State Football Centre Native Vegetation Clearing Permit Application – Supporting Information

Attachment 4

Flora and Vegetation Assessment (GHD 2020)

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Department of Local Government, Sport and Cultural

State Football Centre - environmental planning process road map

Flora survey report

January 2020

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Table of contents

Table index

Figure index

Appendices

1. Introduction

1.1 Project background

A site within the Queens Park Regional Open Space on the corner of Welshpool Road and Gibbs Street in Queens Park has been identified as a suitable location for the development of a State Football Centre.

A process roadmap and advice from State Government departments identifies the need to undertake a Level 2 Flora survey of this site prior to obtaining required environmental and planning approvals.

1.2 Purpose of this report

This report is a variation to the Environmental and Planning approvals roadmap project undertaken by GHD. It will provide ecological information to assist in obtaining environmental and planning approvals.

1.3 Survey area

The survey area (17.32 ha) is located within East Cannington, as part of the Queens Park Regional Bushlands (Figure 1, Appendix A)

1.4 Relevant legislation, conservation codes and background information

In Western Australia some ecological communities and flora are protected under both Federal and State Government legislation. In addition, regulatory authorities 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

1.5 Report limitations and assumptions

This report has been prepared by GHD for Department of Local Government, Sport and Cultural Industries and may only be used and relied on by Department of Local Government, Sport and Cultural Industries for the purpose agreed between GHD and the Department of Local Government, Sport and Cultural Industries as set out in section1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Department of Local Government, Sport and Cultural Industries 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.

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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 within the survey area (Figure 1, Appendix A). Should the survey area or extended 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 study area (10 km radius around 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 *Environment Protection and Biodiversity Act 1999* (EPBC Act) potentially occurring within the study area (DotEE 2019) (Appendix C)
- The Department of Biodiversity, Conservation and Attractions (DBCA) TEC and PEC database to determine the potential for conservation significant communities to be present within the study area
- The DBCA *NatureMap* database for flora and fauna species previously recorded within the study area (DBCA 2019) (Appendix C)
- The DBCA Threatened (Declared Rare) 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 study area
- Existing datasets including previous pre-European vegetation mapping of the survey area (Beard 1979; Heddle et al. 1980 and Webb et al. 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 Senior Botanist Anna Napier completed a broad flora and vegetation survey 22 October 2019.

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

Data collection

Field survey methods involved a combination of sampling quadrats, relevés, photographic reference points located in identified vegetation types and walking transects.

Two Quadrats (measuring 10 m x 10 m – area of 100 m^2) were established within the survey area. Quadrats were locatedin vegetation units considered conservation significant or in vegetation that was in Very Good condition. One Relevé (unmarked area) was established to supplement quadrat data. 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.
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 Appendix D

Vegetation types

Vegetation types were identified and boundaries delineated using a combination of aerial photography, topographical features and field data/observations.

Vegetation types were described based on structure, dominant taxa and cover characteristics as defined by quadrat and relevé data and field observations. Vegetation type descriptions follow NVIS and are consistent with NVIS Level V (Association). At Level V up to three taxa per stratum are used to describe the association (NVIS Technical Working Group 2017).

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 (2016)). The scale recognises the intactness of vegetation and consists of six rating levels. The vegetation condition rating scale is located in Appendix B

Conservation significant flora

Prior to the field survey, information obtained from the desktop assessments (e.g. previous surveys, aerial photography, geology, soils and topography data, EPBC Act PMST (DotEE 2019), TPFL, NatureMap (DBCA 2019) and the WAHERB databases search results) were reviewed to determine conservation significant flora taxa potentially present within the study area. Additionally, ecological information (e.g. habitat, associated flora taxa and phenology) was sourced from FloraBase (WA Herbarium 1998–2019) to provide further details.

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 (2019. Nomenclature used in this report follows that used by the WA Herbarium as reported on *FloraBase* (WA Herbarium 1998–2019).

2.3 Limitations

2.3.1 Desktop limitations

Desktop investigations use a variety of online resources such as the DBCA *NatureMap* database, and the EPBC Act PMST. 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, cannot be dated and often misrepresent the current range of Threatened species.

