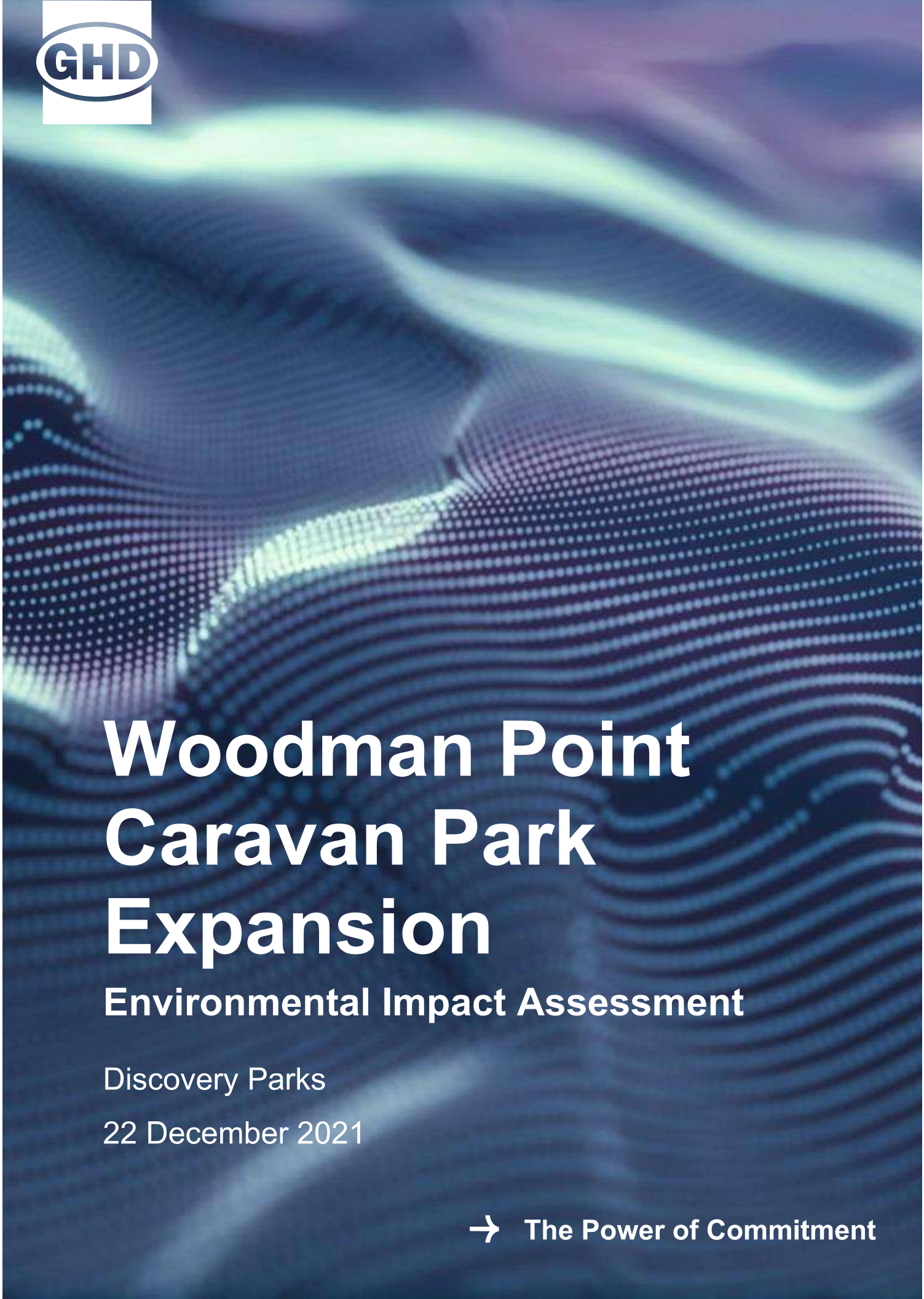

Woodman Point Caravan Park Expansion

Environmental Impact Assessment

Discovery Parks

22 December 2021

The Power of Commitment

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Executive summary

Discovery Parks is proposing to expand the Woodman Point Caravan Park (the Project), located at 132 on the corner of Cockburn Road and Magazine Court, Coogee in Western Australia (WA). The proposed expansion (the Project) will increase the current caravan park area by approximately 3.48 hectares (ha). The Project will add an additional 115 accommodation sites to the park and additional supporting facilities and structures.

GHD Pty Ltd (GHD) was commissioned by Discovery Parks to conduct an Environmental Impact Assessment (EIA) to determine broad environmental values and potential constraints relating to the proposed expansion of Woodman Point Caravan Park. The purpose of this report is to identify potential environmental constraints within and nearby to the Project area, and provide advice on the likely environmental approval requirements.

The EIA involved a review of publicly available spatial datasets, publications, government managed databases and the detailed flora and vegetation surveys and a Level 1 fauna surveys completed by GHD (2020a, b).

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

The EIA identified the following potential environmental impacts associated with the construction of the Project:

- Possible disturbance of hazardous substances (i.e. asbestos) from the old Munitions Magazines.
- If the Project requires the taking of groundwater (e.g. dewatering or construction/installation of bores to abstract water for construction) these activities are likely to impact groundwater quality and quantities, and would require appropriate licences/permits from the regulating authority (Department of Water and Environment Regulation [DWER]).
- Contamination of surface and groundwater associated with the storage, handling and use of chemical and hydrocarbons.
- The development of the Project will directly impact on a Department of Biodiversity, Conservation and Attractions (DBCA) managed Conservation Park (R 42469), Bush Forever Site (No. 341) and an Environmentally Sensitive Area (ESA).
- Direct loss of approximately 1.30 ha of native vegetation, and associated fauna habitat, as a result of clearing for construction of the Project. This will result in a reduction in the extent of native vegetation from the Local Government Area (LGA; City of Cockburn) and regional (Swan Coastal Plain) areas.
- Clearing of 0.55 ha of vegetation (including 0.01 ha of native vegetation and 0.54 ha of revegetation) that is representative of the floristic community type (FCT) 30a – *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands TEC.
- Clearing of one patch of vegetation that is representative of the Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain TEC and PEC. This patch consisted of 1.59 ha of vegetation (including 0.33 ha of native vegetation, and 1.25 ha of planted/revegetation).
- Introduction and/or spread of existing weeds and dieback into the Project area and adjacent vegetation.
- Direct loss of approximately 1.53 ha of suitable foraging habitat (comprised of 0.15 ha of VT02 and 1.38 ha of VT04) for Black Cockatoos.
- Death and/or injury of fauna during earth works and construction associated with vehicle strikes and excavations.
- Secondary impacts to local fauna from noise, vibration and light.
- Disturbance and/or damage to Registered/listed heritage (Aboriginal and non-indigenous) sites and heritage values, within or immediately adjacent to the Project area.

Based on these potential impacts, it is likely the following environmental approvals will be required for the development of the Project:

- Native Vegetation Clearing Permit under the *Environmental Protection Act 1986* (EP Act) from the DWER.
- A Negotiated Planning Outcome is required from Department of Planning, Heritage and Lands (DPLH) for clearing in Bush Forever areas.

- Approval of an offset for the clearing of vegetation is required from DWER under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004.*
- Approval from DPLH and the City of Cockburn under the *Heritage Act 2018* for the potential disturbance of a non-indigenous State and municipal listed heritage site Munitions Magazines (ID 4626). This is typically undertaken during the development approvals process.
- A Section 18 approval under the *Aboriginal Heritage Act 1972* may be required from the DPLH for the potential disturbance of a Registered Aboriginal heritage site Cockburn Road (ID 15840).
- A 26D and 5C licence from the Department of Water and Environmental Regulation under the *Rights in Water and Irrigation Act 1914* (RIWI Act) for disturbance to groundwater if dewatering or bores are required
- Discussions with the DPLH to determine if Native Title for the Project area has previously been extinguished, and advice on how to proceed if it has not been extinguished.
- The Project will require Development Approval from the Development Assessment Panel, supported by the City of Cockburn.
- Discovery Parks may choose to refer the projects to the Department of Agriculture, Water and Environment for legal certainty.

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Appendices

1. Introduction

1.1 Project introduction

Discovery Parks is proposing to expand the Woodman Point Caravan Park (the Project), located at 132 on the corner of Cockburn Road and Magazine Court Munster, Coogee in Western Australia (WA). The proposed expansion will increase the current caravan park area by approximately 3.48 hectares (ha) (the Project area). The Project will add an additional 115 accommodation sites to the park and additional supporting facilities and structures.

1.2 Project background

The Project area has a long history of human occupation and use both pre and post European settlement. There is evidence of a large presence of Aboriginal people in the Woodman Point area and several remnants from early European settlement, where the area acted as a quarantine station for incoming travellers. The modern history of the area has links to World War II with three munitions magazines, unique in their design, in the vicinity of the Project area. The reserve where the park is located was established in 1987 (DPAW 2010) and established as Woodman Point Regional Park (WPRP) in 1997. The caravan park has been present in the Project area for over 20 years.

Discovery Parks bought the existing operating caravan park adjacent to the Project in 2016. The Project area is zoned predominantly as a recreation zone in the Woodman Point Regional Management Plan (WPRMP), within which the management emphasis is to “provide a variety of recreation opportunities while minimising impacts of visitor activities through sensitive placement” (DPAW 2010). By expanding to the north of the existing park, the caravan park can increase to the desired size while remaining within the area zoned for recreation.

1.3 Purpose of this report

GHD Pty Ltd (GHD) was commissioned by Discovery Parks to conduct an Environmental Impact Assessment (EIA) to determine broad environmental values and potential constraints relating to the proposed expansion of Woodman Point Caravan Park. The purpose of this report is to identify potential environmental constraints within and nearby to the Project area and provide advice on the likely environmental approvals requirements.

1.4 Project location

The existing Woodman Point Caravan Park is located at 132 Cockburn Road on the corner of Magazine Court, Coogee in WA, approximately 9 kilometres (km) south of Fremantle within the City of Cockburn. The Park is accessed from Cockburn Road, which is a main road linking Fremantle, Kwinana and Rockingham. The Project area is located adjacent to, and north of the existing Woodman Point Caravan Park. Both the existing Woodman Point Caravan Park and the Project area are located in Crown reserve 49220 within the WPRP (Appendix A, Figure 1) The Project area covers approximately 3.48 ha.

A 5km study area was utilised for the desktop searches undertaken for this Project.

1.5 Relevant legislation requirements

Key Commonwealth and WA environmental legislation which may be relevant to the Project is outlined in Table 1. This report identifies where approvals are likely to be required under this legislation, in addition to selected other non-environmental Acts and/or regulations.

Table 1 Key environmental legislation relevant to the Project

Legislation	Responsible agency	Aspect
Commonwealth legislation		
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Department of Agriculture, Water and the Environment (DAWE)	Matters of National Environmental Significance including threatened flora and fauna
Native Title Act 1993	National Native Title Tribunal	Native title
State legislation		
Aboriginal Heritage Act 1972	Department of Planning, Lands and Heritage (DPLH)	Archaeological and ethnographic sites
Biodiversity Conservation Act 2016	Department of Biodiversity, Conservation and Attractions (DBCA)	Conservation and protection of biodiversity and biodiversity components
Biosecurity and Agricultural Management Act 2007	Department of Primary Industries and Regional Development (DPIRD)	Weeds and feral animals
Conservation and Land Management Act 1984	DBCA	Use, protection and management of public lands and waters and its flora and fauna
Contaminated Sites Act 2003	Department of Water and Environmental Regulation (DWER)	Management of contaminated sites
Environmental Protection Act 1986	Environmental Protection Authority (EPA) (Part IV) DWER (Part V)	Environmental impact assessment and management
Environmental Protection (Noise) Regulations 1997	DWER	Noise standards
Environmental Protection (Clearing of Native Vegetation) Regulations 2004	DWER	Clearing of native vegetation
Heritage Act 2018	Heritage Council of Western Australia	European heritage protection
Rights in Water and Irrigation Act 1914 (RIWI Act)	DWER	Access to and use of water resources; protection and management of river flows and drainage

2. Methodology

2.1 Desktop assessment

The desktop environmental impact assessment for the Project involved a review of publicly available spatial datasets (largely sourced from the Government of Western Australia [GoWA] 2021), publications and government managed databases. The Desktop study area included a buffer of 5 km around the Project area. The information sources used in this assessment are presented in Table 2.

Table 2 Information sources

Aspect	Information Source
Climate	Bureau of Meteorology (BoM) Climate Data Online (BoM 2021)
Geology, landform and soils	Soil-landscape mapping (DPIRD 2018) 1:500 000 State interpreted bedrock geology (DMIRS-016)
Acid Sulphate Soils (ASS)	Australian Soil Resources Information System (ASRIS 2021)

Aspect	Information Source
Contaminated sites	Contaminated Sites Database (DWER-059)
Land use	City of Cockburn Town Planning Scheme (TPS) No. 3
Conservation reserves and areas	DBCA – Legislated Lands and Waters (DBCA-011) DBCA – Lands of Interest (DBCA-012)
Environmentally Sensitive Areas (ESA)	Clearing Regulations - ESAs (DWER-046)
Offsets	Environmental Offsets Register (GoWA 2021)
Bush fire prone areas	Bush Fire Prone Areas 2019 No. 3 (OBRM-017)
Hydrology	Public Drinking Water Source Areas (DWER-033) RIWI Act, Surface Water Areas and Irrigation Districts (DWER-037) RIWI Act, Groundwater Areas (DWER-034) RIWI Act, Rivers (DWER-036) Waterways Conservation Act Management Areas (DWER-072) Ramsar Sites (DBCA-010) Directory of Important Wetlands in Australia - Western Australia (DBCA-045) Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)
Vegetation	Heddle et al. vegetation mapping (1980) DBCA Statewide and South West Vegetation Statistics (GoWA 2019) Flora and Fauna Survey (GHD 2020a) Additional Vegetation Survey (GHD 2020b)
Threatened and Priority Ecological Communities	DBCA Threatened Ecological Community (TEC) and Priority Ecological Community (PEC) spatial dataset Flora and Fauna Survey (GHD 2020a) Additional Vegetation Survey (GHD 2020b)
Conservation Significant Flora and Fauna	DBCA NatureMap database (DBCA 2007–) Threatened and Priority Flora database (TPFL) Western Australian Herbarium database (WAHERB) Flora and Fauna Survey (GHD 2020a) Additional Vegetation Survey (GHD 2020b)
Dieback	Project Dieback (2014)
Heritage	Aboriginal Heritage Places (DPLH-001) Aboriginal Heritage Inquiry System (DPLH 2019) Heritage Council WA - State Register (DPLH-006)
Matters of National Environmental Significance (MNES)	EPBC Act Protected Matters Search Tool (PMST; DAWE 2021)

2.2 Technical studies

GHD (2020a) completed a detailed flora and vegetation survey, and a Level 1 fauna survey of the initial Woodman Point Caravan Park expansion site. The survey assessed an area of 3.19 ha (Appendix A, Figure 1), to delineate key flora, vegetation and fauna values, and potential impact to areas of sensitivity. Following completion of this survey, Discovery Parks determined the requirement for an additional 0.29 ha to the north of the initial expansion site. Subsequently, GHD undertook a targeted vegetation assessment for significant ecological communities and targeted Black Cockatoo tree survey within the additional expansion area (GHD 2020b) (Appendix A, Figure 1). The total survey area for the Woodman Point Caravan Park expansion covers 3.48 ha.

A summary of the field survey methods are provided below, with further information provided in Appendix B and Appendix C.

2.2.1 Flora and vegetation

Flora and Fauna Survey (GHD 2020a)

A single-season detailed flora and vegetation survey was conducted by GHD on the 9 September 2019. The survey assessed an area of 3.19 ha. The survey was undertaken with reference to the EPA Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016a).

The field survey was undertaken to identify and describe the dominant vegetation units, assess vegetation condition, and identify and record vascular flora taxa present at the time of survey. Field survey methods involved a combination of sampling quadrats and relevés and located in identified vegetation units and walking traverses. Five non-permanent quadrats and two relevés were described throughout the survey area. Searches for conservation significant and/or other significant ecological communities and flora taxa were also undertaken during the field survey.

Additional Vegetation Survey (GHD 2020b)

A vegetation assessment of the additional area (0.29 ha) was conducted by GHD on the 18 March 2020. The survey methodology employed by GHD was undertaken with reference to the Environmental Protection Authority (EPA) Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016).

The field survey was undertaken to identify and map significant ecological communities and search for significant flora taxa within the additional area.

The vegetation types and condition within the 0.29 ha additional area were extrapolated based on the GHD (2020a) survey and an interrogation of aerial imagery.

2.2.2 Fauna

Flora and Fauna Survey (GHD 2020a)

A Level 1 fauna survey (reconnaissance survey) of the initial survey area (3.19 ha) was conducted by GHD in conjunction with the flora and vegetation survey. The survey methodology employed by GHD was undertaken in accordance with the EPA Technical Guidance – Sampling methods for terrestrial vertebrate fauna (EPA 2016b) and Technical Guidance – Terrestrial Fauna Surveys (EPA 2016c).

The survey area was traversed on foot over the course of the survey to identify and describe the dominant fauna habitat types present and their condition, assess habitat connectivity, and identify and record fauna species within the survey area. An assessment of the likelihood of conservation significant fauna and their habitats occurring within the survey area was also undertaken.

In addition, a Black Cockatoo habitat assessment (for Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo) was undertaken for the survey area to assess the presence, quality and extent of habitat. For the purpose of the assessment, the DAWE (2012) Black Cockatoo referral guidelines were used to define breeding, foraging and night roosting habitat.

Additional Vegetation Survey (GHD 2020b)

A targeted Black Cockatoo tree survey was conducted by GHD in conjunction with the additional vegetation survey to identify any potential breeding trees (suitable breeding tree with a Diameter at Breast Height (DBH) greater than 500 mm) within the additional area (0.29 ha).

The tree survey was conducted in accordance with the EPBC Act referral guidelines for three threatened Black Cockatoo species: Carnaby's Cockatoo (Endangered) *Calyptorhynchus latirostris,* Baudin's Cockatoo (Vulnerable) *Calyptorhynchus baudinii,* and Forest Red-tailed Black Cockatoo (Vulnerable) *Calyptorhynchus banksii naso* (DSEWPaC 2012).

Fauna habitats within the 0.29 ha additional area were extrapolated based on the GHD (2020a) survey and aerial imagery.

2.3 Structure of document

Section 3 of this document has been structured to in accordance with the following aspects:

- Physical environment
- Land use
- Hydrology
- Vegetation and flora
- Fauna
- Dieback
- Heritage

Within each of these aspects the information from the Desktop study and listed technical studies has been used summarise the aspect and assess the relevant potential impacts.

3. Assessment of environmental aspects and impacts

3.1 Physical environment

3.1.1 Climate

The Perth Metropolitan area experiences a Mediterranean climate with cool, wet winters and warm, dry summers. Rainfall is generally received in winter (June-August); however, the area also receives periodic summer rainfall as a result of thunderstorm activity or rain-bearing depressions from tropical cyclones. The nearest BoM weather station with sufficient historical data is Fremantle (site number 009017) located approximately 9 km north of the Project area. Climate data from this station indicates the mean maximum temperature ranges from 27.9 °C in February to 17.1 °C in July. The mean minimum temperature ranges from 18.1 °C in February to 10.0 °C in July. The mean annual rainfall is 771.8 mm (BoM 2021).

3.1.2 Landforms and soils

The Project lies on the Swan Coastal Plain, which is part of the larger Perth Basin. Soil-landscape mapping of South West WA indicates the Project lies on the Quindalup Dune System. The Quindalup Dunes comprises dunes and ridges generally oriented parallel to the present coast, composed of unconsolidated (calcareous) sands and shell fragments.

3.1.3 Acid sulphate soils

A review of the Australian Soil Resource Information System (ASRIS) risk mapping indicates the Project area is not located in an area that is at risk of Acid Sulphate Soils (ASS) (GoWA 2021). The Project area also has a low surface and subsurface acidity (GoWA 2021).

3.1.4 Contamination and hazardous substances

The Project area is not known to be contaminated, based on a search of the DWER Contaminated Sites Database. There are 897 registered contaminated sites within the Desktop study area. The closest contaminated site is located approximately 0.57 km south of the Project area. This site is classified as ‘Contaminated – restricted use’ due to the presence of lead, organotin compounds and hydrocarbons in the soil.

The Project area includes two old Munitions Magazines (bunkers and blast barriers) from World War II. These have been fenced to restrict access due to the presence of hazardous substances (i.e.

asbestos). It is noted that high explosive ordinance were test fired at the site and the facility was closed in the 1980s. Searches have found only small quantity of .303 inch ammunition and detonators (GoWA 2021).

3.1.5 Potential impacts

The Project could potentially result in impacts to the physical environment. The following potential impacts could be expected to occur during the construction of the Project:

– Possible disturbance of hazardous substances (i.e. asbestos) from the old Munitions Magazines.

3.2 Land use

3.2.1 Land vesting and current use

The Project area is located adjacent to Woodman Point Caravan Park, at 132 on the corner of Cockburn Road and Magazine Court Munster, Coogee in WA. The Project area is zoned as “Parks and Recreation” under the City of Cockburn TPS No. 3.

The Project area currently comprises vegetation and Munitions Magazines (bunkers and blast barriers) from World War II. The Project area is located directly adjacent to Woodman Point Caravan Park.

Discovery Parks are currently in consultation with DBCA regarding the elase of the site, with the grant of a lease expected by end 2021/Q1 2022.

3.2.2 Conservation reserve and areas

DBCA managed lands

The Project area lies within the DBCA managed un-named Conservation Park (R 49220, Appendix A, Figure 2). The Conservation Park extends north and south of the Project area and covers approximately 130.9 ha. Un-named Nature Reserve (R 42469) is located approximately 0.25 km to the west of the Project area. A further 38 DBCA managed lands were found within the Desktop study area.

Regional Parks

The Project area is located within the wider WPRP which covers approximately 250 ha. The Park contains important nature conservation, cultural heritage and recreational values.

The Project is located within two management zones as described in the existing WPRMP 2010 (DPAW 2010) (Appendix A, Figure 3). The majority of the expansion occurs within land zoned for ‘Recreation’; however, 1.15 ha of the western portion of the Project extends into land zoned as “Natural Environment Uses”.

Bush Forever

The Project area is located within Bush Forever Site No. 341 (Appendix A,

Figure 4), Woodman Point, Coogee. A further six Bush Forever sites are located within the Desktop study area, with the nearest (Site No. 261) located approximately 0.7 km to the east of the Project area.

Ecological linkages

The Project area intersects one regional ecological linkage mapped in the Regional Ecological Linkages for the Perth Metropolitan Region (PMR) dataset. Link No. 76 intersects the majority of the Project area and links to ecological linkage numbers 35, 51, 53, 50 and Bush Forever Sites 490, 247, 341, 346, 349, 356 (Appendix A, Figure 2).

Environmental offsets

The Project area is not listed as an environmental offset on the WA Environmental Offsets Register.

3.2.3 Environmentally sensitive areas

The entirety of the Project area is located within an ESA, with a further five ESAs occurring within the Desktop study area. The majority of these ESAs appear to align with Bush Forever sites and TECs (Appendix A,

Figure 4).

3.2.4 Bushfire prone area

The Project area is located within a bush fire prone area (as defined in the Bushfire Management Plan, [Bushfire Prone Planning 2020]) and the proposed development is considered a sensitive/vulnerable land use. Designated bush fire prone areas have been identified by the Fire and Emergency Services Commissioner as being subject, or likely to be subject, to bushfire attack (Figure 10). Additional planning and building requirements may apply to development within these areas.

3.2.5 Potential impacts

The Project will involve the expansion of the existing Woodman Point Caravan Park. Whilst the zoning is compatible with the proposed land use, the Project will require planning approval.

Given the siting of the Project within the above described land uses, the development of the Project will directly affect a DBCA managed Conservation Park (R 42469), Bush Forever Site (No. 341) and an ESA. Due to the Project location having a vested interest from multiple State government agencies, a Negotiated Planning Outcome (NPO) and clearing permit will be required for clearing the Project area. In addition, bushfire management, planning and building approvals will be required for the Project.

3.3 Hydrology

The hydrology data layers indicate that the Project area intersects one area Proclaimed under the RIWI Act. A summary of the review is provided in Table 3.

Table 3 Hydrology queries within the Project area

Aspect	Details	Result
Groundwater Areas	Groundwater areas proclaimed under the RIWI Act	Cockburn groundwater area
Surface Water Areas	Surface water areas proclaimed under the RIWI Act	None present
Irrigation District	Irrigation Districts proclaimed under the RIWI Act	None present
Rivers	Rivers proclaimed under the RIWI Act	None present
Public Drinking Water Source Areas (PDWSAs)	PDWSA is a collective term used for the description of Water Reserves, Catchment Areas and Underground Pollution Control Areas declared (gazetted) under the provisions of the *Metropolitan Water Supply, Sewage and Drainage Act 1909* or the *Country Area Water Supply Act 1947*	None present
Waterways Conservation Areas	Areas proclaimed under the *Waterway Conservation Act 1976.*	None present

3.3.1 Surface water and drainage

A review of aerial imagery indicates that there are no drainage lines or surface water features within the Project area. No surface water features were recorded during the flora and fauna surveys (GHD 2020a, b).

3.3.2 Wetlands

Internationally and Nationally important wetlands

No Wetlands of International Importance (Ramsar) intersect the Project area or Desktop study area.

Geomorphic wetlands

No Geomorphic Wetlands of the Swan Coastal Plain occur within or immediately adjacent to the Project area. Within the Desktop study area there are 17 wetlands, with the closest wetland (Lake Coogee – Conservation Category Wetland) located approximately 1 km east of the Project area.

3.3.3 Potential impacts

The following potential impacts could be expected to occur during the construction and of the Project:

- If the Project requires the taking of groundwater (e.g. dewatering or construction/installation of bores to abstract water for construction) these activities may impact groundwater quality and quantities, and would require appropriate licences/permits from the regulating authority (DWER)
- Contamination of groundwater associated with the storage, handling and use of chemical and hydrocarbons
- Altered local hydrological processes (e.g. infiltration and surface water flows) from earth works and native vegetation clearing associated with the Project. Potential localised impacts to erosion and sedimentation.

3.4 Vegetation and flora

3.4.1 Vegetation

Broad vegetation mapping and extent

The Project area is located within the Swan Coastal Plain bioregion and Perth (SWA02) subregion.

There is one Vegetation Association within the Project area. The Vegetation Association and extent is presented within Table 4.

Table 4 Pre-European Vegetation Representation

Pre-European Vegetation Association	Scale	Pre–European (ha)	Current Extent (ha)	% Remaining	% Remaining in DBCA reserves
Veg Assoc No. 998 Jarrah, marri and wandoo *Eucalyptus 9anksia9o, Corymbia calophylla, E. wandoo*.	Statewide Western Australia	51,015	18,492	36.25	48.68
	Interim Biogeographic Regionalisation for Australia (IBRA) Bioregion Swan Coastal Plain	50,867	18,492	36.35	48.68
	IBRA Subregion Perth	50,867	18,492	36.35	48.68
	Local Government Authority City of Cockburn	4,464	845	18.93	34.36

The national objectives and targets for biodiversity conservation Australia have been set to prevent clearance of ecological communities with less than 30% of their pre-European extent, below which species loss appears to accelerate exponentially (Commonwealth of Australia, 2001). The 30% threshold does not consider the effect of habitat fragmentation and isolation which reduced areas of available habitat (DER, 2014). Given that the Project is within the constrained Swan Coastal Plain area, retention objective of at least 10% applies (DER, 2014). Vegetation Association 998 has greater than 10% of its pre-European extent remaining for all levels.

Regional vegetation has also been mapped by Heddle et al. (1980) based on major geomorphic units on the Swan Coastal Plain. The Heddle et al. (1980) mapping indicates that one vegetation complex is present within the Project area:

– Cottesloe Complex-Central and South: Mosaic of woodland of *Eucalyptus gomphocephala* (Tuart) and open forest of Eucalyptus gomphocephala (Tuart) – Eucalyptus 10anksia10o (Jarrah) – Corymbia calophylla (Marri); closed heath on the Limestone outcrops.

GoWA (2019b) has assessed the vegetation complexes mapped by Heddle et al. (1980) against presumed pre-European extents within the Swan Coastal Plain (Table 5) and the City of Cockburn (Table 6). The Cottesloe Complex Central, South complex and the City of Cockburn has greater than 10% of its pre-European extent remaining on the Swan Coastal Plain.

Table 5 Extents of vegetation complexes on the Swan Coastal Plain mapped within the Project area (GoWA 2019b)

Vegetation complex	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	% Current extent in all DBCA managed lands
Cottesloe Complex-Central and South	45,299	14,567	32.16	14.58

Table 6 Extents of vegetation complexes within the Local Government Area (LGA) mapped within the Project area (GoWA 2019b)

Vegetation complex	Pre-European extent (ha)	Current extent (ha)	% of pre-European extent	Proportion of the vegetation complex within the LGA %
Cottesloe Complex-Central and South	4,990	961	19.27	11.02

Project area specific vegetation types and condition

The vegetation and flora field survey identified five vegetation types as well as cleared/highly degraded areas within the Project area (GHD 2020a, b). The Project area consists of a mix of remnant (VT01, VT02), non-native (VT03), revegetated (VT04) and planted coastal vegetation (VT05). The vegetation within the Project area ranged from Good to Completely Degraded condition. The Project area has a long history of disturbances including clearing, activity associated with the Munitions Magazines, recreational use, weed invasion, introduced fauna and edge effects from adjacent land uses (e.g. caravan park and roads).

Vegetation type and condition mapping is provided in Appendix A (see Figure 5 and Figure 6 respectively). A breakdown of vegetation type by condition rating is provided in Table 7.

Table 7 Vegetation types and condition recorded in the Project area

Vegetation type	Description	Vegetation condition rating	Area (ha)
Acacia Closed Shrubland (VT01 – native)	*Acacia rostellifera* and *Spyridium globulosum* closed shrubland with scattered emergent *Eucalyptus gomphocephala* over **Fumaria capreolata*, **Oxalis pes-caprae*, *Spergularia marina* and **Euphorbia* spp. Herbland over **Asparagus asparagoides* and *Clematis linearifolia* open vineland.	Good	1.08
		Completely Degraded	0.07
Melaleuca Shrubland (VT02 – native)	*Melaleuca systena*, *Spyridium globulosum* and **Leptospermum laevigatum* shrubland with scattered emergent *Eucalyptus gomphocephala* over *Leucopogon parviflorus*, *Rhagodia baccata* and *Acanthocarpus preissii* low open shrubland over *Austrostipa elegantissima*, **Lagurus ovatus* and **Avena barbata* open grassland over *Spergularia marina*, **Fumaria capreolata* and **Pelargonium*	Good	0.15

Vegetation type	Description	Vegetation condition rating	Area (ha)
	capitatum open herbland over **Asparagus asparagoides* and *Clematis linearifolia* open vineland.		
**Cenchrus* Grassland (VT03 – non-native)	*Acanthocarpus preissii, Acacia cochlearis* and *Spyridium globulosum* scattered shrubs over **Cenchrus setaceus, Schoenus grandiflorus* and **Lagurus ovatus* grassland over **Brassica tournefortii, *Euphorbia terracina* and **Pelargonium capitatum* open herbland.	Degraded	0.20
Revegetation (VT04)	Previously cleared areas where natural regrowth of some native plant species has occurred. Natural regrowth is scattered with an understorey dominated by introduced grasses and herbs. Evidence of revegetation of native trees and shrubs (plastic plant bags) was present around a number of tree species including *Eucalyptus gomphocephala* (tuart) and *Callitris preissii* (Rottnest Pine).	Degraded	1.38
Planted (VT05)	Planted trees and shrubs located along the boundary of the existing caravan park. Species include non-native *Eucalyptus*, *Agonis flexuosa*, *Adenanthos sericeus* and *Grevillea* sp.	Degraded	0.06
		Completely degraded	0.03
Cleared/ Highly disturbed	Generally completely cleared of native vegetation and consists of roads, tracks, planted non-native vegetation and building structures.	Completely degraded	0.51
Total			**3.48**

3.4.2 Significant ecological communities

Desktop searches identified the potential presence of three TECs and one PEC occurring within the Desktop study area. These included:

- Banksia Woodlands of the Swan Coastal Plain TEC – TEC listed as Endangered under the EPBC Act and as a PEC (Priority 3) by the DBCA
- Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain – TEC listed as Critically Endangered under the EPBC Act and as Priority 3 by the DBCA
- *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands, Swan Coastal Plain (FCT30a) – TEC listed as Vulnerable under BC Act
- Northern Spearwood shrublands and woodlands (FCT24) – PEC listed as Priority 3 by the DBCA.

The GHD (2020b) (Appendix C) survey identified 0.47 ha of vegetation (including 0.01 ha of native vegetation and 0.46 ha of revegetation) within the Project area that is representative of the floristic community type (FCT) 30a – *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands TEC. Follow up consultation with the local branch of DBCA in 2021 resulted in a review of the survey data, and this was revised to 0.55 ha including 0.01 ha of native vegetation and 0.54 ha planted/revegetation undertaken by DBCA.

In addition, the GHD (2020b) survey identified one patch of vegetation that is representative of the Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain TEC and PEC. This patch consisted of 1.59 ha of vegetation (including 0.33 ha of native vegetation and 1.25 ha of planted/revegetation)..

The locations of the *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands TEC and the Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain TEC and PEC is shown on Appendix A, Figure 7.

The *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands TEC is listed as Vulnerable under the BC Act. There is an estimated 628.63 ha of the *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands TEC remaining based on available data within the interim recovery plan

(DPAW 2014) for the TEC. Clearing of 0.55 ha required for the Project would reduce the extent of this TEC by 0.087%.

The Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain Ecological Community is listed as Critically Endangered under the EPBC Act and Priority 3 by the DBCA. There is an estimated 17,060 ha of the Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain Ecological Community remaining, based on the indicative 2015 extent (DAWE 2017). Of the current extent of the Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain Ecological Community, 5535 ha has been reserved by the Government of Western Australia in 20 reserves. This is 22% of the remaining extent of the ecological community (DAWE 2017). Clearing of 1.59 ha required for the Project will reduce the 2015 indicative extent of the TEC by 0.009%.

Vegetation meeting the diagnostic requirements of Banksia Woodlands of the Swan Coastal Plain TEC and Northern Spearwood shrublands and woodlands (FCT24) were not identified in the project area.

3.4.3 Flora diversity

The *NatureMap* database identified 281 flora taxa, representing 79 families and 194 genera previously recorded within the study area. This total comprised 171 native taxa and 110 naturalised (introduced) taxa. Dominant families recorded included *Fabaceae* (65 taxa), *Poa*ceae (59 taxa) and *Asteraceae* (38 taxa).

The GHD field survey recorded sixty-three taxa (including subspecies and varieties) representing 31 families and 51 genera were recorded from the Project area during the field survey. This total comprised 31 native taxa and 32 introduced/weed flora taxa (GHD 2020a).

3.4.4 Significant flora

Searches of the EPBC Act PMST, *NatureMap* database and DBCA TPFL and WAHERB databases identified the potential presence of 20 significant flora taxa within the study area. The searches identified six Threatened taxa listed under the EPBC Act and/or BC Act and 14 Priority taxa listed by the DBCA potentially occurring within the Project area.

No significant flora were recorded within the Project area during the field survey (GHD 2020a). A likelihood of occurrence assessment conducted post-field survey concluded that all significant flora are considered unlikely to occur within the Project area (GHD 2020a) based on habitat preferences. A copy of the likelihood table is provided in Appendix B (GHD 2020a).

3.4.5 Potential impacts

The following potential impacts could be expected to occur during the construction of the Project:

- Direct loss of approximately 1.30 ha of native vegetation and 1.67 ha of planted, revegetated and non-native vegetation as a result of clearing for construction of the Project. This will result in a reduction in the extent of native vegetation from the local (City of Cockburn) and regional (Swan Coastal Plain) areas.
- Direct loss of 0.55 ha of vegetation that is representative of the floristic community type (FCT) 30a – *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands TEC. This will reduce the estimated extent of this TEC (based on available data) by 0.087%.
- Direct loss of 1.59 ha of vegetation that is representative of the Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain TEC and PEC. This will reduce the reduce the 2015 indicative extent of the TEC by 0.009%.
- Impacts to surrounding vegetation including erosion, dust and edge effects from altered hydrological processes.
- Introduction and/or spread of existing weeds and dieback into the Project area and adjacent vegetation.

3.5 Fauna

3.5.1 Fauna habitats

The fauna field survey identified three main habitat types within the Project area (GHD 2020a). The trees and shrubs within the Project area provide good value fauna habitat, particularly for bird species, providing shelter and food resources. Some areas are highly degraded from historical clearing (tracks, old buildings) and provide very little to no habitat value for most fauna species as these areas are generally devoid of vegetation.

Fauna habitat mapping is provided in Appendix A (see Figure 8). A summary of fauna habitats within the Project area is provided in Table 8.

Table 8 Fauna habitats within the Project area

Habitat type	Area (ha)
Grassland	0.20
Mixed Shrublands	1.30
Scattered trees/mixed shrubs	1.47
Total	**2.97**

3.5.2 Fauna diversity

The *NatureMap* database identified 336 fauna species previously recorded within 5 km of the Project area. This total comprised 172 birds, 35 reptiles, 11 mammals, 4 amphibians, and 52 invertebrates and 62 fish. Of the 336 fauna species previously recorded 327 were native species and nine were introduced species.

The GHD field survey recorded 25 fauna species including 20 birds, two mammal and three reptile species. Three of the species recorded are introduced (GHD 2020a).

3.5.3 Significant fauna

Searches of the EPBC Act PMST and *NatureMap* database identified the presence/potential presence of 65 significance fauna within the study area. This total does not include those species that are exclusively marine, as no marine habitat is present within the Project area or will be indirectly impacted by the Project.

The desktop searches identified:

- 33 species listed as Threatened under the EPBC Act and/or as Threatened under the BC Act (many are also listed as Migratory under the EPBC Act/BC Act)
- 21 bird species listed as Migratory only (terrestrial and wetland) under the EPBC Act and/or as Migratory species under the BC Act
- One species listed as Other specially protected fauna under the BC Act
- 10 species listed as Priority by DBCA.

During the field survey (GHD 2020a) one significant fauna species was recorded:

- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) – listed as Endangered under the EPBC Act and BC Act.

Black Cockatoos

One species of Black Cockatoo, Carnaby's Cockatoo, was recorded during the field survey. A small flock of approximately 15 Carnaby's Cockatoos were observed feeding on the *Callitris preissii* (Rottnest Pine) trees in the north-east corner of the Project area (GHD 2020a). The Forest Red-tailed Black Cockatoo was also identified as likely to occur as an opportunistic visitor (GHD 2020a).

A summary of Black Cockatoo habitat present within the Project area is included in Table 9.

Table 9 Black Cockatoo habitat present within the Project area

Habitat	Description
Breeding	Three potential breeding trees were recorded in the Project area. These trees were *Eucalyptus gomphocephla* – Tuart) with DBH > 500 mm. The trees did not contain any visible hollows.
Roosting	No suitable Black Cockatoo roosting habitat was recorded in the Project area.
Foraging	The Project area contains potential foraging habitat for Black Cockatoos including Tuart (*E. gomphocephala*) and Rottnest Pines (*Callitris preissii*). The Project will require removal of approximately 1.53 ha of moderate to low value foraging habitat, comprised of 0.15 ha of VT02 and 1.38 ha of VT04. The species suitable for foraging are scattered throughout the Project area and therefore, clearing of actual potential foraging habitat will be less than 1.53 ha. VT02 and VT04 are considered to have low to moderate foraging value for Black Cockatoos. The remaining vegetation types are considered to have nil to negligible foraging value (GHD 2020a, b).

Likelihood of occurrence assessment

A likelihood of occurrence assessment was conducted post-assessment, and concluded that one species (Carnaby's Cockatoo) is known to occur in the Project area and seven species are likely to occur in the Project area. No evidence of the species considered likely to occur was recorded during the field survey. Given the small size, fragmented nature, the history of disturbances within the Project area, it is considered unlikely that the Project area contains significant habitat for significant fauna species.

A summary of the significant fauna considered likely to occur in the Project area is provided in Table 10. A copy of the likelihood table is provided in Appendix B(GHD 2019).

Table 10 Conservation significant fauna known or likely to occur in the Project area.

Species	EPBC Act	BC Act/ DBCA	Likelihood of occurrence
Calyptorhynchus latirostris Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo	Endangered	Endangered	**Present** The Project area provides some suitable foraging habitat for this species A small flock of Carnaby's Cockatoo were observed feeding on *Callitris preissii* trees during the field survey.
Calyptorhynchus 14anksia subsp. *Naso* Forest Red-tailed Black Cockatoo	Vulnerable	Vulnerable	**Likely** The Project area provides suitable feeding habitat for this species. This species is known to occur in the area.
Falco peregrinus Peregrine Falcon	-	Specially protected	**Likely** Suitable foraging habitat is present within the Project area. Suitable nesting sites are limited.
Pandion cristatus Osprey, Eastern Osprey	Migratory	International Agreement	**Likely** The Project area may provide suitable habitat to support this species.
Tyto novaehollandiae subsp. *Novaehollandiae* Masked Owl (southwest)	-	Priority 3	**Likely** This species has previously been recorded in the Woodman Point area. The Project area may be used opportunistically for foraging however there is no suitable nesting sites in the Project area
Isoodon fusciventer Quenda	-	Priority 4	**Likely** Suitable habitat is present in the Project area. There are a number of records in the

Species	EPBC Act	BC Act/ DBCA	Likelihood of occurrence
			area however no evidence of their presence was recorded during the survey.
Lerista lineata Perth Slider, Lined Skink	-	Priority 3	**Likely** The Project area provides suitable habitat to support this species.
Neelaps calonotos Black-striped Snake	-	Priority 3	**Likely** The Project area provides suitable habitat for this species.

3.5.4 Potential impacts

The following potential impacts could be expected to occur during the construction of the Project:

- Direct loss of approximately 2.97 ha of potential fauna habitat as a result of the construction of the Project
- Direct loss of approximately 1.53 ha of low to moderate quality foraging habitat for Black Cockatoos (comprised of 0.15 ha of VT02 and 1.38 ha of VT04)
- Death and/or injury of fauna during earth works and construction associated with vehicle strikes and excavations
- Secondary impacts from noise, vibration and light.

3.6 Dieback

Dieback is found throughout the southern extent of Western Australia in areas with susceptible plant species that receive rainfall in excess of 400 mm/year (Dieback Working Group 2014). There is no dieback mapping available for the Project area.

3.6.1 Potential Impacts

The vegetation present within the Project area is likely to be susceptible to dieback. If present, the Project has the potential to spread dieback into adjacent conservation areas during the construction phase. A Dieback assessment and preparation of a site-specific management plan is recommended for the Project.

3.7 Heritage

3.7.1 Aboriginal heritage

A search of Registered Aboriginal Heritage sites identified the eastern extent of the Project area intersects a Registered Aboriginal heritage site, Cockburn Road (ID 15840) (Appendix A, Figure 9). The site type is classed as mythological and of ethnographic importance, and is the focus of a Noongar narrative concerning the acquisition of fire (Derbal Nara n.d.). Site 15840 is also associated with a limestone ridge that has proximity to archaeological sites. As the Project area has been previously disturbed there is a low risk of new archaeological discoveries resulting from ground disturbance during Project construction.

Consultation with the DPLH will be required to clarify if the Project has the potential to directly impact the Registered site, given its mythological importance, or if the Project boundary falls within the buffer for the registered site. Clarification will be required to ascertain whether a Section 18 approval will be required for the development of the Project.

Archaeological and Ethnographic surveys

A search of the Aboriginal Heritage Inquiry System identified 17 heritage surveys that have occurred within the study area, comprising of five ethnographic, five archaeological and seven combined

ethnographical and archaeological. Within the Project area, six heritage surveys have occurred, comprising of three ethnographic, one archaeological and two combined ethnographic and archaeological. The two ethnographic and archaeological combined surveys were both field and desktop based and classified as having moderate to good spatial accuracy. A survey specific to the Project may be required to support the s18 approval for the Project.

3.7.2 Non indigenous heritage

The EPBC PMST identified no Commonwealth listed heritage sites within the Project or wider study area.

Woodman Point Munitions Magazines (fmr), (ID 4626) falls within the Project area (Appendix A, Figure 9). It is listed in the WA Heritage Council State Register and the City of Cockburn Municipal Inventory. A search of the WA State Heritage Office (SHO) Inherit database identified 10 registered sites within the wider study area. Consultation with the State Heritage office will be required to amend these sites.

3.7.3 Native Title

The Project area is located within Crown reserve R 49220, which is in the traditional lands of the Whadjuk people and subject to Native Title under the *Native Title Act 1993*. The South West Native Title Settlement was finalised in February 2021, and includes the development of six Indigenous land use agreements (ILUAs) negotiated between the Noongar people and the WA Government, with compensation provided in exchange for the land use rights. The project area is within the Whadjuk People ILUA area. No action is required by Discovery Parks regarding native title.

3.7.4 Potential impacts

The following potential impacts could be expected to occur during the construction of the Project:

– Disturbance and/or damage to Registered/listed heritage (Aboriginal and non-indigenous) sites and heritage values, within or immediately adjacent to the Project area. Discovery Parks plan to refurnish and renovate the Munitions bunkers for use as a recreation room and camp kitchen.

4. Environmental approvals recommendations

4.1 Potential environmental constraints

Table 11 summarises the identified potential environmental constraints relevant to the Project area based on the desktop assessment, field survey and reviewed technical studies.

Table 11 Summary of potential environmental constraints relevant to the Project

Aspect	Discussion	Recommendation
Contamination	The Project area contains two old Munitions Magazines which are understood to contain asbestos.	Impacts associated with the old Munitions Magazines can be adequately managed through a Project-specific Construction Environmental Management Plan (CEMP).
Conservation reserves and areas	The Project area is located within a Bush Forever Site (No. 341), an ESA and intersects areas mapped as regional ecological linkages.	– Any native vegetation clearing will require a clearing permit under Part V of the EP Act from DWER. – Clearing exemptions do not apply in an ESA. – Bush Forever sites and regional ecological linkages do not have legislative protection, but presence, significance and potential impacts to these areas will be considered and assessed as part of a clearing permit assessment. – A NPO will be required to negotiate the potential clearing of native vegetation within these environmentally sensitive areas with the departments who have jurisdiction over the values. This may include rehabilitation of specified areas and/or a monetary offset. An agreed planning outcome will need be negotiated with Bush Forever Office of the DPLH.
Bush Fire	The Project area is located within a bush fire prone area and the proposed development is considered a sensitive/ vulnerable land use.	A Bushfire Management Plan (BMP) and Emergency Evacuation Plan has been developed (Bushfire Prone Planning 2021) to support planning applications/ approvals.
Groundwater	The Project area is within the proclaimed Cockburn Groundwater Area.	If groundwater abstraction and/or bore/well construction/ alteration is required for the Project, a licence from DWER may be required and should be considered in later project phases.
Vegetation and flora	A vegetation and flora survey was completed in 2020 for the initial survey area. An additional vegetation survey was also completed in 2020 for the additional area. The Project area supports native vegetation in Good to Completely Degraded condition. There is 0.55 ha of vegetation (including 0.01 ha of native vegetation and 0.54 ha of revegetation) that is representative of the floristic community type (FCT) 30a – *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands TEC	– Any native vegetation clearing will require a clearing permit under Part V of the EP Act from DWER. – Clearing exemptions do not apply in an ESA.

