Appendix M – Specialist Box-Gum Woodland report

Roads and Maritime Services

Kapooka bridge - Species Impact Statement
Box-Gum Woodland and hollow-bearing trees

November 2013

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Terms and acronyms

The following definitions are used in this report and should be referred to when interpreting the results in this document:

DBH – diameter at breast height

Direct impacts – are those that directly affect the habitat and individuals, usually within the footprint of the proposal. They include, but are not limited to, clearing and habitat removal. Consideration must be given to all of the likely direct impacts of the proposed activity or development (DEC 2004).

EPBC Act – *Environment Protection and Biodiversity Conservation Act 1999*.

Indirect impacts - occur when project-related activities affect species, populations or ecological communities in a manner other than direct loss, usually beyond the footprint of the proposal. Indirect impacts can include loss of individuals through predation by domestic and/or feral animals, deleterious hydrological changes (including increased runoff and raising or lowering of the water table), erosion, weed invasion, pollution, trampling or other impacts due to increased human activity within or directly adjacent to sensitive habitat areas, altered fire regimes, habitat fragmentation and disruption of wildlife movement corridors. As with direct impacts, consideration must be given to all of the likely indirect impacts of the proposed activity or development (DEC 2004).

Likely – taken to be a real chance or possibility (DEC 2004).

Locality – the area within a 10 kilometre radius of the subject site.

OEH – Office of Environment and Heritage

Proposal – the development, activity or action proposed. In this case the construction of a new four lane bridge over the Great Southern Railway and realignment of the Olympic Highway to the east of the existing alignment at Kapooka near Wagga Wagga in south west New South Wales.

Region – in this case, region refers to the Wagga Wagga local government area.

Subject site – the area directly affected by the proposal. In this case the portion of land within which the bridge and highway realignment would be constructed.

Study area – means the subject site and any additional areas which are likely to be affected by the proposal, either directly or indirectly. The study area should extend as far as is necessary to take all potential impacts into account (DEC 2004). As a minimum the study area must include all land within 500 metres of the subject site.

Subject species – those species, populations and ecological communities listed in Table 1 of the Director Generals Requirements for the Kapooka bridge Species Impact Statement issued by the Office of Environment and Heritage on 13 December 2012.

TSC Act – *Threatened Species Conservation Act 1995*

1. Introduction

Roads and Maritime Services NSW (Roads and Maritime) proposes to construct a new four lane bridge and realign 2.7 kilometres of the Olympic Highway over the Great Southern Railway at Kapooka ('the proposal'). The proposed bridge would be located about 460 metres north of the existing bridge and would improve the Olympic Highway and Camp Access Road intersection. The proposal is located about eight kilometres south of Wagga Wagga in the Wagga Wagga Local Government Area (LGA) (Figure 1).

The existing bridge does not meet current network standards and poses a number of restrictions to traffic on the Olympic Highway and nearby Camp Access Road. In addition to addressing these restrictions, the new bridge is also required to cater for the increased overhead clearance requirements of trains on the Great Southern Railway.

1.1 Scope of work

GHD has been engaged by Roads and Maritime to undertake targeted surveys for White Box Yellow Box Blakely's Red Gum Woodland (Box-Gum Woodland) and hollow-bearing trees in the locality of the proposal. These surveys will inform the Species Impact Statement (SIS) being prepared for the proposal in accordance with the Director General's Requirements (DGRs).

The primary objectives of the targeted surveys are to:

- Map Box-Gum Woodland and hollow-bearing trees at representative locations in the locality using both desktop and ground-truthed field surveys.
- Map the on ground extent of Box-Gum Woodland and hollow-bearing trees in the subject site and study area using ground-truthed field surveys.
- Ground truth selected areas of Box-Gum Woodland and conduct transects for hollow-bearing trees in the locality.
- Produce a report for Box-Gum Woodland and hollow-bearing trees to address the matters outlined above and further outlined in the DGRs issued for the SIS.

1.2 DGRs - survey and reporting

In accordance with the project brief issued by Roads and Maritime for Box-Gum Woodland and hollow-bearing trees, targeted surveys and reporting specifically address Section 5.2 and 5.3 of the DGRs issued for the SIS.

Surveys for Box-Gum Woodland are to identify and map the extent and condition of the ecological community in the subject site, study area and locality. Vegetation surveys are to be conducted in the subject site and study area while surveys in the locality may include the use of datasets held by the Office of Environment and Heritage (OEH) and ground-truthing of selected sites.

Hollow-bearing tree surveys are to include the subject site, study area and locality, with intensive searches in the subject site and study area. Surveys in the locality are to include representative sampling using transects in selected locations.

Following targeted surveys a report would be compiled for Box-Gum Woodland. Section 5.2 of the DGRs requires a discussion of the local and regional abundance of subject species in accordance with Section 110 (2)(d) of the *Threatened Species Conservation Act 1995* (TSC Act). Section 5.3 requires an assessment of the habitat for Box-Gum Woodland, including size,

distribution and condition, in accordance with Section 110 (2)(f) and Section 110 (3)(c) of the TSC Act.

1.3 Assumptions

As per the project brief supplied by Roads and Maritime to GHD, we have assumed that this report in part, will be incorporated into the SIS and hence minimal supporting contextual information is required in this report. The report has been structured to specifically address sections 5.2 and 5.3 of the DGRs issued for the SIS as per the Roads and Maritime brief for this report.

It is noted that section 5.2.2 of the DGR's (discussion of habitat utilisation – section 3.1.2 of this report) is largely focussed on subject species not ecological communities. Therefore this section has been written with a focus on the outcomes of the hollow-bearing tree assessment which can later be used to inform some of the discussion outcomes of the specialist reports.

An assessment of significance has not been prepared as part of this report as the information in this report would be used to provide a revised assessment of significance in the final SIS.

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EUBERTA
GOBBAGOMBALIN
Murrumbidgee River
Olympic Highway
NORTH WAGGA WAGGA
WAGGA WAGGA
Sturt Highway
MOORONG
YARRAGUNDRY
SAN ISIDORE
ASHMONT
TURVEY PARK
EAST WAGGA WAGGA
GLENFIELD PARK
MOUNT AUSTIN
KOORINGAL
TOLLAND
LLOYD
BOURKELANDS
KAPOOKA
TATTON
LAKE ALBERT
SPRINGVALE
ROWAN
URANQUINTY
Sydney to Melbourne Rail Line
Olympic Highway
GREGADOO

520,000 530,000

LEGEND

- Sydney to Melbourne Rail Line
- Highway
- Murrumbidgee River
- Subject site
- Study area
- Locality
- Suburb

Paper size A3

0 1 2 4

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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GHD

Roads and Maritime Services
Kapooka bridge SIS - Box-Gum Woodland Surveys

Job Number	23-14107
Revision	0
Date	21 Nov 2013

Subject site, study area and locality

Figure 1

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Data source: NSW Roads and Maritime Services: Proposal site - 2012, aerial photography - 2013; NSW Government: Highways, railways, river, suburbs - 2012. Created by:rtrobinson

2. Methods

2.1 OEH consultation

A plan of the field survey methods was drafted and provided to OEH for their input and approval prior to the field surveys being undertaken. The methods were reviewed by OEH and following a teleconference between GHD, Roads and Maritime and OEH the Box-Gum Woodland and hollow-bearing tree survey methods were approved (see section 2.3.1 and 2.3.2).

2.2 Desktop review

2.2.1 Aerial photography and OEH vegetation mapping

Vegetation within the locality was viewed using satellite imagery. OEH provided GHD with the most recent vegetation mapping for the locality that included mapping of vegetation types using the Vegetation Classification Assessment (VCA). Vegetation types classified as Box-Gum Woodland were filtered and overlayed on the satellite imagery to produce a map showing locations of Box-Gum Woodland in the locality (Appendix A). This analysis is mostly limited to an analysis of the overstorey vegetation with varying levels of confidence on the classification of each patch.

Using this map, aerial photograph interpretation and GHD ecologists' knowledge of vegetation types in the locality, targeted areas that required investigation were highlighted for discussion and agreement prior to field surveys.

2.2.2 Previous ecological reports and surveys

A desktop review of previous surveys was conducted to determine the extent of Box-Gum Woodland in the locality and the extent of past surveys. A review of GHD's ecological assessment for the Kapooka bridge replacement (GHD 2012) was essential in efficiently and effectively identifying likely vegetation in the locality and those areas that were previously surveyed.

Information previously collected by GHD includes:

- Hollow-bearing tree data in all publicly accessible land and Planning Agreement Areas within the subject site and study area.
- Vegetation mapping in all publicly accessible land and Planning Agreement Areas in the subject site and study area.
- Vegetation plots in the subject site, study area and parts of the locality in Lloyd (GHD 2008).

2.3 Field survey

Targeted field surveys were conducted in the study area and locality from 31 July to 20 August 2013.

The primary objectives of the field surveys were to:

- Identify Box-Gum Woodland in the subject site, study area and locality, including:

  - Mapping vegetation using Plant Community Types (PCT's) from the NSW Vegetation Information System (VIS).
  - Recording vegetation condition using the definition of low condition vegetation outlined in the BioBanking Assessment Methodology (BBAM) (DECC 2009).
- Identify hollow-bearing trees in the subject site, study area and locality, including:
  - Intensive searches in the subject site and study area, identifying all hollow-bearing trees.
  - Representative sampling of the locality in selected locations.

2.3.1 Box-Gum Woodland

GHD surveyed 28, 50 metre by 20 metre plots (with nested 20 metre by 20 metre plots) in the study area and locality. This included plots undertaken during the preparation of the ecological assessment and other projects in the study area and locality. This allowed verification of the presence of Box-Gum Woodland. Within each plot, ten variables were recorded as per the BBAM. These ten variables were:

- Number of trees with hollows.
- Proportion of overstorey regeneration.
- Total length of fallen logs.
- Number of native plant species.
- Percent native overstorey cover.
- Percent native midstorey cover.
- Percent native groundcover grasses.
- Percent native groundcover shrubs.
- Percent native groundcover other.
- Percent exotic plant cover.

Cover abundances for all species were also recorded to assist in determining if areas of Box-Gum Woodland listed under the TSC Act also qualified for the Box-Gum Grassy Woodland critically endangered ecological community listed under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). This data collection would be made available to Roads and Maritime for any potential future requests from relevant agencies regarding the community's distribution in the locality.

Vegetation condition and plot numbers

In woody vegetation, the vegetation is considered to be in low condition if:

- Native overstorey per cent foliage cover is less than 25 per cent of the lower value of the overstorey per cent foliage cover benchmark for that vegetation type; and
  - Less than 50 per cent of groundcover vegetation is indigenous species; or
  - Greater than 90 per cent of groundcover vegetation is cleared (DECC 2009).

The number of plots completed is consistent with the BBAM for vegetation in moderate/good condition:

- Zero to four hectares – one plot per two hectares.
- Greater than four to 20 hectares – three plots.
- Greater than 20 to 50 hectares – four plots.

