivision known as Epiq Super Lot 5 (Stage 1B) at Lot 5 DP 1239938, Montwood Drive Lennox Head against the requirements of Planning for Bushfire Protection, 2006 (PBP2006).

Whilst, the subject allotment is not mapped as being bushfire prone, the revegetation of the conservation land to the south and southeast of the proposed subdivision has been taken into consideration in the bushfire threat assessment as potentially being a bushfire hazard. The concept plan provided identifies a nominal 10m rear building line setback to the boundary adjoining the bushfire hazard. In this regard the report demonstrates compliance with Table A2.5 PBP2006.

The following table is provided as a summary of the recommendations and method of assessment for each consideration relating to Planning for Bushfire Protection 2006.

MEASURE	RECOMMENDATION	METHOD OF ASSESSMENT
APZ Required	Each allotment is to be maintained as an inner protection area (IPA).	Acceptable Solution
Water Supply	Street hydrants are to comply with s4.1.3 PBP2006.	Acceptable Solution
Electricity Supply	New electricity supply to be in accordance with s4.1.3 PBP2006	Acceptable Solution
Gas Supply	Gas supply to comply with PBP2006.	Acceptable Solution
Construction Standards	Future dwellings are capable of being sited to receive <29kW/m^2 & are to be assessed in accordance with s4.15 or s100B for subdivision.	Acceptable Solution
Landscape	Landscaping is to comply with Appendix 5 of PBP2006.	Acceptable Solution
Access	Public roads to comply with s4.1.3(1) PBP2006 however no perimeter road is required.	Performance Solution

The report makes the following summary of recommendations for the development.

1. Any future dwellings on the proposed lots are to be assessed in accordance with s4.15 of the Environmental Planning and Assessment Act 1979 or s100B of the Rural Fires Act 1997 for subdivision.

2. At the commencement of works and in perpetuity each allotment is to be managed and maintained as an Asset Protection Zone (APZ) to prevent the spread of a fire towards the buildings in accordance with the requirements of Standards for Asset Protection Zones (RFS 2005) (see Appendix C).

3. The public road is to comply with s4.1.3(1) of Planning for Bushfire Protection 2006 with exception to the requirement for a perimeter road.

4. Water, electricity and gas services shall comply with s4.1.3 of Planning for Bushfire Protection 2006.

5. Landscaping is to be undertaken in accordance Appendix 5 of Planning for Bushfire Protection 2006 and managed and maintained in perpetuity.

2.0 INTRODUCTION

2.1 GENERAL

The purpose of this report is to establish suitable measures to provide bushfire mitigation measures in order for Council to make determination of the proposed 145-lot residential subdivision known as Epiq Super Lot 5 (Stage 1B) at Lot 5 DP 1239938, Montwood Drive Lennox Head against the requirements of Planning for Bushfire Protection, 2006.

Whilst the subject allotment is not mapped as being bushfire prone, the revegetation of the conservation land to the south and southeast of the proposed subdivision has been taken into consideration in the bushfire threat assessment as potentially being a bushfire hazard.

2.2 SIGNIFICANT ENVIRONMENTAL FEATURES

An assessment is to be undertaken, if applicable, with regard to:

- State Environmental Planning Policy No. 44 (Koala Habitat Protection)
- Biodiversity Conservation Act 2016 (NSW)
- Local Land Services Act 2013 (NSW)
- Land Management (Native Vegetation) Code 2017 (NSW)
- National Parks and Wildlife Act 1974 (NSW)
- Environmental Protection and Biodiversity Conservation Act 1999 (Cwlth).

This report does not consider the above legislation and in this regard this report should be read in conjunction with the Statement of Environmental Effects submitted with the application to the consent authority.

2.3 REPORT DETAILS

Report Reference No.:	18/273
Property Address:	Lot 5 DP 1239938, Montwood Drive Lennox Head
Client:	Clarence Property Corporation Limited
Local Government Area:	Ballina Shire Council
Proposal:	145-lot residential subdivision
Drawings:	TVS Architects, Site plan Dwg. No.5551.1S.02.0 dated 03.08.2018
Report Prepared By:	Peter Thornton MFireSafeEng Building Surveyor (MAIBS) BPAD – L3 Accredited Practitioner

3.0 PROPOSED DEVELOPMENT

The applicant is proposing a 145-lot residential subdivision known as Epiq Super Lot 5 (Stage 1B) at Lot 5 DP 1239938, Montwood Drive Lennox Head with no Special Fire Protection Purpose (SFPP) development proposed.

The subdivision will include public roads that will be constructed to Ballina Shire Council construction design requirements.

The proposed modification will seek to undertake amendments to the Concept Approval (MP 07_0026). The key changes proposed for the approved development:
• Amending the development concept for Super Lot 5 from 'retirement community' to 'small lot integrated housing';
• Establishing detailed design guidelines for the proposed subdivision and development of Super Lot 5 to supersede the current retirement community design guidelines; and
• Amending the lot layout and road network to respond to the revised proposal.

These matters are described in more detail below.

3.1.1 Modify Super Lot 5 to Provide Small Lot Integrated Housing

The proposal seeks to subdivide and develop Super Lot 5 to provide small lot integrated housing on torrens title allotments, rather than seniors or retirement living. The rationale for the change relates to the following:

a. *Since the time of the original approval, two large seniors living developments have been approved in the Ballina / Lennox Head area – Palm Lakes Resort at North Creek Road Ballina (partly occupied and under construction) and GemLife Lennox Head at Skennars Head Road (to be constructed). These facilities provide a range of 'resort style' selfcare seniors living units and supplement the current supply of 'standard' selfcare accommodation opportunities provided by St Andrews Village, Crowley Village and the RSL Lifecare. As such, there is limited market demand for further accommodation of this kind at the current time.*
b. *Our clients are aware that there is significant demand for affordable entry level housing options in locations which are readily accessible to services and infrastructure. This is evidenced by the high level of demand for the early subdivision releases within Epiq Lennox.*
c. *Super Lot 5 is ideally located adjacent to shopping and sporting facilities to cater for relatively higher density integrated small lot housing. As such the proposal will cater for all age groups.*

The modified proposal seeks to provide subdivide the subject land into 145 torrens title allotments with sizes ranging between 123m2 to 672m2, with a 'typical' area ranging between 125m2 to 225m2. Internal public roads and pedestrian pathways will be provided in generally a modified grid pattern, whilst on-street parking is also afforded within the public road design.

It is intended the allotments will be sold on a 'house and land package' basis, with each property constructed with a 2 storey attached or semi-detached dwelling. Four separate unit types are proposed depending on available lot frontage as illustrated within the design package contained within ***Attachment 1****.*

The current modification seeks to adopt design guidelines for these dwellings, which will then form the basis of the assessment of future development application/s to Ballina Shire Council. Given the nature of the subdivision, clear design guidelines are considered critical to guide the integrated development of Super Lot 5, including matters such as:

- *Car parking;*
- *Building design;*
- *Site and open space design;*
- *Lot size and subdivision;*
- *Street design; and*
- *Connectivity to neighbourhood retail centre.*

The design guidelines will ensure the desired architectural and operational features of this form of development are embodied into an integrated housing package.