Aspect	Discussion	Recommendation
	In addition, there is one 1.59 ha of vegetation (including 0.28 ha of native vegetation, and 1.25 ha of planted/revegetation) representing The Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain TEC and PEC.	
Fauna	A Level 1 fauna survey was completed in 2020 for the initial survey area. An additional survey was also completed in 2020 for the Project area. The Project area contains three potential breeding trees and up to 1.53 ha of suitable foraging habitat for Carnaby's Cockatoo and the Forest Red-tailed Black Cockatoo. The three potential breeding trees did not contain any visible hollows. Vegetation types VT02 and VT04 are considered to have low to moderate foraging value for Black Cockatoos. Carnaby's Cockatoo was recorded during the 2020 survey. A further five significant fauna were considered likely to occur within the Project area.	– Any native vegetation (and associated fauna habitat) clearing will require a clearing permit under Part V of the EP Act from DWER. – Clearing exemptions do not apply in an ESA. – Do we need to institute any other controls such as trapping and relocation of fauna prior to clearing?
Dieback	There is no dieback mapping available for the Project area. There is potential for dieback to occur or spread into the Project area.	Consideration of dieback investigations/management based on Project needs. DBCA may have information regarding the dieback status of the site, otherwise a dieback survey is recommended.
Aboriginal Heritage	One registered Aboriginal heritage site, Cockburn Road (ID 15840) falls within the Project area.	Consultation with the DPLH is required to determine whether the Project will potentially impact the Registered Aboriginal heritage site, and the requirement for a Section 18 approval under the *Aboriginal Heritage Act 1972*. A heritage survey may be required for the s18 approval.
Non-indigenous heritage	One registered heritage site, the Woodman Point Munitions Magazines (fmr), (ID 4626) falls within the Project area.	Once the planning approvals for this Project are submitted to the City of Cockburn, these will be forwarded to Western Australian Planning Commission (WAPC). WAPC will request input from the SHO regarding impacts to State listed heritage sites. A heritage survey may be requested by SHO. It is also expected that the Planning Officer at City of Cockburn will notify their internal Heritage Officer of the proposed impacts to the State heritage site which is also Municipally listed.
Native Title	The Project area is located within Crown reserve R 49220, which is subject to native title, in accordance with the *Native Title Act 1993*	Consultation with DPLH to determine approval and consultation requirements.

4.2 Environmental approval evaluation

4.2.1 EPBC Act (Commonwealth)

Referral to DAWE under the EPBC Act is triggered if a proposed action has or potentially has a significant impact on any MNES, which are factors that require legislated protection in order to

conserve biodiversity, protect World Heritage and National Heritage Places, and comply with international treaties.

An assessment was undertaken to determine whether MNES are likely or maybe present within the Project area (Table 12). The assessment has identified that EPBC listed TECs, Threatened species and migratory species are known and/or likely to occur within the Project area. The Project area is small, however will involve the clearing of 1.59 ha of the Critically Endangered Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain Ecological Community. While the Project does involve clearing, in the regional context the amount is small. The 1.59 ha of clearing required for the Project will reduce the 2015 indicative extent of the TEC by 0.009%. Additionally, the clearing is in an area that is managed by DBCA, which has strategies in place to reduce threats to flora and vegetation, including a weed control, access restrictions, and disease reduction hygiene standards (DPAW 2010). The WPRMP (2010) also ensures fewer external threats to the remainder of the reserve by restricting planning and land use opportunities. Therefore, assessment against the *MNES Significant Impact Guidelines 1.1. (DoE 2013)* finds that referral under the EPBC Act is not required. Discovery Parks may chose to refer to DAWE for legal certainty.

A summary of MNES present in the project area is detailed below,

Table 12 Assessment of the Project against MNES

Matter of National Environmental Significance	Presence / potential presence within Project area including local and regional significance of impact
World heritage properties	None present
National heritage places	None present
Wetlands of international importance	None present
Nationally threatened species and ecological communities	– 1.59 ha of the Critically Endangered TEC – Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain Ecological Community was identified within the Project area. Of this, 79% was planted by DBCA in the last approximately 10 to 20 years. – One Threatened fauna species was recorded during the field survey, Carnaby's Cockatoo – listed as Endangered. – One Threatened fauna species is considered likely to occur within the Project area, Forest Red-tailed Black Cockatoo – listed as Vulnerable. – The Project area supports up to 1.53 ha of potential foraging habitat (low to moderate value). Suitable foraging species are scattered throughout the Project area and therefore, actual clearing of potential foraging habitat is considered to be less than 1.53 ha. – The DBCA managed Conservation Park (R 49220) contains approximately 51.41 ha of potential Black Cockatoo foraging habitat (GoWA 2021). Clearing of up to 1.53 ha of low quality potential foraging habitat for the Project represents 2.98% of foraging resources in the immediate area. – The City of Cockburn contains approximately 3599 ha of potential Black Cockatoo foraging habitat (GoWA 2021). Clearing for the Project represents only 1.43% of potential foraging habitat within the City of Cockburn. – In the Project area the majority of trees observed were young and did not form a continuous upper canopy. The majority of habitat in the project area is planted by DBCA. – The Project area also contains three potential breeding trees (Tuart > 500 mm DBH with no visible hollows. These are likely to be retained for amenity in the park, if permitted under the Bushfire regulations.

Matter of National Environmental Significance	Presence / potential presence within Project area including local and regional significance of impact
Migratory species	No migratory species were recorded during the 2020 field survey. One migratory species is considered likely to occur within the Project area, the Osprey (*Pandion cristatus*). Given the size of the Woodman Point Regional Park, significant impact to this species is unlikely.
Commonwealth marine areas	Not applicable
Great Barrier Reef Marine Park	Not applicable
Nuclear actions (including uranium mining)	Not applicable
A water resource, in relation to coal seam gas development and large coal mining development	Not applicable

4.2.2 EP Act IV (WA)

Part IV of the EP Act makes provisions for the EPA to carry out impact assessment of significant proposals, strategic proposals and land use planning schemes. In deciding whether a proposal will be subject to the formal environmental impact assessment process, the EPA takes into account the environmental significance of potential impacts that may result from the implementation of the proposal or scheme. Developments assessed by the EPA must receive Ministerial Approval in order to proceed.

The EPA uses environmental factors and associated objectives as the basis for assessing whether a proposal or scheme's impact on the environment is acceptable. The environmental factors and objectives, therefore, underpin the environmental impact assessment process. Environmental factors are those parts of the environment that may be impacted. The EPA (2018) has grouped these factors into five broad themes, an assessment against each factor for the Project is presented in Table 14.

The likely environmental factors potentially impacted by the Project include flora and vegetation, terrestrial fauna, and social surrounds. Based on the assessment in Table 14, it is determined that the project can be adequately assessed under Part V of the EP Act and the relevant heritage acts.

Table 13 Assessment of the Project against EPA factors

Theme	Factor	Potentially impacted	Factor assessment
Sea	Benthic Communities and Habitats	No	The Project area is situated approximately 1 km from the coast. There are no benthic communities or habitats present, nor is there likely to be any impact to coastal processes, marine water, sediment quality, or marine fauna.
	Coastal Processes	No	
	Marine Environmental Quality	No	
	Marine Fauna	No	
Land	Flora and Vegetation	Yes	– The Project will require the clearing of approximately 1.30 ha of native vegetation. – The Project will require the clearing of 0.55 ha of *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands, Swan Coastal Plain (FCT30a) – listed as Vulnerable under BC Act.
	Terrestrial Fauna	Yes	– The Project area contains three potential breeding trees and up to 1.53 ha ha of foraging habitat of low to moderate value for Carnaby's Cockatoo and the Forest Red-tailed Black Cockatoo. This includes 0.15

			ha of native vegetation; the remainder is revegetation undertaken by DBCA. The three potential breeding trees did not contain any visible hollows. – Carnaby's Cockatoo was recorded during the 2020 survey. A further five significant fauna are considered likely to occur within the Project area.
	Terrestrial Environmental Quality	No	While the Project may cause some short-term, localised soil erosion and/or compaction, it is unlikely to result in any long term, significant impacts to the overall terrestrial environmental quality.
	Landforms	No	The Project is unlikely to result in any significant changes to landforms.
	Subterranean Fauna	No	The Project is unlikely to result in any impacts to subterranean fauna.
Water	Inland Waters	No	The Project area does not intersect any surface water drainage features, or geomorphic or internationally important wetlands.
Air	Air Quality	No	With limited air emissions, during construction, which can be managed under the CEMP, the Project is not expected to significantly impact to air quality.
	Greenhouse Gas Emissions	No	The construction and operation of the Project is unlikely to significantly contribute to greenhouse gas emissions.
People	Social Surroundings	No	The Project is located within the Woodman Point Munitions Magazines (fmr), (ID 4626), which is listed in the WA Heritage Council State Register and the City of Cockburn Municipal Inventory. The impact to this site can be adequately assessed under the *Heritage Act 2018.* No significant impacts to social surrounds are expected from the Project.

4.2.3 EP Act Part V (WA)

Clearing of native vegetation is regulated by DWER and requires a clearing permit under Part V of the EP Act, except when a Project is assessed under Schedule 6 of the Act or is prescribed by regulation in the *Environmental Protection (Clearing Native Vegetation) Regulations 2004* and not in an ESA.

Development of the Project will require clearing of native vegetation in an ESA. The Project will therefore, require a Native Vegetation Clearing Permit.

When preparing a Native Vegetation Clearing Application an assessment against the "Ten Clearing Principles" is required to determine whether the Project is likely to be at variance to the Principles. The Ten Clearing Principles aim to ensure that potential impacts resulting from removal of native vegetation can be assessed in an integrated way. An assessment of the Project against the Ten Clearing Principles was undertaken and is provided in Table 14. The preliminary assessment determined the Project is at variance with Principle a) d) and h).As such, an offset will be offered in accordance with the WA Environmental Offsets Policy (EPA 2011).

Table 14 Preliminary assessment of the Project against the Ten Clearing Principles

Principle	Assessment
a) Native vegetation should not be cleared if it	**The proposed clearing is at variance with this Principle.**

Principle	Assessment
comprises a high level of biological diversity.	There is 1.30 ha of native vegetation within the Project area. The Project area comprises of two native vegetation types (Appendix A, Figure 5), including: – Acacia Closed Shrubland (1.15 ha) – Melaleuca Shrubland (0.15 ha). The vegetation condition ranged from Good to Completely Degraded (Appendix A, Figure 6). The Project area has been subject to a long history of disturbance, weed invasion, introduced fauna and edge effects from the adjacent land uses (GHD 2020a, b). Desktop searches identified the presence/potential presence of three TECs occurring within the 5 km of Project area. These included: – *Banksia* Woodlands of the Swan Coastal Plain TEC - listed as Endangered under the EPBC Act and as Priority 3 by the DBCA – Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain TEC - listed as Critically Endangered under the EPBC Act and as Priority 3 by the DBCA – *Callitris preissii* (or *Melaleuca lanceolata*) Woodlands and Forests of the Swan Coastal Plain TEC – listed as Vulnerable under the BC Act The biological survey conducted by GHD (2020b) confirmed the presence of the Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain PEC and the *Callitris preissii (or Melaleuca lanceolata*) Woodlands and Forests of the Swan Coastal Plain TEC within the Project area. The GHD (2020b) survey identified a total of 1.59 ha of vegetation that is representative of the Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain TEC and PEC. Of this, 0.33 ha is native vegetation, the remainder is planted or revegetation (1.25 ha). DBCA has confirmed this vegetation was planted for conservation purposes by the agency. The Tuart PEC has an estimated 17,060 ha remaining, based on the indicative 2015 extent (DAWE 2017). The proposed clearing represents less than 0.009 of the Tuart TEC extent. The GHD (2020b) survey identified 0.55 ha that is representative of the of the floristic community type (FCT) 30a – *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands TEC, of which 0.01 ha is native and 0.54 ha was planted for conservation purposes by DBCA. The clearing of the vegetation will reduce the extent by 0.087%. The *NatureMap* database identified 281 flora taxa, representing 79 families and 194 genera previously recorded within the study area. A flora survey by GHD (2020a) identified 63 taxa (including subspecies and varieties) representing 31 families and 51 genera within the survey area. This total comprised 31 native taxa and 32 introduced/weed flora taxa. Desktop searches identified the presence/potential presence of 20 significant flora taxa within the study area. No significant flora were recorded within the Project area during the field survey (GHD 2020a). A likelihood of occurrence assessment conducted post-field survey concluded that all significant flora are considered unlikely to occur within the Project area (GHD 2020a). Three main fauna habitat types were identified during the GHD (2020a) field survey, including grasslands, native mixed shrublands and scattered trees/mixed shrubs. The mixed shrubland (1.30 ha) habitat is comprised of native vegetation including *Acacia* closed shrubland (1.15) and *Melaleuca* shrubland (0.15). The trees and shrubs within the Project area are scattered, however, provide some value to fauna, particularly for bird species by providing shelter and food resources. The *NatureMap* database identified 336 fauna species previously recorded within 5 km of the Project area. The GHD field survey (GHD 2020a) recorded 25 fauna species including 20 bird, two mammal and three reptile species. Three of the species recorded are introduced (GHD 2020a). The Project area intersects one regional ecological linkage mapped in the Regional Ecological Linkages for the PMR dataset. Link No. 76 intersects the majority of the Project area and links to Link numbers 35, 51, 53, 50 and Bush Forever Sites 490, 247, 341, 346, 349, 356. The Project area is located within Bush Forever Site No. 341 (Appendix A, Figure 4), Woodman Point, Coogee. A total of 1.3 ha of native vegetation is required to be cleared within Bush Forever Site No. 341.

Principle	Assessment
	The Project will result in vegetation and habitat loss through direct clearing of native vegetation. The Project area contains vegetation that is representative of significant ecological communities and the proposed clearing is variance with this Principle.
b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia	**The proposed clearing is unlikely to be at variance with this Principle.** One native fauna habitat (mixed shrublands – 1.30 ha) is mapped within the Project area (Appendix A, Figure 8). Desktop searches identified the presence/potential presence of 65 significance fauna within the study area. This total does not include those species that are exclusively marine, as no marine habitat is present within the Project area or will be indirectly impacted by the Project. One species of Black Cockatoo, Carnaby's Cockatoo, was recorded during the field survey. A small flock of approximately 15 Carnaby's Cockatoos were observed feeding on the *Callitris preissii* (Rottnest Pine) trees in the north-east corner of the Project area (GHD 2020a). The Forest Red-tailed Black Cockatoo was also identified as likely to occur as an opportunistic visitor (GHD 2020a). The Project area contains low to moderate value foraging habitat for Black Cockatoos including Tuart (*E. gomphocephala*) and Rottnest Pines (*Callitris preissii*). There is approximately 0.15 ha of native vegetation (VT02) that comprises potential Black Cockatoo foraging habitat within the Project area. Within the DBCA managed Conservation Park there is approximately 51.21 ha of potential Black Cockatoo foraging habitat and within the City of Cockburn there is approximately 3599.72 ha of potential Black Cockatoo foraging habitat (GoWA 2021). Clearing of 0.15 ha of native foraging habitat represents 0.3% and 0.004% of these extents respectively. Three potential Black Cockatoo breeding trees (Tuart) with DBH > 500 mm were recorded within the revegetated area of the Project and are likely planted. These trees did not contain any hollows. The Project will not require the clearing of any known Black Cockatoo breeding trees. No suitable Black Cockatoo roosting habitat is currently present in the Project area (GHD 2020a, b). A likelihood of occurrence assessment was conducted post-assessment and concluded that a further seven significant fauna species are likely to occur in the Project area. Given the small size, fragmented nature, the history of disturbances within the Project area, it is considered unlikely that the Project area contains significant habitat for these significant fauna species. The Project area is unlikely to support fauna habitat that is in better condition than the surrounding available habitat and is therefore not considered to be significant in the regional context. The Project clearing is not likely to comprise of habitat necessary for the maintenance of indigenous fauna and is not at variance to this principle.
c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.	**The proposed clearing is not at variance with this Principle.** Desktop searches identified the presence/potential presence of four Priority flora taxa listed under the BC Act. No significant flora were recorded within the Project area during the field survey (GHD 2020a). A likelihood of occurrence assessment conducted post-field survey concluded that all Threatened flora are considered unlikely to occur within the Project area (GHD 2020a) The proposed clearing is unlikely to have any significant impact on rare flora in the region.
d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for, the maintenance of a threatened ecological community.	**The proposed clearing is at variance with this Principle.** The GHD (2020b) survey identified 0.55 ha of vegetation that is representative of the floristic community type (FCT) 30a – *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands TEC (Appendix A, Figure 7). Of this, 0.01 ha is native vegetation and 0.54 ha was planted by DBCA for conservation purposes. The *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands TEC is listed as Vulnerable under the BC Act. There is an estimated 628.63 ha of the *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands TEC remaining based on available data within the interim Recovery Plan (DPAW 2014) for the TEC. Clearing of this TEC would reduce the estimated extent of this TEC by less than 0.087%. The GHD (2020b) survey identified a total of 1.59 ha of vegetation that is representative of the Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain TEC, Endangered under the EPBC Act. Of this, 0.28 ha is native vegetation, the remainder is planted or revegetation. The Tuart PEC has an estimated 17,060 ha remaining, based on the indicative 2015 extent (DAWE 2017). Clearing of 1.59 ha required for the Project will reduce the 2015 indicative extent of the TEC by 0.009%.

<table>
<tr><th>Principle</th><th>Assessment</th></tr>
<tr><td></td><td>The proposed clearing is at variance with this Principle.</td></tr>
<tr><td>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.</td><td>The proposed clearing is not at variance with this Principle.
Vegetation mapping indicates that one Vegetation Association is present within the Project area. This is Veg Association No. 998, described as Jarrah, marri and wandoo Eucalyptus marginata, Corymbia calophylla, E. wandoo.
Regional vegetation mapping by Heddle et al. (1980) indicates that one vegetation complex is present within the Project area, the Cottesloe Complex-Central and South, which is described as a mosaic of woodland of Eucalyptus gomphocephala (Tuart) and open forest of Tuart – E. marginata (Jarrah) - Corymbia calophylla (Marri); closed heath on the Limestone outcrops.
The national objectives and targets for biodiversity conservation Australia have been set to prevent clearance of ecological communities with less than 30% of their pre-European extent, below which species loss appears to accelerate exponentially (Commonwealth of Australia, 2001). Given that the Project is within the constrained Swan Coastal Plain area, a retention objective of 10% is typically applied.
The current extent of Vegetation Association 998 is above 10% of its pre-European extent remaining at all levels.
<table><tr><th>Pre-European Vegetation Association</th><th>Scale</th><th>Pre–European (ha)</th><th>Current Extent (ha)</th><th>% Remaining</th><th>% Remaining in DBCA reserves</th></tr><tr><td rowspan="4">Veg Assoc No. 998
Jarrah, marri and wandoo Eucalyptus marginata, Corymbia calophylla, E. wandoo.</td><td>Statewide
Western Australia</td><td>51,015</td><td>18,492</td><td>36.25</td><td>48.68</td></tr><tr><td>IBRA Bioregion
Swan Coastal Plain</td><td>50,867</td><td>18,492</td><td>36.35</td><td>48.68</td></tr><tr><td>IBRA Subregion
Perth</td><td>50,867</td><td>18,492</td><td>36.35</td><td>48.68</td></tr><tr><td>Local Government Authority
City of Cockburn</td><td>4,464</td><td>845</td><td>18.93</td><td>34.36</td></tr></table>
GoWA (2019b) has assessed the vegetation complexes mapped by Heddle et al. (1980) against presumed pre-European extents within the Swan Coastal Plain and the City of Cockburn. The Cottesloe Complex Central and South complex has greater than 10% of its pre-European extent remaining on the Swan Coastal Plain and within the City of Cockburn.
Whilst the vegetation within the Project area has been extensively cleared at a local scale, the Project area does not represent a significant remnant of native vegetation on a regional scale. The proposed clearing (approximately 1.3 ha of native vegetation) required for the development of the Project will not significantly reduce the current percentage of the pre-European extent remaining and therefore the proposed clearing is unlikely to be at variance with this Principle..</td></tr>
<tr><td>f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.</td><td>The proposed clearing is not at variance with this Principle.
The vegetation within the Project area does not grow in association with drainage lines, watercourses or wetland. There are no permanent wetlands or watercourses located within or immediately adjacent to the Project area.
Vegetation clearing is not considered likely to adversely alter water tables, and will not impact any ecological communities that are wetland or groundwater dependent.</td></tr>
<tr><td>g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.</td><td>The proposed clearing is not at variance with this Principle.
There may be some short-term soil erosion associated with vegetation clearing for the Project. However, this will be mitigated with the use of appropriate water management infrastructure, regimes and procedures, detailed within the Construction Environmental Management Plan.</td></tr>
</table>

Principle	Assessment
	Soil salinity is not considered likely to increase as a result of clearing. The Project does not lie within an area that is at risk of ASS. The proposed clearing is not at variance with this Principle.
h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	**The proposed clearing is at variance with this Principle.** The Project lies within the DBCA managed un-named Conservation Park (R 49220) (Appendix A, Figure 2), Bush Forever Site No. 341 (Appendix A, Figure 9), and intersects one regional ecological linkage (Link 76) mapped in the Regional Ecological Linkages for the PMR dataset (Del Marco et al. 2004). The clearing of 1.30 ha of native vegetation for the Project will directly impact upon un-named Conservation Park (R 49220) and Bush Forever Site No. 341. The proposed clearing is at variance with this Principle.
i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	**The Project is not at variance with this Principle.** The vegetation within the Project area does not grow in association with any drainage lines, watercourse or wetlands. It is unlikely the clearing will alter the quality of surface or groundwater within the Project area. Any potential localised erosion will be managed with appropriate infrastructure and erosion controls and a Project specific CEMP. The proposed clearing is unlikely 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 or intensity of flooding.	**The Project is not at variance with this Principle.** The proposed clearing is for a relatively small area (approximately 1.3 ha of native vegetation), on flat land, which is not associated with any permanent surface water features. It is considered unlikely the clearing will cause or exacerbate the incidence of flooding. Development of the Project will include appropriate drainage infrastructure and erosion controls to manage surface water runoff.

4.3 Other approvals

4.3.1 RIWI Act (WA)

The DWER issues licences and permits under the RIWI Act to take water (from a watercourse, well, and/or underground source), construct wells (commence, construct, enlarge, deepen or alter wells, bores and soaks) and interfere with the bed and banks of a watercourse or wetland.

If the Project requires the taking of groundwater (e.g. dewatering or construction/installation of bores to abstract water for construction) approval may be required from DWER. Generally a 26D and 5C licence can be submitted at the same time. It is strongly recommended for Discovery Parks to enter into discussions with DWER, as early as possible, regarding the necessary water licences, as review of the DWER Water Register indicates surface and groundwater for the Project area is fully allocated (DWER 2019b).

4.3.2 Aboriginal Heritage Act 1972 (WA)

The Project area intersects one Registered Aboriginal heritage site, Cockburn Road (ID 15840). This site is classified as mythological and is of ethnographic importance. Project activities have the potential to impact upon the heritage values of this site. As the Project area has been previously disturbed, there is a low risk of new archaeological discoveries; however, consultation with the DPLH is recommended to clarify if the Project will directly impact the mythological value of the Cockburn Road heritage site and to ascertain whether a Section 18 approval, will be required for the development of the Project. If a Section 18 approval is required, a supporting ethnographic and/or archaeological survey may also be requested.

4.3.3 Heritage Act 2018

The Woodman Point Munitions Magazines (fmr), (ID 4626) heritage site falls within the Project area. Referral of the project to the SHO for comment will occur as part of the Development Approval process outlined in Section 4.3.5. Discovery Parks plan to refurnish and renovate the Munitions bunkers for use as a recreation room and camp kitchen. The Heritage Officer and DPLH will provide feedback on the proposed development, and may require a heritage survey to support their assessment.

4.3.4 Native Title Act 1993 (Commonwealth)

Discovery Parks will need to seek clarification from DPLH to determine if Native Title for the Project area has previously been extinguished as part of the recent South West Indigenous Land Use Agreement settlement. DPLH can also provide advice on how to proceed if Native Title has not been extinguished.

4.3.5 Planning approvals (Development Application)

The Project is located within the City of Cockburn. The City of Cockburn will assess a development against the applicable State and Local planning framework provisions, and forward its recommendation to the Western Australian Planning Commission (WAPC) for their consideration as part of their assessment of the application. As part of the Development Application process, it is anticipated that the WAPC will forward the application to any affected public authorities or utility providers for comment, including the Heritage Council where relevant.

In this instance, given the application type and the capital cost of the proposed Project is greater than $10 million (approximately $10.7 million), the development application will require determination by the Joint Development Assessment Panel (JDAP) as the responsible authority.

4.3.6 Negotiated Planning Outcome

Discovery Parks has submitted a letter to the DPLH to initiate a NPO for clearing within Bush Forever Site 341. The letter provided information on the Project background, policy background and the avoidance, mitigation and management measures to be taken. As part of this process, an offset proposal will be required in accordance with State Planning Policy 2.8 - Bushland policy for the Perth Metropolitan Region Appendix 4, as detailed in Section 5.3.

4.4 Expected supported studies

Table 15 outlines the anticipated studies required to inform the approvals process.

Table 15 Technical studies required to support environmental approvals

Study type	Scope / Description	Related Approval
Groundwater	Groundwater modelling - level of detail to be determined based on discussions with DWER in relation to groundwater allocations and quantities of water required to be abstracted.	RIWI Act 26D and 5C applications
Aboriginal heritage	Consultation with local Aboriginal groups and/or representatives Archaeological and ethnographical surveys.	Section 18 approval from DPLH
Non-indigenous heritage	Heritage values assessment for the registered heritage site (Woodman Point Munitions Magazines (fmr), (ID 4626).	WA SHO and City of Cockburn
Dieback	Dieback assessment and preparation of dieback management measures to minimise the risk of dieback spread/infestation within the Project area.	Dieback Management plan

5. Avoidance, mitigation and management

5.1 Avoidance and mitigation

The Project has been designed to minimise potential environmental impacts and maintain ecological linkages by locating the Project area within previously disturbed areas. The long history of disturbance in the Project area includes clearing, activity associated with the munitions magazines, weed invasion, introduced fauna (rabbits and foxes) and edge effects from adjacent land uses (caravan park and roads). Tree and shrub plantings are evident across the survey area, identified by DBCA as being planted approximately 10 years ago for the purposes of conservation. Historical aerial imagery shows a large proportion of the area has been previously cleared within the last 40 years, with revegetation evident over the last 10 to 20 years.

The vegetation surveys (GHD 2020a, b) (Appendix B and Appendix C) identified that the majority of the Project area was considered to be in Degraded or Completely Degraded condition (2.24 ha, 64.4%). A small portion of the Project area was assessed to be in Good condition (1.24 ha, 35.6%).

Within the Project area, 0.55 ha of vegetation (of which is 0.01 ha is native vegetation and 0.54 ha is revegetated area) is considered representative of the floristic community type (FCT) 30a – *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands TEC and 1.59 ha (of which 0.28 ha is native vegetation and 1.31 ha is revegetated area) is representative of the Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain TEC and PEC (Appendix A, Figure 7). Avoidance of these ecological communities has been undertaken where possible. It is noted that complete avoidance is not possible as the majority of the surrounding vegetation is also likely to be representative of the PEC or TEC vegetation (GHD 2020b), therefore emphasis was placed on clearing already disturbed areas and revegetation/planted vegetation installed by DBCA and remaining within areas already zoned for disturbance.

A bushfire management area will be applied around the proposed caravan park construction area. To avoid excess clearing and retain the amenity of the area for park users, mature trees within the bushfire management zone will be retained where possible, with groundcover and mid-story vegetation removed to manage bushfire risk. At this point of planning, the exact area of this is unknown, therefore the clearing areas in this EIA assumes the entire site will be either cleared or parkland cleared. Clearing will also be restricted to the minimum area required for construction works and will be clearly demarcated on site to prevent accidental clearing.

5.2 Management

A BMP for the Project has been prepared with the intent of retaining as much vegetation as possible in the bushfire management zone. The BMP minimises clearing required, by not locating any permanent structures within this area. Mature trees will be retained as part of the site design and other vegetation will be converted to meet the definition of Low Threat as per c.2.2.3.2(f) of AS3959. The BMP is included in Appendix D.

A Construction Environmental Management Plan (CEMP) will be prepared by the contractor for the Project. The CEMP will include specific management actions, mitigation measures and Project responsibilities. The CEMP will include the requirements to:

– Restricted the removal of vegetation to the minimum area required for construction works.
– Clearly demark approved clearing areas on site. Clearing is to be checked pre and post clearing.

A clearing permit will be obtained from DWER for this Project prior to clearing of native vegetation. An offset is expected to be required for the clearing of PEC and/or TEC vegetation.

In the event of the discovery of sub-surface archaeological material during clearing and earthworks, works would need to cease, and the relevant regulatory authorities contact to ascertain the nature of the material uncovered and the required permitting/license required prior to works recommencing.

5.3 Offsets

The WA Environmental Offsets Policy (GoWA, 2011) states that environmental offsets are to be used as a last resort, after avoidance, minimisation and rehabilitation have been pursued and where a residual impact remains.

An environmental offset is an offsite action or actions to address significant residual environmental impacts of a development or activity. There are two categories of environmental offsets:

1. Direct offsets, which are actions designed to provide for on-ground improvement, rehabilitation and conservation of habitat. Direct offsets vary, depending on the specific circumstances of environmental impacts, and include acquisition, restoration, revegetation and rehabilitation of natural areas outside the Project area.
2. Indirect offsets, which are actions aimed at improving scientific or community understanding and awareness of environmental values that are affected by a development or activity. These actions are designed to result in positive conservation outcomes and may include research to improve the management and protection of existing conservation estate or contributions to State Government initiatives, policies or strategic funds.

There are three types of offsets:

1. Land acquisition offsets: these involve the protection of environmental values through improved security of tenure or restricting the use of the land
2. On-ground management: this includes revegetation (re-establishment of native vegetation in degraded areas) and rehabilitation (repair of ecosystem processes and management of weeds, disease or feral animals)
3. Research projects: research project offsets can only be applied under Part IV of the EP Act and must be reasonably related to the impact. Research projects can add significant value to the outcomes of on-ground management and the understanding of the environmental value being impacted.

An offset proposal will be developed for the Project in consultation with DBCA and DPLH, and meet all statutory, planning and regulatory requirements, including auditing and compliance. As the Project will be subject to a Negotiated Planning Outcome, the offset proposal will also align with the requirements of *State Planning Policy 2.8 - Bushland policy for the Perth Metropolitan Region* Appendix 4 - A guide for offset criteria.

6. References

Australian Soil Resource Information System (ASRIS) 2021, *Australian Soil Resource Information Viewer*, retrieved August 2019 from http://www.asris.csiro.au/index_ie.html.

Bureau of Meteorology (BoM) 2021 *Climate Data Online*, retrieved August 2019, from http://www.bom.gov.au/climate/data/.

Bushfire Prone Planning 2021, *Bushfire Management Plan Woodman Point Holiday Park,* Perth, Bushfire Prone Planning

Del Marco, A, Taylor, R, Clarke, K, Savage, K, Cullity, J and Miles C 2004, *Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region*, Perth, Local Government Association

Department of Agriculture and Food Western Australia (DAFWA) 2007, *Soil-landscape mapping in South-western Australia*, Perth, Department of Agriculture and Food.

Department of Agriculture, Water and the Environment and Energy (DAWE) 2017, *Tuart (Eucalyptus Gomphocephala) Woodlands and Forests Of The Swan Coastal Plain Ecological Community Draft Conservation Advice Including Draft Listing Advice October 2017*, retrieved September 2021, from https://www.environment.gov.au/biodiversity/threatened/nominations/comment/tuart-woodlands-forests-swan-coastal-plainl.

Department of Agriculture, Water and the Environment and Energy (DAWE) 2021, *Environmental Protection and Biodiversity Conservation Act 1999 Protected Matters Search Tool Results*, retrieved August 2019, from http://www.environment.gov.au/epbc/pmst/index.html.

Department of Biodiversity, Conservation and Attractions (DBCA) 2007–, *NatureMap: Mapping Western Australia's Biodiversity*, retrieved September 2021, from http://naturemap.dpaw.wa.gov.au/default.aspx/.

Department of Environmental Regulation (DER) 2014, *A Guide to the Assessment of Applications to Clear Native Vegetation,* Perth, Department of Environmental Regulation

Department of Parks and Wildlife (DPAW) 2010. *Woodman Point Regional Park Management Plan*, Perth, Department of Parks and Wildlife

Department of Parks and Wildlife (DPAW) 2014. *Callitris preissii (or Melaleuca lanceolata) forests and woodlands (Swan Coastal Plain community type 30a – Gibson et al. 1994) Interim Recovery Plan 2014-2019*, retrieved September 2021 from https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/recovery_plans/Approved_interim_recovery_plans_/IRP340_Callitris_preissii_forest_and_woodlands_SCP30a_2014.pdf

Department of Planning, Lands and Heritage (DPLH) 2021, *Aboriginal Heritage Inquiry System*, retrieved September 2021, from http://maps.dia.wa.gov.au/AHIS2/default.aspx.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2012, *EPBC Act referral guidelines for three threatened Black Cockatoo species*, Canberra, Australia, Department of Sustainability, Environment, Water, Population and Communities.

Department of Water and Environmental Regulation (DWER) 2021, *Water Register*. https://maps.water.wa.gov.au/#/webmap/register.

Derbal Nara n.d., *Indigenous Heritage Sites,* retrieved October 2021, from https://www.derbalnara.org.au/IndigenousHeritageSites.pdf

Environmental Protection Authority (EPA) 2011, *WA Environmental Offsets Policy,* Perth, Environmental Protection Authority

Environmental Protection Authority (EPA) 2016a, *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment*, Perth, Environmental Protection Authority.

Environmental Protection Authority (EPA) 2016b, *Sampling Methods for Terrestrial Vertebrate Fauna*, Perth, Environmental Protection Authority

Environmental Protection Authority (EPA) 2016c, *Technical Guidance, Terrestrial Fauna Surveys*, Perth, Environmental Protection Authority.

Environmental Protection Authority (EPA) 2018, *Statement of Environmental Principles, Factors and Objectives*, Perth, Environmental Protection Authority.

GHD Pty Ltd (GHD) 2020a, *Woodman Point Caravan Park Expansion, Flora and Fauna Survey*, unpublished report prepared for Discovery Parks.

GHD Pty Ltd (GHD) 2020b, *Additional vegetation survey*, unpublished memorandum prepared for Discovery Parks.

Government of Western Australia (GoWA) 2000, *Bush Forever Volume 2, Directory of Bush Forever Sites Perth*, Perth, Department of Environmental Protection.

Government of Western Australia (GoWA) 2021, *Data WA*, retrieved August 2019 and updated December 2021, from https://data.wa.gov.au/.

Government of Western Australia (GoWA) 2019, 2018 South West Vegetation Complex Statistics, Current as of March 2019, Perth, Australia, Department of Biodiversity, Conservation and Attractions, retrieved September 2021, from https://catalogue.data.wa.gov.au/dataset/dbca..

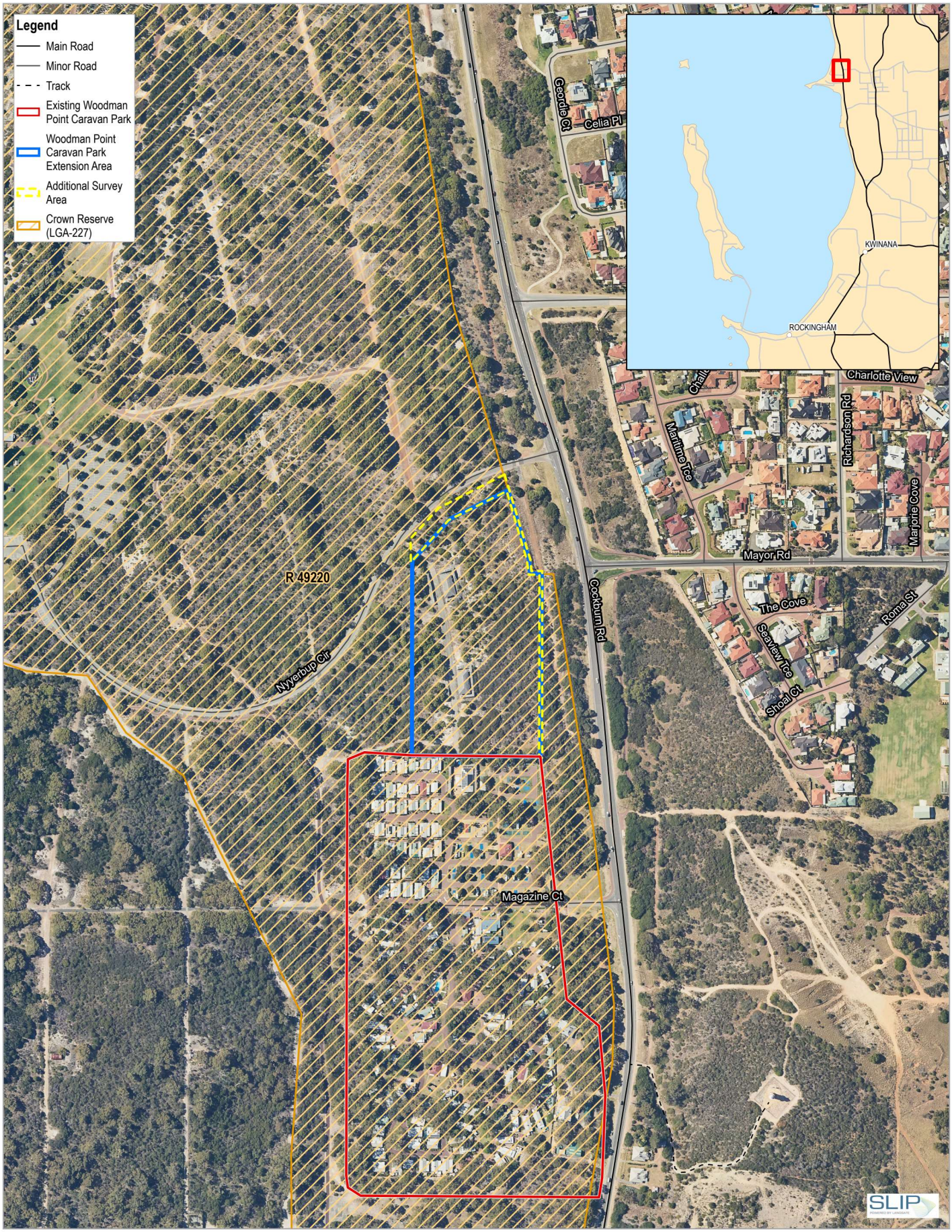
Heddle, EM, Loneragan. OW and Havel JJ 1980, Vegetation Complexes of the Darling System, WA, in Atlas of Natural Resources, Darling System WA, Department of Conservation and Environment.

Project Dieback 2014, Dieback Public Map, retrieved September 2021, from http://www.dieback.net.au/about/dieback-map.html

Tourism WA 2020, *Annual Report 2019-20*, retrieved October 2021, from https://www.tourism.wa.gov.au/Publications%20Library/About%20us/Annual%20Report%202019-20.pdf

Appendix A

Figures



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Metres

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

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GHD

Discovery Holiday Parks
Woodman Point EIA

Project No. **12511610**
Revision No. **2**
Date **10/7/2021**

Project Area

FIGURE 1

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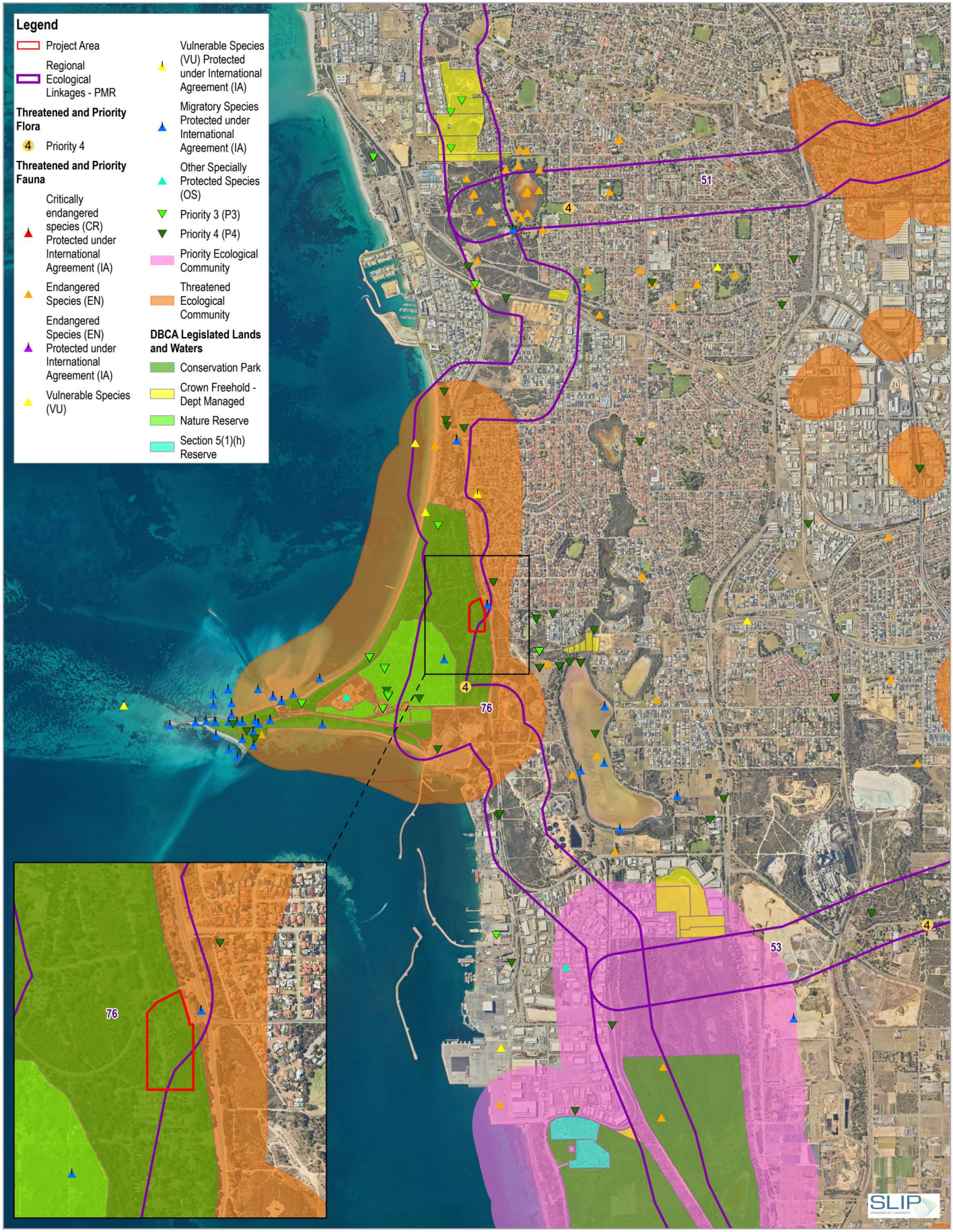
Print date: 07 Oct 2021 - 09:36

Data source: Survey area - 20200518: GHD; Roads, aerial photography - WANow: Landgate / SLIP. Created by: hbaniza



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Metres

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

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GHD

Discovery Holiday Parks
Woodman Point Caravan Park Expansion

Project No. **12511610**
Revision No. **2**
Date **10/6/2021**

Environmental Constraints

FIGURE 2

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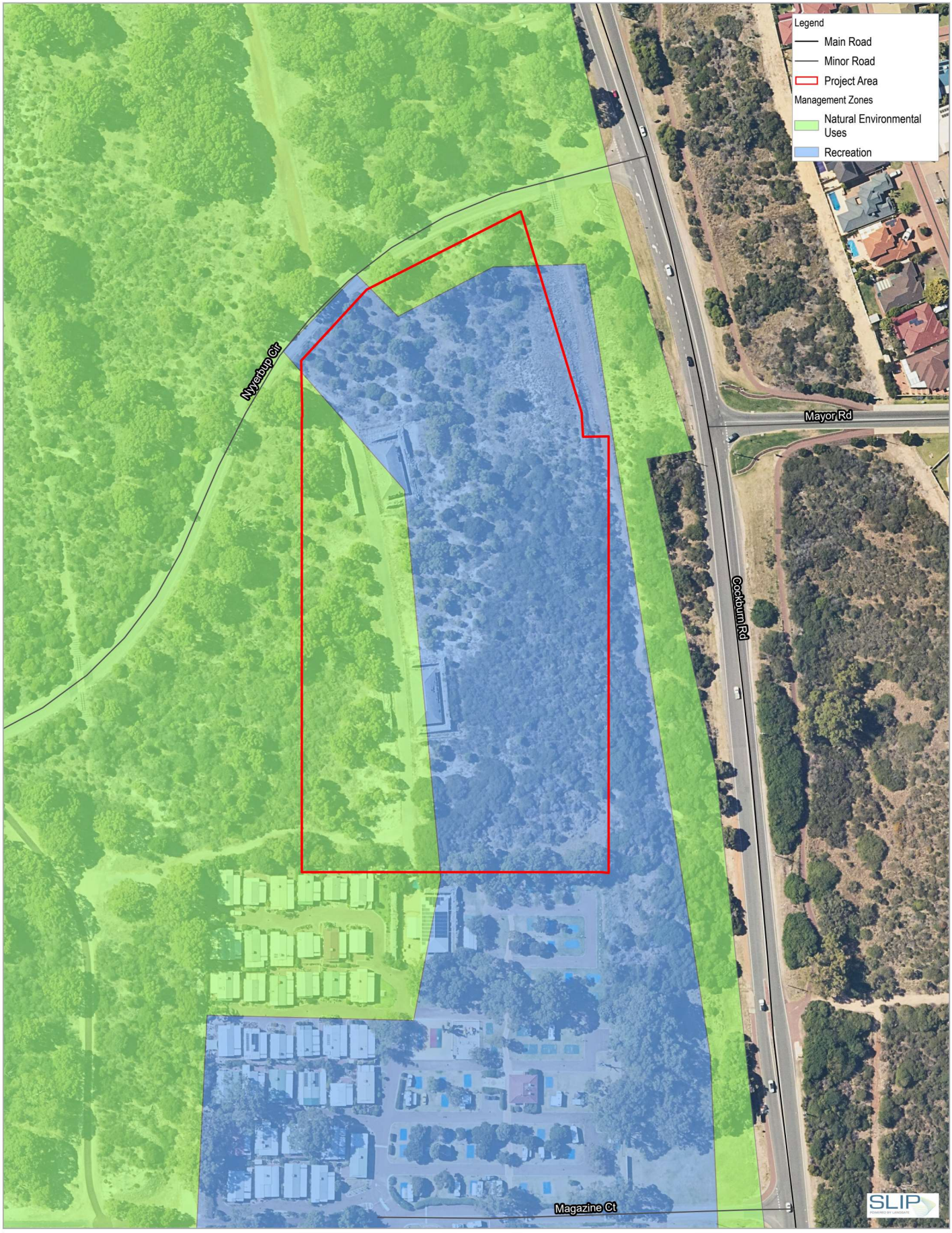
Print date: 06 Oct 2021 - 12:17

