Fraser Ecological Consulting

abn 797 637 40114

665 Scenic Road

Macmasters Beach NSW 2257

telephone 042323 8193

Flora and Fauna Assessment

90 Weavers Road

MAROOTA

18th July 2015

SUMMARY

Fraser Ecological Consulting has been contracted by Max and Marie Endicott to prepare an impact assessment of the proposed 6 (six) lot subdivision on the terrestrial ecology located at 90 Weavers Road Maroota in the Hills Shire Council local government area.

This assessment has been conducted in accordance with Commonwealth and State legislation.

Commonwealth legislation (*Environment Protection and Biodiversity Conservation (EPBC) Act 1999*) requires that actions judged to significantly impact upon matters of National Environmental Significance are to be assessed via a formal referral process. This assessment report determines whether a referral to be made to the Department of the Environment, Water, Heritage and the Arts for further assessment is required.

State legislation (*Environmental Planning and Assessment Act 1979*) requires that actions judged to significantly impact upon threatened species, populations or ecological communities, or their habitats listed under the *Threatened Species Conservation Act (1995)* trigger the preparation of a Species Impact Statement.

This assessment report applies considerations under Section 5A of the EPA Act (1979) and determines whether a significant impact is likely to occur and, correspondingly, whether a Species Impact Statement is required.

The site for the proposed development comprises of land predominantly absent of native vegetation. Remnant bushland mapped as Shale Sandstone Transition Forest Endangered Ecological Community listed under the *Threatened Species Conservation Act 1995* surrounds the proposed subdivision. This development application includes offering Council a residual lot of this endangered vegetation type comprising over half (5.91 ha) of the entire 10 (ten) hectare property. The residual lot would be down slope of the newly created allotments. It is unlikely that future development on proposed Lots 2, 3, 4, 5 & 6 would have a significant impact upon the health of surrounding good quality bushland and will not interfere with local wildlife corridor functions.

The major conclusion arising from this Flora and Fauna Impact Assessment is that the proposed works are unlikely to result in a significant impact on any listed species or communities providing that the applicant actively implements the recommendations from this assessment. Therefore in accordance with the EPA Act (1979), TSC Act (1995) and FM Act (1994), a Species Impact Statement is not required.

Licensing

When conducting flora and fauna surveys, consultants are required to possess licences to ensure that works are completed in an appropriate manner. Fraser Ecological Consulting is licensed under s.132c and s.91 of the NSW National Parks and Wildlife Act (1974) from the NSW Office of Environment & Heritage. This allows Alex Fraser to undertake scientific investigations, collect specimens of protected flora and fauna across NSW in service and non-service areas and undertake bushland restoration works in EECs. This licence requires that all survey results are reported to the NSW NPWS for inclusion into the Atlas of NSW Wildlife.

Alex Fraser also holds an Animal Research Authority under the Animal Research Act (1995), as administered by NSW Agriculture. Surveys are approved and supervised by an Animal Care and Ethics Committee, applying the standards as detailed in the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes (NHMRC 1997).

1. Introduction

1.1. Introduction

This terrestrial ecological assessment was commissioned by Mr and Mrs Endicott to accompany the subdivision application with the Hills Shire Council for the property at 90 Weavers Road Maroota (Lot 239 DP 752025).

The terrestrial ecological assessment:

- Identifies key flora and fauna habitats within the subject site;
- Reviews literature and databases relevant to the subject site;
- Describes the methodology and results of the survey;
- Addresses potential impacts on flora and fauna and their habitats resulting from the proposed development;
- Proposes appropriate mitigation measures; and
- Provides an assessment of the likelihood of significant impacts on threatened species and populations, and endangered ecological communities, according to Section 5A of the NSW EPA Act, TSC ACT, Commonwealth EPBC Act. This was done to determine the need for an SIS or an application under the EPBC Act.

Activities specifically related to the preparation of this report included:

- Identification of weed and indigenous native species recorded from the subject site including APZ area required in bushland south of the existing cleared lots
- Assessment of impacts of the proposed development
- Outlining the applicant's responsibilities including weed control and environmental safeguards before, during and post construction.

1.2 Site characteristics

The study site is located approximately 50km north-west of the Sydney CBD situated in the Hills Shire Council LGA and within the Sydney Basin Bioregion (Figure 1). Weavers Road occurs on ridge line at similar elevation to the nearest cross road Wisemans Ferry Road and is located 5km south of the Hawkesbury River system (Figure 2).

The site is an irregular rectangular shape and covers an area of approximately ten (10) hectares (Figure 1).

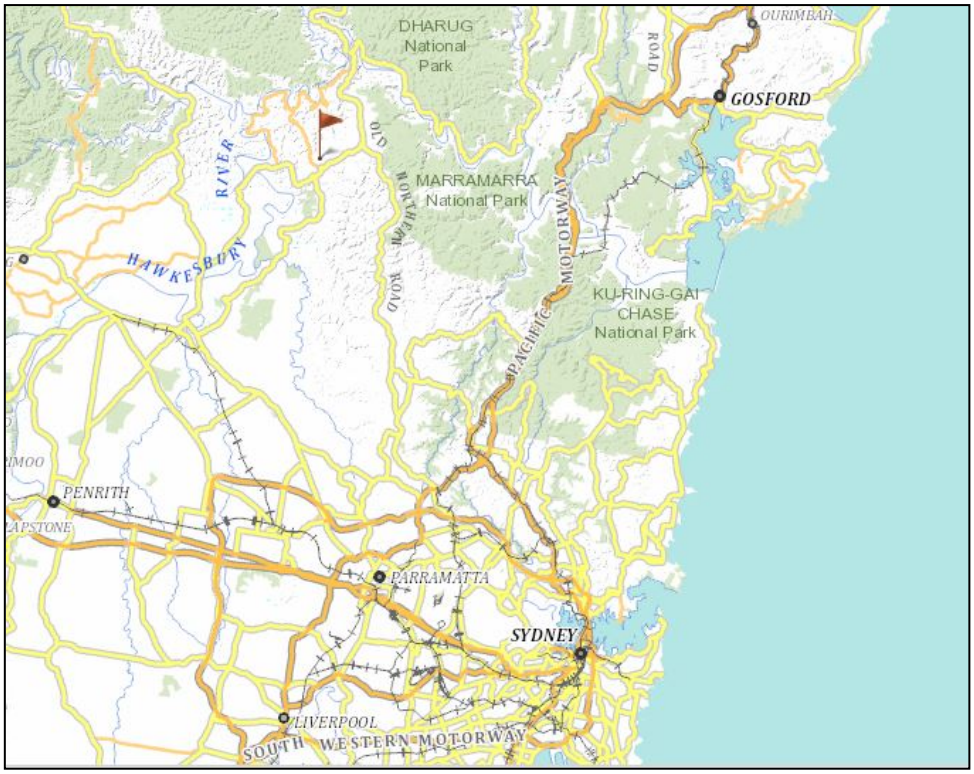


Figure 1: The site (red) in relation to the Sydney CBD and basin

Figure 2: Aerial map of the site (red) in relation to the Hawkesbury River and surrounding development in cleared areas

Figure 3: Aerial map of the site (yellow polygon) showing site boundaries in red (Source: Department of Lands SIX maps website accessed 15/3/2015)

1.3 Soils and Geology

Vegetation within the catchment is a result of the interaction of many environmental factors including the underlying geology, soil, rainfall, temperature, aspect and fire regime.

The site contains two soil types including Hawkesbury Sandstone and accumulated silt and clay from eroded soils (derived from Wianamatta Shale ridgetops).

On the Hawkesbury Sandstone the most extensive soils are grey and yellow-brown inform sands to sandy yellow leached gradational soils. They are strongly acidic and are characteristically deficient in phosphate and are often locally deficient in nitrogen. They also have poor water holding capacity. Shallow skeletal sands are common on the ridges, but in the gullies, sands may be metres deep, enriched by soil removed from the upper slopes, silt and organic matter. Where the shaley Narrabeen sandstone has been exposed in the deeper gullies, eroded shales form deep clay rich soils and these rich soils are accompanied by a change in vegetation. Shale lenses occur in both Hawkesbury and Narrabeen groups; their soils typically have sandy top soils overlying usually yellow clay subsoils (Ryan et al 1996).

1.4 Climate

The climate of the area is temperate and influenced by hot dry summers and mild to cool winters. The nearest Maroota (Old Northern Road) station shows a mean annual rainfall of 1036mm (Bureau of Meteorology website accessed 15/3/2015).

Summary statistics for all years — Information about climate statistics

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	96.5	112.4	103.3	85.1	59.2	92.2	46.2	52.9	54.0	65.6	80.3	79.9	913.9
Lowest	0.0	0.0	2.1	0.0	1.5	0.0	0.0	0.0	0.4	0.6	0.0	0.0	353.9
5th %ile	9.6	11.0	13.6	8.9	7.8	8.9	1.6	0.7	4.2	7.2	7.7	3.1	554.9
10th %ile	22.0	19.9	23.6	14.0	11.2	10.4	6.2	4.4	8.0	10.4	17.7	12.2	577.7
Median	73.6	81.5	84.0	59.8	43.7	55.2	26.3	22.5	41.4	53.7	68.8	76.5	903.0
90th %ile	178.1	232.9	194.2	159.3	113.8	237.8	112.2	140.9	123.0	153.1	155.0	174.3	1184.5
95th %ile	221.4	265.9	231.3	257.5	142.6	313.5	147.7	182.0	153.9	173.9	182.9	210.5	1513.2
Highest	395.5	464.9	437.7	467.2	370.1	445.4	250.6	497.4	174.0	220.3	208.3	375.0	1773.6

Figure 4: Summary rainfall statistics for all years for the Maroota (Old Northern Road) weather station

1.6 Proposed development

The proposed development includes subdivision of the existing 10 ha property on Lot 239 DP 752025 into 6 new individual lots comprising the following areas:

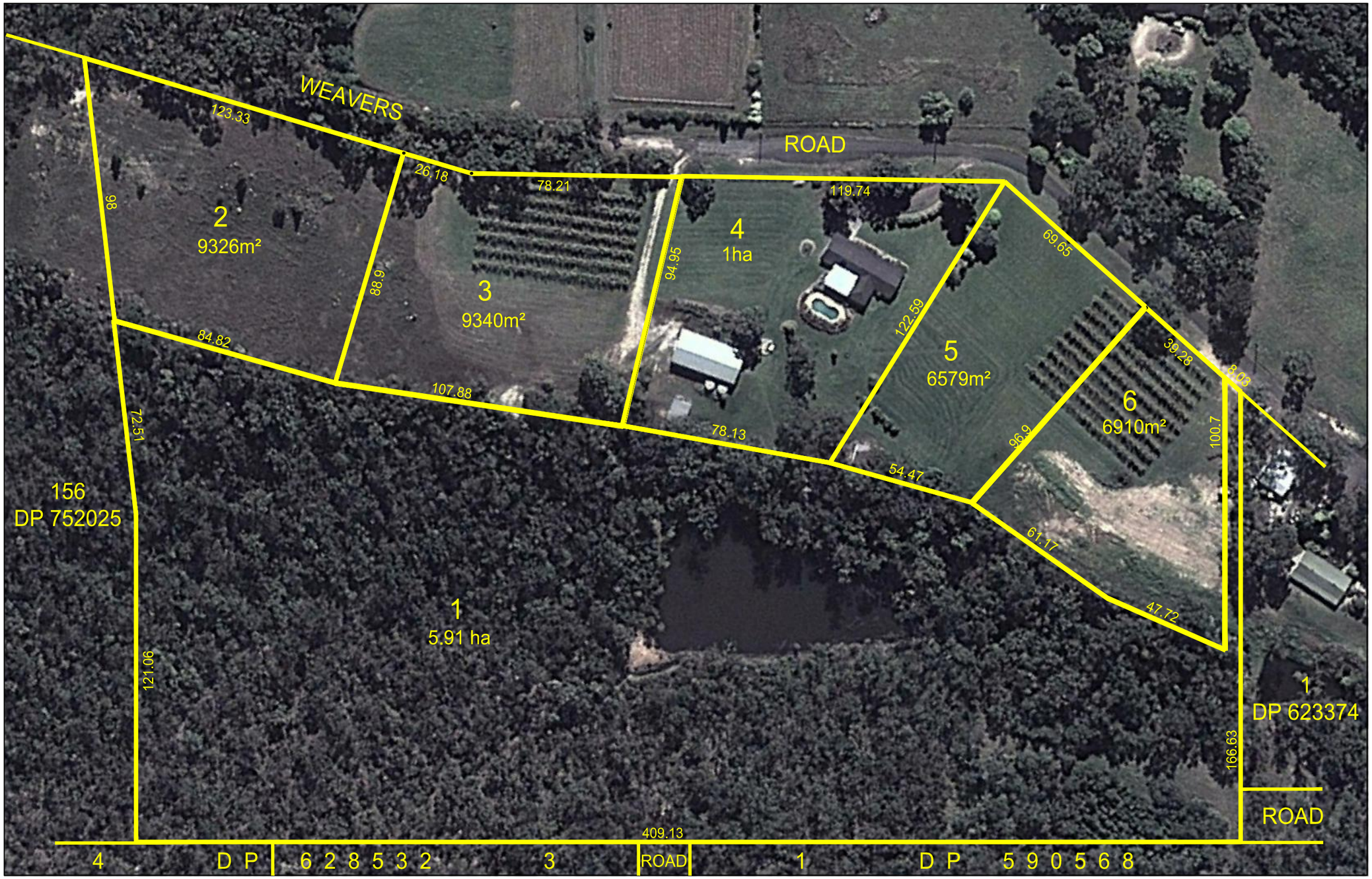
- Lot 1 – 5.91ha (bushland lot offered to Council)
- Lot 2 – 9326 sqm (existing cleared land)
- Lot 3 – 9340 sqm (existing cleared land/ former orchard)
- Lot 4 – 1 ha (existing house and rural shed to be retained)
- Lot 5 – 6579 sqm (existing cleared land/ former orchard)
- Lot 6 – 6910 sqm (existing cleared land/ former orchard)

