



Department of Water and Environmental Regulation (DWER)  
Department of Mines, Industry Regulation and Safety (DMIRS)

## Application to amend a clearing permit

*Environmental Protection Act 1986, section 51KA*

### FORM C4

The clearing of native vegetation is prohibited in Western Australia unless a clearing permit has been granted for the clearing or where a permit is not required (either due to a referral determination that one is not needed or because an exemption applies). A person who causes or allows unauthorised clearing commits an offence.

For further information on the stages of assessment for clearing permit applications (including amendments to existing permits), see the [Procedure: Native vegetation clearing permits](#) on DWER's website.

CPS No.

Date stamp

#### Part 1: Assessment bilateral agreement

If the amendment of a clearing permit will or is likely to impact on a matter of national environmental significance identified under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) the original application must have been assessed in accordance with the bilateral assessment, and a variation under the EPBC Act is required prior to submitting this amendment application form.

To be assessed in this manner, the proposed clearing action must be referred to the Commonwealth under the EPBC Act and deemed a '[controlled action](#)' prior to submitting this application form.

Further information is located in *Form Annex C7* and *A guide to native vegetation clearing processes under the Assessment bilateral agreement* available at [www.der.wa.gov.au/our-work/clearing-permits](http://www.der.wa.gov.au/our-work/clearing-permits).

Do you want your proposed clearing action assessed in accordance with, or under, an EPBC Act Accredited Process such as the assessment bilateral agreement?

Yes EPBC number:

No Proceed to Part 2

List the controlling provisions identified in the notification of the controlled action decision.

*Form Annex C7* is complete and the required supporting information is attached.

#### Part 2: Clearing permit details

Amendments can only be made to active clearing permits.

Applications must be made more than 90 working days prior to the existing permit expiring to ensure there is adequate time to assess the amendment.

Permit number for existing clearing permit CPS 7919/1

Permit holder's name (as it appears on the existing clearing permit) Holcim (Australia) Pty Ltd

FILE REFERENCE

Permit expiry date: 7 April 2023

Mark this box if there are less than 90 working days until the expiry of the existing permit.

Part 3: Applicant																							
<b>Applicant details</b>																							
<p>To apply for an amendment to a permit you must be the current holder of the existing permit.</p> <p>Include Australian Company Number (ACN) if the proposed permit holder is a body corporate or other entity formed at law.</p>	<p>Are you applying as an individual, a company or incorporated body? Enter details for one only.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;"></td> <td style="width: 15%; text-align: center;">Title</td> <td style="width: 10%; text-align: center;">Mr</td> <td style="width: 10%; text-align: center;"><input type="checkbox"/></td> <td style="width: 10%; text-align: center;">Mrs</td> <td style="width: 10%; text-align: center;"><input type="checkbox"/></td> <td style="width: 10%; text-align: center;">Ms</td> <td style="width: 10%; text-align: center;"><input type="checkbox"/></td> <td style="width: 15%; text-align: center;">Other:</td> <td style="width: 10%;"></td> </tr> <tr> <td style="vertical-align: top;">An individual</td> <td style="text-align: center;">Name/s</td> <td colspan="8"></td> </tr> </table> <p><b>OR</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%;">A body corporate or other entity formed at law (include ACN)</td> <td>Holcim (Australia) Pty Ltd</td> </tr> </table>		Title	Mr	<input type="checkbox"/>	Mrs	<input type="checkbox"/>	Ms	<input type="checkbox"/>	Other:		An individual	Name/s									A body corporate or other entity formed at law (include ACN)	Holcim (Australia) Pty Ltd
	Title	Mr	<input type="checkbox"/>	Mrs	<input type="checkbox"/>	Ms	<input type="checkbox"/>	Other:															
An individual	Name/s																						
A body corporate or other entity formed at law (include ACN)	Holcim (Australia) Pty Ltd																						
<b>Applicant contact details</b>																							
<p>If applying as a company or incorporated body, please also supply the registered business office address.</p> <p>DWER and DMIRS prefer to send all correspondence via email.</p> <p>We request that you consent to receiving all correspondence relating to instruments and notices under Part V of the EP Act ("Part V documents") via email by indicating your consent in this section of the application form.</p> <p>Where 'yes' is selected, all correspondence from DWER or DMIRS (as applicable) will be sent to you via email, to the email address provided in this section.</p> <p>Where 'no' has been selected, Part V documents will be posted to you in hard copy to the postal/business address you have provided in this section.</p> <p>Other general correspondence may still be sent to you via email.</p>																							
<b>Contact details for enquiries</b>																							
<p>If different from the applicant's contact details, enter the contact details of a person with whom DWER or DMIRS should liaise with concerning this clearing application.</p>																							

Part 4: Proposed amendments		
<p>Additional information to support the assessment of your application to amend may be attached.</p> <p>Please ensure you have included the following as part of your application:</p> <ul style="list-style-type: none"> <li>• a photocopy of the granted clearing permit, with proposed changes highlighted, <i>and</i></li> <li>• payment of the prescribed fee.</li> </ul> <p>When providing details of the proposed change(s), if any additional clearing is proposed, include details of:</p> <ul style="list-style-type: none"> <li>• the proposed method of the clearing;</li> <li>• the purpose of the clearing;</li> <li>• the period within which the clearing is proposed to be undertaken (taking note of the published minimum assessment timeframes for DWER / DMIRS, as applicable); <i>and</i></li> <li>• the final land use.</li> </ul>	<p>Indicate the types of proposed change(s) to your clearing permit by selecting the relevant box(es):</p> <p><input checked="" type="checkbox"/> Extend the duration of the clearing permit.</p> <p><input type="checkbox"/> Vary / add / remove a permit condition relating to a matter other than the size or boundary of the area to be cleared.</p> <p><input checked="" type="checkbox"/> Amend the size of the area permitted to be cleared, or add / remove a land parcel on the clearing permit.</p> <p><input type="checkbox"/> Redescribe the boundary of the area authorised to be cleared <i>[for an area permit only]</i></p> <p><input type="checkbox"/> Make a correction to the clearing permit.</p> <p><input type="checkbox"/> Other.</p>	
	<p>Provide details of the proposed change(s), and the rationale(s) for it / them.</p> <p>The existing granted Clearing Permit CPS 7919/1 (attached) requires amendment to extend to areas that were previously disturbed/cleared and now have regrown with vegetation and to cover Mining Lease M52/59 for further development of the approved pit for the Newman Quarry. In addition, Holcim requests that the expiry date of the clearing permit is extended for another ten years to 23 April 2033.</p> <p>The existing granted Clearing Permit CPS 7919/1 is approved to clear up to 9.748 ha of vegetation. This Clearing Permit Amendment Application is to increase the total approved area to up to 23.73 ha to cover the approved pit area within Mining Lease M52/59.</p> <p>A Level 1 Flora and Fauna Biological Assessment Survey (Animal Plant Mineral Pty Ltd, 2009) and Newman Quarry – Rapid Biodiversity Assessment (MWH, 2015), both attached, show much of the area as already disturbed/cleared and degraded due to existing pit development. Photographs taken in 2022 showing the current condition of the vegetation (attached).</p>	
	<p>For an application to amend the size of the area permitted to be cleared, or add a land parcel to the clearing permit, you must have the authority of the landowner to access the land and undertake the clearing.</p>	<p>State the nature of the applicant’s authority to access the land to be cleared. Evidence of authority can include e.g. a copy of the certificate of title or a letter of authority signed by the landowner or other person with authority to give legal land access permission. <i>[Attach evidence of authority. Note that a letter of authority must explicitly state the applicant has authority to clear on the land.]</i></p> <p>Mining Lease M52/59 held by Holcim (Australia) Pty Ltd</p>
	<p>Provide additional property details if required – if applying to extend the size of the area to be cleared into another land parcel.</p>	<p>Land description: volume and folio number, lot or location number(s), Crown lease or reserve number, pastoral lease number, or mining tenement number of all properties.</p> <p>Mining Lease M52/59</p>
	<p>You must provide evidence that avoidance and mitigation options have been pursued to eliminate, reduce or otherwise mitigate the need for, and scale of, the proposed clearing of native vegetation.</p>	<p>Have alternatives that would avoid or minimise the need for clearing been considered and applied? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>If yes, provide details:</p> <p>The area to be cleared occurs within the approved pit area.</p>
	<p>Refer to DWER’s <a href="#">Clearing of native vegetation offsets procedure guideline</a> available on the DWER website, and the</p>	<p>Do you want to submit a clearing permit offset proposal with your application? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>



CPS 7910/1 Amendment  
● Application Area -  
M52/59

CESTRUM Data services

Photo viewer ^

Timeline ^

POWERED BY propeller

50 m

GDA94 / MGA zone 50 N 7 418 438.602 m E 775 460.306 m Z 520.372 m



## **Holcim Newman: Level 1 Flora and Fauna Biological Assessment Survey**

**Principal Author**

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## Summary

This report presents the findings of a flora, vegetation and fauna assessment for the Holcim Newman Quarry, located approximately 5km north east of Newman, Western Australia. The survey covered more than 120 ha, including the lease areas and a 200m buffer, and was conducted over three field days from 7 to 9 October 2009.

The quarry has been in operation for a number of years and more than 70% of the survey area is completely cleared and developed. The area that remains is significantly disturbed and retains little, if any, vegetation or fauna habitat of conservation value. The flora and vegetation are typical of the Elimunna Land System (van Vreeswyck et al. 2004) over which the survey area occurs.

The primary existing impacts on the site are weeds, dust and recreational vehicle use.

With regard to future clearing, presently uncleared vegetation in the survey area retains little natural value. Loss of vegetation and fauna habitat would not compromise the populations of species and communities within the area and within the vicinity.

APM recommends only that water draining from within the quarry area be contained within the bunded walls to abate the seepage of hydrocarbons, solvents and mineral solutes into the surrounding environment.

It is also recommended that the Turkey's nest in the south east corner of the site be fenced off to stop larger native and feral fauna accessing the water. Fauna ramps should be placed along the sides of the sump to assist other smaller fauna from escaping the sump if they are to fall in. These ramps should be constructed so they do not puncture the sump liner.

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## 1 Scope

Animal Plant Mineral Pty Ltd ('APM') was engaged by Strategen Environmental Consultants Pty Ltd on behalf of Holcim (formerly CEMEX) to provide the following services:

- To undertake a Level 2 flora and Level 1 fauna field survey of the Holcim Newman Quarry;
- To document the flora and fauna habitats of the quarry lease area and an approximately 200m buffer around the lease area;
- To document the outcomes of the survey and determine the conservation significance of the area;
- To document the outcomes of the survey as they relate to the 10 clearing principles associated with Native Vegetation Clearing Permit; and
- To document the outcomes of the survey such that the information can be provided as an addenda to a Beds and Banks permit.

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## 2 Introduction

This report presents the findings of a flora, vegetation and fauna assessment for the Holcim Newman Quarry. The Newman Quarry area is located approximately 5km north east of Newman, Western Australia and includes Holcim mining lease M52/59 , general purpose leases G52/18 and G52/15 (wholly located within Special Lease 3116/3685, Windell Location 17).

The field survey covered an area of approximately 120 ha, including the Holcim leases and an area of 200m surrounding these lease areas (Figure 1).

The field survey was undertaken by Dr Mitch Ladyman, Principal Biologist, from 7 to 9 October, 2009. The data collected was of a general nature, and mainly consisted of plant community (vegetation) and condition information as well as an assessment for the potential presence of fauna of conservation significance or poorly represented and valuable fauna habitat.

A desktop assessment over a 50 km radius from the Holcim lease areas was also undertaken and included searches of the Department of Environment and Conservation (DEC) databases, assessment of regional representation of land system types as defined by van Vreeswyk et al. (2004) and assessment using the Pilbara Biodiversity Audit and the Pilbara Bioregionalisation of Thackway and Cresswell (1995). State and Federal databases containing information on conservation significant flora and fauna were also searched and assessed.

This report does not consider the impact of the Holcim Newman Quarry survey on individual plants or animals that may occur within the lease.

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### 3 Methodology

#### 3.1 Desktop Methodology

It is possible to assess the conservation value of an area, and therefore the potential future impacts, using the biogeographical regionalisation of Australia (Thackway and Cresswell 1995). Bioregions form a basis for setting boundaries of areas that have similar attributes, in terms of flora and fauna and conservation values. The Biodiversity Audit of Western Australia (2002) details information about the bioregions. Bioregions are large, geographically distinct areas of land with common characteristics such as climate, ecological features and plant and animal communities. Bioregions represent lowest order of resolution between different flora and fauna habitats. There are 85 bioregions and 403 sub-regions in Australia. A synopsis of the relevant Pilbara bioregion was assessed with respect to fauna of conservation significance. These included Schedule fauna (listed under the WA Wildlife Protection Act 1950), Priority Fauna (as defined by the DEC nature protection branch) and endemic fauna as defined by Kendrick and McKenzie (Kendrick and McKenzie 2002).

Land system mapping (1:125,000) by the Department of Agriculture and Food (DAF) (van Vreeswyk et al., 2004) was consulted to enable a broad assessment of the regional representation of vegetation that occurs in the study area. Land systems are defined as a 'recurring pattern of topography, soils and vegetation' (van Vreeswyk et al., 2004).

A search of the DEC Threatened Species Branch and Western Australian Herbarium databases was completed for a 40km radius around a spot location on the northern outskirts of Newman town (23°21'20"S, 119°44'15"E)(Figure 2). This location was chosen so that the 40 km radius would encompass the 120ha survey area, the Holcim tenements, and also encompass a greater area adjacent to Newman where significant previous biological survey work has been undertaken. The results of this search are included as Appendix A of this report.

The Department of Environment, Heritage, Water and the Arts (DEWHA) provide an on-line research tool that enables the user to access the database for a specific search area. The search tool then provides a report on matters of national environmental significance. The report is meant as a guide to matters that may occur within a proponent's area of interest. This allows the proponent to consider if the survey may constitute a 'controlled action' and decide whether to refer the survey to DEWHA for assessment under the Environmental Protection and Biodiversity Conservation Act ('EPBC') Act 1999. The search tool was used for the current survey for the same location previously described (Figure 2). The report, in its entirety is provided as Appendix B.

The DEC also provides an online search tool (Naturemap) detailing historical collection records of flora and fauna across Western Australia. An area search was also conducted for the same location over a 40km radius from the centre point (Figure 2). The results of this search are presented as Appendix C for flora and Appendix D for fauna.

There are a number of fauna surveys that have been conducted in the immediate vicinity for environmental impact assessments. The data for the majority of these surveys is not readily accessible in the public domain. However, Terrestrial Ecosystems provide summary data of

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any fauna records that are available in this 'grey' literature. These fauna records are provided in Appendix E.

Appendix F provides the definitions of the terms and references used within this document. Appendix G is a standardised list of all Threatened Ecological Communities in the Pilbara, while Appendix H is a list of Priority Ecological Communities. Appendix I provides the definitions for TECs and PECs.

Finally, lists of fauna expected to occur in the survey area (the area of which desktop studies have been conducted) were produced using information from the database searches and a number of other sources. These included publications that provide information on general patterns of distribution of frogs (Tyler and Doughty 2009), reptiles (Storr *et al.* 1983, 1990, 1999 and 2002), birds (Barrett *et al.* 2003; Johnstone and Storr 1998; Johnstone and Storr 2004), and mammals (Menkhorst and Knight 2001; Van Dyck and Strahan 2008).

These sources of information were used to create lists of species expected to occur in the study area. As far as possible, expected species are those that are likely to utilise the study area, or be affected by changes to the study area. The lists exclude species that have been recorded in the general region as vagrants or for which suitable habitat is absent.

Taxonomy and nomenclature for flora follows the WA Herbarium. For fauna species used in this report, taxonomy generally follows the WA Museum (2008) with alternative bird taxonomy from Christidis and Boles (2008) given in parentheses. This is because the WA Museum utilises a different bird taxonomy to that which is nationally accepted (Christidis and Boles, 2008).

## **3.2 Field Methodology**

### **3.2.1 Flora and Vegetation**

The field survey (encompassing an area of 120ha) was undertaken in October. No rainfall had fallen within the vicinity of the survey area for several months prior to the survey. The last significant rainfall event in Newman was 36mm falling on 25 June, 2009. Therefore, flora collections made during quadrat sampling were for the purposes of characterising vegetation only.

A total of seven flora quadrats were established over four major landform units within the survey area. The flora and vegetation quadrats were approximately 50x50 m. Within each quadrat the physical attributes of the site were first described, including topography (slope, morphology and aspect), drainage and soil texture.

The dominant flora species from each of the definable flora strata were collected to assist in the description of the vegetation. Height and percentage cover were recorded. A systematic sweep of the quadrat was then made to collect all other discernable species. As it was not the objective of this survey to fully detail all species likely to occur at the site under favourable conditions, annual flora that had senesced or desiccated were not collected as identification of these species is difficult, if not impossible.

Each site was photographed and a GPS record was taken. These data are presented in Appendix J.

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### **3.2.2 Vegetation Mapping and Condition Assessment**

Following completion of the quadrat sampling, the entire survey area, including a 200m buffer (Figure 3) was continually traversed by vehicle or foot where ever accessible, to determine the boundaries of the major vegetation communities. These boundaries were transcribed onto an aerial photograph which was then digitised to produce a vegetation and condition map (Figure 3).

Vegetation types were grouped together as they were seen to be located within each of the four landforms described by van Vreeswyk et al. (2004) for the appropriate Land System. Vegetation descriptions are based on the structure classes, as defined by the Government of Western Australia (2000) (Appendix F, Table 1). The vegetation condition scale (Government of Western Australia, 2000) used is presented in (Appendix F, Table 2).

### **3.2.3 Flora collections**

The flora of the survey area is not described in detail in this report as the survey was not conducted during a season appropriate for flora inventory collection. However, the full list of expected flora species is provided in Appendix K.

### **3.2.4 Fauna Habitats**

Fauna assemblages are closely aligned with landforms and vegetation. Therefore, the vegetation communities provide appropriate boundaries to describe fauna habitats.

During the flora quadrat sampling, additional notes were made describing site attributes that influence fauna assemblages. Primarily these included soil structure, the presence of rock outcrops or breakaways, the presence of standing or fallen hollow limbs and bark, and the percentage of ground cover comprising either vegetation or leaf litter. The presence of termite mound, anthropogenic disturbance and feral fauna was also noted.

Fauna habitats were then categorised based on their condition using a hierarchy developed by Thompson and Thompson (Unpublished). The condition ranking table is provided in Appendix L.

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## 4 Results

### 4.1 Interpretation of Desktop Assessment

The survey area is located on the eastern fringe of the Hamersley Ranges. The area is described by direct extracts from the Biodiversity Audit of Western Australia (DEC 2002):

- The Hamersley subregion is a mountainous area of Proterozoic sedimentary ranges and plateaux, dissected by basalt, shale and dolerite gorges. The valley floors have low mulga woodland over bunch grasses on fine textured soils, while the ranges have *Eucalyptus leucophloia* over *Triodia brizoides* on skeletal soils.

The subregion is recognised for;

- Persisting populations of threatened and endangered species (mulgara *Dasycercus cristicauda* (now *blythi*), spectacled hare-wallaby *Lagorchestes conspicillatus leichardti*, bilby *Macrotis lagotis*, orange leaf nosed bat *Rhinonictis aurantius* and princess parrot *Polytelis alexandrae*)
- Arid zone populations of the northern brush-tail possum *Trichosurus vulpecula arnhemensis*, ghost bats *Macroderma gigas* and north-western long-eared bat *Nyctophilus bifax daedalus*;
- Species rich refugial ecosystems mainly associated with rugged topography and isolated perennial water bodies; and
- Bioregional endemism of invertebrate and vertebrate fauna and flora.

In general, mining development is not mentioned in Van Vreeswyk et al. (2004) as a primary stress factor for the region. Stress factors comprise anthropogenic fire regimes, the introduction of feral fauna and weeds and pressures associated with extensive pastoralism. The survey area most certainly suffers from these impacts due to historical disturbances within the lease associated with mining but also due to the close proximity to Newman town and the recreational areas.

Bioregional endemic fauna that may be impacted would include *Ningau timealeyi*, *Planigale* sp. *Dasykaluta rosamondae*, *Pseudantechinus roryi*, *Diplodactylus savagei*, *Diplodactylus wombeyi*, *Delma elegans*, *Delma pax*, *Ctenotus rubicundus*, *Egernia pilbarensis*, *Lerista zietzi*, *Lerista flammicauda*, *Lerista neander*, the *Lerista muelleri* complex, *Nototscincus butleri*, *Varanus pilbarensis*, *Acanthophis wellsi*, *Demansia rufescens*, *Ramphotyphlops pilbarensis*, *Ramphotyphlops ganei*.

There are no important wetlands within or near the survey area and the survey area is not adjacent to or impacting upon any significant riparian zones. Minor drainage lines border the lease areas but these flow intermittently as water disperses off the nearby hills and low slopes out to the surrounding plains.

The list of Threatened Ecological Communities ('TEC') produced by the DEC (2006) is included as Appendix G. In the Pilbara region there are only two TECs: the Ethel Gorge stygobiont community and the *Themeda* grasslands on cracking clay (Hamersley Station, Pilbara). Neither of these occurs on or near the Holcim Newman quarry lease area.

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The Bioregional Summary of the 2002 Biodiversity Audit for Western Australia (2002) identifies 35 community types in the Pilbara are considered to be at risk due to under-representation in DEC conservation reserves and estates. These include freshwater wetlands, mulga and snakewood communities, scree and hilltop communities, grasslands, salt marshes and cracking clay communities. None of these communities are to be impacted by the quarry.

Only one Declared Rare Flora (DRF) species of relevance, *Lepidium catapycnon* was recorded from the database search area (Appendix A). *Lepidium catapycnon* is an open, woody perennial, herb or shrub, 0.2–0.3 m high with stems that zigzag and white flowers. It occurs on skeletal soils on hillsides and has been located on nearby Whaleback mine. Here the species is frequently documented and monitored as part of ongoing environmental management commitments for the Whaleback mine. Eight Priority 1 taxa, one Priority 2 and seven priority 3 taxa have also been recorded previously in the area. The extent of rare and priority taxa found here to possibly occur in the study area reflects the large amount of survey work that has been done in the region and not necessarily a particularly rare or high value conservation area. However, further survey efforts after rain will be required to discount the occurrence of these rare and priority flora from the study site.

The EPBC protected matters search tool reports the potential presence of the Mt Augustus Foxglove, *Pityrodia augustensis*. However, records on Florabase show this species to have only been located a considerable distance away.

DEC Priority flora listings were considered as part of the framework for this assessment, and Western Australia Herbarium records consulted for the presence of rare and priority flora in the vicinity of the study area. Appendix A lists rare and priority taxa recorded in previous searches of the vicinity and known to occur in habitats also present in the current study area. These taxa consist of one rare flora *Lepidium catapycnon*, known to occur on skeletal soils on hillsides.

The survey area occurs on or is representative of the Elimunna land system, as described by Van Vreeswyk (2004), which consists of stony plains on basalt supporting sparse acacia and cassia shrubland and patch tussock grassland. These are mainly deposition surfaces of either flat or very gently undulating stony plains with a mosaic of surfaces including, with widely spaced tributary and non-tributary drainage floors with clay soils. Drainage patterns can be sluggish resulting in the formation of clay pans. The tussock grass vegetation is attractive to grazing animals and susceptible to fire and other disturbance. It is highly prone to disturbance and this is the case for the survey area.

## 4.2 Vegetation

### 4.2.1 Plant Communities (Vegetation Types)

The five landform units that encompass the vegetation types are based on those described by van Vreeswyk (2004) for the Elimunna land system

- 1 **Hills and Low rises.** These comprise hills to 15m, covered in pebbles or cobbles, over stony soils and red shallow loams. They comprise hummock grasslands of *Triodia wiseana* or very scattered shrublands of *Acacia* and *Senna* spp.

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- a. *Eucalyptus leucophloia* ssp. *leucophloia* low open woodland over mixed *Acacia* tall open shrubland over *Triodia wiseana* hummock grassland on skeletal soils with pebbles, cobbles and small boulders.
  - b. *Eucalyptus leucophloia* ssp. *leucophloia* low open woodland over mixed *Acacia* tall open shrubland over *Triodia wiseana* hummock grassland on gravely clay soils, occurring downslope from Vegetation Type 1.
- 2 **Stony Plains.** These are level to gently undulating plains of pebbles over red/brown non-cracking clays. The vegetation is typically described as very scattered to scattered mixed height shrublands with *Acacia aneura* (mulga) among other acacias, *Senna* and *Eremoophylla*. Patchy hard *Triodia* occurs
- a. Mixed *Acacia synchronicia*, *Acacia pruinocarpa*, *Hakea lorea* ssp. *lorea* tall shrubland over \**Cenchrus ciliaris*, *Eriachne mucronata* and *Enneapogon caerulescens* tussock grassland on gravely clay soils
  - b. *Acacia synchronicia*, *Eremophila lachnocalyx* and *Rhagodia eramaea* low mixed shrub over mixed tussock grasses on gravely clay soils.
  - c. *Acacia aneura* var. *macrocarpa* and *Acacia pruinocarpa* tall shrubland over *Triodia pungens* hummock grassland over stony soils.
  - d. *Acacia synchronicia* and *Acacia aneura* tall shrubland over *Eriachne mucronata* and *Aristida latifolia* tussock grassland.
  - e. *Acacia synchronicia* and *Acacia aneura* tall shrubland over *Eriachne mucronata*, *Aristida latifolia* and *Triodia pungens* tussock and hummock grassland.
  - f. *Senna glaucifolia* low open shrubland over *Triodia pungens* hummock grassland on gravely silty clay.
- 3 **Hardpan plains.** These are level plains subject to sheet flow with small abundant ironstone pebbles on red loamy earths. These are covered with scattered tall shrublands of various acacias.
- a. *Acacia pachyacra* and *Acacia synchronicia* tall open shrubland over \**Cenchrus ciliaris* tussock grass on clay soils.
  - b. *Senna artemisioides* ssp. *oligophylla* over \**Cenchrus ciliaris* tussock grass on clay soils.
  - c. *Acacia aneura* var. *macrocarpa* and *Acacia pruinocarpa* tall shrubland over mixed tussock grassland on silty clay soils
- 4 **Groves.** These occur in discrete clumps and are arranged perpendicular to sheet flow on stony plains and hardpans. They occur on red loamy earths and are vegetation with a moderate to closed canopy of tall shrublands of *Acacia aneura* with numerous other shrubs and patch perennial grasses.
- a. *Acacia aneura* var. *macrocarpa* tall shrubland over *Aristida latifolia* tussock grassland on clay soils.
- 5 **Drainage floors.** Level tracts with variable surfaces of soil stone and pebbles with central channels that may support larger boulders. Tussock grassland with *Astrebela* and *Eragrostris* spp. are common and scattered to moderately closed tall shrubland of *Acacia* spp. with various low shrubs and patch tussock and hummock grasses.
- a. \**Cenchrus ciliaris* tussock grassland.

Plates 1 to 6 on the following pages show examples of the five main landform units and the vegetation types they support.

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#### 4.2.2 Vegetation Condition

The survey area epitomises the poor condition typical of the native vegetation around Newman. The combined effect of weeds, bushfires and grazing is exacerbated by disturbance by vehicles and dust blowing across the site from the Holcim quarry, but also from nearby Mt Whaleback mine.

All of the vegetation within the vicinity of the quarry is disturbed to an equal degree, with the exception of Vegetation Types 1a, 1b, 2a and 2f that are located in close proximity to the west of the active quarry. This vegetation has been more heavily degraded by dust blown from prevailing easterly winds.

Weeds (primarily *Cenchrus ciliaris*) are prevalent in the landscape and, on more than one occasion, represented the dominant flora taxa in a flora survey quadrat.

#### 4.3 Flora

No DRF or Priority flora were located during the survey. This was expected due to the timing of the survey.

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Plate 1 Elimunna land system Landform 1: Hills and Low rises.



Plate 2 Elimunna land system Landform 1: Hills and Low rises.

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Plate 3 Elimunna land system Landform 2: Stony Plains.



Plate 4 Elimunna land system Landform 3: Hard pan

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Plate 5 Elimunna land system Landform 4: Groves.



Plate 6 Elimunna land system Landform 5: Drainage floors.

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#### 4.4 Fauna and Fauna Habitats

- 1 Hills and Low rises (Vegetation associations 1a and 1b). These habitats were classified as Disturbed. They occurred in very close proximity to the quarry site. Dust had had a significant impact on the vegetation with most of the trees and shrubs covered in a heavy dust layer. Similarly, the *Triodia* hummock grasses were heavily laden with dust. The impact of dust, together noise, movement and vibration from the quarry means the habitat is unlikely to be used by any fauna other than the most common small reptiles, of which none were observed. Feral fauna and larger native predatory fauna such as *Varanus panoptes* and *Pseudechis australis* may move across this habitat.
- 2 Stony Plains (Vegetation associations 2a - 2f). These habitats were classified as Disturbed. There was little structural complexity in the habitat, which comprised mainly of bunch grasses and low scattered *Acacia* species. Native tussock grass species were interspersed with large tracts of *Chenchrus ciliaris*.
- 3 Hardpan plains (Vegetation associations 3a – 3c). These habitats were also classified as disturbed. Small areas where water had accumulated in sumps had dried to form cracking surfaces which provide valuable fauna habitat for mammal and reptile species such as *Ningai timealeyi*, *Planigale* sp. *Dasykaluta rosamondae*, *Pseudantechinus roryi*, *Diplodactylus savagei*. However, these habitats were dissected by multiple vehicle tracks lowering the conservation value of the habitat.
- 4 Groves (Vegetation association 4a). These habitats were classified as Good, and were the most valuable habitat within the survey area. However, they are a poor representation of this habitat when compared with other areas locally adjacent. For instance these groves occur broadly around Ophthalmia Dam, less than 15km to the south east and also on the alluvial plains close to established iron ore mines. In such areas they are afforded some protection as they occur on active mining leases but do not constitute areas of interest for mining and are typically left undisturbed.
- 5 Drainage floors (Vegetation association 5a). These habitats were similar in their structure complexity to the Groves. However, they were not in as good condition and are described as Disturbed fauna habitats within the survey area. This is primarily due to infestation from weeds that have infiltrated the area during times when the water is flowing through the area from other adjacent disturbed areas. Moreover, as they retain moisture longer, weeds that are established by any means do well.

There were no fauna habitats of regional, or local, significance on the survey area.

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#### 4.5 Fauna of Conservation Significance

Within the search area (20km radius of the survey area) the following fauna species of conservation significance have been recorded

- *Ardeotis australis* Australian Bustard P4
- *Liasis olivaceus* subsp. *barroni* T
- *Macroderma gigas* Ghost Bat P4
- *Petrogale lateralis* subsp. *lateralis* Black-footed Rock-wallaby T
- *Pseudomys chapmani* Western Pebble-mound Mouse P4
- *Ramphotyphlops ganeii* P1
- *Sminthopsis longicaudata* Long-tailed Dunnart P4

Based on the habitats present within the survey area only the Australian Bustard, the Pilbara Olive Python, the Western Pebble-mound Mouse, the blind snake *R. Ganeii* and the Long-tailed Dunnart could potentially occur.

The Australian Bustard is a transient species that may move through the survey area but will not reside specifically in one place, such that it might be threatened by the development.

The closest record of a Pilbara olive python known to this author is less than 15km away on the Nullagine Road adjacent OB23/25. One individual was captured in 2004 and one in 2005 within only 200m of each other. Any Pilbara olive pythons that may occur in the current survey area are not likely to persist in the area due to lack of optimal habitat and, more likely, lack of food.

The low hills within the survey area provide suitable habitat (i.e. small pebbles) from which the Western Pebble-mound mouse constructs burrows. However, it is unlikely that this species persists in the survey area due to the fact that the area is so disturbed.

The blind snake, *R. ganeii* may occur based on the habitat available, however this is a secretive animal that is rarely recorded and it is not known what density this species exists within its preferred habitat. Therefore, any disturbance to the small areas of low stony hills is very unlikely to impact populations of this species.

Finally, the Long-tailed dunnart has been trapped on a number of occasions at Whaleback mine site. This species is likely more broadly distributed than once thought and the small area of disturbance proposed by the current survey will not significantly impact populations.

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#### 4.6 *Other Fauna Related Issues and Management*

Plate 7 shows a turkey's nest (i.e. man made water sump) located in the south-eastern corner of the lease area. This structure of the sump and the availability of fresh water could cause a number of native fauna deaths with terrestrial fauna seeking water drowning in the sump. There was no fence around the sump and the gradient of the sump was relatively steep and lined with black plastic.



Plate 7 Turkey's nest with no barrier to prevent fauna deaths

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## 5 Conclusions and Outcomes

### 5.1 Clearing Principles

The following table (Table 1) outlines each of the 10 clearing principles used as a query tool to determine the significance or environmental impact of further clearing at the Holcim Newman quarry site.

**Table 1 Ten vegetation clearing principles.**

Clearing Principle	Assessment of Vegetation Proposed for Clearing
a) What is the level of biodiversity?	Very low – the majority of the site is structurally very simple. The dominant tree and shrub species include common <i>Eucalyptus</i> and <i>Acacia</i> . <i>Triodia wiseana</i> , some <i>T. pungens</i> and a small number of grasses comprise the ground story. Notwithstanding the high level of disturbance to the site, the area would not support a very diverse flora, vegetation or fauna assemblage.
b) Is the vegetation part of significant fauna habitat?	No. There are no habitats in the survey area that are poorly represented in the local area or in the region. There are no caves, springs, gilgai plains or major water courses in the survey area.
c) Does the vegetation contain rare flora?	It is possible that the vegetation may contain rare flora as records of <i>Lepidium catapycnon</i> have been located very close by. However, <i>Lepidium catapycnon</i> occur on stony slopes and the only stony slopes in the survey area were immediately adjacent the quarry where there was significant existing disturbance from vehicle use and dust.
d) Is the vegetation necessary for the maintenance of a TEC?	No
e) Is the vegetation well represented elsewhere?	Yes. The Elimunna land system covers an area of 617km <sup>2</sup> or .3% of the total area described by Van Vreeswyk (2002). Though the land system is not well represented in the Pilbara, the area contained within the survey area is covered by mining tenements and is extremely small; less than 120 ha. The vegetation is better represented elsewhere away from such intense disturbance as that which takes place at the Holcim quarry.
f) Is the vegetation within or adjacent a watercourse?	No. Not a significant water course. Only a minor drainage line.
g) Will the clearing of the vegetation cause degradation?	No. The area is already highly degraded. Moreover topographic setting of the site dictates that secondary disturbances should be easily contained within the survey lease area.
h) Will clearing the vegetation impact on adjacent conservation reserves?	No. There are no nearby conservation reserves.

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Clearing Principle		Assessment of Vegetation Proposed for Clearing
i)	Will clearing the vegetation effect surface or ground water?	No.
j)	Will clearing the vegetation result in an increase of flooding?	No

## 5.2 Risk Assessment

The following table (Table 2) is a Risk Assessment matrix that has been used to assess the risk of the continuation of the survey leading to issues of environmental significance and conservation concern. Residual scores above five will require specific management procedures to be developed and implemented to mitigate impacts.

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Risk Issue (Taxa or feature of conservation / environmental significance)	Event or Action	Impact	Inherent Risk			Controls	Residual Risk		
			Likelihood	Consequence	Risk Level		Likelihood	Consequence	Significance
Pseudomys chapmani Western Pebble-mound Mouse	Clearing of fauna habitat	Loss of family groups in burrow systems	3	2	6	Minimise clearing. Trap and translocate prior to disturbance	2	2	4
Falco hypoleucus Grey Falcon	Clearing of fauna habitat	Disturbance to predating individuals	2	1	2	No management required. Impacts not likely	2	1	2
Dasyurus hallucatus Northern Quoll	Clearing of fauna habitat	Loss of habitat and possible death of individuals	3	3	9	Minimise clearing in suitable habitat. Move rather than destroy all large hollow logs that are temporary refuges	2	2	4
Liasis olivaceus barroni Pilbara Olive Python	Clearing of fauna habitat	Impact to individuals during construction and maintenance	3	3	9	Educated clearing contractors. Olive Pythons are large, easy to spot and easy to avoid	2	2	4
Leggadina lakedownensis Lakeland Downs Mouse	Clearing of fauna habitat	Loss of individuals	3	2	6	Minimise cleaning	2	2	4
Sminthopsis longicauda Long-tailed Dunnart	Clearing of fauna habitat	Loss of individuals during clearing and construction	4	3	12	Minimise clearing	3	2	6
Amytornis striatus subsp. striatus Striated Grasswren	Clearing of fauna habitat	Loss of individuals during clearing and construction	3	2	6	Minimise clearing	2	2	4
Ardeotis australis Australian Bustard	Clearing of fauna habitat	Disturbance to individuals	3	1	3	No management required. Impacts not likely	3	1	3
Burhinus grallarius Bush Stone-curlew	Clearing of fauna habitat	Disturbance to individuals	3	1	3	No management required. Impacts not likely	3	1	3
Falco peregrinus subsp macropus Peregrine Falcon	Clearing of fauna habitat	Disturbance to predating individuals	3	1	3	No management required. Impacts not likely	3	1	3
Ramphotyphlops ganei Blind Snake	Clearing of fauna habitat	Loss of individuals	3	2	6	No possibility for management other than reduction of clearing footprint particularly around low stony hills	2	2	4
General loss of Priority and DRF flora	Clearing of individual flora	Loss of individuals	5	2	10	Minimise clearing. The total loss is relatively small compared with regional representation	4	2	8

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Risk Assessment Rating		LIKELIHOOD				
		5: Almost Certain Is expected to occur in most circumstance	4: Likely Will probably occur in most circumstance	3: Possible Could occur	2: Unlikely Could occur but not expected	1: Rare Occurs in exceptional circumstances
CONSEQUENCES	<b>5: Catastrophic</b> Significant impact (loss of population) to taxa or feature of conservation significance or regional biodiversity	25	20	15	10	5
	<b>4: Major</b> Permanent impact (reduction in population size or extent) to taxa or feature of conservation significance in project area.	20	16	12	8	4
	<b>3: Moderate</b> Longer term (>3yrs) localised impact to taxa or feature of conservation significance or biodiversity in project area.	15	12	9	6	3
	<b>2: Minor</b> Limited short term (<2yr) localised impact to taxa or feature of conservation significance or biodiversity.	10	8	6	4	2
	<b>1: Insignificant</b> No impact to taxa or feature of conservation significance or biodiversity.	5	4	3	2	1

<b>11-25</b>	High risk, specific management programmes required, advice/approval from regulators required.
<b>6 – 10</b>	Medium risk, specific management and procedures must be specified.
<b>1 – 5</b>	Low risk, managed by routine procedures.

