White Mountain Project
EPC1260
Wet Season Flora and Fauna Report 2012

NRA Environmental Consultants

NATURAL RESOURCE ASSESSMENT AND MANAGEMENT

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13 July 2012

Guildford Coal Ltd
Level 7, 490 Upper Edward St
BRISBANE QLD 4000

Attention: Mark Turner

Dear Mark

RE: White Mountain Project EPC1260 – Wet Season Flora and Fauna Report 2012

Please find enclosed the final report for the wet season flora and fauna survey undertaken at the White Mountain Project (EPC1260) by NRA Environmental Consultants (NRA) in 2012.

The final report addresses comments received from Guildford Coal Ltd (Mark Turner) and Environmental and Licensing Professionals P/L & Muddy Boots (Peter Allen).

The report provides guidance on additional flora and fauna surveys recommended as part of the baseline survey works.

If you have any questions regarding the enclosed report please do not hesitate to contact me.

Yours sincerely

NRA Environmental Consultants

S Wetherall

Shannon Wetherall
Senior Environmental Scientist

Encl: White Mountains Project EPC1260 - Wet Season Flora and Fauna Report (1 x hardcopy and 1 x CD).
Cc: Peter Allen, ELP

Document Control Summary

NRA Environmental Consultants

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Report Summary	
Key Words	Guildford Coal, White Mountain, flora, fauna, regional ecosystems, wet season
Abstract	NRA conducted a wet season flora and fauna survey for Guildford Coal Ltd for the western part of the White Mountain EPC1260. This report presents the approach, results and recommendations of the baseline survey.

Quality Assurance					
Author	**Technical Review**	**Editor**	**Document Version**	**Approved for Issue by QA Manager**	
				Date	**Signature**
Ing Toh PhD, BSc(Hons) Terry Reis BSc(Hons)	Shannon Wetherall BAppSc (Hons)	Alison Darroch MA, BA	R02	13/7/2012	

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Summary

NRA Environmental Consultants (NRA) was commissioned by Guildford Coal Ltd (Guildford) to conduct a flora and fauna Survey of the White Mountain project area (EPC 1250). The survey was undertaken during the 2012 wet season.

The field survey identified the following.

- Two fauna species listed as Vulnerable under Commonwealth and/or State legislation (the *Environment Protection and Biodiversity Conservation* Act (EPBC Act) and the *Nature Conservation* Act 1992 (NC Act) respectively) were recorded: Squatter Pigeon (southern subspecies) was observed and Koala calls were heard. Squatter Pigeon was expected to occur. Koala is known from the nearby White Mountains National Park.
- Two flora species listed under Commonwealth and/or State legislation were recorded. *Dichanthium setosum* is listed as Vulnerable under the EPBC Act and Near Threatened under the NC Act. *Desmodium macrocarpum* is listed as Near Threatened under the NC Act.
- One species listed as Migratory under the EPBC Act was recorded: Rainbow Bee-eater. This species was expected to occur.

Access constraints meant that the area to the east of the Flinders River was not surveyed.

Logistical constraints meant that fauna trapping was only conducted in ironbark woodland, the overwhelmingly dominant habitat type on site.

1. Introduction

1.1 Context

NRA Environmental Consultants (NRA) was commissioned by Guildford Coal Ltd (Guildford) to conduct a flora and fauna Survey during the 2012 wet season for the White Mountain project area. Prior to this commission, Environmental and Licensing Professionals P/L & Muddy Boots (ELP) commissioned Biodiversity Assessment and Management P/L (BAAM) to provide a desktop flora and fauna assessment and a scope for future fieldwork on exploration permit for coal EPC1260. Guildford proposes to develop the White Mountain project area as a coal mine. The desktop report recommended that a description of the existing ecological values of the project area be prepared. The report that follows documents the results of the 2012 baseline wet season flora and fauna field survey conducted by NRA to fulfil BAAM's recommendation.

1.2 Project Description

Exploration permit for coal EPC1260 has been acquired to enhance the Hughenden Project in north Queensland. EPC1260 adjoins EPC1250 which covers the old White Mountain Coal Mine where the Permian Betts Creek coal seams were mined (Guildford Coal, 2011). The White Mountain Project is a potential early stage development opportunity in the Hughenden Project. The Hughenden Project is located in the northern end of the coal bearing Galilee Basin in Queensland and covers approximately 16,500 km^2 of exploration permits for coal (Guildford, 2011). The project is targeting substantial export thermal coal tonnages with open cut and underground mining potential.

1.3 Site Description

The project site is on EPC1260 in north Queensland (**Figure 1**). The EPC covers approximately 44,000 ha and is within two bioregions: the Einasleigh Uplands and the Desert Uplands (Sattler & Williams 1999). This report is concerned only with the western extent of EPC1260, which is almost wholly contained in the Einasleigh Uplands, with only a small extent in the Desert Uplands (**Figure 1**). This area (the study area) is approximately 7,970 ha and lies in the Southern Gulf Natural Resource Management (NRM) catchment with the Flinders River running north-south through the tenement.

2. Methods

2.1 Desktop assessment

The report *Desktop Terrestrial Flora and Fauna Assessment and Study Scoping* documents a desktop assessment of EPC1260 conducted by Biodiversity Assessment and Management P/L (BAAM 2012).

2.2 Field survey

2.2.1 Flora

NRA botanist, Ing Toh, conducted a wet season flora survey of the survey area from 30 March to 3 April 2012 inclusive.

Tertiary and Quaternary field data was collected as per Neldner *et al*. (2005). A minimum of one transect survey (with more transects in extensive Regional Ecosystems) and multiple point observations were conducted at each Regional Ecosystem (RE) visited.

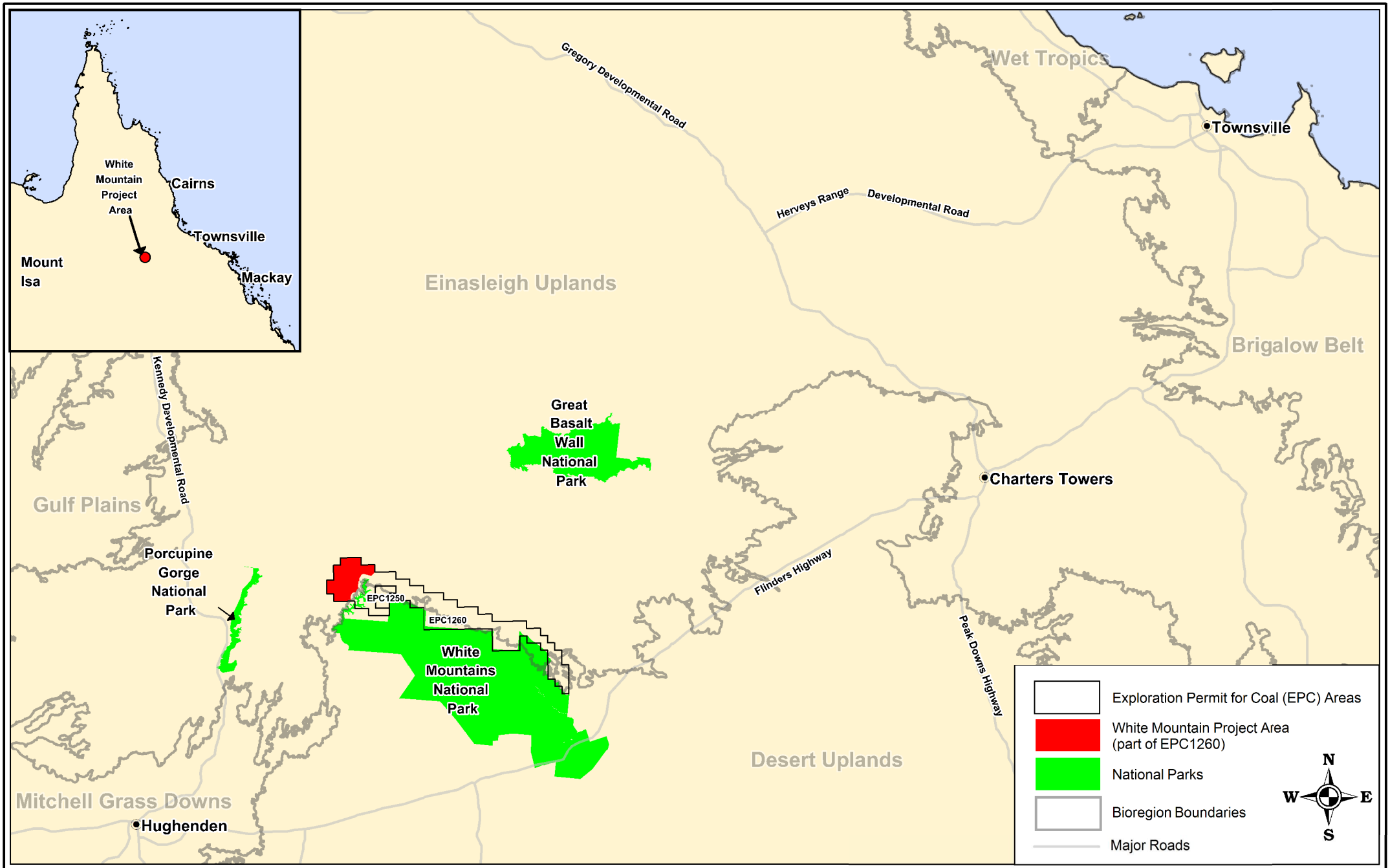
Habitat integrity, species composition and the presence of weeds and other pre-operational degrading factors were noted. Conservation significant species and their habitat were searched for as part of the field survey and opportunistically while traversing the survey area.

2.2.2 Fauna

Two NRA ecologists, Terry Reis and Kate Grundy, conducted a wet season fauna survey of the survey area from 30 March to 3 April 2012 inclusive. Five trap sites (**Figure 2**) were established.

The following methods were used at each of the trap sites.

- Surveillance cameras, targeting Northern Quoll *Dasyurus hallucatus*, but also collecting opportunistic data on other species.
- Elliott traps, targeting small mammals but also capturing some reptile and frog species.
- Cage traps, targeting medium-sized mammals.
- Funnel traps, targeting reptiles.
- Pitfall traps, targeting small mammals, reptiles and frogs.
- Anabat (ultrasonic detector), targeting micro-bats.
- Bird survey.
- Active searching, targeting small mammals, reptiles and frogs.
- Spotlighting, including active searching for nocturnal reptiles.
- Harp trapping, conducted on two of the sites that had adequate flyways (ie The trap sites 2 and 4).



PROJECT: White Mountain Project EPC1260 Wet Season Flora and Fauna Report
TITLE: White Mountain Project Area Location Map

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JOB NO: 376001
DATE: June 2012
SOURCE: NRA, Google Earth

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Figure 1

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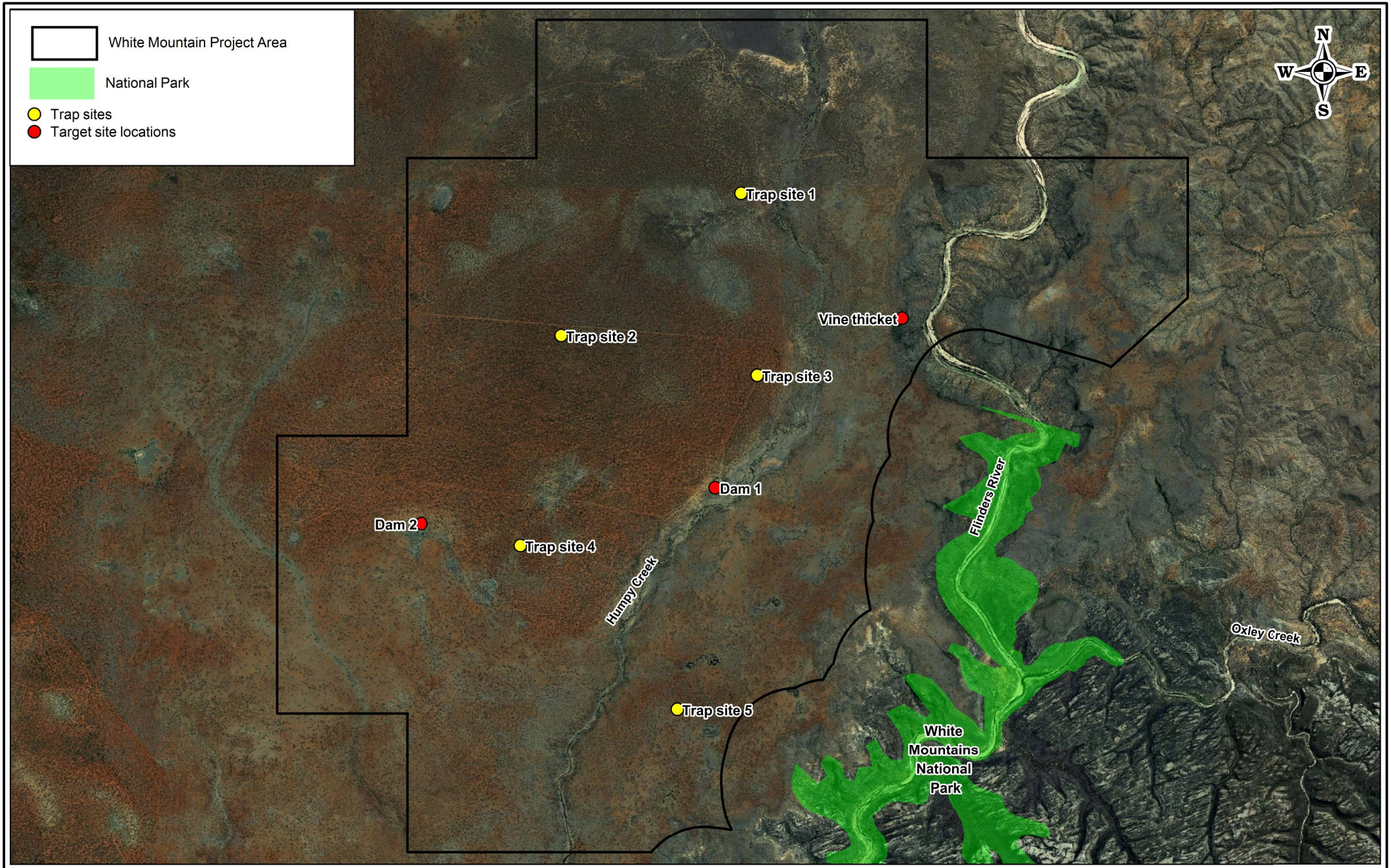

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PROJECT: White Mountain Project EPC1260 Wet Season Flora and Fauna Report
TITLE: Fauna Trap Sites and Target Site Locations

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JOB NO: 376001
DATE: June 2012
SOURCE: NRA, Google Earth

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Figure 2

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Methods used elsewhere in the survey area were as follows.

- Direct diurnal observation, continuous opportunistic recording.
- Targeted waterhole and creek surveys.
- Targeted vine thicket survey.
- Opportunistic spotlighting.
- Harp trapping.
- Qualitative assessment of fauna habitat values.

Techniques used were consistent with draft survey techniques for impact assessment developed by NRA (NRA 2011) in response to Queensland Department of Environment and Heritage Protection (DEHP, formerly DERM) requirements for input into the impact assessment process. At the time of writing this report these guidelines had been provided to DEHP.

Site selection was based on micro-habitat and resource availability and reflected the dominance of ironbark woodland on the site. Traps were checked at or soon after dawn to ensure the welfare of any captured animals. As a result trapping was not conducted in some habitats on-site, such as vine thicket, due to a lack of adequate vehicle access.

3. Results

3.1 Flora

The vegetation community in the study area is predominantly ironbark woodlands with minor occurrences of other community types.