The lots would be accessed off Weavers Road. The bushfire consultant has recommended a 65m Asset Protection Zone established south of existing cleared land (Figure 5).

This development application includes offering Council a residual lot of mapped Shale Sandstone Transition Forest Endangered Ecological Community vegetation comprising over half (5.91 ha) of the entire 10 (ten) hectare property. The residual lot would be down slope of the newly created allotments.

The proposed subdivision layout is provided on the following page.

MGA



DIAL 1100
BEFORE YOU DIG

NOTES

* NO FIELD SURVEY HAS BEEN UNDERTAKEN IN PREPARATION OF THIS PLAN.
* RELATIONSHIP OF IMPROVEMENTS AND DETAIL TO BOUNDARIES IS DIAGRAMMATIC AND IF CRITICAL SHOULD BE CONFIRMED BY A BOUNDARY SURVEY.
* ALL DIMENSIONS AND AREAS AREA APPROXIMATE ONLY AND ARE SUBJECT TO APPROVAL, FINAL SURVEY AND REGISTRATION OF PLAN AT THE LAND AND PROPERTY MANAGEMENT AUTHORITY NSW.
* THIS PROPOSAL IS AN INDICATIVE LAYOUT ONLY & IS SUBJECT TO CHANGE FOLLOWING FUTURE ADVICE FROM FLORA & FAUNA, BUSHFIRE & EFFLUENT REPORTS.

0m 10 20 30 40 50 75 100
Bar Scale
1:1500 (A3)

CLIENT Max Endicott

REV/DATE	DETAILS	SVY	DWN	CHK
C / 18.02.2014	AMEND LAYOUT	-	JM	JM
B / 28.01.2014	AMEND LAYOUT	-	SD	JM
A / 9.01.2014	INITIAL ISSUE	-	SD	JM

surveyplus
surveyors planners engineers
Inc. Barrie Green & Associates
P 02 9651 2921
F 02 9651 2501
info@surveyplus.com.au
www.surveyplus.com.au

DATE OF SURVEY	N / A
ORIGIN OF LEVELS	N / A
CONTOUR INTERVAL	N / A
CAD FILE No.	12266_SUB_C.dwg

TITLE

PLAN OF PROPOSED CLUSTER SUBDIVISION OF LOT 239 DP 752025 No.90 WEAVERS ROAD, MAROOTA

SCALE	1:1500 @ A3
REVISION	C
SHEET	1 OF 1
JOB No.	12266

Properties considered to be affected by possible bushfire impact are determined from the local Bushfire Prone Land Map as prepared by Council and / or the Rural Fire Service. All property development within affected areas is subject to the conditions detailed in the document '*Planning for Bush Fire Protection - 2006'* (PBP).

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Set back distances for the purpose of creating Asset Protection Zones (APZ) must be applied and any buildings must then conform to corresponding regulations detailed in *Australian Standard 3959 'Construction of buildings in bushfire-prone areas' - 2009*.

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In this instance the subject property is depicted on Council's Bushfire Prone Land Map as partly containing Category 1 Vegetation and being within the 100 metre buffer zone from Category 1 Vegetation. The subject site is therefore considered to be bushfire prone. Any development within a bushfire prone property is subject to the strict application of *Planning for Bush Fire Protection 2006* including set back restrictions (Asset Protection Zones) and building materials.

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The proposal relates to a rural subdivision and therefore it will be assessed under section 100B of the Rural Fires Act - 1997.

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Asset Protection Zones (APZ) for rural / residential subdivisions are determined from Table A2.4 of PBP or bushfire design modelling achieving a radiant heat impact of no more than 29 kW/m2 at the closest point of the available building footprint.

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This overlay depicts the minimum required Asset Protection Zones to achieve compliance with Planning for Bush Fire Protection 2006. Please note these Asset Protection Zones have been determined assuming all existing maintained grounds will be maintained in accordance with an Asset Protection Zone.

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There is opportunity to 'pull' the south-western APZ further down the slope within the existing native bushland, however you should seek the advice of an environmental expert before pursuing this concept.

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All proposed building footprints must be located within 200 metres of Weavers Road. Any new access drive servicing the proposed building footprints must provide a minimum 4 metre wide carriageway and provide loop access around the building footprints or a turning circle with a minimum 12 metre outer radius.

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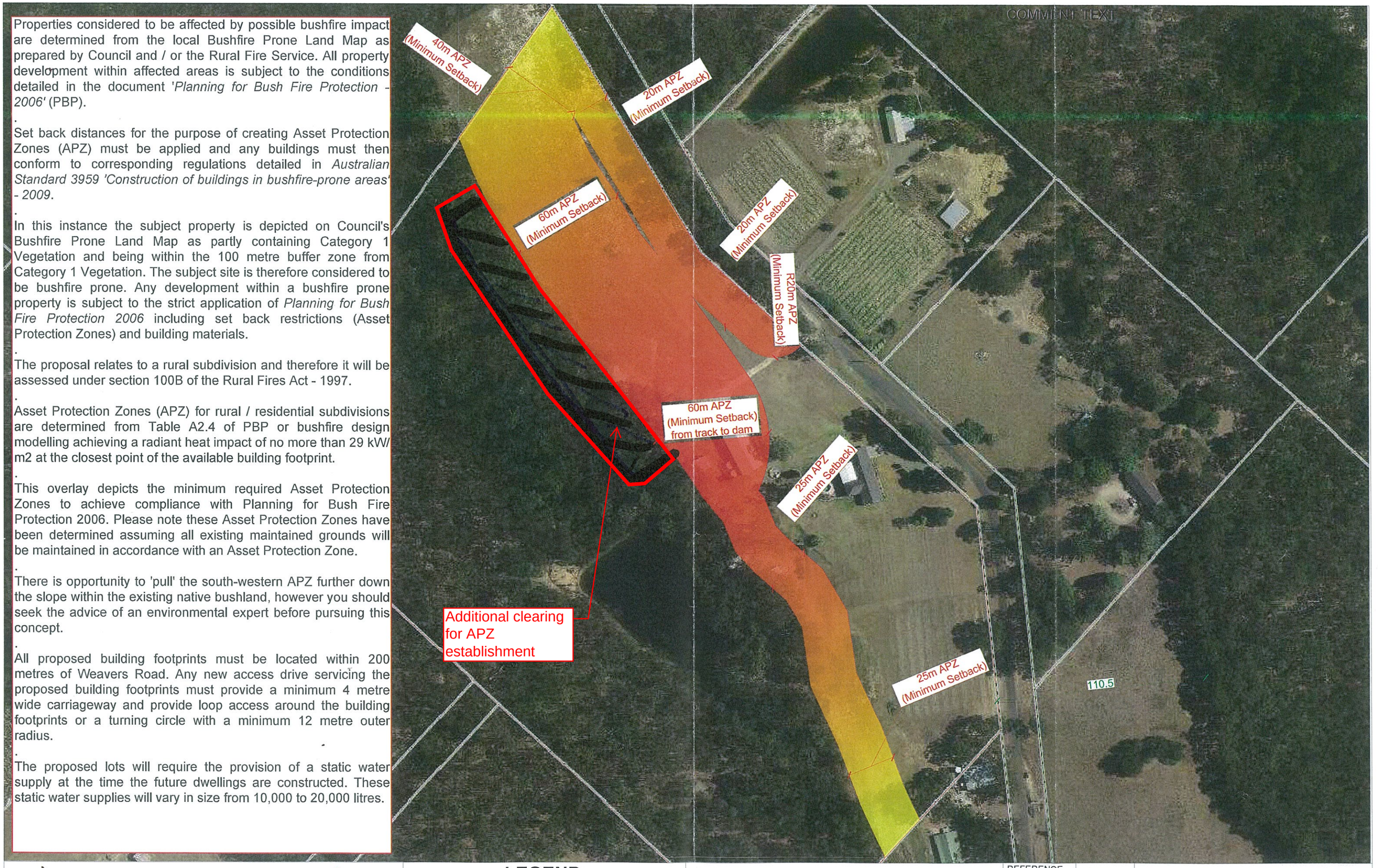
The proposed lots will require the provision of a static water supply at the time the future dwellings are constructed. These static water supplies will vary in size from 10,000 to 20,000 litres.



Building Code & Bushfire Hazard Solutions
(Pty. Limited) ABN 19 057 337 774
PO Box 124, Berowra NSW 2081
Telephone: (02) 9457 6530 Facsimile: (02) 9457 6532
www.bushfirehazardsolutions.com.au

FPA AUSTRALIA
Certified Business
Bushfire Planning & Design
BPD-BA-02354

LEGEND

APZ (IPA)

CONSTRAINTS OVERLAY

Figure 5: Extra area required for APZ

REFERENCE NO.	150714	LOT 239 DP 752025		
ADDRESS	90 WEAVERS ROAD, MAROOTA NSW 2756			
DATE.	26/02/2015	DRAWN BY	IT	SCALE: NTS
REVISION	A	REVISION DATE	26/02/2015	
CLIENT	MAX ENDICOTT			

2. Statutory Framework

The criteria used to assess likely impacts upon threatened species, populations or endangered ecological communities vary between Commonwealth and State jurisdictions. The following describes the legislative requirements for each level.

2.1. Commonwealth

The *Environment Protection and Biodiversity Conservation Act (1999)* (EPBC Act) is a nationally applicable Act that is administered by the Department of the Environment, Water, Heritage and the Arts. This Act requires approval for actions that are likely to have a significant impact on matters of National Environmental Significance (NES).

There are seven matters of NES that are triggers for Commonwealth assessment and approval. These are:

1. World Heritage properties;
2. National Heritage places;
3. Ramsar wetlands of international importance;
4. Nationally threatened species and communities;
5. Migratory species;
6. Nuclear actions; and
7. Commonwealth marine environment.

Threatened species and ecological communities are listed under Part 13, Division 1, Subdivision A of the EPBC Act 1999. Migratory species are listed under part 13, Division2, Subdivision A of the Act.

The Department of the Environment and Water Resources identifies the following:

"*Under the EPBC Act a person must not take an action that has, will have or is likely to have significant impact on any of these matter of NES without approval from the Commonwealth Environment Minister. There are penalties for taking such an action without approval.*

In general, an action that may need approval under the Act will involve some physical interaction with the environment, such as clearing native vegetation, building a new road, discharging pollutants into the environment, or offshore seismic survey.

If, following a referral, it is determined that that an action is likely to have a significant impact, and approval is therefore required, the action is called a 'controlled action'. The proposal will then undergo a formal assessment and approval process, and cannot proceed unless approval is granted.