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### **5.3 Conclusion**

The Holcim Newman Quarry site is located on stony plains on basalt supporting sparse acacia and cassia shrublands and patch tussock grasslands.

The quarry has been in operation for a number of years and more than 70% of the survey area is completely cleared and developed.

The area that remains is significantly disturbed and retains little, if any, vegetation or fauna conservation value. The flora and vegetation are typical of the Elimunna Land System (van Vreeswyck et al. 2004) over which the survey area occurs.

The primary existing impacts on the site are weeds, dust and recreational vehicle use.

There are few recommendations for environmental management that would extend beyond the pollution control under which the quarry already operates. Similarly, the risk assessment has not identified any flora, vegetation or fauna issues that require specific management.

APM recommends only that water draining from within the quarry area be contained within the bunded walls to abate the seepage of hydrocarbons, solvents and mineral solutes into the surround environment.

It is also recommended that the Turkey's nest in the south east corner of the site be fenced off to stop larger native and feral fauna accessing the water. Fauna ramps should be placed along the sides of the sump to assist other smaller fauna from escaping the sump if they were to fall in. These ramps should be constructed so they do not puncture the sump liner.

### **5.4 Limitations**

As defined in the introduction of this report, the survey was not intended to be a full flora or fauna inventory survey.

Short Range Endemic and sub-terranean fauna were not considered in this current survey.

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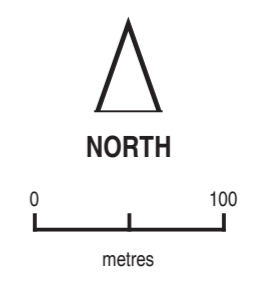
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## Figures

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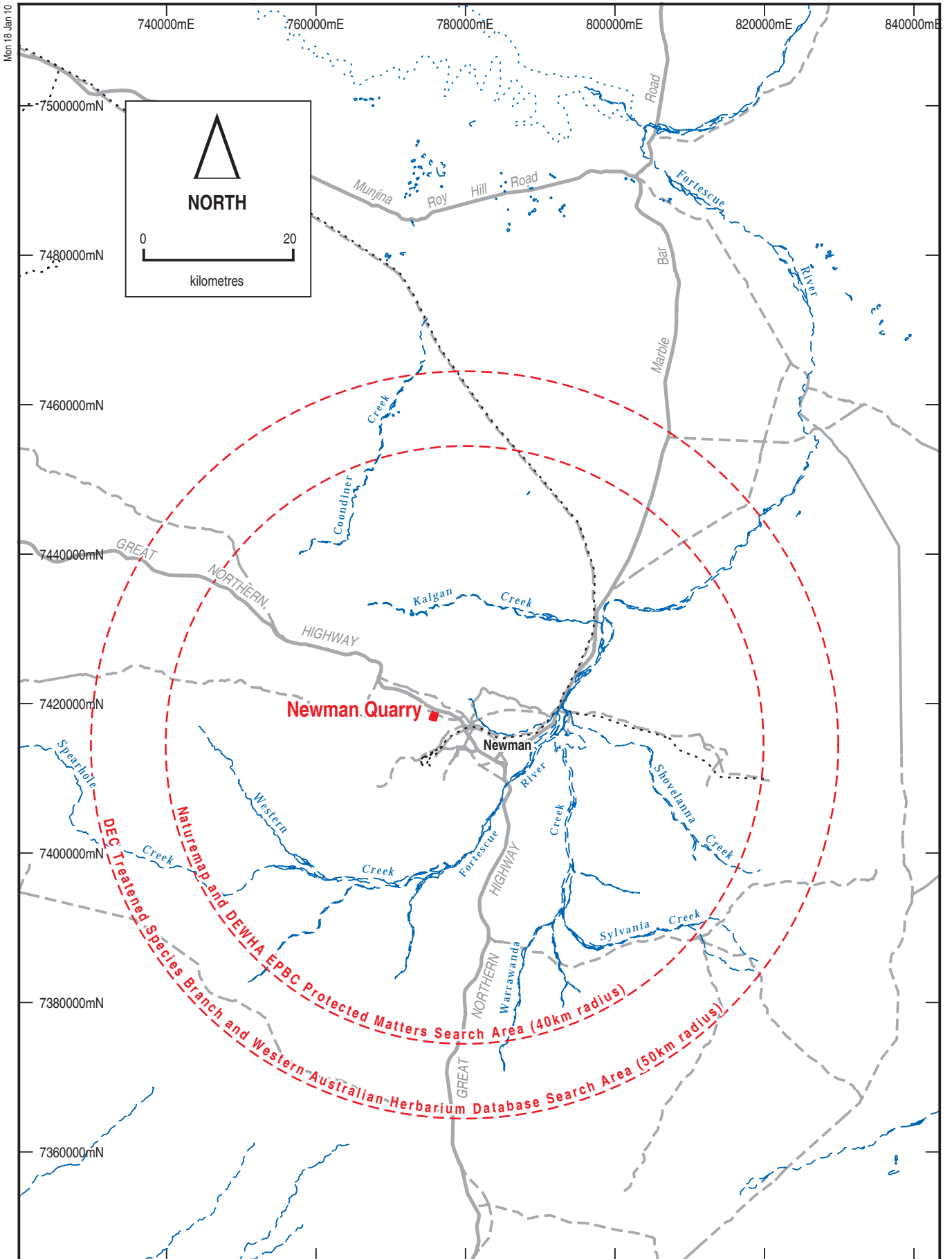


# Animal Plant Mineral

Auth: M. Ladyman	Project: STR09-004
Datum: GDA94 (MGA Zone 50)	Date: Jan 2010

Cemex Holcim  
 NEWMAN BIOLOGICAL SURVEY  
**Figure 1**  
**NEWMAN QUARRY LEASE AREAS**

str09-004\_F01.dgn



# Animal Plant Mineral

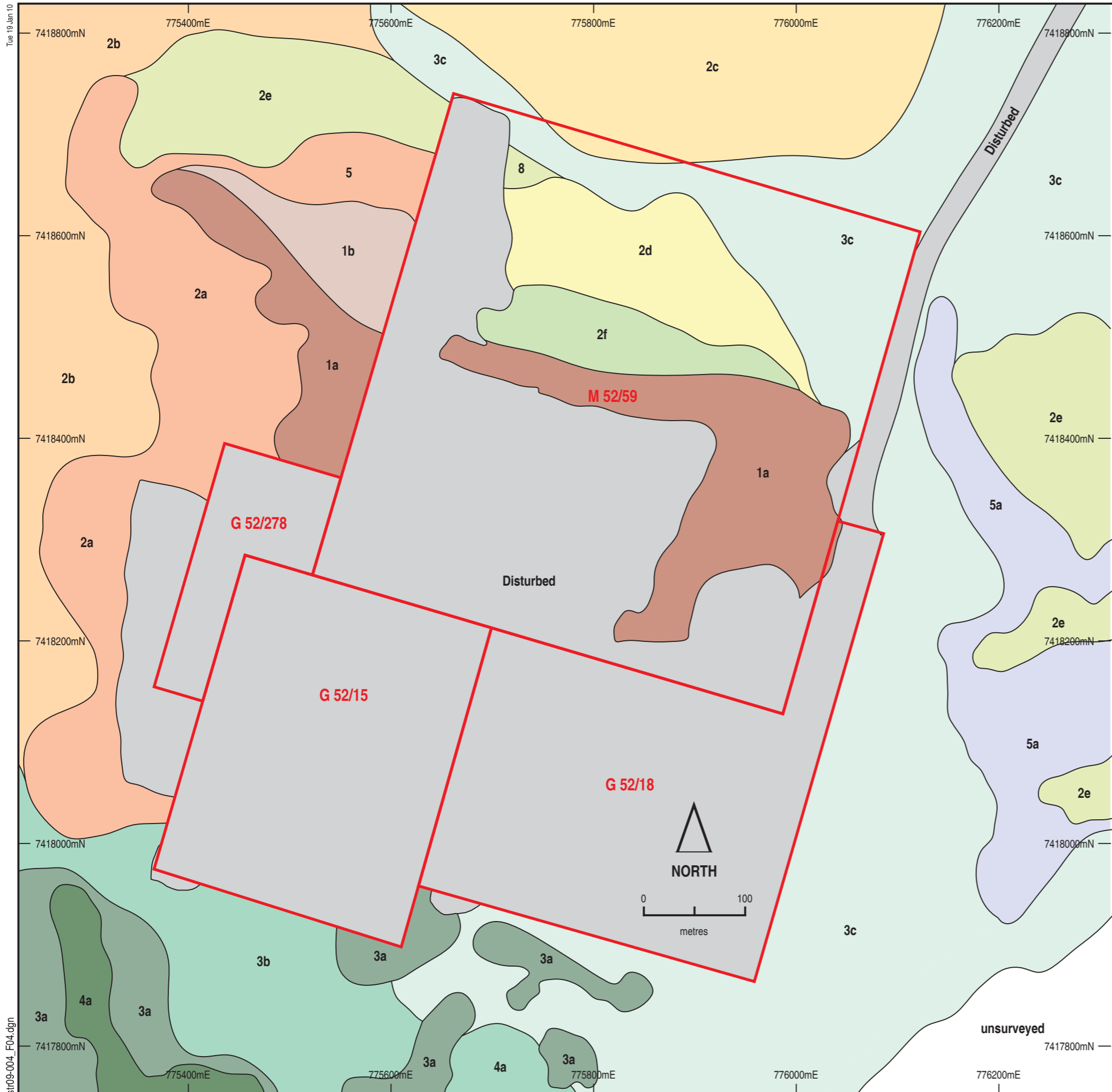
Cemex Holcim  
NEWMAN BIOLOGICAL SURVEY

**Figure 2**  
**DATABASE SEARCH AREAS**

Auth: M. Ladyman	Project: STR09-004
Datum: GDA94 (MGA Zone 50)	Date: Jan 2010

str09-004\_F02.dgn





**Hills and Low Rises.**  
 These comprise hills to 15m, covered in pebbles or cobbles, over stony soils and red shallow loams. They comprise hummock grasslands of *Triodia wiseana* or very scattered shrublands of *Acacia* and *Senna* spp.

**1a** *Eucalyptus leucophloia* ssp. *leucophloia* low open woodland over mixed *Acacia* tall open shrubland over *Triodia wiseana* hummock grassland on skeletal soils with pebbles, cobbles and small boulders.

**1b** *Eucalyptus leucophloia* ssp. *leucophloia* low open woodland over mixed *Acacia* tall open shrubland over *Triodia wiseana* hummock grassland on gravelly clay soils, occurring downslope from Vegetation Type 1.

**Stony Plains.**  
 These are level to gently undulating plains of pebbles over red/brown non-cracking clays. The vegetation is typically described as very scattered to scattered mixed height shrublands with *Acacia aneura* (mulga) among other acacias, *Senna* and *Eremophylla*. Patchy hard *Triodia* occurs.

**2a** Mixed *Acacia synchronicia*, *Acacia pruinocarpa*, *Hakea lorea* ssp. *lorea* tall shrubland over *Cenchrus ciliaris*, *Eriachne mucronata* and *Enneapogon caeruleus* tussock grassland on gravelly clay soils.

**2b** *Acacia synchronicia*, *Eremophila lachnocalyx* and *Rhagodia eramaea* low mixed shrub over mixed tussock grasses on gravelly clay soils.

**2c** *Acacia aneura* var. *macrocarpa* and *Acacia pruinocarpa* tall shrubland over *Triodia pungens* hummock grassland over stony soils.

**2d** *Acacia synchronicia* and *Acacia aneura* tall shrubland over *Eriachne mucronata* and *Aristida latifolia* tussock grassland.

**2e** *Acacia synchronicia* and *Acacia aneura* tall shrubland over *Eriachne mucronata*, *Aristida latifolia* and *Triodia pungens* tussock and hummock grassland.

**2f** *Senna glaucifolia* low open shrubland over *Triodia pungens* hummock grassland on gravelly silty clay.

**Hardpan Plains.**  
 These are level plains subject to sheet flow with small abundant ironstone pebbles on red loamy earths. These are covered with scattered tall shrublands of various acacias.

**3a** *Acacia pachyacra* and *Acacia synchronicia* tall open shrubland over *Cenchrus ciliaris* tussock grass on clay soils.

**3b** *Senna artemisioides* ssp. *oligophylla* over *Cenchrus ciliaris* tussock grass on clay soils.

**3c** *Acacia aneura* var. *macrocarpa* and *Acacia pruinocarpa* tall shrubland over mixed tussock grassland on silty clay soils.

**Groves.**  
 These occur in discrete clumps and are arranged perpendicular to sheet flow on stony plains and hardpans. They occur on red loamy earths and are vegetated with a moderate to closed canopy of tall shrublands of *Acacia aneura* with numerous other shrubs and patchy perennial grasses.

**4a** *Acacia aneura* var. *macrocarpa* tall shrubland over *Aristida latifolia* tussock grassland on clay soils.

**Drainage Floors.**  
 Level tracts with variable surfaces of soil, stone and pebbles with central channels that may support larger boulders. Tussock grassland with *Astrebela* and *Eragrostis* spp. are common and scattered to moderately closed tall shrubland of *Acacia* spp. with various low shrubs and patchy tussock and hummock grasses.

**5a** *Cenchrus ciliaris* tussock grassland.

## Animal Plant Mineral

Auth: M. Ladyman	Project: STR09-004
Datum: GDA94 (MGA Zone 50)	Date: Jan 2010

Cemex Holcim  
 NEWMAN BIOLOGICAL SURVEY  
**Figure 4**  
**VEGETATION ASSOCIATIONS**

unsurveyed  
 7417800mN



## Appendix A

### DEC and WAH Declared Rare and Priority Flora Search

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Appendix A Declared Rare and Priority Flora Search

Species	Conservation Code	Habitat	Habit
<i>Lepidium catapycnon</i>	R	Stony hills	Perennial shrub
<i>Aristida jerichoensis</i> var. <i>subspinulifera</i>	P1	Hardpan plains	Perennial grass
<i>Bothriochloa decipens</i> var. <i>cloncurrans</i>	P1	Hamersley Range	Perennial grass
<i>Brachyscombe</i> sp. Wanna Munna Flats (S. van Leeuwen 4662)	P1	Hardpan plains	Herb
<i>Brunonia</i> sp. long hairs (D.E. Symon 2440)	P1	Creek lines	Herb
<i>Calotis squamigera</i>	P1	Gravelly loam	Annual herb
<i>Crotalaria smithiana</i>	P1	Floodplain	Herb
<i>Eremophila rigida</i>	P1	Hardpan plains	Shrub
<i>Oxalis</i> sp. Pilbara (M.E. Trudgen 12725)	P2	Hummock grassland	Herb
<i>Spartothamnella puberula</i>	P2	Rocky loam	Shrub
<i>Acacia bromilowiana</i>	P3	Stony rises	Perennial shrub
<i>Amaranthus centralis</i>	P3	River bank	Herb
<i>Frankenia georgei</i>	P3	Rocky slopes	Small shrub
<i>Goodenia nuda</i>	P3	Flood plain	Herb
<i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794)	P3	Hardpan plains	Perennial shrub
<i>Tephrosia bidwillii</i>	P3	Sandy gravel	Shrub
<i>Themeda</i> sp. Hamersley Station (M.E. Trudgen 11431)	P3	Clay plains	Perennial grass



## Appendix B

### EPBC Search for Matters of National Environmental Significance

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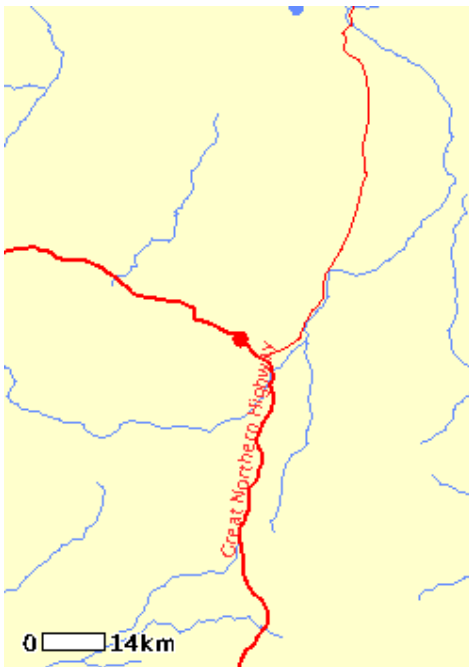
# EPBC Act Protected Matters Report

6 November 2009 08:17

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Information on the coverage of this report and qualifications on data supporting this report are contained in the [caveat](#) at the end of the report.

You may wish to print this report for reference before moving to other pages or websites.

The Australian Natural Resources Atlas at <http://www.environment.gov.au/atlas> may provide further environmental information relevant to your selected area. Information about the EPBC Act including significance guidelines, forms and application process details can be found at <http://www.environment.gov.au/epbc/assessmentsapprovals/index.html>



This map may contain data which are  
© Commonwealth of Australia  
(Geoscience Australia)  
© PSMA Australia Limited

**Search Type:** Point  
**Buffer:** 50 km  
**Coordinates:** -23.32581,119.72343



**Report Contents:** [Summary](#)

[Details](#)

- [Matters of NES](#)
- [Other matters protected by the EPBC Act](#)
- [Extra Information](#)

[Caveat](#)

[Acknowledgments](#)

---

## Summary

### Matters of National Environmental Significance

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

<http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html>.

**World Heritage Properties:** None

**National Heritage Places:** None

**[Wetlands of International Significance:](#)** 1

**(Ramsar Sites)**

**Commonwealth Marine Areas:** None

**Threatened Ecological Communities:** None

**[Threatened Species:](#)** 7

**[Migratory Species:](#)** 8

### Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity

that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage/index.html>.

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at <http://www.environment.gov.au/epbc/permits/index.html>.

<b><u>Commonwealth Lands:</u></b>	2
<b>Commonwealth Heritage Places:</b>	None
<b><u>Places on the RNE:</u></b>	1
<b><u>Listed Marine Species:</u></b>	5
<b>Whales and Other Cetaceans:</b>	None
<b>Critical Habitats:</b>	None
<b>Commonwealth Reserves:</b>	None

## **Extra Information**

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

<b>State and Territory Reserves:</b>	None
<b>Other Commonwealth Reserves:</b>	None
<b>Regional Forest Agreements:</b>	None

---

## **Details**

# Matters of National Environmental Significance

Wetlands of International Significance [ [Dataset Information](#) ]  
(Ramsar Sites)

## [EIGHTY MILE BEACH](#)

Within same catchment as  
Ramsar site

Threatened Species [ [Dataset Information](#) ]

Status      Type of Presence

### Birds

[Pezoporus occidentalis](#)

Night Parrot

Endangered      Species or species habitat likely to occur within area

[Polytelis alexandrae](#)

Princess Parrot, Alexandra's Parrot

Vulnerable      Species or species habitat may occur within area

### Mammals

[Dasyurus hallucatus](#)

Northern Quoll

Endangered      Species or species habitat likely to occur within area

[Rhinonicteris aurantia \(Pilbara form\)](#)

Pilbara Leaf-nosed Bat

Vulnerable      Species or species habitat likely to occur within area

### Reptiles

[Liasis olivaceus barroni](#)

Olive Python (Pilbara subspecies)

Vulnerable      Species or species habitat may occur within area

### Plants

[Lepidium catapycnon](#)

Hamersley Lepidium, Hamersley Catapycnon

Vulnerable      Species or species habitat likely to occur within area

[Pityrodia augustensis](#)

Mt Augustus Foxglove

Vulnerable      Species or species habitat likely to occur within area

Migratory Species [ [Dataset Information](#) ]

Status      Type of Presence

### Migratory Terrestrial Species

#### Birds

[Merops ornatus](#)

Rainbow Bee-eater

Migratory      Species or species habitat may occur within area

[Pezoporus occidentalis](#)

Night Parrot

Migratory      Species or species habitat likely to occur within area

### Migratory Wetland Species

#### Birds

[Ardea alba](#)

Great Egret, White Egret

Migratory      Species or species habitat may occur within area

[Ardea ibis](#)

Migratory      Species or species habitat may



Cattle Egret		occur within area
<a href="#"><i>Charadrius veredus</i></a>	Migratory	Species or species habitat may occur within area
Oriental Plover, Oriental Dotterel		
<b>Migratory Marine Birds</b>		
<a href="#"><i>Apus pacificus</i></a>	Migratory	Species or species habitat may occur within area
Fork-tailed Swift		
<a href="#"><i>Ardea alba</i></a>	Migratory	Species or species habitat may occur within area
Great Egret, White Egret		
<a href="#"><i>Ardea ibis</i></a>	Migratory	Species or species habitat may occur within area
Cattle Egret		

## Other Matters Protected by the EPBC Act

Listed Marine Species [ <a href="#">Dataset Information</a> ]	Status	Type of Presence
<b>Birds</b>		
<a href="#"><i>Apus pacificus</i></a>	Listed	Species or species habitat may occur within area
Fork-tailed Swift	-	overfly marine area
<a href="#"><i>Ardea alba</i></a>	Listed	Species or species habitat may occur within area
Great Egret, White Egret	-	overfly marine area
<a href="#"><i>Ardea ibis</i></a>	Listed	Species or species habitat may occur within area
Cattle Egret	-	overfly marine area
<a href="#"><i>Charadrius veredus</i></a>	Listed	Species or species habitat may occur within area
Oriental Plover, Oriental Dotterel	-	overfly marine area
<a href="#"><i>Merops ornatus</i></a>	Listed	Species or species habitat may occur within area
Rainbow Bee-eater	-	overfly marine area

### Commonwealth Lands [ [Dataset Information](#) ]

Defence

Unknown

Places on the RNE [ [Dataset Information](#) ]

Note that not all Indigenous sites may be listed.

**Indigenous**

[Ethel Gorge Rockshelter Area WA](#)



## Appendix C

### DEC Naturemap Database Flora Search

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## Appendix C: Naturemap Flora Database Search

Method='By Circle'; Centre=119°44' 15" E,23°21' 20 " S; Buffer=20km; Kingdom=Plantae; Species Group= Vascular Plant

### Species

TOTAL 389

#### Species List

Abutilon amplum  
Abutilon dioicum  
Abutilon fraseri Lantern Bush  
Abutilon lepidum  
Abutilon otocarpum Desert Chinese Lantern  
Acacia acradenia  
Acacia adoxa var. adoxa  
Acacia adsurgens  
Acacia ancistrocarpa Fitzroy Wattle  
Acacia aneura Mulga  
Acacia aneura var. macrocarpa  
Acacia aneura var. pilbarana  
Acacia aneura var. tenuis (flat)  
Acacia arida  
Acacia atkinsiana  
Acacia bivenosa  
Acacia bivenosa weeping variant  
Acacia catenulata subsp. occidentalis  
Acacia citrinoviridis  
Acacia coriacea Wirewood  
Acacia coriacea subsp. pendens  
Acacia dictyophleba Sandhill Wattle  
Acacia dictyophleba/melleodora  
Acacia elachantha  
Acacia elachantha (Silvery hairy variant)  
Acacia eriopoda Broome Pindan Wattle  
Acacia hamersleyensis  
Acacia hilliana  
Acacia inaequilatera Baderi  
Acacia maitlandii Maitland's Wattle  
Acacia melleodora  
Acacia monticola Gawar  
Acacia pachyacra  
Acacia pachycarpa  
Acacia paraneura  
Acacia pruinocarpa Gidgee  
Acacia ptychophylla  
Acacia pyrifolia var. morrisonii  
Acacia pyrifolia var. pyrifolia  
Acacia rhodophloia  
Acacia sclerosperma subsp. sclerosperma  
Acacia sericophylla  
Acacia sibirica Bastard Mulga  
Acacia spondylophylla

## Appendix C: Naturemap Flora Database Search

Acacia synchronicia  
Acacia tenuissima  
Acacia tetragonophylla Kurara  
Acacia victoriae Bramble Wattle  
Acacia wanyu  
Acacia x ayersiana  
Alternanthera nodiflora Common Joyweed  
Alternanthera pungens Khaki Weed  
Alternanthera sp.  
Amaranthus mitchellii Boggabri Weed  
Amaranthus undulatus  
Amphipogon caricinus Long Greybeard Grass  
Amyema fitzgeraldii Pincushion Mistletoe  
Amyema gibberula var. gibberula  
Amyema miquelii Stalked Mistletoe  
Amyema preissii Wireleaf Mistletoe  
Anthobolus leptomerioides  
Aristida contorta Bunched Kerosene Grass  
Aristida latifolia Feathertop Wiregrass  
Aristida sp.  
Atriplex codonocarpa Flat-topped Saltbush  
Atriplex semilunaris Annual Saltbush  
Bergia pedicellaris  
Bidens bipinnata Bipinnate Beggartick  
Bonamia media var. villosa  
Bonamia rosea Felty Bellflower  
Brachyscome ciliaris  
Brachyscome sp. Wanna Munna Flats (S. van Leeuwen 4662) P1  
Brunonia australis Native Cornflower  
Bulbostylis barbata  
Calandrinia Ptychosperma  
Calandrinia quadrivalvis  
Calandrinia reticulata  
Calandrinia schistorhiza  
Calotis hispidula Bindy Eye  
Calotis multicaulis Many-stemmed Burr-daisy  
Calotis plumulifera  
Calytrix carinata  
Capparis lasiantha Split Jack  
Cenchrus ciliaris Buffel Grass  
Cheilanthes brownii  
Cheilanthes lasiophylla Woolly Cloak Fern  
Cheilanthes sieberi subsp. sieberi  
Cheilanthes tenuifolia Rock Fern  
Chloris sp.  
Chrysocephalum pterochaetum  
Chrysopogon fallax Golden Beard Grass  
Citrullus lanatus Pie Melon

### **Cleome oxalidea**

**Clerodendrum floribundum var. angustifolium**

**Codonocarpus cotinifolius Native Poplar**

Convolvulus clementii  
 Corchorus crozophorifolius  
 Corchorus lasiocarpus  
 Corchorus sp. Hamersley Range hilltops (S. van Leeuwen 3826)  
 Corymbia aspera  
 Corymbia candida  
 Corymbia candida subsp. dipsodes  
 Corymbia deserticola subsp. deserticola  
 Corymbia ferritcola  
 Corymbia hamersleyana  
 Corymbia opaca  
 Cullen cinereum  
 Cullen graveolens  
 Cullen leucanthum  
 Cullen leucochaites  
 Cullen pogonocarpum  
 Cymbopogon ambiguus Scentgrass  
 Cymbopogon bombycinus Silky Oilgrass  
 Cymbopogon procerus Lemon Grass  
 Cynanchum floribundum Dumara Bush  
 Cynodon dactylon Couch  
 Cyperus vaginatus Stiffleaf Sedge  
 Dactyloctenium radulans Button Grass  
 Dampiera candidans  
 Desmanthus virgatus  
 Desmodium campylocaulon  
 Desmodium filiforme  
 Dichanthium sericeum subsp. humilium  
 Dicladanthera forrestii  
 Dicrastylis cordifolia  
 Dicrastylis kumarinensis  
 Diplopeltis stuartii var. stuartii Desert Pepperflower  
 Dipteracanthus australasicus subsp. australasicus  
 Dodonaea coriacea  
 Dodonaea pachyneura  
 Drosera indica Indian Sundew  
 Dysphania melanocarpa (name not current)  
 Echinochloa colona Awnless Barnyard Grass  
 Elytrophorus spicatus Spikegrass  
 Enchylaena tomentosa var. tomentosa Barrier Saltbush  
 Enneapogon caeruleus Limestone Grass  
 Enneapogon lindleyanus Wiry Nineawn  
 Enneapogon polyphyllus Leafy Nineawn  
 Eragrostis dielsii Mallee Lovegrass  
 Eragrostis laniflora Hairy-flowered Woollybutt  
 Eragrostis lanipes Creeping Wanderrie  
 Eragrostis leptocarpa Drooping Lovegrass  
 Eragrostis setifolia Neverfail Grass  
 Eragrostis sp.  
 Eragrostis tenellula Delicate Lovegrass  
 Eremophila canaliculata  
 Eremophila clarkei Turpentine Bush  
 Eremophila cuneifolia Pinyuru

## Appendix C: Naturemap Flora Database Search

*Eremophila exilifolia*  
*Eremophila forrestii* subsp. *forrestii*  
*Eremophila fraseri* subsp. *fraseri*  
*Eremophila lachnocalyx* Woolly-calyxed *Eremophila*  
*Eremophila lanceolata*  
*Eremophila latrobei* Warty Fuchsia Bush  
*Eremophila latrobei* subsp. *latrobei*  
*Eremophila longifolia* Berrigan  
*Eremophila maculata* Native Fuchsia  
*Eremophila maculata* subsp. *brevifolia* Native Fuchsia  
*Eremophila margarethae* Sandbank Poverty Bush  
*Eremophila platycalyx* subsp. *pardalota*  
*Eremophila platycalyx* subsp. *platycalyx*  
*Eremophila* sp.  
*Eremophila tietkensis*  
***Eriachne lanata***  
***Eriachne mucronata* Mountain Wanderrie Grass**  
***Eriachne pulchella* subsp. *pulchella***  
*Eriachne tenuiculmis*  
*Erodium cygnorum* Blue Heronsbill  
*Eucalyptus camaldulensis* var. *obtusa* Blunt-budded River Red Gum  
*Eucalyptus gamophylla* Twin-leaf Mallee  
*Eucalyptus kingsmillii* Kingsmill's Mallee  
*Eucalyptus kingsmillii* subsp. *kingsmillii*  
*Eucalyptus leucophloia* subsp. *leucophloia*  
*Eucalyptus lucasii* Barlee Box  
*Eucalyptus socialis* Red Mallee  
*Eucalyptus trivalva* Victoria Spring Mallee  
*Eucalyptus victrix*  
*Eucalyptus xerothermica*  
*Eulalia aurea*  
*Euphorbia alsiniflora*  
*Euphorbia australis* Namana  
*Euphorbia coghlanii* Namana  
*Euphorbia schultzei*  
*Euphorbia* sp.  
*Euphorbia tannensis* subsp. *eremophila* Desert Spurge  
*Evolvulus alsinoides* var. *villosicalyx*  
*Frankenia setosa* Bristly Frankenia  
*Glycine* sp.  
*Gompholobium karjini*  
*Gomphrena canescens* Batchelors Buttons  
*Gomphrena cunninghamii*  
*Gomphrena kanisii*  
*Gomphrena sordida*  
*Gonocarpus ephemerus*  
*Goodenia forrestii*  
*Goodenia iyouta*  
*Goodenia lamprosperma*  
*Goodenia microptera*  
*Goodenia muelleriana*  
*Goodenia prostrata*  
*Goodenia ramelii*  
*Goodenia* sp.  
*Goodenia stobbsiana*  
*Goodenia tenuiloba*  
*Goodenia triodiophila*  
*Goodenia vilmoriniae*  
*Gossypium sturtianum* var. *sturtianum*  
*Grevillea juncifolia* subsp. *juncifolia*  
*Grevillea stenobotrya*  
*Grevillea striata* Beefwood  
*Grevillea wickhamii* subsp. *aprica*

## Appendix C: Naturemap Flora Database Search

*Gymnanthera cunninghamii* P3  
*Hakea chordophylla*  
*Hakea lorea* Witinti  
*Hakea lorea* subsp. *lorea*  
*Hakea preissii* Needle Tree  
*Haloragis gossei*  
*Haloragis gossei* var. *gossei*  
*Haloragis maierae*  
*Heliotropium cunninghamii*  
*Heliotropium heteranthum*  
*Heliotropium pachyphyllum*  
*Heliotropium tanythrix*  
*Heliotropium tenuifolium* Mamukata  
*Hibiscus burtonii*  
*Hibiscus coatesii*  
*Hibiscus panduriformis* Yellow Hibiscus (name not current)  
*Hibiscus* sp.  
*Hibiscus sturtii* Sturt's Hibiscus  
*Hybanthus aurantiacus*  
*Indigofera brevidens* Widji  
*Indigofera georgei* Bovine Indigo  
*Indigofera monophylla*  
*Ipomoea costata* Rock Morning Glory  
*Ipomoea muelleri* Poison Morning Glory  
*Ipomoea pes-caprae* subsp. *brasiliensis*  
*Ipomoea* sp.  
*Iseilema dolichotrichum*  
*Iseilema membranaceum* Small Flinders Grass  
*Iseilema vaginiflorum* Red Flinders Grass  
*Isotropis atropurpurea* Poison Sage  
*Isotropis forrestii*  
*Jacksonia aculeata*  
*Kennedia prorepens*  
*Lamarchea sulcata*  
*Lepidium catapycnon* Hamersley Lepidium T  
*Lepidium echinatum*  
*Lepidium pedicellosum*  
*Lepidium phlebopetalum* Veined Peppercross  
*Lepidium platypetalum* Slender Peppercross  
*Lotus cruentus* Redflower Lotus  
*Maireana georgei* Satiny Bluebush  
*Maireana melanocoma* Pussy Bluebush  
*Maireana planifolia* Low Bluebush  
*Maireana tomentosa* Felty Bluebush  
*Marsilea exarata*  
*Marsilea hirsuta* Nardoo  
*Melaleuca glomerata*  
*Melaleuca* sp.  
*Mimulus gracilis*  
*Mimulus* sp.  
*Minuria integerrima* Smooth Minuria  
*Mirbelia viminalis*  
*Mitrasacme connata*  
*Myoporum montanum* Native Myrtle  
*Neptunia dimorphantha* Sensitive Plant  
*Newcastelia cephalantha*  
*Nicotiana benthamiana* Tjuntiwari  
*Nicotiana occidentalis* subsp. *obliqua*  
*Oldenlandia crouchiana*  
*Operculina aequisepala*  
*Panicum decompositum* Native Millet  
*Paraneurachne muelleri* Northern Mulga Grass  
*Paspalidium constrictum* Knottybutt Grass



## Appendix C: Naturemap Flora Database Search

Peplidium sp.  
Perotis rara Comet Grass  
Petalostylis labicheoides Slender Petalostylis  
**Plumbago zeylanica Native Plumbago**  
**Polymeria sp.**  
**Portulaca cyclophylla**  
Portulaca pilosa Djanggara  
Pterocaulon sphacelatum Apple Bush  
Ptilotus aervoides  
Ptilotus astrolasius  
Ptilotus astrolasius var. astrolasius  
Ptilotus auriculifolius  
Ptilotus axillaris Mat Mulla Mulla  
Ptilotus calostachyus Weeping Mulla Mulla  
Ptilotus carinatus  
Ptilotus clementii Tassel Top  
Ptilotus exaltatus Tall Mulla Mulla  
Ptilotus exaltatus var. exaltatus Tall Mulla Mulla  
Ptilotus gaudichaudii  
Ptilotus gomphrenoides  
Ptilotus gomphrenoides var. gomphrenoides  
Ptilotus helipteroides Hairy Mulla Mulla  
Ptilotus incanus  
Ptilotus macrocephalus Featherheads  
Ptilotus obovatus Cotton Bush  
Ptilotus polystachyus Prince of Wales Feather  
Ptilotus polystachyus var. polystachyus Prince of Wales Feather  
Ptilotus rotundifolius Royal Mulla Mulla  
Ptilotus schwartzii  
Rhagodia eremaea Thorny Saltbush  
Rhodanthe charsleyae  
Rhodanthe floribunda  
Rhodanthe margarethae  
Rhodanthe pollackii  
Rhodanthe sterilecens  
Rhodanthe stricta  
Rotala diandra  
Rulingia luteiflora Yellow-flowered Rulingia  
Ruppia polycarpa  
Rutidosis helichrysoides Grey Wrinklewort  
Rutidosis helichrysoides subsp. helichrysoides  
Salsola tragus  
Santalum lanceolatum Northern Sandalwood  
Scaevola acacioides  
Scaevola browniana subsp. browniana  
Scaevola parvifolia subsp. pilbarae  
Scaevola sp. Mt Nameless (P.A.S. Wurm 1443)  
Scaevola spinescens Currant Bush  
Schoenoplectus laevis  
Sclerolaena convexula  
Sclerolaena cornishiana Cartwheel Burr  
Sclerolaena cuneata Yellow Bindii  
Sclerolaena lanicuspis Spinach Burr  
Senna artemisioides  
Senna artemisioides subsp. filifolia  
Senna artemisioides subsp. helmsii  
Senna artemisioides subsp. oligophylla  
Senna glutinosa subsp. glutinosa  
Senna glutinosa subsp. pruinosa  
Senna glutinosa subsp. x luerssenii  
Senna hamersleyensis  
Senna notabilis  
Setaria dielsii Diels' Pigeon Grass

## Appendix C: Naturemap Flora Database Search

Setaria verticillata Whorled Pigeon Grass  
Sida arenicola  
Sida echinocarpa  
Sida fibulifera Silver Sida  
Sida sp. Excedentifolia (J.L. Egan 1925)  
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)  
Sida sp. verrucose glands (F.H. Mollemans 2423)  
Solanum centrale Desert Raisin  
Solanum lasiophyllum Flannel Bush  
Solanum sturtianum Thargomindah Nightshade  
Sporobolus actinocladus Ray Grass  
Sporobolus australasicus Fairy Grass  
Stackhousia intermedia  
Streptoglossa decurrens  
Streptoglossa liatroides  
Streptoglossa odora  
Swainsona decurrens  
Swainsona leeana  
Tecticornia disarticulata  
Tephrosia clementii  
Tephrosia densa  
Tephrosia rosea var. clementii  
Tephrosia sp. B Kimberley Flora (C.A. Gardner 7300)  
Tephrosia sp. Cathedral Gorge (F.H. Mollemans 2420) P3  
Themeda triandra  
Trachymene oleracea  
Trachymene oleracea subsp. oleracea  
Tragus australianus Small Burrgrass  
Trianthema glossostigma  
Trianthema pilosa  
Tribulus hirsutus  
Tribulus sp.  
Trichodesma zeylanicum Camel Bush  
Trichodesma zeylanicum var. zeylanicum  
Triodia angusta  
Triodia basedowii Lobed Spinifex  
Triodia brizoides  
**Triodia epactia**  
**Triodia longiceps Giant Grey Spinifex**  
**Triodia pungens Soft Spinifex**  
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)  
Triodia triticooides  
Triodia wiseana Limestone Spinifex  
Triumfetta leptacantha  
Triumfetta maconochieana  
Urochloa piligera  
Velleia glabrata Pee the Bed  
Velleia sp.  
Vigna sp. Hamersley Clay (A.A. Mitchell PRP 113)  
Vittadinia sp.  
Wahlenbergia tumidifruca  
Zygophyllum iodocarpum