Data source: Survey area - 20200518: GHD; TEC/PEC, threatened and priority flora - 20190902, threatened and priority fauna - 20190829: DBCA; Legislated lands and waters - 20210924: DBCA; LGATE: Roads, aerial photography - WANow: Landgate / SLIP. Created by: htaniza



Paper Size ISO A3

0 10 20 30 40

Metres

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

N

GHD

Discovery Holiday Parks
Woodman Point Caravan Park Expansion

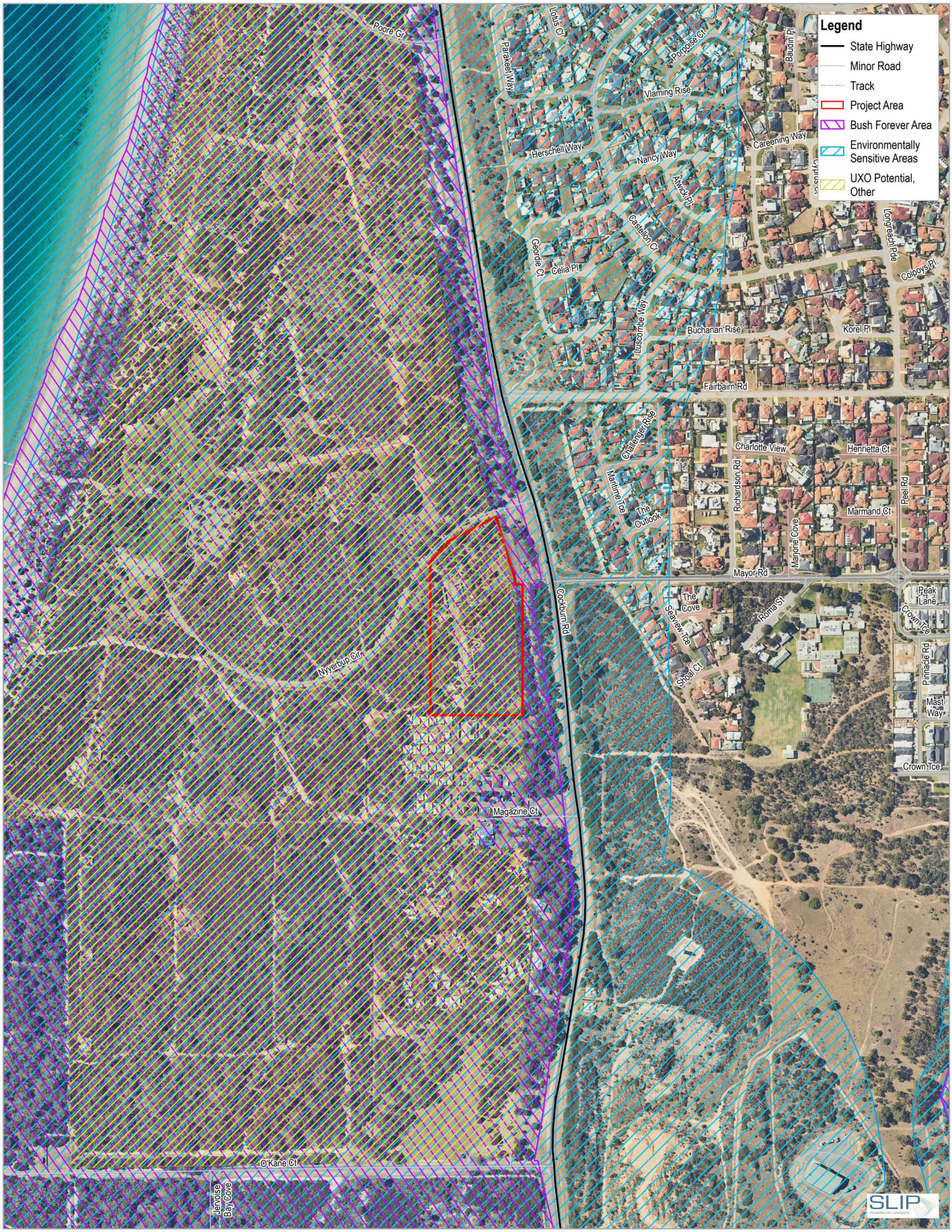
Woodman Point Caravan Park Extension Area and Management Zones

Project No. **12511610**
Revision No. **2**
Date **10/6/2021**

FIGURE 3

\\ghdnet.internal\ghd\AU\Adelaide\Projects\33\12511610\GIS\Maps\Working\12511610\12511610_3.aprx\\12511610_2_004_MA_Rev1
Print date: 06 Oct 2021 - 17:54

Data source: GHD: Woodman Point Caravan Park Extension Area, Additional Survey Area, TEC/PEC, Management Zones; LGATE: Roads (LGATE-012), Imagery accessed on 10/6/2021 Landgate_Subscription_ImageryWANow: Landgate / SLIP. Created by: htaniza



Paper Size ISO A3
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0 25 50 75 100

Metres

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

N

GHD

Discovery Holiday Parks
Woodman Point EIA

Project No. **12511610**
Revision No. **1**
Date **22/12/2021**

Land Use Constraints

FIGURE 4

\\ghdnet\ghd\AU\Adelaide\Projects\33\12511610\GIS\Maps\Working\12511610_FigureUpdates\12511610_FigureUpdates.aprx\612511610_2_003_LandUseConstraints_Rev1
Print date: 22 Dec 2021 - 10:11

Data source: Project area - 20210924: GHD; Roads, aerial photography, bush forever areas, WANow: Landgate / SLIP- 20210924. Created by: rbrown3

Paper Size ISO A3
at Scale: 1:1,000

0 5 10 15 20

Metres

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

N

GHD

Discovery Holiday Parks
Woodman Point Caravan Park Expansion

Vegetation Type

Project No. **12511610**
Revision No. **2**
Date **10/6/2021**

FIGURE 5

\\ghdnet.internal\ghd\AU\Adelaide\Projects\33\12511610\GIS\Maps\Working\12511610_FigureUpdates\12511610_FigureUpdates.aprx\612511610_005_VegetationType_Rev2
Print date: 06 Oct 2021 - 12:17

Data source: Survey area - 20200518, vegetation types - 20190920: GHD; Roads, aerial photography - WANow: Landgate / SLIP. Created by: htaniza

Paper Size ISO A3
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0 5 10 15 20

Metres

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

N

GHD

Discovery Holiday Parks
Woodman Point Caravan Park Expansion

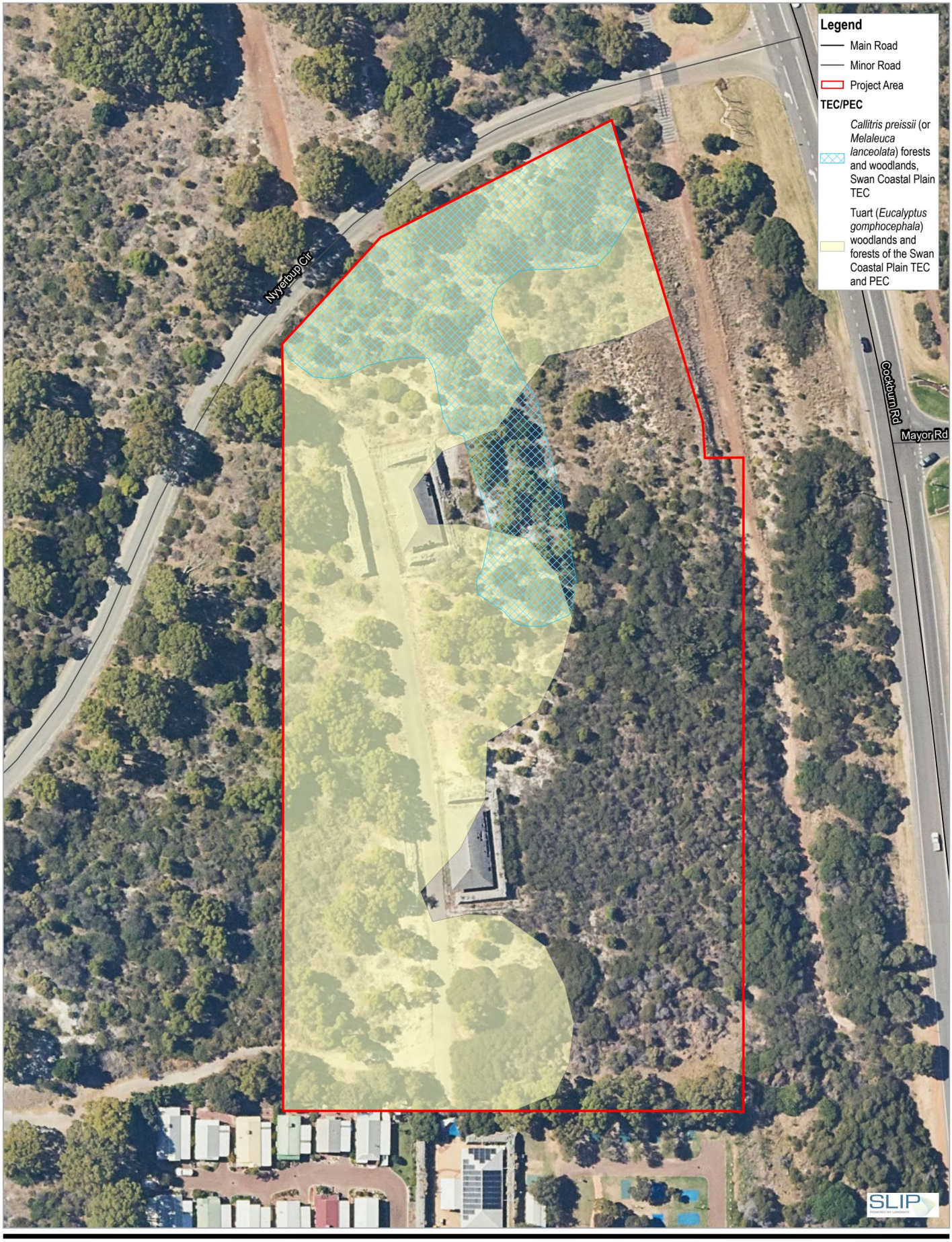
Vegetation Condition

Project No. **12511610**
Revision No. **2**
Date **10/6/2021**

FIGURE 6

\\ghdnet.internal\ghd\AU\Adelaide\Projects\33\12511610\GIS\Maps\Working\12511610_FigureUpdates\12511610_FigureUpdates.aprx\6112511610_006_VegetationCondition_Rev2
Print date: 06 Oct 2021 - 12:18

Data source: Survey area - 20200518, vegetation conditions - 20190920: GHD; Roads, aerial photography - Landgate_Subscription_ImageryIWANow: Landgate / SLIP. Created by: hlaniza



Paper Size ISO A3
at Scale: 1:1,000

0 10 20 30 40

Metres

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

N

GHD

Discovery Holiday Parks
Woodman Point Caravan Park Expansion

Threatened and Priority Ecological Communities

Project No. **12511610**
Revision No. **1**
Date **13/12/2021**

FIGURE 7

N:\AU\Adelaide\Projects\33\12511610\GIS\Maps\Working\12511610_FigureUpdates\12511610_FigureUpdates.aprx\12511610_001_TECPEC_Rev1
Print date: 13 Dec 2021 - 13:38

Data source: Survey areas, TEC/PEC - 20200518: GHD; Roads, aerial photography - WANow: Landgate / SLIP. Created by: rbrown3

Paper Size ISO A3
at Scale: 1:1,000

0 5 10 15 20

Metres

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

N

GHD

Discovery Holiday Parks
Woodman Point Caravan Park Expansion

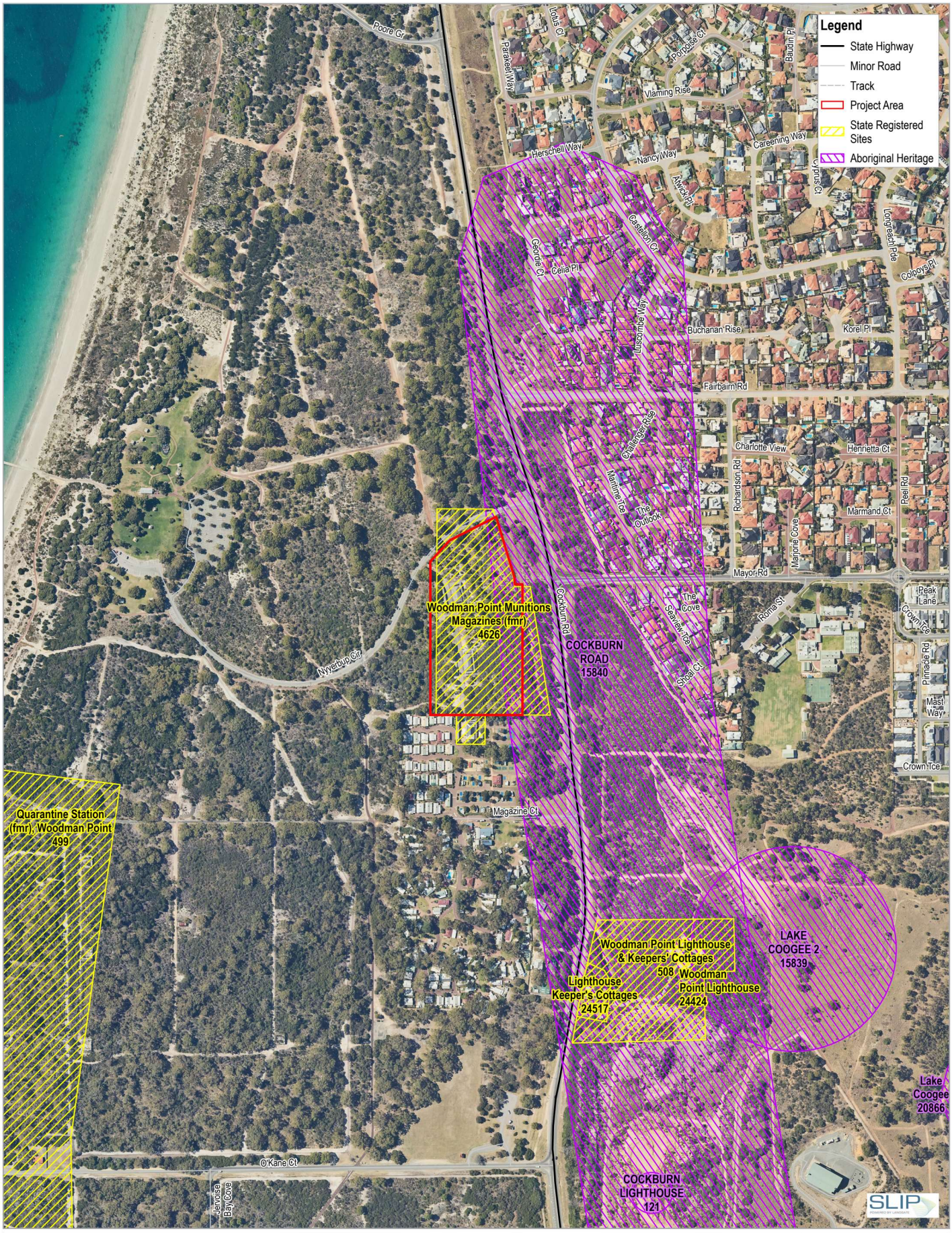
Fauna Habitat and Threatened Species Records

Project No. **12511610**
Revision No. **2**
Date **10/6/2021**

FIGURE 8

\\ghdnet.internal\ghd\AU\Adelaide\Projects\33\12511610\GIS\Maps\Working\12511610_FigureUpdates\12511610_FigureUpdates.aprx\612511610_007_FaunaHabitat_Rev2
Print date: 06 Oct 2021 - 12:19

Data source: Survey area - 20200518, vegetation conditions - 20190920: GHD; Roads, aerial photography - Landgate_Subscription_Imagery\WANow: Landgate / SLIP. Created by: hlaniza



Paper Size ISO A3
at Scale: 1:5,000
0 25 50 75 100
Metres

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

N

GHD

Discovery Holiday Parks
Woodman Point EIA

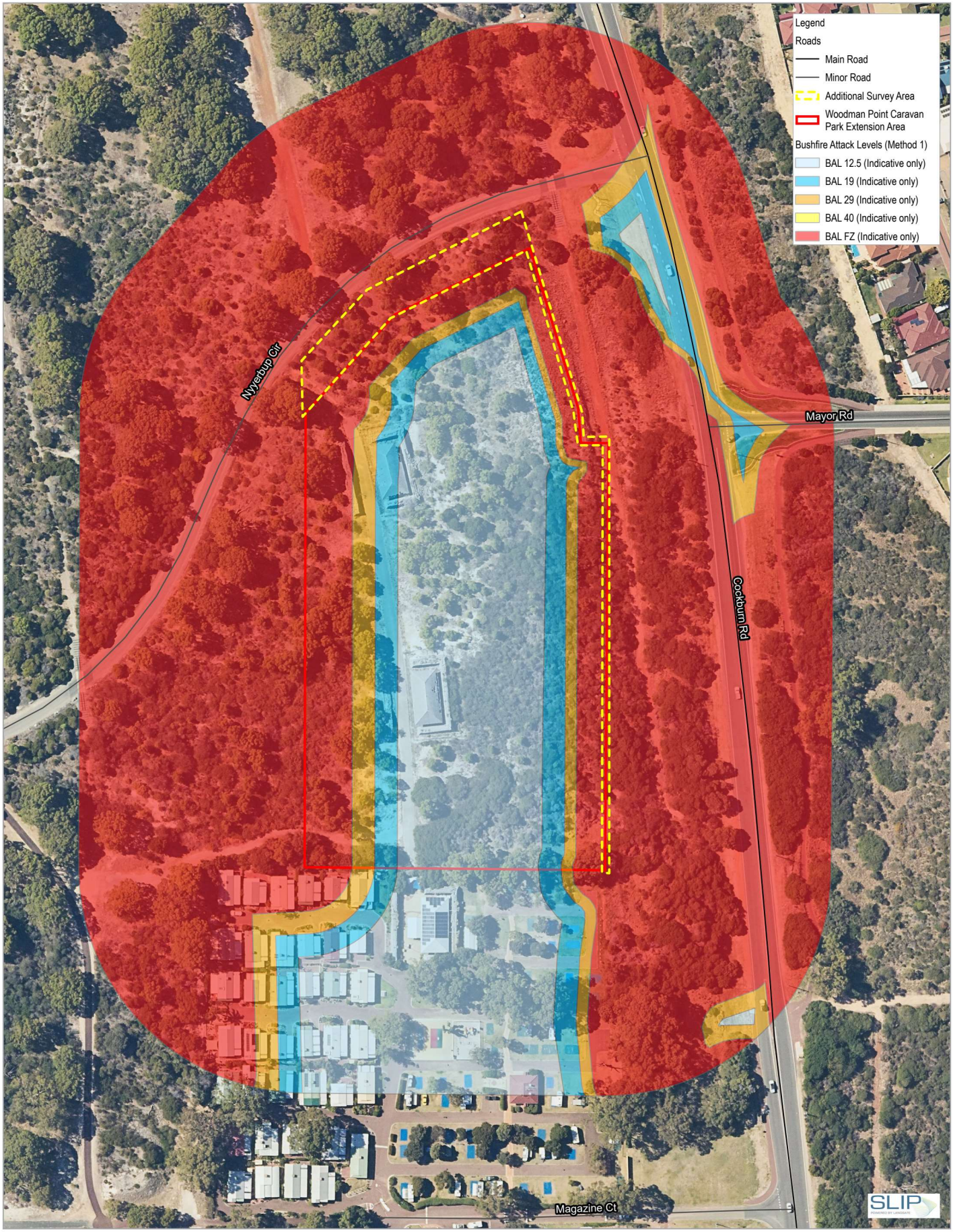
Project No. **12511610**
Revision No. **1**
Date **22/12/2021**

Heritage Constraints

FIGURE 9

\\ghdnet\ghd\AU\Adelaide\Projects\33\12511610\GIS\Maps\Working\12511610_FigureUpdates\12511610_FigureUpdates.aprx\612511610_2_004_HeritageConstraints_Rev1
Print date: 22 Dec 2021 - 10:21

Data source: Project area - 20210924: GHD; Roads, aerial photography, State registered sites, state registered aboriginal heritage ,WANow: Landgate / SLIP- 20210924. Created by: rbrown3



Paper Size ISO A3

0 10 20 30 40

Metres

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

N

GHD

Discovery Holiday Parks
Woodman Point Caravan Park Expansion

Project No. **12511610**
Revision No. **0**
Date **21/09/2021**

Bushfire Management Zones

FIGURE 10

\\ghdnet\ghd\AU\Adelaide\Projects\33\12511610\GIS\Maps\Working\12511610\12511610_3.aprx\612511610_2_006_Bushfire_Attack_Rev0
Print date: 21 Sep 2021 - 21:58

Data source: GHD: Woodman Point Caravan Park Extension Area, Additional Survey Area - 202106, Bushfire Attack Levels (Method 1) - 202109; LGATE: Roads (LGATE-012), Imagery accessed on 21/09/2021 Landgate_Subscription_ImageryWANow: Landgate / SLIP. Created by: mczekaj

Appendix B

Flora and fauna survey (GHD 2019)

Discovery Holiday Parks

Woodman Point Caravan Park Expansion - Environmental Studies

Flora and Fauna Survey

May 2020

Executive summary

GHD was commissioned by Discovery Parks to undertake a detailed flora and vegetation survey and Level 1 fauna survey of the proposed Woodman Point Caravan Park expansion, located off Cockburn Road, Munster. The purpose of the survey is to delineate key flora, vegetation and fauna values and potential impact to areas of sensitivity. The outcomes of the assessment will be used to inform the project design and viability and for environmental approvals process.

The survey methodology and reporting was undertaken with reference to the Environmental Protection Authority (EPA) *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016a), EPA Technical Guidance – Sampling methods for terrestrial vertebrate fauna (EPA 2016b) and Technical Guidance – Terrestrial Fauna Surveys (EPA 2016c).

This report is subject to, and must be read in conjunction with, the limitations set out in Section 1.6 and the assumptions and qualifications contained throughout the Report.

Key findings for the survey area:

- Five vegetation types, not including cleared/highly degraded areas, have been mapped and described across the survey area. The survey area consists of a mix of remnant and revegetated coastal vegetation. Remnant vegetation in the survey area is dominated by *Acacia rostellifera* closed shrubland and *Melaleuca systena* shrubland over an understorey dominated by weedy herbs and grasses.
- No Threatened Ecological Communities (TEC's) listed under the EPBC Act and/or BC Act or Priority Ecological Communities (PEC's) listed by the DBCA were identified within the survey area during the field survey.
- The vegetation within the survey area ranged from *Good* to *Completely Degraded* condition and has been subject to a long history of disturbances including clearing, activity associated with the Munitions Magazines, weed invasion, introduced fauna (rabbits and foxes) and edge effects from adjacent land uses (caravan park and roads). Tree and shrub plantings are evident across the survey area.
- Sixty-three taxa (including subspecies and varieties) representing 31 families and 51 genera were recorded from the survey area during the field survey. This total comprised 31 native taxa and 32 introduced/weed flora taxa.
- Extensive weed invasion, which has replaced much of the ground layers, has occurred throughout the survey area. One weed species identified in the survey area, **Asparagus asparagoides* (Bridal Creeper), is listed as a Declared Pest under the *Biosecurity and Management Act 2007* and a Weed of National Significance (WoNS).
- No flora of conservation significance was recorded within the survey area. The likelihood of occurrence assessment for the survey area concluded that no conservation significant flora are likely to occur within the survey area.
- The survey area comprises of three main habitat types consisting of grassland, shrublands and scattered trees/mixed shrubs (revegetation/planted).
- During the field survey 25 fauna species were recorded within the survey area, including 20 bird, two mammal and three reptile species. Three of the species recorded are introduced.
- One conservation significant fauna species was recorded within the survey area during the field survey: Carnaby's Cockatoo (*Calyptorhynchus latirostris*) – listed as Endangered

under the EPBC Act and BC Act. A small flock of approximately 15 Carnaby's Cockatoos were observed feeding on the *Callitris preissii* (Rottnest Pine) trees in the north-east corner of the survey area.

- The survey area contains some suitable foraging habitat for black cockatoos. Suitable species include tuarts (*E. gomphocephala*) and Rottnest Pines (*Callitris preissii*).
- One potential Black Cockatoo breeding tree (tuart) with a DBH greater than 500 mm was recorded within the survey area. This tree did not contain any hollows. The majority of the tuarts in the survey area are young trees.
- No suitable black cockatoo roosting habitat is currently present in the survey area.

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Appendices

1. Introduction

1.1 Project background

GHD has been engaged by Discovery Parks to undertake a range of environmental studies for the proposed expansion of Woodman Point Caravan Park located off Cockburn Road, Munster. The project will increase the current caravan park by 3.19 ha.

This report has been prepared by GHD to assess the potential impacts of the project on terrestrial flora and fauna.

1.2 Purpose of this report

GHD was commissioned by Discovery Parks to undertake a detailed flora and vegetation survey and Level 1 fauna survey of the proposed Woodman Point Caravan Park expansion. The purpose of the survey is to delineate key flora, vegetation and fauna values and potential impact to areas of sensitivity. The outcomes of the assessment will be used to inform the project design and viability and for environmental approvals process.

1.3 Location

The survey area for the project is located adjacent to Woodman Point Caravan Park, 132 Cockburn Road, Munster on Crown reserve R 49220.

The survey area is shown on Figure 1, Appendix A.

1.4 Scope of works

The scope of this report is as follows:

- A review of relevant databases including the *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool (PMST) and the Department of Biodiversity Conservation and Attractions (DBCA) NatureMap and FloraBase
- Undertake a biological survey to verify / ground truth the desktop assessment findings through a detailed flora and vegetation survey and a Level 1 fauna survey (reconnaissance survey)
- Conservation significant flora and fauna species were actively searched for based on habitat requirements and previous records.
- Vegetation types, condition, and conservation significant species were mapped where present
- The presence and significance of any Threatened Ecological Communities (TEC), Priority Ecological Communities (PEC) and any other areas of ecological importance was identified, mapped and discussed based on the results of the field survey
- An inventory of plant taxa (including weed species) was compiled
- An inventory of vertebrate fauna species was compiled through opportunistic recording of species, tracks, scats, bones, diggings and feeding areas
- A concise report (this document) on the findings of the biological survey

This report is subject to, and must be read in conjunction with, the limitations set out in Section 1.6 and the assumptions and qualifications contained throughout the report.

1.5 Relevant legislation, conservation codes and background information

In Western Australia (WA) some communities, flora and fauna are protected under both Federal and State Government legislation. In addition, regulatory bodies also provide a range of guidance and information on expected standards and protocols for environmental surveys.

An overview of key legislation and guidelines, conservation codes and background information relevant to this biological survey is provided in Appendix B.

1.6 Report limitations and assumptions

This report has been prepared by GHD for Discovery Parks and may only be used and relied on by Discovery Parks for the purpose agreed between GHD and Discovery Parks as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Discovery Parks arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report (including species listings). GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Discovery Parks and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of access tracks, operational works, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions may change after the date of the field survey. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

This report has assessed the flora and fauna within the survey area (Figure 1, Appendix A). Should the survey area change or be refined, further assessment may be required.

2. Methodology

2.1 Desktop assessment

Prior to the commencement of the field survey, a desktop assessment was undertaken to identify relevant environmental information pertaining to the survey area and to assist in survey design. This included a review of:

- The Department of the Environment and Energy (DotEE) Protected Matters Search Tool (PMST) to identify communities and species listed under the EPBC Act potentially occurring within the survey area (DotEE 2019a) (Appendix C)
- The DBCA TEC and PEC database to determine the potential for conservation significant communities to be present within the survey area (DBCA 2019a)
- The DBCA *NatureMap* database for flora and fauna species previously recorded within the survey area (DBCA 2007-2019) (Appendix D)
- The DBCA Threatened and Priority Flora (TPFL) database and the WA Herbarium database (WAHERB) for Threatened flora listed under the *Biodiversity Conservation Act 2016* (BC Act) and listed as Priority by the DBCA, previously recorded within the survey area (DBCA 2019b)
- Existing datasets including previous pre-European vegetation mapping of the survey area (Beard 1979; Heddle et al. 1980, Mattiske and Havel 1998 and Webb (DBCA) 2016), aerial photography, hydrology information to provide background information on the variability of the environment, likely vegetation units and fauna habitats and to identify areas that potentially contain TECs and PECs

2.2 Field survey

2.2.1 Flora and vegetation

GHD ecologist Erin Lynch (flora licence no. SL012374) completed a single-season detailed flora and vegetation survey of the survey area on the 9 September 2019. The field survey was undertaken to identify and describe the dominant vegetation units, assess vegetation condition, and identify and record vascular flora taxa present at the time of survey. Searches for conservation significant or other significant ecological communities and flora taxa were also undertaken during the field survey.

The survey methods involved a combination of sampling quadrats, relevés and photographic reference points located in identified vegetation units and walking traverses. Quadrats (measuring 10 m x 10 m – area of 100 m^2) were located within each identified vegetation unit. A minimum of three quadrats were located within each identified vegetation unit, where possible. Quadrats were not established in vegetation units that had been significantly altered by clearing and weeds. Relevés (unmarked area) were performed to supplement quadrat data and in areas where the vegetation was highly modified or size of the vegetation type was restricted. Field data at each quadrat was recorded on a pro-forma data sheet and included the parameters detailed in Table 1.

Table 1 Data collected during the field survey

Aspect	Measurement
Collection attributes	Site code, personnel/recorder; date, quadrat dimensions, photograph of the quadrat.
Physical features	Aspect, slope, landform, soil attributes, ground surface cover, leaf and wood litter.

Aspect	Measurement
Location	Coordinates recorded in GDA94 datum using a hand-held GPS tool to accuracy approximately ± 5 m.
Vegetation condition	Vegetation condition was assessed using the condition rating scale adapted by EPA (2016a) for the South West Botanical Province.
Disturbance	Level and nature of disturbances (e.g. weed presence, fire and time since last fire, impacts from grazing, exploration activities).
Flora	List of dominant flora from each structural layer. List of all species within the quadrat including average height and cover (using NVIS)

A flora inventory was compiled from taxa listed in described quadrats and relevés and from opportunistic floristic records throughout the survey area.

The survey methodology employed by GHD was undertaken with reference to the Environmental Protection Authority (EPA) *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016a).

Vegetation condition

The vegetation condition was assessed and mapped in accordance with the vegetation condition rating scale for the South West and Interzone Botanical Provinces of Western Australia (IBRA) (devised by Keighery (1994) and adapted by EPA (2016a)). The scale recognises the intactness of vegetation and consists of six rating levels. The vegetation condition rating scale is located in Appendix B.

Flora identification and nomenclature

Species well known to the survey botanist were identified in the field; all other species were collected and assigned a unique collection number to facilitate tracking. All specimens collected during the field assessment were dried and processed in accordance with the requirements of the WA Herbarium. Species were identified by the use of taxonomic literature, electronic keys and online electronic databases.

The conservation status of all recorded flora was compared against the current lists available on *FloraBase* (WA Herbarium 1998–2019) and the EPBC Act Threatened species database provided by DotEE (2019b). Nomenclature used in this report follows that used by the WA Herbarium as reported on *FloraBase* (WA Herbarium 1998–2019).

2.2.2 Fauna

GHD ecologist Erin Lynch undertook a level 1 fauna survey (reconnaissance survey) in conjunction with the flora and vegetation survey. The survey area was traversed on foot over the course of the survey to identify and describe the dominant fauna habitat types present and their condition, assess habitat connectivity, and identify and record fauna species within the survey area. An assessment of the likelihood of conservation significant fauna and their habitats occurring within the survey area was also undertaken.

The survey methodology employed by GHD was undertaken in accordance with the EPA Technical Guidance – Sampling methods for terrestrial vertebrate fauna (EPA 2016b) and Technical Guidance – Terrestrial Fauna Surveys (EPA 2016c).

Opportunistic fauna searches

Opportunistic fauna searches were also conducted across the survey area. Opportunistic searches involved:

- Searching the survey area for tracks, scats, bones, diggings and feeding areas for both native and feral species

- Searching through microhabitats including turning over logs or rocks, turning over leaf litter and examining tree hollows and hollow logs
- Visual and aural surveys, which accounted for many bird species potentially utilising the survey area
- Recording GPS locations of any conservation significant fauna species observed.

Targeted Black Cockatoo habitat assessment

A Black Cockatoo habitat assessment (for Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo) was undertaken for the survey area to assess the presence, quality and extent of habitat. The assessment involved visual and aural assessment of the survey area, identifying breeding habitat (presence/absence of actual and potential breeding trees), foraging habitat, roosting areas, current activity and any other signs of use by Black Cockatoos. For the purpose of this assessment, the DSEWPaC (2012) Black Cockatoo referral guidelines were used to define breeding, foraging and night roosting habitat.

Information collected during the field survey included:

- Identification of suitable foraging habitat
- Record the location of suitable breeding trees - suitable breeding habitat for Black Cockatoos is defined by DSEWPaC (2012) as trees of species known to support breeding within the range of the species which either have a suitable nest hollow or are of a suitable Diameter at Breast Height (DBH) to develop a nest hollow. For most tree species on the Swan Coastal Plain, suitable DBH is 500 mm. On average, Carnaby's Black Cockatoos are known to nest in hollows with an entrance diameter greater than 20 - 30 cm (Johnstone and Storr 1998; Groom 2011). While the Forrest Red-tailed Black Cockatoo is known to nest in hollows with an entrance of greater than 12 cm (Johnstone and Storr 1998). Therefore, during the field survey hollows were graded into small (up to 6 cm) medium (6 to 10 cm) and large (10+ cm).
- Identification of night roosting habitat - suitable roosting habitat is defined by DSEWPaC (2012). Suitable roosting habitat was identified based on the presence of suitable tall trees, evidence of roosting (feathers, twig clips etc.) and proximity of known roosting sites in the survey area.
- Opportunistic observations - both visual and aural observations of Black Cockatoos within the survey area and surrounding region were noted during the survey.

Fauna species identification

Identification of fauna species was made in the field using available field guides and electronic guides (e.g. Morcombe 2014). Where identification was not possible, photographs of specimens were collected to be later identified.

Nomenclature used in this report follows that used by the WA Museum as reported on *NatureMap*. This nomenclature is deemed the most up-to-date species information for WA fauna, with the exception of birds, which follows Christidis and Boles (2008).

2.3 Limitations

2.3.1 Desktop limitations

The EPBC Act PMST is based on bioclimatic modelling for the potential presence of species. As such, this does not represent actual records of the species within the area. The records from the DBCA searches of Threatened fauna provide more accurate information for the general area

and local occurrence. However, some collection, sighting or trapping records cannot be dated and often misrepresent the current range of Threatened species.

2.3.2 Field survey limitations

The EPA (2016a and 2016c) Technical Guide states flora and fauna survey reports for environmental impact assessment in WA should contain a section describing the limitations of the survey methods used. The limitations and constraints associated with this field survey are discussed in Table 2. Based on this assessment, the present survey effort has not been subject to any constraints which affect the thoroughness of the assessment and the conclusions which have been formed.

Table 2 Field survey limitations

Aspect	Constraint	Comment
Sources of information and availability of contextual information	Nil	Adequate information is available for the survey area.
Scope (what life forms were sampled etc.)	Nil	Vascular flora and terrestrial vertebrate fauna were sampled during the survey. Non-vascular flora, invertebrate and aquatic fauna were not surveyed.
Proportion of flora collected and identified (based on sampling, timing and intensity) Proportion of fauna identified, recorded and/or collected	Minor	The vegetation survey was a single season survey and was undertaken over one day in September (Spring). Spring is considered the most optimal time to undertake vegetation surveys in the Swan Coastal Plain bioregion. The vegetation survey was a broad scale and targeted assessment, undertaken to identify and describe the dominant vegetation units and map conservation significant flora and vegetation. The fauna survey (Level 1) was undertaken in conjunction with the flora and vegetation survey.
Flora determination	Minor	Flora determination was undertaken by GHD ecologists in the field and at the WA Herbarium. One taxa could only be identified to family level only, three taxa could be identified to genus level only, due to lack of flowering and/or fruiting material required for identification. None of these species were considered to be potential conservation significant flora. The taxonomy and conservation status of the WA flora is dynamic. This report was prepared with reliance on taxonomy and conservation status current at the time of report development, but it should be noted this may change in response to ongoing research and review of the International Union for Conservation Nature criteria.
Completeness and further work which might be needed (e.g. was the relevant area fully surveyed)	Nil	The survey area was entirely accessible and was accessed by foot. The two Munition Magazines (historic sites) have been fenced off with no access however these areas have previously been cleared and were dominated by weed species.
Mapping reliability	Minor	The vegetation was mapped using high-resolution ESRI aerial imagery obtained from Landgate, topographical features, previous broad scale mapping (Beard 1979) and field data. Data was recorded in the field using hand-held GPS tools (e.g. Samsung tablet and Garmin

Aspect	Constraint	Comment
		GPS). Certain atmospheric factors and other sources of error can affect the accuracy of GPS receivers. The Garmin GPS units used for this survey are accurate to within ±5 metres on average. Therefore the data points consisting of coordinates recorded from the GPS may contain inaccuracies.
Timing/weather/season/cycle	Minor	The field survey was conducted in September 2019. In the three months prior to the flora survey (June to August), Perth weather station (Bureau of Meteorology (BoM) 2019) recorded a total of 334.8 mm of rainfall. This rainfall total is lower than the long term average for the same period (June-August; 455.7 mm) (BoM 2019). The weather conditions recorded during the survey were considered unlikely to have impacted the survey results. The survey timings were considered appropriate for the flora and fauna field surveys.
Disturbances (e.g. fire, flood, accidental human intervention)	Nil	Much of the survey area has been subjected to historical disturbance events (e.g. clearing, infrastructure, tracks); however, these disturbances did not impact the survey.
Resources	Nil	Adequate resources were employed during the field survey. One person days were spent undertaking the survey using an experienced ecologist.
Access restrictions	Nil	No access problems were encountered during the survey.
Experience levels	Nil	The ecologist who executed the survey is a practitioner suitably qualified and experienced in their respective fields. Erin Lynch has over 12 years' experience undertaking flora and fauna surveys within WA and on the Swan Coastal Plain bioregion.

3. Desktop assessment

3.1 Regional biogeography

The survey area is situated in the South West Botanical Province of Western Australia (Beard 1990) within the Swan Coastal Plain bioregion and Perth sub-region described by the Interim Biogeographic Regionalisation of Australia (IBRA) (DotEE 2019b).

The Swan Coastal Plain bioregion is a low lying coastal plain, mainly covered with woodlands. The Perth sub-region is characterised by colluvial and aeolian sands, alluvial river flats and coastal limestone. Heath and/or Tuart woodlands occur on limestone, Banksia and Jarrah-Banksia woodlands on Quaternary marine dunes of various ages, and Marri on colluvial and alluvials. The region also includes a complex series of seasonal wetlands (Mitchell *et al*. 2002).

3.2 Soils, geology and landforms

The project lies on the Swan Coastal Plain, which is part of the larger Perth Basin. Soil-landscape mapping of South West WA indicates that the project is within the Quindalup South System. This is described as; Coastal dunes, of the Swan Coastal Plain, with calcareous deep sands and yellow sands. Coastal scrub.

3.3 Environmentally Sensitive Area

The entirety of the survey area is located within an ESA, with a further five ESAs occurring within the 5 km study area. The majority of these ESAs appear to align with Bush Forever sites and Threatened Ecological Communities.

3.4 Vegetation and flora

3.4.1 Broad vegetation association

Broad scale (1:250,000) pre-European vegetation mapping of the Perth area was completed by Beard (1979) at an association level. The mapping indicates that one vegetation association is present within the survey area

- Medium woodland; tuart (association 998).

The pre-European mapping has been adapted and digitised by Shepherd et al. (2002). The extent of vegetation associations have been determined by the state-wide vegetation remaining extent calculations maintained by DBCA (latest update December 2019 – GoWA 2019). As shown in Table 3, the current extent remaining of vegetation association 998 is more than 36% at scales, State, IBRA bioregion, IBRA subregion, with the exception of the Local Government Area (LGA) which is less than 20%..

Regional vegetation has also been mapped by Heddle et al. (1980) based on major geomorphic units on the Swan Coastal Plain. The Heddle et al. (1980) mapping indicates that one vegetation complex is present within the survey area:

- Cottesloe Complex-Central and South: Mosaic of woodland of *Eucalyptus gomphocephala* (Tuart) and open forest of *Eucalyptus gomphocephala* (Tuart) - *Eucalyptus marginata* (Jarrah) - *Corymbia calophylla* (Marri); closed heath on the Limestone outcrops.

GoWA (2018d) has assessed the vegetation complexes mapped by Heddle et al. (1980) against presumed pre-European extents within the Swan Coastal Plain (Table 4) and the City of Gosnells (Table 5). The Cottesloe Complex Central and South has greater than 30% of its pre-

European extent remaining on the Swan Coastal Plain, but less than 30% of its pre-European extent remaining in the City of Cockburn.

Table 3 Extents of vegetation complexes on the Swan Coastal Plain mapped within the survey area

Vegetation association	Scale	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	% Current extent in all DBCA managed land (proportion of current extent)
998	State: Western Australia	51,015.33	18,492.63	36.25	48.68
	IBRA Bioregion: Swan Coastal Plain	50,867.50	18,492.32	36.35	48.68
	IBRA Subregion: Perth	50,867.50	18,492.32	36.35	48.68
	LGA: City of Cockburn	4,464.34	845.02	18.93	34.36

Table 4 Extent of vegetation complexes on the SWA mapped within the survey area (GoWA 2019)

Vegetation complex	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	% Current extent in all DBCA managed lands
Cottesloe Complex-Central and South	45,299.61	14,567.87	32.16	14.58

Table 5 Extent of vegetation complexes within the City of Cockburn for the survey area (GoWA 2019)

Vegetation complex	Pre-European extent (ha)	Current extent (ha)	% of pre-European extent	Proportion of the vegetation complex within the LGA %
Cottesloe Complex-Central and South	4,990.60	961.70	19.27	11.02

3.4.2 Conservation significant ecological communities

The EPBC Act PMST (DotEE 2019a) identified the potential presence of two TEC's occurring within the study area:

- Banksia Woodlands of the Swan Coastal Plain TEC. Listed as Endangered under the EPBC Act
- Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain TEC. Listed as Critically Endangered under the EPBC Act

These TECs were also identified in a search of the DBCA TEC/PEC database along with one additional TEC and one PEC:

- *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands, Swan Coastal Plain (FCT30a) –Vulnerable under BC Act

- Northern Spearwood shrublands and woodlands (FCT24) – Priority 3

The extents of TEC and PEC buffers based on the DBCA search results are provided on Figure 2, Appendix A.

The survey area is located within the known occurrence/buffer area of one State-listed TEC. The TEC is identified as *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands (Swan Coastal Plain community type 30a) listed under the *Biodiversity and Conservation Act 2016* (BC Act). The community was endorsed as a TEC with a threat ranking of Vulnerable by the WA Minister for Environment in November 2011.

This TEC is described as a woodland and forest community located on calcareous sandy soils of the Quindalup Dunes between Trigg and Point Peron and on the Swan River in Peppermint Grove. The community is also present on Garden Island and Rottnest Island. Typical and common native taxa in the community are: *Callitris preissii*, *Melaleuca lanceolata*, *Spyridium globulosum*, *Acanthocarpus preissii*, *Rhagodia baccata*, *Austrostipa flavescens* and *Trachymene pilosa* (Gibson et al. 1994). The introduced herbs **Galium murale* (small bedstraw), **Asparagus asparagoides* (bridal creeper) and **Trachyandra divaricata* (dune onion weed) are common in the community (DPaW 2014). The coastal occurrences of this TEC occur on calcareous sandy soils associated with the Quindalup dunes and the Swan River occurrence is on the Aeolian deposits of the Cottesloe complex – central and south. Species richness is naturally quite low in the community. There have not been any detailed groundwater studies completed for this community but it is believed that this community is at least a partially groundwater dependent ecosystem (Department of Parks and Wildlife (DPaW) 2014).

3.4.3 Flora diversity

The *NatureMap* database identified 281 flora taxa, representing 79 families and 194 genera previously recorded within the survey area. This total comprised 171 native taxa and 110 naturalised (introduced) taxa. Dominant families recorded included Fabaceae (65 taxa), Poaceae (59 taxa) and Asteraceae (38 taxa).

The *NatureMap* database search is provided in Appendix C.

3.4.4 Conservation significant flora

Searches of the EPBC Act PMST, *NatureMap* database and DBCA TPFL and WAHERB databases identified the presence/potential presence of 20 conservation significant flora taxa within the study area. The searches identified six Threatened taxa listed under the EPBC Act and/or BC Act and 14 Priority taxa listed by the DBCA

The locations of conservation significant flora registered on the DBCA databases are mapped on Figure 2, Appendix A.

3.5 Fauna

3.5.1 Fauna diversity

The *NatureMap* database identified 336 fauna species previously recorded within 5 km of the survey area. This total comprised 172 birds, 35 reptiles, 11 mammals, 4 amphibians, and 52 invertebrates and 62 fish. Of the 336 fauna species previously recorded 327 are native species and 9 are naturalised (introduced) species.

The *NatureMap* database search is provided in Appendix C.

3.5.2 Conservation significant fauna

Searches of the EPBC Act PMST and *NatureMap* database identified the presence/potential presence of 65 conservation significance fauna within the survey area. This total does not include those species that are exclusively marine as no marine habitat is present within the survey area or indirectly impacted by the project.

The desktop searches identified:

- 33 species listed as Threatened under the EPBC Act and/or as Threatened under the BC Act (many are also listed as Migratory under the EPBC Act/BC Act)
- 21 bird species listed as Migratory only (terrestrial and wetland) under the EPBC Act and/or as Migratory species under the BC Act
- One species listed as Other specially protected fauna under the BC Act
- 10 species listed as Priority by DBCA.

4. Field survey results

4.1 Flora and vegetation

4.1.1 Vegetation types

The survey area consists of a mix of remnant and revegetated coastal vegetation. The landform and soils comprises of a tertiary dune system with grey to brown sandy soils. The survey area has experienced a long history of disturbances and includes the site of old Munitions Magazines (bunkers and blast barriers) from World War II which have been fenced around due to hazardous substances (i.e. asbestos). The area immediately surrounding the munition magazines has previously been cleared or disturbed and it is evident that many of the trees and shrubs have been planted to restore the area, including young tuarts and Rottnest pines. Remnant vegetation in the survey area is dominated by *Acacia rostellifera* closed shrubland and *Melaleuca systena* shrubland over an understorey dominated by weedy herbs and grasses.

Five vegetation types, not including cleared/highly degraded area, have been mapped and described across the survey area:

- *Acacia* closed shrubland (VT01)
- *Melaleuca* shrubland (VT02)
- **Cenchrus* grassland (VT03)
- Revegetation (VT04)
- Planted (VT05)

The vegetation types are described in further detail in Table 6 and mapped in Figure 3, Appendix A.

4.1.2 Vegetation condition

The vegetation within the survey area ranged from *Good* to *Completely Degraded* condition. The survey area appears to have been subject to a long history of disturbances including clearing, activity associated with the Munitions Magazines, weed invasion, introduced fauna (rabbits and foxes) and edge effects from adjacent land uses (caravan park and roads). A number of trees and shrub species were observed to have plastic plant bags around their bases which may be a result of previous revegetation projects in the area. The ground cover is dominated by weed species including **Asphodelus fistulosus*, **Pelargonium capitatum*, **Briza maxima*, **Oxalis pes-caprae, *Cenchrus setaceus, *Fumaria capreolata* and **Lagurus ovatus.*

The Acacia Closed Shrubland and Melaleuca Shrubland are generally in good condition however much of the ground cover is dominated by weed species including **Asphodelus fistulosus, *Asparagus asparagoides, *Euphorbia paralias and *Ammophila arenaria.*

The vegetation condition of the survey area is mapped on Figure 4, Appendix A.

