FIGURE

ATTACHMENT 1

Landscape Masterplan (August 2017)

URBIS

SHENTON PARK HOSPITAL REDEVELOPMENT

LANDSCAPE MASTER PLAN

1:2000 @ A3

0 20 40 60 80 160

DATE: 30.08.17
JOB NO: ND1676
DWG NO: 001
REV: D

ATTACHMENT 2

MRS Amendment Approval – EPA

ATTACHMENT 2

MRS Amendment Approval – EPA

GOVERNMENT OF WESTERN AUSTRALIA

Environmental Protection Authority

Chief Executive Officer
Western Australian Planning Commission
Locked Bag 2506
PERTH WA 6000

Your Ref:
Our Ref: CMS15294
Enquiries: [redacted]
Email: [redacted]

Dear Sir/Madam

DECISION UNDER SECTION 48A(1)(a)
Environmental Protection Act 1986

SCHEME:	**Shenton Park Rehabilitation Hospital Improvement Scheme**
LOCATION:	**Improvement Plan 43**
RESPONSIBLE AUTHORITY:	**Western Australian Planning Commission**
DECISION:	**Scheme Not Assessed: Advice Given (no appeals)**

Thank you for referring the above proposed scheme to the Environmental Protection Authority (EPA).

After consideration of the information provided by you, the EPA considers that the proposed scheme should not be assessed under Part IV Division 3 of the *Environmental Protection Act 1986* (EP Act) but nevertheless provides the attached advice and recommendations.

Please note the following:

- For the purposes of Part IV of the EP Act, the scheme is defined as an assessed scheme. In relation to the implementation of the scheme, please note the requirements of Part IV Division 4 of the EP Act.
- There is no appeal right in respect of the EPA's decision to not assess the scheme.

Level 8, The Atrium, 168 St Georges Terrace, Perth, Western Australia 6000
Telephone 08 6145 0800 Facsimile 08 6145 0895 Email info@epa.wa.gov.au

Locked Bag 10, East Perth WA 6892

www.epa.wa.gov.au

A copy of this letter and the attached advice and recommendations will be made available to the public via the EPA website.

Yours sincerely

ntal Protection Authority
d 17 December 2013

ons

ADVICE UNDER SECTION 48A(1)(a) ENVIRONMENTAL PROTECTION ACT 1986

Shenton Park Rehabilitation Hospital Improvement Scheme

Location: Shenton Park

Determination: Scheme Not Assessed – Advice Given (no appeals)

Determination Published: 30 November 2015

Summary

In accordance with the Western Australian Planning Commission (WAPC) *Improvement Plan No. 43 Shenton Park Rehabilitation Hospital*, which authorises the making of an improvement scheme over the Shenton Park Rehabilitation Hospital (SPRH) site, Landcorp has prepared the SPRH improvement scheme for referral to the Environmental Protection Authority (EPA).

The EPA has considered the improvement scheme in accordance with the requirements of the *Environmental Protection Act 1986* (EP Act). In making its decision on whether to assess the improvement scheme, the EPA has applied its 'Significance Framework' which relates to the extent to which the improvement scheme meets the EPA's environmental objectives for the environmental factors.

The EPA considers that the scheme amendment is unlikely to have a significant effect on the environment and does not warrant formal assessment under Part IV of the EP Act, providing the following advice is implemented.

1. Environmental Factors

The EPA has identified the following environmental factors relevant to this improvement scheme:

a) Flora and vegetation; and
b) Terrestrial fauna.

2. Advice and Recommendations regarding Environmental Factors

Flora and vegetation, and Terrestrial fauna

The EPA has based its decision on the improvement scheme documentation provided by the Landcorp and the WAPC.

The subject area contains remnant Banksia woodland on the western side of the site, which is habitat for terrestrial fauna, specifically the Carnaby's Black Cockatoo. The EPA supports the retention of native vegetation within the woodland precincts as depicted in the Landscape Master Plan (Urbis 2015).

Recommendation

The EPA concludes that the improvement scheme can be managed to meet the EPA's environmental objectives through the retention of native vegetation within the woodland precincts as depicted in the Landscape Master Plan (Urbis 2015).

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Environmental Protection Authority

Chief Executive Officer
Western Australian Planning Commission
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Location: Shenton Park

Determination: Scheme Not Assessed – Advice Given (no appeals)

Determination Published: 30 November 2015

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Recommendation

The EPA concludes that the improvement scheme can be managed to meet the EPA's environmental objectives through the retention of native vegetation within the woodland precincts as depicted in the Landscape Master Plan (Urbis 2015).

ATTACHMENT 3

EPBC Approval

Australian Government
Department of the Environment

Notification of

REFERRAL DECISION – not controlled action
Shenton Park Rehabilitation Hospital Redevelopment, Shenton Park, WA (EPBC 2015/7622)

This decision is made under Section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Proposed action

person named in the referral	Western Australian Land Authority trading as LandCorp ABN: 34 868 192 835
proposed action	To redevelop, including the clearance of vegetation, on Lot 3240 Selby Street, Shenton Park, Western Australia; as described in the referral received by the Department on 10 December 2015 [See EPBC Act referral 2015/7622].

Referral decision: Not a controlled action

status of proposed action	The proposed action is not a controlled action.

Person authorised to make decision

Name and position	Tim Wyndham A/g Assistant Secretary Assessments (WA, SA, NT) and Air Branch
signature	
date of decision	29 January 2016

ATTACHMENT 4

Flora and Fauna Assessment

LandCorp

Department of Health Shenton Park Site
Flora and Fauna Assessment

April 2015

Executive summary

LandCorp is undertaking preliminary investigations at Shenton Park Rehabilitation Hospital (Shenton Park) to determine its potential for future redevelopment.

LandCorp commissioned GHD Pty Ltd (GHD) to undertake Level 1 flora and Level 1 fauna surveys at Shenton Park (The Study area) to investigate and report on the presence of any significant flora and fauna.

The scope of works to complete the flora and fauna survey of the Study area aimed to satisfy all scoping requirements documented by LandCorp. The survey was undertaken in accordance with relevant legislation and guidelines.

The results of the flora and fauna surveys are summarised below.

The Shenton Park site includes a section of Jarrah Banksia woodland in the western part of the property that is in good condition and has relatively high environmental value. The area is adjacent to Bush Forever site 218. The remainder of the site includes parkland cleared areas and a man-made sump with a number of introduced species.

The survey resulted in the recording of 109 flora species (41 of these are introduced). One Priority 4 species, *Jacksonia sericea,* was recorded in the western section of the site. Approximately 100 plants are present. One Threatened species, the orchid *Caladenia huegelii,* could potentially occur at the site. The timing of the survey was not suitable for determining the presence of this species.

There are no recorded Threatened Ecological Communities (TECs) listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or by the Department of Parks and Wildlife (DPaW) within 5 km of the Shenton Park site. Some of the site vegetation may align with a Priority Ecological Community, PEC 27 – *Banksia dominated woodlands of the Swan Coastal Plain.*

Eleven conservation significant fauna species were considered to possibly occur or be likely to occur on the Shenton Park site, based on habitat suitability and records. No conservation significant species were recorded during the site survey. Three EPBC listed species are considered likely to occur at the site, and eight species may possibly utilize the site opportunistically. The three likely species are:

- *Calyptorhynchus latirostris* (Carnaby's Black Cockatoo);
- *Calyptorhynchus banksia naso* (Forest Red-tailed Black Cockatoo); and
- *Calyptorhynchus baudinii* (Baudin's Black Cockatoo)

The Shenton Park site has potential nesting trees spread across the site. Based on DSEWPaC (2012) guidelines, approximately 1.88 hectares of feeding habitat and 2.4 hectares of potential breeding habitat is present.

Potential for referrals under State or Commonwealth environmental acts

DSEWPaC (2012) provides a risk table that gives guidance on what the Department views as risks\impacts to Black Cockatoos that will trigger referral.

Based on an assessment of the risks, clearing of bushland at sites and subsequent impacts to Black Cockatoos would trigger referral based on:

- Clearing of 2.4 hectares of potential breeding habitat at Shenton Park.
- Clearing of 1.88 hectares of feeding habitat at Shenton Park.
- Potential hydrological changes to feeding habitat at Shenton Park.

- Degradation of habitat through land changes; in particular, further edging effect of feeding habitat at Shenton Park.
- Increased competition of breeding habitat by other species by removing hollows.
- And potential movement or establishment of Phytophthora spp. (dieback) into Black Cockatoo habitat.

Recommendations

Further survey of the bushland section of the Shenton Park hospital site may be required if that area is to be cleared in the future. There is potential for the presence of the King Spider Orchid, *Caladenia huegelii*, which must be surveyed for in late September to mid-October.

This report is subject to, and must be read in conjunction with, the limitations set out in sections 1.3 and 1.4 and the assumptions and qualifications contained throughout the Report.

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1. Introduction

1.1 Background

LandCorp has undertaken preliminary investigations on the Shenton Park Rehabilitation Hospital site (Study area) to determine its potential for future redevelopment. LandCorp commissioned GHD Pty Ltd (GHD) to undertake a Level 1 flora and Level 1 fauna survey to investigate and report on any significant flora and fauna at this site.

1.2 Study area

The Study area at Shenton Park Rehabilitation Hospital comprises 15.79 hectares at Reserve 2290 and contains a range of buildings, car parks and vegetated areas. The site is situated on Lemnos and Selby Streets in Shenton Park and is shown in Figure 1.

1.3 Scope and limitations

This scope of works for this assessment involves both desktop and field components. The field component consisted of a level 1 flora and fauna survey of the Study area and aimed to satisfy all requirements documented within the request for tender. The survey was undertaken in accordance with:

- Environmental Protection Authority (EPA) guidelines for flora surveys as outlined in Guidance Statement No. 51 Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA, 2004a);
- EPA Guidelines for Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3 (EPA, 2002); and
- EPA Assessment of Environmental Factors for Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia. Guidance Statement No.56 (EPA, 2004b).

1.4 Assumptions

The assessment is based on the site footprints provided by LandCorp in the project brief and shown in Figure 1. Any changes to the sites or scope, outside the description provided above, are outside the scope of this assessment.

GHD has relied upon external data, namely publicly available databases, to identify species previously recorded in the area. The accuracy of this data lies with the provider, not with GHD.

2. Methodology

2.1 Desktop assessment

A comprehensive desktop review was undertaken prior to the commencement of the field survey to identify any potentially sensitive areas.

In regard to flora and vegetation this review included:

- a review of existing flora and vegetation surveys provided by LandCorp and other relevant reports, as available
- a review of the potential for Threatened and Priority Flora to be present within the study areas. This included species listed under both the *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*) and the *WA Wildlife Conservation (Rare Flora) Notice 2007-)*;
- a review of the Department of Parks and Wildlife's (DPaW) Threatened Ecological Communities (TEC) and Priority Ecological Communities (PEC) databases to determine the potential for TECs or PECs to be present within the study areas.
- a review of the Department of the Environment (DotE) Protected Matters Search Tool (PMST) – to identify species listed under the *EPBC Act* potentially occurring within the study areas;

In regard to fauna this review included;

- a review of the DPaW Threatened Fauna database – to identify species listed under the *Wildlife Conservation Act 1950* (WC Act), or those species listed as Priority by the DPaW, that have previously been recorded within or adjacent to the study areas;
- the Western Australian Museum and DPaW *NatureMap* database – to determine vertebrate fauna species lodged in the museum's collection from within or adjacent to the study areas;
- The development of base maps (aerial photography with cadastre, topography and Beard mapping) for field survey.

2.2 Flora field assessment

The field surveys were undertaken in Spring 2011, by qualified and experienced ecologists.

Field surveys were undertaken with regards to the EPA Guidance Statement No. 51, *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* and included the following:

- A representative number of quadrats located in each vegetation type. In accordance with EPA Guidance Statement 51, a minimum of 2 quadrats were located within each identified vegetation type. Vegetation types were identified by means of a combination of

aerial photography, topographical features and field observation. Quadrat sampling sites were an area of 10 m x 10 m and the position of each site was recorded using a GPS unit.

- The intensity of sampling (the number of sites, spacing and area) did not require more than two quadrats per vegetation unit, as the vegetation complexity and structure was simple and the site was relatively small. Targeted surveys were carried out in the drainage line as these areas typically support a higher level of biodiversity.
- In addition to quadrat sampling, *relévés*[1] were walked across the sites allowing opportunistic collection of flora species.
- Rapid assessment points were conducted across in various areas across the sites to provide more thorough spatial coverage.
- Where field identification of plant taxa was not possible, specimens were collected in a systematic manner and then later identified at the West Australian Herbarium by comparison with the reference collection and use of identification keys.
- An assessment of *Lomandra* spp. on the site in line with the Graceful Sun-moth (GSM) guidelines (Bishop *et al.*, 2010).

2.3 Fauna field assessment

The fauna assessment was consistent with a Level 1 assessment (reconnaissance survey) in accordance with *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia – Guidance Statement No. 56*, EPA, Perth.

The methodology used to undertake the fauna assessment included:

- Opportunistic searches across all habitat types within the site. This ensured the maximum suite of species potentially occurring at the site was observed. This involved searching through microhabitats including turning over logs or rocks, turning over leaf litter and examining hollow logs.
- Opportunistic visual and aural surveys. This accounted for many bird species potentially utilising the site.
- The site was also be searched for tracks, scats, bones, diggings and feeding areas for both native and feral fauna.
- Species – specific search strategies were used to identify any protected species in the area or signs that they utilise the site.
- Domestic animals that were present at the Study area were discounted in the species diversity results for this report.
- Advice was sought from Site Managers/Officers on the site about the presence and abundance of more cryptic and conservation listed species.
- Nomenclature used in the report follows that used by the Western Australian Museum *NatureMap* program, as it is deemed to contain the most up-to-date species information for Western Australia.