2.3.2 Field survey limitations

The EPA (2016) technical guideline states that flora 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 that 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, this includes: Regional biogeography (Mitchell et al. 2002). Broad scale (1:250,000) mapping by Beard (1979) and digitised by Shepherd et al. (2002) Vegetation mapping by Heddle et al. (1980) and Webb et al. (2016)
Scope (what life forms were sampled etc.)	Nil	Vascular flora were sampled during the survey. Non-vascular florawere not surveyed.
Proportion of flora collected and identified (based on sampling, timing and intensity)	Nil	The vegetation survey was a undertaken in October 2019. Spring is considered the 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. The portion of flora collected and identified was considered appropriate for the purpose of this assessment
Flora determination	Nil	Flora determination was undertaken by GHD Senior Botanist in the field and via a range of on-line resources. All taxa could be identified to species level. 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 entire survey area was accessible and was accessed by foot.
Mapping reliability	Nil	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 (Garmin GPS) and tablet (Samsung Galaxy Tablet S2). 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	Nil	The field survey was conducted in October 2019. In the three months prior to the October flora survey (July to September), Gosnells City weather station (No 009106 Bureau of Meteorology (BoM) 2019) recorded a total of 230 mm of rainfall. This rainfall total is comparable to the long term average for the same period (July to September; 223.5 mm) (BoM 2019).

Aspect	Constraint	Comment
		The timing of the flora and vegetation survey is considered the most optimal time to complete surveys on the Swan Coastal Plain (optimal time is during spring). The weather conditions recorded during the survey did not impact upon the vegetation and flora survey.
Disturbances (e.g. fire, flood, accidental human intervention)	Nil	Much of the survey area has been subjected to historical disturbance events (e.g. clearing, weeds); however, these disturbances did not impact the survey.
Resources	Nil	Adequate resources were employed during the field survey. A total of one day was spent undertaking the survey.
Access restrictions	Nil	The majority of the survey area was accessible at the time of the survey. The central, artificially created, island within the wetland was not accessible due to water depth.
Experience levels	Nil	The botanist who executed the survey, Anna Napier, is suitably qualified with over 30 years' experience in undertaking flora surveys and assessments in Western Australia. Anna has extensive experience undertaking flora and assessments on the Swan Coastal Plain.

3. Desktop assessment

3.1 Regional biogeography

The study 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 Hydrology

Table 3 summarises the results of the hydrological constraints search relevant to the study area

Table 3 Hydrological features within the survey area

Aspect	Details	Result
Groundwater Areas	Groundwater areas proclaimed under the RIWI Act	Perth
Surface Water Areas	Surface water areas proclaimed under the RIWI Act	Canning River
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

3.2.1 Wetlands and surface water

Internationally and Nationally important wetlands

No internationally or nationally important wetlands intersect the survey area or study area.

Geomorphic Wetlands of the Swan Coastl Plain (SCP)

Three geomorphic wetlands intersect the survey area:

- ID 15819 (Dampland) Resource Enhancement
- ID 7490 (Dampland) Multiple Use

- ID 15817 (Dampland) Resource Enhancement

Suface water present within the survey area is assocated with Multiple Use Wetland (UFI 7490). A further 13 geomorphic wetlands are found within 1 km of the survey area Table 4.These are mapped on Figure 4 Appendix A.

Table 4 Geomorphic wetlands mapped within the 1 km of the survey area

Name	Type	Unique Feature Identifier (UFI)	Category	Location relative to survey area
Unknown	Dampland	14956	Resource Enhancement	Located approximately 0.8 km east of the survey area
Unknown	Dampland	7443	Multiple Use	Located approximately 0.7 km west
Unknown	Dampland	7491	Multiple Use	Located approximately 0.5 km south east
Unknown	Palusplain	15254	Multiple Use	Located approximately 0.9 km north east
Unknown	Artificial Lake	7728	Resource Enhancement	Located approximately 1.1 km north east
Unknown	Sumpland	15476	Resource Enhancement	Located approximately 0.93 km north east
Unknown	Dampland	14952	Conservation	Located approximately 0.68 km east of the survey area
Unknown	Dampland	7714	Conservation	Located approximately 0.8 km south east
Unknown	Sumpland	15474	Resource Enhancement	Located approximately 0.92 km north east
Unknown	Not Assessed	7715	Resource Enhancement	Located approximately 0.4 km north east

3.3 Landforms and soils

The SWA is comprised of five major geomorphological units, which lie more or less parallel to the coast. These geomorphological units are the Quindalup, Spearwood and Bassendean Dunes, the Pinjarra Plain and the Ridge Hill Shelf (McArthur and Bettenay 1960, Churchwood and McArthur 1980). The survey area lies within the Bassendean Dunes. This land system is broadly described as:

- Swan Coastal Plain from Busselton to Jurien. Sand dunes and sandplains with pale deep sand, semi-wet and wet soil. Banksia-paperbark woodlands and mixed heaths.
- The Department of Primary Industries and Regional Development (previously Department of Agriculture and Food Western Australia (DAFWA)) soil mapping indicates one soil type for the survey area; 212Bs_S8 - SAND - very light grey at surface, yellow at depth, fine to medium-grained, sub-rounded quartz, moderately well sorted of eolian origin (DAFWA 2007.