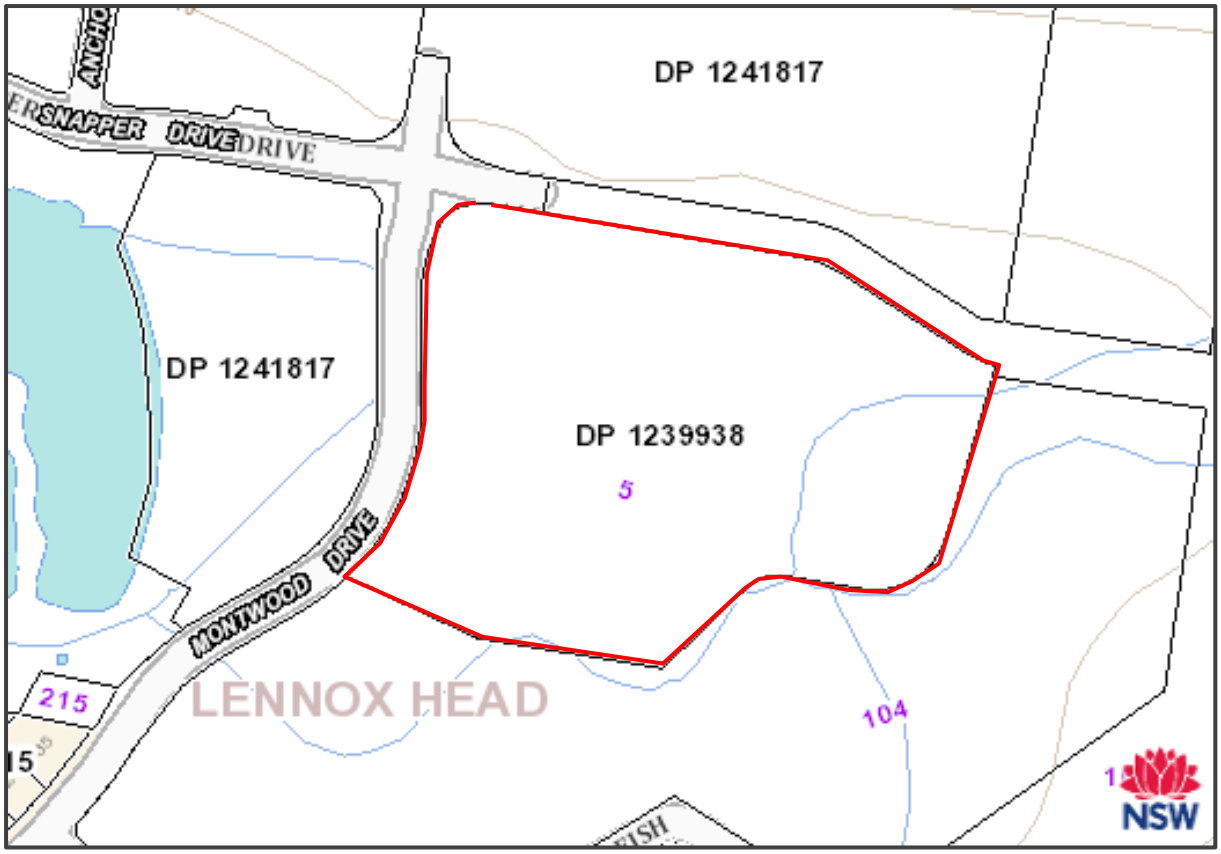


Figure 1: Location of proposed subdivision *Source: NSW Govt Six Maps*

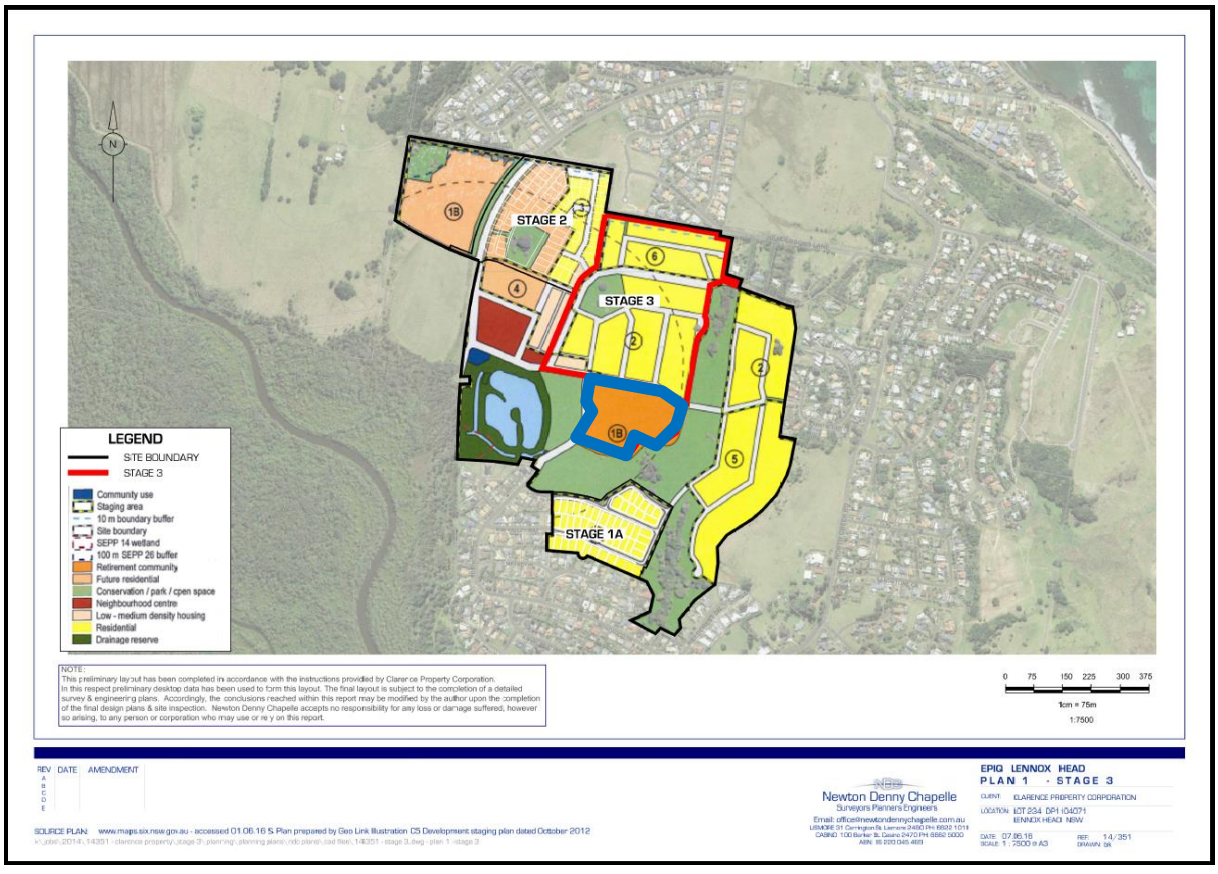


Figure 2: Super Lot 5 (now known as Stage 1B) – Blue outline

Figure 3: Plan of subdivision of Super Lot 5 (larger image in Appendix A).

4.0 BUSHFIRE THREAT ASSESSMENT

The bushfire mapping shows the proposed development is not located on mapped bushfire prone land (see Figure 4).

Aerial mapping and inspection of the site shows the mapping is accurate however does not take account of revegetation which is considered in this assessment.

Figure 4: Bushfire prone land map with subdivision not on mapped bushfire prone land

Planningportal.nsw.gov.au

Freshwater wetland to the south and southeast.

Remnant vegetation to the southeast

Figure 5: Current aerial image (boundary approximate) *TerraServer, 03.07.2018*

An inspection of the subject site was undertaken to establish the hazard classification that will most likely influence the bushfire behaviour. The inspection identified that the proposed conservation area as outlined in the Environmental Management Plan (EMP) prepared by Geolink UPR 1675-1141, Updated Final v8 dated 09/08/2013 identified on site.

The hazard that will impact the Super Lot 5 (stage 1b) will be the revegetation of the conservation land to the south and southeast that requires the management of hairy joint grass, freshwater wetland, rainforest and small patch of swamp forest. The slopes varied from upslope to 0-5^0 downslope in relation to the proposed development area however it was generally located on flat topography. The area of conservation is identified in the EMP Illustrations 3.2 provided in Attachment 1.

It was noted the Pacific Pines Conservation Zone Management Plan Final v4 prepared by Geolink dated 01/08/2013 establishes that the existing regeneration of the swamp sclerophyll forest will be minimal in area in comparison to the littoral rainforest, grassland and freshwater wetland regeneration. In turn, this area of forest and the location amongst the other vegetation classifications will not be the dominant vegetation that will determine the bushfire behaviour at the hazard interface.

For the subdivision of Super Lot 5 it is considered that the proposed freshwater wetland revegetation will influence the bushfire behaviour given the area of forested wetland (existing and proposed) is shown to be approximately 0.4ha and the freshwater wetland is located at the development interface as shown in Figure 6. Confirmation of the vegetation classifications has been received by the consultant ecologist Veronica Silver (Geolink Pty Ltd).

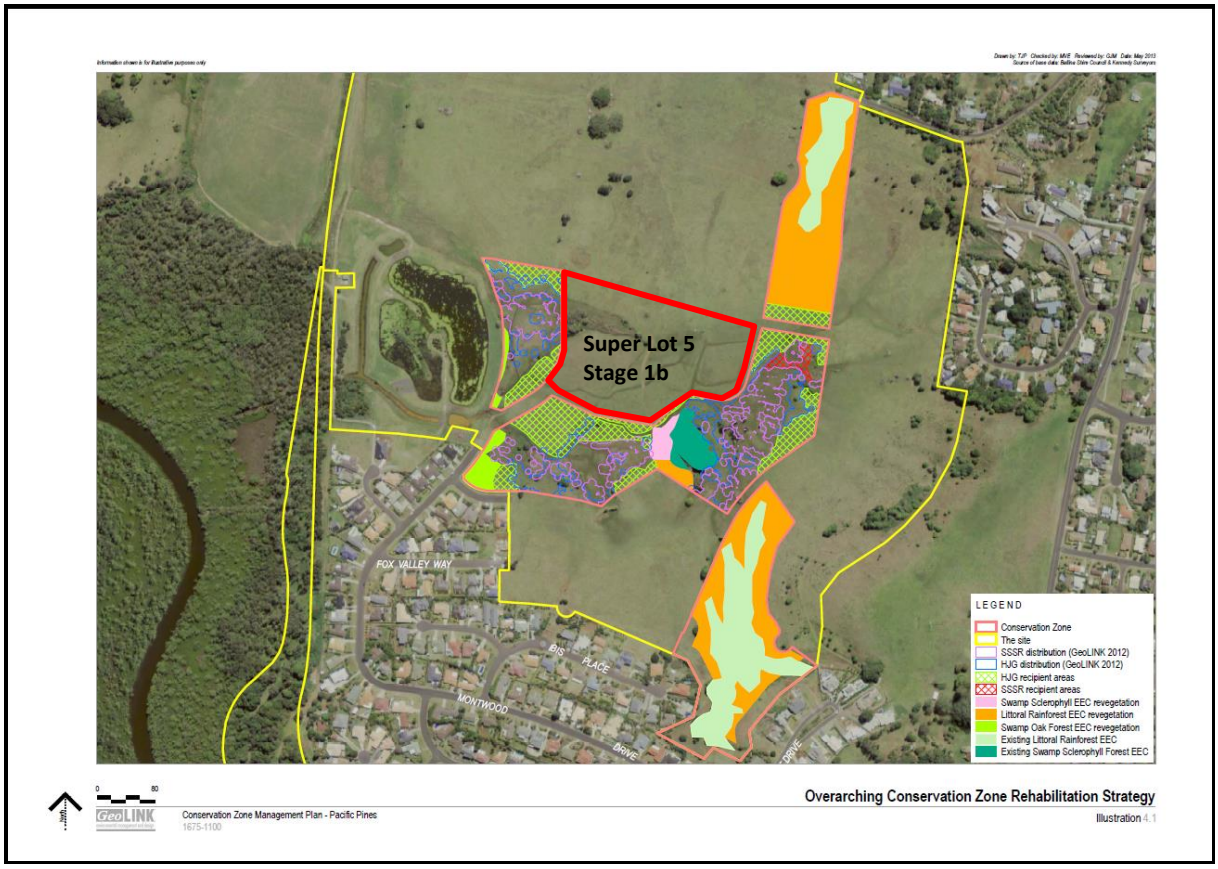
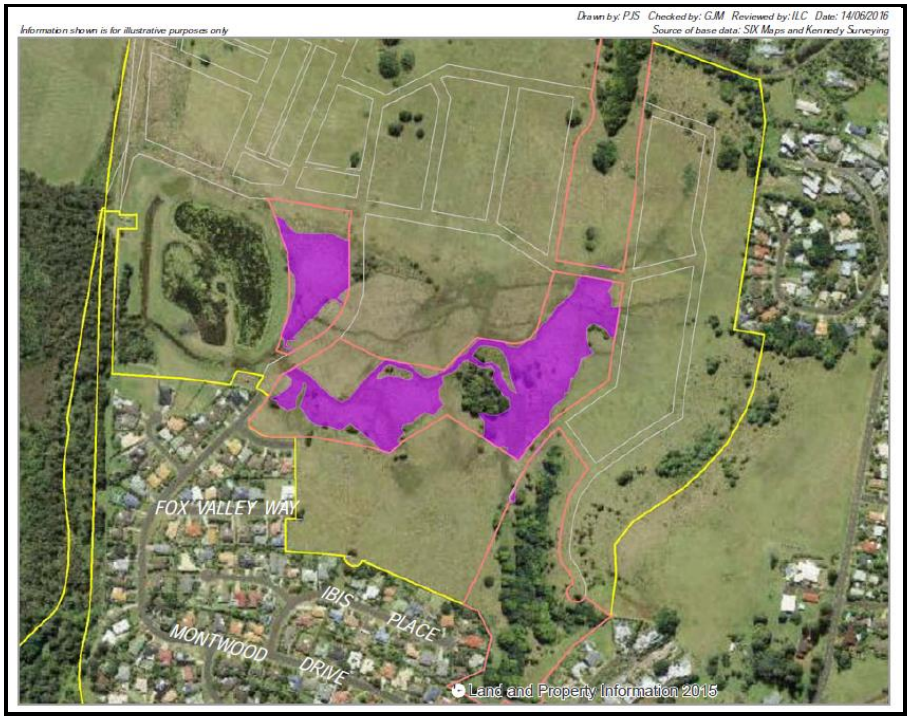


Figure 6: Revegetation plan

In response to initial NSW RFS advice following consultation with the response was that *''the NSW RFS would require specific detail on the revegetation of the riparian corridor adjoin the residential lots''.* In this regard this office was provided with the Vegetation Monitoring Report prepared by Geolink dated August 2015 with first issue though dated 14th September 2015. The relevant excerpts relating to the forested wetland and the on-going maintenance to ensure it remains treeless in these areas as shown in Figure 7 is provided in Appendix B.

The future development is proposed as residential unit development and is not classified as a retirement village or the like. In turn, Planning for Bushfire Protection 2006 does not classify this type of development as a Special Fire Protection Purpose.

In this regard the asset protection zones (APZs) for this type of development of Super Lot 5, based on the Conservation Zone Management Plan and the dominant area of freshwater wetland will be a minimum 10m pursuant to Table A2.5 of Planning for Bushfire Protection 2006.