[1] For the purposes of this flora and vegetation assessment, a *relévé* is defined as an unconfined survey area in which a general statement about the floristic composition of the location can be made.

2.4 Survey limitations

Fauna survey limitations

The fauna assessment undertaken was a reconnaissance survey only and thus only sampled those species that can be easily seen, heard or have distinctive signs, such as tracks, scats, diggings etc. Many cryptic and nocturnal species would not have been identified during a reconnaissance survey.

The fauna assessment was aimed at identifying habitat types within the Study area. In addition, terrestrial vertebrate fauna utilising the site were identified. No sampling for invertebrates or aquatic species occurred. The information available on the identification, distribution and conservation status of invertebrates is generally less extensive than that of vertebrate species.

This survey was carried out during only one season and in one year. Complete faunal surveys often require multiple surveys, at different times of year, and over a period of a number of years, to enable full survey of all species present

Flora survey limitations

Complete flora and vegetation surveys can require multiple surveys, at different times of year, and over a period of a number of years, to enable observation of all species present. Some flora species, such as annuals, are only available for collection at certain times of the year and others are only identifiable at certain times (such as when they are flowering). Additionally, climatic and stochastic events (such as fire) may affect the presence of plant species. Species that have a very low abundance in the area are more difficult to locate, due to the above factors.

Flora composition changes over time, with flora species having specific growing periods, especially annuals and ephemerals (some plants lasting for a markedly brief time, some only a day or two). Therefore, the results of future botanical surveys in this location may differ from the results of this survey.

Desktop Investigation Limitations

Desktop investigations use a variety of online resources (such as NatureMap and the EPBC Protected Matter database) the responsibility for the accuracy of such data remains with the issuing authority, not with GHD. The DotE Protected Matters database is used to identify species listed under the EPBC Act; this data base draws on various sources to report on the potential of the species occurrence within the area. The DotE search tool is broad-scale in its' reporting and often the specific habitat requirements of the species do not occur within project sites and are unlikely to occur within the area. For this reason not all species reported by the search tool need to be considered in management decisions. The *NatureMap* database reports on actual records of the species within the designated area and can provide more accurate information of the likelihood of species presence.

3. Results

3.1 Broad vegetation classification

The study area lies within the Swan Coastal Plain 2 (SWA2- Swan Coastal Plain sub-region) biogeographic region of the Interim Biogeographic Regionalization for Australia (IBRA) (Thackway and Cresswell, 1995). The Swan Coastal Plain is dominated by woodlands on a low lying sandy coastal plain. The woodlands tree species include Tuart (*Eucalyptus gomphocephala*), Mari (*Corymbia calophylla*), Jarrah (*Eucalyptus marginata*) and various *Banksia* species in the sandy soils. *Casuarina* and *Melaleuca* species dominate the wetlands, swampy areas and riparian areas (Beard 1990).

3.2 Vegetation association

A vegetation type is considered under-represented if there is less than 30% of its original distribution remaining. From a purely biodiversity perspective, and not taking into account any other land degradation issues, there are several key criteria now being applied to vegetation (EPA, 2000). These are;

- The "threshold level" below which species loss appears to accelerate exponentially at an ecosystem level is regarded as being at 30% of the pre-European extent for the vegetation type;
- 10% of the pre-European extent for the vegetation type is regarded as being a level representing *Endangered*; and
- Clearing which would put the threat level into the class below should be avoided.

Such status can be delineated into five (5) classes:

- *Presumed Extinct*: Likely no longer present in the bioregion
- *Endangered**: < 10% of pre-European extent remains
- *Vulnerable**: 10-30% of pre-European extent exists
- *Depleted**: > 30% and up to 50% of pre-European extent exists
- *Least Concern*: > 50% pre-European extent exists and subject to little or no degradation over a majority of this area.

* Or a combination of depletion, loss of quality, current threats and rarity gives a comparable status

The extent of remnant native vegetation has been assessed by Government of Western Australia (2010), based on vegetation association mapping undertaken by Beard (1979).

The Study area is situated in the Spearwood System. The vegetation types recorded in the field survey are mapped in Figure 2. The extent of the relevant Beard native vegetation type remaining in the State, Bioregion and Local Government area is presented in Table 1.

Table 1 Extent remaining of vegetation type in the State, Bioregion and relevant Local Government Area

Scale / Beard Vegetation Association 6	Pre- European extent within area	Current extent in area	Percentage remaining	Percentage of current extent in Reserves	Status
State wide: Western Australia	56,343	14,018	24.88	35.85	Vulnerable
IBRA Bioregion: Swan Coastal Plain	56,343	14,018	24.88	35.85	Vulnerable
IBRA Subregion:	56,343	14,018	24.88	35.85	Vulnerable
LGA: City of Subiaco	696 ha	4.94 ha	0.71	0	Endangered

3.3 Threatened and Priority Ecological Communities

Ecological communities are defined as 'naturally occurring biological assemblages that occur in a particular type of habitat' (English and Blythe, 1997). Threatened Ecological Communities (TECs) are ecological communities that have been assessed and assigned to one of four categories related to the status of the threat to the community, i.e. Presumed Totally Destroyed, Critically Endangered, Endangered, and Vulnerable.

The DPaW maintains a list of TECs which have been endorsed by the Minister for the Environment (DPaW 2014a). Some of these TECs are protected under the EPBC Act. DPaW listed ecological communities are given special consideration in environmental impact assessments and have special status under the land clearing regulations of the *Environmental Protection Act 1986* (EP Act). The EPA's position on TECs states that proposals that result in the direct loss of TECs are likely to require formal assessment.

No TECs are known to occur within the Study area or adjacent vegetation. A PEC **Banksia dominated woodlands of the Swan Coastal Plain IBRA region** (Priority 3(iii)) (Swan PEC 27) is potentially present in the Study area, as Site Vegetation Type 1 (see Section 3.4 below). The main feature of these Banksia woodlands is the presence of *Banksia attenuata* and/or *B. menziesii* occurring on deep sands. The species commonly co-occur. The community occurs on the Quindalup, Spearwood and Bassendean dunes and rarely on the Pinjarra Plain landforms that comprise the dominant landforms of the Swan Coastal Plain (DPaW, 2014b).

3.4 Site vegetation types

Four vegetation types were identified within the Study area during the field survey. These vegetation types are described in detail in Table 2 and mapped in Figure 2.

Table 2 Vegetation types

Vegetation Type	Description	Photo
Vegetation Type 1. Jarrah/Banksia woodland over mixed shrubs and herbs.	Low Open Woodland of *Eucalytpus marginata, Banksia menziesii* and *Allocasuarina fraseriana* over Tall Shrubland of *Xanthorrhoea preissii* and *Jacksonia furcellata* over Open Shrubland of *Hypocalymma robustum* over Low Shrubland of *Petrophile macrostachya, Acacia huegelii* and *Hibbertia hypericoides* over Very Open Grassland of **Ehrharta calycina, *Avena barbata* and **Briza maxima* with Herbland of *Caesia micrantha, *Ursinia anthemoides* and **Freesia alba* x *leichtlinii* with Sedgeland of *Mesomelaena pseudustygia, Schoenus grandiflorus* and *Desmocladus flexuosus*. Potentially identifies with PEC Swan 27.	
Vegetation Type 2. Sump/ Damp area with mixed trees and shrubs	Man-made drainage sump with Tall Open Woodland of *Eucalyptus wandoo, Eucalyptus rudis* and **Corymbia maculata* over open Forest of *Melaleuca rhaphiophylla, *Salix babylonica* and **Melia azedarach* over Tall Open Scrub of **Olea europea, *Ricinus communis* and **Watsonia* sp. over Herbland of *Typha* sp. and **Rumex crispus*.	
Vegetation Type 3. Planted *Eucalyptus* species (locally native and non-locally native species)	Highly modified tall open mixed *Eucalyptus* woodland over Tall Shrubland of *Xanthorrhoea preissii* over grassland of grass weed species.	

Vegetation Type	Description	Photo
Vegetation Type 4. Completely degraded and modified/ garden beds, buildings and car parks.	Highly modified tall open mixed *Eucalyptus* woodland over lawn and garden beds or completely cleared lawn areas/ car parks.	

3.5 Vegetation condition

The vegetation condition of the site was assessed using the vegetation condition rating scale developed by Keighery (1994) that recognises the intactness of vegetation, which is defined by the following:

Table 3 Vegetation condition rating scale

Vegetation condition rating	Vegetation condition	Description
1	Pristine or Nearly so.	No obvious signs of disturbance.
2	Excellent	Vegetation structure intact, disturbance affecting individual species, and weeds are non-aggressive species.
3	Very Good	Vegetation structure altered, obvious signs of disturbance.
4	Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances retains basic vegetation structure or ability to regenerate it.
5	Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not in a state approaching good condition without intensive management.
6	Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost without native species.

The vegetation condition for the Study area is mapped in Figure 3. The site has a patch of bush land in the western half of the property that ranges in condition from Very Good (3) to Degraded (5). The central and eastern parts of the site (along Selby Street) are considered to be in Degraded (5) to Completely Degraded (6) condition and consist of car parks, buildings and garden beds.

3.6 Flora diversity

Desktop investigations identified 983 flora species as potentially occurring within 5 km of the Study area (DPaW 2007-).

A total of 109 plant taxa (including subspecies and varieties) representing 38 plant families and 85 genera were recorded during the field survey. This total is comprised of 67 native species and 42 introduced (exotic) species.

Dominant families at the site were:

- Fabaceae (18 species)
- Poaceae (13 species) and
- Myrtaceae (12 species)

Twelve (potentially) native taxa in the collection could not be identified to species level due to the absence of adequate flowering parts and/or fruiting bodies. None of these samples matched Threatened or Priority species previously found within 5 km of the Study area.

A full list of flora species present within the Study area is provided in Appendix C.

3.7 Conservation significant flora

Species of significant flora are protected under both State and Federal Acts. Any activities that are deemed to have a significant impact on species that are recognised by the EPBC Act and the WC Act can trigger referral to DotE and/or the EPA. The meanings of conservation codes relating to flora of conservation significance are provided in Appendix D.

DPaW produces a supplementary list of Priority Flora, these being species that are not considered Threatened under the WC Act but for which the Department feels there is a cause for concern. These species have no special legislative protection, but their presence would normally be considered relevant to an assessment of the conservation status of an area. Such taxa need further survey and evaluation of conservation status before consideration can be given to declaration as threatened flora.

Desktop investigations identified 27 species of conservation significant flora (including one fungus species) previously recorded within 5 km of the Study area. This included two Threatened and 24 Priority species and one species presumed extinct. Results of these searches are provided in Appendix B.

One Priority 4 species, *Jacksonia sericea*, was recorded during the field survey with over 100 plants recorded in vegetation type 1 (as shown on Figure 2, Appendix A), which is the bushland area towards the western edge of the property.

There is a low possibility that one of the Threatened species, *Caladenia huegelii*, could be present on the site. The survey was not undertaken at a time of year which would identify this species and the habitat is potentially suitable. The second Threatened species, *Diuris drummondii*, occurs only in low lying depressions and swamps, and such habitat is not present on the site.

3.8 Fauna habitat

The fauna habitat types within the Study area are closely aligned with the vegetation types identified in section 3.4. The area of vegetation along the western edge of the site;

- has the most intact and diverse habitat values of the site;
- is mostly in good condition; and
- supports the highest abundance and diversity of fauna species recorded during the field survey.

There are potential nesting trees for Black Cockatoos spread across the Study area and the western patch of bush has several flora species that are known to be feeding resources for Black Cockatoo species (detailed in section 3.9.1).

The presence of cats in the area, a long history of nearby development and the small, fragmented nature of this bushland limits the habitat values of this patch of vegetation. However

this area would provide habitat for birds, some reptiles, frogs and possibly small ground mammals. The western patch of bush in the Shenton Park site should be considered in relation to its role as linkage through patches of remnant vegetation in the wider Swan Coastal Plain environment.

3.9 Fauna diversity

The desktop search of DPaW's *NatureMap* (DPaW 2007-) identified 558 fauna species previously recorded within 5 km of the Shenton Park site.

The field survey recorded 35 fauna species, including 30 native species and 5 introduced species. There were no conservation significant species recorded during the site survey. These results are presented in Table 4.

Table 4 Fauna species recorded during field survey

Family	Species	Common Name
Birds		
Acanthizidae	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill
Acanthizidae	*Gerygone fusca*	Western Gerygone
Artamidae	*Artamus cinereus*	Black-faced Woodswallow
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike
Campephagidae	*Lalage tricolor*	White-winged Triller
Columbidae	*Columba livia*	Domestic Pigeon*
Columbidae	*Phaps chalcoptera*	Common Bronzewing
Columbidae	*Streptopelia senegalensis*	Laughing Turtle-Dove*
Corvidae	*Corvus bennetti*	Little Crow
Corvidae	*Corvus coronoides*	Australian Raven
Cracticidae	*Cracticus nigrogularis*	Pied Butcherbird
Cracticidae	*Cracticus tibicen*	Australian Magpie
Dicruridae	*Rhipidura leucophrys*	Willie Wagtail
Dicruridae	*Grallina cyanoleuca*	Magpie-lark
Dicruridae	*Rhipidura fuliginosa*	Grey Fantail
Halcyonidae	*Dacelo novaeguineae*	Laughing Kookaburra*
Hirundinidae	*Hirundo neoxena*	Welcome Swallow
Meliphagidae	*Acanthorhynchus superciliosus*	Western Spinebill
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird
Meliphagidae	*Anthochaera lunulata*	Western Little Wattlebird
Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater
Meropidae	*Merops ornatus*	Rainbow Bee-eater
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler
Psittacidae	*Platycercus zonarius semitorquatus*	Twenty-eight Parrot
Psittacidae	*Cacatua sanguinea*	Little Corella
Psittacidae	*Cacatua roseicapilla*	Pink and grey Galah
Threskiornithidae	*Threskiornis molucca*	Australian White Ibis
Zosteropidae	*Zosterops lateralis*	Grey-breasted White-eye
Mammals		
Felidae	*Felis catus*	Cat*
Leporidae	*Oryctologus cuniculus*	Rabbit*
Reptiles		

Family	Species	Common Name
Scincidae	*Lerista elegans*	Western Four Toed Skink
Scincidae	*Morethia obscura*	Southern Flecked Morethia
Scincidae	*Menetia greyii*	Common Dwarf Skink

3.10 Conservation significant fauna

The Federal conservation level of fauna species and their significance status is considered under the EPBC Act. The significance levels for fauna under the EPBC Act are those recommended by the International Union for the Conservation of Nature and Natural Resources (IUCN).