Table 6 Vegetation types recorded within the survey area

Vegetation type	Vegetation type description	Landform/substrate	Representative photograph
Acacia Closed Shrubland (VT01)	*Acacia rostellifera* and *Spyridium globulosum* closed shrubland with scattered emergent *Eucalyptus gomphocephala* over **Fumaria capreolata, *Oxalis pes-caprae, Spergularia marina* and **Euphorbia* spp. herbland over **Asparagus asparagoides* and *Clematis linearifolia* open vineland.	Tertiary dunes and dune swales. White/grey sand.	
Melaleuca Shrubland (VT02)	*Melaleuca systena, Spyridium globulosum* and **Leptospermum laevigatum* shrubland with scattered emergent *Eucalyptus gomphocephala* over *Leucopogon parviflorus*, *Rhagodia baccata* and *Acanthocarpus preissii* low open shrubland over *Austrostipa elegantissima, *Lagurus ovatus* and **Avena barbata* open grassland over *Spergularia marina, *Fumaria capreolata* and **Pelargonium capitatum* open herbland over *Asparagus asparagoides and Clematis linearifolia open vineland.	Low undulating dunes.	

Vegetation type	Vegetation type description	Landform/substrate	Representative photograph
**Cenchrus* Grassland (VT03)	*Acanthocarpus preissii, Acacia cochlearis* and *Spyridium globulosum* scattered shrubs over **Cenchrus setaceus, Schoenus grandiflorus* and **Lagurus ovatus* grassland over **Brassica tournefortii, *Euphorbia terracina* and **Pelargonium capitatum* open herbland.	Sandy upper dune. White/grey sand.	
Revegetation (VT04)	Previously cleared areas where natural regrowth of some native plant species has occurred. Natural regrowth is scattered with an understorey dominated by introduced grasses and herbs. Evidence of revegetation of native trees and shrubs (plastic plant bags) was present around a number of tree species including *Eucalyptus gomphocephala* (tuart) and *Callitris preissii* (Rottnest Pine).	Sandy plain and low undulating dunes. Grey/brown sand.	

Vegetation type	Vegetation type description	Landform/substrate	Representative photograph
Planted (VT05)	Planted trees and shrubs located along the boundary of the existing caravan park. Species include non-native *Eucalyptus*, *Agonis flexuosa, Adenanthos sericeus* and *Grevillea* sp.	Grey/brown sand. Plain.	
Cleared/ Highly disturbed	Generally completely cleared of native vegetation and consists of roads, tracks, planted non-native vegetation and building structures.	-	

4.1.3 Conservation significant ecological communities

No TEC's listed under the EPBC Act or WC Act or PECs listed by the DBCA were identified within the survey area during the field survey.

Callitris preissii (or Melaleuca lanceolata) forests and woodlands TEC

The survey area is situated within a known occurrence of the *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands TEC (Swan Coastal Plain community type 30a – Gibson et al. 1994). There are small patches/isolated trees of *Callitris preissii* scattered in the survey area in the area mapped as 'Revegetation'. It was evident that these trees had been planted with plastic plant bags remaining around many of the trunks. The vegetation in the survey area has been subject to a long history of disturbances including clearing and the natural structure of the vegetation has been severely altered. Weed species completely dominate the ground layer of the vegetation remaining in the survey area. The vegetation within the survey area does not meet the key diagnostic criteria for this TEC (Department of Parks and Wildlife 2014).

Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain TEC

Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain has recently been upgraded as a TEC under the EPBC Act and BC Act. A number of young tuart trees are scattered throughout the survey area. It was evident many of these trees had been planted whilst some are likely a result of natural regeneration.

One of the key diagnostic characteristics of this TEC (DotEE 2019d) is the presence of at least two living established tuart trees in the uppermost canopy layer, although they may occur with trees of other species. Additionally there is a gap of no more than 60 m between the outer edges of the canopies of adjacent tuart trees. The survey area contains only two isolated mature tuart trees which are greater than 60 m apart. The tuarts within the survey area are young and scattered and do not form a continuous upper canopy. There is likely to be a patch north of the survey area however this patch does not intersect with the current survey area.

The vegetation within the survey area does not meet the key diagnostic criteria for this TEC (DotEE 2019d).

4.1.4 Flora diversity

Sixty-three taxa (including subspecies and varieties) representing 31 families and 51 genera were recorded from the survey area during the field survey. This total comprised 31 native taxa and 32 introduced/weed flora taxa.

Dominant families recorded from the survey area included:

- Poaceae (9 taxa)
- Myrtaceae (7 taxa)
- Fabaceae (5 taxa)
- Asteraceae (5 taxa).

Flora recorded in the survey area is provided in Appendix D.

4.1.5 Introduced flora

Extensive weed invasion, which has replaced much of the ground layers, has occurred throughout the survey area. Of the 32 introduced taxa recorded within the survey area, one

species, **Asparagus asparagoides* (Bridal Creeper), is listed as a Declared Pest under the *Biosecurity and Management Act 2007* and a Weed of National Significance (WoNS).

4.1.6 Conservation significant flora

No flora of conservation significance was recorded within the survey area.

Likelihood of occurrence

A likelihood of occurrence assessment was conducted post-field survey for all conservation significant flora taxa identified in the desktop assessment (Appendix C). This assessment took into account previous records, habitat requirements, efficacy of the survey, intensity of the survey, flowering times and the cryptic nature of species.

The likelihood of occurrence assessment for the survey area concluded that no conservation significant flora are likely to occur within the survey area.

4.2 Fauna

4.2.1 Fauna habitat

The survey area comprises of three main habitat types consisting of grassland, shrublands and scattered trees/mixed shrubs (revegetation/planted). The understorey throughout the survey area is generally sparse and comprised mostly of introduced herbs and grasses. The trees and shrubs provide good value fauna habitat, particularly for bird species, providing shelter and food resources. Some areas have been highly degraded by historical clearing (tracks, old buildings) and provide very little to no habitat value for most fauna species as these areas are generally devoid of vegetation.

The fauna habitat of the survey area is described in further detail in Table 7 and mapped on Figure 5, Appendix A.

Table 7 Fauna habitat types within the survey area

Habitat type	Description	Representative photo
Grassland	Grassland dominated by **Cenchrus setaceus*, with scattered shrubs of *Acanthocarpus preissii, Acacia cochlearis* and *Spyridium globulosum* on sandy upper dunes. Ground cover is relatively low with limited leaf litter and structural diversity. This habitat would be utilised by skinks, burrowing reptiles, small birds and mammal species. **Conservation significant fauna** The deep sandy soils provide suitable habitat for *Lerista lineata* (P3) and *Neelaps calonotos* (P3). The Peregrine Falcon (OS) would opportunistically utilise this habitat for foraging.	
Mixed Shrublands	Open to closed mixed shrublands dominated by *Acacia rostellifera*, Spyridium globulosum, *Melaleuca systena* and **Leptospermum laevigatum* on secondary coastal dunes. The understorey was generally covered in introduced grasses and herbs or bare sandy soil. Scattered shrubs include *Acanthocarpus preissii*, *Leucopogon parviflorus* and *Rhagodia baccata*. The Acacia thicket provides good fauna habitat, particularly for small bird species, providing shelter and food resources. This habitat would also be utilised by a number of coastal species such as skinks, burrowing reptiles, and mammal species. These areas also provides ideal habitat for burrowing skinks. **Conservation significant fauna** The sandy soils provide suitable habitat for *Lerista lineata* and *Neelaps calonotos*. The dense shrubs provide suitable habitat for Quenda (P4).	

Habitat type	Description	Representative photo
Scattered trees/mixed shrubs	Comprises of previously cleared areas where natural regrowth of some native plant species has occurred. Natural regrowth is scattered with an understorey dominated by introduced grasses and herbs. Tree species include *Eucalyptus gomphocephala* (tuart) and *Callitris preissii* (Rottnest Pine). Majority of the tuart trees were young with only one tree identified as a potential black cockatoo habitat tree with a DBH greater than 500 mm. Logs and woody debris were scattered and litter was associated to tuarts and shrubs with areas of bare sandy ground present in between vegetation. **Conservation Significant Fauna** One conservation significant species were observed utilising this habitat; the Carnaby's Cockatoo (Endangered) was observed feeding on *Callitris preissii*. This habitat is likely to be used opportunistically by Black Cockatoo species (for foraging) and other mobile species such as the Peregrine Falcon, Masked Owl (P3), Osprey (Mi) and in denser areas the Quenda. *Neelaps calonotos* is likely to utilise this habitat due to the deep sands but restricted to dense litter areas. *Lerista lineata* may also utilise the sandy soils in this area.	

4.2.2 Fauna diversity

During the field survey 25 fauna species were recorded within the survey area, including 20 bird, two mammal and three reptile species. Three of the species recorded are introduced.

A full list of fauna recorded during the survey is provided in Appendix D.

4.2.3 Conservation significant fauna

One conservation significant fauna species was recorded within the survey area during the field survey: Carnaby's Cockatoo (*Calyptorhynchus latirostris*) – listed as Endangered under the EPBC Act and BC Act. A small flock of approximately 15 Carnaby's Cockatoos were observed feeding on the *Callitris preissii* (Rottnest Pine) trees in the north-east corner of the survey area.

Likelihood of occurrence

A likelihood of occurrence assessment was conducted for all conservation significant fauna species identified in the desktop assessment. This assessment was based on species biology, habitat requirements, the likely quality and availability of suitable habitat (based on vegetation associations present within the survey area) and records of the species in the vicinity of the survey area. The assessment is provided in Appendix D.

Of the 65 conservation significant fauna identified in the desktop searches one is identified as present (Carnaby's Cockatoo) and seven are considered likely to occur, including:

- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) – Vulnerable (EPBC Act and BC Act)
- Peregrine Falcon (*Falco peregrinus*) – Other Specially Protected Fauna (BC Act)
- Osprey (*Pandion cristatus*) – Migratory (EPBC Act and BC Act)
- Masked Owl (*Tyto novaehollandiae* subsp*. novae-hollandiae*) – Priority 3 (DBCA)
- Quenda (*Isoodon fusciventer*) – Priority 4 (DBCA)
- Perth Lined Skink *(Lerista lineata)* – Priority 3 (DBCA)
- Black-striped Snake (*Neelaps calonotos)* – Priority 3 (DBCA)

No evidence of these species was recorded in the survey area during the survey. Given the small size and fragmented nature of the survey area and history of disturbances, clearing of the survey area is unlikely to have a significant impact on the above conservation significant fauna species.

4.2.4 Targeted black cockatoo assessment

One species of Black Cockatoo, Carnaby's Cockatoo, was recorded during the survey. The Forest Red-tailed Black Cockatoo was also identified as likely to occur as an opportunistic visitor.

Foraging habitat

The survey area contains some suitable foraging habitat for black cockatoos. Suitable species include tuarts (*E. gomphocephala*) and Rottnest Pines (*Callitris preissii*). These species were scattered throughout the survey area but mostly associated with VT04 (Revegetation) and VT02 (*Melaleuca* shrubland). VT04 and VT02 are considered to have low to moderate foraging value for black cockatoos. The remaining vegetation types are considered to have nil to negligible foraging value.

Breeding habitat

One potential breeding tree (tuart) with a DBH greater than 500 mm was recorded within the survey area. This tree did not contain any hollows. The majority of the tuarts in the survey area are young trees.

Roosting habitat

No suitable black cockatoo roosting habitat is currently present in the survey area.

5. References

Beard, JS 1979, *Vegetation Survey of Western Australia: the Vegetation of the Perth Area Western Australia*, map and explanatory memoir 1:250,000 series, Applecross, Vegmap Publications.

Bureau of Meteorology (BoM) 2019, *Climate Data Online*, retrieved September 2019, from http://www.bom.gov.au/climate/data/.

Christidis, L and Boles, WE 2008, *Systematics and Taxonomy of Australian Birds*, Melbourne, CSIRO Publishing.

Churchwood H.M. and McArthur W.M. 1984, Darling System, Landforms and Soils, Department of Conservation and Environment, Western Australia.

Department of Biodiversity, Conservation and Attractions (DBCA) 2007–, *NatureMap: Mapping Western Australia's Biodiversity*, retrieved August 2019, from https://naturemap.dpaw.wa.gov.au/default.aspx.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2012, *EPBC Act Referral Guidelines for Three Threatened Black Cockatoo Species*, Canberra, Australia, Department of Sustainability, Environment, Water, Population and Communities.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2019, Species Profile and Threats Database (SPRAT), Department of Sustainability, Environment, Water, Population and Communities, Australian Government Canberra.

Department of the Environment and Energy (DotEE) 2019a, *Environmental Protection and Biodiversity Conservation Act 1999 Protected Matters Search Tool Results*, retrieved August 2019, from http://www.environment.gov.au/epbc/pmst/index.html.

Department of the Environment and Energy (DotEE) 2019b, *Species Profile and Threats Database (SPRAT)*, retrieved September 2019, from http://www.environment.gov.au/cgi-bin/sprat/public/.

Department of the Environment and Energy (DotEE) 2019c, *Interim Biogeographic Regionalisation of Australia*, Version 7, retrieved August 2019, from http://www.environment.gov.au/land/nrs/science/ibra/australias-bioregions-maps.

Department of the Environment and Energy (DotEE) 2019d, *Approved Conservation Advice (incorporating listing advice) for the Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain ecological community*. Canberra: Department of the Environment and Energy. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/153-conservation-advice.pdf

Department of Parks and Wildlife 2014, *Callitris preissii (or melaleuca lanceolata) forests and woodlands (Swan Coastal Plain community type 30a – Gibson et al. 1994). Interim Recovery Plan No. 340.* Department of parks and Wildlife, Perth.

Environmental Protection Authority (EPA) 2016a, *Technical Guidance – Sampling methods for terrestrial vertebrate fauna*, Perth, Environmental Protection Authority.

Environmental Protection Authority (EPA) 2016b, *Technical Guidance – Terrestrial Vertebrate Fauna Surveys*, Perth, Environmental Protection Authority.

Garnett S.T. & Crowley G.M. 2000, The Action Plan for Australian Birds 2000. Environment Australia, Canberra

Mitchell, D, Williams, K & Desmond, A 2002, *Swan Coastal Plain 2 (SWA2 — Swan Coastal Plain subregion)*, in Department of Conservation and Land Management (ed), A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002, pp 724.

Appendices

Appendix A – Figures

Paper Size ISO A3

0 0.025 0.05 0.075 0.1

Kilometers

N

GHD

Discovery Holiday Parks
Woodman Point Caravan Park Expansion

Project No. **61-12511610**
Revision No. **0**
Date **15/09/2020**

Survey Area

FIGURE 1

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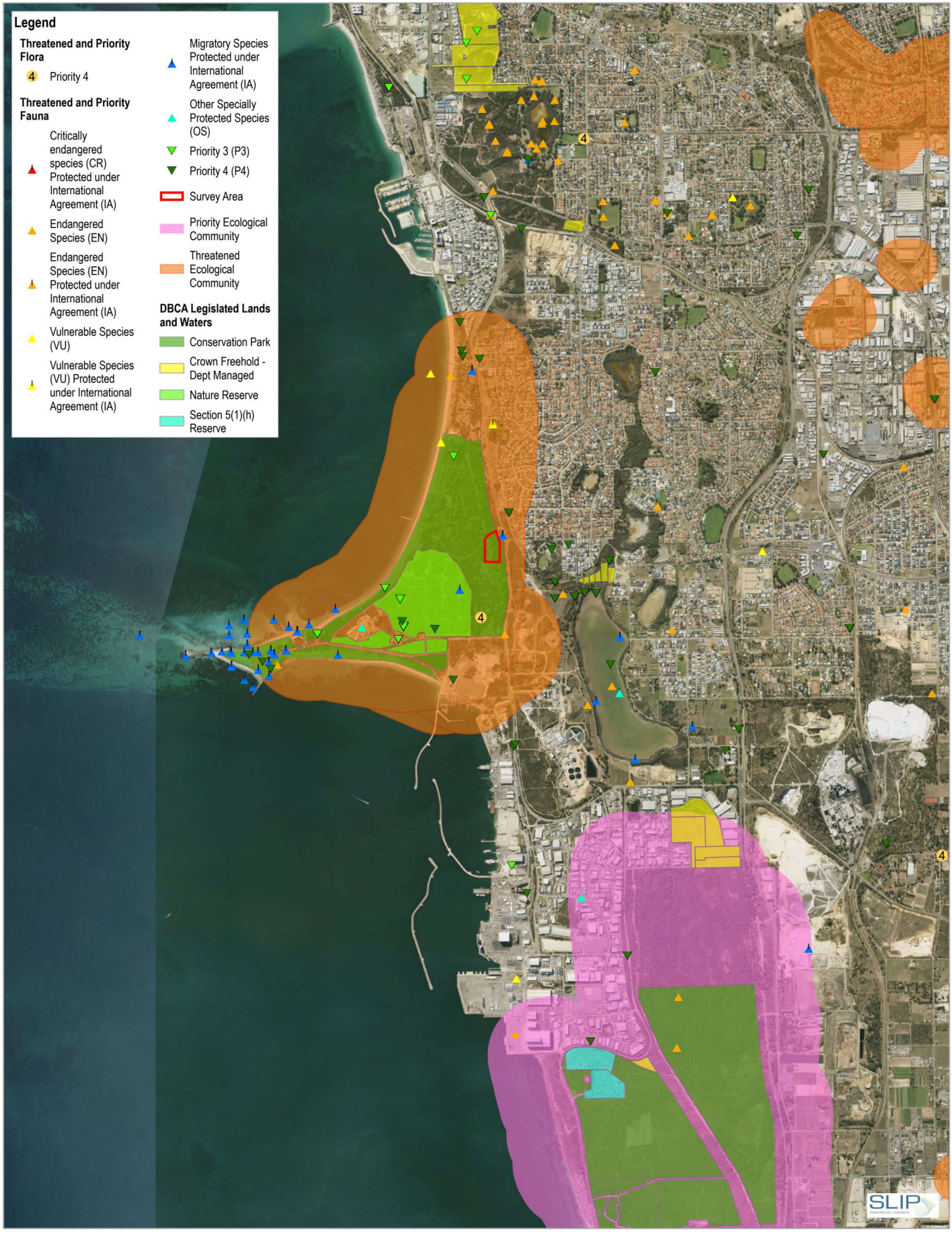
Print date: 15 Sep 2020 - 13:45

Data source: GHD: Survey Area - 20190814; LGATE: Imagery - 201904, Roads. Created by: mmikkonen



Paper Size ISO A3

0 200 400 600 800

Metres

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

N

GHD

Discovery Holiday Parks
Woodman Point Caravan Park Expansion

Project No. **61-12511610**
Revision No. **0**
Date **15/09/2020**

Environmental Constraints

FIGURE 2

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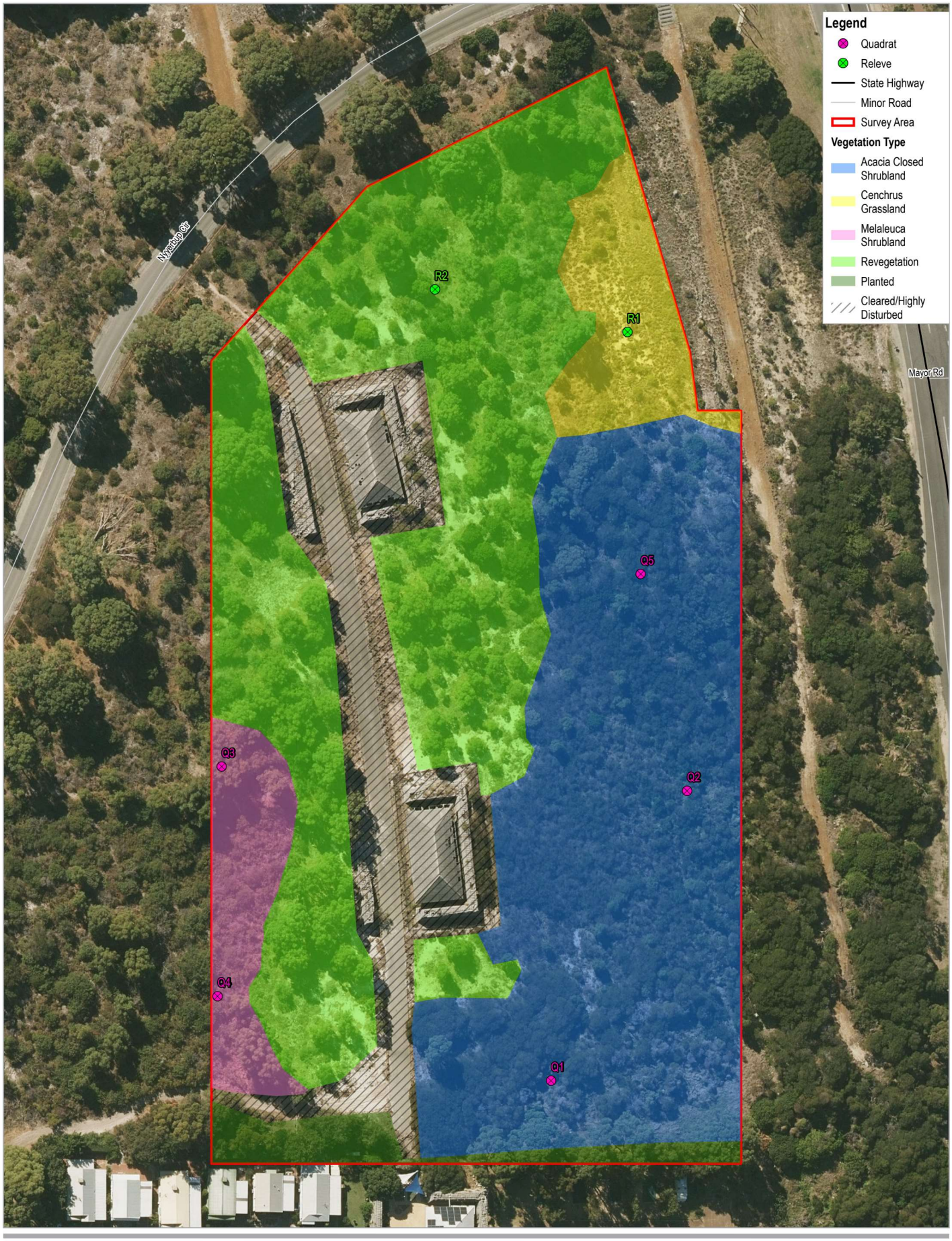
Print date: 15 Sep 2020 - 13:54

Data source: GHD: Survey Area - 20190814; DBCA: TEC/PEC, Threatened And Priority Flora - 20190902, Threatened and Priority Fauna - 20190829, DBCA: Legislated Lands and Waters - 20190818; LGATE: Landgate_Subscription_ImageryWANow; Landgate / SLIP - 201904. Created by: mmikkonen



Paper Size ISO A3

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Metres

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

N

Discovery Holiday Parks
Woodman Point Caravan Park Expansion

Project No. **61-12511610**
Revision No. **0**
Date **15/09/2020**

Vegetation Type

FIGURE 3

Data source: GHD: Survey Area - 20190814, Vegetation Types, Quadrat, Releve - 20190920, LGATE: Imagery - 201904, Roads. Created by: mmikkonen

S:\GIS\Temp\6112511610\GIS\Maps\WORS\6112511610_ProjectFolder\6112511610_ProjectFolder.ap
Print date: 15 Sep 2020 - 14:01

Paper Size ISO A3

0 5 10 15 20

Metres

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

N

GHD

Discovery Holiday Parks
Woodman Point Caravan Park Expansion

Project No. **61-12511610**
Revision No. **0**
Date **15/09/2020**

Vegetation Condition

FIGURE 4

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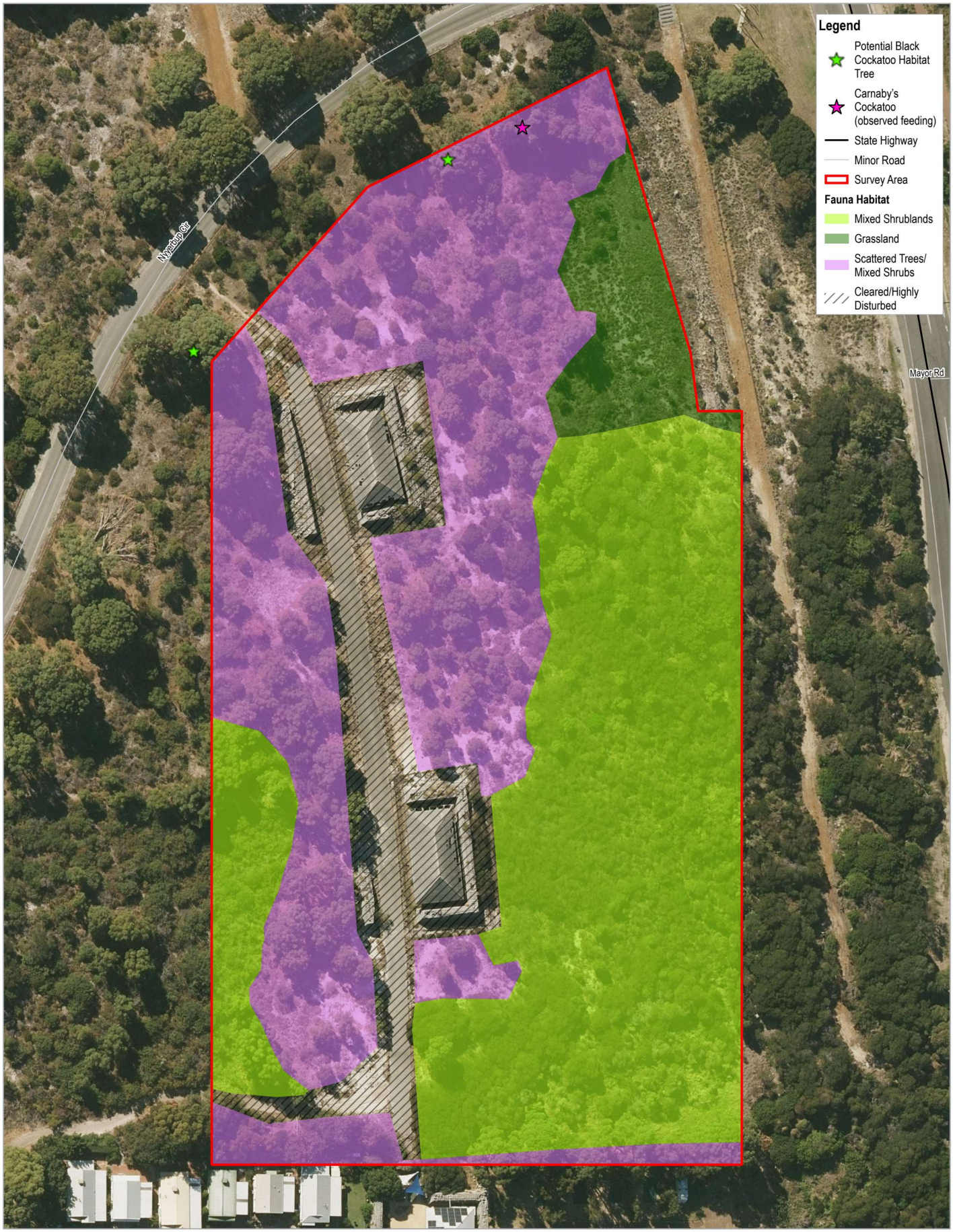
Data source: GHD: Survey Area - 20190814, Vegetation Conditions - 20190920; LGATE: Imagery - 201904, Roads. Created by: mmikkonen



Paper Size ISO A3

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Metres

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

N

Discovery Holiday Parks
Woodman Point Caravan Park Expansion

Fauna Habitat and Threatened Species Records

Project No. **61-12511610**
Revision No. **0**
Date **16/09/2020**

FIGURE 5

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Print date: 16 Sep 2020 - 14:53

Data source: GHD: Survey Area - 20190814, Fauna Habitat, Threatened Species Records - 20190920; LGATE: Imagery - 201904, Roads. Created by: mmikkonen

Appendix B – Conservation codes

Appendix C – Desktop searches

Naturemap Flora

Naturemap Fauna

EPBC Act Protected Matters Search

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 11/09/2019

Kingdom Plantae
Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 115° 45' 58" E,32° 07' 36" S
Buffer 5km
Group By Family

Family	Species	Records
Aizoaceae	3	4
Amaranthaceae	3	5
Amaryllidaceae	1	1
Anarthriaceae	1	1
Apiaceae	5	10
Araliaceae	1	3
Asparagaceae	8	18
Asphodelaceae	2	3
Asteraceae	23	38
Brassicaceae	4	4
Bryaceae	1	2
Campanulaceae	1	1
Caprifoliaceae	1	4
Caryophyllaceae	6	13
Casuarinaceae	1	1
Chenopodiaceae	7	9
Convolvulaceae	3	5
Crassulaceae	3	11
Cupressaceae	1	9
Cymodoceaceae	2	2
Cyperaceae	10	19
Dilleniaceae	4	8
Droseraceae	2	3
Ericaceae	2	5
Euphorbiaceae	4	8
Fabaceae	32	66
Fissidentaceae	1	2
Frankeniaceae	1	3
Gentianaceae	1	3
Geraniaceae	4	7
Goodeniaceae	3	3
Gyrostemonaceae	1	2
Haemodoraceae	3	5
Haloragaceae	2	3
Hemerocallidaceae	2	2
Iridaceae	1	4
Juncaceae	1	1
Juncaginaceae	1	1
Lamiaceae	2	2
Lauraceae	2	7
Linaceae	1	1
Loganiaceae	1	1
Malvaceae	7	10
Montiaceae	3	5
Myrtaceae	14	26
Onagraceae	2	4
Ophioglossaceae	1	1
Orchidaceae	6	8
Orobanchaceae	2	2
Papaveraceae	2	3
Phyllanthaceae	1	5
Phytolaccaceae	1	1
Pinaceae	2	2
Plantaginaceae	2	2
Poaceae	32	62
Polygalaceae	2	6
Polyphysaceae	1	2
Pottiaceae	5	11
Primulaceae	2	3
Proteaceae	8	15
Racopilaceae	1	1
Ranunculaceae	2	5
Restionaceae	2	2
Rhamnaceae	3	10
Rhodomelaceae	1	1
Rubiaceae	3	9
Rutaceae	1	2
Santalaceae	2	2
Sapindaceae	1	6
Scrophulariaceae	3	4
Solanaceae	7	14
Stylidiaceae	2	4
Thymelaeaceae	2	2
Urticaceae	1	1
Violaceae	1	3

Vitaceae	1	1
Xanthorrhoeaceae	1	1
Zamiaceae	1	1
Zygophyllaceae	1	3
TOTAL	**287**	**540**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Aizoaceae					
1.	2795	*Carpobrotus edulis (Hottentot Fig)*	Y		
2.	2813	*Mesembryanthemum crystallinum (Iceplant)*	Y		
3.	2820	*Tetragonia decumbens (Sea Spinach)*	Y		
Amaranthaceae					
4.	2668	*Amaranthus powellii (Powell's Amaranth)*	Y		
5.	2751	*Ptilotus polystachyus (Prince of Wales Feather)*			
6.	15856	*Ptilotus sericostachyus subsp. sericostachyus*			
Amaryllidaceae					
7.	44860	*Pancratium maritimum*	Y		Y
Anarthriaceae					
8.	1097	*Lyginia barbata*			
Apiaceae					
9.	6210	*Apium annuum*			
10.	6211	*Apium prostratum (Sea Celery)*			
11.	6218	*Daucus glochidiatus (Australian Carrot)*			
12.	6221	*Foeniculum vulgare (Fennel)*	Y		
13.	6289	*Xanthosia huegelii*			
Araliaceae					
14.	6280	*Trachymene pilosa (Native Parsnip)*			
Asparagaceae					
15.	1208	*Acanthocarpus preissii*			
16.	1287	*Dichopogon capillipes*			
17.	1370	*Lachenalia reflexa*	Y		
18.	1231	*Lomandra maritima*			
19.	1239	*Lomandra preissii*			
20.	1372	*Ornithogalum arabicum (Lesser Cape Lily)*	Y		
21.	1312	*Sowerbaea laxiflora (Purple Tassels)*			
22.	1319	*Thysanotus arenarius*			
Asphodelaceae					
23.	1364	*Asphodelus fistulosus (Onion Weed)*	Y		
24.	1368	*Trachyandra divaricata*	Y		
Asteraceae					
25.	7838	*Arctotheca calendula (Cape Weed, African Marigold)*	Y		
26.	7851	*Asteridea pulverulenta (Common Bristle Daisy)*			
27.	7911	*Carthamus lanatus (Saffron Thistle)*	Y		
28.	7915	*Centaurea calcitrapa (Star Thistle)*	Y		
29.	7916	*Centaurea melitensis (Maltese Cockspur, Malta Thistle)*	Y		
30.	7939	*Conyza bonariensis (Flaxleaf Fleabane)*	Y		
31.	20074	*Conyza sumatrensis*	Y		
32.	7976	*Galinsoga parviflora (Potato Weed)*	Y		
33.	12624	*Gnephosis angianthoides*			
34.	12741	*Hyalosperma cotula*			
35.	8086	*Hypochaeris glabra (Smooth Catsear)*	Y		
36.	8106	*Millotia tenuifolia (Soft Millotia)*			
37.	8127	*Olearia axillaris (Coastal Daisybush)*			
38.	8149	*Olearia rudis (Rough Daisybush)*			
39.	42281	*Pithocarpa cordata*			
40.	20161	*Senecio pinnatifolius*			
41.	25884	*Senecio pinnatifolius var. latilobus*			
42.	8220	*Senecio vulgaris (Common Groundsel)*	Y		
43.	8230	*Sonchus asper (Rough Sowthistle)*	Y		
44.	9367	*Sonchus hydrophilus (Native Sowthistle)*			
45.	8231	*Sonchus oleraceus (Common Sowthistle)*	Y		
46.	8254	*Urospermum picroides (False Hawkbit)*	Y		
47.	8257	*Vellereophyton dealbatum (White Cudweed)*	Y		
Brassicaceae					
48.	3000	*Brassica tournefortii (Mediterranean Turnip)*	Y		
49.	2995	*Brassica x napus*	Y		
50.	3011	*Diplotaxis muralis (Wall Rocket)*	Y		
51.	3016	*Heliophila pusilla*	Y		
Bryaceae					

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
52.	44608	*Rosulabryum billarderii*			
Campanulaceae					
53.	7384	*Wahlenbergia capensis (Cape Bluebell)*	Y		
Caprifoliaceae					
54.	7368	*Scabiosa atropurpurea (Purple Pincushion)*	Y		
Caryophyllaceae					
55.	19883	*Arenaria leptoclados*	Y		
56.	2889	*Cerastium glomeratum (Mouse Ear Chickweed)*	Y		
57.	19825	*Petrorhagia dubia*	Y		
58.	2908	*Sagina maritima*	Y		
59.	2909	*Silene gallica (French Catchfly)*	Y		
60.	2918	*Stellaria media (Chickweed)*	Y		
Casuarinaceae					
61.	1732	*Allocasuarina humilis (Dwarf Sheoak)*			
Chenopodiaceae					
62.	2452	*Atriplex cinerea (Grey Saltbush)*			
63.	2483	*Chenopodium album (Fat Hen)*	Y		
64.	2578	*Rhagodia baccata (Berry Saltbush)*			
65.	11341	*Rhagodia baccata subsp. baccata*			
66.	48430	*Salicornia quinqueflora*			
67.	2639	*Suaeda australis (Seablite)*			
68.	2644	*Threlkeldia diffusa (Coast Bonefruit)*			
Convolvulaceae					
69.	6611	*Convolvulus arvensis (Field Bindweed)*	Y		
70.	6658	*Wilsonia backhousei (Narrow-leaf Wilsonia)*			
71.	6659	*Wilsonia humilis (Silky Wilsonia)*			
Crassulaceae					
72.	3137	*Crassula colorata (Dense Stonecrop)*			
73.	3140	*Crassula glomerata*	Y		
74.	3142	*Crassula natans*	Y		
Cupressaceae					
75.	96	*Callitris preissii (Rottnest Island Pine, Maro)*			
Cymodoceaceae					
76.	126	*Amphibolis antarctica (Sea Nymph)*			
77.	127	*Amphibolis griffithii*			
Cyperaceae					
78.	743	*Baumea juncea (Bare Twigrush)*			
79.	907	*Gahnia trifida (Coast Saw-sedge)*			
80.	910	*Isolepis cernua (Nodding Club-rush)*			
81.	925	*Lepidosperma angustatum*			
82.	940	*Lepidosperma pubisquameum*			
83.	29150	*Lepidosperma sp. Margaret River (B.J. Lepschi 1841)*			
84.	945	*Lepidosperma squamatum*			
85.	955	*Mesomelaena pseudostygia*			
86.	992	*Schoenus grandiflorus (Large Flowered Bogrush)*			
87.	1036	*Tetraria octandra*			
Dilleniaceae					
88.	5135	*Hibbertia hypericoides (Yellow Buttercups)*			
89.	45534	*Hibbertia hypericoides subsp. hypericoides*			
90.	5162	*Hibbertia racemosa (Stalked Guinea Flower)*			
91.	11461	*Hibbertia spicata subsp. leptotheca*		P3	
Droseraceae					
92.	3095	*Drosera erythrorhiza (Red Ink Sundew)*			
93.	3118	*Drosera pallida (Pale Rainbow)*			
Ericaceae					
94.	6427	*Leucopogon parviflorus (Coast Beard-heath)*			
95.	6436	*Leucopogon propinquus*			
Euphorbiaceae					
96.	4582	*Adriana quadripartita (Bitter Bush)*			
97.	29940	*Euphorbia maculata*	Y		
98.	4636	*Euphorbia paralias (Sea Spurge)*	Y		
99.	4638	*Euphorbia peplus (Petty Spurge)*	Y		

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Fabaceae					
100.	3262	*Acacia cochlearis (Rigid Wattle)*			
101.	3282	*Acacia cyclops (Coastal Wattle)*			
102.	3409	*Acacia lasiocarpa (Panjang)*			
103.	11611	*Acacia lasiocarpa var. lasiocarpa*			
104.	15481	*Acacia pulchella var. glaberrima*			
105.	3525	*Acacia rostellifera (Summer-scented Wattle)*			
106.	3527	*Acacia saligna (Orange Wattle, Kudjong)*			
107.	30032	*Acacia saligna subsp. saligna*			
108.	3584	*Acacia truncata*			
109.	18560	*Daviesia divaricata subsp. divaricata*			
110.	16585	*Daviesia nudiflora subsp. nudiflora*			
111.	20475	*Gastrolobium capitatum*			
112.	20482	*Gastrolobium nervosum*			
113.	3945	*Gompholobium aristatum*			
114.	3957	*Gompholobium tomentosum (Hairy Yellow Pea)*			
115.	3961	*Hardenbergia comptoniana (Native Wisteria)*			
116.	4037	*Kennedia coccinea (Coral Vine)*			
117.	4065	*Lupinus angustifolius (Narrowleaf Lupin)*	Y		
118.	4066	*Lupinus cosentinii*	Y		
119.	4075	*Medicago littoralis (Strand Medic)*	Y		
120.	4085	*Melilotus indicus*	Y		
121.	4256	*Templetonia retusa (Cockies Tongues)*			
122.	4289	*Trifolium angustifolium (Narrowleaf Clover)*	Y		
123.	17145	*Trifolium angustifolium var. angustifolium*	Y		
124.	4292	*Trifolium campestre (Hop Clover)*	Y		
125.	17763	*Trifolium campestre var. campestre (Hop Clover)*	Y		
126.	4293	*Trifolium cernuum (Drooping Flower Clover)*	Y		
127.	4298	*Trifolium hirtum (Rose Clover)*	Y		
128.	14738	*Trifolium resupinatum var. resupinatum*	Y		
129.	4315	*Trifolium tomentosum (Woolly Clover)*	Y		
130.	15509	*Trifolium tomentosum var. tomentosum*	Y		
131.	11474	*Vicia sativa subsp. nigra*	Y		
Fissidentaceae					
132.	32369	*Fissidens tenellus*			
Frankeniaceae					
133.	5209	*Frankenia pauciflora (Seaheath)*			
Gentianaceae					
134.	6539	*Centaurium erythraea (Common Centaury)*	Y		
Geraniaceae					
135.	4332	*Erodium botrys (Long Storksbill)*	Y		
136.	4333	*Erodium cicutarium (Common Storksbill)*	Y		
137.	4343	*Pelargonium capitatum (Rose Pelargonium)*	Y		
138.	4346	*Pelargonium littorale*			
Goodeniaceae					
139.	7580	*Lechenaultia linarioides (Yellow Leschenaultia)*			
140.	7626	*Scaevola nitida (Shining Fanflower)*			
141.	13152	*Scaevola thesioides subsp. thesioides*			
Gyrostemonaceae					
142.	2791	*Tersonia cyathiflora (Button Creeper)*			
Haemodoraceae					
143.	1418	*Conostylis aculeata (Prickly Conostylis)*			
144.	1427	*Conostylis candicans (Grey Cottonhead)*			
145.	11438	*Conostylis candicans subsp. candicans*			
Haloragaceae					
146.	6161	*Gonocarpus pithyoides*			
147.	6198	*Myriophyllum salsugineum*			
Hemerocallidaceae					
148.	1259	*Dianella revoluta (Blueberry Lily)*			
149.	1260	*Stypandra glauca (Blind Grass)*			
Iridaceae					
150.	1556	*Romulea rosea (Guildford Grass)*	Y		
Juncaceae					
151.	11922	*Juncus kraussii subsp. australiensis*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Juncaginaceae					
152.	147	*Triglochin mucronata*			
Lamiaceae					
153.	6881	*Marrubium vulgare (Horehound)*	Y		
154.	6929	*Salvia verbenaca (Wild Sage)*	Y		
Lauraceae					
155.	2951	*Cassytha flava (Dodder Laurel)*			
156.	2957	*Cassytha racemosa (Dodder Laurel)*			
Linaceae					
157.	4362	*Linum marginale (Wild Flax)*			
Loganiaceae					
158.	6515	*Logania vaginalis (White Spray)*			
Malvaceae					
159.	4906	*Alyogyne huegelii (Lilac Hibiscus)*			
160.	14646	*Lagunaria patersonia*	Y		
161.	4958	*Lawrencia spicata*			
162.	36480	*Malva arborea (Tree Mallow)*	Y		
163.	36522	*Malva pseudolavatera*	Y		
164.	5077	*Thomasia cognata*			
165.	5105	*Thomasia triphylla*			
Montiaceae					
166.	2845	*Calandrinia brevipedata (Short-stalked Purslane)*			
167.	2846	*Calandrinia calyptrata (Pink Purslane)*			
168.	2848	*Calandrinia corrigioloides (Strap Purslane)*			
Myrtaceae					
169.	35816	*Calothamnus quadrifidus subsp. quadrifidus*			
170.	17104	*Corymbia calophylla (Marri)*			
171.	5615	*Eucalyptus decipiens (Limestone Marlock, Moit)*			
172.	5659	*Eucalyptus gomphocephala (Tuart, Duart)*			
173.	5825	*Hypocalymma robustum (Swan River Myrtle)*			
174.	15498	*Kunzea glabrescens (Spearwood)*			
175.	5850	*Leptospermum laevigatum (Coast Teatree)*	Y		
176.	5900	*Melaleuca cuticularis (Saltwater Paperbark)*			
177.	5920	*Melaleuca huegelii (Chenille Honeymyrtle)*			
178.	13271	*Melaleuca huegelii subsp. huegelii*			
179.	5922	*Melaleuca lanceolata (Rottnest Teatree, Moonah)*			
180.	5959	*Melaleuca rhaphiophylla (Swamp Paperbark)*			
181.	18598	*Melaleuca systena*			
182.	5978	*Melaleuca teretifolia (Banbar)*			
Onagraceae					
183.	6138	*Oenothera drummondii (Beach Evening Primrose)*	Y		
184.	14292	*Oenothera stricta subsp. stricta*	Y		
Ophioglossaceae					
185.	12782	*Ophioglossum gramineum*			
Orchidaceae					
186.	1599	*Caladenia latifolia (Pink Fairy Orchid)*			
187.	17760	*Caladenia nobilis*			
188.	10916	*Cyrtostylis huegelii*			
189.	15418	*Leptoceras menziesii*			
190.	15426	*Pterostylis aspera*			
191.	12217	*Pterostylis sanguinea*			
Orobanchaceae					
192.	7046	*Bellardia trixago (Bellardia)*	Y		
193.	7122	*Orobanche minor (Lesser Broomrape)*	Y		
Papaveraceae					
194.	17797	*Argemone ochroleuca subsp. ochroleuca*	Y		
195.	2969	*Fumaria capreolata (Whiteflower Fumitory)*	Y		
Phyllanthaceae					
196.	4675	*Phyllanthus calycinus (False Boronia)*			
Phytolaccaceae					
197.	2793	*Phytolacca octandra (Red Ink Plant)*	Y		
Pinaceae					
198.	17671	*Pinus halepensis*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
			Y		
199.	88	*Pinus radiata (Radiata Pine)*	Y		
Plantaginaceae					
200.	7304	*Plantago major (Greater Plantain)*	Y		
201.	7108	*Veronica arvensis (Wall Speedwell)*	Y		
Poaceae					
202.	184	*Aira caryophyllea (Silvery Hairgrass)*	Y		
203.	17240	*Austrostipa flavescens*			
204.	231	*Avellinia michelii*	Y		
205.	233	*Avena barbata (Bearded Oat)*	Y		
206.	234	*Avena fatua (Wild Oat)*	Y		
207.	244	*Briza maxima (Blowfly Grass)*	Y		
208.	245	*Briza minor (Shivery Grass)*	Y		
209.	249	*Bromus diandrus (Great Brome)*	Y		
210.	250	*Bromus hordeaceus (Soft Brome)*	Y		
211.	41566	*Cenchrus longisetus (Feathertop)*	Y		
212.	41563	*Cenchrus purpureus (Elephant Grass)*	Y		
213.	41568	*Cenchrus setaceus (Fountain Grass)*	Y		
214.	347	*Ehrharta calycina (Perennial Veldt Grass)*	Y		
215.	349	*Ehrharta longiflora (Annual Veldt Grass)*	Y		
216.	351	*Ehrharta villosa (Pyp Grass)*	Y		
217.	20019	*Lachnagrostis filiformis*			
218.	467	*Lagurus ovatus (Hare's Tail Grass)*	Y		
219.	478	*Lolium rigidum (Wimmera Ryegrass)*	Y		
220.	485	*Microlaena stipoides (Weeping Grass)*			
221.	11494	*Phalaris arundinacea var. arundinacea*	Y		
222.	571	*Poa annua (Winter Grass)*	Y		
223.	573	*Poa drummondiana (Knotted Poa)*			
224.	578	*Poa porphyroclados*			
225.	582	*Polypogon monspeliensis (Annual Beardgrass)*	Y		
226.	10970	*Rostraria cristata*	Y		
227.	603	*Secale cereale (Rye)*	Y		
228.	624	*Spinifex hirsutus (Hairy Spinifex)*			
229.	625	*Spinifex longifolius (Beach Spinifex)*			
230.	627	*Spinifex x alterniflorus*			
231.	635	*Sporobolus virginicus (Marine Couch)*			
232.	636	*Stenotaphrum secundatum (Buffalo Grass)*	Y		
233.	724	*Vulpia myuros (Rat's Tail Fescue)*	Y		
Polygalaceae					
234.	4552	*Comesperma confertum*			
235.	4555	*Comesperma integerrimum*			
Polyphysaceae					
236.	48409	*Acetabularia caliculus*			
Pottiaceae					
237.	32390	*Gymnostomum calcareum*			
238.	32437	*Syntrichia antarctica*			
239.	32438	*Syntrichia pagorum*			
240.	32439	*Syntrichia papillosa*			
241.	32450	*Trichostomum eckelianum*			
Primulaceae					
242.	6483	*Samolus junceus*			
243.	6484	*Samolus repens (Creeping Brookweed)*			
Proteaceae					
244.	1819	*Banksia grandis (Bull Banksia, Pulgarla)*			
245.	32077	*Banksia sessilis var. cygnorum*			
246.	2054	*Grevillea olivacea (Olive Grevillea)*		P4	
247.	15839	*Grevillea preissii subsp. preissii*			
248.	2197	*Hakea prostrata (Harsh Hakea)*			
249.	2273	*Persoonia saccata (Snottygobble)*			
250.	20368	*Petrophile axillaris*			
251.	2309	*Petrophile serruriae*			
Racopilaceae					
252.	32480	*Racopilum cuspidigerum var. convolutaceum*			
Ranunculaceae					
253.	10804	*Clematis linearifolia*			
254.	2932	*Ranunculus colonorum (Common Buttercup)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Restionaceae					
255.	16595	*Desmocladus flexuosus*			
256.	1078	*Leptocarpus coangustatus*			
Rhamnaceae					
257.	4802	*Cryptandra mutila*			
258.	4828	*Spyridium globulosum (Basket Bush)*			
259.	11665	*Trymalium ledifolium var. ledifolium*			
Rhodomelaceae					
260.	27002	*Laurencia forsteri*			
Rubiaceae					
261.	17348	*Galium aparine (Goosegrass)*	Y		
262.	7323	*Galium murale (Small Goosegrass)*	Y		
263.	7348	*Opercularia hispidula (Hispid Stinkweed)*			
Rutaceae					
264.	4454	*Diplolaena dampieri (Southern Diplolaena)*			
Santalaceae					
265.	10765	*Exocarpos sparteus (Broom Ballart, Djuk)*			
266.	2356	*Santalum acuminatum (Quandong, Warnga)*			
Sapindaceae					
267.	4763	*Dodonaea hackettiana (Hackett's Hopbush)*		P4	
Scrophulariaceae					
268.	7054	*Dischisma arenarium*	Y		
269.	7215	*Eremophila glabra (Tar Bush)*			
270.	17175	*Eremophila glabra subsp. albicans*			
Solanaceae					
271.	6968	*Lycium ferocissimum (African Boxthorn)*	Y		
272.	6974	*Nicotiana glauca (Tree Tobacco)*	Y		
273.	47240	*Petunia x atkinsiana*	Y		
274.	6984	*Physalis philadelphica (Tomatillo)*	Y		Y
275.	7022	*Solanum nigrum (Black Berry Nightshade)*	Y		
276.	7025	*Solanum oldfieldii*			
277.	7037	*Solanum symonii*			
Stylidiaceae					
278.	7694	*Stylidium bulbiferum (Circus Triggerplant)*			
279.	7785	*Stylidium repens (Matted Triggerplant)*			
Thymelaeaceae					
280.	5237	*Pimelea calcicola*		P3	
281.	18117	*Pimelea rosea subsp. rosea*			
Urticaceae					
282.	1767	*Urtica urens (Small Nettle)*	Y		
Violaceae					
283.	5216	*Hybanthus calycinus (Wild Violet)*			
Vitaceae					
284.	34481	*Parthenocissus quinquefolia*	Y		
Xanthorrhoeaceae					
285.	1256	*Xanthorrhoea preissii (Grass tree, Palga)*			
Zamiaceae					
286.	85	*Macrozamia riedlei (Zamia, Djiridji)*			
Zygophyllaceae					
287.	4383	*Tribulus terrestris (Caltrop)*	Y		