- Greater than 50 to 100 hectares – five plots.
- Greater than 100 to 250 hectares – six plots.
- Greater than 250 to 1000 hectares – seven plots.
- Greater than 1000 hectares – eight plots.

No plots outside the subject site were undertaken in vegetation in low condition due to the highly degraded state of low condition vegetation in the locality and common occurrence of low condition Box-Gum Woodland across the locality.

2.3.2 Hollow-bearing trees

All hollow-bearing trees in the subject site and study area were recorded (combined with data from the Kapooka bridge replacement ecological assessment (GHD 2012)). Locations of all hollow-bearing trees were logged using a GPS and the following attributes were recorded:

- Tree species.
- Diameter at breast height (dbh).
- Number of hollows in five different size classes:
  - Less than five centimetres diameter.
  - Five to 10 centimetres diameter.
  - Greater than 10 to 20 centimetres diameter.
  - Greater than 20 to 30 centimetres diameter.
  - Greater than 30 centimetres diameter.
- Hollow types (branch, spout or trunk).
- Observations of any evidence of use by fauna species e.g. wash, scratch marks, landing pads etc.

Hollow-bearing tree transects of 100 metres in length by 50 metres wide were undertaken at select locations in the locality. Transects were completed in a number of different vegetation types and were not restricted to Box-Gum Woodland.

2.3.3 Survey locations and effort

Survey method and effort for Box-Gum Woodland and hollow-bearing tree surveys are provided in Table 1 and Figure 2. Locations of surveys are outlined in Table 2.

Table 1 Survey method and effort for Box-Gum Woodland and hollow-bearing tree surveys.

Survey type	Dates	Method	Effort
Box-Gum Woodland	16 November 2007 (previous surveys) 6 December 2011 31 July 2013 13 to 15 August 2013 20 August 2013	50 metre by 20 metre plots with nested 20 metre by 20 metre plots. Visual assessment in low condition (no plots)	Eight, 50 metre by 20 metre plots in the study area. 18, 50 metre by 20 metre plots in the locality.
Hollow-bearing	6 December 2011	50 metre by 100 metre	All hollow-bearing trees

Survey type	Dates	Method	Effort
trees	14 March 2012 13 to 15 August 2013 20 August 2013	transects.	in the study area. 26, 50 metre by 100 metre transects in the locality.

Table 2 Survey locations for Box-Gum Woodland and hollow-bearing trees

Location	Survey type	Vegetation type surveyed
Thirteen Mile Reserve	Hollow-bearing tree transects and Box-Gum Woodland condition plots	Box-Gum Woodland and Tumbledown Red Gum Woodland
Coolamon Road TSR	Hollow-bearing tree transects and Box-Gum Woodland condition plots	Box Gum Woodland
CSU equine cross country course	Box-Gum woodland condition plot	Box Gum Woodland and Grey Box/White Cypress Pine Woodland (visual only)
Kapooka Military Area	Hollow-bearing tree transects and Box-Gum Woodland condition plots	Grey Box Woodland, Box-Gum Woodland, Dwyer's Red Gum Woodland
Malebo Range	Hollow-bearing tree transect	Grey Box Woodland
North Wagga Flats	Hollow-bearing tree transect	River Red Gum Woodland
Pomingalarna Reserve	Hollow-bearing tree transects and Box-Gum Woodland condition plots	Grey Box Woodland and Box-Gum Woodland
Private property (Gregadoo Hills)	Hollow-bearing tree transects and Box-Gum Woodland condition plots	Box-Gum Woodland and Tumbledown Red Gum Woodland
Red Hill Reserve	Hollow-bearing tree transects and Box-Gum Woodland condition plots	Box Gum Woodland
River Reserve	Hollow-bearing tree transect	River Red Gum Woodland
River Road	Hollow-bearing tree transect	River Red Gum Woodland
Burke's Creek TSR	Hollow-bearing tree transects and Box-Gum Woodland condition plots	Grey Box Woodland and Box-Gum Woodland
Willans Hill Reserve	Hollow-bearing tree transects and Box-Gum Woodland condition plots	Box-Gum Woodland

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Murrumbidgee River
Olympic Highway
Sturt Highway
Sturt Highway
Sydney to Melbourne Rail Line
Olympic Highway

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LEGEND

- Hollow-bearing tree transect
- Flora survey plot
- Sydney to Melbourne Rail Line
- Highway
- Murrumbidgee River
- Subject site
- Study area
- Locality

Paper size A3

0 1 2 4

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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Roads and Maritime Services
Kapooka bridge SIS - Box-Gum Woodland Surveys

Survey locations for Box-Gum Woodland plots and hollow-bearing tree transects in the locality

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Figure 2

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ata source: NSW Roads and Maritime Services: Proposal site - 2012, aerial photography - 2013; NSW Government: Highways, river - 2012. Created by:rtrobinson

3. Results

3.1 Local and regional abundance (DGRs section 5.2)

3.1.1 Discussion of other known local populations (DGRs section 5.2.1)

Box-Gum Woodland vegetation mapping

The OEH vegetation mapping classifies five different vegetation types in the locality that qualify as Box-Gum Woodland under the TSC Act:

- Blakely's Red Gum - White Box - Yellow Box - Black Cypress Pine box grass/shrub woodland on clay loam soils on undulating hills of central NSW South-western Slopes Bioregion.
- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South-western Slopes Bioregion.
- White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South-western Slopes Bioregion.
- White Box grassy woodland in the upper slopes sub-region of the NSW South-western Slopes Bioregion.
- Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South-western Slopes Bioregion.

In the locality, areas of Box Gum Woodland that qualify as the TSC Act community are restricted to larger vegetation patches and mostly do not include Box-Gum Woodland patches in low condition. OEH vegetation mapping of Box-Gum Woodland in the locality equates to about 1352 hectares (Appendix A). GHD conducted condition mapping of both moderate/good and low condition vegetation in representative locations across the locality. Some areas not previously mapped as Box-Gum Woodland were verified through field survey as were some areas mapped as Box-Gum Woodland that were actually Grey Box Woodland and vice versa. Notably, Willans Hill within the Wagga Wagga city limits contains about 130 hectares of native vegetation that has not been classified as Box-Gum Woodland in the OEH vegetation mapping but which for the most part qualifies as this community.

A revised Box-Gum Woodland vegetation map has been produced based on representative plot surveys in the locality. Where access to some patches was not possible or the site was not selected for validation, the condition of the site was assumed to be moderate/good.

Representative ground truthing of Box-Gum Woodland in the locality and the revised mapping indicate that there is about 1845 hectares of Box-Gum Woodland in the locality (Figure 3).

Condition

Identified Box-Gum Woodland vegetation types in the locality are all part of the Keith Class of Western Slopes Grassy Woodland. This class all have the same benchmark values in the Murrumbidgee catchment. The lower benchmark for native overstorey cover is eight. Therefore, for Box-Gum Woodland vegetation in the locality to be in low condition, the per cent foliage cover in the patch must be less than two per cent and the groundcover vegetation must be less than 50 per cent native.

Much of the scale of the OEH vegetation mapping would not include Box-Gum Woodland in low condition as these patches are more likely to occur as a scattered paddock tree type environment where there are canopy gaps greater than 50 metres. All vegetation mapped and ground truthed in the locality is in moderate/good condition (Figure 3).

Local occurrences

There are few remnants of Box-Gum Woodland in good condition in the locality. Remnants of the ecological community in the locality are largely restricted to isolated patches of canopy trees with a highly degraded understorey. These patches of Box-Gum Woodland are zoned either E2 (Environmental Conservation) or RE1 (Public Recreation) but do not have formal conservation agreements in place to protect these sites specifically for their biodiversity values. In addition, large areas of Box-Gum Woodland in the locality occur on Commonwealth land in the Kapooka Military Area

Major Box-Gum Woodland remnant vegetation patches in the locality include:

- Kapooka Military Area – part only
- Pomingalarna Reserve – part only, mostly Grey Box and *Allocasuarina verticillata*.
- Willans Hill Reserve.
- Red Hill Reserve.

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Pomingalarna Park

Red Hill Reserve

Willans Hill Reserve

Plum Pudding Reserve

Gregadoo Hills

LEGEND

Subject site
Study area
Locality

Box-Gum Woodland VCA vegetation type

- Blakely's Red Gum - White Box - Yellow Box - Black Cypress Pine box grass/shrub woodland on clay loam soils on undulating hills of central NSW South-western Slopes Bioregion
- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South-western Slopes Bioregion
- White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South-western Slopes Bioregion
- White Box grassy woodland in the upper slopes sub-region of the NSW South-western Slopes Bioregion
- Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South-western Slopes Bioregion

Note: all mapped vegetation communities are in moderate/good condition

Paper size A3

0 1 2 4

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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Ground-truthed vegetation mapping of Box-Gum Woodland in the locality

Figure 3

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Data source: NSW Roads and Maritime Services: Proposal site - 2012, aerial photography - 2013; NSW Office of Environment and Heritage: Vegetation mapping - 2013. Created by:rtrobinson

3.1.2 Discussion of habitat utilisation (DGRs section 5.2.2)

Box-Gum Woodland in the subject site represents about 0.7 per cent (12.8 hectares) of Box-Gum Woodland in the locality. Box-Gum Woodland in the subject site forms part of an east west corridor established for biodiversity conservation as part of the Wagga Wagga LEP 2010. Although the vegetation to be removed represents only 0.7 per cent of that in the locality, it occurs in an area that has been specifically targeted for conservation purposes. The project would create a north south break in Box-Gum Woodland vegetation through this conservation area.

A total of 240 hollow-bearing trees were identified in the study area and an additional 179 in the locality during the hollow-bearing tree surveys (section 3.2.1 and Appendix C).Therefore the total numbers of hollow-bearing trees in the locality is 439. Numbers of hollow-bearing trees are from 26 representative transects (50 metres by 100 metres), the subject site and study area and are not comprehensive of the entire locality. The removal of 13 trees from the subject site represents a likely over estimate of 2.9 per cent of hollow-bearing trees in the locality. The actual percentage is likely to be less than this given that not all hollow-bearing trees in the locality were recorded.

The 439 trees in the locality (inclusive of the study area) contain 1378 hollows. Forty-five hollows would be removed by the proposal which represents about 3.2 per cent of hollows recorded in the locality.

The size and number of hollows in the study area (including the subject site) and locality, is shown in Table 3. Thirteen trees would be removed by the proposal that includes 45 hollows. Hollow attributes of each individual tree in the subject site to be removed are in Appendix C.

Table 3: Size and numbers of hollows in the study area and locality

Hollow size (diameter)	Number in study area	Representative number in locality
<5 centimetres	191	222
>5-10 centimetres	234	238
>10-20 centimetres	157	164
>20-30 centimetres	50	65
>30 centimetres	24	33
TOTAL	**656**	**722**

A number of subject species identified in the DGRs are known to be hollow-dependent or at least use hollows at some point during their life cycle, including:

- Brown Treecreeper.
- Glossy-black Cockatoo.
- Turquoise Parrot.
- Superb Parrot.
- Little Lorikeet.
- Barking Owl.
- Squirrel Glider.