If it is determined that an action is not likely to have a significant impact, then the action is not a controlled action. Approval under the EPBC Act is not required and the action may proceed, subject to obtaining any other necessary permits or approvals."

2.2. State

Threatened Species Conservation Act 1995

Section 5A of the (Environmental Planning and Assessment) EPA Act (1979) sets out seven factors that require consideration in terms of the likely significance of the impact of an action.

For the purposes of this Act and, in particular, in the administration of sections 78A, 79C (1) and 112, these seven factors must be taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats listed under the Threatened Species Conservation (TSC) Act (1995).

If the proposed works are on land that is, or is a part of, critical habitat, or is likely to significantly affect threatened species, populations or ecological communities, or their habitats, a Species Impact Statement (SIS) must be prepared.

An SIS provides an more detailed assessment of threatened biota issues and proposes measures to manage and mitigate adverse impacts on threatened species, populations or ecological communities, or their habitats, resulting from the proposal.

This assessment considers these factors in accordance with the aforementioned legislative requirements. It also provides conclusions in regard to the necessity for a Species Impact Statement.

Water Management Act 2000

Under Part 3 (Approvals], Division 1, Section 91 (2), a controlled activity approval confers a rights on its holder to carry out a specified controlled activity at a specified location in, on or under waterfront land. Waterfont land is defined as:

a) the bed of any river or lake, and any land lying between the bed of the river or lake and in a line drawn parallel to, and the prescribed distance inland of:

- in the case of non-tidal waters, the highest bank or shore above the river or lake, and
- in the case of tidal waters, the mean high water mark of the river or lake, and

b) if the regulations so provide, the bed of the coastal waters of the State, and any land lying between the shoreline of the coastal waters and a line drawn parallel to, and the prescribed distance inland of, the mean high water mark of the coastal waters, where the prescribed distance is 40 metres of (if the regulations prescribe a lesser distance, either generally or in relation to a particular location or class of locations) that lesser distance.

Under the WM Act, a controlled activity is defined as:

a) the erection of a building or the carrying out of work (within the meaning of the EPA&A Act), or

b) the removal of material (whither or not extractive material) or vegetation from land, whether by way of excavation or other wise, or

c) the deposition of material (whether or not extractive material) on land, whether by way of landfill operations or otherwise, or

d) the carrying out of any other activity that affects the quantity of or flow of water in a waters sources.

A controlled activity approval will not be granted unless the Minister is satisfied that adequate arrangements are in force to ensure that minimal harm will be done to any waterfront land as a s consequence of carrying out the proposed controlled activity.

3. Methodology

This chapter presents the methods used in conducting the ecological survey and assessment of the conservation importance of the study area.

3.1 Existing records

Records of threatened flora and fauna species and populations, listed in the schedule of the TSC and EPBC Acts, were obtained and reviewed to document known locations threatened and regionally significant fauna within the locality. The source of these records was the National Parks and Wildlife Services' Atlas of Wildlife and the Department of Environment, Water, Heritage and the Arts online Protected Matters Search Tool database (Appendix B) for an area covering approximately 10km radius of the subject site.

3.2. Literature review

A literature review was carried out. Of particular importance were those containing records of species, populations and communities of conservation significance. This background information informed the impact assessment.

The following information was relied upon in regard to local conservation and planning issues for this study.

1. ***Soil landscapes of the Sydney 1: 100 000 Sheet (Hazelton and Tile 1990)***

The subject site has been mapped as occupying the Hawkesbury and Wianamatta soil landscape as already described in Section 1.4.

2. ***The Natural Vegetation of the Sydney 1: 100, 000 Map Sheet (Benson and Howell 1994)***

This survey of the natural vegetation across the Sydney 1:100 00 map sheet classifies the subject as containing Sydney Sandstone Gully Forest (Map Unit Ag).

This mapping has been superseded by mapping by NPWS (2002) and Tozer (2003).

3. ***The Native Vegetation of the Sydney Cumberland Plain: Systematic classification and field identification of communities (Tozer 2003)***

This work was the result of a large and complex mapping program across the Cumberland Plain and some of the hilly country on its edge.

5. ***Hills Shire Council Vegetation Classification Mapping (updated 2010)***

Council's vegetation mapping program commenced in 2000 as part of Council's Sustainable Natural Assets Assessment Program and will continue to be updated as new data becomes available or more detailed survey worked is carried out.

The mapping incorporates aerial photography, vegetation/bushland cover and field survey work. The mapping identifies a variety of vegetation types across the Shire, including endangered ecological communities.

The vegetation mapping is available as 14 tiles for specific areas of the Shire as PDFs from the following link http://www.thehills.nsw.gov.au/vegetation-classification-mapping.html#.TtFPDBzdI1E.

3.3 Desktop survey

A desktop survey was performed to ensure all relevant documentation is considered when preparing the plan. Documents and other information resources utilised include:

- Aerial photographs (Google Maps, NearMaps & DPI Land Information)
- Architectural and Arborist Report
- Native Vegetation of the Cumberland Plain Maps (Tozer 2003)
- Soil Landscapes of the Sydney 1:100,000 Sheet (Hazerton and Tile 1990)

3.4 Field Surveys

A visual inspection was undertaken on the 15/3/2015 to identify and evaluate the current vegetation community occurring on the subject site, identify any threatened flora and fauna species and assess the current nature and extent of fauna habitats. Given the relatively small size of the site one day of surveying was considered an appropriate period of time to assess the native flora and fauna and values of the site. **Further targeted flora surveys were undertaken on 10th July 2015 within the area for the required APZ (Figure 5).**

Features of the vegetation including floristics, structure, extent, type and projective foliage cover, presence of weed species and other significant features were noted and recorded). All flora recorded were predominantly identified to family, genus and species level with confirmation according to *Field Guide to the Native Plants of Sydney* (Robinson, 2003), *Weeds of the south-east: an identification guide for Australia* (Richardson, 2006*), Tree & Shrubs in Rainforest of New South Wales and Southern QLD* (Williams et al 1984), *Native Plants of the Sydney District* (Fairly and Moore 2000) and the Botanic Gardens Trust (2009) *PlantNET* flora database.

It was not possible to determine with certainty all the fauna that utilise habitats in the subject site. This is because of the likely seasonal occurrences of some fauna species, the occasional occurrence of vagrant species, and because some species are difficult to detect because of their timid or cryptic behaviour. Therefore, fauna investigations comprised an assessment of fauna habitats present on site and an indication of their potential to support native wildlife populations and, in particular, threatened species.

The fauna habitat assessment criteria included:

Mammals: extent of ground cover, shrub layer and tree canopy, hollow-bearing trees, substrate type (for burrowing etc), evidence such as droppings, diggings, footprints, scratches on trees, nests, burrow paths and runways.

Birds: structural; features such as the extent and nature of the canopy, understorey and ground strata and flowering character

Reptiles and amphibians: cover shelter, suitable substrate, basking and breeding site availability, reptiles and frogs sough in likely sheltering places

Invertebrates: logs and other debris, leaf and bark accumulations around base of trees, grass clumps, loose soil for burrowing

Wildlife corridor values: Importance of the creek systems and riparian vegetation as movement corridors for fauna, especially birds, aquatic fauna, mammals (e.g. microchiropteran bats) & amphibians

3.5 Assessment of conservation value

Conservation value parameters

The conservation value of flora and fauna habitats on the subject site was determined by reference to the following criteria:

- Representativeness - whether the vegetation communities of the site are unique, typical or common in the bioregion. In addition the criteria takes into account whether or not such vegetation units are presently held in conservation reserves;
- the presence of threatened or regionally significant species on the site;
- the extent of human influence on the natural environment of the site and the condition of habitats (e.g. the presence of weeds, fire frequency, etc.);
- the uniqueness of the natural values of the site;
- the amount of native vegetation to be cleared or modified by the proposed development in relation to what remnant vegetation will remain in the locality; and
- the relative importance of the site as a corridor for the movement of wildlife.

4. Results

The site for the proposed development is essentially cleared paddocks and former orchards (Photograph 1and 2). Some native regrowth native vegetation was observed on proposed Lots 2 and 3, however, these were limited to a small diversity of common native species and no threatened plant species were recorded. These paddocks are essentially dominated by exotic pasture grasses and are of minor ecological significance.

Some remnant native trees occur along the Council nature strip technically outside of the subject site for the proposed development (Photograph 3). It is highly likely that that these trees can be retained whilst facilitating future dwelling houses on the proposed allotments.

The native vegetation outside the proposed allotments within the road reserve at the end of Weavers Road was consistent Council vegetation mapping as Shale Sandstone Transition Forest EEC. This vegetation will also remain unaffected by the proposed development.

Native bushland occurring with gully and hillside that is within proposed Lot 1 is consistent with Sydney Sandstone Gully Forest and Shale Sandstone Transition Forest EEC vegetation communities. This Lot is offered to Council for conservation in perpetuity unless Council wishes to develop it (unlikely).

A mixture of native and planted exotic tree specimens occur within proposed Lot 4 which is the existing homestead and rural shed. These trees are not proposed for removal.

The *Noxious Weeds Act 1993* defines the roles of government, councils, private landholders and public authorities in the management of noxious weeds. The Act sets up categorisation and control actions for noxious weeds and imposes penalties for various offences. *Lantana camara* is listed as a Class 4 under *Noxious Weeds Act 1993* for the Hawkesbury City Council LGA. Other introduced environmental weeds included African Lovegrass (*Eragrostis curvula* spp. *curvula*), Kikuyu (*Pennisetum clandestinum*) and Paspalum (*Paspalum dilatum*).

In the Hawkesbury City Council LGA, weed species pose a serious threat to native biodiversity, generally (depending on the type of species) increase the risk of bushfire, reduce productivity in primary industry and can block water courses.

No threatened species listed under the NSW *Threatened Species Conservation Act 1995* and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* were recorded on site and surrounding vegetation.

An inventory of all plant species recorded on the site have been provided on the following pages.

Figure 8 shows vegetation mapping zones of the site.

Re-growth native vegetation recorded within Lots 2 and 3

- *Kunzea ambigua*
- *Aristida vagans*
- *Lomandra obliqua*
- *Cyathochaeta diandra*
- *Acacia myrtifolia*
- *Pimelea linifolia*

No threatened plant species were recorded.

Photograph 1: Cleared paddocks of Lot 2 and 3 showing remnant vegetation of the road reserve in background

Photograph 2: Cleared paddocks (former orchards) of proposed Lots 5 and 6 showing Weavers Road on right side of photo

Plant species recorded within Weavers Road Reserve

Remnant bushland in the form of mapped Shale Sandstone Transition Forest occurs at the end of Weavers Road to the east of proposed Lots 2 and 3, outside the boundaries (Photograph 3and Figure 7&8).

Native species recorded in this area included:

- *Eucalyptus oblonga* (Sandstone Stringybark)
- *Corymbia eximea* (Yellow Bloodwood)
- *Corymbia gummifera* (Red Bloodwood)
- *Syncarpia glomulifera* (Sydney Turpentine)
- *Angophora bakeri* (Narrow-leaved Apple)
- *Allocasuarina littoralis* (Black She Oak)
- *Themeda australis* (Kangaroo Grass)
- *Leucopogon juniperinus*
- *Breynia oblongifolia (Coffee Bush)*
- *Pittosporum undulatum (Sweet Pittosporum)*
- *Acacia parramatensis*
- *Imperata cylindrica* (Blady Grass)
- *Aristida vagans* (Three Awn Grass)
- *Entolasia stricta*
- *Pratia purpurascens*
- *Paspalidium spp.*
- *Bossea lenticulata*
- *Persoonia pinifolia*
- *Persoonia levis*
- *Persoonia linearis*
- *Xanthorrhea media*
- *Bosseaea obcordata*
- *Acacia myrtifolia*
- *Anisopogon avecenus*
- *Dichelachne micrantha*
- *Hardenbergia vioalcea*
- *Glycine clandestine*
- *Isopogon anemifolius*
- *Petrophile pulchella*
- *Hakea dactyloides*
- *Lomandra filiformis*
- *Leptospermum polygalifolium*
- *Banksia spinulosa*
- *Gompholobium spp.*
- *Acacia brownii*
- *Hibbertia spp.*
- *Acacia suaveolens*

No threatened plant species were recorded.