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

Fauna Woodman Point 5km

Created By Guest user on 20/08/2019

Current Names Only Yes
Core Datasets Only Yes
Species Group All Animals
Method 'By Circle'
Centre 115° 45' 45" E,32° 07' 44" S
Buffer 5km
Group By Species Group

Species Group	Species	Records
Amphibian	4	25
Bird	172	6252
Fish	62	100
Invertebrate	52	207
Mammal	11	92
Reptile	35	299
TOTAL	**336**	**6975**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Amphibian					
1.	25410	*Heleioporus eyrei (Moaning Frog)*			
2.	25415	*Limnodynastes dorsalis (Western Banjo Frog)*			
3.	25378	*Litoria adelaidensis (Slender Tree Frog)*			
4.	25388	*Litoria moorei (Motorbike Frog)*			
Bird					
5.	24260	*Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)*			
6.	24261	*Acanthiza chrysorrhoa (Yellow-rumped Thornbill)*			
7.	24262	*Acanthiza inornata (Western Thornbill)*			
8.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			
9.	25536	*Accipiter fasciatus (Brown Goshawk)*			
10.	25755	*Acrocephalus australis (Australian Reed Warbler)*			
11.	41323	*Actitis hypoleucos (Common Sandpiper)*		IA	
12.	24312	*Anas gracilis (Grey Teal)*			
13.	24313	*Anas platyrhynchos (Mallard)*			
14.		*Anas platyrhynchos subsp. domesticus*			
15.	24315	*Anas rhynchotis (Australasian Shoveler)*			
16.	24316	*Anas superciliosa (Pacific Black Duck)*			
17.	47414	*Anhinga novaehollandiae (Australasian Darter)*			
18.	24561	*Anthochaera carunculata (Red Wattlebird)*			
19.	24562	*Anthochaera lunulata (Western Little Wattlebird)*			
20.	24285	*Aquila audax (Wedge-tailed Eagle)*			
21.	41324	*Ardea modesta (great egret, white egret)*			
22.	24341	*Ardea pacifica (White-necked Heron)*			
23.	41326	*Ardenna carneipes (Flesh-footed Shearwater, Fleshy-footed Shearwater)*		T	
24.	48573	*Ardenna pacifica (Wedge-tailed Shearwater)*		IA	
25.	25736	*Arenaria interpres (Ruddy Turnstone)*		IA	
26.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
27.	24353	*Artamus cyanopterus (Dusky Woodswallow)*			
28.	24318	*Aythya australis (Hardhead)*			
29.		*Barnardius zonarius*			
30.	24319	*Biziura lobata (Musk Duck)*			
31.	25714	*Cacatua pastinator (Western Long-billed Corella)*			
32.	25716	*Cacatua sanguinea (Little Corella)*			
33.	24729	*Cacatua tenuirostris (Eastern Long-billed Corella)*	Y		
34.	25598	*Cacomantis flabelliformis (Fan-tailed Cuckoo)*			
35.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
36.	24780	*Calidris alba (Sanderling)*		IA	
37.	25738	*Calidris canutus (Red Knot, knot)*		IA	
38.	24784	*Calidris ferruginea (Curlew Sandpiper)*		T	
39.	24788	*Calidris ruficollis (Red-necked Stint)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
				IA	
40.	24790	*Calidris tenuirostris (Great Knot)*		T	
41.	25717	*Calyptorhynchus banksii (Red-tailed Black-Cockatoo)*			
42.	24731	*Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black Cockatoo)*		T	
43.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)*		T	
44.	48400	*Calyptorhynchus sp. (white-tailed black cockatoo)*		T	
45.	25575	*Charadrius leschenaultii (Greater Sand Plover)*		T	
46.	25576	*Charadrius mongolus (Lesser Sand Plover)*		T	
47.	24377	*Charadrius ruficapillus (Red-capped Plover)*			
48.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
49.		*Chroicocephalus novaehollandiae*			
50.	24432	*Chrysococcyx lucidus subsp. plagosus (Shining Bronze Cuckoo)*			
51.	24288	*Circus approximans (Swamp Harrier)*			
52.	24774	*Cladorhynchus leucocephalus (Banded Stilt)*			
53.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
54.	24399	*Columba livia (Domestic Pigeon)*	Y		
55.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
56.	24416	*Corvus bennetti (Little Crow)*			
57.	25592	*Corvus coronoides (Australian Raven)*			
58.	24417	*Corvus coronoides subsp. perplexus (Australian Raven)*			
59.	24671	*Coturnix pectoralis (Stubble Quail)*			
60.	25701	*Coturnix ypsilophora (Brown Quail)*			
61.	24420	*Cracticus nigrogularis (Pied Butcherbird)*			
62.	25595	*Cracticus tibicen (Australian Magpie)*			
63.	25596	*Cracticus torquatus (Grey Butcherbird)*			
64.	24322	*Cygnus atratus (Black Swan)*			
65.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*	Y		
66.	25673	*Daphoenositta chrysoptera (Varied Sittella)*			
67.	24687	*Daption capense (Cape Petrel)*			
68.	25607	*Dicaeum hirundinaceum (Mistletoebird)*			
69.	30836	*Diomedea exulans subsp. exulans (Snowy Albatross)*		T	
70.		*Egretta garzetta*			
71.		*Egretta novaehollandiae*			
72.		*Elanus axillaris*			
73.	47937	*Elseyornis melanops (Black-fronted Dotterel)*			
74.		*Eolophus roseicapillus*			
75.	24379	*Erythrogonys cinctus (Red-kneed Dotterel)*			
76.	25746	*Eudyptula minor (Little Penguin)*			
77.	24818	*Eudyptula minor subsp. novaehollandiae (Little Penguin)*			
78.	25621	*Falco berigora (Brown Falcon)*			
79.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
80.	25623	*Falco longipennis (Australian Hobby)*			
81.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
82.	25727	*Fulica atra (Eurasian Coot)*			
83.	25729	*Gallinula tenebrosa (Dusky Moorhen)*			
84.	24401	*Geopelia cuneata (Diamond Dove)*			
85.	25530	*Gerygone fusca (Western Gerygone)*			
86.	24443	*Grallina cyanoleuca (Magpie-lark)*			
87.	25627	*Haematopus fuliginosus (Sooty Oystercatcher)*			
88.	24487	*Haematopus longirostris (Pied Oystercatcher)*			
89.	24293	*Haliaeetus leucogaster (White-bellied Sea-Eagle)*			
90.	24295	*Haliastur sphenurus (Whistling Kite)*			
91.	47965	*Hieraaetus morphnoides (Little Eagle)*			
92.	25734	*Himantopus himantopus (Black-winged Stilt)*			
93.	24491	*Hirundo neoxena (Welcome Swallow)*			
94.	48587	*Hydroprogne caspia (Caspian Tern)*		IA	
95.	25638	*Larus pacificus (Pacific Gull)*			
96.	25661	*Lichmera indistincta (Brown Honeyeater)*			
97.	30932	*Limosa lapponica (Bar-tailed Godwit)*		IA	
98.	24690	*Macronectes giganteus (Southern Giant Petrel)*		IA	
99.	24691	*Macronectes halli (Northern Giant Petrel)*		IA	
100.	24326	*Malacorhynchus membranaceus (Pink-eared Duck)*			
101.	25654	*Malurus splendens (Splendid Fairy-wren)*			
102.	24598	*Merops ornatus (Rainbow Bee-eater)*			
103.		*Microcarbo melanoleucos*			
104.	48008	*Morus serrator (Australasian Gannet)*			
105.	24738	*Neophema elegans (Elegant Parrot)*			
106.	24739	*Neophema petrophila (Rock Parrot)*			
107.	24798	*Numenius madagascariensis (Eastern Curlew)*		T	

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
108.	25742	*Numenius phaeopus (Whimbrel)*		IA	
109.	25564	*Nycticorax caledonicus (Rufous Night Heron)*			
110.	24497	*Oceanites oceanicus (Wilson's Storm-petrel)*		IA	
111.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
112.	41347	*Onychoprion anaethetus (Bridled Tern)*		IA	
113.	24328	*Oxyura australis (Blue-billed Duck)*		P4	
114.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
115.	25707	*Pachyptila salvini (Salvin's Prion)*			
116.	24696	*Pachyptila turtur (Fairy Prion)*			
117.	48591	*Pandion cristatus (Osprey, Eastern Osprey)*		IA	
118.	25681	*Pardalotus punctatus (Spotted Pardalote)*			
119.	25682	*Pardalotus striatus (Striated Pardalote)*			
120.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
121.	48060	*Petrochelidon ariel (Fairy Martin)*			
122.	48061	*Petrochelidon nigricans (Tree Martin)*			
123.	48066	*Petroica boodang (Scarlet Robin)*			
124.	25697	*Phalacrocorax carbo (Great Cormorant)*			
125.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
126.	25699	*Phalacrocorax varius (Pied Cormorant)*			
127.	24409	*Phaps chalcoptera (Common Bronzewing)*			
128.	25587	*Phaps elegans (Brush Bronzewing)*			
129.	48071	*Phylidonyris niger (White-cheeked Honeyeater)*			
130.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			
131.	24841	*Platalea flavipes (Yellow-billed Spoonbill)*			
132.	25720	*Platycercus icterotis (Western Rosella)*			
133.	25721	*Platycercus zonarius (Australian Ringneck, Ring-necked Parrot)*			
134.	24382	*Pluvialis fulva (Pacific Golden Plover)*		IA	
135.	24383	*Pluvialis squatarola (Grey Plover)*		IA	
136.	25704	*Podiceps cristatus (Great Crested Grebe)*			
137.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
138.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
139.	24771	*Porzana tabuensis (Spotless Crake)*			
140.	25711	*Pterodroma mollis (Soft-plumaged Petrel)*			
141.	24711	*Puffinus assimilis subsp. assimilis (Little Shearwater)*			
142.		*Purpureicephalus spurius*			
143.	24776	*Recurvirostra novaehollandiae (Red-necked Avocet)*			
144.	48096	*Rhipidura albiscapa (Grey Fantail)*			
145.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
146.	25534	*Sericornis frontalis (White-browed Scrubwren)*			
147.	24279	*Sericornis frontalis subsp. maculatus (White-browed Scrubwren)*			
148.	30948	*Smicrornis brevirostris (Weebill)*			
149.	48116	*Stercorarius antarcticus (Brown Skua)*		P4	
150.	24517	*Stercorarius parasiticus (Arctic jaeger, Arctic Skua)*		IA	
151.	24518	*Stercorarius pomarinus (Pomarine Jaeger, Pomarine Skua)*		IA	
152.	25640	*Sterna dougallii (Roseate Tern)*		IA	
153.	25642	*Sterna hirundo (Common Tern)*		IA	
154.	24526	*Sterna hirundo subsp. hirundo (Common Tern)*		IA	Y
155.	48593	*Sternula albifrons (Little Tern)*		IA	
156.	48594	*Sternula nereis (Fairy Tern)*			
157.	25589	*Streptopelia chinensis (Spotted Turtle-Dove)*	Y		
158.	25590	*Streptopelia senegalensis (Laughing Turtle-Dove)*	Y		
159.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
160.	24331	*Tadorna tadornoides (Australian Shelduck, Mountain Duck)*			
161.	44607	*Thalassarche melanophris (Black-browed Albatross)*		T	
162.	48597	*Thalasseus bergii (Crested Tern)*		IA	
163.	48135	*Thinornis rubricollis (Hooded Plover, Hooded Dotterel)*		P4	
164.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
165.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
166.	25723	*Trichoglossus haematodus (Rainbow Lorikeet)*			
167.	24754	*Trichoglossus haematodus subsp. rubritorquis (Red-collared Lorikeet)*			
168.	24803	*Tringa brevipes (Grey-tailed Tattler)*		P4	
169.	24808	*Tringa nebularia (Common Greenshank, greenshank)*		IA	
170.	24809	*Tringa stagnatilis (Marsh Sandpiper, little greenshank)*		IA	
171.	48147	*Turnix varius (Painted Button-quail)*			
172.	24851	*Turnix velox (Little Button-quail)*			
173.	24855	*Tyto novaehollandiae subsp. novaehollandiae (Masked Owl (southwest))*		P3	
174.	24386	*Vanellus tricolor (Banded Lapwing)*			
175.	41351	*Xenus cinereus (Terek Sandpiper)*		IA	
176.	25765	*Zosterops lateralis (Grey-breasted White-eye, Silvereye)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Fish					
177.		*? ?*			
178.		*Acanthaluteres brownii*			
179.		*Acanthaluteres spilomelanurus*			
180.		*Acanthaluteres vittiger*			
181.		*Afurcagobius suppositus*			
182.		*Anoplocapros lenticularis*			
183.		*Anoplocapros robustus*			
184.		*Aploactisoma milesii*			
185.		*Apogon rueppellii*			
186.		*Apogon victoriae*			
187.		*Aracana aurita*			
188.		*Arripis georgiana*			
189.		*Callogobius mucosus*			
190.	34031	*Carcharodon carcharias (Great White Shark)*		T	
191.		*Cleidopus gloriamaris*			
192.		*Cochleoceps spatula*			
193.		*Colurodontis paxmani*			
194.		*Contusus brevicaudus*			
195.		*Cristiceps australis*			
196.		*Cristiceps sp.*			
197.		*Dactylopus dactylopus*			
198.		*Diodon nicthemerus*			
199.		*Elops hawaiensis*			
200.		*Epinephelus sp.*			
201.		*Fistularia petimba*			
202.		*Girella zebra*			
203.		*Gonorynchus greyi*			
204.		*Gymnapistes marmoratus*			
205.		*Haletta semifasciata*			
206.		*Heteroclinus adelaidae*			
207.		*Hippocampus elongatus*			
208.		*Histiogamphelus cristatus*			
209.		*Histrio histrio*			
210.		*Hypnos monopterygium*			
211.		*Ichthyscopus barbatus*			
212.		*Idiotropiscis australe?*			
213.		*Maxillicosta scabriceps*			
214.		*Meuschenia flavolineata*			
215.		*Meuschenia freycineti*			
216.		*Meuschenia hippocrepis*			
217.		*Microcanthus strigatus*			
218.		*Paraploactis intonsa*			
219.		*Perryena leucometopon*			
220.		*Petroscirtes breviceps*			
221.		*Phyllophryne sp.*			
222.		*Platax teira*			
223.		*Platycephalus sp.*			
224.		*Plotosus lineatus*			
225.		*Pomatomus saltatrix*			
226.		*Pterois antennata*			
227.		*Pterygotrigla polyommata*			
228.		*Rhycherus gloveri*			
229.		*Scobinichthys granulatus*			
230.		*Scorpaena papillosa*			
231.		*Scorpis georgianus*			
232.		*Siganus fuscescens*			
233.		*Sillago sp.*			
234.		*Siphamia cuneiceps*			
235.		*Solegnathus lettiensis*			
236.		*Stigmatopora argus*			
237.		*Strongylura leiura*			
238.		*Torquigener pleurogramma*			
Invertebrate					
239.		*Aname mainae*			
240.		*Anoplodactylus pycnosoma*			Y
241.		*Araneus senicaudatus*			
242.		*Argiope trifasciata*			
243.		*Artema atlanta*			
244.		*Artoria linnaei*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
245.		*Artoria taeniifera*			
246.		*Austracantha minax*			
247.		*Badumna insignis*			
248.		*Cercophonius sulcatus*			
249.		*Cherax destructor*			
250.		*Cherax sp.*			
251.		*Cormocephalus aurantiipes*			
252.		*Cryptoerithus quobba*			
253.		*Cyclosa trilobata*			
254.		*Delena cancerides*			
255.		*Dingosa serrata*			
256.		*Eriophora biapicata*			
257.		*Ero aphana*			
258.		*Erythracarus decoris*			
259.		*Geogarypus taylori*			
260.		*Hasarius adansoni*			
261.		*Holasteron aspinosum*			
262.		*Idiommata blackwalli*			
263.	48935	*Idiosoma sigillatum (Swan Coastal Plain shield-backed trapdoor spider)*		P3	
264.		*Isopeda leishmanni*			
265.		*Lampona brevipes*			
266.		*Lampona cylindrata*			
267.		*Latrodectus hasseltii*			
268.		*Longepi woodman*			
269.		*Lycosa australicola*			
270.		*Lycosa lacertosa*			
271.		*Maratus pavonis*			
272.		*Missulena granulosa*			
273.		*Mituliodon tarantulinus*			
274.		*Molycria vokes*			
275.		*Myandra bicincta*			
276.		*Nephila edulis*			
277.		*Oecobius navus*			
278.		*Phenasteron longiconductor*			
279.		*Pinkfloydia harveii*			
280.		*Pseudolampona woodman*			
281.		*Pycnothea flynni*			
282.		*Raveniella arenacea*			
283.		*Raveniella peckorum*			
284.		*Raveniella subcirrata*			
285.		*Smeringopus natalensis*			
286.		*Supunna funerea*			
287.		*Supunna picta*			
288.		*Venator immansueta*			
289.	34113	*Westralunio carteri (Carter's Freshwater Mussel)*		T	
290.		*Westrarchaea sinuosa*			
Mammal					
291.	47713	*Austronomus australis (White-striped Free-tailed Bat)*			
292.	24072	*Caperea marginata (Pygmy Right Whale)*			
293.	24186	*Chalinolobus gouldii (Gould's Wattled Bat)*			
294.	24041	*Felis catus (Cat)*	Y		
295.	24215	*Hydromys chrysogaster (Water-rat, Rakali)*		P4	
296.	48588	*Isoodon fusciventer (Quenda, southwestern brown bandicoot)*		P4	
297.	24223	*Mus musculus (House Mouse)*	Y		
298.	24042	*Mustela putorius (European Polecat, Ferret)*	Y		
299.	24210	*Neophoca cinerea (Australian Sea-lion)*		T	
300.	24194	*Nyctophilus geoffroyi (Lesser Long-eared Bat)*			
301.	24245	*Rattus rattus (Black Rat)*	Y		
Reptile					
302.	24991	*Aprasia repens (Sand-plain Worm-lizard)*			
303.	42381	*Brachyurophis semifasciatus (Southern Shovel-nosed Snake)*			
304.	25335	*Caretta caretta (Loggerhead Turtle)*		T	
305.	24980	*Christinus marmoratus (Marbled Gecko)*			
306.	30893	*Cryptoblepharus buchananii*			
307.	25027	*Ctenotus australis*			
308.	25039	*Ctenotus fallens*			
309.	25766	*Delma fraseri (Fraser's Legless Lizard)*			
310.	25346	*Dermochelys coriacea (Leatherback Turtle)*		T	
311.	25096	*Egernia kingii (King's Skink)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
312.	25119	*Hemiergis quadrilineata*			
313.	24961	*Heteronotia binoei (Bynoe's Gecko)*			
314.	25366	*Hydrophis elegans (Elegant Seasnake, Bar-bellied Seasnake)*			
315.	42410	*Hydrophis ornatus (Ornate Reef Seasnake, Sea Snake)*			
316.	43384	*Hydrophis platurus (Yellow-bellied Seasnake)*			
317.	25128	*Lerista christinae*			
318.	25133	*Lerista elegans*			
319.	25147	*Lerista lineata (Perth Slider, Lined Skink)*		P3	
320.	25005	*Lialis burtonis*			
321.	25184	*Menetia greyii*			
322.	25191	*Morethia lineoocellata*			
323.	25192	*Morethia obscura*			
324.	25248	*Neelaps bimaculatus (Black-naped Snake)*			
325.	25249	*Neelaps calonotos (Black-striped Snake, black-striped burrowing snake)*		P3	
326.	25510	*Pogona minor (Dwarf Bearded Dragon)*			
327.	24907	*Pogona minor subsp. minor (Dwarf Bearded Dragon)*			
328.	25511	*Pseudonaja affinis (Dugite)*			
329.	25259	*Pseudonaja affinis subsp. affinis (Dugite)*			
330.	25266	*Simoselaps bertholdi (Jan's Banded Snake)*			
331.	25518	*Strophurus spinigerus*			
332.	24942	*Strophurus spinigerus subsp. spinigerus*			
333.	24946	*Strophurus strophurus*			
334.	25203	*Tiliqua occipitalis (Western Bluetongue)*			
335.	25519	*Tiliqua rugosa*			
336.	25207	*Tiliqua rugosa subsp. rugosa*			

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.

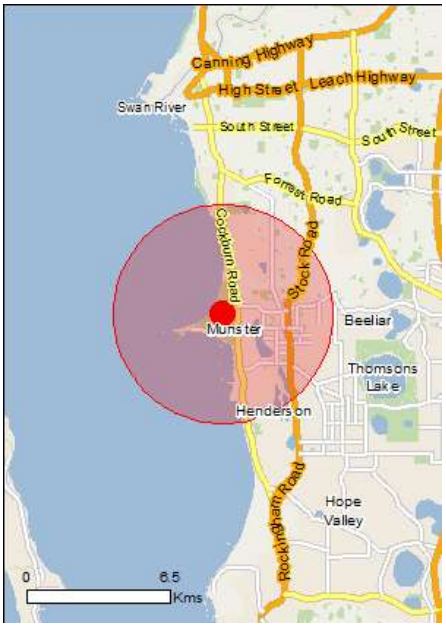
EPBC Act Protected Matters Report

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: 19/08/19 15:43:15



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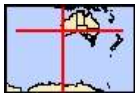

Summary

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:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	48
Listed Migratory Species:	54

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

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:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	84
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	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:	4
Regional Forest Agreements:	None
Invasive Species:	40
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Forrestdale and thomsons lakes	Within 10km of Ramsar

Listed Threatened Ecological Communities [Resource Information]

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.

Name	Status	Type of Presence
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area
Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered	Community likely to occur within area

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
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris tenuirostris Great Knot [862]	Critically 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 known to occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
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 Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, 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
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Status	Type of Presence
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed 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
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat known to occur within area
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat likely to occur within area
Plants		
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat likely to 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, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat likely to occur within area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known

Name	Status	Type of Presence
		to occur within area
Sharks		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may 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		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		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 Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Hydroprogne caspia Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area
Macronectes giganteus Southern Giant-Petrel, 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
Onychoprion anaethetus Bridled Tern [82845]		Foraging, feeding or related behaviour likely to occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Thalassarche carteri		
Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta		
Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed 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*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis		
Southern Right Whale [75529]	Endangered*	Breeding known to occur within area
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata		
Pygmy Right Whale [39]		Species or species habitat may occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Lamna nasus		
Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta alfredi		
Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		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
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Name	Threatened	Type of Presence
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur

Name	Threatened	Type of Presence within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat 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 -

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]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely 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]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris alba Sanderling [875]		Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat 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 Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Species or species habitat known to occur within area
Larus pacificus Pacific Gull [811]		Foraging, feeding or related behaviour may

Name	Threatened	Type of Presence
		occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, 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
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Puffinus assimilis Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna anaethetus Bridled Tern [814]		Foraging, feeding or related behaviour likely to occur within area
Sterna caspia Caspian Tern [59467]		Foraging, feeding or related behaviour known to occur within area

Name	Threatened	Type of Presence
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed 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*	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat known to occur within area
Fish		
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Hippocampus subelongatus West Australian Seahorse [66722]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus fatiloquus Prophet's Pipefish [66250]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys meraculus Western Crested Pipefish [66259]		Species or species habitat may occur within area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known

Name	Threatened	Type of Presence
		to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Unnamed WA39584	WA
Unnamed WA39752	WA
Unnamed WA42469	WA
Unnamed WA49220	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 within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur 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

Name	Status	Type of Presence
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 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 habitat likely to occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species 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

Name	Status	Type of Presence 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
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

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.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

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

-32.12873 115.76212

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:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian 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, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-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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Appendix D – Flora and fauna results

Flora recorded within the survey area

Flora likelihood of occurrence assessment

Fauna recorded within the survey area

Fauna likelihood of occurrence assessment

Flora species recorded in the survey area during the spring 2019 survey

Family	Genus	Species	Status
Aizoaceae	*Carpobrotus*	*edulis*	*
Anacardiaceae	*Schinus*	*terebinthifolia*	*
Asparagaceae	*Acanthocarpus*	*preissii*	
Asparagaceae	*Asparagus*	*asparagoides*	*DP
Asphodelaceae	*Trachyandra*	*divaricata*	*
Asteraceae	*Hypochaeris*	*radicata*	*
Asteraceae	*Osteospermum*	*ecklonis*	*
Asteraceae	*Senecio*	*condylus*	
Asteraceae	*Senecio*	*vulgaris*	*
Asteraceae	*Sonchus*	*oleraceus*	*
Brassicaceae	*Brassica*	*tournefortii*	*
Caryophyllaceae	*Minuartia*	*mediterranea*	*
Caryophyllaceae	*Spergularia*	*marina*	
Chenopodiaceae	*Rhagodia*	*baccata*	
Cupressaceae	*Callitris*	*preissii*	
Cyperaceae	*Lepidosperma*	*costale*	
Cyperaceae	*Schoenus*	*grandiflorus*	
Ericaceae	*Leucopogon*	*insularis*	
Ericaceae	*Leucopogon*	*parviflorus*	
Euphorbiaceae	*Euphorbia*	*peplus*	*
Euphorbiaceae	*Euphorbia*	*terracina*	*
Fabaceae	*Acacia*	*cochlearis*	
Fabaceae	*Acacia*	*rostellifera*	
Fabaceae	*Acacia*	*saligna*	
Fabaceae	*Hardenbergia*	*comptoniana*	
Fabaceae	*Lupinus*	*angustifolius*	*
Geraniaceae	*Geranium*	*molle*	*
Geraniaceae	*Pelargonium*	*capitatum*	*
Haemodoraceae	*Conostylis*	*candicans* subsp. *calcicola*	
Hemerocallidaceae	*Dianella*	*revoluta* var. *divaricata*	
Lamiaceae	*Hemiandra*	*pungens*	
Lauraceae	*Cassytha*	*racemosa*	
Myrtaceae	*Agonis*	*flexuosa*	Planted
Myrtaceae	*Eucalyptus*	*gomphocephala*	
Myrtaceae	*Eucalyptus*	sp.	*Planted
Myrtaceae	*Eucalyptus*	sp.	*Planted
Myrtaceae	*Leptospermum*	*laevigatum*	*
Myrtaceae	*Melaleuca*	*huegelii*	
Myrtaceae	*Melaleuca*	*systena*	
Orchidaceae	*Caladenia*	*latifolia*	
Papaveraceae	*Fumaria*	*capreolata*	*
Papaveraceae	*Fumaria*	*muralis*	*
Phyllanthaceae	*Phyllanthus*	*calycinus*	
Poaceae	*Austrostipa*	*elegantissima*	

Family	Genus	Species	Status
Poaceae	*Avena*	*barbata*	*
Poaceae	*Avena*	*fatua*	*
Poaceae	*Briza*	*maxima*	*
Poaceae	*Bromus*	*diandrus*	*
Poaceae	*Cenchrus*	*setaceus*	*
Poaceae	*Lagurus*	*ovatus*	*
Poaceae	*Pennisetum*	*setaceum*	*
Primulaceae	*Lysimachia*	*arvensis*	*
Proteaceae	*Adenanthos*	*sericeus*	Planted
Proteaceae	*Grevillea*	*preissii*	
Proteaceae	*Grevillea*	*preissii*	
Proteaceae	*Grevillea*	sp.	Planted
Ranunculaceae	*Clematis*	*linearifolia*	
Rhamnaceae	*Spyridium*	*globulosum*	
Rutaceae	*Diplolaena*	*dampieri*	
Santalaceae	*Exocarpos*	*sparteus*	
Santalaceae	*Santalum*	*acuminatum*	
Scrophulariaceae	*Eremophila*	*glabra*	

Quadrat species data

Quadrat	Taxa	Cover	height
Q1	*Acacia rostellifera*	70-100	4
Q1	*Clematis linearifolia*	10-30	climber
Q1	**Asparagus asparagoides*	<10	climber
Q1	**Fumaria capreolata*	<10	0.5
Q1	**Fumaria muralis*	<10	0.4
Q1	**Trachyandra divaricata*	<2	0.4
Q1	*Spergularia marina*	<2 numerous	0.03
Q1	**Oxalis pes-caprae*	10-30	0.4
Q1	*Santalum acuminatum*	<10	2.1
Q1	**Sonchus oleraceus*	<2 numerous	0.5
Q1	*Austrostipa elegantissima*	<2	1.1
Q1	**Avena barbata*	30-70	0.7
Q1	**Euphorbia peplus*	<10	0.3
Q1	*Rhagodia baccata*	<10	1.2
Q1	**Lagurus ovatus*	<2 numerous	0.3
Q1	**Euphorbia terracina*	<2 numerous	0.3
Q1	*Acacia saligna*	<2	2.4
Q2	*Acacia rostellifera*	70-100	4
Q2	*Clematis linearifolia*	10-30	climber
Q2	**Asparagus asparagaceae*	10-30	climber
Q2	**Avena barbata*	30-70	0.4
Q2	*Spyridium globulosum*	<10	2.8
Q2	**Oxalis pes-caprae*	<10	0.3
Q2	*Austrostipa elegantissima*	<2	1
Q2	**Euphorbia peplus*	<10	0.2
Q2	*Spergularia marina*	<2 numerous	0.03
Q2	**Euphorbia terracina*	<2 numerous	1
Q2	**Fumaria capreolata*	<2	0.3
Q2	**Minuartia mediterranea*	<2 numerous	0.03
Q3	*Eucalyptus gomphocephala*	10-30	8
Q3	**Leptospermum laevigatum*	10-30	3.5
Q3	*Melaleuca systena*	30-70	1.6
Q3	*Spyridium globulosum*	10-30	2.3
Q3	*Rhagodia baccata*	<2	1.1
Q3	*Leucopogon parviflorus*	<10	1.4
Q3	*Acanthocarpus preissii*	10-30	1.2
Q3	**Asparagus asparagaceae*	10-30	climber
Q3	**Fumaria muralis*	<10	0.4
Q3	**Lagurus ovatus*	<2 numerous	0.4
Q3	**Sonchus oleraceus*	<2 numerous	0.3
Q3	**Pelargonium capitatum*	<10	0.5
Q3	**Avena barbata*	10-30	0.4
Q3	**Briza maxima*	<2	0.4
Q3	*Schoenus grandiflorus*	<10	0.5

Quadrat	Taxa	Cover	height
Q3	**Euphorbia terracina*	<2	0.4
Q3	*Hardenbergia comptoniana*	<2	climber
Q3	**Poaceae sp.*	10-30	0.3
Q3	*Austrostipa elegantissima*	<10	1.2
Q3	*Clematis linearifolia*	<10	climber
Q3	**Minuartia mediterranea*	<2 numerous	0.03
Q3	*Spergularia marina*	<2 numerous	0.05
Q3	*Cassytha racemosa*	<2	climber
Q3	*Lepidosperma costale*	<2	0.5
Q3	*Dianella revoluta*	<2	0.8
Q3	**Cenchrus setaceus*	<2	0.6
Q3	**Lysimachia arvensis*	<2	0.5
Q3	*Diplolaena dampieri*	<2	1.5
Q3	**Schinus terebinthifolia*	<2	1.2
Q3	**Euphorbia peplus*	<2 numerous	0.2
Q4	*Spyridium globulosum*	<10	2.2
Q4	*Eucalyptus gomphocephala*	<10	8
Q4	**Leptospermum laevigatum*	10-30	3
Q4	*Melaleuca systena*	10-30	2
Q4	**Asparagus asparagaceae*	10-30	climber
Q4	*Schoenus grandiflorus*	<2	0.4
Q4	*Austrostipa elegantissima*	<10	1.3
Q4	**Lagurus ovatus*	<10	0.4
Q4	**Bromus diandrus*	10-30	0.4
Q4	**Euphorbia peplus*	<2 numerous	0.2
Q4	*Cassytha racemosa*	<2	climber
Q4	*Leucopogon parviflorus*	<10	1.2
Q4	**Minuartia mediterranea*	<2 numerous	0.05
Q4	*Spergularia marina*	<2 numerous	0.05
Q4	*Hardenbergia comptoniana*	<10	climber
Q4	**Avena barbata*	30-70	0.6
Q4	**Sonchus oleraceus*	<2 numerous	0.2
Q4	*Hemiandra pungens*	<10	1
Q4	**Euphorbia terracina*	<2	0.6
Q4	**Pelargonium capitatum*	<2	0.5
Q4	**Oxalis pes-caprae*	<2	0.3
Q4	**Cenchrus setaceus*	<2	0.4
Q4	*Conostylis candicans subsp. calcicola*	<2	0.5
Q4	*Acanthocarpus preissii*	<2	0.5
Q4	**Trachyandra divaricata*	<2	0.4
Q4	*Lepidosperma costale*	<2	0.4
Q5	*Acacia rostellifera*	30-70	4
Q5	**Schinus terebinthifolia*	<10	2.7
Q5	*Melaleuca huegelii*	<10	2.4
Q5	*Spyridium globulosum*	10-30	2.2

Quadrat	Taxa	Cover	height
Q5	**Asparagus asparagaceae*	30-70	climber
Q5	**Oxalis pes-caprae*	30-70	0.2
Q5	**Bromus diandrus*	10-30	0.2
Q5	**Euphorbia terracina*	<10	0.3
Q5	**Avena barbata*	10-30	0.3
Q5	**Sonchus oleraceus*	<2 numerous	0.2
Q5	**Leptospermum laevigatum*	30-70	4
Q5	*Caladenia latifolia*	<2	0.4
Q5	**Euphorbia peplus*	<2 numerous	0.1
Q5	*Eucalyptus gomphocephala*	<2	2.1
Q5	**Lagurus ovatus*	<2	0.3
Q5	**Fumaria muralis*	<2	0.3
Q5	*Austrostipa elegantissima*	<2	1.2
R1	*Acanthocarpus preissii*	2-10	0.7
R1	*Acacia cochlearis*	<2	1.8
R1	*Spyridium globulosum*	<2	2
R1	**Cenchrus setaceus*	30-70	1
R1	**Euphorbia terracina*	<2	0.5
R1	**Pelargonium capitatum*	<10	0.5
R1	*Dianella revoluta*	<2	0.8
R1	*Schoenus grandiflorus*	<10	0.7
R1	**Brassica tournefortii*	<2	0.5
R1	**Bromus diandrus*	<2	0.4
R1	**Avena barbata*	<2	0.4
R1	*Austrostipa elegantissima*	<2	1
R1	**Oxalis pes-caprae*	<2	0.1
R1	**Lagurus ovatus*	<2	0.2
R1	**Leptospermum laevigatum*	<2	2
R1	*Hardenbergia comptoniana*	<2	climber
R1	*Leucopogon insularis*	<2	1
R2	*Eucalyptus gomphocephala*	<10	7
R2	*Acacia saligna*	<2	2
R2	*Acacia cochlearis*	<2	1.2
R2	*Acanthocarpus preissii*	<10	1
R2	*Spyridium globulosum*	<10	2
R2	*Callitris preissii*	<2	4
R2	**Leptospermum laevigatum*	1.6	3
R2	**Pelargonium capitatum*	<10	0.6
R2	*Schoenus grandiflorus*	<10	0.9
R2	*Conostylis candicans subsp. calcicola*	<2	0.6
R2	**Cenchrus setaceus*	10-30	0.8
R2	**Bromus diandrus*	<10	0.3
R2	**Avena barbata*	<10	0.3
R2	**Lagurus ovatus*	<2 numerous	0.2
R2	*Melaleuca huegelii*	<2	1.6

Quadrat	Taxa	Cover	height
R2	*Eremophila glabra*	<2	1.3
R2	**Lysimachia arvensis*	<2 numerous	0.05

Quadrat/Releve Photographs

Quadrat 1 – *Acacia* closed shrubland (VT01)

Quadrat 2 - *Acacia* closed shrubland (VT01)

Quadrat 3 – *Melaleuca* shrubland (VT02)

Quadrat 4 – *Melaleuca* shrubland (VT02)

Quadrat 5 – *Acacia* closed shrubland (VT01)

Releve 1 – **Cenchrus* grassland (VT03)

Releve 2 – Revegetation (VT04)

Planted vegetation (VT05)

Flora likelihood of occurrence assessment guidelines

Likelihood of occurrence	Guideline
Known	Species recorded within study area from field project results (none as this is a desktop search only).
Likely	Species previously recorded within 2 km and large areas of suitable habitat occur in the project area.
Possible	Species previously recorded within 10 km and areas of suitable habitat occur/may occur in the project area.
Unlikely	Species previously recorded within 20 km, or suitable habitat does not occur in the project area.
Highly unlikely	Species not previously recorded within 20 km, suitable habitat does not occur in the project area and/or the project area is outside the natural distribution of the species.
Other considerations	Date of known records, cryptic nature of species, anecdotal evidence from previous Broome studies/surveys

Definitions

Term	Description
Study area	A 5 km buffer around the survey area
Survey area	The potential project footprint
Cr	Critically endangered
En	Endangered
T	Threatened
Vu	Vulnerable
P1 – P4	Priority 1 – Priority 4
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999
DBCA	Department of Biodiversity and Conservation Attractions 2018. WA Government, Department of Parks and Wildlife Threatened (Declared Rare) and Priority Flora List
BC Act	Biodiversity Conservation Act 2016

Flora likelihood of occurrence assessment of conservation significant flora identified in the desktop assessment as potentially occurring within the survey area.

Taxa	Common Name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		EPBC Act	BC Act/ DBCA	PMST	NM	DBCA		
Acacia lasiocarpa var. bracteolata			P1			X	Shrub, 0.4-1.5 m high. Flowers yellow in May or August. Grey or black sand over clay. Occurs in	Unlikely No suitable habitat considered at the survey area.

Taxa	Common Name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		EPBC Act	BC Act/ DBCA	PMST	NM	DBCA		
							swampy areas, winter wet lowlands.	
Austrostipa mundula	-		P3		X	X	Fine clumping grass to 0.5 m. Known to occur on shallow grey sand over limestone on moderate slopes. Limestone ridges.	Unlikely Closest available record located approximately 7 km south of the survey area.
Caladenia huegelii	King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid	EN	T	X		X	Tuberous, perennial, herb, 0.25-0.6 m high. Flowers green & cream & red, Sep to Oct. Grey or brown sand, clay loam.	Unlikely No suitable habitat considered at the survey area
Dampiera triloba			P3			X	Erect perennial, herb or shrub, to 0.5 m high. Flowers blue, August to December.	Unlikely Closest available records are located over 8 km north and north-east of the survey area.
Diuris drummondii	Tall Donkey Orchid	VU	T			X	Tuberous, perennial, herb, 0.5-1.05 m high. Flowers yellow, November to December or January. Low-lying depressions, swamps.	Unlikely No suitable habitat considered at the survey area
Diuris micrantha	Dwarf Bee-orchid	VU	T	X			Tuberous, perennial, herb, 0.3-0.6 m high. Flowers yellow & brown, Sep to Oct. Brown loamy clay. Winter-wet swamps, in shallow water.	Unlikely No suitable habitat considered at the survey area
Diuris purdiei	Purdie's Donkey-orchid	EN	T	X			Tuberous, perennial, herb, 0.15-0.35 m high. Flowers yellow, Sep to Oct. Grey-black sand, moist. Winter-wet swamps.	Unlikely No suitable habitat considered at the survey area
Dodonaea hackettiana	Hackett's Hopbush		P4		X	X	Erect shrub or tree, 1-5 m high. Flowers yellow-green/red, mainly July to October. Sand. Outcropping limestone.	Unlikely This species is known from the local area with the closest known record approximately 500 m south of the survey area.

Taxa	Common Name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		EPBC Act	BC Act/ DBCA	PMST	NM	DBCA		
								This species is distinctive and would not likely to have been overlooked within the survey area given the survey intensity.
Drakaea elastica	Glossy-leafed Hammer Orchid, Warty Hammer Orchid	EN	T	X			Tuberous, perennial, herb, 0.12-0.3 m high. Flowers red & green & yellow, Oct to Nov. White or grey sand. Low-lying situations adjoining winter-wet swamps.	Unlikely No suitable habitat considered at the survey area
Drakaea micrantha	Dwarf Hammer-orchid	VU	T	X			Tuberous, perennial, herb, 0.15-0.3 m high. Flowers red and yellow, September to October. White-grey sand.	Unlikely The closest known records are more than 13 km east of the survey area.
Grevillea olivacea			P4		X	X	Erect, non-lignotuberous shrub, 1-4.5 m high. Flowers red/pink, June to September. White-grey sand. Coastal dunes, limestone rocks.	Unlikely There is one record of this species from the Woodman Point area. This species is distinctive and would not likely to have been overlooked within the survey area given the survey intensity.
Hibbertia spicata subsp. *leptotheca*	-		P3		X	X	Erect or spreading shrub, 0.2-0.5 m high. Flowers yellow, Jul to Oct. Sand. Near-coastal limestone ridges, outcrops & cliffs.	Unlikely No suitable habitat considered at the survey area.
Jacksonia sericea	Waldjumi		P4		X		Low spreading shrub, to 0.6 m high. Flowers orange, usually Dec or Jan to Feb. Calcareous & sandy soils.	Unlikely Suitable habitat may be present however not observed during the survey.
Microtis quadrata	-		P4			X	Erect herb with tuber, 40 cm high. Cream/greenish flowers. Grey sand, shallow clay, sandy clay loam, swamp.	Unlikely No suitable habitat considered at the survey area.

Taxa	Common Name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		EPBC Act	BC Act/ DBCA	PMST	NM	DBCA		
Phlebocarya pilosissima subsp. pilossissima	-		P3		X	X	Shortly rhizomatous, compactly tufted perennial, grass-like or herb, 0.15-0.4 m high. Flowers cream-white, August to October. White or grey sand, lateritic gravel.	Unlikely No suitable habitat considered at the survey area.
Pimelea calcicola	-		P3		X	X	Erect to spreading shrub, 0.2-1 m high. Flowers pink, Sep to Nov. Sand. Coastal limestone ridges.	Unlikely No suitable habitat considered at the survey area.
Stylidium longitubum			P4			X	Erect annual (ephemeral) herb, 0.05-0.12 m high. Flowers pink October-December. Sandy clay, clay. Seasonal Wetlands.	Unlikely. No suitable habitat considered at the survey area.
Stylidium paludicola			P3			X	Reed-like perennial herb 0.35-1 m high. Flowers pink, October to December. Occurs on peaty sand over clay. Winter wet habitats. Marri and *Melaleuca* woodland, *Melaleuca* shrubland.	Unlikely. No suitable habitat considered at the survey area.
Styphelia filifolia			P3			X	Shrub up to 70 cm tall. Flat sandplain, yellow sand and grey sand. Banksia woodland.	Unlikely. No suitable habitat considered at the survey area.
Thelymitra variegata			P2			X	Tuberous, perennial, herb, 0.1-0.35 m high. Flowers orange and red and purple and pink, June to September. Occurs on sandy clay, sand, laterite.	Unlikely. No suitable habitat considered at the survey area.

