FLORA, VEGETATION AND FAUNA ASSESSMENT OF MILLSTREAM DAM TO GREENBUSHES PIPELINE ROUTE

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Prepared for

Water Corporation

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PERMITS

This flora survey was conducted under the following licences issued by the Department of Environment and Conservation; Licence to take flora for scientific or other prescribed purposes: SL009488 issued to Joel Collins and SL009422 issued to Catherine Webb.

STATEMENT OF LIMITATIONS

Scope of Services

This environmental site assessment report ('the report') has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and ENV.Australia Pty Ltd (ENV) ('scope of services'). In some circumstances the scope of services may have been limited by factors such as time, budget, access and/or site disturbance constraints.

Reliance on Data

In preparing the report, ENV has relied on data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations, most of which are referred to in the report ('the data'). Except as otherwise stated in the report, ENV has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ("conclusions") are based in whole or in part on the data, those conclusions are contingent upon the accuracy and completeness of the data. ENV will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, unavailable, misrepresented or otherwise not fully disclosed to ENV.

Environmental Conclusions

In accordance with the scope of services, ENV has relied on the data and has conducted environmental field monitoring and/or testing in the preparation of the report. The nature and extent of monitoring and/or testing conducted is described in the report.

Within the limitations imposed by the scope of services, the monitoring, testing, sampling and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care ordinarily exercised by reputable environmental consultants under similar circumstances. No other warranty, express or implied, is made.

Report for Benefit of Client

The report has been prepared for the benefit of the Client (Water Corporation) and for no other party. ENV assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including, without limitation, matters arising from any negligent act or omission of ENV or for any loss or damage suffered by any other party relying on the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions, and should make their own enquiries and obtain independent advice in relation to such matters.

Other Limitations

ENV will not be liable to update or revise the report to take into account any events or circumstances occurring or facts becoming apparent after the date of the report.

The scope of services did not include any assessment of the title to or ownership of the properties, buildings and structures referred to in the report, nor the application or interpretation of laws in the jurisdiction in which those properties, buildings and structures are located.

EXECUTIVE SUMMARY

ENV. Australia Pty Ltd ('ENV') was commissioned by the Water Corporation in October 2011 to undertake a Level 2 Flora and Vegetation assessment and a Level 1 Fauna assessment of the proposed Millstream Dam to Greenbushes pipeline route ("the study area"). The study area is located 216 km south of Perth and is approximately 35 hectares in size and comprises Jarrah (*Eucalyptus marginata)* and Marri (*Corymbia calophylla*) forests, Pine (*Pinus* sp.) and Bluegum (*Eucalyptus globulus*) plantations, cleared land and water pipeline/mining associated infrastructure.

The purpose of this assessment was to provide information on the significance of the flora, vegetation and fauna in the survey area, as part of supporting documentation for an application for a Native Vegetation Clearing Permit (NVCP) under the *Environmental Protection Act 1986*.

The survey was conducted during 25-27 October 2011. The flora and vegetation survey recorded 172 taxa from 123 genera and 51 families, including 60 introduced species.

No plant species listed as Threatened under the *Environment Protection and Biodiversity Conservation Act 1999*, or as Threatened (Declared Rare Flora) pursuant to the *Wildlife Conservation Act 1950*. Two Priority Flora listed by the Department of Environment and Conservation were recorded during the survey; *Eucalyptus rudis* subsp. *cratyantha* (Priority 4) and *Tetratheca parvifolia* (Priority 3).

Sixty introduced species were identified during the survey, of which three are listed as Declared Plants; **Asparagus asparagoides* (Bridal Creeper), **Rubus anglocandicans* (European Blackberry) and **Zantedeschia aethiopica* (Arum Lily).

Ten vegetation associations were identified in the study area. These associations generally formed forests and were dominated by *Eucalyptus marginata* subsp. *marginata* (Jarrah) and *Corymbia calophylla* (Marri).

The vegetation did not represent any TECs listed under the *Environmental Protection and Biodiversity Conservation Act 1999* or endorsed by the Western Australian Minister of Environment, or PECs listed by the Department of Environment and Conservation.

Vegetation condition ranged from Completely Degraded to Excellent, with the majority of the vegetation in a Degraded condition. The proximity of vegetation to major roads and residential developments, historical vegetation clearing for firebreaks/tracks and the presence of some very aggressive weeds at high density had the greatest impact on remnant vegetation.

Two natural fauna habitats were recorded in the study area; *Eucalyptus marginata* subsp. *marginata* (Jarrah) and *Corymbia calophylla* (Marri) Forest (of High habitat value) and Major Drainage Line (of Moderate habitat value). In addition to these natural

habitats a section of the route consisted of Pine and Blugum Plantation. These are of limited value to fauna and as a result were considered to be of limited value to fauna.

A total of 21 vertebrate fauna (one reptile, 19 birds and one mammal) were recorded. Three of these species are of conservation significance; the Carpet Python (*Morelia spilota imbricata* [S4]), Carnaby's Cockatoo (*Calyptorhynchus latirostris* [Endangered EPBC Act]) and Rainbow Bee-eater (*Merops ornatus* [Migratory EPBC Act]).

A total of 20 conservation significant species potentially occur based on results of previous surveys conducted in the area and database searches. These comprise two reptiles, 10 birds and eight mammals. Five of the 20 species are considered as 'Unlikely' to occur within the study area, five species are considered as 'Possible' to occur and ten species are considered as 'Likely' to occur within the study area

The Forest Red-tailed Black Cockatoo (FRBC) (*Calyptorhynchus banksii naso*), Baudin's Cockatoo (*Calyptorhynchus baudinii*) are likely to occur in the study area based on the modelled distribution maps presented in the draft referral guidelines for these species.

A total of 211 trees, primarily Marri (*Corymbia calophylla*) and Jarrah (*Eucalyptus marginata* subsp. *marginata*) had a diameter at breast height (DBH) larger than 500 mm making the study area a potential breeding, roosting and foraging habitat for these cockatoos. The area contained 11 plant species known to be food resources for Carnaby's Cockatoo.

1 INTRODUCTION

1.1 THE PROJECT

ENV. Australia Pty Ltd ('ENV') was commissioned by the Water Corporation in October 2011 to undertake a Level Two Flora and Vegetation assessment and a Level One Fauna assessment of the proposed Millstream Dam to Greenbushes pipeline route ("the study area"), in the South West Region of Western Australia.

The Water Corporation has refined the proposed pipeline route since an initial survey was conducted in 2009 (AECOM 2010), resulting in a route which now passes through areas of vegetation which were not previously surveyed. The study area encompasses the entire revised pipeline route and alignments, including areas not surveyed in the initial 2009 survey.

The purpose of the assessment is to provide supporting documentation for an application for a Native Vegetation Clearing Permit under the *Environmental Protection Act 1986* (*EP Act*) (Western Australia).

1.2 OBJECTIVES

The objectives of the flora, vegetation and fauna assessment was to:

- conduct a comprehensive flora, vegetation and fauna database review;
- survey, describe and map the vegetation associations present;
- assess and map vegetation condition;
- conduct a targeted survey for Threatened Flora (Declared Rare Flora), Priority Flora, Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs);
- document, describe and map the vertebrate fauna habitats present;
- record opportunistic fauna sightings;
- assess and record significant Black Cockatoo and Ring Tailed Possum habitat trees; and
- identify fauna of conservation significance that may potentially occur within the study area.

1.3 LOCATION

The study area is located approximately 216 kilometres (km) south of Perth and approximately 70 km south-east of Bunbury. The pipeline route is approximately 15 km long and 34.97 hectare (ha) in size. The study area commences at the George Street Tank Complex in the Greenbushes town site, and travels in a south-westerly direction roughly along Maranup Ford Road before heading west through state forest to terminate at the Camp Brook pump station near the Blackwood River Crossing (Figure 1). The pipeline route falls within two shires; the Shire of Bridgetown-Greenbushes and the Shire of Donnybrook-Balingup.

1.4 BACKGROUND TO THE PROTECTION OF FLORA, VEGETATION AND FAUNA

Flora and fauna are protected formally and informally by various legislative and non-legislative measures, which are as follows:

Legislative Protection

- *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*);
- *Wildlife Conservation Act 1950* (*WC Act*);
- *Environmental Protection Act 1986* (*EP Act*); and
- *Agriculture and Related Resources Protection Act 1976* (*ARRP Act*).

Non-Legislative Protection

- Western Australian Department of Environment and Conservation (DEC) Priority lists for flora, fauna and vegetation; and
- Recognition of locally significant populations by the DEC.

A short description of each is given below. Other definitions, including species conservation categories, are provided in Appendix A for flora and Appendix B for fauna. Conservation categories for ecological communities are provided in Appendix C.

Environmental Protection and Biodiversity Conservation Act 1999

The *Environmental Protection and Biodiversity Conservation Act 1999* (*EPBC Act*) aims to protect matters of national environmental significance. Under the *EPBC Act*, the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC 2011a), lists threatened species and communities in categories determined by criteria set out in the Act (*www.environment.gov.au/epbc/index.html*); Appendix A2, Appendix B1 and Appendix C1).

Studies likely to cause impacts on matters of national environmental significance should be referred to DSEWPaC for assessment under the *EPBC Act*.

Wildlife Conservation Act 1950

The Western Australian DEC lists flora and fauna under the provisions of the *Wildlife Conservation Act 1950* ***(****WC Act)* as protected according to their need for protection (Appendix A for flora and Appendix B for fauna).

Flora is gazetted as Threatened (Declared Rare Flora) when populations are geographically restricted or are threatened by local processes. In addition, under the *WC Act*, by Notice in the Western Australian Government Gazette of 9 October 1987, all native flora (spermatophytes, pteridophytes, bryophytes and thallophytes) is protected throughout the State.

Fauna are classified as Schedule 1 to Schedule 4 according to their need for protection (Appendix B).

Environmental Protection Act 1986

Declared Rare Flora (DRF) and Threatened Ecological Communities (TECs) are afforded special consideration in environmental impact assessments, and have special status as Environmentally Sensitive Areas (ESAs) under the *Environmental Protection Act 1986* (*EP Act)* and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. Exemptions for a clearing permit do not apply in an ESA.

Agricultural and Related Resources Protection Act 1976

Introduced species may be 'Declared' under the *Agricultural and Related Resources Protection Act 1976 (ARRP Act)*. Declared Plants are gazetted under five categories (P1-P5), which define the action required. Details of the definitions of these categories are provided in Appendix D. A declaration may apply to the whole State, to districts, individual properties or even to single paddocks. If a plant is 'Declared', landholders are obliged to control that plant on their properties (Department of Agriculture and Food Western Australia [DAFWA] 2011).

The Environmental Weed Strategy for Western Australia (Department of Conservation and Land Management [CALM] 1999) contains criteria for the assessment and ranking of weeds in terms of their environmental impact on biodiversity (Appendix D). The Strategy defines environmental weeds as 'plants that establish themselves in natural ecosystems and proceed to modify natural processes, usually adversely, resulting in the decline of the communities they invade.'

Department of Environment and Conservation Priority Lists

The Department of Environment and Conservation (DEC) lists 'Priority' flora and fauna that has not been assigned statutory protection under the *WC Act*, but which are under consideration for declaration as DRF (Threatened) or Scheduled fauna. Flora and fauna assessed as Priority 1-3 are in urgent need of further survey. Priority 4 species require monitoring every 5-10 years, and Priority 5 taxa are deemed to be dependent upon specific conservation programs for their continued survival (Appendix A). Although DEC Priority species have no formal legal protection, they are under consideration as 'Rare' flora or Scheduled fauna under the *WC Act*.

In addition, the DEC maintains a list of Priority Ecological Communities (PECs) which identifies those communities that need further investigation before possible nomination for TEC status.

Once listed, a community is a PEC, and when endorsed by the Western Australian Minister of Environment becomes a TEC, and protected as an ESA under *Environmental Protection (Clearing of Native Vegetation) Regulations* 2004 (Appendix C for definitions).

Informal Recognition of Flora and Fauna

The World Conservation Union (IUCN) publishes an international listing of species of conservation importance, known as the IUCN Red List (IUCN 2011). This list identifies those species most in need of conservation attention.

Certain populations or communities of flora and fauna may be of local significance or interest because of their patterns of distribution and abundance. For example, flora and fauna may be locally significant because they are range extensions to the previously known distribution or are newly discovered taxa (and therefore have the potential to be of more than local significance). In addition, many species are in decline as a result of threatening processes (primarily land clearing), and relict populations of such species assume local importance for the DEC. It is not uncommon for the DEC to make comment on these species of interest.

Environmentally Sensitive Areas

Environmentally Sensitive Areas (ESAs) are protected under the Environmental Protection (Clearing of Native Vegetation) Regulation 2004 and are selected for their environmental values at state or national levels. They include:

- Defined wetlands and riparian vegetation within 50 m;
- Areas covered by Threatened Ecological Communities;
- Area of vegetation within 50 m of Declared Rare Flora;
- Bush Forever sites; and

- Declared World Heritage property sites.

Black Cockatoo Assessment

There is an increasing focus from the regulatory authorities on proposals that have the potential to impact on Black Cockatoo habitat. New draft referral guidelines for protected Black Cockatoos have recently been released by the DSEWPaC (2011b). These guidelines are designed to assist in the determination of likely impacts of proposed actions and whether a referral is required (Table 1).

Table 1: DSEWPaC Black Cockatoo Referral Guidelines (DSEWPaC 2011b).

High risk of significant impacts: referral recommended
• Clearing of any known nesting tree. • Clearing of any part or degradation of breeding habitat. • Clearing of more than 1 ha of quality foraging habitat. • Creating a gap of greater than 4 km between patches of Black Cockatoo habitat (breeding, foraging or roosting). • Clearing or degradation (including pruning the top canopy) of a known roosting site.
Uncertainty: referral recommended or contact the Department
• Degradation (such as through altered hydrology or fire regimes) of more than 1 ha of foraging habitat. Significance will depend on the level and extent of degradation and the quality of the habitat. • Clearing or disturbance in areas surrounding Black Cockatoo habitat that has the potential to degrade habitat through introduction of invasive species, edge effects, hydrological changes, increased human visitation or fire. • Actions that do not directly affect the listed species but that have the potential for indirect impacts such as increasing competitors for nest hollows. • Actions with the potential to introduce known plant diseases such as *Phytophthora* spp.
Low risk of significant impacts: referral may not be required but you may refer for legal certainty
• Actions that do not affect Black Cockatoo habitat or individuals. • Actions whose impacts occur outside the modeled distribution of the three Black Cockatoos.

Three species of threatened Black Cockatoos that occur in the State's South West are protected under the *EPBC Act 1999* and the *WC Act 1950* (Table 1):

- Carnaby's Cockatoo (*Calyptorhynchus latirostris*),
- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) and
- Baudin's Cockatoo (*Calyptorhynchus baudinii*).

Based on the modelled distribution maps presented in the draft referral guidelines for these three species, two of the three are likely to occur in the study area; the Carnaby's Cockatoo and the Forest Red-tailed Black Cockatoo (DSEWPaC 2011b). The site does not occur within the modelled distribution of the Baudin's Cockatoo.

2 BIOPHYSICAL ENVIRONMENT

2.1 CLIMATE

The nearest reliable rainfall data is available from the Greenbushes township and the nearest reliable data for temperature is available from the Bridgetown Bureau of Meteorology (BoM).

The Greenbushes/ Bridgetown area has a Mediterranean climate characterised by hot dry summers and cool wet winters with an average maximum summer temperature of 29.8 °C and an average minimum winter temperature of 4.4°C. The region receives an average annual rainfall of 930.9 millimetres (mm), with the majority of precipitation occurring in winter (BOM 2011) (Figure 2).

The area received 901.6 mm of rain in the 12 months prior to survey (November 2010 – October 2011), 3.1% below the average long term (1893-2011) rainfall of 930.9 mm for the same period. In the three months prior to survey (July-September 2011), the Greenbushes / Bridgetown area received 408 mm, consistent with the average rainfall for the same period of 412.9 mm (BOM 2011).

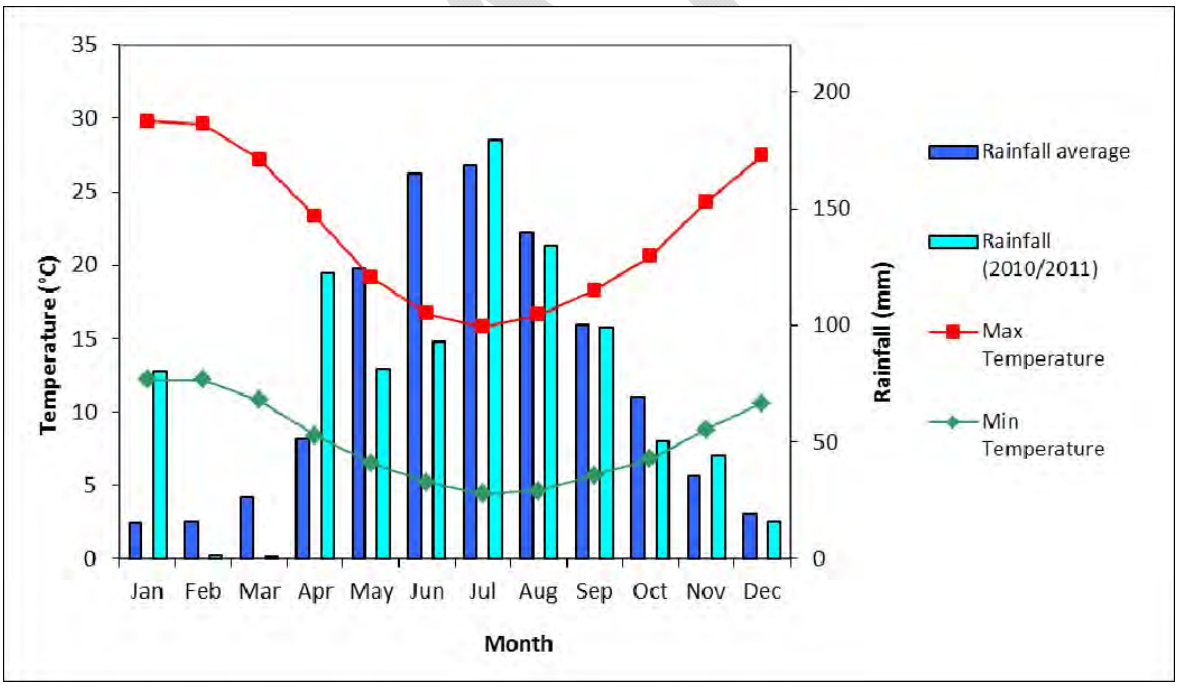

Figure 2: Average long-term (1893-2011) and 2010-2011 monthly rainfall for Greenbushes and average maximum and minimum temperatures (1901-2011) at Bridgetown (BOM 2011).

2.2 GEOLOGY AND SOILS

South-western Australia has been mapped into soil-landscape zones, which describes broad soil and landscape characteristics (Tille 2006). The survey area resides within the

Avon Province which Tille (2006) describes as a Laterised plateau (dissected at fringes and with saline drainage lines inland) on deeply weathered mantle and alluvium over granitic rocks of the Yilgarn Craton (and Albany-Fraser Orogen). Soils of this Province are characterised by sandy duplexes soils and Ironstone gravelly soils with Loamy earths, Loamy duplexes, Sandy earths, Deep sands and Wet soils (Tille 2006).

The survey area occurs on the Darling Plateau portion of the Darling System (Churchward & McArthur 1980). Landforms and Soils of the Darling Plateau have been described by Churchward & McArthur (1980) as dominated by lateritic uplands and duricrust gravels and sands which form a gently undulating surface. The study area occurs on the following:

- Hester: Narrow plateau remnants with duricrust and gravels; some duricrust on ridges;
- Bridgetown: Very Deeply incised valley of the Blackwood River; shallow red and yellow earths and rock outcrop on slopes; narrow alluvial terraces; and
- Goonaping: Shallow upland valleys with grey sands and some swamps.

2.3 BIOGEOGRAPHIC REGIONALISATION OF AUSTRALIA

The Biogeographic Regionalisation of Australia (IBRA) divides Australia into 85 bioregions based on major biological and geographical/geological attributes (Thackway and Cresswell 1995). These bioregions are subdivided into 403 subregions, as part of a refinement of the IBRA framework (Department of Sustainability, Environment, Water, Population and Communities [DSEWPaC] 2011a).

The study area is located in the Southern Jarrah Forest (JF2) subregion of the Jarrah Forest (JF) bioregion (Thackway and Cresswell 1995). The Southern Jarrah Forest subregion is characterised by *Eucalyptus marginata* subsp. *marginata* (Jarrah) and *Corymbia calophylla* (Marri) forest on laterite gravels in the west grading to Wandoo-Marri woodlands on clayey soils in the east. The dominant land use for the Southern Jarrah Forest subregion is grazing and dry land agricultures, forestry and conservation (Hearn *et al.* 2002).

2.4 BROAD VEGETATION TYPES

Mapping of the vegetation of Western Australia was completed on a broad scale (1:250,000) by Beard (1978). These vegetation units were re-assessed by Shepherd *et al.* (2001) to account for clearing in the intensive land use zone, dividing some larger vegetation units into smaller units. The study area is situated in the Menzies Botanical Subdistrict of the South West Botanical Province (Beard 1990). There is one Beard / Shepherd vegetation unit in the study area and is summarised in Table 2.

Table 2: Vegetation Associations as mapped by Beard (1978) and Shepherd *et al.* (2001)

Vegetation Type Vegetation Description	Beard / Shepherd Code	Extent of Pre-European Vegetation (ha)	Current Extent (ha)	Proportion of Vegetation Remaining (%)	Extent of Vegetation Within Survey Area (Ha)
Medium forest; Jarrah – Marri (*Eucalyptus marginata - Corymbia calophylla*)	$e_{2,3}$Mc / 3	3 046 385	2 197 837	72.1	34.97

Mattiske & Havel (1998) mapped the vegetation of the Bridgetown area as part of the Regional Forest Agreement (RFA). Seven vegetation complexes, as described by Mattiske and Havel (1998) occur in the study area (Table 3)

Table 3: Regional Forest Agreement Vegetation Complexes occurring in the Study area

Code	Name	Description
BL	Balingup	Open forest of *Eucalyptus marginata* subsp. *marginata–Corymbia calophylla* on slopes and woodland of *Eucalyptus rudis* on the valley floors in the humid zone.
BT	Bridgetown	Mixture of open forest of *Eucalyptus marginata* subsp. *marginata–Corymbia calophylla* with some *Eucalyptus patens* on slopes to low open forest of *Eucalyptus rudis–Melaleuca rhaphiophylla* on the valley floors in the humid zone.
BTf	Bridgetown Valley Floors	Open forest of *Corymbia calophylla* over *Hakea lasianthoides* with some *Eucalyptus rudis* on lower less undulating footslopes in the humid zone.
CC1	Catterick	Open forest of *Eucalyptus marginata* subsp. *marginata–Corymbia calophylla* mixed with *Eucalyptus patens* on slopes, *Eucalyptus rudis* and *Banksia littoralis* on valley floors in the humid zone.
G	Goonaping	Mosaic of open forest of *Eucalyptus marginata* (humid zones) and *Eucalyptus marginata* subsp. *thalassic* (semiarid to perarid zones) on the sand-gravels, low woodland of *Banksia attenuata* on the drier sandier sites (humid to perarid zones) with some *Banksia menziesii* (northern arid and perarid zones) and low open woodland of *Melaleuca preissiana–Banksia littoralis* on the moister sandy soils (humid to perarid zones).
GR	Grimwade	Tall open forest to open forest of *Corymbia calophylla–Eucalyptus marginata* subsp. *marginata* with *Eucalyptus patens* on slopes and *Eucalyptus rudis* over some *Agonis flexuosa* on lower slopes in the

Code	Name	Description
		humid zone.
HR	Hester	Tall open forest to open forest of *Eucalyptus marginata* subsp. *marginata–Corymbia calophylla* on lateritic uplands in perhumid and humid zones.

Mapping by Heddle, Lonergan and Havel (1978) identified two vegetation complexes occurring in the study area:

- 1: Dwellingup and Hester Complex in High Rainfall – Central and South - Open forest of *Eucalyptus marginata–Eucalyptus calophylla*; and
- 19: Bridgetown Complex in Medium to High Rainfall – Vegetation ranges from open forest of *Eucalyptus marginate – Eucalyptus calophylla* with some *Eucalyptus patens* to a low open forest of *Eucalyptus rudis – Melaleuca rhaphiophylla* on the valley floors.

2.5 PREVIOUS BIOLOGICAL SURVEYS

2.5.1 Flora

AECOM (2010) provided the initial survey for the Millstream Dam to Greenbushes Pipeline corridor. In terms of vegetation associations and floristics, it is particularly relevant to the current survey. The 2010 study involved a single season Level 2 flora and vegetation survey, including data collection from 8 quadrats and targeted searching for conservation significant flora and ecological communities.

A total of 86 taxa, including 29 introduced species, from 70 genera and 35 families were recorded during the 2010 survey. AECOM (2010) did not record any Threatened species pursuant to the *EPBC Act* and/or gazetted as Threatened (DRF) pursuant to the *WC Act,* Priority Flora and TECs or PECs along the initial pipeline corridor route.

AECOM (2010) recorded 19 vegetation associations, which includes cleared areas, pine plantations and other degraded areas.

Other studies most relevant to the current survey include:

- *Millstream Dam Calothamnus rupestris Priority Search* (ENV 2009a);
- *Biological Assessment of Millstream Dam and Gregory Brook Preliminary Environmental Impact Assessment* (ENV 2008);

2.5.2 Fauna

AECOM (2010) conducted a Level 1 Fauna assessment as part of the Bridgetown RWSS Pipelines Millstream Dam to Greenbushes Link. The survey consisted of a desktop review followed by a field assessment in October and November 2009. The field survey consisted of habitat assessments as well as opportunistic fauna observations. During the field survey 13 birds, one reptile, and one amphibian species were recorded. Of these species two were of conservation significance; the Forest Red-tailed Black Cockatoo listed as Vulnerable under the *EPBC Act* and Schedule 1 under the *WC Act*, and another of the Black Cockatoos that was unable to be identified (either Baudin's or Carnaby's Cockatoo).

ENV (2009b) conducted a Level 2 fauna assessment specifically targeting conservation significant species in the Millstream Dam project area during August 2009. The assessment involved both systematic and non-systematic sampling. The systematic sampling consisted of seven trapping grids with a total of 63 cage trap nights, 252 funnel trap nights, a further 12 cage traps were set out with 30 trap nights, 139 hair trap nights, bird surveys, acoustic bat surveys and habitat assessments. The non-systematic sampling comprised opportunistic observations of fauna while conducting searches. During the survey five amphibians, two reptiles, 38 birds and 17 mammals were recorded. Five species of conservation were recorded; Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii* subsp. *naso*) and Baudin's Cockatoo (*Calyptorhynchus baudinii*) listed as Vulnerable under the EPBC Act and Schedule 1 under the WC Act and Carnaby's Cockatoo (*Calyptorhynchus latirostris*) listed as Endangered under the EPBC Act and Schedule 1 under the WC act, Western Brush Wallaby (*Macropus irma*) and Western False Pipistrelle (*Falsistrellus mackenziei*), both listed as Priority 4 under the DEC Priority List.

ENV (2009c) conducted a Black Cockatoo habitat assessment from 5- 8 January 2009 at four sites as part of developing a biodiversity offset for the Millstream Dam Expansion project. The assessment consisted of habitat assessments, searching for feeding evidence, roosting behaviour during dawn and dusk surveys, and assessing the potential for trees to contain suitable for hollows. During the survey all three Black Cockatoo species were recorded (Forest Red-tailed Black Cockatoo, Baudin's Cockatoo and Carnaby's Cockatoo). No roosting or breeding activity was recorded but foraging evidence, in the form of chewed Marri and Jarrah nuts were recorded.

ENV (2008) conducted a Level 1 fauna assessment as part of an environmental impact assessment of the Millstream Dam and Gregory Brook. The survey consisted of a desktop review followed by a field survey in October and November 2008. The field survey consisted of habitat assessments as well as opportunistic fauna observations. During the survey two bird species were recorded and four main faunal habitat types were identified in the Millstream Dam survey area and four main faunal habitat types were recognized in the Gregory Brook survey area. No conservation significant fauna were recorded during the survey.

2.6 POTENTIALLY OCCURRING FLORA AND ECOLOGICAL COMMUNITIES OF CONSERVATION SIGNIFICANCE

No species listed under the *EPBC Act* or gazetted as Threatened (DRF) under the *WC Act* have been previously recorded in the study area. No species listed as Priority Flora by the DEC have been previously recorded in the study area.

A search of DEC databases (Appendix A), including a 20 km buffer around the study area, identified one DRF (Threatened) species: the orchid *Caladenia harringtoniae*, and 19 Priority Flora. An additional priority species, *Calothamnus rupestris*, was recorded in a nearby survey of Millstream Dam (ENV 2009a) and is therefore considered as potentially occurring in the study area. The likelihood of the occurrence of these species within the study area is presented in Table 4. Of the 20 Threatened and Priority Flora that potentially occur in the study area, three species are considered as 'Likely', 12 species are considered 'Possible', and 5 species are considered 'Unlikely' to occur.

Table 4: The Likelihood of Threatened and Priority Flora Occurring in the Study Area based on the DEC Database Search results

Priority Taxa	Conservation Status	Habitat Preference (WAH 2011)	Suitable Habitat Present	Number of Records[1]	Closest Record[2]	Likelihood in the study area
Acacia flagelliformis	P4	Sandy soils. Winter-wet areas.	Yes	1	10 km	Possible
Astroloma sp. Nannup (R.D. Royce 3978)	P4	Sandy & gravelly lateritic soils.	Yes	1	5.3 km	Likely
Boronia humifusa	P1	Gravelly clay loam over laterite. Jarrah-marri open forest.	Yes	1	16.2 km	Possible
Caladenia harringtoniae	T	Sandy loam. Winter-wet flats, margins of lakes, creeklines, granite outcrops.	Yes	9	0.6 km	Likely
Caladenia uliginosa subsp. *patulens*	P1	Clay loam and gravel. Well drained soils amongst dense shrubs.	Yes	1	18 km	Possible
Calothamnus graniticus subsp. *graniticus*	P4	Skeletal sandy soils. Granite outcrops.	No	1	20 km	Unlikely
Calothamnus microcarpus	P2	Lateritic clay, sandy soils.	Yes	1	20 km	Possible
Calothamnus rupestris[3]	P4	Gravelly skeletal soils. Granite outcrops & rocks, hillsides.	Yes	1	1.1 km	Likely
Carex tereticaulis	P1	Black peaty sand.	No	4	15.3 km	Unlikely
Conospermum paniculatum	P3	Sandy or clayey soils. Swampy areas, plains, slopes.	Yes	1	20 km	Possible
Dampiera heteroptera	P3	Sandy soils. Swampy areas	No	1	9.7 km	Unlikely

Priority Taxa	Conservation Status	Habitat Preference (WAH 2011)	Suitable Habitat Present	Number of Records[1]	Closest Record[2]	Likelihood in the study area
Gastrolobium sp. Yoongarillup (S.Dilkes s.n. 1/9/1969)	P1	Valley. In forest, open plain. White; dry sand, Rocky; red gravel.	Yes	1	18.3 km	Possible
Grevillea ripicola	P4	Amongst medium trees, tall (sclerophyll) shrubland, or low (sclerophyll) shrubland; in gravelly soil, or loam, or clay; occupying riverbanks, swamps.	Yes	3	3 km	Possible
Meeboldina thysanantha	P3	Sand. Swamps.	No	1	20 km	Unlikely
Melaleuca incana subsp. *Gingilup* (N. Gibson & M. Lyons 593)	P2	Red-grey sand, sandy clay over ironstone. Seasonally wet flats.	No	1	20 km	Unlikely
Senecio gilbertii	P1	Peaty sand. Swamps, slopes	Yes	1	19.3 km	Possible
Synaphea otiostigma	P3	Clayey laterite, gravelly loam, sand.	Yes	3	19.5 km	Possible
Tetratheca parvifolia	P3	Jarrah/Marri forest. On Brown/yellow sandy loam with concretionary/lateritic gravel	Yes	3	13 km	Possible
Thysanotus gageoides	P3	Sand, clay, granite, sandstone, laterite.	Yes	1	19 km	Possible
Thysanotus unicupensis	P2	Woodlands. Lower slope near large swamp. Grey sand over laterite.	Yes	1	19 km	Possible

1 Number of DEC records from Database Search within a 20 km radius (DEC 2011a)
2 Closest DEC Record (based on locations provided in Database Search) (DEC 2011a)
3 Recorded in nearby report (ENV 2009a)

Likely – suitable habitat and close (<10 km) records suggest species is likely to occur;
Possible – suitable habitat and records (10-20 km) suggests species may possibly occur; and
Unlikely – lack of suitable habitat suggests species is unlikely to occur.

No TECs, listed under the *EPBC Act* or as endorsed by the Western Australian Minister for the Environment, were identified as occurring in the study area. No PECs, as listed by the DEC, are known to occur in the study area.

A DEC database search (DEC 2011b), including a 20km buffer around the study area, did not identify any TECs or PECs; however, one Priority Two PEC, the Blackwood Alluvial Flats is located 40 km from the study area.

No TECs or PECs have been identified in previous biological surveys (AECOM 2010, ENV 2009b) as occurring in the vicinity of the study area.

2.7 POTENTIALLY OCCURRING FAUNA OF CONSERVATION SIGNIFICANCE

A total of 20 conservation significant fauna species potentially occur in the study area, (Table 5, Appendix E) (DEC 2011f). These comprise two reptiles, 10 birds and eight mammals. Five of the 20 species are considered as 'Unlikely' to occur within the study area, five species are considered as 'Possible' to occur and seven species are considered as 'Likely' to occur within the study area (Appendix E).

Table 5: Conservation Significant Fauna Potentially Occurring in the Study Area

Taxa	Conservation Status	Likelihood
Reptiles		
Ctenotus delli	P4	Unlikely
Carpet Python (*Morelia spilota imbricata*)	S4	Likely (further recorded during the survey)
Birds		
Fork-tailed Swift (*Apus pacificus*)	Mi	Possible
Peregrine Falcon (*Falco peregrinus*)	S4	Possible
Australian Bustard (*Ardeotis australis*)	P4	Unlikely
Bush Stone-curlew (*Burhinus grallarius*)	P4	Unlikely
Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*)	Vu, S1	Likely
Baudin's Cockatoo (*Calyptorhynchus baudinii*)	Vu, S1	Likely
Carnaby's Cockatoo (*Calyptorhynchus latirostris*)	En, S1	Likely (further recorded during the survey)
Masked Owl (*Tyto novaehollandiae*)	P3	Possible

Taxa	Conservation Status	Likelihood
Rainbow Bee-eater (*Merops ornatus*)	Mi	Likely (further recorded during the survey)
Crested Shrike-tit (*Falcunculus frontatus leucogaster*)	P4	Possible
Mammals		
Western Quoll (*Dasyurus geoffroyi*)	Vu, S1	Likely
Brush-tailed Phascogale (*Phascogale tapoatafa*)	S1	Likely
Numbat (*Myrmecobius fasciatus*)	Vu, S1	Likely
Quenda (*Isoodon obesulus fusciventer*)	P5	Unlikely
Western Brush Wallaby (*Macropus irma*)	P4	Likely
Quokka (*Setonix brachyurus*)	Vu, S1	Possible
Western Ringtail Possum (*Pseudocheirus occidentalis*)	Vu, S1	Unlikely
Western False Pipistrelle (*Falsistrellus mackenziei*)	P4	Likely

En Listed as Endangered under the *EBPC Act 1999*.
Vu Listed as Vulnerable under the *EBPC Act 1999*.
Mi Listed as Migratory under the *EBPC Act 1999*.
S Scheduled under the *WC Act 1950*. Schedule 1 and 2 fauna are also protected by the *EBPC Act 1999*.
P Listed as Priority by the DEC.

2.8 POTENTIALLY OCCURRING ENVIRONMENTALLY SENSITIVE AREAS

There are no ESAs recorded in the study area. The closest ESA to the study area is approximately 600 m west of the corridor in the Greenbushes State Forest (DEC 2011c).

3 METHODS

3.1 FLORA

The survey was consistent with a Level 2 survey, as set out in the following documents:

- *Environmental Protection of Native Vegetation in Western Australia: Clearing of Native Vegetation with Particular Reference to Agricultural Areas. Position Statement No.2* (EPA 2000);
- *Terrestrial Biological Surveys as an Element of Biodiversity Protection. Position Statement No. 3* (EPA 2002); and
- *EPA Guidance for the Assessment of Environmental Factors: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia No. 51* (EPA 2004a).

3.1.1 Database Review

A desktop study was undertaken to gather background information on flora and vegetation of the study area. This involved a search of the following sources:

- DEC Threatened and Priority Flora database (DEC 2011a) (area search based on an 20 km buffer around the study area);
- DEC Threatened and Priority Ecological Communities database (DEC 2011b) (area search based on an 40 km buffer around the study area);
- DSEWPaC Protected Matters Search Tool (DSEWPaC 2011a), also known as an *EPBC* search (area search based on an 20 km buffer around the study area); and
- Previous flora surveys from the vicinity of the study area (e.g. previous consultants reports, DEC reports).

A request for a database search was submitted to the DEC, a shape file of the study area was provided, including a 20 km buffer, to collate information on Declared Rare or Priority species and Threatened or Priority Ecological Communities previously recorded in the study and surrounding areas. In addition, a literature review was also conducted to analyse previous biological surveys of the area. These sources were used to compile a list of expected Threatened or Priority species (Table 4), and TECs or PECs that may occur in the study area.

3.1.2 Field Survey

The survey was undertaken during 25-27 October 2011 with 6 person-days invested in the flora and vegetation assessment of the study area.

The survey recorded floristics, vegetation composition and structure and assessed vegetation condition using quadrat data and by traversing the study area. Field staff collected flora and environmental information using 10 x 10 m vegetation survey plots, relevés and opportunistic collections. Quadrat and relevé locations are illustrated in Figure 3.

A total of eight quadrats and three relevés were surveyed. The sites were selected to be representative of the flora and vegetation. The information recorded at each quadrat included habitat, aspect, soils, bare ground, litter cover, approximate fire age, disturbance, and vegetation condition. Every plant species was recorded, including an estimate on height and percentage cover. This enabled the description of vegetation associations, and facilitated vegetation mapping. Targeted searches and opportunistic collections focused mainly on the location of new taxa not recorded in the quadrats, introduced species, and in particular, Declared Rare and Priority Flora, and taxa not well known or currently described.