3.1.1 Regional Ecosystems

Regional Ecosystems (REs) in the study area that have been mapped by DERM (now DEHP) are described in **Table 1**. These descriptions include dominant and, in mixed polygons, sub-dominant REs. Representative units of most of the area west of the Flinders River, including limited portions of the west bank of the river within the valley were assessed. The major vegetation communities encountered are described in **Table 2**. Apart from several REs which could not be accessed, the major mapped REs were verified as being present.

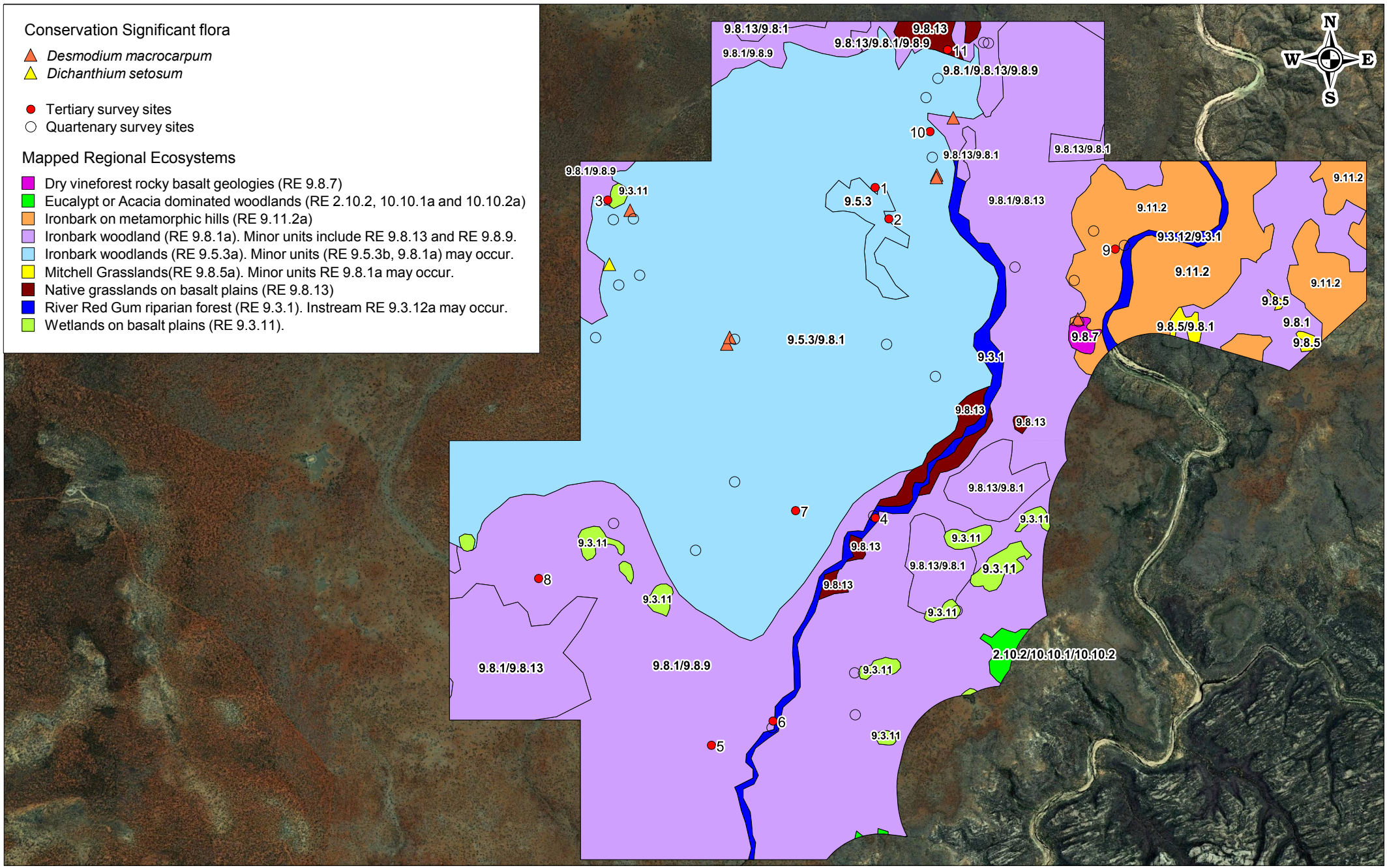
Table 1: Mapped Regional Ecosystems (DERM version 6.1)

RE Number	Short Description[1]	Biodiversity Status	VM Act Class[2]	Site Survey
2.10.2	Mixed eucalypt woodland on plateaus, mesas and scarps on shallow soils	No concern at present	Least concern	Not assessed[3]
9.3.1	*Eucalyptus camaldulensis* or *E. tereticornis* +/- *Casuarina cunninghamiana* +/- *Melaleuca* spp. fringing woodland on channels and levees. Generally on eastern flowing rivers	**Of concern**	Least concern	Present
9.3.11	Wetlands (sometimes ephemeral) with aquatic species and fringed with *Eucalyptus* spp. communities on basalt plains	**Of concern**	Least concern	Present
9.3.12a	River beds and associated waterholes	**Of concern**	Least concern	Present
9.5.3a, 9.5.3b	*Eucalyptus crebra* (*sens. lat.*) +/- *Eucalyptus* spp. +/- *Corymbia* spp. woodland on kandosols	No concern at present	Least concern	Present
9.8.1a	*Eucalyptus crebra* (*sens. lat.*) or *E. cullenii* +/- *Corymbia erythrophloia* +/- *E. leptophleba* woodland on plains and rocky rises of basalt geologies	No concern at present	Least concern	Present
9.8.5a	*Astrebla* spp. +/- *Iseilema vaginiflorum* tussock grassland +/- emergent *Corymbia terminalis* on basalt plains	No concern at present	Least concern	Not assessed[3]
9.8.9	*Eucalyptus orgadophila* +/- *Corymbia* spp. open woodland to woodland on basalt plains and rocky basalt hills	No concern at present	Least concern	Present
9.8.13	*Dichanthium* spp. or *Bothriochloa* spp. +/- *Iseilema* spp. tussock grassland on basalt plains	No concern at present	Least concern	Present
9.11.2a, 9.11.2b	*Eucalyptus crebra* (*sens. lat.*) dominated woodland +/- *Corymbia* spp. on shallow texture contrast soils on low hills and lowlands	No concern at present	Least concern	Present
10.10.1a	*Acacia shirleyi* woodland or *A. catenulata* low open woodland on sandstone ranges	No concern at present	Least concern	Not assessed[3]
10.10.2a	*Acacia burdekensis* or *A. julifera* low open woodland and bare rock platforms on sandstone ranges	No concern at present	Least concern	Not assessed[3]

[1] reference DERM 2012a [2] *Vegetation Management Act* 1999

[3] Not assessed during the field survey due to access constraints.

Figure 3 displays the DERM mapped REs amended to show some field assessed changes to the vegetation communities, specifically the more extensive presence of wetlands (RE 9.3.11) and a vineforest dominated community (RE 9.8.7) not previously mapped.



PROJECT: White Mountain Project EPC1260 Wet Season Flora and Fauna Report
TITLE: Mapped Regional Ecosystems

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JOB NO: 376001
DATE: June 2012
SOURCE: NRA, Google Earth

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Figure 3

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Table 2: Vegetation Communities encountered during the field assessment

Vegetation Community	RE equivalent	General Site Description[1]	Representative Photo
Riparian Forest	9.3.1	Open forest community of River Red Gum on river and creek banks. This community is generally in good condition although subject to weed invasion at some locations. Existing impacts include introduced species and grazing. Emergents: (18 m - 20 m): *Eucalyptus camaldulensis* T1 (14 m - 18 m): *Eucalyptus camaldulensis* (d) T2 (10 m – 14 m): *Casuarina cunninghamiana* (a) Shrub: None (Site 4) or *Melaleuca bracteata* (d) at Site 6. Ground: (0.5 m): *Heteropogon contortus* (a), *Bothriochloa pertusa* (a), **Sida rhombifolia* (f), *Bothriochloa bladhii* (f). Other species present (in no particular order): **Euphorbia hirta*, *Tephrosia* sp., **Senna occidentalis*, *Sida hackettiana*, *Lomandra longifolia*, **Stylosanthes humilis*, *Arundinella setosa*, **Xanthium pungens*. Tertiary sites 4 & 6.	
Ephemeral Swamps	9.3.11	Open swamp fringed by eucalypt trees around the edges. This community appeared to be intact although there were indications of seasonally heavy grazing pressure and a low (although relatively higher than the surrounding communities) but diverse weed flora. Due to the high level of the water in the swamp, the survey transect was on the eucalypt dominated edge of this community and not optimal. *Eleocharis ochrostachys* was the dominant groundcover in the swamp. Emergents: Absent. T1 (12 m – 16 m): *Eucalyptus camaldulensis* (d) T2 (8 m – 10 m): *Eucalyptus crebra* (a), *Eucalyptus camaldulensis* (a) Shrub: Absent. Ground: (0.5 m – 1 m): *Heteropogon contortus* (d), *Bothriochloa bladhii* (a), *Themeda triandra* (a), **Melinis repens* (f) Other species present (in no particular order): *Tephrosia* sp, *Cajanus reticulatus*, *Indigofera linnaei*, *Galactia* sp, *Glycine tomentella*, *Aristida* sp., *Zornia muriculata*, *Lobelia leucotos*, *Crotalaria montana*, *Alternanthera denticulata*. Tertiary site 3.	

Vegetation Community	RE equivalent	General Site Description[1]	Representative Photo
River Bed	9.3.12a	Visual assessment indicates that this RE is correctly mapped *ie* generally sandy bed with occasional instream vegetation comprising Red River Gum *Eucalyptus camaldulensis* and Black Teatree *Melaleuca bracteata*. Quaternary site.	
Ironbark Woodlands	9.5.3a	Open ironbark woodland community on plains of dark brown silty sand. The community is in good condition with fire and grazing the main disturbances. Introduced species were a minor component. Emergent: Absent. T1 (10 m – 12 m): *Eucalyptus crebra* (*sens. lat*.) (d) T2 (8 m): *Eucalyptus crebra* (*sens. lat*.) (d) Shrub: (4 m): *Petalostigma pubescens* (o). Ground: (0.5 m – 0.75 m): *Heteropogon contortus* (d), *Themeda triandra* (f) Other species present (in no particular order): *Glycine tomentella, Cyanthillium cinereum, Panicum effusum, Galactia tenuiflora, Evolvulus alsinoides, Indigofera linnaei, Grewia retusifolia, Wahlenbergia* sp, *Wedelia spilanthoides, *Sonchus oleraceus, Enneapogon lindleyanus, Crotalaria montana, Goodenia* sp., *Lobelia leucotos*. Conservation significant species: *Desmodium macrocarpum* and *Dichanthium setosum* observed in the RE. Tertiary site 10.	

Vegetation Community	RE equivalent	General Site Description[1]	Representative Photo
Ironbark Woodlands	9.5.3b	This open woodland community was encountered on light coloured sandy clay. The woodland was in very good condition with the main visible disturbances associated with fire and grazing. Introduced species were a minor component. Emergent: Absent. T1 (14 m-16 m): *Eucalyptus crebra* (*sens. lat.*) (d) T2 (5 m – 6 m): *Corymbia setosa* (d), *Bursaria incana* (f) Shrub: Absent. Ground: (0.5 m – 1 m): *Themeda triandra* (a), *Heteropogon contortus* (a), *Vigna lanceolata* (f). Other species present (in no particular order): *Hakea lorea*, *Cyanthillium cinereum*, *Aristida calycina*, *Eragrostis* sp., *Grewia retusifolia*, *Cajanus reticulatus*, *Indigofera hirsuta*, *Alphitonia obtusifolia*, *Chamaecrista* sp., *Glycine* sp., *Pterocaulon sphacelatum*, *Wahlenbergia* sp., **Melinis repens*, *Panicum decompositum*, *Indigofera linifolia*, *Rostellularia ascendens.* Tertiary site 1	
Ironbark Woodlands	9.8.1a	This very sparse to open woodland community occurs on orange to red clay coil. The woodland was in moderate to good condition with dead trees occasionally to commonly present. Fire and grazing were common disturbances. Introduced species were a minor component. Emergent: Absent. T1 (8m – 12 m – 15 m): *Eucalyptus crebra* (*sens. lat.*) (d) all sites. T2 (6 m – 8 m): *Corymbia dallachiana* (f) at Site 8, *Eucalyptus crebra* (*sens. lat.*) at Site 5, *Bursaria incana* (f), *Corymbia erythrophloia* (o) at Site 7. Shrub: None at sites 5 & 8 or with *Erythroxylon australe* (a) at Site 7. Ground (0.5 m – 1 m): *Aristida calycina* (a), *Heteropogon contortus* (a - d), *Themeda triandra* (f), *Bothriochloa decipiens* (f). Other species present (in no particular order): *Petalostigma pubescens*, *Dichanthium sericeum*, *Zornia dyctiocarpa*, *Zornia muriculata*, *Aristida latifolia*, *Indigofera linnaei*, *Crotalaria montana*, **Stylosanthes humilis*, **Stylosanthes scabra*, *Galactia tenuiflora*, *Mnesithea granularis*, *Grewia retusifolia*, *Pterocaulon redolens*, **Stylosanthes scabra*, *Crotalaria medicaginea*, *Solanum nemophilum*, *Enneapogon lindleyanus*. Conservation significant species *Desmoium Macrocapum* observed in the RE. Tertiary sites 5, 7, 8	

Vegetation Community	RE equivalent	General Site Description[1]	Representative Photo
Ironbark Woodlands	9.11.2a	This low open woodland community occurs on a steep rocky hillside with yellow clay soil thickly interbedded with gravel and cobbles. Some gully formation and surface scouring occurs in the surrounding area. Fire and grazing disturbances were also recorded. Otherwise the community is in a good condition. Introduced species were a minor component. Emergent: Absent. T1 (8 m – 10 m): *Eucalyptus crebra* (*sens. lat.*) (d) Shrub: None present. Ground (0.5 m): *Themeda triandra* (d), *Heteropogon triticeus* (f), *Indigofera linnaei* (f), *Tephrosia filipes* (f). Other species present (in no particular order): *Grevillea parallela, Maytenus cunninghamii, *Melinis repens, Tephrosia juncea, Crotalaria medicaginea, Scleria mackaviensis, Rhynchosia minima, Coronidum lanosum, Grewia retusifolia, Panicum effusum, Bursaria incana, Glycine* sp., *Cyanthillium cinereum, Enneapogon lindleyanus, Brunoniella acaulis, Peripleura bicolor, Peripleura hispidula, Cymbopogon bombycinus, Galactia* sp. Tertiary site 9	
Mountain Coolabah Woodland	9.8.9	This community was only present as a very small area bordered by the riparian community on one side and ironbark woodland on the other. The dominant Mountain Coolabah was very scattered in occurrence but there were no overt signs of clearing. Site integrity was moderate as weed and introduced species were common and there were signs of high grazing pressure. Emergent: Absent. T1 (16 m): *Eucalyptus orgadophila* (d) Shrub: Absent. Ground: (0.5 m): **Bothriochloa pertusa* (d), *Heteropogon contortus* (a), *Themeda triandra* (f), Other species present (in no particular order): *Murdannia graminea, Ipomoea plebeia, Neptunia gracilis, *Xanthium pungens, *Senna occidentalis, *Sida rhombifolia, Crinum* sp. Quaternary site	

Vegetation Community	RE equivalent	General Site Description[1]	Representative Photo
Native Grasslands	9.8.13	Open grassland on a black cracking clay plain with basalt cobble inclusions. The community seemed to be intact with the primary signs of disturbance associated with grazing. Emergent: Absent. T1: Absent. Shrub: Absent. Ground: (0.5 m – 1 m): *Aristida leptopoda* (d), *Iseilema vaginiflorum* (f), *Ophiuros exaltatus* (f), *Vigna radiata* (f), *Trichodesma zeylanicum* var. *zeylanicum* (f) Other species present (in no particular order): *Euphorbia drummondii*, **Melinis repens*, **Bothriochloa pertusa*, *Heteropogon contortus*, *Panicum effusum*, *Goodenia byrnesii*, *Hypoxis pratensis*, **Vachellia farnesiana*, *Ptilotus* sp., *Mitrasacme* sp. Tertiary site 11	
Vineforest	9.8.7	The vineforest vegetation only occurs as a small community; approximately 3 - 4 ha forming a well-developed vine thicket adjacent to a further 10 ha of broken vine thicket or vegetation with a vine thicket understory. This community is located where the basalt plains end in cliffs dropping down into the Flinders River valley. This location appears to be protected from fire both above and below. Emergent: *Ficus virens*, *Brachychiton australis*. T1 (5 m – 7 m): Mixed vineforest species. Common species include *Geijera salicifolia*, *Drypetes deplanchei*, *Diospyros humilis*, *Notelaea microcarpa*, *Alphitonia excelsa*, *Parsonsia lanceolata*, *Pleiogynium timorensis* Shrub: (2 m – 4 m): *Alyxia spicata*, *Exocarpos latifolius*, *Alectryon connatus*, *Erythroxylon australe*, *Antidesma parvifolium*, *Pavetta granitica*, *Bridelia leichhardtii*, *Breynia oblongifolia*, *Psydrax johnsonii*, *Sersalisia sericea*. Ground: (0.5 m): *Sigesbeckia orientalis*, *Cissus cardiophylla*, *Paraceterach muelleri*, *Plectranthus parviflorum*, *Melhania oblongifolia*, *Cucumis maderaspatana*, *Scleria mackaviensis*, *Ancistrachne uncinulata*, *Clematicissus opaca*, *Cyperus gracilis*, *Cheilanthes sieberi*. Quaternary site	

* Indicates introduced flora species

[1] The qualitative DAFOR rating is used: (d) = dominant, (a) = abundant, (f) = frequent, (o) = occasional and (r) = rare. Refer to Appendix A for further information on the plant species encountered within each broad vegetation community.