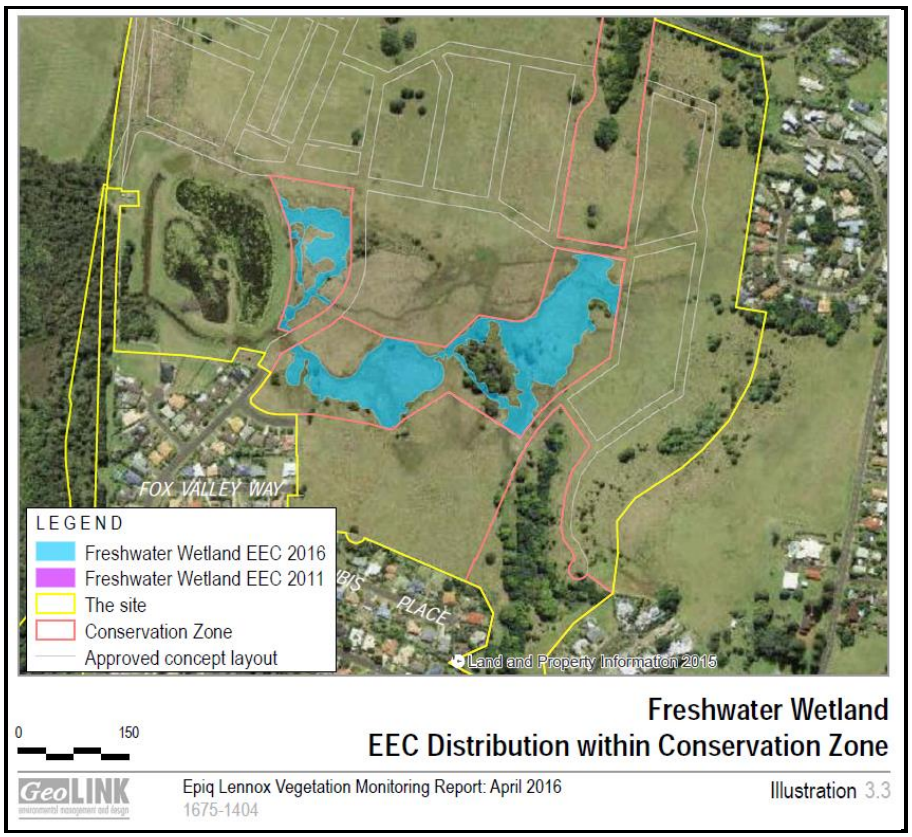


Figure 7: Location of freshwater wetlands

It was noted that the Final EMP prepared by Geolink dated 16/07/2013 s5.4 (see Figure 8) identifies asset protection zones (APZs) for Super Lot 5 that are for Special Fire Protection Purpose developments (except grassland) however this does not relate to the proposed use being subject to this report.

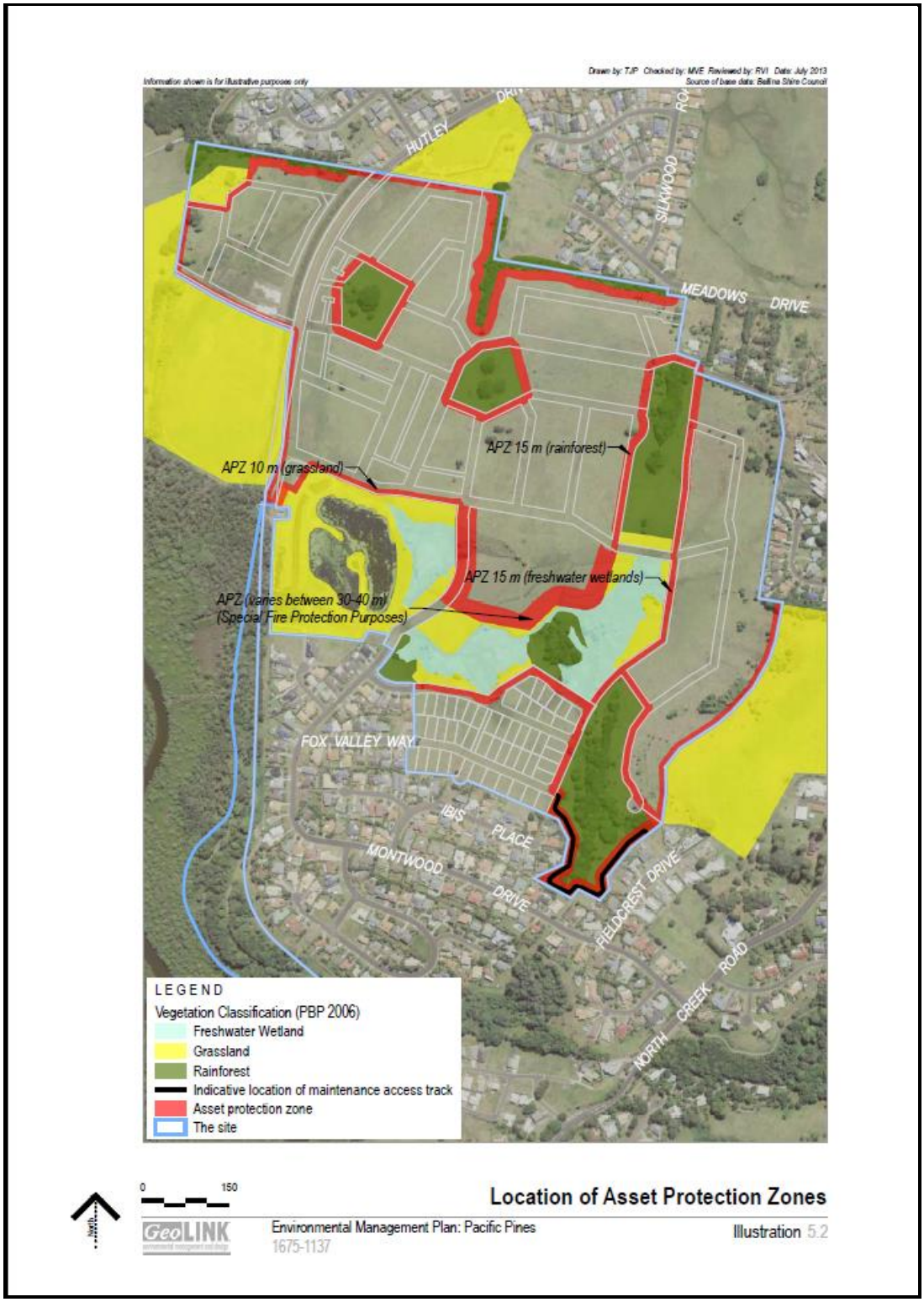


Figure 8: Geolink APZs outlined in the Environmental Management Plan prepared by Geolink dated 16/07/2013 s5.4.

Table 1: Bushfire Threat Assessment

Aspect	Veg. Slope	Dominant Vegetation Formation Class (Table A2.1 PBP2006)
North	n/a	Future subdivision – non-hazard.
East	0^0	Freshwater wetland.
South	0^0	Freshwater wetland.
West	0^0	Freshwater wetland.

5.0 ASSET PROTECTION ZONES AND CONSTRUCTION STANDARDS

Asset Protection Zones are areas established and maintained to ensure that bushfire fuels are progressively reduced between the development and the bushfire hazard. The asset protection zone incorporates an Inner Protection Area (IPA) having reduced fuel loadings of approximately 3t/ha.

At the commencement of works and in perpetuity each allotment is to be managed and maintained as an Asset Protection Zone (APZ) to prevent the spread of a fire towards the buildings in accordance with the requirements of Standards for Asset Protection Zones (RFS 2005) (see Appendix C). The building line to the boundary adjacent to the conservation area is to be a minimum 10m.

Table 2: Summary Bushfire Threat Assessment

Aspect	Veg. Slope	Vegetation Class	Setback from Hazard	Complies A2.5 PBP2006 and <29kW/m^2 received.
North	n/a	n/a	-	Yes
East	0^0	Freshwater wetland.	10m	Yes
South	0^0	Freshwater wetland.	10m	Yes
West	0^0	Freshwater wetland.	10m	Yes

6.0 WATER AND UTILITY SERVICES

6.1 WATER SERVICES

The development will be required to have street hydrants to council requirements pursuant to clause 142 Local Government Regulation which will provide adequate coverage and pressure and flows for fire brigade intervention in a bushfire event.

6.2 ELECTRICITY SERVICES

Electricity services shall comply with s4.1.3 of Planning for Bushfire Protection 2006.

6.3 GAS SERVICES

Should a gas service be installed the following aspects will require consideration:

- Reticulated or bottled gas installed and maintained in accordance with AS 1596 with metal piping used.
- Fixed gas cylinders to be kept clear of flammable material by a distance of 10m and shielded on the hazard side of the installation
- Gas cylinders close to the dwelling are to have the release valves directed away from the building and at least 2m from flammable material with connections to and from the gas cylinder being of metal.
- Polymer sheathed flexible gas supply lines to gas meters adjacent to the buildings are not used.

7.0 ACCESS

The applicant is proposing an internal road network that will allow egress away from the bushfire hazard that has mapped the subject property as being designated bushfire prone land. There will be provided a fire hydrant system to AS 2419.1-2005 it being noted that the site is serviced by the NSW Fire Brigade.

Perimeter Roads

As stated in section 4.1.3(1) PBP2006 a perimeter road is the preferred option in subdivision design. The primary purpose of the perimeter road is to;

- Provide fire-fighters with easier access to structures, allowing more efficient use of firefighting resources;

  Comment:
  There will be access through the subject properties that allow fire fighters easy access to the structures. It is also noted that street hydrants will be provided with compliant coverage and will allow fire fighters to stage any fire-fighting from the street.

- Provide a safe retreat for firefighters;

Comment:
Given the potential street hydrant locations and the short intervals between access points allowing fire hydrant hoses to cover all areas of the structure when staged from the public road.

- Provide a clear control line from which to conduct hazard reduction or back burning operations.

  Comment:
  Consideration in relation to perimeter roads needs to take the bushfire hazard and risk into account. When the hazard is high in relation to vegetation type i.e. forest, slopes and fire runs then a bushfire will have the potential to have a high level of intensity and rate of spread. In these circumstances it is critical to have perimeter roads to enable firefighters to be able to work adjacent to the hazard in order to create clear control lines to undertaken hazard reduction or back burning operations to minimize the fire intensity at the development interface.

  The bushfire hazard potentially impacting the proposed subdivision is not considered to be high risk given it is predominantly freshwater wetland and grassland. These vegetation types and the limited size of the hazard will not have significantly sustained fire fronts and will unlikely require back burning.

  Further, the direct fire run backing on to the development is approximately 100-150m in length at the widest points and is disconnected from the primary hazard further to the west. The growth stage through the treed area from a point ignition will limit the intensity of the bushfire at the development interface. Therefore, the likely need to back burn or undertaken hazard reduction with this size and type of hazard is negligible. It is also noted, although freshwater wetlands can dry out the likelihood of reaching a curing point as outlined in PBP2006 methodology is less than any other vegetation type given the catchment area.

There is a small area (0.4ha) of forested wetland in the central portion of the conservation zone however it is not considered to be the most dominant vegetation to influence bushfire behaviour at the APZ interface. This area is remnant is size, it being noted that remnant APZs are less than that for freshwater wetlands pursuant to Appendix 2 PBP2006

It is noted that the consent authority is required to have consideration to s142 Local Government Regulation for a house fire event and in this regard the required specification for this consideration will allow adequate fire brigade intervention.

It is therefore considered that a perimeter road in the location of Super Lot 5 is not required to meet the objectives of s4.1.3 PBP2006 and the aim of PBP2006 which is to "minimise impacts on property from the threat of bush fire, while having due regard to development potential, on-site amenity and protection of the environment".

8.0 LANDSCAPING

The majority of buildings adversely impacted upon in a bushfire event happen through ember attack and in this regard combustible material surrounding the buildings e.g. landscaping, can play a significant part during the event. Adequate management of landscaping is critical to the survivability of an asset and for occupant safety during a bushfire.

It is recommended that landscaping is undertaken in accordance Appendix 5 of Planning for Bushfire Protection 2006 and managed and maintained for the life of the development.

9.0 CONCLUSION

This assessment demonstrates that whilst requirements of Planning for Bushfire Protection 2006 do not apply directly given that the proposed buildings which are not located on bushfire prone land consideration has been given to PBP2006 pursuant to an assessment against s4.15 of the Environmental Planning and Assessment Act 1979.