### Conservation Status

- T - Rare or likely to become extinct
- X - Presumed extinct
- IA - Protected under international agreement
- S - Other specially protected fauna
- 1 - Priority 1
- 2 - Priority 2
- 3 - Priority 3
- 4 - Priority 4
- 5 - Priority 5

## Appendix C: Naturemap Flora Database Search

Cyclorana australis Giant Frog  
Cyclorana maini Sheep Frog  
Dasyercus blythi Brush-tailed Mulgara, Ampurta P4  
Dasyercus cristicauda Crest-tailed Mulgara T  
Dasykaluta rosamondae Little Red Kaluta  
Dasyurus hallucatus Northern Quoll T  
Delma haroldi  
Delma pax  
Delma tincta  
Demansia psammophis subsp. cupreiceps  
Diplodactylus conspicillatus Fat-tailed Gecko  
Diporiphora valens  
Diporiphora winneckeii Blue-lined Dragon  
Egernia depressa Pygmy Spiny-tailed Skink  
Eremiascincus richardsonii Broad-banded Sand Swimmer  
Furina ornata Moon Snake  
Gallirallus philippensis subsp. mellori  
Gehyra pilbara  
Gehyra punctata  
Gehyra purpurascens  
Gehyra variegata  
Gerygone tenebrosa Dusky Gerygone  
Heteronotia binoei Bynoe's Gecko  
Heteronotia spelea Desert Cave Gecko  
Lerista bipes  
Lerista jacksoni  
Lialis burtonis  
Litoria rubella Little Red Tree Frog  
Lucasium stenodactylum  
Macroderma gigas Ghost Bat P4  
Macrotis lagotis Bilby, Dalgyte T  
Malurus lamberti subsp. assimilis  
Menetia greyii  
Morethia ruficauda subsp. exquisita  
Mormopterus lorae subsp. cobourgiana Little North-western Mastiff Bat P1  
Neobatrachus aquilonius Northern Burrowing Frog  
Neochima ruficauda subsp. subclarescens Star Finch (western) P4  
Nephurus levis subsp. pilbarensis  
Ningauia timealeyi Pilbara Ningauia  
Notaden nicholli Desert Spadefoot  
Notomys alexis Spinifex Hopping-mouse  
Notoscincus ornatus subsp. ornatus  
Opisthodon spenceri Centralian Burrowing Frog  
Phaps histrionica Flock Bronzewing (Flock Pigeon) P4  
Pogona minor  
Pogona minor subsp. mitchelli  
Proablepharus reginae  
Pseudechis australis Mulga Snake  
Pseudomys chapmani Western Pebble-mound Mouse P4  
Pseudomys delicatulus Delicate Mouse  
Pseudomys desertor Desert Mouse  
Pseudomys hermannsburgensis Sandy Inland Mouse  
Pseudonaja modesta Ringed Brown Snake  
Pseudonaja nuchalis Gwardar  
Pygopus nigriceps  
Ramphotyphlops ammodytes  
Ramphotyphlops grypus  
Ramphotyphlops pilbarensis  
Rhynchoedura ornata Beaked Gecko  
Simoselaps anomalus Desert Banded Snake  
Sminthopsis macroura Stripe-faced Dunnart  
Sminthopsis youngsoni Lesser Hairy-footed Dunnart

## Appendix C: Naturemap Flora Database Search

*Strophurus ciliaris* subsp. *aberrans*  
*Strophurus elderi*  
*Suta punctata* Spotted Snake  
*Taphozous georgianus* Common Sheath-tail-bat  
*Tiliqua multifasciata* Central Blue-tongue  
*Tringa brevipes* Grey-tailed Tattler  
*Tringa cinerea* Terek Sandpiper  
*Tyto alba* subsp. *delicatula*  
*Uperoleia glandulosa* Glandular Toadlet  
*Uperoleia russelli* Northwest Toadlet  
*Varanus acanthurus* Spiny-tailed Monitor  
*Varanus brevicauda* Short-tailed Pygmy Monitor  
*Varanus eremius* Pygmy Desert Monitor  
*Varanus gouldii* Bungarra or Sand Monitor  
*Vespadelus finlaysoni* Finlayson's Cave Bat  
*Zyzomys argurus* Common Rock-rat

**Method='By Circle'; Centre=118°36' 50" E, 20°19' 35 " S; Buffer=40km; Kingdom=Animalia; Origin=Native; Species Group= All Animals;**

**Area 5**

**122 Potential Species**

*Acanthopis pyrrhus* Desert Death Adder  
*Amphibolurus longirostris*  
*Antaresia perthensis* Pygmy Python  
*Antaresia stimsoni* subsp. *stimsoni*  
*Antechinomys laniger* Kultarr  
*Ardeotis australis* Australian Bustard P4  
*Arenaria interpres* subsp. *interpres*  
*Artamus cinereus* subsp. *melanops*  
*Artamus leucorhynchus* White-breasted Woodswallow  
*Aspidites melanocephalus* Black-headed Python  
*Aspidites ramsayi* Woma S  
*Burhinus grallarius* Bush Stone-curlew P4  
*Calidris acuminata* Sharp-tailed Sandpiper  
*Calidris alba* Sanderling  
*Calidris ferruginea* Curlew Sandpiper  
*Calidris ruficollis* Red-necked Stint  
*Calidris tenuirostris* Great Knot  
*Carlia triacantha*  
*Chaerephon jobensis* Northern Freetail-bat  
*Charadrius mongolus* subsp. *mongolus*  
*Charadrius ruficapillus* Red-capped Plover  
*Cincloramphus mathewsi* Rufous Songlark  
*Circus assimilis* Spotted Harrier  
*Corvus orru* subsp. *ceciliae* Western Crow  
*Cryptoblepharus buchananii*  
*Ctenophorus caudicinctus* subsp. *caudicinctus*  
*Ctenophorus isolepis* subsp. *isolepis*  
*Ctenophorus nuchalis* Central Netted Dragon  
*Ctenotus duricola*  
*Ctenotus grandis* subsp. *titan*  
*Ctenotus hanloni*  
*Ctenotus helenae*  
*Ctenotus pantherinus* subsp. *ocellifer*  
*Ctenotus rufescens*  
*Ctenotus saxatilis* Rock Ctenotus  
*Ctenotus serventyi*  
*Cyclorana australis* Giant Frog  
*Cyclorana maini* Sheep Frog  
*Dasymercus blythi* Brush-tailed Mulgara, Ampurta P4  
*Dasykaluta rosamondae* Little Red Kaluta

## Appendix C: Naturemap Flora Database Search

*Dasyurus hallucatus* Northern Quoll T  
*Delma haroldi*  
*Delma pax*  
*Delma tincta*  
*Demansia rufescens* Rufous Whipsnake  
*Diplodactylus conspicillatus* Fat-tailed Gecko  
*Diporiphora winneckeii* Blue-lined Dragon  
*Eopsaltria pulverulenta* Mangrove Robin  
*Eremiascincus fasciolatus* Narrow-banded Sand Swimmer  
*Furina ornata* Moon Snake  
*Gallinago stenura* Pin-tailed Snipe  
*Gallirallus philippensis* subsp. *mellori*  
*Gehyra pilbara*  
*Gehyra punctata*  
*Gehyra purpurascens*  
*Gehyra variegata*  
*Gerygone tenebrosa* Dusky Gerygone  
*Heteronotia binoei* Bynoe's Gecko  
*Lerista bipes*  
*Lerista clara*  
*Lialis burtonis*  
*Limicola falcinellus* subsp. *sibiricus*  
*Limnodromus semipalmatus* Asian Dowitcher  
*Litoria rubella* Little Red Tree Frog  
*Lucasium stenodactylum*  
*Macroderma gigas* Ghost Bat P4  
*Macropus robustus* subsp. *erubescens* Euro, Biggada  
*Macrotis lagotis* Bilby, Dalgyte T  
*Malurus lamberti* subsp. *assimilis*  
*Menetia greyii*  
*Morethia ruficauda* subsp. *exquisita*  
*Mormopterus loriae* subsp. *cobourgiana* Little North-western Mastiff Bat P1  
*Motacilla flava* subsp. *simillima*  
*Neobatrachus aquilonius* Northern Burrowing Frog  
*Neochima ruficauda* subsp. *subclarescens* Star Finch (western) P4  
*Nephrurus levis* subsp. *pilbarensis*  
*Notaden nicholli* Desert Spadefoot  
*Numenius madagascariensis* Eastern Curlew P4  
*Nycticorax caledonicus* subsp. *hilli*  
*Nyctophilus arnhemensis* Arnhem Land Long-eared Bat  
*Nyctophilus geoffroyi* Lesser Long-eared Bat  
*Opisthodon spenceri* Centralian Burrowing Frog  
*Pachycephala lanioides* White-breasted Whistler  
*Phalaropus lobatus* Red-necked Phalarope  
*Pogona minor* subsp. *mitchelli*  
*Proablepharus reginae*  
*Pseudechis australis* Mulga Snake  
*Pseudomys delicatulus* Delicate Mouse  
*Pseudomys hermannsburgensis* Sandy Inland Mouse  
*Pseudonaja modesta* Ringed Brown Snake  
*Pseudonaja nuchalis* Gwardar  
*Ptilonorhynchus maculatus* subsp. *guttatus* Western Bowerbird  
*Pygopus nigriceps*  
*Ramphotyphlops ammodytes*  
*Ramphotyphlops grypus*  
*Ramphotyphlops pilbarensis*  
*Recurvirostra novaehollandiae* Red-necked Avocet  
*Rhynchoedura ornata* Beaked Gecko  
*Simoselaps anomalus* Desert Banded Snake  
*Sminthopsis youngsoni* Lesser Hairy-footed Dunnart  
*Sterna caspia* Caspian Tern  
*Sterna hybrida* subsp. *javanica*  
*Sterna leucoptera* White-winged Black Tern

## Appendix C: Naturemap Flora Database Search

*Sterna nilotica* subsp. *macrotarsa* Australian Gull-billed Tern  
*Strophurus ciliaris* subsp. *aberrans*  
*Strophurus elderi*  
*Strophurus jeanae*  
*Suta punctata* Spotted Snake  
*Taphozous georgianus* Common Sheath-tail-bat  
*Tiliqua multifasciata* Central Blue-tongue  
*Tringa brevipes* Grey-tailed Tattler  
*Tringa cinerea* Terek Sandpiper  
*Tringa stagnatilis* Marsh Sandpiper  
*Turnix velox* Little Button-quail  
*Tyto alba* subsp. *delicatula*  
*Uperoleia glandulosa* Glandular Toadlet  
*Uperoleia russelli* Northwest Toadlet  
*Varanus acanthurus* Spiny-tailed Monitor  
*Varanus brevicauda* Short-tailed Pygmy Monitor  
*Varanus eremius* Pygmy Desert Monitor  
*Varanus gouldii* Bungarra or Sand Monitor  
*Vespadelus finlaysoni* Finlayson's Cave Bat

Appendix C: Naturemap Flora Database Search

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## Appendix D

### DEC Naturemap Database Fauna Search

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Appendix D: Naturemap Fauna Database Search

Method='By Circle'; Centre=119°46' 45"  
E,23°21' 05" S; Buffer=20km

Species

TOTAL 214

Species List	Terrestrial / Bat	Bird	Amphibian	Reptile	Ferals
Dasykaluta rosamondae Little Red Kaluta	1				
Macropus robustus	1				
Euro, Biggada	1				
Macropus rufus Red Kangaroo, Marlu	1				
Mus musculus House Mouse	1				
Ningau timealeyi Pilbara Ningau	1				
Notomys alexis Spinifex Hopping-mouse	1				
Oryctolagus cuniculus Rabbit	1				
<b>Black-footed Rock-wallaby T</b>	<b>1</b>				
Pseudantechinus	1				
<b>mound Mouse P4</b>	<b>1</b>				
Pseudomys desertor Desert Mouse	1				
Inland Mouse	1				
<b>Dunnart P4</b>	<b>1</b>				
Dunnart	1				
Sminthopsis ooldea Ooldea Dunnart	1				
footed Dunnart	1				
Tachyglossus aculeatus Echidna	1				
Zyomys argurus Common Rock-rat	1				
bat		1			
Chalinolobus gouldii Gould's Wattled Bat		1			
<b>Macroderma gigas Ghost Bat P4</b>		<b>1</b>			
bat		1			
Sheathtail-bat		1			
Scotorepens greyii Little Broad-nosed Bat		1			
Sheathtail-bat		1			
Taphozous hilli Hill's Sheathtail-bat		1			
Bat		1			
Honeyeater			1		
Thornbill			1		
Thornbill			1		
Accipiter fasciatus Brown Goshawk			1		
Acrocephalus australis subsp. gouldi			1		
Anthus australis Australian Pipit			1		
Aquila audax Wedge-tailed Eagle			1		
Heron			1		
Ardea pacifica White-necked Heron			1		
<b>P4</b>			<b>1</b>		
Woodswallow			1		
Cacatua roseicapilla subsp. assimilis			1		
Cacatua sanguinea Little Corella			1		
Calidris acuminata Sharp-tailed Sandpiper			1		
Calidris melanotos Pectoral Sandpiper			1		

Appendix D: Naturemap Fauna Database Search

Calidris subminuta Long-toed Stint	1
Certhionyx niger Black Honeyeater	1
Dotterel	1
Swallow	1
Cuckoo	1
Cuckoo	1
Cincloramphus mathewsi Rufous Songlark	1
Climacteris melanura subsp. wellsii	1
Colluricincla harmonica subsp. rufiventris	1
Cuckoo-shrike	1
subpallida	1
Corvus orru Torresian Crow	1
Cracticus nigrogularis Pied Butcherbird	1
Cracticus tibicen Australian Magpie	1
Cuculus pallidus Pallid Cuckoo	1
Dacelo leachii Blue-winged Kookaburra	1
Dicaeum hirundinaceum Mistletoebird	1
Dromaius novaehollandiae Emu	1
Emblema pictum Painted Finch	1
Epthianura aurifrons Orange Chat	1
Epthianura tricolor Crimson Chat	1
Eremiornis carteri Spinifex-bird	1
Eurostopodus argus Spotted Nightjar	1
Falco berigora Brown Falcon	1
Falco berigora subsp. berigora	1
Falco cenchroides Australian Kestrel	1
Falco cenchroides subsp. cenchroides	1
Falco longipennis Australian Hobby	1
Falco longipennis subsp. longipennis	1
Geopelia cuneata Diamond Dove	1
Geopelia striata Peaceful Dove	1
Geophaps plumifera Spinifex Pigeon	1
Gerygone fusca Western Gerygone	1
Grallina cyanoleuca Magpie-lark	1
Haliastur sphenurus Whistling Kite	1
Buzzard	1
Hirundo ariel Fairy Martin	1
Lalage tricolor White-winged Triller	1
novaehollandiae	1
Honeyeater	1
Honeyeater	1
Honeyeater	1
Lichmera indistincta Brown Honeyeater	1
Malurus lamberti Variegated Fairy-wren	1
wren	1
Manorina flavigula Yellow-throated Miner	1
Megalurus gramineus subsp. gramineus	1
Honeyeater	1
Melopsittacus undulatus Budgerigar	1

Appendix D: Naturemap Fauna Database Search

Merops ornatus Rainbow Bee-eater	1	
Milvus migrans Black Kite	1	
Neochima ruficauda subsp. clarescens	1	
Neophema bourkii Bourke's Parrot	1	
Ninox novaeseelandiae subsp. boobook	1	
Nymphicus hollandicus Cockatiel	1	
Ocyphaps lophotes Crested Pigeon	1	
Oreoica gutturalis Crested Bellbird	1	
Pachycephala rufiventris Rufous Whistler	1	
Pardalote	1	
Pardalotus striatus Striated Pardalote	1	
Pardalotus striatus subsp. murchisoni	1	
Petroica goodenovii Red-capped Robin	1	
Cormorant	1	
(Ring-necked Parrot)	1	
Platycercus zonarius subsp. zonarius	1	
Babbler	1	
Rhipidura leucophrys Willie Wagtail	1	
Smicronis brevirostris Weebill	1	
Taeniopygia guttata Zebra Finch	1	
Kingfisher	1	
Todiramphus sanctus Sacred Kingfisher	1	
Tringa hypoleucos Common Sandpiper	1	
Turnix velox Little Button-quail	1	
Tyto alba subsp. delicatula	1	
Cyclorana maini Sheep Frog		1
Litoria rubella Little Red Tree Frog		1
Neobatrachus kunapalari Kunapalari Frog		1
Frog		1
Pseudophryne douglasi Gorge Toadlet		1
Uperoleia russelli Northwest Toadlet		1
Acanthophis wellsi Pilbara Death Adder		1
Amphibolurus longirostris		1
Antaresia perthensis Pygmy Python		1
Antaresia stimsoni Stimson's Python		1
Antaresia stimsoni subsp. stimsoni		1
Aspidites melanocephalus Black-headed Python		1
Brachyurophis approximans		1
Caimanops amphiboluroides (name not current)		1
Carlia munda		1
Carlia triacantha		1
Chelodina steindachneri Flat-shelled Turtle		1
Cryptoblepharus ustulatus		1
Ctenophorus caudicinctus Ring-tailed Dragon		1
Ctenophorus caudicinctus subsp. caudicinctus		1
Ctenophorus isolepis Crested Dragon		1

Appendix D: Naturemap Fauna Database Search

Ctenophorus isolepis subsp. isolepis	1
Ctenophorus nuchalis Central Netted	
Dragon	1
Ctenophorus reticulatus Western Netted	
Dragon	1
Ctenotus ariadnae	1
Ctenotus duricola	1
Ctenotus grandis	1
Ctenotus helenae	1
Ctenotus leonhardii	1
Ctenotus pantherinus Leopard Ctenotus	1
Ctenotus pantherinus subsp. ocellifer	1
Ctenotus rubicundus	1
Ctenotus rutilans	1
Ctenotus saxatilis Rock Ctenotus	1
Ctenotus uber	1
Cyclodomorphus melanops Slender Blue-tongue	1
Cyclodomorphus melanops subsp. melanops	1
Delma butleri	1
Delma elegans	1
Delma haroldi	1
Delma nasuta	1
Delma pax	1
Demansia psammophis Yellow-faced Whipsnake	1
Demansia psammophis subsp. cupreiceps	1
Demansia rufescens Rufous Whipsnake	1
Diplodactylus conspicillatus Fat-tailed Gecko	1
Diplodactylus savagei	1
Egernia depressa Pygmy Spiny-tailed Skink	1
Egernia formosa	1
Eremiascincus richardsonii Broad-banded Sand Swimmer	1
Furina ornata Moon Snake	1
Gehyra punctata	1
Gehyra variegata	1
Heteronotia binoei Bynoe's Gecko	1
Heteronotia spelea Desert Cave Gecko	1
Lerista muelleri	1
Lerista neander	1
Lerista zietzi	1
Lialis burtonis	1
<b>Liasis olivaceus subsp. barroni T</b>	<b>1</b>
Lucasium stenodactylum	1
Lucasium wombeyi	1
Menetia greyii	1
Menetia surda subsp. surda	1
Morethia ruficauda	1
Morethia ruficauda subsp. exquisita	1
Nephrurus wheeleri subsp. cinctus	1

Appendix D: Naturemap Fauna Database Search

Oedura marmorata Marbled Velvet Gecko	1	
Parasuta monachus	1	
Pogona minor subsp. minor	1	
Pseudechis australis Mulga Snake	1	
Pseudonaja modesta Ringed Brown Snake	1	
Pseudonaja nuchalis Gwardar	1	
Pygopus nigriceps	1	
Ramphotyphlops ammodytes	1	
<b>Ramphotyphlops ganeii P1</b>	<b>1</b>	
Ramphotyphlops grypus	1	
Ramphotyphlops hamatus	1	
Rhynchoedura ornata Beaked Gecko	1	
Strophurus elderi	1	
Strophurus wellingtonae	1	
Suta fasciata Rosen's Snake	1	
Suta punctata Spotted Snake	1	
Tiliqua multifasciata Central Blue-tongue	1	
Varanus acanthurus Spiny-tailed Monitor	1	
Varanus breviceuda Short-tailed Pygmy Monitor	1	
Varanus caudolineatus	1	
Varanus gouldii Bungarra or Sand Monitor	1	
Varanus panoptes subsp. rubidus	1	
Varanus pilbarensis Pilbara Rock Monitor	1	
Varanus tristis Racehorse Monitor	1	
Varanus tristis subsp. tristis Racehorse Monitor	1	
Vermicella snelli	1	
Bos taurus European Cattle		1
Camelus dromedarius Dromedary, Camel		1
Canis lupus subsp. dingo Dingo		1
Felis catus Cat		1

**Conservation Status**

- T - Rare or likely to become extinct
- X - Presumed extinct
- IA - Protected under international agreement
- S - Other specially protected fauna
- 1 - Priority 1
- 2 - Priority 2
- 3 - Priority 3
- 4 - Priority 4
- 5 - Priority 5



**Appendix E**  
**Terrestrial Ecosystems Fauna Database Search**

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**Appendix F**  
**Terms of Reference**

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**Appendix G**  
**Threatened Ecological Communities**

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## List of Threatened Ecological Communities on the Department of Environment and Conservation's Threatened Ecological Community (TEC) Database endorsed by the Minister for the Environment

### Species & Communities Branch (Correct to December 2006)

Community identifier	Community name	General Location (IBRA Regions)	Category of Threat and criteria met under WA criteria	Category under Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
<u>1. SCP20a</u>	Banksia attenuata woodland over species rich dense shrublands	Swan Coastal Plain	EN B) ii)	
<u>2. TOOLIBIN</u>	Perched wetlands of the Wheatbelt region with extensive stands of living Swamp Sheoak ( <i>Casuarina obesa</i> ) and Paperbark ( <i>Melaleuca strobophylla</i> ) across the lake floor.	Avon Wheatbelt	CR A) i); CR A) 11); CR C)	EN
<u>3. SCP10b</u>	Shrublands on southern Swan Coastal Plain Ironstones (Busselton area)	Swan Coastal Plain	CR B) ii)	EN
<u>4. SCP19</u>	Sedgelands in Holocene dune swales of the southern Swan Coastal Plain	Swan Coastal Plain	CR B) ii)	EN
<u>5. Clifton-microbialite</u>	Stromatolite like freshwater microbialite community of coastal brackish lakes	Swan Coastal Plain	CR B) i), CR B) ii)	
<u>6. Richmond-microbial</u>	Stromatolite like microbialite community of coastal freshwater lakes	Swan Coastal Plain	CR B)i), CR B) ii)	EN
<u>7. Mound Springs SCP</u>	Communities of Tumulus Springs (Organic Mound Springs, Swan Coastal Plain)	Swan Coastal Plain	CR A) i), CR A) ii), CR B) i), CR B) ii)	EN
<u>8. SCP20c</u>	Shrublands and woodlands of the eastern side of the Swan Coastal Plain	Swan Coastal Plain	CR B) ii)	EN
<u>10. NTHIRON</u>	Perth to Gingin Ironstone Association	Swan Coastal Plain	CR A) ii), CR B) ii), CR C)	EN
<u>11. MUCHEA LIMESTONE</u>	Shrublands and woodlands on Muchea Limestone	Swan Coastal Plain	EN B) ii)	EN
<u>12. Augusta-microbial</u>	Rimstone Pools and Cave Structures Formed by Microbial Activity on Marine Shorelines	Warren	EN B) ii)	
<u>13. SCP30a</u>	Callitris preissii (or Melaleuca lanceolata) forests and woodlands, Swan Coastal Plain	Swan Coastal Plain	VN B)	
<u>14. SCP18</u>	Shrublands on calcareous silts of the Swan Coastal Plain	Swan Coastal Plain	VN B)	
<u>15. SCP02</u>	Southern wet shrublands, Swan Coastal Plain	Swan Coastal Plain	EN B) ii)	

<u>16. SCP3a</u>	<i>Eucalyptus calophylla</i> - <i>Kingia australis</i> woodlands on heavy soils, Swan Coastal Plain	Swan Coastal Plain	CR B) ii)	EN
<u>17. SCP3c</u>	<i>Eucalyptus calophylla</i> - <i>Xanthorrhoea preissii</i> woodlands and shrublands, Swan Coastal Plain	Swan Coastal Plain	CR B) ii)	EN
<u>18. Thetis-microbialite</u>	Stromatolite community of stratified hypersaline coastal lakes	Geraldton Sandplain	VN B)	
<u>19. SCOTT IRONSTONE</u>	Scott River Ironstone Association	Warren	EN B) i), EN B) ii)	
<u>20. SCP20b</u>	<i>Banksia attenuata</i> and/or <i>Eucalyptus marginata</i> woodlands of the eastern side of the Swan Coastal Plain	Swan Coastal Plain	EN B) i), EN B) ii)	
<u>21. SCP15</u>	Forests and woodlands of deep seasonal wetlands of the Swan Coastal Plain	Swan Coastal Plain	VN C)	
<u>22. SCP1b</u>	<i>Eucalyptus calophylla</i> woodlands on heavy soils of the southern Swan Coastal Plain	Swan Coastal Plain	VN B)	
<u>23. SCP3b</u>	<i>Eucalyptus calophylla</i> - <i>Eucalyptus marginata</i> woodlands on sandy clay soils of the southern Swan Coastal Plain	Swan Coastal Plain	VN B)	
<u>24. CAVES SCP01</u>	Aquatic Root Mat Community Number 1 of Caves of the Swan Coastal Plain	Swan Coastal Plain	CR B) i), CR B) ii)	EN
<u>25. CAVES LEEUWIN01</u>	Aquatic Root Mat Community Number 1 of Caves of the Leeuwin Naturaliste Ridge	Warren	CR B) i), CR B) ii)	EN
<u>26. CAVES LEEUWIN02</u>	Aquatic Root Mat Community Number 2 of Caves of the Leeuwin Naturaliste Ridge	Warren	CR B) i), CR B) ii)	EN
<u>27. CAVES LEEUWIN03</u>	Aquatic Root Mat Community Number 3 of Caves of the Leeuwin Naturaliste Ridge	Warren	CR B) i), CR B) ii)	EN
<u>28. CAVES LEEUWIN04</u>	Aquatic Root Mat Community Number 4 of Caves of the Leeuwin Naturaliste Ridge	Warren	CR B) i), CR B) ii)	EN
<u>29. MONTANE</u>	Montane Thicket of the eastern Stirling Range	Esperance Sandplain	CR B) ii)	EN
<u>30. MEELUP GRANITES</u>	<i>Calothamnus graniticus</i> heaths on south west coastal granites	Warren/Jarrah Forest	VN B)	
<u>32. SCP07</u>	Herb rich saline shrublands in clay pans	Swan Coastal Plain	VN B)	
<u>33. SCP08</u>	Herb rich shrublands in clay pans	Swan Coastal Plain	VN B)	
<u>34. SCP09</u>	Dense shrublands on clay flats	Swan Coastal Plain	VN B)	
<u>35. SCP10a</u>	Shrublands on dry clay flats	Swan Coastal Plain	EN B) ii)	
<u>38. Morilla swamp</u>	Perched fresh-water wetlands of the northern Wheatbelt dominated by extensive stands of living <i>Eucalyptus camaldulensis</i> (River Red Gum) across the lake floor.	Avon Wheatbelt	PD B)	

<u>39. Camerons</u>	Camerons Cave Troglobitic Community	Carnarvon Basin	CR B) i), CR B) ii)
<u>40. Bryde</u>	Unwooded freshwater wetlands of the southern Wheatbelt of Western Australia, dominated by <i>Muehlenbeckia horrida</i> subsp. <i>abdita</i> and <i>Tecticornia verrucosa</i> across the lake floor	Avon Wheatbelt	CR B) i), CR B) ii)
<u>41. Bundera</u>	Cape Range Remipede Community	Carnarvon Basin	CR B) ii)
<u>42. Greenough River Flats</u>	<i>Acacia rostellifera</i> low forest with scattered <i>Eucalyptus camaldulensis</i> on Greenough Alluvial Flats.	Geraldton Sandplain	CR C)
<u>44. Roebuck Bay mudflats</u>	Species-rich faunal community of the intertidal mudflats of Roebuck Bay	Kimberley	VU B)
<u>46. Themeda Grasslands</u>	Themeda grasslands on cracking clays (Hamersley Station, Pilbara). Grassland plains dominated by the perennial Themeda (kangaroo grass) and many annual herbs and grasses.	Pilbara	VN A)
<u>49. Bentonite Lakes</u>	Herbaceous plant assemblages on Bentonite Lakes	Avon Wheatbelt	EN B) iii)
<u>55. Coomberdale chert hills</u>	Heath dominated by one or more of <i>Regelia megacephala</i> , <i>Kunzea praestans</i> and <i>Allocasuarina campestris</i> on ridges and slopes of the chert hills of the Coomberdale floristic region.	Avon Wheatbelt	EN B) ii)
<u>56. Billeranga System</u>	Plant assemblages of the Billeranga System (Beard 1976): <i>Melaleuca filifolia</i> – <i>Allocasuarina campestris</i> thicket on clay sands over laterite on slopes and ridges; open mallee over mixed scrub on yellow sand over gravel on western slopes; <i>Eucalyptus loxophleba</i> woodland over sandy clay loam or rocky clay on lower slopes and creeklines; and mixed scrub or scrub dominated by <i>Dodonaea inaequifolia</i> over red/brown loamy soils on the slopes and ridges	Avon Wheatbelt	VN A), VN B)
<u>59. Koolanooka System</u>	Plant assemblages of the Koolanooka System (Beard 1976): <i>Allocasuarina campestris</i> scrub over red loam on hill slopes; Shrubs and emergent mallees on shallow loam red over massive ironstone on steep rocky slopes; <i>Eucalyptus ebbanoensis</i> subsp. <i>ebbanoensis</i> mallee and <i>Acacia</i> sp. scrub with scattered <i>Allocasuarina huegeliana</i> over red loam and ironstone on the upper slopes and summits; <i>Eucalyptus loxophleba</i> woodland over scrub on the footslopes; and mixed <i>Acacia</i> sp. scrub on granite	Avon Wheatbelt	VN A), VN B)

<u>60. Moonagin System</u>	Plant assemblages of the Moonagin System (Beard 1976): <i>Acacia</i> scrub on red soil on hills; <i>Acacia</i> scrub with scattered <i>Eucalyptus loxophleba</i> and <i>Eucalyptus oleosa</i> on red loam flats on the foothills.	Avon Wheatbelt	VN A), VN B)
<u>62. Limestone ridges (SCP 26a)</u>	<i>Melaleuca huegelii</i> - <i>Melaleuca acerosa</i> shrublands on limestone ridges (Gibson <i>et al.</i> 1994 type 26a)	Swan Coastal Plain	EN B) iii)
<u>63. Irwin River Clay Flats</u>	Clay flats assemblages of the Irwin River: Sedgeland and grasslands with patches of <i>Eucalyptus loxophleba</i> and scattered <i>E. camaldulensis</i> over <i>Acacia acuminata</i> and <i>A. rostellifera</i> shrubland on brown sand/loam over clay flats of the Irwin River.	Avon Wheatbelt	PD A), PD B)
<u>67. Monsoon thickets</u>	Monsoon (vine) thickets on coastal sand dunes of Dampier Peninsula	West Kimberley, Dampierland Bioregion	VU C)
<u>70. Mt Lindesay</u>	Mt Lindesay – Little Lindesay Vegetation Complex	Frankland District, Warren Region	EN B) ii)
<u>71. Russell Range</u>	Russell Range mixed thicket complexes	South Coast, Esperance Plains Bioregion	VN B), VN C)
<u>72. Ferricrete</u>	Ferricrete floristic community (Rocky Springs type)	Geraldton Sandplain	VU B)
<u>74. Herblands and Bunch Grasslands</u>	Herblands and Bunch Grasslands on gypsum lunette dunes alongside saline playa lakes	Esperance Sandplain	VU B)
<u>75. Inering System</u>	Plant assemblages of the Inering System (Beard 1976)	Avon Wheatbelt	VN A)
<u>76. Lesueur-Coomallo Floristic Community D1</u>	Lesueur-Coomallo Floristic Community D1	Geraldton Sandplain	CR B) i) CR B) ii)
<u>77. Lesueur-Coomallo Floristic Community A1.2</u>	Lesueur-Coomallo Floristic Community A1.2	Geraldton Sandplain	EN B) ii)
<u>78. Ethel Gorge</u>	Ethel Gorge aquifer stygobiont community	Pilbara	EN B) ii)
<u>80. Theda Soak</u>	Assemblages of Theda Soak rainforest swamp	North Kimberley	VU A), VU B)
<u>81. Walcott Inlet</u>	Assemblages of Walcott Inlet rainforest swamps	North Kimberley	VU B)
<u>82. Roe River</u>	Assemblages of Roe River rainforest swamp	North Kimberley	VU B)
<u>84. Dragon Tree Soak</u>	Assemblages of Dragon Tree Soak organic mound spring	Kimberley Region, Great Sandy Desert Bioregion	EN B) i)
<u>85. Bunda Bunda</u>	Assemblages of Bunda Bunda organic mound spring	West Kimberley, Dampierland Bioregion	VU A), VU B)
<u>86. Big Springs</u>	Assemblages of Big Springs organic mound springs	West Kimberley, Dampierland Bioregion	VU A), VU B)
<u>89. North Kimberley mounds</u>	Organic mound spring sedgeland community of the North Kimberley Bioregion	North Kimberley	VU A), VU B)

<u>92. Black Spring</u>	Black Spring organic mound spring community	North Kimberley	EN B) i), EN B) ii)
<u>95. Mandora Mounds</u>	Assemblages of the organic springs and mound springs of the Mandora Marsh area	West Kimberley, Dampierland and Greats Sandy Desert Bioregions	EN B) iii)
<u>96. Broomehill</u>	Plant assemblages of the Broomehill System	Avon Wheatbelt	PD A)
<u>97. Mound Springs (Three Springs area)</u>	Assemblages of the organic mound springs of the Three Springs area	Avon Wheatbelt	EN B) i), EN B) ii)
<u>99. Depot Springs</u>	Depot Springs stygofauna community	Goldfields Region, Murchison Bioregion	VU B)
<u>102. Eucalyptus acies mallee heath</u>	Thumb Peak, Mid mount Barren, Woolburnup Hill (Central Barren Ranges) <i>Eucalyptus acies</i> mallee heath	Esperance Sandplain	VU B)

Total = 69 TECs in Western Australia that are endorsed by the Minister for Environment(16 of these are listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*)

Critically Endangered: 21; Endangered: 17; Vulnerable: 28; Presumed Destroyed: 3



**Appendix H**  
**Priority Ecological Communities**

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## PRIORITY ECOLOGICAL COMMUNITIES FOR WESTERN AUSTRALIA

27 August 2008

Note:

- i) Nothing in this table may be construed as a nomination for listing under the Commonwealth *EPBC Act 1999*.
- ii) The inclusion in this table of a community type does not necessarily imply any status as a threatened ecological community.
- iii) Regions eg Pilbara are based on Department of Environment and Conservation regional boundaries.
- iv) For definitions of categories (Priority 1 etc.) refer document entitled 'Definitions and Categories'.