Due to access constraints to the Flinders River gorge and to the east of the Flinders River, REs mapped (DERM ver. 6.1) in these areas could not be verified. RE polygon 2.10.2/10.10.1/10.10.2 in the south-east of the study site also was not verified during the field survey.

One vegetation community not mapped by DERM was encountered in the study area. This was the vineforest community on the rocky cliffs overlooking the Flinders River. This community is best described as belonging to RE 9.8.7: *Semi-evergreen vine thicket on cones, craters and rocky basalt flows with little soil development.* This RE has an Of Concern Biodiversity Status and a Least Concern *Vegetation Management Act* 1999 (VM Act) Class.

Environmentally Sensitive Areas

There are no Category A or Category B Environmentally Sensitive Areas (under the *Environmental Protection Act* 1994 (EP Act)) mapped as occurring in the study area (DERM 2012a). The White Mountains National Park (Category A ESA) lies to the south-east of the study area. A 1 km buffer between the National Park and study area was applied during the wet season field survey (**Figure 1**). The buffer has since been reduced to 200 m in the environmental authority (EA) (*pers comm.* Mark Turner, Chief Operating Officer, Guildford Coal Ltd, email dated 14 June 2012). The Flinders River flows through the study area, before flowing through the White Mountains National Park.

Biodiversity Planning Assessment

Biodiversity Planning Assessments (BPA) exist for the Einasleigh Uplands and the Desert Uplands bioregions. The BPA for the Einasleigh Uplands (DERM 2009) was reviewed as the majority of the site lies within this bioregion.

The mapping[1] associated with the Einasleigh Uplands BPA identifies the eastern half of the study area (surrounding the Flinders River and Humpy Creek) as being a corridor of State significance. The wetlands scattered across the study area are deemed to have regional significance.

The BPA was compiled in 2009 and several of the species recommendations have been implemented *ie* status changes made in the *Nature Conservation (Wildlife) Regulation* 2006 reprint 1c. Nevertheless it covers a broad range of vegetation concerns not necessarily addressed in the Queensland legislated Endangered, Vulnerable and Near Threatened listing. Of specific interest, the BPA also addresses plants currently listed as Least Concern (NC Act) but which, due to their habitats, distribution, threatening processes or (frequently) general scarcity of specimens and information on those species, are of greater conservation interest than other Least Concern plants. These include many of the following species:

- *Tephrosia* species
- *Heliotropium* species
- *Lomandra* species
- some ferns such as *Paraceterach Muelleri.*

[1] This mapping is not reproduced due to its coarse scale (1:100,000) and because it is based on out dated RE mapping (version 5.0).

Some of the species listed in the Einasleigh Uplands BPA occur frequently and widely throughout the study area *eg Tephrosia filipes* subsp. *filipes* or *Tephrosia leptoclada*. Although there is no direct management requirement associated with these species, they are worth noting, and taking them into consideration may add value to the environmental management of the site *eg* during rehabilitation.

Vegetation mapped as essential habitat or high value regrowth

None of the mapped REs are recognised as essential habitat; *Vegetation Management Act Essential Habitat Mapping version* 3.1 (DERM 2012a).

No high value regrowth or regrowth along a watercourse is mapped for the study area (DERM 2012b).

Wetlands

Two wetland types occur in the study area:

- riverine wetlands of Humpy Creek and the Flinders River and associated drainages, and
- palustrine wetlands.

The flow characteristics of the main watercourses need characterising where the Flinders River flows through the study area; this reach appears to be perennial. Humpy Creek was observed flowing during the survey and is likely to retain some flow and/or pools of water into at least the early part of the dry season. Both watercourses have distinct and well developed riparian vegetation.

The palustrine wetlands observed were all well established with signature wetland species (refer to **Appendix A**). It is not known whether these wetlands are spring fed and thus perennial waterbodies, or perched features which dry out during the dry season.

Connectivity, integrity, sensitive communities and refugial habitat values

The local region is largely intact with the Kennedy Development Road between Hughenden and the Lynd, local roads and access tracks, and homesteads forming relatively isolated pockets and lines of disturbance in the generally unaltered landscape. All the vegetation communities in the study area are contiguous on one or more sides with other remnant communities and no significant anthropogenic barriers to connectivity were observed during the field survey.

The integrity of the vegetation communities in the study area was generally high. There were no obvious signs of historical clearing, although new exploration tracks and drill sites are increasing the general level of impact. Introduced plant species were present in most of the vegetation communities and were locally significant in the riparian and associated alluvial communities. Fire appeared to be frequent in the landscape, although apparently patchy or with long inter-fire periods as areas of ironbark woodland with vineforest shrub elements commonly occur.

Major disturbances are expected to be associated with fire. The study area is dominated by ironbark woodlands with either an established dense shrub layer or native grassland. This vegetation type is susceptible to fire and therefore refugial habitat values are not expected to occur. Humpy Creek appeared largely susceptible to fire in the areas observed. Many ridges and slopes leading down into the Flinders River valley are dominated by ironbark woodlands, and show evidence of fire. Sections with steep rocky scarps are protected from fire. The vineforest community occurs in one such area and is considered to be of significant refugial value in the study area.

3.1.2 Flora Species

Over 240 species of plants were recorded during the site assessment (**Appendix A**). The largest proportion[2] of these species was recorded from the ironbark woodlands (69%) followed by vineforest (21%), creek lines and adjacent alluvial flats (18%), swamps (13%), and grasslands (11%) which were relatively less species rich. This is not surprising as the predominant community type is ironbark woodland and the boundary between the ironbark woodlands and the grasslands in particular but also the alluvial flats are diffuse (hence many of the species occur in all three of these communities. The vineforest community stands out as being particularly species rich; despite its small area of occurrence (less than 0.1% of the assessment area) it contains over 20% of the recorded site flora, many of which appear to be largely restricted to this community type.

Of the 69 families of plants encountered (**Appendix A**), the majority of the species were grasses (Poaceae, 45 species) with pea flowered plants the other dominant group (Fabaceae, 28 species). Other well represented families include the daisy family (Asteraceae, 19 species), eucalypts and allied (Myrtaceae, 14 species), sedges (Cyperaceae, 10 species) and wattles (Mimosaceae, 10 species).

3.1.3 Species of conservation significance

In this report, flora of conservation significance include:

- species listed as Critically Endangered, Endangered or Vulnerable under the EPBC Act
- species listed under Endangered, Vulnerable or Near Threatened under the NC Act.

Recorded species

Two plant species of conservation significance were recorded[3] during the wet season field assessment:

- *Desmodium macrocarpum* (listed as Near Threatened under the NC Act)
- *Dichanthium setosum* (listed as Vulnerable under the EPBC Act and Near Threatened under the NC Act).

Desmodium macrocarpum

This species was encountered at several locations (**Figure 3**) on-site, and comprised nine individual plants, including two isolated individuals and one cluster of three and two clusters of two individuals (large leaved pea flowered plant shown in **Plate 1**). These plants appear to be associated with the ironbark woodland across the northern half of the study area. It is expected that more individuals may be present given the dominance of the ironbark woodland habitat within the study area. *Desmodium macrocarpum* is semi-cryptic in habit and although this plant is distinctive up close, it is not easily seen amongst vegetation, particularly as it often co-occurs with other similar pea-flowered plants which are widespread throughout its range. All of the individuals encountered had already dropped most of their fruiting structures suggesting that flowering had occurred in February and the bulk of fruiting in late February to March.

[2] Many species were recorded in more than one habitat type hence the percentages provided are an estimate against the total number of species encountered; summing the percentages for the different habitats will exceed 100%.

[3] Specimens were confirmed by the Queensland Herbarium 17 May 2012, reference number DM:552/12 – amended.

This phenology fits with that of other populations of *Desmodium macrocarpum* encountered whose individuals were recorded flowering in early March near Moranbah, central Queensland and as late as early May near the Lynd, north Queensland (*pers. obs*. Dr Ing Toh).

Plate 1: The *Desmodium macrocarpum* photographed in the study area

Desmodium macrocarpum is noted as a rare plant associated with sandy soils in eucalypt woodlands west of Townsville and occasionally elsewhere (Hacker 1990). A search of the Australian Virtual Herbarium online facility shows its distribution to be largely east and south of the study area although some records exist between the Atherton Tablelands and the Lynd (AVH 2012). Therefore, this population appears to be at or near the limit of its known extent.

Dichanthium setosum

One cluster of the bluegrass *Dichanthium setosum* (**Plate 2**) was encountered in open ironbark woodland in the north-west section of the study area (**Figure 3**). It was growing amongst mixed native grasses, including other bluegrasses, (mainly *Dichanthium sericeum*, *Bothriochloa bladhii*, *Eulalia aurea*, *Heteropogon contortus* and *Themeda triandra*). This bluegrass species is semi-cryptic and not easily recognised from any distance as it often grows in association with other bluegrasses and can blend in with other native grasses. Given the dominance of the ironbark woodland habitat within the study area it is expected that *Dichanthium setosum* is likely to occur more widely within EPC 1260. The individuals seen were flowering and fruiting at the time of the survey (late March – early April).

Dichanthium setosum is associated with heavy basaltic black soils and stony red-brown hardsetting loam with clay subsoil where it may form the dominant cover (DSEWPaC 2012c). These soil types were widely present across the study area.

This plant has a disjunct distribution. Published reports indicate that *Dichanthium setosum* occurs quite widely down the east coast of Australia (Simon & Alfonso 2011). The bulk of records come from northern New South Wales to south-east Queensland with a second group of records from central Queensland (mostly inland of and between the south of Cardwell through to Rockhampton). Isolated records occur as far afield as the base of Cape York

Peninsula, south of Mt Isa and Tasmania (AVH 2012). Therefore the population encountered in the EPC is well within the known distribution for this species.

Plate 2: *Dichanthium setosum* encountered in the study area

Although *Dichanthium setosum* is expected to occur more widely in the area, the wet season survey assessed a moderate subset of the suitable habitat and only encountered one cluster. Given it is known to occur in the region (records within approximately 100 km radius to the north, south and east of the study site, AVH 2012) and because it was not encountered as a pure sward or as multiple clumps (*ie* not forming a potentially conservation significant population) within the study area it is unlikely to trigger the need for referral. A targeted search for this species is needed to confirm the abundance and distribution of *Dichanthium setosum* in the study area.

Desktop assessment of conservation significant flora species

Seventeen conservation significant plant species were reported to occur in the area based on Wildlife Online reports, Queensland Herbarium database records and the EPBC Protected Matters Report. These species and their predicted likelihood of occurrence are listed in **Table 3**.

Table 3: Conservation significant[1] flora species predicted to occur on or near EPC1260

Scientific name	Status[2]		Likelihood of occurrence (BAAM 2012[3])	Likelihood of occurrence subsequent to field survey
	EPBC Act	NC Act		
Acacia armitii	-	NT	Possible. Reported from sandstone plateaus in Queensland. Also occurs in streambeds in the Northern Territory (Maslin 2001).	Possible. It is unlikely that *Acacia armitii* will occur in most of the study area. However, minor areas of sandstone mapped as occurring in the south-east of the study area and also the rocky slopes into the Flinders River may be potential habitat.
Acacia crombiei	V	V	Possible. Often found on basaltic soils and is known to occur in White Mountains National Park.	Possible. This species was not encountered in the area traversed. However large areas of suitable habitat exist within the study area.
Acacia polyadenia	-	NT	Unlikely. Known from 3 islands off the central Qld coast.	Unlikely. The Queensland Herbarium records list one record 25 km NE of Hughenden growing on shallow sandy soil in Lemon-scented Gum and ironbark woodlands. Despite the close proximity of this record the topography and community appears different from the primary habitats encountered on-site.
Acacia ramiflora	V	LC	Likely. Grows on sandstone hills in the area and is known to occur in White Mountains National Park.	Possible. It is unlikely that *Acacia ramiflora* will occur within most of the study area. However, minor areas of sandstone have been mapped as occurring in the south-east of the study area and may be possible habitat.
Aristida burraensis	-	NT	Likely. Species recorded in area. Found on sandstone in associations with *Eucalyptus similis.*	Possible. It is unlikely that *Aristida burraensis* will occur within most of the study area. However, minor areas of sandstone have been mapped as occurring in the south-east of the study area and may be possible habitat.

Scientific name	Status[2]		Likelihood of occurrence (BAAM 2012[3])	Likelihood of occurrence subsequent to field survey
	EPBC Act	NC Act		
Boronia eriantha	-	NT	Likely. Species recorded in area.	Possible. It is unlikely that *Boronia eriantha* will occur within most of the study area. However, minor areas of sandstone have been mapped as occurring in the south-east of the study area and may be possible habitat
Cajanus mareebensis	E	E	Unlikely. Known to occur in grassy woodlands on sandy soils derived from igneous substrates.	Unlikely. *Cajanus mareebensis* is unlikely to occur within the areas assessed.
Cycas couttsiana	-	NT	Possible. Known to occur in the region within ironbark dominated grassy woodlands on red sandy loams derived from basalt or dolerite (Hill & Osborne 2002).	Unlikely. Although suitable habitat is present, this species is not likely to occur as it is a highly distinctive and visible plant and populations are likely to have been encountered if present.
Cycas platyphylla	V	V	Likely. Species recorded in the area.	Unlikely. Potentially suitable habitat is present but this species is not likely to occur as it is a highly distinctive and visible plant and populations are likely to have been encountered if present.
Desmodium macrocarpum	-	NT	Likely. Known from a wide range of habitats, including Eucalyptus woodlands and vine thickets.	Present. Recorded within the study area during this vegetation assessment.
Dichanthium queenslandicum	V	V	Likely. Associated with RE 9.8.13, which is mapped within the EPC.	Possible. Although this species was not encountered, it is semi-cryptic and may occur as suitable habitat is present.
Dichanthium setosum	V	NT	Possible. Associated with basaltic black soils and stony red-brown hardsetting loams with clay subsoil.	Present. Recorded within the study area during this vegetation assessment.