The recommendations in the executive summary of this report have been provided in consultation with the NSW RFS and are considered to be compliant with the performance criteria of Planning for Bushfire Protection 2006 based on the future hazard as described.

DISCLAIMER

This report was prepared for the purposes and exclusive use of the stated client to accompany an application to Ballina Shire Council for a proposed residential subdivision and is not to be used for any other purpose or by any other person or Corporation. BCA Check Pty Ltd accepts no responsibility for any loss or damage suffered howsoever arising to any person or Corporation who may use or rely on this report in contravention of the terms of this clause.

Reporting has been based on the relevant Council and Rural Fire Service Guidelines, however, recommendations given in this report are based on our site investigation at the time of reporting. In some cases site conditions may change dramatically within a few years due to rapid vegetation re-growth and invading weed species.

The report has been established to reduce the risk of ignition to the building and to promote occupant safety and this is dependent on the property and structure being maintained in perpetuity to the recommendations in this report and the standards of Planning for Bushfire Protection 2006. It is noted however that the report and the recommendations within cannot and do not propose that the building or occupants will not be adversely impacted upon given that bushfire is a natural phenomenon and cannot fully be predicted as can occupant behavior.

REFERENCES

ABCB, (2016), The Building Code of Australia, *Australian Building Codes Board Canberra,* Volume 2.

NSW Rural Fire Service and Planning NSW (2006), *Planning for bushfire protection, A guide for councils planners fire authorities developers and homeowners.* Rural Fire Service NSW Australia.

Standards Australia, (2009), AS3959 *Construction of buildings in bushfire prone areas,* Australian Standards, Sydney.

LEGISLATION

Environmental Planning and Assessment Act 1979 and Regulations 2000. *New South Wales.* Parliamentary Counsel's Office, NSW Government Information Service.

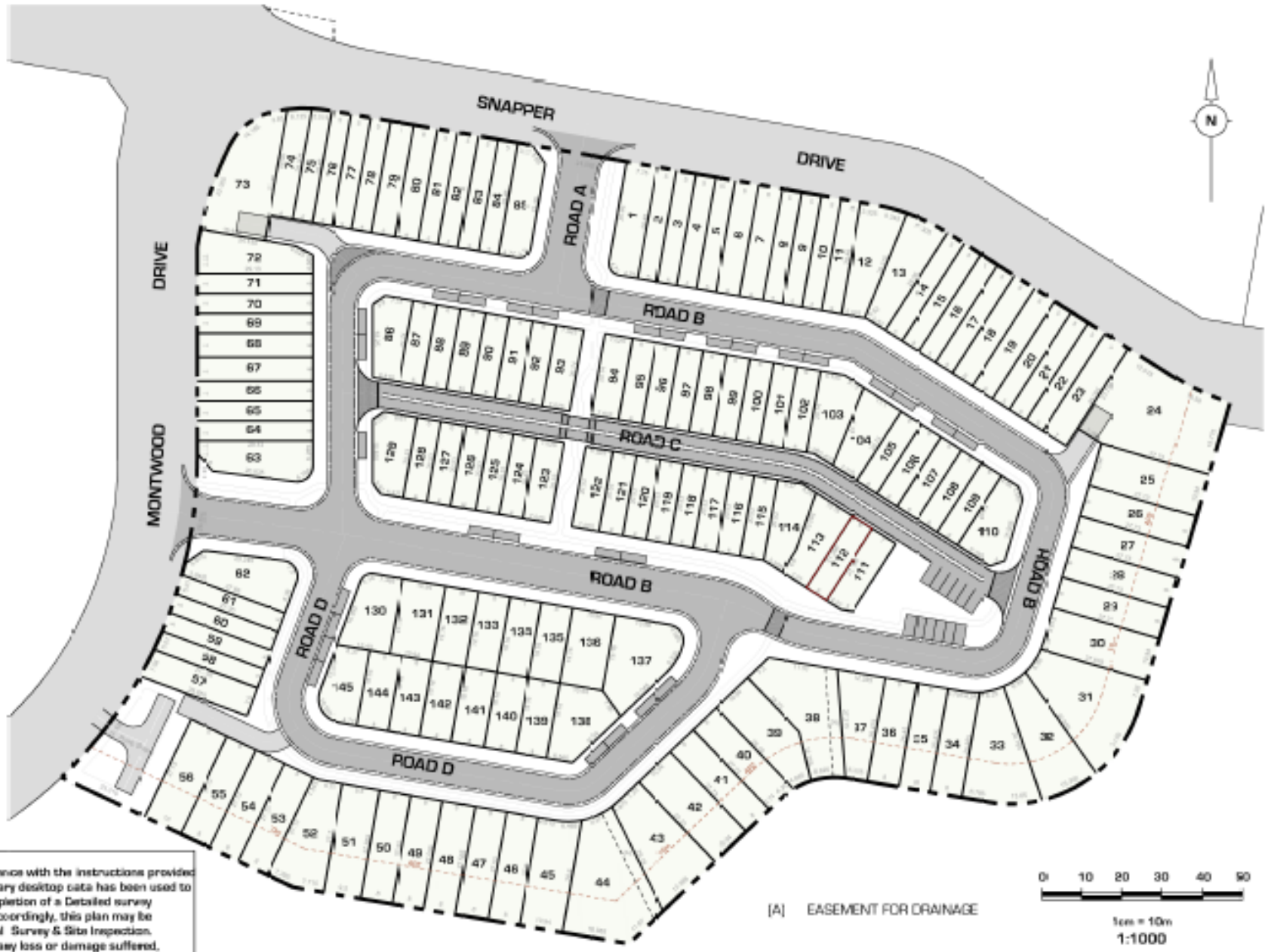
APPENDIX A: Proposed Subdivision Plans


SNAPPER DRIVE
MONTWOOD DRIVE
ROAD A
ROAD B
ROAD C
ROAD D
BLOCK 1
BLOCK 2
BLOCK 3
BLOCK 4
BLOCK 5
BLOCK 6
BLOCK 7
BLOCK 8
BLOCK 9
BLOCK 10
BLOCK 11
BLOCK 12
BLOCK 13
BLOCK 14
BLOCK 15
BLOCK 16
BLOCK 17
BLOCK 18
BLOCK 19
Pocket Park
No. | Unit Type
33 | Type A - 5m
63 | Type B - 6m
34 | Type C - 7m
15 | Type D - 9.8m
145 | Total
On Street Parking Provided
46
Terrace Homes Development
EPIQ – Lennox Heads
Site Plan
6651.19.02.0
TVS architects

LOT AREA TABLE

Lot No.	Area m²	Lot No.	Area m²	Lot No.	Area m²
1	218.6	51	263.0	101	124.4
2	162.3	52	309.9	102	124.4
3	162.3	53	217.0	103	200.1
4	162.3	54	217.0	104	190.0
5	162.3	55	217.0	105	124.4
6	170.7	56	271.3	106	124.4
7	170.7	57	211.0	107	124.4
8	162.3	58	137.6	108	124.4
9	162.3	59	136.4	109	124.4
10	162.3	60	136.4	110	201.8
11	162.3	61	137.6	111	148.2
12	255.5	62	271.6	112	128.4
13	248.7	63	249.2	113	181.5
14	148.3	64	145.6	114	178.9
15	148.3	65	145.6	115	123.2
16	148.3	66	145.6	116	123.2
17	148.3	67	174.8	117	123.2
18	174.4	68	174.8	118	123.2
19	174.4	69	145.6	119	123.2
20	148.3	70	145.6	120	123.2
21	148.3	71	145.6	121	123.2
22	148.3	72	249.5	122	144.2
23	203.4	73	431.5	123	144.2
24	672.4	74	186.0	124	123.2
25	303.4	75	141.9	125	123.2
26	221.8	76	142.3	126	123.2
27	221.8	77	142.3	127	123.2
28	221.8	78	142.3	128	123.2
29	221.8	79	170.7	129	192.0
30	303.5	80	170.7	130	222.1
31	489.89	81	142.3	131	209.6
32	334.8	82	142.3	132	153.3
33	377.2	83	142.3	133	153.3
34	211.9	84	142.3	134	153.3
35	211.5	85	211.2	135	153.3
36	211.7	86	174.2	136	209.6
37	237.9	87	124.4	137	320.8
38	414.9	88	124.4	138	233.7
39	286.7	89	124.4	139	153.3
40	282.5	90	124.4	140	153.3
41	221.8	91	124.4	141	153.3
42	303.4	92	124.4	142	153.3
43	377.5	93	145.7	143	153.3
44	543.0	94	145.7	144	153.3
45	303.0	95	124.4	145	182.7
46	220.1	96	124.4		
47	220.4	97	124.4		
48	220.6	98	124.4		
49	220.9	99	124.4		
50	221.2	100	124.4		

NOTE:
This preliminary layout has been completed in accordance with the instructions provided by Westlawn Property Trust. In this respect preliminary desktop data has been used to form this layout. The final layout is subject to the completion of a Detailed survey Subdivision Survey Plans and or Engineering plans. Accordingly, this plan may be modified by the author upon the completion of the final Survey & Site Inspection. Newton Denny Chapelle accepts no responsibility for any loss or damage suffered, however so arising, to any person or corporation who may use or rely on this Plan.



REV	DATE	AMENDMENT
A	20.06.18	
B	15.08.18	LOT 111 REMOVED. LOT NUMBERS 111 - 145 DELETED - LOT RE-NUMBERED
C		
D		
E		

SOURCE PLAN: n/a

A:\jobs\2014\14351 - clarence property superlot 5\planning\planning plans\autocad\14351 - proposed subdivision.dwg - plan 2

Newton Denny Chapelle
Surveyors Planners Engineers
Email: office@newtondennychapelle.com.au
LISMORE 31 Carrington St. Lismore 2480 PH: 6622 1011
CASINO 100 Barker St. Casino 2470
PH: 6662 5000
ABN: 86 220 045 466

PLAN 2 - PROPOSED SUBDIVISION

CLIENT: WESTLAWN PROPERTY TRUST
LOCATION: EPIQ
HUTLEY DRIVE
LENNOX HEAD NSW
REV B
DATE: 15.08.18 REF: 14/351
SCALE: 1 :1000 @ A3 DRAWN: bk

Information shown is for illustrative purposes only

Drawn by: TJP Checked by: MVF Reviewed by: GJM Date: May 2013
Source of base data: Ballina Shire Council & Kennedy Surveyors

0 80

GeoLINK

Conservation Zone Management Plan - Pacific Pines
1675-1100

Overarching Conservation Zone Rehabilitation Strategy

Illustration 4.1

APPENDIX B: Excerpts from Vegetation Monitoring Report, dated 14.09.2015

Vegetation Monitoring Report: August 2015

Epiq Lennox

GeoLINK
environmental management and design

PO Box 119
Lennox Head NSW 2478
T 02 6687 7666

PO Box 1446
Coffs Harbour NSW 2450
T 02 6651 7666

PO Box 1267
Armidale NSW 2350
T 0488 677 666

Unit 10 Warlina Walk Arcade
156 Molesworth St
Lismore NSW 2480
T 02 6621 6677

info@geolink.net.au

Prepared for: Clarence Property Corp

UPR	Description	Date Issued	Issued By
1675-1387	First issue	14/09/2015	VJS

In addition to this data, the following specific data will be collected for HJG and SSSR (when present):

- Foliage vigour within the quadrat using the following scoring method (*1-dead, 2-poor condition/ discoloured, 3-minor discoloration, 4-good condition, 5-excellent condition*).
- Photographs of example HJG and SSSR individuals within the quadrat.