	<b>Community name</b>	Category
	<b>PILBARA</b>	
1	<b>West Angelas Cracking-Clays</b> Open tussock grasslands of <i>Astrebla pectinata</i> , <i>A. elymoides</i> , <i>Aristida latifolia</i> , in combination with <i>Astrebla squarrosa</i> and low scattered shrubs of <i>Sida fibulifera</i> , on cracking-clay loam depressions and flowlines. Threats: Disturbance footprints increasing from mine, future infrastructure development, possible weed invasion and changes in fire regime.	Priority 1
2	<b>Weeli Wolli Spring community</b> Weeli Wolli Spring's riparian woodland and forest associations are unusual as a consequence of the composition of the understorey. The sedge and herbfield communities that fringe many of the pools and associated water bodies along the main channels of Weeli Wolli Creek have not been recorded from any other wetland site in the Pilbara. The spring and creekline are also noted for their relatively high diversity of stygofauna and this is probably attributed to the large-scale calcrete and alluvial aquifer system associated with the creek. Threat: dewatering and re-watering altering patterns of inundation.	Priority 1
3	<b>Burrup Peninsula rock pool communities</b> Calcareous tufa deposits. Interesting aquatic snails. Threats: recreational impacts, and potential development; NOX and SOX emissions.	Priority 1
4	<b>Burrup Peninsula rock pile communities</b> Comprise a mixture of Pilbara and Kimberley species, communities are different from those of the Hamersley and Chichester Ranges. Threats: mining	Priority 1
5	<b>Roebourne Plains coastal grasslands</b> The Roebourne Plains coastal grasslands with gilgai micro-relief of deep cracking clays are self mulching cracking clays that emerge on depositional surfaces. The Roebourne Plains gilgai grasslands occur on microrelief of deep cracking clays, surrounded by clay plains/flats and sandy coastal and alluvial plains. The gilgai depressions supports ephemeral and perennial tussock grasslands dominated by <i>Sorghum</i> sp. and <i>Eragrostis xerophila</i> (Roebourne Plains grass) along with other native species including <i>Astrebla pectinata</i> (barley mitchell grass), <i>Eriachne benthamii</i> (swamp wanderrie grass), <i>Chrysopogon fallax</i> (golden beard grass) and <i>Panicum decompositum</i> (native millet). It differs from the surrounding clay flats of the Horseflat land system which are dominated by <i>Eragrostis xerophila</i> and other perennial tussock grass species ( <i>Eragrostis</i> mostly). Threats: Grazing, clearing for mining and infrastructure	Priority 1
6	<b>Stony Chenopod association of the Roebourne Plains area</b> Roebourne Common and airport. Not a very common community. Threats: Preferentially grazed by stock.	Priority 1
7	<b>Barrow Island subterranean fauna</b> Barrow Island stygofauna and troglofauna. Threats: Mining	Priority 1
8	<b>Subterranean invertebrate communities of mesas in the Robe Valley region</b> A series of isolated mesas occur in the Robe Valley in the state's Pilbara Region. The mesas are remnants of old valley infill deposits of the palaeo Robe River. The troglobitic faunal communities occur in an extremely specialised habitat and appear to require the particular structure and hydrogeology associated with mesas to provide a suitable humid habitat. Short range endemism is common in the fauna. The habitat is the humidified pisolitic strata. Threats: Mining	Priority 1
9	<b>Subterranean invertebrate community of pisolitic hills in the Robe Valley</b> A series of isolated mesas and low undulating hills occur in the Robe Valley in the state's Pilbara region. The troglofauna have very short range distributions, generally with each species appearing to be restricted to its individual mesa or hills. Threats: mining	Priority 1
10	<b>Peedamulla Marsh vegetation complex</b> Peedamulla (Cane River) Swamp Cyperaceae community, near mouth of Cane River. Plants are unusual. Threats: grazing	Priority 1
11	<b>Barrow Island creekline vegetation</b> General cover of <i>Triodia angusta</i> with shrubs principally <i>Hakea suberea</i> , <i>Petalostylis labicheoides</i> , <i>Acacia bivenosa</i> , and <i>Gossypium robinsonii</i> . Mangrove thickets ( <i>Avicennia marina</i> ) at the creek mouths.	Priority 1
12	<b><i>Astrebla lappacea</i> grasslands</b> On boundary of Hamersley and Brockman Stations	Priority 1

	Threats: Heavily grazed.	
13	<b>Sand Sheet vegetation (Robe Valley)</b> <i>Corymbia zygophylla</i> scattered low trees over <i>Acacia tumida</i> var. <i>pilbarensis</i> , <i>Grevillea eriostachya</i> high shrubland over <i>Triodia schinzii</i> hummock grassland. Other associated species include <i>Cleome uncifera</i> , <i>Heliotropium transforme</i> , <i>Indigofera boviparda</i> subsp. <i>boviparda</i> , and <i>Ptilotus arthrolasius</i> . Most northern example/expression of vegetation of Carnarvon Basin. Community is poorly represented type in the Pilbara Region, and not represented in the reserve system. Community contains many plant species that are at their northern limits or exist as disjunct populations. Vulnerable to invasion by weeds (particularly buffel grass) Threats: mining, weed invasion	Priority 1
14	<b>Mingah Springs calcrete groundwater assemblage type on Gascoyne palaeodrainage on Mingah Spring Station</b> Unique assemblages of invertebrates have been identified in the groundwater calcretes. Threats: mining	Priority 1
15	<b>Plant assemblages of the Wona Land System</b> A system of basalt upland gilgai plains with tussock grasslands, in Chichester National Park and in pastoral leases. Threats: preferential grazing by stock and kangaroos. High level erosion.	Priority 3 (iii)
16	<b>Coolabah-lignum flats: <i>Eucalyptus victrix</i> over <i>Muehlenbeckia</i> community</b> Woodland or forest of <i>Eucalyptus victrix</i> (coolibah) over thicket of <i>Muehlenbeckia florulenta</i> (lignum) on red clays in run-on zones. Associated species include <i>Eriachne benthamii</i> , <i>Themeda triandra</i> , <i>Aristida latifolia</i> , <i>Eulalia aurea</i> and <i>Acacia aneura</i> . Threats: dewatering and grazing.	Priority 3(i)
17	<b>Invertebrate assemblages (Errawallana Spring type) Coolawanya Station</b> Geologically distinct. Sherlock River system. Permanent spring-fed creek. Has atypical invertebrate community. Threats: grazing.	Priority 4 (b)
18	<b>Invertebrate assemblages (Nyeetberry Pool type)</b> Jimmawurrada Creek. Nyeetberry pool, Robe River. Permanent River Pool in the Pilbara (groundwater fed). Blind isopod collected from this site. Threats: mining and feral animals	Priority 4 (b)
19	<b>Stygofaunal communities of the Millstream Freshwater Aquifer</b> A unique assemblage of subterranean invertebrate fauna. Threats: Groundwater drawdown and salinisation.	Priority 4(b)
	<b>KIMBERLEY</b>	
1	<b>Perched spring-fed peat-based swamps on hillslopes of the Durack Range area</b> Assemblages of spring-fed wetlands on organic substrates perched on sandstone hill-slopes in the Central Kimberley bioregion. Drainage lines are vegetated with a forest of <i>Corymbia ptychocarpa</i> (swamp bloodwood), <i>Grevillea pteridifolia</i> , <i>Melaleuca</i> spp, <i>Pandanus spiralis</i> , and some <i>Livistona</i> spp. over the fern <i>Cyclosorus interruptus</i> and the climbing fern <i>Lygodium microphyllum</i> . Sedges occur in the understorey and clumps of Reed Grass <i>Arundinella nepalensis</i> are dominant in the understorey where the canopy is more open. Also associated with the drainage lines are swamps vegetated by dense sedgelands with grasses and herbs. Threats: Cattle grazing and weeds.	Priority 1
2	<b>Assemblages of Point Spring and Long Spring rainforest swamps</b> Closed canopy rainforest on freshwater swamps on alluvial floodplain soils in the east Kimberley. Two occurrences are known, these are Point Spring and Long Swamp. At Point Spring the canopy is 17m high and the dominant tree species include <i>Canarium australianum</i> , <i>Carallia brachiata</i> , <i>Euodia elleryana</i> , <i>Ficus racemosa</i> , <i>F. virens</i> and <i>Terminalia sericocarpa</i> . The rainforest canopy height at Long Swamp is 30m, and the dominant tree species include <i>Nauclea orientalis</i> , <i>Terminalia sericocarpa</i> and <i>Euodia elleryana</i> . The periphery of the patch is permanently moist and supports a <i>Melaleuca leucadendra</i> forest. Threats: Invasion by feral fish, impacts of stock, climate change and rising sea levels.	Priority 1
3	<b>Assemblages of the wetlands associated with the organic mound springs on the tidal mudflats of the Victoria-Bonaparte Bioregion</b> East Kimberley (i.e. Brolga Spring, King Gordon Spring, Attack Spring etc on Carlton Hill Station). Large wetlands with <i>Melaleuca</i> forest with small patches of rainforest on central mounds. Rainforest and paperbark forest associated with mound springs and seepage areas of the Victoria Bonaparte coastal lands.	Priority 1
4	<b>Monsoon vine thickets of limestone ranges</b> Nimbing Range, Napier Range, and Jeremiah hills.	Priority 1
5	<b><i>Oryza australiensis</i> (wild rice) grasslands on alluvial flats of the Ord River</b> West side of Weaber Hills, Weaber Plain, Mantini Flats, Knox Creek.	Priority 1
6	<b>Inland Mangrove (<i>Avicennia marina</i>) community of Salt Creek</b> Anna Plains Station, Mandora.	Priority 1
7	<b>Plant assemblages on vertical sandstone surfaces</b> Eg. Two undescribed spinifex spp. at Bungles and Molly Spring, foxtail spinifex at Cathedral Gorge and Thompsons Spring. Fire sensitive plants, fire regimes a threat.	Priority 1
8	<b>Invertebrate community of Napier Range Cave</b> On Old Napier Downs, Karst No. KNI. Threats: Mine close by and tourist visitation.	Priority 1





## Appendix I

### Definitions of Threatened and Priority Ecological Communities

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**Department of Environment and Conservation  
2007**

**DEFINITIONS, CATEGORIES AND CRITERIA FOR THREATENED AND PRIORITY  
ECOLOGICAL COMMUNITIES**

**1. GENERAL DEFINITIONS**

**Ecological Community**

A naturally occurring biological assemblage that occurs in a particular type of habitat.

Note: The scale at which ecological communities are defined will often depend on the level of detail in the information source, therefore no particular scale is specified.

A **threatened ecological community** (TEC) is one which is found to fit into one of the following categories; “presumed totally destroyed”, “critically endangered”, “endangered” or “vulnerable”.

Possible threatened ecological communities that do not meet survey criteria are added to DEC’s Priority Ecological Community Lists under Priorities 1, 2 and 3. Ecological Communities that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

An **assemblage** is a defined group of biological entities.

**Habitat** is defined as the areas in which an organism and/or assemblage of organisms lives. It includes the abiotic factors (eg. substrate and topography), and the biotic factors.

**Occurrence:** a discrete example of an ecological community, separated from other examples of the same community by more than 20 metres of a different ecological community, an artificial surface or a totally destroyed community.

By ensuring that every discrete occurrence is recognised and recorded future changes in status can be readily monitored.

**Adequately Surveyed** is defined as follows:

“An ecological community that has been searched for thoroughly in most likely habitats, by relevant experts.”

**Community structure** is defined as follows:

“The spatial organisation, construction and arrangement of the biological elements comprising a biological assemblage” (eg. *Eucalyptus salmonophloia* woodland over scattered small shrubs over dense herbs; structure in a faunal assemblage could refer to trophic structure, eg. dominance by feeders on detritus as distinct from feeders on live plants).

**Definitions of Modification and Destruction** of an ecological community:

**Modification:** “changes to some or all of ecological processes (including abiotic processes such as hydrology), species composition and community structure as a

direct or indirect result of human activities. The level of damage involved could be ameliorated naturally or by human intervention.”

**Destruction:** “modification such that reestablishment of ecological processes, species composition and community structure within the range of variability exhibited by the original community is unlikely within the foreseeable future even with positive human intervention.”

**Note:** Modification and destruction are difficult concepts to quantify, and their application will be determined by scientific judgement. Examples of modification and total destruction are cited below:

Modification of ecological processes: The hydrology of Toolibin Lake has been altered by clearing of the catchment such that death of some of the original flora has occurred due to dependence on fresh water. The system may be bought back to a semblance of the original state by redirecting saline runoff and pumping waters of the rising underground watertable away to restore the hydrological balance. Total destruction of downstream lakes has occurred due to hydrology being altered to the point that few of the original flora or fauna species are able to tolerate the level of salinity and/or water logging.

Modification of structure: The understorey of a plant community may be altered by weed invasion due to nutrient enrichment by addition of fertiliser. Should the additional nutrients be removed from the system the balance may be restored, and the original plant species better able to compete. Total destruction may occur if additional nutrients continue to be added to the system causing the understorey to be completely replaced by weed species, and death of overstorey species due to inability to tolerate high nutrient levels.

Modification of species composition: Pollution may cause alteration of the invertebrate species present in a freshwater lake. Removal of pollutants may allow the return of the original inhabitant species. Addition of residual highly toxic substances may cause permanent changes to water quality, and total destruction of the community.

**Threatening processes** are defined as follows:

“Any process or activity that threatens to destroy or significantly modify the ecological community and/or affect the continuing evolutionary processes within any ecological community.”

Examples of some of the continuing threatening processes in Western Australia include: general pollution; competition, predation and change induced in ecological communities as a result of introduced animals; competition and displacement of native plants by introduced species; hydrological changes; inappropriate fire regimes; diseases resulting from introduced microorganisms; direct human exploitation and disturbance of ecological communities.

**Restoration** is defined as returning an ecological community to its pre-disturbance or natural state in terms of abiotic conditions, community structure and species composition.

**Rehabilitation** is defined as the re-establishment of ecological attributes in a damaged ecological community although the community will remain modified.

## 2. DEFINITIONS AND CRITERIA FOR PRESUMED TOTALLY DESTROYED, CRITICALLY ENDANGERED, ENDANGERED AND VULNERABLE ECOLOGICAL COMMUNITIES

### Presumed Totally Destroyed (PD)

An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.

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

- A) Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats **or**
- B) All occurrences recorded within the last 50 years have since been destroyed

### Critically Endangered (CR)

An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.

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

- A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% **and either or both** of the following apply (i or ii):
  - i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years);
  - ii) modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated.
- B) Current distribution is limited, **and one or more** of the following apply (i, ii or iii):
  - i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years);

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

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

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

### **Endangered (EN)**

An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.

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

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

i) the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years);

ii) modification throughout its range is continuing such that in the short term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated.

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

i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years);

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

iii) there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes.

C) The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).

### **Vulnerable (VU)**

An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.

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

- A) The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated.
- B) The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations.
- C) The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.

### **3. DEFINITIONS AND CRITERIA FOR PRIORITY ECOLOGICAL COMMUNITIES**

#### **PRIORITY ECOLOGICAL COMMUNITY LIST**

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

#### **Priority One:** Poorly-known ecological communities

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

#### **Priority Two:** Poorly-known ecological communities

Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.

#### **Priority Three:** Poorly known ecological communities

- (i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or:
- (ii) communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or;
- (iii) communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes.

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

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

- (a) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands.
- (b) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.
- (c) Ecological communities that have been removed from the list of threatened communities during the past five years.

**Priority Five:** Conservation Dependent ecological communities

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





**Appendix J**  
**Flora Site Data Sheets**

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Appendix J: Flora site data sheets

<b>Site Number:</b>	CN001		<b>Date:</b>	8/10/2009	<b>Zone:</b>	50 K	
<b>Collectors:</b>	ML		<b>Easting:</b>	775556			
	Photo 2		<b>Northing:</b>	7418422 SW cr			
<b>Site Description</b>							
<b>Slope:</b>	MO	<b>Morphology:</b>	M	<b>Drainage:</b>	MD	<b>Soil Texture:</b>	2
LE=level		C=crest		VP=very poorly drained		1=clay	
VG=very gently inclined		H=		PD=poorly drained		2=silty clay	
GE=gently inclined		R=ridge		ID=Imperfectly drained		3=clay loam	
MO=moderately inclined		S=simple slope		MD=Moderately well drained		4=silty clay loam	
ST=steep		U=upper slope				5=sandy clay	
VS=very steep		M=mid slope				6=sandy clay loam	
PR=precipitous		L=lower slope		<b>No. Logs in quadrat:</b>		7=loam	
CL=cliffed		F=flat		Nil		8=silty loam	
		V=vale		<b>No. Termite Mounds:</b>		9=sandy loam	
		D=closed depression		Nil		10=loamy sand	
<b>Aspect:</b>	NW			<b>Max. Mound Height:</b>		11=sand	
				m			
<b>Coarse Fragments:</b>	A	3				<b>%Cover</b>	50
0=no coarse fragments	B	5	<b>Disturbance Type:</b>			<b>%Litter</b>	0
1=<2%(very few)	C	5	<b>Fire Frequency:</b>	0		<b>%Bare</b>	50
2=2-10%(few)	D	3	0=absent				
3=10-20%(common)	E	2	1=present season			<b>Feral Frequency:</b>	
4=20-50%(many)	F	1	2=previous season			0=absent	
5=50-90%(abundant)	G	1	<b>Fire Intensity:</b>			1=present season	
6=>90%(very abundant)			0=no damage			2=previous season	
A=2-6mm(small pebbles)			1=minor scars some trees/shrubs			<b>% of Quadrat:</b>	
B=6-20mm(medium pebbles)			2=minor scars most trees/shrubs			<b>Feral Name:</b>	
C=20-60mm(large pebbles)			3=major scars			<b>Feral Intensity:</b>	
D=60-200mm(cobbles)			4=some trees/shrubs killed			0=no damage	
E=200-600mm(stones)			5=most trees/shrubs killed			1=<5% growth removed	
F=600mm-2m(boulders)			<b>Fire Height:</b>			2=5-25% growth removed	
G=>2m(Large boulders)			0=none			3=25-50% growth removed	
			1=<1m			4=50-75% growth removed	
			2=1-4m			5=>75% growth removed	
			3=>4m				
	<b>Dominant Vegetation:</b>					<b>Water Depth:</b>	m
	Growth Form	Canopy Cover %	Height Class				
<b>Stratum 1:</b>	Very sparse 01-001 over sparse						
<b>Stratum 2:</b>	mixed shrubs 01-002-8, over						
<b>Stratum 3:</b>	spinifex 01-009 grassland!						
	<b>Dominant Species:</b>			<b>Height Classes:</b>	<b>Growth Forms:</b>		
<b>Stratum 1:</b>				1=<0.25m	T=tree		
<b>Stratum 2:</b>				2=0.26m-0.5m	M=tree mallee		
<b>Stratum 3:</b>				3=0.51-1m	S=shrub		
				4=1.01-3m	Y=mallee shrub		
				5=3.01-6m	Z=heath shrub		
				6=6.01-12m	C=chenopod shrub		
				7=12.01-20m	G=tussock grass		
				8=20.01m-35m	H=hummock grass		
				9=>35.01m	O=sod grass		
<b>Water Parameters:</b>							
<b>Temperature:</b>			°C				
<b>Conductivity:</b>			mS				
<b>Salinity:</b>			ppl				
<b>Turbidity</b>							

Appendix J: Flora site data sheets

<b>pH:</b>						<b>Basal Area:</b>	V=sedge
							R=rush
<b>Comments:</b>							L=vine
Covered in heavy clay dust layer from nearby crusher.							F=forb
							E=fern
							Q=moss

Site	CN001	Date	####		
Field Number	Field Name	Cover	Heigh	Final ID	Form
01-001	EUC thin curly	plus	4	Eucalyptus leucophloia ssp. leucophloia	T
01-002	Nasty spike stem acacia	plus	3	Acacia inequilatera	S
01-003	long thin leaf acacia	plus	4	Acacia aneura	S
01-004	Nude christmas tree	1%	3	Acacia aneura	S
01-005	Yellow pea pod	2%	3	Acacia adoxa var. Adoxa	S
01-006	Brown pea pod	2%	3	Acacia dictyophleba	S
01-007	Sheeps tail	1%	3	Ptilotus rotundifolius	O
01-008	Nasty christmas	1%	4	Acacia tetragonaphylla	S
01-009	SOB spini	50%	3	Triodia wiseana	H
01-010	Purple lamb tail	plus	2	Ptilotus exatatus	
01-011	Powder puff tail	plus	2	Ptilotus clementii	
01-012	Tiny pumpkin	plus	2	Sida fibulifera	
01-013	Bonsai	plus	2	Acacia adoxa var. adoxa	

<b>Site Number:</b>	CN002	<b>Date:</b>	8/10/2009	<b>Zone:</b>	50 K
<b>Collectors:</b>	ML	<b>Easting:</b>	775963		
	Photo 3-4	<b>Northing:</b>	7418344 NW cm		

<b>Site Description</b>					
<b>Slope:</b>	MO	<b>Morphology:</b>	C	<b>Drainage:</b>	MD
<b>Soil Texture:</b>	2				
LE=level	C=crest	VP=very poorly drained	1=clay		
VG=very gently inclined	H=	PD=poorly drained	2=silty clay		
GE=gently inclined	R=ridge	ID=Imperfectly drained	3=clay loam		
MO=moderately inclined	S=simple slope	MD=Moderately well drained	4=silty clay loam		
ST=steep	U=upper slope		5=sandy clay		
VS=very steep	M=mid slope	<b>No. Logs in quadrat:</b>	6=sandy clay loam		
PR=precipitous	L=lower slope	0	7=loam		
CL=cliffed	F=flat	<b>No. Termite Mounds:</b>	8=silty loam		
	V=vale	0	9=sandy loam		
<b>Aspect:</b>	E	D=closed depression	<b>Max. Mound Height:</b>		
			10=loamy sand		
			11=sand		
<b>Coarse Fragments:</b>	A	3	<b>%Cover</b>	70	
0=no coarse fragments	B	4	<b>%Litter</b>	5	
1=<2%(very few)	C	5	<b>%Bare</b>	25	
2=2-10%(few)	D	4	<b>Disturbance Type:</b>		
			<b>Fire Frequency:</b>		
			0=absent		

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3=10-20%(common)	E	2	1=present season		<b>Feral Frequency:</b>	0
4=20-50%(many)	F	1	2=previous season		0=absent	
5=50-90%(abundant)	G	1	<b>Fire Intensity:</b>		1=present season	
6=>90%(very abundant)			0=no damage		2=previous season	
A=2-6mm(small pebbles)			1=minor scars some trees/shrubs		<b>% of Quadrat:</b>	
B=6-20mm(medium pebbles)			2=minor scars most trees/shrubs		<b>Feral Name:</b>	
C=20-60mm(large pebbles)			3=major scars		<b>Feral Intensity:</b>	
D=60-200mm(cobbles)			4=some trees/shrubs killed		0=no damage	
E=200-600mm(stones)			5=most trees/shrubs killed		1=<5% growth removed	
F=600mm-2m(boulders)			<b>Fire Height:</b>		2=5-25% growth removed	
G=>2m(Large boulders)			0=none		3=25-50% growth removed	
			1=<1m		4=50-75% growth removed	
			2=1-4m		5=>75% growth removed	
			3=>4m			
	<b>Dominant Vegetation:</b>					
	Growth Form	Canopy Cover %	Height Class			
<b>Stratum 1:</b>	Sparse tall shrubland of 02-001				<b>Water Depth:</b>	m
<b>Stratum 2:</b>	over mixed shrubs over 01-009					
<b>Stratum 3:</b>	hummock grass					
	<b>Dominant Species:</b>			<b>Height Classes:</b>	<b>Growth Forms:</b>	
<b>Stratum 1:</b>				1=<0.25m	T=tree	
<b>Stratum 2:</b>				2=0.26m-0.5m	M=tree mallee	
<b>Stratum 3:</b>				3=0.51-1m	S=shrub	
				4=1.01-3m	Y=mallee shrub	
				5=3.01-6m	Z=heath shrub	
				6=6.01-12m	C=chenopod shrub	
				7=12.01-20m	G=tussock grass	
				8=20.01m-35m	H=hummock grass	
				9=>35.01m	O=sod grass	
				<b>Basal Area:</b>	V=sedge	
					R=rush	
					L=vine	
					F=forb	
					E=fern	
					Q=moss	
<b>Water Parameters:</b>						
<b>Temperature:</b>			°C			
<b>Conductivity:</b>			mS			
<b>Salinity:</b>			ppl			
<b>Turbidity</b>						
<b>pH:</b>						
<b>Comments:</b>	Much less dust more diverse Pebble mound potential					

Site	CN002	Date	###	
Field Number	Field Name	Cover%	Heigh	Final ID
				Form
	01-008	1	4	Acacia tetragonaphylla
	Cenchrus	5	3	Cenchrus ciliaris
02-007	Tussock	1	1	
02-009	Evc long balls	plus	4	
	01-012	1%	2	
	01-010	1%	2	
	01-011	1%	2	
	01-003	1%	3	
	01-002	1%	3	
	01-009	20-50	2	
02-001	Yellow grevillea	5	4	
02-002	Green pea acacia	2	4	
02-003	Opposite leaf acacia	2	4	
02-004	Bluebell	1	2	
02-005	Brown fluff ball acacia	1	3	

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02-006	Miny pairs acacia	1	2
02-008	Not so bonsai	1	2
02-0010	Fragile christmas	plus	4
02-0011	Spiral grass		

<b>Site Number:</b>	CN003		<b>Date:</b>	8/10/2009	<b>Zone:</b>	51 K	
<b>Collectors:</b>	ML		<b>Easting:</b>	776041			
	Photo 5		<b>Northing:</b>	7418027 NW cm			
<b>Site Description</b>							
<b>Slope:</b>	LE	<b>Morphology:</b>	F	<b>Drainage:</b>	ID	<b>Soil Texture:</b>	1
LE=level		C=crest		VP=very poorly drained		1=clay	
VG=very gently inclined		H=		PD=poorly drained		2=silty clay	
GE=gently inclined		R=ridge		ID=Imperfectly drained		3=clay loam	
MO=moderately inclined		S=simple slope		MD=Moderately well drained		4=silty clay loam	
ST=steep		U=upper slope				5=sandy clay	
VS=very steep		M=mid slope				6=sandy clay loam	
PR=precipitous		L=lower slope		<b>No. Logs in quadrat:</b>		7=loam	
CL=cliffed		F=flat		Few		8=silty loam	
		V=vale		<b>No. Termite Mounds:</b>		9=sandy loam	
		D=closed depression		0		10=loamy sand	
<b>Aspect:</b>	Nil			<b>Max. Mound Height:</b>		11=sand	
				m			
<b>Coarse Fragments:</b>	A	4				<b>%Cover</b>	40
0=no coarse fragments	B	5	<b>Disturbance Type:</b>			<b>%Litter</b>	0
1=<2%(very few)	C	2	<b>Fire Frequency:</b>			<b>%Bare</b>	60
2=2-10%(few)	D	2	0=absent				
3=10-20%(common)	E	0	1=present season			<b>Feral Frequency:</b>	0
4=20-50%(many)	F	0	2=previous season			0=absent	
5=50-90%(abundant)	G	0	<b>Fire Intensity:</b>			1=present season	
6=>90%(very abundant)			0=no damage			2=previous season	
A=2-6mm(small pebbles)			1=minor scars some trees/shrubs			<b>% of Quadrat:</b>	
B=6-20mm(medium pebbles)			2=minor scars most trees/shrubs			<b>Feral Name:</b>	
C=20-60mm(large pebbles)			3=major scars			<b>Feral Intensity:</b>	
D=60-200mm(cobbles)			4=some trees/shrubs killed			0=no damage	
E=200-600mm(stones)			5=most trees/shrubs killed			1=<5% growth removed	
F=600mm-2m(boulders)			<b>Fire Height:</b>			2=5-25% growth removed	
G=>2m(Large boulders)			0=none			3=25-50% growth removed	
			1=<1m			4=50-75% growth removed	
			2=1-4m			5=>75% growth removed	
			3=>4m				
<b>Dominant Vegetation:</b>						<b>Water Depth:</b>	m
	Growth Form	Canopy Cover %	Height Class				
<b>Stratum 1:</b>	Scattered 03-001 over mixed						
<b>Stratum 2:</b>	sparse shrubs over 03-005 & 6						
<b>Stratum 3:</b>	mixed tussock grassland						
<b>Dominant Species:</b>				<b>Height Classes:</b>	<b>Growth Forms:</b>		
<b>Stratum 1:</b>				1=<0.25m	T=tree		
<b>Stratum 2:</b>				2=0.26m-0.5m	M=tree mallee		
<b>Stratum 3:</b>				3=0.51-1m	S=shrub		
				4=1.01-3m	Y=mallee shrub		
				5=3.01-6m	Z=heath shrub		
				6=6.01-12m	C=chenopod shrub		
				7=12.01-20m	G=tussock grass		
				8=20.01m-35m	H=hummock grass		
				9=>35.01m	O=sod grass		
				<b>Basal Area:</b>	V=sedge		
					R=rush		
					L=vine		
					F=forb		
					E=fern		
					Q=moss		
<b>Water Parameters:</b>							
<b>Temperature:</b>						°C	
<b>Conductivity:</b>						mS	
<b>Salinity:</b>						ppl	
<b>Turbidity</b>							
<b>pH:</b>							
<b>Comments:</b>							
Much less dust more diverse							
Pebble mound potential							

Appendix J: Flora site data sheets

Site	CN003	Date	####	
Field Number	Field Name	Cover%	Height	Comment
03-001	Mirror ball	2	4	
03-002	Green pea pod	1	3	
03-003	Spiky hemp bud	plus	2	
03-004	Like a pine	2%	3	
03-005	Little tussock	20%	2	
	01-010	1%	2	
03-006	Tall Tussock	20%	3	
03-007	Cuddly chenopod	plus	2	

<b>Site Number:</b>	CN004	<b>Date:</b>	8/10/2009	<b>Zone:</b>	51 K
<b>Collectors:</b>	ML	<b>Easting:</b>	775722		
	Photo 6	<b>Northing:</b>	7417857 SW crn		

Site Description	
<b>Slope:</b> LE	<b>Morphology:</b> F
LE=level VG=very gently inclined GE=gently inclined MO=moderately inclined ST=steep VS=very steep PR=precipitous CL=cliffed	C=crest H= R=ridge S=simple slope U=upper slope M=mid slope L=lower slope F=flat V=vale D=closed depression
<b>Aspect:</b> Nil	<b>Drainage:</b> ID
	VP=very poorly drained PD=poorly drained ID=Imperfectly drained MD=Moderately well drained
	<b>Soil Texture:</b> 2
	1=clay 2=silty clay 3=clay loam 4=silty clay loam 5=sandy clay 6=sandy clay loam 7=loam 8=silty loam 9=sandy loam 10=loamy sand 11=sand
<b>Coarse Fragments:</b>	<b>No. Logs in quadrat:</b>
0=no coarse fragments 1=<2%(very few) 2=2-10%(few) 3=10-20%(common) 4=20-50%(many) 5=50-90%(abundant) 6=>90%(very abundant)	Few 0
A=2-6mm(small pebbles) B=6-20mm(medium pebbles) C=20-60mm(large pebbles) D=60-200mm(cobbles) E=200-600mm(stones) F=600mm-2m(boulders) G=>2m(Large boulders)	<b>No. Termite Mounds:</b> 0
	<b>Max. Mound Height:</b> 0 m
	<b>Disturbance Type:</b>
	0=absent 1=present season 2=previous season
	<b>Fire Frequency:</b> 2
	0=no damage 1=minor scars some trees/shrubs 2=minor scars most trees/shrubs 3=major scars 4=some trees/shrubs killed 5=most trees/shrubs killed
	<b>Fire Intensity:</b> 1
	<b>Fire Height:</b> 2
	0=none 1=<1m 2=1-4m 3=>4m
	<b>Feral Frequency:</b> 0
	0=absent 1=present season 2=previous season
	<b>% of Quadrat:</b>
	<b>Feral Name:</b>
	<b>Feral Intensity:</b>
	0=no damage 1=<5% growth removed 2=5-25% growth removed 3=25-50% growth removed 4=50-75% growth removed 5=>75% growth removed
<b>Dominant Vegetation:</b>	
Growth Form	Canopy Cover %
Height Class	
<b>Stratum 1:</b>	Tall 02-010 and 03-001 shrubland over
<b>Water Depth:</b>	m

Appendix J: Flora site data sheets

<b>Stratum 2:</b>	cenchrus tussock grass			
<b>Stratum 3:</b>				
	<b>Dominant Species:</b>		<b>Height Classes:</b>	<b>Growth Forms:</b>
<b>Stratum 1:</b>			1=<0.25m	T=tree
<b>Stratum 2:</b>			2=0.26m-0.5m	M=tree mallee
<b>Stratum 3:</b>			3=0.51-1m	S=shrub
			4=1.01-3m	Y=mallee shrub
			5=3.01-6m	Z=heath shrub
			6=6.01-12m	C=chenopod shrub
			7=12.01-20m	G=tussock grass
			8=20.01m-35m	H=hummock grass
			9=>35.01m	O=sod grass
<b>Water Parameters:</b>			<b>Basal Area:</b>	V=sedge
<b>Temperature:</b>				R=rush
<b>Conductivity:</b>				L=vine
<b>Salinity:</b>				F=forb
<b>Turbidity:</b>				E=fern
<b>pH:</b>				Q=moss
<b>Comments:</b>	Much less dust more diverse Pebble mound potential			

Site	CN004	Date	####		
Field Number	Field Name	Cover%	Heigh	Comment	Final ID
04-001	Tiny spini	2	2		
04-002	Yellow pea ipod	plus	3		
04-003	Club spike tussock	2	2		
04-004	Short long shrub				
	Cenchrus	20-50%	3		
	01-010	2%	3		
	02-010	10%	5	Most dead	
	01-008	2	4		
	03-001	5	5		
	02-004	plus	2		

<b>Site Number:</b>	CN005	<b>Date:</b>	9/10/2009	<b>Zone:</b>	50 K
<b>Collectors:</b>	ML	<b>Easting:</b>	775321		
	Photo 7	<b>Northing:</b>	7418089 SE crn		

<b>Site Description</b>					
<b>Slope:</b>	LE	<b>Morphology:</b>	F	<b>Drainage:</b>	ID
LE=level		C=crest		VP=very poorly drained	<b>Soil Texture:</b>
VG=very gently inclined		H=		PD=poorly drained	1=clay
GE=gently inclined		R=ridge		ID=Imperfectly drained	2=silty clay
MO=moderately inclined		S=simple slope		MD=Moderately well drained	3=clay loam
ST=steep		U=upper slope			4=silty clay loam
VS=very steep		M=mid slope			5=sandy clay
PR=precipitous		L=lower slope			6=sandy clay loam
CL=cliffed		F=flat			7=loam
		V=vale			8=silty loam
<b>Aspect:</b>	Nil	D=closed depression			9=sandy loam
				<b>No. Logs in quadrat:</b>	10=loamy sand
				Several	11=sand
				<b>No. Termite Mounds:</b>	
				None	
				<b>Max. Mound Height:</b>	
				m	
<b>Coarse Fragments:</b>	A	6		<b>%Cover</b>	40
0=no coarse fragments	B	4	<b>Disturbance Type:</b>	<b>%Litter</b>	0

Appendix J: Flora site data sheets

1=<2%(very few)	C	2	<b>Fire Frequency:</b>	0	%Bare	60
2=2-10%(few)	D	0	0=absent		<b>Feral Frequency:</b>	1
3=10-20%(common)	E	0	1=present season		0=absent	
4=20-50%(many)	F	0	2=previous season		1=present season	
5=50-90%(abundant)	G	0	<b>Fire Intensity:</b>		2=previous season	
6=>90%(very abundant)			0=no damage		<b>% of Quadrat:</b>	N/A
A=2-6mm(small pebbles)			1=minor scars some trees/shrubs		<b>Feral Name:</b>	Rabbit
B=6-20mm(medium pebbles)			2=minor scars most trees/shrubs		<b>Feral Intensity:</b>	1
C=20-60mm(large pebbles)			3=major scars		0=no damage	
D=60-200mm(cobbles)			4=some trees/shrubs killed		1=<5% growth removed	
E=200-600mm(stones)			5=most trees/shrubs killed		2=5-25% growth removed	
F=600mm-2m(boulders)			<b>Fire Height:</b>		3=25-50% growth removed	
G=>2m(Large boulders)			0=none		4=50-75% growth removed	
			1=<1m		5=>75% growth removed	
			2=1-4m			
			3=>4m			
<b>Dominant Vegetation:</b>						
	Growth Form	Canopy Cover %	Height Class			
<b>Stratum 1:</b>	Mixed 03001,02-003,05001 tall shrubland			<b>Water Depth:</b>	m	
<b>Stratum 2:</b>	over cenchrus and 03-006,04-003,03-005					
<b>Stratum 3:</b>	tussock grassland					
	<b>Dominant Species:</b>			<b>Height Classes:</b>	<b>Growth Forms:</b>	
<b>Stratum 1:</b>				1=<0.25m	T=tree	
<b>Stratum 2:</b>				2=0.26m-0.5m	M=tree mallee	
<b>Stratum 3:</b>				3=0.51-1m	S=shrub	
				4=1.01-3m	Y=mallee shrub	
				5=3.01-6m	Z=heath shrub	
				6=6.01-12m	C=chenopod shrub	
				7=12.01-20m	G=tussock grass	
				8=20.01m-35m	H=hummock grass	
				9=>35.01m	O=sod grass	
				<b>Basal Area:</b>	V=sedge	
					R=rush	
					L=vine	
					F=forb	
					E=fern	
					Q=moss	
<b>Water Parameters:</b>						
<b>Temperature:</b>				°C		
<b>Conductivity:</b>				mS		
<b>Salinity:</b>				ppl		
<b>Turbidity</b>						
<b>pH:</b>						
<b>Comments:</b>						
Much less dust more diverse						
Pebble mound potential						

Site	CN005	Date	####		
Field Number	Field Name	Cover%	Height	Comment	Final ID
05-001	Decorated christmas	2	5		
05-002	Less fragile christmas	2	4		
05-003	Mini purple puff	plus	2		
05-004	Flat opposite	plus	2		
05-005	Molecule plant	plus	2		
05-006	Wide flat pod	plus	2		
	03-006	5-10%	2		
	04-003	5-10%	2		
	03-005	5-10%	2		
	Cenchrus	5-10%	3		
	02-004	1	3		
	03-001	5	4		
	02-003	10	5		
	01-008	1	3		
	03-004	1	3		
	04-002	1	3		
	04-004	plus	3		
	03-003	plus	3		



Appendix J: Flora site data sheets

<b>Site Number:</b>	CN006	<b>Date:</b>	9/10/2009	<b>Zone:</b>	50 K
<b>Collectors:</b>	ML	<b>Easting:</b>	77620		
	Photo 8	<b>Northing:</b>	7418731	SE cm	
<b>Site Description</b>					
<b>Slope:</b>	LE	<b>Morphology:</b>	F	<b>Drainage:</b>	ID
LE=level		C=crest		VP=very poorly drained	
VG=very gently inclined		H=		PD=poorly drained	
GE=gently inclined		R=ridge		ID=Imperfectly drained	
MO=moderately inclined		S=simple slope		MD=Moderately well drained	
ST=steep		U=upper slope			
VS=very steep		M=mid slope			
PR=precipitous		L=lower slope			
CL=cliffed		F=flat			
		V=vale			
<b>Aspect:</b>		D=closed depression			
				<b>No. Logs in quadrat:</b>	
				Few	
				<b>No. Termite Mounds:</b>	
				Nil	
				<b>Max. Mound Height:</b>	
				m	
<b>Coarse Fragments:</b>	A	5			
0=no coarse fragments	B	1	<b>Disturbance Type:</b>		%Cover
1=<2%(very few)	C	0	<b>Fire Frequency:</b>	0	%Litter
2=2-10%(few)	D	0	0=absent		%Bare
3=10-20%(common)	E	0	1=present season		
4=20-50%(many)	F	0	2=previous season		<b>Feral Frequency:</b>
5=50-90%(abundant)	G	0	<b>Fire Intensity:</b>		0=absent
6=>90%(very abundant)			0=no damage		1=present season
A=2-6mm(small pebbles)			1=minor scars some trees/shrubs		2=previous season
B=6-20mm(medium pebbles)			2=minor scars most trees/shrubs		<b>% of Quadrat:</b>
C=20-60mm(large pebbles)			3=major scars		<b>Feral Name:</b>
D=60-200mm(cobbles)			4=some trees/shrubs killed		<b>Feral Intensity:</b>
E=200-600mm(stones)			5=most trees/shrubs killed		0=no damage
F=600mm-2m(boulders)			<b>Fire Height:</b>		1=<5% growth removed
G=>2m(Large boulders)			0=none		2=5-25% growth removed
			1=<1m		3=25-50% growth removed
			2=1-4m		4=50-75% growth removed
			3=>4m		5=>75% growth removed
	<b>Dominant Vegetation:</b>				
	Growth Form	Canopy Cover %	Height Class		
<b>Stratum 1:</b>	06-001 Tall sparse tree over			<b>Water Depth:</b>	m
<b>Stratum 2:</b>	05-002 and 02-003 shrub over				
<b>Stratum 3:</b>	mixed tussock grassland				
	<b>Dominant Species:</b>			<b>Height Classes:</b>	<b>Growth Forms:</b>
<b>Stratum 1:</b>	Dominated by 010-001			1=<0.25m	T=tree
<b>Stratum 2:</b>				2=0.26m-0.5m	M=tree mallee
<b>Stratum 3:</b>				3=0.51-1m	S=shrub
				4=1.01-3m	Y=mallee shrub
				5=3.01-6m	Z=heath shrub
				6=6.01-12m	C=chenopod shrub
				7=12.01-20m	G=tussock grass
				8=20.01m-35m	H=hummock grass
				9=>35.01m	O=sod grass
				<b>Basal Area:</b>	V=sedge
					R=rush
					L=vine
					F=forb
					E=fern
					Q=moss
<b>Comments:</b>					
Basking pogona. Varied tracks. Cat tracks					