Scientific name	Status[2]		Likelihood of occurrence (BAAM 2012[3])	Likelihood of occurrence subsequent to field survey
	EPBC Act	NC Act		
Kardomia squarrulosa	-	V	Possible. The genus *Kardomia* occurs in dry sclerophyll or heath habitats on a number of substrates including sandstone, granite and rhyolite.	Possible. It is unlikely that *Kardomia squarrulosa* will occur within most of the study area. However, minor areas of sandstone have been mapped as occurring in the south-east of the study area and may be possible habitat..
Leptospermum pallidum	-	NT	Possible. The genus *Leptospermum* is known to occur across a wide range of habitats, mostly on poor sandstone or granite derived soils.	Possible. It is unlikely that *Leptospermum pallidum* will occur in most of the study area. Possible habitats which were not assessed during this trip include the steep slopes of the Flinders River.
Peripleura scabra	-	NT	Possible. Found in open eucalypt forest and woodland, and in vine thicket, heathland and grassland.	Possible. Although not encountered, two other species of *Peripleura* (*P. hispida* and *P. bicolor*) were noted and extensive habitat exists for this species. It is a small herbaceous plant which can easily be missed.
Peripleura sericea	-	NT	Possible. The *Peripleura* genus is known to occur in a wide variety of habitats, including grasslands, shrublands and woodlands.	Possible. Although not encountered, two other species of *Peripleura* (*P. hispida* and *P. bicolor*) were noted and extensive habitat exists for this species. It is a small herbaceous plant which can easily be missed.
Sesbania erubescens	-	NT	Possible. Grows on moist clay soils in water courses and often in standing water (Hacker 1990).	Possible. *Sesbania erubescens* was not encountered in the areas searched but suitable habitat in the form of gilgais and watercourses were present.

[1] Species listed as Endangered, Vulnerable, or Near Threatened under the EPBC Act and/or NC Act.

[2] Status: E = Endangered, V = Vulnerable, NT = Near Threatened, LC = Least Concern

[3] The list of species has been revised based on those species reported from the database searches within the new study area. BAAM 2012 evaluations of desktop likelihood of occurrence has been utilised where possible. Likelihood has been assessed separately for three species (*Acacia armitii*, *Cycas couttsiana* and *Sesbania erubescens*) which are listed in current database search results but not covered by the BAAM 2012 desktop assessment.

3.1.4 Introduced Weed Species

The Queensland Herbarium database records 64 introduced species for the surrounding area, although more are likely to be present (BAAM 2012). Twenty five species were recorded during the site assessment (**Table 4**).

Table 4: Introduced flora species recorded during the wet season survey

Family	Species	Common name	Listed species[1]
Amaranthaceae	**Alternanthera pungens*	Khaki weed	-
Amaranthaceae	**Amaranthus viridis*	Slender Amaranth	-
Amaranthaceae	**Gomphrena celosioides*	Gomphrena	-
Apocynaceae	**Asclepias curassavica*	Red Head Cotton Bush	-
Apocynaceae	**Cryptostegia grandiflora*	Rubber vine	Class 2, LP Act, Weed Of National Significance, Protected Matters Report (PMR)
Asteraceae	**Acanthospermum hispidum*	Star Burr	-
Asteraceae	**Bidens bipinnata*	Native Cobbler's Pegs	-
Asteraceae	**Tridax procumbens*	Tridax Daisy	-
Asteraceae	**Xanthium occidentale*	Noogoora Burr	-
Asteraceae	**Xanthium pungens*	Noogoora Burr	-
Caesalpiniaceae	**Senna occidentalis*	Coffee Senna	-
Cucurbitaceae	**Citrullus colocynthis*	Colocynth	-
Euphorbiaceae	**Euphorbia hirta*	Asthma Weed	-
Fabaceae	**Stylosanthes humilis*	Townsville Stylo	-
Fabaceae	**Stylosanthes scabra*	Shrubby Stylo	-
Malvaceae	**Malvastrum americanum*	Malvastrum	-
Malvaceae	**Malvastrum coromandelianum*	Spiked Malvastrum	-
Malvaceae	**Sida cordifolia*	Flannel Weed	-
Malvaceae	**Sida rhombifolia*	Common Sida	-
Mimosaceae	**Vachellia farnesiana*	Mimosa Bush	-
Poaceae	**Cenchrus pennisetiforme*	White Buffel Grass	-
Poaceae	**Echinochloa colona*	Awnless Barnyard Grass	-
Poaceae	**Echinochloa crus-galli*	Barnyard Grass	-
Poaceae	**Melinis repens*	Ret Natal Grass	-
Solanaceae	**Solanum americanum*	Glossy Nightshade	-

[1] Listed species include species listed under the *Land Protection (Pest and Stock Route Management)* Act 2003 and the EPBC Protected Matters Report (PMR).

* Denotes introduced species.

Of the introduced species encountered at the site (**Table 4)**, Rubbervine *Cryptostegia grandiflora*, is the only species listed as requiring management under the LP Act[4].

Red Natal Grass *Melinis repens* was a visually significant component of the groundlayer in several places, but not to the exclusion of other species. At most, it represented one of several frequent to abundant ground layer species. Most of the remaining introduced species were best represented in the riparian zone where several species were dominant in patches.

Rubbervine *Cryptostegia grandiflora*

Rubbervine was located in a drainage line flowing from the plains down into the Flinders River valley (**Plate 3**). Here it was seen as an isolated individual. However it is expected that a more comprehensive search along the drainage lines and the Flinders River may identify further occurrences of Rubbervine.

Plate 3: Rust affected Rubbervine photographed in the study area

Current weed mapping shows that the Hughenden region lies near the boundary of the known existing area of infestation with the potential for further spread based on projected mapping (http://www.weeds.gov.au/weeds/lists/wons.html accessed 22 May 2012). Control of Rubbervine and prevention of its further spread should be considered a matter of importance.

Under the Queensland LP Act, Rubbervine is a Class 2 pest species requiring control to prevent further spread.

[4] Weeds Of National Significance (WONS). An intergovernmental agreement between the Australian Government and the State and Territory governments has been established to manage WONS. The national steering committee only oversees coordination and high level implementation. Local implementation and management is incorporated into individual state pest management legislation: the *Land Protection (Pest and stock Route Management) Act* (2002) in Queensland.

3.2 Fauna

Unless otherwise stated, all fauna records in this report refer to the March/April survey period. The nomenclature of this report follows the *Australian Faunal Directory* maintained by DSEWPaC (2012a), unless otherwise noted.

3.2.1 Native species

Five frog, 14 reptile, 66 bird and 20 mammal species were recorded[5] (**Appendix B**). Eleven of these species were not identified by the desktop assessment as occurring in the project area (BAAM 2012), however none of these species was unexpected based on known distributions. Four of the 11 species, Stripe-burrowing Frog *Cyclorana alboguttata*, Cicadabird *Coracina tenuirostris*, Eastern Grey Kangaroo *Macropus giganteus* and Troughton's Sheathtail-bat *Taphozous troughtoni* are listed for the nearby White Mountain National Park (Kutt *et al*. 2005). The remaining seven species, all of which are reptiles, are mapped as occurring in the general area (Wilson 2005; Wilson & Swan 2010). The recorded species assemblage is discussed in **Section 3.2.4**.

3.2.2 Conservation significant species

In this report, fauna of conservation significance include:

- species listed as Critically Endangered, Endangered or Vulnerable under the EPBC Act
- species listed under Endangered, Vulnerable or Near Threatened under the NC Act
- species listed as Migratory under the EPBC Act due to their inclusion under one of more of the following:
  - Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)
  - China-Australia Migratory Bird Agreement (CAMBA)
  - Japan-Australia Migratory Bird Agreement (JAMBA)
  - Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)
- species considered of 'critical' or 'high' priority under the *Back on Track framework* (DERM 2011)
- species considered to be significant in the Einasleigh Uplands and Desert Uplands bioregions under DEHP's *Biodiversity Assessment and Mapping Methodology* (EPA 2002).

[5] Includes six micro-bat species whose identification certainty is 'possible' (Barden 2012). Five of those species are identified in the desktop assessment (BAAM 2012) and the other is expected based on known distribution.

Recorded species

Three conservation significant fauna species were recorded during the wet season field survey:

- Squatter Pigeon (southern subspecies) *Geophaps scripta scripta* (listed as Vulnerable under the EPBC Act and NC Act)
- Koala *Phascolarctos cinereus* (listed as Vulnerable under the EPBC Act and as Special Least Concern[6] under the NC Act)
- Rainbow Bee-eater *Merops ornatus* (listed as Migratory under the EPBC Act and as Special Least Concern[7] under the NC Act).

Three species recorded on-site are considered significant in the Desert Uplands bioregion: Grey-crowned Babbler *Pomatostomus temporalis*, Common Brushtail Possum *Trichosurus vulpecula* and Rufous Bettong *Aepyprymnus rufescens*. These species were all recorded in the Einasleigh Uplands section of the site but, given the continuous nature of the habitat - ironbark woodland, it is expected that the three species also occur in the Desert Uplands section of the site. On that basis they are included here as conservation significant species at the bioregional level.

Descriptions of the life histories of the six recorded conservation significant species are provided below, with most emphasis on the Vulnerable species: Squatter Pigeon and Koala.

All other recorded native species are listed as Least Concern under the NC Act and are not listed under the EPBC Act. No species considered of 'critical' or 'high' priority under the *Back on Track framework* or regionally significant within the Einasleigh Uplands bioregion was recorded.

Squatter Pigeon (southern subspecies) *Geophaps scripta scripta*

The southern subspecies of the Squatter Pigeon (**Plate 4**) was observed on site on three occasions, with at least nine individuals recorded. All sightings were near water and in disturbed areas.

[6] Special least concern animal means the following— (a) the koala (*Phascolarctos cinereus*); (b) the echidna (*Tachyglossus aculeatus*); (c) the platypus (*Ornithorhynchus anatinus*); (d) a least concern bird to which any of the following apply— (i) the agreement called 'Agreement Between the Government of Australia and the Government of Japan for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment' and signed at Tokyo on 6 February 1974; (ii) the agreement called 'Agreement Between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment' and signed at Canberra on 20 October 1986; (iii) the convention called 'Convention on the Conservation of Migratory Species of Wild Animals' and signed at Bonn on 23 June 1979.

[7] The proposed management intent for each special least concern animal includes ensuring each person exercising a power or carrying out a function for a State government agency has regard to, when exercising the power or carrying out the function—(a) the special cultural significance of the animal; and (b) the need to conserve existing populations of the animal (Nature Conservation (Wildlife) Regulation 2006).

Plate 4: Squatter Pigeon *Geophaps scripta scripta* near Dam 1 on 2/4/2012

The southern subspecies occurs mainly in dry grassy eucalypt woodlands and open forests (Frith 1982; Leach 1988; Crome & Shields 1992) and also inhabits Cypress Pine *Callitris* spp. and acacia woodlands (Frith 1982). It mostly occurs on sandy sites near permanent water (Blakers *et al*. 1984). Birds will forage along roads and railway lines (Lord 1956; Longmore 1976) and are often found around homesteads and cattle yards (Pizzey 1980; DSEWPaC 2012b). Squatter Pigeons dust-bathe and are frequently encountered on dirt tracks and in areas of bare soil denuded of ground cover by livestock (Crome 1976; Frith 1982; Higgins & Davies 1996). Breeding is poorly known but does appear to be greatly influenced by rainfall. The nest is a shallow depression on the ground (Frith 1982; Higgins & Davies 1996).

The Squatter Pigeon is endemic to Australia and is now largely, if not wholly, restricted to Queensland. The species formerly occurred as far south as 34^{o}S (Blakers *et al*. 1984) but there has been no record in New South Wales since the 1970s (NSW NPWS 2003). In Queensland, the southern subspecies occurs north to the Burdekin River (Frith 1982) with an intergrade zone with the northern subspecies *G. s. peninsulae* around the Burdekin-Lynd Divide (Crome 1976; Ford 1986; Schodde &Mason 1997). The species extends west to Longreach, Barcaldine and Charleville and east to Townsville, Proserpine, Warwick and Esk (Storr 1973; Frith 1982; Schodde & Mason 1997). The subspecies is known from White Mountains National Park to the east of the site (Kutt *et al*. 2005) and its presence was anticipated.

Koala *Phascolarctos cinereus*

The Koala is one of three species considered of cultural significance in Queensland and as such is listed as Special Least Concern under the NC Act (**see footnote 6**). In Queensland the Koala is listed as Vulnerable under the NC Act only in the South-east Queensland bioregion. At the time of survey the species was not listed under the EPBC Act. As of the 30th April 2012 populations in Queensland, New South Wales and the Australian Capital Territory are listed as Vulnerable under the EPBC Act. The species was formerly common and widespread in forests and woodland along the east coast of Australia from north Queensland to South Australia. The Koala feeds almost entirely on the leaves of eucalypts and its

distribution is linked to the presence and abundance of food species. They are most abundant on coastal plains and in foothills but do extend inland along watercourses with *Eucalyptus camaldulensis*. In Queensland, clearing of habitat has decreased their range by about 30% (Martin *et al*. 2008; Krockenberger *et al*. 2012).

The food preferences of the Koala vary regionally (Martin *et al*. 2008). In north Queensland the common food trees are *E. camaldulensis* and *E. tereticornis* but *E. cambageana, E. citriodora, E. crebra, E. drepanophylla* and *E. populnea* are also eaten (Lee & Martin 1988). Eucalypt leaf is poor quality food, low in major nutrients and containing high levels of indigestible fibre and potentially toxic compounds (Martin *et al*. 2008). The compounds that act as deterrents to folivores may also vary between individual trees of the same species and habitat suitability for Koala may vary at small scales (Krockenberger *et al*. 2012). Habitat quality for Koalas is determined not just by the species of eucalypt and extent of tree cover but also by soil fertility and water regime.

During the field survey a Koala was heard calling at dawn in open *E. crebra* woodland at Trap Site 2 (**Figure 2**). The animal was not located. No other evidence of occurrence was found despite searches for scats and scratches on *E. camaldulensis* along Humpy Creek. Based on the field survey and no database records (BAAM, 2012), the species is likely to occur on site only at very low densities. Koala was recorded in 2000 from nearby White Mountains National Park (Kutt *et al*. 2005).

Rainbow Bee-eater *Merops ornatus*

The Rainbow Bee-eater is a common species that occurs in almost any habitat suitable for catching insects, including in towns and other highly modified areas. It is widespread in Australia, New Guinea, Indonesia and Micronesia. The species favours bees and wasps, which they catch mostly in the air, but will also take food from the ground, vegetation and, occasionally, water. Rainbow Bee-eaters may nest colonially or as solitary pairs and often nest in the same sites year after year. Nests are burrows in soft sand or soil (Higgins 1999, Boland 2004).

The species was reasonably common on site, particularly in more open areas.

Common Brushtail Possum *Trichosurus vulpecula*

The Common Brushtail Possum is found in a variety of habitats, including urban areas, but generally prefers dry eucalypt forests and woodlands. It occurs in all mainland states and territories and in Tasmania and a number of other islands. Despite its ability to live in towns the species has declined in many areas, including the tropical woodlands of northern Australia (Kerle & How 2008). In tropical woodlands the Common Brushtail Possum has a patchy distribution, occurring where there are large eucalypts and a well-developed understorey. The species is nocturnal, sheltering by day in tree hollows, fallen logs and rock cavities. It also uses buildings. The species eats leaves, flowers and fruit and meat may be eaten occasionally (Kerle & How 2008).