2.4 Translocation Areas for HJG and SSSR

Baseline data for translocated areas of HJG/ SSSR will be collected during the peak growth period (February to May) two years after translocation to allow for establishment. All subsequent monitoring of the success of translocation will be based on this baseline cover level measured at this point. Therefore, this data was not collected as part of the current monitoring event.

HJG translocation (seed collection and direct seeding) within the Conservation Zone was undertaken in the period of May to July 2015. SSSR translocation (collection and division of propagules for SSSR translocation) within the Conservation Zone has been undertaken and planting of propagules will be undertaken later in 2015 when propagules have matured and are ready for planting.

Monitoring sites for collection of this baseline data were established randomly in representative translocation areas (refer to **Illustration 2.1**). Monitoring will be conducted along (10 m x 2 m) belt transects, containing 20 x 1 m x 1 m quadrats laid out contiguously, with ten quadrats on either side of a centre line. Data collection will follow the methodology outlined for monitoring of treeless vegetation in **Section 2.2.3**.

2.5 Mapping of HJG and SSSR Distribution and Freshwater Wetlands EEC

Collection of pre-construction baseline data mapping the distribution of HJG and SSSR and the Freshwater EEC boundary within the Conservation Zone was collected in 2011 and not collected for the current monitoring event. The first post-construction mapping of the distribution of HJG, SSSR and the Freshwater Wetland within the Conservation Zone is scheduled to occur in the peak growth season for these species in February to May 2016.

The mapping methodology is as follows:

- HJG and SSSR distribution:
  - Line transects 5 m apart were walked within the Conservation Zone, with all locations of SSSR and HJG marked with a GPS. Where larger areas of HJG and SSSR were encountered, GPS points were taken every 2-3 m to allow for the distribution of occurrences to be identified. A GIS map layer of the distribution of threatened species within the Conservation Zone was generated.
- Freshwater wetlands EEC boundary:
  - Mapping of the boundary of the Freshwater Wetlands EEC within the Conservation Zone was undertaken by on ground tracking of the location of the boundary with a GPS. This was supplemented by aerial photograph interpretation of the area. A GIS map layer of the location of the boundary was generated.

2.6 Weeds

A pre-construction weed audit was undertaken in March 2015 across the site to inform weed control priorities, map infestations and to identify any new infestations of noxious and environmental weeds. This will be conducted prior to construction commencing and then annually thereafter.

In addition to the weed audit data collected, the density of weeds within monitoring quadrats/ transects was also collected to provide more detailed information on weed infestations occurring at the site.

The extent of these weed infestations was recorded with a GPS and a simple map showing the locations of priority weeds was prepared.

2.7 Revegetation Areas

Monitoring data was collected on the state of the revegetation areas in June 2015 to provide information on the current success of the revegetation plantings. Information collected was qualitative and consisted of information such as the health of plants, evidence or damage or death of plants, the need to replace tree guards or mulch, and the degree of weed infestation. This data will feed into maintenance requirements for the revegetation areas, including weed control and replacement plantings.

Location of Monitoring Quadrats and Transects

Epiq Lennox Vegetation Monitoring Report: August 2015

Illustration

Plate 3.9 Transect 1 – Photo point

3.2.2 Transect 2 – Freshwater Wetlands EEC with HJG/ SSSR

Transect 2 is located at 557077: 6812778 (transect start); 557084: 6812782 (transect end) (GDA 94, Zone 56) (refer to **Illustration 2.1** and **Plate 3.10**) and monitors existing area of Freshwater Wetlands EEC and HJG/ SSSR within the Conservation Zone.

Table 3.31 Transect 2 – Flora Species Cover

Quadrat	*Common Name*	*Scientific Name*	*Cover %*	*Height (m)*	*Reproduction*	*Foliage Vigour (class)*
A	Vasey Grass*	*Paspalum urvelli*	5	0.4	n/a	n/a
	-	*Commelina sp.*	5	0.2	n/a	n/a
	Swamp Ricegrass	*Leersia hexandra*	70	0.4	n/a	n/a
	Spotted Knotweed	*Persicaria decipiens*	10	0.4	n/a	n/a
	Sida*	*Sida rhombifolia*	5	0.4	n/a	n/a
	Farmer's Friend*	*Bidens pilosa*	5	0.3	n/a	n/a
	Austral Bracken	*Pteridium esculentum*	5	0.1	n/a	n/a
	Swamp Foxtail	*Pennisetum alopecuroides*	5	1.1	n/a	n/a

Quadrat	Common Name	Scientific Name	Cover %	Height (m)	Reproduction	Foliage Vigour (class)
	Hairy Joint-grass^	*Arthraxon hispidus*	15	0.4	seeding profusely	3
B	a Sedge	*Cyperus* sp.	5	0.1	n/a	n/a
	Swamp Buttercup	*Ranunculus undosus*	5	0.1	n/a	n/a
	Austral Bracken	*Pteridium esculentum*	5	0.2	n/a	n/a
	Spotted Knotweed	*Persicaria decipiens*	5	0.6	n/a	n/a
	Swamp Foxtail	*Pennisetum alopecuroides*	5	1.2	n/a	n/a
	Vasey Grass*	*Paspalum urvelli*	5	0.8	n/a	n/a
	Farmer's Friend*	*Bidens pilosa*	5	0.4	n/a	n/a
	Spotted Knotweed	*Persicaria strigosa*	5	0.4	n/a	n/a
	Swamp Ricegrass	*Leersia hexandra*	65	0.5	n/a	n/a
	Hairy Joint-grass^	*Arthraxon hispidus*	10	0.3	seeding heavily	4
C	Swamp Ricegrass	*Leersia hexandra*	60	0.4	n/a	n/a
	Spotted Knotweed	*Persicaria strigosa*	5	0.4	n/a	n/a
	-	*Fimbristylis* sp.	5	0.8	n/a	n/a
	Swamp Buttercup	*Ranunculus undosus*	5	0.1	n/a	n/a
	a Sedge	*Cyperus* sp.	5	0.2	n/a	n/a
	Vasey Grass*	*Paspalum urvelli*	5	0.5	n/a	n/a
	Spotted Knotweed	*Persicaria decipiens*	5	0.4	n/a	n/a
	Hairy Joint-grass^	*Arthraxon hispidus*	25	0.4	seeding heavily	4
D	Colombian Waxweed*	*Cuphea carthagenensis*	5	0.2	n/a	n/a
	-	*Commelina* sp.	5	0.3	n/a	n/a
	Spotted Knotweed	*Persicaria strigosa*	5	0.2	n/a	n/a
	Swamp Ricegrass	*Leersia hexandra*	60	0.6	n/a	n/a
	Vasey Grass*	*Paspalum urvelli*	5	0.9	n/a	n/a
	a Sedge	*Cyperus* sp.	5	0.2	n/a	n/a
	Tropical Chickweed*	*Drymaria cordata*	5	0.2	n/a	n/a

Quadrat	Common Name	Scientific Name	Cover %	Height (m)	Reproduction	Foliage Vigour (class)
	Flax-leaf Fleabane*	*Conyza bonariensis*	5	0.4	n/a	n/a
	Swamp Buttercup	*Ranunculus undosus*	5	0.1	n/a	n/a
	Hairy Joint-grass^	*Arthraxon hispidus*	35	0.5	seeding heavily	4
E	-	*Fimbristylis* sp.	5	0.4	n/a	n/a
	Swamp Buttercup	*Ranunculus undosus*	5	0.1	n/a	n/a
	Spotted Knotweed	*Persicaria strigosa*	5	0.3	n/a	n/a
	Vasey Grass*	*Paspalum urvelli*	5	0.7	n/a	n/a
	Swamp Ricegrass	*Leersia hexandra*	70	0.6	n/a	n/a
	Swamp Foxtail	*Pennisetum alopecuroides*	5	1.1	n/a	n/a
	a Sedge	*Cyperus* sp.	5	0.2	n/a	n/a
	Farmer's Friend*	*Bidens pilosa*	5	0.2	n/a	n/a
	Hairy Joint-grass^	*Arthraxon hispidus*	10	0.5	seeding	4
F	Swamp Ricegrass	*Leersia hexandra*	65	0.3	n/a	n/a
	Swamp Buttercup	*Ranunculus undosus*	5	0.1	n/a	n/a
	Vasey Grass*	*Paspalum urvelli*	5	0.7	n/a	n/a
	Farmer's Friend*	*Bidens pilosa*	5	0.1	n/a	n/a
	a Sedge	*Cyperus sp.*	5	0.2	n/a	n/a
	Hairy Joint-grass^	*Arthraxon hispidus*	10	0.4	seeding heavily	3
G	a Clover*	*Trifolium* sp.	5	0.1	n/a	n/a
	Sow Thistle*	*Sonchus oleraceus*	5	0.3	n/a	n/a
	Swamp Buttercup	*Ranunculus undosus*	5	0.1	n/a	n/a
	Swamp Ricegrass	*Leersia hexandra*	70	0.6	n/a	n/a
	-	*Fimbristylis* sp.	5	0.5	n/a	n/a
	Vasey Grass*	*Paspalum urvelli*	5	0.9	n/a	n/a
	Hairy Joint-grass^	*Arthraxon hispidus*	5	0.5	seeding	4
H	Swamp Ricegrass	*Leersia hexandra*	75	0.5	n/a	n/a

Quadrat	Common Name	Scientific Name	Cover %	Height (m)	Reproduction	Foliage Vigour (class)
	Vasey Grass*	*Paspalum urvelli*	5	0.9	n/a	n/a
	Flax-leaf Fleabane*	*Conyza bonariensis*	5	0.7	n/a	n/a
	Swamp Buttercup	*Ranunculus undosus*	5	0.1	n/a	n/a
	a Sedge	*Cyperus* sp.	5	0.1	n/a	n/a
	Sow Thistle*	*Sonchus oleraceus*	5	0.1	n/a	n/a
	Hairy Joint-grass^	*Arthraxon hispidus*	5	0.3	seeding	4
	Square-stemmed Spike-rush^	*Eleocharis tetraquetra*	5 (1 stem)	0.4	seeding	4
I	Swamp Foxtail	*Leersia hexandra*	75	0.5	n/a	n/a
	Vasey Grass*	*Paspalum urvelli*	10	0.8	n/a	n/a
	Swamp Buttercup	*Ranunculus undosus*	5	0.1	n/a	n/a
	a Clover*	*Trifolium* sp.	5	0.1	n/a	n/a
	a Sedge	*Cyperus* sp.	5	0.1	n/a	n/a
	Common Spike-rush	*Eleocharis equisitina*	5	0.3	n/a	n/a
	Hairy Joint-grass^	*Arthraxon hispidus*	5	0.3	seeding	4
	Square-stemmed Spike-rush^	*Eleocharis tetraquetra*	5	0.4	seeding	4
J	Vasey Grass*	*Paspalum urvelli*	5	1.1	n/a	n/a
	Swamp Ricegrass	*Leersia hexandra*	75	0.7	n/a	n/a
	Swamp Buttercup	*Ranunculus undosus*	5	0.1	n/a	n/a
	Farmer's Friend*	*Bidens pilosa*	5	0.1	n/a	n/a
	a Clover*	*Trifolium* sp.	5	0.1	n/a	n/a
	Common Spike-rush	*Eleocharis equisitina*	5	0.2	n/a	n/a
	Hairy Joint-grass^	*Arthraxon hispidus*	5	0.2	seeding	4
K	Swamp Ricegrass	*Leersia hexandra*	60	0.5	n/a	n/a
	Vasey Grass*	*Paspalum urvelli*	10	0.9	n/a	n/a
	Swamp Buttercup	*Ranunculus undosus*	5	0.1	n/a	n/a