The State conservation level of fauna species and their significance status is considered under the WC Act (*Wildlife Conservation (Specially Protected Fauna) Notice 2014*). The WC Act uses a set of Schedules but also classifies species using some of the IUCN categories. Schedule 3 fauna species are those which are "subject to an agreement between the government of Australia and the governments of Japan, China and the Republic of Korea relating to the protection of migratory birds, are declared to be fauna that is in need of special protection" (Government of Western Australia, 2010).

Additionally, in Western Australia, DPaW produces a supplementary list of Priority fauna, these being species that are not considered Threatened under the WC Act but for which the Department feels there is a cause for concern. These species have no special legislative protection, but their presence would normally be considered relevant to an assessment of the conservation status of an area. Such taxa need further survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna. The meanings of conservation codes relating to fauna of conservation significance are provided in Appendix D.

The desktop searches for the Shenton Park site identified the potential presence of some conservation significant marine fauna species due to the 5km seach radius. These species are omitted from further evaluation because the site does not contain marine habitat.

Desktop searches identified 56 Threatened or Priority fauna species that may potentially occur in the area (from the PMST) or that have been recorded within 5 km of the Study area (*NatureMap*). The likelihood of occurrence of the terrestrial (non-marine) species based on their habitat requirements is considered in Table 5.

Table 5 Likelihood of occurrence of conservation significant fauna

Species	Status		Likelihood of Occurrence
	State	Federal	
Birds			
Botaurus poiciloptus Australian bittern	Schedule 1	Endangered	Unlikely. No suitable habitat. This species prefers wetlands with dense vegetation.
Ixobrychus flavicollis australis Black Bittern	Priority 3		Unlikely. No Suitable habitat. This species requires wetlands with dense water-edge vegetation.
Ixobrychus minutus dubius Little Bittern	Priority 4		Unlikely. No Suitable habitat. This species prefers wetlands with dense vegetation.
Calyptorhynchus latirostris Carnaby's Black Cockatoo	Schedule 1	Endangered	Likely. Suitable feeding plants and breeding trees on site and has been recorded within 5 km.

Species	Status		Likelihood of Occurrence
	State	Federal	
Calyptorhynchus banksii naso Forest Red-tailed Black Cockatoo	Schedule 1	Vulnerable	Likely. Suitable feeding plants and breeding trees on site, and recorded within 5 km of site.
Calyptorhynchus baudinii Baudin's Black Cockatoo	Schedule 1	Vulnerable	Likely. Suitable feeding plants and breeding trees on site, and recorded within 5 km.
Sternula nereis nereis Fairy Tern		Vulnerable	Unlikely. This species is closely associated with coastal habitats.
Rostratula benghalensis australis Australian Painted Snipe	Schedule 1	Vulnerable	Unlikely. No suitable habitat. This species prefers wetlands with dense vegetation.
Tyto novaehollandiae novaehollandiae Masked Owl	Priority 3		Possible. There is some habitat for the owl and it has been recorded within 5 km of the site.
Limosa lapponica (Bar-tailed Godwit)	Schedule 1	Migratory	Unlikely. No suitable habitat present.
Limosa limosa (Black-tailed Godwit)	Schedule 3	Migratory	Unlikely. No suitable habitat present.
Merops ornatus (Rainbow Bee-eater)		Migratory	Possible. There is some habitat for this species and it has been recorded within 5 km of the site.
Ninox connivens subsp. connivens (Barking Owl (southwest pop P2), Barking Owl)	Priority 2		Possible. There is some habitat for this species and it has been recorded within 5 km of the site.
Mammals			
Macropus irma Western Brush Wallaby	Priority 4		Highly unlikely. The species has undergone massive decline on the Swan Coastal Plain only persisting in large remnant bushland areas.
Setonix brachyurus Quokka	Schedule 1	Vulnerable	Highly unlikely. This species is associated with dense forests and thickets, it is highly susceptible to predation from cats and foxes (both present within or nearby the site) and is considered extinct in the Perth metropolitan area.
Hydromys chrysogaster Water-rat	Priority 4		Highly unlikely. No suitable habitat.
Macrotis lagotis Bilby	Schedule 1	Vulnerable	Highly unlikely. The species has been locally extinct for over 50 years.
Dasyurus geoffroii Chuditch	Schedule 1	Vulnerable	Highly unlikely. This species is considered extinct within the inner metropolitan area.
Isoodon obesulus subsp. fusciventer (Quenda, Southern Brown Bandicoot)	Priority 5		Possible. Some suitable habitat occurs and has been recorded within 5 km.
Myrmecobius fasciatus (Numbat, Walpurti)	Schedule 1	Vulnerable	Highly unlikely. This species is highly susceptible to predation from cats and foxes (both present within or nearby the site) and is considered extinct in the

Species	Status		Likelihood of Occurrence
	State	Federal	
			Perth metropolitan area.
Reptiles			
Neelaps calonotos Black-striped Snake	Priority 3		Possible. This species is restricted to sandy habitats on the Swan Coastal Plain but has not been recorded within 5 km of the site.
Morelia spilota imbricata Carpet Python	Schedule 5; Priority 4		Possible. The species has been recorded within 5 km of the site and there is some suitable habitat. The surrounding levels of development and disturbance would limit habitat value for this species.
Insects			
Synemon gratiosa Graceful Sun-moth	Priority 4		Possible. Suitable habitat is present on the site and the species has been recorded nearby in Shenton Park Bushland.
Arbanitis inornatus Trapdoor Spider	Priority 1		Possible, some habitat is present within the site.

3.11 Black cockatoos

There are three species of Black Cockatoos that can potentially occur on the Swan Coastal Plain, and all have been recorded within 5 km of the Shenton Park site. These are:

- *Calyptorhynchus latirostris* (Carnaby's Black Cockatoo) is listed as Endangered under the EPBC Act and Threatened/Schedule 1 under the WC Act
- *Calyptorhynchus baudinii* (Baudin's Black Cockatoo) is listed as Vulnerable under the EPBC Act and Threatened/Schedule 1 under the WC Act.
- *Calyptorhynchus banksii naso* (Forest Red-tailed Black Cockatoo) is listed as Vulnerable under the EPBC Act and Threatened/Schedule 1 under the WC Act.

These Cockatoos are known to feed on *Banksia*, *Allocasuarina*, *Eucalyptus* and *Hakea* species and these plant species were identified in the flora surveys. Additionally, the Cockatoos are known to use a wide variety of plant taxa as food resources, therefore all vegetation within the study area was assessed for signs of use. Trees with potential nesting qualities were considered to have a diameter at breast height (DBH) of greater than 500 mm (DBH >500 mm) and generally include Tuart (*Eucalyptus gomphocephala*), Wandoo (*Eucalyptus wandoo*), Jarrah (*Eucalyptus marginata*) or Marri (*Corymbia calophylla*). Trees of this size are considered to have current nesting potential, or within 100 years of now (that is the tree may have, or develop hollows within 100 years). Trees of these species and a DBH of >500 mm were further surveyed for the presence of hollows and nesting activity by Cockatoos. Any trees that met the actual or potential criteria for nesting were recorded by GPS and mapped for each site.

The Study area has potential nesting trees spread across the site and comprises of approximately 2.4 ha, as mapped in Figure 4, however the feeding resources are limited to the western patch of vegetation which comprises of approximately 1.88 ha.

3.12 Risk referral table

DSEWPaC (2012) provides a risk table that gives guidance on what the Department views as risks\impacts to Black Cockatoos that will trigger referral. Risk is broken into 3 categories high, uncertain and low and primarily focuses on breeding, feeding and roosting areas as well as indirect impacts. If there is uncertainty in regards to risks on Black Cockatoos then the Department recommends referring the project or contacting the Department to ensure legal certainty. Table 6 below identifies the risks and considers whether or not the risk triggers referral.

Based on Table 11, impacts to Black Cockatoos trigger referral based on:

- Clearing of 2.4 hectares of potential breeding habitat
- Clearing of 1.88 hectares of feeding habitat
- Potential hydrological changes to feeding habitat
- Degradation of habitat through land changes; in particular, further edging effect of feeding habitat
- Increased competition of breeding habitat by other species by removing hollows.
- And potential movement or establishment of *Phytophthora spp.* (dieback) into Black Cockatoo habitat.

Table 6 Black cockatoo risk referral assessment

High Risk of Significant Impacts: Referral Recommended	Referral Trigger
Clearing of any known nesting tree.	No
Clearing of any part or degradation of breeding habitat in a woodland or forest within a species known breeding range.	Yes
Clearing of more than 1 ha of quality foraging habitat.	Yes
Creating a gap or greater than 4 km between patches of Black Cockatoo Habitat (Breeding, Foraging or Roosting).	No
Clearing or degradation (including pruning of top canopy) of a known roosting site.	No
Uncertainty: Referral recommended or contact the department	
Degradation (such as through altered hydrology or fire regimes) of more than 1 ha of foraging habitat. Significance will depend on the level and extent of degradation and the quality of the habitat.	Possible
Clearing or disturbance in areas surrounding Black Cockatoo habitat that has the potential to degrade habitat through introduction of invasive species, edge effect, hydrological changes, increase human visitation or fire.	Yes
Actions that do not directly affect the listed species but that have the potential for indirect impacts such as increasing competitors for nest hollows.	Yes
Actions with the potential to introduce known plant diseases such as Phytophthora spp.	Possible.
Low Risk of significant impacts: referral may not be required but you may refer for legal certainty	
Actions that do not affect Black Cockatoo habitat or individuals.	No
Actions whose impacts occur outside the modelled distribution of the three Black Cockatoos.	No

3.12.1 Graceful Sun-moth

To confirm if a Graceful Sun-moth population is present a targeted moth survey was required. The survey is only able to be undertaken between late February and early April. An indication of presence can be established based on habitat type and the presence/absence of *Lomandra* species, or historical records. An indication of presence can also be established based on habitat type and the presence/absence of *Lomandra* species. In this case the Study area has some Banksia Woodland species which are known to support GSM populations even though no *Lomandra maritima* or *L. hermaphrodita* was recorded. The Study area is directly opposite a known Graceful Sun-moth site (Bush Forever site 218) and was considered to have habitat suitable to support a population (Government of Western Australia 2000).

As a result of the possibility of the presence of the Graceful Sun-moth, GHD undertook a targeted moth survey during the required survey period within the Study area. No Sun-moths were recorded during the survey.

4. Conclusion and recommendations

The Study area is primarily buildings and infrastructure but does contain some remnant Jarrah Banksia woodland vegetation on its western side that is intact and has a vegetation condition of 3 (Very Good). The remainder of the site has a vegetation condition ranging from Very Good (3) to Completely Degraded (6). The vegetation does not match any known Threatened Ecological Communities from the broader region. However, it may match PEC 27, *Banksia dominated woodlands of the Swan Coastal Plain IBRA region* due to the presence of *Banksia menziesii* in the area. The vegetation type is poorly conserved within the City of Subiaco but relatively well conserved across the Perth IBRA sub-region.

A Priority 4 flora shrub species, *Jacksonia sericea*, is present on the western part of the site, with over 100 plants recorded.

There are 11 conservation significant fauna species that are considered likely to occur or to possibly occur, based on the available habitat and known records. No conservation significant species were recorded during the site survey. Three species are considered likely to occur at the site, and five may possibly utilize the site opportunistically. The three likely species are:

- *Calyptorhynchus latirostris* (Carnaby's Black Cockatoo);
- *Calyptorhynchus banksia naso* (Forest Red-tailed Black Cockatoo)
- *Calyptorhynchus baudinii* (Baudin's Black Cockatoo)

Based on DSEWPaC (2012) guidelines approximately 1.88 hectares of feeding habitat and 2.4 hectares of potential breeding habitat is present. Clearing of these areas would trigger referral to DSEWPaC.

4.1 Recommendations

Further survey of the bushland section of the Study area may be required if that area is to be cleared in the future. There is potential for the presence of the King Spider Orchid, *Caladenia huegelii*, which must be surveyed for in late September to mid-October. In addition. The

Due to the Black Cockatoo feeding habitat and potential breeding habitat within the Study area, it is recommended that the project is referred to the DotE, if the land is proposed to be cleared.