- Corben's Long-eared Bat.
- Southern Myotis.
- Yellow-bellied Sheathtail Bat.

A summary of the hollow-dependent subject species and the number of potential suitable habitat hollows for each species in the study area and representative number in the locality are outlined in Table 4.

Table 4 Hollow dependent subject species and the potential number of suitable hollows available in the study are and representative number on the locality.

Hollow-dependent subject species	Species minimum hollow size (cm)	No. of hollows in study area	Representative no. of hollows in locality	Recorded in the study area
Birds				
Barking Owl	≥20	74	172	No
Brown Treecreeper	≥6	465	965	Yes
Glossy Black-cockatoo	≥26	74	172	No
Little Lorikeet	≥3	465	965	Yes
Superb Parrot	≥6	465	965	Yes
Turquoise Parrot	≥10	231	493	No
Mammals				
Corben's Long-eared Bat	No minimum size	656	1378	No
Southern Myotis	No minimum size	656	1378	Yes
Squirrel Glider	≥5	465	965	Yes
Yellow-bellied Sheathtail-bat	No minimum size	656	1378	Yes

There is a resident population of Squirrel Gliders (*Petaurus norfolcensis*) present in the study area and subject site with the species recorded during past surveys and surveys for the SIS (van der Ree *et al*. 2013, GHD 2012). The species is listed as an endangered population in the Wagga Wagga LGA. Squirrel Gliders are dependent on hollows in trees for diurnal denning. Within the region they are known to use on average seven different hollows (some use as many as 13 different hollows) in response to the availability of food resources (Crane *et al* 2010). Hollows suitable for use by the species are usually greater than five centimetres diameter. 465 hollows in the study area and an additional 500 in the locality are a suitable size for denning for this species.

Hollows in the study area also provide potential roosting and breeding habitat for bat species, including the Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*) and Southern Myotis (*Myotis macropus*), which were recorded or potentially recorded during surveys for the SIS

(WSP 2013). Most hollow sizes are suitable for use by these species and therefore most hollows in the study area and locality provide suitable potential roosting sites for these species

A number of bird species are also known or likely to utilise hollow-bearing trees in the study area and locality for nesting requirements. The Brown Treecreeper (*Climacteris picumnus victoriae*) has been recorded in the study area during field surveys. This species requires hollows that are greater than or equal to six centimetres in diameter, 465 of which would be suitable nesting hollows for the species in the study area.

The Little Lorikeet (*Glossopsitta pusilla*) requires hollows about three centimetres in diameter for suitable nesting habitat, 465 of which would be suitable nesting hollows for the species in the study area. The Turquoise Parrot (*Neophema pulchella*), which has not been recorded in the study area, requires hollows about 10 centimetres by seven centimetres for suitable nesting habitat, 231 of which would be suitable nesting hollows for the species in the study area.

3.1.3 Description of vegetation (DGRs section 5.2.3)

Box-Gum Woodland is an open woodland community characterised by three main canopy species, White Box (*Eucalyptus albens*), Yellow Box (*E. melliodora*) and Blakely's Red Gum (*E. blakelyi*), of which one or more may be present. Intact sites, which are rare, contain a high diversity of other strata plant species and support a range of fauna species, many of which are threatened themselves. Modified sites include those where the canopy is completely absent and only the grassy groundlayer remains, and those where the canopy species are present and the groundlayer is comprised of predominantly introduced species (OEH 2013a).

The study area consists of woodland dominated by White Box (*Eucalyptus albens*), which complies with the classification criteria for the NSW plant community type (PCT) *White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion* (PCTID 266) (OEH 2013b) (Figure 4). All vegetation in this community is in moderate/good condition as defined under the BioBanking Assessment Methodology (DECC 2009).

In the study area, areas of native grassland that are likely to have once supported a canopy of White Box were classified as the derived grassland form of the community (Figure 4). Woodland on the south-eastern side of the proposed road-over-rail bridge is predominantly grassy with an overstorey of White Box and no shrubs. Woodland on the north-western side of the proposed bridge is a mix of mature and regenerating White Box with a grassy understorey and midstorey of regenerating Golden Wattle (*Acacia pycnantha*).

There are patches of Box-Gum Woodland in Pomingalarna Reserve, in the locality, that contain a co-dominant canopy of White Box, White Cypress Pine (*Callitris glaucophylla*) and Western Grey Box (*E. microcarpa*). These areas of woodland comply with the classification criteria for the NSW PCT *White Box – White Cypress Pine – Western Grey Box shrub-grass-forb Woodland in the NSW South Western Slopes Bioregion* (PCT ID 267) (OEH 2013b).

Box-Gum Woodland patches where plots were completed in the study area and locality and their corresponding PCT ID's are in Table 5.

Table 5 Box-Gum Woodland patches and their corresponding PCT ID

Plot No. and location	PCT ID
Plot 1, 2 and 3. Pomingarlarna Reserve	• Plot 1 and 2 - PCTID 266 – White Box Grassy Woodland in the upper slopes sub-region of the NSW South Western Slopes bioregion. • Plot 3 - PCTID 267 – White Box – White Cypress Pine – Western Grey Box shrub/grass/forb Woodland in the NSW South Western Slopes bioregion.
Plot 4 Uranquinty TSR	PCTID 276 - Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South-western Slopes bioregion
Plot 5, 6 and 7 Willans Hill	PCTID 266 – White Box Grassy Woodland in the upper slopes sub-region of the NSW South Western Slopes bioregion.
Plot 8, 9, 10 and 11 Kapooka Military Area	• Plot 8 and 9 - PCTID 266 – White Box Grassy Woodland in the upper slopes sub-region of the NSW South Western Slopes bioregion. • Plot 10 – PCTID 277 - Blakely's' Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes bioregion • Plot 11 – PCTID 346 – White Box - Blakely's Red Gum - White Cypress Pine shrubby woodland on metamorphic hills in the Wagga Wagga - Cootamundra region of the NSW South Western Slopes bioregion
Plot 12 Red Hill Reserve	PCTID 267 – White Box – White Cypress Pine – Western Grey Box shrub/grass/forb Woodland in the NSW South Western Slopes bioregion.
Plot 13 13 Mile Reserve	PCTID 266 – White Box Grassy Woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion.
Plot 14 Equine cross country	PCTID 276 - Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South-western Slopes bioregion
Plot 15 Coolamon Road reserve	PCTID 277 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South-western Slopes bioregion
Plot 16 to 27 Subject site, study area and Lloyd locality	PCTID 266 – White Box Grassy Woodland in the upper slopes sub-region of the NSW South Western Slopes bioregion.

White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion (PCTID 266) is the most commonly occurring vegetation type in the study area. Parts of the study area were mapped by OEH as native grasslands; however these are likely to be derived grassland of PCTID 266 rather than part of the Keith vegetation Class of Riverine Plain Grasslands. Ground-truthed vegetation types in the study area are outlined in Table 6 and Figure 4. Of the 208.4 hectares of the mapped vegetation in the study area, 168.3 hectares is Box-Gum Woodland.

Table 6 Plant community types and areas within the study area

PCT	TSC Act	Area (ha) in study area
White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes bioregion (PCTID 266)	Box-Gum Woodland	155
White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South-western Slopes bioregion (PCTID 267)	Box-Gum Woodland	2.1
Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South-western Slopes bioregion (PCTID 277)	Box-Gum Woodland	11.2
Planted woody vegetation	Not listed	40.1
TOTAL area all vegetation		**208.4 ha**
TOTAL area Box-Gum Woodland		**168.3 ha**

Species diversity and cover abundance for each plot in the locality are presented in Appendix B and variables recorded in each plot are in Appendix D.

Much of the vegetation in the study area is in good condition structurally and floristically. The derived native grasslands in the central and eastern sections of the study area are lacking the canopy, midstorey and shrub structural complexity but have a high number of native species in the groundcover and have more than 50 per cent cover of native species in most areas.

The southern section of Silvalite Reserve (south of Red Hill Road) is structurally and floristically diverse with a canopy of White Box of various ages (old growth, early regeneration and middle aged), a naturally sparse mid storey and shrub layer and a diverse native dominated understorey. The southern and western sections of the study area are predominately cleared and consist of introduced or pasture improved grasslands with scattered old growth paddock trees. These areas are low in structural and floristic diversity and have little potential for recovery given past and current management practices. The north and north-western sections of the study area include large areas of planted woody vegetation of which some is native but most is introduced species.

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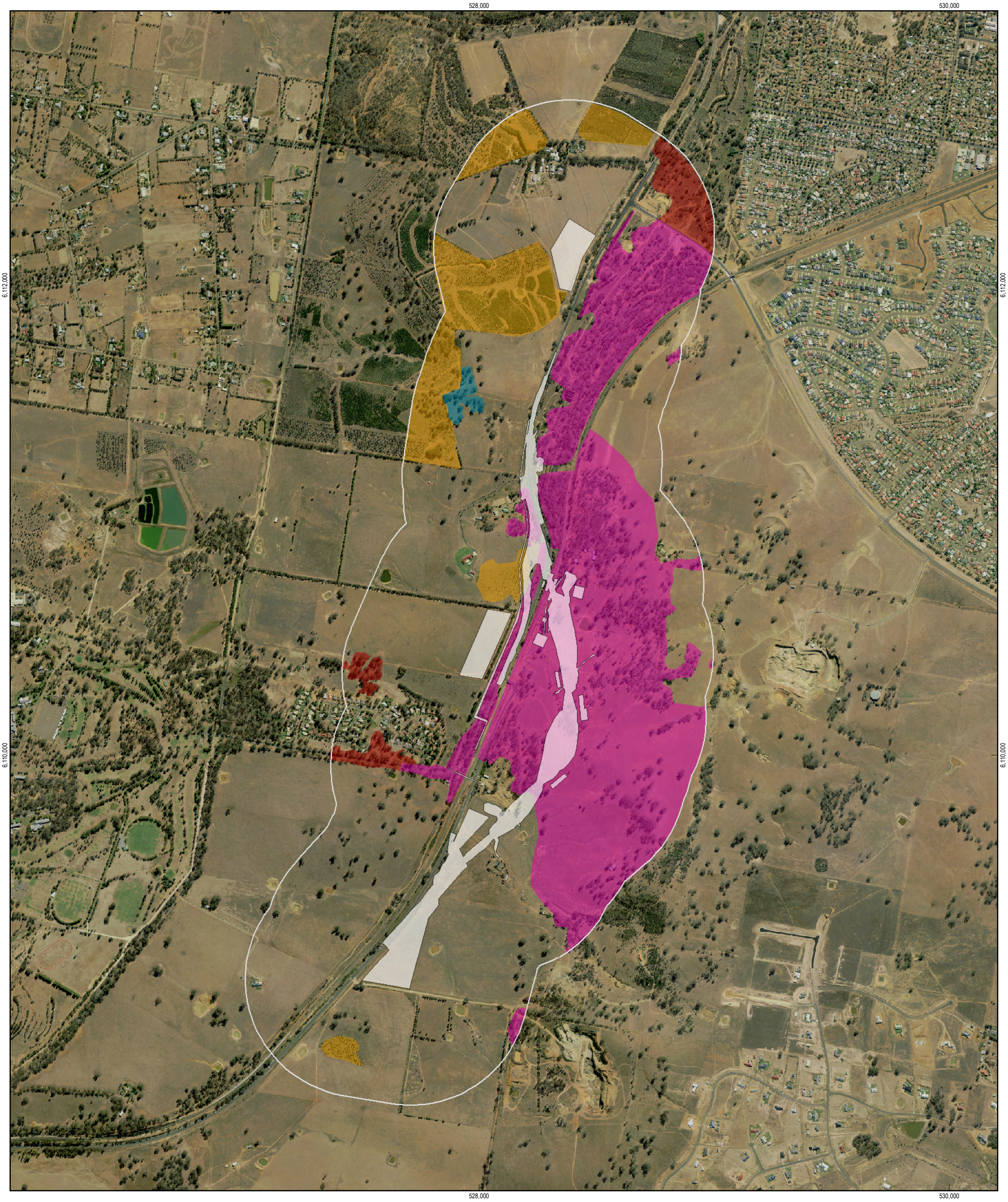