3.4 Land use

3.4.1 DBCA legislated lands

No DBCA managed lands intersect the survey area oroccur within the study area. The closest to the survey area is located approximately 3.3 km south east (ID R 50529 class A, Kenwick wetlands). No DBCA regional parks intersect the survey area. One occurs within the study area. This is located approximately 3 km south west of the survey area (Canning River).

3.4.2 Bush Forever

The majority of the survey area is interected by Bush Forever site 283 – Queens Park Bushland, Queens Park Figure 3 Appendix A.

3.4.3 Environmentally Sensitive Areas

The survey area lies within one large ESA.

3.5 Vegetation and Flora

3.5.1 Broad vegetation mapping and extents

Vegetation associations

Broad scale (1:250,000) pre-European vegetation mapping of the surveyarea has been completed by Beard (1979) at an association level. The mapping indicates one vegetation association occurs within the survey area:

- Medium very sparse woodland; jarrah, with low woodland; banksia & casuarina (Association 1001)

The pre-European mapping has been adapted and digitised by Shepherd et al. (2002). The extent of the vegetation associations have been determined by the state-wide vegetation remaining extent calculations maintained by the DBCA (Latest update December 2018 – GoWA 2019b). As shown in Table 5, the current extent of vegetation association 1001 is less than 30% at all scales (State, IBRA bioregion, IBRA subregion and Local Government Area (LGA)).

Vegetation complexes

Regional vegetation complex mapping has been completed by Heddle *at al.* (1980) with updates from Webb *et al*. (2016) based on major landform boundaries within the SWA and forested region of south-west Western Australia. The mapping indicates one vegetation complex present within the survey area; Southern River Complex: Open woodland of *Corymbia calophylla* (Marri) - *Eucalyptus marginata* (Jarrah) - *Banksia* species with fringing woodland of *Eucalyptus rudis* (Flooded Gum) - *Melaleuca rhaphiophylla* (Swamp Paperbark) along creek beds.

GoWA (2018c) has assessed the vegetation complexes described and mapped by Heddle *et al.* (1980) against presumed pre-European extents within the SCP IBRA bioregion (Table 6) and the City of Canning (Table 7) respectively. The Southern River Complex has less than 30% of its pre-European extent, with the SCP IBRA bioregion and City of Cockburn.

3.5.2 Conservation significant ecological communities

The EPBC Act PMST identified four EPBC Act-listed TEC's potenitally occurring within the study area. These included:

- *Banksia* Woodlands of the Swan Coastal Plain (SCP)
- Clay Pans of the Swan Coastal Plain
- *Corymbia calophylla-Kingia* Woodlands on heavy soils of the SCP.
- Tuart (*Eucalyptus gomophocepala*) Woodlands and Forests of the SCP

DBCA TEC/PEC database searches provided by the Department of Local Government, Sport and Cultural Indsurties showed the potential presence of multiple TECs and PECs within the survey area and study area, however the names of these communities was not supplied. The locations of the TECs and PECs are illustrated in Figure 2. A description of the TECs identified in the EPBC Act PMST are described in Table 8

Table 5 Extents of vegetation associations

Vegetation association	Scale	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	Remaining within DBCA managed lands (%)	% of current extent within the survey area
1001	State: WA	57,410.23	12,660.76	22.05	14.19	0.14%
	IBRA bioregion: Swan Coastal Plain	57,410.23	12,660.76	22.05	14.19	0.14%
	Sub-region: Perth	57,410.23	12,660.76	22.05	14.19	0.14%
	LGA: City of Canning	5,025.15	329.53	6.56	5.55	5.26%

Table 6 Extent of vegetation complexes on the SWA mapped within the City of Canning (GoWA 2019c)

Vegetation complex	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	Remaining within DBCA managed lands (%)	% of current extent within the survey area
Southern River Complex	10,832.18	18.43	947.72	1.60	100 %

Table 7 Extent of vegetation within the City of Canning for the survey area (GoWA 2019c)

Vegetation complex	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	Proportion of the vegetation complex within the LGA (%)
Southern River Complex	1,645.62	150.43	9.14	25.39%