5. References

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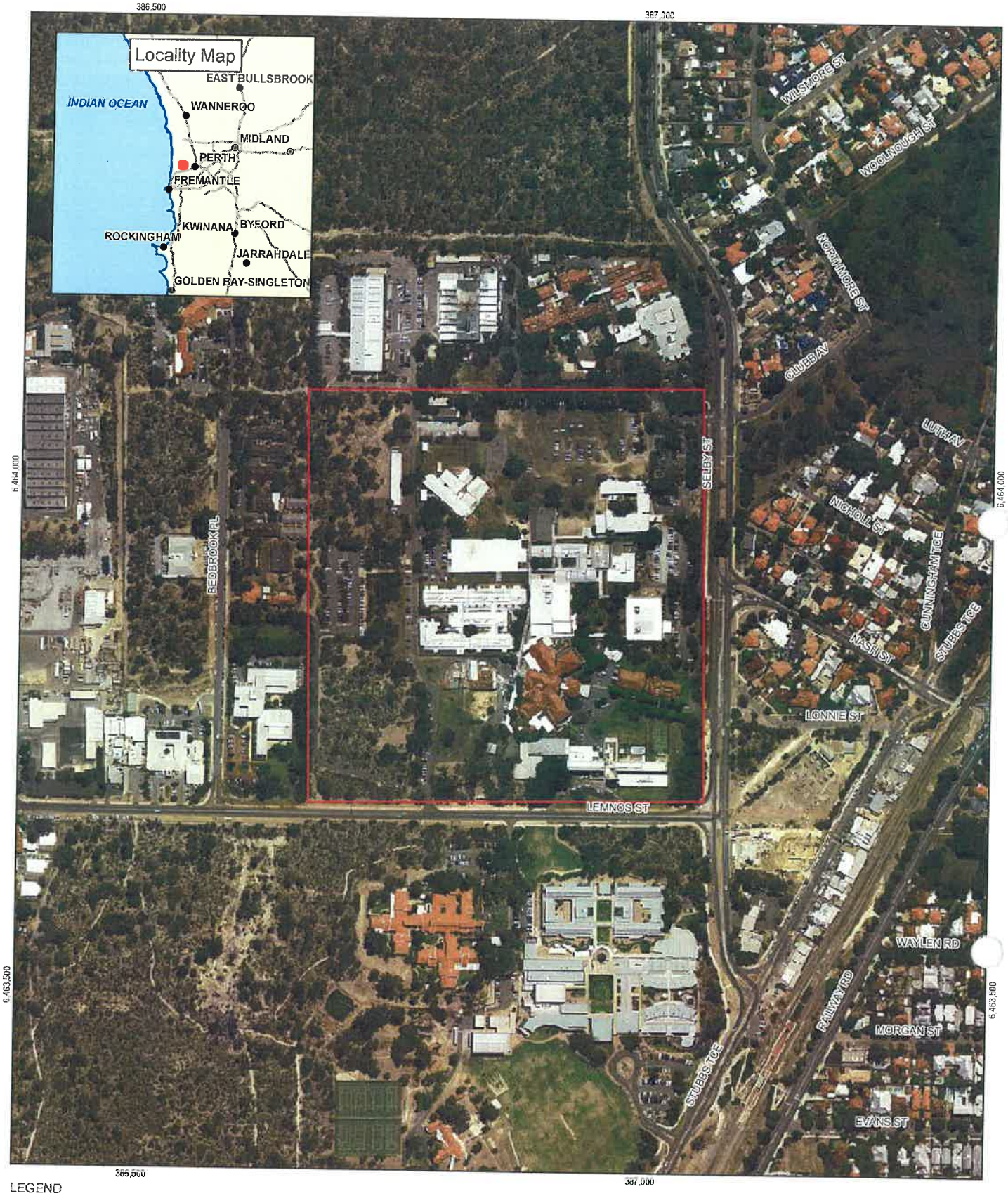
Appendices

Appendix A - Figures



LEGEND

Study Area

1:5,000 at A4

0 25 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

CLIENTS|PEOPLE|PERFORMANCE

SLIP ENABLER

LandCorp
LandCorp Hospital sites

Job Number 61-27623
Revision 0
Date 13 Jan 2012

Locality; Shenton Park

Figure 1

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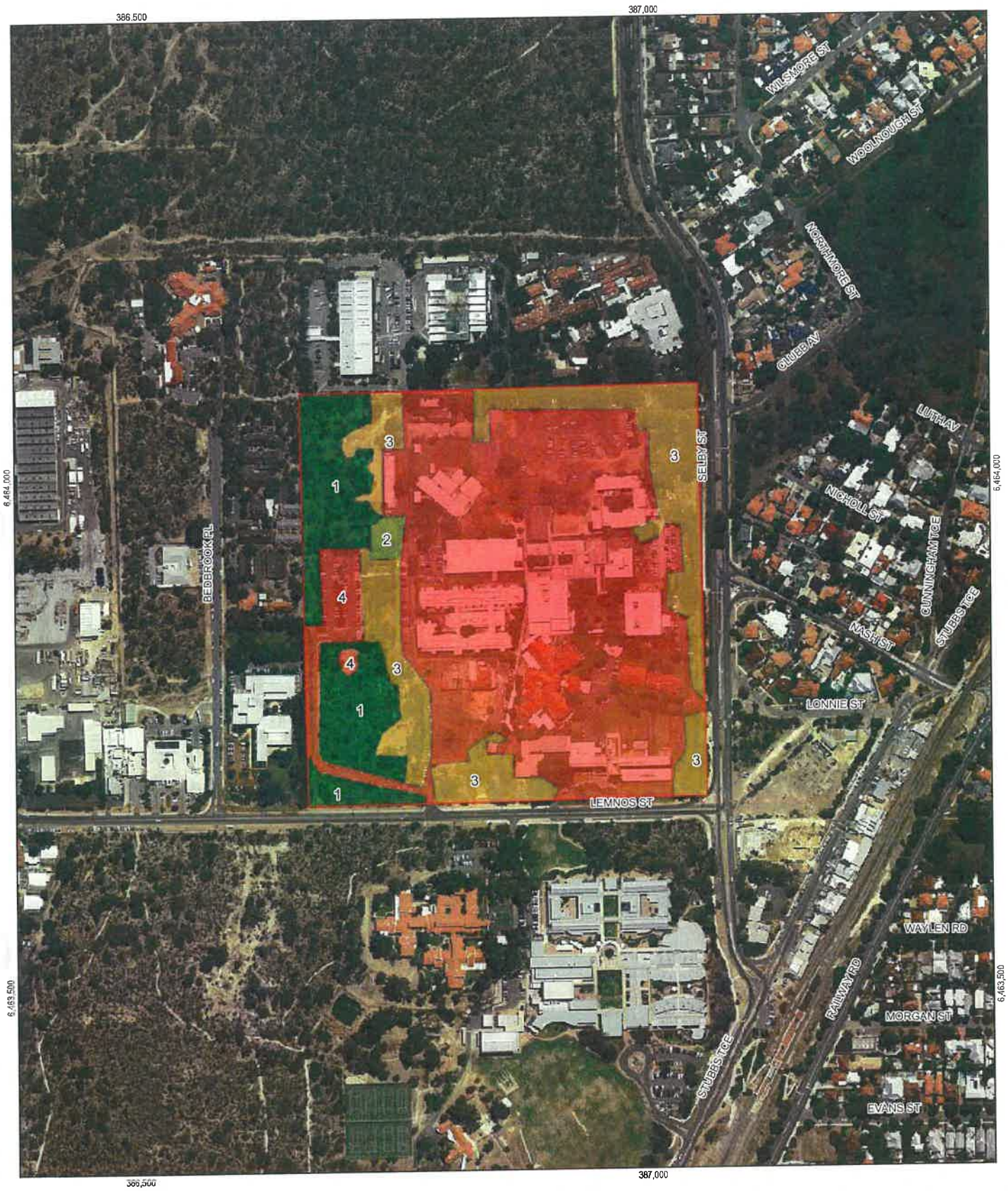
GHD House, 239 Adelaide Terrace Perth WA 6004 T 61 8 6222 8222 F 61 8 6222 8555 E permail@ghd.com.au W www.ghd.com.au

Data source: GHD : Study Area - 20111216; Landgate : Central Metro Mosaic - 2011, Roads - 20111216; GA: Topo 250k Series 3 - 2006. Created by:vdinh



LEGEND

Study Area

Vegetation Type

1. Jarrah / Banksia over mixed shrubs and herbs
2. Sump / damp area with mix trees and shrubs
3. Planted Euc's (Locally and non-locally native species)
4. Completely degraded and modified / garden beds buildings and car parks

1:5,000 at A4

0 25 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

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LandCorp Hospital sites

Job Number 61-27623
Revision 0
Date 11 Jan 2012

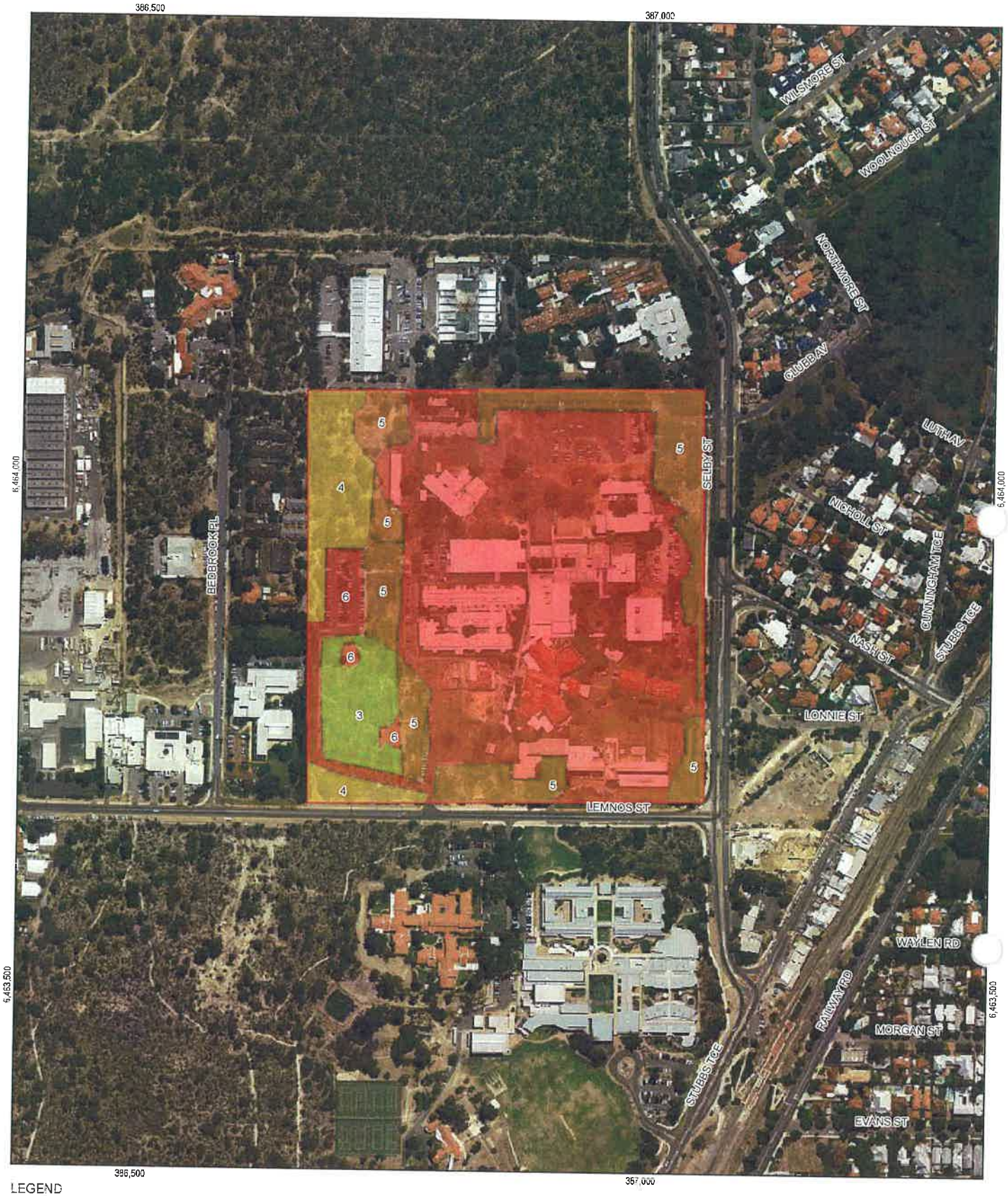
Vegetation Types; Shenton Park

Figure 2

GHD House, 239 Adelaide Terrace Perth WA 6004 T 61 8 6222 8222 F 61 8 6222 8555 E permail@ghd.com.au W www.ghd.com.au

G:\61\27623\GIS\Maps\MXD\6127623_G004_Rev0.mxd

Data source: GHD : Study Area - 20111216, Vegetation Type - 201111912; Landgate : Central Metro - 2011, Roads - 20111216. Created by:vdinh



LEGEND

Study Area

Vegetation Condition

1. Pristine or Nearly so
2. Excellent
3. Very good
4. Good
5. Degraded
6. Completly Degraded

1:5,000 at A4

0 25 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Job Number 61-27623
Revision 0
Date 13 Jan 2012

Vegetation Condition; Shenton Park Figure 3

G:\61\27623\GIS\Maps\MXD\6127623_G005_Rev0.mxd

Data source: GHD : Study Area - 20111216, Vegetation Condition - 20111912; Landgate : Central Metro Mosaic - 2011, Roads - 20111216. Created by:vdinh

GHD House, 239 Adelaide Terrace Perth WA 6004 T 61 8 6222 8222 F 61 8 6222 8555 E permail@ghd.com.au W www.ghd.com.au

LEGEND

- Potential Nesting Trees for Black Cockatoos
- Study Area

1:5,000 at A4

0 25 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

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LandCorp Hospital sites

Job Number 61-27623
Revision 0
Date 13 Jan 2012

Potential Nesting Trees for Black Cockatoos; Shenton Park

Figure 8

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GHD House, 239 Adelaide Terrace Perth WA 6004 T 61 8 6222 8222 F 61 8 6222 8555 E permail@ghd.com.au W www.ghd.com.au

Data source: GHD : Study Area - 20111216; Potential Nesting Trees for Black Cockatoos - 20111122; Landgate : Central Metro Mosaic - 2011, Roads - 20111216. Created by:vdinh

Appendix B – Desktop Search Results

EPBC Protected Matters Search Tool

NatureMap Search (Conservation Significant Flora)

NatureMap Search (Conservation Significant Fauna)