3.1.3 Taxonomy

At least one specimen of each taxon was collected. In addition, where field identification of taxa was not possible, specimens were collected (including vegetative, flowering or fruiting material, as well as plant bases, where possible) for later identification by taxonomists utilising identification keys including Flora of Central Australia (Jessop 1981), Flora of Australia (1981-2011), AusGrass (Sharp and Simon 2002), EUCLID (EUCLID 2006), WATTLE (Maslin 2001), relevant taxonomic papers published in journals including Australian Systematic Botany (1988-2011) and Nuytsia (1975-2011). If required resources of the Western Australian Herbarium (WAH) were also utilised.

The species list for the study area was checked against FloraBase (WAH 2011) to determine whether any of the species are listed as Threatened, Priority Flora or introduced species. Declared Rare and Priority Flora were also verified against the *EPBC Act* listing of threatened species to determine whether any are federally listed. Introduced species were checked against the *ARRP Act* to determine whether any are listed as Declared Plants. Species identified as Declared Plants were checked against the Environmental Weed Strategy for Western Australia (CALM 1999) and the DEC Invasive Plant Prioritisation Process – South West Weed Assessment List (DEC 2011d), to determine the ranking in terms of their environmental impact.

3.1.4 Vegetation Mapping

Vegetation was described based on structure and species composition, as defined by quadrat data and field observations. Locations of quadrats were selected using aerial photographs and were positioned to cover observed variations in vegetation (Figure 3).

Vegetation mapping was undertaken in the field and finalised in the office. Field mapping was carried out using GPS (Garmin) and GIS (OziExplorer and ArcGIS 9.3.1)

hardware and software. GPS accuracy can be variable depending on signal strength and may have an effect on data quality given the narrow breadth of the corridor (10 m wide).

Once the vegetation associations were determined, they were checked against the listing of Federal and State TECs and State PECs. The vegetation associations were also checked against regional databases, such as Beard (1978), Shepherd *et al.* (2001) and Comprehensive Adequate and Representative (CAR) Reserve Analysis (DAFWA 2007), to determine their regional representation.

3.1.5 Vegetation Condition Mapping

Quadrat data, combined with field traverses of the study area were assessed for vegetation condition based on Bushforever (Government of Western Australia 2000). Vegetation condition boundaries were delineated using aerial photography (Figure 4). The vegetation condition mapping was then digitised and produced as manipulable electronic mapping data using ARCGIS 9.3.1. Vegetation condition was assessed based on the condition scale presented in Appendix F. Vegetation condition mapping is combined with the vegetation associations, shown in Figure 5.

3.2 FAUNA

The survey was compliant with a Level 1 survey, as set out in the following documents:

- *Terrestrial Biological Surveys as an Element of Biodiversity Protection. Position Statement No. 3* (EPA 2002);
- *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia. Guidance Statement No. 56* (EPA 2004b); and
- *Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA 2010*).*

3.2.1 Database Review

The purpose of the desktop review was to gather background information on the study area and the fauna that it may support. This involved a search of the following sources:

- Western Australian Museum (WAM) and DEC combined biological database NatureMap (DEC 2011e) (area search based on an approximate 10 km buffer around the study area);
- DEC Threatened and Priority Fauna Database (DEC 2011f) (area search based on an approximate 10 km buffer around the study area);

- Birds Australia's Birdata (Birdata 2011) (area search based on a one degree square at around the study area);
- DSEWPaC Protected Matters Search Tool (DSEWPaC 2011a), also known as an *EPBC* search (10 km buffer); and
- Previous fauna surveys (e.g. previous ENV reports and other consultant's reports).

Collectively, these sources were used to compile a list of species that have been previously recorded in the region. This list invariably includes some species that do not occur in the current study area due to its restricted size. Furthermore some fauna have a limited or patchy distribution or a high level of habitat specificity for habitats which are not located in the study area. Some fauna may also have become locally extinct or were erroneously identified in previous surveys. These fauna were excluded from the list where relevant.

3.2.2 Field Survey

The purpose of the field survey was to verify the accuracy of the desktop survey and to further delineate and characterise the fauna and faunal assemblages in the study area. The survey consisted of a fauna habitat assessment and opportunistic observations. Searches for tracks, scats and other signs (e.g. dreys of the Western Ringtail Possum [*Pseudocheirus occidentalis*]) of Threatened species identified in the database searches were conducted. However, the focus of this survey was to assess the suitability of trees and shrubs that occur in the proposed pipeline corridor for use by Black Cockatoos i.e. does the pipeline corridor contain foraging, roosting and breeding habitat.

3.2.3 Fauna Habitat Assessment

Broad fauna habitats based on vegetation structure and landforms were identified during the field survey and assessed for their potential to support species of conservation significance, and the suitability to a wider suite of fauna (Figure 6). Habitat value was rated on the basis of complexity, presence of microhabitats, including significant trees with hollows, loose bark, fallen hollow logs and leaf litter, and representation of the habitat in the site and region.

3.2.4 Black Cockatoo Assessment

There is an increasing focus from the regulatory authorities on proposals that have the potential to impact on Black Cockatoo habitat. The draft referral guidelines for Black Cockatoos have recently been released by the DSEWPaC (2011b). These guidelines are designed to assist in the determination of likely impacts of proposed actions and whether a referral is required (Table 1).

Three species of threatened Black Cockatoos that occur in the State's south-west are protected under the *EPBC Act 1999* and the *WC Act 1950* (Table 1): Forest Red-tailed

Black Cockatoo (FRBC) (*Calyptorhynchus banksii naso*), Baudin's Cockatoo (*Calyptorhynchus baudinii*) and Carnaby's Cockatoo (*Calyptorhynchus latirostris*). Based on the modelled distribution maps presented in the draft referral guidelines for these three species, all are likely to occur in the study area (DSEWPaC 2011b).

As part of this survey, a Black Cockatoo habitat assessment was conducted along the entire pipeline route. Sites were assessed on their potential to provide foraging, roosting and breeding habitat.

3.2.5 Black Cockatoo Foraging Assessment

In areas where Black Cockatoos have been feeding, the remains of food on the ground (often chewed eucalypt nuts) can be attributed to one of the three Black Cockatoo species. One of the most important indicators is the fruit of the Marri tree. Potential foraging plants were identified and the ground under these plants was searched for any evidence of Black Cockatoo foraging. The distribution of known foraging resources within the study area was recorded.

3.2.6 Black Cockatoo Roosting Assessment

The Black Cockatoo draft referral guidelines regard roosting habitat for Black Cockatoos as any tall tree in the Perth metropolitan area. Outside of the metropolitan area roost sites are generally found in or near riparian environments or natural and artificial water sources for Baudin's and Carnaby's Cockatoos and tall Jarrah and Marri trees within or on the edge of forests for FRBC (DSEWPaC 2011b). Any tall Jarrah and Marri trees were examined for evidence of roosting activity (presence of feathers and droppings) and if found were recorded (GPS location, species and height).

3.2.7 Black Cockatoo Breeding Assessment

Breeding habitat is a particularly important aspect for any assessment of impacts upon Black Cockatoos. To determine the breeding potential of the site in accordance with DSEWPaC referral guidelines, a habitat assessment was undertaken.

In the *EPBC Act* Black Cockatoo draft referral guidelines, any patch of woodland or forest that contains live or dead trees of the appropriate species with a DBH greater than 500 mm or the presence of a suitable nest hollow is classified as breeding habitat (DSEWPaC 2011b). All such trees in the study area had various measurements taken (DBH, number and size of hollow and a GPS co-ordinate was recorded) so that the breeding potential of the study area could be assessed. GPS accuracy can be variable depending on signal strength and may have an effect on data quality given the narrow breadth of the corridor (10 m wide).

3.2.8 Taxonomy

If there is any doubt as to the taxonomy of species identified in the desktop assessment as a result of subsequent name changes or taxonomic reviews, an effort was made to determine the current scientific name for each taxon was used. In some cases, old scientific names may be presented where correct nomenclature could not be determined due to name changes. Some taxon names may be followed by 'sp.', meaning that the species name was not given in the data source or the identification is in doubt. Previously recorded taxa that have the potential to be of conservation significance are discussed specifically in the Results and Discussion section.

Taxonomy and nomenclature in this report follows the accepted listing of published terrestrial vertebrate species. The listing for amphibians follows Tyler and Doughty (2009), reptiles follows Wilson and Swan (2010), birds follows Christidis and Boles (2008) and mammals Van Dyck and Strahan (2008).

4 RESULTS

4.1 FLORA SURVEY LIMITATIONS AND CONSTRAINTS

It is important to note the variables associated with individual surveys, which are often difficult to predict, as is the extent to which they influence survey outcomes. Survey variables of the flora survey are detailed in Table 6.

Table 6: Limitations and Constraints Associated with the Flora and Vegetation Survey

Variable	Impact on Survey Outcomes
Access	The study area was accessible and adequately surveyed.
Experience	The scientists who conducted these surveys were practitioners suitably qualified in their respective fields. • Coordinating Botanist: Joel Collins (Senior Botanist); • Field Staff: Joel Collins (Senior Botanist) and Catherine Webb (Environmental Biologist); • Taxonomy: Peter Jobson (Senior Botanist / Taxonomist); and • Data Interpretation: Joel Collins and Catherine Webb
Timing[1], weather, season	The survey was undertaken during spring with average rainfall experienced in the region prior to the survey. For further details of rainfall prior to the survey please see section 1.4. The three months prior to survey (July-September), Greenbushes recorded 408.2 mm of rainfall, consistent with average rainfall (BOM 2011).
Scope: Life forms	As the survey was conducted at a suitable time in spring, the majority of life forms, including annuals and herbs were expected to be present during the survey.
Sources of information	Those most relevant to the current study are listed in Section 2.1.2.
Completeness	The study area was accessible, the survey season was considered to be optimal and the time spent conducting the survey was considered to be adequate. It was considered that all vegetation types within the study area were adequately surveyed; with quadrats, relevés and vegetation mapping notes recorded for all vegetation types.

[1] *EPA Guidance Statement 51* (2004) stipulates that flora and vegetation surveys should be undertaken following the season that contributes the greatest rainfall in the region. In the South-west Province the main rain is in winter, requiring surveys to be undertaken in spring. Short-term variations in normal weather patterns (e.g. drought) may necessitate supplementary survey work at other times of year or in later years to take into account temporal changes in diversity.

4.2 FLORA

4.2.1 Recorded Flora

A total of 172 taxa (including species, subspecies, varieties and forms) from 123 genera and 51 families were recorded from the study area. The most frequently recorded families were; Fabaceae (32 taxa), Poaceae (15 taxa), Asteraceae (15 taxa) and Myrtaceae (10). The most frequently recorded genera were *Acacia* (10 taxa), *Hibbertia* (5 taxa), *Oxalis* (4) and *Stylidium* (4 taxa). An average of 21.1 taxa were recorded in each quadrat, with a standard deviation of ± 11.2.

Quadrat data, including photographs, is presented in Appendix G, the flora by site matrix in Appendix H and the flora inventory in Appendix I.

4.2.2 Flora of Conservation Significance

No Threatened species pursuant to the *EPBC Act* and/or gazetted as Threatened (DRF) pursuant to the *WC Act* were recorded in the study area.

Two Priority species were recorded:

- *Tetratheca parvifolia* (Priority 3) (Plate 1) is a small shrub up to 0.3 m with pink flowers in October and is found in Jarrah/Marri forest (WAH 2011); and
- *Eucalyptus rudis* subsp. *cratyantha* (Priority 4) (Plate 2) is a large tree growing to 20 m with box-like bark and has white flowers during July-September. This subspecies differs from the typical species in having larger buds and fruits. It is often found growing near drainage lines on loam soils (WAH 2011).

The locations of the Priority Flora are presented in Figure 7 and listed below (Table 7).

Plate 1: *Tetratheca parvifolia* (Priority 3)

Plate 2: *Eucalyptus rudis* subsp. *cratyantha* (Priority 4)

Table 7: Location of Conservation Significant Flora in the study area.

Taxa	Site Number	# Easting	# Northing	% cover
Eucalyptus rudis subsp. *cratyantha* (P4)	MP10	404295	6247296	5
	MP11	404261	6247250	50
Tetratheca parvifolia (P3)	MP01	412782	6253783	<1
	MP07	411239	6249937	<1

World Geodetic System 1984 (WGS84), Zone 50K

4.2.3 Flora of Interest

Five species, including three native and two introduced species, were recorded outside of their current known distribution and represent range extensions. *Dianella brevicaulis, Diuris amplissima, Thelymitra canaliculata, *Ligustrum ovalifolium, and *Plantago bellardii* have not been previously recorded in the Greenbushes/Bridgetown area (WAH 2011).

4.2.4 Introduced Flora

Sixty introduced species were recorded in the study area. Of these, three species are listed as Declared Plants under the *ARRP Act* (WA); **Asparagus asparagoides* (Bridal Creeper; Plate 3), **Rubus anglocandicans* (European Blackberry; Plate 4) and **Zantedeschia aethiopica* (Arum Lily, Plate 5). These species are listed as environmental weeds (CALM 1999). The rating and criteria for these species' inclusion under this strategy, as well as their rating against the invasiveness (DEC 2011d), is presented in Table 8. Their locations in the study area are shown in Figure 4.

The introduced species **Ligustrum ovalifoliumi*, was recorded in quadrat MP10 (404295E, 6247296N) at the southern end of the study area. This species is regarded as highly invasive and was previously thought to have been eradicated (G. Keighery *pers. com.*). This species will be discussed further in section 5.4.

Plate 3: Bridal Creeper (**Asparagus asparagoides*)

Plate 4: European Blackberry (**Rubus anglocandicans*)

Plate 5: Arum Lily (**Zantedeschia aethiopica*)

Table 8: Declared Plant Species Recorded in the Study Area, including their rating by Environmental Weed Strategy (CALM 1999) and DEC Invasive Plant Prioritization Process (DEC 2011d)

Declared Plants	Criteria (CALM 1999)				Criteria (DEC 2011d) Invasiveness
	Rating	Invasiveness	Distribution	Impacts	
**Asparagus asparagoides* (Bridal Creeper)	High	Yes	Yes	Yes	Rapid
**Rubus anglocandicans* (European Blackberry)	Moderate	Yes	Yes	N/A	Rapid
**Zantedeschia aethiopica* (Arum Lily)	High	Yes	Yes	Yes	Moderate

4.3 VEGETATION

4.3.1 Vegetation Associations

Ten vegetation associations were identified within the study area, including revegetation areas located near the mine site and plantation areas located in the southern section of the study area (Figure 3). The vegetation associations mapped within the study area are summarised in Table 9.

Table 9: Vegetation Association recorded in the Study Area

Vegetation Association Code	Vegetation Association Description	Extent within Study Area (ha)
CcEmBlPe	*Corymbia calophylla* and *Eucalyptus marginata* subsp. *marginata* open forest over *Bossiaea linophylla* low open shrubland over *Pteridium esculentum* and **Freesia alba x leichtlinii* very open *herbland* over **Briza maxima* very open grassland.	1.30
EmCcBgBl	*Eucalyptus marginata* subsp. *marginata* and *Corymbia calophylla* open forest with scattered *Banksia grandis* over *Bossiaea linophylla, Billardiera fusiformis, Phyllanthus calycinus* and *Acacia extensa* open shrubland over *Lepidosperma gracile* very open sedgeland over *Pteridium esculentum* very open herbland.	1.57
MpCpHpAl	*Melaleuca preissiana* low open woodland over **Chamaecytisus palmensis, Hakea prostrata* and *Astartea leptophylla* tall open shrubland over **Typha orientalis* very open herbland and *Juncus holoschoenus* and *Juncus pallidus* very open sedgeland.	0.29
EmCcAmAeXp	*Eucalyptus marginata* subsp. *marginata* and *Corymbia calophylla* woodland over *Acacia myrtifolia, Acacia extensa* and *Xanthorrhoea preissii* shrubland	3.18
CcErAp	*Corymbia calophylla, *Eucalyptus resinifera* and **Acacia pycnantha* open forest over *Hypocalymma strictum* and *Bossiaea linophylla* open heath over *Lepidosperma gracile* very open sedgeland.	0.24
CcEmBoHlHd	*Corymbia calophylla* and *Eucalyptus marginata* subsp. *marginata* open forest over *Bossiaea ornata*, *Hakea lissocarpha* and *Hibbertia diamesogenos* low shrubland over *Lepidosperma gracile* very open sedgeland.	0.95
CcRa	*Corymbia calophylla* closed forest over **Rubus anglocandicans* closed herbland	0.76

Vegetation Association Code	Vegetation Association Description	Extent within Study Area (ha)
ErMiRa	*Eucalyptus rudis* subsp. *cratyantha* (P4) open woodland over *Melaleuca incana* subsp. *incana* open shrubland over **Rubus anglocandicans* very open herbland over **Ehrharta longiflora, *Bromus diandrus* and **Avena barbata* grassland	0.58
N/A	Planted/Weed Species: **Eucalyptus resinifera*, **Eucalyptus* sp **Acacia pycnantha*, **Acacia decurrens*, **Chamaecytisus palmensis* and *Pinus* sp	0.89
N/A	Pine/Bluegum Plantation	2.63

4.3.2 Vegetation Condition

Vegetation condition in the study area ranged from Completely Degraded to Excellent (Figure 4). The majority (64.57%) of the study area is mapped as Cleared Areas/Firebreaks/Infrastructure and has not been assessed for vegetation condition. Degraded areas account for 12.77% of the study area (Table 10). Completely degraded areas account for 10.03% of the study area. A smaller proportion, (9.89%), of the study area is in Very Good to Excellent condition. The proximity of vegetation to major roads and residential developments, historical vegetation clearing for firebreaks/tracks and the presence of some very aggressive weeds (**Rubus anglocandicans*) had the greatest impact on remnant vegetation.

Table 10: Vegetation Condition (Government of Western Australia 2000) recorded in the Study Area

Vegetation Condition	Area (ha)	Proportion of Study Area (%)
Excellent	2.06	5.88
Very Good	1.40	4.01
Good	0.96	2.74
Degraded	4.46	12.77
Completely Degraded	3.51	10.03
Cleared Areas/Firebreaks/Infrastructure	22.58	64.57
Total	34.97	100

4.3.1 Threatened and Priority Ecological Communities

No vegetation analogous to any known TECs, or PECs was described in the study area.

4.3.2 Environmentally Sensitive Areas

No ESAs were recorded in the study area (DEC 2011c)

4.3.3 Vegetation Extent by Local Government

The study area is situated in the Bridgetown and Donnybrook-Ballingup shires. Both shires occur within the Intensive Land-use Zone (ILZ), a region that has been extensively cleared for agricultural activities. Only the Marri, Jarrah and Karri forests of the extreme south-west remain largely intact (Shepherd *et al.* 2001). The extent of vegetation remaining is presented in Table 11.

Table 11: Vegetation Extent Remaining in the Katanning LGA (Shepherd *et al.* 2001)

Local Government Authority	Total Area (ha)	Native Vegetation Remaining	
		(ha)	(%)
Bridetown/Greenbushes	135,387	91,961	67.9
Donnybrook/Balingup	155,143	111,737	72.0

4.3.4 Regional Representation of Vegetation Associations

Beard (1978) described one vegetation type in the study area, which has been correlated to subsequent mapping by Shepherd *et al.* (2001) (Table 12). The vegetation associations recorded during this study have been broadly correlated with the Beard (1978) vegetation type by examining similarities in vegetation descriptions (Table 9). Differences exist with the terminology used in the descriptions as they are based on different methods of categorising and characterising vegetation types, and the different spatial scale of the analysis (i.e. region vs. local scale).

One Beard / Shepherd vegetation type (Shepherd *et al*. 2001) occurs in the study area. Each vegetation type is categorised according to the area of remaining pre-European vegetation by the Department of Natural Resources and Environment (DNRE 2002). The five categories are:

Presumed Extinct: *Probably no longer present in the bioregion;*

Endangered: *<10% of pre-European extent remains;*

Vulnerable: *10-30% of pre-European extent exists;*

Depleted: *>30% of pre-European extent exists; and*

Least Concern: *>50% of pre-European extent exists and subject to little to no degradation over a majority of this area.*

This conservation status of the vegetation type (Shepherd *et al.* 2001) recorded in the study area is considered to be of Least Concern (DNRE 2002).

Table 12: Regional Representation of Vegetation within the Study Area

Vegetation Code*	Pre-European Extent (ha)**	Current Extent (ha)**	Remaining (%)**	Pre-European % in IUCN Class I-IV Reserves**	Conservation Status***	ENV Vegetation Associations (2011)		
Jarrah Forest 2 (IBRA)	4,506,655	2,440,940	54.2	13.7	Least Concern	N/A		
Vegetation Type (Beard 1978) Western Australia								
3 - Medium forest; Jarrah – Marri (*Eucalyptus marginata - Corymbia calophylla*)	2,661,405	1,863,719	70.0	18	Least Concern	CcEmBlPe	EmCcAmAeXp	CcEmBoHlHd
						EmCcBgBl	CcErAp	CcRa

*Shepherd *et al*. (2001)

**Department of Agriculture and Food (2007)

***Department of Natural Resources and Environment (2002)

4.4 FAUNA SURVEY LIMITATIONS AND CONSTRAINTS

It is important to note the variables associated with individual surveys are often difficult to predict, as is the extent to which they influence survey outcomes. Survey variables are detailed in Table 13.

Table 13: Variables Associated with the Fauna Survey

Variable	Impact on Survey Outcomes
Access	All sections of the study area were accessible and adequately surveyed.
Experience	The scientists who undertook these surveys were practitioners suitably qualified in their respective fields. • Field Staff: Dr Ron Firth (Principal Zoologist) • Data Interpretation and Reporting: James Sansom & Dr Ron Firth.
Timing, weather, season	The survey was undertaken during spring with average rainfall experienced in the region prior to the survey. For further details of rainfall prior to the survey please see section 1.4. The three months prior to survey (July-September), Greenbushes recorded 283.5 mm of rainfall, 8.2% below average (BOM 2011).
Scope: sampling methods/ intensity	A Level One survey was undertaken. Many cryptic species that are typically recorded by various trapping techniques would not have been recorded during the survey e.g. small mammals. All conservation significant species previously recorded in the area have been considered. Based on the habitat present, species that potentially occur in the study areas have been addressed in this report.
Sources of information	The southern Jarrah Forest sub-bioregion has not been extensively cleared for agriculture. Sources of information for the study area come primarily from consultant reports undertaken in the area (see section 9.9.9). Keighery *et al.* (2004) have undertaken a regional biodiversity assessment that encompasses the study area and surrounds.

4.5 FAUNA

4.5.1 Fauna of Conservation Significance

Three conservation significant species were recorded during the current survey, the Carpet Python (*Morelia spilota imbricata*), Carnaby's Cockatoo and Rainbow Bee-eater (*Merops ornatus*) (Figure 6, Appendix J). Of the previously recorded species, four

mammals are listed under the *EPBC Act* as Vulnerable, 32 birds are listed as migratory (including 30 species which will not occur in the study area as a result of no suitable habitat e.g. waders, terns and gulls), and two birds are listed under the *EPBC Act* (one Vulnerable and one Endangered). One reptile, four birds and one mammal previously recorded in the vicinity of the study area are listed under the *WC Act* and seven birds, two reptile and four mammal species are listed on the DEC Priority List.

Some marine fauna or terrestrial fauna that use marine habitats are listed as Marine under the *EPBC Act*. These species are only considered conservation significant when a proposed development occurs in a Commonwealth marine area (i.e. any Commonwealth Waters or Commonwealth Marine Protected Area). Outside of such areas, the EPBC Act does not consider these species to be matters of national environmental significance, and so are not protected under the Act. Consequently species listed as Marine under the EPBC Act have not been considered to be conservation significant in this assessment.

4.6 FAUNA ASSEMBLAGES

Fauna assemblages in the study area have been compiled from the DEC threatened fauna database search, *NatureMap* (DEC 2011e), and DSEWPaC Protected Matters Search Tool (DSEWPaC 2011a), Birds Australia's Birdata (Birdata 2011) and previous surveys (Appendix K).

A total of 239 vertebrate fauna have been previously recorded in the vicinity (within 10km) of the study area (Appendix K). This includes seven amphibians, seven reptiles, 198 birds (including several families of shorebird and water fowl which will not occur in the study area as a result of unsuitable habitat) and 27 mammals. Many of these species are unlikely to occur in the study area on a regular basis as these records are from a large area encompassing a wide range of habitats and are old records (i.e. the species have declined or have become extinct locally or regionally as is typically the case with threatened species). Furthermore, small, common, ground-dwelling reptiles and mammals tend not to be distributed evenly across the landscape and many are habitat specific.

4.6.1 Recorded Fauna

A total of 21 vertebrate fauna (one reptile, 19 birds and one mammal) were recorded during the field survey (Appendix K). Fauna recorded previously in the region are listed in Appendix K. Three species were of conservation significance; the Carpet Python, Carnaby's Cockatoo and Rainbow Bee-eater; the locations are shown in Figure 6 and Appendix J.

4.6.2 Amphibians

No amphibian species were recorded in the study area. Frogs likely to occur in the study area are the Banjo Frog (*Limnodynastes dorsalis*), Slender Tree Frog (*Litoria adelaidensis*) and the Glauert's Froglet (*Crinia glauerti*).

4.6.3 Reptiles

One reptile (the Carpet Python) was recorded in the study area (Appendix K). The most common reptiles in the study area are likely to be the South-Western Bobtail (*Tiliqua rugosa*) and the Dugite (*Pseudonaja affinis*).

4.6.4 Birds

A total of 198 birds have previously been recorded in the general vicinity of the study area (Appendix K). During the field survey a total of 19 birds were observed.

The most common birds likely to occur in the study area are the Silvereye (*Zosterops lateralis*) and species from the family Meliphagidae, particularly the Red Wattlebird (*Anthochaera carunculata*) and Western Spinebill (*Acanthorhynchus superciliosus*). Common raptors likely to occur in the study area include the Brown Falcon (*Falco berigora*) and Wedge-tailed eagle (*Aquila audax*).

4.6.5 Mammals

A total of 27 mammals (including six micro bats and seven introduced species) have previously been recorded in the general vicinity of the study area (Appendix K), with one species, the Western Grey kangaroo (*Macropus fuliginosus*) recorded during the survey.

The most common mammals likely to occur in the study area include the Grey-bellied Dunnart (*Sminthopsis grisenoventer*) and the Common Brushtail Possum (*Trichosurus vulpecula hypoleucus*).

Seven species of introduced mammal have previously been recorded in the general vicinity of the study area: the House Mouse (*Mus musculus*), Black Rat (*Rattus rattus*), Rabbit (*Oryctolagus cuniculus*), Fox (*Vulpes vulpes*), Cat (*Felis catus*), Pig (S*us scrofa*) and Dog (*Canis lupus familiaris*) (Appendix K).

4.7 FAUNA HABITATS

Five habitat assessments were undertaken in the study area (Figure 6). The data sheets for these habitat assessments are provided in Appendix L. The study area consists of two broad fauna habitat types: Marri/ Jarrah Forest and Major Drainage Line. The study area also contains areas that have been cleared or developed (Cleared/Developed); these areas provide low to no habitat value and principally comprise infrastructure, roads and tracks (Table 14). Pine/ Bluegum plantations of the study area do not represent a native habitat and as such have not been assessed as a habitat type,

however Pine plantations are known to be utilised by all three Black Cockatoo species as foraging habitat.

Table 14: Habitat Types of the Study Area

Habitat Type	Area (Ha)	Habitat Value
Marri/ Jarrah Forest	9.18	High
Major Drainage Line	0.58	Moderate
Pine / Bluegum Plantation	2.63	Moderate (Only for Black Cockatoos)
Cleared/Developed	22.58	N/A
Total	**34.97**	

Marri-Jarrah Forest

The Marri/ Jarrah Forest habitat type is dominated by an Open Forest of Marri and Jarrah with Sparse *Banksia sp*. and grasses and herbs. The vegetation structure of this habitat type typically provides a range of microhabitats including trees with hollows, hollow logs, leaf litter and exfoliating bark. Conservation significant species likely to utilise this habitat type include: Carpet Python, Red-tailed Black Cockatoo, Baudin's Cockatoo, Carnaby's Cockatoo, Masked Owl, Rainbow Bee-eater, Southern Brush-tailed Phascogale, Numbat, Western Brush Wallaby and Western False Pipistrelle. This habitat was considered to be of High value due to the diversity in microhabitats and the number of conservation significant species likely to utilize it.

Major Drainage Line

The vegetation structure of the Major Drainage Line is of moderate complexity and is dominated by *Eucalyptus* and *Melaleuca* species. This habitat type contains a variety of microhabitats such as trees with hollows, hollow logs, leaf litter, and soils suitable for burrowing species. The high density of large trees associated with the Major Drainage Line habitat provide suitable nesting habitat for species such as the Silvereye, Australian Ringneck and Sacred Kingfisher, as well as roosting habitat for Gould's Wattled Bat. This habitat provides suitable foraging habitat for species such as the Common Brushtail Possum. The embankments of this habitat may be suitable for nesting birds such as the Rainbow Bee-eater. For these reasons, the Major Drainage Line habitat is considered to be of Moderate value.

Pine/Bluegum Plantation

The Pine/ Bluegum plantation sections located in the study area are of Low habitat value as they tend to be depaurperate in terms of fauna. However, the three conservation significant Black Cockatoo species: Forest Red-tailed Cockatoo, Baudin's Cockatoo and Carnaby's Cockatoo are known to use pine plantations. Although these

plantations are not native vegetation they can be of value for all three Black Cockatoo species. Due to the lack of vegetation structure (native or otherwise), and limited number of species that use this habitat, it was considered to have Low value.

4.8 BLACK COCKATOO ASSESSMENT

During the Black Cockatoo habitat assessment of the study area, 11 plant species that are utilised for foraging by Black Cockatoos were recorded, including *Corymbia calophylla, Eucalyptus marginata, Banksia grandis* and *Hakea prostrata.*

Roosting trees used by Black Cockatoos such as Marri and Jarrah were present on site. During the assessment 211 trees suitable for roosting (dominated by Marri) with a Diameter at Breast Height (DBH) greater than 500 mm were recorded (Appendix M, Figure 6). Eight trees with hollows (three with large hollows and five with medium hollows) were recorded during the assessment.

5 DISCUSSION

5.1 FLORA OF CONSERVATION SIGNIFICANCE

Two Priority flora were recorded in the study area; *Tetratheca parvifolia* (Priority 3) and *Eucalyptus rudis* subsp. *cratyantha* (Priority 4) (WAH 2011). These were new records for the study area (AECOM 2010).

Tetratheca parvifolia (Priority 3) was recorded in two quadrats of *Eucalyptus marginata* subsp. *marginata* and *Corymbia calophylla* open forest. The first site (Quadrat MP01) is located in the Talison mine site and the second site (Quadrat MP07) is located along Maranup Ford Road. The species has been previously recorded in the surrounding area with the closest record 3.5 km north of Balingup. This species is also known from Donnybrook, Harvey and Collie (WAH 2011). The species has not been previously collected from the Greenbushes area with these new records additionally representing a range extension to the South Further targeted searches would be required to determine the species full distribution and plant numbers across the corridor route.

Eucalyptus rudis subsp. *cratyantha* (Priority 4) is the dominant overstorey species at two quadrats (MP10 and MP11) along the Blackwood River at the southern extremity of the study area. The species occurred in high numbers in this area. There is a single record of this species collected near Collie, however, the species is predominately distributed along the coast from south of Mandurah to Busselton (WAH 2011). The new records from this survey represent a range extension of approximately 50 km south of Collie to the Greenbushes area (WAH 2011).

No Threatened species pursuant to the *EPBC Act* and/or gazetted as Threatened (DRF) pursuant to the *WC Act* were recorded in the survey area. One Threatened (DRF) taxa (*Caladenia harringtoniae*) occurs within 10 km of the study area. The species is found in low-lying swampy areas or near granite (WAH 2011). The study area contained only a small area of similar habitat for *Caladenia harringtoniae* along Maranup Road; however, the area was highly degraded and the species was not recorded. The species flowering period is October-November and therefore would have been detectable if it was present in the study area.

5.2 FLORA OF INTEREST

Several species were recorded outside of their current known distribution and represent range extensions:

- *Dianella brevicaulis* is distributed along the coast from south of Mandurah to Augusta and through the southern Wheatbelt region (WAH 2011).It represents a range extension of approximately 100km from the nearest record;

- *Diuris amplissima* has a scattered distribution along the coast in the South-West and some outliers in the southern and eastern Wheatbelt (WAH 2011). It represents a range extension of approximately 100km from the nearest record;

- **Ligustrum ovalifolium* has been previously collected near Pemberton where it was thought to be eradicated (WAH 2011). The new record represents a significant range extension of approximately 70km to the North for this highly invasive introduced species;

- **Plantago bellardii* has been previously collected in the southern Wheatbelt, near Kojonup and Kondinin (WAH 2011). The new record represents a significant range extension approximately 200 km to the west; and

- *Thelymitra canaliculata* is distributed along the south coast with one outlier in the central Wheatbelt (WAH 2011). The new record represents a significant range extension of approximately 100 km to the west.

5.3 SPECIES RICHNESS

The number of taxa (recognised species, subspecies, varieties and forms, and excluding informal taxa) of this survey was 172, including 60 introduced species, which is double the previous survey (AECOM 2010).

The average flora richness recorded was 21.1 taxa per quadrat. As the quadrats were located in degraded vegetation, the species richness would be slightly lower than in native vegetation in better condition. It is difficult to provide a comparison of species richness with other floristic studies in the southern Jarrah forest bioregion as only few surveys have been conducted under comparable conditions. The time of the survey (spring) combined with ideal seasonal conditions resulted in a comprehensive species list.

5.4 INTRODUCED FLORA

Sixty introduced species were recorded in the study area, representing 35% of the total number of taxa recorded during the survey. The majority of these species are common agricultural (**Arctotheca calendula* and **Avena barbata*) and bushland (**Ehrharta calycina*) weeds in the South-West region (Hussey *et al.* 2007).

Three of the 60 introduced flora recorded are listed as Declared Plants under the *ARRP Act* 1976 (WA); **Asparagus asparagoides* (Bridal Creeper), **Rubus anglocandicans* (European Blackberry) and **Zantedeschia aethiopica* (Arum Lily).

**Asparagus asparagoides* is one of the State's worst environmental weeds, extremely invasive and commonly found along roadsides and creeklines (Hussey *et al.* 2007).

**Rubus anglocandicans* is the most dominant blackberry in Western Australia, growing along rivers and creeklines, in wetlands and in disturbed forestry areas from Perth to Albany (Hussey *et al.* 2007).

**Zantedeschia aethiopica* is primarily found in wet swampy habitats that can form dense stands (Hussey *et al.* 2007).

Under the *ARRP Act* all three species are categorised as P1, indicating that the introduction of the plant into, or movement of the plant within an area is prohibited. **Rubus anglocandicans* and **Zantedeschia aethiopica* are additionally categorised as P4, indicating the spread of the plant is to be prevented. These categories apply for the whole state. Information about requirements relating to the introduction, movement, eradication and control of declared plants is available from the Department of Agriculture and Food.

Due to the presence of these three Declared Plants in the Study area, an effective weed hygiene plan will need to be implemented, and the potential spread of these species should be monitored during the construction and rehabilitation of the pipeline.

**Ligustrum ovalifolium* (Oleaceae) is significant as the species was previously considered eradicated in Western Australia (G. Keighery *pers. com.*). Prior to eradication it was known to occur south of Pemberton at the Warren River crossing (WAH 2011). **Ligustrum ovalifolium* is a medium sized shrub to small tree. The flowers are small, white and fragrant, the berries are purple-black, and are poisonous to humans but are readily eaten by birds and thus dispersed. The species is endemic to Japan. It is regarded as highly invasive in the cooler areas of the South-West land division (G. Keighery *pers. com.*) and is considered invasive in parts of North America (Swearingen *et al.* 2010).

5.5 VEGETATION ASSOCATIONS

Ten vegetation associations were identified, all were dominated by *Eucalyptus marginata* subsp. *marginata* and *Corymbia calophylla.*

One PEC occurs approximately 40km of the study area (DEC 2011b): Blackwood Alluvial Flats (Priority 3). This PEC consists of six vegetation types including:

- woodlands and shrublands on the alluvial soils of the upper Blackwood River (Condinup and Darkan 5f soil-landscape sub-systems),
- wet shrublands on alluvial clay flats,
- Jarrah-Marri woodlands on alluvial grey-brown loams,
- Wandoo woodlands on alluvial grey-brown clay-loams (includes vernal pools),
- Flooded Gum-Wandoo woodland on alluvial grey clays (includes vernal pools) and
- Wandoo woodlands on grey sandy-loams' (DEC 2010).

No vegetation associations mapped in the study area are analagous to the PEC Blackwood Alluvial Flats. Flooded Gum (*Eucalyptus rudis* subsp. *cratyantha*) forms a vegetation association along the Blackwood River in the southern extremity of the study area, however, was not recorded in association with Wandoo (*Eucalyptus wandoo*). This area also lacked alluvial grey clays as the soil type required for the PEC, the area contained brown-grey sandy loam-clay.

5.6 VEGETATION CONDITION

The vegetation of the study area represents Remnant Vegetation. The proximity to major roads and residential developments, historical vegetation clearing for firebreaks/tracks had infrastructure, and the presence of some very aggressive weeds at high density, had the greatest impact on this remnant. Some degraded areas had low densities of native vegetation with altered vegetation structure. Other degraded areas were characterised by high densities of aggressive weed species and a severely impacted native vegetation structure, such as around the St Georges Tanks in the Greenbushes town site and on the banks of the Blackwood River, where high densities of aggressive grass weeds (**Avena barbata, *Bromus diandrus* and **Ehrharta longiflora*) and European blackberry (**Rubus anglocandicans*) cover the majority of the site, reducing native vegetation to scattered isolated trees, with very little / no native understorey present. There is little to no scope for natural regeneration of these areas without intensive management extending beyond the study area. Completely Degraded areas correlate with Pine/Bluegum plantations.

Vegetation in Very Good to Excellent condition showed little anthropogenic disturbance (fire, invasive species, clearing), and vegetation structure was intact. These areas are situated alongside Maranup Ford Road, adjoining Greenbushes State Forest.

The majority of the study area is mapped as Cleared Areas/Firebreaks/Infrastructure and has not been assessed for vegetation condition, however, to these areas would naturally increase the exposure of any fringing native vegetation to the transportation of invasive species from areas of higher weed density to areas of lower weed densities. Minimising any effects to fringing native vegetation is recommended by the implementation of an effective weed hygiene plan.

5.7 REGIONAL REPRESENTATION

The Beard (1978) vegetation association mapped in the study area, Medium forest – Jarrah/Marri ($e_{2,3}$Mc) contains more than 70% of their pre-European extent and are categorised as 'Least Concern' (DNRE 2002).