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LEGEND

Subject site

Study area

OEH vegetation mapping - NSW VCA name - GHD modified

- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South-western Slopes Bioregion
- Planted woody vegetation
- White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South-western Slopes Bioregion
- White Box grassy woodland in the upper slopes sub-region of the NSW South-western Slopes Bioregion

Paper size A3

0 200 400 800

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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Ground-truthed vegetation mapping of Box-Gum Woodland in the study area

Figure 4

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Data source: NSW Roads and Maritime Services: Proposal site - 2012, aerial photography - 2013; NSW Office of Environment and Heritage: Vegetation mapping - 2013. Created by:rtrobinson

3.1.4 Discussion of corridors (DGRs section 5.2.4)

The woodland in the study area forms part of a vegetation corridor running north-south (around the western edge of Wagga Wagga), and to a lesser degree part of a vegetation corridor running east-west, linking with a corridor that runs through the urbanised area of Wagga Wagga (Figure 3). These corridors link to remnant vegetation patches south of the study area in the locality and beyond, including Mount Flakney, Gregadoo Hills and Livingstone National Park. Parts of both Gregadoo Hills and Livingstone National Park that contain remnant patches of Box-Gum Woodland.

Box-Gum Woodland patches in the corridor running north-south include parts of Pomingalarna Reserve and Red Hill Reserve, which are connected to those located in the study area (Kapooka Military Area, Silvalite Reserve and the Planning Agreement Areas), which in turn are connected to patches south of the study area; Gregadoo Hills and Livingstone National Park.

The vegetation corridor running east-west includes patches of Box-Gum Woodland located in Willans Hill Reserve and the areas zoned E2 under the Wagga Wagga LEP 2010 which are connected to the patches of woodland located in the study area.

The Box-Gum Woodland in the subject site and study area is connected to Box-Gum Woodland in the Kapooka Military Area via an east to west woodland corridor along Camp Access Road from Silvalite Reserve to the Kapooka Military Area.

3.2 Assessment of habitat (DGRs section 5.3)

3.2.1 Description of habitat values (DGRs section 5.3.1)

Box-Gum Woodland

The project would remove 12.8 hectares of Box-Gum Woodland. There is about 168.3 hectares of Box-Gum Woodland in the study area and about 1845 hectares in the locality. The removal of 12.8 hectares in the subject site represents about 7.6 per cent of Box-Gum Woodland in the study area and 0.7 per cent in the locality (Table 7).

Table 7 Box-Gum Woodland in the subject site, study area and locality

	Area of Box-Gum Woodland (ha)	Percentage of Box-Gum Woodland to be removed
Subject site	12.8	100
Study area	168.3	7.6
Locality	1845	0.7

The existing Olympic Highway dissects the study area from north to south and runs parallel to the existing Great Southern railway line. The only two other arterial roads in the study area are Red Hill Road in the north-east that adjoin the Olympic Highway and dissects Silvalite Reserve and Camp Access Road that provides access to the Kapooka Military Area (Figure 1).

Groundcover vegetation in the study area is mostly introduced except for areas that are White Box grassy woodland in the upper slopes sub-region of the NSW south-western slopes bioregion, which are mostly native (Table 8 and Figure 4) (N.B. areas of bare ground and leaf litter account for remaining groundcover).

Table 8 Plot variables for groundcover attributes in the study area

Variable	Plot number in study area							
	21	22	23	24	25	26	27	28
Native groundcover (grasses)	44	40	46	60	20	16	37	41
Native groundcover (other)	2	6	4	4	4	0	13	12
Exotic plant cover	10	6	12	8	20	47.5	47.5	28

Generally, introduced species are common throughout the study area; however, declared noxious weeds are uncommon. Six species listed as noxious for the Wagga Wagga control area were recorded in the study area in low densities (GHD 2012). St John's Wort (*Hypericum perforatum*) is moderately common throughout the study area and occurs in higher densities in the south-east of the study area in agricultural land.

Grazing by livestock is generally restricted to private property west of the existing Olympic Highway and the far south of the study area. These areas are mostly cleared of native vegetation and dominated by introduced groundcover species. The study area east of the existing Olympic Highway is mostly excluded from grazing by livestock and is mostly native. This includes Silvalite Reserve and the areas zoned E2 (Conservation). No resource extraction has occurred in the study area though there are two operational gravel quarry pits within 200 metres of the eastern boundary of the study area.

The last occurrences of bushfires in the study are not known with the exception of a small 0.5 hectare bushfire in the northern end of Silvalite Reserve in early 2012. There is no historical or recent evidence of fire in the study area though it is likely to have occurred at some point.

Hollow-bearing trees

Table 9 provides a summary of the numbers of hollow-bearing trees and hollows identified in the subject site, study area and locality. The size and number of hollows in the study area and locality are provided in Table 3. Thirteen hollow-bearing trees are likely to be removed by the project, which contain a total of 45 hollows. These 13 trees are equivalent to 2.9 per cent of the hollow-bearing tree resources in the locality, with the 45 hollows equivalent to 3.2 per cent of the hollows in locality.

Table 9 Hollow-bearing trees and hollows in the subject site, study area and locality

	No. of HBTs	Percentage of HBTs to be removed	No. of hollows	Percentage of hollows to be removed
Subject site	20	65	72	62
Study area	~159	8.1	~374	12
Locality	Min. 439	2.9	Min. 1378	3.2

Hollow-bearing tree surveys identified a total of 240 hollow-bearing trees in the study area (Figure 5) and an additional 179 in the locality (section 3.2.1 and Appendix C).Therefore the minimum total numbers of hollow-bearing trees in the locality is 439. Numbers of hollow-bearing trees are from 26 representative transects (50 metres by 100 metres), the subject site and study

area and are not comprehensive of the entire locality. The removal of 13 trees from the subject site represents a likely over estimate of 2.9 per cent of hollow-bearing trees in the locality. The actual percentage is likely to be less than this given that not all hollow-bearing trees in the locality were recorded.

The 439 trees in the locality (inclusive of the study area) contain 1378 hollows. Forty-five hollows would be removed by the proposal which represents about 3.2 per cent of hollows recorded in the locality. This is also likely to be an overestimate as hollow-bearing trees transects are only from representative locations in the locality.

3.2.2 Distribution and condition of regional habitats (DGRs section 5.3.2)

In NSW, Box Gum Woodland occurs on the tablelands and western slopes of the Great Dividing Range. Within the regional area of the Wagga Wagga Local Government Area, Box-Gum Woodland is widely distributed with the community transitioning to Inland Grey Box Woodland in the west of the region. Although the community is widespread throughout most of the region, this community has been widely cleared for agriculture and now occurs mostly as small cleared patches, roadside corridors, paddock trees and limited larger remnant vegetation patches.

A review of the OEH vegetation mapping that covers the region indicates that at least 11,521 hectares of Box-Gum Woodland occurs in the region. Box-Gum Woodland in the region is extremely depleted, in comparison to its original extent with most remnants having a weedy understorey and low diversity of native forbs (Priday and Mulvaney 2005). All remnants of Box-Gum Woodland in the region have conservation significance given the communities extremely depleted occurrence, however, those with a high species diversity, particularly in the understorey are considered of high conservation value due to their limited occurrence. Much of the Box-Gum Woodland in the subject site is of high quality having high species diversity. Three of the five plots in the subject site have benchmark levels (23) of number of native plant species (see Appendix D).

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LEGEND

- Hollow-bearing tree proposed to be removed
- Hollow-bearing tree in study area
- Subject site
- Study area

Paper size A3

0 200 400 800

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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Kapooka bridge SIS - Box-Gum Woodland Surveys

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Hollow-bearing trees in the study area

Figure 5

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Data source: NSW Roads and Maritime Services: Proposal site - 2012, aerial photography - 2013; NSW Office of Environment and Heritage: Vegetation mapping - 2013. Created by:rtrobinson

4. Conclusion

Box-Gum Woodland is widespread in the study area, locality and region of the proposal. Despite this, the community has been historically depleted through intensive clearing and the remaining patches of this community are limited to mostly degraded roadside reserves, travelling stock reserves and isolated patches on private properties.

Box-Gum Woodland in the subject site and parts of the study area are unique in that they have a mostly native understorey, which, in most retained Box-Gum Woodland patches, is largely absent or severely degraded being dominated by introduced species.

The proposal will result in the loss of 12.8 hectares of Box-Gum Woodland in the locality which represents 168.3 hectares (7.6%) of this community in the study area and 1845 hectares (0.7%) in the locality.

The proposal will result in the loss of 13 hollow-bearing trees in the subject site which contain total of 45 different sized hollows. This represents a maximum of about 2.9 per cent of the hollow-bearing trees in the locality, with the 45 hollows equivalent to a maximum of 3.2 per cent of the hollows in locality.