Australian Government
Department of the Environment

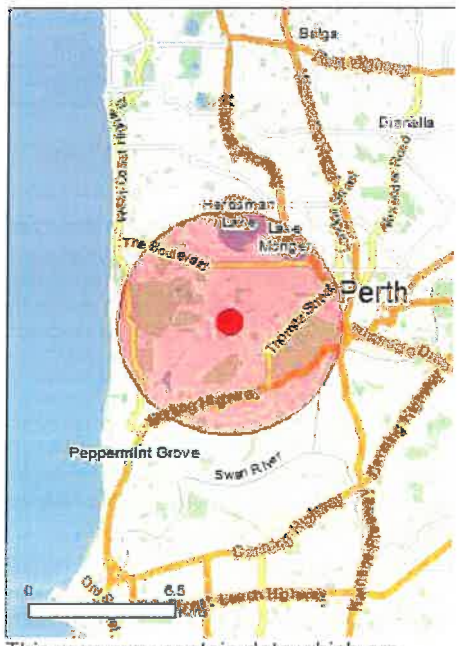
EPBC Act Protected Matters Report

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

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

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

Report created: 16/04/15 12:51:10



Coordinates
Buffer: 5.0Km

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	34
Listed Migratory Species:	52

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. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html

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

Commonwealth Land:	4
Commonwealth Heritage Places:	2
Listed Marine Species:	55
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	5
Regional Forest Agreements:	None
Invasive Species:	42
Nationally Important Wetlands:	2
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat may occur within area
Calyptorhynchus baudinii Baudin's Black-Cockatoo, Long-billed Black-Cockatoo [769]	Vulnerable	Species or species habitat likely to occur within area
Calyptorhynchus latirostris Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat likely to occur within area
Diomedea epomophora epomophora Southern Royal Albatross [25996]	Vulnerable	Species or species habitat likely to occur within area
Diomedea epomophora sanfordi Northern Royal Albatross [82331]	Endangered	Species or species habitat likely to occur within area
Diomedea exulans amsterdamensis Amsterdam Albatross [82330]	Endangered	Species or species habitat may occur within area
Diomedea exulans exulans Tristan Albatross [82337]	Endangered	Species or species habitat may occur within area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant-Petrel [1061]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding likely to occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris impavida Campbell Albatross [82449]	Vulnerable	Species or species habitat may occur within area
Mammals		
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir [25911]	Vulnerable	Species or species habitat likely to occur within area
Plants		
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat known to occur within area
Centrolepis caespitosa [6393]	Endangered	Species or species habitat likely to occur within area
Darwinia foetida Muchea Bell [83190]	Critically Endangered	Species or species habitat may occur within area
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area
Diuris purdiei Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat may occur within area
Drakaea elastica Glossy-leafed Hammer-orchid, Praying Virgin [16753]	Endangered	Species or species habitat likely to occur within area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat likely to occur within area
Thelymitra stellata Star Sun-orchid [7060]	Endangered	Species or species habitat may occur within area
Reptiles		

Name	Status	Type of Presence
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered*	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered*	Species or species habitat may occur within area
Diomedea epomophora (sensu stricto) Southern Royal Albatross [1072]	Vulnerable*	Species or species habitat likely to occur within area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered*	Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta (sensu stricto) Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross [64459]	Vulnerable*	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Migratory Marine Species		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Roosting known to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]		Roosting known to occur within area
Calidris ferruginea Curlew Sandpiper [856]		Roosting known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Roosting known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]		Roosting known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area

Name	Threatened	Type of Presence
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]		Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]		Roosting known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Roosting known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion cristatus Eastern Osprey [82411]		Breeding known to occur within area
Phalaropus lobatus Red-necked Phalarope [838]		Roosting known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Roosting known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Tringa totanus Common Redshank, Redshank [835]		Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name

Commonwealth Land -

Defence - CAMPBELL BARRACKS - SWANBOURNE

Defence - IRWIN BARRACKS - KARRAKATTA

Defence - SWANBOURNE RIFLE RANGE

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Historic		
Army Magazine Buildings Irwin Barracks	WA	Listed place
Claremont Post Office	WA	Listed place

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Roosting known to occur within area
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]		Roosting known to occur within area
Calidris ferruginea Curlew Sandpiper [856]		Roosting known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Roosting known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]		Roosting known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]		Roosting known to occur within area

Name	Threatened	Type of Presence
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]		Roosting known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered*	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered*	Species or species habitat may occur within area
Diomedea epomophora (sensu stricto) Southern Royal Albatross [1072]	Vulnerable*	Species or species habitat likely to occur within area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered*	Species or species habitat likely to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area
Himantopus himantopus Black-winged Stilt [870]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Roosting known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Macronectes giganteus Southern Giant-Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant-Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Phalaropus lobatus Red-necked Phalarope [838]		Roosting known to occur within area

Name	Threatened	Type of Presence
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Roosting known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta (sensu stricto) Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross [64459]	Vulnerable*	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Species or species habitat likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat known to occur within area
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Roosting known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Tringa totanus Common Redshank, Redshank [835]		Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Matilda Bay Reserve	WA
Unnamed WA31906	WA
Unnamed WA45772	WA
Unnamed WA45773	WA
Unnamed WA50067	WA

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus declinatus Bridal Veil, Bridal Veil Creeper, Pale Berry Asparagus Fern, Asparagus Fern, South African Creeper [66908]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Protasparagus densiflorus Asparagus Fern, Plume Asparagus [5015]		Species or species habitat likely to occur within area
Protasparagus plumosus Climbing Asparagus-fern, Ferny Asparagus [11747]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area
Ramphotyphlops braminus Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		Species or species habitat likely to occur within area

Nationally Important Wetlands	[Resource Information]
Name	State
Herdsman Lake	WA
Swan-Canning Estuary	WA

Caveat

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-31.95392 115.80238

Acknowledgements

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

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

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

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

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NatureMap
Mapping Western Australia's biodiversity

NatureMap Conservation Significant Flora Report

Created By Guest user on 10/03/2015

Kingdom Plantae
Conservation Status Conservation Taxon (T, X, IA, S, P1-P5)
Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 115°47' 53" E,31°57' 18" S
Buffer 5km
Group By Family

Family	Species	Records
Araceae	1	1
Asteraceae	1	1
Brassicaceae	1	1
Cyperaceae	1	1
Dilleniaceae	1	8
Euphorbiaceae	1	1
Fabaceae	3	29
Fabroniaceae	1	3
Malvaceae	1	7
Myrtaceae	5	7
Orchidaceae	2	3
Phyllanthaceae	1	2
Poaceae	2	2
Proteaceae	1	1
Pteridaceae	1	1
Restionaceae	1	1
Sapindaceae	1	7
Stylidiaceae	1	2
TOTAL	**26**	**78**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Araceae					
1.	19209	*Typhonium peltandroides*		P1	
Asteraceae					
2.	14180	*Picris compacta*		X	Y
Brassicaceae					
3.	3040	*Lepidium pseudohyssopifolium*		P1	Y
Cyperaceae					
4.	980	*Schoenus capillifolius*		P3	
Dilleniaceae					
5.	11461	*Hibbertia spicata subsp. leptotheca*		P3	
Euphorbiaceae					
6.	34236	*Beyeria cinerea subsp. cinerea*		P3	
Fabaceae					
7.	3237	*Acacia benthamii*		P2	
8.	3373	*Acacia horridula*		P3	
9.	4027	*Jacksonia sericea (Waldjumi)*		P4	
Fabroniaceae					
10.	20162	*Fabronia hampeana*		P2	
Malvaceae					
11.	5038	*Lasiopetalum membranaceum*		P3	
Myrtaceae					
12.	11333	*Calothamnus graniticus subsp. leptophyllus*		P4	
13.	5418	*Calothamnus macrocarpus*		P2	
14.	13097	*Eucalyptus educta*		P2	

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
15.	16915	*Eucalyptus x mundijongensis*		P1	
16.	37683	*Melaleuca viminalis*		P2	
Orchidaceae					
17.	1596	*Caladenia huegelii (Grand Spider Orchid)*		T	
18.	10796	*Diuris drummondii (Tall Donkey Orchid)*		T	
Phyllanthaceae					
19.	42022	*Poranthera moorokatta*		P2	
Poaceae					
20.	35317	*Austrostipa mundula*		P2	
21.	19959	*Austrostipa sp. Cairn Hill (M.E. Trudgen 21176)*		P3	
Proteaceae					
22.	13452	*Grevillea manglesii subsp. ornithopoda*		P2	
Pteridaceae					
23.	26	*Adiantum capillus-veneris (Maidenhair)*		P2	
Restionaceae					
24.	17622	*Hypolaena robusta*		P4	
Sapindaceae					
25.	4763	*Dodonaea hackettiana (Hackett's Hopbush)*		P4	
Stylidiaceae					
26.	13127	*Stylidium maritimum*		P3	

Conservation Codes
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

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

NatureMap
Mapping Western Australia's biodiversity

NatureMap Conservation Significant Fauna

Created By Guest user on 10/03/2015

Kingdom Animalia
Conservation Status Conservation Taxon (T, X, IA, S, P1-P5)
Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 115°47' 53" E,31°57' 16" S
Buffer 5km
Group By Species Group

Species Group	Species	Records
Bird	42	1496
Fish	1	1
Invertebrate	2	6
Mammal	8	38
Reptile	3	38
TOTAL	**56**	**1579**

	Name ID	Species Name	Naturalised	Conservation Code	Endemic To Query Area
Bird					
1.	41323	*Actitis hypoleucos (Common Sandpiper)*		IA	
2.	24506	*Anous tenuirostris subsp. melanops (Australian Lesser Noddy)*		T	
3.	25554	*Apus pacificus (Fork-tailed Swift)*		IA	
4.	24334	*Apus pacificus subsp. pacificus (Fork-tailed Swift)*		IA	
5.	41324	*Ardea modesta (Eastern Great Egret)*		IA	
6.	24345	*Botaurus poiciloptilus (Australasian Bittern)*		T	
7.	24779	*Calidris acuminata (Sharp-tailed Sandpiper)*		IA	
8.	25738	*Calidris canutus (Red Knot)*		IA	
9.	24784	*Calidris ferruginea (Curlew Sandpiper)*		T	
10.	24788	*Calidris ruficollis (Red-necked Stint)*		IA	
11.	24790	*Calidris tenuirostris (Great Knot)*		T	
12.	24731	*Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black-Cockatoo)*		T	
13.	24733	*Calyptorhynchus baudinii (Baudin's Cockatoo (long-billed black-cockatoo), Baudin's Cockatoo)*		T	
14.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo (short-billed black-cockatoo), Carnaby's Cockatoo)*		T	
15.	25575	*Charadrius leschenaultii (Greater Sand Plover)*		IA	
16.	25576	*Charadrius mongolus (Lesser Sand Plover)*		T	
17.	24376	*Charadrius rubricollis (Hooded Plover)*		P4	
18.	30908	*Diomedea chlororhynchos (Yellow-nosed Albatross)*		T	
19.	30907	*Diomedea chlororhynchos subsp. carteri (Indian Yellow-nosed Albatross)*		T	
20.	24468	*Diomedea chrysostoma (Grey-headed Albatross)*		T	
21.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
22.	24475	*Falco peregrinus subsp. macropus (Australian Peregrine Falcon)*		S	
23.	24293	*Haliaeetus leucogaster (White-bellied Sea-Eagle)*		IA	
24.	24347	*Ixobrychus flavicollis subsp. australis (Australian Black Bittern)*		P1	
25.	25563	*Ixobrychus minutus (Little Bittern)*		P4	
26.	24348	*Ixobrychus minutus subsp. dubius (Australian Little Bittern)*		P4	
27.	30932	*Limosa lapponica (Bar-tailed Godwit)*		IA	
28.	25741	*Limosa limosa (Black-tailed Godwit)*		IA	
29.	24598	*Merops ornatus (Rainbow Bee-eater)*		IA	
30.	24819	*Ninox connivens subsp. connivens (Barking Owl (southwest pop P2), Barking Owl)*		P2	
31.	24328	*Oxyura australis (Blue-billed Duck)*		P4	
32.	24462	*Phoebetria fusca (Sooty Albatross)*		T	
33.	24843	*Plegadis falcinellus (Glossy Ibis)*		IA	
34.	24383	*Pluvialis squatarola (Grey Plover)*		IA	
35.	24716	*Puffinus pacificus (Wedge-tailed Shearwater)*		IA	
36.	24777	*Rostratula benghalensis subsp. australis (Australian Painted Snipe)*		T	
37.	24523	*Sterna caspia (Caspian Tern)*		IA	
38.	24529	*Sterna leucoptera (White-winged Black Tern)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
				IA	
39.	24530	*Sterna nereis subsp. nereis (Fairy Tern)*		T	
40.	24806	*Tringa glareola (Wood Sandpiper)*		IA	
41.	24808	*Tringa nebularia (Common Greenshank)*		IA	
42.	24855	*Tyto novaehollandiae subsp. novaehollandiae (Masked Owl (southern subsp))*		P3	
Fish					
43.	34039	*Phycodurus eques (Leafy Sea Dragon)*		P2	
Invertebrate					
44.	33903	*Arbanitis inornatus (trapdoor spider)*		P1	
45.	33992	*Synemon gratiosa (Graceful Sunmoth)*		P4	
Mammal					
46.	24092	*Dasyurus geoffroii (Chuditch, Western Quoll)*		T	
47.	24215	*Hydromys chrysogaster (Water-rat)*		P4	
48.	24153	*Isoodon obesulus subsp. fusciventer (Quenda, Southern Brown Bandicoot)*		P5	
49.	24133	*Macropus irma (Western Brush Wallaby)*		P4	
50.	24168	*Macrotis lagotis (Bilby, Dalgyte)*		T	
51.	24146	*Myrmecobius fasciatus (Numbat, Walpurti)*		T	
52.	24210	*Neophoca cinerea (Australian Sea Lion)*		S	
53.	24145	*Setonix brachyurus (Quokka)*		T	
Reptile					
54.	25335	*Caretta caretta (Loggerhead Turtle)*		T	
55.	25240	*Morelia spilota subsp. imbricata (Carpet Python)*		S	
56.	25249	*Neelaps calonotos (Black-striped Snake)*		P3	