Six of the vegetation associations, including the *Eucalyptus marginata* subsp. *marginata* and *Corymbia calophylla* forest communities (CcEmBlPe, EmCcBgBl, EmCcAmAeXp, CcErAp, CcEmBoHlHd and CcRa) broadly corresponded to (Beard 1978) vegetation association $e_{2,3}$Mc. The remaining vegetation associations, *Eucalyptus rudis* subsp.

cratyantha (ErMiRa) open woodland and *Melaleuca preissiana* low open woodland (MpCpHpAl), do not correspond to the Beard (1978) vegetation association mapped in the study area.

5.8 FAUNA HABITAT TYPES

The habitat types present in the study area ranged from Excellent to Degraded as a result of disturbances such as tracks, and weeds such as Blackberry (*Rubus ulmifolius*). Both native habitat types (Marri-Jarrah Forest and Major Drainage Line) are widespread and common in the bioregion, with 70% of Marri-Jarrah remaining (Shepherd *et al.* 2001); therefore the resulting impacts from the clearing of a 10 m wide corridor for the proposed pipeline on the overall habitats will be minimal, although impacts along the margins of narrow corridor may be significant.

The Pine/Bluegum plantations are not native vegetation, contain little to no vegetation structure, are depaurperate for fauna and therefore have low habitat value. The plantations are known to have forage and roosting value for all three Black Cockatoo species. Valentine and Stock (2008) collected a number of Carnaby's Cockatoos from the Somerville, Gnangara and Mundaring plantations and examined their crop content. The analysis of the crop contents revealed 86%, 97% and 98% respectively of the birds crops contained pine seed.

5.9 FAUNAL ASSEMBLAGE

Twenty-one species of vertebrate fauna were recorded, including one reptile, 19 birds and one mammal. As this was a Level 1 survey (a reconnaissance survey), many of the potentially occurring species were not recorded. Many of the ground dwelling reptiles and small mammals are mainly recorded or captured from trapping during a Level 2 survey.

5.10 CONSERVATION SIGNIFICANT FAUNA

Three species of conservation significance were recorded (the Carpet Python, Carnaby's Cockatoo and Rainbow Bee-eater), with a further seven conservation significant species considered 'Likely' to occur, based on habitat preference, previous records and dispersal capabilities; these are the Red-tailed Black Cockatoo, Baudin's Cockatoo, Western Quoll, Brush-tailed Phascogale, Numbat, Western Brush Wallaby and Western False Pipistrelle.

Carpet Python

The South-Western carpet python is a threatened taxon on the basis of declines in parts of its range as a result of habitat clearance and degradation (Pearson *et al.* 2005). Carpet pythons use a range of habitats including coastal shrublands, heath, forest, woodlands, the margins of agricultural land and outer metropolitan areas (Pearson *et al.*

2005). This species shelters in hollow trunks and limbs of trees, hollow logs, disused burrows, caves, rock crevices, beneath boulders and dense shrubs. It is now rarely recorded in most of the Wheatbelt Region and the Swan Coastal Plain, which is impacted by metropolitan development (Pearson *et al.* 2005). It is still widespread on the south west mainland and is most abundant on offshore islands (Wilson and Swan 2010). The one individual recorded during the survey was found in pine plantation. The Woodland habitat type in the study area contains some tree hollows and fallen hollow logs which are the favoured shelter sites for this species. However, given the limited extent of the proposed footprint (a 10 m wide corridor), the clearing of vegetation associated with the development would be unlikely to impact significantly on populations of this species in the area or particularly more broadly in the region.

Plate 6: Carpet Python (*Morelia spilota imbricata*)

Carnaby's Cockatoo

Carnaby's Cockatoo is a threatened species as a result of large scale clearing removing a large proportion of its habitat. Carnaby's Cockatoo is endemic to south-west Western Australia, and is distributed from the Murchison River to Esperance and inland to Coorow, Kellerberrin and Lake Cronin (Cale 2003). The species was once common, but the population has declined significantly in the last half century, and is now locally extinct in some areas (Johnstone and Storr 1998, Shah 2006). In the last 45 years the species has suffered a 50% reduction in its abundance. This reduction is due to the clearing of core breeding habitat in the Wheatbelt, the deterioration of nesting hollows, and clearing of food resources on the Swan Coastal Plain (Cale 2003). The total

population of Carnaby's Cockatoo is currently estimated at 40,000 (Johnstone and Kirkby 2008).

Carnaby's Cockatoos feed on seeds, nuts and flowers of a variety of native and exotic plants. Food plants include *Banksia* (including those previously included in the genus *Dryandra*), Pine trees (*Pinus* spp.), Marri, Jarrah, *Grevillea* spp., *Allocasuarina* spp., and *Hakea* spp. (Shah 2006). Marri fruit that is damaged extensively, especially on the main body of the fruit, is likely to have been chewed by Carnaby's Cockatoo or FRBC. The severed new growth, developing flower heads and chewed seed pods of Banksias are also a good indicator of Black Cockatoo feeding. Recent damage to bark indicates Black Cockatoo feeding activity along with the stripping of pine needles and cones (Cale 2003).

The study area contains several food source species utilized by the Black Cockatoos including Bull Banksia (*Banksia grandis*), Snottygobble (*Persoonia longifolia*), Honeybush (*Hakea lissocarpha*) Marri (*Corymbia calophylla*) and Jarrah (*Eucalyptus marginata*). These species define the study area as 'Suitable Habitat' (DSEWPaC 2011b): "Any area within the range of the black cockatoos that contains known food or nesting plant species is considered to be habitat for the species".

The study area contains 66 Jarrah trees and 126 Marri trees that are suitable roosting sites. There was a total of 211 trees (including 10 dead stags and nine Flooded Gum (*Eucalyptus rudis*)) with a DBH greater than 50 cm; these are classified as potential future breeding trees (DSEWPaC 2011b) (Figure 6) Five of the trees recorded had a hollow large enough that could be currently used as a nesting tree (Appendix M). During the survey Carnaby's Cockatoos were observed overflying the study area and a few were seen close to the study area in a dead stag.

Rainbow Bee-eater

The Rainbow Bee-eater is listed as Migratory under the EPBC Act. This species is one of the most common and widespread birds in Australia covering the majority of Australia (Barrett *et al.* 2003). In Western Australia, this species can occur as a resident, breeding visitor, postnuptial nomad, passage migrant and winter. It generally breeds in summer in the greater south-west and occurs as a passage migrant or visitor in the northern part of its range throughout the rest of the year. It occurs in lightly wooded, often sandy country, preferring areas near water. The Rainbow Bee-eater feeds on airborne insects, and nests in burrows excavated in sandy ground or banks, often at the margins of roads and tracks (Johnstone and Storr 1998; Barrett *et al*. 2003). This species was observed in the study area. However, given the limited extent of the proposed footprint (a 10 m wide corridor), the clearing of vegetation associated with the development would be unlikely to impact significantly on populations of this species in the area or particularly more broadly in the region.

Forest Red-tailed Black Cockatoo

The Forest Red-tailed Black Cockatoo (FRTBC) is distributed through the humid and sub humid south-west of Western Australia from Gingin through the Darling Ranges to the south-west from Bunbury to Albany. It occasionally occurs in the southern Swan Coastal Plain, and rarely in the Perth metropolitan area. The FRTBC occurs in pairs or small flocks, or occasionally large flocks of up to 200 birds (Johnstone and Storr 1998). The FRTBC inhabits dense Jarrah (*Eucalyptus marginata*), Karri (*Eucalyptus diversicolor*) and Marri (*Corymbia calophylla*) forests that receive more than 600 mm average annual rainfall (DSEWPaC 2011).

The FRTBC feeds primarily on Marri and Jarrah fruit (DSEWPaC 2011b, Johnstone and Kirkby 1999) and to a lesser extent on Blackbutt (*Eucalyptus patens*), Albany Blackbutt (*Eucalyptus staeri*), Karri, Sheoak (*Allocasuarina fraseriana*) and Snottygobble (*Persoonia longifolia*). FRTBC can obtain energy faster when feeding on Marri and Jarrah than other food sources (Cooper et al. 2002) and these two plant species make up 90% of the diet of the FRTBC (DSEWPaC 2011).

The study area is located in the known distribution of this species (DSEWPaC 2011) and the vegetation contains species, such as Marri, Jarrah and Snottygobble, that provide suitable roosting, breeding and foraging habitat. During the survey no individuals were recorded.

Baudin's Cockatoo

Baudin's Cockatoo is distributed through the south-western humid and sub humid zones, from the northern Darling Range and adjacent far east of the Swan Coastal Plain (south of the Swan River), south to Bunbury and across to Albany. Baudin's Cockatoo rarely occurs near the coast north of Mandurah, and rarely occurs north of the Swan River (Johnstone and Kirkby 2008, Johnstone and Storr 1998). Baudin's Cockatoo usually occur in small flocks of up to 30, or occasionally up to 50 and rarely in aggregations of up to 1200 (Johnstone and Kirkby 2008). Baudin's Cockatoo is distinguished from the other white-tailed black cockatoo (Carnaby's Cockatoo) by its longer bill and slightly different call.

This species forages primarily in eucalypt forest, where it feeds on Marri seeds, flowers, nectar and buds. They also feed on a wide range of seeds of *Eucalyptus*, *Banksia*, *Hakea* and Pines (*Pinus* sp.) as well as fruiting apples and pears and beetle larvae from under the bark of trees (Johnstone and Kirkby 2008, Johnstone and Storr 1998).

The study area is located within the known distribution of this species (DSEWPaC 2011b) and the vegetation contains species, such as Marri, *Eucalyptus, Banksia sp.*, *Hakea sp.* and *Pinus sp.*, that provide suitable foraging, roosting and breeding habitat. During the survey no individuals were recorded.

Masked Owl

The southern subspecies of the Masked Owl is distributed in the south-west of Western Australia from around Yanchep to Albany. It breeds in the forested deep south-west, with some autumn-winter movement northwards and north-westwards. It is locally common around Karridale and Manjimup, but uncommon elsewhere (Johnstone and Storr 1998). The major threat to this species is the decline in nesting site availability because of the clearing of forest and the decline in the number of small mammals due to fox and cat predation. Areas of suitable habitat exist in the proposed 10 m wide corridor. Five trees had a hollow large enough that could be used by a Masked Owl as a roost or nesting tree (see large hollows in Appendix M). Masked Owls from south-eastern Australia are known to roost and nest in trees with hollows that have entrances that are at least 40 cm in diameter (Kavanagh 1996: Kavanagh and Murray 1996). Given the extensive areas of forest that exist outside the study area, and the limited number of large trees in the corridor, populations of this species are unlikely to be impacted.

Western Quoll

The range of the Western Quoll has contracted dramatically since European settlement and it is now restricted to a fragmented distribution in the south-west of WA and is now only found in sclerophyll forest, woodland and mallee shrubland (van Dyck and Strahan 2008, Menkhorst and Knight 2004). It is highly mobile, and appears able to utilise bush remnants and corridors. Numbers have decreased because of habitat alteration, removal of suitable den logs and dens, and competition for food and predation by foxes and cats (van Dyck and Strahan 2008). The Western Quoll is locally extinct throughout the metropolitan area. The closest records are 7 km from the study area, these date back to 1987. The most recent record from 2005 was within 10 km of the study area (DEC 2011f). This species requires hollow logs or earth burrows in which to den. During this assessment no signs or individuals recorded.

Brush-tailed Phascogale

The Brush-tailed Phascogale's distribution has been reduced to approximately 50% of its former range (DEC 2008). It is restricted to the extreme south-west, and its characteristic low population densities make it vulnerable to localised extinction (Van Dyck and Strahan 2008). This species has been observed in dry sclerophyll forests and open woodlands containing hollow-bearing trees, with a sparse ground cover. Habitat destruction, in particular the loss of hollow-bearing trees with dens (van der Ree *et al.* 2006) and predation by feral animals, are the major threats to surviving populations (DEC 2008).

The Brush-tailed Phascogale is likely to be present in the study area although it was not recorded during the survey. The closest record is within 1 km of Greenbushes (DEC 2011f), and therefore it may use the forest in the study area as part of a larger home range. Loss of any suitable hollows and fallen logs potentially impacts on this species.

However, extensive areas of suitable habitat exist in the vicinity, thus the impact of clearing a 10 m wide corridor is insignificant in a local or regional context.

Numbat

The range of the Numbat has contracted significantly since European settlement and it is now restricted to Jarrah and Wandoo Woodlands, where it dens in hollow logs and branches (Van Dyck and Strahan 2008). Foxes contributed to the decline in the Numbat population. In the mid-1980s the species was found at only two sites in south-west WA (Dryandra near Narrogin and Perup near Manjimup). It has since been reintroduced to four sites in south-west WA, concurrent with widespread fox control (Van Dyck and Strahan 2008). The closest and most recent record of this species is approximately 4.5 km north west of Greenbushes in 2006 (DEC 2011f). Individuals of this species can have several den sites in hollow logs and burrows in their home range and the size of their home range can be up to 100 ha in size (Christensen *et al*. 1984). Consequently, any disturbance associated with the clearing of a 10 m wide corridor is unlikely to impact this species significantly in a local or regional context.

Western Brush Wallaby

The Western Brush Wallaby occurs in open forest or woodland, particularly where grassy understory and scrubby thickets is present). It is found only in south-western Western Australia, where it is in decline, probably as a result of an increase in the numbers of foxes. Due to limited studies on this species, very little is known of its food preferences, but it seems to manage without free water (van Dyck and Strahan 2008).

The closest record of this species is 1 km of Greenbushes, recorded in 2001. Given the woodland vegetation in the corridor, it is likely that this species utilizes the area, although it is likely to be an infrequent visitor, given the absence of seasonally wet flats. As a result, any impact on populations of this species is expected to be minimal.

Western False Pipistrelle

The Western False Pipistrelle prefers Karri forest, wetter stands of Jarrah and Tuart, and *Corymbia* woodlands. It roosts in tree hollows and forages mainly at canopy level (van Dyck and Strahan 2008). It lives in colonies of 5-30 individuals with sexes segregating for roosting during much of spring and summer (Churchill 2008). The major threat to this species is the loss of feeding grounds, loss of suitable habitat to forestry and clearing for agriculture. This species was recorded previously (ENV 2009b) in the vicinity of the study area. As tree hollows were observed, the Western False Pipistrelle may roost in the study area. As suitable habitat exists in the vicinity of the study area, the impact on this species is expected to be low.

5.11 SIGNIFICANCE OF FAUNA HABITAT

The study area represents a significant fauna habitat. It contains 11 plant species, such as Marri, Jarrah and Snottygobble and others, that are known foraging resources for Black Cockatoos (Valentine and Stock 2009). As such, the clearing of more than 1 ha of foraging habitat would most likely require referral of the project under the EPBC to DSEWPAC. In addition, the study area contains 66 Jarrah trees and 126 Marri trees that are suitable as roosting sites (DSEWPaC 2011b). There were a total of 211 trees (including 10 dead stags and nine Flooded Gum) with a DBH greater than 50 cm which classified as potential future breeding trees (DSEWPaC 2011b)(Figure 6).

6 ASSESSMENT AGAINST THE TEN CLEARING PRINCIPLES

Any clearing of native vegetation requires a permit under Part V Division 2 of the *Environmental Protection Act 1986* (EP Act), except where an exemption applies under Schedule 6 of the EP Act, or where the clearing is prescribed by regulations in the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. Exemptions do not apply in an ESA.

PRINCIPLE A

NATIVE VEGETATION SHOULD NOT BE CLEARED IF IT COMPRISES A HIGH LEVEL OF BIOLOGICAL DIVERSITY

The flora and vegetation survey recorded 172 taxa from 123 genera and 51 families, including 60 introduced species, from the study area. The high number of weed species (nearly 35% of the total taxa recorded) is a result of previous clearing and other disturbances throughout part of the study area. The biological diversity is variable across the study area, as expected for a long corridor that includes different land uses. Areas in Degraded-Good condition had lower biological diversity, with more introduced species, than areas in Excellent condition. The highest floristic diversity occurred along Maranup Ford Road, which adjoins the Greenbushes State Forest. This area is representative of the expected floristic diversity of native vegetation of the area.

No Threatened species pursuant to the *EPBC Act* and/or gazetted as Threatened (DRF) pursuant to the *WC Act* were recorded. Two species listed as Priority Flora by the DEC (WAH 2011) were recorded in the study area; *Tetratheca parvifolia* (Priority 3) and *Eucalyptus rudis* subsp. *cratyantha* (Priority 4).

No TECs or PECs were recorded. No ESAs were recorded in the study area.

A total of 21 vertebrate fauna (one reptile, 19 birds and one mammal) were recorded. The study area contains two (native?) habitat types (Marri-Jarrah Forest and Major Drainage Line) and Plantation areas (Pine and Blue Gum) that do not qualify as native fauna habitat.

A total of 239 fauna have been previously recorded in the vicinity of the study area. These consist of seven amphibians, seven reptiles, 198 birds (including several families of shorebird and water fowl which will not occur in the study area as a result of unsuitable habitat) and 27 mammals. The proposed development is unlikely to significantly impact the fauna assemblage (and populations of species) of the study area as they are generally common and widespread throughout the region and not specifically dependent upon the habitat of the study area.

Assessed Outcome: High biological diversity was recorded in parts of the study area, such as along the Maranup Ford road adjoining Greenbushes State Forest. The

vegetation was in Excellent condition as a result of a lack of weeds and a relatively higher number of flora species. Clearing in these areas is likely to be at variance with Principle A.

PRINCIPLE B

NATIVE VEGETATION SHOULD NOT BE CLEARED IF IT COMPRISES THE WHOLE OR A PART OF, OR IS NECESSARY FOR THE MAINTENANCE OF, A SIGNIFICANT HABITAT FOR FAUNA INDIGENOUS TO WESTERN AUSTRALIA

Three conservation significant species were recorded during the current survey, the Carpet Python (*Morelia spilota imbricata*), Carnaby's Cockatoo and Rainbow Bee-eater (*Merops ornatus*).

In addition seven species are considered as 'Likely' to occur within the study area as it provides them with suitable habitat; the Red-tailed Black Cockatoo, Baudin's Cockatoo, Western Quoll, Brush-tailed Phascogale, Numbat, Western Brush Wallaby and Western False Pipistrelle. However, there is similar habitat located in the vicinity of the study area so the proposed development is not likely to impact upon the local or regional status of these species.

The study area contains suitable foraging, roosting and potential breeding habitat for the Forest Red-tailed Black Cockatoo, Baudins Cockatoo and Carnaby's Cockatoo. The study area contains 11 botanical species that are known foraging resources for Black Cockatoos and 66 Jarrah trees and 126 Marri trees that have dimensions which classifies them as roosting sites. There were a total of 211 trees (including 10 dead stags and nine Flooded Gum) with a DBH greater than 500 mm and these are also classified as potential future breeding trees. If the proposed development requires the clearing of more than one hectare of foraging habitat or any of these trees it would be classified as a high risk of significant impact and referral is recommended. Suitable Black Cockatoo habitat exists within close proximity to the study area; therefore, the proposed development will not produce a gap of greater than 4 km between patches of Black Cockatoo habitat.

Assessed Outcome: The study area contains suitable foraging, roosting and breeding habitat for the Forest Red-tailed Black Cockatoo, Baudins Cockatoo and Carnaby's Cockatoo. If the proposed development requires the clearing of more than 1 hectare of foraging habitat or the clearing of the mature Marri or Jarrah trees referral is recommended and as such clearing is likely to be at variance with this Principle.

PRINCIPLE C

NATIVE VEGETATION SHOULD NOT BE CLEARED IF IT INCLUDES, OR IS NECESSARY FOR THE CONTINUED EXISTENCE OF, RARE FLORA

No Threatened species pursuant to the *EPBC Act* and/or gazetted as DRF (Threatened) pursuant to the *WC Act* were recorded in the survey area.

Two species listed as Priority Flora by the DEC (WAH 2011) were recorded: *Tetratheca parvifolia* (P3) and *Eucalyptus rudis* subsp. *cratyantha* (P4). Priority flora is not protected under the *WC Act.*

Assessed Outcome: The proposal will not impact upon any known DRF or Threatened flora. The Priority flora that occur in the study area are known to occur in several other locations in the South West botanical province. The proposal is unlikely to be at variance with Principle C.

PRINCIPLE D

NATIVE VEGETATION SHOULD NOT BE CLEARED IF IT COMPRISES THE WHOLE OR A PART OF, OR IS NECESSARY FOR THE MAINTENANCE OF A THREATENED ECOLOGICAL COMMUNITY

Ten vegetation associations were identified within the study area, none of them analogous to PECs or TECs.

Assessed Outcome: The proposal is unlikely to be at variance with Principle D.

PRINCIPLE E

NATIVE VEGETATION SHOULD NOT BE CLEARED IF IT IS SIGNIFICANT AS A REMNANT OF NATIVE VEGETATION IN AN AREA THAT HAS BEEN EXTENSIVELY CLEARED

The Beard (1978) vegetation association mapped in the study area, Medium forest – Jarrah/Marri ($e_{2,3}$Mc) contains more than 70% of their pre-European extent and are categorised as 'Least Concern' (NRE 2002).

The amount of proposed clearing would not significantly reduce the pre-European extent of Beard (1978) Medium forest –Jarrah/Marri ($e_{2,3}$Mc).

Assessed Outcome: The proposal is unlikely to be at variance with Principle E.

PRINCIPLE F

NATIVE VEGETATION SHOULD NOT BE CLEARED IF IT IS GROWING IN, OR IN ASSOCIATION WITH, AN ENVIRONMENT ASSOCIATED WITH A WATERCOURSE OR WETLAND

The vegetation associations, *Eucalyptus rudis* subsp. *cratyantha* open woodland (ErMiRa) and *Melaleuca preissiana* low open woodland (MpCpHpAl) are associated with a watercourse and wetland. The vegetation association ErMiRa was recorded along the Blackwood River, vegetation association MpCpHpAl was recorded along Maranup Ford Road. The *Melaleuca preissiana* low open woodland (MpCpHpAl) has been significantly altered with the road construction and the mine site impacting on the edge of this wetland.

Assessed Outcome: The proposal is likely to be at variance with Principle F in the areas containing vegetation that is associated with the Blackwood River - *Eucalyptus rudis* subsp. *cratyantha* (ErMiRa) open woodland and the *Melaleuca preissiana* low open woodland (MpCpHpAl) wetland along Maranup Ford Road.

PRINCIPLE G

NATIVE VEGETATION SHOULD NOT BE CLEARED IF THE CLEARING OF THE VEGETATION IS LIKELY TO CAUSE APPRECIABLE LAND DEGRADATION

Land degradation includes clearing of vegetation, decline in vegetation condition due to weeds and changes in natural fire regimes, and a decline in soil condition caused by erosion. Clearing of native vegetation has the potential to cause soil erosion, however, this can be mitigated through effective control measures. There is a low risk that clearing of native vegetation in the study area will lead to water logging and land salinisation.

Assessed Outcome: Provided effective control measures are put in place to minimise erosion, clearing in the study area is unlikely to be at variance with Principle G.

PRINCIPLE H

NATIVE VEGETATION SHOULD NOT BE CLEARED IF THE CLEARING OF THE VEGETATION IS LIKELY TO HAVE AN IMPACT ON THE ENVIRONMENTAL VALUES OF ANY ADJACENT OR NEARBY CONSERVATION AREA

The northern section of the study area is adjacent to sections of the Greenbushes State Forest. Clearing in these areas would impact on the environmental values of the conservation area, such as increased weed invasion. If appropriate control measures are implemented, such as drainage, revegetation and weed hygiene plans, potential impacts on the Greenbushes State Forest can be reduced.

Assessed Outcome: The proposal is likely to be at variance with Principle H in the areas adjacent to the Greenbushes State Forest.

PRINCIPLE I

NATIVE VEGETATION SHOULD NOT BE CLEARED IF THE CLEARING OF THE VEGETATION IS LIKELY TO CAUSE DETERIORATION IN THE QUALITY OF SURFACE OR UNDERGROUND WATER

Provided effective erosion control measures are put in place, the proposed vegetation clearing would be unlikely to cause deterioration in the quality of surface or underground water.

Assessed Outcome: Provided effective erosion control measures are put in place, clearing in the study area is unlikely to be at variance with Principle I.

PRINCIPLE J

NATIVE VEGETATION SHOULD NOT BE CLEARED IF THE CLEARING OF THE VEGETATION IS LIKELY TO CAUSE, OR EXACERBATE, THE INCIDENCE OR INTENSITY OF FLOODING

The scale of the proposal is small and will not cause or exacerbate flooding if control measures are implemented.

Assessed Outcome: If control measures are implemented the proposed clearing in the study area is unlikely to be at variance with Principle J.

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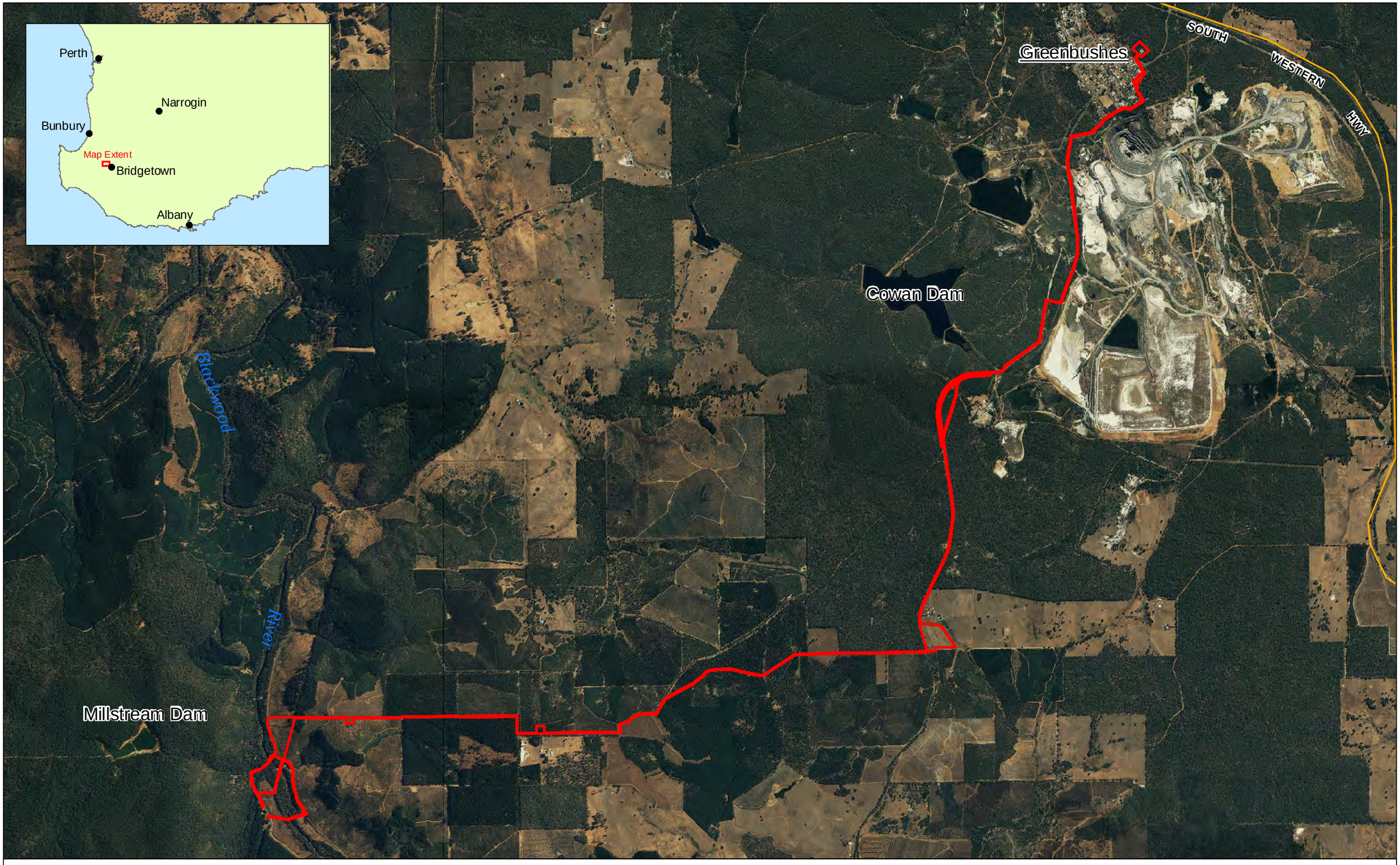
FIGURES



CLIENT: Water Corporation
JOB NO.: J101331
AUTHOR: J. Collins
DRAWN: M. Mikkonen
DATE: 21-12-2011
SCALE: 1:34,697 @ A3
PROJECTION: GDA 94 MGA 50

N

0 1 2
Kilometres

Legend

Survey Area

Site Location

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **1**

412,800 413,000 413,200 413,400

6,254,600 6,254,400 6,254,200

Legend

- Survey Area
- Quadrat
- Relevé

Vegetation Type

- CcEmBlPe
- EmCcBgBl
- MpCpHpAl
- EmCcAmAeXp
- CcErAp
- CcEmBoHlHd
- CcRa
- ErMiRa
- Cleared/Firebreak/Infrastructure
- Pine/Bluegum Plantation
- **Eucalyptus resinifera*, **Eucalyptus* sp. **Acacia pycnantha*, **Acacia decurrens*, **Chamaecytisus palmensis* and **Pinus* sp.

CcEmBlPe

MP02

CcEmBlPe

CcEmBlPe

TOURMALINE ST
GEORGE ST
STANIFER ST
BLACKWOOD RD
JEPHSON ST
TELLURIDE ST

env Australia

CLIENT	JOB NO.
Water Corporation	J101331
AUTHOR	DRAWN / DATE
J. Collins	M. Mikkonen / 19-12-2011
SCALE	PROJECTION
1:2,000 @ A3	GDA 94 MGA 50

N

0 25 50 Metres

Vegetation Associations and Location of Quadrat and Relevé Sites

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **3.1**

412,600 412,800 413,000 413,200 413,400

6,252,000 6,251,800

Legend

- Survey Area
- Quadrat
- Relevé

Vegetation Type

- CcEmBlPe
- EmCcBgBl
- MpCpHpAl
- EmCcAmAeXp
- CcErAp
- CcEmBoHlHd
- CcRa
- ErMiRa
- Cleared/Firebreak/Infrastructure
- Pine/Bluegum Plantation
- **Eucalyptus resinifera*, **Eucalyptus* sp. **Acacia pycnantha*, **Acacia decurrens*, **Chamaecytisus palmensis* and **Pinus* sp.

TELKURIDE ST
BLACKWOOD RD
TANTALITE ST
CcEmBlPe
EmCcBgBl
MP01
EmCcBgBl

env Australia

CLIENT		JOB NO.	
Water Corporation		J101331	
AUTHOR	DRAWN	DATE	
J. Collins	M. Mikkonen	19-12-2011	
SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Vegetation Associations and Location of Quadrat and Relevé Sites

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **3.2**

412,200 412,400 412,600 412,800

6,251,600 6,251,400 6,251,200

Legend

Survey Area

Quadrat

Relevé

Vegetation Type

- CcEmBlPe
- EmCcBgBl
- MpCpHpAl
- EmCcAmAeXp
- CcErAp
- CcEmBoHlHd
- CcRa
- ErMiRa
- Cleared/Firebreak/Infrastructure
- Pine/Bluegum Plantation
- **Eucalyptus resinifera*, **Eucalyptus* sp. **Acacia pycnantha*, **Acacia decurrens*, **Chamaecytisus palmensis* and **Pinus* sp.

EmCcBgBl

MARANUP FORD RD

MPR03

EmCcBgBl

MARANUP FORD RD

EmCcBgBl

env Australia

CLIENT	JOB NO.
Water Corporation	J101331

AUTHOR	DRAWN	DATE
J. Collins	M. Mikkonen	19-12-2011

SCALE	PROJECTION
1:2,000 @ A3	GDA 94 MGA 50

N

0 25 50 Metres

Vegetation Associations and Location of Quadrat and Relevé Sites

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **3.3**

412,200 412,400 412,600 412,800

6,252,200 6,252,000 6,251,800

Legend

- Survey Area
- Quadrat
- Relevé

Vegetation Type

- CcEmBlPe
- EmCcBgBl
- MpCpHpAl
- EmCcAmAeXp
- CcErAp
- CcEmBoHlHd
- CcRa
- ErMiRa
- Cleared/Firebreak/Infrastructure
- Pine/Bluegum Plantation
- **Eucalyptus resinifera*, **Eucalyptus* sp. **Acacia pycnantha*, **Acacia decurrens*, **Chamaecytisus palmensis* and **Pinus* sp.

MARANUP FORD RD

EmCcBgBl

EmCcBgBl

MpCpHpAl

env Australia

CLIENT		JOB NO.	
Water Corporation		J101331	
AUTHOR	DRAWN	DATE	
J. Collins	M. Mikkonen	19-12-2011	
SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Vegetation Associations and Location of Quadrat and Relevé Sites

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **3.4**

412,000 412,200 412,400 412,600

6,252,600 6,252,400

Legend

- Survey Area
- Quadrat
- Relevé

Vegetation Type

- CcEmBlPe
- EmCcBgBl
- MpCpHpAl
- EmCcAmAeXp
- CcErAp
- CcEmBoHlHd
- CcRa
- ErMiRa
- Cleared/Firebreak/Infrastructure
- Pine/Bluegum Plantation
- **Eucalyptus resinifera*, **Eucalyptus* sp. **Acacia pycnantha*, **Acacia decurrens*, **Chamaecytisus palmensis* and **Pinus* sp.

MPR04

MpCpHpAl

KARANUP FORD RD

env Australia

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SCALE	PROJECTION
1:2,000 @ A3	GDA 94 MGA 50

N

0 25 50 Metres

Vegetation Associations and Location of Quadrat and Relevé Sites

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **3.5**

412,000
412,200
412,400
412,600
6,251,200
6,251,000
6,250,800

Legend

- Survey Area
- Quadrat
- Relevé

Vegetation Type

- CcEmBlPe
- EmCcBgBl
- MpCpHpAl
- EmCcAmAeXp
- CcErAp
- CcEmBoHlHd
- CcRa
- ErMiRa
- Cleared/Firebreak/Infrastructure
- Pine/Bluegum Plantation
- **Eucalyptus resinifera*, **Eucalyptus* sp. **Acacia pycnantha*, **Acacia decurrens*, **Chamaecytisus palmensis* and **Pinus* sp.

MARANUP FORD RD

EmCcAmAeXp

EmCcAmAeXp

env Australia

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SCALE 1:2,000 @ A3	**PROJECTION** GDA 94 MGA 50		

N

0 25 50 Metres

Vegetation Associations and Location of Quadrat and Relevé Sites

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 3.6

411,800 412,000 412,200 412,400

6,251,600 6,251,400

Legend

- Survey Area
- Quadrat
- Relevé

Vegetation Type

- CcEmBlPe
- EmCcBgBl
- MpCpHpAl
- EmCcAmAeXp
- CcErAp
- CcEmBoHlHd
- CcRa
- ErMiRa
- Cleared/Firebreak/Infrastructure
- Pine/Bluegum Plantation
- **Eucalyptus resinifera*, **Eucalyptus* sp. **Acacia pycnantha*, **Acacia decurrens*, **Chamaecytisus palmensis* and **Pinus* sp.

EmCcAmAeXp

MPR05

MARANUP FORD RD

MARANUP FORD RD

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SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Vegetation Associations and Location of Quadrat and Relevé Sites

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **3.7**

411,200 411,400 411,600 411,800

6,251,200 6,251,000

EmCcAmAeXp
EmCcAmAeXp
EmCcAmAeXp
MARANUP FORD RD
MARANUP FORD RD
CcErAp
MP06
EmCcAmAeXp
EmCcAmAeXp
MARANUP FORD RD
EmCcAmAeXp

Legend

- Survey Area
- Quadrat
- Relevé

Vegetation Type

- CcEmBlPe
- EmCcBgBl
- MpCpHpAl
- EmCcAmAeXp
- CcErAp
- CcEmBoHlHd
- CcRa
- ErMiRa
- Cleared/Firebreak/Infrastructure
- Pine/Bluegum Plantation
- **Eucalyptus resinifera*, **Eucalyptus* sp. **Acacia pycnantha*, **Acacia decurrens*, **Chamaecytisus palmensis* and **Pinus* sp.

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PROJECTION GDA 94 MGA 50

N

0 25 50 Metres

Vegetation Associations and Location of Quadrat and Relevé Sites

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 3.8

410,800
411,000
411,200
411,400
6,251,800
6,251,600
6,251,400

Legend

- Survey Area
- Quadrat
- Relevé

Vegetation Type

- CcEmBlPe
- EmCcBgBl
- MpCpHpAl
- EmCcAmAeXp
- CcErAp
- CcEmBoHlHd
- CcRa
- ErMiRa
- Cleared/Firebreak/Infrastructure
- Pine/Bluegum Plantation
- **Eucalyptus resinifera, *Eucalyptus* sp. **Acacia pycnantha, *Acacia decurrens, *Chamaecytisus palmensis* and **Pinus* sp.

EmCcAmAeXp
EmCcAmAeXp
MARANUP FORD RD
KARANUP FORD RD

env Australia

CLIENT		JOB NO.	
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AUTHOR	DRAWN	DATE	
J. Collins	M. Mikkonen	19-12-2011	
SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N
0 25 50
Metres

Vegetation Associations and Location of Quadrat and Relevé Sites

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **3.9**

410,800
411,000
411,200
411,400
6,250,200
6,250,000

Legend

- Survey Area
- Quadrat
- Relevé

Vegetation Type

- CcEmBlPe
- EmCcBgBl
- MpCpHpAl
- EmCcAmAeXp
- CcErAp
- CcEmBoHlHd
- CcRa
- ErMiRa
- Cleared/Firebreak/Infrastructure
- Pine/Bluegum Plantation
- **Eucalyptus resinifera*, **Eucalyptus* sp. **Acacia pycnantha*, **Acacia decurrens*, **Chamaecytisus palmensis* and **Pinus* sp.

HUTSON RD
NARANUP FOREST RD
EmCcAmAeXp
CcEmBoHlHd
MP07

CLIENT: Water Corporation		JOB NO.: J101331	
AUTHOR: J. Collins	DRAWN: M. Mikkonen	DATE: 19-12-2011	
SCALE: 1:2,000 @ A3	PROJECTION: GDA 94 MGA 50		

N

0 25 50 Metres

env Australia

Vegetation Associations and Location of Quadrat and Relevé Sites

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **3.10**

410,800
411,000
411,200
411,400
6,241,800
6,241,600

Legend

- Survey Area
- Quadrat
- Relevé

Vegetation Type

- CcEmBlPe
- EmCcBgBl
- MpCpHpAl
- EmCcAmAeXp
- CcErAp
- CcEmBoHlHd
- CcRa
- ErMiRa
- Cleared/Firebreak/Infrastructure
- Pine/Bluegum Plantation
- **Eucalyptus resinifera, *Eucalyptus* sp. **Acacia pycnantha, *Acacia decurrens, *Chamaecytisus palmensis* and **Pinus* sp.