Photograph 3: Remnant Shale Sandstone Transition Forest occurs at the end of Weavers Road

Plant species recorded within Lot 1 (dedicated to Council)

- *Eucalyptus oblonga* (Sandstone Stringybark)
- *Corymbia eximea* (Yellow Bloodwood)
- *Eucalyptus punctata* (Grey Gum)
- *Angophora bakeri* (Narrow-leaved Apple)
- *Eucalyptus piperita* (Sydney Peppermint)
- *Corymbia gummifera* (Red Bloodwood)
- *Syncarpia glomulifera* (Sydney Turpentine)
- *Angophora bakeri* (Narrow-leaved Apple)
- *Allocasuarina littoralis* (Black She Oak)
- *Themeda australis* (Kangaroo Grass)
- *Leucopogon juniperinus*
- *Breynia oblongifolia (Coffee Bush)*
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- *Pratia purpurascens*
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- *Bossea lenticulata*
- *Persoonia pinifolia*
- *Persoonia levis*
- *Persoonia linearis*
- *Xanthorrhea media*
- *Bosseaea obcordata*
- *Acacia myrtifolia*
- *Anisopogon avecenus*
- *Dichelachne micrantha*
- *Hardenbergia violacea*
- *Glycine clandestine*
- *Isopogon anemifolius*
- *Petrophile pulchella*
- *Hakea dactyloides*
- *Lomandra filiformis*

- *Leptospermum polygalifolium*
- *Banksia spinulosa*
- *Pteridum esculentum*
- *Acacaia linifolia*
- *Hakea spp.*
- *Kunzea ambigua*
- *Persoonia levis*
- *Caustis flexusoa*
- *Epacris microphylla*
- *Entolasia stricta*

No threatened plant species were recorded.

Photograph 4: Remnant Sydney Sandstone Gully Forest within proposed Lot 1 dedicated to Council

Plant species recorded within the Asset Protection Zone (Figure 5)

The proposed APZ area as shown in Figure includes Sandstone Gully Forest that includes the following species:

- *Eucalyptus oblonga* (Sandstone Stringybark)
- *Eucalyptus piperita* (Sydney Peppermint)
- *Corymbia eximea* (Yellow Bloodwood)
- *Eucalyptus punctata* (Grey Gum)
- *Angophora bakeri* (Narrow-leaved Apple)
- *Eucalyptus piperita* (Sydney Peppermint)
- *Corymbia gummifera* (Red Bloodwood)
- *Syncarpia glomulifera* (Sydney Turpentine)
- *Angophora bakeri* (Narrow-leaved Apple)
- *Allocasuarina littoralis* (Black She Oak)
- *Themeda australis* (Kangaroo Grass)
- *Leucopogon juniperinus*
- *Breynia oblongifolia (Coffee Bush)*
- *Pittosporum undulatum (Sweet Pittosporum)*
- *Grevillea sericea*
- *Grevillea mucronulata*
- *Monotoca elliptica*
- *Acacia parramatensis*
- *Acacia suaveolens*
- *Imperata cylindrica* (Blady Grass)
- *Aristida vagans* (Three Awn Grass)
- *Entolasia stricta*
- *Pratia purpurascens*
- *Paspalidium spp.*
- *Bossea lenticulata*
- *Persoonia pinifolia*
- *Persoonia levis*
- *Lomatia silaifolia*
- *Cassytha glabella*
- *LIndsaea microphylla*
- *Pultenaea elliptica*
- *Lambertia formosa*
- *Lomandra obliqua*
- *Gompholobium grandiflorum*
- *Petrophile pulchella*
- *Bauera rubioides*
- *Eripstemon australiasius spp. australiasius*
- *Xanthorrhea media*
- *Bosseaea lenticulata*
- *Acacia myrtifolia*
- *Acacia linifolia*
- *Dianella caerulea var. producta*
- *Dichelachne micrantha*
- *Hardenbergia violacea*
- *Glycine clandestine*
- *Isopogon anemifolius*
- *Petrophile pulchella*
- *Hakea dactyloides*
- *Angophora hispida*
- *Micrantheum ericoides*
- *Leptospermum polygalifolium*
- *Banksia spinulosa*
- *Banksia oblonga*
- *Geijeria salicifolia var.latifolia*
- *Cyathochaeta diandra*
- *Phyllanthus hirtellus*
- *Pteridum esculentum*
- *Acacaia linifolia*
- *Hakea spp.*
- *Kunzea ambigua*
- *Persoonia levis*
- *Caustis flexusoa*
- *Epacris pulchella*
- *Entolasia stricta*

No threatened plant species were recorded.

Photograph 5: Remnant Sydney Sandstone Gully Forest within proposed Asset Protection Zone

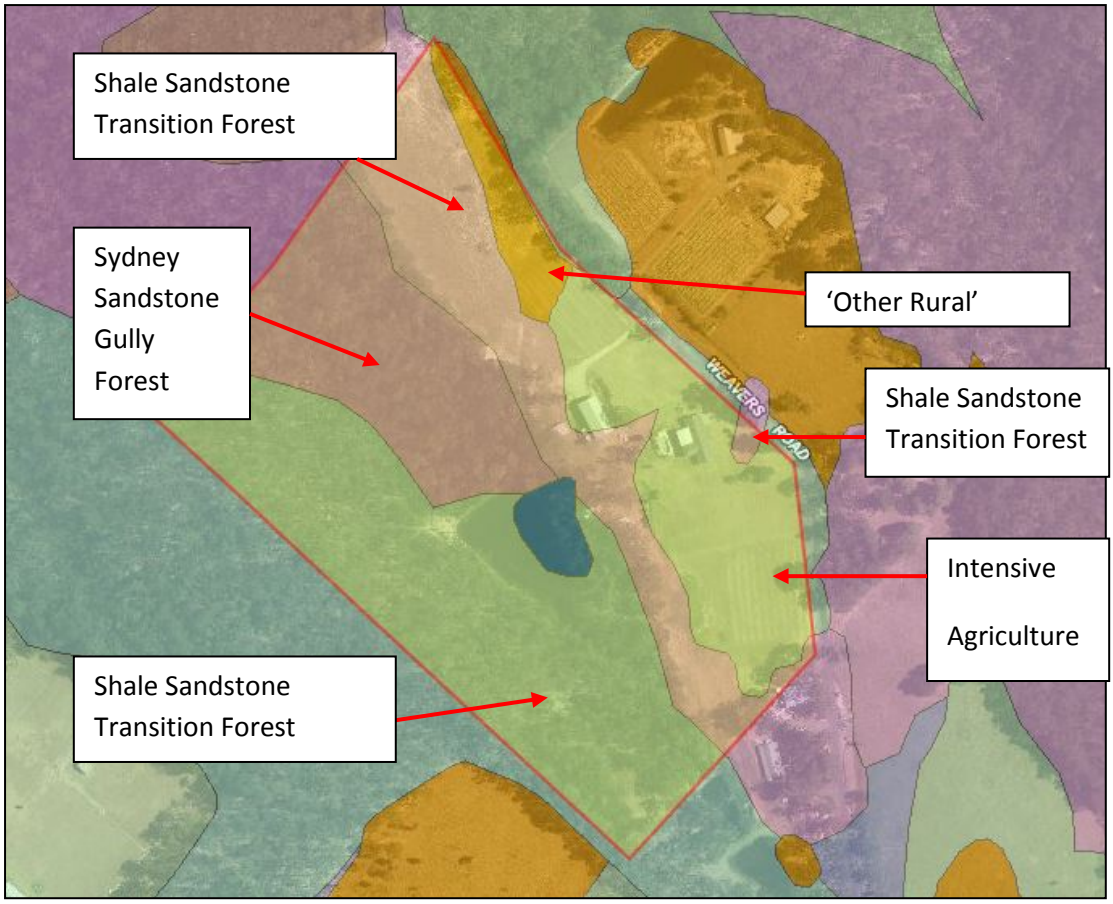

Figure 8: Broad-scale Council vegetation mapping (Source: SIX Maps Vegetation Viewer)

Figure 9: On ground observations of vegetation mapping zones

4.3 Fauna habitat and species

Fauna habitats present on site are limited to:

- Minimal leaf litter and groundcover vegetation
- Sparse upper canopy connectivity and roosting sites within remnant canopy trees
- Seed, pollen and fruit resources from Pittosporum and other fleshy fruit bearing weed species adjacent to the site
- Drainage gully and creek line with intact fully structured gully bushland occurring immediately down-slope of the development footprint is likely to form part of a local habitat corridor and refuge for a variety of native fauna

The main development impact area provides limited fauna habitat value, however, the surrounding bushland provides pristine fauna habitat features. A full list of species of animal that are likely to use these features that have been previously recorded within 5km of the site is shown Appendix A. A detailed targeted fauna survey program was not considered necessary for this assessment due to the perceived minimal impacts likely to occur as a result of the development proposal within the existing cleared area.

Large Forest Owls including threatened Powerful Owl (*Ninox strenua*) may occasionally visit the site depending upon the availability of prey such as Common Ringtail Possum (*Pseudocheirus ringus*), however important breeding habitats in the form of tree hollows are absent. The Sandstone Gully Forest provides refuge for Swamp Wallaby (*Wallabia bicolor*) and other ground-dwelling mammals and reptiles.

The good connectivity of the site and its function as a regional corridor as means that a variety of mobile threatened fauna are likely to be seasonally transient through the site. However, the site does not contain unique or critical habitat features that will be impacted by the proposed development. Appendix C provides a list of fauna previously recorded within 10km of the site.

4.4 State Environmental Planning Policy No.44 – Koala Habitat Protection

The site contains *Eucalyptus punctata* (Grey Gum) which is a known Koala feed tree species. Therefore, SEPP 44 has been considered in this Flora and Fauna Assessment.

Under SEPP 44, 'potential' Koala habitat means areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component. If potential koala habitat is identified then there is a requirement to assess the site for the occurrence of core koala habitat. The site does contain 'potential' Koala habitat.

Under the SEPP, 'Core' Koala habitat means an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population. No evidence of Koala were observed on site despite targeted searches of indirect evidence of their presence (i.e. scats, tracks and scratches near potential feed trees).

4.5 Corridors and connectivity

The biodiversity value of corridor networks is well known. Landscapes that retain more connections between patches of otherwise isolated areas of vegetation are more likely to maintain more numerous and more diverse populations of various plant and animal species (Lindenmayer and Fischer, 2006). Conversely, a lack of landscape connectivity can have a range of negative impacts on species populations (Lindenmayer and Fischer, 2006). It is thought that if existing remnants are left to persist without sufficient immigration to maintain genetic diversity, continued losses of biodiversity are certain (Parker *et al.* 2008).

The proposed development will not impact upon the corridor function of bushland on site.

4.6 Fauna of Conservation Significance

Commonwealth

Results from the Protected Matters Search Tool and the Atlas of NSW Wildlife database searches revealed a number of EPBC Act (1999) listed species that require consideration as part of this assessment (see Appendix A, B & C).

State

The results of the Atlas of NSW Wildlife/ Bionet (NSW Office of Environment & Heritage 2011) database search indicated that a number of threatened fauna species and population were recorded within 10 kilometres of the subject site (see Appendix A).

A Section 5A Assessment (also known as 'seven part tests') were not required due to the perceived unlikely impacts to occur listed species considered as result of database searches for previous records in the area.

The proposal is unlikely to constitute a significant impact on these species given that:

- NSW Atlas records exist for these species within the same locality
- the proposed works would only remove poor quality habitat for these species
- other areas of better quality habitat will be retained immediately adjacent to within the subject site and surrounding landscape
- the proposal is not likely to fragment habitat to an extent that would prevent dispersal and/or pollination of the local viable population that exists within the sub-catchment

5. Assessment of Ecological Impacts

This chapter evaluates if the proposed development will significantly impact on ecological processes and the conservation value of the subject site and neighbouring bushland areas, especially with respect to threatened biota and migratory fauna species, and their habitats, and on the ecological integrity of the landscape. It also recommends ways in which impacts can be minimised or avoided.

Trees proposed for removal

The proposed development includes the modification of approximately 5600 square metres of Sydney Sandstone Gully Forest (a locally common vegetation type) for the establishment of an Asset Protection Zone as per Figure 5:

Asset Protection Zones ensure that the presence of fuel, which could become involved in fire, is minimised. Minimum fine fuel is permitted at ground level, which could be set alight by bushfire. This area should be regularly mowed and all fuel removed e.g. fallen branches, leaf build-up.