Fauna recorded within the survey area during the spring 2019 survey

Family	Taxon	Common name	Status
Birds			
Acanthizidae	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill	
Acanthizidae	*Gerygone fusca*	Western Gerygone	
Acanthizidae	*Smicrornis brevirostris*	Weebill	
Artamidae	*Cracticus tiibicen dorsalis*	Australian Magpie	
Cacatuidae	*Calyptorhynchus latirostris*	Carnaby's Cockatoo	En
Cacatuidae	*Eolophus roseicapilla*	Galah	
Columbidae	*Phaps chalcoptera*	Common Bronzewing	
Columbidae	*Streptopelia senegalensis*	Laughing Dove	*
Corvidae	*Corvus coronoides perplexus*	Australian Raven	
Falconidae	*Falco longipennis*	Hobby Falcon	
Maluridae	*Malurus splendens*	Splendid Fairy-wren	
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	
Meliphagidae	*Lichenostomus virescens*	Singing Honeyeater	
Meliphagidae	*Lichmera indistincta*	Brown Honeyeater	
Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater	
Monarchidae	*Grallina cyanoleuca*	Magpie-lark	
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler	
Psittacidae	*Barnadius zonarius*	Australian Ringneck	
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail	
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	
Mammals			
Canidae	*Canis domesticus*	Domestic Dog	*
Leporidae	*Oryctolagus cuniculus*	Rabbit	*
Reptiles			
Scincidae	*Cryptoblepharus buchananii*		
Scincidae	*Menetia greyii*		
Scincidae	*Tiliqua rugosa rugosa*	Bobtail	

Fauna likelihood of occurrence assessment guidelines

Assessment outcome	Description
Present	Species recorded during the field survey or from recent, reliable records from within or close proximity to the project area.
Likely	Species are **likely** to occur in the project area where there is suitable habitat within the survey area and there are recent records of occurrence of the species in close proximity to the project area. OR Species known distribution overlaps with the project area and there is suitable habitat within the project area.
Unlikely	Species assessed as **unlikely** include those species previously recorded within 5 km of the project area however: • There is limited (i.e. the type, quality and quantity of the habitat is generally poor or restricted) habitat in the project area. • The suitable habitat within the project area is isolated from other areas of suitable habitat and the species has no capacity to migrate into the survey area. OR Those species that have a known distribution overlapping with the project area however: • There is limited habitat in the project area (i.e. the type, quality and quantity of the habitat is generally poor or restricted). • The suitable habitat within the project area is isolated from other areas of suitable habitat and the species has no capacity to migrate into the survey area.
Highly unlikely	Species that are considered **highly unlikely** to occur in the project area include: • Those species that have no suitable habitat within the project area. • Those species that have become locally extinct, or are not known to have ever been present in the region of the project area.

Source information - desktop searches

NM – DBCA *NatureMap* (accessed September 2019)

PMST – DEE Protected Matters Search Tool (PMST) to identify fauna listed under the EPBC Act potentially occurring within the study area (accessed August 2019)

Fauna likelihood of occurrence assessment of conservation significant fauna identified in the desktop assessment as potentially occurring within the survey area.

Taxon	Common name	Status		Source		Habitat requirements	Likelihood of occurrence within the survey area
		EPBC Act	BC Act/ DBCA	PMST	NM		
Birds							
Anous tenuirostris subsp. melanops	Australian Lesser Noddy	Vu	En	X	X	The Australian Lesser Noddy is usually found only around its breeding islands in the Houtman Abrolhos Islands in Western Australia. There are also some records north of the breeding islands, for example at the Wallabi Group of islands, in the northern Houtman Abrolhos Islands, on Barrow Island, and at Webb Island. The species usually occupies coral-limestone islands that are densely fringed with White Mangrove *Avicennia marina*. It occasionally occurs on shingle or sandy beaches (Higgins & Davies 1996). The Australian Lesser Noddy roosts mainly in mangroves, especially at night but may sometimes rest on beaches.	**Unlikely** The survey area is not considered to provide suitable habitat to support this species.
Ardenna carneipes	Flesh-footed Shearwater, Fleshy-footed Shearwater	Mi	Vu		X	Mainly occurs in the subtropics over continental shelves and slopes and occasionally inshore waters. Individuals also pass through the tropics and over deeper waters when on migration (Marchant & Higgins 1990).	**Unlikely** The survey area is not considered to provide suitable habitat to support this species.
Arenaria interpres	Ruddy Turnstone	Mi	IA		X	The Ruddy Turnstone is found in most coastal regions with exposed rock coast lines or coral reefs, and also near platforms and shelves, often with shallow tidal pools and rocky, shingle or gravel beaches. It can be found on sand, coral or shell beaches, shoals, cays and dry ridges of sand or coral, and in occasionally near river beds, and on inland lakes and adjacent farmland. It strongly prefers rocky shores or beaches with large deposits of rotting seaweed. It has occasionally been sighted in estuaries, harbours, bays and coastal lagoons, among low saltmarsh or on exposed beds of seagrass, around sewage ponds and on mudflats.	**Unlikely** The survey area does not provide suitable habitat to support this species.

Taxon	Common name	Status		Source		Habitat requirements	Likelihood of occurrence within the survey area
		EPBC Act	BC Act/ DBCA	PMST	NM		
						In south-west Australia, it may occur on pebble-strewn shores of saltlakes near the coast. On Rottnest Island, it prefers shores with scattered fragments of limestone (DotE 2016). It is also common on all the larger islands south to Penguin Island, but is uncommon from Augusta to Cape Arid (Nevill 2013).	
Ardenna pacifica	Wedge-tailed Shearwater	Mi	Mi		X	The Wedge-tailed Shearwater breeds on the east and west coasts of Australia and on off-shore islands. The species is common in the Indian Ocean, the Coral Sea and the Tasman Sea (Lindsey 1986). Areas where breeding occurs include (Lindsey 1986).	**Unlikely** The survey area does not provide suitable habitat to support this species.
Botaurus poiciloptilus	Australasian Bittern	En	En	X		The Australasian Bittern occurs in or over water in tall reedbeds, sedges, rushes, cumbungi, lignum, rice fields, drains in tussocky paddocks, occasionally in saltmarsh and brackish wetlands. It is present in most southern Australian states including the south of WA.	**Highly unlikely** The survey area does not provide suitable habitat to support this species.
Calidris alba	Sanderling	Mi	IA		X	In Australia, the Sanderling is almost always found on the coast, mostly on open sandy beaches exposed to open sea-swell, and also on exposed sandbars and spits, and shingle banks, where they forage in the wave-wash zone and amongst rotting seaweed. Sanderlings also occur on beaches that may contain wave-washed rocky outcrops. Less often the species occurs on more sheltered sandy shorelines of estuaries, inlets and harbours. Rarely, they are recorded in near-coastal wetlands. There are rare inland records from sandy shores of ephemeral brackish lakes and brackish river-pools (DotE 2016). They are moderately common, and can be found every year on Rottnest beaches and salt lakes (Nevill 2013).	**Unlikely** The survey area does not provide suitable habitat to support this species.

Taxon	Common name	Status		Source		Habitat requirements	Likelihood of occurrence within the survey area
		EPBC Act	BC Act/ DBCA	PMST	NM		
Calidris canutus	Red Knot	En	En, IA	X	X	In Australasia the Red Knot mainly inhabits intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. They are occasionally seen on terrestrial saline wetlands near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks, but rarely use freshwater swamps, inland lakes or swamps (DotE 2016). They are found near mudflats and estuaries from Murchison to Bunbury but are then uncommon from Wilson Inlet to Esperance. In the Perth region they are mainly found in Alfred Cove and Peel Inlet (Nevill 2013).	**Unlikely** The survey area does not provide suitable habitat to support this species.
Calidris ferruginea	Curlew Sandpiper	Cr, Mi	Cr	X		Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters (Higgins & Davies 1996). Curlew Sandpipers forage on mudflats and nearby shallow water. They forage at the edges of shallow pools and drains of intertidal mudflats and sandy shores. At high tide, they forage among low sparse emergent vegetation, such as saltmarsh, and sometimes forage in flooded paddocks or inundated saltflats. Curlew Sandpipers generally roost on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons	**Unlikely** The survey area does not provide suitable habitat to support this species.

Taxon	Common name	Status		Source		Habitat requirements	Likelihood of occurrence within the survey area
		EPBC Act	BC Act/ DBCA	PMST	NM		
						and other wetlands, occasionally roosting in dunes during very high tides and sometimes in saltmarsh (Higgins & Davies 1996).	
Calidris ruficollis	Red-necked Stint	Mi	IA		X	In Australasia, the Red-necked Stint is mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores. Occasionally they have been recorded on exposed or ocean beaches, and sometimes on stony or rocky shores, reefs or shoals. They also occur in saltworks and sewage farms; saltmarsh; ephemeral or permanent shallow wetlands near the coast or inland, including lagoons, lakes, swamps, riverbanks, waterholes, bore drains, dams, soaks and pools in saltflats. They sometimes use flooded paddocks or damp grasslands. They have occasionally been recorded on dry gibber plains, with little or no perennial vegetation (Higgins & Davies 1996).	**Unlikely** The survey area does not provide suitable habitat to support this species.
Calidris tenuirostris	Great Knot	Cr	Cr	X	X	In Australasia, the species typically prefers sheltered coastal habitats, with large intertidal mudflats or sandflats. This includes inlets, bays, harbours, estuaries and lagoons. They are occasionally found on exposed reefs or rock platforms, shorelines with mangrove vegetation, ponds in saltworks, at swamps near the coast, saltlakes and non-tidal lagoons. The Great Knot rarely occurs on inland lakes and swamps. Typically, the Great Knot roosts in large groups in open areas, often at the waters edge or in shallow water close to feeding grounds (DSEWPaC 2013).	**Unlikely** The survey area does not provide suitable habitat to support this species.
Calyptorhynchus banksii subsp. *naso*	Forest Red-tailed Black Cockatoo	Vu	Vu	X	X	Forest Red-tailed Black Cockatoo typically occurs in dense Jarrah (*Eucalyptus marginata*), Karri (*E. diversicolor*) and Marri (*Corymbia calophylla*) forests, however the species also occurs in a range	**Likely** The survey area provides suitable feeding habitat for this

Taxon	Common name	Status		Source		Habitat requirements	Likelihood of occurrence within the survey area
		EPBC Act	BC Act/ DBCA	PMST	NM		
						of other forest and woodland types, including Blackbutt (*E. patens*), Wandoo (*E. wandoo*), Tuart (*E. gomphocephala*), Albany Blackbutt, Yate (*E. cornuta*), and Flooded Gum (*E. rudis*) (DSEWPaC, 2012). Habitats also tend to have an understorey of *Banksia* spp., *Persoonia* spp., *Allocasuarina* spp. The Forest red-tailed Black Cockatoo generally nests in hollows in live or dead trees of marri, karri, wandoo, bullich, blackbutt, tuart and jarrah (DSEWPaC 2012).	species. This species is known to occur in the area.
Calyptorhynchus latirostris	Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo	En	En	X	X	This species mainly occurs in uncleared or remnant native eucalypt woodlands and in shrubland or kwongan heathland dominated by Hakea, Dryandra, Banksia and Grevillea species. The species also occurs in forests containing Marri (*Corymbia calophylla*), Jarrah (*Eucalyptus marginata*) or Karri (*E. diversicolor*). Breeding usually occurs in the Wheatbelt region of Western Australia, with flocks moving to the higher rainfall coastal areas to forage after the breeding season. Feeds on the seeds of a variety of native plants, including Allocasuarina, Banksia, Dryandra, Eucalyptus, Grevillea and Hakea, and some introduced plants (DSEWPaC, 2012).	**Present** The survey area provides suitable foraging habitat for this species and potential breeding habitat. Carnaby's Cockatoo were observed feeding on *Callitris preissii* trees during the survey.
Charadrius leschenaultii	Greater Sand Plover, Large Sand Plover	Vu, Mi	Vu	X		In the non-breeding grounds in Australasia, the species is almost entirely coastal, inhabiting littoral and estuarine habitats. They mainly occur on sheltered sandy, shelly or muddy beaches with large intertidal mudflats or sandbanks, as well as sandy estuarine lagoons and inshore reefs, rock platforms, small rocky islands or sand cays on coral reefs. They are occasionally recorded on near-coastal saltworks and saltlakes, including marginal saltmarsh, and on brackish swamps (DotE 2019).	**Unlikely** The survey area does not provide suitable habitat to support this species.

Taxon	Common name	Status		Source		Habitat requirements	Likelihood of occurrence within the survey area
		EPBC Act	BC Act/ DBCA	PMST	NM		
Charadrius mongolus	Lesser Sand Plover, Mongolian Plover	En, Mi	En	X	X	In non-breeding grounds in Australia, the Lesser Sand Plover usually occurs in coastal littoral and estuarine environments. It inhabits large intertidal sandflats or mudflats in sheltered bays, harbours and estuaries, and occasionally sandy ocean beaches, coral reefs, wave-cut rock platforms and rocky outcrops. It also sometimes occurs in short saltmarsh or among mangroves, in saltworks and near-coastal saltpans, brackish swamps and sandy or silt islands in river beds. The species is seldom recorded away from the coast, at margins of lakes, soaks and swamps associated with artesian bores (DotE 2016). The Lesser Sand Plover mainly occurs in northern regions, and becomes more scarce in the south west (Nevill 2013).	**Unlikely** The survey area does not provide suitable habitat to support this species.
Diomedea amsterdamensis	Amsterdam Albatross	En	Cr	X		The Amsterdam Albatross is a marine, pelagic seabird. It nests in open patchy vegetation (among tussocks, ferns or shrubs) near exposed ridges or hillocks. The Amsterdam Albatross is a non-resident visitor to Australia, and may occur in south-west and south Australian waters (DotE 2019).	**Highly unlikely** No suitable habitat is present within the survey area.
Diomedea dabbenena	Tristan Albatross	En, Mi	Cr	X		Tristan albatross is a marine, pelagic seabird. It forages in open water in the Atlantic Ocean near the Cape of Good Hope, South Africa. It sleeps and rests on ocean waters when not breeding (Marchant & Higgins 1990). The at-sea distribution of this species is poorly defined. There is currently only one definitive record of the Tristan Albatross from Australian waters. A bird banded as a chick on Gough Island was recaptured four years later off Wollongong, NSW (DotE 2019). Satellite-tracking of non-breeding birds from Gough Island have tracked the species to waters off the southern coast of Western Australia and South Australia (ACAP 2009).	**Highly unlikely** No suitable habitat is present within the survey area.

Taxon	Common name	Status		Source		Habitat requirements	Likelihood of occurrence within the survey area
		EPBC Act	BC Act/ DBCA	PMST	NM		
Diomedea epomophora	Southern Royal Albatross	Vu, Mi	Vu	X		This species breeds on Campbell Island and Auckland Island (NZ region). When not breeding, distribution is possible circumpolar. They can be found in offshore waters of south Australia and over the continental slope off southeast NSW, west and south Tasmania, Victoria and southeast South Australia. They casually visit southern WA and northern NSW (Pizzey & Knight 2012).	**Highly unlikely** No suitable habitat is present within the survey area.
Diomedea exulans	Wandering Albatross	Vu, Mi	Vu	X		The Wandering Albatross is marine, pelagic and aerial and breeds on Macquarie Island in Australia. On breeding islands, the Wandering Albatross nests on coastal or inland ridges, slopes, plateaux and plains, often on marshy ground (DotE 2019). Nests of the Wandering Albatross are sited on moss terraces, in dense tussocks, and often in loose aggregations on the west (windward) side of islands.	**Highly unlikely** No suitable habitat is present within the survey area.
Diomedea sanfordi	Northern Royal Albatross	En, Mi	En	X		The Northern Royal Albatross is marine, pelagic and aerial. Its habitat includes subantarctic, subtropical, and occasionally Antarctic waters (Marchant & Higgins 1990). The Northern Royal Albatross nests on flat or gently sloping ground, on slopes, ridges, gullies and plateaux of large islands, and on the summits of islets. Its nests are placed among vegetation that are open enough for adults to easily walk through (DotE 2019).	**Highly unlikely** No suitable habitat is present within the survey area.
Falco peregrinus	Peregrine Falcon		S		X	The Peregrine Falcon is seen occasionally anywhere in the south-west of Western Australia. It is found everywhere from woodlands to open grasslands and coastal cliffs - though less frequently in desert regions. The species nests primarily on ledges of cliffs, shallow tree hollows, and ledges of building in cities. (Morcombe, 2004).	**Likely** Suitable foraging habitat is present within the survey area. Suitable nesting sites are limited.
Halobaena caerulea	Blue Petrel	Vu		X		The Blue Petrel is gregarious, occurring in small loose flocks of up to 100, with larger flocks close to	**Highly unlikely**

Taxon	Common name	Status		Source		Habitat requirements	Likelihood of occurrence within the survey area
		EPBC Act	BC Act/ DBCA	PMST	NM		
						breeding islands. It is circumpolar, ranging from pack ice to 30° S. It breeds on offshore stacks near Macquarie Island where 500-600 breeding pairs occur. It is also known to breed on a number of other islands in the southern Atlantic and Indian Oceans. On mainland Australia, the species is mainly seen between July and September.	No suitable habitat is present within the survey area.
Hydroprogne caspia	Caspian Tern	Mi	IA		X	The Caspian Tern is widespread around the Australian coast and is also found in inland areas of the eastern states. The species breeds in pairs or colonies on small islands and sandspits. Habitat consists of coastal or offshore waters, beaches, mudflats, estuaries, larger livers, reservoirs and some inland lakes (Pizzey & Knight 2012).	**Unlikely** The survey area does not provide suitable habitat to support this species.
Leipoa ocellata	Malleefowl	Vu	Vu	X		The Malleefowl is found in semi-arid to arid shrublands and low woodlands, especially those dominated by mallee and/or acacias. A sandy substrate and abundance of leaf litter are required for breeding. While Malleefowl are present on Mainland WA, it is not known to occur on Garden Island.	**Highly unlikely** No suitable habitat is present within the survey area. The closest available record is more than 10 km from the survey area on the mainland.
Limosa lapponica	Bar-tailed Godwit	Vu or Cr, Mi	Vu or Cr, IA	X	X	The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh (Morcombe 2004). They usually forage near the edge of water or in shallow water, mainly in tidal estuaries and harbours and roost on sandy beaches, sandbars, spits and also in near-coastal saltmarshs (Marchant & Higgins 1993).	**Unlikely** The survey area does not provide suitable habitat to support this species.
Macronectes giganteus	Southern Giant Petrel	En, Mi	IA	X	X	The Southern Giant-Petrel is marine bird that occurs in Antarctic to subtropical waters. In summer, it mainly occurs over Antarctic waters, and	**Highly unlikely**

Taxon	Common name	Status		Source		Habitat requirements	Likelihood of occurrence within the survey area
		EPBC Act	BC Act/ DBCA	PMST	NM		
						it is widespread south as far as the pack-ice and onto the Antarctic continent (Marchant & Higgins 1990). The species is not known to breed in Australia.	No suitable habitat is present within the survey area.
Macronectes halli	Northern Giant Petrel	Vu, Mi	IA	X		The Northern Giant Petrel breeds in the sub-Antarctic and visits areas off the Australian mainland during the winter months (May-Oct). They are usually seen in waters off the south of Australia (DotE 2019). The species is primarily Marine.	**Highly unlikely** No suitable habitat is present within the survey area.
Numenius madagascariensis	Eastern Curlew	Cr, Mi	Cr	X	X	The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass (Marchant & Higgins 1993).	**Unlikely** The survey area does not provide suitable habitat to support this species.
Numenius phaeopus	Whimbrel	Mi	IA		X	The Whimbrel is often found on the intertidal mudflats of sheltered coasts. It is also found in harbours, lagoons, estuaries and river deltas, often those with mangroves, but also open, unvegetated mudflats. It is occasionally found on sandy or rocky beaches, on coral or rocky islets, or on intertidal reefs and platforms. It has been infrequently recorded using saline or brackish lakes near coastal areas. It also uses saltflats with saltmarsh, or saline grasslands with standing water left after high spring-tides, and in similar habitats in sewage farms and saltfields (Higgins & Davies 1996).	**Unlikely** The survey area does not provide suitable habitat to support this species.
Oceanites oceanicus	Wilson's Storm-petrel	Mi	IA		X	Wilsons Storm Petrel spends most of its time at sea but will come onshore to breed. Breeding does not occur within Australia. Birds often congregate and feed at ocean fronts, and are occasionally sighted inshore. Outside of breeding season Wilsons Storm Petrol roosts on the sea surface. Foraging occurs at sea. It is common and widespread from Carnarvon to the north-east Kimberley Division, Western Australia. It is occasionally seen on the south coast	**Highly unlikely** No suitable habitat is present within the survey area.

Taxon	Common name	Status		Source		Habitat requirements	Likelihood of occurrence within the survey area
		EPBC Act	BC Act/ DBCA	PMST	NM		
						of Western Australia and has occasionally been recorded in south-west Western Australia and further north to Shark Bay (DotE 2019).	
Onychoprion anaethetus	Bridled Tern	Mi	IA		X	In Australia, Bridled Terns are widespread, breeding on offshore islands in western, northern and north-eastern Australia. In Western Australia, breeding is widespread from islands off Cape Leeuwin (extending round the southern coast to Seal Rocks) north to Shark Bay and in Pilbara region and Kimberley Division. At sea, distribution extends from Cape Leeuwin north to Dirk Hartog Island, with isolated mainland coastal records at Point Maud and Ningaloo, and from Barrow Island to the Dampier Archipelago, and at sea off the Kimberley coast from waters west of the Dampier Peninsula to Ashmore Reef and Joseph Bonaparte Gulf (DotE 2019)	**Unlikely** The survey area does not provide suitable habitat to support this species.
Oxyura australis	Blue-billed Duck		P4		X	The blue-billed duck is a small Australian almost entirely aquatic duck. The blue-billed duck is endemic to Australia's temperate regions, ranging from the south west of Western Australia, extending to southern Queensland, through New South Wales and Victoria, to Tasmania. The species is readily seen on freshwater lakes and billabongs where deep fresh water is present (Morcombe 2004).	**Highly unlikely** No suitable habitat is present within the survey area.
Pachyptila turtur subantarctica	Fairy Prion (southern)	Vu		X		The fairy prion (southern) breeds on Macquarie Island and a number of other subantarctic islands outside of Australia. In Australia, breeding is recorded on two rock stacks off Macquarie Island and on the nearby Bishop and Clerk Island. The subspecies digs burrows among rocks or low vegetation in which to nest. Burrows may be dug below mat forming herbs. Feeds by plucking food from the ocean surface. Some individuals may	**Highly unlikely** The survey area is not considered to provide suitable habitat to support this species.

Taxon	Common name	Status		Source		Habitat requirements	Likelihood of occurrence within the survey area
		EPBC Act	BC Act/ DBCA	PMST	NM		
						migrate towards New Zealand and southern Australia in winter	
Pandion cristatus	Osprey, Eastern Osprey	Mi	IA		X	Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They require extensive areas of open fresh, brackish or saline water for foraging. They frequent a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes. They exhibit a preference for coastal cliffs and elevated islands in some parts of their range but may also occur on low sandy, muddy or rocky shores and over coral cays. They may occur over atypical habitats such as heath, woodland or forest when travelling to and from foraging (DSEWPaC 2016)	**Likely** The survey area may provide suitable habitat to support this species. T
Pluvialis squatarola	Grey Plover	Mi	IA		X	Australia, the Grey Plover has been recorded in all states, where it is found along the coasts, and it especially abundant on the western and southern coastlines, mainly between The Coorong and western beaches of the Eyre Peninsula in South Australia, and the coast of Western Australia between Albany and the northern Kimberley coast (DotE 2019).	**Unlikely** The survey area does not provide suitable habitat to support this species.
Pterodroma mollis	Soft-plumaged Petrel	Vu		X		The Soft-plumaged Petrel is a marine, oceanic species. Soft-plumaged Petrels are mainly subantarctic, but occur over a wide range of sea surface-temperatures. Soft-plumaged Petrels breed on Maatsuyker Island off southern Tasmania (Wiltshire & Hamilton 2002). Beachcast birds have been found from Maryborough, Queensland, south	**Unlikely** The survey area is not considered to provide suitable habitat to support this species. .

Taxon	Common name	Status		Source		Habitat requirements	Likelihood of occurrence within the survey area
		EPBC Act	BC Act/ DBCA	PMST	NM		
						to NSW, Tasmania, Victoria, South Australia and south-west Western Australia.	
Rostratula australis	Australian Painted Snipe	En	En	X	X	The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. Australian Painted Snipe breeding habitat requirements may be quite specific: shallow wetlands with areas of bare wet mud and both upper and canopy cover nearby. The species rarely occurs in south-western Australia, where it was once more common (Marchant & Higgins 1993; Garnett and Crowley 2000).	**Unlikely** The survey area is not considered to provide suitable habitat to support this species.
Stercorarius antarcticus	Brown Skua		P4		X	This species occurs mostly beyond the continental shelf break but will occasionally venture onto beaches if a seal or whale carcass is present. While breeding does not occur in Australia, the species is a regular winter migrant to Australia waters north to Shark Bay (WA however they are sparse and uncommon (Pizzey & Knight 2012).	**Highly unlikely** The survey area does not provide suitable habitat to support this species.
Stercorarius parasiticus	Arctic jaeger, Arctic Skua	Mi	IA		X	The Arctic Jaeger primarily lives in offshore waters, bays and harbours and seldom comes to shore. Breeding does not occur within Australia. The Arctic Jaeger can be found in Australian offshore waters between Oct-April and when present, is local and sedentary (Pizzey & Knight 2012).	**Highly unlikely** The survey area does not provide suitable habitat to support this species.
Stercorarius pomarinus	Pomarine Jaeger, Pomarine Skua	Mi	IA		X	The Pomarine Jager lives in offshore waters, bays and harbours and is seldom found onshore. Breeding does not occur within Australia (Pizzey & Knight 2012).	**Unlikely** The survey area is not considered to provide suitable habitat to support this species.
Sternula nereis nereis	Australian Fairy Tern	Vu	Vu	X		The Fairy Tern occurs along the coast of WA as far north as the Dampier Archipelago near Karratha, but mostly in the southern part of Australia including most of the coastline in the south west. It nests on	**Unlikely** The survey area does not provide suitable

Taxon	Common name	Status		Source		Habitat requirements	Likelihood of occurrence within the survey area
		EPBC Act	BC Act/ DBCA	PMST	NM		
						sheltered sandy beaches, coastal inlets, spits and banks above the high tide line and below vegetation. It has been found in embayments of a variety of habitats including offshore, estuarine or lacustrine (lake) islands, wetlands, and mainland coastline (DotE 2016; Nevill 2013). They can also be seen in saltfields, saline or brackish lakes, and sewage ponds near the coast (Pizzey and Knight 2012).	habitat to support this species.
Sterna dougallii	Roseate Tern	Mi	IA		X	In Australia, the subspecies gracillis occurs on much of the west, north and north-east coasts. In Western Australia, the subspecies is regularly recorded north from Mandurah to around Eighty Mile Beach, in the Pilbara Region. In addition, breeding colonies have been established on Lancelin Island and Second Rock, off Western Australia (Higgins & Davies 1996).	**Unlikely** The survey area does not provide suitable habitat to support this species.
Sterna hirundo	Common Tern	Mi	IA		X	The species is a non-breeding migrant to Australia, where it is widespread and common on the eastern coast south to eastern Victoria, and common on parts of the northern coast, mainly east of Darwin. In Western Australia, the species is rarely recorded south of approximately 30° S. Common Terns are marine, pelagic and coastal. In Australia, they are recorded in all marine zones, but are commonly observed in near-coastal waters, both on ocean beaches, platforms and headlands and in sheltered waters, such as bays, harbours and estuaries with muddy, sandy or rocky shores.	**Unlikely** The survey area is not considered to provide suitable habitat to support this species.
Thalassarche carteri	Indian Yellow-nosed Albatross	Vu, Mi	En	X		The Indian Yellow-nosed Albatross is a marine bird, located in subtropical and warmer subantarctic waters. The Indian Yellow-nosed Albatross forages mostly in the southern Indian Ocean where it is particularly abundant off Western Australia (Marchant & Higgins 1990). In breeding and non-	**Highly unlikely** The survey area does not provide suitable habitat to support this species.

Taxon	Common name	Status		Source		Habitat requirements	Likelihood of occurrence within the survey area
		EPBC Act	BC Act/ DBCA	PMST	NM		
						breeding seasons, the species concentrates over the productive waters of continental shelves, often at coastal upwellings and the boundaries of currents (DotE 2019).	
Thalassarche cauta cauta	Shy Albatross, Tasmanian Shy Albatross	Vu, Mi	Vu	X		The Shy Albatross is the only albatross to breed within Australia. Breeding occurs on Albatross Island (Bass Straight), Pedra Branca and the Mewstone (Tasmania). Adults remain within a few hundred kilometres of breeding sites feeding mostly over continental slope and shelves. Common in all months (but mostly winter) in Vic, Tas, NSW and SA but uncommon in WA north of Carnarvon (Pizzey & Knight 2012).	**Highly unlikely** The survey area does not provide suitable habitat to support this species.
Thalassarche cauta steadi	White-capped Albatross	Vu, Mi	Vu	X		The White-capped Albatross is a marine species and occurs in subantarctic and subtropical waters. It reaches tropical areas associated with the cool Humboldt Current off South America (Marchant & Higgins 1990). The White-capped Albatross has been noted in shelf-waters around breeding islands and over adjacent rises. During the non-breeding season, birds have been observed over continental shelves around continents. The species occurs both inshore and offshore and enters harbours and bays (DotE 2019).	**Highly unlikely** The survey area does not provide suitable habitat to support this species.
Thalassarche impavida	Campbell Albatross, Campbell Black-browed Albatross	Vu, Mi	Vu	X		The Campbell Albatross is a marine sea bird inhabiting sub-Antarctic and subtropical waters from pelagic to shelf-break water habitats (Marchant & Higgins 1990). In breeding and non-breeding seasons, the Campbell Albatross are specialised shelf feeders, concentrating around breeding islands or over adjacent submarine banks (Weimerskirch et al. 1986, 1988). In winter, they are commonly found in the coastal waters of continents, over up-wellings or boundaries of currents (DotE 2019). The Campbell Albatross breed on Campbell	**Highly unlikely** The survey area does not provide suitable habitat to support this species.

Taxon	Common name	Status		Source		Habitat requirements	Likelihood of occurrence within the survey area
		EPBC Act	BC Act/ DBCA	PMST	NM		
						Island (Marchant & Higgins 1990). They make their nests on tussock-covered ledges and terraces of cliffs, slopes and hills, overlooking the sea or valleys, and on the summits of rocky islets (DotE 2019).	
Thalassarche melanophris	Black-browed Albatross	Vu, Mi	En	X		The Black-browed Albatross is a marine species that inhabits Antarctic, subantarctic and temperate waters and occasionally enters the tropics (Brooke 2004; Marchant & Higgins 1990). The Black-browed Albatross breeds within Australian jurisdiction on Heard Island, McDonald Islands, Macquarie Island and Bishop and Clerk Islets (DotE 2019).	**Highly unlikely** The survey area does not provide suitable habitat to support this species.
Thalasseus bergii	Crested Tern	Mi	IA		X	This species occurs in coastal and offshore waters, beaches, bays, inlets, tidal rivers, salt swamps, lakes and large rivers. It is found around the coast of Australia including Tasmania. Breeding colonies are known to seek islands (Pizzey & Knight 2012).	**Unlikely** The survey area does not provide suitable habitat to support this species.
Tringa nebularia	Common Greenshank, greenshank	Mi	IA		X	The Common Greenshank does not breed in Australia; however, the species occurs in all types of wetland and has the widest distribution of any shorebird in Australia (DSEWPaC 2013).	**Unlikely** The survey area does not provide suitable habitat to support this species.
Sternula albifrons	Little Tern	Mi	Mi		X	The Australian breeding population can be divided into two major subpopulations: (1) a northern subpopulation that breeds across northern Australia, from about Broome in north-western Western Australia (where first recorded only in December 1995), through coastal Northern Territory (mainly from just west of Darwin to the Queensland border) to the Gulf of Carpentaria and eastern Cape York Peninsula (with an extended breeding season covering most of the year); and (2) an eastern subpopulation that breeds on the eastern and south-eastern coast of the mainland and northern and eastern Tasmania, occasionally extending as	**Unlikely** The survey area does not provide suitable habitat to support this species.

Taxon	Common name	Status		Source		Habitat requirements	Likelihood of occurrence within the survey area
		EPBC Act	BC Act/ DBCA	PMST	NM		
						far west as western Victoria and south-eastern South Australia (and breeding in the austral spring-summer).(DoEE 2019)	
Thinornis rubricollis	Hooded Plover	Mi	Mi		X	The Hooded Plover occurs on sandy beaches between Jervis Bay, New South Wales and the Eyre Peninsula, South Australia, as well as in Tasmania and between Esperance and Perth in south-west Western Australia.They are not abundant (Birdlife Australia 2019)	**Unlikely** The survey area does not provide suitable habitat to support this species.
Tringa brevipes	Grey-tailed Tattler		P4		X	There are a few scattered records for the species along the south coast near the Eyre Bird Observatory, Point Malcolm, Rossiter Bay, Shark Lake Nature Reserve and surrounding swampland. It is found in the south-west between Augusta and Cervantes. The Grey-tailed Tattler is widespread from Houtman Abrolhos and the mainland adjacent to the Kimberley Division. It has also been recorded inland at Lake Argyle and on islands off the coast (Higgins & Davies 1996).	**Unlikely** The survey area does not provide suitable habitat to support this species.
Actitis hypoleucos	Common Sandpiper	Mi	Mi		X	Habitat for this species is varied: coastal and interior wetlands – narrow muddy edges of billabongs, river pools, mangroves, among rocks and snags, reefs or rocky beaches. Avoids wide open mudflats. This species is widespread and scattered, common on the north and west coasts and uncommon in the south-east and interior (Morcombe 2004).	**Unlikely** The survey area does not provide suitable habitat to support this species.
Tringa stagnatilis	Marsh Sandpiper, little greenshank	Mi	Mi		X	The Marsh Sandpiper is found on coastal and inland wetlands throughout Australia. In Western Australia they are mainly found around the coast. A few visit New Zealand. The Marsh Sandpiper is also recorded on Lord Howe Island, Norfolk Island, Chatham Island and Christmas Island (Higgins & Davies 1996).	**Unlikely** The survey area does not provide suitable habitat to support this species.

Taxon	Common name	Status		Source		Habitat requirements	Likelihood of occurrence within the survey area
		EPBC Act	BC Act/ DBCA	PMST	NM		
Pluvialis fulva	Pacific Golden Plover	Mi	Mi		X	Mainly coastal habitats; usually in small parties or quite large flocks on estuaries, intertidal mudflats, beaches, reefs, salt marshes, offshore islands; only rare far inland.	**Unlikely** The survey area does not provide suitable habitat to support this species.
Tyto novaehollandiae subsp. *novaehollandiae*	Masked Owl (southwest)		P3		X	Roosts and nests in heavy forest; hunts over open woodland and farmland. Uncommon to rare. Nest is usually a cavernous hollow in the trunk or a main limb of a large tree in heavy forest, but often near open country over which the owls hunt.	**Likely** This species has previously been recorded in the Woodman Point area. The survey area may be used oportunistically for foraging however there is no suitable nesting sites in the survey area.
Xenus cinereus	Terek Sandpiper		P3		X	In Western Australia (WA), the Terek Sandpiper is rarely seen on the south coast: occasionally around Eyre and several records around Albany. On Swan River plain, it has been recorded between Bunbury and the mouth of the Moore River. The species is widespread in the Pilbara region and Kimberley Division, from Dampier to Wyndham, with occasional records around Shark Bay. In the Northern Territory (NT), widespread records occur from Darwin, north to Melville Island, and east to the western section of the Gulf of Carpentaria, around Gove Peninsula, Groote Eylandt, Sir Edward Pellew Island and the mouth of the McArthur River (DoEE 2019). Inhabits coastal mudflats in sheltered estuaries and lagoons as well as sandbars, reefs, coastal swamps, saltfields.	**Unlikely** The survey area does not provide suitable habitat to support this species.
Mammals							

Taxon	Common name	Status		Source		Habitat requirements	Likelihood of occurrence within the survey area
		EPBC Act	BC Act/ DBCA	PMST	NM		
Dasyurus geoffroii	Chuditch, Western Quoll	Vu	Vu	X		The Chuditch inhabits eucalypt forest (especially Jarrah, *E. marginata*), dry woodland, mallee shrublands, heaths, and desert, particularly in the south coast of WA. They also occur at lower densities in drier woodland and mallee shrubland in the goldfields and wheatbelt, as well as in Kalbarri National Park (translocated). Chuditch require adequate numbers of suitable den and refuge sites (horizontal hollow logs or earth burrows) to survive (DEC 2012). In Jarrah forest, Chuditch populations occur in both moist, densely vegetated, steeply sloping forest and drier, open, gently sloping forest (Van Dyke and Strahan 2008). The species can travel large distances, and for this reason requires habitats that are of a suitable size and not excessively fragmented.	**Highly unlikely** The survey area does not provide suitable habitat to support this species. The closest available record is more than 10 km from the survey area.
Hydromys chrysogaster	Water-rat, Rakali		P4		X	Water-rats live primarily in a wide variety of freshwater habitats, from sub-alpine streams and other inland waterways to lakes, swamps, farm dams and irrigation channels and are thought to be one of the few native species to have at least partially benefited from human encroachment (Gardner and Serena, 1995).	**Highly unlikely** The survey area does not provide suitable habitat to support this species.
Isoodon fusciventer	Quenda		P4		X	The Quenda prefers dense scrubby, often swampy, vegetation with dense cover up to one metre high. However, it also occurs in woodlands, and may use less ideal habitat where this habitat occurs adjacent to the thicker, more desirable vegetation. The species often feeds in adjacent forest and woodland that is burnt on a regular basis and in areas of pasture and cropland lying close to dense cover (Van Dyck and Strahan, 2008).	**Likely** Suitable habitat is present in the survey area. There are a number of records in the area however no evidence of their presence was recorded during the survey.
Pseudocheirus occidentalis	Western Ringtail	Cr	Vu	X		Ideal habitat for the Western Ringtail Possum comprises long unburnt mature remnants of	**Highly unlikely**

Taxon	Common name	Status		Source		Habitat requirements	Likelihood of occurrence within the survey area
		EPBC Act	BC Act/ DBCA	PMST	NM		
	Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit					peppermint (*Agonis flexuosa*) woodlands with high canopy continuity; others comprise of jarrah (*Eucalyptus marginata*)/marri (*Corymbia calophylla*) forests and woodlands with adequate hollows, coastal heath, myrtaceous heaths and shrublands, Bullich (*E. megacarpa*) dominated riparian zones and karri forests. Populations are associated with swamps, water courses or floodplains, and at topographic low points which provide cooler, often more fertile conditions. Their current distribution is patchy and largely restricted to the moister south-western corner of WA, especially in the Australind/Eaton area to Waychinicup National Park. The Upper Warren area east of Manjimup is the only place the possum survives in the absence of coastal peppermint (DotE 2019).	The survey area does not provide suitable habitat to support this species. The closest available record is more than 10 km from the survey area.
Reptiles							
Lerista lineata	Perth Slider, Lined Skink		P3		X	Locally restricted to the Swan Coastal Plain south of the Swan River including Rottnest and Garden Islands, where it inhabits coastal dunes, banksia/eucalypt woodlands and suburban gardens. There are also isolated populations on the mid-west coast at Woodleigh Station and in Busselton (Wilson and Swan 2013).	**Likely** The survey area provides suitable habitat to support this species.
Neelaps calonotos	Black-striped Snake		P3		X	This Black-striped Snake is restricted to the sandy coastal strip near Perth, between Mandurah and Lancelin. It occurs on dunes and sand-plains vegetated with heaths and eucalypt/banksia woodlands. This species is seriously threatened by increasing development within its restricted distribution (Wilson and Swan, 2013).	**Likely** The survey area provides suitable habitat for this species.
Invertebrates							
Idiosoma sigillatum	Swan Coastal Plain shield-		P3		X	*Idiosoma sigillatum* is the dominant idiopid trapdoor spider on the Swan Coastal Plain, where it occurs from Dalyellup north to at least Ledge Point	Unlikely The survey area is not considered to contain

Taxon	Common name	Status		Source		Habitat requirements	Likelihood of occurrence within the survey area
		EPBC Act	BC Act/ DBCA	PMST	NM		
	backed trapdoor spider					(including Rottnest Island and Garden Island) with the eastern limit of its range along the sandy foothills of the Darling Escarpment, from Boyanup north to at least Gingin (Rix et al. 2018, WAM 2018). Many of these records are historical in nature and occur within the Perth metropolitan area. It is highly likely that much of the habitat for this species within the Perth metropolitan area has been cleared for urban development and the species is unlikely to occur through much of its historical distribution in urban areas except in remnant habitats (e.g. Kings Park, Bold Park, and Shenton Park bushland) (Rix et al 2018). Burrows of *Idiosoma sigillatum* usually occur in *Banksia* woodland and heathland on sandy soils (Rix *et al.* 2018).	significant habitat for this species.
Westralunio carteri	Carter's Freshwater Mussel	VU	VU		X	Carter's Freshwater Mussel is usually found in freshwater river pools. They are most common in areas with muddy, silty and sandy bottoms and flowing permanent water. Environmental tolerances of W. carteri are not precisely known, but they can be found where water temperatures range from 4 °C to over 30 °C.	Highly Unlikely There are no water bodies within the survey area.

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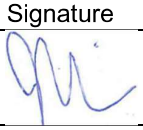
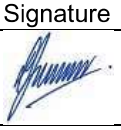
Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	E Lynch	J Collins		D Farrar		25/05/2020

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Appendix C

Additional biological survey (GHD 2020)

Memorandum

18 May 2020

To	Discovery Holiday Parks		
Copy to			
From	Erin Lynch	Tel	+61 8 62228316
Subject	Additional vegetation survey	Job no.	12511610

1 Introduction

GHD has been engaged by Discovery Parks to undertake a range of environmental studies for the proposed expansion of Woodman Point Caravan Park located off Cockburn Road, Munster. In September 2019 GHD undertook a detailed flora and vegetation survey and Level 1 fauna survey of the proposed Woodman Point Caravan Park expansion (an original project area of 3.19 ha) (GHD 2020). Discovery Parks has recently identified they will need to increase the footprint of the park extension to the north and east, with an additional footprint of 0.29 ha.

Discovery Parks has commissioned GHD to undertake a targeted vegetation assessment for significant ecological communities and targeted black cockatoo tree survey within the additional footprint of the revised caravan park boundary.

The limitations and assumptions outlined in the GHD biological assessment report (GHD 2020) also apply to this memorandum.

2 Methodology

2.1 Vegetation assessment

GHD ecologist Erin Lynch (flora licence no. SL012374) completed a vegetation assessment of the additional footprint (additional survey area) on the 18 March 2020. The field survey was undertaken to verify the dominant vegetation units and vegetation condition of the additional survey area are consistent with the results of the previous flora and vegetation assessment of the adjoining project area (GHD 2020). The identification and mapping of conservation significant ecological communities and searches for conservation significant flora taxa was also undertaken within the additional survey area.

The survey methods involved traversing the additional survey area on foot and making opportunistic recordings, photographic reference points within identified vegetation units and targeted searches for the presence of indicator species for two Threatened Ecological Communities (TECs) identified as potentially occurring within the project area.

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Navigation across the site and the recording of data in the field was achieved by using hand-held GPS tools, including a Samsung tablet and Garmin GPS. This ensured accurate representation of features observed on the ground into spatial mapping.

The survey methodology employed by GHD was undertaken with reference to the Environmental Protection Authority (EPA) *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016).

Vegetation condition

The vegetation condition was assessed and mapped in accordance with the South West and Interzone Botanical Provinces of Western Australia (IBRA) scale devised by Keighery (1994) and adapted by EPA (2016). The scale recognises the intactness of vegetation and consists of six rating levels.

2.2 Black cockatoo assessment

A targeted Black Cockatoo tree survey was undertaken in conjunction with the vegetation survey to identify any potential breeding trees (suitable breeding tree with a Diameter at Breast Height (DBH) greater than 500 mm) within the additional footprint.

The tree survey was conducted in accordance with the EPBC Act referral guidelines for three threatened black cockatoo species: Carnaby's Cockatoo (Endangered) *Calyptorhynchus latirostris*, Baudin's Cockatoo (Vulnerable) *Calyptorhynchus baudinii*, and Forest Red-tailed Black Cockatoo (Vulnerable) *Calyptorhynchus banksii naso* (Department of Sustainability, Environment, Water, Populations, and Communities (DSEWPaC 2012).

2.3 Survey limitations

The limitations and constraints associated with this field survey are consistent with those outlined in Table 2 of the GHD Biological assessment report (GHD 2020). The present survey effort has not been subject to any further constraints which affect the thoroughness of the assessment and the conclusions which have been formed.

3 Results

3.1 Vegetation types and condition

The vegetation identified within the additional footprint is consistent with the vegetation types and condition previously identified by GHD (2020). The vegetation within the additional survey area ranges from good to degraded condition. The project area has been subject to a long history of disturbances including clearing, activity associated with the Munitions Magazines, weed invasion, introduced fauna (rabbits and foxes), and edge effects from adjacent land uses (caravan park and roads). All five vegetation types identified by GHD (2020) extended into the additional survey area and include:

- *Acacia* closed shrubland (VT01)
- *Melaleuca* shrubland (VT02)
- **Cenchrus* grassland (VT03)
- Revegetation (VT04)
- Planted (VT05)

However, based on observations and a reassessment of the vegetation in the area due to the additional footprint, the Revegetation vegetation type (VT04) is also considered representative of Tuart open woodland. This is based on the presence of a number of larger mature tuarts within the extended footprint and the presence of more mature tuarts to the north (north of Nyyerbup Circuit) and west of the project area. Within the original survey area there was only one mature sized tuart with a number emerging tuarts scattered throughout the revegetated area. The majority of which had evidence of being planted (green plastic plant bags remain around the base of trees).

The tuart open woodland consists of *Eucalyptus gomphocephala* (tuart) open woodland with occasional scattered *Callitris preissii* over *Acacia cochlearis*, *Spyridium globulosum* and *Melaleuca huegelii* open shrubland to scattered tall shrubs over *Acanthocarpus preissii, Eremophila glabra* and *Rhagodia baccata* low open shrubs over an predominantly cleared ground cover dominated by weedy grasses and herbs (dominant species **Lagurus ovatus*, **Avena barbata, *Asparagus asparagoides*, and **Cenchrus setaceus*).

Historical aerial imagery shows a large proportion of the area which has been mapped as tuart open woodland/Revegetation (VT04) has previously been cleared within the last 40 years, with revegetation evident over the last 15 to 20 years. The revegetation of trees and shrubs within the area appears to be successful.

3.2 Conservation significant ecological communities

Callitris preissii (or Melaleuca lanceolata) forests and woodlands TEC

As identified in the desktop assessment by GHD (2020), the proposed expansion is located within the known occurrence/buffer area of one State-listed TEC. The TEC is identified as *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands (Swan Coastal Plain community type 30a) listed under the *Biodiversity and Conservation Act 2016* (BC Act). The community was endorsed as a TEC with a threat ranking of Vulnerable by the WA Minister for Environment in November 2011.

The flora and vegetation survey undertaken in September 2019 (GHD 2020) identified the presence of small patches/isolated trees of *Callitris preissii* within the original survey area. The vegetation in this area was identified as Revegetation (VT04). VT04 was described as previously cleared areas where natural regrowth of some native plant species has occurred. Natural regrowth is scattered with an understorey dominated by introduced grasses and herbs. Evidence of revegetation of native trees and shrubs (presence of plastic plant bags around tree trunks and bamboo sticks) was present around a number of tree species including *Eucalyptus gomphocephala* (tuart) and *Callitris preissii* (Rottnest Pine).