Quadrat	Common Name	Scientific Name	Cover %	Height (m)	Reproduction	Foliage Vigour (class)
	a Sedge	*Cyperus* sp.	5	0.2	n/a	n/a
	Hairy Joint-grass^	*Arthraxon hispidus*	5	0.4	seeding	4
L	Vasey Grass*	*Paspalum urvelli*	15	1.2	n/a	n/a
	Swamp Ricegrass	*Leersia hexandra*	65	0.5	n/a	n/a
	Farmer's Friend*	*Bidens pilosa*	5	0.2	n/a	n/a
	a Sedge	*Cyperus* sp.	5	0.1	n/a	n/a
	a Clover*	*Trifolium* sp.	5	0.1	n/a	n/a
	Swamp Buttercup	*Ranunculus undosus*	5	0.1	n/a	n/a
M	Swamp Ricegrass	*Leersia hexandra*	85	0.5	n/a	n/a
	Vasey Grass*	*Paspalum urvelli*	10	0.8	n/a	n/a
	a Sedge	*Cyperus* sp.	5	0.3	n/a	n/a
	Swamp Buttercup	*Ranunculus undosus*	5	0.1	n/a	n/a
	Hairy Joint-grass^	*Arthraxon hispidus*	5	0.3	seeding	4
N	Sow Thistle *	*Sonchus oleraceus*	5	0.2	n/a	n/a
	Swamp Ricegrass	*Leersia hexandra*	70	0.4	n/a	n/a
	Spotted Knotweed	*Persicaria strigosa*	5	0.2	n/a	n/a
	Vasey Grass*	*Paspalum urvelli*	5	1	n/a	n/a
	a Sedge	*Cyperus* sp.	5	0.2	n/a	n/a
	Swamp Buttercup	*Ranunculus undosus*	5	0.1	n/a	n/a
	Gotu Cola	*Centella asiatica*	5	0.1	n/a	n/a
	Hairy Joint-grass^	*Arthraxon hispidus*	15	0.3	seeding heavily	4
O	Swamp Ricegrass	*Leersia hexandra*	65	0.2	n/a	n/a
	-	*Fimbristylis* sp.	5	0.4	n/a	n/a
	Spotted Knotweed	*Persicaria strigosa*	5	0.2	n/a	n/a
	a Clover*	*Trifolium* sp.	5	0.1	n/a	n/a
	-	*Commelina* sp.	5	0.1	n/a	n/a
	Vasey Grass*	*Paspalum urvelli*	5	0.8	n/a	n/a
	Hairy Joint-grass^	*Arthraxon hispidus*	10	0.4	seeding	4

Quadrat	Common Name	Scientific Name	Cover %	Height (m)	Reproduction	Foliage Vigour (class)
P	Swamp Foxtail	*Pennisetum alopecuroides*	5	1	n/a	n/a
	Swamp Ricegrass	*Leersia hexandra*	70	0.4	n/a	n/a
	Vasey Grass*	*Paspalum urvelli*	5	0.9	n/a	n/a
	Austral Bracken	*Pteridium esculentum*	5	0.2	n/a	n/a
	Spotted Knotweed	*Persicaria strigosa*	5	0.2	n/a	n/a
	a Sedge	*Cyperus* sp.	5	0.2	n/a	n/a
	Swamp Buttercup	*Ranunculus undosus*	5	0.1	n/a	n/a
	Hairy Joint-grass^	*Arthraxon hispidus*	20	0.4	seeding heavily	4
Q	Austral Bracken	*Pteridium esculentum*	5	0.1	n/a	n/a
	Spotted Knotweed	*Persicaria strigosa*	5	0.2	n/a	n/a
	Swamp Ricegrass	*Leersia hexandra*	60	0.5	n/a	n/a
	Vasey Grass*	*Paspalum urvelli*	10	1.1	n/a	n/a
	Sida	*Sida rhombifolia*	5	0.2	n/a	n/a
	a Sedge	*Cyperus* sp.	5	0.1	n/a	n/a
	Swamp Buttercup	*Ranunculus undosus*	5	0.1	n/a	n/a
	a Clover*	*Trifolium* sp.	5	0.1	n/a	n/a
	Hairy Joint-grass^	*Arthraxon hispidus*	30	0.4	seeding heavily	4
R	Swamp Ricegrass	*Leersia hexandra*	65	0.5	n/a	n/a
	Swamp Foxtail	*Pennisetum alopecuroides*	5	1	n/a	n/a
	Austral Bracken	*Pteridium esculentum*	5	0.2	n/a	n/a
	Vasey Grass*	*Paspalum urvelli*	10	1	n/a	n/a
	a Sedge	*Cyperus* sp.	5	2	n/a	n/a
	Hairy Joint-grass^	*Arthraxon hispidus*	25	0.4	seeding	4
S	a Sedge	*Cyperus* sp.	5	0.2	n/a	n/a
	Spotted Knotweed	*Persicaria decipiens*	10	0.5	n/a	n/a
	Farmer's Friend*	*Bidens pilosa*	5	0.2	n/a	n/a
	Vasey Grass*	*Paspalum urvelli*	5	1	n/a	n/a

Quadrat	Common Name	Scientific Name	Cover %	Height (m)	Reproduction	Foliage Vigour (class)
	Gotu Cola	*Centella asiatica*	5	0.1	n/a	n/a
	Swamp Ricegrass	*Leersia hexandra*	70	0.4	n/a	n/a
	Austral Bracken	*Pteridium esculentum*	5	0.1	n/a	n/a
	Hairy Joint-grass^	*Arthraxon hispidus*	20	0.3	seeding	4
T	Spotted Knotweed	*Persicaria decipiens*	5	0.4	n/a	n/a
	Swamp Ricegrass	*Leersia hexandra*	65	0.4	n/a	n/a
	Swamp Foxtail	*Pennisetum alopecuroides*	10	0.4	n/a	n/a
	Austral Bracken	*Pteridium esculentum*	5	0.2	n/a	n/a
	Gotu Cola	*Centella asiatica*	5	0.1	n/a	n/a
	Farmer's Friend*	*Bidens pilosa*	5	0.1	n/a	n/a
	Vasey Grass*	*Paspalum urvelli*	5	0.5	n/a	n/a
	Hairy Joint-grass^	*Arthraxon hispidus*	5	0.3	seeding	4

* Exotic species or invasive native species

^ Threatened flora species listed under the TSC Act and/ or the EPBC Act

3.2.2.1 General comments

- Presence of dead plants: nothing of significance.
- Regeneration of HJG and SSSR: refer to **Table 3.31**.
- Degree of weed infestation: (moderate weed infestation – particularly weed grasses).
- Condition/ health of community: this area of vegetation has undergone moderate past disturbance (e.g. cattle grazing) and is currently in medium condition (moderate weed infestation – particularly weed grasses).
- Presence of threatened flora: HJG and SSSR.

Plate 3.10 Transect 2 – Photo point

3.2.3 Transect 3 – Freshwater Wetlands EEC with HJG/ SSSR

Transect 2 is located at 557377: 6812943 (transect start); 557371: 6812953 (transect end) (GDA 94, Zone 56) (refer to **Illustration 2.1** and **Plate 3.11**) and monitors existing area of Freshwater Wetlands EEC and HJG/ SSSR within the Conservation Zone.

Table 3.32 Transect 3 – Flora Species Cover

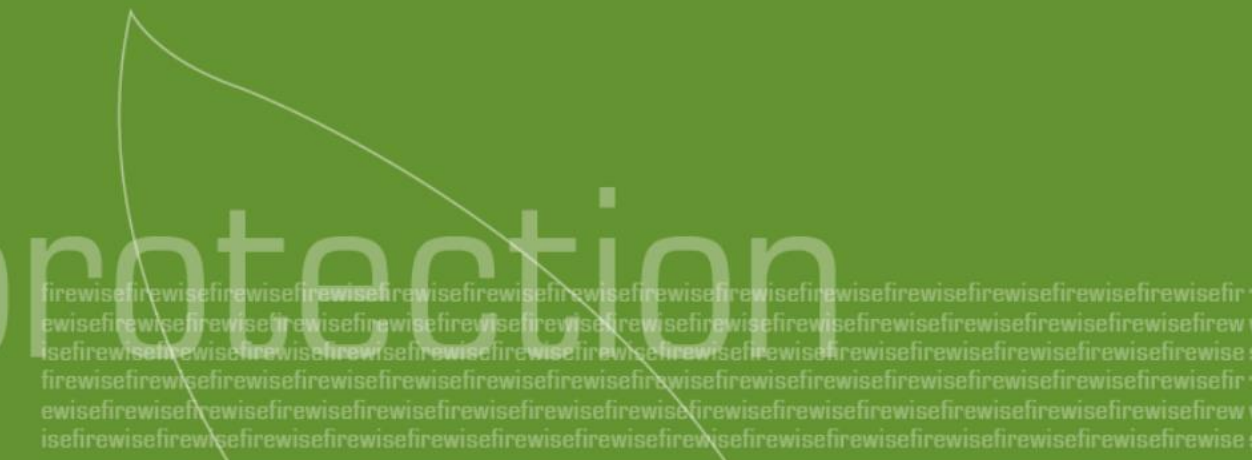
Quadrat	*Common Name*	*Scientific Name*	*Cover %*	*Height (m)*	*Reproduction*	*Foliage Vigour (class)*
A	Swamp Ricegrass	*Leersia hexandra*	60	0.3	n/a	n/a
	Vasey Grass*	*Paspalum urvelli*	15	1.1	n/a	n/a
	Fireweed*	*Senecio madagascariensis*	5	0.3	n/a	n/a
	a Sedge	*Cyperus* sp.	5	0.2	n/a	n/a
	Common Spike-rush	*Eleocharis equisitina*	5	0.2	n/a	n/a
	Hairy Joint-grass^	*Arthraxon hispidus*	20	0.3	seeding	3
	Swamp Buttercup	*Ranunculus undosus*	5	0.1	n/a	n/a
B	Vasey Grass*	*Paspalum urvelli*	10	1	n/a	n/a
	Sow Thistle*	*Sonchus oleraceus*	5	0.2	n/a	n/a

APPENDIX C: Standards for Asset Protection Zones (RFS 2005)

standards

for asset protection zones

protection



NSW RURAL FIRE SERVICE

STANDARDS FOR ASSET PROTECTION ZONES

INTRODUCTION

For thousands of years bush fires have been a natural part of the Australian landscape. They are inevitable and essential, as many Australian plants and animals have adapted to fire as part of their life cycle.

In recent years developments in bushland areas have increased the risk of bush fires harming people and their homes and property. But landowners can significantly reduce the impact of bush fires on their property by identifying and minimising bush fire hazards. There are a number of ways to reduce the level of hazard to your property, but one of the most important is the creation and maintenance of an Asset Protection Zone (APZ).

A well located and maintained APZ should be used in conjunction with other preparations such as good property maintenance, appropriate building materials and developing a family action plan.

WHAT IS AN ASSET PROTECTION ZONE?

An Asset Protection Zone (APZ) is a fuel reduced area surrounding a built asset or structure. This can include any residential building or major building such as farm and machinery sheds, or industrial, commercial or heritage buildings.

An APZ provides:

- a buffer zone between a bush fire hazard and an asset;
- an area of reduced bush fire fuel that allows suppression of fire;
- an area from which backburning may be conducted; and
- an area which allows emergency services access and provides a relatively safe area for firefighters and home owners to defend their property.

Potential bush fire fuels should be minimised within an APZ. This is so that the vegetation within the planned zone does not provide a path for the transfer of fire to the asset either from the ground level or through the tree canopy.

WHAT WILL THE APZ DO?

An APZ, if designed correctly and maintained regularly, will reduce the risk of:

- direct flame contact on the asset;
- damage to the built asset from intense radiant heat; and
- ember attack on the asset.