Conservation Codes
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

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

Appendix C - Field Survey Results

Species List

Study Area Species List

Family	Status	Name
Alliaceae		*Agapanthus sp.*
Anacardiaceae	*	*Schinus terebinthifolius*
Anthericaceae		*Thysanotus patersonii/manglesianus*
Apocynaceae	*	*Nerium oleander*
Asparagaceae		*Lomandra caespitosa*
Asparagaceae		*Sowerbaea laxiflora*
Asteraceae	*	*Arctotheca calendula*
Asteraceae		*Asteraceae sp.*
Asteraceae	*	*Hypochaeris glabra*
Asteraceae		*Lactuca sp.*
Asteraceae	*	*Sonchus oleraceus*
Asteraceae	*	*Taraxacum officinale*
Asteraceae	*	*Ursinia anthemoides*
Brassicaceae		*Brassica sp.*
Cactaceae	*	*Opuntia stricta*
Campanulaceae	*	*Wahlenbergia capensis*
Casuarinaceae		*Allocasuarina fraseriana*
Ceramiaceae		*Ptilothamnion polysporum*
Colchicaceae		*Burchardia congesta*
Cupressaceae		*Callitris preissii*
Cupressaceae	*	*Cupressus sempervirens*
Cyperaceae		*Lepidosperma leptostachyum*
Cyperaceae		*Lepidosperma sp.*
Cyperaceae		*Mesomelaena pseudostygia*
Cyperaceae		*Schoenus ?clandestinus*
Cyperaceae		*Schoenus grandiflorus*
Dilleniaceae		*Hibbertia hypericoides*
Droseraceae		*Drosera sp.*
Ericaceae		*Leucopogon paradoxus*
Euphorbiaceae	*	*Euphorbia peplus*
Euphorbiaceae	*	*Euphorbia terracina*
Euphorbiaceae	*	*Ricinus communis*
Fabaceae		*Acacia alata*
Fabaceae		*Acacia cochlearis*
Fabaceae		*Acacia cyclops*
Fabaceae		*Acacia huegelii*
Fabaceae		*Acacia pulchella*
Fabaceae		*Acacia saligna*
Fabaceae		*Acacia stenoptera*
Fabaceae		*Daviesia divaricata subsp. divaricata*

Family	Status	Name
Fabaceae		*Daviesia nudiflora subsp. nudiflora*
Fabaceae		*Daviesia triflora*
Fabaceae		*Gastrolobium capitatum*
Fabaceae		*Gompholobium tomentosum*
Fabaceae		*Hardenbergia comptoniana*
Fabaceae		*Jacksonia furcellata*
Fabaceae	P4	*Jacksonia sericea*
Fabaceae	*	*Lupinus cosentinii*
Fabaceae	*	*Trifolium sp.*
Fabaceae	*	*Vicia sp.*
Geraniaceae		*Erodium sp.*
Geraniaceae	*	*Pelargonium capitatum*
Goodeniaceae		*Scaevola canescens*
Goodeniaceae		*Scaevola repens var. repens*
Haemodoraceae		*Conostylis aculeata*
Haemodoraceae		*Conostylis setigera*
Haemodoraceae		*Haemodorum sp.*
Hemerocallidaceae		*Caesia micrantha*
Hemerocallidaceae		*Dianella revoluta*
Hemerocallidaceae		*Tricoryne elatior*
Iridaceae	*	*Freesia alba x leichtlinii*
Iridaceae		*Gladiolus sp.*
Iridaceae		*Orthrosanthus laxus*
Iridaceae	*	*Romulea rosea*
Lauraceae		*Cassytha sp.*
Malvaceae		*Corchorus macropetalus*
Meliaceae	*	*Melia azedarach*
Myrtaceae		*Agonis flexuosa*
Myrtaceae	*	*Callistemon sp.*
Myrtaceae		*Calothamnus quadrifidus*
Myrtaceae		*Corymbia calophylla*
Myrtaceae	*	*Eucalyptus botryoides*
Myrtaceae		*Eucalyptus erythrocorys*
Myrtaceae		*Eucalyptus gomphocephala*
Myrtaceae		*Eucalyptus marginata*
Myrtaceae		*Eucalyptus sp.*
Myrtaceae		*Hypocalymma robustum*
Myrtaceae		*Melaleuca nesophila*
Myrtaceae	*	*Melaleuca sp.*
Orchidaceae	*	*Disa bracteata*
Orchidaceae		*Microtis media*
Oxalidaceae	*	*Oxalis pes-caprae*

Family	Status	Name
Pinaceae	*	*Pinus radiata*
Poaceae	*	*Aira sp.*
Poaceae	*	*Avena barbata*
Poaceae	*	*Briza maxima*
Poaceae	*	*Bromus diandrus*
Poaceae	*	*Catapodium rigida*
Poaceae	*	*Cynodon dactylon*
Poaceae	*	*Ehrharta calycina*
Poaceae	*	*Ehrharta longiflora*
Poaceae	*	*Eragrostis curvula*
Poaceae	*	*Lagurus ovatus*
Poaceae	*	*Lolium rigidum*
Poaceae	*	*Poa annua*
Poaceae	*	*Stenotaphrum secundatum*
Polygonaceae	*	*Emex australis*
Proteaceae		*Banksia attenuata*
Proteaceae		*Banksia menziesii*
Proteaceae		*Grevillea bipinnatifida*
Proteaceae		*Grevillea vestita*
Proteaceae		*Hakea prostrata*
Proteaceae		*Petrophile linearis*
Proteaceae		*Petrophile macrostachya*
Restionaceae		*Desmocladus flexuosus*
Solanaceae	*	*Solanum nigrum*
Xanthorrhoeaceae		*Xanthorrhoea brunonis*
Xanthorrhoeaceae		*Xanthorrhoea preissii*
Zamiaceae		*Macrozamia riedlei*

Appendix D - Relevant legislation, conservation codes and background information

Legislation

Federal *Environment Protection and Biodiversity Conservation Act 1999*

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Federal Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as Matters of National Environmental Significance (MNES).

The biological aspects listed as MNES include:

- Nationally threatened flora and fauna species and ecological communities
- Migratory species

A person must not take an action that has, will have, or is likely to have a significant impact MNES, without approval from the Federal Minister for the Environment.

A person must not undertake an action that has, will have, or is likely to have a significant impact (direct or indirect) on MNES, without approval from the Australian Government Minister for the Environment.

State *Environmental Protection Act 1986*

The *Environmental Protection Act 1986* (EP Act) is the primary legislative Act dealing with the protection of the environment in Western Australia. It provides for an Environmental Protection Authority (EPA), for the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the above.

Clearing of native vegetation in Western Australia requires a permit from the Department of Environment Regulation (DER) (formerly the Department of Environment and Conservation – DEC), unless exemptions apply. Native vegetation includes aquatic and terrestrial vegetation indigenous to Western Australia, and intentionally planted vegetation declared by regulation to be native, but not vegetation planted in a plantation or planted with commercial intent.

In the EP Act Section 51A, clearing is defined as the killing or destruction of; the removal of; the severing or ringbarking of trunks or stems of; or the doing of substantial damage of some or all of the native vegetation in an area, including the flooding of land, the burning of vegetation, the grazing of stock or an act or activity that results in the above.

When making a decision to grant or refuse a permit to clear native vegetation the assessment considers clearing against the ten clearing principles as specified in Schedule 5 of the EP Act:

a) Native vegetation should not be cleared if it comprises a high level of biodiversity.

b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a significance habitat for fauna indigenous to Western Australia.

c) Native vegetation should not be cleared if it includes, or is necessary, for the continued existence of rare flora.

d) Native vegetation should not be cleared if it comprises the whole or part of native vegetation in an area that has been extensively cleared.

e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

g) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

h) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.

There are a number of Environmentally Sensitive Areas (ESAs) within Western Australia where exemptions in regulations do not apply. ESAs include locations of threatened communities and species.

State *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*

ESAs are declared by a notice under Section 51B of the EP Act. Table B.1 outlines the aspects of areas declared as ESA (under the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 – Reg 6).

Table Aspects of Environmentally Sensitive Areas

Aspects of Environmentally Sensitive Areas
A declared World Heritage property as defined in Section 13 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
An area that is registered on the Register of the National Estate (RNE), because of its natural values, under the *Australian Heritage Commission Act 1975* of the Commonwealth (the RNE was closed in 2007 and is no longer a statutory list – all references to the RNE were removed from the EPBC Act on 19 February 2012).
A defined wetland and the area within 50 m of the wetland.
The area covered by vegetation within 50 m of rare flora, to the extent to which the vegetation is continuous with the vegetation in which the rare flora is located.
The area covered by a TEC.
A Bush Forever Site.
The areas covered by the following policies: a) The *Environmental Protection (Gnangara Mound Crown Land) Policy 1992*. b) The *Environmental Protection (Western Swamp Tortoise Habitat) Policy 2002*.
The areas covered by the lakes to which the *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992* (SCPL) (EPP Lakes) applies.
Protected wetlands as defined in the *Environmental Protection (South West Agricultural Zone Wetlands) Policy 1998*.
Areas of fringing native vegetation in the policy area as defined in the *Environmental Protection (Swan and Canning Rivers) Policy 1997*.

State *Wildlife Conservation Act 1950*

The *Wildlife Conservation Act 1950* (WC Act) provides for the conservation and protection of wildlife. It is administered by the Department of Parks and Wildlife (DPaW) (formerly the DEC) and applies to both flora and fauna. Any person wanting to capture, collect, disturb or study fauna requires a permit to do so. A permit is required under the WC Act if removal of threatened species is required.

State *Biosecurity and Agriculture Management Act 2007*

Under the *Biosecurity and Agriculture Management Act 2007* (BAM Act), a Declared Pest is a prohibited organism or an organism for which a declaration under Section 22(2) is in force. The Department of Agriculture and Food Western Australia (DAFWA) maintains a list of Declared Pests for Western Australia. If a Pest is declared for the whole of the State or for particular

Local Government Areas, all landholders are obliged to comply with the specific category of control. Declared plants are gazetted under categories, which define the action required. The category may apply to the whole of the State, districts, individual properties or even paddocks. Categories of control are defined in Table B.2. Among the factors considered in categorising Declared Pests are:

- The impact of the plant on individuals, agricultural production and the community in general
- Whether it is already established in the area
- The feasibility and cost of possible control measures

The BAM Act replaces the repealed *Agriculture and Related Resources Protection Act 1976* (ARRP Act).

Table Department of Agriculture and Food (Western Australia) Categories for Declared Pests under the *Biosecurity and Agriculture Management Act 2007*

Control class code	Description
C1 (Exclusion)	Pests will be assigned to this category if they are not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
C2 (Eradication)	Pests will be assigned to this category if they are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3 (Management)	Pests will be assigned to this category if they are established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

Background information and conservation codes

Reserves and conservation areas

Department of Parks and Wildlife managed lands and waters

DPaW manages lands and waters throughout Western Australia to conserve ecosystems and species, and to provide for recreation and appreciation of the natural environment. DPaW managed lands and waters include national parks, conservation parks and reserves, marine parks and reserves, regional parks, nature reserves, State forest and timber reserves. DPaW managed conservation estate, is vested with the Conservation Commission of Western Australia. Access to, or through, some areas of DPaW managed lands may require a permit or could be restricted due to management activities. Proposed land use changes and development proposals that abut DPaW managed lands will generally be referred to DPaW throughout the assessment process.

Wetlands

Wetlands include not only lakes with open water, but areas of seasonally, intermittently or permanently waterlogged soil. Approximately 25 percent of the Swan Coastal Plain between Moore River and Mandurah is classified as wetland (Hill et al. 1996).

Though extensive in area, not all wetlands retain significant ecological values due to the concentration of urban and agricultural development in the region. Most wetlands have been cleared, filled or developed over, leaving only 20 percent of all the wetlands that were present on the Swan Coastal Plain prior to European settlement. Of these, an estimated 15 percent of the wetland area has retained high ecological values (Hill et al. 1996).

Ramsar Listed Wetlands

The Convention of Wetlands of International Importance was signed in 1971 at the Iranian town of Ramsar. The Convention has since been referred to as the Ramsar Convention. Ramsar Listed wetlands are "sites containing representative, rare or unique wetlands, or wetlands that are important for conserving biological diversity ... because of their ecological, botanical, zoological, limnological or hydrological importance" (DotE 2014b). Once a Ramsar Listed Wetland is designated, the country agrees to manage its conservation and ensure its wise use. Under the Convention, wise use is broadly defined as "maintaining the ecological character of a wetland" (DotE 2014b).

Nationally important wetlands

Wetlands of national significance are listed under the Directory of Important Wetlands in Australia. Nationally important wetlands are wetlands which meet at least one of the following criteria (DoE 2014a):

- It is a good example of a wetland type occurring within a biogeographic region in Australia
- It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex
- It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail
- The wetland supports one percent or more of the national populations of any native plant or animal taxa
- The wetland supports native plant or animal taxa or communities which are considered endangered or vulnerable at the national level
- The wetland is of outstanding historical or cultural significance

Lakes covered under the *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992*

The *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992* (EPP Lakes) protects the environmental values of selected lakes/wetlands on the Swan Coastal Plain.

Geomorphic wetlands

Categorisation of wetlands has been conducted by Hill et al. (1996), delineating Swan Coastal Plain wetlands into levels of protection and management categories. Conservation Category Wetlands are wetlands that support high levels of attributes and functions. Resource Enhancement Wetlands are those that have been partly modified but still support substantial functions and attributes. Multiple Use Wetlands are classified as those wetlands with few attributes that still provide important wetland functions. Multiple Use wetlands have few important ecological attributes and functions remaining.

The Geomorphic Wetlands Swan Coastal Plain dataset displays the location, boundary, geomorphic classification (wetland type) and management category of wetlands on the Swan Coastal Plain.