MARANUP FORD RD

CcEmBoHlHd

MARANUP FORD RD

env
Australia

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SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Vegetation Associations and Location of Quadrat and Relevé Sites

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **3.11**

410,800
411,000
411,200
411,400
6,249,400
6,249,200
6,249,000

Legend

- Survey Area
- Quadrat
- Relevé

Vegetation Type

- CcEmBlPe
- EmCcBgBl
- MpCpHpAl
- EmCcAmAeXp
- CcErAp
- CcEmBoHlHd
- CcRa
- ErMiRa
- Cleared/Firebreak/Infrastructure
- Pine/Bluegum Plantation
- **Eucalyptus resinifera*, **Eucalyptus* sp. **Acacia pycnantha*, **Acacia decurrens*, **Chamaecytisus palmensis* and **Pinus* sp.

CcEmBoHlHd
EmCcBgBl
MP08
KARNUP FORD RD
KARNUP FORD RD

env
Australia

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AUTHOR	DRAWN	DATE	
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SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N
0 25 50
Metres

Vegetation Associations and Location of Quadrat and Relevé Sites

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **3.12**

410,600 410,800 411,000 411,200

6,241,800 6,241,600

MARANUP FORD RD

Legend

- Survey Area
- Quadrat
- Relevé

Vegetation Type

- CcEmBlPe
- EmCcBgBl
- MpCpHpAl
- EmCcAmAeXp
- CcErAp
- CcEmBoHlHd
- CcRa
- ErMiRa
- Cleared/Firebreak/Infrastructure
- Pine/Bluegum Plantation
- **Eucalyptus resinifera, *Eucalyptus* sp. **Acacia pycnantha, *Acacia decurrens, *Chamaecytisus palmensis* and **Pinus* sp.

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SCALE	**PROJECTION**
1:2,000 @ A3	GDA 94 MGA 50

N

0 25 50 Metres

Vegetation Associations and Location of Quadrat and Relevé Sites

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **3.13**

410,600
410,800
411,000
411,200
6,248,400
6,248,200
6,248,000
MARANUP FORD RD
EmCcBgBl

Legend

- Survey Area
- Quadrat
- Relevé

Vegetation Type

- CcEmBlPe
- EmCcBgBl
- MpCpHpAl
- EmCcAmAeXp
- CcErAp
- CcEmBoHlHd
- CcRa
- ErMiRa
- Cleared/Firebreak/Infrastructure
- Pine/Bluegum Plantation
- **Eucalyptus resinifera, *Eucalyptus* sp. **Acacia pycnantha, *Acacia decurrens, *Chamaecytisus palmensis* and **Pinus* sp.

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N

0 25 50 Metres

Vegetation Associations and Location of Quadrat and Relevé Sites

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 3.14

409,800 410,000 410,200 410,400

6,248,400 6,248,200 6,248,000

Legend

- Survey Area
- Quadrat
- Relevé

Vegetation Type

- CcEmBlPe
- EmCcBgBl
- MpCpHpAl
- EmCcAmAeXp
- CcErAp
- CcEmBoHlHd
- CcRa
- ErMiRa
- Cleared/Firebreak/Infrastructure
- Pine/Bluegum Plantation
- **Eucalyptus resinifera*, **Eucalyptus* sp. **Acacia pycnantha*, **Acacia decurrens*, **Chamaecytisus palmensis* and **Pinus* sp.

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N

0 25 50 Metres

Vegetation Associations and Location of Quadrat and Relevé Sites

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 3.15

409,000
409,200
409,400
409,600

6,249,400
6,249,200
6,249,000

HUTTON RD

Legend

- Survey Area
- Quadrat
- Relevé

Vegetation Type

- CcEmBlPe
- EmCcBgBl
- MpCpHpAl
- EmCcAmAeXp
- CcErAp
- CcEmBoHlHd
- CcRa
- ErMiRa
- Cleared/Firebreak/Infrastructure
- Pine/Bluegum Plantation
- **Eucalyptus resinifera*, **Eucalyptus* sp. **Acacia pycnantha*, **Acacia decurrens*, **Chamaecytisus palmensis* and **Pinus* sp.

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SCALE 1:2,000 @ A3

PROJECTION GDA 94 MGA 50

N

0 25 50 Metres

Vegetation Associations and Location of Quadrat and Relevé Sites

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 3.16

408,200
408,400
408,600
408,800
6,248,200
6,248,000
6,247,800
HUTTSON RD

Legend

- Survey Area
- Quadrat
- Relevé

Vegetation Type

- CcEmBlPe
- EmCcBgBl
- MpCpHpAl
- EmCcAmAeXp
- CcErAp
- CcEmBoHlHd
- CcRa
- ErMiRa
- Cleared/Firebreak/Infrastructure
- Pine/Bluegum Plantation
- **Eucalyptus resinifera, *Eucalyptus* sp. **Acacia pycnantha, *Acacia decurrens, *Chamaecytisus palmensis* and **Pinus* sp.

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SCALE 1:2,000 @ A3

PROJECTION GDA 94 MGA 50

N

0 25 50 Metres

Vegetation Associations and Location of Quadrat and Relevé Sites

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 3.17

407,600 407,800 408,000 408,200

6,241,600 6,241,400

HUTSON RD

HUTSON RD

HUTSON RD

HUTSON RD

Legend

- Survey Area
- Quadrat
- Relevé

Vegetation Type

- CcEmBlPe
- EmCcBgBl
- MpCpHpAl
- EmCcAmAeXp
- CcErAp
- CcEmBoHlHd
- CcRa
- ErMiRa
- Cleared/Firebreak/Infrastructure
- Pine/Bluegum Plantation
- **Eucalyptus resinifera*, **Eucalyptus* sp. **Acacia pycnantha*, **Acacia decurrens*, **Chamaecytisus palmensis* and **Pinus* sp.

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N

0 25 50 Metres

Vegetation Associations and Location of Quadrat and Relevé Sites

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 3.18

406,800 407,000 407,200 407,400

6,247,800 6,247,600 6,247,400

EmCcBgBl

HUITSON RD

HUITSON RD

HUITSON RD

Legend

- Survey Area
- Quadrat
- Relevé

Vegetation Type

- CcEmBlPe
- EmCcBgBl
- MpCpHpAl
- EmCcAmAeXp
- CcErAp
- CcEmBoHlHd
- CcRa
- ErMiRa
- Cleared/Firebreak/Infrastructure
- Pine/Bluegum Plantation
- **Eucalyptus resinifera*, **Eucalyptus* sp. **Acacia pycnantha*, **Acacia decurrens*, **Chamaecytisus palmensis* and **Pinus* sp.

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PROJECTION GDA 94 MGA 50

N

0 25 50 Metres

Vegetation Associations and Location of Quadrat and Relevé Sites

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 3.19

406,000 406,200 406,400 406,600

6,248,000 6,248,000

6,247,800 6,247,800

6,247,600 6,247,600

Legend

- Survey Area
- Quadrat
- Relevé

Vegetation Type

- CcEmBlPe
- EmCcBgBl
- MpCpHpAl
- EmCcAmAeXp
- CcErAp
- CcEmBoHlHd
- CcRa
- ErMiRa
- Cleared/Firebreak/Infrastructure
- Pine/Bluegum Plantation
- **Eucalyptus resinifera, *Eucalyptus* sp. **Acacia pycnantha, *Acacia decurrens, *Chamaecytisus palmensis* and **Pinus* sp.

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PROJECTION GDA 94 MGA 50

N

0 25 50 Metres

Vegetation Associations and Location of Quadrat and Relevé Sites

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 3.20

405,200 405,400 405,600 405,800

6,241,800 6,241,600

Legend

- Survey Area
- Quadrat
- Relevé

Vegetation Type

- CcEmBlPe
- EmCcBgBl
- MpCpHpAl
- EmCcAmAeXp
- CcErAp
- CcEmBoHlHd
- CcRa
- ErMiRa
- Cleared/Firebreak/Infrastructure
- Pine/Bluegum Plantation
- **Eucalyptus resinifera, *Eucalyptus* sp. **Acacia pycnantha, *Acacia decurrens, *Chamaecytisus palmensis* and **Pinus* sp.

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N

0 25 50 Metres

Vegetation Associations and Location of Quadrat and Relevé Sites

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **3.21**

404,400 404,600 404,800 405,000

6,247,800 6,247,800

Legend

- Survey Area
- Quadrat
- Relevé

Vegetation Type

- CcEmBlPe
- EmCcBgBl
- MpCpHpAl
- EmCcAmAeXp
- CcErAp
- CcEmBoHlHd
- CcRa
- ErMiRa
- Cleared/Firebreak/Infrastructure
- Pine/Bluegum Plantation
- **Eucalyptus resinifera*, **Eucalyptus* sp. **Acacia pycnantha*, **Acacia decurrens*, **Chamaecytisus palmensis* and **Pinus* sp.

MP09

CcRa

6,247,600 6,247,600

env Australia

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N

0 25 50 Metres

Vegetation Associations and Location of Quadrat and Relevé Sites

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **3.22**

404,000 404,200 404,400 404,600

6,247,400 6,247,200

Legend

- Survey Area
- Quadrat
- Relevé

Vegetation Type

- CcEmBlPe
- EmCcBgBl
- MpCpHpAl
- EmCcAmAeXp
- CcErAp
- CcEmBoHlHd
- CcRa
- ErMiRa
- Cleared/Firebreak/Infrastructure
- Pine/Bluegum Plantation
- **Eucalyptus resinifera*, **Eucalyptus* sp. **Acacia pycnantha*, **Acacia decurrens*, **Chamaecytisus palmensis* and **Pinus* sp.

Blackwood River

SOUTHAMPTON RD

MP10

MP11

ErMiRa

CcRa

env Australia

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SCALE 1:2,000 @ A3	**PROJECTION** GDA 94 MGA 50		

N

0 25 50 Metres

Vegetation Associations and Location of Quadrat and Relevé Sites

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 3.23

404,000 404,200 404,400 404,600

6,247,000 6,246,800 6,246,600

CcRa

ErMiRa

SOUTHAMPTON RD

Blackwood River

ErMiRa

Legend

- Survey Area
- Quadrat
- Relevé

Vegetation Type

- CcEmBlPe
- EmCcBgBl
- MpCpHpAl
- EmCcAmAeXp
- CcErAp
- CcEmBoHlHd
- CcRa
- ErMiRa
- Cleared/Firebreak/Infrastructure
- Pine/Bluegum Plantation
- **Eucalyptus resinifera*, **Eucalyptus* sp. **Acacia pycnantha*, **Acacia decurrens*, **Chamaecytisus palmensis* and **Pinus* sp.

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CLIENT	JOB NO.
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AUTHOR	**DRAWN** / **DATE**
J. Collins	M. Mikkonen / 19-12-2011
SCALE	**PROJECTION**
1:2,000 @ A3	GDA 94 MGA 50

N

0 25 50 Metres

Vegetation Associations and Location of Quadrat and Relevé Sites

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **3.24**

Legend

Vegetation Type

CcEmBlPe — *Corymbia calophylla* and *Eucalyptus marginata* subsp. *marginata* open forest over *Bossiaea linophylla* low open shrubland over *Pteridium esculentum* and **Freesia alba x leichtlinii* very open herbland over **Briza maxima* very open grassland.

EmCcBgBl — *Eucalyptus marginata* subsp. *marginata* and *Corymbia calophylla* open forest with scattered *Banksia grandis* over *Bossiaea linophylla, Billardiera fusiformis, Phyllanthus calycinus* and *Acacia extensa* open shrubland over *Lepidosperma gracile* very open sedgeland over *Pteridium esculentum* very open herbland.

MpCpHpAl — *Melaleuca preissiana* low open woodland over **Chamaecytisus palmensis, Hakea prostrata* and *Astartea leptophylla* tall open shrubland over **Typha orientalis* very open herbland over *Juncus holoschoenus* and *Juncus pallidus* very open sedgeland.

EmCcAmAeXp — *Eucalyptus marginata* subsp. *marginata* and *Corymbia calophylla* woodland over *Acacia myrtifolia, Acacia extensa* and *Xanthorrhoea preissii* shrubland

CcErAp — *Corymbia calophylla, *Eucalyptus resinifera* and **Acacia pycnantha* open forest over *Hypocalymma strictum* and *Bossiaea linophylla* open heath over *Lepidosperma gracile* very open sedgeland.

CcEmBoHlHd — *Corymbia calophylla* and *Eucalyptus marginata* subsp. *marginata* open forest over *Bossiaea ornata, Hakea lissocarpha* and *Hibbertia diamesogenos* low shrubland over *Lepidosperma gracile* very open sedgeland.

CcRa — *Corymbia calophylla* closed forest over **Rubus anglocandicans* closed herbland

ErMiRa — *Eucalyptus rudis* subsp. *cratyantha* (P4) open woodland over *Melaleuca incana* subsp. *incana* open shrubland over **Rubus anglocandicans* very open herbland over **Ehrharta longiflora, *Bromus diandrus* and **Avena barbata* grassland

Cleared/Firebreak/Infrastructure

Pine/Bluegum Plantation

**Eucalyptus resinifera, *Eucalyptus* sp. **Acacia pycnantha, **Acacia decurrens, **Chamaecytisus palmensis* and **Pinus* sp.

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CLIENT		JOB NO.	
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SCALE	PROJECTION		
N/A @ A4	N/A		

Vegetation Associations Legend

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **3**

412,800 413,000 413,200 413,400

6,251,600 6,251,400 6,251,200

Legend

Survey Area

Declared Plants

- *Asparagus asparagoides
- *Rubus anglocandicans
- *Zantedeschia aethiopica

Weed of Interest

- *Ligustrum ovalifolium

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded
- Cleared

TOURMALINE ST
GEORGE ST
STANIFER ST
JEPHSON ST
BLACKWOOD RD
TELLURIDE ST

env Australia

CLIENT		JOB NO.	
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J. Collins	M. Mikkonen	20-12-2011	
SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Vegetation Condition and Declared Plants

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 4.1

412,600 412,800 413,000 413,200 413,400

6,254,000 6,253,800

Legend

Survey Area

Declared Plants

- *Asparagus asparagoides
- *Rubus anglocandicans
- *Zantedeschia aethiopica

Weed of Interest

- *Ligustrum ovalifolium

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded
- Cleared

STANFER ST
TELKURIDE ST
BLACKWOOD RD
DIORITE ST
TANTALITE ST

CLIENT		JOB NO.	
Water Corporation		J101331	
AUTHOR	DRAWN	DATE	
J. Collins	M. Mikkonen	20-12-2011	
SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Vegetation Condition and Declared Plants

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 4.2

412,200 412,400 412,600 412,800

6,252,600 6,252,400 6,252,200

MARANUP FORD RD

MARANUP FORD RD

MARANUP FORD RD

Legend

Survey Area

Declared Plants

- **Asparagus asparagoides*
- **Rubus anglocandicans*
- **Zantedeschia aethiopica*

Weed of Interest

- **Ligustrum ovalifolium*

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded
- Cleared

env Australia

CLIENT
Water Corporation

JOB NO.
J101331

AUTHOR
J. Collins

DRAWN
M. Mikkonen

DATE
20-12-2011

SCALE
1:2,000 @ A3

PROJECTION
GDA 94 MGA 50

N

0 25 50
Metres

Vegetation Condition and Declared Plants

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **4.3**

412,200 412,400 412,600 412,800

6,252,200 6,252,000 6,251,800

Legend

Survey Area

Declared Plants

- *Asparagus asparagoides
- *Rubus anglocandicans
- *Zantedeschia aethiopica

Weed of Interest

- *Ligustrum ovalifolium

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded
- Cleared

MARANUP FORD RD

MARANUP FORD RD

MARANUP FORD RD

MARANUP FORD RD

env Australia

CLIENT: Water Corporation

JOB NO.: J101331

AUTHOR: J. Collins

DRAWN: M. Mikkonen

DATE: 20-12-2011

SCALE: 1:2,000 @ A3

PROJECTION: GDA 94 MGA 50

N

0 25 50 Metres

Vegetation Condition and Declared Plants

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 4.4

412,000 412,200 412,400 412,600

6,252,600 6,252,400

Legend

Survey Area

Declared Plants

- *Asparagus asparagoides
- *Rubus anglocandicans
- *Zantedeschia aethiopica

Weed of Interest

- *Ligustrum ovalifolium

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded
- Cleared

KARANUP FORD RD

env Australia

CLIENT		JOB NO.	
Water Corporation		J101331	
AUTHOR	DRAWN	DATE	
J. Collins	M. Mikkonen	20-12-2011	
SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Vegetation Condition and Declared Plants

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 4.5

412,000 412,200 412,400 412,600

6,251,200 6,251,000 6,250,800

Legend

Survey Area

Declared Plants

- **Asparagus asparagoides*
- **Rubus anglocandicans*
- **Zantedeschia aethiopica*

Weed of Interest

- **Ligustrum ovalifolium*

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded
- Cleared

MARANUP FORD RD

MARANUP FORD RD

env Australia

CLIENT		JOB NO.	
Water Corporation		J101331	
AUTHOR	DRAWN	DATE	
J. Collins	M. Mikkonen	20-12-2011	
SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Vegetation Condition and Declared Plants

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **4.6**

411,800
412,000
412,200
412,400
6,251,600
6,251,400

Legend

Survey Area

Declared Plants

- *Asparagus asparagoides
- *Rubus anglocandicans
- *Zantedeschia aethiopica

Weed of Interest

- *Ligustrum ovalifolium

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded
- Cleared

MARANUP FORD RD

MARANUP FORD RD

env Australia

CLIENT		JOB NO.	
Water Corporation		J101331	
AUTHOR	DRAWN	DATE	
J. Collins	M. Mikkonen	20-12-2011	
SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Vegetation Condition and Declared Plants

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **4.7**

411,200
411,400
411,600
411,800
6,251,200
6,251,000

MARANUP FORD RD

Legend

Survey Area

Declared Plants

- **Asparagus asparagoides*
- **Rubus anglocandicans*
- **Zantedeschia aethiopica*

Weed of Interest

- **Ligustrum ovalifolium*

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded
- Cleared

env Australia

CLIENT: Water Corporation
JOB NO.: J101331
AUTHOR: J. Collins
DRAWN: M. Mikkonen
DATE: 20-12-2011
SCALE: 1:2,000 @ A3
PROJECTION: GDA 94 MGA 50

N
0 25 50 Metres

Vegetation Condition and Declared Plants

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 4.8

410,800
411,000
411,200
411,400
6,250,800
6,250,600
6,250,400

Legend

Survey Area

Declared Plants

- *Asparagus asparagoides
- *Rubus anglocandicans
- *Zantedeschia aethiopica

Weed of Interest

- *Ligustrum ovalifolium

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded
- Cleared

MARANUP FORD RD

KARANUP FORD RD

env Australia

CLIENT		JOB NO.	
Water Corporation		J101331	
AUTHOR	DRAWN	DATE	
J. Collins	M. Mikkonen	20-12-2011	
SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Vegetation Condition and Declared Plants

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **4.9**

410,800
411,000
411,200
411,400
6,251,200
6,251,000

Legend

Survey Area

Declared Plants

- *Asparagus asparagoides
- *Rubus anglocandicans
- *Zantedeschia aethiopica

Weed of Interest

- *Ligustrum ovalifolium

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded
- Cleared

HUTSON RD

NARANUP FORD RD

env Australia

CLIENT		JOB NO.	
Water Corporation		J101331	
AUTHOR	DRAWN	DATE	
J. Collins	M. Mikkonen	20-12-2011	
SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Vegetation Condition and Declared Plants

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **4.10**

410,800
411,000
411,200
411,400
6,241,800
6,241,600

Legend

Survey Area

Declared Plants

- **Asparagus asparagoides*
- **Rubus anglocandicans*
- **Zantedeschia aethiopica*

Weed of Interest

- **Ligustrum ovalifolium*

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded
- Cleared

MARANUP FORD RD

env Australia

CLIENT: Water Corporation
JOB NO.: J101331
AUTHOR: J. Collins
DRAWN: M. Mikkonen
DATE: 20-12-2011
SCALE: 1:2,000 @ A3
PROJECTION: GDA 94 MGA 50

N
0 25 50 Metres

Vegetation Condition and Declared Plants

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 4.11

410,800
411,000
411,200
411,400
6,249,400
6,249,200
6,249,000

Legend

Survey Area

Declared Plants

- *Asparagus asparagoides
- *Rubus anglocandicans
- *Zantedeschia aethiopica

Weed of Interest

- *Ligustrum ovalifolium

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded
- Cleared

MARANUP FORD RD

env Australia

CLIENT: Water Corporation		JOB NO.: J101331	
AUTHOR: J. Collins	DRAWN: M. Mikkonen	DATE: 20-12-2011	
SCALE: 1:2,000 @ A3	PROJECTION: GDA 94 MGA 50		

N

0 25 50 Metres

Vegetation Condition and Declared Plants

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **4.12**

410,600
410,800
411,000
411,200
6,248,800
6,248,600

MARANUP FORD RD

Legend

Survey Area

Declared Plants

- *Asparagus asparagoides
- *Rubus anglocandicans
- *Zantedeschia aethiopica

Weed of Interest

- *Ligustrum ovalifolium

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded
- Cleared

env Australia

CLIENT		JOB NO.	
Water Corporation		J101331	
AUTHOR	DRAWN	DATE	
J. Collins	M. Mikkonen	20-12-2011	
SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Vegetation Condition and Declared Plants

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **4.13**

410,600
410,800
411,000
411,200
6,244,400
6,244,200
6,244,000
MARANUP FORD RD

Legend

- Survey Area

Declared Plants

- *Asparagus asparagoides
- *Rubus anglocandicans
- *Zantedeschia aethiopica

Weed of Interest

- *Ligustrum ovalifolium

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded
- Cleared

env Australia

CLIENT		JOB NO.	
Water Corporation		J101331	
AUTHOR	DRAWN	DATE	
J. Collins	M. Mikkonen	20-12-2011	
SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Vegetation Condition and Declared Plants

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **4.14**

409,800
410,000
410,200
410,400
6,248,400
6,248,200
6,248,000

Legend

- Survey Area

Declared Plants

- *Asparagus asparagoides
- *Rubus anglocandicans
- *Zantedeschia aethiopica

Weed of Interest

- *Ligustrum ovalifolium

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded
- Cleared

env Australia

CLIENT: Water Corporation
JOB NO.: J101331
AUTHOR: J. Collins
DRAWN: M. Mikkonen
DATE: 20-12-2011
SCALE: 1:2,000 @ A3
PROJECTION: GDA 94 MGA 50

N
0 25 50 Metres

Vegetation Condition and Declared Plants

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 4.15

409,000
409,200
409,400
409,600

6,249,400
6,249,200
6,249,000

HUTTON RD

Legend

- Survey Area

Declared Plants

- *Asparagus asparagoides
- *Rubus anglocandicans
- *Zantedeschia aethiopica

Weed of Interest

- *Ligustrum ovalifolium

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded
- Cleared

env Australia

CLIENT: Water Corporation		JOB NO.: J101331	
AUTHOR: J. Collins	DRAWN: M. Mikkonen	DATE: 20-12-2011	
SCALE: 1:2,000 @ A3	PROJECTION: GDA 94 MGA 50		

N

0 25 50 Metres

Vegetation Condition and Declared Plants

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **4.16**

408,200
408,400
408,600
408,800
6,248,200
6,248,000
6,247,800
HUTTSON RD

Legend

- Survey Area

Declared Plants

- *Asparagus asparagoides
- *Rubus anglocandicans
- *Zantedeschia aethiopica

Weed of Interest

- *Ligustrum ovalifolium

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded
- Cleared

env Australia

CLIENT: Water Corporation
JOB NO.: J101331
AUTHOR: J. Collins
DRAWN: M. Mikkonen
DATE: 20-12-2011
SCALE: 1:2,000 @ A3
PROJECTION: GDA 94 MGA 50

N
0 25 50 Metres

Vegetation Condition and Declared Plants

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 4.17

407,600
407,800
408,000
408,200
6,241,600
6,241,400

HUTSON RD
HUTSON RD
HUTSON RD
HUTSON RD

Legend

- Survey Area

Declared Plants

- *Asparagus asparagoides
- *Rubus anglocandicans
- *Zantedeschia aethiopica

Weed of Interest

- *Ligustrum ovalifolium

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded
- Cleared

env Australia

CLIENT: Water Corporation
JOB NO.: J101331
AUTHOR: J. Collins
DRAWN: M. Mikkonen
DATE: 20-12-2011
SCALE: 1:2,000 @ A3
PROJECTION: GDA 94 MGA 50

N
0 25 50 Metres

Vegetation Condition and Declared Plants

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 4.18

406,800
407,000
407,200
407,400
6,247,800
6,247,600
6,247,400
HUITSON RD
HUITSON RD
HUITSON RD
HUITSON RD

Legend

Survey Area

Declared Plants

Asparagus asparagoides

Rubus anglocandicans

Zantedeschia aethiopica

Weed of Interest

Ligustrum ovalifolium

Condition

Excellent

Very Good

Good

Degraded

Completely Degraded

Cleared

env Australia

CLIENT: Water Corporation

JOB NO.: J101331

AUTHOR: J. Collins

DRAWN: M. Mikkonen

DATE: 20-12-2011

SCALE: 1:2,000 @ A3

PROJECTION: GDA 94 MGA 50

N

0 25 50 Metres

Vegetation Condition and Declared Plants

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **4.19**

406,000 406,200 406,400 406,600

6,248,000 6,247,800 6,247,600

Legend

Survey Area

Declared Plants

- **Asparagus asparagoides*
- **Rubus anglocandicans*
- **Zantedeschia aethiopica*

Weed of Interest

- **Ligustrum ovalifolium*

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded
- Cleared

env Australia

CLIENT		JOB NO.	
Water Corporation		J101331	
AUTHOR	DRAWN	DATE	
J. Collins	M. Mikkonen	20-12-2011	
SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Vegetation Condition and Declared Plants

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **4.20**

405,200 405,400 405,600 405,800

6,241,800 6,241,600

Legend

Survey Area

Declared Plants

- *Asparagus asparagoides
- *Rubus anglocandicans
- *Zantedeschia aethiopica

Weed of Interest

- *Ligustrum ovalifolium

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded
- Cleared

env Australia

CLIENT		JOB NO.	
Water Corporation		J101331	
AUTHOR	DRAWN	DATE	
J. Collins	M. Mikkonen	20-12-2011	
SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Vegetation Condition and Declared Plants

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **4.21**

404,400 404,600 404,800 405,000

6,241,800 6,241,600

Legend

Survey Area

Declared Plants

- *Asparagus asparagoides
- *Rubus anglocandicans
- *Zantedeschia aethiopica

Weed of Interest

- *Ligustrum ovalifolium

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded
- Cleared

env Australia

CLIENT		JOB NO.	
Water Corporation		J101331	
AUTHOR	DRAWN	DATE	
J. Collins	M. Mikkonen	20-12-2011	
SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Vegetation Condition and Declared Plants

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **4.22**

404,000
404,200
404,400
404,600
6,247,400
6,247,200

Legend

Survey Area

Declared Plants

- *Asparagus asparagoides
- *Rubus anglocandicans
- *Zantedeschia aethiopica

Weed of Interest

- *Ligustrum ovalifolium

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded
- Cleared

Blackwood River

SOUTHAMPTON RD

env Australia

CLIENT: Water Corporation			JOB NO.: J101331
AUTHOR: J. Collins	DRAWN: M. Mikkonen		DATE: 20-12-2011
SCALE: 1:2,000 @ A3	PROJECTION: GDA 94 MGA 50		

N

0 25 50 Metres

Vegetation Condition and Declared Plants

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 4.23

404,000
404,200
404,400
404,600
6,247,000
6,246,800
6,246,600
Blackwood River
SOUTHAMPTON RD
TUART RD

Legend

- Survey Area

Declared Plants

- *Asparagus asparagoides
- *Rubus anglocandicans
- *Zantedeschia aethiopica

Weed of Interest

- *Ligustrum ovalifolium

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded
- Cleared

env Australia

CLIENT		JOB NO.	
Water Corporation		J101331	
AUTHOR	DRAWN	DATE	
J. Collins	M. Mikkonen	20-12-2011	
SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Vegetation Condition and Declared Plants

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **4.24**

412,800
413,000
413,200
413,400
6,251,600
6,251,400
6,251,200

Legend

Vegetation Type Boundary

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

CcEmBlPe

Planted Species

CcEmBlPe

CcEmBlPe

env Australia

CLIENT		**JOB NO.**	
Water Corporation		J101331	
AUTHOR	**DRAWN**	**DATE**	
J. Collins	M. Mikkonen	21-12-2011	
SCALE	**PROJECTION**		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Combined Vegetation Associations, Vegetation Condition and Location of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 5.1

412,600 412,800 413,000 413,200 413,400

6,254,000 6,253,800

Legend

Vegetation Type Boundary

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

CcEmBlPe

Planted Species

EmCcBgBl

EmCcBgBl

EmCcBgBl

N

0 25 50 Metres

env Australia

CLIENT	JOB NO.
Water Corporation	J101331
AUTHOR	DRAWN / DATE
J. Collins	M. Mikkonen / 21-12-2011
SCALE	PROJECTION
1:2,000 @ A3	GDA 94 MGA 50

Combined Vegetation Associations, Vegetation Condition and Location of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **5.2**

412,200 412,400 412,600 412,800

6,251,600 6,251,400 6,251,200

Legend

Vegetation Type Boundary

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

EmCcBgBl

EmCcBgBl

EmCcBgBl

env Australia

CLIENT	JOB NO.
Water Corporation	J101331

AUTHOR	DRAWN	DATE
J. Collins	M. Mikkonen	21-12-2011

SCALE	PROJECTION
1:2,000 @ A3	GDA 94 MGA 50

N

0 25 50 Metres

Combined Vegetation Associations, Vegetation Condition and Location of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **5.3**

412,200 412,400 412,600 412,800

6,252,200 6,252,000 6,251,800

Legend

Vegetation Type Boundary

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

EmCcBgB

EmCcBgB

EmCcBgB

MpCpHpA

env Australia

CLIENT		JOB NO.	
Water Corporation		J101331	
AUTHOR	DRAWN	DATE	
J. Collins	M. Mikkonen	21-12-2011	
SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Combined Vegetation Associations, Vegetation Condition and Location of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **5.4**

412,000
412,200
412,400
412,600
6,252,600
6,252,400

Legend

Vegetation Type Boundary

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

MpCpHpAl

Planted Species

env Australia

CLIENT: Water Corporation			JOB NO.: J101331
AUTHOR: J. Collins	DRAWN: M. Mikkonen		DATE: 21-12-2011
SCALE: 1:2,000 @ A3	PROJECTION: GDA 94 MGA 50		

N

0 25 50 Metres

Combined Vegetation Associations, Vegetation Condition and Location of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **5.5**

412,000 412,200 412,400 412,600

6,252,200 6,252,000 6,251,800

Legend

Vegetation Type Boundary

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

Planted Species

Planted Species

Pine/Bluegum Plantation

EmCcAmAeXp

EmCcAmAeXp

CLIENT: Water Corporation		JOB NO.: J101331	
AUTHOR: J. Collins	DRAWN: M. Mikkonen	DATE: 21-12-2011	
SCALE: 1:2,000 @ A3	PROJECTION: GDA 94 MGA 50		

N

0 25 50 Metres

env Australia

Combined Vegetation Associations, Vegetation Condition and Location of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **5.6**

411,800
412,000
412,200
412,400
6,251,600
6,251,400

Legend

Vegetation Type Boundary

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

EmCcAmAeXp

env Australia

CLIENT: Water Corporation			JOB NO.: J101331
AUTHOR: J. Collins	DRAWN: M. Mikkonen		DATE: 21-12-2011
SCALE: 1:2,000 @ A3	PROJECTION: GDA 94 MGA 50		

N

0 25 50 Metres

Combined Vegetation Associations, Vegetation Condition and Location of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **5.7**

411,200 411,400 411,600 411,800

6,251,200 6,251,000

Legend

Vegetation Type Boundary

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

EmCcAmAeXp

EmCcAmAeXp

EmCcAmAeXp

CcErAp

EmCcAmAeXp

EmCcAmAeXp

EmCcAmAeXp

env Australia

CLIENT		JOB NO.	
Water Corporation		J101331	
AUTHOR	DRAWN	DATE	
J. Collins	M. Mikkonen	21-12-2011	
SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Combined Vegetation Associations, Vegetation Condition and Location of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **5.8**

410,800
411,000
411,200
411,400
6,256,800
6,256,600
6,256,400

Legend

Vegetation Type Boundary

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

EmCcAmAeXp

EmCcAmAeXp

env Australia

CLIENT: Water Corporation
JOB NO.: J101331
AUTHOR: J. Collins
DRAWN: M. Mikkonen
DATE: 21-12-2011
SCALE: 1:2,000 @ A3
PROJECTION: GDA 94 MGA 50

N

0 25 50 Metres

Combined Vegetation Associations, Vegetation Condition and Location of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **5.9**

410,800
411,000
411,200
411,400
6,250,200
6,250,000

Legend

Vegetation Type Boundary

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

EmCcAmAeXp

CcEmBoHlHd

CLIENT: Water Corporation		JOB NO.: J101331	
AUTHOR: J. Collins	DRAWN: M. Mikkonen	DATE: 21-12-2011	
SCALE: 1:2,000 @ A3	PROJECTION: GDA 94 MGA 50		

N

0 25 50 Metres

Combined Vegetation Associations, Vegetation Condition and Location of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **5.10**

410,800
411,000
411,200
411,400
6,241,800
6,241,600

Legend

Vegetation Type Boundary

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

CcEmBoHIHd

CLIENT: Water Corporation		JOB NO.: J101331	
AUTHOR: J. Collins	DRAWN: M. Mikkonen	DATE: 21-12-2011	
SCALE: 1:2,000 @ A3	PROJECTION: GDA 94 MGA 50		

N

0 25 50 Metres

Combined Vegetation Associations, Vegetation Condition and Location of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **5.11**

410,800
411,000
411,200
411,400
6,249,400
6,249,200
6,249,000

Legend

Vegetation Type Boundary

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

CcEmBoHHd

EmCcBgB1

env Australia

CLIENT		JOB NO.	
Water Corporation		J101331	
AUTHOR	DRAWN	DATE	
J. Collins	M. Mikkonen	21-12-2011	
SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Combined Vegetation Associations, Vegetation Condition and Location of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **5.12**

410,600
410,800
411,000
411,200
6,248,800
6,248,600

Legend

Vegetation Type Boundary

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

N

0 25 50 Metres

env Australia

CLIENT		**JOB NO.**	
Water Corporation		J101331	
AUTHOR	**DRAWN**	**DATE**	
J. Collins	M. Mikkonen	21-12-2011	
SCALE	**PROJECTION**		
1:2,000 @ A3	GDA 94 MGA 50		

Combined Vegetation Associations, Vegetation Condition and Location of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 5.13

410,600
410,800
411,000
411,200
6,241,400
6,241,200
6,241,000
EmCcBgBl

Legend

- Vegetation Type Boundary

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

env Australia

CLIENT	JOB NO.
Water Corporation	J101331

AUTHOR	DRAWN	DATE
J. Collins	M. Mikkonen	21-12-2011

SCALE	PROJECTION
1:2,000 @ A3	GDA 94 MGA 50

N

0 25 50 Metres

Combined Vegetation Associations, Vegetation Condition and Location of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **5.14**

410,600
410,800
411,000
411,200
6,241,400
6,241,200
6,241,000
EmCcBgBl

Legend

- Vegetation Type Boundary

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

env Australia

CLIENT	JOB NO.
Water Corporation	J101331

AUTHOR	DRAWN	DATE
J. Collins	M. Mikkonen	21-12-2011

SCALE	PROJECTION
1:2,000 @ A3	GDA 94 MGA 50

N

0 25 50 Metres

Combined Vegetation Associations, Vegetation Condition and Location of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **5.14**

409,800
410,000
410,200
410,400
6,248,400
6,248,200
6,248,000

Pine/Bluegum Plantation

Legend

- Vegetation Type Boundary

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

env Australia

CLIENT: Water Corporation
JOB NO.: J101331
AUTHOR: J. Collins
DRAWN: M. Mikkonen
DATE: 21-12-2011
SCALE: 1:2,000 @ A3
PROJECTION: GDA 94 MGA 50

N
0 25 50 Metres

Combined Vegetation Associations, Vegetation Condition and Location of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **5.15**

409,000
409,200
409,400
409,600
6,241,400
6,241,200
6,241,000

Pine/Bluegum Plantation
Pine/Bluegum Plantation
Pine/Bluegum Plantation
Pine/Bluegum Plantation

Legend

- Vegetation Type Boundary

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

env Australia

CLIENT: Water Corporation			JOB NO.: J101331
AUTHOR: J. Collins	DRAWN: M. Mikkonen		DATE: 21-12-2011
SCALE: 1:2,000 @ A3	PROJECTION: GDA 94 MGA 50		

N

0 25 50 Metres

Combined Vegetation Associations, Vegetation Condition and Location of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **5.16**

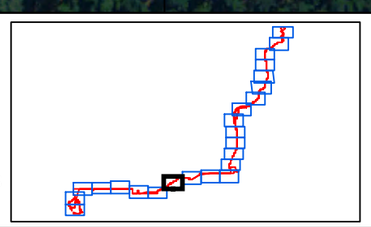
408,200
408,400
408,600
408,800
6,244,200
6,244,000
6,243,800

env Australia

CLIENT		JOB NO.	
Water Corporation		J101331	
AUTHOR	DRAWN	DATE	
J. Collins	M. Mikkonen	21-12-2011	
SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres



Combined Vegetation Associations, Vegetation Condition and Location of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **5.17**

407,600
407,800
408,000
408,200
6,241,600
6,241,400

Legend

- Vegetation Type Boundary

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

env Australia

CLIENT: Water Corporation
JOB NO.: J101331
AUTHOR: J. Collins
DRAWN: M. Mikkonen
DATE: 21-12-2011
SCALE: 1:2,000 @ A3
PROJECTION: GDA 94 MGA 50

N
0 25 50 Metres

Combined Vegetation Associations, Vegetation Condition and Location of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 5.18

406,800 407,000 407,200 407,400

6,241,800 6,241,600 6,241,400

Legend

Vegetation Type Boundary

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

Pine/Bluegum Plantation

EmCcBgBl

env Australia

CLIENT: Water Corporation
JOB NO.: J101331
AUTHOR: J. Collins
DRAWN: M. Mikkonen
DATE: 21-12-2011
SCALE: 1:2,000 @ A3
PROJECTION: GDA 94 MGA 50

N

0 25 50 Metres

Combined Vegetation Associations, Vegetation Condition and Location of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **5.19**