The species was recorded twice on site, both times in woodland with reasonably large trees, abundant tree hollows and a well-developed understorey. It could be common on the site based on food and shelter resource availability.

Rufous Bettong *Aepyprymnus rufescens*

The Rufous Bettong (a medium sized marsupial) occurs in forest and woodlands with a sparse native grass groundcover. In coastal regions it is found in coastal eucalypt forests and tall wet sclerophyll forests and west of the ranges it occurs in dry open woodlands (Johnson 2003; Dennis & Johnson 2008). The species is found from around Newcastle in New South

Wales north to Cooktown in Queensland, with a gap in distribution in northern New South Wales. It formerly occurred in inland New South Wales and in Victoria (Claridge *et al*. 2007). Population densities are highly variable and correlate with soil fertility. The species is nocturnal and feeds on herbs, grasses, roots, tubers and underground fungi. Home ranges can be up to 110 ha for males and 60 ha for females (Johnson 2003; Dennis & Johnson 2008).

Only one animal was observed on site but the species was common in the surrounding area. It is expected to be common through much of the site.

Grey-crowned Babbler *Pomatostomus temporalis*

The Grey-crowned Babbler occurs in woodland, scrub and farmland. The species was found in all mainland states and territories but has declined in southern Australia (Blakers *et al*. 1984) and is now extinct in South Australia and the Australian Capital Territory and is endangered in Victoria (Garnett & Crowley 2000). The species remains abundant and widespread in northern Queensland (Garnett *et al*. 2011). The Grey-crowned Babbler lives in highly social groups that maintain communal territories and breed co-operatively. Unassisted pairs of Grey-crowned Babblers can breed successfully but larger groups produce more fledglings (Blackmore & Heinsohn 2007).

Grey-crowned Babblers were observed and/or heard a number of times during the field survey. The bird was mostly recorded from areas of woodland with a shrub layer. The species is likely to be widespread through the site.

Table 5 lists those conservation significant species identified by the desktop assessment (BAAM 2012) as potentially occurring on site. Species considered of low or very low likelihood of occurrence (by BAAM) are not included, other than White-bellied Sea-Eagle *Haliaeetus leucogaster* and Australian Painted Snipe *Rostratula australis* which, subsequent to field survey, are considered of possible likelihood on some waterbodies in the site. Any additional species considered significant at the bioregional level that may occur on site are identified by the desktop assessment (BAAM 2012) and are not addressed in this report.

3.2.3 Feral species

Three feral species were recorded: Cane Toad *Rhinolla marina*, Dingo/Wild Dog *Canis lupus dingo/familiaris* and Rabbit *Oryctolagus cuniculus.* BAAM (2012) state that seven feral species occur in the project area, without providing the species. However, ten introduced species are identified by the EPBC Protected Matters Report and the Wildlife Online and Birds Australia database search results provided as appendices in that report. Two of these species, Cattle *Bos taurus* and Horse *Equus caballus*, are presumably considered livestock rather than feral populations. As Dingo *Canis lupus dingo* is not identified by DEHP as an introduced species in the Wildlife Online database it may have been overlooked or disregarded.

Table 5: Conservation significant[1] terrestrial vertebrates predicted to occur on or near EPC1260[2]

Scientific name[3]	Common name	Status[4]		Likelihood of occurrence (BAAM)[5]	Likelihood of occurrence subsequent to field survey
		EPBC Act	NC Act		
Endangered and Vulnerable species					
Egernia rugosa	Yakka Skink	V	V	No actual records. Potential occurrence.	Potential occurrence.
Geophaps scripta scripta	Squatter Pigeon (southern subspecies)	V	V	Likely to occur.	Known to occur.
Rostratula australis[6, 7]	Australian Painted Snipe	V, M	V	Low potential to occur.	Possible occurrence on waterbodies on site.
Grantiella picta[7]	Painted Honeyeater	-	V	Potential to occur.	Mistletoe (food resource) is patchily distributed on site but is common in areas. Potential to occur.
Dasyurus hallucatus	Northern Quoll	E	LC	Potential to occur.	Potential to occur. Most likely in the vicinity, and to the east, of the Flinders River. The areas most likely to support the species were unable to be surveyed.
Near Threatened species					
Lerista wilkinsi	Two-toed Fine-lined Slider	-	NT	Likely to occur in a variety of habitats.	Likely only in the immediate vicinity of the Flinders River and in other rocky areas to the east of Flinders River.
Acanthophis antarcticus	Common Death Adder[6]	-	NT	Potential to occur.	The species is known from White Mountains National Park. On site it is most likely to occur in areas unsuitable for livestock and Cane Toads *Rhinella marina* such as the patches of vine thicket on boulder fields fringing the Flinders River.
Antaioserpens warro	North-eastern Plain-nosed Burrowing Snake	-	NT	Potential to occur.	Potential to occur.
Nettapus coromandelianus	Cotton Pygmy-goose	-	NT	Potential to occur on waterbodies with abundant floating vegetation	In the area surveyed there is no suitable habitat. Suitable waterbodies may exist east of the Flinders River.
Lophoictinia isura	Square-tailed Kite	-	NT	Likely to occur.	Likely to occur.
Melithreptus gularis	Black-chinned Honeyeater	-	NT	Potential to occur.	Potential to occur.

Scientific name[3]	Common name	Status[4]		Likelihood of occurrence (BAAM)[5]	Likelihood of occurrence subsequent to field survey
		EPBC Act	NC Act		
Migratory species					
Ardea modesta[8]	Eastern Great Egret	M	SLC	May occur.	Possible occurrence.
Haliaeetus leucogaster	White-bellied Sea-Eagle	M	SLC	Low potential.	Could occur on the Flinders River.
Merops ornatus	Rainbow Bee-eater	M	SLC	Likely to occur.	Known to occur.

1. Species listed as Endangered, Vulnerable, Near Threatened, Migratory and/or Special Least Concern under the EPBC Act and/or NC Act. Species listed as critical or high priority under the Back on Track framework (DERM 2011). Species considered significant in the Einasleigh Uplands bioregion under the Biodiversity Assessment and Mapping Methodology (EPA 2002).
2. Species predicted to occur are taken from the report *Desktop Terrestrial Flora and Fauna Assessment and Study Scoping* (BAAM 2012). Species with a low or very low potential to occur are not included unless field survey indicated that they may occur.
3. Nomenclature follows the *Australian Faunal Directory* maintained by DSEWPaC, http://www.environment.gov.au/biodiversity/abrs/online-resources/fauna/afd/home; unless otherwise noted.
4. Status: E = Endangered, V = Vulnerable, NT = Near Threatened, M = Migratory, LC = Least Concern (Common).
5. BAAM's comments (BAAM 2012) are summarised.
6. Listed under the EPBC Act (as a migratory species under CAMBA) as Painted Snipe *Rostratula benghalensis s. lat*. Australian birds elevated to full species level as *R. australis* (Baker *et al*. 2007; Christidis & Boles 2008).
7. Also listed as of 'high' priority under the Back on Track framework for the Southern Gulf NRM region.
8. Listed under the EPBC Act as Great Egret *Ardea alba* (CAMBA, JAMBA). Australian birds elevated to full species level as *A. modesta* (Kushlan & Hancock 2005; Christidis & Boles 2008).

The eight feral species, excluding livestock, are listed in **Table 6**. **Table 6** also presents their currently recognised densities and distributions derived from mapping of pest species by the Primary Industries and Fisheries branch of the Department of Employment, Economic Development and Innovation (DEEDI)[8]. Density is categorised as abundant, common, occasional, absent or unknown. Distribution is either widespread or localised.

Five of these species are recognised as Class 2 pests under the *Land Protection (Pest and Stock Route Management) Act* 2002 (LP Act). None of the Class 2 species is unexpected and all are commonly found in the Einasleigh Uplands and Desert Uplands bioregions.

Under the LP Act, a Class 2 pest is one that '*is established in Queensland and has, or could have a substantial adverse economic, environmental, or social impact. The management of these pests requires coordination and they are subject to local government, community or landowner-led programs. Landowners must take reasonable steps to keep land free from Class 2 pests.*'

Table 6: Feral terrestrial vertebrate fauna known from the project area and their density and distribution and likelihood of occurrence

Scientific name	Common name	LP Act status[1]	Density[2]	Distribution[2]	Occurrence on Project Site
Rhinella marina	Cane Toad	Non-declared	Common	Widespread	Recorded
Passer domesticus	House Sparrow	-	Not mapped	Not mapped	Not expected
Mus musculus	House Mouse	Non-declared	Not mapped	Not mapped	Expected
Canis lupus dingo/familiaris	Dingo/ Wild Dog	Class 2	Common	Widespread	Recorded
Vulpes vulpes	Fox	Class 2	Occasional	Widespread	Possible
Felis catus	Cat	Class 2	Common	Widespread	Expected
Oryctolagus cuniculus	Rabbit	Class 2	Occasional	Widespread	Recorded
Sus scrofa	Pig	Class 2	Abundant	Localised	Expected

1. Status under the *Land Protection (Land and Stock Route Management) Act* 2002.

2. Derived from mapping provided by DEEDI <http://www2.dpi.qld.gov.au/extra/asp/IPA-maps/search.asp>.

3.2.4 Species Assemblage

Frogs

The desktop assessment (BAAM 2012) identified eleven species (including the introduced Cane Toad) but, despite heavy rain the previous week, the lack of rain during the survey

[8] Functions of the former Department of Employment, Economic Development and Innovation are now administered by the following departments:

Department of State Development, Infrastructure and Planning
Queensland Treasury and Trade
Department of Education, Training and Employment
Department of Agriculture, Fisheries and Forestry
Department of Natural Resources and Mines
Department of Energy and Water Supply
Department of Science, Information Technology, Innovation and the Arts
Department of National Parks, Recreation, Sport and Racing
Department of Tourism, Major Events, Small Business and the Commonwealth Games

period constrained frog activity on site. Conditions particularly suitable for high levels of frog activity preclude vehicle access to the site and so the species assemblage is expected to be only a subset of the species actually present. With the exception of Green Tree Frog *Litoria caerulea* and Cane Toad, which were both found while spotlighting on foot and during active searching, all frog records were on roads at night or from pitfall traps. Only Cane Toads were heard calling. All species recorded and identified by the desktop assessment are listed as Least Concern (NC Act) and none is listed under the EPBC Act. The seven species identified by the desktop assessment but not recorded during the survey are all likely to occur on site based on known distributions and habitat use. No conservation significant species is expected to occur based on known distributions.

Reptiles

Fourteen reptile species were recorded (**Appendix B**). Eight of these species were identified by the desktop assessment (BAAM 2012). The other six species were not unexpected, based on known distributions. All species recorded are listed as Least Concern (NC Act) and none is listed under the EPBC Act. The desktop assessment (BAAM 2012) identified 44 species. Although not all 44 species are expected to occur on site the species recorded will still represent only a subset of the likely species assemblage for the site. The cryptic nature, behaviour patterns and/or low levels of abundance of many reptile species means that multiple surveys spread over a number of years are typically required to identify a majority of the reptile species present in a particular location. That 40% of those species recorded during the field survey were not identified by the desktop assessment is an indication of how much field work is required to achieve an accurate picture of the reptile assemblage.

Trapping data shows that reptiles were active but there was little obvious reptile activity during the survey, despite favourable conditions. No reptiles were observed on tracks during the day, though a presumed road-killed Black-tailed Monitor *Varanus tristis* was found. No agamid of any species was recorded and common and widespread species such as Bynoe's Gecko *Heteronotia binoei* were not located. Some of the species trapped, particularly the two *Menetia* and a *Proablepharus* species, are very small, cryptic animals and are typically not recorded except by trapping or active searching. The visibility of other diurnal species known to be present, such as various *Carlia* species, was significantly reduced by the density of the groundcover and the lack of substantial areas of bare earth. Only the Outcrop Rainbow-skink *Liburnascincus mundivensis* in the rocky areas of the vine thicket was readily observed. Given the very suitable micro-habitats present for reptiles this somewhat unrepresentative species assemblage is likely to be a sampling artefact rather than a sign of some disturbance regime.

The desktop assessment identified one Vulnerable (EPBC Act and NC Act) and three Near Threatened (NC Act) reptile species that, based on known distributions and habitat use, may occur on the site. These species are listed in **Table 5**.

Birds

Sixty-six bird species were recorded (**Appendix B**). All of these species except Cicadabird were identified by the desktop assessment (BAAM 2012). The desktop assessment identified 199 bird species for the project area. Not all of these species would be expected to occur on site and some species would only be seasonal or sporadic visitors. The waterbodies present do not provide suitable resources for a number of the waterbirds known for the area and a number of species are confined locally to habitats not found on site. The project area encompasses the nearby White Mountains National Park which *lies at the confluence of multiple major landscape features and* [has a] *fauna assemblage that reflects this position at climatic and biogeographic crossroads* (Kutt *et al*. 2005: 27). This means that its species assemblage includes species more typical of habitats to the east, south and west.

The site, for its size, is homogeneous with regard to habitats, being mostly ironbark woodland. West of the Flinders River (the section of the site east of the Flinders River was not accessible during the survey and was not assessed) the site does not contain a sufficient variety of habitat types to support a large number of species. Hence the desktop assessment suggests a much greater possible bird species assemblage than is possible. This is also the case for reptiles and mammals.

The recorded bird species assemblage includes very few honeyeaters (four species), of which only Noisy Miner *Manorina melanocephala* was common. A lack of blossom during the survey period accounts for the absence of more nomadic species but more species were expected. The number of insectivorous birds, especially those that feed by sallying (catching insects in flight from a perch), was also less than anticipated. The common small insectivores, Weebill *Smicrornis brevirostris*, White-throated Gerygone *Gerygone albogularis*, Striated Pardalote *Pardalotus striatus* and Rufous Whistler *Pachycephala rufiventris*, all glean or hover glean (take their prey from leaves and other surfaces). Other insectivores that are more aerial in feeding, such as Jacky Winter *Microeca fascinans*, Hooded Robin *Melanodryas cucullata* and Restless Flycatcher *Myiagra inquieta* were not recorded and Willie Wagtail *Rhipidura leucophrys* and Grey Fantail *R. albiscapa* were only recorded once each.

An underrepresentation of small insectivorous birds is often a reflection of habitat disturbance especially due to the presence of larger, aggressive species ('increaser' species) such as Noisy Miner and butcherbirds (see **Section 3.3** for more detail). Much of the woodland on site, however, was intact with a well-developed shrub layer and should have supported more small insectivorous species. There was no apparent explanation for their absence.

Of the conservation significant species considered to possibly occur on site (**Table 5**), Square-tailed Kite and Black-chinned Honeyeater (both listed as Near Threatened under the NC Act) and the widespread and common Eastern Great Egret (listed as Migratory under the EPBC Act) are the most likely.

Mammals

Twenty mammal species were recorded (**Appendix B**), though there is some uncertainty with the identification of some micro-bat species based on Anabat call analysis. The desktop assessment (BAAM 2012) identified 43 mammal species, which included all but two of the species recorded during the field survey. The majority of the recorded species are micro-bats (ten species) and macropods (five species). No dasyurids, bandicoots or rodents were recorded despite the good conditions during the survey period. Digging that could have been done by a bandicoot was found in ironbark woodland but Rufous Bettong *Aepyprymnus rufescens*, which was recorded, may have been responsible. It is often very difficult to distinguish between the two species (Triggs 2004). A lack of captures of small dasyurids and rodents in Elliott traps is not particularly surprising west of the ranges but no captures were made in pitfall traps. The only conservation significant mammal predicted to occur (other than at the bioregional level) (**Table 5**) is Northern Quoll (listed as Endangered under the EPBC Act). It is known from *Eucalyptus crebra* woodland in more southerly parts of its range (Pollock 1999) but is most likely to occur on site in rocky areas (Oakwood 2008) associated with the Flinders River. It is possible, based on aerial photography, that areas to the east of the Flinders River (that have not been assessed) are more likely to support Northern Quolls than areas to the west due to the more rocky terrain.