Vegetation extent and status

The National Objectives and Targets for Biodiversity Conservation 2001–2005 (Commonwealth of Australia 2001) recognise that the retention of 30 percent or more of the pre-clearing extent of each ecological community is necessary if Australia's biological diversity is to be protected. This is the threshold level below which species loss appears to accelerate exponentially and loss below this level should not be permitted. This level of recognition is in keeping with the targets recommended in the review of the National Strategy for the Conservation of Australia's Biological Diversity (ANZECC 2000) and in Environmental Protection Authority (EPA) Position Statement No. 2 on environmental protection of native vegetation in Western Australia (EPA 2000).

From a purely biodiversity perspective and taking no account of any other land degradation issues, there are a number of key criteria now being applied to the clearing of native vegetation in Western Australia (EPA 2000).

- The "threshold level" below which species loss appears to accelerate exponentially at an ecosystem level is regarded as being at a level of 30 percent of the pre-European extent of the vegetation type.
- A level of 10 percent of the original extent is regarded as being a level representing Endangered.
- Clearing which would put the threat level into the class below should be avoided.
- From a biodiversity perspective, stream reserves should generally be in the order of at least 200 metres (m) wide.

Within the Swan Coastal Plain, EPA Position Statement No. 9 (EPA 2006a) identifies vegetation complexes with 30 percent or less or their pre-clearing extent remaining in a bioregion, or 10 percent or less of their pre-clearing extent remaining in constrained areas (i.e. areas of urban development in cities and major town) on the Swan Coastal Plain, to be critical assets.

The extent of remnant native vegetation has been assessed by Shepherd et al. (2002) and the Government of Western Australia (2013), based on broadscale vegetation association mapping by Beard (1979).

The Local Biodiversity Program (2013) has assessed the extent of Mattiske and Havel (1998) vegetation complexes currently present against presumed pre-European extents. At the regional scale, information is available on 2013 native vegetation extent by vegetation complexes for the Jarrah Forest IBRA bioregion (Local Biodiversity Program 2013).

It is important to note that the "remnant native vegetation mapping used in the Region is derived from dated aerial photography (in this case 1998) with limited ground-truthing. As a consequence, the percentages of ecological communities remaining are generally an overestimate of the native vegetation remaining at present and at the date of this Guidance (2006). The principal factors contributing to this overestimation are:

- The preferential mapping of treed landscapes, leading to some mapping of areas that are parkland cleared or completely degraded
- The inclusion of areas that are approved for clearing through development approvals and/or clearing permits
- Some areas that have been cleared since the time of the aerial photography

It is therefore important to bear these issues in mind when the percentage of the vegetation complexes remaining is approaching 30 percent" (EPA 2006b). Furthermore, as a result of the clearing of the Swan Coastal Plain since 1998, it is likely that the actual percentage remaining of each vegetation type is less.

Conservation codes

Species of significant flora, fauna and communities are protected under both Federal and State Acts. The Federal EPBC Act provides a legal framework to protect and manage nationally important flora and communities. The State WC Act is the primary wildlife conservation legislation in Western Australia. Information on the conservation codes is summarised in the following sections.

Conservation significant communities

Ecological communities are defined as naturally occurring biological assemblages that occur in a particular type of habitat (English and Blyth 1997). Federally listed Threatened Ecological Communities (TECs) are protected under the EPBC Act administered by the Department of the Environment (DotE) (formerly Department of Sustainability, Environment, Water, Population and Communities – DSEWPaC). The DPaW also maintains a list of TECs for Western Australia; some of which are also protected under the EPBC Act. TECs are ecological communities that have been assessed and assigned to one of four categories related to the status of the threat to the community, i.e. Presumed Totally Destroyed, Critically Endangered, Endangered and Vulnerable.

Possible TEC that do not meet survey criteria are added to the DPaW Priority Ecological Community (PEC) List under Priorities 1, 2 and 3. These are ecological communities that are adequately known; are rare but not threatened, or meet criteria for Near Threatened. PECs 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. PECs are not listed under any formal Federal or State legislation.

Table **Conservation codes and definitions for Threatened Ecological Communities endorsed by the Western Australian Minister for the Environment and listed under the *Environment Protection and Biodiversity Conservation Act 1999***

Western Australia conservation categories		Federal Government Conservation Categories (EPBC Act)	
Presumed Totally Destroyed (PD)	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.	Critically Endangered (CR)	If, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future
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	Endangered (EN)	If, at that time, it is not critically endangered and is facing a very high risk of extinction in the wild in the near future
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.	Vulnerable (VU)	If, at that time, it is not critically endangered or endangered, and is facing a high risk of extinction in the wild in the medium-term future
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.		

Table **Conservation categories and definitions for Priority Ecological Communities as listed by the Department of Parks and Wildlife**

Category	Description
Priority 1	**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 ≤100 ha). 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 2	**Poorly known ecological communities.** Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200 ha). 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 3	**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 4	**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.** (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.

Category	Description
Priority 5	**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.

Other significant vegetation

Vegetation may be significant for a range of reasons, other than a statutory listing as TEC or because the extent is below a threshold level. The EPA (2004) states that significant vegetation may include vegetation that includes the following:

- Scarcity
- Unusual species
- Novel combinations of species
- A role as a refuge
- A role as a key habitat for Threatened species or large population representing a significant proportion of the local to regional total population of a species
- Being representative of the range of a unit (particularly, a good local and/or regional example of a unit in 'prime' habitat, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)
- A restricted distribution

This may apply at a number of levels, so the unit may be significant when considered at the fine-scale (intra-locality), intermediate-scale (locality or inter-locality) or broad-scale (local to region).

Conservation significant flora and fauna

Species of significant flora are protected under both Federal and State legislation. Any activities that are deemed to have a significant impact on species that are recognised by the EPBC Act, and/or the WC Act can warrant referral to the DotE and/or the EPA. According to the DPaW (WA Herbarium, 1998–): "Threatened flora are plants which have been assessed as being at risk of extinction. In Western Australia the term Declared Rare Flora (DRF) is applied to Threatened flora due to the laws regarding threatened flora conservation. The WC Act is the primary wildlife conservation legislation in the State and the Minster for the Environment can declare taxa (species, subspecies or variety) as "Rare Flora" if they are considered to be in danger of extinction, rare or otherwise in need of special protection." For the purposes of this report, flora listed by the WC Act as DRF is described as Threatened.

The Federal conservation level of flora and fauna species and their significance status is assessed under the EPBC Act. The significance levels for fauna used in the EPBC Act are those recommended by the International Union for the Conservation of Nature and Natural Resources (IUCN).

The State conservation level of fauna species and their significance status is assessed under the State WC Act (*Wildlife Conservation (Specially Protected Fauna) Notice 2010(2)*). This Act uses a set of Schedules, but also classifies species using some of the IUCN categories. Schedule 3 fauna species are those which are "subject to an agreement between the Government of Australia and the Governments of Japan, China and the Republic of Korea relating to the protection of migratory birds, are declared to be fauna that is in need of special protection".

In Western Australia, the DPaW also maintains a list of Priority listed flora species. Conservation codes for Priority species are assigned by the DPaW to define the level of conservation significance. Priority species are not currently protected under the WC Act.

For the purposes of this assessment, all species listed under the EPBC Act, WC Act and DPaW Priority species are considered conservation significant.

Table Conservation categories and definitions for *Environment Protection and Biodiversity Conservation Act 1999* listed flora & fauna species

Conservation category	Definition
Extinct	Taxa not definitely located in the wild during the past 50 years
Extinct in the Wild	Taxa known to survive only in captivity
Critically Endangered	Taxa facing an extremely high risk of extinction in the wild in the immediate future
Endangered	Taxa facing a very high risk of extinction in the wild in the near future
Vulnerable	Taxa facing a high risk of extinction in the wild in the medium-term
Near Threatened	Taxa that risk becoming Vulnerable in the wild
Conservation Dependent	Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classified as Vulnerable or more severely threatened.
Data Deficient (Insufficiently Known)	Taxa suspected of being Rare, Vulnerable or Endangered, but whose true status cannot be determined without more information.
Least Concern	Taxa that are not considered Threatened

Table **Conservation codes and descriptions for Western Australian flora and fauna**

Code	Conservation category	Description
Wildlife Conservation Act 1950		
T	Schedule 1 under the WC Act	**Threatened Fauna (Fauna that is rare or is likely to become extinct)** **Threatened Flora (Declared Rare Flora – Extant)** Taxa that 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. ***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.
X	Schedule 2 under the WC Act	**Presumed Extinct Fauna** **Presumed Extinct Flora (Declared Rare Flora – Extinct)** Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such.
IA	Schedule 3 under the WC Act	**Birds protected under an international agreement.** Birds that are subject to an agreement between governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction.
S	Schedule 4 under the WC Act	**Other specially protected fauna.** Fauna that is in need of special protection, otherwise than for the reasons mentioned in the above schedules.
DPaW Priority Listed		
1	Priority One: Poorly-known taxa	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.

Code	Conservation category	Description
2	Priority Two: Poorly-known taxa	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.
3	Priority Three: Poorly-known taxa	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.
4	Priority Four: Rare, Near Threatened and other taxa in need of monitoring	(a) 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. (b) Near Threatened. Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
5	Priority 5: Conservation Dependent taxa	Taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxon becoming threatened within five years.

Migratory species listed under the EPBC Act

The EPBC Act also protects land and migratory species that are listed under International Agreements. The list of migratory species established under section 209 of the EPBC Act comprises:

- Migratory species which are native to Australia and are included in the appendices to the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals Appendices I and II)
- Migratory species included in annexes established under the Japan-Australia Migratory Bird Agreement (JAMBA) and the China–Australia Migratory Bird Agreement (CAMBA)
- Native, migratory species identified in a list established under, or an instrument made under, an international agreement approved by the Minister, such as the republic of Korea–Australia Migratory Bird Agreement (ROKAMBA)

Other significant flora and fauna

Flora species, subspecies, varieties, hybrids and ecotypes may be significant for a range of reasons, other than as Threatened (Declared Rare) Flora or Priority Flora. The EPA (2004) states that significant flora may include taxa that have:

- A keystone role in a particular habitat for threatened species or supporting large populations representing a significant proportion of the local regional population of a species
- Relic status
- Anomalous features that indicate a potential new discovery
- Being representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)
- The presence of restricted subspecies, varieties, or naturally occurring hybrids
- Local endemism/a restricted distribution
- Being poorly reserved

The application of the degree of significance may apply at a range of scales.

Introduced plants (weeds)

Declared Pests

Information on species considered to be Declared Pests is provided under *State Biosecurity and Agriculture Management Act 2007.*

Weeds of National Significance

The spread of weeds across a range of land uses or ecosystems is important in the context of socio-economic and environmental values. The assessment of Weeds of National Significance (WoNS) is based on four major criteria:

- Invasiveness
- Impacts
- Potential for spread
- Socio-economic and environmental values

Australian state and territory governments have identified thirty two Weeds of National Significance (WoNS); a list of 20 WoNS was endorsed in 1999 and a further 12 were added in 2012 (Australian Government 2014).

Environmental weeds

"Environmental weeds are plants that establish themselves in natural ecosystems (marine, aquatic and terrestrial) and proceed to modify natural processes, usually adversely, resulting in the decline of the communities they invade" (CALM 1999). The Environmental Weed Strategy for Western Australia (EWSWA) was published in 1999. This document provides direction and an approach to tackling environmental weeds in Western Australia (CALM 1999). Following on from this strategy (in 2008), in an effort to address invasive weeds and implement an integrated approach to weed management on DPaW-managed lands in WA, the Weed Prioritisation Process was developed. A series of workshops were held in each of the nine DPaW regions with the purpose of scoring all weeds which occurred in each of the DPaW regions according to the following key attributes (DPaW 2013):

- Potential distribution and impact
- Invasiveness

- Current distribution
- Feasibility of control
- Weed management ability
- Weed risk

This process resulted in the following five ratings for each weed species (DPaW 2013):

- Very high (VH)
- High (H)
- Medium (M)
- Low (L)
- Negligible (N)

The suggested management actions for each species ranged from no action required (the weed species ranking is as low as to not warrant any investment in regional strategic management actions), through targeted control to reduce infestation or spread, to species requiring state-wide eradication (DPaW 2013).

The prioritisation for individual weeds within a DPaW region should be treated as a guide and does not diminish any other requirements of land managers or developers e.g. Declared Pest requirements of the BAM Act or Ministerial requirements under Part IV of the EP Act (DPaW 2013).

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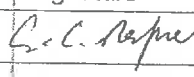
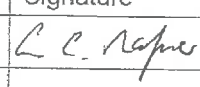
0	C Perry	A Napier		A Napier		9/04/2015

www.ghd.com

ATTACHMENT 5

Targeted survey 2013

23 September 2013

Peter Hale

Landcorp
Level 6 Wesfarmers House
40 The Esplanade
Perth WA 6000

Dear Peter,

RE: Shenton Park Rehabilitation Hospital Redevelopment – Targeted Flora Survey

Following are the results of the targeted flora survey undertaken on the Shenton Park Rehabilitation Hospital site.

Background

A flora survey of the Shenton Park Rehabilitation Hospital site was undertaken by GHD, presumably in 2011 although the date of the survey is not reported (GHD, 2012). The survey was a comprehensive level 2 flora survey which included sampling from quadrats.

The report identified native Jarrah/Banksia woodland occurring in the western part of the site, ranging in condition from Good to Very Good. The survey recorded 109 plant taxa including 67 native and 42 introduced species. One Priority 4 species, *Jacksonia sericea*, was recorded in abundance in the native woodland on the site with approximately 100 plants present. No Threatened Ecological Communities were recorded on the site although the identity of the floristic community on the site was not discussed by GHD.