406,000 406,200 406,400 406,600

6,248,000 6,247,800 6,247,600

Legend

Vegetation Type Boundary

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

Pine/Bluegum Plantation

Pine/Bluegum Plantation

env Australia

CLIENT	JOB NO.
Water Corporation	J101331
AUTHOR / DRAWN / DATE	
J. Collins / M. Mikkonen / 21-12-2011	
SCALE	PROJECTION
1:2,000 @ A3	GDA 94 MGA 50

N

0 25 50 Metres

Combined Vegetation Associations, Vegetation Condition and Location of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **5.20**

405,200 405,400 405,600 405,800

6,241,800 6,241,600

Legend

Vegetation Type Boundary

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

Pine/Bluegum Plantation

env Australia

CLIENT: Water Corporation
JOB NO.: J101331
AUTHOR: J. Collins
DRAWN: M. Mikkonen
DATE: 21-12-2011
SCALE: 1:2,000 @ A3
PROJECTION: GDA 94 MGA 50

N

0 25 50 Metres

Combined Vegetation Associations, Vegetation Condition and Location of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **5.21**

404,400 404,600 404,800 405,000

6,247,800 6,247,800

6,247,600 6,247,600

Legend

Vegetation Type Boundary

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

GcRa

env Australia

CLIENT		JOB NO.	
Water Corporation		J101331	
AUTHOR	DRAWN	DATE	
J. Collins	M. Mikkonen	21-12-2011	
SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Combined Vegetation Associations, Vegetation Condition and Location of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **5.22**

404,000 404,200 404,400 404,600

6,247,400 6,247,200

Legend

Vegetation Type Boundary

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

Blackwood River

ErMiRa

CcRa

CLIENT: Water Corporation		JOB NO.: J101331	
AUTHOR: J. Collins	DRAWN: M. Mikkonen	DATE: 21-12-2011	
SCALE: 1:2,000 @ A3	PROJECTION: GDA 94 MGA 50		

N

0 25 50 Metres

Combined Vegetation Associations, Vegetation Condition and Location of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **5.23**

404,000
404,200
404,400
404,600
6,247,000
6,246,800
6,246,600

CcRa
ErMiRa
Blackwood River
ErMiRa

Legend

- Vegetation Type Boundary

Condition

- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

env Australia

CLIENT: Water Corporation		JOB NO.: J101331
AUTHOR: J. Collins	DRAWN: M. Mikkonen	DATE: 21-12-2011
SCALE: 1:2,000 @ A3	PROJECTION: GDA 94 MGA 50	

N

0 25 50 Metres

Combined Vegetation Associations, Vegetation Condition and Location of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 5.24

412,800
413,000
413,200
413,400
6,254,600
6,254,400
6,254,200

Legend

- Survey Area
- Habitat Assessment Location

Conservation Significant Fauna

- *Calyptorhynchus latirostris*
- *Merops ornatus*
- *Morelia spilota imbricata*

Significant Trees

- *Corymbia calophylla*
- Dead Stag
- *Eucalyptus marginata*
- *Eucalyptus rudis*
- Marri/Jarrah Forest
- Major Drainage
- Pine/Bluegum Plantation
- Cleared

env Australia

CLIENT		**JOB NO.**	
Water Corporation		J101331	
AUTHOR	**DRAWN**	**DATE**	
R. Firth	M. Mikkonen	21-12-2011	
SCALE	**PROJECTION**		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Fauna Habitats, Location of Conservation Significant Fauna and Location of Significant Trees

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 6.1

412,600 412,800 413,000 413,200 413,400

6,254,000 6,253,800

Legend

- Survey Area
- Habitat Assessment Location

Conservation Significant Fauna

- *Calyptorhynchus latirostris*
- *Merops ornatus*
- *Morelia spilota imbricata*

Significant Trees

- *Corymbia calophylla*
- Dead Stag
- *Eucalyptus marginata*
- *Eucalyptus rudis*
- Marri/Jarrah Forest
- Major Drainage
- Pine/Bluegum Plantation
- Cleared

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CLIENT	JOB NO.
Water Corporation	J101331

AUTHOR	DRAWN	DATE
R. Firth	M. Mikkonen	21-12-2011

SCALE	PROJECTION
1:2,000 @ A3	GDA 94 MGA 50

N

0 25 50 Metres

Fauna Habitats, Location of Conservation Significant Fauna and Location of Significant Trees

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **6.2**

412,200 412,400 412,600 412,800

6,252,600 6,252,400 6,252,200

Legend

- Survey Area
- Habitat Assessment Location

Conservation Significant Fauna

- *Calyptorhynchus latirostris*
- *Merops ornatus*
- *Morelia spilota imbricata*

Significant Trees

- *Corymbia calophylla*
- Dead Stag
- *Eucalyptus marginata*
- *Eucalyptus rudis*
- Marri/Jarrah Forest
- Major Drainage
- Pine/Bluegum Plantation
- Cleared

HA2

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CLIENT	JOB NO.
Water Corporation	J101331

AUTHOR	DRAWN	DATE
R. Firth	M. Mikkonen	21-12-2011

SCALE	PROJECTION
1:2,000 @ A3	GDA 94 MGA 50

N

0 25 50 Metres

Fauna Habitats, Location of Conservation Significant Fauna and Location of Significant Trees

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **6.3**

412,200 412,400 412,600 412,800

6,252,200 6,252,000 6,251,800

Legend

- Survey Area
- Habitat Assessment Location

Conservation Significant Fauna

- *Calyptorhynchus latirostris*
- *Merops ornatus*
- *Morelia spilota imbricata*

Significant Trees

- *Corymbia calophylla*
- Dead Stag
- *Eucalyptus marginata*
- *Eucalyptus rudis*
- Marri/Jarrah Forest
- Major Drainage
- Pine/Bluegum Plantation
- Cleared

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CLIENT Water Corporation		**JOB NO.** J101331	
AUTHOR R. Firth	**DRAWN** M. Mikkonen	**DATE** 21-12-2011	
SCALE 1:2,000 @ A3	**PROJECTION** GDA 94 MGA 50		

N

0 25 50 Metres

Fauna Habitats, Location of Conservation Significant Fauna and Location of Significant Trees

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 6.4

412,000 412,200 412,400 412,600

6,252,600 6,252,400

Legend

- Survey Area
- Habitat Assessment Location

Conservation Significant Fauna

- *Calyptorhynchus latirostris*
- *Merops ornatus*
- *Morelia spilota imbricata*

Significant Trees

- *Corymbia calophylla*
- Dead Stag
- *Eucalyptus marginata*
- *Eucalyptus rudis*
- Marri/Jarrah Forest
- Major Drainage
- Pine/Bluegum Plantation
- Cleared

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CLIENT Water Corporation		**JOB NO.** J101331
AUTHOR R. Firth	**DRAWN** M. Mikkonen	**DATE** 21-12-2011
SCALE 1:2,000 @ A3	**PROJECTION** GDA 94 MGA 50	

N

0 25 50 Metres

Fauna Habitats, Location of Conservation Significant Fauna and Location of Significant Trees

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 6.5

412,000 412,200 412,400 412,600

6,251,200 6,251,000 6,250,800

Legend

- Survey Area
- Habitat Assessment Location

Conservation Significant Fauna

- *Calyptorhynchus latirostris*
- *Merops ornatus*
- *Morelia spilota imbricata*

Significant Trees

- *Corymbia calophylla*
- Dead Stag
- *Eucalyptus marginata*
- *Eucalyptus rudis*
- Marri/Jarrah Forest
- Major Drainage
- Pine/Bluegum Plantation
- Cleared

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CLIENT Water Corporation			**JOB NO.** J101331
AUTHOR R. Firth	**DRAWN** M. Mikkonen	**DATE** 21-12-2011	
SCALE 1:2,000 @ A3	**PROJECTION** GDA 94 MGA 50		

N

0 25 50 Metres

Fauna Habitats, Location of Conservation Significant Fauna and Location of Significant Trees

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 6.6

411,800
412,000
412,200
412,400
6,251,600
6,251,400

Legend

- Survey Area
- Habitat Assessment Location

Conservation Significant Fauna

- *Calyptorhynchus latirostris*
- *Merops ornatus*
- *Morelia spilota imbricata*

Significant Trees

- *Corymbia calophylla*
- Dead Stag
- *Eucalyptus marginata*
- *Eucalyptus rudis*
- Marri/Jarrah Forest
- Major Drainage
- Pine/Bluegum Plantation
- Cleared

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CLIENT	JOB NO.
Water Corporation	J101331
AUTHOR	DRAWN / DATE
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SCALE	PROJECTION
1:2,000 @ A3	GDA 94 MGA 50

N

0 25 50 Metres

Fauna Habitats, Location of Conservation Significant Fauna and Location of Significant Trees

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **6.7**

411,200
411,400
411,600
411,800
6,251,200
6,251,000

Legend

- Survey Area
- Habitat Assessment Location

Conservation Significant Fauna

- *Calyptorhynchus latirostris*
- *Merops ornatus*
- *Morelia spilota imbricata*

Significant Trees

- *Corymbia calophylla*
- Dead Stag
- *Eucalyptus marginata*
- *Eucalyptus rudis*
- Marri/Jarrah Forest
- Major Drainage
- Pine/Bluegum Plantation
- Cleared

env Australia

CLIENT: Water Corporation
JOB NO.: J101331
AUTHOR: R. Firth
DRAWN: M. Mikkonen
DATE: 21-12-2011
SCALE: 1:2,000 @ A3
PROJECTION: GDA 94 MGA 50

N
0 25 50 Metres

Fauna Habitats, Location of Conservation Significant Fauna and Location of Significant Trees

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 6.8

410,800
411,000
411,200
411,400
6,259,800
6,259,600
6,259,400

Legend

- Survey Area
- Habitat Assessment Location

Conservation Significant Fauna

- *Calyptorhynchus latirostris*
- *Merops ornatus*
- *Morelia spilota imbricata*

Significant Trees

- *Corymbia calophylla*
- Dead Stag
- *Eucalyptus marginata*
- *Eucalyptus rudis*
- Marri/Jarrah Forest
- Major Drainage
- Pine/Bluegum Plantation
- Cleared

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CLIENT		JOB NO.	
Water Corporation		J101331	
AUTHOR	DRAWN	DATE	
R. Firth	M. Mikkonen	21-12-2011	
SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Fauna Habitats, Location of Conservation Significant Fauna and Location of Significant Trees

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **6.9**

410,800
411,000
411,200
411,400
6,251,200
6,251,000

Legend

- Survey Area
- Habitat Assessment Location

Conservation Significant Fauna

- *Calyptorhynchus latirostris*
- *Merops ornatus*
- *Morelia spilota imbricata*

Significant Trees

- *Corymbia calophylla*
- Dead Stag
- *Eucalyptus marginata*
- *Eucalyptus rudis*
- Marri/Jarrah Forest
- Major Drainage
- Pine/Bluegum Plantation
- Cleared

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CLIENT Water Corporation

JOB NO. J101331

AUTHOR R. Firth

DRAWN M. Mikkonen

DATE 21-12-2011

SCALE 1:2,000 @ A3

PROJECTION GDA 94 MGA 50

N

0 25 50 Metres

Fauna Habitats, Location of Conservation Significant Fauna and Location of Significant Trees

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 6.10

410,800
411,000
411,200
411,400
6,241,800
6,241,600

Legend

- Survey Area
- Habitat Assessment Location

Conservation Significant Fauna

- *Calyptorhynchus latirostris*
- *Merops ornatus*
- *Morelia spilota imbricata*

Significant Trees

- *Corymbia calophylla*
- Dead Stag
- *Eucalyptus marginata*
- *Eucalyptus rudis*
- Marri/Jarrah Forest
- Major Drainage
- Pine/Bluegum Plantation
- Cleared

env Australia

CLIENT Water Corporation

JOB NO. J101331

AUTHOR R. Firth

DRAWN M. Mikkonen

DATE 21-12-2011

SCALE 1:2,000 @ A3

PROJECTION GDA 94 MGA 50

N

0 25 50 Metres

Fauna Habitats, Location of Conservation Significant Fauna and Location of Significant Trees

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 6.11

410,800
411,000
411,200
411,400
6,249,400
6,249,200
6,249,000

Legend

- Survey Area
- Habitat Assessment Location

Conservation Significant Fauna

- *Calyptorhynchus latirostris*
- *Merops ornatus*
- *Morelia spilota imbricata*

Significant Trees

- *Corymbia calophylla*
- Dead Stag
- *Eucalyptus marginata*
- *Eucalyptus rudis*
- Marri/Jarrah Forest
- Major Drainage
- Pine/Bluegum Plantation
- Cleared

env Australia

CLIENT		JOB NO.	
Water Corporation		J101331	
AUTHOR	DRAWN	DATE	
R. Firth	M. Mikkonen	21-12-2011	
SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Fauna Habitats, Location of Conservation Significant Fauna and Location of Significant Trees

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **6.12**

410,600 410,800 411,000 411,200

6,241,800 6,241,600

Legend

- Survey Area
- Habitat Assessment Location

Conservation Significant Fauna

- *Calyptorhynchus latirostris*
- *Merops ornatus*
- *Morelia spilota imbricata*

Significant Trees

- *Corymbia calophylla*
- Dead Stag
- *Eucalyptus marginata*
- *Eucalyptus rudis*
- Marri/Jarrah Forest
- Major Drainage
- Pine/Bluegum Plantation
- Cleared

env Australia

CLIENT	JOB NO.
Water Corporation	J101331

AUTHOR	DRAWN	DATE
R. Firth	M. Mikkonen	21-12-2011

SCALE	PROJECTION
1:2,000 @ A3	GDA 94 MGA 50

N

0 25 50 Metres

Fauna Habitats, Location of Conservation Significant Fauna and Location of Significant Trees

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **6.13**

410,600 410,800 411,000 411,200

6,244,400 6,244,200 6,244,000

env Australia

CLIENT: Water Corporation
JOB NO.: J101331
AUTHOR: R. Firth
DRAWN: M. Mikkonen
DATE: 21-12-2011
SCALE: 1:2,000 @ A3
PROJECTION: GDA 94 MGA 50

N
0 25 50 Metres

Fauna Habitats, Location of Conservation Significant Fauna and Location of Significant Trees

Millstream to Greenbushes Flora and Fauna Survey

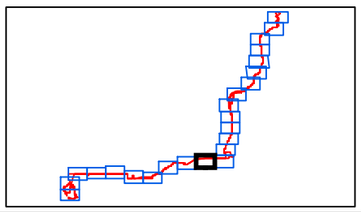
FIGURE 6.14

409,800
410,000
410,200
410,400
6,241,400
6,241,200
6,241,000

env Australia

CLIENT: Water Corporation
JOB NO.: J101331
AUTHOR: R. Firth
DRAWN: M. Mikkonen
DATE: 21-12-2011
SCALE: 1:2,000 @ A3
PROJECTION: GDA 94 MGA 50

N
0 25 50 Metres

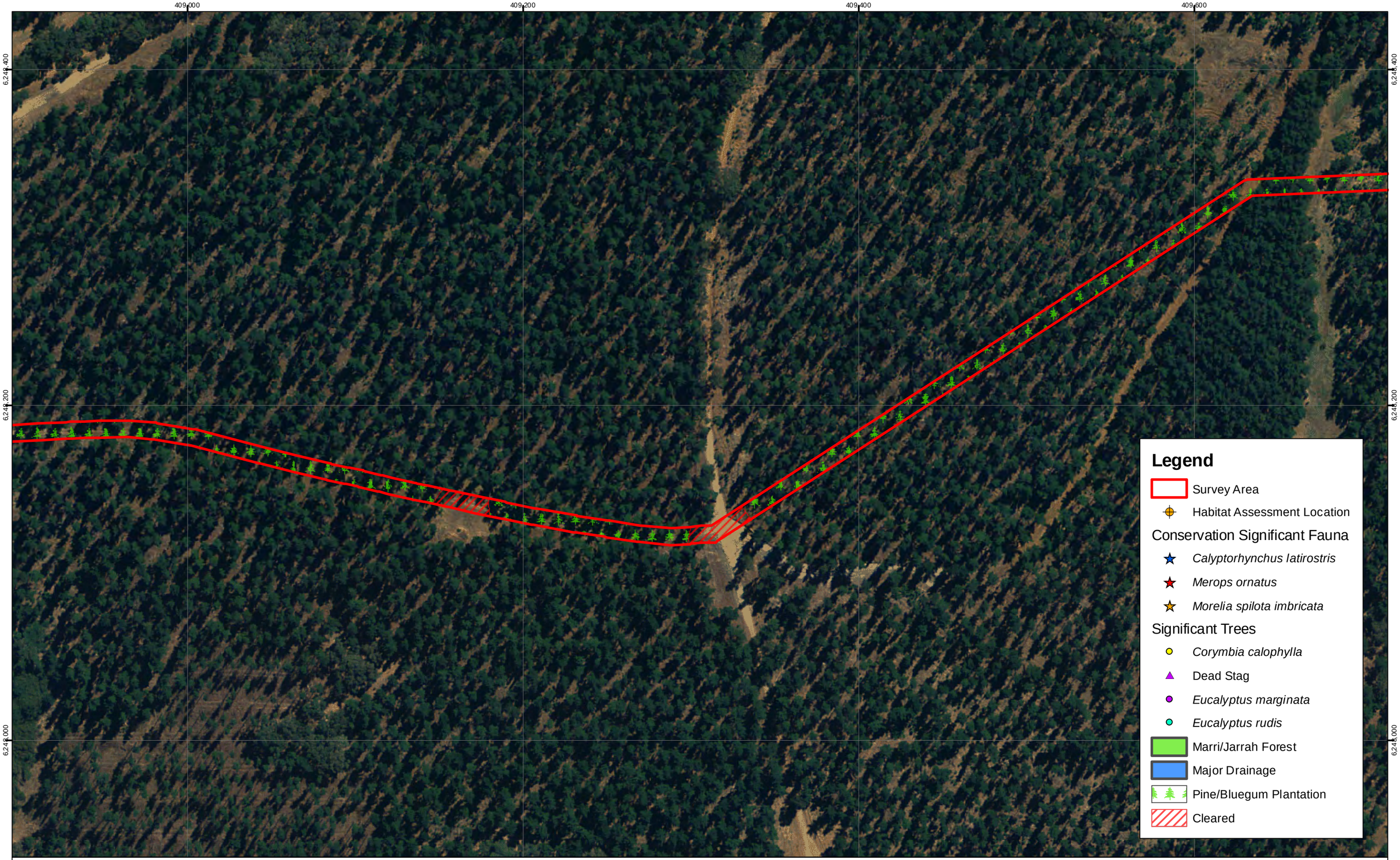


Fauna Habitats, Location of Conservation Significant Fauna and Location of Significant Trees

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 6.15

409,000
409,200
409,400
409,600
6,249,400
6,249,200
6,249,000



env Australia

CLIENT: Water Corporation
JOB NO.: J101331
AUTHOR: R. Firth
DRAWN: M. Mikkonen
DATE: 21-12-2011
SCALE: 1:2,000 @ A3
PROJECTION: GDA 94 MGA 50

N
0 25 50 Metres

Fauna Habitats, Location of Conservation Significant Fauna and Location of Significant Trees

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 6.16

408,200
408,400
408,600
408,800
6,249,200
6,249,000
6,248,800

env Australia

CLIENT: Water Corporation
JOB NO.: J101331
AUTHOR: R. Firth
DRAWN: M. Mikkonen
DATE: 21-12-2011
SCALE: 1:2,000 @ A3
PROJECTION: GDA 94 MGA 50

N
0 25 50 Metres

Fauna Habitats, Location of Conservation Significant Fauna and Location of Significant Trees

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 6.17

407,600
407,800
408,000
408,200
6,247,600
6,247,400

Legend

- Survey Area
- Habitat Assessment Location

Conservation Significant Fauna

- *Calyptorhynchus latirostris*
- *Merops ornatus*
- *Morelia spilota imbricata*

Significant Trees

- *Corymbia calophylla*
- Dead Stag
- *Eucalyptus marginata*
- *Eucalyptus rudis*

- Marri/Jarrah Forest
- Major Drainage
- Pine/Bluegum Plantation
- Cleared

env Australia

CLIENT		JOB NO.	
Water Corporation		J101331	
AUTHOR	DRAWN	DATE	
R. Firth	M. Mikkonen	21-12-2011	
SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Fauna Habitats, Location of Conservation Significant Fauna and Location of Significant Trees

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **6.18**

406,800
407,000
407,200
407,400
6,247,800
6,247,600
6,247,400

Legend

- Survey Area
- Habitat Assessment Location

Conservation Significant Fauna

- *Calyptorhynchus latirostris*
- *Merops ornatus*
- *Morelia spilota imbricata*

Significant Trees

- *Corymbia calophylla*
- Dead Stag
- *Eucalyptus marginata*
- *Eucalyptus rudis*
- Marri/Jarrah Forest
- Major Drainage
- Pine/Bluegum Plantation
- Cleared

env Australia

CLIENT		JOB NO.	
Water Corporation		J101331	
AUTHOR	DRAWN	DATE	
R. Firth	M. Mikkonen	21-12-2011	
SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Fauna Habitats, Location of Conservation Significant Fauna and Location of Significant Trees

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **6.19**

406,000 406,200 406,400 406,600

6,248,000 6,247,800 6,247,600

Legend

- Survey Area
- Habitat Assessment Location

Conservation Significant Fauna

- *Calyptorhynchus latirostris*
- *Merops ornatus*
- *Morelia spilota imbricata*

Significant Trees

- *Corymbia calophylla*
- Dead Stag
- *Eucalyptus marginata*
- *Eucalyptus rudis*
- Marri/Jarrah Forest
- Major Drainage
- Pine/Bluegum Plantation
- Cleared

env Australia

CLIENT Water Corporation

JOB NO. J101331

AUTHOR R. Firth

DRAWN M. Mikkonen

DATE 21-12-2011

SCALE 1:2,000 @ A3

PROJECTION GDA 94 MGA 50

N

0 25 50 Metres

Fauna Habitats, Location of Conservation Significant Fauna and Location of Significant Trees

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 6.20

405,200 405,400 405,600 405,800

6,241,800 6,241,600

Legend

- Survey Area
- Habitat Assessment Location

Conservation Significant Fauna

- *Calyptorhynchus latirostris*
- *Merops ornatus*
- *Morelia spilota imbricata*

Significant Trees

- *Corymbia calophylla*
- Dead Stag
- *Eucalyptus marginata*
- *Eucalyptus rudis*
- Marri/Jarrah Forest
- Major Drainage
- Pine/Bluegum Plantation
- Cleared

env Australia

CLIENT Water Corporation

JOB NO. J101331

AUTHOR R. Firth

DRAWN M. Mikkonen

DATE 21-12-2011

SCALE 1:2,000 @ A3

PROJECTION GDA 94 MGA 50

N

0 25 50 Metres

Fauna Habitats, Location of Conservation Significant Fauna and Location of Significant Trees

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 6.21

404,400
404,600
404,800
405,000
6,241,800
6,241,600

Legend

- Survey Area
- Habitat Assessment Location

Conservation Significant Fauna

- *Calyptorhynchus latirostris*
- *Merops ornatus*
- *Morelia spilota imbricata*

Significant Trees

- *Corymbia calophylla*
- Dead Stag
- *Eucalyptus marginata*
- *Eucalyptus rudis*
- Marri/Jarrah Forest
- Major Drainage
- Pine/Bluegum Plantation
- Cleared

env Australia

CLIENT: Water Corporation
JOB NO.: J101331
AUTHOR: R. Firth
DRAWN: M. Mikkonen
DATE: 21-12-2011
SCALE: 1:2,000 @ A3
PROJECTION: GDA 94 MGA 50

N

0 25 50 Metres

Fauna Habitats, Location of Conservation Significant Fauna and Location of Significant Trees

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 6.22

404,000 404,200 404,400 404,600

6,247,400 6,247,200

Legend

- Survey Area
- Habitat Assessment Location

Conservation Significant Fauna

- *Calyptorhynchus latirostris*
- *Merops ornatus*
- *Morelia spilota imbricata*

Significant Trees

- *Corymbia calophylla*
- Dead Stag
- *Eucalyptus marginata*
- *Eucalyptus rudis*
- Marri/Jarrah Forest
- Major Drainage
- Pine/Bluegum Plantation
- Cleared

Blackwood River

HA4

HA5

env Australia

CLIENT		**JOB NO.**	
Water Corporation		J101331	
AUTHOR	**DRAWN**	**DATE**	
R. Firth	M. Mikkonen	21-12-2011	
SCALE	**PROJECTION**		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Fauna Habitats, Location of Conservation Significant Fauna and Location of Significant Trees

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 6.23

404,000 404,200 404,400 404,600

6,247,000 6,246,800 6,246,600

Blackwood River

Legend

- Survey Area
- Habitat Assessment Location

Conservation Significant Fauna

- *Calyptorhynchus latirostris*
- *Merops ornatus*
- *Morelia spilota imbricata*

Significant Trees

- *Corymbia calophylla*
- Dead Stag
- *Eucalyptus marginata*
- *Eucalyptus rudis*
- Marri/Jarrah Forest
- Major Drainage
- Pine/Bluegum Plantation
- Cleared

env Australia

CLIENT	JOB NO.
Water Corporation	J101331

AUTHOR	DRAWN	DATE
R. Firth	M. Mikkonen	21-12-2011

SCALE	PROJECTION
1:2,000 @ A3	GDA 94 MGA 50

N

0 25 50 Metres

Fauna Habitats, Location of Conservation Significant Fauna and Location of Significant Trees

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **6.24**

412,600
412,800
413,000
413,200
413,400
6,254,000
6,253,800

Legend

Survey Area

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

env Australia

CLIENT Water Corporation

JOB NO. J101331

AUTHOR J. Collins

DRAWN M. Mikkonen

DATE 21-12-2011

SCALE 1:2,000 @ A3

PROJECTION GDA 94 MGA 50

N

0 25 50 Metres

Locations of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 7.1

410,800
411,000
411,200
411,400
6,250,200
6,250,000

Legend

Survey Area

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

env Australia

CLIENT: Water Corporation
JOB NO.: J101331
AUTHOR: J. Collins
DRAWN: M. Mikkonen
DATE: 21-12-2011
SCALE: 1:2,000 @ A3
PROJECTION: GDA 94 MGA 50

N
0 25 50 Metres

Locations of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE 7.2

404,000
404,200
404,400
404,600
6,247,400
6,247,200

Legend

Survey Area

Species

- *Eucalyptus rudis* subsp. *cratyantha* (P4)
- *Tetratheca parvifolia* (P3)

env Australia

CLIENT		JOB NO.	
Water Corporation		J101331	
AUTHOR	DRAWN	DATE	
J. Collins	M. Mikkonen	21-12-2011	
SCALE	PROJECTION		
1:2,000 @ A3	GDA 94 MGA 50		

N

0 25 50 Metres

Locations of Conservation Significant Flora

Millstream to Greenbushes Flora and Fauna Survey

FIGURE **7.3**

APPENDIX A

DEFINITIONS OF DECLARED RARE / PRIORITY / THREATENED FLORA AND SIGNIFICANT FLORA POTENTIALLY OCCURRING IN THE STUDY AREA

APPENDIX A

DEFINITION OF DECLARED RARE / PRIORITY / THREATENED FLORA AND SIGNIFICANT FLORA POTENTIALLY OCCURRING IN THE PROJECT AREA

A1: Categories of Declared Rare and Priority Flora

Conservation Code	Category
X	**Presumed Extinct Flora (Declared Rare Flora – Extinct)** "Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such (Schedule 2 under the *Wildlife Conservation Act 1950*)."
T	**Threatened Flora (Declared Rare Flora – Extant)** "Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such (Schedule 1 under the *Wildlife Conservation Act 1950*)." "Threatened Flora (Schedule 1) are further ranked by the Department according to their level of threat using IUCN Red List criteria: • CR: Critically Endangered – considered to be facing an extremely high risk of extinction in the wild; • EN: Endangered – considered to be facing a very high risk of extinction in the wild; • VU: Vulnerable – considered to be facing a high risk of extinction in the wild."
P1	**Priority One: Poorly-known taxa** "Taxa which are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes."
P2	**Priority Two: Poorly-known taxa** "Taxa which are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown Land, water reserves, etc. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes."
P3	**Priority Three: Poorly-known taxa** "Taxa which are known from collections or sight records from several localities not under nent threat, or few but widespread localities with either large population size or significant ining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be ded if they are comparatively well known from several localities but do not meet adequacy of ey requirements and known threatening processes exist that could affect them."

Conservation Code	Category
P4	**Priority Four: Rare, Near Threatened and other taxa in need of monitoring** a. Rare. "Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands." b. Near Threatened. "Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable." c. "Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy."
P5	**Priority Five: Conservation Dependent taxa** "Taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxon becoming threatened within five years."

Source: Department of Environment and Conservation (2011). *Western Australian Flora Conservation Codes*. Department of Environment and Conservation, Perth, Western Australia. Online: http://florabase.calm.wa.gov.au.

A2: Categories of Threatened Flora Species

Category Code	Category
Ex	**Extinct** Taxa which at a particular time if, at the time, there is no reasonable doubt that the last member of the species has died**.**
ExW	**Extinct in the Wild** Taxa which is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
CE	**Critically Endangered** Taxa which at a particular time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
E	**Endangered** Taxa which is not critically endangered and it is facing a very high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
V	**Vulnerable** Taxa which is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
CD	**Conservation Dependent** Taxa which at a particular time if, at that time, the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

Source: *Environment Protection and Biodiversity Conservation Act* 1999

A3: Significant Flora Species Potentially Occurring in the Project Area

Priority Taxa	Conservation Status	Habitat Preference (WAH 2011)
Acacia brachypoda	T	Sandy clay or loam. Low-lying seasonal swampy areas
Acacia grisea	P4	Lateritic gravelly loamy soils. Undulating plains, slopes
Banksia acanthopoda	P2	Gravelly clay-sand over laterite. Low ridges
Banksia acuminata	P4	Gravelly soils
Banksia lepidorhiza	P1	Gravelly sand or sandy loam
Banksia porrecta	P4	White/grey sand, sandy loam
Banksia rufistylis	P2	Gravelly loam or sand
Caladenia integra	P4	Granite outcrops, rocky slopes
Caladenia luteola	P1	Lateritic sand
Grevillea newbeyi	P3	Clay loam, sandy gravelly soils
Hakea oldfieldii	P3	Amongst low (sclerophyll) shrubland (heathland); in gravelly soil, or sand. Seasonally wet flats
Stylidium emarginatum subsp. *exappendiculatum*	P2	Clayey sand
Thysanotus brevifolius	P2	Gravel, sandy loam
Tribonanthes purpurea	T	Seasonally wet soils in moss swards & herbfields among granite rocks
Verticordia brevifolia subsp. *brevifolia*	P3	Gravelly loam & clay. Road verges
Verticordia fimbrilepis subsp. *fimbrilepis*	T	Gravelly sandy or clayey soils. Flats, road verges
Xanthorrhoea brevistyla	P4	Sand, clay, laterite

APPENDIX B
DEFINITIONS OF CONSERVATION CODES FOR FAUNA OF CONSERVATION SIGNIFICANCE

APPENDIX B

DEFINITIONS OF CONSERVATION CODES FOR FAUNA OF CONSERVATION SIGNIFICANCE

B1: *Environment Protection and Biodiversity Conservation Act 1999* (*Cth*): Threatened Species and Threatened Ecological Communities Codes

The *EPBC Act* prescribes seven matters of national environmental significance:-

- World Heritage properties;
- National Heritage places;
- Wetlands of international importance;
- Threatened species and ecological communities;
- Migratory species;
- Commonwealth marine areas; and
- Nuclear actions (including uranium mining).

Species in the categories ExW, CE, E, V and M (see below), and Threatened Ecological Communities in the CE and E categories are protected as matters of national environmental significance under the *EPBC Act*.

Category	Code	Category
Extinct	**Ex**	Taxa for which there is no reasonable doubt that the last member of the species has died.
Extinct in the Wild	**ExW**	Taxa known to survive only in cultivation, in captivity or as a naturalised population well outside its past range; or not recorded in its known and/or expected habitat at appropriate seasons anywhere in its past range despite exhaustive surveys over a timeframe appropriate to its life cycle and form.
Critically Endangered	**CE**	Taxa facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered	**E**	Taxa not critically endangered and facing a very high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
Vulnerable	**V**	Taxa not critically endangered or endangered and facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria**.**
Conservation Dependent	**CD**	Taxa which are the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within five years.

Category	Code	Category
Migratory	**Mi**	Taxa that migrate to Australia and its external territories, or pass through or over Australian waters during their annual migrations, that are included in an international agreement approved by the Minister for the Environment, Heritage and the Arts and that have been placed on the national List of Migratory Species under the provisions of the EPBC Act. At present there are four such agreements: • the Bonn Convention • the China-Australia Migratory Bird Agreement (CAMBA) • the Japan-Australia Migratory Bird Agreement (JAMBA) • the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)
Marine	**Ma**	Taxa protected in a Commonwealth Marine Protected Area by virtue of section 248 of the *EPBC Act*. These taxa include certain seals, crocodiles, turtles and birds, as well as various marine fish. Commonwealth marine areas are matters of national environmental significance under the *EPBC Act*. An action will require approval if the: • action is taken in a Commonwealth marine area and the action has, will have, or is likely to have a significant impact on the environment, or • action is taken outside a Commonwealth marine area and the action has, will have, or is likely to have a significant impact on the environment in a Commonwealth marine area[1] The Commonwealth marine area is any part of the sea, including the waters, seabed, and airspace, within Australia's exclusive economic zone and/or over the continental shelf of Australia, that is not State or Northern Territory waters. The Commonwealth marine area stretches from 3 to 200 nautical miles (approximately 5-370 km) from the coast. Marine protected areas are marine areas which are recognised to have high conservation value.

B2: Western Australian Threatened Fauna Categories

Wildlife Conservation Act 1950 (WA)

Category	Code	Description
Schedule 1	S1	Rare or likely to become extinct.
Schedule 2	S2	Presumed extinct.
Schedule 3	S3	Birds subject to an agreement between the governments of Australia and Japan, the People's Republic of China & the Republic of Korea relating to the protection of migratory birds and birds in danger of extinction.
Schedule 4	S4	Other specially protected fauna.

B3: Department of Environment and Conservation Fauna Priority Codes

Category	Code	Description
Priority 1	P1	Taxa with few, poorly known populations on threatened lands.
Priority 2	P2	Taxa with few, poorly known populations on conservation lands.
Priority 3	P3	Taxa with several, poorly known populations, some on conservation lands.
Priority 4	P4	Taxa in need of monitoring: not currently threatened or in need of special protection, but could become so. Usually represented on conservation lands.
Priority 5	P5	Taxa in need of monitoring: not considered threatened, but the subject of a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

APPENDIX C
DEFINITION OF THREATENED AND PRIORITY ECOLOGICAL COMMUNITIES

APPENDIX C

DEFINITIONS OF THREATENED AND PRIORITY ECOLOGICAL COMMUNITIES

C1: Definitions of Threatened Ecological Communities

Presumed Totally Destroyed (PD)

An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant **and either** of the following applies (A or B);

A) Records within the last 50 years have not been confirmed despite thorough searches or known or likely habitats **or**

B) All occurrences recorded within the last 50 years have since been destroyed.

Critically Endangered (CR)

An ecological community will be listed as **Critically Endangered** when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting **any one or more** of the following criteria (A, B or C):

A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and **either or both** of the following apply (i or ii)

   i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 5 years)

   ii) modification throughout its range is continuing such that in the immediate future (within approximately 5 years) the community is unlikely to be capable of being substantially rehabilitated.

B) Current distribution is limited, and **one or more** of the following apply (i, ii or iii):

   i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 5 years)

   ii) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes

   iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes

C) The ecological community exists only as highly modified occurrences which may be capable of being rehabilitated if such work begins in the immediate future (within approximately 5 years)

Endangered (EN)

An ecological community will be listed as **Endangered** when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information, by it meeting **any one or more** of the following criteria (A, B or C):

A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 70% and **either or both** of the following apply (i or ii)

i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term (within approximately 10 years)
ii) modification throughout its range is continuing such that in the short term future (within approximately 10 years) the community is unlikely to be capable of being substantially restored or rehabilitated.

B) Current distribution is limited, and **one or more** of the following apply (i, ii or iii):

i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 10 years)
ii) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes
iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes

C) The ecological community exists only as highly modified occurrences which may be capable of being rehabilitated if such work begins in the short term future (within approximately 10 years).

Vulnerable (VU)

An ecological community will be listed as **Vulnerable** when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction in the medium to long term future. This will be determined on the basis of the best available information, by it meeting **any one or more** of the following criteria (A, B or C):

A) The ecological community exists largely as modified occurrences which are likely to be capable of being substantially restored or rehabilitated.
B) The ecological community can be modified or destroyed and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations.

C) The ecological community may still be widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.

Source: Department of Environment and Conservation (2010). *Definitions, Categories and Criteria for Threatened and Priority Ecological Communities*. Department of Environment and Conservation, Perth, Western Australia. Online: www.naturebase.net/

C2: Definitions of Priority Ecological Communities

Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community Lists under Priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community, and evaluation of conservation status, so that consideration can be given to their declaration as threatened ecological communities. Ecological Communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

Priority One: Poorly known ecological communities Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.

Priority Two: Poorly known ecological communities. Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation.

Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.

Priority Three: Poorly known ecological communities

(i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or:

(ii) Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or;

(iii) Communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes.

Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.

Priority Four: Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.

(a) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands.

(b) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.

(c) Ecological communities that have been removed from the list of threatened communities during the past five years.

Priority Five: Conservation Dependent ecological communities. Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Source: Department of Environment and Conservation (2010). *Definitions, Categories and Criteria for Threatened and Priority Ecological Communities*. Department of Environment and Conservation, Perth, Western Australia. Online: www.naturebase.net/

APPENDIX D
ENVIRONMENTAL WEEDS AND DECLARED PLANT CATEGORIES

APPENDIX D

ENVIRONMENTAL WEEDS AND DECLARED PLANT CATEGORIES

D1: Criteria used for Ranking Environmental Weeds

The Environmental Weed Strategy for Western Australia (CALM 1999) contains criteria for the assessment and ranking of weeds in terms of their environmental impact on biodiversity. These criteria are as follows:

- **Invasiveness –** ability to invade bushland in good to excellent condition or ability to invade waterways. (Score as yes or no).
- **Distribution** – wide current or potential distribution including consideration of known history of wide spread distribution elsewhere in the world. (Score as yes or no).
- **Environmental Impacts** – ability to change the structure, composition and function of ecosystems. In particular an ability to form a monoculture in a vegetation community. (Score as yes or no).