General recommendations for maintenance of Asset Protection Zones:

- All vegetation will be maintained in a fuel free condition;
- Controlled burning is not required. Manual fuel reduction will sufficiently reduce fuel loads surrounding the proposed development;
- All trees will be maintained so that a continuous canopy is not formed;
- All regrowth of shrubs and bushes will be removed.

Refer to Appendix D of this report for more information on Asset Protection Zones. The specific management of the APZ shall be as per Council's Conditions and the bushfire management report. An Integrated Bushfire and Vegetation Management Plan can be provided by Fraser Ecological (post consent issued) if determined necessary by Council.

Overall loss of terrestrial flora and fauna habitat

Biodiversity is the diversity and richness of living things. This includes the variety of plant communities and animal habitats, and the number of different species. Most natural areas support a complex mixture of different species and plant communities. Biodiversity in disturbed areas is generally lower than in more pristine areas. An awareness on native biodiversity emphasis the conservation of the variety of native life, rather just rare or threatened species.

There are three important principles associated with ESD. These are:

- maintenance of native biodiversity
- erring on the side of caution when assessing and taking risks with the biological environment; and

- passing on to future generations a natural environment that is at least as good and enjoyable as our own.

- many species of forest flora and fauna are threatened both nationally and within NSW. This is largely a result of the clearing of this native habitat.

The proposed development is unlikely to result in the loss of biodiversity at a local, regional, state or national level. This is because no bushland will be removed from the site, the highly degraded or modified habitat area to be developed, the unlikelihood of the status of threatened or regionally significant species being significantly placed at risk, and the broader distribution of other fauna and flora species.

Impacts on wildlife corridor

The native vegetation present on the subject site is likely to function as a stepping stone for the movement of mobile fauna such as birds, microchiropteran bats and megachiropteran bats, through the presence of inter connecting canopy connectivity of trees. The proposal will interrupt upper canopy connectivity but this would not significantly impact upon the movement of wildlife and genetic exchange and dispersal of plant pollen in the local ecosystem.

Impacts on migratory species

Under the EPBC Act, a migratory species is significantly impacted on if a proposal will or is likely to:

- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycle), destroy or isolate an area of important habitat of the migratory species; or

- result in invasive species that are harmful to the migratory species becoming established in an area of important habitat of the migratory species; or

- seriously disrupt the life cycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the species.

Significant habitat for migratory species does not exist on site.

Impacts on threatened species

No species listed under the NSW *Threatened Species Conservation Act 1995* and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* were recorded on site. Threatened flora and fauna previous recorded within 10km of the site (OEH 2011) and have the potential to occur site have been considered in the table provided in Appendix A, B and C.

The proposal will **not** have a significant impact upon the local population of threatened species that may use the site as a marginal foraging area.

Impacts on Endangered Ecological Communities

The proposed development does not propose the removal of any trees. Future development on the site is unlikely to impact upon Shale Sandstone Transition Forest EEC.

6. Conclusion

The proposed works are unlikely to result in a significant impact upon species, populations and communities listed under the *Threatened Species Conservation Act 1995* and a Species Impact Statement is not required.

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APPENDIX A

EPBC Online Protected Matters Search Tool Results

The following report was generated on the 15th March 2015.

Australian Government

Department of the Environment

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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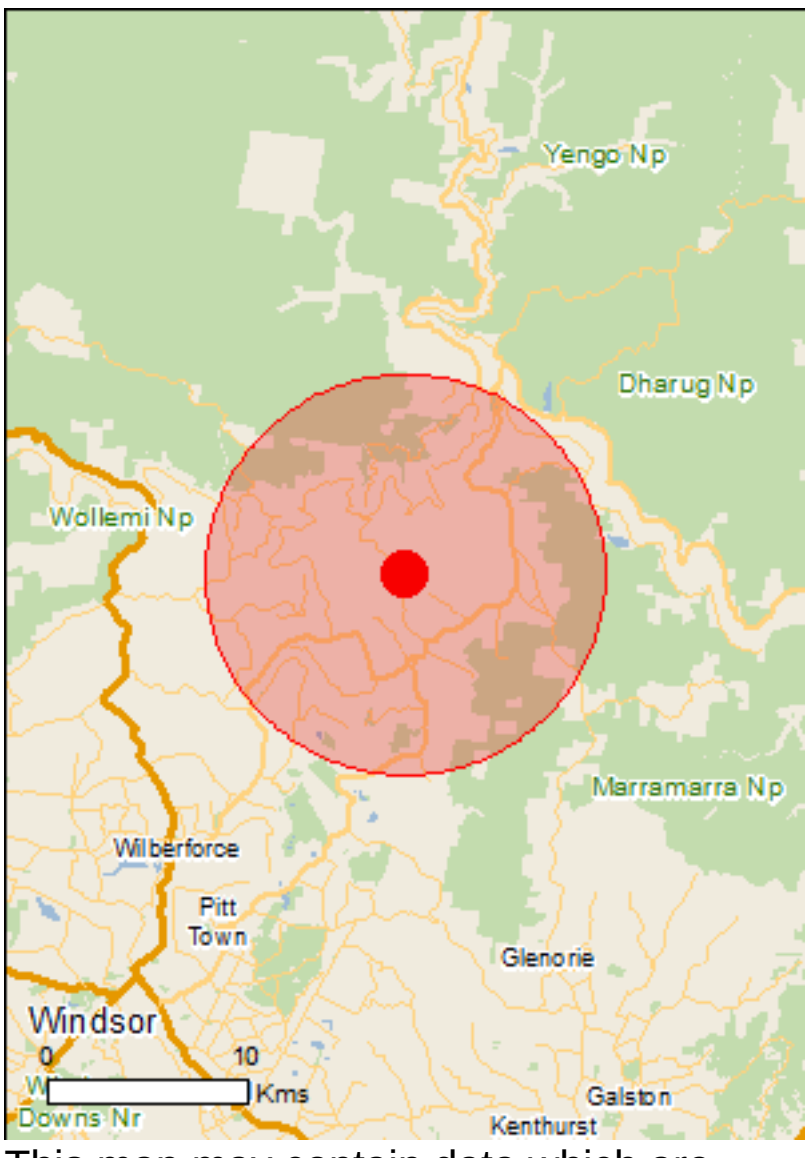

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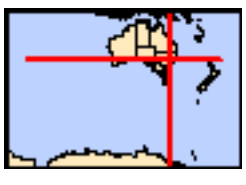


Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	2
National Heritage Places:	1
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	66
Listed Migratory Species:	33

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate.

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	2
Commonwealth Heritage Places:	None
Listed Marine Species:	34
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

Place on the RNE:	11
State and Territory Reserves:	7
Regional Forest Agreements:	1
Invasive Species:	51
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

World Heritage Properties [Resource Information]

Name	State	Status
Australian Convict Sites (Old Great North Road Buffer Zone)	NSW	Declared property
Australian Convict Sites (Old Great North Road)	NSW	Declared property

National Heritage Properties [Resource Information]

Name	State	Status
Historic		
Old Great North Road	NSW	Listed place

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	Critically Endangered	Community likely to occur within area
Shale Sandstone Transition Forest of the Sydney Basin Bioregion	Critically Endangered	Community likely to occur within area
Turpentine-Ironbark Forest in the Sydney Basin Bioregion	Critically Endangered	Community likely to occur within area
Western Sydney Dry Rainforest and Moist Woodland on Shale	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat likely to occur within area
Diomedea epomophora epomophora Southern Royal Albatross [25996]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora sanfordi Northern Royal Albatross [82331]	Endangered	Foraging, feeding or

Name	Status	Type of Presence
		related behaviour likely to occur within area
Diomedea exulans antipodensis Antipodean Albatross [82269]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans exulans Tristan Albatross [82337]	Endangered	Species or species habitat may occur within area
Diomedea exulans gibsoni Gibson's Albatross [82271]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Lathamus discolor Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta salvini Salvin's Albatross [82343]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris impavida Campbell Albatross [82449]	Vulnerable	Species or species habitat may occur within area
Fish		
Epinephelus daemelii Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Frogs		
[Heleioporus australiacus](#) Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat likely to occur within area
[Litoria aurea](#) Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat may occur within area
[Litoria littlejohni](#) Littlejohn's Tree Frog, Heath Frog [64733]	Vulnerable	Species or species habitat may occur within area
[Mixophyes balbus](#) Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat likely to occur within area
Mammals		
[Chalinolobus dwyeri](#) Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat known to occur within area
[Dasyurus maculatus maculatus (SE mainland population)](#) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area
[Isoodon obesulus obesulus](#) Southern Brown Bandicoot (Eastern) [68050]	Endangered	Species or species habitat may occur within area
[Petrogale penicillata](#) Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat likely to occur within area
[Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)](#) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
[Pseudomys novaehollandiae](#) New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
[Pteropus poliocephalus](#) Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Plants		
[Acacia bynoeana](#) Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat likely to occur within area
[Acacia gordonii](#) [5031]	Endangered	Species or species habitat likely to occur within area
[Allocasuarina glareicola](#) [21932]	Endangered	Species or species habitat likely to occur within area
[Asterolasia elegans](#) [56780]	Endangered	Species or species habitat known to occur within area
[Cryptostylis hunteriana](#) Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat may occur within area
[Darwinia biflora](#) [14619]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Genoplesium baueri Yellow Gnat-orchid [7528]	Endangered	Species or species habitat likely to occur within area
Haloragis exalata subsp. exalata Wingless Raspwort, Square Raspwort [24636]	Vulnerable	Species or species habitat may occur within area
Kunzea rupestris [8798]	Vulnerable	Species or species habitat likely to occur within area
Lasiopetalum joyceae [20311]	Vulnerable	Species or species habitat may occur within area
Leptospermum deanei Deane's Tea-tree [21777]	Vulnerable	Species or species habitat likely to occur within area
Melaleuca deanei Deane's Melaleuca [5818]	Vulnerable	Species or species habitat likely to occur within area
Micromyrtus blakelyi [6870]	Vulnerable	Species or species habitat likely to occur within area
Olearia cordata [6710]	Vulnerable	Species or species habitat likely to occur within area
Pelargonium sp. Striatellum (G.W.Carr 10345) Omeo Stork's-bill [84065]	Endangered	Species or species habitat likely to occur within area
Persoonia hirsuta Hairy Persoonia [19006]	Endangered	Species or species habitat likely to occur within area
Pimelea curviflora var. curviflora [4182]	Vulnerable	Species or species habitat known to occur within area
Pomaderris brunnea Rufous Pomaderris [16845]	Vulnerable	Species or species habitat likely to occur within area
Pterostylis gibbosa Illawarra Greenhood, Rufa Greenhood, Pouched Greenhood [4562]	Endangered	Species or species habitat may occur within area
Pterostylis pulchella Pretty Greenhood [6448]	Vulnerable	Species or species habitat may occur within
Pterostylis saxicola Sydney Plains Greenhood [64537]	Endangered	Species or species habitat likely to occur within area
Pultenaea parviflora [19380]	Vulnerable	Species or species habitat likely to occur within area
Streblus pendulinus Siah's Backbone, Sia's Backbone, Isaac Wood [21618]	Endangered	Species or species habitat likely to occur within area
Syzygium paniculatum Magenta Lilly Pilly, Magenta Cherry, Pocket-less Brush Cherry, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
[Thesium australe](#) Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area
[Zieria involucrata](#) [3087]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
[Eretmochelys imbricata](#) Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
[Hoplocephalus bungaroides](#) Broad-headed Snake [1182]	Vulnerable	Species or species habitat likely to occur within area
[Natator depressus](#) Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
[Apus pacificus](#) Fork-tailed Swift [678]		Species or species habitat likely to occur within area
[Diomedea antipodensis](#) Antipodean Albatross [64458]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
[Diomedea dabbenena](#) Tristan Albatross [66471]	Endangered*	Species or species habitat may occur within area
[Diomedea epomophora (sensu stricto)](#) Southern Royal Albatross [1072]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
[Diomedea exulans (sensu lato)](#) Wandering Albatross [1073]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea gibsoni](#) Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
[Diomedea sanfordi](#) Northern Royal Albatross [64456]	Endangered*	Foraging, feeding or related behaviour likely to occur within area
[Macronectes giganteus](#) Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
[Macronectes halli](#) Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta (sensu stricto) Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross [64459]	Vulnerable*	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons		
Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat likely to occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Telstra Corporation Limited

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat likely to occur within area
Diomedea antipodensis		
Antipodean Albatross [64458]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea dabbenena		
Tristan Albatross [66471]	Endangered*	Species or species habitat may occur within area
Diomedea epomophora (sensu stricto)		
Southern Royal Albatross [1072]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans (sensu lato)		
Wandering Albatross [1073]	Vulnerable	Foraging, feeding or

Name	Threatened	Type of Presence
		related behaviour likely to occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered*	Foraging, feeding or related behaviour likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta (sensu stricto) Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour likely

Name	Threatened	Type of Presence
		to occur within area
Thalassarche impavida		
Campbell Albatross [64459]	Vulnerable*	Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini		
Salvin's Albatross [64463]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Reptiles		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

Extra Information

Places on the RNE [Resource Information]

Note that not all Indigenous sites may be listed.