6. References

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Appendices

Appendix A – OEH vegetation mapping of Box-Gum Woodland in the locality (not ground truthed)

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LEGEND

- Subject site
- Study area
- Locality

Box-Gum Woodland VCA vegetation type

- Blakely's Red Gum - White Box - Yellow Box - Black Cypress Pine box grass/shrub woodland on clay loam soils on undulating hills of central NSW South-western Slopes Bioregion
- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South-western Slopes Bioregion
- White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South-western Slopes Bioregion
- White Box grassy woodland in the upper slopes sub-region of the NSW South-western Slopes Bioregion
- Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South-western Slopes Bioregion

Paper size A3

0 1 2 4

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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OEH vegetation mapping of Box-Gum Woodland in the locality

Job Number	23-14107
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Date	21 Nov 2013

Appendix A

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Data source: NSW Roads and Maritime Services: Proposal site - 2012, aerial photography - 2013; NSW Office of Environment and Heritage: Vegetation mapping - 2013. Created by:rtrobinson

Appendix B Flora list

FLORA LIST

* Introduced species

✓Species present

All numbers are per cent cover

r Less than one per cent cover, few individuals

+ Less than one per cent cover, numerous individuals

Scientific Name	Common Name	Locality surveys														
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
Acacia dealbata	Silver Wattle														1	
Acacia deanei	Green Wattle												20		<1	
Acacia pycnantha	Golden Wattle					2		r	<1				2			
Allocasuarina verticillata	Drooping Sheoak	<1														
*Anagallis arvensis**	Scarlet Pimpernel			<1		5	5	5	2	2	4	1	+			
*Arctotheca calendula**	Capeweed	3			5		+	+	10	7	3	2		1		<1
Aristida ramosa	Purple Wiregrass		<1				10	5						3		
Arthropodium milleflorum	Pale Vanilla-lily	<1	10	<1							<1	<1		<1	<1	
Arthropodium minus								r					+			
Asperula conferta	Common Woodruff			<1										<1		
Atriplex semibaccata	Creeping Saltbush												r			
Austrostipa bigeniculata					20	10		5							4	20
Austrostipa densiflora		8	2													
Austrostipa falcata									1							

Scientific Name	Common Name	Locality surveys														
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
Austrostipa scabra	Speargrass	3				2		2	5		4		5			
Austrostipa scabra subsp. *scabra*	Speargrass		1	1						2		2				
Avena sp.*	Oats							+								
*Avena barbata**	Bearded Oats						+									
Boerhavia dominii	Tarvine													<1		
Bothriochloa macra	Red Grass										2	<1				
Brachychiton populneus	Kurrajong		<1								<1		r	1		
Brassicaceae						r										
*Briza maxima**	Quaking Grass		<1	1										<1		
Bromus arenarius	Sand Brome	1														
*Bromus diandrus**	Great Brome		4											2	1	2
Bromus sp.*	Brome								5		15					
Bulbine bulbosa	Bulbine Lily												+			
Callitris glaucophylla	White Cypress Pine	<1		<1		5	5	5	<1				2		3	
Calotis cuneifolia	Purple Burr-daisy					+				<1						
Calotis lappulacea	Yellow Burr-daisy										<1					
Calytrix tetragona	Common Fringe-myrtle						r									
*Carthamus lanatus**	Saffron Thistle								1							
*Cerastium glomeratum**	Mouse-ear Chickweed								3					<1	<1	

Scientific Name	Common Name	Locality surveys														
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
Cheilanthes austrotenuifolia	Rock Fern									<1						
Cheilanthes distans	Bristly Cloak Fern						r									
Cheilanthes sieberi	Poison Rock Fern	<1	2			2	+	+	<1	<1	1	1	+	<1		
Chrysocephalum apiculatum	Common Everlasting	<1					+									
*Cirsium vulgare**	Spear Thistle							r							<1	
Convolvulus erubescens	Blushing Bindweed														<1	<1
*Conyza bonariensis**	Flaxleaf Fleabane										<1					
*Cotoneaster microphyllus**						1										
Crassula colorata			1						<1	1		<1				
Cymbonotus lawsonianus	Bears-ear			<1								<1				
*Cymbopogon refractus**	Barbed Wire Grass						+									
Daucus glochidiatus	Native Carrot	<1		<1		+			<1	<1			+			
Dianella longifolia var. *longifolia*	Blueberry Lily					5	20	+					20			
Dianella revoluta	Blueberry Lily		1	<1												
Dichelachne sp.	A Plumegrass	1														
Dillwynia sericea	Showy Parrot-pea												+			
Drosera peltata								r						<1		

Scientific Name	Common Name	Locality surveys														
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
*Echium plantagineum**	Paterson's Curse	1	1		3				8	8	1	1				
Einadia nutans subsp. *nutans*	Climbing Saltbush	<1	<1						<1	<1		<1			<1	
Elymus scaber			<1		r										<1	1
Enneapogon sp.	A Nineawn						r									
*Eragrostis cilianensis**	Stinkgrass													<1		
*Erodium botrys**	Long Storksbill									<1						
Erodium crinitum	Blue Storksbill	<1					+	+	<1	1						
*Erodium moschatum**	Musky Crowfoot	<1														
Eucalyptus albens	White Box	2		8		20			6	6	5		20	1		
Eucalyptus blakelyi	Blakely's Red Gum	2	<1				10	10				8		6		
Eucalyptus melliodora	Yellow Box				20						3				12	2
Eucalyptus microcarpa	Grey Box		1		2											
Fumaria muralis subsp. *muralis**	Wall Fumitory					+	+	+								
*Galium aparine**	Cleavers						2	r				<1				
Galium gaudichaudii	Rough Bedstraw			<1			r									
Geranium solanderi	Native Geranium	<1								1				<1	<1	
Glycine sp.					r											
Glycine canescens						r	+	+								

Scientific Name	Common Name	Locality surveys														
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
Glycine clandestina			<1	<1							<1	<1				
Glycine tabacina							+									
Gonocarpus elatus						+	+	+					+		<1	
Gonocarpus tetragynus		8	<1	1		+	r		2			2				
Goodenia gracilis													+			
Goodenia hederacea	Forest Goodenia														1	<1
Goodenia pusilliflora	Small-flower Goodenia					r		+					5			
Haloragis sp.				<1						<1	<1					
Haloragis aspera	Rough Raspwort					r										
Hydrocotyle laxiflora	Stinking Pennywort			2		+			7				10			
Hypericum gramineum	Small St John's Wort													<1		
*Hypericum perforatum**	St John's Wort	1	1						2	10	3	1	+	2		<1
*Hypochaeris glabra**	Smooth Catsear	<1														
*Hypochaeris radicata**	Catsear	2	2		+	5	20	5	2	2	1	3		2	1	1
Hypoxis glabella var. *glabella*	Tiny Star									<1						
Indigofera australis	Australian Indigo						r									
Juncus sp.														<1		
*Lactuca serriola**	Prickly Lettuce														<1	
*Lepidium africanum**										<1						

Scientific Name	Common Name	Locality surveys														
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
Lepidium pseudohyssopifolium	Peppercress					r										
*Ligustrum lucidum**	Large-leaved Privet					2										
*Lolium rigidum**	Wimmera Ryegrass		<1	1						<1	10			1	3	2
Lomandra filiformis	Wattle Mat-rush	<1	<1	<1												
Lomandra filiformis subsp. *filiformis*	Wattle Mat-rush					r	r	r					r			
Lomandra multiflora subsp. *multiflora*	Many-flowered Mat-rush	<1	<1			r	+	+								
*Lycium ferocissimum**	African Boxthorn					1	r									
Maireana enchylaenoides	Wingless Bluebush															<1
*Malva parviflora**	Small-flowered Mallow				r											
*Marrubium vulgare**	White Horehound								5							<1
Olea europaea subsp. *cuspidata**	African Olive					1										
*Orobanche minor**	Broomrape	<1							<1							
Oxalis corniculata		<1	<1								<1	<1				<1
Oxalis perennans					+		r									
*Oxalis pes-caprae**	Soursob		<1													
Panicum effusum	Hairy Panic						5	5								
*Pinus halepensis**	Aleppo Pine												r			

Scientific Name	Common Name	Locality surveys														
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
*Pinus radiata**	Radiata Pine							r								
Plantago gaudichaudii	Narrow Plantain												2			
*Plantago lanceolata**	Lamb's Tongues	1		<1												
Poaceae*					5	10	+	2					5			
Poaceae 2*					5	10	+	+					5			
*Poa annua**	Winter Grass				5								+	15		
Pultenaea foliolosa	Small-leaf Bush-pea					+							+			
*Romulea rosea**	Onion Grass	1	2	1						1	1	<1		3	2	1
Romulea rosea var. *australis**	Onion Grass				30	30	10	10					+			
Rumex brownii	Swamp Dock				r				<1					<1		<1
*Rumex crispus**	Curled Dock															
Rytidosperma sp.	Wallaby Grass				5			5					10			
Rytidosperma caespitosum	Ringed Wallaby Grass	1													1	2
Rytidosperma fulvum	Wallaby Grass														3	
Schoenus sp.														<1		
Scleranthus sp.														<1		
Senna artemisioides	Silver Cassia									<1						
Sida corrugata	Corrugated Sida				+		+									<1

Scientific Name	Common Name	Locality surveys														
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
*Silybum marianum**	Variegated Thistle								<1					1	<1	
*Solanum nigrum**	Black-berry Nightshade								<1							
*Sonchus oleraceus**	Common Sowthistle	<1		<1			+	r	<1	<1	<1			<1	1	
Solenogyne dominii	Smooth Solenogyne			<1												<1
Stackhousia monogyna	Creamy Candles			<1												
Stuartina muelleri	Spoon Cudweed								<1	<1		<1				
Tricoryne elatior	Yellow Autumn-lily						r					<1	r			
Trifolium sp.*	A Clover												+			
*Trifolium angustifolium**	Narrow-leaved Clover															<1
*Trifolium arvense**	Haresfoot Clover				+					1			+		<1	1
*Trifolium campestre**	Hop Clover			<1					<1	<1				<1		
*Trifolium glomeratum**	Clustered Clover									<1		<1			<1	
*Trifolium repens**	White Clover				5		r	+								
*Trifolium subterraneum**	Subterranean Clover	1									1					<1
*Urtica urens**	Small Nettle											<1				
*Verbena bonariensis**	Purpletop										<1					
Vittadinia cuneata	Fuzzweed	<1	1							<1	<1	2				1
Wahlenbergia communis	Tufted Bluebell															<1
Wahlenbergia gracilis	Sprawling Bluebell									<1					2	1

Scientific Name	Common Name	Locality surveys														
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
Wahlenbergia luteola													+			
Wurmbea dioica subsp. *dioica*	Early Nancy	<1		<1		r	r	r	<1	<1		1	+			
Xerochrysum bracteatum	Golden Everlasting	5	4	2								6		<1		
Xerochrysum viscosum	Sticky Everlasting	1				+	5	r	5			1	10			