3.3 Fauna Habitat Values

3.3.1 Overview

Woody vegetation, as present on the majority of the site, is mapped as remnant by DEHP where the canopy is dominated by species characteristic of the vegetation's undisturbed canopy and has greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover. These requirements do not, however, indicate the quality of other important components of the habitat that may provide the resources required by native fauna and flora. Hence vegetation classed as remnant may not always be suitable for certain native fauna species. This is particularly relevant for many conservation significant species. Therefore it is necessary to assess habitat quality, not just habitat type, to determine the likelihood of particular species occurring in a particular location.

Habitat type is, nonetheless, the most significant factor in determining the composition of the fauna species present in a particular area, whether as residents or as seasonal or sporadic visitors. Two especially important components of any particular habitat are physical structure and resource availability. Structure refers to the abundance and complexity of the vegetation, debris (fallen timber, bark and leaf litter) and substrate. Habitats with greater structural complexity will generally have more fauna species and are less likely to be dominated by only a few species.

The availability and variety of resources (food, water, shelter and breeding sites) also affects the number and type of fauna species inhabiting an area. The loss of complexity and resources through disturbance may mean that conservation significant species do not occur in particular locations despite the habitat(s) being nominally suitable. Habitat use by some species may also be seasonal or may reflect current conditions, for example recent rainfall or mass flowering events. Therefore, assessment of a site based simply on the species present at the time of survey may be misleading. The habitats present on site should be assessed with seasonal and longer time frames in mind.

The quality of the habitat and hence its suitability for many species is also dependent, in part, on other factors including severity and types of disturbance, patch size and connectivity at local and regional scales. These factors are very site specific and may be synergistic, though soil type is typically the underlying factor. The most common disturbance factors in the project area are weeds, feral animals and degradation of habitat by livestock and feral herbivores, particularly Pigs.

Weed infestations and habitat degradation can have deleterious impacts on fauna, particularly reptiles, small mammals and insectivorous birds that forage on the ground (Adair & Groves 1998; Woinarski & Ash 2002; Maron & Lill 2005). This may significantly alter the species present in a particular patch of habitat. Historical land use, particularly that involving substantial disturbance and/or loss of soil, may have reduced structural complexity, and shrubs and canopy tree species may not be replaced due to grazing by livestock. Habitats may also be subject to edge effects due to fragmentation which influences the likelihood of the presence of feral species and native ‘increaser’ species (Landsberg *et al*. 1997; Moran *et al*. 2004) such as miners *Manorina* spp., Pied Butcherbird *Cracticus nigrogularis* and Laughing Kookaburra *Dacelo novaeguineae*. These large, aggressive bird species invade disturbed habitats and may negatively affect many woodland and forest birds, either through nest predation (Piper & Catterall 2004) or aggressive behaviour interrupting foraging (Grey *et al*. 1998; Maron 2009). The presence of increaser and feral species, both plants and animals, often reflects high levels of disturbance (Recher 1999; Martin & McIntyre 2007).

Connectivity of wooded areas within the landscape also influences the species found in a particular patch of vegetation. Patches of woodland and forest surrounded by cleared land have an increased abundance of medium and large-bodied generalist species, including the increaser species mentioned above, and a decreased abundance of small-bodied insectivorous species ('decreaser' species) (Barrett *et al*. 1994; Martin *et al*. 2006; Woinarski *et al*. 2006). The absence of such species may indicate that conservation significant species are also likely to be absent.

The various aspects of habitat value as described above are discussed with reference to the major habitat types in the following section.

3.3.2 Habitat types

Five broad habitat types present on site were assessed for fauna:

- ironbark woodland with a shrub layer
- ironbark woodland without a shrub layer
- vine thicket
- riparian areas
- highly modified areas including dams and pasture.

Ironbark woodland with shrub layer

The vast majority of the site west of the Flinders River was ironbark woodland, with or without a shrub layer.

This habitat was in very good condition. It had structural complexity, with substantial micro-habitats such as large amounts of coarse woody debris (fallen timber) and exfoliating bark (**Plates 5** and **6**). The shrub layer provided resources for smaller insectivorous bird species, reducing the impacts of the 'increaser' species Noisy Miner, which was comparatively common throughout the site. Its abundance is typically reduced in areas with a shrub layer and the effects of its aggressive behaviour to other species are reduced by the shelter provided by shrubs. Species that prefer areas with a shrub layer, such as Grey-crowned Babbler and Red-backed Fairy-wren *Malurus melanocephala*, were only recorded in this habitat.

The habitat had abundant tree hollows, including hollows sufficiently large for arboreal mammals such as Common Brushtail Possum. Roosting resources were especially plentiful for micro-bats. Disturbance regimes were limited to patchy invasion by Red Natal Grass, low levels of grazing by livestock and some presence of Cane Toads. Levels of disturbance presumably vary with season but were low at the time of survey. Red Natal Grass typically doesn't choke groundlayer habitats and is likely to be having an insignificant impact. Cane Toads were mostly found in disturbed areas and, as they are well established in the area, are likely to be having a comparatively minor impact on the fauna species that persist (Shine 2010).

Although the impacts of livestock were low at the time of survey, their negative effects may increase under less favourable conditions. The habitat condition indicates, however, that their impact over recent seasons has not had significant effect. The habitat (and site overall) had excellent connectivity and is likely to be providing resources for a substantial fauna species assemblage.

Plate 5: Ironbark woodland with shrub layer

Plate 6: Ironbark woodland with shrub layer and coarse woody debris

Ironbark woodland without a shrub layer

The reason for the lack of a shrub layer through much of the ironbark woodland (**Plate 7**) on site is unknown. Although there were large numbers of dead trees none appeared to be ring-barked. It is unlikely that drought would have resulted in such a habitat mosaic. Poisoning may have occurred previously and fire regimes and grazing by livestock may be suppressing recruitment of canopy species, though there was some evidence of recruitment. The absence of a shrub layer may be linked to substrate.

The lack of shrub layer alters the species assemblage present, with a greater abundance of 'increaser' species and a reduced number of small insectivores. Some open country species, such as Crested Pigeon *Ocyphaps lophotes*, Brown Falcon *Falco berigora* and Magpie-lark *Grallina cyanoleuca*, were only recorded in this habitat or in more disturbed areas, such as around dams. Nonetheless, areas of woodland without a shrub layer did support species such Varied Sittella *Daphoenositta chrysoptera* and White-throated Honeyeater *Melithreptus albogularis*, indicating that high levels of connectivity are, to some degree, offsetting the effects of reduced habitat complexity.

Riparian areas

The riparian vegetation was dominated by *Eucalyptus camaldulensis* and *Casuarina cunninghamiana*. There were also patches of *Melaleuca bracteata*. Generally the riparian vegetation was very sparse, only one or two trees wide on each bank and with very little or no shrub layer (**Plate 8**). This sparseness substantially reduces its value to fauna, both as long-term habitat and as a corridor for movement. This habitat was heavily infested by weeds and subject to high levels of disturbance by livestock.

E. camaldulensis does provide large tree hollows for arboreal mammals and hollow-nesting birds such as owls and parrots. In many areas this aspect is a very important component of a site but, in this instance, the abundance of large hollows in the extensive ironbark woodland greatly reduces the importance of such hollows in the riparian zone. The good connectivity of wooded habitats across the site means that its limited function as a local corridor is further reduced. Nonetheless, riparian zones are important for their high productivity levels, supporting higher numbers of invertebrates than many surrounding habitats (food resources for a variety of fauna species), and provide alternative water resources to farm dams and other artificial waterbodies. Dams can be focal points for predators, particularly goshawks and falcons and many small bird species do not like to drink from such open habitats.

Plate 7: Ironbark woodland with no shrub layer

Plate 8: Humpy Creek and riparian vegetation

Vine thicket

Due to a lack of vehicle access, survey of vine thicket (**Figure 2**) was limited to a single visit during the middle of day. Ideally this habitat should be subject to a variety of survey techniques as it is likely to support a number of species not found locally in other habitat types. The fauna observed included species such as Outcrop Rainbow-skink *Liburnascincus mundivensis* and Allied Rock-wallaby *Petrogale assimilis* that are associated with boulders and other rocky habitats (**Plates 9** and **10**). The boulders provide high quality shelter resources for a number of reptile species and vine thicket is known habitat for species such as Speckled Worm-skink *Anomalopus gowi* and Vine-thicket Fine-lined Slider *Lerista cinerea* (the latter listed as Near Threatened under the NC Act). Accumulations of leaf litter in rocky areas may also support Two-toed Fine-lined Slider and Common Death Adder (both listed as Near Threatened under the NC Act). Kutt *et al.* (2005) mention a Queensland Parks and Wildlife Service record of Grey Goshawk for nearby White Mountains National Park. This species, which is listed as Near Threatened under the NC Act, is not listed in the Wildlife Online database search results (BAAM 2012) but should it occur in the area it would most likely be in the vine thicket fringing the Flinders River.

Plate 9: Vine thicket on western fringes of the Flinders River

Plate 10: Boulders in vine thicket

Modified areas and artificial waterbodies

There are a number of highly modified areas on site: pasture, dams for livestock (**Plate 11**), vehicle tracks and drill sites. The drill sites are typically located in woodland and are small, discrete areas. They were not surveyed in any formal fashion. There would be some edge effects and increased access for feral predators to surrounding woodland, but the small size

of the sites and their spacing through a largely intact landscape means that these impacts are comparatively minor.

The vehicle tracks, both farm tracks and exploration tracks, do provide resources for some native fauna. Many species move along roads, predators hunt on them, scavengers patrol them for carcasses, some species, notably agamids (dragons) and pardalotes (small birds), breed on the roadsides and in cuttings, some frog species breed in flooded drainage ditches, reptiles will sun on roads to warm up and some birds, including the conservation significant Squatter Pigeon, will use them to dust bathe.

But tracks are a modification to the natural habitats that also create impacts that penetrate into adjacent areas. Tracks create edge effects, may act as barriers, disturb fauna through noise of traffic, result in road-kills, increase sedimentation, and facilitate the invasion of weeds and provide easy access to habitat for exotic predators (Andrews 1990; Forman and Alexander 1998). The abundance and activity of Cane Toads increases along tracks (Seabrook & Dettmann 1996) and wild Dogs and Foxes are known to follow tracks and use them for hunting (Edwards *et al*. 2000). Dingoes were observed on tracks on site and were reportedly seen regularly on tracks by exploration staff. However, within a particular region Dingoes specialise on the most commonly available wildlife (Corbett 2008) and may help regulate native mammal communities through predation of smaller predators such as Foxes, (which benefits smaller native mammals eaten by Foxes) and of kangaroos and Rabbits, which reduces overgrazing (Glen *et al*. 2007; Letnic & Koch 2010).

Plate 11: Dam in a cleared area

Plate 12: Weed-infested highly modified area

The dams and their immediate surrounds were typically weed infested (**Plate 12**) but some areas were denuded of ground cover due to trampling and grazing by livestock and soil compaction. Although there was some tree cover this is a very open habitat and attracts feral species, 'increaser' species and open country species. The dams themselves are likely to attract feral Pigs which need to drink daily in hot weather and are usually found within 2 km of water under such conditions. The creation of farm dams may have facilitated the spread of this species in Australia (Mitchell 1993; Roberts *et al*. 1996). The dams were providing resources for a number of waterbirds that were not recorded elsewhere on site and Plumed Whistling-Duck *Dendrocygna eytoni* and Australian Wood Duck *Chenonetta jubata* had both bred at the dams surveyed.

All Squatter Pigeons observed on site were at or near Dam 1 (**Figure 2)**, including two birds beside a vehicle track (**Plate 4**). The species mostly occurs near permanent water, is often found in disturbed areas such as cattle yards, on dirt tracks and in areas denuded of ground cover by livestock. The presence of birds in a disturbed area was not surprising nor was it unusual to not record them in undisturbed areas.

Summary of habitat values

The habitats present on site are generally in good condition, with severe disturbance (livestock and weed infestation) largely restricted to waterbodies. The site is in a landscape of high connectivity. Although feral fauna species are present the large population of Dingoes is likely to be controlling many of these species.

4. Additional survey and assessment work

Access constraints meant that the section of the study site east of the Flinders River was not assessed during the field survey. A lack of vehicle access to the Flinders River also meant that fringing habitats, in particular vine thicket on the ridge lines, were not surveyed. The following recommendations are made to address this.

A dry season survey should be conducted for the site, including areas surveyed during the wet season. The scope of the survey should include:

- Vine thicket communities (for flora and fauna).
- Areas to the east of the Flinders River, with requirements of survey effort determined by *in situ* assessment of the habitats present (for flora and fauna).
- Mapped REs not visited during the wet season assessment (flora):
  - RE 2.10.2 Mixed eucalypt woodland on plateaus, mesas and scarps on shallow soils;
  - RE 9.8.5a *Astrebla* spp.+/- *Iseilema vaginiflorum* tussock grassland +/- emergent *Corymbia terminalis* on basalt plains;
  - RE 10.10.1a *Acaia shirleyi* woodland or *A. catenulate* low open woodland on sandstone ranges;
  - RE 10.10.2a *Acacia burdekensis* or *A. julifera.*
- Targeted search for Koala to identify abundance.

A wet season survey (*ie* when the species would be flowering) targeting *Dichanthium setosum,* should be conducted to confirm the abundance and distribution of this bluegrass species in the study area. Findings from this survey will assist when determining regulatory requirements, such as the need for an EPBC referral.