Previous vegetation mapping of the Woodman Point area (Regeneration Technology 2002, as cited in Department of Environment and Conservation 2010) shows the vegetation within the additional survey area as *Acacia rostellifera* open heath, closed heath and low closed forest, as well as cleared areas. Patches of *Eucalypus gomphocepha* open forest also occurs in the general area. The *Callitris preissii* (or *Melaleuca lanceolata*) low closed and low open forest (TEC) appears to be generally restricted closer to the coastline.

GHD (2020) concluded the vegetation within the original project area did not meet the key diagnostic criteria for this TEC due to the degraded nature of the vegetation and evidence of plantings. However after the follow-up survey, additional patches of *Callitris preissii* trees were identified within the extended footprint, which were growing in association with *Eucalyptus gomphocephala*, *Spyridium globulosum*, *Acanthocarpus preissii*, *Rhagodia baccata* and **Asparagus asparagoides*, which are all considered typical and common native and introduced taxa associated with this TEC community (Plates 1 and 2).


Plate 1 and 2 Site photographs of *Callitris preissii (or Melaleuca lanceolata) forests and woodlands TEC* within the additional survey area

Callitris preissii is indicative of the floristic community type (FCT) 30a – *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands and its presence at a site distinguishes the 30a community type from other communities. The species is not present in other FCTs. In the case of the additional survey area and following advice from Department of Biodiversity Conservation and Attractions, the presence of the TEC is confirmed where *Callitris preissii* is present (within its known range of occurrence), even if the trees have been planted and the vegetation is in degraded condition.

It is considered that degraded remnants of the *Callitris preissii (*or *Melaleuca lanceolata)* forests and woodlands TEC is present within the extended footprint as well as within the original footprint of the proposed park extension. The area has suffered a long history of disturbances including clearing and revegetation, therefore the vegetation types present have undergone considerable changes.

There is a total of 0.47 ha of vegetation which is considered representative of the TEC within the original footprint and additional survey area. The extent of the TEC is mapped in Figure 1 (attached). Spatial mapping of the extent of the TEC focused on the presence of *Callitris preissii*.

Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain TEC and Tuart (Eucalyptus gomphocephala) woodlands of the Swan Coastal Plain PEC

Tuart (*Eucalyptus gomphocephala*) woodland and forests of the SCP TEC was listed in July 2019 as a Critically Endangered TEC under the EPBC Act. DotEE (2019) defines the key diagnostic characteristics of this community to include, but not limited to:

- Occurs in the Swan Coastal Plain (SCP) Bioregion
- Primarily occurs on the Spearwood and Quindalup dune systems
- The primary defining feature is the presence of at least two living established (>15 cm DBH) tuart trees in the uppermost canopy layer, although they may co-occur with trees of other species
- There is a gap of no more than 60 m between the outer edges of the canopies of adjacent Tuart trees
- Biotic and patch size thresholds.

GHD (2020) did not consider the vegetation within the original project area to meet the key diagnostic criteria for this TEC as only two isolated mature tuart trees were present, which were greater than 60 m apart. It was noted there is likely to be a patch north of the original project area however, this patch did not intersect with the original survey area.

Based on a reassessment of the project area with the additional footprint, and measuring the size of the young planted tuart trees scattered within the revegetated area, it is considered the vegetation

(VT04) is representative of the Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain TEC and the Tuart *(Eucalyptus gomphocephala)* woodlands of the SCP PEC.

The key characteristics of VT04 that are synonymous with the Tuart TEC and PEC include:

- The community occurs on the SCP within the Quindalup dune system
- The vegetation of VT04 forms part of a larger remnant of similar vegetation in similar or better condition (north and west of the extended project area), which is likely to have a patch size greater than 5 hectares (ha). All Tuart patches that are >5 ha are considered part of the Tuart TEC regardless of the understorey condition
- The community is described as a Tuart woodland with 10-30% Tuart canopy cover. The distance between the outer edges of significant tuart trees is less than 60 m.

The difference between the Tuart TEC and Tuart PEC is that the PEC has no minimum condition or patch size thresholds. Therefore the Tuart PEC is also considered to be present.

There is one patch of this TEC (which forms part of a larger patch outside the project area) occurring within the total project area, which is 1.885 ha (total patch size excludes the building structures located within the 30 m buffer of the tree canopies).

Mapping of the extent of the Tuart TEC and PEC within the project area is shown on Figure 1 (attached) and representative photographs of the tuart woodlands within the project area are shown in Plates 3 and 4.

Plates 3 and 4 Site photographs of the *Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain TEC and Tuart (Eucalyptus gomphocephala) woodlands of the Swan Coastal Plain PEC*

3.3 Conservation significant flora

No flora of conservation significance was recorded within the additional footprint and none are considered likely to occur.

3.4 Black cockatoo habitat trees

Two additional black cockatoo potential breeding trees (*Eucalyptus gomphocephala* - tuart) with a DBH greater than 500 mm were identified and recorded within the additional footprint. These trees did not contain hollows. The majority of the tuarts throughout the project area are young trees with a medium DBH of approximately 15-20 cm.

4 References

Department of the Environment and Energy (DotEE) 2019, *Approved Conservation Advice (incorporating listing advice) for the Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain ecological community*. Canberra: Department of the Environment and Energy. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/153-conservation-advice.pdf

Department of Environment and Conservation (DEC) 2010, Woodman Point Regional Park Management Plan 2010, prepared by the Department of Environment and Conservation on behalf of the Conservation Commission od Western Australia.

Department of Parks and Wildlife 2014, *Callitris preissii (or melaleuca lanceolata) forests and woodlands (Swan Coastal Plain community type 30a – Gibson et al. 1994). Interim Recovery Plan No. 340.* Department of parks and Wildlife, Perth.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2012, *EPBC Act Referral Guidelines for Three Threatened Black Cockatoo Species: Carnaby's Black Cockatoo, Baudin's Black Cockatoo and Forest red-tailed Black Cockatoo*, Canberra, Department of Sustainability, Environment, Water, Population and Communities.

Environmental Protection Authority (EPA) 2016, *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment,* Perth, Environmental Protection Authority.

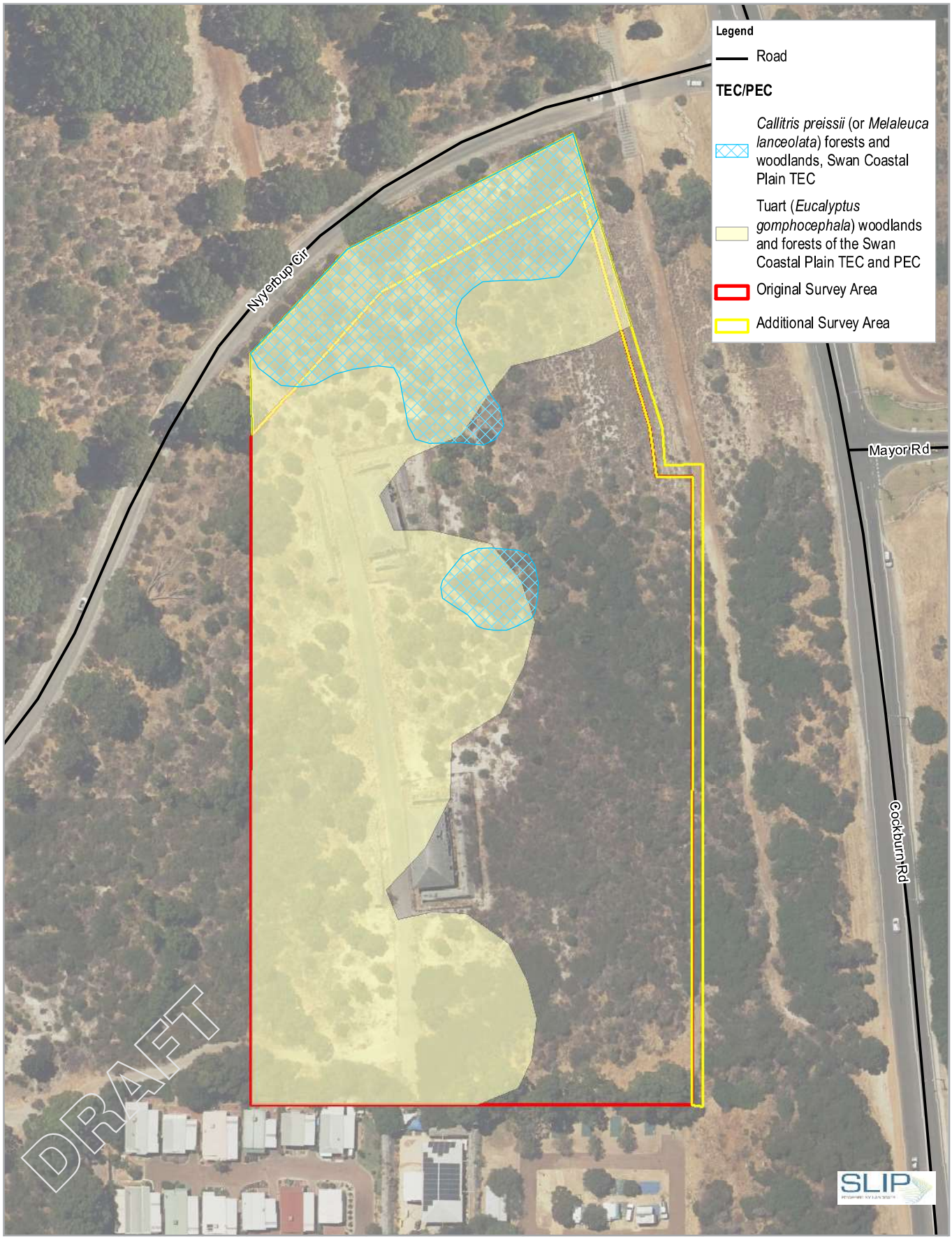
GHD 2020, *Woodman Point Caravan Park Expansion - Environmental Studies Flora and Fauna Survey*, unpublished report for Discovery Holiday Parks, Perth, Western Australia.

Keighery, BJ 1994, *Bushland Plant Survey: A Guide to Plant Community Survey for the Community*, Nedlands, Australia, Wildflower Society of Western Australia (Inc.).

Regeneration Technology 2002, Woodman Point Regional Park Weed Control and Revegetation Plan, Department of Conservation and Land Management, Perth, Western Australia.

Regards

Erin Lynch
Ecologist



Paper Size ISO A4

0 25 50

Metres

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

N

GHD

Discovery Holiday Parks
Woodman Point Caravan Park Expansion

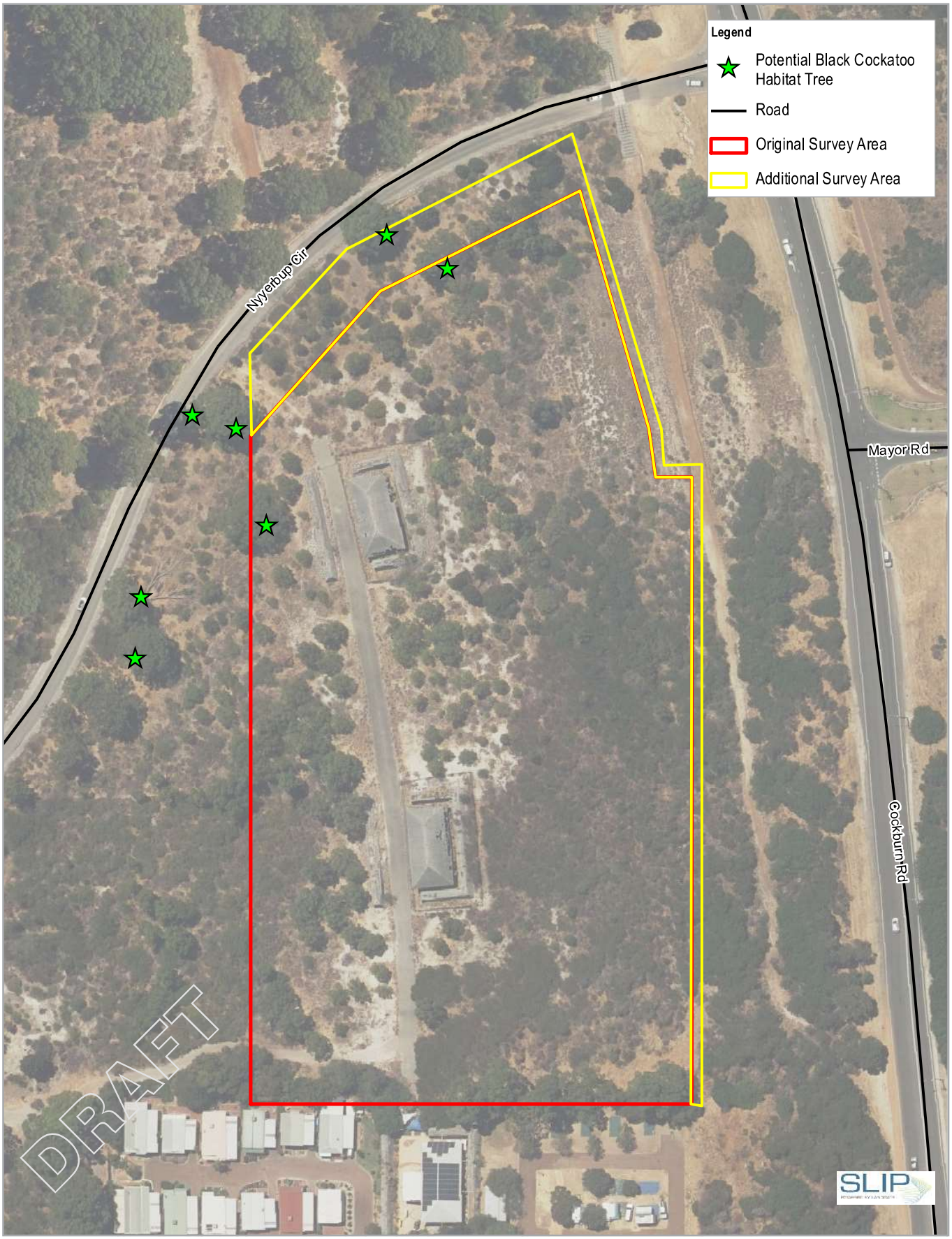
Threatened and Priority Ecological Communities

Project No. **61-12511610**
Revision No. **A**
Date **18/05/2020**

FIGURE 1

S:\GIS\Temp\61251161 0\GIS\Maps\MXD\12511610_001_TECPEC_RevA.mxd
Print date: 18 May 2020 - 21:40

Data source: GHD: Survey Areas, TEC/PEC - 20200518; Landgate: Aerial photography - WA Now Jan/Feb 2020, Roads - 2019. . Created by: mmikkonen



Paper Size ISO A4

0 25 50

Metres

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

N

GHD

Discovery Holiday Parks
Woodman Point Caravan Park Expansion

Black Cockatoo Potential Habitat Trees

Project No. **61-12511610**
Revision No. **A**
Date **18/05/2020**

FIGURE 2

S:\GIS\Temp\61125116 10\GIS\Maps\MXD\12511610_002_BCTrees_RevA.mxd
Print date: 18 May 2020 - 21:39

Data source: GHD: Survey Areas, Cockatoo trees - 20200518; Landgate: Aerial photography - WA Now Jan/Feb 2020, Roads - 2019. . Created by: mmikkonen

Appendix D

Bushfire Management Plan

Bushfire Management Plan Coversheet

This Coversheet and accompanying Bushfire Management Plan has been prepared and issued by a person accredited by Fire Protection Association Australia under the Bushfire Planning and Design (BPAD) Accreditation Scheme.

Bushfire Management Plan and Site Details

Site Address / Plan Reference: Woodman Point Caravan Park		
Suburb: Coogee	**State:** WA	**P/code:** 6166
Local government area: City of Cockburn		
Description of the planning proposal: Tourism Land Use - Caravan Park		
BMP Plan / Reference Number: 190354	**Version:** v1.0	**Date of Issue:** 14/01/2021
Client / Business Name: GHD Consulting		

Reason for referral to DFES	Yes	No
Has the BAL been calculated by a method other than method 1 as outlined in AS3959 (tick no if AS3959 method 1 has been used to calculate the BAL)?	☐	☒
Have any of the bushfire protection criteria elements been addressed through the use of a performance principle (tick no if only acceptable solutions have been used to address all of the BPC elements)?	☐	☒
Is the proposal any of the following special development types (see SPP 3.7 for definitions)?		
Unavoidable development (in BAL-40 or BAL-FZ)	☐	☒
Strategic planning proposal (including rezoning applications)	☐	☒
Minor development (in BAL-40 or BAL-FZ)	☐	☒
High risk land-use	☐	☒
Vulnerable land-use	☒	☐

If the development is a special development type as listed above, explain why the proposal is considered to be one of the above listed classifications (E.g. considered vulnerable land-use as the development is for accommodation of the elderly, etc.)?

Tourism Land Use - Short stay accommodation or visitation uses that involve people who are unaware of their surroundings and who may require assistance or direction in the event of a bushfire.

Note: The decision maker (e.g. local government or the WAPC) should only refer the proposal to DFES for comment if one (or more) of the above answers are ticked "Yes".

BPAD Accredited Practitioner Details and Declaration

Name	Accreditation Level	Accreditation No.	Accreditation Expiry
Kathy Nastov	Level 3	BPAD 27794	01/08/2021
Company Bushfire Prone Planning		**Contact No.** 6477 1144	

I declare that the information provided within this bushfire management plan is to the best of my knowledge true and correct

Signature of Practitioner  **Date** 14/01/2021

Bushfire Management Plan

Woodman Point Holiday Park
128 Woodman Point View, Coogee

City of Cockburn

Planning Stage:	Development Application (Standard BMP)
Planning Development Type:	Change or Addition to a Land Use
Bushfire Policy – Specific Development or Use Type:	Vulnerable Land Use (Tourism)

Job Number:	190354
Assessment Date:	16 December 2020
Report Date:	11 January 2021

BPP Group Pty Ltd t/a Bushfire Prone Planning
ACN: 39 166 551 784 | ABN: 39 166 551 784

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PO Box 388
Guildford WA 6935

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DOCUMENT CONTROL

PREPARATION		
Author:	Sean Winter (BPAD Level 2 - No. 37118)	
Co-Author:		
Review/Authorise:	Kathy Nastov (BPAD Level 3 - No. 27794)	

VERSION HISTORY		
Version	**Version Details**	**Date**
1.0	BMP provided to client	14 January 2021
-		

BMP (Standard DA-Tourism) Template v8.6

DISTRIBUTION				
Destination	**Version**	**No. Copies**	**Hard Copy**	**Electronic Copy**
Person/Business: Kym Petani, GHD Email: kym.petani@ghd.com			☐	☒
Person/Business: Callum Little, GHD Email: callum.little@ghd.com			☐	☒

TABLE OF CONTENTS

LIST OF FIGURES

EXECUTIVE SUMMARY

This BMP outlines bushfire issues related to the extension of the Woodman Point Caravan Park and processes to mitigate identified bushfire risks.

The proposed extension to the Caravan Park covers approximately 3.85 ha of revegetated bushland in an area previously used for military uses during World War Two. The area of the Park extension is surrounded by bushfire prone vegetation. The area is listed as a Bush Forever site and environmental surveys carried out for this development identified a number of mature trees and protected species which will be retained within the development design. The caravan park seeks to maintain as much vegetation as possible within a parkland cleared area that will be used for short term caravan and tent sites, and some longer term onsite cabins and ablution blocks.

All vegetation retained within the boundaries of the caravan park will be converted to meet the definition of Low Threat as per c.2.2.3.2(f) of AS3959. A BAL-29 APZ can be implemented within the boundaries of the development, and no permanent structures will be situated within this area.

Woodman Point is a relatively large area (approximately 350 ha) of remnant vegetation within a wider built out suburban environment. There are numerous low threat developed areas throughout Woodman Point such as parks, caravan parks, and other land uses, which serve to break up flammable vegetation and limit the development of a landscape style bushfire. As a caravan park within the Perth metropolitan area, the site is close to emergency services, and suburban areas with low threat of bushfire. As such evacuation of the Caravan Park is identified as the primary process and this BMP establishes the requirement for a Bushfire Emergency Plan (BEP) to be created and implemented prior to the occupation of the Park extension by park-users.

The Position Statement on Tourism Land Uses in Bushfire Prone Areas has been applied to this development. The siting and design of the development, access, and firefighting water issues are all able to be mitigated within the acceptable solutions listed in the Position Statement for Caravan Parks.

1 PROPOSAL DETAILS

1.1 Description and Associated Plans and Maps

Landowner / Proponent:	Woodman Park Caravan Park
Bushfire Prone Planning Commissioned to Produce the Bushfire Management Plan (BMP) By:	Kym Petani, GHD Consulting
For Submission To:	City of Cockburn
Purpose of the BMP:	To satisfy a condition of planning approval
'Development' Site Total Area:	3.85 hectares
No. of Existing/Proposed Lots:	N/A
Description of the Proposed Development/Use:	
The proponent is proposing to extend the caravan park to the north as shown in Figure 1.1. The area to be developed will provide an area for caravan and tent sites, with ablution blocks and some semi-permanent cabins being the only standing buildings to be constructed.	
Staged Development and Management of Potential Bushfire Hazard Issues	
N/A	

Figure 1.1

Proposed Development

Lot 304 on Plan 050276
Cockburn Road
WOODMAN POINT

Map Document Path / Name: K:\Projects\Jobs 2019\190354 - Woodman Point Caravan Park (BMP)\Mapping\MXD\190354_Fig1-1_DEV_SK7_Woodman_Pt_Carav.mxd

Figure 1.2

Location Plan

(SPATIAL CONTEXT)

Lot 304 on Plan 050276
Cockburn Road
WOODMAN POINT

LEGEND

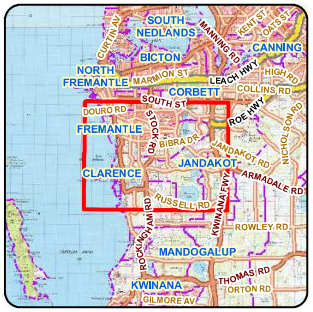
- Subject Area
- Local Government Authority
- Locality / Suburb
- Bush Fire Brigade
- Career Fire & Rescue Service
- State Emergency Service Unit
- Volunteer Marine Rescue Service
- Bush Forever
- Nature Reserve
- Conservation Park
- Crown Freehold - DBCA Managed

SCALE (A3)

0 0.5 1 1.5 2

Kilometers

LOCALITY



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Aerial Imagery : Landgate/SLIP
Image Date : Apr 2019

Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Mercator Units: Metre

BUSHFIRE PRONE PLANNING

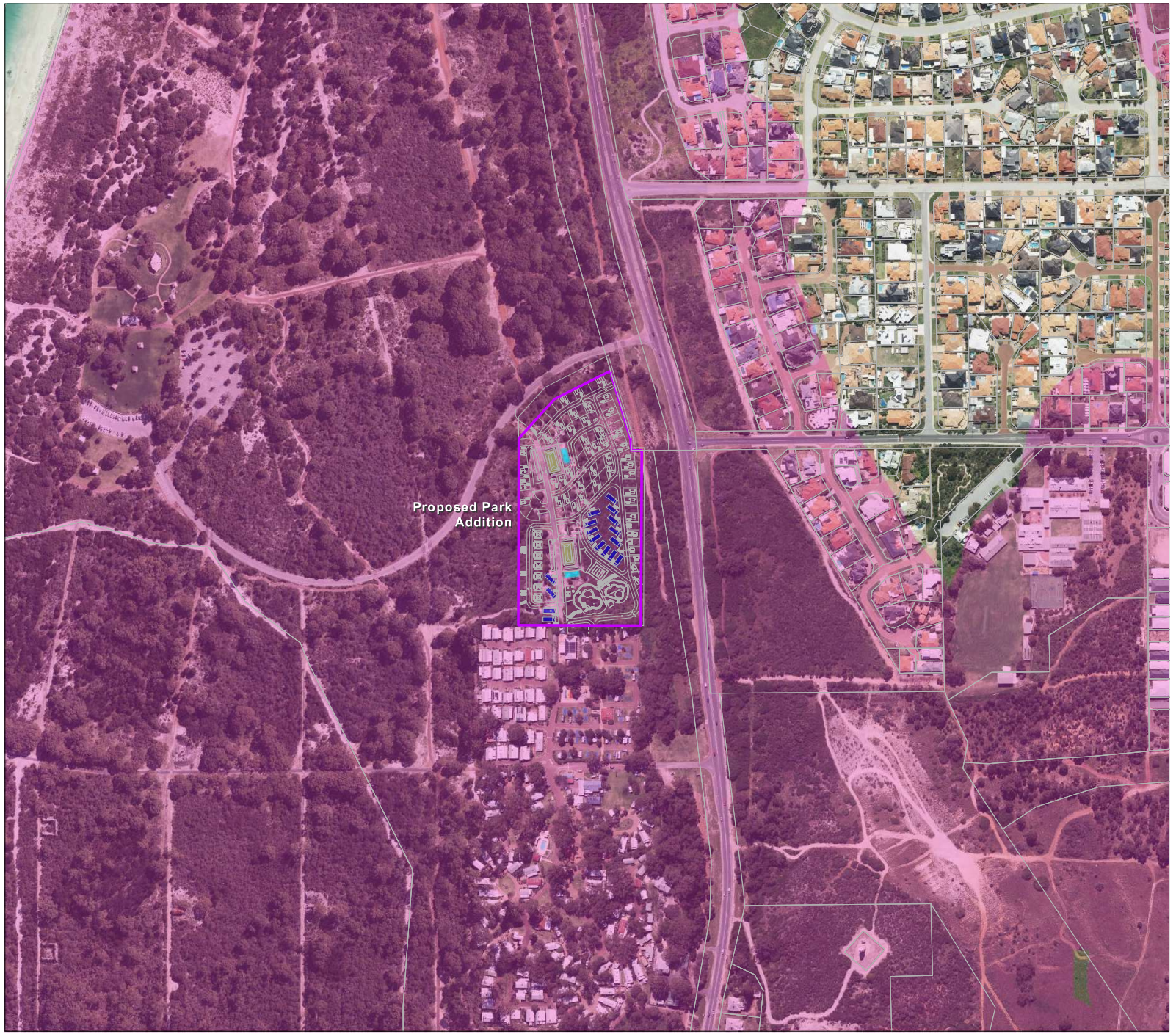
Map compiled by: Ian Ross 17/09/2019
Map udated by: Ian Ross 17/09/2019

Map Document Path / Name: K:\Projects\Jobs 2019\190354 - Woodman Point Caravan Park (BMP)\Mapping\MXD\190354_LOC_BMP_Woodman_Pt_Caravan_pk_A3L.mxd

Figure 1.3

Bushfire Prone Area

Lot 304 on Plan 050276
Cockburn Road
WOODMAN POINT



LEGEND

- Subject Area
- Other Lots

Proposed Building

- Class 1(b)
- Class 10(a)

Existing Building

- Class 10(a)
- Bushfire Prone Areas (2019)

SCALE (A3)

0 50 100 150 200

Metres

LOCALITY

N

Aerial Imagery : Landgate/SLIP
Image Date : Aug 2020

Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Mercator Units: Metre

BUSHFIRE PRONE PLANNING

Map compiled by: Ian Ross 11/01/2021
Map udated by: Ian Ross 11/01/2021

Map Document Path / Name: K:\Projects\Jobs 2019\190354 - Woodman Point Caravan Park (BMP)\Mapping\MXD\190354_Fig1-3_BPA_SK7_Woodman_Pt_Carav.mxd

1.2 The Specific 'Land Use' and the Bushfire Planning Requirements

SPP 3.7, the associated Guidelines and Position Statements, define certain land uses that require additional and/or alternative bushfire related assessment and additional information to be provided. This is necessary to facilitate planning application assessment and for subsequent operational use.

When such a proposal is unable to fully achieve the implementation of all required bushfire protection measures - as established by the 'acceptable solutions' contained in the Guidelines and Position Statements – further assessments and the development of additional protection measures are required.

The land use classification that applies to the proposal is identified in Table 1.2, along with the required additional assessments and information and the form and location in which this is provided.

Table 1.2: The determined land use and assessment/information requirements.

THE PROPOSED LAND USE CLASSIFICATION AND BUSHFIRE PLANNING REQUIREMENTS		
Assessment / Information / Documents Detail		
The proposed land use classification is determined to be:		Vulnerable (Tourism)
Category, type and/or operations of the land use that have determined the classification:		Caravan Park / Camping Ground
The Policies, Guidelines and Position Statements against which the proposed land use will be assessed, and which guide the information to be provided.[1]	SPP 3.7	☒
	Guidelines including the BPC	☐
	Guidelines excluding the BPC	☒
	Position Statement - BPC Element 1 and 2	☒
	Position Statement - Tourism	☒
The documents and the information developed and the format and location in which they are provided.	Bushfire Management Plan (BMP)	N/A
	Risk Management Plan (RMP)	N/A
	Risk Assessment and Treatment Plan	N/A
	Vulnerability Assessment - Short Stay Accommodation/Visitation (supporting BMP and BEP)	N/A
	Bushfire Emergency Plan (BEP)	☒ Separate Document
	BEP Supporting Information	☒ Addendum to BEP
	Additional bushfire protection measures	☒ In BMP s5.3
	Owner/operator additional responsibilities associated with the land use.	☐ In BMP s5.6
Note [1]: State Planning Policy 3.7 Planning in Bushfire Prone Areas; Guidelines for Planning in Bushfire Prone Areas WAPC 2017 v1.3; Bushfire Protection Criteria (BPC) established in the Guidelines; Position Statement: Planning in bushfire prone areas – Demonstrating Element 1: Location and Element 2: Siting and design WAPC November 2019; Position Statement: Tourism land uses in bushfire prone areas WAPC November 2019.		

1.3 Existing Documentation Relevant to the Construction of this Plan

This section acknowledges any known reports or plans that have been prepared for previous planning stages, that refer to the subject area and that may or will impact upon the assessment of bushfire risk and/or the implementation of bushfire protection measures and will be referenced in this Bushfire Management Plan.

Table 2.1: Existing relevant documentation.

RELEVANT EXISTING DOCUMENTS		
Existing Document	Copy Provided by Client	Title
Structure Plan	-	N/A
Environmental Report	Yes	Discovery Parks – Woodman Point Caravan Park Expansion - Environmental Impact Assessment (Oct 2020) - Flora and Fauna Survey (Oct 2020) - Additional Vegetation and Cockatoo Survey (May 2020)
Landscaping (Revegetation) Plan	-	N/A
Bushfire Risk Assessments	No	City of Cockburn Bushfire Risk Management Plan 2015-2020
Heritage Assessments	No	Register of Heritage Places – Permanent Entry No. 04626

The Woodman Point Recreation Reserve is a Bush Forever site and it is not covered by any existing Structure or Local Development Plan. It is zoned as Parks and Recreation with associated Heritage Place zoning.

The proposed development area has a number of existing environmental considerations.

It is a listed Bush Forever site, with mapped Threatened Ecological Communities (TEC) of *Callitris preissii*. Individual specimens of *C. preissii* were noted within the proposed development area. The area is also mapped as a confirmed roosting area, and potential feeding area for Carnaby's Cockatoos. The area is mapped as potential Quenda habitat.

SPP3.7 policy objective 5.4 requires new development to "achieve an appropriate balance between bushfire risk management measures and, biodiversity conservation values, environmental protection and biodiversity management" and given the above identified conservation values, it is not likely that bushfire risk mitigation processes will be able to be applied outside of the lot proposed for development.

Environmental Surveys conducted on behalf of the proponent in 2020 provide specific details of environmental considerations and these are covered in Section 2 of this BMP.

The site includes two buildings and associated infrastructure listed on the State Register of Heritage Places, under the number 04626. These buildings are protected under the *Heritage Act* 2018.

The City of Cockburn Bushfire Risk Management Plan (BRMP) provides a bushfire risk assessment process and risk rating for Woodman Point and the Woodman Point Caravan Park, based on risk to one of four factors: Human Settlement; Economic; Environmental; and Cultural Assets. The risk rating is provided as one of five levels from Low through to extreme (pages 61-67). The assessed risk under these four categories is as follows:

Human Settlement – Extreme Risk
Economic – Low Risk
Environmental – Very High Risk
Cultural – High Risk

As demonstrated in the BRMP it is considered for the purposes of this BMP that the loss of tents or caravans due to a bushfire comprises a low level economic risk, and as such is considered a "tolerable risk" for the purposes of this bushfire assessment.

The bushfire assessment and management strategies contained in this BMP, thus assume that environmental approval will be achieved or clearing permit exemptions will apply only *within* the area proposed for development. Confirmation should be included from relevant agencies that the proposed clearing is acceptable.

2 ENVIRONMENTAL CONSIDERATIONS

2.1 Native Vegetation – Restrictions to Modification and/or Clearing

Many bushfire prone areas also have high biodiversity values. SPP 3.7 policy objective 5.4 recognises the need to consider bushfire risk management measures alongside environmental, biodiversity and conservation values (Guidelines s2.3).

There is a requirement to identify any need for onsite modification and/or clearing of native vegetation and whether this may trigger potential environmental impact/referral requirements under State and Federal environmental legislation. Confirmation that any proposed native vegetation modification and/or clearing is acceptable, should be received from the relevant agencies by the proponent and provided to the bushfire consultant for inclusion in the Bushfire Management Plan if it will influence the required bushfire planning assessments and outcomes. The following table details any potential environmental restrictions of which the author of this report is aware.

Table 2.2: Native vegetation and potential environmental considerations and restrictions.

NATIVE VEGETATION MODIFICATION / CLEARING - POTENTIAL ENVIRONMENTAL RESTRICTIONS IDENTIFIED				
Environmental Considerations / Features	Potential Mapping Data Source (SLIP / Local Planning)	Relevant to Proposed Development	Data Applied	Action Required
Onsite clearing of native vegetation is required.		Yes		
Environmental impact/referral requirements under State and Federal environmental legislation may be triggered.		Yes		
National Park / Nature Reserve	DBCA-011	No- Confirmed by Proponent	N/A	N/A
Conservation Covenant	DPIRD-023	No- Confirmed by Proponent	N/A	N/A
Bush Forever Site	DPLH-019	Yes- Confirmed by Proponent	Relevant Database Reviewed by Bushfire Consultant	Proponent to Seek Advice
RAMSAR Wetland	DBCA-010	No- Confirmed by Proponent	N/A	N/A
Geomorphic and Other Wetland	DBCA-011-019, 040, 043, 044	No- Confirmed by Proponent	N/A	N/A
Threatened and Priority Ecological Communities (TECs or PECs)	DBCA-038	Yes- Confirmed by Proponent	Evidence Submitted by Proponent	Proponent to Seek Advice
Threatened and Priority Flora including Declared Rare Flora (DRFs)	DBCA-036	Yes- Confirmed by Proponent	Evidence Submitted by Proponent	Proponent to Seek Advice
Land Identified as significant through a Local Biodiversity Strategy	LG - Intramaps	Yes- Confirmed by Proponent	Evidence Submitted by Proponent	Proponent to Seek Advice
Statement of how the identified environmental feature(s) is dealt with in this Bushfire Management Plan (and the location of relevant information): Extensive environmental flora and fauna surveys have been carried out by the proponent as part of planning for this development. They identified that the area of the development had previously been cleared for military uses				

(munitions dump) during World War Two, and that vegetation present across the site was as the result of revegetation. The majority of trees present across the site were immature with only a small number of mature *Eucalyptus gomphocephala* (Tuarts) present. Some specimens of *Callitris preissii* (Rottnest Island Cypress) were also identified, primarily in the north-east corner of the development area. Vegetation throughout the majority of the development area was primarily the result of revegetation activities in recent decades, and there was significant weed invasion. Understory species which comprise the majority of bushfire risk were identified as weed species or significantly degraded.

Mature *E. gomphocephala* and *C. preissii* will be retained within the development design. Understory weed species will be removed and remnant vegetation parkland cleared to allow the installation of caravan and tent sites throughout. Any retained vegetation will be converted to meet the definition of Low Threat as per c.2.2.3.2(f) of AS3959.

Clearing permits will be required before any vegetation is removed from the site.

Development Design Considerations

Establishing development in bushfire prone areas can adversely affect the retention of native vegetation through clearing associated with the creation of lots and/or asset protection zones. Where loss of vegetation is not acceptable or causes conflict with landscape or environmental objectives, it will be necessary to consider available design options to minimise the removal of native vegetation.

Table 2.3: Development design.

MINIMISE THE REMOVAL OF NATIVE VEGETATION	
Design Option	Assessment / Action
Reduction of lot yield	N/A
Cluster development	N/A
Construct building to a standard corresponding to a higher BAL as per BCA (AS 3959:2018 and/or NASH Standard)	N/A
Modify the development location	Considered and development location has been modified. See comments below.
As a caravan park located in a woodland setting it is desirable to maintain as much vegetation within the bounds of the park as possible. Mature trees will be retained with the entire development site to be parkland cleared for the purpose of the development. Any other retained vegetation will be modified to meet the definition of Low Threat as defined by c.2.2.3.2(f) of AS3959.	
IMPACT ON ADJOINING LAND	
Is this planning proposal able to implement the required bushfire protection measures within the boundaries of the land being developed so as not to impact on the bushfire and environmental management of neighbouring reserves, properties or conservation covenants?	Yes
An APZ will be created entirely within the Park boundaries.	

2.2 Retained Vegetation / Re-vegetation / Landscape Plans (including POS)

Riparian zones, wetland/foreshore buffers, road verges and public open space may have plans to re-vegetate or retain vegetation as part of the proposed development. Vegetation corridors may be created between offsite and onsite vegetation and provide a route for fire to enter a development area.

All retained/planned vegetation and its management will be considered in the development of this Bushfire Management Plan.

Is re-vegetation of riparian zones and/or wetland or foreshore buffers and/or public open space a part of this Proposal?	No
N/A	
Is the requirement for ongoing maintenance of existing vegetation in riparian zones and/or wetland or foreshore buffers and/or public open space a part of this Proposal?	No
N/A	
Has a landscape plan been developed for the proposed development?	No
N/A	

3 POTENTIAL BUSHFIRE IMPACT ASSESSMENT

3.1 Assessment Input

3.1.1 Fire Danger Index (FDI) Applied

AS 3959:2018 Table 2.1 specifies the fire danger index values to apply for different regions. The values used in the model calculations are for the Forest Fire Danger Index (FFDI) and for which equivalent representative values of the Grassland Fire Danger Index (GFDI) are applied as per Appendix B. The values can be modified if appropriately justified.

Table 3.1: Applied FDI Value

FDI VALUE			
Vegetation Areas	As per AS 3959:2018 Table 2.1	As per DFES for the Location	Value Applied
1-5	80	N/A	80

3.1.2 Vegetation Classification and Effective Slope

Classification: Bushfire prone vegetation identification and classification has been conducted in accordance with AS 3959:2018 s2.2.3 and the Visual Guide for Bushfire Risk Assessment in WA (DoP February 2016).

When more than one vegetation type is present, each type is identified separately, and the applied classification considers the potential bushfire intensity and behaviour from the vegetation types present and ensures the worst case scenario is accounted for – this may not be from the predominant vegetation type.

The vegetation structure has been assessed as it will be in its mature state (rather than what might be observed on the day). Areas of modified vegetation are assessed as they will be in their natural unmodified state (unless maintained in a permanently low threat, minimal fuel condition, satisfying AS 3959:2018 s2.2.3.2(f) and asset protection zone standards). Vegetation destroyed or damaged by a bushfire or other natural disaster has been assessed on its revegetated mature state.

Effective Slope: Refers to the ground slope under each area of classified vegetation and is described in the direction relative to the view from the building or proposed development site. Effective slope is not the same as 'average slope', rather it is the slope which most significantly influences fire behaviour. This slope has a direct and significant influence on a bushfire's rate of spread and intensity.

Where there is a significant change in effective slope under an area of classified vegetation, that will cause a change in fire behaviour, separate vegetation areas will be identified to enable the correct assessment.

When the effective slope, under a given area of bushfire prone vegetation, will be different relative to multiple proposed development sites, then the effective slopes corresponding to the different locations, are separately identified.

Table 3.2: Vegetation classification and effective slope.

ALL VEGETATION WITHIN 150 METRES OF THE PROPOSED DEVELOPMENT				
Vegetation Area	Identified Vegetation Types [1] or Description if 'Excluded'	Applied Vegetation Classification [1]	Effective Slope (degrees)[2] (AS 3959:2018 Method 1)	
			Assessed	Applied Range
1	Closed Scrub D-13	Class D Scrub	0	upslope or flat
2	Closed Tussock Grassland G-21	Class G Grassland	0	upslope or flat
3	Low Open Forest A-04	Class A Forest	0	upslope or flat
4	Closed Scrub D-13	Class D Scrub	0	upslope or flat
5	Closed Scrub D-13	Class D Scrub	0	upslope or flat
6	Open Forest A-03	Class A Forest	0	upslope or flat
N/A	Managed Caravan Park	Excluded AS 3959-2018 2.2.3.2 (f)	NA	N/A
Representative photos of each vegetation area, descriptions and classification justification, are presented on the following pages. The areas of classified vegetation are defined, and the photo locations identified on Figure 3.1, the vegetation and topography map.				
Note[1]: Described and classified as per AS 3959:2018 Table 2.3 and Figures 2.3 and 2.4 (A)-(H) Note[2]: Effective slope measured as per AS 3959:2018 Section 2.2.5 and Appendix B Part B4				

Additional Supporting Information

The majority of the assessed vegetation within Area 3 has been subject to revegetation either in the past, or which is currently occurring in an ongoing fashion. There are subsequently a range of immature trees (particularly tuarts and marris) which have been assessed as if they were in their mature state. As a result this area has been assessed as Class A Forest, as that classification represents the worst case scenario for predicting fire behaviour in the future.

In contrast, Areas 1, 2, 4 and 5 do not contain enough immature tuart or marri trees to comprise more than 10% canopy cover when fully grown, and have consequently been classified as Class D Scrub or Class G Grassland, dependent on the predominant vegetation in each area.

VEGETATION AREA 1	
AS 3959:2018 Vegetation Classification Applied:	Class D Scrub
Vegetation Types Present:	Closed scrub D-13
Description/Justification:	Mixed dense acacia and tea-tree scrub over weed grasses. Average height 4m. Considerable infestation by pepper (*Schinus sp.*) trees at eastern boundary. Occasional cypress and immature eucalypt trees (less than 10%) throughout.
Post Dev. Assumptions:	The majority of vegetation inside the boundaries of the caravan park will be modified to Low Threat status, while mature trees will be retained.

Photo ID: 1a

Photo ID: 1b

VEGETATION AREA 2	
AS 3959:2018 Vegetation Classification Applied:	Class G Grassland
Vegetation Types Present:	Closed tussock grassland G-21
Description/Justification:	Mixed weed grasses with no overstory.
Post Dev. Assumptions:	As weed grasses there is no impediment to removing this vegetation, which will occur as part of the development design.

Photo ID: 2a

Photo ID: 2b

VEGETATION AREA 3	
AS 3959:2018 Vegetation Classification Applied:	Class A Forest
Vegetation Types Present:	Low open forest A-04
Description/Justification:	Regrowth tuart (*E. gomphocephela*) forest. Comprises an overstory of mixed mature and immature tuart trees, over dense elevated fuels including acacia, tea-tree and introduced weed species, over scrub and grasses. Clear tiered vegetation structure. At least 50% of the tuarts are immature and can be expected to grow to produce canopy coverage greater than 50% across the whole area.
Post Dev. Assumptions:	The majority of vegetation in Area 3 to the north and west will not be impacted by the development. A small amount of vegetation inside the development area will be converted to Low Threat, with mature trees retained.

Photo ID: 3a

Photo ID: 3b

VEGETATION AREA 4	
AS 3959:2018 Vegetation Classification Applied:	Class D Scrub
Vegetation Types Present:	Closed scrub D-13
Description/Justification:	Mixed dense acacia and tea-tree scrub over weed grasses. Average height 4m. Some eucalypts (less than 10% canopy) throughout.
Post Dev. Assumptions:	This vegetation area will not be impacted by the development.

Photo ID: 4a

Photo ID: 4b

VEGETATION AREA 5	
AS 3959:2018 Vegetation Classification Applied:	Class D Scrub
Vegetation Types Present:	Closed scrub D-13
Description/Justification:	Mixed dense acacia and pepper scrub over weed grasses. Average height 4m. Significant pepper (*Schinus sp.*) tree infestation at south end of plot and adjacent to Cockburn Road.
Post Dev. Assumptions:	This vegetation area will not be impacted by the development.

Photo ID: 5a

Photo ID: 5b

VEGETATION AREA 6	
AS 3959:2018 Vegetation Classification Applied:	Class A Forest
Vegetation Types Present:	Open forest A-03
Description/Justification:	Mature Tuart trees over peppermint and acacia elevated fuels and dense shrub understory. Clear tiered vegetation structure.
Post Dev. Assumptions:	This vegetation area will not be impacted by the development.

Photo ID: 6a

VEGETATION AREA 7	
AS 3959:2018 Vegetation Classification Applied:	Excluded as per Section 2.2.3.2 (f) Low Threat Vegetation
Vegetation Types Present:	Managed garden and caravan park areas,
Description/Justification:	Managed garden and caravan park areas, including tent and caravan sites. Some mature trees over managed lawns. Meets the definition of "Low Threat" as defined in clause 2.2.3.2(f).
Post Dev. Assumptions:	This will be maintained as Low Threat in perpetuity.

Photo ID: 7a

Photo ID: 7b

Photo ID: 7c

Photo ID: 7d

Figure 3.1

Topography & Classified Vegetation

Lot 304 on Plan 050276
Cockburn Road
WOODMAN POINT

LEGEND

- Subject Area
- Other Lots
- Hydrant

Proposed Building

- Class 1(b)
- Class 10(a)

Existing Building

- Class 10(a)
- Proposed Development

150m Assessment Area

- 150m Assessment Area
- 100m Assessment Area

Classified Vegetation

- Class (A) Forest
- Class (D) Scrub
- Class (G) Grassland
- Exclusion 2.2.3.2
- Photo No., Location & Direction

SCALE (A3)
0 25 50 75 100
Metres

LOCALITY

Aerial Imagery : Landgate/SLIP
Image Date : Aug 2020

Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Mercator Units: Metre

BUSHFIRE PRONE PLANNING

Map compiled by: Ian Ross 11/01/2021
Map udated by: Ian Ross 11/01/2021

Map Document Path / Name: K:\Projects\Jobs 2019\190354 - Woodman Point Caravan Park (BMP)\Mapping\MXD\190354_Fig3-1_VEG_SK7_Woodman_Pt_Caravmxd

3.1.3 Vegetation Separation Distance

The vegetation separation distance is the horizontal distance measured from the relevant parts of an existing building or a future building's planned location (within a lot), to the determined edge of an area of classified vegetation.

This separation distance applied to determining a Bushfire Attack Level (BAL) can be either:

- The *measured distance* – for which the location of the building relative to the edge of classified vegetation must be known. This will result in single determined BAL that will apply to a building. (The measured distance is a required calculation input); or
- A *calculated minimum and maximum distance (range)* that will correspond to each individual BAL. The calculated distances provide an indicative (or achievable) BAL for which the determined BAL will be dependent on the known location of the building relative to the edge of classified vegetation.

  The calculated range of distances corresponding to each BAL can be presented in different formats (tables or a BAL contour map), dependent on the form of information that is most appropriate for the proposed development/use. These distance ranges corresponding to BAL(s) will be presented in Section 3.2: 'Assessment Output".

For the proposed development/use, the applicable vegetation separation distances will be presented within the Bushfire Management Plan in this location:	In Section 3.2 'Assessment Output' as a table containing the calculated ranges of distance corresponding to each BAL and illustrated as a BAL Contour Map.