Species list 2

Scientific Name	Common Name	Locality surveys					Study area surveys							
		Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28
Acacia baileyana	Cootamundra Wattle										✓			
Acacia doratoxylon	Currawang					✓								
Acacia kettlewelliae					✓									
Acacia lanigera	Woolly Wattle					✓								
Acacia pycnantha	Golden Wattle										✓			
*Acetosella vulgaris**	Sheep Sorrell					✓								
*Aira cupaniana**	Silvery Hairgrass	<1						+						
*Arctotheca calendula**	Capeweed												3	
Aristida behriana	Bunch Wiregrass					✓	+	+	+					
Aristida jerichoensis	Jericho Wiregrass						<1							
Aristida ramosa	Purple Wiregrass	7		1	✓	✓	2	2		<1			6	3
Atriplex semibaccata	Creeping Saltbush										✓			
Austrostipa aristiglumis	Plains Grass	<1												
Austrostipa bigeniculata						✓	20		15	10				
Austrostipa falcata							5		3					
Austrostipa scabra	Speargrass	2	1	3			5	3	3	20	✓	5	9	2
Austrostipa sp.	A Speargrass					✓								
*Avena fatua**	Wild Oats	10	1				5	5	1	+	✓	2	2	
Bothriochloa macra	Red Grass	5	5	15		✓	20	10	10	5		4	25	27

Scientific Name	Common Name	Locality surveys					Study area surveys							
		Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28
*Briza maxima**	Quaking Grass				✓	✓		<1			✓			
*Briza minor**	Shivery Grass							+						
Bromus arenarius	Sand Brome										✓			
*Bromus diandrus**	Great Brome										✓			
*Bromus molliformis**	Soft Brome						<1	+	3	+		8		
Bromus sp.*	Brome					✓								
Bursaria spinosa	Blackthorn					✓								
Callitris glaucophylla	White Cypress Pine										✓			
*Carthamus lanatus**	Saffron Thistle						+							
*Centaurium erythraea**	Common Centaury							<1		<1				
Chamaesyce drummondii	Caustic Weed			<1		✓	+	+	<1	+			<1	
Cheilanthes austrotenuifolia	Rock Fern				✓	✓		+	+					
Chenopodium melanocarpum	Black Crumbweed									+				
Chloris truncata	Windmill Grass						10			10				3
*Chondrilla juncea**	Skeleton Weed								+					
*Cirsium vulgare**	Spear Thistle										✓			
Convolvulus erubescens	Blushing Bindweed										✓			
*Conyza bonariensis**	Flaxleaf Fleabane					✓								

Scientific Name	Common Name	Locality surveys					Study area surveys							
		Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28
*Conyza sumatrensis**	Tall Fleabane									+				
Cucumis myriocarpus subsp. *leptodermis**	Paddy Melon						+			+				
*Cymbopogon refractus**	Barbed Wire Grass								2					
Cynodon dactylon	Couch			1			20	5		5				2
Dianella longifolia	Blueberry Lily				✓						✓			
Dianella revoluta	Blueberry Lily										✓			
Dichelachne sp.	A Plumegrass					✓		20		2				
Dichelachne sp. 2								10						
Dichondra repens	Kidney Weed								+					
Drosera peltata					✓									
*Echium plantagineum**	Paterson's Curse	15	30	5	✓		<1		+				<1	
Einadia nutans subsp. *nutans*	Climbing Saltbush					✓								
Elymus scaber						✓		<1	5	1	✓			
Eragrostis brownii	Brown's Lovegrass				✓									
*Erodium botrys**	Long Storksbill						+							
Erodium crinitum	Blue Storksbill												10	
*Erodium moschatum**	Musky Crowfoot	2												
Eucalyptus albens	White Box										✓			

Scientific Name	Common Name	Locality surveys					Study area surveys							
		Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28
Eucalyptus blakelyi	Blakely's Red Gum				✓	✓								
Fraxinus angustifolia subsp*. angustifolia*	Claret Ash / Desert Ash										✓			
Geranium solanderi	Native Geranium				✓				+	+				
Glycine tabacina						✓								
Gnaphalium sp.											✓			
Gonocarpus elatus		1												
Gonocarpus tetragynus					✓	✓		<1						
Goodenia hederacea	Forest Goodenia							<1						
Goodenia sp.					✓									
Haloragis sp.								+		+				
Hibbertia obtusifolia	Hoary Guinea Flower				✓									
*Hordeum leporinum**	Barley Grass												<1	7
Hydrocotyle laxiflora	Stinking Pennywort				✓						✓			
Hypericum gramineum	Small St John's Wort				✓			+	1	<1				
*Hypericum perforatum**	St John's Wort				✓		+	+	<1					
*Hypochaeris glabra**	Smooth Catsear							+						
*Hypochaeris radicata**	Catsear	<1	<1		✓	✓					✓			
Juncus sp.							+	<1						
Juncus usitatus		<1												

Scientific Name	Common Name	Locality surveys					Study area surveys							
		Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28
*Lolium rigidum**	Wimmera Ryegrass	25	15	15			2	2	3	5	✓	12	5	5
Lomandra filiformis	Wattle Mat-rush	1				✓		+					2	2
Lomandra multiflora subsp. *multiflora*	Many-flowered Mat-rush					✓								
Lythrum hyssopifolia	Hyssop Loosestrife								+					
*Orobanche minor**	Broomrape										✓			
Oxalis corniculata			<1				+	+	+	1	✓	<1	<1	
Panicum effusum	Hairy Panic						10			1	✓			
*Paspalum dilatatum**	Paspalum							+	+		✓			
Poa sp.					✓									
*Poa annua**	Winter Grass				✓									
*Romulea rosea**	Onion Grass	15	15	20		✓	2	<1	<1	1		15	17	12
Rumex brownii	Swamp Dock		<1				+	+	+	+			<1	
*Rumex crispus**	Curled Dock	<1		<1							✓			
Rytidosperma bipartitum	Wallaby Grass								5					
Rytidosperma caespitosum	Ringed Wallaby Grass	5	1	2	✓	✓		5	3		✓	7	5	6
Rytidosperma carphoides	Short Wallaby Grass	1						2		5				
*Salvia verbenaca**	Vervain						+							
*Schinus areira**	Pepper Tree										✓			

Scientific Name	Common Name	Locality surveys					Study area surveys							
		Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28
Senecio sp.						✓								
Sida corrugata	Corrugated Sida	1							+	2				
*Sonchus oleraceus**	Common Sowthistle										✓			
Solenogyne dominii	Smooth Solenogyne							+						
Tricoryne elatior	Yellow Autumn-lily							1						
*Trifolium angustifolium**	Narrow-leaved Clover						+	<1	+			3	1	
*Trifolium arvense**	Haresfoot Clover		1	2				+				1	3	
*Trifolium campestre**	Hop Clover											1		
*Trifolium glomeratum**	Clustered Clover	1	1	5				+				5	6	1
*Trifolium subterraneum**	Subterranean Clover				✓	✓								
Vittadinia cuneata	Fuzzweed							+	+	1	✓			
*Vulpia bromoides**	Squirrel-tail Fescue	5	2	1				<1						1
Wahlenbergia gracilis	Sprawling Bluebell									+	✓			
Wahlenbergia luteola											✓			
Wahlenbergia stricta	Australian Bluebell					✓								
Walwhalleya proluta	Panic Grass								+				2	
Xerochrysum bracteatum	Golden Everlasting				✓						✓			
Xerochrysum viscosum	Sticky Everlasting										✓			

Appendix C – Hollow-bearing trees

Hollow-bearing trees in the subject site

Species	dbh (cm)	Number of hollows and diameter (cm)					Treatment	GPS location
		<5	<10	10-20	20-30	>30		
White Box	180	5	4	4	-	-	Remove	6109758, 528104
White Box	120	-	1	1	-	-	Retain	6109836, 528268
White Box	110	-	1	-	-	-	Remove	6109856, 528259
White Box	60	2	2	5	2	-	Remove	6109850, 528230
White Box	140	-	-	-	-	1	Remove	6110112, 528394
White Box	70	2	-	-	-	-	Remove	6110223, 528381
White Box	110	-	-	3	-	-	Remove	6110377, 528351
White Box	200	1	1	-	-	-	Remove	6110593, 528339
White Box	70		1	-	-	-	Remove	6110599, 528299
White Box	70	1	2	-	-	-	Retain	6110599, 528298
White Box	60	1	1	-	-	-	Remove	6110604, 528298
White Box	60	-	1	-	-	-	Remove	6110596, 528296
Sugar Gum	50	-	-	-	1	-	Remove	6111063, 528214
White Box	40	-	1	-	-	-	Remove	6110993, 528241
Stag	65	3	-	-	-	-	Retain	6111017, 528285
Stag	90	-	1	-	-	-	Retain	6111027, 528277
White Box	100	4	1	1	-	-	Remove	6111254, 528245
White Box	120	4	3	-	1		Retain	6111281, 528274
White Box	150	2	3	-	1	-	Retain	6111335, 528257
White Box	150	3	1	-	-	-	Retain	6109919, 527899
Total		**28**	**24**	**14**	**5**	**1**	**Total 72 hollows**	

Hollow-bearing trees in the study area

Species	dbh (cm)	Number of hollows and diameter (cm)					Hollow types
		<5	<10	10-20	20-30	>30	
August 2013 survey							
White Box	120	1	1	-	-	-	Branch
White Box	140	2	2	-	-	-	Branch
Stag	110	3	1	-	-	-	Branch
Blakely's Red Gum	90	-	1	-	-	-	Branch
White Box	120	1	1	-	-	-	Spout
White Box	50	1	1	-	-	-	Branch

Species	dbh (cm)	Number of hollows and diameter (cm)					Hollow types
		<5	<10	10-20	20-30	>30	
White Box	130	2	-	-	-	-	Branch
White Box	80	-	1	-	-	-	Spout
White Box	70	-	1	-	-	-	Branch
White Box	50	-	1	-	-	-	Spout
White Box	30	-	-	1	-	-	Trunk
White Box	60	-	1	-	-	-	Branch
Stag	70	1	-	-	-	-	Branch
White Box	140	-	1	-	-	-	Branch
White Box	110	-	1	-	-	-	Branch
Stag	50	1	1	-	-	-	Trunk
White Box	80	1	-	-	-	-	Branch
White Box	120	-	2	-	-	-	Branch, trunk
Stag	60	-	1	-	-	-	Spout
White Box	90	1	1	1	-	-	Spout
White Box	140	1	-	-	-	-	Branch
White Box	100	1	1	-	-	-	Branch
White Box	90	-	-	1	1	-	Branch
White Box	110	-	1	-	-	-	Spout
White Box	40	-	1	-	-	-	Spout
White Box	90	-	1	-	-	-	Spout
White Box	220	4	3	2	-	-	Branch, trunk
White Box	80	-	-	1	-	-	Spout
White Box	130	-	-	1	1	-	Trunk
White Box	160	1	2	-	-	-	Branch
White Box	100	-	-	2	-	-	Branch
White Box	120	-	2	-	-	-	Spout
White Box	90	1	3	-	-	-	Branch
White Box	140	-	3	1	-	1	Branch, trunk
White Box	110	2	-	2	1	-	Branch, spout
White Box	130	-	2	-	-	-	Branch
White Box	160	2	1	-	-	-	Branch
White Box	110	1	-	-	-	-	Branch