5. References

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Appendix A:
Wet season field survey flora results

Listing of the flora species and the vegetation communities they were encountered during the 2012 wet season field survey

Status	Family	Species	Common Name	Ironbark Woodland	Streams and adjacent flats	Swamp	Grassland	Vineforest
	Acanthaceae	*Brunoniella acaulis*	Brunoniella	x				
	Acanthaceae	*Rostellularia ascendens*	Pink Tongues	x			x	x
	Adiantaceae	*Cheilanthes brownii*	Woolly Cloak Fern					x
	Adiantaceae	*Cheilanthes sieberi*	Mulga Fern	x				x
	Adiantaceae	*Paraceterach muelleri*						x
	Amaranthaceae	*Achyranthes aspera*	Chaff Flower	x	x			x
*	Amaranthaceae	*Alternanthera pungens*	Khaki Weed	x	x	x		
*	Amaranthaceae	*Amaranthus viridis*	Slender Amaranth	x		x		
*	Amaranthaceae	*Gomphrena celosioides*	Gomphrena	x	x			
	Amaryllidaceae	*Crinum flaccidum*	Murray Lily		x			
	Anacardiaceae	*Euroschinus falcatus*	Cudgerie					x
	Anacardiaceae	*Pleiogynium timorense*	Burdekin Plum					x
	Apiaceae	*Eryngium plantagineum*	Eryngo			x		
	Apocynaceae	*Alyxia spicata*	Chain Fruit					x
*	Apocynaceae	*Asclepias curassavica*	Red Head Cotton Bush		x			
	Apocynaceae	*Carissa lanceolata*	Conker Berry	x			x	
	Apocynaceae	*Carissa ovata*	Conker Berry	x				
*	Apocynaceae	*Cryptostegia grandiflora*	Rubbervine		x			
	Apocynaceae	*Marsdenia viridiflora* subsp. *tropica*	Bush Banana	x				x
	Apocynaceae	*Parsonsia lanceolata*	Rough Silkpod					x
	Apocynaceae	*Tylophora erecta*		x				
*	Asteraceae	*Acanthospermum hispidum*	Star Burr	x		x		
*	Asteraceae	*Bidens bipinnata*	Native Cobbler's Pegs	x				x
	Asteraceae	*Calotis cuneifolia*	Purple Burr-Daisy	x				
	Asteraceae	*Camptacra barbata*		x				
	Asteraceae	*Chrysocephalum apiculatum*	Yellow Buttons					x
	Asteraceae	*Coronidum lanosum*		x				
	Asteraceae	*Coronidum rupicola*		x				
	Asteraceae	*Peripleura bicolor*		x				
	Asteraceae	*Peripleura hispidula*	Fuzzweed	x				

Status	Family	Species	Common Name	Ironbark Woodland	Streams and adjacent flats	Swamp	Grassland	Vineforest
	Asteraceae	*Pterocaulon redolens*	Ragweed	x			x	
	Asteraceae	*Pterocaulon sphacelatum*	Fruit Salad Plant	x				
	Asteraceae	*Pycnosorus chrysanthes*	Golden Billy-buttons			x		
	Asteraceae	*Sigesbeckia orientalis*	Indian Weed					x
	Asteraceae	*Streptoglossa sp.*		x				
*	Asteraceae	*Tridax procumbens*	Tridax Daisy	x			x	x
	Asteraceae	*Wedelia asperrima*	Sunflower Daisy	x				
	Asteraceae	*Wedelia spilanthoides*		x				
*	Asteraceae	*Xanthium occidentale*	Noogoora Burr		x			
*	Asteraceae	*Xanthium pungens*	Noogoora Burr		x			
	Asteraceae	*Xerochrysum bracteatum*	Golden Everlasting	x				
	Bignoniaceae	*Pandorea pandorana*	Wonga Vine	x				x
	Boraginaceae	*Heliotropium sp.*			x			
	Boraginaceae	*Trichodesma zeylanicum*	Camel Bush	x	x		x	x
	Byttneriaceae	*Waltheria indica*	Waltheria	x				
*	Caesalpiniaceae	*Senna occidentalis*	Coffee Senna		x			
	Campanulaceae	*Lobelia leucotos*			x	x		
	Campanulaceae	*Wahlenbergia sp*	Bluebell	x				
	Capparaceae	*Capparis canescens*	Wild Orange	x				
	Capparaceae	*Capparis sepiaria*	Wild Caper	x			x	
	Capparaceae	*Capparis spinosa*	Flinders Rose				x	
	Caryophyllaceae	*Polycarpaea corymbosa*	Copperbush	x				
	Caryophyllaceae	*Polycarpaea spirostylis*	Copper Bush					
	Casuarinaceae	*Casuarina cunninghamii*	River She-oak		x			
	Celastraceae	*Denhamia oleaster*	Kapok					x
	Celastraceae	*Maytenus cunninghamii*	Yellow Berry Bush	x				
	Chenopodiaceae	*Einadia nutans*	Climbing Saltbush				x	
	Chenopodiaceae	*Maireana sp.*						
	Combretaceae	*Terminalia aridicola* subsp. *aridicola*	Arid Peach	x				x
	Commelinaceae	*Commelina ensifolia*	Scurvy Weed	x		x		x
	Commelinaceae	*Murdannia graminea*	Grass Lily	x	x	x		

Status	Family	Species	Common Name	Ironbark Woodland	Streams and adjacent flats	Swamp	Grassland	Vineforest
	Convolvulaceae	*Evolvulus alsinoides*	Native Evolvulus	x				
	Convolvulaceae	*Ipomoea plebeia*	Bell Vine	x				
	Convolvulaceae	*Jacquemontia paniculata*		x	x			
*	Cucurbitaceae	*Citrullus colocynthis*	Colocynth	x		x		
	Cucurbitaceae	*Cucumis maderaspatana*	Madras Sea Pumpkin	x				x
	Cyperaceae	*Bulbostylis barbata*	Dainty Sedge	x				
	Cyperaceae	*Cyperus castaneus*		x				
	Cyperaceae	*Cyperus dietrichiae* var. *dietrichiae*				x		
	Cyperaceae	*Cyperus fulvus*	Sticky Sedge			x		
	Cyperaceae	*Cyperus gracilis*	Graceful Sedge					x
	Cyperaceae	*Eleocharis ochrostachys*				x		
	Cyperaceae	*Fuirena nodiflora*				x		
	Cyperaceae	*Scleria mackaviensis*						x
	Cyperaceae	*Scleria sphacelata*	Razor Grass	x				x
	Cyperaceae	*Scleria tricuspidata*		x				
	Droseraceae	*Drosera burmanni*	Burmann's Sundew	x				
	Droseraceae	*Drosera indica*	Sundew/Flycatcher	x				
	Droseraceae	*Drosera spathulata*	Common Sundew	x				
	Ebenaceae	*Diospyros humilis*	Small Leaved Ebony					x
	Erythroxylaceae	*Erythroxylum australe*	Erythroxylum	x				x
*	Euphorbiaceae	*Euphorbia hirta*	Asthma Weed	x		x		
	Euphorbiaceae	*Petalostigma pubescens*	Quinine Tree	x				x
	Fabaceae	*Aeschynomene indica*	Budda Pea			x		
	Fabaceae	*Cajanus marmoratus*		x				
	Fabaceae	*Cajanus reticulatus*		x				
	Fabaceae	*Crotalaria brevis*	Rattlepod	x				
	Fabaceae	*Crotalaria medicaginea*	Trefoil Rattlepod	x	x		x	
	Fabaceae	*Crotalaria mitchelli*	Sand Rattlepod	x				
	Fabaceae	*Crotalaria montana*	Rattlepod	x	x	x	x	
	Fabaceae	*Crotalaria verrucosa*	Blue Rattlepod	x	x	x		
NT	Fabaceae	*Desmodium macrocarpum*	Poplar Box	x				
	Fabaceae	*Desmodium rhytidophyllum*		x				

Status	Family	Species	Common Name	Ironbark Woodland	Streams and adjacent flats	Swamp	Grassland	Vineforest
	Fabaceae	*Galactia tenuiflora*		x				
	Fabaceae	*Hovea longipes*	Bush Hovea	x				
	Fabaceae	*Indigofera hirsuta*	Hairy Indigo	x				
	Fabaceae	*Indigofera linifolia*	Narrow-leaved Indigo	x				
	Fabaceae	*Indigofera linnaei*	Birdsville Indigo	x			x	
	Fabaceae	*Indigofera pratensis*	Forest Indigo	x				
	Fabaceae	*Jacksonia ramosissima*		x				
	Fabaceae	*Rhynchosia minima*	Rhynchosia	x				
*	Fabaceae	*Stylosanthes humilis*	Townsville Stylo	x		x		
*	Fabaceae	*Stylosanthes scabra*	Shrubby Stylo	x		x		
	Fabaceae	*Tephrosia filipes* subsp. *filipes*		x				
	Fabaceae	*Tephrosia juncea*		x				
	Fabaceae	*Tephrosia leptoclada*		x				
	Fabaceae	*Uraria lagopodioides*		x				
	Fabaceae	*Vigna lanceolata*	Maloga Bean	x				
	Fabaceae	*Vigna radiata*	Mung Bean	x		x		
	Fabaceae	*Zornia dyctiocarpa*		x				
	Fabaceae	*Zornia muriculata*	Upright Zornia	x				
	Goodeniaceae	*Goodenia byrnesii*		x			x	
	Haemodoraceae	*Haemodorum coccineum*	Bloodroot	x				
	Hemerocallidaceae	*Dianella longifolia*	Blue Flax Lily	x				
	Hypoxidaceae	*Hypoxis pratensis*	Golden Stars	x				
	Juncaceae	*Juncus usitatus*	Common Rush	x				
	Lamiaceae	*Plectranthus parviflorus*	Coleus					x
	Lauraceae	*Cassytha filiformis*	Dodder	x				
	Laxmanniaceae	*Eustrephus latifolius*	Wombat Berry	x				x
	Laxmanniaceae	*Lomandra longifolia*	Spiny-headed Mat-Rush		x			
	Loganiaceae	*Mitrasacme sp.*		x				
	Loranthaceae	*Lysiana spathulata* subsp. *spathulata*	Collared Mistletoe	x				
	Lythraceae	*Ammannia baccifera*	Acrid weed	x				
	Lythraceae	*Ammannia multiflora*	Jerry-Jerry			x		

Status	Family	Species	Common Name	Ironbark Woodland	Streams and adjacent flats	Swamp	Grassland	Vineforest
	Malvaceae	*Hibiscus meraukensis*	Native Hibiscus	x				
*	Malvaceae	*Malvastrum americanum*	Malvastrum	x				
*	Malvaceae	*Malvastrum coromandelianum*	Spiked Malvastrum		x			
	Malvaceae	*Melhania oblongifolia*	Velvet Hibiscus	x				x
*	Malvaceae	*Sida cordifolia*	Flannel Weed		x			
	Malvaceae	*Sida hackettiana*	Golden Sida	x	x			
*	Malvaceae	*Sida rhombifolia*	Common Sida	x	x			
	Marsileaceae	*Marsilea sp.*	Nardoo			x		
	Meliaceae	*Turraea pubescens*	Turraea					x
	Mimosaceae	*Acacia bidwillii*	Corkwood Wattle	x				
	Mimosaceae	*Acacia elachantha*	Cowle's Wattle	x				
	Mimosaceae	*Acacia excelsa* subsp. *excelsa*	Ironwood	x				
	Mimosaceae	*Acacia melleodora*	Waxy Wattle	x				
	Mimosaceae	*Acacia salicina*	Willow Wattle	x				
	Mimosaceae	*Acacia stenophylla*	River Cooba	x				
	Mimosaceae	*Acacia victoriae* subsp. *fascicaria*	Bramble Wattle		x			
	Mimosaceae	*Archidendropsis basaltica*	Red Lancewood	x				
	Mimosaceae	*Neptunia gracilis*	Native Sensitive Plant	x				
*	Mimosaceae	*Vachellia farnesiana*	Mimosa Bush	x				
	Moraceae	*Ficus aculeata*	Sandpaper Fig					x
	Moraceae	*Ficus virens*	Mountain Fig					x
	Myoporaceae	*Eremophila debilis*	Winter Apple				x	
	Myoporaceae	*Myoporum acuminatum*	Boobialla	x				x
	Myrtaceae	*Corymbia dallachiana*	Ghost Gum	x				
	Myrtaceae	*Corymbia erythrophloia*	Red Bloodwood	x				
	Myrtaceae	*Corymbia lamprophylla*	Shiny-leaved Bloodwood	x				
	Myrtaceae	*Corymbia setosa*	Rough-leaved Bloodwood	x				
	Myrtaceae	*Corymbia terminalis*	Western Bloodwood	x				
	Myrtaceae	*Eucalyptus brownii*	Reid River Box			x		
	Myrtaceae	*Eucalyptus camaldulensis*	River Red Gum		x	x		
	Myrtaceae	*Eucalyptus crebra*	Narrow-leaved Ironbark	x				
	Myrtaceae	*Eucalyptus orgadophila*	Mountain Coolibah		x			

Status	Family	Species	Common Name	Ironbark Woodland	Streams and adjacent flats	Swamp	Grassland	Vineforest
	Myrtaceae	*Eucalyptus xanthoclada*	Yellow-branched Ironbark	x				
	Myrtaceae	*Lithomyrtus microphylla*		x				
	Myrtaceae	*Melaleuca bracteata*	Black Teatree		x			
	Myrtaceae	*Melaleuca nervosa*	Paperbark	x				
	Myrtaceae	*Melaleuca trichostachya*	River Paperbark		x			
	Nyctaginaceae	*Boerhavia sp.*			x			
	Oleaceae	*Notelaea microcarpa*	Native Olive					x
	Orchidaceae	*Cymbidium canaliculatum*	Black Orchid	x				
	Phyllanthaceae	*Antidesma parvifolium*	Alexandra Palm					x
	Phyllanthaceae	*Breynia oblongifolia*	Coffee Bush	x				x
	Phyllanthaceae	*Bridelia leichhardtii*	Brush Ironbark					x
	Pittosporaceae	*Bursaria incana*	Box Thorn	x				
	Poaceae	*Alloteropsis cimicina*	Summer Grass	x				
	Poaceae	*Ancistrachne uncinulata*	Hookey Grass					x
	Poaceae	*Aristida gracilipes*	Three-awn Speargrass					x
	Poaceae	*Aristida latifolia*	Feathertop	x				
	Poaceae	*Aristida leptopoda*	White Speargrass	x			x	
	Poaceae	*Bothriochloa bladhii*	Forest Bluegrass	x	x			
	Poaceae	*Bothriochloa decipiens*	Pitted Bluegrass	x				
	Poaceae	*Bothriochloa pertusa*	Indian Bluegrass	x	x		x	
	Poaceae	*Capillipedium parviflorum*	Scented Top		x			
*	Poaceae	*Cenchrus pennisetiforme*	White Buffel Grass	x				
	Poaceae	*Chloris inflata*	Purple-topped Rhodes Grass	x		x		
	Poaceae	*Chloris pectinata*	Slender Chloris	x				
	Poaceae	*Cleistochloa subjuncea*		x				
	Poaceae	*Cymbopogon bombycinus*	Silky-Oil Grass	x				
	Poaceae	*Cymbopogon obtectus*	Silky Heads	x				
	Poaceae	*Cymbopogon retroflexus*	Barb-wire Grass		x			
	Poaceae	*Dactyloctenium radulans*	Button Grass		x			
	Poaceae	*Dichanthium sericeum*	Bluegrass	x			x	
NT[1], V[2]	Poaceae	*Dichanthium setosum*	Bluegrass	x				

Status	Family	Species	Common Name	Ironbark Woodland	Streams and adjacent flats	Swamp	Grassland	Vineforest
*	Poaceae	*Echinochloa colona*	Awnless Barnyard Grass		x	x		
*	Poaceae	*Echinochloa crus-galli*	Barnyard Grass	x		x		
	Poaceae	*Eleusine indica*	Crowsfoot Grass		x			
	Poaceae	*Enneapogon gracilis*	Slender Nineawn	x				
	Poaceae	*Enneapogon lindleyanus*	Bottle Washer Grass	x				
	Poaceae	*Enneapogon polyphyllus*	Leafy Nine Awn	x				
	Poaceae	*Eragrostis cumingii*	Cumming's Lovegrass			x		
	Poaceae	*Eulalia aurea*	Silky Browntop	x				
	Poaceae	*Heteropogon contortus*	Black Speargrass	x	x		x	
	Poaceae	*Heteropogon triticeus*	Giant Spear Grass	x				
	Poaceae	*Iseilema vaginiflorum*	Red Flinders Grass				x	
	Poaceae	*Leptochloa decipiens*	Bamboo Grass	x				
*	Poaceae	*Melinis repens*	Red Natal Grass	x	x		x	x
	Poaceae	*Mnesithea granularis*		x				
	Poaceae	*Ophiuros exaltatus*	Canegrass				x	
	Poaceae	*Panicum effusum*	Hairy Panic Grass	x			x	
	Poaceae	*Perotis rara*	Comet Grass	x				
	Poaceae	*Pseudoraphis spinescens*	Spiny Mudgrass			x		
	Poaceae	*Sarga plumosum*	Plume Sorghum	x				
	Poaceae	*Schizachyrium pseudeulalia*		x				
	Poaceae	*Setaria surgens*	Annual Pigeon Grass	x	x	x		
	Poaceae	*Sporobolus australasicus*	Australina Dropsead	x				
	Poaceae	*Sporobolus caroli*	Fairy Grass	x				
	Poaceae	*Sporobolus elongatus*	Slender Rat's Tail Grass				x	
	Poaceae	*Themeda triandra*	Kangaroo Grass	x	x		x	
	Poaceae	*Tragus australianus*	Small Burr Grass	x				
	Pontederiaceae	*Monochoria cyanea*	Monochoria			x		
	Proteaceae	*Grevillea glauca*	Bushmans Pegs	x				
	Proteaceae	*Grevillea parallela*	Silver Beefwood	x				
	Proteaceae	*Hakea chordophylla*	Bull Oak	x				
	Proteaceae	*Hakea lorea*	Sphagetti Hakea	x				
	Putranjivaceae	*Drypetes deplanchei*	Yellow Tulipwood					x