<b>Site</b>	CN060	<b>Date</b>	####		
<b>Field Number</b>	<b>Field Name</b>	<b>Cover%</b>	<b>Heigh</b>	<b>Comment</b>	<b>Final ID</b>
06-001	Ball and needle	5	5		
06-002	Tulip acacia	5	3		

Appendix J: Flora site data sheets

06-003	Vine	plus	2	
06-004	Little round leaf salty		2	4
06-005	Sticky spini		1	3
06-006	Mini triodia		5	2
06-007	Minin spiny clump		5%	2
	01-010		1%	2
	03-003		1%	2
	05-003		1%	3
	05-002		2	4
	04-002		1	3
	02-003		2	4
	Cenchrus		2	3
06-008	010-001 opp		50	

<b>Site Number:</b>	CN007	<b>Date:</b>	9/10/2009	<b>Zone:</b>	50 K
<b>Collectors:</b>	ML	<b>Easting:</b>	775865		
	Photo 9	<b>Northing:</b>	7418638		

<b>Site Description</b>					
<b>Slope:</b>	LE	<b>Morphology:</b>	F	<b>Drainage:</b>	PD
LE=level		C=crest		VP=very poorly drained	
VG=very gently inclined		H=		PD=poorly drained	
GE=gently inclined		R=ridge		ID=Imperfectly drained	
MO=moderately inclined		S=simple slope		MD=Moderately well drained	
ST=steep		U=upper slope			
VS=very steep		M=mid slope			
PR=precipitous		L=lower slope			
CL=cliffed		F=flat			
		V=vale			
<b>Aspect:</b>		D=closed depression			
<b>Soil Texture:</b>					2
					1=clay
					2=silty clay
					3=clay loam
					4=silty clay loam
					5=sandy clay
					6=sandy clay loam
					7=loam
					8=silty loam
					9=sandy loam
					10=loamy sand
					11=sand
<b>Coarse Fragments:</b>	A	4			
0=no coarse fragments	B	3	<b>Disturbance Type:</b>		
1=<2%(very few)	C	2	<b>Fire Frequency:</b>	0	
2=2-10%(few)	D	1	0=absent		
3=10-20%(common)	E	0	1=present season		
4=20-50%(many)	F	0	2=previous season		
5=50-90%(abundant)	G	0	<b>Fire Intensity:</b>		
6=>90%(very abundant)			0=no damage		
A=2-6mm(small pebbles)			1=minor scars some trees/shrubs		
B=6-20mm(medium pebbles)			2=minor scars most trees/shrubs		
C=20-60mm(large pebbles)			3=major scars		
D=60-200mm(cobbles)			4=some trees/shrubs killed		
E=200-600mm(stones)			5=most trees/shrubs killed		
F=600mm-2m(boulders)			<b>Fire Height:</b>		
G=>2m(Large boulders)			0=none		
			1=<1m		
			2=1-4m		
			3=>4m		
<b>Dominant Vegetation:</b>					
Growth Form	Canopy Cover %	Height Class			
<b>Stratum 1:</b>				<b>Water Depth:</b>	m
<b>Stratum 2:</b>					
<b>Stratum 3:</b>					
<b>Dominant Species:</b>			<b>Height Classes:</b>	<b>Growth Forms:</b>	
<b>Stratum 1:</b>			1=<0.25m	T=tree	
<b>Stratum 2:</b>			2=0.26m-0.5m	M=tree mallee	
<b>Stratum 3:</b>			3=0.51-1m	S=shrub	

Appendix J: Flora site data sheets

<b>Water Parameters:</b>				4=1.01-3m	Y=mallee shrub
<b>Temperature:</b>			°C	5=3.01-6m	Z=heath shrub
<b>Conductivity:</b>			mS	6=6.01-12m	C=chenopod shrub
<b>Salinity:</b>			ppl	7=12.01-20m	G=tussock grass
<b>Turbidity</b>				8=20.01m-35m	H=hummock grass
<b>pH:</b>				9=>35.01m	O=sod grass
<b>Comments:</b>				<b>Basal Area:</b>	V=sedge
					R=rush
					L=vine
					F=forb
					E=fern
					Q=moss

Site	CN07	Date	####		
Field Number	Field Name	Cover%	Heigh	Comment	Final ID
	010-001	40	3		
	Cenchrus	5	3		
	04-002	1	3		
	01-010	1	3		
	03-004	5	3		
07-001	Straight and curly	2	4		
07-002	Black ink shrub	plus	3		
	06-004	1%	4		
	03-001	2%	4		
	03-005	2%	2		
	06-005	2	3		
	01-008	2	4		
07-003	White puff thin leaf	1	3		
07-004	Little leaf Eccc	plus	5	White trunk branch no oxfol bark	



**Appendix K**  
**Flora Species Inventory**

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Appendix K: Flora species inventory

<b>Family</b>	<b>Species</b>
Amaranthaceae	Ptilotus rotundifolius Ptilotus exatatus Ptilotus clementii Ptilotus obovatus
Asclepiadaceae	Marsdenia australis
Asteraceae	Pterocaulon sphacelatum
Boraginaceae	Trichodesma zeylanicum var. zeylanicum
Caesalpinaceae	Senna glutinosa ssp. glutinosa Senna glaucifolia Senna artemisioides ssp. helmsii Senna artemisioides ssp. oligophylla
Chenopodiaceae	Salsola australis Maireana triptera Rhagodia eramaea
Malvaceae	Sida fibulifera
Mimosaceae	Acacia adoxa var. adoxa Acacia aneura Acacia aneura var. macrocarpa Acacia bivenosa Acacia dictyophleba Acacia inequilatera Acacia ligulata Acacia pachyacra Acacia pruinocarpa Acacia synchronica Acacia tetragonaphylla
Myoporaceae	Eremophila lachnocalyx Eremophila latrobei ssp. latrobei Eremophila longifolia
Myrtaceae	Eucalyptus leucophloia ssp. leucophloia Eucalyptus socialis ssp. socialis
Poaceae	Aristida contorta Aristida latifolia Enneapogon caerulescens Enneapogon lindleyanus Eriachne mucronata Triodia pungens Triodia wiseana
Proteaceae	Hakea chordophylla Hakea lorea ssp. Lorea



**Appendix L**  
**Flora Site Data Sheets**

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## **HABITAT CONDITION DESCRIPTORS**

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<b>Habitat condition label</b>	<b>Condition description</b>
High quality fauna habitat:	These areas closely approximate the vegetation mix and quality that would have been in the area prior to any disturbance. The habitat has connectivity with other habitats and is likely to contain the most natural vertebrate fauna assemblage.
Very good fauna habitat:	These areas show minimal signs of disturbance (e.g. grazing, clearing, fragmentation, weeds) and retains almost all of the characteristics of the habitat had it not been disturbed. The habitat has connectivity with other habitats, and fauna assemblages in these areas are likely to be minimally effected by disturbance.
Good fauna habitat:	These areas show signs of disturbance (e.g. grazing, clearing, fragmentation, weeds) but generally retain many of the characteristics of the habitat had it not been disturbed. The habitat has connectivity with other habitats but fauna assemblages in these areas are likely to be affected by disturbance. Fauna assemblages in these areas are likely to be similar to what might be expected in the area.
Disturbed fauna habitat:	These areas show signs of significant disturbance. Many of the trees, shrubs and undergrowth have died or have been cleared. These areas may be in the early succession and regeneration stages. Areas may show signs of significant grazing, contain weeds or have been damaged by vehicles or machinery. Habitats are fragmented or have limited connectivity with other fauna habitats. Fauna assemblages in these areas are likely to differ significantly from what might be expected in the area had the disturbance not occurred.
Highly degraded fauna habitat:	These areas often have a significant loss of vegetation, and / or abundance of weeds, and / or a large number of vehicle tracks or have been completely cleared. There is limited or no fauna habitat connectivity. Fauna assemblages in these areas are likely to differ significantly to what existed prior to the disturbance, and are often depleted compared to what existed prior to the disturbance.

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## REVISION SCHEDULE

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V1.0	05/06/15	Draft Report for Review	MS/BH	BH	AS	PB & KH
V2.0	16/09/15	FINAL	MS/BH	BH	AS	PB & KH

## EXECUTIVE SUMMARY

Holcim Australia Pty Ltd (Holcim) own and operate river sand and hard rock quarries throughout Australia. The Newman Quarry is approximately 5 km northwest of Newman in Western Australia, located within tenement M 52/59. Holcim operates all sites in accordance with their Safety, Health and Environmental Management System (SHEMS), based on ISO 9001: Quality Management Systems standard. The SHEMS contains directives and guidelines, including those for biodiversity. Holcim commissioned MWH Australia Pty Ltd (MWH) to undertake a Rapid Biodiversity Assessment (RBA) at their Newman Quarry to meet the requirements of their SHEMS.

The overarching objective of this assessment was to assist Holcim to achieve compliance with their internal SHEMS for Biodiversity in Australia. The specific objectives of the RBA were to:

- complete a desktop study to identify flora, vegetation and terrestrial vertebrate fauna of conservation significance, with the potential to occur within and adjacent to the Newman Quarry;
- undertake a RBA survey of the vegetation at the Newman Quarry;
- identify the key features, principal vegetation types and habitats;
- identify flora and fauna associated with each vegetation type and habitat; and
- categorise the biodiversity importance of the Newman Quarry and assess the likely level of impact; and associated biodiversity risk level.

The RBA method is intended to present a robust but brief overview, only, of the biodiversity values of the Study Area. It should not be considered a comprehensive assessment of all flora, vegetation and fauna taxa and communities within the area, nor does it identify all potential impacts required for formal environmental impact assessment (EIA). Database searches and a literature review were completed, prior to the RBA field survey being undertaken, to determine the flora taxa, vegetation communities and fauna taxa likely to be present in the Study Area. Six database searches were conducted around a central coordinate within the Study area, and a total of five relevant literature sources were publically available. During the RBA field survey, conducted in April 2015 following a late wet season, broad vegetation and habitat mapping was undertaken and a flora and fauna habitat assessment was completed for each broad habitat type/vegetation unit. An inventory of fauna taxa was compiled during opportunistic sighting and targeted searching throughout the survey.

A total of seven broad vegetation units/habitat types were identified and mapped. None of the vegetation units were analogous to any TECs or PECs listed as occurring in the region. None of the vegetation units are considered locally or regionally significant. The vegetation condition of the Study Area ranged from 'excellent' to 'completely degraded', with primary impacts consisting of mining operations, the presence of waste dumps and windrows, vegetation clearing, sand excavation, vehicle movements, high-density weed infestations and the presence of rabbits.

The desktop study identified one conservation significant flora taxon *Calotis latiuscula* (P3) as likely to occur, however this taxon was not recorded within the Study Area. There were no DPaW-listed Threatened flora taxa or DPaW-listed Priority flora taxa recorded in the desktop assessment. The survey identified three introduced flora taxa. There were no range extensions.

A total of 57 vascular flora taxa were recorded within the Study Area during the April 2015 field survey, representing 20 families and 36 genera. The most dominant families were Fabaceae (legumes; 16 taxa), Poaceae (grasses; 10 taxa) and Amaranthaceae (amaranths; 6 taxa). The most dominant genera were *Acacia* (11 taxa), *Ptilotus* (4 taxa) and *Senna* (3 taxa).

A total of 14 vertebrate fauna species were recorded during the field survey, comprising two mammals (one native), 11 birds, one reptile and no amphibian species. No species of conservation significance were recorded during the field survey.

The desktop study identified 34 vertebrate fauna taxa of conservation significance that have previously been recorded within the vicinity of the Study Area. An assessment of likelihood of occurrence of these species was made based on the proximity of these records, and the occurrence of suitable habitat within the Study Area. It is considered that three species possibly occur (the Eastern Great Egret [Mig], Fork-tailed Swift [Mig], and the skink *Lerista macropisthopus remota* [P2]), and two species are likely to occur (The Rainbow Bee-eater [Mig] and Australian Bustard [P4]). No threatened species were assessed as possibly or likely to occur, and in respect to the Priority-listed and Migratory species above none are considered to be dependent on the habitat within the Study Area.

A risk assessment was completed for the Study Area. Based on the results of the RBA, and subsequent risk assessment, it was determined that the risk of the proposed development of the Newman Quarry to local biodiversity was low, and that a Holcim BAP would not be required.

# Holcim Australia Pty Ltd

## Newman Quarry: Rapid Biodiversity Assessment

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# 1 Introduction

## 1.1 Project Background and Location

Holcim Australia Pty Ltd (Holcim) own and operate river sand and hard rock quarries throughout Australia. The Newman Quarry is approximately 5 km northwest of Newman in Western Australia, located within tenement M 52/59 (**Figure 1-1**). Holcim operates all sites in accordance with their Safety, Health and Environmental Management System (SHEMS), based on ISO 9001: Quality Management Systems standard (International Organization for Standardization 2008). The SHEMS contains directives and guidelines, including those for biodiversity. Holcim commissioned MWH Australia Pty Ltd (MWH) to undertake a Rapid Biodiversity Assessment (RBA) at their Newman Quarry to meet the requirements of their SHEMS.

## 1.2 Report Scope and Objectives

The field and reporting methods implemented as part of the RBA were consistent with the following Holcim, Environmental Protection Authority (EPA) and Department of Environment and Conservation (DEC) documents:

- Holcim's Biodiversity Management Recommendation (including Annex 4 –Terms of Reference for Rapid Biodiversity Survey);
- Holcim's Safety, Health and Environmental Management Standards;
- Holcim's mapping standards;
- EPA Position Statement No. 3 (2002) Terrestrial Biological Surveys as an Element of Biodiversity Protection;
- EPA Position Statement No. 2 (2000) Environmental Protection of Native Vegetation in Western Australia;
- EPA Guidance No. 51 (2004b) Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia;
- EPA Guidance No. 56 (2004a) Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia; and
- EPA and Department of Environment and Conservation's (DEC) Technical Guide (2010) Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment.

The overarching objective of this assessment was to assist Holcim to achieve compliance with their internal SHEMS for Biodiversity in Australia. The specific objectives of the RBA were to:

- complete a desktop study to identify flora, vegetation and terrestrial vertebrate fauna of conservation significance, with the potential to occur within and adjacent to the Newman Quarry;
- undertake a RBA survey of the vegetation at the Newman Quarry;
- identify the key features, principal vegetation types and habitats;
- identify flora and fauna associated with each vegetation type and habitat; and
- categorise the biodiversity importance of the Newman Quarry and assess the likely level of impact; and associated biodiversity risk level.

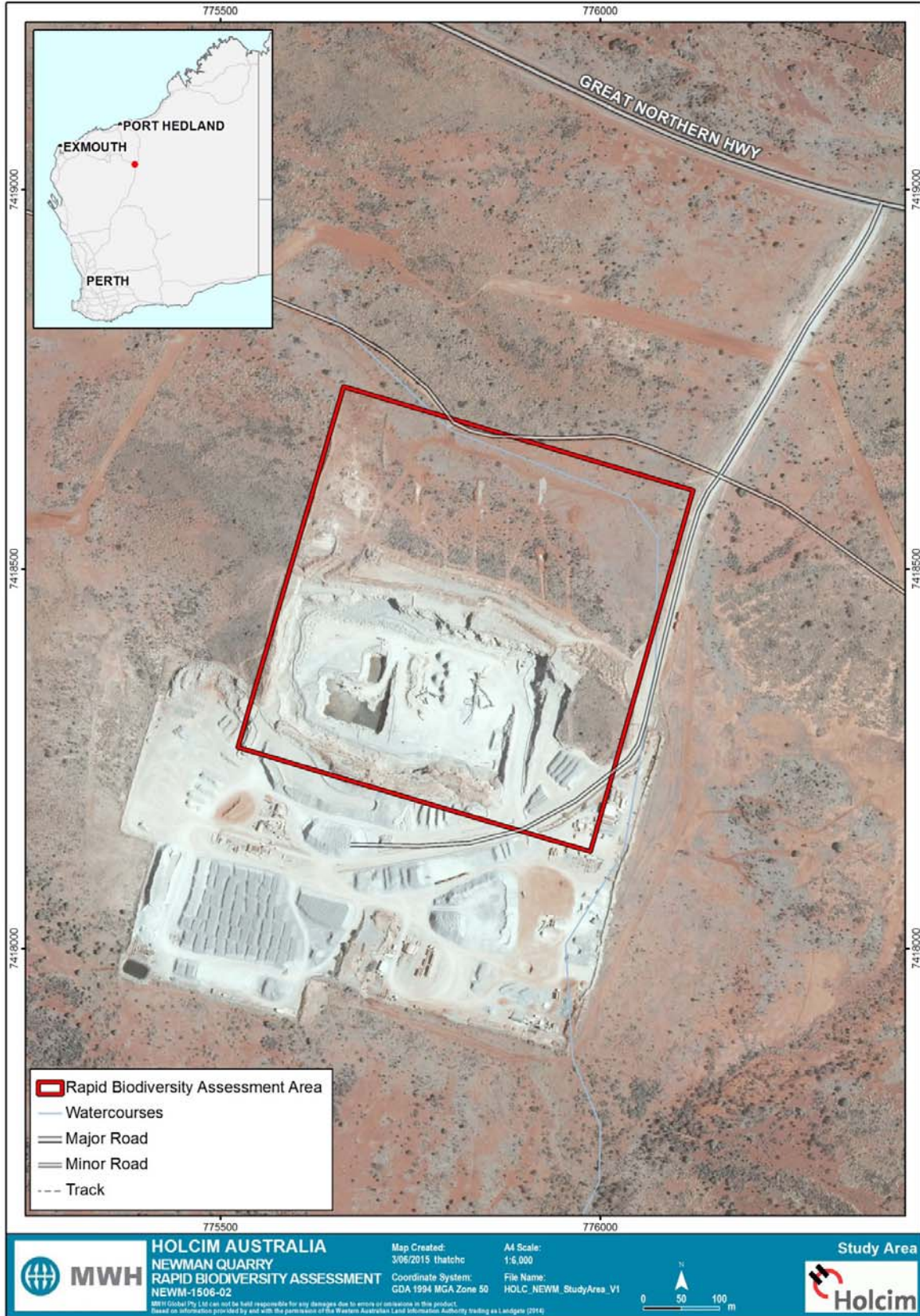


Figure 1-1: Location of the Study Area in relation to Newman, Western Australia.



## 2 Existing Environment

### 2.1 Biogeographic Region and Land Use

The Study Area is located in the Pilbara bioregion, as defined by the Interim Biogeographic Regionalisation for Australia (IBRA) classification system (Thackway and Cresswell 1995). The Pilbara is characterised by vast coastal plains, inland mountain ranges, cliffs and deep gorges, with vegetation consisting predominantly of low mulga woodlands or snappy gum over tussock and hummock grasses (Thackway and Cresswell 1995). Land tenure comprises Aboriginal land, leasehold (for grazing cattle) and conservation reserves (Thackway and Cresswell 1995). The Pilbara provides the majority of Western Australia's exports in petroleum, natural gas and iron ore.

The Study Area is located within the Pilbara 3 Hamersley (PIL3) subregion, which spans an area of 6,215,092 ha and is characterised by Proterozoic sedimentary ranges and plateaux, dissected by gorges (Kendrick 2001). The valley floors comprise fine textured soils with low mulga woodlands, while the ranges comprise snappy gum over *Triodia brizoides* on skeletal soils (Kendrick 2001). Drainage for the region is into the Fortescue, Ashburton or Robe River systems (Kendrick 2001). The dominant land uses with the PIL3 subregion are grazing, Unallocated Crown Land (UCL), Crown reserves, native pastures, conservation, mining and urban development (Kendrick 2001). There are no conservation reserves within the Study Area. The nearest DPaW conservation estates are Karijini National Park, approximately 115 km north north-west, Collier Range National Park approximately 120 km South south-west and Karlamilya National Park approximately 200 km north east.

### 2.2 Land Systems

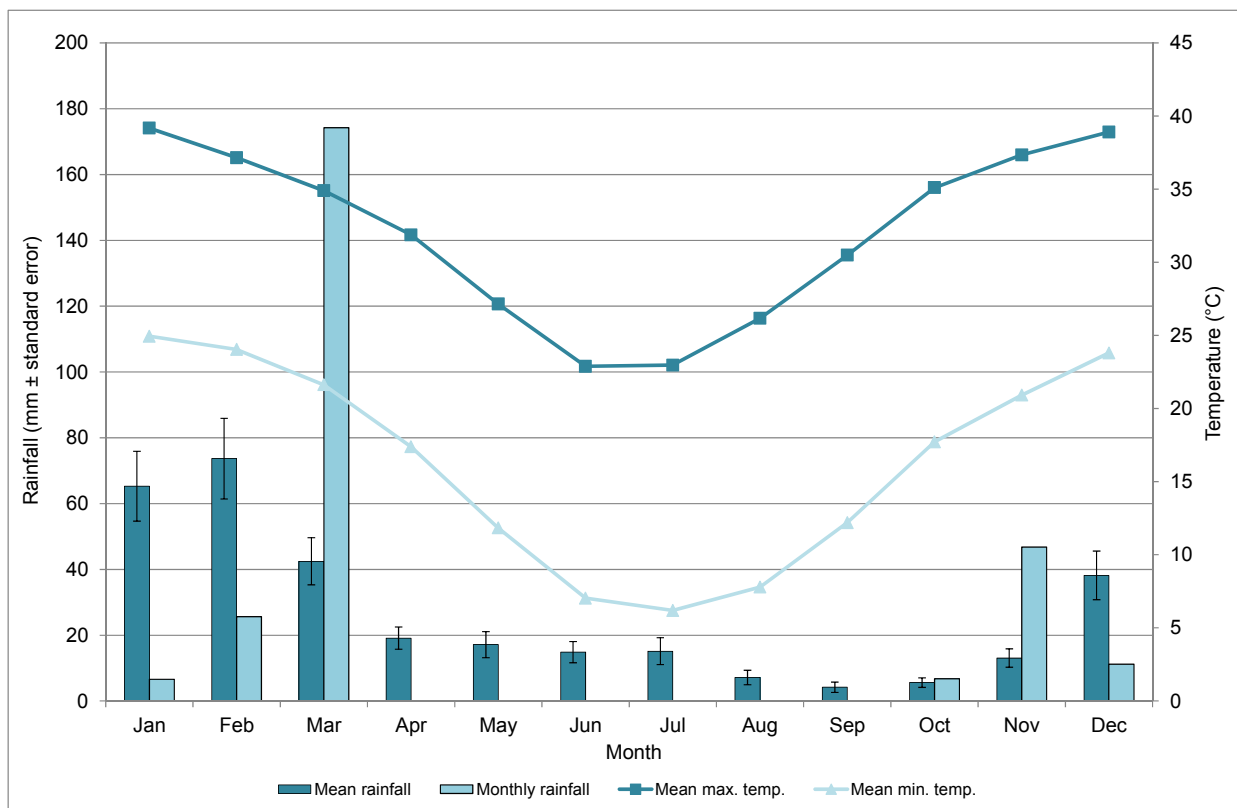
An assessment of land systems (Van Vreeswyk *et al.* 2004) provided an indication of the occurrence and distribution of fauna habitats, vegetation and flora present within, and adjacent to, the Study Area. The Study Area encompasses a single land system, the Elimuna Land System, which is dominated by stony plains on basalt supporting sparse *Acacia* and *Senna* shrublands and patchy tussock grasslands (Van Vreeswyk *et al.* 2004).

### 2.3 Pre-European Vegetation

Pre-European vegetation mapping of the Study Area was obtained from the Department of Agriculture and Food (DAF) (2011), which utilises mapping by Beard (1975) as its source data. The Study Area comprises one vegetation association, Vegetation Association 82, described as "hummock grasslands, low tree steppe; snappy gum over *Triodia wiseana*" (Department of Agriculture and Food 2011). The EPA (2000) defines the threshold level of vegetation preservation, below which species loss appears to accelerate exponentially at the ecosystem level, as being 30% of the pre-clearing extent of the vegetation type. Vegetation Association 82 has 100% (2,565,901 ha) of the Pre-European extent remaining, however only 10.24% (262,747 ha) is protected in Class 1 – V conservation reserves, located outside of the Study Area.

## 2.4 Climate

The climate of the PIL3 subregion is semi-desert tropical, averaging 300 mm rainfall annually generally as a result of summer cyclonic or thunderstorm events; however winter rain is not uncommon (Kendrick 2001). Rainfall is variable, with an annual long-term mean for Newman of 327 mm (Newman Airport station 007176) (Bureau of Meteorology 2015a). The majority of precipitation falls in mid to late summer (January to February, **Figure 2-1**) as a result of ex-tropical cyclones (Bureau of Meteorology 2015b), and mean annual evaporation for the region is high, at approximately 3,400 mm per year (Water and Rivers Commission 2000). Maximum temperatures occur from October to March, in alignment with maximum rainfall, and minimum temperatures occur from April to September (**Figure 2-1**), during the dry season (Bureau of Meteorology 2015a). In the six months prior to the April 2015 field survey, a total of 271.2 mm of rainfall was recorded, with the majority falling in March 2015 (**Figure 2-1**).



**Figure 2-1: Long-term monthly mean rainfall totals, minimum and maximum temperatures recorded at Newman Airport (BoM station 007176).**

## 3 Desktop Study Methodology

Background information on the Study Area and adjacent habitats was compiled prior to the April 2015 field survey to inform survey design and assist with planning for the field survey. Historical vegetation mapping conducted by Beard (1975), land systems mapping (Van Vreeswyk *et al.* 2004) and the IBRA classification system (Kendrick and McKenzie 2001, Kendrick and Stanley 2001) were consulted to provide broad contextual knowledge of the Study Area. A literature review and database searches were undertaken to identify Threatened and Priority flora and fauna species, Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs), and vertebrate fauna that could potentially occur in the Study Area.

### 3.1 Database Searches

Database searches were undertaken to generate a list of vascular flora and vertebrate fauna taxa previously recorded within, and nearby, the Study Area, including introduced species and taxa of conservation significance. Conservation codes for flora and fauna of conservation significance are provided in **Appendix A** and **Appendix B**, respectively. Six database searches were conducted around a central coordinate (50K 784396 mE, 7410883 mS), with varying buffers as deemed appropriate (**Table 3-1**).

**Table 3-1: Database searches.**

Custodian	Database	Targeted Taxa	Reference	Buffer (km)
DPaW	Threatened and Priority Fauna	Vertebrate fauna	(DPaW 2015d)	35
DPaW	Threatened and Priority Ecological Communities	Vegetation communities	(Department of Parks and Wildlife 2015c)	30
DPaW	Threatened and Priority Flora	Flora	(DPaW 2015f)	30
DPaW	NatureMap	Flora and vertebrate fauna	(DPaW 2015b)	30
Birdlife Australia	Birdlife Birdata	Vertebrate fauna	(Birdlife Australia 2015)	35
Department of the Environment	Protected Matters	Flora and vertebrate fauna	(DoE 2015a)	30

### 3.2 Literature Review

The literature review considered five previous surveys of relevance to the Study Area, including three with flora and vegetation information (**Table 3-2**) and four with vertebrate fauna information (**Table 3-3**). Surveys considered were those that were publically available, recently conducted, and in close proximity to the Study Area. In addition, the fauna survey reports were reviewed and results collated to generate an inventory of the vertebrate fauna known to occur in the vicinity of the Study Area and within the surrounding region (**Appendix J**).

**Table 3-2: Key findings of the flora literature review.**

Reference	Study Details	Proximity to Study Area	Methods	Vegetation Units	Flora Recorded	Vegetation Condition	Species/Communities of Conservation Significance
A Animal Plant Mineral (2009)	<u>Project:</u> Newman Quarry <u>Client:</u> Holcim Australia Pty Ltd <u>Survey type:</u> Level 1 <u>Survey date:</u> October 2009	Within Study Area	Quadrats	5 vegetation types comprising hills and low rises, stony plains, hardpan plains, groves, and drainage floors.	Not provided	Poor, with disturbances including weeds, fire, grazing, vehicles and dust. Weeds are prevalent, particularly <i>Cenchrus ciliaris</i> .	No TECs, PECs, Threatened flora or Priority flora identified in survey area
B Onshore Environmental (2015)	<u>Project:</u> Orebody 31 <u>Client:</u> BHP Billiton Iron Ore Pty Ltd <u>Survey type:</u> Environmental Impact Assessment <u>Survey date:</u> February 2015	~25 km northeast	Quadrats and relevés	47 Vegetation types, primarily comprising <i>Acacia</i> shrublands and <i>Triodia</i> hummock grasslands	Not provided. 88 Priority flora taxa recorded as potentially occurring within a 50 km radius.	Ranged from excellent to good. Disturbances included grazing, erosion and weeds.	No TECs, PECs, or Threatened flora identified in survey area. Three Priority 3 taxa were recorded: <ul style="list-style-type: none"> <li>• <i>Acacia</i> sp. East Fortescue (J. Bull &amp; D. Roberts ONS A 27.01) (P1)</li> <li>• <i>Triodia</i> sp. Mt Ella (M.E. Trudgen 12739) (P3)</li> <li>• <i>Goodenia nuda</i> (P3)</li> </ul>
C ENV Australia (2009a)	<u>Project:</u> Whaleback Power Station <u>Client:</u> Worley Parsons <u>Survey type:</u> Flora and Vegetation Assessment <u>Survey date:</u> April 2009	~7 km southwest	Quadrats	7 vegetation units	124 vascular flora taxa from 28 families and 65 genera	Ranged from excellent to completely degraded, with most recorded as good	No TECs, PECs, Threatened flora or Priority flora identified in survey area

**Table 3-3: Key findings of the fauna literature review.**

Reference	Study Details	Proximity to Study Area	Methods	Habitats defined or noted	Fauna recorded	Potential Con. Sig. Fauna	Notes
A Animal Plant Mineral (2009)	<u>Project:</u> Newman Quarry <u>Client:</u> Holcim Australia Pty Ltd <u>Survey type:</u> Level 1 Fauna <u>Survey date:</u> October 2009	Within the Study Area	<ul style="list-style-type: none"> <li>Area searches</li> <li>Habitat assessment</li> </ul>	<ul style="list-style-type: none"> <li>hills and low rises</li> <li>stony plains</li> <li>hardpan plains</li> <li>groves</li> <li>drainage floors</li> </ul>	<ul style="list-style-type: none"> <li>Not provided</li> </ul>	<ul style="list-style-type: none"> <li>Olive python (S1)</li> <li><i>Ramphotyphlops ganei</i> (P1)</li> <li>Australian Bustard (P4)</li> <li>Ghost Bat (P4)</li> <li>Black-footed Rock Wallaby (S1)</li> <li>Western Pebble-mound Mouse (P4)</li> <li>Long-tailed Dunnart (P4)</li> </ul>	None of the habitats were considered to be regionally significant.
B Biologic (2014)	<u>Project:</u> Orebody 31 <u>Client:</u> BHP Billiton Iron Ore Pty Ltd <u>Survey type:</u> Environmental Impact Assessment <u>Survey date:</u> May 2014	~25 km northeast	<ul style="list-style-type: none"> <li>Area searches</li> <li>Habitat assessment</li> <li>Trapping</li> </ul>	<ul style="list-style-type: none"> <li>minor drainage line</li> <li>sand plain</li> <li>crest/slope</li> <li>drainage area</li> <li>gorge/gully</li> </ul>	<ul style="list-style-type: none"> <li>194 species:</li> <li>32 mammals;</li> <li>81 birds;</li> <li>78 reptiles;</li> <li>3 amphibian</li> </ul>	<ul style="list-style-type: none"> <li>Brush tailed Mulgara (P4)</li> <li>Western Pebble-mound Mouse (P4)</li> <li>Australian Bustard (P4)</li> <li>Rainbow Bee-eater (MI)</li> <li>Fork-tailed Swift (MI)</li> </ul>	Sand Plain and Gorge/ Gully were considered to be of high importance because they provide potential breeding, shelter and/or foraging habitat for a number of conservation significant fauna.
C ENV Australia (2009b)	<u>Project:</u> Whaleback Power Station <u>Client:</u> Worley Parsons <u>Survey type:</u> Terrestrial Fauna Assessment <u>Survey date:</u> April 2009	~7 km southwest	<ul style="list-style-type: none"> <li>Area searches</li> <li>Habitat assessment</li> <li>Bat echolocation</li> </ul>	<ul style="list-style-type: none"> <li>mulga plain</li> <li>riverine</li> <li>flood plain</li> </ul>	<ul style="list-style-type: none"> <li>32 species:</li> <li>8 mammals;</li> <li>24 birds;</li> <li>1 reptiles</li> </ul>	<ul style="list-style-type: none"> <li>Rainbow Bee-eater (MI)</li> <li>Star finch (P4)</li> </ul>	All habitat types were considered to be of moderate to low conservation significance.

Reference	Study Details	Proximity to Study Area	Methods	Habitats defined or noted	Fauna recorded	Potential Con. Sig. Fauna	Notes
D MWH Australia (2015)	<p><u>Project:</u> Warrawanda Creek Quarry</p> <p><u>Client:</u> Holcim Australia Pty Ltd</p> <p><u>Survey type:</u> Level 1 Flora Fauna Assessment</p> <p><u>Survey date:</u> April 2015</p>	~12 km east southeast	<ul style="list-style-type: none"> <li>• Desktop assessment</li> <li>• Fauna assessments</li> <li>• Opportunistic observation</li> </ul>	<ul style="list-style-type: none"> <li>• Major drainage line</li> <li>• Mulga woodland</li> </ul>	<ul style="list-style-type: none"> <li>• 48 species:</li> <li>• 4 mammals;</li> <li>• 39 birds;</li> <li>• 2 reptiles;</li> <li>• 3 amphibians</li> </ul>	<ul style="list-style-type: none"> <li>• Rainbow Bee-eater (MI)</li> </ul>	Both habitat types were considered widespread and of limited significance

### 3.3 Likelihoods of Occurrence for Flora and Fauna of Conservation Significance

The likelihood of occurrence of each species of flora and fauna of conservation significance in the Survey Area was assessed and ranked. The rankings were assigned using the following definitions:

**Confirmed** – the presence of the species in the Survey Area has been recorded unambiguously during the last ten years (i.e. during recent surveys of the Survey Area or from reliable records obtained via database searches);

**Very likely** – the Survey Area lies within the known distribution of the species and is likely to contain suitable habitat(s), plus the species generally occurs in suitable habitat and has been recorded nearby within the last 20 years;

**Likely** – the Survey Area lies within the known distribution of the species and the species has been recorded nearby within the last 20 years; however, either:

- a.the Survey Area is likely to contain only a small area of suitable habitat, or habitat that is only marginally suitable; or
- b.the species is generally rare and patchily distributed in suitable habitat;

**Possible** – there is an outside chance of occurrence, because:

- a.the Survey Area is just outside the known distribution of the species, but is likely to contain suitable and sufficient habitat (the species may be common, rare, or patchily distributed); or
- b.the Survey Area lies within the known distribution of the species, but the species is very rare and/or patchily distributed; or
- c.the Survey Area lies on the edge of, or within, the known distribution and is likely to contain suitable habitat, but the species has not been recorded in the area for over 20 years.

**Unlikely** – the Survey Area lies outside the known distribution of the species, the Survey Area is unlikely to contain suitable habitat, and the species has not been recorded in the area for over 20 years.

See **Appendix A** and **Appendix B** for full descriptions of all conservation codes.

## 4 Field Survey Methodology

The RBA method is intended to present a robust but brief overview, only, of the biodiversity values of the Study Area. It should not be considered a comprehensive assessment of all flora, vegetation and fauna taxa and communities within the area, nor does it identify all potential impacts required for formal environmental impact assessment (EIA).

### 4.1 Survey Timing and Weather

The field survey was conducted on the 17<sup>th</sup> of April 2015 following a late wet season, with the month preceding (March 2015) recording 174.2 mm of precipitation, four times the long-term average for Newman Airport (42.5 mm, **Figure 2-1**) (Bureau of Meteorology 2015a). Total rainfall recorded from the Newman Airport in the six months prior to the survey was 271.2 mm, slightly higher than the long-term average of 238.2 mm for the same period (Bureau of Meteorology 2015a). Rainfall from December 2014 to February 2015 was substantially lower than the long-term average (Bureau of Meteorology 2015a). The EPA (2004b) recommends that surveys should be conducted following the season of highest rainfall to optimise the likelihood of encountering flowering and fruiting taxa, and capturing ephemeral species. The timing of the survey was considered appropriate for conducting an RBA.

Conditions on the day of the survey were mild, with a maximum temperature of 24.4°C and a maximum humidity of 57% (Bureau of Meteorology 2015a). No rainfall was recorded on the day of the survey (Bureau of Meteorology 2015a). Weather conditions at the time of the survey were considered appropriate for conducting an RBA.

### 4.2 Survey Team and Licensing

The field survey was undertaken by two experienced MWH ecologists, Chris Knuckey (Senior Zoologist) and Megan Stone (Botanist). The fauna survey was conducted under a Regulation 17 licence, pursuant to the *Wildlife Conservation Act 1950* (WA) (WC Act). All plant collections were taken under flora collecting permit (SL011123), pursuant to the WC Act section 23C and section 23F.