The GHD report stated that there was a low possibility that the Threatened (Declared Rare) orchid species *Caladenia huegelii* (Grand Spider Orchid) could occur on the site but the timing of the survey was not done at a time when the species could be identified.

Targeted Flora and Vegetation Survey

A targeted flora and vegetation survey was undertaken by Paul van der Moezel, from PGV Environmental, on 23 September 2013. The objective of the survey was to verify the findings of the GHD flora and vegetation survey and to search for any rare orchid species on the site. The prime species of interest, *Caladenia huegelii*, usually flowers between mid-September to mid-October.

The results of the survey are as follows:

- The native vegetation described by GHD as a Jarrah Banksia woodland is generally accurate and consists of two parcels, one in the north-west corner and one in the south-west corner, separated by a car park. Sheoak (*Allocasuarina fraseriana*) trees were also present in both woodland parcels and Tuart trees were present in the south-west woodland.
- The condition of the native vegetation reported by GHD is accurate, with the south-west parcel (Very Good) slightly better than the north-west parcel (Good).
- The Priority 4 species *Jacksonia sericea* recorded by GHD on the site was found to be abundant, predominantly in the south-west woodland.
- The Floristic Community Type is likely to be FCT 28 "Spearwood *Banksia attenuata* or *B. attenuata – Eucalyptus* woodlands" which is not a Threatened Ecological Community.
- No Threatened (Declared Rare) plant species were recorded on the site.

The timing of the survey was appropriate to be able to identify the presence of *Caladenia huegelii* if it had occurred on the site. The wet spring season in 2013 was also favourable for the flowering of spider orchids. No specimens of *Caladenia huegelii* were recorded. An additional five orchid species were recorded by PGV Environmental from the two recorded by GHD. The species, none of which are Threatened or Priority species, were as follows:

- *Caladenia flava* (Cowslip Orchid);
- *Caladenia arenicola* (Carousel Spider Orchid);
- *Caladenia georgei* (Tuart Spider Orchid);
- *Diuris corymbosa* (Common Donkey Orchid); and
- *Pterostylis vittata* (Banded Greenhood).

PGV Environmental concludes that no Threatened (Declared Rare) species occur on the site and no further flora or vegetation surveys need to be conducted to assess the conservation significance of the flora and vegetation on the site.

Please contact me if you require any clarification of these results.

Yours sincerely

[redacted]

[redacted]

ATTACHMENT 6

Targeted Survey 2016

pgv

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1 November 2016

Daniel Chatley

Landcorp
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Dear Daniel,

RE: Shenton Park Rehabilitation Hospital Redevelopment – Targeted Flora Survey 2016

Following are the results of the targeted flora survey undertaken on the Shenton Park Rehabilitation Hospital site in 2016. This survey was undertaken given the excellent season for orchids experienced in 2016 in which additional species may have been found that were not recorded in the previous surveys.

Previous Flora Surveys

GHD

A flora survey of the Shenton Park Rehabilitation Hospital site was undertaken by GHD in spring (GHD, 2012). The survey was a comprehensive level 2 flora survey which included sampling from quadrats.

The survey recorded 109 plant taxa including 67 native and 42 introduced species. One Priority 4 species, *Jacksonia sericea*, was recorded in abundance in the native woodland on the site with approximately 100 plants present. GHD stated that there was a low possibility that the Threatened (Declared Rare) orchid species *Caladenia huegelii* (Grand Spider Orchid) could occur on the site but the timing of the survey was not done at a time when the species could be identified.

GHD recorded two orchid species on the site, the native *Microtis media* and the introduced orchid species *Disa bracteata.*

PGV Environmental

A targeted flora and vegetation survey was undertaken by PGV Environmental on 23 September 2013. The survey was undertaken at a time when the species of interest, *Caladenia huegelii,* usually flowers which is between mid-September to mid-October.

The survey confirmed the findings of GHD that the Priority 4 species *Jacksonia sericea* occurs abundantly on the site, predominantly in the south-west woodland. No specimens of *Caladenia huegelii* were recorded. An additional five orchid species were recorded by PGV Environmental from the two recorded by GHD. The species, none of which are Threatened or Priority species, were as follows:

- *Caladenia flava* (Cowslip Orchid);
- *Caladenia arenicola* (Carousel Spider Orchid);
- *Caladenia georgei* (Tuart Spider Orchid);
- *Diuris corymbosa* (Common Donkey Orchid); and
- *Pterostylis vittata* (Banded Greenhood).

Targeted Flora Survey 2016

The 2016 flowering season was a particularly good year for native plants, including orchids, due to the pattern in which rain fell consistently through the winter and spring months and the lower than average maximum temperatures. The Threatened orchid species *Caladenia huegelii* was monitored by PGV Environmental in a reference site as flowering from early September through to mid-October.

The native vegetation at the western end of the Shenton Park Hospital Rehabilitation Site was surveyed by Dr Paul van der Moezel of PGV Environmental on 28 September 2016. The site was walked in transects approximately 20m apart.

No Threatened plant species, including *Caladenia huegelii* were recorded during the survey. Other orchid species recorded, all of which are not Threatened or Priority, and their general distribution with respect to the northern and southern stands of vegetation were:

- *Caladenia arenicola* (Carousel Spider Orchid) – abundant in southern area and carpark strip
- *Caladenia flava* (Cowslip Orchid) – scattered throughout both areas
- *Caladenia georgei* (Tuart Spider Orchid) – one plant among several *C. arenicola* in southern area
- *Caladenia latifolia* (Pink Fairy Orchid) – one in northern area (not recorded previously on site)
- *Diuris corymbosa* (Common Donkey Orchid) – scattered throughout both areas
- *Pterostylis vittata* (Banded Greenhood) – uncommon in both areas
- *Microtis media* (Mignonette Orchid) – clump of six orchids in northern area

Conclusion

PGV Environmental concludes that, following two spring flora surveys, no Threatened (Declared Rare) species occur on the site. Both surveys were done under good conditions for flowering, with 2016 a particularly exceptional year. As a result, no further flora surveys need to be conducted to assess the conservation significance of the flora on the site.

Please contact me if you require any clarification of these results.

Yours sincerely

ATTACHMENT 7

Fauna Linkage Study

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21 April 2015

Peter Hale

Landcorp
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Dear Peter,

RE: Shenton Park Rehabilitation Hospital Redevelopment – Advice on the Use of the Understorey by Small Birds

Please find following our advice on the use of the understorey by small birds in the native bushland area on the western side of the Shenton Park Rehabilitation Hospital site.

The question you have asked us to address is what role does the bushland area on the western part of the site play in providing a linkage corridor for small birds to adjoining bushland areas.

Summary of Site Characteristics

The vegetation in the western bushland area was surveyed by GHD (2012) and described as Jarrah/Banksia over mixed shrubs and herbs. The native vegetation contains a northern and southern patch separated by a carpark with garden beds and an access road into the carpark. The condition of the vegetation was assessed by GHD as Good in the northern half and Good to Very Good in the southern half.

The condition of the understorey is variable. In some places the understorey is reasonably intact with a mix of mid and smaller shrubs as well as a range of herbs and sedges (Photo 1) while in other areas the understorey is dominated by introduced grasses such as Veldtgrass (*Ehrharta calycina*) and Wild Oats (*Avena barbata*) as well as other weed species (Photo 2).

Typical native shrub species in areas of Good to Very Good understorey include *Xanthorrhoea preissii, Jacksonia furcellata, Hypocalymma robustum, Hibbertia hypericoides, Petrophile macrostachya* and *Acacia huegelii* while common herbs and sedges include *Caesia micrantha, Mesomelaena pseudostygia, Schoenus grandiflorus* and *Desmocladus flexuosus* (GHD, 2012).

Photo 1 Very Good quality native understorey

Photo 2 Understorey of introduced grasses

A fauna survey of the Shenton Park Rehabilitation Hospital site undertaken by GHD (2012) identified ten small bird species on the site as follows:

- Yellow-rumped Thornbill
- Western Gerygone
- White-winged Triller
- Willie Wagtail
- Grey Fantail
- Western Spinebill
- New Holland Honeyeater
- Rainbow Bee-eater
- Rufous Whistler
- Grey-breasted White-eye

A number of medium sized and larger birds were also recorded. No information was contained in the GHD report about where each species was recorded although the comment was made that the area of vegetation along the western edge of the site contained the highest abundance and diversity of fauna species. The role of the western bushland as part of a fauna linkage "through patches of remnant vegetation in the wider Swan Coastal Plain environment" was raised as an issue for consideration.

Ecological Linkage

The vegetation in the western part of the site is part of a semi-contiguous patch of bushland that includes other remnant bushland areas that have been recognised as providing an ecological linkage between Bush Forever site 218 'Shenton Bushland, Shenton Park' located to the south across Lemnos Street and Bush Forever Site 119 'Underwood Avenue Bushland, Shenton Park' located approximately 130m to the north. This local linkage is also part of a wider regional linkage between Kings Park and Bold Park.

As previously advised to LandCorp on 12 January 2015 PGV Environmental considers that the native fauna that could use the ecological corridor would mainly include birds and small reptiles. The movement of larger ground-dwelling fauna, if they exist in the area, would be restricted by the tall

chain-mesh fence around the Underwood Avenue site to the north and a wire mesh fence surrounding the remnant bushland on the Hospital site. The presence of Lemnos Street would also provide a barrier to the safe movement of any ground-dwelling fauna between the site and the Shenton Bushland to the south.

The movement of small bird species in developed areas in the Perth Metropolitan Region on a part of the Swan Coastal Plain was addressed by Bamford Consulting Ecologists (2005) in a technical report used in the preparation of the Hope Valley Wattleup Redevelopment Project Biodiversity Strategy. Bamford Consulting acknowledge that the persistence of birds in the urban environment is a complex issue. Most bird species are mobile enough to move through urban areas, however some species that rely on native vegetation and also have poor powers of dispersal rely on linkages between bushland areas.

A number of small bird species were nominated by Bamford Consulting as being most reliant on native vegetation as well as connecting linkages and included the Splendid Fairy-wren, White-browed Scrubwren, Weebill, Inland Thornbill, Western Thornbill, Yellow-rumped Thornbill, Scarlet Robin, Varied Sittella and Grey Shrike-thrush. Of these species, the Yellow-rumped Thornbill has been recorded on the Shenton Park Hospital site.

Bamford Consulting considered that, of this suite of species, the Western Thornbill and Grey Shrike-thrush were most reliant on large tracts of native vegetation whereas the other species have been observed dispersing through urban gardens up to 200m from the closest area of native bushland habitat. Dispersal of these species was observed across roads and sterile urban landscapes of houses, concrete and lawns.

Bamford Consulting considered that the most important features required to assist the dispersal of birds reliant on native vegetation was the presence of native vegetation together with some degree of connectivity between the remnants. The connectivity did not need to be continuous as roads and other unfavourable habitat are able to be crossed at distances of 100-200m for most species. Effective linkages may be as simple as a narrow strip of bushes. In a similar fashion the strips of vegetation within the carpark at the Shenton Park site provide linkages for small birds between the northern and southern native vegetation patches (Photo 3).

Photo 3 Strips of planted vegetation within the western carpark on the Shenton Park site.

Bamford Consulting considered that a road verge planted with native vegetation could be an effective linkage even if the vegetation was discontinuous because of roads and driveways. The structure of the vegetation, however, was considered important with a requirement for both an overstorey of trees and an understorey of thick shrubs, ideally local native species.

In summary, Bamford Consulting recommended that for a linkage to be effective for small birds that are reliant on native vegetation to survive in an urban environment the minimum requirement would be for an overstorey and understorey of preferably local plan species, with the understorey forming thickets more than 2m wide and with most gaps in the linkage less than 50m for such things as roads and driveways.

The area between the western bushland area on the Shenton Park site and the Underwood Avenue Bush Forever site to the north contains some native vegetation with a variable understorey similar to that on the Shenton Park site. To the south, the site is separated from the Shenton Bushland Bush Forever site by a 20m wide road pavement. Native vegetation occurs in the southern part of the Lemnos Street road reserve but not the northern side.

It is considered that, given the conclusions of Bamford Consulting in relation to the movement of small birds across fragmented urban areas that the ten small bird species identified on the Shenton Park site could currently move between the two Bush Forever sites. The structure of the vegetation with an overstorey of trees and an understorey of native species provides important habitat for the survival of small birds in the area.

Conclusion

Ten small bird species have been recorded on the Shenton Park Hospital Redevelopment Site. Most, if not all of the species occur in the native Jarrah/Banksia woodland on the western part of the site.

Research by Bamford Consulting on the Swan Coastal Plain indicates that small birds that are reliant on native vegetation for survival are able to move between areas of native vegetation along corridors that contain both native tree and understorey species. Importantly, the corridors do not necessarily need to be continuous. Most small birds are able to move across roads, driveways and other non-bushland areas for a distance of at least 50m.

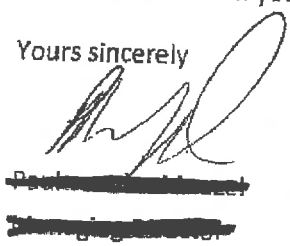
Based on this research, and given the characteristics of the land between site and the Bush Forever sites to the south and north, the small bird species on the Shenton Park site are expected to be able to move across the north-south ecological linkage. Both overstorey and understorey vegetation is important for survival of the small bird species on the site and across the linkage.

The ecological linkage does not require continuous native vegetation for it to be effective. This may be an important point if the redevelopment of the site retains an area of native vegetation in the western part of the site and vegetation requires fire hazard reduction measures such as the inclusion of 20m wide gaps between cells of retained native vegetation. Providing gaps between areas of native vegetation such as mown turf, mulch, hard surfaces or ground covers would not affect the ability of the retained vegetation acting as part of an ecological linkage. Fire management

requirements within areas of retained native vegetation such as reducing the amount of grassy weeds should result in an overall improvement of the understorey in these areas.

Please contact me if you require any clarification of this advice.

Yours sincerely



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