3.2 Assessment Output

UNDERSTANDING THE RESULTS OF THE BUSHFIRE IMPACT ASSESSMENT

Bushfire Attack Levels (BALs) – Their Application in the Building Environment is Different to the Planning Environment

In the building environment, a ***determined BAL*** is required for the proposed construction at the building application stage. This is to inform approval considerations and establish the bushfire construction standards that are to apply. An indicative BAL is not acceptable for a building application.

In the planning environment, through the application of SPP 3.7 and associated Guidelines, the deemed to satisfy requirement for a proposed 'development site' or sites (defined by the LPS Amendment Regulations 2015 as "that part of a lot on which a building that is the subject of development stands or is to be constructed"), is that a BAL-29 or lower rating can be achieved once all works associated with the proposal are completed. For planning approval purposes, an ***indicative BAL*** can provide the required information.

Determined Bushfire Attack Level

A determined BAL is to apply to an existing building or the 'development site' on which the building is to be constructed and not to a lot or building envelope. Its purpose is to state the potential radiant heat flux to which the building will be exposed, thereby determining the construction standard to be applied.

A determined BAL cannot be given for a future building whose design and position on the lot are unknown or the vegetation separation distance has not been established. It is not until these variables have been fixed that a determined BAL can be stated, and a BAL Certificate can be issued.

The one exception is when a building ***of any dimension*** can be ***positioned anywhere*** on a proposed lot (within R-Code building setbacks) or within a defined building envelope, and always remain subject to the same BAL, regardless of the retention of any existing classified vegetation either onsite or offsite.

Indicative Bushfire Attack Level

If a BAL is not able to achieve 'determined' status it will be an indicative BAL. It indicates the BAL that can be achieved by the proposed development/use. However, it is conditional upon an assessment variable(s) being confirmed at a later stage (e.g. the building location is established/changed, or vegetation is modified/removed to establish the vegetation separation distance).

A BAL certificate cannot be issued for an indicative BAL – unless that BAL cannot vary (refer to 'Determined BAL' above).

In table form, a single or a range of indicative BAL(s) may be presented. If a single indicative BAL is stated for a defined area (i.e. the lot or building envelope), this will be the highest indicative BAL impacting the defined area.

In BAL contour map form (refer to Section 3.2.1), the illustrated BAL contours visually identify areas of land for which if any part of an existing or proposed building is located on that land and within the BAL contours, then the highest BAL affecting that building (or part of the land on which the building will be constructed), will be the indicative BAL that is to apply.

The BAL can only become a determined BAL once the actual location of that building on the land is known and/or the required minimum vegetation separation distance corresponding to the relevant BAL contour is established (refer to Table 3.3).

3.2.1 Bushfire Attack Level Results - BAL Contour Map Format

INTERPRETATION OF THE BUSHFIRE ATTACK LEVEL (BAL) CONTOUR MAP

The contour map will present different coloured contour intervals extending from the areas of classified bushfire prone vegetation. These represent the different bushfire attack levels that will exist at varying distances away from the classified vegetation in the event of a bushfire in that vegetation.

The areas of classified vegetation to be considered in developing the BAL contours, are those that will remain as the intended end state of the subject development once earthworks, clearing and/or landscaping and re-vegetation have been completed (or each stage completed).

Each bushfire attack level corresponds to a set range of radiant heat flux that is generated by a bushfire. That range is defined by the AS 3959:2018 BAL determination methodology.

The width of each shaded BAL contour is a diagrammatic representation of the separation distances from the classified vegetation that correspond to each BAL for each separately identified area of classified vegetation. They have been calculated by the application of the unique site variables including vegetation types and structure, ground slope and applied fire weather.

Refer to Section 3.2 'Understanding the Results of the Bushfire Impact Assessment' for the explanation of how BAL(s) for buildings will be assessed from the BAL Contour Map).

Construction of the BAL Contours

VEGETATION AREAS APPLIED TO THE DEVELOPMENT OF THE BAL CONTOUR MAP

All identified areas of classified vegetation have been applied with the following exceptions:

1. For Figure 3.2, all classified vegetation within the boundaries of the proposed lot is excluded and the BAL contours are constructed into the lot from any classified vegetation outside the boundaries of the proposed lot; and

This approach is applied to indicate the achievable bushfire attack levels within the specified lot and the resultant area of developable land (i.e. subject to BAL-29 or less). It is based on the following assumptions:

1. Any classified vegetation within the lot can potentially be managed by the landowner to meet asset protection zone standards and dimensions corresponding to an indicated BAL.

VEGETATION SEPARATION DISTANCES APPLIED

The distances that have been applied to illustrating the width of each BAL contour shown in Figures 3.2 and 3.3 are stated in Table 3.3. These correspond to each Bushfire Attack Level and are specific to the proposed development site.

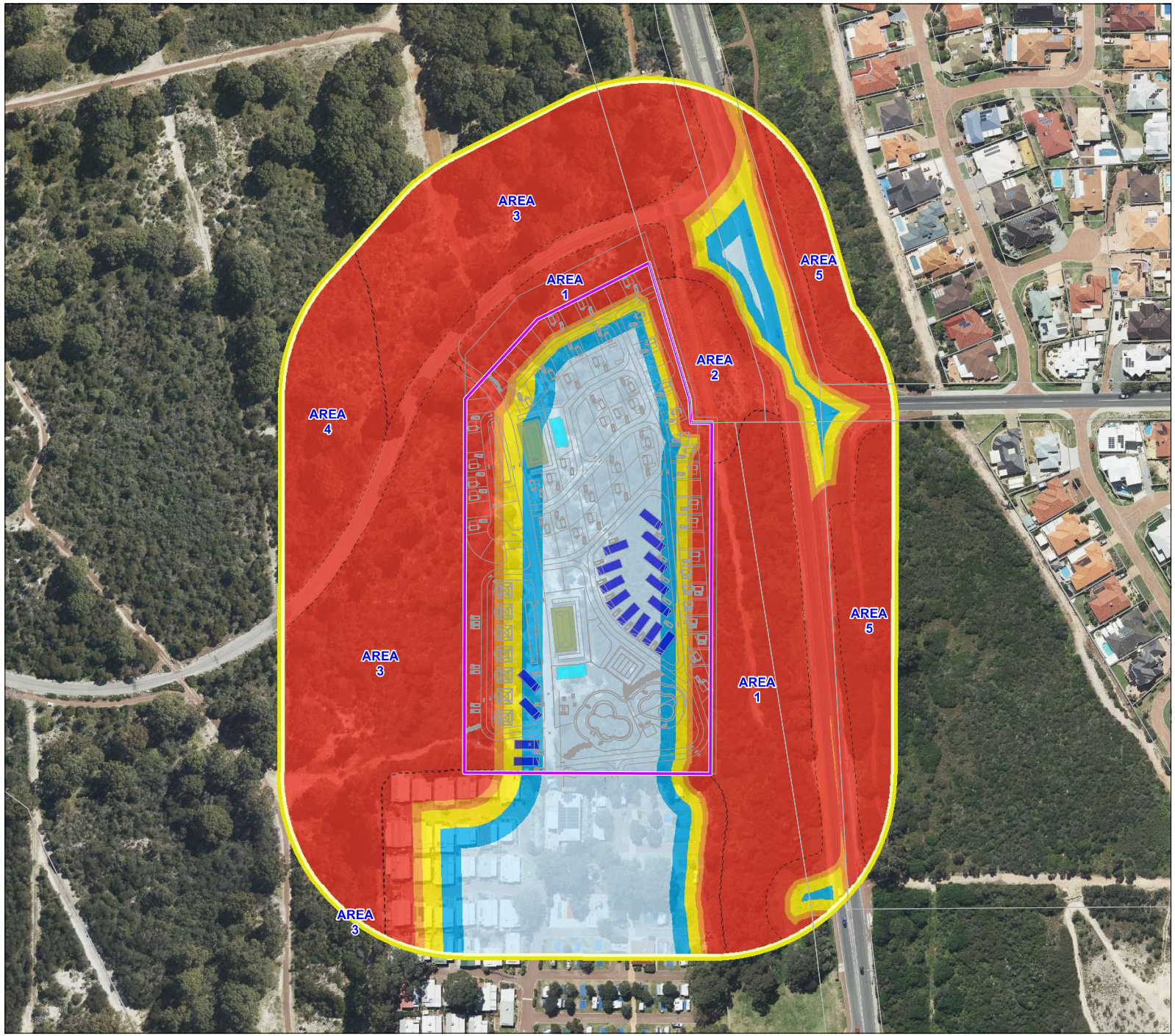
Table 3.3: Vegetation separation distances applied to construct the BAL contours.

BAL CONTOUR MAP – APPLIED VEGETATION SEPARATION DISTANCES								
Derived from the Application of Method 1 BAL Determination Methodology (AS 3959:2018 Section 2, Table 2.5)[1]								
Vegetation Area	Vegetation Classification	Effective Slope (degree range)	BAL and Corresponding Separation Distance (m)					
			BAL-FZ	BAL-40	BAL-29	BAL-19	BAL12.5	BAL-LOW
1	Class D Scrub	upslope or flat	<10	10-<13	13-<19	19-<27	27-<100	>100
2	Class G Grassland	upslope or flat	<6	6-<8	8-<12	12-<17	17-<50	>50
3	Class A Forest	upslope or flat	<16	16-<21	21-<31	31-<42	42-<100	>100
4	Class D Scrub	upslope or flat	<10	10-<13	13-<19	19-<27	27-<100	>100
5	Class D Scrub	upslope or flat	<10	10-<13	13-<19	19-<27	27-<100	>100
6	Class A Forest	upslope or flat	<16	16-<21	21-<31	31-<42	42-<100	>100

Figure 3.2

BAL Contour Map

Lot 304 on Plan 050276
Cockburn Road
WOODMAN POINT



LEGEND

- Subject Area
- Other Lots

Proposed Building

- Class 1(b)
- Class 10(a)

Existing Building

- Class 10(a)
- 100m Assessment Area

Bushfire Attack Levels (Method 1)

- Vegetation edge (Indicative only)
- BAL FZ (Indicative only)
- BAL 40 (Indicative only)
- BAL 29 (Indicative only)
- BAL 19 (Indicative only)
- BAL 12.5 (Indicative only)
- Proposed Development

SCALE (A3)

0 25 50 75 100

Metres

LOCALITY

N

Aerial Imagery : Landgate/SLIP
Image Date : Aug 2020

Coordinate System: GDA 1994 MGA Zone 50
Projection: Universal Transverse Mercator Units: Metre

BUSHFIRE PRONE PLANNING

Map compiled by: Ian Ross 11/01/2021
Map udated by: Ian Ross 11/01/2021

Map Document Path / Name: K:\Projects\Jobs 2019\190354 - Woodman Point Caravan Park (BMP)\Mapping\MXD\190354_Fig3-2_BAL_SK7_Woodman_Pt_Carav.mxd

3.2.2 Bushfire Attack Level Results - Derived from The BAL Contour Map

Table 3.4: Indicative bushfire attack levels and corresponding building setbacks.

INDICATIVE BUSHFIRE ATTACK LEVELS FOR FUTURE BUILDING ON THE LOT AND REQUIRED BUILDING SETBACKS							
Vegetation Area	Relevant Lot Boundary[2]	Highest BAL Impacting the Lot	AS 3959:2018 BAL Determination Method Applied	Required Minimum Building Setback to Achieve BAL-29 (from relevant lot boundary)		Applied R-Code Building Setback	Additional Building Setback Required (restrictive covenant)
				BAL	metres	metres	metres
1	North and East	BAL-FZ	Method 1	BAL-29	13	N/A	N/A
2	North-east	BAL-FZ	Method 1	BAL-29	8	N/A	N/A
3	West	BAL-FZ	Method 1	BAL-29	21	N/A	N/A
Note[2]: The lot boundary adjacent to the relevant vegetation area from which the required building setback distance to achieve the stated BAL is to be applied.							

As a caravan park the majority of the land area will be used for short stay accommodation in tents and caravans. Some permanent cabins meeting the definition of Class B buildings and highlighted blue in Figure 3.2 are included within the site design, but all are impacted by a maximum of BAL-29. The safari tents do not meet the definition of a "habitable building" under Planning Legislation, or a classified building under the BCA.

4 IDENTIFICATION OF BUSHFIRE HAZARD ISSUES

In response to the Bushfire Management Plan requirements established by Appendix 5 of the Guidelines for Planning in Bushfire Prone Areas (WAPC 2017 v1.3), the following statements are made to assist in the understanding of whether the proposal is likely to be able to comply with the bushfire protection criteria now or in subsequent planning stages.

Spatial Context - Broader Landscape Considerations	
Wider road network and access constraints	Woodman Point is an area of remnant bushland within a larger built-out suburban area. The surrounding area has an extensive public road network at the larger scale and the caravan park fronts onto Cockburn Road, which provides two access options, with numerous other options provided by the surrounding road network. There is no access constraint for the subject site with regard to what is considered acceptable from a planning perspective.
Proximity of settlements and emergency services	Woodman Point is an area of remnant bushland within a larger built-out suburban area. It is located inside the gazetted fire district with fire response from Success, Murdoch and Fremantle CFRS Brigades, and from helitak aircraft based at Jandakot airport. In the event of an evacuation from the site Park users can quickly and easily reach built out "safe" areas.
Bushfire prone vegetation types and extent (including conserved vegetation)	Woodman Point is a relatively large area (approximately 350 ha) of remnant vegetation within a wider built out suburban environment. There are numerous low threat developed areas throughout Woodman Point such as parks, caravan parks, and other land uses, which serve to break up flammable vegetation and limit the development of a landscape style bushfire. The caravan park site is surrounded by bushfire prone vegetation, comprising Class A, Class D and Glass G vegetation types. The majority of vegetation exists to the east and north, with only a relatively thin strip of classified vegetation to the east.
Topography and fire behaviour interactions.	Woodman point is coastal and the caravan park site sits at the rear of a low dune system. The ground surface is essentially flat for the purposes of determining fire behaviour. Typical local weather conditions suggest a fire is most likely to impact from the west and south-west driven by a sea breeze.
Potential for extreme fire behaviour and pyro convective events.	Woodman Point is a relatively large area (approximately 350 ha) of remnant vegetation within a wider built out suburban environment. There are numerous low threat developed areas throughout Woodman Point such as parks, caravan parks, and other land uses, which serve to break up flammable vegetation and limit the development of a landscape style bushfire. The type of vegetation (predominantly coastal heath) and constrained geographic area make a plume driven bushfire extremely unlikely, limiting the possibility for pyro-convective events. Any fire will likely be wind driven with high Rates of Spread and short duration.
Environmental Considerations	
Constraints to implementing required and/or additional bushfire protection measures	The caravan park is located within a Bush Forever area limiting the capacity for clearing. However environmental surveys on behalf of the proponent have identified limited significant flora and fauna within the development site. Mature trees will be retained as part of the site design and other vegetation will be converted to meet the definition of Low Threat as per c.2.2.3.2(f) of AS3959.
Provision of Access Within the Subject Site	
Potential constraints	As a caravan park the site has good access and egress to allow for the movement of caravans within the site boundaries. The development will connect the north end of the caravan park to Nyyerbup Circle providing through access, with existing access to Cockburn Road at the south-east.
Potential Bushfire Impacts	

Flame and radiant heat and ability to establish an APZ	A BAL-29 dimensioned APZ can be established within the boundaries of the caravan park. This will prevent flame contact from the classified vegetation. Application of the BAL-29 bushfire construction standard for the few cabins will mitigate the risks from radiant heat impact to what is considered an acceptable level. As a caravan park there is significant scope to alter the park design and layout to ensure all structures have a maximum BAL-29 exposure.
Embers/firebrands, smoke and fire-driven wind	Strict management of the APZ will mitigate the risk to what is considered an acceptable level. For all fires early evacuation of all park users will be of the highest priority.
Issues to be Considered at Subsequent Planning Stages (additional assessments/documents)	
Specific land uses to be addressed	N/A
Additional assessments	N/A
Additional documents	An Emergency Evacuation Plan specific to bushfires will need to be developed prior to the caravan park extension being opened to the public.
Discretionary Decision Making and the Precautionary Principle (SPP 3.7 and Guidelines)	
Does the bushfire consultant consider there are issues that need to be addressed in this space?	No.

5 ASSESSMENT AGAINST THE ACCEPTABLE SOLUTIONS (POLICY MEASURES) ESTABLISHED BY THE 'TOURISM LAND USE' POSITION STATEMENT

For a proposal (application) that is a 'Tourism Land Use' to be considered compliant with SPP 3.7, it must satisfy the requirements established by the *Position Statement: Tourism land uses in bushfire prone areas WAPC November 2019*. The position statement establishes 'tourism land use specific' policy objectives and measures and establishes a set of elements and corresponding acceptable solutions (policy measures) against which a tourism proposal is to be assessed (replacing the bushfire protection criteria established by the Guidelines). Compliance can be achieved by either:

- Meeting all applicable acceptable solutions corresponding to each element (i.e. the minimum bushfire protection measures that are deemed to satisfy planning requirements); or
- Where an acceptable solution cannot be met, conduct a risk based assessment and if necessary, apply additional and/or contingency bushfire protection measures to reduce the risk to an acceptable level (as relevant to the proposed use and its scale and location).

5.1 Local Government Variations to Apply

Local governments may add to or modify the acceptable solutions of the Bushfire Protection Criteria (BPC) and/or apply technical requirements that vary from those specified in the Guidelines for Planning in Bushfire Prone Areas (WAPC). In such instances, this Proposal will be assessed against these variations and/or any specific local government technical requirements for emergency access and water. Refer to Appendices 2 and 3 for relevant technical requirements.

Will local or regional variations (endorsed by WAPC / DFES) to the applicable acceptable solutions established by the *Guidelines* or the *Position Statement: Tourism land uses in bushfire prone areas WAPC November 2019,* apply to this Proposal?	No

5.2 Summary of Assessment Against the Acceptable Solutions for Tourism Land Use

SUMMARISED OUTCOME OF THE ASSESSMENT AGAINST THE ACCEPTABLE SOLUTIONS (POLICY MEASURES) OF THE TOURISM LAND USE POSITION STATEMENT			
Element (Table 1: Tourism Land Uses - 'Tourism Position Statement')	Basis of Achieving the Intent of the Bushfire Protection Measures Established in Table 1 of the Position Statement: Tourism land uses in bushfire prone areas (WAPC November 2019) and Compliance with SPP 3.7		
	All Applicable Acceptable Solutions (Policy Measures) Are or Can be Fully Met	The Proposal is Supported by a Risk-Based Assessment (in a form that reflects the nature and scale of the development) and The Application of Additional Bushfire Protection Measures as Necessary	
		Bushfire Risk Assessment and Treatment Plan (refer to separate document)	Vulnerability Assessment (refer to Addendum 1)
1. Siting and Design	✓	N/A	N/A
2. Vehicular Access	✓		
3. Provision of Water	✓		

Note: The development proposal has been assessed:

1. Against the requirements established by Table 1 of the *Position Statement: Tourism land uses in bushfire prone areas (WAPC November 2019)*
2. Against the requirements established in Appendix 4 of the *Guidelines for Planning in Bushfire Prone Areas, WAPC 2017 v1.3 (Guidelines)* but excluding the Bushfire Protection Criteria unless referenced by the above 'Position Statement'. The Guidelines are found at https://www.planning.wa.gov.au/8194.aspx; and
3. Applying the interpretation guidance provided in *Position Statement: Planning in bushfire prone areas – Demonstrating Element 1: Location and Element 2: Siting and design (WAPC Nov 2019)* – to the extent guidance regarding Element 2 may be applied to a development application.

5.3 Assessment Detail

Element 1 (Tourism Land Use): Siting and Design of Development	
Tourism Type: Caravan Park – Includes Camping Ground	
Intent: To provide bushfire protection for tourism uses relevant to the characteristics of the occupants and/or surrounding community to preserve life and reduce the impact of bushfire on property and infrastructure.	
Compliance: How the proposed development achieves the intent of Element 1:	By fully meeting all applicable acceptable solutions established by Table 1 of Position Statement: Tourism land uses in bushfire prone areas (WAPC October 2019)
ASSESSMENT (COMPLIANCE) STATEMENTS For each applicable acceptable solution, the following statements present the results of the assessment of the proposed development/use against the requirements established by the *Position Statement: Tourism land uses in bushfire prone areas (WAPC November 2019)*.	
Acceptable Solution (Policy Measure): 1.1: Siting and design to reduce levels of radiant heat, smoke and ember attack. Consideration should be given to: • The provision of an APZ to achieve 29kW/m2 around the campground facilities, which may include the office, manager's residence, camp kitchen and shower/laundry. • Clustering of camp sites and securing an APZ around the entire development or providing an APZ to separate the site from the potential adjoining hazard. • Where there is no bushfire construction standard (i.e. tents and caravans and some eco tents) and the loss of these structures is identified in a risk assessment as a 'tolerable' risk, then no APZ is required and subject to a risk assessment, these structures may be located in areas of BAL-40 or BAL-FZ.	
The Woodman Point Caravan Park is not located in a remote or regional area. Instead it is located in an area of remnant vegetation within a built out suburban area, part of the Perth Metropolitan area. As such it will not be subject to a landscape level fire. • An APZ will be established around the margins of the caravan park, and the entire area of the caravan park will be maintained in a Low Threat state as per c.2.2.3.2(f) of AS3959. • All permanent or semi-permanent structures will be located with a maximum of BAL-29 exposure. No structures meeting the definition of a "habitable building" will be located in areas with a BAL-40 or BAL-FZ exposure. • The external areas of the site with a BAL-40 or BAL-FZ exposure will be used for short stay van and tent sites. As per the Risk Assessment listed in the City of Cockburn BRMP, the loss of caravans and tents in the event of a fire is considered a "tolerable" risk and risk to humans is mitigated by the ability to evacuate to safe areas quickly and easily.	
Acceptable Solution (Policy Measure): 1.2: Where a building is to function as an on-site shelter, there must be sufficient separation distance from the predominant bushfire prone vegetation to avoid exposure to a radiant heat flux exceeding 10kW/m2 (with an assumed flame temperature of 1200K); or where an open space area is to function as an on-site shelter, there must be sufficient separation distance from the predominant bushfire prone vegetation to avoid exposure to a radiant heat flux exceeding 2kW/m2 (with an assumed flame temperature of 1200K).	
An on-site shelter is not considered appropriate for this development due to the capacity to enact an evacuation into safe areas.	

Element 1 (Tourism Land Use): Siting and Design of Development
Acceptable Solution (Policy Measure): 1.3: Buildings identified as suitable on-site shelter shall be designed and constructed in accordance with National Construction Code and the ABCB Community Shelter Handbook.
An on-site shelter is not considered appropriate for this development due to the capacity to enact an evacuation into safe areas.

Element 2 (Tourism Land Use): Vehicular Access	
Tourism Type: Caravan Park – Includes Camping Ground	
Intent: To provide bushfire protection for tourism uses relevant to the characteristics of the occupants and/or surrounding community to preserve life and reduce the impact of bushfire on property and infrastructure.	
Compliance: How the proposed development achieves the intent of Element 2:	By fully meeting all applicable acceptable solutions established by Table 1 of Position Statement: Tourism land uses in bushfire prone areas (WAPC October 2019)
ASSESSMENT (COMPLIANCE) STATEMENTS For each applicable acceptable solution, the following statements present the results of the assessment of the proposed development/use against the requirements established by the *Position Statement: Tourism land uses in bushfire prone areas (WAPC November 2019.*	
Acceptable Solution: 2.1: Caravan parks located in residential built-out areas should provide one access route which connects to the public road network and provides safe access and egress.	
The caravan park is located in a residential built-out area and the site design has two points of access/egress, at the north end to Nyyerbup Circuit, and at the south-east to Cockburn Road.	
Acceptable Solution: 2.2: Caravan parks located outside of residential built-out areas -where vehicular access in two different directions to two different destinations cannot be provided, the BMP should identify the risks and propose bushfire management measures to reduce this risk, which may include on-site shelter and or closure.	
The caravan park is located in a residential built-out area.	
Acceptable Solution: 2.3: All roads should be through roads. Dead end roads are not recommended but if unavoidable, or they are existing, they should be no more than 200 metres.	
All internal roads and pathways provide through access. There are no dead-ends within the caravan park design.	
Acceptable Solution: 2.4: Access routes should achieve the requirements of Table 6 in the *Guidelines for Planning in Bushfire Prone Areas*.	
The construction technical requirements established by the Guidelines and/or the local government can and will be complied with. These requirements are set out in Appendix 2.	

Element 3 (Tourism Land Use): Provision of Water	
Tourism Type: Caravan Park – Includes Camping Ground	
Intent: To provide bushfire protection for tourism uses relevant to the characteristics of the occupants and/or surrounding community to preserve life and reduce the impact of bushfire on property and infrastructure.	
Compliance: How the proposed development achieves the intent of Element 3:	By fully meeting all applicable acceptable solutions established by Table 1 of Position Statement: Tourism land uses in bushfire prone areas (WAPC October 2019)
ASSESSMENT (COMPLIANCE) STATEMENTS For each applicable acceptable solution, the following statements present the results of the assessment of the proposed development/use against the requirements established by the *Position Statement: Tourism land uses in bushfire prone areas (WAPC November 2019)*.	
Acceptable Solution: 3.1: The development or land use is provided with a reticulated water supply in accordance with the specifications of the relevant water supply authority and/or the local government; or Acceptable Solution 3.2 or 3.3.	
A reticulated water supply is available to the subject site. The proposed development is located over 200m from the nearest hydrant located at the corner of Magazine Court and Cockburn Road. This will require the installation of a new hydrant on Cockburn Road near the corner of Nyyerbup Circuit to provide appropriate firefighting water to the site. Firefighting hosereels are located throughout the caravan park and will be installed in the new development area. The construction technical requirements established by the Guidelines and/or the local government can and will be complied with.	
Acceptable Solution: 3.2: Where the intention is to actively defend property and infrastructure, provision of a minimum 10,000 litre static water supply for firefighting purposes per building/structure, in addition to any requirements for potable water; or Acceptable Solution 3.3.	
N/A	
Acceptable Solution: 3.3: Where the intention is to actively defend property and infrastructure, provision of a minimum 50,000 litre static water supply for firefighting purposes per 25 buildings/structures, to the satisfaction of the local government.	
N/A	
Acceptable Solution: 3.4: Dedicated water supplies shall be non-combustible (or suitably shielded) and located such that fire services can readily gain access to appropriate fittings and connect fire fighting vehicles to dedicated water supplies in a safe manner.	
N/A	

5.3.1 Additional Measures Established by the Bushfire Emergency Plan

SPP 3.7 establishes the requirement for a Bushfire Emergency Plan to be developed and used as a bushfire protection measure for 'vulnerable' land uses. The emergency plan is produced as a separate operational document.

It establishes the required actions corresponding to a set of relevant procedures that are to be followed in preparation for a bushfire emergency event and in response to and recovery from, a bushfire emergency event.

The responsibility for the facility/premises owner/manager to ensure the requirements of Bushfire Emergency Plan are actioned every year, is established in Section 6 of this Bushfire Management Plan.

This BMP establishes a requirement for a BEP to be developed prior to occupancy of the site.

6 RESPONSIBILITIES FOR IMPLEMENTATION AND MANAGEMENT OF THE BUSHFIRE PROTECTION MEASURES

Table 6.1: BMP Implementation responsibilities prior to occupancy or building.

Landowner (Developer) - Prior to Occupancy	
No.	Implementation Actions
1	The local government may condition a development application approval with a requirement for the landowner/proponent to register a notification onto the certificate of title and deposited plan. This will be done pursuant to Section 70A *Transfer of Land Act 1893* as amended ('Factors affecting use and enjoyment of land, notification on title'). This is to give notice of the bushfire hazard and any restrictions and/or protective measures required to be maintained at the owner's cost. This condition ensures that: 1. Landowners/proponents are aware their lot is in a designated bushfire prone area and of their obligations to apply the stated bushfire risk management measures; and 2. Potential purchasers are alerted to the Bushfire Management Plan so that future landowners/proponents can continue to apply the bushfire risk management measures that have been established in the Plan.
2	Prior to sale and post planning approval, the entity responsible for having the BMP prepared should ensure that anyone listed as having responsibility under the Plan has endorsed it and is provided with a copy for their information and informed that it contains their responsibilities. This includes the landowners/proponents (including future landowners where the Plan was prepared as part of a subdivision approval), local government and any other authorities or referral agencies ('Guidelines' s4.6.3).
3	Establish the Asset Protection Zone (APZ) throughout the caravan park area to the largest dimension as shown in Table 3.4 of this Plan. Establish the APZ to the standards established by the Guidelines (refer to Appendix 1) or as varied by the local government through their Firebreak Notice (refer to the following responsibility). Convert all vegetation throughout the Park area to meet the definition of Low Threat as per c.2.2.3.2(f) of AS3959. Any vegetation clearing within the Park area should not be undertaken without first considering environmental concerns and the need for clearing permits. This is the responsibility of the landowner to be completed prior to occupancy of the Park extension.
4	There is an outstanding obligation, created by this Bushfire Management Plan, for a Bushfire Emergency Plan for proposed occupants to be developed and approved for the 'vulnerable' land use.
5	Prior to occupancy, all actions contained within the Pre-Season Procedure established by the Bushfire Emergency Plan, must be completed.
6	Prior to any building work, inform the builder of the existence of this Bushfire Management Plan and the responsibilities it contains, regarding the required construction standards. This will be: • The standard corresponding to the determined BAL, as per the bushfire provisions of the Building Code of Australia (BCA); and/or • A higher standard because the BMP establishes that the construction standard is to correspond to a higher BAL as an additional bushfire protection measure.

Table 6.2: Ongoing management responsibilities for the Landowner/Occupier.

Landowner/Occupier - Ongoing	
No.	Ongoing Management Actions
1	Maintain all vegetation to meet the definition of Low Threat status as per c.2.2.3.2(f) of AS3959, throughout the entire Park area Maintain the APZ to the above dimensions and to the standards established by the Guidelines (refer to Appendix 1) or as varied by the local government through their Firebreak Notice (refer to the following responsibility). by the relevant local government through their Firebreak Notice (refer to the following responsibility).
2	Ensure that the only land uses within the APZ area as listed in Table 3.4 of this Plan are short term caravan and tent sites.
3	Comply with the City of Cockburn's annual Fire Control Order issued under s33 of the Bush Fires Act 1954. This may include specifications for asset protection zones that differ from the Guideline's APZ Standards, with the intent to better satisfy local conditions. When these are more stringent than those created by the Guidelines, or less stringent and endorsed by the WAPC and DFES, they must be complied with. Refer to Appendix 1.
4	Maintain vehicular access routes within the lot to the required surface condition and clearances as stated in the BMP.
5	Ensure that any builders (of future structures on the lot) are aware of the existence of this Bushfire Management Plan and the responsibilities it contains regarding the application of construction standards corresponding to a determined BAL.
6	Ensure all future buildings the landowner has responsibility for, are designed and constructed in full compliance with: 1. the requirements of the WA Building Act 2011 and the bushfire provisions of the Building Code of Australia (BCA); and 2. with any identified additional requirements established by this BMP or the relevant local government.
7	Annually review the Bushfire Emergency Plan and conduct the pre-season preparation procedure.

Table 6.3: Ongoing management responsibilities for the Local Government.

Local Government - Ongoing	
No.	Ongoing Management Actions
1	Monitor landowner compliance with the Bushfire Management Plan and the annual Fire Control Order.
2	Where control of an area of vegetated land is vested in the control of the local government and that area of land has influenced the assessed BAL(s) of the subject site(s) – and the BAL has been correctly assessed and considered all reasonable and likely future expectations for changes in vegetation classification - there is an obligation to consider the impact of any changes to future vegetation management and/or revegetation plans with respect to that area.

A1.1 Requirements Established by the Guidelines – Standards for Asset Protection Zones

(Source: Guidelines for Planning in Bushfire Prone Areas - WAPC 2017 v1.3 Appendix 4, Element 2, Schedule 1 and Explanatory Note E2.1)

DEFINING THE ASSET PROTECTION ZONE (APZ)

Description: An APZ is an area surrounding a building that is managed to reduce the bushfire hazard to an acceptable level (by reducing fuel loads). The width of the required APZ varies with slope and vegetation and varies corresponding to the BAL rating determined for a building (lower BAL = greater dimensioned APZ).

For planning applications, the minimum sized acceptable APZ is that which is of sufficient size to ensure the potential radiant heat impact of a fire does not exceed 29kW/m² (BAL-29). It will be site specific.

For subdivision planning, design elements and excluded/low threat vegetation adjacent to the lot(s) can be utilised to achieve the required vegetation separation distances and therefore reduce the required dimensions of the APZ within the lot(s).

Defendable Space: The APZ includes a defendable space which is an area adjoining the asset within which firefighting operations can be undertaken to defend the structure. Vegetation within the defendable space should be kept at an absolute minimum and the area should be free from combustible items and obstructions. The width of the defendable space is dependent on the space, which is available on the property, but as a minimum should be 3 metres.

Establishment: The APZ should be contained solely within the boundaries of the lot on which the building is situated, except in instances where the neighbouring lot or lots will be managed in a low-fuel state on an ongoing basis, in perpetuity.

The APZ may include public roads, waterways, footpaths, buildings, rocky outcrops, golf courses, maintained parkland as well as cultivated gardens in an urban context, but does not include grassland or vegetation on a neighbouring rural lot, farmland, wetland reserves and unmanaged public reserves.

[Note: Regardless of whether an Asset Protection Zone exists in accordance with the acceptable solutions and is appropriately maintained, fire fighters are not obliged to protect an asset if they think the separation distance between the dwelling and vegetation that can be involved in a bushfire, is unsafe.]

Schedule 1: Standards for APZ

Fences: within the APZ are constructed from non-combustible materials (e.g. iron, brick, limestone, metal post and wire). It is recommended that solid or slatted non-combustible perimeter fences are used.

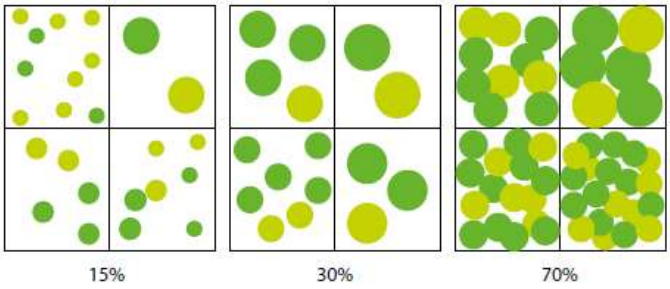
Objects: within 10 metres of a building, combustible objects must not be located close to the vulnerable parts of the building i.e. windows and doors.

Fine Fuel Load: combustible dead vegetation matter less than 6 mm in thickness reduced to and maintained at an average of two tonnes per hectare (example below).

Example: Fine fuel load of 2 t/ha
(Image source: Shire of Augusta Margaret River's Firebreak and Fuel Reduction Hazard Notice)

Trees (> 5 metres in height): trunks at maturity should be a minimum distance of 6 metres from all elevations of the building, branches at maturity should not touch or overhang the building, lower branches should be removed to a height of 2 metres above the ground and or surface vegetation, canopy cover should be less than 15% with tree canopies at maturity well spread to at least 5 metres apart as to not form a continuous canopy. Diagram below represents tree canopy cover at maturity.

Tree canopy cover – ranging from 15 to 70 per cent at maturity



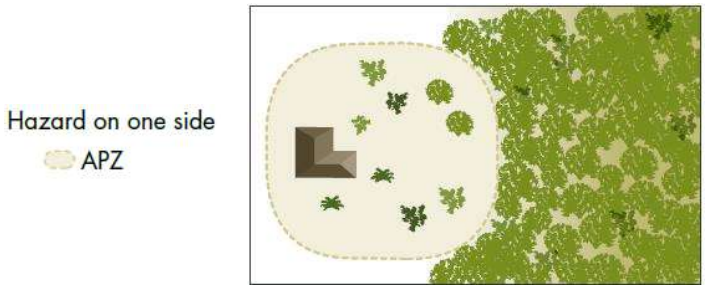
(Source: Guidelines for Planning in Bushfire Prone Areas 2017, Appendix 4)

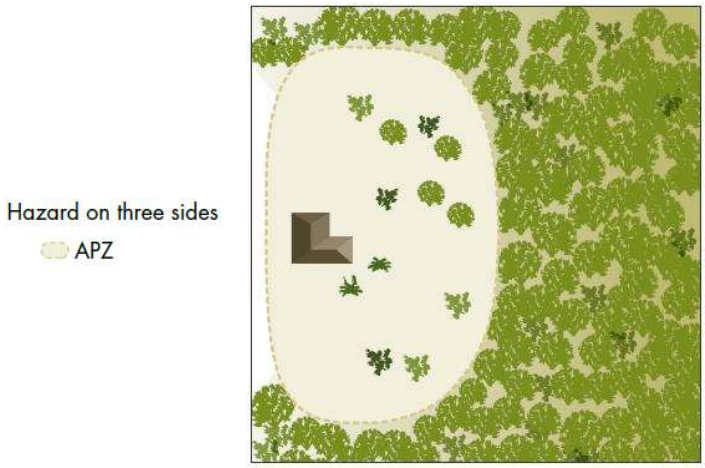
Shrubs (0.5 metres to 5 metres in height): should not be located under trees or within 3 metres of buildings, should not be planted in clumps greater than 5m2 in area, clumps of shrubs should be separated from each other and any exposed window or door by at least 10 metres. Shrubs greater than 5 metres in height are to be treated as trees.

Ground covers (<0.5 metres in height): can be planted under trees but must be properly maintained to remove dead plant material and any parts within 2 metres of a structure, but 3 metres from windows or doors if greater than 100 mm in height. Ground covers greater than 0.5 metres in height are to be treated as shrubs.

Grass: should be managed to maintain a height of 100 mm or less.

The following example diagrams illustrate how the required dimensions of the APZ will be determined by the type and location of the vegetation.





A1.2 Requirements Established by the Local Government – the Firebreak Notice

The relevant local government's current Firebreak Notice is available on their website, at their offices and is distributed as ratepayer's information. It must be complied with.

These requirements are established by the relevant local government's Firebreak Notice created under s33 of the Bushfires Act 1954 and issued annually (potentially with revisions). The Firebreak Notice may include additional components directed at managing fuel loads, accessibility and general property management with respect to limiting potential bushfire impact.

If Asset Protection Zone (APZ) specifications are defined in the Firebreak Notice, these may differ from the Standards established by the Guideline's, with the intent to better satisfy local conditions. When these are more stringent than those created by the Guidelines, or less stringent and endorsed by the WAPC and DFES, they must be complied with.

The APZ dimensions to be physically established and maintained, will be based on which of the following establishes the larger APZ dimension:

- The dimensions corresponding to the determined BAL of a building (refer to Section 3.2 explanation of the 'planning' versus 'building' requirements and 'indicative' versus 'determined' BAL(s)); or
- The APZ dimensions established by the local government's Firebreak Notice.

A1.3 Requirements Recommended by DFES – Property Protection Checklists

Further guidance regarding ongoing/lasting property protection (from potential bushfire impact) is presented in the publication 'DFES – Fire Chat – Your Bushfire Protection Toolkit'. It is available from the Department of Fire and Emergency Services (DFES) website.

A1.4 Requirements Established by AS 3959:2018 – 'Minimal Fuel Condition'

This information is provided for reference purposes. This knowledge will assist the landowner to comply with Management Requirement No. 3 set out in the Guidance Panel at the start of this Appendix. It identifies what is required for an area of land to be excluded from classification as a potential bushfire threat.

"Australian Standard - AS 3959:2018 Section 2.2.3.2: Exclusions - Low threat vegetation and non-vegetated areas:

The Bushfire Attack Level shall be classified BAL-LOW where the vegetation is one or a combination of the following:

a) Vegetation of any type that is more than 100m from the site.

b) Single areas of vegetation less than 1ha in area and not within 100m of other areas of vegetation being classified vegetation.

c) Multiple area of vegetation less than 0.25ha in area and not within 20m of the site or each other or other areas of vegetation being classified vegetation.

d) Strips of vegetation less than 20m in width (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20m of the site or each other, or other areas of vegetation being classified vegetation.

e) Non-vegetated areas, that is, areas permanently cleared of vegetation, including waterways, exposed beaches, roads, footpaths, buildings and rocky outcrops.

f) *Vegetation regarded as low threat due to factors such as flammability, moisture content or fuel load. This includes grassland managed in a* ***minimal fuel condition,*** *(means insufficient fuel available to significantly increase the severity of a bushfire attack – for example, recognisable as short cropped grass to a nominal height of 100mm), mangroves and other saline wetlands, maintained lawns, golf courses (such as playing areas and fairways), maintained public reserves and parklands, sporting fields, vineyards, orchards, banana plantations, market gardens (and other non-curing crops), cultivated gardens, commercial nurseries, nature strips and windbreaks (single row of trees)."*

APPENDIX 2: TECHNICAL REQUIREMENTS FOR VEHICULAR ACCESS

Each local government may have their own standard technical requirements for emergency vehicular access, and they may vary from those stated in the Guidelines.

When required, these are stated in Section 5.1 of this bushfire management plan.

Requirements Established by the Guidelines – The Acceptable Solutions

(Source: Guidelines for Planning in Bushfire Prone Areas WAPC 2017 v1.3, Appendix 4)

VEHICULAR ACCESS TECHNICAL REQUIREMENTS - PART 1

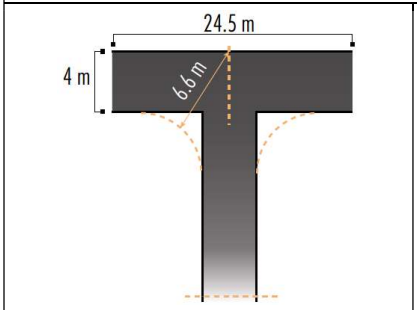
Acceptable Solution 3.5: Private Driveways

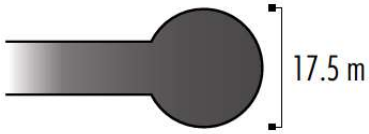
The following requirements are to be achieved:

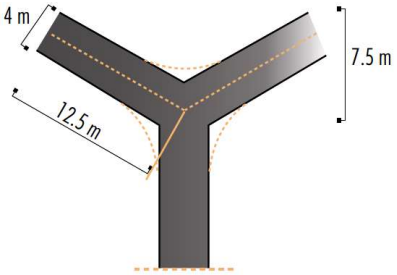
- The design requirements set out in Part 2 of this appendix; and

Where the house site is more than 50 metres from a public road:

- Passing bays every 200 metres with a minimum length of 20 metres and a minimum width of two metres (ie combined width of the passing bay and constructed private driveway to be a minimum six metres);
- Turn-around areas every 500 metres and within 50 metres of a house, designed to accommodate type 3.4 fire appliances to turn around safely (ie kerb to kerb 17.5 metres);
- Any bridges or culverts are able to support a minimum weight capacity of 15 tonnes; and
- All weather surface (i.e. compacted gravel, limestone or sealed).







Acceptable Solution 3.8: Firebreak Width

Lots greater than 0.5 hectares must have an internal perimeter firebreak of a minimum width of three meters or to the level as prescribed in the local firebreak notice issued by the local government.

VEHICULAR ACCESS TECHNICAL REQUIREMENTS - PART 2

Technical Component	Vehicular Access Types				
	Public Roads	Cul-de-sacs	Private Driveways	Emergency Access Ways	Fire Service Access Routes
Minimum trafficable surface (m)	6*	6	4	6*	6*
Horizontal clearance (m)	6	6	6	6	6
Vertical clearance (m)	4.5	4.5	4.5	4.5	4.5
Maximum grade <50 metres	1 in 10	1 in 10	1 in 10	1 in 10	1 in 10
Minimum weight capacity (t)	15	15	15	15	15
Maximum cross-fall	1 in 33	1 in 33	1 in 33	1 in 33	1 in 33
Curves minimum inner radius (m)	8.5	8.5	8.5	8.5	8.5

VEHICULAR ACCESS TECHNICAL REQUIREMENTS - PART 1
* A six metre trafficable surface does not necessarily mean paving width. It could, for example, include four metres of paving and one metre of constructed road shoulders. In special circumstances, where 8 lots or less are being serviced, a public road with a minimum trafficable surface of four metres for a maximum distance of ninety metres may be provided subject to the approval of both the local government and DFES.

Reticulated Areas

[Source: Guidelines for Planning in Bushfire Prone Areas WAPC 2017 v1.3, Appendix 4, Element 4]

The Water Corporation's 'No 63 Water Reticulation Standard' is deemed to be the baseline criteria for developments and should be applied unless local water supply authority's conditions apply.

The requirement is to supply a reticulated water supply and fire hydrants, in accordance with the technical requirements of the relevant water supply authority and DFES.

Key specifications in the most recent version/revision of the design standard include:

- ***Residential Standard*** – hydrants are to be located so that the maximum distance between the hydrants shall be no more than 200 metres.
- ***Commercial Standard*** – hydrants are to be located with a maximum of 100 metre spacing in Industrial and Commercial areas.
- ***Rural Residential Standard*** – where minimum site areas per dwelling is 10,000 m^2 (1ha), hydrants are to be located with a maximum 400m spacing. If the area is further subdivided to land parcels less than 1ha, then the residential standard (200m) is to be applied.

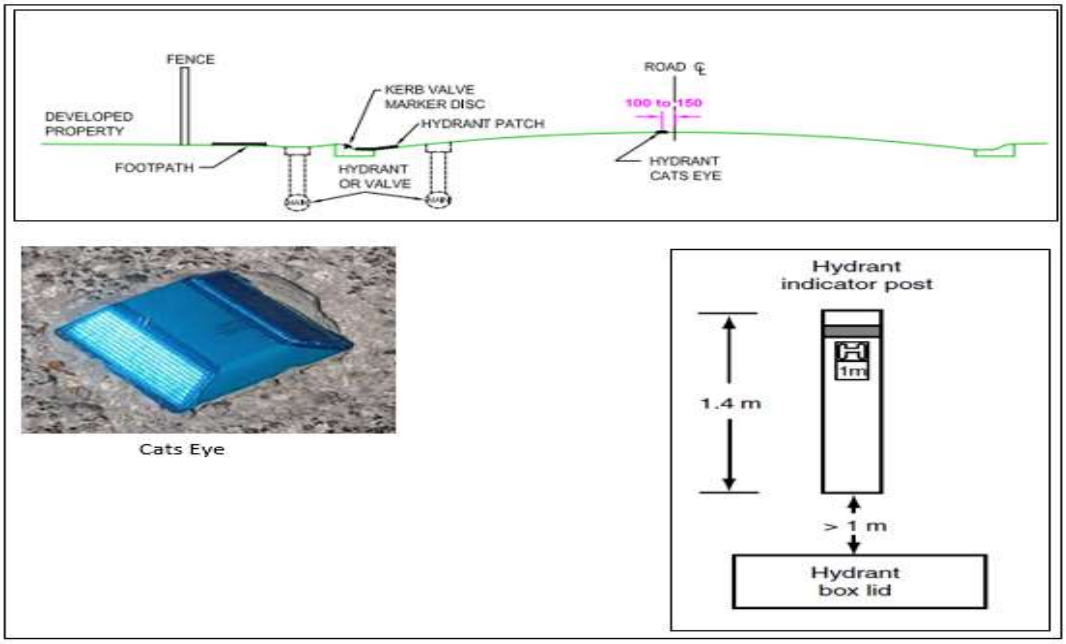


Figure A4.1: Hydrant Location and Identification Specifications

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