Species	dbh (cm)	Number of hollows and diameter (cm)					Hollow types
		<5	<10	10-20	20-30	>30	
White Box	60	1	1	-	-	-	Branch
Stag	50	-	-	1	1	1	Trunk, branch
White Box	90	-	1	-	-	-	Branch
White Box	140	1	-	1	-	-	Branch, spout
White Box	90	-	1	-	1	-	Spout
Stag	100	-	2	4	-	-	Branch, spout
White Box	100	-	2	1	-	-	Branch, spout
White Box	90	1	1	-	-	-	Branch
White Box	200	1	-	1	-	-	Spout
White Box	110	1	-	1	-	-	Spout
White Box	130	2	-	-	-	-	Branch
White Box	130	2	-	-	-	-	Branch
White Box	100	2	1	1	-	-	Branch
Stag	130	-	1	1	1	-	Spout, branch
White Box	120	2	-	2	-	-	Branch
Stag	130	2	-	-	-	-	Branch
White Box	110	2	1	-	-	-	Branch
White Box	90	1	2	-	-	-	Branch
White Box	80	1	-	-	-	-	Branch
White Box	120	-	2	-	-	-	Branch
White Box	110	1	-	-	-	-	Branch
White Box	130	1	2	-	-	-	Branch
White Box	100	1	3	-	-	-	Spout
White Box	70	-	2	-	-	-	Branch
White Box	110	-	1	1	-	-	Branch
Stag	40	1	-	-	-	-	Branch
Stag	50	-	3	1	-	-	Branch
September 2012 survey							
Stag	140	3	-	-	1	-	
White Box	100	-	-	1	-	-	
White Box	110	3	2	-	-	-	
White Box	100	-	2	-	-	-	

Species	dbh (cm)	Number of hollows and diameter (cm)					Hollow types
		<5	<10	10-20	20-30	>30	
White Box	110	-	-	-	1	-	
White Box	100	1	-	1	-	-	
White Box	100	2	-	1	-	-	
White Box	120	1	1	-	-	-	
White Box	110	1	-	1	-	-	
White Box	140	2	1	2	-	-	
Stag	100	3	2	-	1	-	
White Box	120	-	1	-	-	-	
Blakely's Red Gum	70	-	1	-	-	-	
Blakely's Red Gum	60	-	1	1	-	-	
Stag	120	-	1	-	-	-	
White Box	90	-	1	-	-	-	
White Box	70	-	1	-	1	-	
White Box	60	2	1	-	-	-	
White Box	60	1	-	1	-	-	
White Box	70	2	2	-	-	-	
White Box	70	-	1	-	-	-	
White Box	60	1	1	-	-	-	
White Box	50	-	-	1	-	-	
White Box	50	1	-	-	-	-	
Stag	70	3	-	-	-	-	
White Box	50	1	-	-	-	-	
White Box	50	-	-	1	-	-	
White Box	80	-	-	-	1	1	
Stag	60	-	1	-	-	-	
White Box	60	2	1	-	-	-	
White Box	60	-	1	2	-	-	
White Box	80	-	1	-	-	-	
White Box	100	-	2	-	-	-	
White Box	90	1	-	1	-	-	
White Box	60	2	-	1	-	-	
White Box	60	2	1	-	-	-	

Species	dbh (cm)	Number of hollows and diameter (cm)					Hollow types
		<5	<10	10-20	20-30	>30	
White Box	140	3	-	1	-	-	
White Box	120	3	2	-	-	-	
White Box	110	1	-	-	-	1	
White Box	100	1	-	1	-	-	
White Box	150	-	-	1	-	1	
White Box	140	-	1	-	-	1	
White Box	120	1	-	-	-	-	
Stag	100	-	1	1	2	1	
White Box	90	-	-	1	2	-	
White Box	60	-	1	1	-	-	
White Box	100	-	1	-	1	1	
White Box	60	-	1	1	-	-	
White Box	90	-	-	-	1	-	
White Box	80	-	-	2	-	-	
White Box	60	-	1	-	1	-	
White Box	110	-	1	1	-	-	
White Box	130	2	2	1	-	-	
White Box	120	1	1	1	-	-	
White Box	130	-	1	-	1	-	
White Box	60	-	2	1	1	-	
White Box	100	1	2	-	-	-	
White Box	110	1	-	2	-	-	
White Box	130	-	-	1	-	-	
White Box	100	-	2	-	-	-	
White Box	120	1	1	-	-	-	
White Box	80	3	1	-	-	-	
White Box	100	-	-	-	1	-	
White Box	80	2	1	-	-	-	
White Box	90	-	1	1	-	-	
White Box	70	1	1	-	-	-	
White Box	100	-	-	4	-	-	
White Box	80	-	-	-	-	1	

Species	dbh (cm)	Number of hollows and diameter (cm)					Hollow types
		<5	<10	10-20	20-30	>30	
White Box	120	1	-	-	1	-	
White Box	110	-	1	1	-	-	
White Box	70	-	1	-	-	-	
White Box	70	-	3	1	-	-	
White Box	100	2	-	1	-	-	
White Box	130	-	-	1	-	-	
Silvalite August 2013							
White Box	150	-	1	1	-	-	Trunk, spout
White Box	120	2	-	2	-	-	Branch
White Box	100	-	2	4	-	-	Branch
White Box	90	1	1	-	-	-	Spout
White Box	140	2	3	3	2	-	Spout
White Box	110	-	2	4	-	-	Branch, trunk
White Box	110	2	1	-	-	-	Branch
White Box	120	2	1	-	1	-	Branch
White Box	120	-	1	-	2	-	Spout
White Box	120	1	2	1	-	-	Branch
White Box	110	-	-	3	3	-	Trunk, branch
Stag	120	-	5	5	1	-	Spout, branch
White Box	140	2	3	-	1	-	Branch, spout
White Box	110	1	-	-	-	-	Branch
White Box	110	2	2	6	-	-	Branch, spout
White Box	120	2	2	1	-	-	Branch
Stag	110	-	-	1	-	-	Trunk
White Box	140	-	1	-	-	-	Spout
White Box	100	1	1	1	-	-	Branch, spout
White Box	110	-	1	-	-	-	Spout
White Box	130	4	3	2	-	-	Branch
White Box	140	2	4	2	1	-	Branch
White Box	130	-	-	-	-	4	Trunk, spout
Yellow Box	150	2	-	1	2	-	Branch, trunk
White Box	150	3	2	1	-	-	Branch

Species	dbh (cm)	Number of hollows and diameter (cm)					Hollow types
		<5	<10	10-20	20-30	>30	
White Box	80	1	-	2	1	-	Branch, trunk
White Box	110	1	2	3	-	-	Spout, branch
Yellow Box	120	5	1	2	-	-	Branch
White Box	120	-	-	2	-	-	Branch, spout
White Box	110	-	1	-	-	-	Spout
White Box	130	-	3	4	-	1	Branch, spout
White Box	160	1	-	1	-	1	Spout, trunk
Yellow Box	110	1	1	-	-	-	Branch
White Box	110	-	1	2	-	-	Spout, trunk
White Box	150	-	1	1	1	-	Trunk, spout
White Box	110	-	1	1	-	-	Spout, branch
White Box	130	1	1	2	-	-	Spout
Stag	110	1	3	1	-	-	Branch
White Box	160	2	1	3	3	-	Branch
White Box	100	1	1	-	-	-	Branch
White Box	110	-	3	-	-	-	Branch
White Box	100	-	-	2	1	-	Branch
White Box	120	-	-	-	1	-	Branch
White Box	110	1	1	-	-	1	Trunk, branch
White Box	90	-	2	-	-	1	Trunk, branch
Stag	120	1	3	1	-	-	Branch
White Box	120	-	2	1	1	-	Trunk, branch
Camp Access Rd							
White Box	110	-	2	-	-	-	Spout
White Box	130	1	4	1	-	-	Spout
White Box	110	1	3	-	-	-	Trunk
White Box	120	2	-	2	-	-	Trunk
Eucalyptus sp. (planted)	100	-	4	1	-	-	Trunk
Eucalyptus sp. (planted)	90	1	-	1	-	-	Trunk, branch
Eucalyptus sp. (planted)	60	-	-	-	1	-	Trunk

Species	dbh (cm)	Number of hollows and diameter (cm)					Hollow types
		<5	<10	10-20	20-30	>30	
Eucalyptus sp. (planted)	80	-	2	1	-	-	Trunk
White Box	130	-	-	-	-	2	Trunk
White Box	140	3	4	-	1	2	Branch, spout
White Box	140	-	-	-	-	1	Spout
Eucalyptus sp. (planted)	100	1	3	1	-	-	Trunk
White Box	140	-	-	3	-	1	Spout
White Box	110	1	3	1	-	-	Branch

Hollow-bearing tree transects in the locality

Species	dbh (cm)	Number of hollows and diameter (cm)					Hollow types
		<5	<10	10-20	20-30	>30	
Transect 1 – PCT ID 266							
White Box	100	1	2	-	-	-	Trunk
Blakely's Red Gum	100	1	1	2	-	-	Branch
Blakely's Red Gum	120	-	-	3	-	-	Spout
White Box	90	2	1	-	-	-	Branch
Transect 2 – PCT ID 267							
Grey Box – Stag	150	2	2	1	-	-	Branch
Blakely's Red Gum	110	3	1	2	-	-	Branch
Blakely's Red Gum	70	-	1	1	-	-	Spout
Transect 3 – PCT ID 267							
Grey Box	200	-	-	1	1	-	Spout
Grey Box	120	1	2	-	-	-	Branch
Grey Box	160	-	1	2	-	1	Spout
Grey Box	120	-	1	3	-	-	Branch
Grey Box	120	3	-	-	-	-	Branch
Grey Box	160	-	2	1	-	-	Branch
Grey Box	150	3	3	1	-	-	Branch, spout
Transect 4 – PCT ID 267							
Grey Box	210	3	1	-	-	-	Branch
Grey Box	120	1	1	-	-	-	Spout
Grey Box	140	3	-	2	-	-	Spout, branch
Grey Box	140	2	3	-	-	-	Spout, branch
Stag	110	4	1	-	-	-	Branch
Transect 5 – PCT ID 266							
Grey Box	150	1	1	-	-	1	Trunk, branch
White Box	60	-	-	1	-	-	Spout
White Box	100	2	3	2	-	-	Spout, branch
Transect 6 – PCT ID 267							
White Box	70	1	-	-	-	-	Branch
White Box	80	1	-	-	-	-	Branch
White Box	110	2	2	-	1	-	Branch