WHERE SHOULD I PUT AN APZ?

An APZ is located between an asset and a bush fire hazard.

The APZ should be located wholly within your land. You cannot undertake any clearing of vegetation on a neighbour's property, including National Park estate, Crown land or land under the management of your local council, unless you have written approval.

If you believe that the land adjacent to your property is a bush fire hazard and should be part of an APZ, you can have the matter investigated by contacting the NSW Rural Fire Service (RFS).

There are six steps to creating and maintaining an APZ. These are:

1. Determine if an APZ is required;
2. Determine what approvals are required for constructing your APZ;
3. Determine the APZ width required;
4. Determine what hazard reduction method is required to reduce bush fire fuel in your APZ;
5. Take measures to prevent soil erosion in your APZ; and
6. Landscape and regularly monitor in your APZ for fuel regrowth.

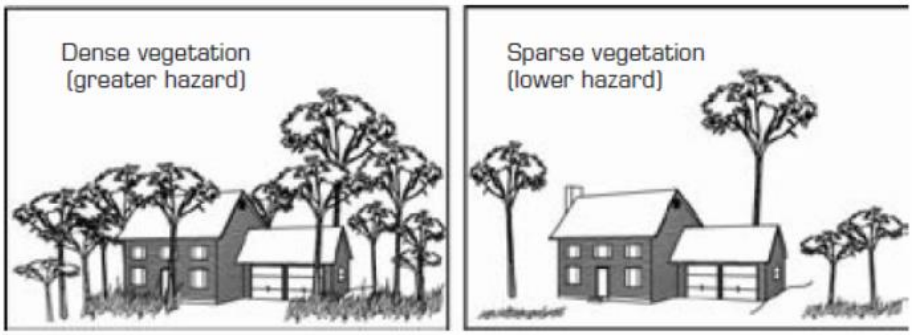
STEP 1. DETERMINE IF AN APZ IS REQUIRED

Recognising that a bush fire hazard exists is the first step in developing an APZ for your property.

If you have vegetation close to your asset and you live in a bush fire prone or high risk area, you should consider creating and maintaining an APZ.

Generally, the more flammable and dense the vegetation, the greater the hazard will be. However, the hazard potential is also influenced by factors such as slope.

- A large area of continuous vegetation on sloping land may increase the potential bush fire hazard.
- The amount of vegetation around a house will influence the intensity and severity of a bush fire.
- The higher the available fuel the more intense a fire will be.



Isolated areas of vegetation are generally not a bush fire hazard, as they are not large enough to produce fire of an intensity that will threaten dwellings.

This includes:

- bushland areas of less than one hectare that are isolated from large bushland areas; and
- narrow strips of vegetation along road and river corridors.

If you are not sure if there is a bush fire hazard in or around your property, contact your local NSW Rural Fire Service Fire Control Centre or your local council for advice.

STEP 2. DETERMINE WHAT APPROVALS ARE REQUIRED FOR CONSTRUCTING YOUR APZ

If you intend to undertake bush fire hazard reduction works to create or maintain an APZ you must gain the written consent of the landowner.

Subdivided land or construction of a new dwelling
If you are constructing an APZ for a new dwelling you will need to comply with the requirements in *Planning for Bushfire Protection*. Any approvals required will have to be obtained as part of the Development Application process.

Existing asset
If you wish to create or maintain an APZ for an existing structure you may need to obtain an environmental approval. The RFS offers a free environmental assessment and certificate issuing service for essential hazard reduction works. For more information see the RFS document *Application Instructions for a Bush Fire Hazard Reduction Certificate* or contact your local RFS Fire Control Centre to determine if you can use this approval process.

Bear in mind that all work undertaken must be consistent with any existing land management agreements (e.g. a conservation agreement, or property vegetation plan) entered into by the property owner.

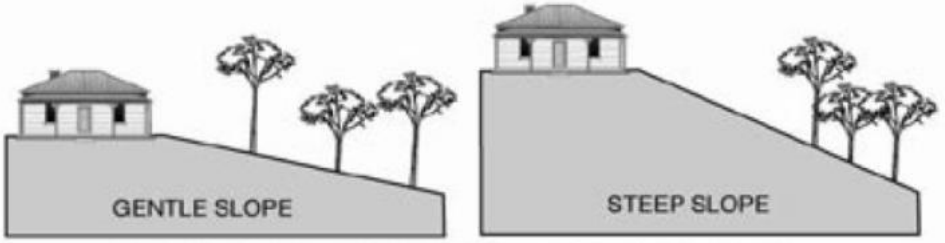
If your current development consent provides for an APZ, you do not need further approvals for works that are consistent with this consent.

If you intend to burn off to reduce fuel levels on your property you may also need to obtain a Fire Permit through the RFS or NSW Fire Brigades. See the RFS document *Before You Light That Fire* for an explanation of when a permit is required.

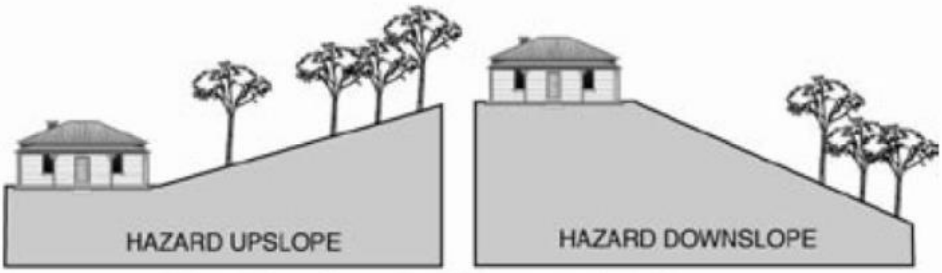
STEP 3. DETERMINE THE APZ WIDTH

The size of the APZ required around your asset depends on the nature of the asset, the slope of the area, the type and structure of nearby vegetation and whether the vegetation is managed.

Fires burn faster uphill than downhill, so the APZ will need to be larger if the hazard is downslope of the asset.



Gentle slopes require a smaller APZ distance than steep slopes



A hazard downslope will require a greater APZ distance then a hazard upslope of the asset

Different types of vegetation (for example, forests, rainforests, woodlands, grasslands) behave differently during a bush fire. For example, a forest with shrubby understorey is likely to result in a higher intensity fire than a woodland with a grassy understorey and would therefore require a greater APZ width.

A key benefit of an APZ is that it reduces radiant heat and the potential for direct flame contact on homes and other buildings. Residential dwellings require a wider APZ than sheds or stockyards because the dwelling is more likely to be used as a refuge during bush fire.

Subdivided land or construction of a new dwelling
If you are constructing a new asset, the principles of *Planning for Bushfire Protection* should be applied. Your Development Application approval will detail the exact APZ distance required.

Existing asset
If you wish to create an APZ around an existing asset and you require environmental approval, the Bush Fire Environmental Assessment Code provides a streamlined assessment process. Your Bush Fire Hazard Reduction Certificate (or alternate environmental approval) will specify the maximum APZ width allowed.

For further information on APZ widths see *Planning for Bushfire Protection* or the *Bush Fire Environmental Assessment Code* (available on the RFS website), or contact your local RFS Fire Control Centre.

STEP 4. DETERMINE WHAT HAZARD REDUCTION METHOD IS REQUIRED TO REDUCE BUSH FIRE FUEL IN YOUR APZ

The intensity of bush fires can be greatly reduced where there is little to no available fuel for burning. In order to control bush fire fuels you can reduce, remove or change the state of the fuel through several means.

Reduction of fuel does not require removal of all vegetation, which would cause environmental damage. Also, trees and plants can provide you with some bush fire protection from strong winds, intense heat and flying embers (by filtering embers) and changing wind patterns. Some ground cover is also needed to prevent soil erosion.

Fuels can be controlled by:

1. raking or manual removal of fine fuels
Ground fuels such as fallen leaves, twigs (less than 6 mm in 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.

2. mowing or grazing of grass
Grass needs to be kept short and, where possible, green.

3. 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 two to five metres. A canopy should not overhang within two to five metres 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.

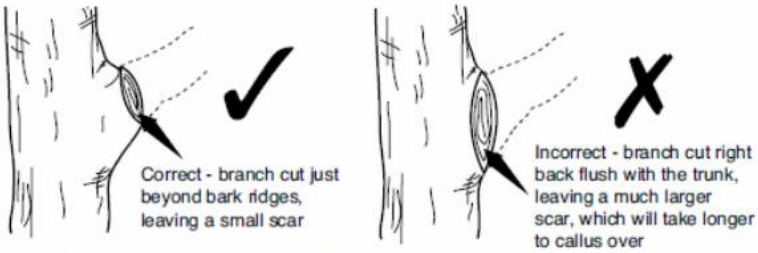
When choosing plants for removal, the following basic rules should be followed:

1. Remove noxious and environmental weeds first. Your local council can provide you with a list of environmental weeds or 'undesirable species'. Alternatively, a list of noxious weeds can be obtained at **www.agric.nsw.gov.au/noxweed/;**
2. Remove more flammable species such as those with rough, flaky or stringy bark; and
3 Remove or thin understorey plants, trees and shrubs less than three metres in height

The removal of significant native species should be avoided.

Prune in acordance with the following standards:

- Use sharp tools. These will enable clean cuts and will minimise damage to the tree.
- Decide which branches are to be removed before commencing work. Ensure that you maintain a balanced, natural distribution of foliage and branches.
- Remove only what is necessary.
- Cut branches just beyond bark ridges, leaving a small scar.
- Remove smaller branches and deadwood first.



There are three primary methods of pruning trees in APZs:

1. Crown lifting (skirting)
Remove the lowest branches (up to two metres from the ground). Crown lifting may inhibit the transfer of fire between the ground fuel and the tree canopy.

2. Thinning
Remove smaller secondary branches whilst retaining the main structural branches of the tree. Thinning may minimise the intensity of a fire.

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3. Selective pruning
Remove branches that are specifically identified as creating a bush fire hazard (such as those overhanging assets or those which create a continuous tree canopy). Selective pruning can be used to prevent direct flame contact between trees and assets.

Your Bush Fire Hazard Reduction Certificate or local council may restrict the amount or method of pruning allowed in your APZ.

See the *Australian Standard 4373 (Pruning of Amenity Trees)* for more information on tree pruning.

4. Slashing and trittering
Slashing and trittering are economical methods of fuel reduction for large APZs that have good access. However, these methods may leave large amounts of slashed fuels (grass clippings etc) which, when dry, may become a fire hazard. For slashing or trittering to be effective, the cut material must be removed or allowed to decompose well before summer starts.

If clippings are removed, dispose of them in a green waste bin if available or compost on site (dumping clippings in the bush is illegal and it increases the bush fire hazard on your or your neighbour's property).

Although slashing and trittering are effective in inhibiting the growth of weeds, it is preferable that weeds are completely removed.

Care must be taken not to leave sharp stakes and stumps that may be a safety hazard.

5. Ploughing and grading
Ploughing and grading can produce effective firebreaks. However, in areas where this method is applied, frequent maintenance may be required to minimise the potential for erosion. Loose soil from ploughed or graded ground may erode in steep areas, particularly where there is high rainfall and strong winds.

6. Burning (hazard reduction burning)
Hazard reduction burning is a method of removing ground litter and fine fuels by fire. Hazard reduction burning of vegetation is often used by land management agencies for broad area bush fire control, or to provide a fuel reduced buffer around urban areas.

Any hazard reduction burning, including pile burns, must be planned carefully and carried out with extreme caution under correct weather conditions. Otherwise there is a real danger that the fire will become out of control. More bush fires result from escaped burning off work than from any other single cause.