### 4.3 Field Survey Design

The site was traversed on foot by the MWH ecologists, ensuring that each vegetation unit/habitat type within the Study Area was visited. All vascular flora and vertebrate fauna taxa observed while traversing the site were recorded.

Broad vegetation and habitat mapping was conducted in the field, with boundaries delineated over aerial photography, and later refined based on survey data. A flora and fauna habitat assessment was undertaken for each broad habitat type/vegetation unit at the site. Each habitat type/vegetation unit was described using the *NVIS Vegetation Structural Classification System* (ESCAVI 2003), based on their structure and composition, and the following information was recorded:



- relevé number;
- date of survey;
- personnel;
- GPS coordinates (GDA 94);
- site photograph;
- vascular flora taxa;
- soil characteristics (texture and colour);
- geology (type, size and nature of any rocks, stones, gravel, or outcropping);
- topography (landform type and aspect);
- vegetation condition (based on Keighery (1994), (**Appendix C**);
- vegetation structure (based on ESCAVI (2003) (**Appendix D**);
- disturbance (if present);
- hollow bearing trees and dead stag trees (average size and abundance);
- any nest, roosts or other evidence of breeding habitat present;
- rocky outcrops (average rock size and extent);
- coarse woody debris, i.e. logs and fallen timber (abundance and size);
- substrate (description of composition, presence of algal crust and % cover of leaf litter);
- wetland habitats and water courses including drainage lines, billabongs, active floodplains, dams etc; and
- approximate time since fire.

Prior to the survey, a list of conservation significant flora and vertebrate taxa with potential to occur within the Study Area was compiled. Field personnel familiarised themselves with photographs and descriptions of these taxa, and the habitat in which they might occur, and actively searched for them while traversing the Study Area. Any conservation significant flora taxa identified in the field were recorded.

Flora taxa not identified in the field were collected and pressed for identification at the Western Australian Herbarium. Identifications were carried out by experienced taxonomist Cate Tauss and experienced MWH botanist Megan Stone. The nomenclature and taxonomy of all vascular flora taxa in this report follows that of the Western Australian Herbarium. All taxa were checked against FloraBase to ensure their currency and validity (Department of Parks and Wildlife 2015a).

Targeted searches were undertaken for fauna taxa of conservation significance, and to develop a species list. Effort focused on habitat likely to support fauna taxa of conservation significance, although all habitat types were searched. Searching methods included hand-searching for cryptic species, for example by overturning logs and stones, searching beneath the bark of dead trees, investigating crevices and exploring in the vicinity of burrows, tracks, diggings, scats, and other signs of vertebrate fauna. An aural survey for avifauna was also carried out. All vertebrate fauna observed or heard, or whose presence was inferred from secondary evidence, were documented.

The nomenclature and taxonomy of mammals, reptiles and amphibians reported follow the Checklist of the Vertebrates of Western Australia (Western Australian Museum 2009), while avifauna identifications follow the Birds Australia Checklist of Australian Birds, based on Christidis and Boles

(2008). Relevant texts, containing more recent taxonomic updates and general patterns of distribution, were also considered for:

- mammals (Van Dyck *et al.* 2013, Woinarski *et al.* 2014);
- birds (Johnstone and Storr 1998a, 2004a, Morcombe 2003, Pizzey and Knight 2007);
- reptiles (Cogger 2014, Storr *et al.* 1999, 2002, Wilson and Swan 2013); and
- amphibians (Cogger 2014, Tyler and Doughty 2009).

## 5 Results and Discussion

### 5.1 Flora and Fauna Habitat Assessments

A total of seven broad habitat types were identified within the Study Area, as defined below:

- Waste dumps - low isolated *Corymbia hamersleyana* trees, over sparse shrubland dominated by *Acacia pruinosa*, *Acacia bivenosa*, *Acacia adsurgens* and *Acacia spondylophylla*, over open hummock grassland dominated by *Triodia wiseana* with \**Cenchrus ciliaris* on an old waste dump and along wind rows (**Table 5-1**).
- Rocky hills - low isolated *Hakea chordophylla* trees, over low open shrubland dominated by *Acacia ayersiana* and *Acacia inaequilatera*, over low open shrubs dominated by *Corchorus lasiocarpus* and *Senna artemisioides* subsp. *helmsii*, over hummock grassland dominated by *Triodia wiseana* on rocky ironstone hills on red clay loam (**Table 5-2**).
- Excavation areas - low open shrubland dominated by \**Aerva javanica* and *Ptilotus clementii*, over low grasses and forbs dominated by *Enneapogon caerulescens* and *Senna notabilis*, on an old excavation area on the edge of the quarry on grey brown clay loam (**Table 5-3**).
- Hummock grasslands - low isolated *Hakea chordophylla* trees, over mid open shrubland dominated by *Acacia bivenosa*, *Acacia adsurgens* and *Acacia tetragonophylla*, over hummock grassland dominated by *Triodia wiseana*, on ironstone plains of brown orange clay loam (**Table 5-4**).
- Open *Acacia* Shrubland - mid open shrubland dominated by *Acacia incurvaneura* and *Acacia pruinocarpa*, over low sparse shrubs dominated by *Senna artemisioides* subsp. *helmsii*, over open hummock grassland dominated by *Triodia wiseana* and *Triodia epactia*, with tussock grasses dominated by *Enneapogon caerulescens* and \**Cenchrus ciliaris* and *Paraneurachne muelleri* on ironstone plains with red loamy sand (**Table 5-5**).
- Rehabilitation areas - mid to low sparse shrubs dominated by *Acacia bivenosa*, *Scaevola spinescens* and *Senna artemisioides* subsp. *helmsii*, over open hummock grassland dominated by *Triodia wiseana* and *Triodia epactia* with mixed forbs and shrubs on a rehabilitated granite plain on orange clay loam (**Table 5-6**).
- Tussock grasslands - mid isolated trees of *Corymbia aspera*, over sparse shrubland dominated by *Pimelea ammodaridifolia*, over tall tussock grassland dominated by \**Cenchrus ciliaris* and *Aristida ingrata* on an orange brown clay loam plain that is prone to waterlogging (**Table 5-7**).


No Department of Parks and Wildlife (DPaW) listed<sup>1</sup> Threatened flora taxa or DPaW-listed Priority flora taxa were recorded during the field survey. No vegetation units comparable to any TECs<sup>1</sup> or PECs<sup>2</sup> were recorded within the Study Area. None of the habitats recorded within the Study Area were considered to be important to any fauna species of conservation significance. The vegetation within the Study Area was rated from 'excellent' to 'completely degraded' based on Keighery (1994). The primary impacts to habitat condition within the Study Area included mining operations, the

<sup>1</sup> as listed under the *Wildlife Conservation Act 1950* (WA) or the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)


<sup>2</sup> as listed under the *Wildlife Conservation Act 1950* (WA)

presence of waste dumps and windrows, vegetation clearing, sand excavation, vehicle movements, high-density weed infestations and the presence of rabbits.


**Table 5-1: Habitat type: Waste Dumps.**

Name	Easting	Northing	Landform	Condition	Disturbance			
Waste Dump	653995	7737498	Waste Dump	Degraded	Gully erosion, vehicle tracks, weeds, clearing			
% Ground Cover	Rock	50						
	Soil	20						
	Leaf Litter	0						
	Vegetation	30						
Rocks	Type	Dolerite						
	Size (mm)	6-2000						
	Abundance (%)	50-90						
	Exposed Bedrock	0						
Soil	Type	Clay loam						
	Colour	Red brown						
Habitat Features	Water	None	<b>Vegetation</b>					
	Fire Presence	Unknown	Stratum	Form	Stage	Height (m)	Cover (%)	Species
	Woody Debris	None	Upper	Shrub	Advanced regeneration	1-3	0-25	<i>Corymbia hamersleyana, Acacia pruinocarpa, Acacia adsurgens</i>
	Peeling Bark	None						
	Rock Crevices	None	Middle	Shrub	Advanced regeneration	0.5-1.5	0-15	<i>*Aerva javanica, Corchorus lasiocarpus, Indigofera monophylla</i>
	Burrowing Suitability	Moderate						
	Tree Hollows (<10cm)	None	Lower	Tussock grass	Advanced regeneration	0.2-0.7	5-60	<i>*Cenchrus ciliaris, Triodia wiseana, Enneapogon caeruleus</i>
	Tree Hollows (>10cm)	None						


**Table 5-2: Habitat type: Rocky Hill.**

Name	Easting	Northing	Landform	Condition	Disturbance			
Rocky Hill	653885	7737113	Low hills	Excellent	Dust			
% Ground Cover	Rock	50						
	Soil	5						
	Leaf Litter	0						
	Vegetation	45						
Rocks	Type	Ironstone						
	Size (mm)	6-600						
	Abundance (%)	50-90						
	Exposed Bedrock (%)	50-90						
Soil	Type	Clay loam						
	Colour	Red						
Habitat Features	Water	None	<b>Vegetation</b>					
	Fire Presence	>15 years	Stratum	Form	Stage	Height (m)	Cover (%)	Species
	Woody Debris	Rare	Upper	Shrub	Mature phase	2-6	0-10	<i>Hakea chordophylla</i> , <i>Acacia ayersiana</i>
	Peeling Bark	Rare						
	Rock Crevices	None	Middle	Shrub	Mature phase	0.6-3	0-5	<i>Acacia inaequilatera</i> , <i>Corchorus lasiocarpus</i> , <i>Sida</i> sp. Spiciform panicles (E. Leyland s.n. 14/8/90)
	Burrowing Suitability	None						
	Tree Hollows (<10cm)	Rare	Lower	Hummock grass	Senescent phase	0.4-0.7	40-90	<i>Triodia wiseana</i> , <i>Enneapogon caeruleus</i>
	Tree Hollows (>10cm)	None						

**Table 5-3: Habitat type: Excavation Area.**


Name	Easting	Northing	Landform	Condition	Disturbance													
Excavation Area	653885	7737113	Slope	Completely Degraded	Clearing, Weeds, active sheet erosion													
% Ground Cover	Rock	85																
	Soil	5																
	Leaf Litter	0																
	Vegetation	10																
Rocks	Type	Dolerite																
	Size (mm)	2-2000																
	Abundance (%)	50-90																
	Exposed Bedrock	No																
Soil	Type	Clay loam																
	Colour	Grey brown																
Habitat Features	Water	None	<b>Vegetation</b>															
	Fire Presence	None	Stratum	Form	Stage	Height (m)	Cover (%)	Species										
	Woody Debris	None	Upper	Shrub	Advanced regeneration	0.5-0.8	0-10	<i>Aerva javanica</i> , <i>Trichodesma zeylanicum</i>										
	Peeling Bark	None																
	Rock Crevices	None	Middle	Shrub	Advanced regeneration	0.2-0.4	0-10	* <i>Cenchrus ciliaris</i> , <i>Enneapogon caeruleus</i> , <i>Ptilotus clementii</i>										
	Burrowing Suitability	Low																
	Tree Hollows (<10cm)	None	Lower	Forb	Early regeneration	0.01-0.1	0-1	<i>Euphorbia australis</i> subsp. <i>subtomentosa</i> , <i>Senna notabilis</i> , <i>Salsola australis</i> , <i>Ptilotus nobilis</i>										
	Tree Hollows (>10cm)	None																

**Table 5-4: Habitat type: Hummock Grassland.**


Name	Easting	Northing	Landform	Condition	Disturbance			
Hummock Grassland	654008	7737023	Plain	Very good	Vehicle tracks, weeds			
% Ground Cover	Rock	10						
	Soil	25						
	Leaf Litter	5						
	Vegetation	60						
Rocks	Type	Ironstone						
	Size (mm)	6-200						
	Abundance (%)	10-20						
	Exposed Bedrock	<2%						
Soil	Type	Clay loam						
	Colour	Brown orange						
Habitat Features	Water	None	<b>Vegetation</b>					
	Fire Presence	>15 years	Stratum	Form	Stage	Height (m)	Cover (%)	Species
	Woody Debris	Rare	Upper	Shrub	Mature phase	2-6	10-30	<i>Acacia bivenosa</i> , <i>Acacia adsurgens</i> , <i>Acacia tetragonophylla</i>
	Peeling Bark	Rare						
	Rock Crevices	None	Middle	Shrub	Uneven age	1-2	10-30	<i>Senna artemisioides</i> subsp. <i>helmsii</i> , <i>Solanum lasiophyllum</i> , <i>Ptilotus obovatus</i>
	Burrowing Suitability	Moderate						
	Tree Hollows (<10cm)	Rare	Lower	Hummock grass	Mature phase	0.4-0.8	30-90	<i>Triodia wiseana</i> , <i>Cymbopogon ambiguus</i>
	Tree Hollows (>10cm)	None						




**Table 5-5: Habitat type: Open *Acacia* Shrubland.**

Name	Easting	Northing	Landform	Condition	Habitat Type													
Open <i>Acacia</i> Shrubland	658668	7717331	Plain	Good	Partly stabilised sheet erosion, vehicle tracks, weeds, clearing, rabbits													
% Ground Cover	Rock	5																
	Soil	75																
	Leaf Litter	0																
	Vegetation	20																
Rocks	Type	Ironstone																
	Size (mm)	6-60																
	Abundance (%)	2-10																
	Exposed Bedrock	2-10																
Soil	Type	Loamy sand																
	Colour	Red																
Habitat Features	Water	Prone to waterlogging	<b>Vegetation</b>															
	Fire Presence	5-15 years	Stratum	Form	Stage	Height (m)	Cover (%)	Species										
	Woody Debris	Rare	Upper	Shrub	Mature phase	2-3	0-20	<i>Acacia incurvaneura</i> , <i>Acacia pruinocarpa</i>										
	Peeling Bark	Rare																
	Rock Crevices	None	Middle	Shrub	Advanced regeneration	1-2	0-5	<i>Senna artemisioides</i> subsp. <i>helmsii</i>										
	Burrowing Suitability	High																
	Tree Hollows (<10cm)	Moderate	Lower	Hummock grass	Mature phase	0.3-0.5	0-25	<i>Triodia wiseana</i> , <i>Enneapogon caerulescens</i> , * <i>Cenchrus ciliaris</i> , <i>Triodia epactia</i>										
	Tree Hollows (>10cm)	None																

**Table 5-6: Habitat type: Rehabilitation Area.**

Name	Easting	Northing	Landform	Condition	Disturbance			
Rehabilitation Area	658943	7716771	Plain	Degraded	Partly stabilised sheet erosion, vehicle tracks, weeds, clearing			
% Ground Cover	Rock	40						
	Soil	40						
	Leaf Litter	0						
	Vegetation	20						
Rocks	Type	Granite						
	Size (mm)	2-60						
	Abundance (%)	50-90						
	Exposed Bedrock	2-10						
Soil	Type	Clay loam						
	Colour	Orange						
Habitat Features	Water	None	<b>Vegetation</b>					
	Fire Presence	Unknown	Stratum	Form	Stage	Height (m)	Cover (%)	Species
	Woody Debris	None	Upper	Shrub	Advanced regeneration	1-2	0-50	<i>Acacia bivenosa</i>
	Peeling Bark	None						
	Rock Crevices	None	Middle	Shrub	Advanced regeneration	0.4-1	0-10	Scaevola spinescens, Senna artemisioides subsp. helmsii
	Burrowing Suitability	Low						
	Tree Hollows (<10cm)	None	Lower	Hummock grass	Early regeneration	0.3-0.8	20-40	<i>Triodia wiseana, Triodia epactia</i>
	Tree Hollows (>10cm)	None						

**Table 5-7: Habitat type: Tussock Grassland.**

Name	Easting	Northing	Landform	Condition	Disturbance													
Tussock Grassland	658345	7716937	Plain	Degraded	Vehicle tracks, clearing, very high weed density													
% Ground Cover	Rock	0																
	Soil	10																
	Leaf Litter	5																
	Vegetation	85																
Rocks	Type	None																
	Size (mm)	2-20																
	Abundance (%)	<2																
	Exposed Bedrock	0																
Soil	Type	Clay loam																
	Colour	Orange brown																
Habitat Features	Water	Prone to waterlogging	<b>Vegetation</b>															
	Fire Presence	Unknown	Stratum	Form	Stage	Height (m)	Cover (%)	Species										
	Woody Debris	None	Upper	Tree	Mature phase	5-12	0-1	<i>Corymbia aspera</i>										
	Peeling Bark	None																
	Rock Crevices	None	Middle	Shrub	Mature phase	1-2	5-10	<i>Pimealea ammocharis</i> , <i>Eremophila longifolia</i>										
	Burrowing Suitability	Low																
	Tree Hollows (<10cm)	Rare	Lower	Tussock grass	Mature phase	0.8-1.2	50-100	* <i>Cenchrus ciliaris</i> , <i>Aristida ingrata</i>										
	Tree Hollows (>10cm)	None																

## 5.2 Flora Composition

A total of 73 flora taxa of conservation significance with the potential to occur in the Study Area were identified by the desktop study (**Appendix E**), with all taxa listed by the DPaW as Threatened or Priority flora (Department of Parks and Wildlife 2015e). Of these:

- none were identified within the Study Area during the April 2015 field survey;
- one was considered likely to occur in the Study Area;
- 20 were considered possible to occur in the Study Area; and
- 52 were considered unlikely to occur in the Study Area.

These rankings were assigned following definitions described in the desktop study methodology (**Section 3**). Flora included with the EPBC Protected Matters database search (Department of the Environment 2015a) was not included in this analysis as the results provided are very broad compared to the data provided by DPaW and the WA Herbarium records.

The taxon of conservation significance, considered likely to occur, was *Calotis latiuscula* (P3). *Calotis latiuscula* is an erect herb to 0.5 m high, with yellow flowers present from June to October (Department of Parks and Wildlife 2015e). *Calotis latiuscula* has previously been recorded on rocky hillsides, floodplains, rocky creeks and river beds (Department of Parks and Wildlife 2015e). The Study Area lies within the known distribution of the taxon, and is approximately 5 km from the nearest known population. Although the Study Area may contain suitable habitat, this taxon was not recorded during the field survey.

A total of 57 vascular flora taxa were recorded within the Study Area during the April 2015 field survey, representing 20 families and 36 genera (**Appendix F**). The most dominant families were Fabaceae (legumes; 16 taxa), Poaceae (grasses; 10 taxa) and Amaranthaceae (amaranths; 6 taxa). The most dominant genera were *Acacia* (11 taxa), *Ptilotus* (4 taxa) and *Senna* (3 taxa). No DPaW-listed<sup>3</sup> Threatened flora taxa or DPaW-listed Priority flora taxa were recorded during the field survey. No vascular flora range extensions were recorded. One taxon *Sclerolaena* sp. could not be wholly identified due to lack of reproductive material and the plant being dead. It is highly unlikely that it represents a Threatened or Priority listed flora as it is not analogous to any conservation significant flora taxa that were identified by the desktop study.

A total of three introduced flora taxa were recorded in the Study Area:

- *Aerva javanica* (Kapok Bush);
- *Cenchrus ciliaris* (Buffel grass); and
- *Tribulus terrestris* (Caltrop).

<sup>3</sup> as listed under the *Wildlife Conservation Act 1950* (WA) or the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)

There were no taxa listed as Declared Pests under the *Biosecurity and Agriculture Management Act 2007* (WA) (BAM Act). There were no taxa listed as Weeds of National Significance (WONS) (Department of the Environment 2015b) recorded within the Study Area.

### 5.3 Vertebrate Fauna Assemblage

A total of 14 vertebrate fauna species were recorded during the field survey (**Appendix I**), comprising two mammals (one native), 11 birds, one reptile and no amphibian species. No species of conservation significance were recorded during the field survey, and one introduced vertebrate fauna taxa was recorded; the rabbit (*Oryctolagus cuniculus*).

The desktop study identified 340 vertebrate fauna species that have previously been recorded within, or adjacent to, the Study Area; or may occur within the Study Area based on their distribution. This total comprised 45 mammal species, 186 birds, 100 reptile species and nine amphibians (**Appendix J**). A total of 34 taxa were considered species of conservation significance which have the potential to occur within the Study Area (**Appendix J**). Of these 34 species:

- eight species were listed as Threatened under the EPBC Act and/or Schedule 1 of the WC Act. Legislation has been developed at Commonwealth (EPBC Act) and State (WC Act) levels to protect species of fauna that have been formally recognised as rare, threatened with extinction or having high conservation value (**Appendix J**);
- eight were recognised by the DPaW as Priority fauna. DPaW recognises several species that are not listed under the WC Act or the EPBC Act, but for which there is some conservation concern, and has produced a supplementary list of Priority fauna (**Appendix J**);
- one species was listed as being recognised by State (WC Act) to be in need of special protection (**Appendix J**); and
- 19 species were listed as Migratory under the EPBC Act and Schedule 3 under the WC Act. Many species of migratory bird are listed under the EPBC Act, the WC Act and international agreements including the Japan-Australia Migratory Bird Agreement, the China-Australia Migratory Bird Agreement, the Republic of Korea-Australia Migratory Bird Agreement and the Bonn Convention on the Conservation of Migratory Species of Wild Animals (**Appendix J**).

Note that some of the species referred to above, listed as Threatened, Migratory and/or Priority fauna, may be included in multiple listed categories. The likelihood of occurrence in the Study Area of each of these species of conservation significance has been assessed and ranked (**Appendix H**).

Based on the proximity of records and the occurrence of habitat within the Study Area, it is considered that three species could possibly occur (the Eastern Great Egret [Mig], Fort-tailed Swift [Mig], and the skink *Lerista macropisthopus remota* [P2]); and two species are likely to occur (the Rainbow Bee-eater [Mig] and Australian Bustard [P4]). No threatened species were assessed as possible or likely to occur.

## 6 Risk Assessment

A risk assessment (risk matrix provided by Holcim) was completed for the Study Area. Based on the results of the RBA, and subsequent risk assessment, it was determined that the risk of the proposed development of the Newman Quarry to local biodiversity was low, and that a Holcim Biodiversity Action Plan (BAP) would not be required.

**Table 6-1: Flora and fauna biodiversity risk assessment.**

1. What is the biodiversity importance of the site?

Biodiversity Importance	Unknown	Global	National	Local	Low
Is the site important for species or area?	No				
FLORA	<p><i>The RBA undertaken for the Newman Quarry provides information on flora and vegetation to allow assessment of the ecological values of the area. No TECs or PECs were recorded within, or adjacent to, the subject site, or have the potential to occur at the site. No Threatened or Priority Flora was recorded at the site during the RBA.</i></p> <p><i>Four weed species were recorded at the Study Area Aerva javanica, Cenchrus ciliari, Vachellia farnesiana and Tribulus terrestris. No Declared Plants or Weeds of National Significance were recorded.</i></p>				
FAUNA	<p><i>The RBA undertaken for the Newman Quarry provides information on fauna and habitats to allow assessment of the ecological values of the area. No critical or regionally-significant habitat occurs. No threatened species are likely to occur. Three Migratory-listed species and two Priority-listed species are either likely to occur or possibly occur. Habitats present are widespread throughout the region.</i></p>				
What is the importance category? (threat category for species, protection category for area).	<p><i>The biodiversity importance of the Newman Quarry is of Low importance.</i></p>				

**Table 6-2: Risk assessment matrices.**

2. Determine the potential impact using the impact matrix.

Likelihood of Impact	Ability to mitigate				
	Unknown	Irreversible	Difficult to Mitigate	Can be Mitigated by Company Action	Easily Reversed Naturally
Unknown					
Almost Certain					
Likely					
Moderately Likely					
Unlikely				<b>Low</b>	
Positive					

Impact Matrix

Likelihood Category?	Unknown	Almost Certain	Likely	Moderately Likely	<b>Unlikely</b>	
Likelihood Explanation.	<i>No conservation significant flora, vegetation or habitat occurs. No threatened fauna species are likely to occur.</i>					
Ability to Mitigate Category?	Unknown	Irreversible	Difficult to Mitigate	<b>Can be Mitigated by Company Action</b>	Easily Reversed Naturally	
Ability to Mitigate Explanation.	<i>Cleared areas can be rehabilitated and weed management can be implemented to reduce the spread of introduced flora taxa.</i>					
Impact Category	Unknown	Very high	High	Moderate	<b>Low</b>	<b>Positive</b>

3. Determine the risk category using biodiversity importance and potential impact

Biodiversity Importance	Unknown	Very high	High	Moderate	Low	Positive
Unknown						
Global						
National						
Local						
Low					<b>Low</b>	

Risk Category?	Unknown	Critical	Significant	Medium	<b>Low</b>	Enhancement
Sensitive?	No BAP not required					



## 7 Limitations

This report is intended to present a RBA of the Study Area only, it should not be considered a comprehensive assessment of all flora taxa, vegetation and fauna issues required for formal environmental assessment. Given the scope of the work, the entire Study Area was not searched systematically for Threatened and Priority flora taxa. While it is unlikely that there is Threatened flora within the Study Area this should be taken into account for future operations. Despite these limitations, the RBA is considered to provide a good indication of the biodiversity values of the Study Area.

## 8 Conclusions

A total of seven broad vegetation units/habitat types were identified and mapped. None of the vegetation units were analogous to any TECs or PECs listed as occurring in the region. None of the vegetation units are considered locally or regionally significant. The vegetation condition of the Study Area ranged from 'excellent' to 'completely degraded', with primary impacts consisting of mining operations, the presence of waste dumps and windrows, vegetation clearing, sand excavation, vehicle movements, high-density weed infestations and the presence of rabbits.

The desktop study identified one conservation significant flora taxon *Calotis latiuscula* (P3) as likely to occur, however this taxon was not recorded within the Study Area. There were no DPaW-listed Threatened flora taxa or DPaW-listed Priority flora taxa recorded in the desktop assessment. The survey identified three introduced flora taxa. There were no range extensions.

A total of 57 vascular flora taxa were recorded within the Study Area during the April 2015 field survey, representing 20 families and 36 genera. The most dominant families were Fabaceae (legumes; 16 taxa), Poaceae (grasses; 10 taxa) and Amaranthaceae (amaranths; 6 taxa). The most dominant genera were *Acacia* (11 taxa), *Ptilotus* (4 taxa) and *Senna* (3 taxa).

A total of 14 vertebrate fauna species were recorded during the field survey, comprising two mammals (one native), 11 birds, one reptile and no amphibian species. No species of conservation significance were recorded during the field survey.

The desktop study identified 34 vertebrate fauna taxa of conservation significance that have previously been recorded within the vicinity of the Study Area. An assessment of likelihood of occurrence of these species over the Study Area was made. Based on the proximity of these records and the occurrence of habitat within the Study Area, it is considered that three species could possibly occur (the Eastern Great Egret [Mig], Fort-tailed Swift [Mig], and the skink *Lerista macropisthopus remota* [P2]), and two species are likely to occur (the Rainbow Bee-eater [Mig] and Australian Bustard [P4]). No threatened species were assessed as possibly or likely to occur, and in respect to the Priority-listed and Migratory species above none are considered to be dependent on the habitat within the Study Area.

A risk assessment was completed for the Study Area. Based on the results of the RBA, and subsequent risk assessment, it was determined that the risk of the proposed development of the Newman Quarry to local biodiversity was low, and that a Holcim BAP would not be required.

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## **Appendix A      Codes and terms used to describe flora and vegetation of conservation significance**



**Definitions of Codes and Terms used to Describe Conservation Significance of Flora**

Status	Code	Description
<b>Schedule 1 of the Wildlife Conservation (Rare Flora) Notice under the <i>Wildlife Conservation Act 1950</i></b>		
Threatened	T	Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such
<b>Schedule 2 of the Wildlife Conservation (Rare Flora) Notice under the <i>Wildlife Conservation Act 1950</i></b>		
Presumed Extinct Flora	X	Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such
<b>Threatened Flora (Schedule 1) are further ranked by DPAW according to their level of threat using IUCN Red List criteria:</b>		
Critically Endangered	CR	considered to be facing an extremely high risk of extinction in the wild
Endangered	EN	considered to be facing a very high risk of extinction in the wild
Vulnerable	VU	considered to be facing a high risk of extinction in the wild.
<b>DPAW Priority List</b>		
Priority One (Poorly known taxa)	P1	Taxa that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.
Priority Two (Poorly known taxa)	P2	Taxa that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.
Priority Three (Poorly known taxa)	P3	Taxa that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.
Priority Four (Near threatened or other taxa in need of monitoring)	P4	<ol style="list-style-type: none"> <li>1. Rare. Taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands.</li> <li>2. Near Threatened. Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.</li> <li>3. Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.</li> </ol>
Priority Five (Conservation dependent taxa)	P5	Taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxon becoming threatened within five years.

**Definitions for Threatened Ecological Communities (TEC)**

TECs are indirectly protected under the Western Australian Environmental Protection Act 1986 and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004.

**Presumed Totally Destroyed (PD)**

An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future. An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies (A or B):

- A) Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats or
- B) All occurrences recorded within the last 50 years have since been destroyed.

**Critically Endangered (CR)**

An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated. An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C):

- A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii):
  - i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years);
  - ii) modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated.
- B) Current distribution is limited, and one or more of the following apply (i, ii or iii):
  - i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years);
  - ii) There are very few occurrences, each of which is small and/or isolated and extremely Vulnerable to known threatening processes;
  - iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely Vulnerable to known threatening processes.
- C) The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years).

**Endangered (EN)**

An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future. An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B, or C):

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

- i) the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years);
  - ii) modification throughout its range is continuing such that in the short term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated.
- B) Current distribution is limited, and one or more of the following apply (i, ii or iii):
- i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years);
  - ii) there are few occurrences, each of which is small and/or isolated and all or most occurrences are very Vulnerable to known threatening processes;
  - iii) there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very Vulnerable to known threatening processes.
- C) The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).

#### **Vulnerable (VU)**

An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range. An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B or C):

- A) The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated.
- B) The ecological community may already be modified and would be Vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations.
- C) The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.

#### **Definitions for Priority Ecological Communities (PEC)**

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

#### **Priority One: Poorly-known ecological communities**

Ecological communities that are known from very few occurrences with a very restricted distribution (generally =5 occurrences or a total area of = 100ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey

requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.

**Priority Two: Poorly-known ecological communities**

Communities that are known from few occurrences with a restricted distribution (generally =10 occurrences or a total area of =200ha). At least some occurrences are not believed to be under immediate threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.

**Priority Three: Poorly known ecological communities**

- (i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or:
- (ii) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or;
- (iii) communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.

**Priority Four:**

- I. *Rare*. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands.
- II. *Near Threatened*. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.
- III. *Ecological communities that have been removed from the list of threatened communities during the past five years*.

These communities require regular monitoring.

**Priority Five: Conservation Dependent ecological communities**

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

## **Appendix B Codes and terms used to describe fauna of conservation significance**

Fauna may be accorded legislative protection by being listed under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) and/or the *Wildlife Conservation Act 1950* (WA) (WC Act), or by being listed on the WA Department of Environment and Conservation's *Priority Species List*. This Appendix presents a summary of the different rankings and listings used to describe conservation status. Some categories, such as 'extinct', 'extinct in the wild' and 'conservation dependent' (EPBC Act) are not presented here, as the table includes only the information needed to fully understand the codes presented in the preceding report. Refer to the relevant legislation for a full description of all codes in use, as well as their associated criteria.

### Definitions of Codes and Terms Used to Describe Conservation Significance Status

Status	Code	Description
<b>Categories used under the EPBC Act</b>		
Critically Endangered	CR	Fauna that is considered to be facing an extremely high risk of extinction in the wild in the immediate future
Endangered	EN	Fauna that is considered to be facing a very high risk of extinction in the wild in the near future
Vulnerable	VU	Fauna that is considered to be facing a high risk of extinction in the wild in the medium-term future
Migratory	M	Species that migrate to, over and within Australia and its external territories.
<b>Schedules used under the WC Act</b>		
Schedule 1	S1	Fauna that is rare or likely to become extinct. Threatened fauna listed under Schedule 1 of the WC Act are further ranked by the DEC, according to the level of threat facing each species. The ranks are CR, EN and VU.
	CR	Critically endangered: considered to be facing an extremely high risk of extinction in the wild
	EN	Endangered: considered to be facing a very high risk of extinction in the wild
	VU	Vulnerable: considered to be facing a high risk of extinction in the wild
Schedule 2	S2	Fauna that is presumed to be extinct
Schedule 3	S3	Birds that are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds
Schedule 4	S4	Fauna that is in need of special protection, other than for reasons mentioned above
	SP	Requires special protection
<b>DEC Priority Fauna Lists</b>		
Priority 1	P1	Taxa with few, poorly known populations on threatened lands. These are known from few specimens or sight records from one or a few localities on lands not managed for conservation, eg agricultural or pastoral lands, urban areas, active mineral leases. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority 2	P2	Taxa with few, poorly known populations on conservation lands. These are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation, eg national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority 3	P3	Taxa with several, poorly known populations, some on conservation lands. These are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority 4	P4	Taxa in need of monitoring. These are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands.
Priority 5	P5	Taxa in need of monitoring. These are not considered threatened but are subject to a specific conservation programme, the cessation of which would result in the species becoming threatened within five years.

## **Appendix C    Vegetation condition scale**

**Vegetation Condition Scale (Keighery 1994)**

Code	Description
<b>Pristine</b>	Pristine or nearly so. No obvious signs of disturbance.
<b>Excellent</b>	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
<b>Very Good</b>	Vegetation structure altered obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
<b>Good</b>	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
<b>Degraded</b>	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
<b>Completely Degraded</b>	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.



## **Appendix D    Vegetation structural scales**

**NVIS Vegetation Structural Classifications**

Cover Characteristics							
Foliage cover *	70-100	30-70	10-30	<10	≈0	0-5	unknown
Crown cover **	>80	50-80	20-50	0.25-20	<0.25	0-5	unknown
% Crown cover ***	>80	50-80	20-50	0.25-20	<0.25	0-5	unknown
Cover code	d	c	i	r	bi	bc	unknown

Growth Form	Height Ranges (m)	Structural Formation Classes						
tree, palm	>30 Tall	closed forest	open forest	woodland	open woodland	isolated trees	isolated clumps of trees	trees
	10-30 Mid							
	<10 Low							
tree mallee	10-30 Tall	closed mallee forest	open mallee forest	mallee woodland	open mallee woodland	isolated mallee trees	isolated clumps of mallee trees	mallee trees
	<10 Mid							
	<3 Low							
shrub, cycad, grass-tree, fern	>2 Tall	closed shrubland	shrubland	open shrubland	sparse shrubland	isolated shrubs	isolated clumps of shrubs	shrubs
	1-2 Mid							
	<1 Low							
mallee shrub	10-30 Tall	closed mallee shrubland	mallee shrubland	open mallee shrubland	sparse mallee shrubland	isolated mallee shrubs	isolated clumps of mallee shrubs	mallee shrubs
	<10 Mid							
	<3 Low							
heath shrub	>2 Tall	closed heathland	heathland	open heathland	sparse heathland	isolated heath shrubs	isolated clumps of heath shrubs	heath shrubs
	1-2 Mid							
	<1 Low							
chenopod shrub	>2 Tall	closed chenopod shrubland	chenopod shrubland	open chenopod shrubland	sparse chenopod shrubland	isolated chenopod shrubs	isolated clumps of chenopod shrubs	chenopod shrubs
	1-2 Mid							
	<1 Low							
samphire shrub	>0.5 Low	closed	samphire	open	sparse	isolated	isolated clumps	samphire

Growth Form	Height Ranges (m)	Structural Formation Classes						
	<0.5 Low	samphire shrubland	shrubland	samphire shrubland	samphire shrubland	samphire shrubs	of samphire shrubs	shrubs
hummock grass	>2 Tall	closed hummock grassland	hummock grassland	open hummock grassland	sparse hummock grassland	isolated hummock grasses	isolated clumps of hummock grasses	hummock grasses
	<2 Tall							
tussock grass	>0.5 Mid	closed tussock grassland	tussock grassland	open tussock grassland	sparse tussock grassland	isolated tussock grasses	isolated clumps of tussock grasses	tussock grasses
	<0.5 Low							
other grass	>0.5 Mid	closed grassland	grassland	open grassland	sparse grassland	isolated grasses	isolated clumps of grasses	other grasses
	<0.5 Low							
sedge	>0.5 Mid	closed sedgeland	sedgeland	open sedgeland	sparse sedgeland	isolated sedges	isolated clumps of sedges	sedges
	<0.5 Low							
rush	>0.5 Mid	closed rushland	rushland	open rushland	sparse rushland	isolated rushes	isolated clumps of rushes	rushes
	<0.5 Low							
forb	>0.5 Mid	closed forbland	forbland	open forbland	sparse forbland	isolated forbs	isolated clumps of forbs	forbs
	<0.5 Low							
fern	>2 Tall	closed fernland	fernland	open fernland	sparse fernland	isolated ferns	isolated clumps of ferns	ferns
	1-2 Tall							
	<1 Low							
bryophyte	<0.5	closed bryophyte land	bryophyte land	open bryophyte land	sparse bryophyte land	isolated bryophytes	isolated clumps of bryophytes	bryophytes
lichen	<0.5	closed lichenland	lichenland	open lichenland	sparse lichenland	isolated lichens	isolated clumps of lichens	lichens
vine	>30 Tall	closed vineland	vineland	open vineland	sparse vineland	isolated vines	isolated clumps of vines	vines
	10-30 Med							
	<10 Low							
aquatic	<1 Tall	closed aquatic bed	aquatic bed	open aquatic bed	sparse aquatics	isolated aquatics	isolated clumps of aquatics	aquatics
	0-0.5 Low							
seagrass	<1 Tall	closed seagrass bed	seagrassbed	open seagrassbed	sparse seagrassbed	isolated seagrasses	isolated clumps of seagrasses	seagrasses
	0-0.5 Low							

From: NVIS Structural Formation Terminology (Australian Vegetation Attribute Manual Version 6.0 August 2003 <http://www.environment.gov.au/erin/nvis/publications/avam/pubs/vegetation-attribute-manual-6.pdf>)

\* Foliage Cover is defined for each stratum as 'the proportion of the ground, which would be shaded if sunshine came from directly overhead'. It includes branches and leaves and is similar to the Crown type of Walker & Hopkins (1990) but is applied to a stratum or plot rather than an individual crown. It is generally not directly measured in the field for the upper stratum, although it can be measured by various line interception methods for ground layer vegetation. For the attribute COVER CODE in the Stratum table, the ground cover category refers to ground foliage cover not percentage cover.