Status	Family	Species	Common Name	Ironbark Woodland	Streams and adjacent flats	Swamp	Grassland	Vineforest
	Rhamnaceae	*Alphitonia excelsa*	Soap Tree	x	x			x
	Rubiaceae	*Pavetta granitica*	Granite Boronia					x
	Rubiaceae	*Pogonolobus reticulatus*	Medicine Bush	x				
	Rubiaceae	*Psydrax johnsonii*	Brigalow Canthium					x
	Rubiaceae	*Spermacoce brachystema*		x				
	Rubiaceae	*Spermacoce sp*		x			x	
	Rutaceae	*Geijera salicifolia*	Brush Wilga	x	x			x
	Santalaceae	*Exocarpos latifolius*	Scrub Cherry					x
	Santalaceae	*Santalum lanceolatum*	Sandalwood	x				
	Sapindaceae	*Alectryon connatus*	Grey Birdseye					x
	Sapindaceae	*Atalaya hemiglauca*	White Wood	x	x		x	
	Sapotaceae	*Sersalisia sericea*	Mongo					x
	Scrophulariaceae	*Striga parviflora*	Witchweed				x	
*	Solanaceae	*Solanum americanum*	Glossy Nightshade	x		x		
	Solanaceae	*Solanum ellipticum*	Potato Bush	x				
	Solanaceae	*Solanum nemophilum*	Bush tomato	x				
	Sparmanniaceae	*Grewia retusifolia*	Dogs Balls	x			x	
	Sterculiaceae	*Brachychiton australis*	Broad-leaved Bottletree	x				x
	Typhaceae	*Typha domingensis*	Cumbungi		x			
	Violaceae	*Hybanthus enneaspermus*	Spade Flower	x				
	Violaceae	*Hybanthus stellarioides*	Spade Flower	x				
	Vitaceae	*Cissus cardiophylla*						x
	Vitaceae	*Clematicissus opaca*	Small-leaved Water Vine					x
	Xanthorrhoeaceae	*Xanthorrhoea johnstonii*	Grasstree	x				

[1] Queensland *Nature Conservation Act* 1992 status: NT = Near Threatened

[2] Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 status: V = Vulnerable

* = Introduced species

Appendix B:
Wet season field survey fauna results

Table 1: Terrestrial vertebrates recorded on or near EPC1260 White Mountains Project

Scientific name[1]	Common name	Status[2]		Trap site					Target site			Inc[4]	Comments
		EPBC Act	NC Act	1	2	3	4	5	Dam 1	Dam 2	VT[3]		
FROGS													
Limnodynastes ornatus	Ornate Burrowing Frog	-	LC			x							More generally recognised now as *Platyplectrum ornatum.*
Limnodynastes tasmaniensis	Spotted Grass Frog	-	LC			x	x	x					Captured repeatedly in pitfall traps.
Cyclorana alboguttata	Striped Burrowing Frog	-	LC									x	One individual on track in ironbark woodland.
Litoria caerulea	Green Tree Frog	-	LC			x							Three individuals, all in ironbark woodland.
Litoria rubella	Red Tree Frog	-	LC									x	One individual on track in ironbark woodland.
Rhinella marina	Cane Toad	-	I		x	x							Common, more so in disturbed areas.
REPTILES													
Strophurus williamsi	Eastern Spiny-tailed Gecko	-	LC		x								One individual trapped.
Gehyra dubia	Dubious Dtella	-	LC				x						One individual trapped.
Delma tincta	Excitable Delma	-	LC									x	One found active by day in a disturbed area adjacent to a creek.
Carlia munda	Shaded-litter Rainbow-skink	-	LC	x	x	x							Common.
Carlia pectoralis	Open-litter Rainbow-skink	-	LC					x					One individual trapped.
Carlia vivax	Tussock Rainbow-skink	-	LC	x	x		x						Common.
Cryptoblepharus virgatus	Cream-striped Shinning-skink	-	LC									x	One observed in open woodland.
Liburnascincus mundivensis	Outcrop Rainbow-skink	-	LC								x		Common on rocks in vine thicket.
Menetia greyii	Common Dwarf Skink	-	LC	x	x	x							Common.
Menetia timlowi	Dwarf Litter-skink	-	LC	x	x			x					Common.
Proablepharus tenuis	Northern Soil-crevice Skink	-	LC					x					One individual trapped.
Varanus tristis	Black-tailed Monitor	-	LC									x	One found road-killed.
Cryptophis boschmai	Carpentaria Snake	-	LC									x	One observed on track in woodland at night.
Demansia psammophis	Yellow-faced Whip Snake	-	LC		x								One individual trapped.
BIRDS													
Dromaius novaehollandiae	Emu	-	LC									x	One seen in open woodland.
Coturnix ypsilophora	Brown Quail	-	LC		x								One bird observed.
Dendrocygna eytoni	Plumed Whistling-Duck	-	LC						x	x			Ducklings present among flocks at both

Scientific name[1]	Common name	Status[2]		Trap site					Target site			Inc[4]	Comments
		EPBC Act	NC Act	1	2	3	4	5	Dam 1	Dam 2	VT[3]		
													dams.
Chenonetta jubata	Australian Wood Duck	-	LC						x	x			Ducklings among a flock at Dam 1. Also present on a large pool on the creek.
Anas gracilis	Grey Teal	-	LC							x			Small numbers present.
Anas superciliosa	Pacific Black Duck	-	LC						x	x			Also present on a large pool on the creek.
Tachybaptus novaehollandiae	Australasian Grebe	-	LC						x	x			Pairs present on both dams.
Phaps chalcoptera	Common Bronzewing	-	LC		x	x	x			x			Singletons seen occasionally in both woodland and disturbed areas.
Ocyphaps lophotes	Crested Pigeon	-	LC					x	x	x			Common, mostly in disturbed areas.
Geophaps scripta scripta	Squatter Pigeon	V	V						x				Observed three times, always near Dam 1. At least nine birds present.
Geopelia striata	Peaceful Dove	-	LC									x	Uncommon, mostly in disturbed areas.
Podargus strigoides	Tawny Frogmouth	-	LC									x	Singletons observed a number of times at night.
Aegotheles cristatus	Australian Owlet-nightjar	-	LC									x	One observed in woodland at night.
Anhinga novaehollandiae	Australasian Darter	-	LC									x	One seen soaring above the Flinders River.
Ardea pacifica	White-necked Heron	-	LC							x			One bird observed.
Egretta novaehollandiae	White-faced Heron	-	LC									x	One bird observed.
Aviceda subcristata	Pacific Baza	-	LC									x	Observed on three occasions in open woodland. At least three birds present.
Haliastur sphenurus	Whistling Kite	-	LC									x	One bird observed.
Accipiter fasciatus	Brown Goshawk	-	LC								x		One bird observed.
Aquila audax	Wedge-tailed Eagle	-	LC							x	x		Three birds seen flying above vine thicket at Flinders River. Inactive nest in emergent in vine thicket. One bird seen over disturbed area.
Falco cenchroides	Nankeen Kestrel	-	LC									x	One bird observed in open area.
Falco berigora	Brown Falcon	-	LC					x					Observed twice at trap site 4 and twice elsewhere. All records from more open woodland.
Grus rubicunda	Brolga	-	LC							x			Two birds seen once.
Burhinus grallarius	Bush Stone-curlew	-	LC									x	Two singletons flushed from tracks at night.
Elseyornis melanops	Black-fronted Dotterel	-	LC						x	x			Pairs at both dams.

Scientific name[1]	Common name	Status[2]		Trap site					Target site			Inc[4]	Comments
		EPBC Act	NC Act	1	2	3	4	5	Dam 1	Dam 2	VT[3]		
Vanellus miles	Masked Lapwing	-	LC						x	x			Only observed in disturbed areas.
Turnix velox	Little Button-quail	-	LC									x	One seen in open woodland.
Calyptorhynchus banksii	Red-tailed Black-Cockatoo	-	LC						x				Two birds observed once.
Eolophus roseicapilla	Galah	-	LC									x	Common in disturbed areas.
Cacatua galerita	Sulphur-crested Cockatoo	-	LC			x							One bird observed once.
Nymphicus hollandicus	Cockatiel	-	LC									x	Small numbers seen in open areas.
Trichoglossus haematodus	Rainbow Lorikeet	-	LC	x			x						Uncommon.
Aprosmictus erythropterus	Red-winged Parrot	-	LC		x		x						Uncommon.
Platycercus adscitus	Pale-headed Rosella	-	LC	x		x		x	x	x			Common.
Centropus phasianinus	Pheasant Coucal	-	LC	x									Observed twice, in ironbark woodland.
Ninox novaeseelandiae	Southern Boobook	-	LC									x	Observed twice, on tracks in open country.
Dacelo novaeguineae	Laughing Kookaburra	-	LC						x				Reasonably common.
Dacelo leachii	Blue-winged Kookaburra	-	LC	x									Heard only, on two occasions.
Merops ornatus	Rainbow Bee-eater	M	SLC			x	x	x		x			Reasonably common, more so in disturbed areas.
Ptilonorhynchus nuchalis	Great Bowerbird	-	LC								x		One bird observed.
Malurus melanocephalus	Red-backed Fairy-wren	-	LC	x		x							Small parties recorded twice.
Smicrornis brevirostris	Weebill	-	LC	x	x	x	x						Very common.
Gerygone albogularis	White-throated Gerygone	-	LC	x		x	x						Common.
Pardalotus striatus	Striated Pardalote	-	LC	x	x	x	x	x					Very common.
Manorina melanocephala	Noisy Miner	-	LC	x	x	x				x			Common.
Melithreptus albogularis	White-throated Honeyeater	-	LC				x				x		Uncommon.
Entomyzon cyanotis	Blue-faced Honeyeater	-	LC									x	Uncommon.
Philemon citreogularis	Little Friarbird	-	LC	x		x			x				Uncommon.
Pomatostomus temporalis	Grey-crowned Babbler	-	LC			x	x						Uncommon.
Daphoenositta chrysoptera striata	Varied Sittella	-	LC									x	One flock seen in open woodland once.
Coracina novaehollandiae	Black-faced Cuckoo-shrike	-	LC	x			x	x			x		Common.
Coracina papuensis	White-bellied Cuckoo-shrike	-	LC	x				x					Singletons recorded twice.
Coracina tenuirostris	Cicadabird	-	LC				x						Heard once. Unusual location for the species.
Pachycephala rufiventris	Rufous Whistler	-	LC	x		x							Commonly heard.
Artamus cinereus	Black-faced Woodswallow	-	LC							x			Three birds present.
Cracticus torquatus	Grey Butcherbird	-	LC	x	x	x	x	x		x			Common.

Scientific name[1]	Common name	Status[2]		Trap site					Target site			Inc[4]	Comments
		EPBC Act	NC Act	1	2	3	4	5	Dam 1	Dam 2	VT[3]		
Cracticus nigrogularis	Pied Butcherbird	-	LC	x				x	x				Reasonably common, more so in open areas.
Cracticus tibicen	Australian Magpie	-	LC	x	x	x	x	x		x			Common.
Strepera graculina	Pied Currawong	-	LC		x						x		Uncommon.
Rhipidura albiscapa	Grey Fantail	-	LC	x									One bird seen once.
Rhipidura leucophrys	Willie Wagtail	-	LC									x	One bird seen once.
Corvus coronoides	Australian Raven	-	LC					x					Uncommon.
Corvus orru	Torresian Crow	-	LC			x		x	x				Common.
Grallina cyanoleuca	Magpie-lark	-	LC					x	x				Uncommon.
Struthidea cinerea	Apostlebird	-	LC			x			x	x			Common, mostly in disturbed areas.
Taeniopygia bichenovii	Double-barred Finch	-	LC				x						Heard once.
MAMMALS													
Phascolarctos cinereus	Koala	V	SLC		x								One heard in the early morning.
Trichosurus vulpecula	Common Brushtail Possum	-	LC	x	x								One trapped and one photographed by surveillance camera.
Aepyprymnus rufescens	Rufous Bettong	-	LC			x							One observed on site. Common in surrounding area.
Macropus giganteus	Eastern Grey Kangaroo	-	LC	x		x							Small numbers in open woodland and pasture.
Macropus robustus	Common Wallaroo	-	LC									x	Occasional sightings in open woodland and pasture.
Macropus rufus	Red Kangaroo	-	LC									x	One female observed in open woodland.
Petrogale assimilis	Allied Rock-wallaby	-	LC								x		Several animals observed on boulders/cliffs in vine thicket near the Flinders River.
Rhinolophus megaphyllus	Eastern Horseshoe-bat	-	LC										Anabat record[5, 6]

Scientific name[1]	Common name	Status[2]		Trap site					Target site			Inc[4]	Comments
		EPBC Act	NC Act	1	2	3	4	5	Dam 1	Dam 2	VT[3]		
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	-	LC										Anabat record[5, 7]
Taphozous troughtoni	Troughton's Sheathtail-bat	-	LC										Anabat record[5, 7]
Chaerephon jobensis	Northern Freetail-bat	-	LC										Anabat record[5, 7]
Mormopterus beccarii	Beccari's Freetail-bat	-	LC										Anabat record[5, 7]
Miniopterus australis	Little Bentwing-bat	-	LC										Anabat record[5, 6]
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	-	LC										Anabat record[5, 7]
Nyctophilus geoffroyi	Lesser Long-eared Bat	-	LC		x								One caught in a harp trap.
Nyctophilus sp.	long-eared bat species	-	LC										Anabat record[5, 8]
Scotorepens balstoni	Inland Broad-nosed Bat	-	LC										Anabat record[5, 7]
Vespadelus troughtoni	Eastern Cave Bat	-	LC				x						One caught in harp trap. Anabat record[5, 7]
Canis lupus dingo	Dingo	-	I								x		Common. Mostly observed on tracks in ironbark woodland but also seen in vine thicket. A pack of five individuals observed. Singletons observed regularly.
Canis lupus familiaris	Common (Wild) Dog	-	I									x	One animal observed near the site.
Oryctolagus cuniculus	Rabbit	-	I									x	Occasional individuals observed.

1. This report follows the nomenclature (scientific and common names) provided by the *Australian Faunal Directory* maintained by DSEWPaC http://www.environment.gov.au/biodiversity/abrs/online-resources/fauna/afd/index.html, unless otherwise noted. Notable variations to this nomenclature, particularly in relation to species protected under the EPBC Act, are identified where appropriate.
2. Status: V = Vulnerable, M = Migratory, SLC = Special Least Concern, LC = Least Concern (Common), I = Introduced.
3. VT = Vine thicket.
4. Inc = Incidental record, *ie* species recorded but not on a trap site or target site.
5. Due to equipment failure location data is not available for the Anabat data.
6. Identification certainty is 'definite' (Barden 2012).
7. Identification certainty is 'possible' (Barden 2012).
8. Anabat analysis can identify *Nyctophilus* at the genus level but not to species. All of the possible *Nyctophilus* species, based on known distributions, are listed as Least Concern under the NC Act and are not listed under the EPBC Act.