Name	State	Status
Natural		
Marramarra National Park	NSW	Indicative Place
Dharug National Park (1978 boundary)	NSW	Registered
Indigenous		
Devils Rock Maroota	NSW	Registered
Historic		
MacDonald Valley / Wollombi Valley Area	NSW	Indicative Place
Methodist Church (former)	NSW	Indicative Place
Solomon Wisemans Well	NSW	Indicative Place
Wisemans Ferry Settlement Site	NSW	Indicative Place
Great Northern Road Section	NSW	Registered
Sackville Cemetery	NSW	Registered
St Thomas Anglican Church	NSW	Registered
Tizzana Winery	NSW	Registered

State and Territory Reserves [Resource Information]

Name	State
Cattai	NSW

Name	State
Dharug	NSW
FMAs in MORISSET	NSW
LNE Special Management Zone No1	NSW
Maroota Ridge	NSW
Marramarra	NSW
Parr	NSW

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
North East NSW RFA	New South Wales

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Carduelis chloris European Greenfinch [404]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata Bitou Bush [16332]		Species or species habitat likely to occur within area
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Dolichandra unguis-cati Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Protasparagus densiflorus Asparagus Fern, Plume Asparagus [5015]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Senecio madagascariensis		
Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Ulex europaeus		
Gorse, Furze [7693]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus		
Asian House Gecko [1708]		Species or species habitat likely to occur within area

Coordinates

-33.45548 150.94386

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Geoscience Australia
-CSIRO
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

Department of the Environment
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111

APPENDIX B

Threatened flora previously recorded within 10km of the site

APPENDIX B: THREATENED SPECIES PREVIOUSLY RECORDED WITHIN 10KM OF THE SITE

Table A-1: Threatened plants previously recorded within 10km of the subject site (NSW Bionet and EPBC Protected Matters Database)

Scientific Name	Common Name	TSC Act	EPBC Act	ROTAP	Habitat
Olearia cordata		V	V	2Ra	Occurs chiefly from Wiseman's Ferry to Wollombi where it grows on sandstone in dry sclerophyll forest and open shrubland {Harden, 1992 #3}. Specifically this species occurs on exposed Hawkesbury Sandstone ridges in shallow or skeletal soils. Occurs on Gymea and Hawkesbury soil types and may be associated with shale. Associated species include Angophora costata, A. bakeri, Eucalyptus punctata and Corymbia eximia with understorey including Allocasuarina torulosa, Acacia linifolia, Persoonia linearis, Leucopogon muticus and grasses. Also been recorded with E.eugenioides or near Wollemi with E. oblonga, E. notabilis and Leptospermum trinervium. Corymbia gummifera and Angophora euryphylla also noted in northern areas {NSW National Parks and Wildlife Service, 2000 #277}.
Dillwynia tenuifolia		V	V	2Vi	Occurs on the Cumberland Plain from the Blue Mountains to Howes Valley area where it grows in dry sclerophyll woodland on sandstone, shale or laterite {Harden, 2002 #5}. Specifically, occurs within Castlereagh woodlands, particularly in shale gravel transition forest. Associated species include Eucalyptus fibrosa, E. sclerophylla, Melaleuca decora, Daviesia ulicifolia, Dillwynia juniperina and Allocasuarina littoralis {James, 1997 #69}.
Acacia bynoeana	Bynoe's Wattle	E1	V	3V	Occurs south of Dora Creek-Morisset area to Berrima and the Illawarra region and west to the Blue Mountains. It grows mainly in heath and dry sclerophyll forest on sandy soils {Harden, 2002 #5}. Seems to prefer open, sometimes disturbed sites such as trail margins and recently burnt areas. Typically occurs in association with Corymbia gummifera, Eucalyptus haemastoma, E. gummifera, E. parramattensis, E. sclerophylla, Banksia serrata and Angophora bakeri {NSW National Parks and Wildlife Service, 1999 #61}.
Acacia gordonii		E1	E	2K	Occurs in the lower Blue Mountains from Bilpin to Faulconbridge and also in the Glenorie district. Grows on sandstone outcrops and amongst rock platforms in dry sclerophyll forest and heath {Harden, 2002 #5; NSW Scientific Committee, 1997 #298}. Specifically this species occurs in Sydney Sandstone Ridgetop Communities {James, 1997 #69}.
Kunzea rupestris		V	V	2Va	Only known to occur between Glenorie and Maroota where it grows in heath on rock platforms {Harden, 2002 #5}.
Micromyrtus blakelyi		V	V	2V	Restricted to areas near the Hawkesbury River where it grows in heath in depressions on sandstone rock platforms {Harden, 2002 #5}.
Ancistrachne maidenii		V		2K	Occurs north of Sydney where it grows on sandstone derived soils {Harden, 1993 #4}. Thought to have specific habitat requirements, with populations occurring in distinct bands in areas associated with a transitional geology between Hawkesbury

Scientific Name	Common Name	TSC Act	EPBC Act	ROTAP	Habitat
					and Watagan soil landscapes {NSW Scientific Committee, 1999 #62}.
Grevillea parviflora		E1			Grows in sandy or light clay soils usually over thin shales, often with lateritic ironstone gravels and nodules. Sydney region occurrences are usually on Tertiary sands and alluvium, and soils edrived from the Mittagong Formation. Soil landscapes include Lucas Heights or Berkshire Park. Occurs in a range of vegetation types from heath and shrubby woodland to open forest. In Sydney it has been recorded from Shale Sandstone Transition Forest and in the Hunter in Kurri Sand Swamp Woodland. however, other communities occupied include Corymbia maculata - Angophora costata open forest in the Dooralong area, in Sydney Sandstone Ridgetop Woodland at Wedderburn and in Cooks River / Castlereagh Ironbark Forest at Kemps Creek.
Persoonia hirsuta ssp. hirsuta		E1		3Ki	Occurs from Gosford to the Royal National Parkand Hill Top to Glen Davis and Putty inland where it grows in woodlands and dry sclerophyll forest on sandstone or very rarely on shale. Typically occurs as isolated individuals or very small populations {NSW Scientific Committee, 1998 #64; Royal Botanic Gardens, 2005 #404}. Habitat in Castle Hill is considered to be "critical habitat" {James, 1997 #69}.
Zieria involucrata		E1	V	2Va	Occurs in the Blue Mountains where it grows in wet sclerophyll forest {Harden, 2002 #5}.
Lasiopetalum joyceae		V	V	2R	Occurs on lateritic to shaley ridgetops of the Hornsby Plateau where it grows in heath and open woodland in sandy soils on sandstone {NSW Scientific Committee, 1999 #18;Harden, 2000 #2;Fairley, 2002 #15}.
Pimelea curviflora var. curviflora		V	V		Confined to coastal areas around Sydney where it grows on sandstone and laterite soils. It is found between South Maroota, Cowan, Narrabeen, Allambie Heights, Northmead and Kellyville, but its former range extended south to the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly. Usually occurs in woodland in the transition between shale and sandstone, often on Lucas Heights soil landscape {NSW Scientific Committee, 1998 #65; James, 1997 #69; James, 1999 #68; Harden, 2000 #2}.
Tetratheca glandulosa		V	V	2V	Occurs from Mangrove Mountain to the Blue Mountains where it grows in sandy or rocky heath or scrub {Harden, 1992 #3}.
Hibbertia superans		E1 P			Flowering time is July to December. The species occurs on sandstone ridgetops often near the shale/sandstone boundary. Occurs in both open woodland and heathland, and appears to prefer open disturbed areas, such as tracksides. The fruit is dehiscent and the seed has a fleshy aril which attracts ants and encourages them to disperse the seeds. The soil seedbank is persistent. Highly sensitive to both frequent and infrequent fire and other disturbance regimes. The recommended minimum fire interval is unknown, however the recommended maximum fire interval is 25 years. An obligate seeder, it is usually killed by fire, sometimes resprouting from the base. Flowers first appear from resprouting material about 2 years after fire.

Scientific Name	Common Name	TSC Act	EPBC Act	ROTAP	Habitat
Leucopogon fletcheri subsp. fletcheri		E1 P			Occurs in dry eucalypt woodland or in shrubland on clayey lateritic soils, generally on flat to gently sloping terrain along ridges and spurs. Flowers August to September. Fruit produced October. Fire response unknown, but Leucopogon fletcheri subsp. brevisepalus is fire tolerant and capable of resprouting following fire.
Amperea xiphoclada var. pedicellata		E4 P			Amperea xiphoclada var. pedicellata was previously widespread in heath, woodland and forest in low-fertility, sandy soils.
Darwinia biflora		V P	V		Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. Associated overstorey species include Eucalyptus haemastoma, Corymbia gummifera and/or E. squamosa. The vegetation structure is usually woodland, open forest or scrub-heath.
Darwinia fascicularis subsp. oligantha		E2			Occurs around rock platforms and in rocky heath associated with friable sandstone shallow soils. Associated species include Allocasuarina nana, A. distyla, Banksia ericifolia and Caustis flexuosa. Flowers Spring - Summer. Stems are killed by fire and is likely to resprouts from the base. Will also germinate from soil stored seed after fire. Soil stored seed is persistent. Sensitive to too frequent and infrequent fire.
Asterolasia elegans		E1P	E		Occurs on Hawkesbury sandstone. Found in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest. The canopy at known sites includes Turpentine (Syncarpia glomulifera subsp. glomulifera), Smooth-barked Apple (Angophora costata), Sydney Peppermint (Eucalyptus piperita), Forest Oak (Allocasuarina torulosa) and Christmas Bush (Ceratopetalum gummiferum). Ecological knowledge about this species is very limited.

1: V= Vulnerable, E1= Endangered, E4 = Presumed extinct (*TSC Act 1995*)

2: V= Vulnerable, E1= Endangered, X = Presumed extinct (*EPBC Act 1999*)

3: Plant distribution: 2=Restricted distribution - range extending over less than 100km, 3=Range more than 100km but in small populations. Conservation Status: X=Presumed extinct - not collected for 50 years or the only known populations destroyed, E Endangered = at serious risk in the short term (one or two decades) ,V Vulnerable= at risk over a longer period (20-50 years), R Rare but with no current identifiable threat, K Poorly known species suspected of being at risk. Reservation Status: C= Species is known to occur within a proclaimed reserve, a= Species is considered to be adequately reserved. 1000 or more plants occur within a proclaimed reserve. i= Species is considered to be inadequately reserved. Less than 1000 plants occur within a proclaimed reserve.