\*\* Crown Cover (canopy cover) as per Walker & Hopkins (1990). Although relationships between the two are dependent on season, species, species age etc (Walker & Hopkins (1990), the crown cover category classes have been adopted as the defining measure.

\*\*\* The percentage cover is defined as the percentage of a strictly defined plot area, covered by vegetation. This can be an estimate and is a less precise measure than using, for example, a point intercept transect methods on ground layer, or overstorey vegetative cover. That is for precisely measured values (e.g. crown densitometer or point intercept transects) the value measured would be 'foliage' cover. Where less precise or qualitative measures are used these will most probably be recorded as 'percentage' cover.

# **Appendix E Conservation significant flora taxa identified as potentially occurring within the Study Area**

Species Name	Conservation Status	Habitat <sup>1</sup>	Recorded in the Literature Review	Likelihood of Occurrence in the Study Area	Reason
<i>Lepidium catapycnon</i>	T	Along tracks, hillslopes, shale slopes, breakaways on drainage lines, on red loam over ironstone	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Thryptomene wittweri</i>	T	Granite hills, steep boulder scree slopes, vertical cliff faces, breakaways, skeletal red brown soil on banded ironstone formations	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Acacia</i> sp. East Fortescue (J. Bull & D. Roberts ONS A 27.01)	P1	Hills slopes and edge of hillcrests on red sandy loam	Yes ~40 km east of the Study Area	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Barbula ehrenbergii</i>	P1	Previously found growing in a very thick layer of a gorge wall restricted to a small area where water trickles down the wall. On iron rich rock, weathered conglomerate	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Bothriochloa decipiens</i> var. <i>cloncurrans</i>	P1	Previously found growing in a small, seasonally damp depression on a plain between a river and low hills on re-brown loam. Also found on a stony clay plain on red-brown clay loam with a sparse surface ironstone mantle	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Brachyscome</i> sp. Wanna Munna Flats (S. van Leeuwen 4662)	P1	Previously found growing on red medium clay over banded ironstone formations, on red clay loam flats and on gentle slopes on undulating plains	No	Possible	The Study Area may contain suitable habitat and the nearest known location is 5 km south of the Study Area
<i>Calotis squamigera</i>	P1	Pebbly loam	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Cochlospermum macnamarae</i>	P1	Previously found growing on granite boulders and hills with exposed granite faces and domes	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Eragrostis</i> sp. Mt Robinson (S. van Leeuwen 4109)	P1	Red-brown skeletal soils, ironstone. Steep slopes, summits	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Eremophila appressa</i>	P1	Ironstone gravel. Ridge slopes	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Eremophila pilosa</i>	P1	Previously found growing in shallow depressions in sand plains on red brown clay loamy soil	No	Unlikely	The Study Area lies outside the known distribution of the species
<i>Eremophila</i> sp. Hamersley Range (K. Walker KW 136)	P1	Hill crest, cliff top, gorge top, steep rock slopes and scree	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Eremophila</i> sp. Snowy Mountain (S. van Leeuwen 3737)	P1	Summit of hills, high in landscape on skeletal red gritty soil over massive ironstone formation	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Eremophila</i> sp. West Angelas (S. van Leeuwen 4068)	P1	High in landscape on hill summits, gently undulating to steep terrain, skeletal gritty red soil over BIF	No	Unlikely	The Study Area is unlikely to contain suitable habitat

Species Name	Conservation Status	Habitat <sup>1</sup>	Recorded in the Literature Review	Likelihood of Occurrence in the Study Area	Reason
<i>Eucalyptus lucens</i>	P1	Ironstone. Rocky slopes and mountain tops, high in the landscape	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Hibiscus</i> sp. Mt Brockman (E. Thoma ET 1354)	P1	Gentle to steep sloping gully floor with boulders, in steep rocky gorge and rocky crevices on red brown sand, BIF ironstone gravel	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Myriocephalus scalpellus</i>	P1	On Claypan edges, depressions, floodplains	No	Unlikely	The Study Area lies outside the known distribution of the species
<i>Nicotiana heterantha</i>	P1	Seasonally inundated flats floodplains, watercourses, saline plains on orange brown alluvial sand over ironstone	No	Unlikely	The Study Area lies outside the known distribution of the species
<i>Sida</i> sp. Hamersley Range (K. Newbey 10692)	P1	Gorges, breakaways, hill summits, ironstone cliffs on stony loamy sand	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Stemodia</i> sp. Battle Hill (A.L. Payne 1006)	P1	Valleys, flats, floodplains on cracking clay	No	Unlikely	The Study Area lies outside the known distribution of the species
<i>Tecticornia</i> sp. Christmas Creek (K.A. Shepherd & T. Colmer et al. KS 1063)	P1	Hillsides, open depressions, floodplains, salt lakes red clayey sand	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Tetrateca fordiana</i>	P1	Cliff faces, rocky ridgelines, shale on ironstone	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Teucrium pilbaranum</i>	P1	Plains, low slopes, rocky outcrops, crabhole plains, river beds on red clay loam	No	Unlikely	The Study Area lies outside the known distribution of the species and is unlikely to contain suitable habitat
<i>Triodia</i> sp. Karijini (S. van Leeuwen 4111) PN	P1	Slopes, black ironstone with outcropping, skeletal dark orange-brown loam soil on banded ironstone formations	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Triodia triticoides</i>	P1	Sandstone hills	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Vittadinia</i> sp. Coondewanna Flats (S. van Leeuwen 4684)	P1	Plains on red sandy clay-loam ironstone pebbles and gravel	No	Unlikely	The Study Area lies outside the known distribution of the species.
<i>Adiantum capillus-veneris</i>	P2	Moist, sheltered sites in gorges and on cliff walls	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Eremophila forrestii</i> subsp. Pingandy (M.E. Trudgen 2662)	P2	Previously found growing on alluvial plains, broad drainage lines, along breakaways on red brown clay loam over ironstone	No	Unlikely	The Study Area lies outside the known distribution of the species

Species Name	Conservation Status	Habitat <sup>1</sup>	Recorded in the Literature Review	Likelihood of Occurrence in the Study Area	Reason
<i>Goodenia hartiana</i>	P2	Sand. Sand dune swales, sandhills	No	Unlikely	The Study Area is just outside the known distribution and is ~40 km west of the nearest known location of the species, and is unlikely to contain suitable habitat.
<i>Hibiscus</i> sp. Gurinbidy Range (M.E. Trudgen MET 15708)	P2	Along rocky gullies, amongst low rocky hills, rocky slopes on skeletal red-brown stony soil	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Ipomoea racemigera</i>	P2	Flat bedded creekline on basalt	No	Possible	The Study Area is 5 km north of the nearest known location, however it is unlikely to contain suitable habitat.
<i>Isotropis parviflora</i>	P2	Valley slope of ironstone plateau	No	Possible	The Study Area is 30 km south east of the nearest known location and may contain suitable habitat.
<i>Oxalis</i> sp. Pilbara (M.E. Trudgen 12725)	P2	Plains, creeklines, gullies on deep brown clayey loam	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Pentalepis trichodesmoides</i> subsp. <i>hispidia</i>	P2	On hills, slopes, ridgelines, creek banks, scree, red brown gravel over ironstone	No	Unlikely	The Study Area lies outside the known distribution of the species
<i>Scaevola</i> sp. Hamersley Range basalts (S. van Leeuwen 3675)	P2	Hill summits, steep slopes, ridgelines on skeletal brown soils	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Acacia daweana</i>	P3	Stony red loamy soils. Low rocky rises, along drainage lines	No	Unlikely	The Study Area lies outside the known distribution of the species.
<i>Acacia subtiliformis</i>	P3	Rocky calcrete plateau	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Amaranthus centralis</i>	P3	Previously found along riverbanks, on volcanic soils and on sandplains. Low in landscape, flat terrain, alluvial flat, gritty red damp clay loam	No	Possible	The Study Area lies within the known distribution of the species, however the nearest known location is ~50 km away and the Study Area is unlikely to contain habitat that is only marginally suitable
<i>Aristida jerichoensis</i> var. <i>subspinulifera</i>	P3	Hardpan plains	No	Possible	The Study Area is unlikely to contain suitable habitat, however the nearest location is only 5 km away.
<i>Atriplex flabelliformis</i>	P3	Clay loam, loam. Saline flats or marshes	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Calotis latiuscula</i>	P3	Rocky hillsides, floodplains, rocky creeks or river beds	No	Likely	The Study Area lies within the known distribution of the species, ~5 km from the nearest population and is likely to contain suitable habitat



Species Name	Conservation Status	Habitat <sup>1</sup>	Recorded in the Literature Review	Likelihood of Occurrence in the Study Area	Reason
<i>Crotalaria smithiana</i>	P3	Regeneration site on floodplain	No	Possible	The Study Area is just outside the known distribution of the species, ~30 km from the nearest location but is unlikely to contain suitable habitat.
<i>Dampiera anonyma</i>	P3	Skeletal red-brown to brown gravelly soil over banded ironstone, basalt, shale and jaspilite. Hill summits, upper slopes (above 1000 m)	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Dampiera metallorum</i>	P3	Skeletal red-brown gravelly soil over banded ironstone. Steep slopes, summits of hills	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Eremophila magnifica</i> subsp. <i>velutina</i>	P3	Skeletal soils over ironstone. Summits	No	Possible	The nearest known location is ~20 km away, however the Study Area is unlikely to contain suitable habitat
<i>Eremophila rigida</i>	P3	Hardpan plains, stony clay depressions	No	Possible	The Study Area is ~30 km away from the nearest known location, however is likely to contain habitat that is unsuitable or only marginally suitable
<i>Eucalyptus rowleyi</i>	P3	On plains in and alongside creekbeds and drainage lines. On steep rocky slopes high in landscapes. On light red brown soils and red loams	No	Unlikely	The Study Area lies outside the known distribution of the species and is unlikely to contain suitable habitat
<i>Fimbristylis sieberiana</i>	P3	Mud, skeletal soil pockets. Pool edges, sandstone cliffs	No	Unlikely	The Study Area lies outside the known distribution of the species and is unlikely to contain suitable habitat
<i>Geijera salicifolia</i>	P3	Skeletal soils, stony soils. Massive rock scree, gorges	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Goodenia lyrata</i>	P3	Red sandy loam. Near claypan	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Goodenia</i> sp. East Pilbara (A.A. Mitchell PRP 727)	P3	Red-brown clay soil, calcrete pebbles. Low undulating plain, swampy plains	No	Possible	The Study Area is ~25 km away from the nearest known location, however is likely to contain habitat that is unsuitable or only marginally suitable
<i>Grevillea saxicola</i>	P3	On low rocky hills and scree slopes on red brown sandy loam with ironstone pebbles	No	Unlikely	The Study Area lies outside the known distribution of the species
<i>Gymnanthera cunninghamii</i>	P3	Sandy soils	No	Possible	The Study Area is ~17 km away from the nearest known location, however is likely to contain habitat that is unsuitable or only marginally suitable

Species Name	Conservation Status	Habitat <sup>1</sup>	Recorded in the Literature Review	Likelihood of Occurrence in the Study Area	Reason
<i>Indigofera</i> sp. Bungaroo Creek (S. van Leeuwen 4301)	P3	Narrow creekbeds, and high energy creeks, watercourses, floodplains, riverbanks and gently undulating drainage lines on dry red brown sandy loam over ironstone	No	Unlikely	The Study Area lies outside the known distribution of the species
<i>Indigofera</i> sp. Gilesii (M.E. Trudgen 15869) PN	P3	Creeklines, gullies, hilltops, sand plains on pebbly red brown loam amongst rocks and boulders	No	Possible	The Study Area lies within the known distribution of the species, the nearest known location is ~35 km away, and the Study Area may contain suitable
<i>Iotasperma sessilifolium</i>	P3	Broad clay plains surrounded by hills, valleys, drainage lines dark reddish brown loose clay, cracking clay	No	Unlikely	The Study Area lies outside the known distribution of the species
<i>Maireana prosthecochoaeta</i>	P3	Laterite. Hills, salty places. In shallow depressions in rock on sandy soil on sandstone mesa, on flat white stone plains, along drainage lines, along breakaways on dry brown red sand, often associated with saline soils	No	Possible	The Study Area is ~46 km away from the nearest known location, however is likely to contain habitat that is unsuitable or only marginally suitable
<i>Nicotiana umbratica</i>	P3	On ridges, creeklines, breakaways in association with red soils and granite outcrops	No	Unlikely	The Study Area is outside the known distribution of the species
<i>Oldenlandia</i> sp. Hamersley Station (A.A. Mitchell PRP 1479)	P3	On flat plains, crabhole drainage depressions on dark reddish brown clay loam, cracking clay.	No	Unlikely	The Study Area is outside the known distribution of the species
<i>Pilbara trudgenii</i>	P3	Cliff faces, scree slopes, gorges, breakaways, hill summits on BIF	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Pleurocarpaea gracilis</i>	P3	Steep gullies, rocky slopes, hilltops, Mesa tops in association with BIF	No	Unlikely	The Study Area lies outside the known distribution of the species
<i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794)	P3	Flat alluvial plains red sandy loam over gravelly ironstone	No	Possible	The Study Area is ~20 km away from the nearest known location, however is likely to contain habitat that is unsuitable or only marginally suitable
<i>Rostellularia adscendens</i> var. <i>latifolia</i>	P3	Drainage lines, riverbeds, floodplains, creeks, hills, red-brown sandy loam soils	No	Possible	The Study Area lies within the known distribution of the species, however the is likely to contain habitat that is unsuitable or only marginally suitable
<i>Sida</i> sp. Barlee Range (S. van Leeuwen 1642)	P3	Drainage lines, steep rocky gullies, deep gorges, cliff lines, scree slopes, with orange BIF, red brown silt with gravel	No	Possible	The Study Area is ~40 km away from the nearest known location, however is likely to contain habitat that is unsuitable or only marginally suitable

Species Name	Conservation Status	Habitat <sup>1</sup>	Recorded in the Literature Review	Likelihood of Occurrence in the Study Area	Reason
<i>Solanum kentrocaule</i>	P3	Seasonal creeks, gorges, cliff faces, exposed outcrops, valleys, steep slopes, hill summits, on red-brown pebbly loam	No	Unlikely	The Study Area lies outside the known distribution of the species and is unlikely to contain suitable habitat
<i>Tecticornia medusa</i>	P3	Floodplains, lake beds, salt lakes, red clayey sand, samphire flats,	No	Unlikely	The Study Area is unlikely to contain suitable habitat
<i>Themeda</i> sp. Hamersley Station (M.E. Trudgen 11431)	P3	Clay pan, grass plain	No	Possible	The Study Area lies within the known distribution of the species, the nearest known location is ~27 km away, and the Study Area may contain suitable habitat
<i>Triodia</i> sp. Mt Ella (M.E. Trudgen 12739)	P3	Rocky slopes, scree slopes, breakaways, gorges, floodplains, in creekbeds, flow lines ironstone	Yes - Approx 30 km North east of the Study Area	Possible	The Study Area is ~30 km away from the nearest known location, however is likely to contain habitat that is unsuitable or only marginally suitable
<i>Triodia</i> sp. Robe River (M.E. Trudgen et al. MET 12367)	P3	Hillsides, hilltops, mesas, watercourses, drainage lines, creeklines, on ironstone, calcrete stone pebbles and gravel	No	Unlikely	The Study Area lies outside the known distribution of the species
<i>Acacia bromilowiana</i>	P4	Red skeletal stony loam, orange-brown pebbly, gravel loam, laterite, banded ironstone, basalt. Rocky hills, breakaways, scree slopes, gorges, creek beds.	No	Possible	The Study Area is ~35 km away from the nearest known location, however is likely to contain habitat that is unsuitable or only marginally suitable
<i>Eremophila magnifica</i> subsp. <i>magnifica</i>	P4	Skeletal soils over ironstone. Rocky screes.	No	Possible	The Study Area is ~20 km away from the nearest known location, however is likely to contain habitat that is unsuitable or only marginally suitable
<i>Goodenia nuda</i>	P4	In valleys, open depressions, along watercourse floodplains on orange brown alluvial sand over ironstone	Yes ~30 km northeast of the Study Area	Possible	The Study Area lies within the known distribution of the species, and the nearest known location is ~30 km away, and may contain suitable habitat
<i>Rhynchosia bungarensis</i>	P4	Hillsides, creekbeds, floodplains, perched wetlands, rocky slopes, on ironstone	No	Unlikely	The Study Area lies outside the known distribution of the species

## **Appendix F Inventory of vascular flora taxa recorded during the field survey**

Family	Taxon
Amaranthaceae	<i>*Aerva javanica</i>
	<i>Gomphrena kanisii</i>
	<i>Ptilotus clementii</i>
	<i>Ptilotus nobilis</i>
	<i>Ptilotus obovatus</i>
	<i>Ptilotus rotundifolius</i>
Asteraceae	<i>Pterocaulon sphacelatum</i>
Boraginaceae	<i>Trichodesma zeylanicum</i>
Chenopodiaceae	<i>Rhagodia eremaea</i>
	<i>Salsola australis</i>
	<i>Sclerolaena</i> sp.
Cleomaceae	<i>Cleome viscosa</i>
Euphorbiaceae	<i>Euphorbia australis</i> var. <i>subtomentosa</i>
	<i>Euphorbia biconvexa</i>
Fabaceae	<i>Acacia adsurgens</i>
	<i>Acacia ayersiana</i>
	<i>Acacia bivenosa</i>
	<i>Acacia dictyophleba</i>
	<i>Acacia inaequilatera</i>
	<i>Acacia incurvaneura</i>
	<i>Acacia maitlandii</i>
	<i>Acacia pruinocarpa</i>
	<i>Acacia spondylophylla</i>
	<i>Acacia synchronica</i>
	<i>Acacia tetragonophylla</i>
	<i>Indigofera monophylla</i>
	<i>Senna artemisioides</i> subsp. <i>helmsii</i>
	<i>Senna glutinosa</i> subsp. <i>glutinosa</i>
	<i>Senna notabilis</i>
<i>Vachellia farnesiana</i>	
Goodeniaceae	<i>Goodenia vilmorinae</i>
	<i>Scaevola amblyanthera</i> var. <i>centralis</i>
	<i>Scaevola spinescens</i>
Gyrostemonaceae	<i>Codonocarpus cotinifolius</i>
Malvaceae	<i>Corchorus lasiocarpus</i>
	<i>Hibiscus sturtii</i>
	<i>Sida</i> sp. <i>Excedentifolia</i> (J.L. Egan 1925)
	<i>Sida</i> sp. <i>spiciform panicles</i> (E. Leyland s.n. 14/8/90)

Family	Taxon
Myrtaceae	<i>Corymbia hamersleyana</i>
Nyctaginaceae	<i>Boerhavia repleta</i>
Plantaginaceae	<i>Stemodia grossa</i>
Poaceae	* <i>Cenchrus ciliaris</i>
	<i>Aristida contorta</i>
	<i>Aristida ingrata</i>
	<i>Cymbopogon ambiguus</i>
	<i>Enneapogon caerulescens</i>
	<i>Eragrostis elongata</i>
	<i>Eragrostis eriopoda</i>
	<i>Paraneurachne muelleri</i>
	<i>Triodia epactia</i>
	<i>Triodia wiseana</i>
Proteaceae	<i>Hakea chordophylla</i>
Rubiaceae	<i>Oldenlandia crouchiana</i>
Scrophulariaceae	<i>Eremophila longifolia</i>
Solanaceae	<i>Solanum lasiophyllum</i>
Thymelaeaceae	<i>Pimelea ammocharis</i>
Zygophyllaceae	* <i>Tribulus terrestris</i>

\*denotes an introduced taxa

## **Appendix G Flora taxa recorded within each habitat at the Study Area**

Taxon	Waste Dump	Excavation Area	Rocky Hill	Hummock Grassland	Open Acacia Shrubland	Rehabilitation Area	Tussock Grassland
<i>Acacia adsurgens</i>	x			x	x	x	
<i>Acacia ayersiana</i>			x				
<i>Acacia bivenosa</i>	x			x		x	
<i>Acacia dictyophleba</i>	x						
<i>Acacia inaequilatera</i>			x	x	x	x	
<i>Acacia incurvaneura</i>					x		
<i>Acacia maitlandii</i>	x						
<i>Acacia pruinocarpa</i>	x			x	x	x	
<i>Acacia spondylophylla</i>	x						
<i>Acacia synchronicia</i>							x
<i>Acacia tetragonophylla</i>			x	x	x		
<i>Aerva javanica</i>	x	x	x				
<i>Aristida contorta</i>	x				x	x	
<i>Aristida ingrata</i>							x
<i>Boerhavia repleta</i>	x						
<i>Cenchrus ciliaris</i>	x	x			x	x	x
<i>Cleome viscosa</i>	x						x
<i>Codonocarpus cotinifolius</i>			x				
<i>Corchorus lasiocarpus</i>	x		x	x	x	x	
<i>Corymbia hamersleyana</i>	x				x		
<i>Cymbopogon ambiguus</i>			x	x	x	x	
<i>Enneapogon caerulescens</i>	x	x	x		x	x	



Taxon	Waste Dump	Excavation Area	Rocky Hill	Hummock Grassland	Open Acacia Shrubland	Rehabilitation Area	Tussock Grassland
<i>Eragrostis elongata</i>	x						
<i>Eragrostis eriopoda</i>							x
<i>Eremophila longifolia</i>							x
<i>Euphorbia australis</i> var. <i>subtomentosa</i>	x	x				x	x
<i>Euphorbia biconvexa</i>							x
<i>Gomphrena kanisii</i>	x						
<i>Goodenia vilmoriniae</i>					x		
<i>Hakea chordophylla</i>			x	x	x		x
<i>Hibiscus sturtii</i>	x				x	x	
<i>Indigofera monophylla</i>	x		x	x		x	
<i>Oldenlandia crouchiana</i>	x						
<i>Paraneurachne muelleri</i>					x		
<i>Pimelea ammocharis</i>							x
<i>Pterocaulon sphacelatum</i>						x	
<i>Ptilotus clementii</i>		x					
<i>Ptilotus nobilis</i>	x	x		x			x
<i>Ptilotus obovatus</i>				x	x	x	
<i>Ptilotus rotundifolius</i>			x				
<i>Rhagodia eremaea</i>							x
<i>Salsola australis</i>	x	x		x			
<i>Scaevola amblyanthera</i> var. <i>centralis</i>	x						

Taxon	Waste Dump	Excavation Area	Rocky Hill	Hummock Grassland	Open Acacia Shrubland	Rehabilitation Area	Tussock Grassland
<i>Scaevola spinescens</i>						x	
<i>Sclerolaena sp.</i>	x					x	
<i>Senna artemisioides subsp. helmsii</i>	x		x	x	x	x	x
<i>Senna glutinosa subsp. glutinosa</i>	x						
<i>Senna notabilis</i>		x			x	x	
<i>Sida sp. Excedentifolia</i> (J.L. Egan 1925)							x
<i>Sida sp. spiciform panicles</i> (E. Leyland s.n. 14/8/90)	x		x			x	x
<i>Solanum lasiophyllum</i>				x		x	
<i>Stemodia grossa</i>						x	
<i>Tribulus terrestris</i>							x
<i>Trichodesma zeylanicum</i>		x		x		x	
<i>Triodia epactia</i>					x	x	
<i>Triodia wiseana</i>	x		x	x	x	x	
<i>Vachellia farnesiana</i>							x

## **Appendix H Fauna of conservation significance potentially occurring within the Study Area**

Common Name (Scientific Name)	Status		Habitat Type	Likelihood Of Occurrence Reason For Likelihood
	EPBC Act	WC Act		
Brush-tailed Mulgara <i>Dasyercus blythei</i>		P4	Sand plains and gibber plains with moderately dense spinifex with 'runways' between clumps (Van Dyck and Strahan 2008).	<b>Unlikely</b> The species has been recorded within the vicinity of the Study Area (~65 km east). However, the Study Area does not contain suitable habitat for the species.
Northern Quoll <i>Dasyurus hallucatus</i>	En	S1	In the Pilbara, ironstone ridges, scree slopes of sandstone or ironstone and granite boulders and outcrops (Van Dyck and Strahan 2008).	<b>Unlikely</b> The species has been recorded within the vicinity of the Study Area (~90 km north). The Study Area does contain some suitable habitat for the species; however the habitat type is restricted.
Long-tailed Dunnart <i>Sminthopsis longicaudata</i>		P4	Rocky, hilly areas, occasionally open areas with a stony, rocky mantle (Van Dyck and Strahan 2008).	<b>Unlikely</b> Few recent records of the species within the vicinity of the Study Area (~20 km north). The Study Area does contain some suitable habitat for the species; however the habitat type is restricted.
Pilbara Leaf-nosed Bat <i>Rhinonicteris aurantius</i> (Pilbara form)	Vu	S1	Roost in caves with high humidity (95%) and temperature (32°C). Forage along waterbodies with fringing vegetation (Armstrong 2001).	<b>Unlikely</b> The most recent DPaW (2015e) record located ~25 km north of the Study Area in 2014. The Study Area does not provide suitable roosting habitat, and is unlikely to provide suitable foraging habitat with more suitable habitat located adjacent (<10 km).
Ghost Bat <i>Macroderma gigas</i>		P4	Caves, rock piles and abandoned mines. Will travel 2 km from roost to hunt. Can disperse up to 50 km during non-breeding season.	<b>Unlikely</b> Few recent records of the species within the vicinity of the Study Area (~20 km north). The Study Area does not contain suitable habitat for the species.
Pebble-mound Mouse <i>Pseudomys chapmani</i>		P4	Spurs and rocky hills with many small pebbles vegetated by spinifex.	<b>Unlikely</b> Moderate number (>10) of recent records (most recent 2008) within the vicinity of the Study Area (<40 km). The Study Area does contain rocky habitat but associated vegetation is restricted to tussock grasses.
Northern Marsupial Mole <i>Notoryctes caurinus</i>	En	S1	Longitudinal sand dunes, inter-dunal flats and possibly sandy soils along river flats (Pearson and Turner 2000).	<b>Unlikely</b> No recent records located within or adjacent to the Study Area (~150 km east). No suitable habitat present within the Study Area.
Greater Bilby <i>Macrotis lagotis</i>	Vu	S1	Variety of habitats on soft soil including spinifex hummock grassland, acacia shrubland, open woodland and cracking clays (Burrows <i>et al.</i> 2012).	<b>Unlikely</b> Few recent records of the species within the vicinity of the Study Area (~90 km east). The Study Area contains some suitable habitat for the species.
Black-footed Rock Wallaby <i>Petrogale lateralis lateralis</i>	Vu	S1	Grassland habitat adjacent to cliffs, rock-piles or escarpments. Adequate rocky shelter and refuge are essential for breeding	<b>Unlikely</b> Few regional records. Suitable habitat is unavailable over the Study Area.
White-bellied Sea-Eagle <i>Haliaeetus leucogaster</i>	Mi	S3	Coastal and marine environments including large island rivers and lakes (Pizzey and Knight 2007).	<b>Unlikely</b> Previously recorded at Ophthalmia Dam ~12 km north of the

Common Name (Scientific Name)	Status		Habitat Type	Likelihood Of Occurrence Reason For Likelihood
	EPBC Act	WC Act		
			They nest on high ground such as pinnacles, rigid shrubs and tall trees (Johnstone and Storr 1998b).	Study Area (Birdlife Australia 2015). The species is casual in the Pilbara (Johnstone and Storr 1998b) and tends to breed on offshore islands or near-coastal areas. May be found near larger rivers adjacent to the Study Area (Johnstone <i>et al.</i> 2013, Johnstone and Storr 1998b). No suitable habitat within the Study Area.
Fork-tailed Swift <i>Apus pacificus</i>	Mi	S3	Aerial species, which forages high above the tree canopy and rarely lower (Johnstone and Storr 1998b).	<b>Possible</b> Previously recorded at Ophthalmia Dam. The next nearest record is located ~70 km northwest of the Study Area (2011) (Department of Parks and Wildlife 2015e). The Study Area is located within the species distribution, however the species is an irregular visitor within the region (Johnstone <i>et al.</i> 2013). It is possible that the species may fly over and forage above the Study Area, however limited woodland areas exist.
Cattle Egret <i>Ardea ibis</i>	Mi	S3	Short grass, especially damp pastures and wetlands usually in company of cattle (Johnstone and Storr 1998b).	<b>Unlikely</b> Previously recorded at Ophthalmia Dam in 2005 (Johnstone <i>et al.</i> 2013) and 2001 (Birdlife Australia 2015). Species considered a very rare visitor in the Pilbara (Johnstone <i>et al.</i> 2013). No suitable habitat within the Study Area.
Eastern Great Egret <i>Ardea modesta</i>	Mi	S3	Shallow freshwater, riverpools, claypans, swamps, lagoons, inundated pastures and wheatfields, ephemeral pools, dams and sewage ponds (Johnstone and Storr 1998b).	<b>Possible</b> Numerous records from drainage lines adjacent to the Study Area. The species is considered an uncommon to very common visitor to the Pilbara. Recorded breeding at Fortescue Marsh and Mulga Downs (Johnstone <i>et al.</i> 2013). However, there is no suitable habitat within the Study Area and there are several more preferable major drainage lines adjacent the Study Area.
Oriental Plover <i>Charadrius veredus</i>	Mi	S3	The species is found on sparsely vegetated plains including Samphire, Spinifex plains (particularly after fire), as well as beaches and tidal flats (Johnstone and Storr 2004b).	<b>Unlikely</b> Species identified from two databases, suggesting that 'habitat may occur' (Department of Parks and Wildlife 2015e). Nearest record located ~250 km north of the Study Area (Department of Parks and Wildlife 2015e). Species has been recorded at Newman Sewage ponds (Johnstone <i>et al.</i> 2013). Within the region, the species is common to coastal areas and may casually occur in inland areas (Johnstone <i>et al.</i> 2013). No suitable habitat within the Study Area.
Grey Falcon <i>Falco hypoleucos</i>		S1	Mainly lightly wooded coastal and riverine plains (Johnstone and Storr 1998b).	<b>Unlikely</b> Two records of the species approximately 30 km west of the Study area between 2000 & 2013. Although no suitable nesting habitat (cliffs) occur in the Study Area, suitable foraging habitat occurs within the Study Area and consequently it is possible the species may forage over the

Common Name (Scientific Name)	Status		Habitat Type	Likelihood Of Occurrence Reason For Likelihood
	EPBC Act	WC Act		
				Study Area from time to time.
Peregrine Falcon <i>Falco peregrinus</i>		S4	The species occurs along coastal cliffs, rivers and ranges as well as wooded watercourses and lakes nesting on cliffs, granite outcrops, quarries (Johnstone and Storr 1998b).	<b>Unlikely</b> Species recorded from within the vicinity of the Study Area (4 records, <26 km, 2006-2011) (Department of Parks and Wildlife 2015e). Potential for limited suitable habitat to exist.
Caspian Tern <i>Hydroprogne caspia</i>	Mi	S3	This species inhabits coastal areas as well as inland watercourses, saline and brackish lakes (Johnstone <i>et al.</i> 2013).	<b>Unlikely</b> Species identified from one database (Birdlife Australia 2015). Nearest record ~350 km north of the Study Area (Department of Parks and Wildlife 2015e). Common visitor to the Pilbara, but preferring coastal areas (Johnstone <i>et al.</i> 2013). No suitable habitat within the Study Area.
Rainbow Bee-eater <i>Merops ornatus</i>	Mi	S3	Lightly wooded, often sandy country, preferring areas near water (Johnstone and Storr 1998b).	<b>Likely</b> Species considered a partial migrant in the region and generally a common species (Barrett <i>et al.</i> 2003, Boland 2004). Previously recorded within the vicinity of Study Area, with adjacent drainage areas providing suitable breeding habitat. Minimal habitat within the Study Area but many occur as a forager or transient within.
Australian Bustard <i>Ardeotis australis</i>		P4	Occurs over much of WA, with the exception of heavily wooded area, prefers inland open, dry woodlands of Mulga, arid shrublands and tussock grasslands supporting spinifex (Ziembicki 2010).	<b>Likely</b> Species recorded within the vicinity of the Study Area (>20 records, <10 km of the Study Area) DPaW (2015e). Minimal suitable habitat The Mulga Woodland is likely to provide suitable habitat within the Study Area.
Australian Painted Snipe <i>Rostratula australis</i>	Vu, Mi	S1 En	Shallow, well-vegetated temporary or infrequently filled inland wetlands (Garnett <i>et al.</i> 2011).	<b>Unlikely</b> Very few inland records of this species within Pilbara region DPaW (2015e). Nearest known record from Coondiner Pool (~75 km northwest, 2012) (Knuckey <i>et al.</i> 2013). No suitable habitat within the Study Area.
Common Sandpiper <i>Actitis hypoleucos</i>	Mi	S3	Found in a variety of sheltered coastal habitats, most commonly on softer substrates associated with tidal creeks in mangrove forests and occasionally on inland wetlands (Geering <i>et al.</i> 2007).	<b>Unlikely</b> Few records of the species in inland Pilbara (Department of Parks and Wildlife 2015e). Species considered moderately common visitor the Pilbara region (Johnstone <i>et al.</i> 2013). No suitable habitat within the Study Area.
Sharp-tailed Sandpiper <i>Calidris acuminata</i>	Mi	S3	Coastal and inland areas saline and freshwater but prefers non-tidal fresh or brackish wetlands (Geering <i>et al.</i> 2007).	<b>Unlikely</b> Species recorded at Ophthalmia Dam in 2001 (Department of Parks and Wildlife 2015e) and Newman sewage ponds in 1981 (Department of Parks and Wildlife 2015e). Species is a common visitor to the Pilbara. No suitable habitat within the Study Area.
Curlew Sandpiper <i>Calidris ferruginea</i>	Mi	S1/S3	Commonly inhabits coastal areas namely exposed tidal mudflats, and less frequently on inland freshwater wetlands (Geering <i>et al.</i> 2007).	<b>Unlikely</b> Species confirmed from Ophthalmia Dam (Department of Parks and Wildlife 2015e), representing the only inland DPaW

Common Name (Scientific Name)	Status		Habitat Type	Likelihood Of Occurrence Reason For Likelihood
	EPBC Act	WC Act		
				record for northwest WA, and considered rare inland of northwest Australia (Johnstone <i>et al.</i> 2013). No suitable habitat within the Study Area.
Pectoral Sandpiper <i>Calidris melanotos</i>	Mi	S3	Mainly fresh waters i.e. swamps, lagoons, river pools, irrigation channels and sewage ponds (Johnstone and Storr 1998b).	<b>Unlikely</b> Records from Newman Sewage Ponds in 1981 (Department of Parks and Wildlife 2015e). Species considered a rare visitor to northern Australia (Johnstone <i>et al.</i> 2013). While there may be suitable habitat adjacent the Study Area, no suitable habitat is contained within.
Red-necked Stint <i>Calidris ruficollis</i>	Mi	S3	Edge of sheltered salt, brackish or fresh waters, mainly estuaries and near coastal wetlands (Johnstone and Storr 1998b).	<b>Unlikely</b> Species previously recorded at Ophthalmia Dam in 2005 (Department of Parks and Wildlife 2015e). Species is considered a very common visitor to coastal Pilbara but a rare visitor inland with very few inland records (Johnstone <i>et al.</i> 2013). While there may be suitable habitat adjacent the Study Area, no suitable habitat is contained within.
Long-toed Stint <i>Calidris subminuta</i>	Mi	S3	The species inhabits the weedy margins of shallow wetlands - coastal and inland, sewerage ponds and tidal mudflats (Johnstone and Storr 1998b).	<b>Unlikely</b> Species identified from three database searches and has previously been recorded at Ophthalmia Dam by Birdlife Australia (2015). Additionally, one record from Newman Sewage ponds (1981) (Johnstone <i>et al.</i> 2013). While there may be suitable habitat adjacent the Study Area, no suitable habitat is contained within.
Wood Sandpiper <i>Tringa glareola</i>	Mi	S3	Freshwater wetlands and occasional brackish intertidal mudflats (Geering <i>et al.</i> 2007).	<b>Unlikely</b> Species recorded from Ophthalmia Dam by Birdlife Australia (2015) in 2007 and nearby by Biota (2001). Considered a regular summer visitor and possible passage migrant in adjacent areas. While there may be suitable habitat adjacent the Study Area, no suitable habitat is contained within.
Common Greenshank <i>Tringa nebularia</i>	Mi	S3	Intertidal mudflats, as well as fresh and saltwater wetlands of the coast or inland (Johnstone and Storr 1998b).	<b>Unlikely</b> Species previously recorded nearby by Biota (2001) and DPaW (2015e). Previously recorded at Ophthalmia Dam by Birdlife Australia (2015) in 2007. Species considered moderately common in Pilbara but preferring coastal areas. While there may be suitable habitat adjacent the Study Area, no suitable habitat is contained within.
Marsh Sandpiper <i>Tringa stagnatilis</i>	Mi	S3	It inhabits freshwater or saltwater wetlands but avoids open beaches and mudflats unless well protected (Geering <i>et al.</i> 2007) (Johnstone and Storr 1998b).	<b>Unlikely</b> Species identified from three database searches (Birdlife Australia 2015) (Department of Parks and Wildlife 2015e). Species considered an uncommon to moderately common visitor to the Pilbara, although commonly occupying near-coastal lagoons and freshwater soaks (Johnstone <i>et al.</i>

Common Name (Scientific Name)	Status		Habitat Type	Likelihood Of Occurrence Reason For Likelihood
	EPBC Act	WC Act		
				2013). While there may be suitable habitat adjacent the Study Area, no suitable habitat is contained within.
Common Redshank <i>Tringa totanus</i>	Mi	S3	Found in a variety of sheltered coastal habitats, most commonly on softer substrates associated with tidal creeks in mangrove forests and occasionally on inland wetlands (Geering <i>et al.</i> 2007).	<b>Unlikely</b> Species recorded from two database searches (Mt Whaleback acid-rock drainage, 2011) (Trainor <i>et al. in review</i> ). Species is considered a rare visitor to coastal areas of northwest Australia, and not common through the region (Johnstone <i>et al.</i> 2013, Trainor <i>et al. in review</i> ). No suitable habitat is contained within the Study Area.
Glossy Ibis <i>Plegadis falcinellus</i>	Mi	S3	Freshwater wetlands, irrigated areas, margins of dams, floodplains, brackish and saline wetlands, tidal mudflats, pastures, lawns and public gardens (Johnstone <i>et al.</i> 2013).	<b>Unlikely</b> Species identified from three database searches, and has previous records adjacent the Study Area. Species is nomadic and considered a drought refugee in northern Australia (Johnstone <i>et al.</i> 2013). While there may be suitable habitat adjacent the Study Area, no suitable habitat is contained within.
Olive Python (Pilbara) <i>Liasis olivaceus barroni</i>	Vu	Vu	Watercourses and areas of permanent water in rocky gorges, escarpments and gullies (Pearson 1993).	<b>Unlikely</b> The species was identified from three database searches (nearest ~20 km north) DPaW (2015e). Previously recorded at Ophthalmia Dam DPaW (2015e). No suitable habitat within the Study Area.
<i>Ctenotus uber johnstonei</i>		P2	Known only from chenopod shrubland at the base of a sandstone hill in the Tanami Desert.	<b>Unlikely</b> Species rarely recorded within the region (5 Pilbara records associated with rocky terrain (nearest ~10 km northeast) DPaW (2015e). The Study Area contains no suitable habitat for the species.
<i>Lerista macropisthopus remota</i>		P2	<i>Acacia</i> shrublands and woodlands with loose, sandy to loamy soil (Wilson and Swan 2013).	<b>Possible</b> Previously recorded <10 km northwest and southeast of the Study Area. While <i>Acacia</i> shrublands exist within the Study Area, the community is generally open, however loam soils are present.
<i>Ramphotyphlops ganei</i>		P1	Variety of habitats; thought to prefer moist gorges.	<b>Unlikely</b> Few recent records of the species within the vicinity of the Study Area ~10 km north) DPaW (2015e). The Study Area contains no suitable habitat for the species.