Species	dbh (cm)	Number of hollows and diameter (cm)					Hollow types
		<5	<10	10-20	20-30	>30	
Transect 7 – PCT ID 276							
Yellow Box	140	-	3	3	-	-	Branch
Yellow Box	110	2	2	2	2	-	Branch, trunk
Yellow Box	110	-	2	3	1	3	Branch
Stag	200	-	3	1	4	-	Branch
Yellow Box	120	-	-	1	3	1	Branch
Yellow Box	130	2	3	-	-	-	Branch
Yellow Box	120	1	-	-	-	-	Branch
Yellow Box	120	-	-	-	1	-	Trunk
Yellow Box	140	1	2	1	-	-	Branch, trunk
Yellow Box	130	-	2	1	1	-	Trunk, branch
Yellow Box	140	1	1	1	-	-	Branch, spout
Yellow Box	130	-	1	1	-	-	Branch
Yellow Box	150	2	-	-	-	-	Branch
Transect 8 – PCT ID 76							
Grey Box	160	4	3	3	-	-	Spout, branch
Grey Box	140	5	1	3	-	-	Branch
Grey Box	150	-	2	-	-	-	Trunk, branch
Grey Box	90	2	2	1	-	-	Branch
Grey Box	110	1	-	-	-	-	Branch
Grey Box	110	2	2	-	-	-	Branch, spout
Transect 9 – PCT ID 346							
White Box	120	-	3	2	2	-	Branch
Stag	130	1	-	-	-	-	Branch
White Box	120	-	1	-	-	-	Branch
White Box	100	1	4	1	-	-	Spout, branch
White Box	60	1	-	-	-	-	Branch
White Box	70	5	1	-	-	-	Branch, spout
White Box	120	-	2	-	1	-	Branch
Stag	90	2	-	1	-	-	Branch, trunk
White Box	70	-	1	-	-	-	Branch
Transect 10 – PCT ID 346							

Species	dbh (cm)	Number of hollows and diameter (cm)					Hollow types
		<5	<10	10-20	20-30	>30	
Stag	90	1	7	-	-	-	Branch
White Box	50	-	2	-	-	-	Branch
White Box	90	-	2	-	-	-	Trunk, branch
Stag	60	2	1	-	-	-	Trunk, branch
White Box	80	1	2	-	-	-	Branch, trunk
White Box	120	-	2	-	-	-	Branch
Stag	110	-	-	3	1	-	Branch
White Box	160	6	4	1	-	-	Branch
Transect 11 – PCT ID 266							
White Box	150	-	-	-	1	-	Spout
White Box	120	2	2	-	-	-	Branch, trunk
White Box	120	3	3	-	-	-	Spout
White Box	240	4	5	1	-	-	Spout, branch
White Box	90	-	1	3	-	-	Branch, spout
Transect 12 – PCT ID 346							
White Box	150	6	3	-	1	-	Branch, spout
White Box	70	-	1	-	-	-	Branch
White Box	80	-	1	-	-	-	Trunk
Yellow Box	110	3	2	-	-	-	Branch
White Box	100	6	3	2	-	-	Branch
White Box	130	7	4	1	-	-	Trunk, branch
White Box	80	3	3	-	-	-	Branch
Transect 13 – PCT ID 266							
White Box	90	-	1	-	-	-	Branch
White Box	100	1	1	2	-	-	Branch, spout
White Box	100	2	3	1	-	-	Branch, spout
White Box	120	-	-	1	-	-	Branch
White Box	110	1	1	-	-	-	Branch
White Box	110	-	1	-	-	-	Branch
White Box	130	1	-	2	-	1	Spout, trunk
White Box	150	-	1	1	2	-	Spout
White Box	130	2	1	2	-	-	Branch, spout

Species	dbh (cm)	Number of hollows and diameter (cm)					Hollow types
		<5	<10	10-20	20-30	>30	
White Box	80	-	1	1	-	-	Trunk, branch
Transect 14 – PCT ID 276							
Yellow Box	100	1	-	-	-	-	Branch
Yellow Box	110	2	1	-	-	-	Branch
Stag	80	-	4	2	-	-	Branch
Yellow Box	100	1	-	-	-	-	Branch
Yellow Box	80	1	-	-	-	-	Branch
Transect 15 – PCT ID 276							
Yellow Box	90	2	-	-	-	-	Branch
Yellow Box	100	-	1	-	-	-	Spout
Yellow Box	90	3	1	-	-	-	Branch
Yellow Box	100	1	-	-	-	-	Branch
Yellow Box	180	1	-	-	-	-	Branch
Yellow Box	70	2	1	-	-	-	Branch
Stag	100	2	1	1	-	-	Branch, spout
Transect 16 – PCT ID 266							
White Box	70	2	-	-	-	-	Branch
White Box	70	2	2	-	-	-	Branch
White Box	90	4	2	-	-	-	Branch, spout
White Box	100	3	-	-	-	-	Branch
White Box	100	2	2	2	-	-	Branch, spout
White Box	60	3	-	-	1	-	Branch
White Box	80	1	1	1	-	-	Branch
Transect 17 – PCT ID 266							
Blakely's Red Gum	50	-	-	1	-	-	Trunk
Blakely's Red Gum	50	3	-	-	-	-	Trunk, branch
Blakely's Red Gum	50	-	1	-	-	-	Trunk
Stag	40	2	1	-	-	-	Branch
Stag	40	1	-	-	-	-	Branch
Transect 18 – PCT ID 5							
River Red Gum	200	3	2	2	2	-	Branch, trunk
River Red Gum	150	1	1	-	-	-	Branch

Species	dbh (cm)	Number of hollows and diameter (cm)					Hollow types
		<5	<10	10-20	20-30	>30	
River Red Gum	220	-	1	2	-	-	Branch
River Red Gum	120	-	2	-	-	-	Branch
River Red Gum	130	1	1	-	1	2	Trunk, branch
Transect 19 – PCT ID 266							
White Box	140	4	5	1	2	-	Branch, spout
White Box	110	3	3	1	-	-	Branch
White Box	120	1	1	2	-	1	Branch, trunk
White Box	140	-	3	-	-	-	Spout
White Box	120	1	4	1	2	1	Trunk, spout
White Box	100	-	1	2	-	-	Branch
White Box	110	-	2	2	-	-	Branch
White Box	110	-	2	1	1	-	Branch, spout
Transect 20 – PCT ID 5							
Stag	210	1	-	-	-	1	Trunk, branch
River Red Gum	200	1	-	3	1	-	Trunk
River Red Gum	250	1	3	2	-	-	Branch
Stag	160	1	2	1	-	-	Branch
River Red Gum	200	1	1	1	3	2	Branch, spout
Stag	160	-	1	1	2	-	Branch, trunk
Stag	140	-	-	-	-	1	Trunk
River Red Gum	140	4	3	5	1	-	Branch
Stag	200	2	5	1	2	-	Branch, trunk
Stag	160	-	-	-	-	1	Trunk
River Red Gum	160	2	4	5	1	-	Branch
Transect 21 – PCT ID 5							
River Red Gum	150	-	-	1	3	2	Branch
River Red Gum	140	1	1	2	2	2	Branch, trunk
River Red Gum	220	-	-	4	1	-	Branch
River Red Gum	120	-	1	1	-	1	Branch
River Red Gum	150	1	1	1	2	-	Trunk, branch
River Red Gum	160	-	1	1	3	-	Trunk, spout
River Red Gum	140	-	-	1	-	-	Trunk

Species	dbh (cm)	Number of hollows and diameter (cm)					Hollow types
		<5	<10	10-20	20-30	>30	
Transect 22 – PCT ID 5							
River Red Gum	120	-	1	1	-	-	Branch
River Red Gum	200	-	2	1	2	-	Branch
River Red Gum	160	-	-	2	-	-	Branch
River Red Gum	200	-	-	1	1	1	Spout, branch
River Red Gum	170	-	-	4	1	-	Trunk, branch
River Red Gum	200	-	1	1	-	2	Branch, trunk
River Red Gum	200	-	-	-	-	5	Trunk, branch
River Red Gum	240	1	1	2	-	-	Branch
River Red Gum	160	-	-	1	-	-	Branch
River Red Gum	220	-	-	4	-	-	Branch, spout
River Red Gum	160	-	-	1	1	1	Spout
River Red Gum	150	1		-	-	1	Branch, trunk
Transect 23 – PCT ID							
White Box	130	-	1	3	-	1	Branch, trunk
Blakely's Red Gum	140	1	1	1	-	-	Branch
White Box	110	2	1	1	-	-	Branch
White Box	120	2	2	-	-	-	Spout
Blakely's Red Gum	120	4	2	1	-	-	Spout
White Box	110	-	4	1	1	-	Branch
White Box	160	1	2	3	-	-	Spout
Blakely's Red Gum	80	2	1	-	-	-	Spout
White Box	180	2	2	-	-	-	Branch
Transect 24 – PCT ID							
Grey Box	120	1	1	3	-	-	Spout
Grey Box	120	2	5	2	1	-	Spout, branch
Grey Box	130	3	1	1	-	-	Branch
Grey Box	100	2	-	-	-	-	Spout
Grey Box	110	1	1	2	1	-	Spout
Stag	100	4	7	2	1	-	Branch, trunk

Species	dbh (cm)	Number of hollows and diameter (cm)					Hollow types
		<5	<10	10-20	20-30	>30	
Transect 25 – PCT ID							
Yellow Box	120	4	1	1	1	-	Branch
Yellow Box	120	-	-	1	1	-	Branch
Transect 26 – PCT ID							
White Box	140	1	3	-	2	1	Branch, spout
Yellow Box	220	-	1	-	-	-	Spout

Appendix D – Plot data

Variable	Plot number																											
	Locality																				Study area							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
No. of native plant species	23	19	18	9	23	25	20	15	16	12	17	25	16	15	14	10	3	5	16	20	14	23	19	23	23	3	8	6
% native overstorey cover (>1m)	5.7	3.8	10.2	4.2	5.1	3.6	6.3	8.4	6.1	7.1	6.9	8.6	2.6	6.5	1.0	0	0	0	0.9	1.5	0	0	7	1	9.5	0	0	0
% native midstorey cover	0.5	1.9	0	0	0.4	3.3	1.6	0.4	0	0	0	2	0	0	0	0	0	0	0.3	0.2	0	0	0	0	1.5	0	0	0
% native groundcover (grasses)	12	14	2	18	18	12	4	0	8	10	4	10	6	6	54	20.5	2	21	42	50	44	40	46	60	20	16	37	41
% native groundcover (shrubs) (<1m)	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0
% native groundcover (other)	6	14	16	0	24	28	30	26	8	0	20	20	8	2	0	3.5	0.5	0.5	26	10	2	6	4	4	4	0	13	12
% exotic plant cover (all strata)	34	20	18	52	26	30	24	26	42	58	20	8	58	8	36	70.5	86	49.5	8	8	10	6	12	8	20	47.5	47.5	28
No. of trees with hollows	0	1	0	0	2	2	0	3	1	0	1	0	1	1	0	0	0	0	1	0	0	0	1	1	2	0	0	0
Proportion of overstorey regeneration	1	0	1	0	1	0.66	1	1	1	1	1	1	1	1	1	0	0	0	1	1	0	1	1	0	1	0	0	0
Total length of fallen logs (m)	7	37	44	5	64	36	43	49	30	38	10	14	4	0	6	0	0	0	20	5	0	1	20	5	32	0	0	0

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