It is YOUR responsibility to contain any fire lit on your property. If the fire escapes your property boundaries you may be liable for the damage it causes.

Hazard reduction burns must therefore be carefully planned to ensure that they are safe, controlled, effective and environmentally sound. There are many factors that need to be considered in a burn plan. These include smoke control, scorch height, frequency of burning and cut off points (or control lines) for the fire. For further information see the RFS document *Standards for Low Intensity Bush Fire Hazard Reduction Burning*, or contact your local RFS for advice.

7. Burning (pile burning)
In some cases, where fuel removal is impractical due to the terrain, or where material cannot be disposed of by the normal garbage collection or composted on site, you may use pile burning to dispose of material that has been removed in creating or maintaining an APZ.

For further information on pile burning, see the RFS document *Standards for Pile Burning*.

In areas where smoke regulations control burning in the open, you will need to obtain a Bush Fire Hazard Reduction Certificate or written approval from Council for burning. During the bush fire danger period a Fire Permit will also be required. See the RFS document *Before You Light that Fire* for further details.

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STEP 5. TAKE MEASURES TO PREVENT SOIL EROSION

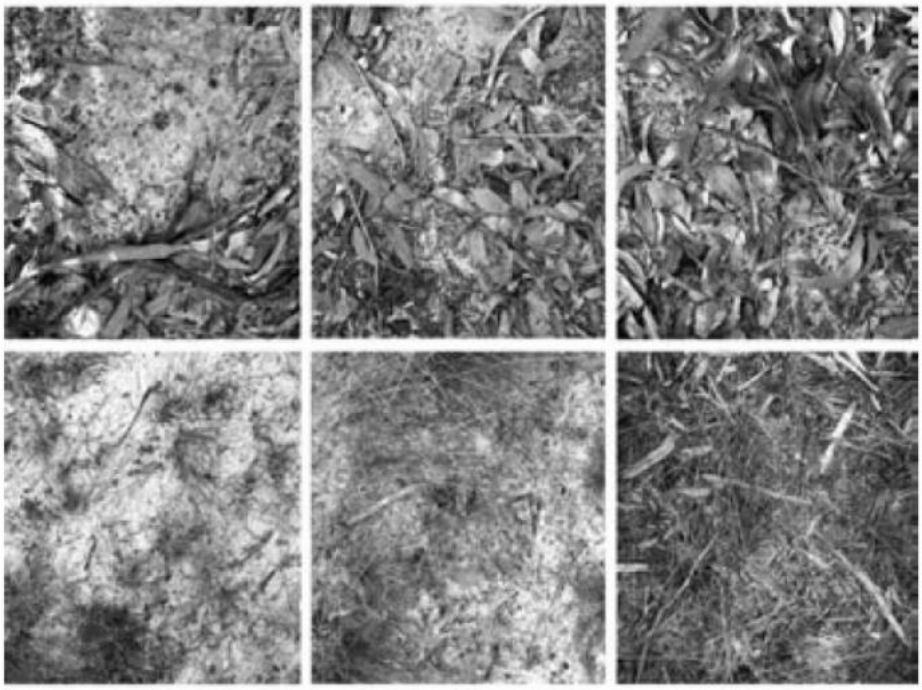
While the removal of fuel is necessary to reduce a bush fire hazard, you also need to consider soil stability, particularly on sloping areas.

Soil erosion can greatly reduce the quality of your land through:

- loss of top soil, nutrients, vegetation and seeds
- reduced soil structure, stability and quality
- blocking and polluting water courses and drainage lines

A small amount of ground cover can greatly improve soil stability and does not constitute a significant bush fire hazard. Ground cover includes any material which directly covers the soil surface such as vegetation, twigs, leaf litter, clippings or rocks. A permanent ground cover should be established (for example, short grass). This will provide an area that is easy to maintain and prevent soil erosion.

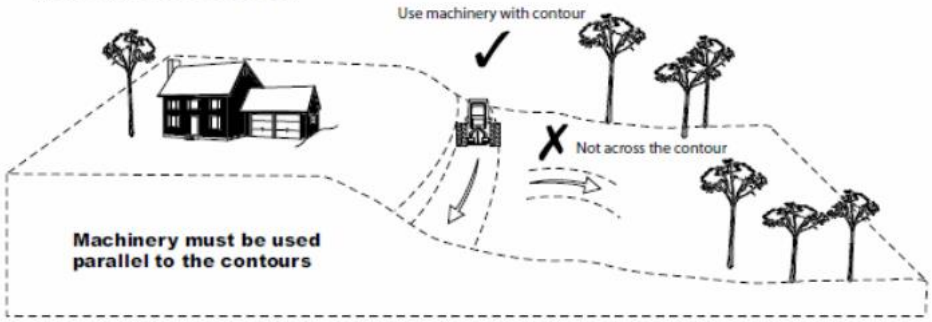
When using mechanical hazard reduction methods, you should retain a ground cover of at least 75% to prevent soil erosion. However, if your area is particularly susceptible to soil erosion, your Hazard Reduction Certificate may require that 90% ground cover be retained.



50% **75%** **100%**

Ground Cover

To reduce the incidence of soil erosion caused by the use of heavy machinery such as ploughs, dozers and graders, machinery must be used parallel to the contours. Vegetation should be allowed to regenerate, but be managed to maintain a low fuel load.

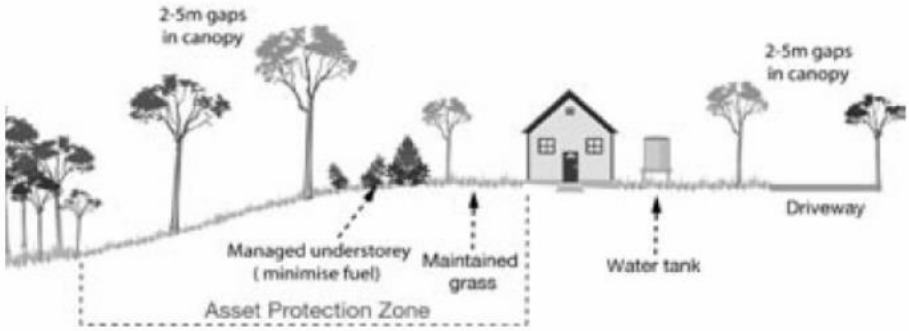


STEP 6. ONGOING MANAGEMENT AND LANDSCAPING

Your home and garden can blend with the natural environment and be landscaped to minimise the impact of fire at the same time. To provide an effective APZ, you need to plan the layout of your garden to include features such as fire resistant plants, radiant heat barriers and windbreaks.

Layout of gardens in an APZ
When creating and maintaining a garden that is part of an APZ you should:

- ensure that vegetation does not provide a continuous path to the house;
- remove all noxious and environmental weeds;
- plant or clear vegetation into clumps rather than continuous rows;
- prune low branches two metres 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;
- plant and maintain short green grass around the house as this will slow the fire and reduce fire intensity. Alternatively, provide non-flammable pathways directly around the dwelling;
- 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 crush tile; and
- avoid erecting brush type fencing and planting "pencil pine" type trees next to buildings, as these are highly flammable.



Removal of other materials
Woodpiles, wooden sheds, combustible material, storage areas, large quantities of garden mulch, stacked flammable building materials etc. should be located away from the house. These items should preferably be located in a designated cleared location with no direct contact with bush fire hazard vegetation.

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Other protective features
You can also take advantage of existing or proposed protective features such as fire trails, gravel paths, rows of trees, dams, creeks, swimming pools, tennis courts and vegetable gardens as part of the property's APZ.

PLANTS FOR BUSH FIRE PRONE GARDENS

When designing your garden it is important to consider the type of plant species and their flammability as well as their placement and arrangement.

Given the right conditions, all plants will burn. However, some plants are less flammable than others.

Trees with loose, fibrous or stringy bark should be avoided. These trees can easily ignite and encourage the ground fire to spread up to, and then through, the crown of the trees.

Plants that are less flammable, have the following features:

- high moisture content
- high levels of salt
- low volatile oil content of leaves
- smooth barks without "ribbons" hanging from branches or trunks; and
- dense crown and elevated branches.

When choosing less flammable plants, be sure not to introduce noxious or environmental weed species into your garden that can cause greater long-term environmental damage.

For further information on appropriate plant species for your locality, contact your local council, plant nurseries or plant society.

If you require information on how to care for fire damaged trees, refer to the Firewise brochure *Trees and Fire Resistance; Regeneration and care of fire damaged trees.*

WIND BREAKS

Rows of trees can provide a wind break to trap embers and flying debris that could otherwise reach the house or asset.

You need to be aware of local wind conditions associated with bush fires and position the wind break accordingly. Your local RFS Fire Control Centre can provide you with further advice.

When choosing trees and shrubs, make sure you seek advice as to their maximum height. Their height may vary depending on location of planting and local conditions. As a general rule, plant trees at the same distance away from the asset as their maximum height.

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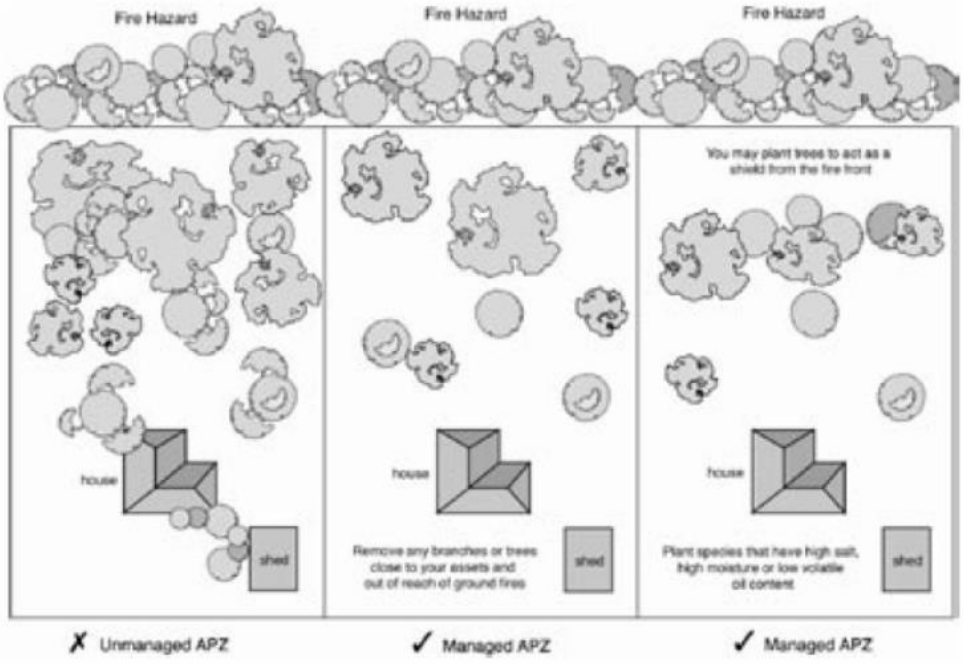
When creating a wind break, remember that the object is to slow the wind and to catch embers rather than trying to block the wind. In trying to block the wind, turbulence is created on both sides of the wind break making fire behaviour erratic.



HOW CAN I FIND OUT MORE?

The following documents are available from your local Fire Control Centre and from the NSW RFS website at **www.rfs.nsw.gov.au.**

- Before You Light That Fire
- Standards for Low Intensity Bush Fire Hazard Reduction Burning
- Standards for Pile Burning
- Application Instructions for a Bush Fire Hazard Reduction Certificate

If you require any further information please contact:

- your local NSW Rural Fire Service Fire Control Centre. Location details are available on the RFS website or
- call the NSW RFS Enquiry Line 1800 679 737 (Monday to Friday, 9am to 5pm), or
- the NSW RFS website at **www.rfs.nsw.gov.au.**

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