# **Appendix I Inventory of vertebrate fauna taxa recorded during the field survey**

Scientific Name	Common Name	Conservation Status	
		EPBC Act	In WA
<b>Mammals</b>			
<i>Oryctolagus cuniculus</i>	Rabbit*		
<i>Macropus robustus</i>	Common Wallaroo		
<b>Birds</b>			
<i>Haliastur sphenurus</i>	Whistling Kite		
<i>Mirafra javanica</i>	Horsfield's Bushlark		
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike		
<i>Geopelia cuneata</i>	Diamond Dove		
<i>Geophaps plumifera</i>	Spinifex Pigeon		
<i>Taeniopygia guttata</i>	Zebra Finch		
<i>Malurus lamberti</i>	Variegated Fairy-wren		
<i>Lichenostomus virescens</i>	Singing Honeyeater		
<i>Anthus novaeseelandiae</i>	Australasian Pipit		
<i>Melopsittacus undulatus</i>	Budgerigar		
<i>Rhipidura leucophrys</i>	Willie Wagtail		
<b>Reptiles</b>			
<i>Heteronotia binoei</i>	Bynoe's Gecko		

## Appendix J     Vertebrate fauna taxa identified in the desktop study

### TABLE CODES

#### Databases

- A. DPaW Threatened and Priority Fauna Database
- B. NatureMap
- C. Birdlife Australia
- D. EPBC Protected Matters Search

#### Literature Review

- A. Animal Plant Mineral (2009)
- B. Biologic (2014)
- C. ENV Australia (2009b)
- D. MWH Australia (2015)

Species Name	Common Name	Conservation Status			This Study	Database Searches				Literature Review			
		EPBC Act	In WA	Non-Native		A	B	C	D	A	B	C	D
<b>Mammals</b>													
<b>BOVIDAE</b>													
<i>Bos taurus</i>	European Cattle			*			*				*		*
<b>CAMELIDAE</b>													
<i>Camelus dromedarius</i>	Dromedary			*			*		*		*		
<b>CANIDAE</b>													
<i>Canis lupus dingo</i>	Dingo			*			*				*		*
<i>Canis lupus familiaris</i>	Common Dog			*					*				
<i>Vulpes vulpes</i>	Fox			*					*		*		
<b>DASYURIDAE</b>													
<i>Dasyercus blythei</i>	Brush-tailed Mulgara		P4								*		
<i>Dasykaluta rosamondae</i>	Kaluta						*				*		
<i>Dasyurus hallucatus</i>	Northern Quoll	En	S1						*				
<i>Ningau timealeyi</i>	Pilbara Ningau						*				*		
<i>Planigale maculata</i>	Common Planigale										*		
<i>Pseudantechinus roryi</i>	Tan False Antechinus						*				*		
<i>Pseudantechinus woolleyae</i>	Woolley's Pseudantechinus						*				*		
<i>Sminthopsis crassicaudata</i>	Fat-tailed Dunnart						*				*		
<i>Sminthopsis longicaudata</i>	Long-tailed Dunnart		P4				*	*			*		
<i>Sminthopsis macroura</i>	Stripe-faced Dunnart						*				*		
<i>Sminthopsis ooldea</i>	Ooldea Dunnart						*				*		
<i>Sminthopsis youngsoni</i>	Lesser hairy-footed Dunnart						*				*		
<b>EMBALLONURIDAE</b>													
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat						*				*	*	
<i>Taphozous georgianus</i>	Common Sheath-tail-bat						*				*	*	
<i>Taphozous hilli</i>	Hill's Sheath-tail-bat						*				*		
<b>EQUIDAE</b>													
<i>Equus asinus</i>	Donkey			*			*		*		*		
<i>Equus caballus</i>	Horse			*					*		*		
<b>FELIDAE</b>													
<i>Felis catus</i>	Cat			*			*		*		*		*
<b>HIPPOSIDERIDAE</b>													
<i>Rhinonicteris aurantius</i> (Pilbara form)	Pilbara Leaf-nosed Bat	Vu	S1				*			*		*	
<b>LEPORIDAE</b>													
<i>Oryctolagus cuniculus</i>	Rabbit			*	*		*	*	*		*		

Species Name	Common Name	Conservation Status			This Study	Database Searches				Literature Review			
		EPBC Act	In WA	Non-Native		A	B	C	D	A	B	C	D
<b>MACROPODIDAE</b>													
<i>Macropus robustus</i>	Common Wallaroo				*		*				*		
<i>Macropus rufus</i>	Red Kangaroo						*				*		*
<i>Petrogale lateralis subsp. lateralis</i>	Black-footed Rock Wallaby	Vu	S1							*			
<i>Petrogale rothschildi</i>	Rothschild's Rock-wallaby						*				*		
<b>MEGADERMATIDAE</b>													
<i>Macroderma gigas</i>	Ghost Bat		P4			*	*			*	*		
<b>MOLOSSIDAE</b>													
<i>Austronomus australis</i>	White-striped Freetail-bat											*	
<i>Chaerephon jobensis</i>	Northern Freetail-bat						*				*	*	
<i>Mormopterus beccarii</i>	Beccari's Freetail-bat						*				*		
<b>MURIDAE</b>													
<i>Mus musculus</i>	House Mouse			*			*		*		*		
<i>Notomys alexis</i>	Spinifex Hopping-mouse						*				*		
<i>Pseudomys chapmani</i>	Pebble-mound Mouse		P4			*	*			*	*		
<i>Pseudomys desertor</i>	Desert Mouse						*				*		
<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse						*				*		
<i>Zyzomys argurus</i>	Common Rock-rat						*				*		
<b>NOTORYCTIDAE</b>													
<i>Notoryctes caurinus</i>	Northern Marsupial Mole	En	S1						*				
<b>TACHYGLOSSIDAE</b>													
<i>Tachyglossus aculeatus</i>	Short-beaked Echidna						*				*		
<b>THYLACOMYIDAE</b>													
<i>Macrotis lagotis</i>	Greater Bilby	Vu	S1						*				
<b>VESPERTILIONIDAE</b>													
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat						*				*	*	
<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat						*				*		
<i>Scotorepens greyii</i>	Little Broad-nosed Bat						*				*	*	
<i>Vespadelus finlaysoni</i>	Inland Cave Bat						*				*	*	
<b>Birds</b>													
<b>ACANTHIZIDAE</b>													
<i>Acanthiza apicalis</i>	Inland Thornbill						*				*		
<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill						*				*		
<i>Acanthiza robustirostris</i>	Slaty-backed Thornbill						*	*			*		
<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill						*	*			*		

Species Name	Common Name	Conservation Status			This Study	Database Searches				Literature Review			
		EPBC Act	In WA	Non-Native		A	B	C	D	A	B	C	D
<i>Aphelocephala leucopsis</i>	Southern Whiteface										*		
<i>Gerygone fusca</i>	Western Gerygone						*	*			*		
<i>Pyrrholaemus brunneus</i>	Redthroat						*	*			*		
<i>Smicronis brevirostris</i>	Weebill						*	*			*		*
<b>ACCIPITRIDAE</b>													
<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk						*	*			*		
<i>Accipiter fasciatus</i>	Brown Goshawk						*	*			*		
<i>Aquila audax</i>	Wedge-tailed Eagle						*	*			*		*
<i>Circus approximans</i>	Swamp Harrier						*	*					
<i>Circus assimilis</i>	Spotted Harrier						*	*			*		
<i>Elanus axillaris</i>	Black-shouldered Kite						*	*			*		
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Mi	S3				*	*	*				
<i>Haliastur sphenurus</i>	Whistling Kite				*		*	*			*		*
<i>Hamirostra melanosternon</i>	Black-breasted Buzzard						*	*			*		
<i>Hieraaetus morphnoides</i>	Little Eagle							*			*		
<i>Lophoictinia isura</i>	Square-tailed Kite							*					
<i>Milvus migrans</i>	Black Kite						*				*		
<b>ACROCEPHALIDAE</b>													
<i>Acrocephalus australis</i>	Australian Reed-Warbler						*	*					
<b>AEGOTHELIDAE</b>													
<i>Aegotheles cristatus</i>	Australian Owlet-nightjar						*	*			*		
<b>ALAUDIDAE</b>													
<i>Mirafrja javanica</i>	Horsfield's Bushlark				*		*	*			*		
<b>ANATIDAE</b>													
<i>Anas gracilis</i>	Grey Teal						*	*					*
<i>Anas rhynchotis</i>	Australasian Shoveler						*	*					
<i>Anas superciliosa</i>	Pacific Black Duck						*	*					
<i>Aythya australis</i>	Hardhead						*	*					
<i>Chenonetta jubata</i>	Australian Wood Duck						*	*			*		*
<i>Cygnus atratus</i>	Black Swan						*	*			*		
<i>Dendrocygna arcuata</i>	Wandering Whistling-Duck						*	*					
<i>Dendrocygna eytoni</i>	Plumed Whistling-Duck						*	*					
<i>Malacorhynchus membranaceus</i>	Pink-eared Duck						*	*					
<i>Stictonetta naevosa</i>	Freckled Duck						*	*					
<i>Tadorna tadornoides</i>	Australian Shelduck						*	*			*		

Species Name	Common Name	Conservation Status			This Study	Database Searches				Literature Review			
		EPBC Act	In WA	Non-Native		A	B	C	D	A	B	C	D
<b>ANHINGIDAE</b>													
<i>Anhinga novaehollandiae</i>	Australasian Darter							*					
<b>ANSERANATIDAE</b>													
<i>Anseranas semipalmata</i>	Magpie Goose						*	*					
<b>APODIDAE</b>													
<i>Apus pacificus</i>	Fork-tailed Swift	Mi	S3						*		*		
<b>ARDEIDAE</b>													
<i>Ardea ibis</i>	Cattle Egret	Mi	S3			*	*	*	*				
<i>Ardea intermedia</i>	Intermediate Egret						*	*					
<i>Ardea modesta</i>	Eastern Great Egret	Mi	S3			*	*	*					
<i>Ardea pacifica</i>	White-necked Heron						*	*			*		
<i>Egretta garzetta</i>	Little Egret							*					
<i>Egretta novaehollandiae</i>	White-faced Heron						*	*			*		*
<i>Nycticorax caledonicus</i>	Nankeen Night Heron						*	*					
<b>ARTAMIDAE</b>													
<i>Artamus cinereus</i>	Black-faced Woodswallow						*	*			*	*	
<i>Artamus cyanopterus</i>	Dusky Woodswallow						*						
<i>Artamus minor</i>	Little Woodswallow						*	*			*		
<i>Artamus personatus</i>	Masked Woodswallow						*	*			*		
<i>Artamus superciliosus</i>	White-browed Woodswallow						*	*					
<i>Cracticus nigrogularis</i>	Pied Butcherbird						*	*			*	*	*
<i>Cracticus tibicen</i>	Australian Magpie						*	*			*		
<i>Cracticus torquatus</i>	Grey Butcherbird						*	*			*		
<b>BURHINIDAE</b>													
<i>Burhinus grallarius</i>	Bush Stone-curlew						*	*			*		
<b>CACATUIDAE</b>													
<i>Cacatua sanguinea</i>	Little Corella						*	*			*		
<i>Eolophus roseicapillus</i>	Galah						*	*			*	*	*
<i>Nymphicus hollandicus</i>	Cockatiel						*	*			*	*	*
<b>CAMPEPHAGIDAE</b>													
<i>Coracina maxima</i>	Ground Cuckoo-shrike										*		
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike				*		*	*			*	*	*
<i>Lalage leucomela</i>	Varied Triller										*		
<i>Lalage sueurii</i>	White-winged Triller						*	*			*		

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<b>CASUARIIDAE</b>													
<i>Dromaius novaehollandiae</i>	Emu					*	*				*		
<b>CHARADRIIDAE</b>													
<i>Charadrius ruficapillus</i>	Red-capped Plover						*	*					
<i>Charadrius veredus</i>	Oriental Plover	Mi	S3			*			*				
<i>Elsayornis melanops</i>	Black-fronted Dotterel						*	*			*	*	
<b>CICONIIDAE</b>													
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork						*	*					
<b>CLIMACTERIDAE</b>													
<i>Climacteris melanura</i>	Black-tailed Treecreeper						*	*			*		
<b>COLUMBIDAE</b>													
<i>Geopelia cuneata</i>	Diamond Dove				*		*	*			*	*	
<i>Geopelia humeralis</i>	Bar-shouldered Dove							*					
<i>Geopelia striata</i>	Peaceful Dove						*	*			*	*	
<i>Geophaps plumifera</i>	Spinifex Pigeon				*		*	*			*	*	
<i>Ocyphaps lophotes</i>	Crested Pigeon						*	*			*	*	
<i>Phaps chalcoptera</i>	Common Bronzewing						*	*			*		
<b>CORVIDAE</b>													
<i>Corvus bennetti</i>	Little Crow						*	*			*		
<i>Corvus coronoides</i>	Australian Raven										*		
<i>Corvus orru</i>	Torresian Crow						*	*			*	*	
<b>CUCULIDAE</b>													
<i>Cacomantis pallidus</i>	Pallid Cuckoo						*	*			*	*	
<i>Centropus phasianinus</i>	Pheasant Coucal										*		
<i>Chalcites basalis</i>	Horsfield's Bronze-Cuckoo						*	*			*	*	
<i>Chalcites osculans</i>	Black-eared Cuckoo						*	*			*		
<b>ESTRILDIDAE</b>													
<i>Emblema pictum</i>	Painted Finch						*	*			*		
<i>Neochmia ruficauda</i>	Star Finch										*		
<i>Neochmia ruficauda subclarescens</i>	Star Finch (western)						*	*					
<i>Taeniopygia guttata</i>	Zebra Finch				*		*	*			*	*	
<b>EUROSTOPODIDAE</b>													
<i>Eurostopus argus</i>	Spotted Nightjar						*	*			*		
<b>FALCONIDAE</b>													
<i>Falco berigora</i>	Brown Falcon						*	*			*	*	



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<i>Falco cenchroides</i>	Nankeen Kestrel						*	*			*	*	
<i>Falco hypoleucos</i>	Grey Falcon		S1										
<i>Falco longipennis</i>	Australian Hobby						*	*			*		
<i>Falco peregrinus</i>	Peregrine Falcon		S4			*	*	*			*		
<b>GLAREOLIDAE</b>													
<i>Stiltia isabella</i>	Australian Pratincole						*	*					
<b>HALCYONIDAE</b>													
<i>Dacelo leachii</i>	Blue-winged Kookaburra						*	*			*		*
<i>Todiramphus pyrrhopygius</i>	Red-backed Kingfisher						*	*			*		
<i>Todiramphus sanctus</i>	Sacred Kingfisher						*	*			*	*	*
<b>HIRUNDINIDAE</b>													
<i>Cheramoeca leucosterna</i>	White-backed Swallow						*	*			*		
<i>Hirundo neoxena</i>	Welcome Swallow						*	*					
<i>Petrochelidon ariel</i>	Fairy Martin						*	*			*		
<i>Petrochelidon nigricans</i>	Tree Martin							*					*
<b>LARIDAE</b>													
<i>Chlidonias hybrida</i>	Whiskered Tern							*					
<i>Chroicocephalus novaehollandiae</i>	Silver Gull						*	*					
<i>Gelochelidon nilotica</i>	Gull-billed Tern							*					
<i>Hydroprogne caspia</i>	Caspian Tern	Mi	S3					*					
<b>MALURIDAE</b>													
<i>Amytornis striatus</i>	Striated Grasswren						*	*			*		
<i>Malurus lamberti</i>	Variigated Fairy-wren				*		*	*			*		
<i>Malurus leucopterus</i>	White-winged Fairy-wren						*	*			*	*	*
<i>Malurus splendens</i>	Splendid Fairy-wren						*	*			*		
<i>Stipiturus ruficeps</i>	Rufous-crowned Emu-wren							*			*		
<b>MEGALURIDAE</b>													
<i>Cincloramphus cruralis</i>	Brown Songlark						*	*			*		
<i>Cincloramphus mathewsi</i>	Rufous Songlark						*	*			*		*
<i>Eremiornis carteri</i>	Spinifexbird						*	*			*		
<i>Megalurus gramineus</i>	Little Grassbird						*	*					
<b>MELIPHAGIDAE</b>													
<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater						*	*			*	*	*
<i>Certhionyx variegatus</i>	Pied Honeyeater						*	*			*		
<i>Conopophila whitei</i>	Grey Honeyeater						*				*		

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<i>Epthianura aurifrons</i>	Orange Chat						*							
<i>Epthianura tricolor</i>	Crimson Chat						*	*			*			
<i>Lichenostomus keartlandi</i>	Grey-headed Honeyeater						*	*			*			
<i>Lichenostomus penicillatus</i>	White-plumed Honeyeater							*			*	*	*	
<i>Lichenostomus plumulus</i>	Grey-fronted Honeyeater										*			
<i>Lichenostomus virescens</i>	Singing Honeyeater				*			*			*	*		
<i>Lichmera indistincta</i>	Brown Honeyeater						*	*			*			
<i>Manorina flavigula</i>	Yellow-throated Miner						*	*			*	*		
<i>Melithreptus gularis</i>	Black-chinned Honeyeater						*	*			*			
<i>Purnella albifrons</i>	White-fronted Honeyeater						*	*			*			
<i>Sugomel niger</i>	Black Honeyeater						*	*			*			
<b>MEROPIIDAE</b>														
<i>Merops ornatus</i>	Rainbow Bee-eater	Mi	S3				*	*	*	*		*	*	*
<b>MONARCHIDAE</b>														
<i>Grallina cyanoleuca</i>	Magpie-lark						*	*			*	*	*	
<b>MOTACILLIDAE</b>														
<i>Anthus novaeseelandiae</i>	Australasian Pipit				*		*	*			*			
<b>NECTARINIIDAE</b>														
<i>Dicaeum hirundinaceum</i>	Mistletoebird						*	*			*			
<b>OTIDIDAE</b>														
<i>Ardeotis australis</i>	Australian Bustard		P4				*	*			*	*		
<b>PACHYCEPHALIDAE</b>														
<i>Colluricincla harmonica</i>	Grey Shrike-thrush						*	*			*		*	
<i>Oreoica gutturalis</i>	Crested Bellbird						*	*			*	*	*	
<i>Pachycephala rufiventris</i>	Rufous Whistler						*	*			*		*	
<b>PARDALOTIDAE</b>														
<i>Pardalotus rubricatus</i>	Red-browed Pardalote						*	*			*		*	
<i>Pardalotus striatus</i>	Striated Pardalote						*	*			*			
<b>PELECANIDAE</b>														
<i>Pelecanus conspicillatus</i>	Australian Pelican						*	*						
<b>PETROICIDAE</b>														
<i>Melanodryas cucullata</i>	Hooded Robin						*	*			*			
<i>Petroica goodenovii</i>	Red-capped Robin						*	*			*			
<b>PHALACROCORACIDAE</b>														
<i>Microcarbo melanoleucos</i>	Little Pied Cormorant							*						

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<i>Phalacrocorax carbo</i>	Great Cormorant						*	*					
<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant						*	*			*		
<i>Phalacrocorax varius</i>	Pied Cormorant						*	*					
<b>PHASIANIDAE</b>													
<i>Coturnix pectoralis</i>	Stubble Quail						*	*			*		
<i>Coturnix ypsilophora</i>	Brown Quail						*	*			*		
<b>PODARGIDAE</b>													
<i>Podargus strigoides</i>	Tawny Frogmouth						*	*			*		*
<b>PODICIPEDIDAE</b>													
<i>Podiceps cristatus</i>	Great Crested Grebe						*	*					
<i>Poliiocephalus poliocephalus</i>	Hoary-headed Grebe						*	*					
<i>Tachybaptus novaehollandiae</i>	Australasian Grebe						*	*					
<b>POMATOSTOMIDAE</b>													
<i>Pomatostomus superciliosus</i>	White-browed Babbler						*	*			*		
<i>Pomatostomus temporalis</i>	Grey-crowned Babbler						*	*			*	*	*
<b>PSITTACIDAE</b>													
<i>Barnardius zonarius</i>	Australian Ringneck						*	*			*	*	*
<i>Melopsittacus undulatus</i>	Budgerigar				*		*	*			*	*	*
<i>Neopsephotus bourkii</i>	Bourke's Parrot						*				*		
<i>Psephotus varius</i>	Mulga Parrot										*		
<b>PSOPHODIDAE</b>													
<i>Cinclosoma castanotum</i>	Chestnut Quail-thrush										*		
<i>Psophodes occidentalis</i>	Chiming Wedgebill						*	*			*		
<b>PTILONORHYNCHIDAE</b>													
<i>Ptilonorhynchus guttatus</i>	Western Bowerbird						*	*			*		
<b>RALLIDAE</b>													
<i>Fulica atra</i>	Eurasian Coot						*	*					
<i>Gallirallus philippensis</i>	Buff-banded Rail						*	*					
<i>Porphyrio porphyrio</i>	Purple Swamphen						*	*					
<i>Porzana pusilla</i>	Baillon's Crake						*	*					
<i>Porzana tabuensis</i>	Spotless Crake						*	*					
<i>Tribonyx ventralis</i>	Black-tailed Native-hen							*			*		
<b>RECURVIROSTRIDAE</b>													
<i>Cladorhynchus leucocephalus</i>	Banded Stilt						*						
<i>Himantopus himantopus</i>	Black-winged Stilt						*	*					

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<i>Recurvirostra novaehollandiae</i>	Red-necked Avocet						*	*					
<b>RHIPIDURIDAE</b>													
<i>Rhipidura albiscapa</i>	Grey Fantail							*			*		
<i>Rhipidura leucophrys</i>	Willie Wagtail				*		*	*			*	*	*
<b>ROSTRATULIDAE</b>													
<i>Rostratula australis</i>	Australian Painted Snipe	Vu, Mi	S1/S3						*				
<b>SCOLOPACIDAE</b>													
<i>Actitis hypoleucos</i>	Common Sandpiper	Mi	S3			*	*	*			*		
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Mi	S3			*	*	*					
<i>Calidris ferruginea</i>	Curlew Sandpiper	Mi	S1/S3			*	*	*					
<i>Calidris melanotos</i>	Pectoral Sandpiper	Mi	S3			*	*						
<i>Calidris ruficollis</i>	Red-necked Stint	Mi	S3			*	*	*					
<i>Calidris subminuta</i>	Long-toed Stint	Mi	S3			*	*	*					
<i>Tringa glareola</i>	Wood Sandpiper	Mi	S3			*	*	*					
<i>Tringa nebularia</i>	Common Greenshank	Mi	S3			*	*	*					
<i>Tringa stagnatilis</i>	Marsh Sandpiper	Mi	S3			*		*					
<i>Tringa totanus</i>	Common Redshank	Mi	S3			*	*						
<b>STRIGIDAE</b>													
<i>Ninox connivens</i>	Barking Owl						*	*			*		
<i>Ninox novaeseelandiae</i>	Southern Boobook Owl						*	*			*		
<b>THRESKIORNITHIDAE</b>													
<i>Platalea flavipes</i>	Yellow-billed Spoonbill						*	*					
<i>Platalea regia</i>	Royal Spoonbill						*	*					
<i>Plegadis falcinellus</i>	Glossy Ibis	Mi	S3			*	*	*					
<i>Threskiornis molucca</i>	Australian White Ibis						*	*					
<i>Threskiornis spinicollis</i>	Straw-necked Ibis						*	*					*
<b>TURNICIDAE</b>													
<i>Turnix velox</i>	Little Button-quail						*	*			*		
<b>TYTONIDAE</b>													
<i>Tyto javanica</i>	Eastern Barn Owl						*	*			*		
<b>Reptiles</b>													
<b>AGAMIDAE</b>													
<i>Amphibolurus longirostris</i>	Long-nosed Dragon						*				*		*
<i>Ctenophorus caudicinctus</i>	Ring-tailed Dragon						*				*		
<i>Ctenophorus cristatus</i>	Crested Dragon										*		

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<i>Ctenophorus isolepis</i>	Central Military Dragon						*					*	
<i>Ctenophorus nuchalis</i>	Central Netted Dragon						*					*	
<i>Ctenophorus reticulatus</i>	Western Netted Dragon						*					*	
<i>Diporiphora valens</i>	Pilbara Two-line Dragon											*	
<i>Moloch horridus</i>	Thorny Devil											*	
<i>Pogona minor minor</i>	Dwarf Bearded Dragon						*					*	
<i>Tympanocryptis cephalus</i>	Pebble Dragon						*						
<b>CHELIDAE</b>													
<i>Chelodina steindachneri</i>	Flat-shelled Turtle						*					*	
<b>ELAPIDAE</b>													
<i>Acanthophis wellsi</i>	Pilbara Death Adder						*						
<i>Brachyuropis approximans</i>	North-western Shovel-nosed Snake						*					*	
<i>Demansia psammophis</i>	Yellow-faced Whip Snake						*					*	
<i>Demansia rufescens</i>	Rufous Whipsnake						*					*	
<i>Furina ornata</i>	Orange-naped Snake						*					*	
<i>Parasuta monachus</i>	Monk Snake						*						
<i>Pseudechis australis</i>	King Brown Snake						*					*	
<i>Pseudonaja modesta</i>	Ringed Brown Snake						*					*	
<i>Pseudonaja nuchalis</i>	Western Brown Snake						*					*	
<i>Suta fasciata</i>	Rosen's Snake						*					*	
<i>Suta punctata</i>	Little Spotted Snake						*					*	
<i>Vermicella snelli</i>							*					*	
<b>GEKKONIDAE</b>													
<i>Diplodactylus conspicillatus</i>	Fat-tailed Diplodactylus						*					*	
<i>Diplodactylus savagei</i>	Yellow-spotted Pilbara Gecko						*					*	
<i>Gehyra pilbara</i>	Pilbara Dtella						*					*	
<i>Gehyra punctata</i>	Spotted Dtella						*					*	
<i>Gehyra purpurascens</i>	Purplish Dtella											*	
<i>Gehyra variegata</i>	Tree Dtella						*					*	
<i>Heteronotia binoei</i>	Bynoe's Gecko					*	*					*	
<i>Heteronotia spelea</i>	Desert Cave Gecko						*					*	
<i>Lucasium stenodactylum</i>	Crowned Gecko						*					*	
<i>Lucasium wombeyi</i>	Pilbara Ground Gecko						*					*	
<i>Nephrurus wheeleri</i>	Banded Knob-tail						*					*	
<i>Oedura marmorata</i>	Marbled Velvet Gecko						*					*	

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<i>Rhynchoedura ornata</i>	Beaked Gecko					*				*			
<i>Strophurus ciliaris</i>	Spiny-tailed Gecko									*			
<i>Strophurus elderi</i>	Jewelled Gecko					*				*			
<i>Strophurus jeanae</i>	Southern Phasmid Gecko									*			
<i>Strophurus wellingtonae</i>	Western Shield Spiny-tailed Gecko					*				*			
<b>PYGOPODIDAE</b>													
<i>Delma butleri</i>	Unbanded Delma					*				*			
<i>Delma elegans</i>	Pilbara Delma					*				*			
<i>Delma haroldi</i>	Neck-barred Delma					*				*			
<i>Delma nasuta</i>	Sharp-snouted Delma					*				*			
<i>Delma pax</i>	Peace Delma					*				*			
<i>Delma tinctoria</i>	Excitable Delma									*			
<i>Lialis burtonis</i>	Burton's Snake-lizard					*				*			
<i>Pygopus nigriceps</i>	Hooded Scaly-foot					*				*			
<b>PYTHONIDAE</b>													
<i>Antaresia perthensis</i>	Pygmy Python					*				*			
<i>Antaresia stimsoni</i>	Stimson's Python					*				*			
<i>Aspidites melanocephalus</i>	Black-headed Python					*				*			
<i>Liasis olivaceus barroni</i>	Olive Python (Pilbara)	Vu	S1			*	*		*	*	*		
<b>SCINCIDAE</b>													
<i>Carlia munda</i>	Shaded-litter Rainbow-skink					*				*			
<i>Carlia triacantha</i>	Desert Rainbow-skink					*				*			
<i>Cryptoblepharus australis</i>										*			
<i>Cryptoblepharus plagioccephalus</i>	Callose-palmed Shinning-skink									*			
<i>Cryptoblepharus ustulatus</i>										*			
<i>Ctenotus ariadnae</i>	Ariadna's Ctenotus									*			
<i>Ctenotus duricola</i>						*				*			
<i>Ctenotus grandis</i>	Grand Ctenotus					*				*			
<i>Ctenotus helenae</i>	Clay-soil Ctenotus					*				*			
<i>Ctenotus leonhardii</i>	Leonhardi's Ctenotus					*				*			
<i>Ctenotus pantherinus</i>	Leopard Ctenotus					*				*			
<i>Ctenotus quattuordecimlineatus</i>	Fourteen-lined Ctenotus									*			
<i>Ctenotus rubicundus</i>	Ruddy Ctenotus					*				*			
<i>Ctenotus rutilans</i>	Rusty-shouldered Ctenotus					*				*			
<i>Ctenotus saxatilis</i>	Stony-soil Ctenotus					*				*			

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<i>Ctenotus schomburgkii</i>	Barred Wedgesnout Ctenotus										*		
<i>Ctenotus serventyi</i>	North-western Sandy-loam Ctenotus										*		
<i>Ctenotus uber</i>	Spotted Ctenotus						*				*		
<i>Ctenotus uber johnstonei</i>			P2			*	*						
<i>Cyclodomorphus melanops</i>	Spinifex Slender Blue-tongue						*				*		
<i>Egernia depressa</i>	Pygmy Spiny-tailed Skink						*				*		
<i>Egernia formosa</i>	Goldfields Crevice-skink						*						
<i>Eremiascincus richardsonii</i>	Broad-banded Sand-swimmer						*				*		
<i>Lerista bipes</i>	North-western Sandslider						*				*		
<i>Lerista flammicauda</i>	Pilbara Flame-tailed Slider										*		
<i>Lerista macropisthopus remota</i>			P2			*	*						
<i>Lerista muelleri</i>	Wood Mulch-slider						*				*		
<i>Lerista neander</i>	Pilbara Robust Slider						*				*		
<i>Lerista timidus</i>											*		
<i>Lerista zietzi</i>							*				*		
<i>Menetia greyii</i>	Common Dwarf Skink						*				*		
<i>Menetia surda</i>	Western Dwarf Skink						*						
<i>Morethia ruficauda</i>	Lined Firetail Skink						*				*		
<i>Tiliqua multifasciata</i>	Centralian Blue-tongue						*				*		
<b>TYPHLOPIDAE</b>													
<i>Ramphotyphlops ammodytes</i>											*		
<i>Ramphotyphlops ganei</i>			P1			*				*	*		
<i>Ramphotyphlops hamatus</i>	Pale-headed Blind Snake										*		
<i>Ramphotyphlops waitii</i>	Beaked Blind Snake										*		
<b>VARANIDAE</b>													
<i>Varanus acanthurus</i>	Ridge-tailed Monitor						*				*		
<i>Varanus breviceauda</i>	Short-tailed Pygmy Monitor						*				*		
<i>Varanus bushi</i>	Pilbara Mulga Monitor						*						
<i>Varanus caudolineatus</i>	Stripe-tailed Monitor						*				*		
<i>Varanus eremius</i>	Pygmy Desert Monitor										*		
<i>Varanus giganteus</i>	Perentie						*				*		
<i>Varanus gouldii</i>	Gould's Goanna						*				*		*
<i>Varanus panoptes</i>	Yellow-spotted Monitor						*				*		
<i>Varanus pilbarensis</i>	Pilbara Rock Monitor						*				*		
<i>Varanus tristis</i>	Black-headed Monitor						*						

Species Name	Common Name	Conservation Status			This Study	Database Searches				Literature Review				
		EPBC Act	In WA	Non-Native		A	B	C	D	A	B	C	D	
<b>Amphibians</b>														
<b>HYLIDAE</b>														
<i>Cyclorana maini</i>	Main's Frog						*					*		*
<i>Cyclorana platycephala</i>	Water-holding Frog											*		
<i>Litoria rubella</i>	Desert Tree Frog						*					*		*
<b>LIMNODYNASTIDAE</b>														
<i>Neobatrachus aquilonius</i>	Northern Burrowing Frog						*							
<i>Neobatrachus centralis</i>	Trilling Frog											*		
<i>Notaden nichollsi</i>	Desert Spadefoot Toad											*		
<i>Platyplectrum spenceri</i>	Spencer's Burrowing Frog						*					*		
<b>MYOBATRACHIDAE</b>														
<i>Pseudophryne douglasi</i>	Douglas's Toadlet						*							
<i>Uperoleia russelli</i>	Russell's Toadlet						*					*		*



**Point 1**

**GPS**

**S 23.19.0653**

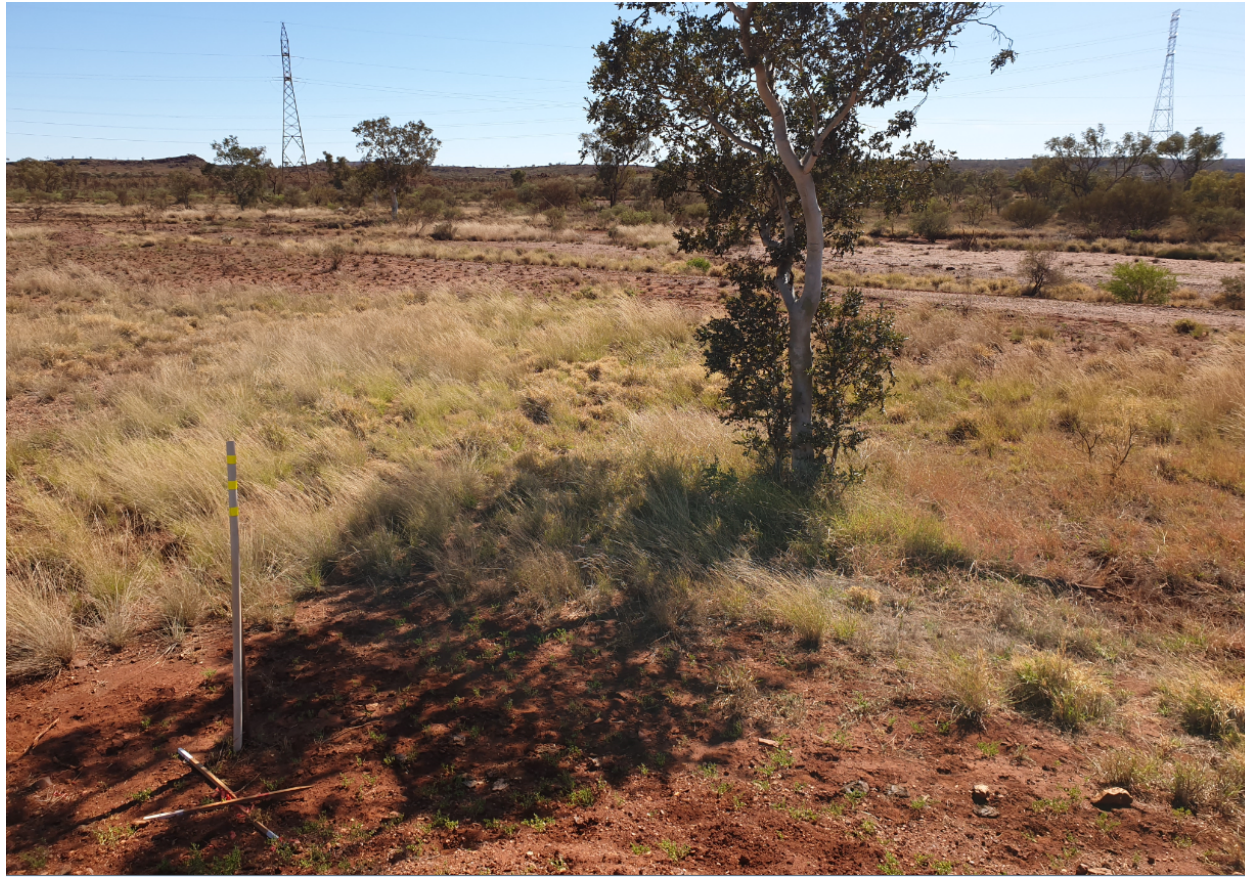
**E 119,41.7338**



Looking South towards current Pit



Looking West from Point 1



Looking towards Highway from Point 1



Looking East from Point 1 (access road to Quarry )

**Point 2**

**GPS**

**S 23.19.1296**

**E 119,42.0035**



Looking north from Point 2 (next to Bore 4)



Point 2 looking East (quarry access road ) yellow pegs current clearing boundary heading east in middle of photo

**Point 3**

**GPS**

**S 23.19.0898**

**E 119,41.8136**



Looking from Point 3 ( right next to access road into quarry ) looking towards Quarry ( foot print for waste dump)