The rating of each weed is determined by the following scoring system:

- **High** - a weed species would have to score yes for all three criteria. Rating a weed species as high would indicate prioritising this weed for control and/or research i.e. prioritising funding to it.
- **Moderate** -a weed species would have to score yes for two of the above criteria. Rating a weed species as moderate would indicate that control or research effort should be directed to it if funds are available, however it should be monitored (possibly a reasonably high level of monitoring).
- **Mild** – a weed species scoring one of the criteria. A mild rating would indicate monitoring of the week and control where appropriate.
- **Low** – a weed species would score none of the criteria. A low ranking would mean that this species would require a low level of monitoring.

Source: Department of Conservation and Land Management (1999). *Environmental Weed Strategy for Western Australia*. Department of Conservation and Land Management, Perth, Western Australia.

D2: Standard Meanings of Declared Plant Categories

P1

Prohibits movement.

The movement of plants or their seeds is prohibited within the State.

This prohibits the movement of contaminated machinery and produce including livestock and fodder.

P2

Aim is to eradicate infestation.

Treat all plants to destroy and prevent propagation each year until no plants remain. The infested area must be managed in such a way that prevents the spread of seed or plant parts on or in livestock, fodder, grain, vehicles and/or machinery.

P3

Aims to control infestation by reducing area and/or density of infestation.

The infested area must be managed in such a way that prevents the spread of seed or plant parts within and from the property on or in livestock, fodder, grain, vehicles and/or machinery.

Treat to destroy and prevent seed set all plants:

* Within 50m inside of the boundaries of the infestation;
* within 50m of roads and high water mark on waterways;
* within 50m of sheds, stock yards and houses.

Treatment must be done prior to seed set each year.

Properties with less than 20ha of infestation must treat the entire infestation.

Additional areas may be ordered to be treated.

P4

Aims to prevent infestation spreading beyond existing boundaries of infestation

The infested area must be managed in such a way that prevents the spread of seed or plant parts within and from the property on or in livestock, fodder, grain, vehicles and/or machinery.

Treat to destroy and prevent seed set all plants:

* within 50m inside of the boundaries of the infested property;

* within 50m of roads and high water mark on waterways;

* within 50m of sheds, stock yards and houses.

Treatment must be done prior to seed set each year. Properties with less than 20ha of infestation must treat the entire infestation.

Additional areas may be ordered to be treated.

Special considerations.

In the case of P4 infestations where they continue across property boundaries there is no requirement to treat the relevant part of the property boundaries as long as the boundaries of the infestation as a whole are treated. There must be agreement between neighbours in relation to the treatment of these areas.

P5

Aims to control infestations on public lands.

Source: Department of Agriculture and Food (2008). *List of Declared Plants*. Department of Agriculture and Food, Western Australia. Online: http://www.agric.wa.gov.au/.

APPENDIX E
CONSERVATION SIGNIFICANT FAUNA RECORDED IN THE VICINITY OF THE STUDY AREA

APPENDIX E
CONSERVATION SIGNIFICANT FAUNA RECORDED IN THE VICINITY OF THE STUDY AREA

Conservation Significant Species	Conservation Status	Distribution and Ecology	Habitat Relevance	Likelihood
REPTILES				
Ctenotus delli	P4	The Darling Range Heath *Ctenotus* is found only in Jarrah/Marri woodlands in the Darling Range, to the east of Perth. Within these woodlands, it favours areas with a shrubby understorey over laterite, sand or clay (Wilson & Swan 2010).	This species primarily inhabits woodlands of the Darling ranges. The closest record of this species to the study area is from approximately 10km east of Greenbushes town site and was recorded in 1982 (DEC 2011b). There is a more recent record from 2006 however this was recorded from over 50km north of the study area (DEC 2011b). Due to low dispersal abilities and no recent records from within the vicinity of the study area this species is deemed as unlikely to occur in the study area.	Unlikely
Carpet Python (*Morelia spilota imbricata*)	S4	This species shelters in hollow trunks and limbs, disused burrows, caves, rock crevices and beneath boulders. This sub species to be declining markedly as urban areas expand. It is still widespread on the south west mainland but seems most abundant on offshore islands (Wilson and Swan 2010)	The Woodland habitat type contains numerous fallen logs and tree hollows which are the favoured shelter sites for this species. One individual was recorded during the survey.	Recorded
BIRDS				
Fork-tailed Swift (*Apus pacificus)*	Mi	The Fork-tailed Swift is a summer migrant (October-April) to Australia. This species is an aerial species, which forages high above the tree canopy and rarely lower so is independent of terrestrial habitats. It usually occurs in flocks of up to 2000 and is often	As this species forages high in the airspace it is reasonably independent of the habitats within the study area.	Possible

Conservation Significant Species	Conservation Status	Distribution and Ecology	Habitat Relevance	Likelihood
		seen accompanying Tree Martins and Masked Woodswallows (Johnstone and Storr 1998).		
Peregrine Falcon (*Falco peregrinus*)	S4	The Peregrine Falcon occurs mainly along cliffs, rivers and ranges as well as wooded watercourses and lakes (Johnstone and Storr 1998). The Peregrine Falcon nests primarily on cliffs, granite outcrops and quarries, and feeds mostly on birds (Johnstone and Storr 1998).	There are no suitable cliffs and granite outcrops for this species to utilize as nesting habitat. The Peregrine Falcon may forage on an infrequent basis in the project area as part of a larger home range. The closest record of this species is from within 10km north of the study area and was recorded in 2001 (DEC 2011b).	Possible
Australian Bustard (*Ardeotis australis*)	P4	The Australian Bustard remains widespread and locally common in parts of northern and central Australia (Ziembicki 2010). In Western Australia Australian Bustard prefers open habitats, ranging from open grassland plains to low shrublands, grassy open woodlands (Ziembicki 2010). This bird is nomadic, irruptive or completes partial movement to exploit favourable conditions, typically after rain (Ziembicki 2010). Invertebrates such as beetles, grasshoppers and as well as fruits and seeds are dominant dietary items (Ziembicki 2010). Habitat, hunting, introduced predators, habitat alteration and altered fire regimes are among the main threats to the bustard (Ziembicki 2010).	The study area does not contain open grasslands , shrublands or woodlands that are the preferred habitat for this species. The closest recent record if from 2005 and was recorded from over 50km east of the study area (DEC 2011b).	Unlikely

Conservation Significant Species	Conservation Status	Distribution and Ecology	Habitat Relevance	Likelihood
Bush-stone Curlew (*Burhinus grallarius*)	P4	The Bush Stone-curlew inhabits dry open woodlands with groundcover of small sparse shrubs, grass or litter of twigs. It tends to avoids dense forest, closed-canopy habitats (Morcombe 2000). The species generally occurs near a watercourse or swamp (Geering, Agnew and Harding 2007). Bush Stone-curlews are locally rare because of predation by foxes, the main concern for their regional decline (Johnstone and Storr 1998).	The study area does not contain suitable habitat for this species as the forest contains a relatively thick canopy. There are no records from the vicinity of the study area (within 40 km) from within the past 20 years. The closest record of the Bush Stone-curlew if from 15km south west of the study area and was recorded in 1935 (DEC 2011b).	Unlikely
Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii* subsp. *naso*)	VU,S1	The Forest Red-tailed Black Cockatoo is distributed through the humid and sub-humid south-west of Western Australia from Gingin through the Darling Ranges to the southwest from approximately Bunbury to Albany (Johnstone and Storr 1998).	The project area contains plant species that are foraging resources for this species and is situated within its known distribution.	Likely
Baudin's Cockatoo (*Calyptorhynchus baudinii*)	VU,S1	Baudin's Cockatoo is distributed through the south-western humid and sub-humid zones, from the northern Darling Range and adjacent far east of the Swan Coastal Plain (south of the Swan River), south to Bunbury and across to Albany (Johnstone and Storr 1998). Baudin's Cockatoo rarely occurs near the coast north of Mandurah, and rarely occurs north of the Swan River (Johnstone and Kirkby 2008, Johnstone and Storr 1998).	The project area contains plant species that are foraging resources for this species and is situated within its known distribution.	Likely

Conservation Significant Species	Conservation Status	Distribution and Ecology	Habitat Relevance	Likelihood
Carnaby's Cockatoo (*Calyptorhynchus latirostris*)	EN,S1	Carnaby's Cockatoo is endemic to south-west Western Australia, and is distributed from the Murchison River to Esperance and inland to Coorow, Kellerberrin and Lake Cronin (Cale 2003). The species was once common, but the population has declined significantly in the last half century (Johnstone and Storr 1998).	The project area contains plant species that are foraging resources for this species and is situated within its known distribution.	Recorded
Masked Owl (SW ssp.) (*Tyto novaehollandiae* subsp. *novaehollandiae*)	P3	The southern subspecies of the Masked Owl is distributed in the south-west of Western Australia from around Yanchep to Albany (Johnstone and Storr 1998). It breeds in the forested deep south-west, with some autumn-winter movement northwards and north-westwards. It is locally common around Karridale and Manjimup, but uncommon elsewhere (Johnstone and Storr 1998). The major threat to this species is the decline in nesting site availability because of clearing and the decline in the number of small mammals due to fox and cat predation (Johnstone and Storr 1998).	The study area contains suitable trees that this species can utilize for roosting as well as hollows used for breeding. The closest record is from Greenbushes dam and was recorded in 2000 (DEC 2011b).	Possible
Rainbow Bee-eater (*Merops ornatus*)	Mi	The Rainbow Bee-eater is a common breeding migrant that occurs in Western Australia in the Kimberley, and Pilbara through to the South-west (Johnstone and Storr 1998). It generally breeds in summer in the greater south-west and occurs as a passage migrant or visitor in the northern part of its range throughout the rest of the year (Johnstone and Storr 1998, Barrett *et al.*	The Rainbow Bee-eater is a commonly recorded migrant that occurs in a variety of habitats. This species was recorded foraging during the survey.	Recorded

Conservation Significant Species	Conservation Status	Distribution and Ecology	Habitat Relevance	Likelihood
		2003). It occurs in lightly wooded, often sandy country, preferring areas near water. The Rainbow Bee-eater feeds on airborne insects, and nests in burrows excavated in sandy ground or banks, often at the margins of roads and tracks (Johnstone and Storr 1998).		
Crested Shrike-tit (*Falcunculus frontatus leucogaster*)	P4	This subspecies of the Crested Shrike-tit occurs in woodland, scrub and open eucalyptus forests. It is locally common in some areas but uncommon across most of its distribution, which ranges from Moora to Albany and east to Lake Cowan. This bird is believed to be extinct on the Swan Coastal Plain where it was formerly common in the Tuart forests. The Crested Shrike-tit feeds on insects gleaned from under tree bark or in crevices (Johnstone and Storr 2004).	Although the study area contains some suitable habitat such as forest, the closest and most recent record of this species is from 2007 from approximately 35km west of the study area (DEC 2011b). The Crested Shrike-tit may possibly utilize the study area however it would not be dependent on it.	Possible
MAMMALS				
Western Quoll/ Chuditch (*Dasyurus geoffroii*)	VU,S1	The Chuditch (Western Quoll) previously occurred over 70% of Australia, but now only occurs in the south-west of Western Australia. Being a relatively large predator, it occurs at low densities. Adult females inhabit a core area of 55-200 hectares around their den, while the corresponding figure for males is 400 hectares or more (van Dyck and Strahan 2008). The Chuditch is now only found in sclerophyll forest, woodland and mallee shrubland (van Dyck and Strahan 2008, Menkhorst and Knight 2004). It is highly	The Chuditch needs large logs as den sites which are not found in this area. The Chuditch has a large home range so may traverse the study area when dispersing. The closest records of the Chuditch are from within 7km of the study area, however these were recorded in 1987. The most recent record was from 2005 and was recorded within 10km of the study area (DEC 2011b).	Likely

Conservation Significant Species	Conservation Status	Distribution and Ecology	Habitat Relevance	Likelihood
		mobile, and appears able to utilise bush remnants and corridors. Numbers have decreased because of habitat alteration, removal of suitable den logs and dens, and competition for food and predation by foxes and cats (van Dyck and Strahan 2008). The Chuditch has been locally extinct through-out the metropolitan area for some time.		
Brush-tailed Phascogale (*Phascogale tapoatafa*)	S1	The Wambenger (is an undescribed subspecies of the Brush-tailed Phascogale (*Phascogale tapoatafa*) that occurs in south-west Western Australia (van Dyck and Strahan 2008, Peter Mawson pers. com. [DEC]). The Wambenger's distribution is believed to have been reduced to approximately 50% of its former range. It is restricted to the extreme south-west, and its characteristic low population densities make it vulnerable to localised extinction (van Dyck and Strahan 2008). This subspecies has been observed in dry sclerophyll forests and open woodlands containing hollow-bearing trees but a sparse ground cover. Habitat destruction, in particular, the loss of hollow-bearing trees and predation by feral animals, are thought to be the major threats to surviving populations.	The study area contains the sparse undergrowth, dry sclerophyll forest and hollow bearing logs preferred by this species. There is one record according to (DEC 2011b) and it was recorded 15km south east of the study area in 2000. A DEC search performed by AECOM (2009) (provided by the client) returned 14 previous records ranging from 1982 to 2006.	Likely
Numbat (*Myrmecobius fasciatus*)	Vu, S1	The Numbat is a small, diurnal marsupial that is endemic to Western Australia. This species once ranged widely but due to predation by foxes and cats, loss of habitat due to clearing	The study area contains suitable forest containing hollow logs that the Numbat utilises for shelter and nesting. The closest and most recent record of this species is	Likely

Conservation Significant Species	Conservation Status	Distribution and Ecology	Habitat Relevance	Likelihood
		for agriculture and changes in fire regimes. Its current distribution is limited to east of Manjimup in upland Jarrah forests, open eucalypt woodlands, Banksia woodlands and tall closed shrublands, where it shelters in hollow logs and branches and feeds almost exclusively on termites.	from approximately 4.5km north west of the Greenbushes town site and was recorded in 2006 (DEC 2011b).	
Quenda, Southern Brown Bandicoot (*Isoodon obesulus* subsp. *fusciventer*)	P5	The Quenda (Southern Brown Bandicoot) occurs in forest, heath or coastal scrub and occurs along the coast of south-western WA from Moore River mouth to approximately Israelite Bay (Menkhorst and Knight 2004). They typically seek daytime refuge from predators in very thick ground-storey vegetation, often associated with swamps or damp-lands, and forage by night in more open areas, leaving distinctive conical feeding holes in the ground. The Quenda is threatened by clearing and fragmentation of its preferred habitat (van Dyck and Strahan 2008).	The study area does not contain thick undergrowth suitable for this species to utilize as shelter. During the survey no conical diggings typical of this species were found. The closest record of the Quenda is from over 100km north of the project area 9DEC 2011b)	Unlikely
Western Brush Wallaby (*Macropus irma*)	P4	The Western Brush Wallaby occurs in open forest or woodland, particularly where there is grassy understory and scrubby thickets present (van Dyck and Strahan 2008). It is found only in south-western Western Australia, where it appears to be in decline, probably as a result of an increase in the numbers of foxes (van Dyck and Strahan 2008).	The forest habitat type of the study area is suitable habitat for this species as there are patches of scrubby thickets that this species prefers habitat. The closest record of the Western Brush Wallaby is from 2001 and was recorded within 2km of Greenbushes town site (DEC 2011b).	Likely

Conservation Significant Species	Conservation Status	Distribution and Ecology	Habitat Relevance	Likelihood
Quokka (*Setonix brachyurus*)	Vu, S1	The Quokka is found in the south-west regions of Western Australia, from south of Perth in Jarrah, Marri and Karri Forest to Two People's Bay (Menkhorst and Knight 2001). It mostly occurs in densely vegetated swamps, tea tree thickets on sandy soils along creek lines and dense heath on slopes (van Dyck and Strahan 2008). Quokka numbers have declined because of predation by foxes and the clearing and burning of swamp habitats.	There are numerous records from within 25km of the study area between 2004 and 2006 (DEC 2011b). The study area contains forest suitable for this species however there is limited swamp and creek habitat in which it mostly occurs. This species would possibly utilize the study area to disperse between more suitable habits.	Possible
Western Ringtail Possum (*Pseudocheirus occidentalis*)	Vu, S1	The WRP was previously widely distributed throughout the south-western forests of Western Australia, ranging from Perth to Albany. The Bunbury to Busselton coast is one of only 3 broad areas with WRP populations remaining. The highest density of the WRP occur in coastal Peppermint habitat in the Busselton area, where the highest density populations correlate with dense, relatively lush vegetation, commonly associated with drainage lines (van Dyck & Strahan 2008). There are two habitat types in the Southern Swan Coastal Plain Region that are particularly important for the Western Ringtail Possum: Coastal Peppermint (*Agonis flexuosa*) and Myrtaceous/other communities that contain stands of Coastal Peppermint.	This species has been recorded 10km south of Greenbushes town site in 2004 (DEC 2011b). It is unlikely that the Western Ringtail Possum would utilize the habitats present in the study area as this species prefers areas that contain Coastal Peppermint (*Agonis flexuosa*).	Unlikely

Conservation Significant Species	Conservation Status	Distribution and Ecology	Habitat Relevance	Likelihood
Western False Pipistrelle (*Falsistrellus mackenziei*)	P4	The Western False Pipistrelle prefers Karri forest, wetter stands of Jarrah and Tuart, and Corymbia woodlands. The Western False Pipistrelle roosts in tree hollows and forages mainly at canopy level (van Dyck and Strahan 2008). The major threat to this species is the loss of feeding grounds and suitable habitat to forestry and clearing for agriculture.	The study area and its surrounds contain suitable forests that contain hollow bearing trees. This species was previously recorded by ENV (2008) in the vicinity of the study area.	Likely

KEY:

En	**Listed as Endangered under the EBPC Act 1999.**
Vu	**Listed as Vulnerable under the EBPC Act 1999.**
Mi	**Listed as Migratory under the EBPC Act 1999.**
S	**Scheduled under the WC Act 1950.**
P	**Listed as Priority by the DEC.**
Recorded	**Recorded during the field survey or site reconnaissance.**
Likely	**Suitable habitat is present in the project area and the project area is in the species' known distribution.**
Possible	**Limited or no suitable habitat is present in project area but is nearby, the species has good dispersal abilities and is known from the general area.**
Unlikely	**No suitable habitat is present in project area but is nearby, the species has poor dispersal abilities, but is known from the general area; or suitable habitat is present, however the project area is outside of the species' known distribution.**
Highly Unlikely	**The species has poor dispersal abilities, no suitable habitat is present, and the species is uncommon; or the species is thought to be locally extinct.**

APPENDIX F
BUSH FOREVER VEGETATION CONDITION SCALE

APPENDIX F

BUSH FOREVER VEGETATION CONDITION SCALE

Condition Scale Code	Condition Scale
P	**Pristine (1)** Pristine or nearly so, no obvious signs of disturbance
E	**Excellent (2)** Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
VG	**Very Good (3)** Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
G	**Good (4)** Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
D	**Degraded (5)** Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
CD	**Completely Degraded (6)** The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

Source: Bush Forever Vegetation Condition Scale as developed by Keighery (1994) and summarized in Bush Forever (Government of Western Australia (2000b)

APPENDIX G
FLORA QUADRAT AND RELEVÉ DATA SHEETS

APPENDIX G

FLORA QUADRAT AND RELEVÉ DATA SHEETS

Site MP01

Described by JOEL COLLINS **Date** 25/10/2011 **Type** QUADRAT 10 x 10 m

Location Greenbushes to Millstream
MGA Zone 50 412782 **mE** 6253783**mN**
Habitat Rocky Hill Slope
Soil Yellow/brown loam clay
Rock Type Laterite
Vegetation *Eucalyptus marginata* subsp. *marginata* and *Corymbia calophylla* open forest over *Banksia grandis* low open woodland over *Bossiaea linophylla, Xanthorrhoea gracilis* and *Billardiera fusiformis* open shrubland over *Lepidosperma gracile* very open sedgeland over *Pteridium esculentum* very open herbland.
Veg Condition Excellent
Fire Age Very Old (<12yrs)
Notes Aspect: S
Bare ground: 0%
Litter cover: +% logs, 20% twigs, 95% leaves
Disturbance: Servicing of nearby infrastructure, fence, firebreak adjacent, tracks, weeds

SPECIES LIST:

Name	Cover	Height	Specimen	Notes
Acacia myrtifolia	+	0.6 m	MP01.30	
Acacia pulchella var. *glaberrima*	+	0.2 m	MP01.33	
**Acacia pycnantha*	+	1.6 m	NC	
Agrostocrinum scabrum subsp. *scabrum*	1%	0.3 m	MP01.16	
Astroloma pallidum	+	0.15 m	MP01.03	
Banksia grandis	2%	1.5-3 m	MP01.19	
Billardiera fusiformis	1%	1.2 m	MP01.09	
Bossiaea linophylla	2%	1.2 m	MP01.05	
Bossiaea ornata	+	0.3 m	MP01.02	
**Briza maxima*	+	0.2 m	NC	
Corymbia calophylla	10%	12 m	MP02.01	
? Cryptostylis sp.	+	0.15 m	MP01.26	Material inadequate to ID
**Disa bracteata*	+	0.15 m	MP01.17	
Diuris amplissima	+	0.15 m	MP01.32	
Drosera erythrorhiza subsp. *erythrorhiza*	+	0.1 m	MP01.29	
Drosera pallida	+	0.1 m	MP03.02	
Eucalyptus marginata subsp. *marginata*	60%	12 m	MP03.01	
**Freesia alba x leichtlinii*	+	0.2 m	MPOP04	
Hardenbergia comptoniana	+	Creeper	MP01.11	
Hovea chorizemifolia	+	0.3 m	MP01.01	
Juncus planifolius	+	0.1 m	MP01.08	
Kennedia prostrata	+	Creeper	MP01.15	

Lagenifera huegelii	+	0.15 m	MP01.20	
Lepidosperma gracile	3%	0.4 m	MP01.25	
Leucopogon capitellatus	+	0.2 m	MP01.06	
Lomandra sonderi	+	0.3 m	MP01.34	
Macrozamia riedlei	+	0.6 m	NC	
Opercularia vaginata	+	0.3 m	MP01.28	
Pteridium esculentum	2%	0.5 m	MP01.12	
Scaevola calliptera	+	0.2 m	MP01.31	
Sphaerolobium scabriusculum	+	0.3 m	MP01.18	
Stylidium ciliatum	+	0.15 m	MP01.14	Fl: white
Stylidium neurophyllum MS	+	0.2 m	MP01.22	
Tetratheca parvifolia (P3)	+	0.2 m	MP01.04	
Thelymitra canaliculata	+	0.2 m	MP01.21	
Thysanotus manglesianus	+	Creeper	MP01.07	
Trichocline spathulata	+	0.15 m	MP01.13	
**Viola odorata*	+	0.2 m	MP01.27	
Xanthorrhoea gracilis	2%	0.4-1 m	MP01.10	

Site MP02

Described by JOEL COLLINS **Date** 26/10/2011 **Type** QUADRAT 10 x 10 m

Location Greenbushes to Millstream
MGA Zone 50 413219 **mE** 6254525 **mN**
Habitat Low Hill
Soil Brown/black loam
Rock Type Laterite
Vegetation *Corymbia calophylla* open forest over *Bossiaea linophylla* low open shrubland over *Pteridium esculentum* and **Freesia alba x leichtlinii* very open herbland over **Briza maxima* very open grassland.
Veg Condition Good
Fire Age Young (1-4 yrs)
Notes Aspect: S
Bare ground: 0%
Litter cover: 5% logs, 40% twigs, 45% leaves
Disturbance: weeds, clearing, tracks, fire

SPECIES LIST:

Name	Cover	Height	Specimen	Notes
Acacia myrtifolia	+	0.5 m	MP01.30	
**Acacia pycnantha*	OUT	0.5 m	NC	
Acaena echinata	+	0.2 m	MP02.03	
**Arctotheca calendula*	OUT	0.2 m	NC	
Austrostipa mollis	OUT	0.4 m	MP02.25	
**Avena barbata*	OUT	0.3 m	NC	
Bossiaea linophylla	2%	0.5 m	MP01.05	
**Briza maxima*	5%	0.2 m	NC	
**Briza minor*	+	0.15 m	NC	
**Bromus madritensis*	+	0.15 m	MP02.17	
**Conyza sumatrensis*	OUT	0.3 m	MP02.20	
Corymbia calophylla	45%	9-12 m	MP02.01	
Dianella brevicaulis	+	0.2 m	MP02.04	
**Dipogon lignosus*	OUT	Creeper	MP02.26	
**Disa bracteata*	+	0.2 m	MP01.17	
**Ehrharta longiflora*	OUT	0.5 m	NC	
Eucalyptus marginata subsp. *marginata*	OUT	15 m	MP03.01	
**Freesia alba x leichtlinii*	5%	0.2 m	MPOP04	
**Fumaria capreolata*	OUT	0.3 m	NC	
Geranium solanderi	+	0.1 m	MP02.12	
Haemodorum discolor	OUT	0.6 m	MP02.23	
Hardenbergia comptoniana	1%	Creeper	MP01.11	
Juncus pallidus	OUT	0.6 m	MP02.22	
Kennedia coccinea	+	Creeper	MP02.05	
Kennedia prostrata	OUT	Creeper	MP01.15	
**Leontodon saxatilis*	+	0.1 m	MP02.11	
Leucopogon australis	+	0.4 m	MP02.13	
Leucopogon capitellatus	+	0.5-1.5 m	MP02.02	

Leucopogon verticillatus	+	0.4 m	MPOP03
Macrozamia riedlei	OUT	0.6 m	NC
Opercularia vaginata	OUT	0.2 m	MP01.28
**Oxalis glabra*	+	0.1 m	MP02.15
**Oxalis pes-caprae*	OUT	0.2 m	NC
**Oxalis purpurea*	+	0.15 m	MP02.08
**Pentaschistis airoides*	+	0.15 m	MP02.07
Persoonia longifolia	OUT	2 m	MP02.14
Pimelea ciliata subsp. *ciliata*	OUT	0.2 m	MPOP05
**Pinus* sp.	OUT	1.1 m	NC
Pteridium esculentum	15%	1 m	MP01.12
**Romulea rosea* var. *australis*	+	0.15 m	MP02.10
**Senecio diaschides*	OUT	0.4 m	MP02.21
Senecio glomeratus subsp. *glomeratus*	OUT	0.8 m	MP02.19
**Silene gallica* var. *gallica*	OUT	0.3 m	MP02.24
**Solanum nigrum*	OUT	0.4 m	NC
**Sonchus oleraceus*	OUT	0.2 m	NC
Sowerbaea laxiflora	+	0.3 m	MP02.18
Tetrarrhena laevis	+	0.15 m	MP02.16
Thelymitra canaliculata	+	0.5 m	MP01.21
**Trifolium campestre*	+	0.15 m	MP02.06
**Trifolium subterraneum*	+	0.15 m	MP02.09

Site MP06

Described by JOEL COLLINS **Date** 26/10/2011 **Type** QUADRAT 10 x 10 m

Location Greenbushes to Millstream
MGA Zone 50 411291 **mE** 6251086**mN**
Habitat Hill Slope
Soil Yellow brown loam clay
Rock Type Laterite
Vegetation *Corymbia calophylla, *Eucalyptus resinifera* and **Acacia pycnantha* open forest over *Hypocalymma strictum* and *Bossiaea linophylla* open heath over *Lepidosperma gracile* very open sedgeland.
Veg Condition Very Good
Fire Age Moderate (4-8 yrs)
Notes Aspect: E
Bare ground: 1%
Litter cover: 0% logs, 10% twigs, 80% leaves
Disturbance: low level weeds, re-growth post clearing/ripping

SPECIES LIST:

Name	Cover	Height	Specimen	Notes
**Acacia baileyana*	OUT	2 m	MP06.01	
Acacia extensa	+	0.5 m	MPOP17	
Acacia pulchella var. *glaberrima*	+	0.4 m	MP01.33	
**Acacia pycnantha*	5%	2-8 m	MPOP24	
Bossiaea linophylla	2%	1.6 m	MP06.02	
**Briza maxima*	+	0.1 m	NC	
Conostylis aculeata subsp. *aculeata*	+	0.3 m	MP06.03	
Corymbia calophylla	25%	10 m	MP02.01	
**Eucalyptus resinifera*	20%	10 m	MP06.04	
Hibbertia hypericoides	2%	0.2 m	MPOP21	
Hypocalymma strictum	35%	1.2 m	MP04.07	
Lepidosperma gracile	6%	0.4 m	MP01.25	
**Lysimachia arvensis*	+	0.1 m	MPOP11	
Patersonia occidentalis var. *occidentalis*	+	0.2 m	MPOP16	
Thelymitra canaliculata	+	0.3 m	MP01.21	
Thomasia grandiflora	+	0.3 m	MPOP22	

Site MP07

Described by JOEL COLLINS **Date** 26/10/2011 **Type** QUADRAT 10 x 10 m

Location Greenbushes to Millstream
MGA Zone 50 411239 **mE** 6249937**mN**
Habitat Gentle Slope
Soil Dark brown loam/gravel
Rock Type Laterite
Vegetation *Corymbia calophylla* and *Eucalyptus marginata* subsp*. marginata* open forest over *Bossiaea ornata*, *Hakea lissocarpha* and *Hibbertia diamesogenos* low shrubland over *Lepidosperma gracile* very open sedgeland.
Veg Condition Excellent
Fire Age Young (1-4 yrs)
Notes Aspect: S
Bare ground: 1%
Litter cover: 5% logs, 5% twigs, 80% leaves
Disturbance: weeds, historical logging, road side maintenance

SPECIES LIST:

Name	Cover	Height	Specimen	Notes
Acacia pulchella var*. glaberrima*	+	0.3 m	MP01.33	
Astroloma pallidum	+	0.15 m	MP01.03	
Banksia dallanneyi subsp*. sylvestris*	+	0.2 m	MP07.03	
Bossiaea ornata	3%	0.2 m	MP05.08	
**Briza maxima*	+	0.1 m	NC	
Burchardia congesta	+	0.2 m	MP03.07	
Clematis pubescens	+	Creeper	MP07.04	
Corymbia calophylla	40%	10-15 m	MP02.01	
Desmocladus fasciculatus	+	0.15 m	MP07.07	
Drosera pallida	+	0.15 m	MP03.02	
Elythranthera brunonis	+	0.15 m	MP07.09	
Eucalyptus marginata subsp*. marginata*	2%	14 m	MP03.01	
Hakea lissocarpha	1%	1 m	MP07.06	
Hibbertia diamesogenos	1%	0.15 m	MP07.01	Fl: yellow
Hyalosperma simplex subsp*. simplex*	+	0.1 m	MP07.02	
Hypocalymma strictum	1%	0.3 m	MP04.07	
**Hypochaeris glabra*	+	0.1 m	NC	
Kennedia prostrata	1%	Creeper	MP01.15	
Lagenifera huegelii	+	0.2 m	MP07.13	
Lepidosperma gracile	2%	0.3 m	MP01.24	
Leucopogon australis	+	0.3 m	MP07.05	
Macrozamia riedlei	+	0.4 m	NC	
**Orobanche minor*	+	0.1 m	MP07.17	
**Oxalis corniculata*	+	0.15 m	MP07.16	
Patersonia pygmaea	+	0.15 m	MP07.14	
Philotheca spicata	+	0.3 m	MP07.08	
Platysace tenuissima	+	0.2 m	MP07.10	

Scaevola calliptera	+	0.15 m	MP07.15	
Stylidium calcaratum	+	0.1 m	MP05.01	Fl: white
Stylidium neurophyllum	+	0.15 m	MP01.22	
Tetrarrhena laevis	+	0.1 m	MP07.12	
Tetratheca parvifolia (P3)	+	0.2 m	MP01.04	
Thelymitra canaliculata	+	0.2 m	MP01.21	
Trachymene pilosa	+	0.1 m	MP07.11	

Site MP08

Described by JOEL COLLINS **Date** 26/10/2011 **Type** QUADRAT 10 x 10 m

Location Greenbushes to Millstream
MGA Zone 50 411066 **mE** 6249109 **mN**
Habitat Hill Slope
Soil Brown loamy clay gravel
Rock Type Laterite
Vegetation *Corymbia calophylla* open forest over *Banksia grandis* low open woodland over *Bossiaea linophylla* and *Bossiaea ornata* low open shrubland over *Pteridium esculentum* open herbland.
Veg Condition Excellent
Fire Age Young (1-4 yrs)
Notes Aspect: SE
Bare ground: 10%
Litter cover: 5% logs, 20% twigs, 30% leaves
Disturbance: track nearby, low presence of weeds

SPECIES LIST:

Name	Cover	Height	Specimen	Notes
Agrostocrinum scabrum subsp. *scabrum*	+	0.2 m	MP01.16	
Banksia grandis	5%	1.8-4 m	MP01.19	
Bossiaea linophylla	3%	0.6 m	MP06.02	
Bossiaea ornata	1%	0.8 m	MP05.08	
**Briza maxima*	+	0.1 m	NC	
Corymbia calophylla	40%	20 m	MP02.01	
Drosera pallida	+	0.15 m	MP03.02	
Eucalyptus marginata subsp. *marginata*	OUT	25 m	MP03.01	
Hardenbergia comptoniana	+	Creeper	MP01.11	
Hibbertia perfoliata	+	0.2 m	MP08.01	
Hovea chorizemifolia	+	0.3 m	MP01.01	
Leucopogon capitellatus	+	0.3 m	MP01.06	
Lomandra sericea	+	0.2 m	MP08.02	
Lomandra sonderi	+	0.2 m	MP01.34	
Macrozamia riedlei	OUT	0.2 m	NC	
Opercularia hispidula	+	0.2 m	MP08.03	
**Oxalis corniculata*	+	0.1 m	MP07.16	
Persoonia longifolia	+	0.4 m	MP02.14	
Pteridium esculentum	25%	0.8 m	MP01.12	
Scaevola calliptera	+	0.15 m	MP07.15	
Stylidium neurophyllum	+	0.1 m	MP01.22	
Tetrarrhena laevis	+	0.1 m	MP07.12	
Trachymene pilosa	+	0.1 m	MP07.11	

Site MP09

Described by JOEL COLLINS **Date** 27/10/2011 **Type** QUADRAT 10 x 10 m

Location Greenbushes to Millstream
MGA Zone 50 404543 **mE** 6247687**mN**
Habitat Steep Rocky Hill
Soil Brown/black loam
Rock Type Granite outcropping
Vegetation *Corymbia calophylla* closed forest over **Rubus anglocandicans* closed herbland.
Veg Condition Degraded
Fire Age Moderate (4-8 yrs)
Notes Aspect: NW
Bare ground: 0%
Litter cover: 0% logs, 30% twigs, 95% leaves
Disturbance: high density of weeds, track nearby

SPECIES LIST:

Name	Cover	Height	Specimen	Notes
**Asparagus asparagoides*	1%	Creeper	MP09.02	
**Avena barbata*	+	0.2 m	NC	
Bossiaea linophylla	OUT	1.5 m	MP01.05	
**Briza maxima*	+	0.1 m	NC	
**Bromus diandrus*	+	0.2 m	MP09.01	
Corymbia calophylla	75%	8-12 m	MP02.01	
Geranium solanderi	+	0.15 m	MP09.03	
Leucopogon capitellatus	+	0.3 m	MP01.06	
**Lysimachia arvensis*	+	0.1 m	MPOP11	
**Pinus* sp.	OUT	14 m	NC	
Pteridium esculentum	OUT	0.6 m	MP01.12	
**Rubus anglocandicans*	80%	1 m	MPOP31	
**Sonchus oleraceus*	+	0.3 m	NC	
Xanthorrhoea preissii	+	0.7 m	NC	

Site MP10

Described by JOEL COLLINS **Date** 27/10/2011 **Type** QUADRAT 10 x 10 m

Location Greenbushes to Millstream
MGA Zone 50 404295 **mE** 6247296**mN**
Habitat River
Soil Brown loam clay
Rock Type N/A
Vegetation *Eucalyptus rudis* subsp. *cratyantha* (P4) open woodland over *Melaleuca incana* subsp. *incana* open shrubland over **Rubus anglocandicans* very open herbland over **Ehrharta longiflora, *Bromus diandrus* and **Avena barbata* grassland
Veg Condition Degraded
Fire Age Moderate (4-8 yrs)
Notes Aspect: W
Bare ground: 0%
Litter cover: 0% logs, 1% twigs, 5% leaves
Disturbance: weeds at high density (Blackberry)

SPECIES LIST:

Name	Cover	Height	Specimen	Notes
**Acetosella vulgaris*	+	0.15 m	MP10.03	
**Avena barbata*	10%	0.5 m	NC	
Banksia littoralis	OUT	4-5 m	NC	
**Bromus diandrus*	25%	0.4 m	MP09.01	
**Chasmanthe floribunda*	+	0.4 m	MPOP06	
Corymbia calophylla	OUT	15m	MP02.01	
**Cynodon dactylon*	OUT	0.2 m	MP10.10	
Dodonaea viscosa subsp. *angustissima*	+	0.9 m	MP10.07	
**Ehrharta longiflora*	30%	0.5 m	NC	
**Eragrostis curvula*	+	0.3 m	MP10.01	
Eucalyptus marginata subsp. *marginata*	OUT	20 m	MP03.01	
Eucalyptus rudis subsp. *cratyantha* (P4)	5%	8-20 m	MP10.06	
Hypolaena exsulca	OUT	0.4 m	MP04.09	
Juncus pallidus	+	1 m	MP10.08	
**Ligustrum ovalifolium*	OUT	3 m	MP10.11	
**Lolium rigidum*	2%	0.3 m	MP10.04	
Melaleuca incana subsp. *incana*	1%	1.5 m	MP10.05	
Melaleuca rhaphiophylla	OUT	2-3 m	MP10.09	
Pteridium esculentum	OUT	0.4 m	MP01.12	
**Rubus anglocandicans*	5%	1.2 m	MPOP31	
**Sonchus oleraceus*	+	0.3 m	NC	
Tetrarrhena laevis	2%	0.2 m	MP10.02	
**Zantedeschia aethiopica*	OUT	0.3 m	NC	

Site MP11

Described by JOEL COLLINS **Date** 27/10/2011 **Type** QUADRAT 10 x 10 m

Location Greenbushes to Millstream
MGA Zone 50 404261 **mE** 6247250**mN**
Habitat Riverbank
Soil Brown-grey sandy loam
Rock Type N/A
Vegetation *Eucalyptus rudis* subsp. *cratyantha* (P4) open forest over **Lolium rigidum* and **Avena barbata* grassland
Veg Condition Degraded
Fire Age Moderate (4-8 yrs)
Notes Aspect: N
Bare ground: 0%
Litter cover: 10% logs, 55% twigs, 30% leaves
Disturbance: weeds, clearing

SPECIES LIST:

Name	Cover	Height	Specimen	Notes
Alternanthera denticulata	OUT	0.1 m	MP11.04	
Astartea leptophylla	OUT	1.5 m	MP04.10	
**Avena barbata*	25%	0.4 m	NC	
**Chasmanthe floribunda*	OUT	0.3 m	MPOP06	
**Cynodon dactylon*	OUT	0.15 m	MP10.10	
Dodonaea viscosa subsp. *angustissima*	OUT	2.5 m	MP10.07	
**Eragrostis curvula*	OUT	0.3 m	MP10.01	
Eucalyptus rudis subsp. cratyantha (P4)	50%	20 m	MP10.06	
Juncus pallidus	OUT	1 m	MP10.08	
Lepidosperma effusum	OUT	1.3 m	MP11.03	
**Lolium rigidum*	30%	0.3 m	MP10.04	
**Lysimachia arvensis*	OUT	0.1 m	MPOP11	
Melaleuca incana subsp. *incana*	OUT	2 m	MP10.05	
Melaleuca rhaphiophylla	OUT	3 m	MP10.09	
Persicaria decipiens	+	0.2 m	MP11.01	
**Raphanus raphanistrum*	+	0.3 m	NC	
**Rubus anglocandicans*	+	0.5 m	MPOP31	
**Senecio diaschides*	+	0.2 m	MP11.02	
**Solanum nigrum*	+	0.1 m	NC	

Site MPR03

Described by JOEL COLLINS **Date** 26/10/2011 **Type** RELEVÉ

Location Greenbushes to Millstream
MGA Zone 50 412446 **mE** 6253518**mN**
Habitat Hill Slope
Soil Brown loamy gravel
Rock Type Laterite
Vegetation *Eucalyptus marginata* subsp. *marginata* and *Corymbia calophylla* open forest over *Banksia grandis* low open woodland over *Xanthorrhoea preissii, Acacia extensa* and *Phyllanthus calycinus* low open shrubland over *Lepidosperma gracile* very open sedgeland.
Veg Condition Excellent
Fire Age Moderate (4-8 yrs)
Notes Aspect: SW
Bare ground: 30%
Litter cover: 10% logs, 30% twigs, 45% leaves
Disturbance: Road nearby

SPECIES LIST:

Name	Cover	Height	Specimen	Notes
Acacia extensa	1%	0.6 m	MPOP17	
Acacia myrtifolia	+	0.4-0.6 m	MP01.30	
Agrostocrinum scabrum subsp. *scabrum*	+	0.3 m	MP03.06	
Austrostipa tenuifolia	+	0.3 m	MP03.10	
Banksia grandis	8%	1-2.5 m	MP01.19	
Burchardia congesta	+	0.3 m	MP03.07	
Conostylis setigera subsp. *setigera*	+	0.2 m	MP03.05	
Corymbia calophylla	25%	11 m	MP02.01	
Daviesia decurrens	+	0.3 m	MP03.09	
**Disa bracteata*	+	0.2 m	MP01.17	
Diuris amplissima	+	0.2 m	MP01.32	
Drosera pallida	+	0.1 m	MP03.02	
Eucalyptus marginata subsp. *marginata*	25%	12 m	MP03.01	
Gompholobium capitatum	+	0.4 m	MPOP10	
Gompholobium marginatum	+	0.15 m	MP03.11	
Gompholobium tomentosum	+	0.3 m	NC	
Hovea chorizemifolia	+	0.2 m	MP01.01	
**Hypochaeris radicata*	+	0.2 m	NC	
Jacksonia furcellata	+	0.8 m	NC	
Kennedia prostrata	+	Creeper	MP01.15	
Lepidosperma gracile	2%	0.3 m	MP01.24	
Macrozamia riedlei	1%	0.4 m	NC	
**Ornithopus pinnatus*	+	0.2 m	MP03.04	
Patersonia occidentalis var. *occidentalis*	+	0.3 m	MPOP16	
Persoonia longifolia	+	0.4 m	MP02.14	
Philotheca spicata	+	0.3 m	NC	
Phyllanthus calycinus	2%	0.3 m	MP03.03	
Scaevola calliptera	+	0.2 m	MP01.31	
**Silene gallica* var. *gallica*	+	0.4 m	MP03.08	Fl: pink

Stylidium brunonianum	+	0.1 m	MPOP01
Stylidium ciliatum	+	0.3 m	MP01.14
Stylidium neurophyllum	+	0.1 m	MP01.22
Taxandria parviceps	+	1.5 m	MPOP19
Xanthorrhoea preissii	2%	1.5 m	NC

Site MPR04

Described by JOEL COLLINS **Date** 26/10/2011 **Type** RELEVÉ

Location Greenbushes to Millstream
MGA Zone 50 412514 **mE** 6252687**mN**
Habitat Drain-Swamp
Soil Bown loam
Rock Type N/A
Vegetation *Melaleuca preissiana* low open woodland over **Chamaecytisus palmensis, Hakea prostrata* and *Astartea leptophylla* tall open shrubland over **Typha orientalis* very open herbland over *Juncus holoschoenus* and *Juncus pallidus* very open sedgeland.
Veg Condition Good
Fire Age Old (8-12 yrs)
Notes Aspect: S
Bare ground: 0%
Litter cover: 5% logs, 10% twigs, 2% leaves
Disturbance: Mine nearby, road verge, weeds, powerlines

SPECIES LIST:

Name	Cover	Height	Specimen	Notes
Acacia cyclops	+	2.5 m	MP04.11	
Acacia extensa	+	0.8 m	MPOP17	
Acacia saligna	+	0.8 m	MP04.12	
Astartea leptophylla	+	2 m	MP04.10	
Baumea rubiginosa	+	0.5 m	MP04.03	
Bossiaea linophylla	+	1 m	MP01.05	
Bossiaea ornata	+	0.3 m	MP04.08	
**Chamaecytisus palmensis*	5%	4 m	NC	
**Cirsium vulgare*	+	0.3 m	MP04.01	
**Cortaderia selloana*	+	2 m	NC	
**Cyperus congestus*	+	0.3 m	MP04.04	
Hakea prostrata	1%	3 m	NC	
**Holcus lanatus*	1%	0.6 m	MP04.05	
Hypocalymma strictum	+	0.5 m	MP04.07	
Hypolaena exsulca	+	0.6 m	MP04.09	
Juncus holoschoenus	5%	0.2 m	MP04.02	
Juncus pallidus	1%	2 m	MP10.08	
Melaleuca preissiana	5%	8 m	NC	
**Raphanus raphanistrum*	+	0.3 m	NC	
**Rubus anglocandicans*	2%	0.2 m	MPOP31	
Taxandria parviceps	15%	2-3 m	MPOP19	
**Typha orientalis*	1%	2 m	NC	
**Vellereophyton dealbatum*	+	0.3 m	MP04.06	

Site MPR05

Described by JOEL COLLINS **Date** 26/10/2011 **Type** RELEVÉ

Location Greenbushes to Millstream
MGA Zone 50 411910 **mE** 6251366**mN**
Habitat Rocky Hill
Soil Brown loam clay
Rock Type Laterite
Vegetation *Eucalyptus marginata* subsp*. marginata* and *Corymbia calophylla* woodland over *Acacia myrtifolia, Acacia extensa* and *Xanthorrhoea preissii* shrubland
Veg Condition Degraded
Fire Age Young (1-4 yrs)
Notes Aspect: S
Bare ground: 80%
Litter cover: +% logs, 10% twigs, 5% leaves
Disturbance: track nearby, powerlines, weeds

Re-growth post clearing

SPECIES LIST:

Name	Cover	Height	Specimen	Notes
Acacia extensa	2%	1.2 m	MPOP17	
Acacia myrtifolia	30%	1.5 m	MP01.30	
Acacia pulchella var*. glaberrima*	+	0.5 m	MP01.33	
Bossiaea ornata	+	0.6 m	MP05.08	
Chorizema retrorsum	+	Creeper	MP05.04	
Corymbia calophylla	5%	12 m	MP02.01	
Dianella brevicaulis	+	0.3 m	MP02.04	
Drosera pallida	+	0.1 m	MP03.02	
Eucalyptus marginata subsp*. marginata*	6%	15 m	MP03.01	
Hibbertia cunninghamii	+	0.2 m	MP05.03	
Hovea chorizemifolia	+	0.3 m	MP01.01	
Hybanthus debilissimus	+	0.15 m	MP05.06	
**Hypochaeris glabra*	+	0.1 m	NC	
Leucopogon capitellatus	1%	0.4 m	MP02.02	
Leucopogon verticillatus	+	0.2 m	MPOP03	
Lomandra sericea	+	0.3 m	MP05.05	
Lomandra sonderi	+	0.3 m	MP01.34	
Macrozamia riedlei	1%	0.4 m	NC	
Persoonia longifolia	+	1.2 m	MP02.14	
Rhodanthe citrina	+	0.15 m	MP05.07	
Stackhousia monogyna	+	0.2 m	MP05.02	
Stylidium brunonianum	+	0.1 m	MPOP01	
Stylidium calcaratum	+	0.15 m	MP05.01	Fl: white
Thysanotus manglesianus	+	Creeper	MP01.07	
Xanthorrhoea preissii	1%	1 m	NC	

Site Opportunistic Collections

SPECIES LIST:

Name	Cover	Height	Specimen	Location/Notes
**Acacia decurrens*	50 ind	10 m	MPOP08	413207E 6253979N
Acacia extensa	5 ind	1 m	MPOP17	412672E 6253675N
Acacia insolita subsp. *insolita*	3 ind	0.4 m	MPOP26	411211E 6249479N road verge
**Acacia iteaphylla*			NC	
**Acacia pycnantha*	common	3-4 m	MPOP24	411268E 6251102N road verge
**Acetosella vulgaris*	common	0.3 m	MPOP34	404540E 6246676N river
**Allium triquetrum*	20 ind	0.3 m	MPOP36	404086E 6247037N river/track
Anigozanthos manglesii subsp. *manglesii*	3 ind	0.3 m	NC	412599E 6253646N Fl: red/green
Bossiaea praetermissa	3 ind	0.3 m	MPOP07	413134E 6254540N
**Briza minor*	common	0.1 m	NC	404540E 6246676N river
**Chamaecytisus palmensis*	NC			
**Chasmanthe floribunda*	1000+	0.4 m	MPOP06	413134E 6254540N
Dampiera linearis	3 ind	0.3 m	MPOP29	410983E 6248384N road verge
**Eragrostis curvula*			NC	
**Freesia alba x leichtlinii*	3 ind	0.2 m	MPOP04	413134E 6254540N
Gompholobium capitatum	5 ind	0.3 m	MPOP10	412672E 6253675N
Hibbertia glomerata subsp. *glomerata*			MPOP14	412672E 6253675N
Hibbertia hypericoides	5 ind	0.3 m	MPOP21	412435E 6253243N Fl: yellow, verge
**Holcus lanatus*	100+ ind	0.7 m	MPOP32	404584E 6246694N river
Hypocalymma strictum	1 ind	0.4 m	MPOP23	411268E 6251102N road verge
Kennedia coccinea	10 ind	Creeper	MPOP27	411058E 6249103N road verge
Laxmannia squarrosa	10 ind	0.1 m	MPOP15	412672E 6253675N
Lechenaultia biloba			MPOP18	412672E 6253675N
Leucopogon capitellatus	3 ind	0.15 m	MPOP30	406973E 6247532N
Leucopogon verticillatus	3 ind	0.4 m	MPOP03	413134E 6254540N
**Lotus subbiflorus*	common	0.2 m	MPOP35	404540E 6246676N river
Loxocarya cinerea	10 ind	0.3 m	MPOP09	412672E 6253675N
**Lupinus luteus*	common	0.3 m	MPOP12	412672E 6253675N
**Lysimachia arvensis*			MPOP11	411268E 6251102N road verge
**Lysimachia arvensis*			MPOP11	412672E 6253675N
Patersonia occidentalis var. *occidentalis*	10 ind	0.3 m	MPOP16	412672E 6253675N
Pimelea ciliata subsp. *ciliata*	1 ind	0.3 m	MPOP13	412672E 6253675N
Pimelea ciliata subsp. *ciliata*	5 ind	0.3 m	MPOP05	413134E 6254540N
**Plantago bellardii*	1000+ ind	0.03 m	MPOP02	413134E 6254540N
Poranthera microphylla	20 ind	0.2 m	MPOP25	411245E 6249755N road verge
**Raphanus raphanistrum*			NC	
Rubus anglocandicans	common	0.4 m	MPOP31	404875E 6247702N track
Stylidium brunonianum	10 ind	0.15 m	MPOP01	412736E 6253724N
Taxandria parviceps	5 ind	1.5 m	MPOP19	412599E 6253646N Fl: white
Thomasia grandiflora	1 ind	0.3 m	MPOP22	411268E 6251102N Fl: pink
**Tolpis barbata*	4 ind	0.2 m	MPOP33	404540E 6246676N river
**Trifolium angustifolium*	10 ind	0.2 m	MPOP20	412435E 6253243N Fl: pink, verge
Tripterococcus brunonis	5 ind	0.3 m	MPOP28	411058E 6249103N road verge

APPENDIX H
FLORA BY SITE MATRIX

Appendix H FLORA BY SITE MATRIX

SPECIES	MP01	MP02	MP06	MP07	MP08	MP09	MP10	MP11	MPR03	MPR04	MPR05	OPCOL
**Acacia baileyana*			OUT									
Acacia cyclops										+		
**Acacia decurrens*												50 ind
Acacia extensa			+						1%	+	2%	5 ind
Acacia insolita subsp. *insolita*												3 ind
**Acacia iteaphylla*												nc
Acacia myrtifolia	+	+							+		30%	
Acacia pulchella var. *glaberrima*	+		+	+							+	
**Acacia pycnantha*	+	OUT	5%									common
Acacia saligna										+		
Acaena echinata		+										
**Acetosella vulgaris*							+					common
Agrostocrinum scabrum subsp. *scabrum*	1%				+				+			
**Allium triquetrum*												20 ind
Alternanthera denticulata								OUT				
Anigozanthos manglesii subsp. *manglesii*												3 ind
**Arctotheca calendula*		OUT										
**Asparagus asparagoides*						1%						
Astartea leptophylla								OUT		+		
Astroloma pallidum	+			+								
Austrostipa mollis		OUT										
Austrostipa tenuifolia									+			
**Avena barbata*		OUT				+	10%	25%				
Banksia dallanneyi subsp. *sylvestris*				+								
Banksia grandis	2%				5%				8%			
Banksia littoralis							OUT					
Baumea rubiginosa										+		
Billardiera fusiformis	1%											
Bossiaea linophylla	2%	2%	2%		3%	OUT				+		
Bossiaea ornata	+			3%	1%					+	+	
Bossiaea praetermissa												3 ind
**Briza maxima*	+	5%	+	+	+	+						
**Briza minor*		+										common
**Bromus diandrus*						+	25%					
**Bromus madritensis*		+										
Burchardia congesta				+					+			
**Chamaecytisus palmensis*										5%		nc
**Chasmanthe floribunda*							+	OUT				1000+
Chorizema retrorsum											+	
**Cirsium vulgare*										+		
Clematis pubescens				+								
Conostylis aculeata subsp. *aculeata*			+									
Conostylis setigera subsp. *setigera*									+			
**Conyza sumatrensis*		OUT										
**Cortaderia selloana*										+		
Corymbia calophylla	10%	45%	25%	40%	40%	75%	OUT		25%		5%	
? Cryptostylis sp.	+											
**Cynodon dactylon*							OUT	OUT				
**Cyperus congestus*										+		
Dampiera linearis												3 ind
Daviesia decurrens									+			
Desmocladus fasciculatus				+								
Dianella brevicaulis		+									+	
**Dipogon lignosus*		OUT										
**Disa bracteata*	+	+							+			
Diuris amplissima	+								+			
Dodonaea viscosa subsp. *angustissima*							+	OUT				
Drosera erythrorhiza subsp. *erythrorhiza*	+											

Appendix H FLORA BY SITE MATRIX

SPECIES	MP01	MP02	MP06	MP07	MP08	MP09	MP10	MP11	MPR03	MPR04	MPR05	OPCOL
Drosera pallida	+			+	+				+		+	
**Ehrharta longiflora*		OUT					30%					
Elythranthera brunonis				+								
**Eragrostis curvula*							+	OUT				nc
Eucalyptus marginata subsp. *marginata*	60%	OUT		2%	OUT		OUT		25%		5%	
**Eucalyptus resinifera*			20%									
Eucalyptus rudis subsp. *cratyantha* (P4)							5%	50%				
**Freesia alba* x *leichtlinii*	+	5%										3 ind
**Fumaria capreolata*		OUT										
Geranium solanderi		+				+						
Gompholobium capitatum									+			5 ind
Gompholobium marginatum									+			
Gompholobium tomentosum									+			
Haemodorum discolor		OUT										
Hakea lissocarpha				1%								
Hakea prostrata										1%		
Hardenbergia comptoniana	+	1%			+							
Hibbertia cunninghamii											+	
Hibbertia diamesogenos				1%								
Hibbertia glomerata subsp. *glomerata*												nc
Hibbertia hypericoides			2%									5 ind
Hibbertia perfoliata					+							
**Holcus lanatus*										1%		100+ ind
Hovea chorizemifolia	+				+				+		+	
Hyalosperma simplex subsp. *simplex*				+								
Hybanthus debilissimus											+	
Hypocalymma strictum			35%	1%						+		1 ind
**Hypochaeris glabra*				+							+	
**Hypochaeris radicata*									+			
Hypolaena exsulca							OUT			+		
Jacksonia furcellata									+			
Juncus holoschoenus										5%		
Juncus pallidus		OUT					+	OUT		1%		
Juncus planifolius	+											
Kennedia coccinea		+										10 ind
Kennedia prostrata	+	OUT		1%					+			
Lagenifera huegelii	+			+								
Laxmannia squarrosa												10 ind
Lechenaultia biloba												nc
**Leontodon saxatilis*		+										
Lepidosperma effusum								OUT				
Lepidosperma gracile	3%		6%	2%					2%			
Leucopogon australis		+		+								
Leucopogon capitellatus	+	+			+	+					1%	3 ind
Leucopogon verticillatus		+									+	3 ind
**Ligustrum ovalifolium*												
**Lolium rigidum*							2%	30%				
Lomandra sericea					+						+	
Lomandra sonderi	+				+						+	
**Lotus subbiflorus*												common
Loxocarya cinerea												10 ind
**Lupinus luteus*												common
**Lysimachia arvensis*			+			+		OUT				nc
Macrozamia riedlei	+	OUT		+	OUT				1%		1%	
Melaleuca incana subsp. *incana*							1%	OUT				
Melaleuca preissiana										5%		
Melaleuca rhaphiophylla							OUT	OUT				
Opercularia hispidula					+							

Appendix H FLORA BY SITE MATRIX

SPECIES	MP01	MP02	MP06	MP07	MP08	MP09	MP10	MP11	MPR03	MPR04	MPR05	OPCOL
Opercularia vaginata	+	OUT										
**Ornithopus pinnatus*									+			
**Orobanche minor*				+								
**Oxalis corniculata*				+	+							
**Oxalis glabra*		+										
**Oxalis pes-caprae*		OUT										
**Oxalis purpurea*		+										
Patersonia occidentalis var. *occidentalis*			+						+			10 ind
Patersonia pygmaea				+								
**Pentaschistis airoides*		+										
Persicaria decipiens								+				
Persoonia longifolia		OUT			+				+		+	
Philotheca spicata				+					+			
Phyllanthus calycinus									2%			
Pimelea ciliata subsp. *ciliata*		OUT										5 ind
**Pinus* sp.		OUT				OUT						
**Plantago bellardii*												1000+ ind
Platysace tenuissima				+								
Poranthera microphylla												20 ind
Pteridium esculentum	2%	15%			25%	OUT	OUT					
**Raphanus raphanistrum*								+		+		nc
Rhodanthe citrina											+	
**Romulea rosea* var. *australis*		+										
**Rubus anglocandicans*						80%	5%	+		2%		common
Scaevola calliptera	+			+	+				+			
**Senecio diaschides*		OUT						+				
Senecio glomeratus subsp. *glomeratus*		OUT										
**Silene gallica var. gallica*		OUT							+			
**Solanum nigrum*		OUT						+				
**Sonchus oleraceus*		OUT				+	+					
Sowerbaea laxiflora		+										
Sphaerolobium scabriusculum	+											
Stackhousia monogyna											+	
Stylidium brunonianum									+		+	10 ind
Stylidium calcaratum				+							+	
Stylidium ciliatum	+								+			
Stylidium neurophyllum MS	+			+	+				+			
Taxandria parviceps									+	15%		5 ind
Tetrarrhena laevis		+		+	+		2%					
Tetratheca parvifolia (P3)	+			+								
Thelymitra canaliculata	+	+	+	+								
Thomasia grandiflora			+									1 ind
Thysanotus manglesianus	+										+	
**Tolpis barbata*												4 ind
Trachymene pilosa				+	+							
Trichocline spathulata	+											
**Trifolium angustifolium*												10 ind
**Trifolium campestre*		+										
**Trifolium subterraneum*		+										
Tripterococcus brunonis												5 ind
**Typha orientalis*										1%		
**Vellereophyton dealbatum*										+		
**Viola odorata*	+											
Xanthorrhoea gracilis	2%											
Xanthorrhoea preissii						+			2%		1%	
**Zantedeschia aethiopica*							OUT					

APPENDIX I
FLORA INVENTORY

APPENDIX I

FLORA INVENTORY

Family	Name
Alliaceae	**Allium triquetrum*
Amaranthaceae	*Alternanthera denticulata*
Apiaceae	*Platysace tenuissima*
	Trachymene pilosa
Araceae	**Zantedeschia aethiopica*
Asparagaceae	**Asparagus asparagoides*
	Laxmannia squarrosa
	Lomandra sericea
	Lomandra sonderi
	Sowerbaea laxiflora
	Thysanotus manglesianus
Asteraceae	**Arctotheca calendula*
	**Cirsium vulgare*
	**Conyza sumatrensis*
	**Hypochaeris glabra*
	**Hypochaeris radicata*
	**Leontodon saxatilis*
	**Senecio diaschides*
	**Sonchus oleraceus*
	**Tolpis barbata*
	**Vellereophyton dealbatum*
	Hyalosperma simplex subsp. *simplex*
	Lagenifera huegelii
	Rhodanthe citrina
	Senecio glomeratus subsp. *glomeratus*
	Trichocline spathulata
Brassicaceae	**Raphanus raphanistrum*
Caryophyllaceae	**Silene gallica* var. *gallica*
Celastraceae	*Stackhousia monogyna*
	Tripterococcus brunonis
Colchicaceae	*Burchardia congesta*
Cyperaceae	**Cyperus congestus*
	Baumea rubiginosa
	Lepidosperma effusum
	Lepidosperma gracile

Family	Name
Dennstaedtiaceae	*Pteridium esculentum*
Dilleniaceae	*Hibbertia cunninghamii*
	Hibbertia diamesogenos
	Hibbertia glomerata subsp. *glomerata*
	Hibbertia hypericoides
	Hibbertia perfoliata
Droseraceae	*Drosera erythrorhiza* subsp. *erythrorhiza*
	Drosera pallida
Elaeocarpaceae	*Tetratheca parvifolia* (P3)
Ericaceae	*Astroloma pallidum*
	Leucopogon australis
	Leucopogon capitellatus
	Leucopogon verticillatus
Fabaceae	**Acacia baileyana*
	**Acacia decurrens*
	**Acacia iteaphylla*
	**Acacia pycnantha*
	**Chamaecytisus palmensis*
	**Dipogon lignosus*
	**Lotus subbiflorus*
	**Lupinus luteus*
	**Ornithopus pinnatus*
	**Trifolium angustifolium*
	**Trifolium campestre*
	**Trifolium subterraneum*
	Acacia cyclops
	Acacia extensa
	Acacia insolita subsp. *insolita*
	Acacia myrtifolia
	Acacia pulchella var. *glaberrima*
	Acacia saligna
	Bossiaea linophylla
	Bossiaea ornata
	Bossiaea praetermissa
	Chorizema retrorsum
	Daviesia decurrens
	Gompholobium capitatum
	Gompholobium marginatum
	Gompholobium tomentosum
	Hardenbergia comptoniana

Family	Name
	Hovea chorizemifolia
	Jacksonia furcellata
	Kennedia coccinea subsp. *coccinea*
	Kennedia prostrata
	Sphaerolobium scabriusculum
Geraniaceae	*Geranium solanderi*
Goodeniaceae	*Dampiera linearis*
	Lechenaultia biloba
	Scaevola calliptera
Haemodoraceae	*Anigozanthos manglesii* subsp. *manglesii*
	Conostylis aculeata subsp. *aculeata*
	Conostylis setigera subsp. *setigera*
	Haemodorum discolor
Hemerocallidaceae	*Agrostocrinum scabrum* subsp. *scabrum*
	Dianella brevicaulis
Iridaceae	**Chasmanthe floribunda*
	**Freesia alba* x *leichtlinii*
	**Romulea rosea* var. *australis*
	Patersonia occidentalis var. *occidentalis*
	Patersonia pygmaea
Juncaceae	*Juncus holoschoenus*
	Juncus pallidus
	Juncus planifolius
Malvaceae	*Thomasia grandiflora*
Myrtaceae	**Eucalyptus resinifera*
	Astartea leptophylla
	Corymbia calophylla
	Eucalyptus marginata subsp. *marginata*
	Eucalyptus rudis subsp. *cratyantha* (P4)
	Hypocalymma strictum
	Melaleuca incana subsp. *incana*
	Melaleuca preissiana
	Melaleuca rhaphiophylla
	Taxandria parviceps
Oleaceae	**Ligustrum ovalifolium*
Orchidaceae	**Disa bracteata*
	? Cryptostylis sp.
	Diuris amplissima
	Elythranthera brunonis
	Thelymitra canaliculata

Family	Name
Orobanchaceae	**Orobanche minor*
Oxalidaceae	**Oxalis corniculata*
	**Oxalis glabra*
	**Oxalis pes-caprae*
	**Oxalis purpurea*
Papaveraceae	**Fumaria capreolata*
Phyllanthaceae	*Phyllanthus calycinus*
	Poranthera microphylla
Pinaceae	**Pinus* sp.
Pittosporaceae	*Billardiera fusiformis*
Plantaginaceae	**Plantago bellardii*
Poaceae	**Avena barbata*
	**Briza maxima*
	**Briza minor*
	**Bromus diandrus*
	**Bromus madritensis*
	**Cortaderia selloana*
	**Cynodon dactylon*
	**Ehrharta longiflora*
	**Eragrostis curvula*
	**Holcus lanatus*
	**Lolium rigidum*
	**Pentaschistis airoides*
	Austrostipa mollis
	Austrostipa tenuifolia
	Tetrarrhena laevis
Polygonaceae	**Acetosella vulgaris*
	Persicaria decipiens
Primulaceae	**Lysimachia arvensis*
Proteaceae	*Banksia dallanneyi* subsp. *sylvestris*
	Banksia grandis
	Banksia littoralis
	Hakea lissocarpha
	Hakea prostrata
	Persoonia longifolia
Ranunculaceae	*Clematis pubescens*
Restionaceae	*Desmocladus fasciculatus*
	Hypolaena exsulca
	Loxocarya cinerea
Rosaceae	**Rubus anglocandicans*

Family	Name
	Acaena echinata
Rubiaceae	*Opercularia hispidula*
	Opercularia vaginata
Rutaceae	*Philotheca spicata*
Sapindaceae	*Dodonaea viscosa* subsp. *angustissima*
Solanaceae	**Solanum nigrum*
Stylidiaceae	*Stylidium brunonianum*
	Stylidium calcaratum
	Stylidium ciliatum
	Stylidium neurophyllum MS
Thymelaeaceae	*Pimelea ciliata* subsp. *ciliata*
Typhaceae	**Typha orientalis*
Violaceae	**Viola odorata*
	Hybanthus debilissimus
Xanthorrhoeaceae	*Xanthorrhoea gracilis*
	Xanthorrhoea preissii
Zamiaceae	*Macrozamia riedlei*

APPENDIX J
PRIORITY FAUNA LOCATIONS

APPENDIX J

PRIORITY FAUNA LOCATIONS

Species Name	Common Name	Listing	Easting[#]	Northing[#]
Morelia spilota imbricata	Carpet Python	S4, P4	404444	6247684
Calyptorhynchus latirostris	Carnaby's Cockatoo	En, S1	Flying over the Project area at 412985, 6253916	
Merops ornatus	Rainbow Bee-eater	Mi	404295	6247296

[#]Australian Geocentric 1994 (GDA94) Zone 50H

APPENDIX K
FAUNA RECORDED FROM CURRENT AND PREVIOUS SURVEYS

APPENDIX K

FAUNA RECORDED IN CURRENT AND PREVIOUS SURVEYS

Appendix K1 Amphibians

Key: EPBC = Environmental Protection and Biodiversity Conservation Act 1999, WC = Wildlife Conservation Act 1950, DEC = Department of Conservation Priority Code, A = Listed in Naturemap, B= DEC Threatened and Priority Fauna Database, C= EPBC Act Protected Matters Search Tool (DSEWPaC 2011), D = Listed by Birds Australia, E = Previous Surveys, F = Current Survey

Note: For Definitions of Conservation Codes see Appendix A.

AMPHIBIANS		**Conservation Codes**								
Scientific Name	**Common Name**	**EPBC**	**WC**	**DEC**	**A**	**B**	**C**	**D**	**E**	**F**
Family HYLIDAE										
Litoria adelaidensis	Slender Tree Frog				x				x	
Litoria moorei	Motorbike Frog, Bell Frog				x					
Family LIMNODYNASTIDAE										
Limnodynastes dorsalis	Bullfrog or Banjo Frog				x				x	
Family MYOBATRACHIDAE										
Crinia georgiana	Quacking Frog				x				x	
Crinia glauerti	Glauert's Froglet				x				x	
Geocrinia leai	Ticking Frog				x					
Pseudophryne guentheri	Crawling Frog or Günther's Toadlet				x				x	

[X] fauna species recorded from the survey area.

APPENDIX K

FAUNA RECORDED IN CURRENT AND PREVIOUS SURVEYS
Appendix K3 - Reptiles

Key: EPBC = Environmental Protection and Biodiversity Conservation Act 1999, WC = Wildlife Conservation Act 1950, DEC = Department of Conservation Priority Code, A = Listed in Naturemap, B= DEC Threatened and Priority Fauna Database, C= EPBC Act Protected Matters Search Tool (SEWPAC 2010), D = Listed by Birds Australia, E = Current Survey

Note: For Definitions of Conservation Codes see Appendix A.

REPTILES		**Conservation Codes**								
Scientific Name	**Common Name**	**EPBC**	**WC**	**DEC**	**A**	**B**	**C**	**D**	**E**	**F**
Family SCINCIDAE										
Ctenotus delli				P4		x				
Hemiergis peronii					x				x	
Tiliqua rugosa	Southwestern Bobtail				x				x	
Family VARANIDAE										
Varanus rosenbergi	Heath Monitor				x					
Family TYPHLOPIDAE										
Ramphotyphlops australis	Southern Blind Snake				x					
Family BOIDAE										
Morelia spilota imbricata	Carpet Python		S4			x				x
Family ELAPIDAE										
Pseudonaja affinis	Dugite				x					

[X] fauna species recorded from the survey area.
[*] denotes introduced species.

APPENDIX K

FAUNA RECORDED IN CURRENT AND PREVIOUS SURVEYS

Appendix K3 - Birds

Key: EPBC = Environmental Protection and Biodiversity Conservation Act 1999, WC = Wildlife Conservation Act 1950, DEC = Department of Conservation Priority Code, A = Listed in Naturemap, B= DEC Threatened and Priority Fauna Database, C= EPBC Act Protected Matters Search Tool (DSEWPaC 2011), D = Listed by Birds Australia, E = Current Survey

Note: For Definitions of Conservation Codes see Appendix A.

BIRDS		**Conservation Codes**								
Scientific Name	**Common Name**	**EPBC**	**WC**	**DEC**	**A**	**B**	**C**	**D**	**E**	**F**
Family CASUARIIDAE										
Dromaius novaehollandiae	Emu				x			x	x	x
Family PHASIANIDAE										
Coturnix pectoralis	Stubble Quail	Ma						x		
Coturnix ypsilophora	Brown Quail							x		
Family ANATIDAE										
**Anas platyrhynchos*	Mallard							x		
Anas castanea	Chestnut Teal							x		
Anas gracilis	Grey Teal				x			x		
Anas rhynchotis	Australasian Shoveler							x		
Anas superciliosa	Pacific Black Duck				x			x		
Aythya australis	Hardhead							x		
Biziura lobata	Musk Duck	Ma			x			x		
Chenonetta jubata	Australian Wood Duck				x			x	x	
Cygnus atratus	Black Swan				x			x	x	
Malacorhynchus membranaceus	Pink-eared Duck							x		
Oxyura australis	Blue-billed Duck							x		
Stictonetta naevosa	Freckled Duck							x		
Tadorna tadornoides	Australian Shelduck				x			x		
Family PODICIPEDIDAE										
Podiceps cristatus	Great Crested Grebe							x		
Poliocephalus poliocephalus	Hoary-headed Grebe				x			x		
Tachybaptus novaehollandiae	Australasian Grebe				x			x	x	
Family COLUMBIDAE										
**Columba livia*	Domestic Pigeon							x		
Ocyphaps lophotes	Crested Pigeon							x		
Phaps chalcoptera	Common Bronzewing				x			x	x	
Phaps elegans	Brush Bronzewing							x		

APPENDIX K

FAUNA RECORDED IN CURRENT AND PREVIOUS SURVEYS

Appendix K3 - Birds

BIRDS		Conservation Codes								
Scientific Name	Common Name	EPBC	WC	DEC	A	B	C	D	E	F
**Streptopelia chinensis*	Spotted Turtle Dove							x		
**Streptopelia senegalensis*	Laughing Turtle Dove							x		
Family PODARGIDAE										
Podargus strigoides	Tawny Frogmouth				x			x		
Family AEGOTHELIDAE										
Aegotheles cristatus	Australian Owlet-nightjar				x			x		
Family APODIDAE										
Apus pacificus	Fork-tailed Swift	Mi, Ma					x			
Family ANHINGIDAE										
Anhinga melanogaster	Darter				x			x		
Family PHALACROCORACIDAE										
Phalacrocorax carbo	Great Cormorant				x			x		
Phalacrocorax melanoleucos	Little Pied Cormorant				x			x		
Phalacrocorax sulcirostris	Little Black Cormorant				x			x		
Phalacrocorax varius	Pied Cormorant				x			x		
Family PELECANIDAE										
Pelecanus conspicillatus	Australian Pelican	Ma						x		
Family ARDEIDAE										
Ardea pacifica	White-necked Heron				x			x		
Egretta novaehollandiae	White-faced Heron				x			x		x
Ardea modesta	Eastern Great Egret	Mi, Ma			x		x	x		
Ardea garzetta	Little Egret	Ma						x		
Ardea ibis	Cattle Egret	Mi, Ma					x	x		
Nycticorax caledonicus	Rufous Night Heron	Ma			x			x		
ixobrychus flavicollis	Black Bittern			P3		x				
Botaurus poiciloptilus	Australasian Bittern					x		x		
Family THRESKIORNITHIDAE										
Platalea flavipes	Yellow-billed Spoonbill				x			x		
Platalea regia	Royal Spoonbill							x		
Plegadis falcinellus	Glossy Ibis	Mi, Ma						x		
Threskiornis molucca	Australian White Ibis	Ma			x			x		
Threskiornis spinicollis	Straw-necked Ibis	Ma			x			x		

APPENDIX K

FAUNA RECORDED IN CURRENT AND PREVIOUS SURVEYS

Appendix K3 - Birds

BIRDS		Conservation Codes								
Scientific Name	Common Name	EPBC	WC	DEC	A	B	C	D	E	F
Family ACCIPITRIDAE										
Accipiter cirrocephalus	Collared Sparrowhawk							x		
Accipiter fasciatus	Brown Goshawk	Ma						x		
Aquila audax	Wedge-tailed Eagle				x			x	x	
Aquila morphnoides	Little Eagle							x		
Circus approximans	Swamp Harrier	Ma			x			x		
Circus assimilis	Spotted Harrier				x			x		
Elanus axillaris	Black-shouldered Kite				x			x		
Haliaeetus leucogaster	White-bellied Sea-Eagle	Mi, Ma					x	x		
Haliastur sphenurus	Whistling Kite	Ma			x			x		
Lophoictinia isura	Square-tailed Kite				x			x		
Pandion cristatus	Eastern Osprey	Mi, Ma						x		
Family FALCONIDAE										
Falco berigora	Brown Falcon				x			x		
Falco cenchroides	Australian Kestrel	Ma			x			x		
Falco longipennis	Australian Hobby				x			x		
Falco peregrinus	Peregrine Falcon		S4		x	x		x		
Family RALLIDAE										
Fulica atra	Eurasian Coot				x			x		
Gallinula tenebrosa	Dusky Moorhen				x			x		
Gallirallus philippensis	Buff-banded Rail	Ma						x		
Porphyrio porphyrio	Purple Swamphen	Ma			x			x	x	
Porzana fluminea	Australian Spotted Crake							x		
Porzana pusilla	Ballion's Crake							x		
Porzana tabuensis	Spotless Crake	Ma						x		
Tribonyx ventralis	Black-tailed Native Hen				x			x		
Family OTIDIDAE										
Ardeotis australis	Australian Bustard			P4		x				
Family BURHINIDAE										
Burhinus grallarius	Bush Stone-curlew			P4		x				
Family HAEMATOPODIDAE										
Haematopus fuliginosus	Sooty Oystercatcher							x		
Haematopus longirostris	Pied Oystercatcher							x		