APPENDIX C

Threatened fauna previously recorded

within 10km of the site

Table B-2: Threatened fauna previously recorded within 10km of the subject site (NSW Atlas of Wildlife and EPBC Protected Matters Database)

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat
Heleioporus australiacus	Giant Burrowing Frog	V	V	Appears to exist as two distinct populations: a northern population largely confined to the sandstone geology of the Sydney Basin, from Wollemi National Park in the north and extending south to Jervis Bay; and a southern population occurring in disjunct pockets from about Narooma south into eastern Victoria. In the northern population there is a marked preference for sandstone ridgetop habitat and broader upland valleys. In these locations the frog is associated with small headwater creeklines and along slow flowing to intermittent creeklines. The vegetation is typically woodland, open woodland and heath and may be associated with 'hanging swamp' seepage lines and where small pools form from the collected water. They have also been observed occupying artificial ponded structures such as fire dams, gravel 'borrows', detention basins and box drains that have naturalised over time and are still surrounded by other undisturbed habitat. Do not appear to inhabit areas that have been cleared for agriculture or for urban development. Breed in summer and autumn in burrows in the banks of small creeks. Often spends significant periods of time underground during unfavourable conditions and to avoid detection during the day. {Cogger, 2000 #20; NSW National Parks and Wildlife Service, 2001 #47}.
Pseudophryne australis	Red-crowned Toadlet	V		Occurs within 160 km of Sydney where it is restricted to Hawkesbury Sandstone. It breeds in deep grass and debris adjacent to ephemeral drainage lines. When not breeding individuals are found scattered on sandstone ridges under rocks and logs {Cogger, 2000 #20}.
Burhinus grallarius	Bush Stone-curlew	E1		Require sparsely grassed, lightly timbered, open forest of woodland. In southern Australia they often occur where there is a well structured litter layer and fallen timber debris. Feed on a range of invertebrates and small vertebrates, as well as seeds and shoots {NSW National Parks and Wildlife Service, 1999 #53; NSW National Parks and Wildlife Service, 2003 #54}.
Callocephalon fimbriatum	Gang-gang Cockatoo	V		Occurs in wetter forests and woodland from sea level to an altitude over 2000 metres, timbered foothills and valleys, coastal scrubs, farmlands and suburban gardens {Pizzey, 1997 #24}.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat
Calyptorhynchus lathami	Glossy Black-Cockatoo	V		Occurs in eucalypt woodland and forest with Casuarina/Allocasuarina spp. Characteristically inhabits forests on sites with low soil nutrient status, reflecting the distribution of key Allocasuarina species. The drier forest types with intact and less rugged landscapes are preferred by the species. Nests in tree hollows {Garnett, 2000 #21; NSW National Parks and Wildlife Service, 1999 #55}.
Lophoictinia isura	Square-tailed Kite	V	M	This species hunts primarily over open forest, woodland and mallee communities as well as over adjacent heaths and other low scrubby habitats in wooded towns. It feeds on small birds, their eggs and nestlings as well as insects. Seems to prefer structurally diverse landscapes {Garnett, 2000 #21}.
Ninox connivens	Barking Owl	V		Occurs in dry sclerophyll woodland. In the south west it is often associated with riparian vegetation while in the south east it generally occurs on forest edges. It nests in large hollows in live eucalypts, often near open country. It feeds on insects in the non-breeding season and on birds and mammals in the breeding season {Garnett, 2000 #21}.
Ninox strenua	Powerful Owl	V		A sedentary species with a home range of approximately 1000 hectares it occurs within open eucalypt, casuarina or callitris pine forest and woodland. It often roosts in denser vegetation including rainforest of exotic pine plantations. Generally feeds on medium-sized mammals such as possums and gliders but will also eat birds, flying-foxes, rats and insects. Prey are generally hollow dwelling and require a shrub layer and owls are more often found in areas with more old trees and hollows than average stands {Garnett, 2000 #21}.
Tyto novaehollandiae	Masked Owl	V		Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats. Pairs have a large home-range of 500 to 1000 hectares. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.
Tyto tenebricosa	Sooty Owl	V		Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. Roosts by day in the hollow of a tall forest tree or in heavy vegetation; hunts by night for small ground mammals or tree-dwelling mammals such as the Common Ringtail Possum (*Pseudocheirus peregrinus*) or Sugar Glider (*Petaurus breviceps*). Nests in very large tree-hollows.
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Occurs in moderately wooded habitats and roosts in caves, mine tunnels and the abandoned, bottle-shaped mud nests of Fairy Martins. Thought to forage below the forest canopy for small flying insects {Churchill, 1998 #26}.
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Occurs from the Bundaberg area in south-east Queensland, south through NSW to western Victoria and Tasmania. In NSW, it occurs on both sides of the Great Dividing Range and north-east NSW represents a national stronghold {NSW National Parks and Wildlife Service, 1999 #502}. Occurs in wide range of forest types, although appears to prefer moist sclerophyll and rainforest forest types, and riparian habitat. Most common in large unfragmented patches of forest. It has also been recorded from dry sclerophyll forest, open woodland and coastal heathland, and despite its occurrence in riparian areas, it also ranges over dry ridges. Nests in rock caves and hollow logs or trees. Feeds on a variety of prey including birds, terrestrial and arboreal mammals, small macropods, reptiles and arthropods {NSW National Parks and Wildlife Service, 1999 #27; NSW National Parks and Wildlife Service, 1999 #502}.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V		Usually roosts in tree hollows in higher rainfall forests. Sometimes found in caves (Jenolan area) and abandoned buildings. Forages within the canopy of dry sclerophyll forest. It prefers wet habitats where trees are more than 20 metres high {Churchill, 1998 #26}.
Miniopterus australis	Little Bent-wing Bat	V		Feeds on small insects beneath the canopy of well timbered habitats including rainforest, Melaleuca swamps and dry sclerophyll forests. Roosts in caves and tunnels and has specific requirements for nursery sites. Distribution becomes coastal towards the southern limit of its range in NSW. Nesting sites are in areas where limestone mining is preferred {Strahan, 1995 #185}.
Miniopterus schreibersii	Eastern Bent-wing Bat	V	C	Usually found in well timbered valleys where it forages on small insects above the canopy. Roosts in caves, old mines, stormwater channels and sometimes buildings and often return to a particular nursery cave each year {Churchill, 1998 #26}.
Mormopterus norfolkensis	Eastern Freetail-bat	V		Thought to live in sclerophyll forest and woodland. Small colonies have been found in tree hollows or under loose bark. It feeds on insects above the forest canopy or in clearings at the forest edge {Churchill, 1998 #26}.
Myotis adversus	Large-footed Myotis	V		Colonies occur in caves, mines, tunnels, under bridges and buildings. Colonies always occur close to bodies of water where this species feeds on aquatic insects {Churchill, 1998 #26}.
Petaurus australis	Yellow-bellied Glider	V		Restricted to tall, mature eucalypt forest in high rainfall areas of temperate to sub-tropical eastern Australia. Feeds on nectar, pollen, the sap of eucalypts and sometimes insects. Preferred habitats are productive, tall open sclerophyll forests where mature trees provide helter and nesting hollows and year round food resources are available from a mixture of eucalypt species {NSW National Parks and Wildlife Service, 1999 #44; NSW National Parks and Wildlife Service, 2003 #45}.
Petrogale penicillata	Brush-tailed Rock-wallaby	E1	V	Occurs in inland and sub-coastal south eastern Australia where it inhabits rock slopes. It has a preference for rocks which receive sunlight for a considerable part of the day. Windblown caves, rock cracks or tumbled boulders are used for shelter. Occur in small groups or "colonies" each usually separated by hundreds of metres {NSW National Parks and Wildlife Service, 2003 #49}.
Cercartetus nanus	Eastern Pygmy-possum	V		Found in a range of habitats from rainforest through sclerophyll forest to tree heath. It feeds largely on the nectar and pollen of banksias, eucalypts and bottlebrushes and sometimes soft fruits. It nests in very small tree holes, between the wood and bark of a tree, abandoned birds nests and shredded bark in the fork of trees (Turner 1995).
Phascolarctos cinereus	Koala	V		Found in sclerophyll forest. Throughout New South Wales, Koalas have been observed to feed on the leaves of approximately 70 species of eucalypt and 30 non-eucalypt species. However, in any one area, Koalas will feed almost exclusively on a small number of preferred species. The preferred tree species vary widely on a regional and local basis. Some preferred species in NSW include Forest Red Gum Eucalyptus tereticornis, Grey Gum E. punctata, Monkey Gum E. cypellocarpa and Ribbon Gum E. viminalis. In coastal areas, Tallowwood E. microcorys and Swamp Mahogany E. robusta are important food species, while in inland areas White Box E. albens, Bimble Box E. populnea and River Red Gum E. camaldulensis are favoured {NSW National Parks and Wildlife Service, 1999 #43; NSW National Parks and Wildlife Service, 2003 #31}.

Scientific Name	Common Name	TSC Act	EPBC Act	Habitat
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps. Urban gardens and cultivated fruit crops also provide habitat for this species. Feeds on the flowers and nectar of eucalypts and native fruits including lilly pillies. It roosts in the branches of large trees in forests or mangroves {NSW National Parks and Wildlife Service, 2001 #56; Churchill, 1998 #26}.
Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat	V		Occurs in eucalypt forest where it feeds above the canopy and in mallee or open country where it feeds closer to the ground. Generally a solitary species but sometimes found in colonies of up to 10. It roosts in tree hollows. Thought to be a migratory species {Churchill, 1998 #26}.
Scoteanax rueppellii	Greater Broad-nosed Bat	V		The preferred hunting areas of this species include tree-lined creeks and the ecotone of woodlands and cleared paddocks but it may also forage in rainforest. Typically it forages at a height of 3-6 metres but may fly as low as one metre above the surface of a creek. It feeds on beetles, other large, slow-flying insects and small vertebrates. It generally roosts in tree hollows but has also been found in the roof spaces of old buildings {Churchill, 1998 #26}.
Hoplocephalus bungaroides	Broad-headed Snake	E1	V	A nocturnal species that occurs in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they generally use rock crevices and exfoliating rock during the cooler months and tree hollows during summer {Webb, 1994 #51; Webb, 1998 #52}.
Xanthomyza phrygia	Regent Honeyeater	E1		The Regent Honeyeater builds a cup-shaped nest of fibres located in forks in live eucalypt (including Angophora) or she-oak canopy. The Regent Honeyeater mostly feeds on nectar from flowering eucalypts, especially boxes and ironbarks, and from Amyema cambagei. They also feed on the sugary exudates of insects (e.g. lerps) which become an important part of their diet when breeding. Within NSW, breeding sub-populations are fragmented and now occur mainly around the Capertee Valley in central-eastern NSW and the Bundarra-Barraba region in northern inland NSW. Minor and sporadic breeding occurs in other areas such as Warrumbungle National Park, Pilliga forests, Mudgee-Wollar region, and the Hunter and Clarence Valleys.
Neophema pulchella	Turquoise Parrot	V		Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Usually seen in pairs or small, possibly family, groups and have also been reported in flocks of up to thirty individuals. Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter. Forages quietly and may be quite tolerant of disturbance. However, if flushed it will fly to a nearby tree and then return to the ground to browse as soon as the danger has passed. Nests in tree hollows, logs or posts, from August to December. It lays four or five white, rounded eggs on a nest of decayed wood dust.
Varanus rosenbergi	Heath Monitor	V		Found in coastal heaths, humid woodlands, wet and dry sclerophyll forests. Mostly a terrestrial species it shelters in burrows, hollow logs and rock crevices {Cogger, 2000 #20}.

1: V= Vulnerable, E1= Endangered, E4 = Presumed extinct (*TSC Act 1995*)

2: V= Vulnerable, E1= Endangered, X = Presumed extinct (*EPBC Act 1999*)

APPENDIX D:

PLANNING FOR BUSHFIRE PROTECTION 2006 GUIDELINESFOR APZs

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.

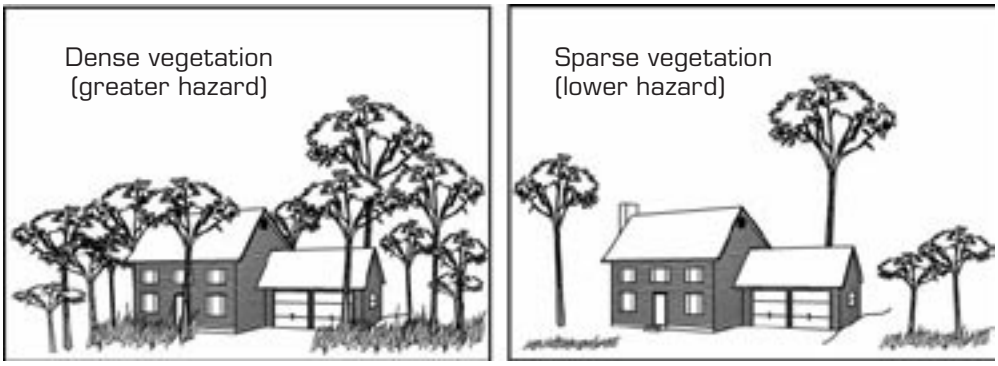
STEP 1. DETERMINE IF AN APZ IS REQUIRED

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.

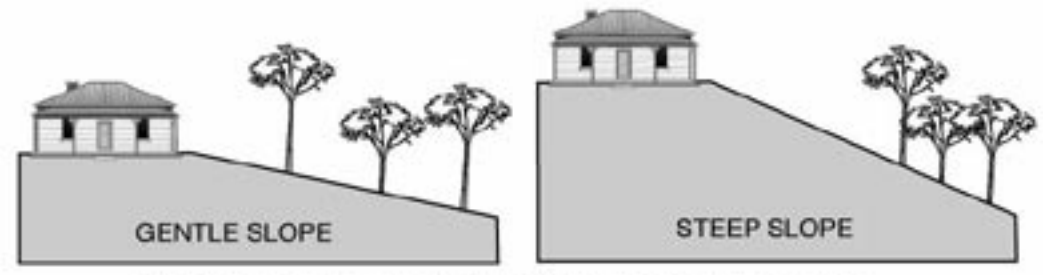
If your current development consent provides for an APZ, you do not need further approvals for works that are consistent with this consent.

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.

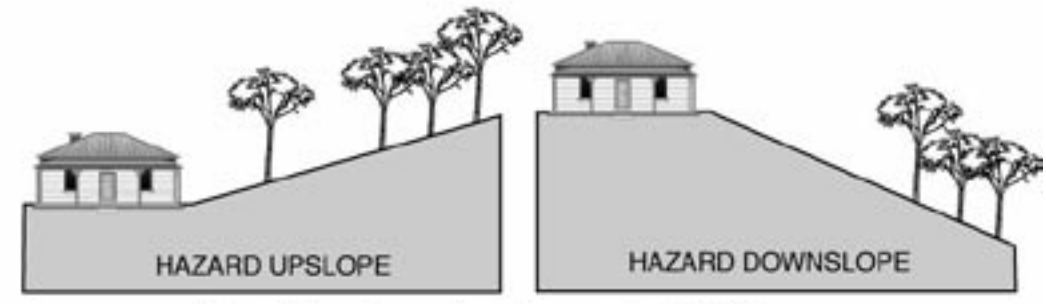
STEP 3. DETERMINE THE APZ WIDTH

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.

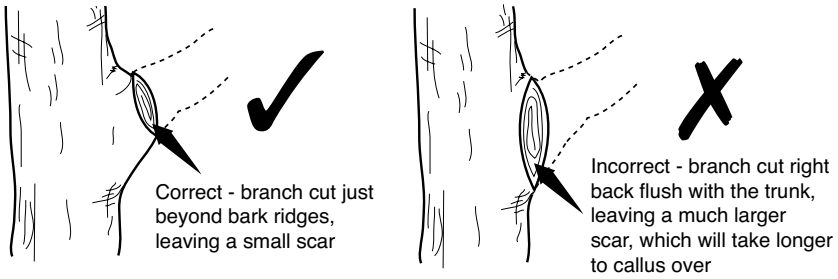
When choosing plants for removal, the following basic rules should be followed:

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.

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.

STEP 5. TAKE MEASURES TO PREVENT SOIL EROSION

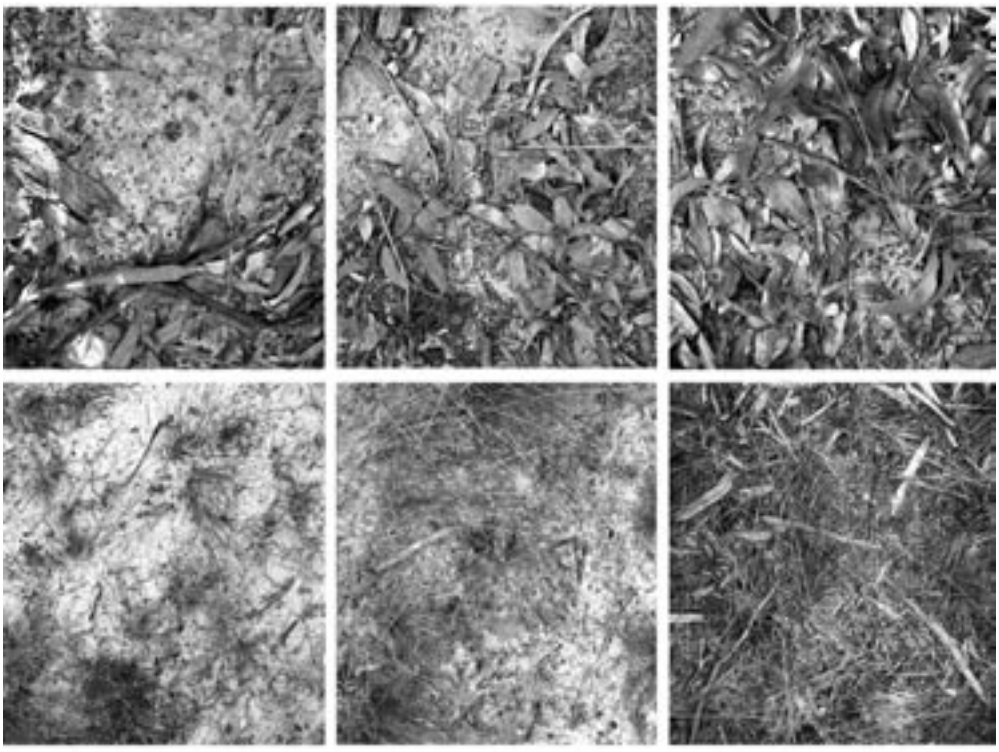
While the removal of fuel is necessary to reduce a bush fire hazard, you also need to consider soil stability, particularly on sloping areas.

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.

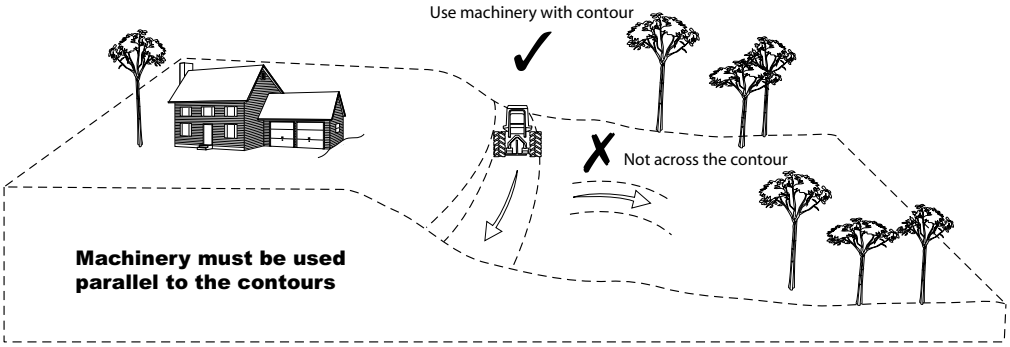
When using mechanical hazard reduction methods, you should retain a ground cover of at least 75% to prevent soil erosion. However, if your area is particularly susceptible to soil erosion, your Hazard Reduction Certificate may require that 90% ground cover be retained.



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.

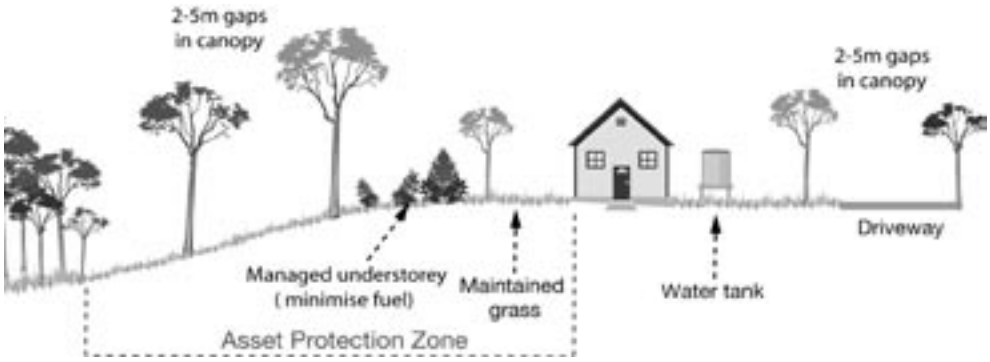


STEP 6. ONGOING MANAGEMENT AND LANDSCAPING

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.

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.*

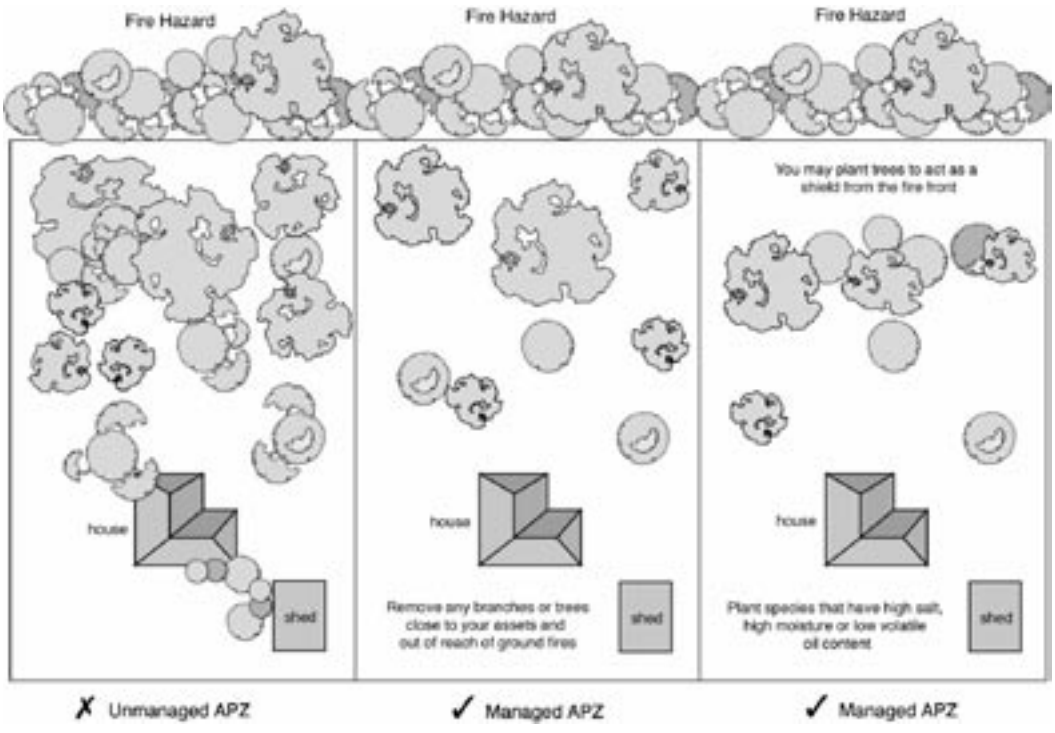
WIND BREAKS

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.

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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APPENDIX E

RELEVANT QUALIFICATIONS & EXPERIENCE

OF THE AUTHOR

Alex Fraser (Fraser Ecological Consulting) has over 10 years experience in ecological assessment and on-ground bushland restoration management. Previous work roles include ecological consulting with Parsons Brinckerhoff (large infrastructure), NPWS (biodiversity surveys), NSW Department of Environment and Climate Change (SIS DGRs) and Hornsby Shire Council (residential and light industrial development) have focussed primarily on ecological survey, development assessment, project management and policy development for consent authorities. Alex also has practical experience in landscape construction, bushland restoration and property management. A full list of flora and fauna assessments previously undertaken can be provided upon request.

Professional Affiliations include the Australian Association of Bush Regenerators, Ecological Society of Australia, Royal Zoological Society of NSW, Birds Australia, Australasian Bat Society, Urban Feral Animal Action Control Group (Sydney North Councils), Surfrider Foundation & Fred Hollows Foundation.

Relevant qualifications and training:

- Bachelor of Applied Science – Coastal Resource Management (Honours)
- Certificate 3 Natural Area Restoration (Ryde Horticultural College)
- Chemcert (Department of Natural Resources)
- Chainsaw Cross Cutting Techniques (Ryde Horticultural College)
- Certificate 3 Vertebrate Animal Pest Control (NSW DPI, Orange)
- OH&S General Induction for Construction Work (Work Cover NSW)
- Senior First Aid (St. Johns Ambulance Australia)
- Project Management 'the hard and soft skills' (NPWS- 2004)
- Frog, Bat and Reptile: species identification and survey skills (Forests NSW)
- Certificate 3&4 Japanese language proficiency (The Japan Foundation)
- Advanced Open Water SCUBA diver (PADI Australia)
- State Rail Contractor Safety Awareness (State Rail Authority)
- NPWS Scientific Licence (NSW Office of Environment and Heritage)