APPENDIX K

FAUNA RECORDED IN CURRENT AND PREVIOUS SURVEYS

Appendix K3 - Birds

BIRDS		Conservation Codes								
Scientific Name	Common Name	EPBC	WC	DEC	A	B	C	D	E	F
Family RECURVIROSTRIDAE										
Cladorhynchus leucocephalus	Banded Stilt							x		
Himantopus himantopus	Black-winged Stilt	Ma						x		
Recurvirostra novaehollandiae	Red-necked Avocet	Ma						x		
Family CHARADRIIDAE										
Charadrius leschenaultii	Greater Sand Plover	Mi, Ma						x		
Charadrius mongolus	Lesser Sand Plover	Mi, Ma						x		
Charadrius rubricollis	Hooded Plover	Ma		P4				x		
Charadrius ruficapillus	Red-capped Plover	Ma						x		
Elseyornis melanops	Black-fronted Dotterel				x			x		
Erythrogonys cinctus	Red-kneed Dotterel							x		
Pluvialis fulva	Pacific Golden Plover	Mi, Ma						x		
Pluvialis squatarola	Grey Plover	Mi, Ma						x		
Vanellus miles	Masked Lapwing							x		
Vanellus tricolor	Banded Lapwing							x		
Family SCOLOPACIDAE										
Actitis hypoleucos	Common Sandpiper	Mi, Ma						x		
Arenaria interpres	Ruddy Turnstone	Mi, Ma						x		
Calidris acuminata	Sharp-tailed Sandpiper	Mi, Ma						x		
Calidris alba	Sanderling	Mi, Ma						x		
Calidris canutus	Red Knot	Mi, Ma						x		
Calidris ferruginea	Curlew Sandpiper	Mi, Ma						x		
Calidris melanotos	Pectoral Sandpiper	Mi, Ma						x		
Calidris ruficollis	Red-necked Stint	Mi, Ma						x		
Calidris subminuta	Long-toed Stint	Mi, Ma						x		
Calidris tenuirostris	Great Knot	Mi, Ma						x		
Limosa lapponica	Bar-tailed Godwit	Mi, Ma						x		
Limosa limosa	Black-tailed Godwit	Mi, Ma						x		
Numenius madagascariensis	Eastern Curlew	Mi, Ma		P4				x		
Numenius phaeopus	Whimbrel	Mi, Ma						x		
Tringa brevipes	Grey-tailed Tattler	Mi, Ma						x		
Tringa glareola	Wood Sandpiper	Mi, Ma						x		
Tringa nebularia	Common Greenshank	Mi, Ma						x		
Tringa stagnatilis	Marsh Sandpiper	Mi, Ma						x		
Xenus cinereus	Terek Sandpiper	Mi, Ma						x		
Family TURNICIDAE										
Turnix varius	Painted Button Quail							x		

APPENDIX K

FAUNA RECORDED IN CURRENT AND PREVIOUS SURVEYS

Appendix K3 - Birds

BIRDS		Conservation Codes								
Scientific Name	Common Name	EPBC	WC	DEC	A	B	C	D	E	F
Turnix velox	Little Button-quail							x		
Family LARIDAE										
Chlidonas hybida	Whiskered Tern							x		
Chroicocephalus novaehollandiae	Silver Gull	Ma						x		
Larus pacificus	Pacific Gull	Ma						x		
Sterna anaethetus	Bridled Tern	Mi, Ma						x		
Sterna bergii	Crested Tern	Ma						x		
Sterna caspia	Caspian Tern	Ma						x		
Sterna leucopterus	White-winged Black tern	Mi, Ma			x					
Sterna nereis	Fairy Tern	Ma						x		
Family PSITTACIDAE										
**Cacatua galerita*	Sulphur-crested Cockatoo							x		
Cacatua pastinator	Western Corella							x		
Cacatua roseicapilla	Galah				x			x		
Cacatua sanguinea	Little Corella							x		
Calyptorhynchus banksii naso	Forest Red-tailed Black Cockatoo	VU	S1		x	x	x	x	x	
Calyptorhynchus baudinii	Baudin's Cockatoo	VU	S1		x	x	x	x	x	
Calyptorhynchus latirostris	Carnaby's Cockatoo	EN	S1		x	x	x	x	x	x
Glossopsitta porphyrocephala	Purple-crowned Lorikeet				x			x		
Neophema elegans	Elegant Parrot				x			x		
Neophema petrophila	Rock Parrot	Ma						x		
Platycercus icterotis	Western Rosella				x			x	x	x
Platycercus spurius	Red-capped Parrot				x			x	x	
Platycercus zonarius	Twenty-eight Parrot; Australian Ringneck				x			x	x	x
Polytelis anthopeplus	Regent Parrot				x			x		
Family CUCULIDAE										
Cacomantis flabelliformis	Fan-tailed Cuckoo	Ma			x			x	x	
Chrysococcyx basalis	Horsfield's Bronze Cuckoo	Ma						x		
Chrysococcyx lucidus	Shining Bronze Cuckoo	Ma			x			x	x	
Cuculus pallidus	Pallid Cuckoo	Ma			x			x		
Family STRIGIDAE										
Ninox connivens	Barking Owl							x		
Ninox novaeseelandiae	Boobook Owl	Ma			x			x	x	
Family TYTONIDAE										

APPENDIX K

FAUNA RECORDED IN CURRENT AND PREVIOUS SURVEYS

Appendix K3 - Birds

BIRDS		Conservation Codes								
Scientific Name	Common Name	EPBC	WC	DEC	A	B	C	D	E	F
Tyto javanica	Eastern Barn Owl				x			x		
Tyto novaehollandiae	Masked Owl			P3	x	x		x		
Family HALCYONIDAE										
**Dacelo novaeguineae*	Laughing Kookaburra				x			x	x	
Todiramphus sanctus	Sacred Kingfisher	Ma			x			x		
Family MEROPIDAE										
Merops ornatus	Rainbow Bee-eater	Mi, Ma			x		x	x		x
Family CLIMACTERIDAE										
Climacteris rufa	Rufous Treecreeper				x			x	x	
Family MALURIDAE										
Malurus elegans	Red-winged Fairy-wren				x			x	x	
Malurus splendens	Splendid Fairy-wren				x			x	x	
Stipiturus malachurus	Southern Emu-wren							x		
Family ACANTHIZIDAE										
Acanthiza apicalis	Broad-tailed Thornbill (Inland Thornbill)				x			x	x	
Acanthiza chrysorrhoa	Yellow-rumped Thornbill				x			x		
Acanthiza inornata	Western Thornbill				x			x	x	
Gerygone fusca	Western Gerygone				x			x	x	
Sericornis frontalis	White-browed Scrubwren				x			x	x	x
Smicrornis brevirostris	Weebill							x		x
Family PARDALOTIDAE										
Pardalotus punctatus	Spotted Pardalote				x			x		
Pardalotus striatus	Striated Pardalote				x			x		x
Family MELIPHAGIDAE										
Acanthorhynchus superciliosus	Western Spinebill				x			x	x	x
Anthochaera carunculata	Red Wattlebird				x			x	x	x
Anthochaera lunulata	Western Little Wattlebird							x		
Epthianura albifrons	White-fronted Chat							x		
Lichenostomus virescens	Singing Honeyeater							x		
Lichmera indistincta	Brown Honeyeater				x			x		
Melithreptus brevirostris	Brown -headed Honeyeater							x		
Melithreptus lunatus	White-naped Honeyeater				x			x	x	

APPENDIX K

FAUNA RECORDED IN CURRENT AND PREVIOUS SURVEYS

Appendix K3 - Birds

BIRDS		Conservation Codes								
Scientific Name	Common Name	EPBC	WC	DEC	A	B	C	D	E	F
Phylidonyris nigra	White-cheeked Honeyeater				x			x		
Phylidonyris novaehollandiae	New Holland Honeyeater				x			x	x	
Family NEOSITTIDAE										
Daphoenositta chrysoptera	Varied Sittella				x			x	x	
Family CAMPEPHAGIDAE										
Coracina novaehollandiae	Black-faced Cuckoo-shrike	Ma			x			x		x
Lalage tricolor	White-winged Triller				x			x		
Family PACHYCEPHALIDAE										
Colluricincla harmonica	Grey Shrike-thrush				x			x	x	x
Falcunculus frontatus leucogaster	Crested Shrike-tit			P4		x		x		
Pachycephala pectoralis	Golden Whistler				x			x	x	
Pachycephala rufiventris	Rufous Whistler				x			x	x	x
Family ARTAMIDAE										
Artamus cinereus	Black-faced Woodswallow				x			x	x	
Artamus cyanopterus	Dusky Woodswallow				x			x		
Family CRACTICIDAE										
Cracticus nigrogularis	Pied Butcherbird							x		
Cracticus tibicen	Australian Magpie				x			x		x
Cracticus torquatus	Grey Butcherbird							x		
Strepera versicolor	Grey Currawong				x			x	x	
Family RHIPIDURIDAE										
Rhipidura fuliginosa	Grey Fantail				x			x	x	x
Rhipidura leucophrys	Willie Wagtail				x			x		
Family CORVIDAE										
Corvus coronoides	Australian Raven				x			x	x	x
Family RHIPIDURIDAE										
Grallina cyanoleuca	Magpie-lark	Ma			x			x		
Myiagra inquieta	Restless Flycatcher				x			x		
Family PETROICIDAE										
Eopsaltria georgiana	White Breasted Robin				x			x	x	
Eopsaltria griseogularis	Western Yellow Robin				x			x		

APPENDIX K

FAUNA RECORDED IN CURRENT AND PREVIOUS SURVEYS

Appendix K3 - Birds

BIRDS		Conservation Codes								
Scientific Name	Common Name	EPBC	WC	DEC	A	B	C	D	E	F
Petroica boodang	Scarlet Robin				x			x	x	x
Petroica cucullata	Hooded Robin							x		
Petroica goodenovii	Red-capped Robin				x			x		
Family ACROCEPHALIDAE										
Acrocephalus australis	Australian Reed-warbler							x		
Family MEGALURIDAE										
Cincloramphus cruralis	Brown Songlark				x			x		
Cincloramphus cmathewsi	Rufous Songlark							x		
Megalurus gramineus	Little Grassbird							x		
Family ZOSTEROPIDAE										
Zosterops lateralis	Silvereye	Ma			x			x	x	x
Family HIRUNDINIDAE										
Hirundo neoxena	Welcome Swallow	Ma			x			x		
Petrochelidon ariel	Fairy Martin							x		
Petrochelidon nigricans	Tree Martin	Ma			x			x	x	
Family STURNIDAE										
Sturnus vulgaris	Common Starling				x					
Family DICAEIDAE										
Dicaeum hirundinaceum	Mistletoebird				x			x		
Family ESTRILIDAE										
Stagonopleura oculata	Red-eared Firetail				x			x	x	
Family MOTACILLIDAE										
Anthus australis	Australian Pipit; Richard's Pipit							x		

[X] fauna species recorded from the survey area.

[*] denotes introduced species.

APPENDIX K

FAUNA RECORDED IN CURRENT AND PREVIOUS SURVEYS

Appendix K4 - Mammals

Key: EPBC = Environmental Protection and Biodiversity Conservation Act 1999, WC = Wildlife Conservation Act 1950, DEC = Department of Conservation Priority Code, A = Listed in Naturemap, B= DEC Threatened and Priority Fauna Database, C= EPBC Act Protected Matters Search Tool (SEWPAC 2010), D = Listed by Birds Australia, E = Current Survey

Note: For Definitions of Conservation Codes see Appendix A.

MAMMALS		Conservation Codes								
Scientific Name	**Common Name**	**EPBC**	**WC**	**DEC**	**A**	**B**	**C**	**D**	**E**	**F**
Family DASYURIDAE										
Antechinus flavipes					x				x	
Dasyurus geoffroii	Western Quoll, Chuditch	VU	S1		x	x	x			
Phascogale tapoatafa ssp. (WAM M434)	Wambenger, Southern Brush-tailed Phascogale		S1		x	x				
Sminthopsis gilberti	Gilbert's Dunnart				x					
Sminthopsis grisenoventer	Grey-bellied Dunnart				x					
Family MYRMECOBIIDAE										
Myrmecobius fasciatus	Numbat	Vu			x					
Family POTORODIAE										
Bettongia pencillata ogilbyi	Brush-tailed Bettong, Woylie					x				
Family PERAMELIDAE										
Isoodon obesulus fusciventer	Southern Brown Bandicoot, Quenda			P5	x	x				
Family MACROPODIDAE										
Macropus fuliginosus	Western Grey Kangaroo				x				x	x
Macropus irma	Western Brush Wallaby			P4	x	x				
Setonix brachyurus	Quokka	VU	S1		x	x	x			
Family PHALANGERIDAE										
Trichosurus vulpecula vulpecula	Common Brushtail Possum				x				x	

APPENDIX K

FAUNA RECORDED IN CURRENT AND PREVIOUS SURVEYS

MAMMALS		Conservation Codes								
Scientific Name	**Common Name**	**EPBC**	**WC**	**DEC**	**A**	**B**	**C**	**D**	**E**	**F**
Family PSEUDOCHEIRIDAE										
Pseudocheirus occidentalis	Western Ringtail Possum	VU	S1			x				
Family BURRAMYIDAE										
Cercartetus concinnus	Western Pygmy-possum, Mundarda				x					
Family VESPERTILIONIDAE										
Chalinolobus gouldii	Gould's Wattled Bat				x				x	
Chalinolobus morio	Chocolate Wattled Bat				x				x	
Falsistrellus mackenziei	Western faulse Pipistrelle			P4	x	x			x	
Vespadelus regulus	Southern Forest Bat								x	
Family MOLOSSIDAE										
Mormopterus planiceps	Southern Freetail-bat				x				x	
Tadarida australis	White-striped Freetail-bat				x				x	
Family MURIDAE										
Hydromys chrysogaster	Water-rat			P4		x				
Rattus fuscipes	Western Bush Rat				x				x	
**Mus musculus*	House Mouse				x				x	
**Rattus rattus*	Black Rat				x				x	
Family LEPORIDAE										
**Oryctolagus cuniculus*	Rabbit						x			
Family CANIDAE										
**Canis lupus familiaris*	Dog								x	
**Vulpes vulpes*	Red Fox				x		x		x	
Family FELIDAE										
**Felis catus*	Cat						x			

APPENDIX K

FAUNA RECORDED IN CURRENT AND PREVIOUS SURVEYS

MAMMALS		Conservation Codes								
Scientific Name	Common Name	EPBC	WC	DEC	A	B	C	D	E	F
Family SUIDAE										
**Sus scrofa*	Pig				x		x		x	

[X] fauna species recorded from the survey area.
[*] denotes introduced species.

APPENDIX L
FAUNA HABITAT DATA SHEETS

APPENDIX L

FAUNA HABITAT DATA SHEETS

Habitat Assessment - HA 1

Broad Fauna Habitat: Marri/Jarrah Forest

UTM Co-ordinates 50H Easting: 412782 **Northing:** 6253783

Total Area of Habitat: 9.18ha

Proportion of Project Area: 26.24%

Habitat Structure and Microhabitats

Aspect:	South	**Exfoliating Slabs:**	None	
Soils:	Yellow brown sandy loam	**Surface rocks:**	Small: Few	Large: None
Boulders:	None	**Caves:**	None	Crevices: None
Cracks:	None	**Cliffs :**	None	
Ground Cover:	**Leaf Litter:** 95%	**Woody Debris:** 20%	**Bare Ground:** 0%	

Vegetation

Stratum	Vegetation Species	Cover	Height
Overstory	*Eucalyptus marginata, and Corymbia calophylla*	70%	12m
Midstory	*Banksia grandis* and *Pteridium esculentum*	2%	1m
Understory	Grasses and Herbs		0.3m
Condition Rating:	Excellent		
Fire Age	Very old appox. 12yrs		

Black Cockatoos Foraging Habitat

Feeding habitat	Species	% cover
Corymbia	*Corymbia calophylla*	10
Banksia	*Banksia grandis*	2
Other	*Eucalyptus marginata*	60

Habitat Assessment – HA 2

Broad Fauna Habitat: Marri/Jarrah Forest

UTM Co-ordinates 50H Easting: 412446 **Northing:** 6253518

Total Area of Habitat:
9.18ha

Proportion of Project Area:
26.24%

Habitat Structure and Microhabitats

Aspect:	Southwest	**Exfoliating Slabs:**	None	
Soils:	Brown sandy loam	**Surface rocks:**	Small: Moderate	Large: None
Boulders:	None	**Cliffs :**	None	
Cracks:	None	**Caves:**	None	Crevices: None

Ground Cover: **Leaf Litter:** 45% **Woody Debris:** 40% **Bare Ground:** 30%

Vegetation

Stratum	Vegetation Species	Cover	Height
Overstory	*Eucalyptus marginata, and Corymbia calophylla*	50%	12m
Midstory	*Banksia grandis, Acacia sp.*	10%	2m
Understory	Grasses and Herbs	20%	0.3m

Condition Rating: Excellent
Fire Age Moderate approx. 4-8yrs

Black Cockatoos Foraging Habitat

Feeding habitat	Species	% cover
Corymbia	*Corymbia calophylla*	25
Banksia	*Banksia grandis.*	8
Other	*Eucalyptus marginata*	25
Other	*Persoonia longifolia*	Presence

Habitat Assessment - HA 3

Broad Fauna Habitat: Marri/Jarrah Forest

UTM Co-ordinates 50H Easting: 411239 **Northing:** 6249937

Total Area of Habitat: 9.18ha

Proportion of Project Area: 26.24%

Habitat Structure and Microhabitats

Aspect:	South	**Exfoliating Slabs:**	None	
Soils:	Dark brown sandy loam	**Surface rocks:**	Small: Moderate	Large: None
Boulders:	None	**Cliffs :**	None	
Cracks:	None	**Caves:**	None	Crevices: None

Ground Cover: **Leaf Litter:** 80% **Woody Debris:** 10% **Bare Ground:** 1%

Vegetation

Stratum	Vegetation Species	Cover	Height
Overstory	*Eucalyptus marginata, and Corymbia calophylla*	30-70%	10-15m
Midstory	*Banksia grandis, Pteridium esculentum*	2-10%	1-2m
Understory	Grasses and Herbs	2-10%	0.3m
Condition Rating:	Excellent		
Fire Age	Approx. 4yrs		

Black Cockatoos Foraging Habitat

Feeding habitat	Species	% cover
Corymbia	*Corymbia calophylla*	40
Banksia	*Banksia sp.*	Presence
Other	*Eucalyptus marginata*	2
Other	*Hakea lissocarpha*	1

Habitat Assessment - HA 4

Broad Fauna Habitat: Major drainage

UTM Co-ordinates 50H Easting: 404295 **Northing:** 6247296

Total Area of Habitat: 0.58ha

Proportion of Project Area: 1.7%

Habitat Structure and Microhabitats

Aspect:	West	**Exfoliating Slabs:**	None	
Soils:	Brown loam clay	**Surface rocks:**	Small: Few	Large: None
Boulders:	None	**Cliffs :**	None	
Cracks:	None	**Caves:**	None	Crevices: None

Ground Cover: **Leaf Litter:** 5% **Woody Debris:** 1% **Bare Ground:** 0% **Vegetation:** -

Vegetation

Stratum	Vegetation Species	Cover	Height
Overstory	*Eucalyptus rudis*	2-10%	20m
Midstory	*Melaleuca sp.*	<2%	1.5m
Understory	Blackberry and Grasses		0.3-1.0m

Condition Rating: Degraded
Fire Age Approx. 4-8yrs

Black Cockatoos Foraging Habitat

Feeding habitat	Species	% cover
Corymbia	*Corymbia calophylla*	Presence
Banksia	*Banksia sp.*	Presence

Habitat Assessment - HA 5

Broad Fauna Habitat: Marri/Jarrah Forest

UTM Co-ordinates 50H Easting: 404261 **Northing:** 6247250

Total Area of Habitat: 9.18ha

Proportion of Project Area: 26.24%

Habitat Structure and Microhabitats

Aspect:	North	**Exfoliating Slabs:**	None	
Soils:	Brown grey sandy loam	**Surface rocks:**	Small: None	Large: None
Boulders:	None	**Cliffs :**	None	
Cracks:	None	**Caves:**	None	Crevices: None

Ground Cover: **Leaf Litter:** 30% **Woody Debris:** 35% **Bare Ground:** 0%

Vegetation

Stratum	Vegetation Species	Cover	Height
Overstory	*Eucalyptus rudis*	30-70%	20m
Midstory	N/A		
Understory	Weeds	10-30%	0.3m
Condition Rating:	Degraded		
Fire Age	Moderate approx. 12yrs		

Black Cockatoos Foraging Habitat

Feeding habitat	Species	% cover
N/A		

APPENDIX M
LOCATION OF MATURE TREES FOR BLACK COCKATOOS

APPENDIX M

LOCATION OF MATURE TREES FOR BLACK COCKATOOS

Habitat Tree	Species Name	#Eastings	#Northings	DBH (mm)	Number of Mature Trees	Foraging Species	Size of Hollows
HT1	*Corymbia calophylla*	413140	6253955	555	1	Yes	N/A
HT2	*Corymbia calophylla*	413140	6253955	910	1	Yes	N/A
HT3	*Corymbia calophylla*	413111	6253933	780	1	Yes	N/A
HT4	*Corymbia calophylla*	413108	6253933	620	1	Yes	N/A
HT5	*Corymbia calophylla*	413108	6253933	680	1	Yes	N/A
HT6	*Corymbia calophylla*	413168	6254470	1320	1	Yes	Medium
HT7	*Corymbia calophylla*	413165	6254466	1045	1	Yes	N/A
HT8	*Corymbia calophylla*	413157	6254457	630	1	Yes	N/A
HT9	*Corymbia calophylla*	413166	6254451	505	1	Yes	N/A
HT10	*Corymbia calophylla*	413181	6254453	1060	1	Yes	N/A
HT11	*Corymbia calophylla*	413196	6254460	1212	1	Yes	N/A
HT12	*Eucalyptus marginata*	413196	6254471	570	1	Yes	N/A
HT13	*Corymbia calophylla*	413201	6254475	565	1	Yes	N/A
HT14	*Corymbia calophylla*	413203	6254479	900	1	Yes	N/A
HT15	*Corymbia calophylla*	413215	6254485	900	1	Yes	N/A
HT16	*Corymbia calophylla*	413237	6254502	500	1	Yes	N/A
HT17	*Corymbia calophylla*	413238	6254502	665	1	Yes	N/A
HT18	*Corymbia calophylla*	413241	6254522	785	1	Yes	N/A
HT19	*Corymbia calophylla*	413213	6254526	540	1	Yes	N/A
HT20	*Corymbia calophylla*	413209	6254526	760	1	Yes	N/A
HT21	*Corymbia calophylla*	413210	6254526	720	1	Yes	N/A

Habitat Tree	Species Name	#Eastings	#Northings	DBH (mm)	Number of Mature Trees	Foraging Species	Size of Hollows
HT22	*Corymbia calophylla*	413215	6254537	560	1	Yes	N/A
HT23	*Corymbia calophylla*	413213	6254549	570	1	Yes	N/A
HT24	*Corymbia calophylla*	413210	6254557	535	1	Yes	N/A
HT25	*Corymbia calophylla*	413181	6254555	515	1	Yes	N/A
HT26	*Corymbia calophylla*	413173	6254570	670	1	Yes	N/A
HT27	*Corymbia calophylla*	413154	6254591	585	1	Yes	N/A
HT28	*Corymbia calophylla*	413145	6254576	670	1	Yes	N/A
HT29	*Corymbia calophylla*	413162	6254545	600	1	Yes	N/A
HT30	*Corymbia calophylla*	413147	6254549	570	1	Yes	N/A
HT31	*Corymbia calophylla*	413133	6254530	570	1	Yes	N/A
HT32	*Corymbia calophylla*	413154	6254515	985	1	Yes	N/A
HT33	*Corymbia calophylla*	413151	6254508	530	1	Yes	N/A
HT34	*Corymbia calophylla*	413142	6254505	510	1	Yes	N/A
HT35	*Corymbia calophylla*	413127	6254517	525	1	Yes	N/A
HT36	*Corymbia calophylla*	413121	6254520	560	1	Yes	N/A
HT37	*Corymbia calophylla*	413125	6254493	550	1	Yes	N/A
HT38	*Corymbia calophylla*	413137	6254483	500	1	Yes	N/A
HT39	*Corymbia calophylla*	413137	6254483	625	1	Yes	N/A
HT40	*Corymbia calophylla*	413149	6254497	570	1	Yes	N/A
HT41	*Corymbia calophylla*	413155	6254491	920	1	Yes	N/A
HT42	*Corymbia calophylla*	413206	6254278	660	1	Yes	N/A
HT43	*Corymbia calophylla*	412452	6253163	517	1	Yes	N/A
HT44	*Corymbia calophylla*	412458	6253155	680	1	Yes	N/A
HT45	*Corymbia calophylla*	412462	6253144	590	1	Yes	N/A
HT46	*Eucalyptus marginata*	412501	6252759	630	1	Yes	N/A
HT47	*Corymbia calophylla*	412504	6252742	600	1	Yes	N/A

Habitat Tree	Species Name	#Eastings	#Northings	DBH (mm)	Number of Mature Trees	Foraging Species	Size of Hollows
HT48	*Corymbia calophylla*	412508	6252728	580	1	Yes	N/A
HT49	*Eucalyptus marginata*	412161	6251654	540	1	Yes	N/A
HT50	*Corymbia calophylla*	411791	6251291	770	1	Yes	N/A
HT51	*Corymbia calophylla*	411413	6251169	725	1	Yes	N/A
HT52	*Corymbia calophylla*	411383	6251159	760	1	Yes	N/A
HT53	*Corymbia calophylla*	411375	6251160	540	1	Yes	N/A
HT54	*Corymbia calophylla*	411371	6251158	530	1	Yes	N/A
HT55	*Corymbia calophylla*	411294	6251157	710	1	Yes	N/A
HT56	*Corymbia calophylla*	411209	6251041	520	1	Yes	Medium
HT57	*Corymbia calophylla*	411209	6251041	650	1	Yes	N/A
HT58	*Eucalyptus marginata*	411198	6251038	665	1	Yes	N/A
HT59	*Corymbia calophylla*	411171	6250993	700	1	Yes	N/A
HT60	*Dead Stag*	411162	6250967	900	1	No	Large
HT61	*Corymbia calophylla*	411154	6250906	540	1	Yes	N/A
HT62	*Eucalyptus marginata*	411151	6250958	785	1	Yes	N/A
HT63	*Corymbia calophylla*	411151	6250958	905	1	Yes	N/A
HT64	*Corymbia calophylla*	411130	6250981	580	1	Yes	N/A
HT65	*Eucalyptus marginata*	411132	6250968	780	1	Yes	N/A
HT66	*Eucalyptus marginata*	411132	6250968	620	1	Yes	N/A
HT67	*Eucalyptus marginata*	411107	6250901	710	1	Yes	N/A
HT68	*Eucalyptus marginata*	411094	6250883	920	1	Yes	Medium
HT69	*Corymbia calophylla*	411095	6250879	930	1	Yes	N/A
HT70	*Eucalyptus marginata*	411092	6250848	640	1	Yes	N/A
HT71	*Eucalyptus marginata*	411097	6250726	785	1	Yes	N/A
HT72	*Eucalyptus marginata*	411099	6250681	840	1	Yes	N/A
HT73	*Eucalyptus marginata*	411103	6250670	740	1	Yes	N/A

Habitat Tree	Species Name	#Eastings	#Northings	DBH (mm)	Number of Mature Trees	Foraging Species	Size of Hollows
HT74	*Corymbia calophylla*	411146	6250543	650	1	Yes	N/A
HT75	*Corymbia calophylla*	411278	6250985	940	1	Yes	N/A
HT76	*Corymbia calophylla*	411146	6250932	615	1	Yes	N/A
HT77	*Eucalyptus marginata*	411157	6250913	610	1	Yes	N/A
HT78	*Eucalyptus marginata*	411122	6250877	535	1	Yes	N/A
HT79	*Corymbia calophylla*	411121	6250864	800	1	Yes	N/A
HT80	*Eucalyptus marginata*	411121	6250862	600	1	Yes	N/A
HT81	*Eucalyptus marginata*	411116	6250838	700	1	Yes	N/A
HT82	*Eucalyptus marginata*	411119	6250829	720	1	Yes	N/A
HT83	*Eucalyptus marginata*	411118	6250828	930	1	Yes	N/A
HT84	*Eucalyptus marginata*	411122	6250757	520	1	Yes	N/A
HT85	*Eucalyptus marginata*	411120	6250751	725	1	Yes	N/A
HT86	*Corymbia calophylla*	411121	6250747	570	1	Yes	N/A
HT87	*Corymbia calophylla*	411126	6250710	690	1	Yes	N/A
HT88	*Corymbia calophylla*	411127	6250700	540	1	Yes	N/A
HT89	*Corymbia calophylla*	411133	6250652	640	1	Yes	N/A
HT90	*Corymbia calophylla*	411138	6250636	550	1	Yes	N/A
HT91	*Corymbia calophylla*	411132	6250620	835	1	Yes	N/A
HT92	*Eucalyptus marginata*	411140	6250607	675	1	Yes	N/A
HT93	*Corymbia calophylla*	411139	6250590	540	1	Yes	N/A
HT94	*Eucalyptus marginata*	411139	6250564	660	1	Yes	N/A
HT95	*Corymbia calophylla*	411156	6250493	850	1	Yes	N/A
HT96	*Corymbia calophylla*	411155	6250494	700	1	Yes	N/A
HT97	*Corymbia calophylla*	411152	6250493	1020	1	Yes	N/A
HT98	*Corymbia calophylla*	411169	6250431	840	1	Yes	N/A
HT99	*Eucalyptus marginata*	411164	6250429	620	1	Yes	N/A

Habitat Tree	Species Name	#Eastings	#Northings	DBH (mm)	Number of Mature Trees	Foraging Species	Size of Hollows
HT100	*Eucalyptus marginata*	411166	6250422	630	1	Yes	N/A
HT101	*Eucalyptus marginata*	411166	6250422	660	1	Yes	N/A
HT102	*Eucalyptus marginata*	411174	6250396	680	1	Yes	N/A
HT103	*Eucalyptus marginata*	411174	6250396	570	1	Yes	N/A
HT104	*Eucalyptus marginata*	411171	6250385	660	1	Yes	N/A
HT105	*Dead Stag*	411171	6250385	540	1	No	N/A
HT106	*Eucalyptus marginata*	411175	6250338	690	1	Yes	N/A
HT107	*Corymbia calophylla*	411175	6250338	530	1	Yes	N/A
HT108	*Corymbia calophylla*	411183	6250313	730	1	Yes	N/A
HT109	*Eucalyptus marginata*	411181	6250291	790	1	Yes	N/A
HT110	*Eucalyptus marginata*	411187	6250282	660	1	Yes	N/A
HT111	*Corymbia calophylla*	411187	6250265	590	1	Yes	N/A
HT112	*Eucalyptus marginata*	411192	6250235	730	1	Yes	N/A
HT113	*Eucalyptus marginata*	411192	6250235	760	1	Yes	N/A
HT114	*Corymbia calophylla*	411202	6250206	530	1	Yes	N/A
HT115	*Eucalyptus marginata*	411201	6250204	505	1	Yes	N/A
HT116	*Eucalyptus marginata*	411202	6250175	925	1	Yes	N/A
HT117	*Eucalyptus marginata*	411200	6250158	690	1	Yes	N/A
HT118	*Eucalyptus marginata*	411200	6250148	610	1	Yes	N/A
HT119	*Corymbia calophylla*	411209	6250120	950	1	Yes	N/A
HT120	*Corymbia calophylla*	411208	6250107	550	1	Yes	N/A
HT121	*Eucalyptus marginata*	411218	6250061	880	1	Yes	N/A
HT122	*Corymbia calophylla*	411218	6250061	900	1	Yes	N/A
HT123	*Eucalyptus marginata*	411230	6250022	830	1	Yes	N/A
HT124	*Eucalyptus marginata*	411227	6249978	1040	1	Yes	Medium
HT125	*Dead Stag*	411229	6249964	595	1	No	N/A

Habitat Tree	Species Name	#Eastings	#Northings	DBH (mm)	Number of Mature Trees	Foraging Species	Size of Hollows
HT126	*Eucalyptus marginata*	411229	6249964	580	1	Yes	N/A
HT127	*Eucalyptus marginata*	411235	6249960	760	1	Yes	N/A
HT128	*Corymbia calophylla*	411244	6249929	860	1	Yes	N/A
HT129	*Corymbia calophylla*	411244	6249922	615	1	Yes	N/A
HT130	*Corymbia calophylla*	411244	6249886	680	1	Yes	N/A
HT131	*Corymbia calophylla*	411249	6249871	540	1	Yes	N/A
HT132	*Eucalyptus marginata*	411248	6249754	650	1	Yes	N/A
HT133	*Eucalyptus marginata*	411249	6249744	575	1	Yes	N/A
HT134	*Eucalyptus marginata*	411249	6249740	780	1	Yes	N/A
HT135	*Eucalyptus marginata*	411247	6249670	760	1	Yes	N/A
HT136	*Eucalyptus marginata*	411231	6249612	790	1	Yes	N/A
HT137	*Eucalyptus marginata*	411230	6249593	810	1	Yes	N/A
HT138	*Corymbia calophylla*	411230	6249593	630	1	Yes	N/A
HT139	*Corymbia calophylla*	411226	6249536	500	1	Yes	N/A
HT140	*Corymbia calophylla*	411225	6249518	690	1	Yes	N/A
HT141	*Dead Stag*	411220	6249504	1230	1	No	N/A
HT142	*Corymbia calophylla*	411214	6249473	545	1	Yes	N/A
HT143	*Eucalyptus marginata*	411211	6249462	1145	1	Yes	N/A
HT144	*Eucalyptus marginata*	411215	6249452	720	1	Yes	N/A
HT145	*Eucalyptus marginata*	411208	6249417	775	1	Yes	N/A
HT146	*Corymbia calophylla*	411193	6249377	670	1	Yes	N/A
HT147	*Corymbia calophylla*	411167	6249304	740	1	Yes	N/A
HT148	*Corymbia calophylla*	411159	6249286	525	1	Yes	N/A
HT149	*Corymbia calophylla*	411141	6249267	670	1	Yes	N/A
HT150	*Corymbia calophylla*	411134	6249236	725	1	Yes	N/A
HT151	*Corymbia calophylla*	411129	6249229	605	1	Yes	N/A

Habitat Tree	Species Name	#Eastings	#Northings	DBH (mm)	Number of Mature Trees	Foraging Species	Size of Hollows
HT152	*Dead Stag*	411129	6249229	1405	1	No	Large
HT153	*Corymbia calophylla*	411119	6249209	625	1	Yes	N/A
HT154	*Corymbia calophylla*	411088	6249152	515	1	Yes	N/A
HT155	*Corymbia calophylla*	411081	6249136	550	1	Yes	N/A
HT156	*Eucalyptus marginata*	411078	6249134	620	1	Yes	N/A
HT157	*Corymbia calophylla*	411068	6249123	550	1	Yes	N/A
HT158	*Corymbia calophylla*	411058	6249106	730	1	Yes	N/A
HT159	*Corymbia calophylla*	411049	6249088	540	1	Yes	N/A
HT160	*Eucalyptus marginata*	411046	6249074	550	1	Yes	N/A
HT161	*Eucalyptus marginata*	411046	6249074	555	1	Yes	N/A
HT162	*Corymbia calophylla*	411046	6249074	735	1	Yes	N/A
HT163	*Eucalyptus marginata*	411042	6249065	620	1	Yes	N/A
HT164	*Corymbia calophylla*	411033	6249041	505	1	Yes	N/A
HT165	*Eucalyptus marginata*	411032	6249039	605	1	Yes	N/A
HT166	*Corymbia calophylla*	411030	6249035	535	1	Yes	N/A
HT167	*Corymbia calophylla*	411027	6249028	730	1	Yes	N/A
HT168	*Corymbia calophylla*	411027	6249028	540	1	Yes	N/A
HT169	*Corymbia calophylla*	410980	6248387	585	1	Yes	N/A
HT170	*Corymbia calophylla*	410980	6248387	640	1	Yes	N/A
HT171	*Corymbia calophylla*	410980	6248387	500	1	Yes	N/A
HT172	*Dead Stag*	407415	6247533	1350	1	No	Large (75cm)
HT173	*Corymbia calophylla*	407380	6247532	1265	1	Yes	N/A
HT174	*Corymbia calophylla*	407368	6247538	980	1	Yes	N/A
HT175	*Eucalyptus marginata*	407354	6247539	590	1	Yes	N/A
HT176	*Dead Stag*	407359	6247542	800	1	No	Large
HT177	*Corymbia calophylla*	407280	6247529	1350	1	Yes	Large

Habitat Tree	Species Name	#Eastings	#Northings	DBH (mm)	Number of Mature Trees	Foraging Species	Size of Hollows
HT178	*Corymbia calophylla*	407183	6247531	1940	1	Yes	N/A
HT179	*Eucalyptus marginata*	407165	6247258	650	1	Yes	N/A
HT180	*Eucalyptus marginata*	407137	6247527	500	1	Yes	N/A
HT181	*Eucalyptus marginata*	407128	6247528	850	1	Yes	N/A
HT182	*Eucalyptus marginata*	407128	6247528	1050	1	Yes	N/A
HT183	*Corymbia calophylla*	407120	6247528	540	1	Yes	N/A
HT184	*Corymbia calophylla*	407084	6247529	505	1	Yes	N/A
HT185	*Corymbia calophylla*	407022	6247527	550	1	Yes	N/A
HT186	*Eucalyptus marginata*	406977	6247526	900	1	Yes	N/A
HT187	*Corymbia calophylla*	406815	6247532	745	1	Yes	N/A
HT188	*Eucalyptus marginata*	406815	6247535	840	1	Yes	N/A
HT189	*Corymbia calophylla*	404542	6247691	740	1	Yes	N/A
HT190	*Eucalyptus marginata*	404539	6247687	540	1	Yes	N/A
HT191	*Eucalyptus marginata*	404316	6247319	1340	1	Yes	N/A
HT192	*Corymbia calophylla*	404314	6247303	740	1	Yes	N/A
HT193	*Corymbia calophylla*	404315	6247302	500	1	Yes	N/A
HT194	*Corymbia calophylla*	404309	6247306	1240	1	Yes	N/A
HT195	*Corymbia calophylla*	404304	6247298	1500	1	Yes	N/A
HT196	*Corymbia calophylla*	404308	6247294	1000	1	Yes	N/A
HT197	*Dead Stag*	404308	6247294	1000	1	No	Medium
HT198	*Eucalyptus rudis*	404274	6247275	1240	1	No	N/A
HT199	*Corymbia calophylla*	404308	6247277	625	1	Yes	N/A
HT200	*Eucalyptus rudis*	404528	6246670	540	1	No	N/A
HT201	*Dead Stag*	404525	6246674	920	1	No	N/A
HT202	*Eucalyptus rudis*	404264	6247238	660	1	No	N/A
HT203	*Eucalyptus rudis*	404256	6247248	1290	1	No	N/A

Habitat Tree	Species Name	#Eastings	#Northings	DBH (mm)	Number of Mature Trees	Foraging Species	Size of Hollows
HT204	*Eucalyptus rudis*	404263	6247251	710	1	No	N/A
HT205	*Eucalyptus rudis*	404257	6247228	1000	1	No	N/A
HT206	*Eucalyptus rudis*	404245	6247221	800	1	No	N/A
HT207	*Corymbia calophylla*	404239	6247217	500	1	Yes	N/A
HT208	*Dead Stag*	404237	6247207	865	1	No	N/A
HT209	*Eucalyptus rudis*	404227	6247204	1500	1	No	N/A
HT210	*Eucalyptus rudis*	404225	6247199	550	1	No	N/A
HT211	*Corymbia calophylla*	404387	6247044	1040	1	Yes	N/A

#Australian Geocentric 1994 (GDA94) Zone 50H

Definition of Hollow Size

size	Diameter
Small	Under 10 cm diameter
Medium	10-20 cm diameter
Large	20 cm or more