Table 8 Threatened Ecological Communities identified within the study area

Community type	EPBC Act	Description
Banksia woodlands of the SCP (TEC)	Endangered	The ecological community is a woodland associated with the Swan Coastal Plain. A key diagnostic feature is a prominent tree layer of *Banksia*, with scattered eucalypts and other tree species often present among or emerging above the *Banksia* canopy. The understorey is a species rich mix of sclerophyllous shrubs, graminoids and forbs. The ecological community is characterised by a high endemism and considerable localised variation in species composition across its range (TSSC 2016).
Tuart (*Eucalyptus gomphocephala*) woodlands and forests of SCP (TEC)	Critically Endangered	Mostly confined to Quindalup Dunes and Spearwood Dunes from Jurien Bay to the Sabina River, with outliers along some rivers. Tuart is the key dominant canopy species however Tuart communities comprise a variety of flora and fauna assemblages. Flora commonly occurring with Tuart include Agonis flexuosa, Banksia attenuata, B. grandis, Allocasuarina fraseriana, Xylomelum occidentale, Macrozamia riedlei, Xanthorrhoea preissii, Spyridium globulosum, Templetonia retusa and Diplolaena dampieri (DBCA 2019)
Clay Pans of the Swan Coastal Plain	Critically Endangered	The ecological community generally occurs as a shrubland (less commonly as a low, open woodland) over a ground layer of geophytes, herbs and sedges which are characteristic of the wetter parts of the sites. There are no dominant species which characterise the entire ecological community. The ecological community, however, shows similar landform and vegetation structural features across its range. A distinctive feature of these clay pan wetlands is the suite of geophytes and annual flora that germinates, grows and flowers sequentially as these areas dry over summer, producing a floral display for over three months. The clay pans have very high species richness, a number of local endemics and are the most floristically diverse of the Swan Coastal Plain wetlands. The seasonally inundated clays that support this ecological community are relatively productive agricultural soils and many were cleared and drained soon after European settlement. Others were mined for clay for brick and tile manufacture. Those that remained intact were largely located on the Swan Coastal Plain in close proximity to metropolitan Perth. In more recent years large areas have disappeared under urban development and today the plant communities of the clay pan wetlands are amongst the most threatened in Western Australia (DSEWPC 2012)
Corymbia calophylla – Kingia australis woodlands on heavy soils (SCP 3a) TEC	Endangered	A woodland community located on heavy soils of the eastern side of the Swan Coastal Plain between Capel and Hazelmere. Typical and common native taxa in the community are: *Corymbia calophylla*; the shrubs *Banksia nivea, Philotheca spicata, Kingia australis* and *Xanthorrhoea preissii*; herbs, rushes and sedges, *Cyathochaeta avenacea, Dampiera linearis, Haemodorum laxum, Desmocladus fasciculatus, Mesomelaena tetragona* and *Tetraria octandra*. The introduced grass *Briza maxima* is also common in the community (DEE 2017)

3.5.3 Flora diversity

The *NatureMap* database identified 1058 flora taxa, representing 116 families and 404 genera previously recorded within the study area. This total comprised 837 native flora taxa and 221 naturalised (introduced) flora taxa. Dominant families recorded included Fabaceae (86 taxa), Cyperaceae (79 taxa) and Myrtaceae (75 taxa).

The *NatureMap* database search is provided in Appendix C

3.5.4 Conservation significant flora

The EPBC Act PMST, *NatureMap* and DBCA Threatened and Priority Flora databases identified the presence/potential presence of 55 conservation significant flora taxa within the study area The searches identified

- Three Threatened taxa listed under the EPBC Act and/or the BC Act
- Eight priority 1 taxa
- Seven Priority 2 taxa
- 24 Priority 3 taxa
- 13 Priority 4 taxa.

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

4. Survey results

4.1 Flora and vegetation

4.1.1 Vegetation types

There are only small areas of native vegetation associations within the survey area (Table 9).The largest (1.09 ha) is a remnant of Marri and Jarrah woodland whch is similar to the *Corymbia calophylla – Kingia australis* woodlands on heavy soils (SCP 3a) TEC, but does not contain any *Kingia australis*. The groundcover species are similar to that of SCP3a but the *Corymbia callophylla* is generally denser than that recorded in other patches of the association.

Two small patches of Banksia woodland in Good condition are also present. These lack much of the original ground-cover layer, being now impacted by introduced grasses and herbs. These align with the Banksia woodland PEC, due to their small size and condition.

A patch of *Eucalyptus rudis* woodland/forest is present in a low lying part of the survey area. Very few other native species are present within this area, with the groundcover mostly not present in any form.

There are two areas of artificial wetland present, relating to low-lying drainage zones. One drain line crosses Welshpool Road into the survey area, and supports mostly introduced trees and sedges, with some native water plants present. The second is a wetland which appears to have been created as a sancturary area for wetland bird nesting, consisting of an island in the centre of a circular channel. This area supports very few native trees or shrubs, but has patches of native sedges. There was no access to the central island during the survey due to water levels. Native, floating water plants covered the open water areas. Vegetation tyeps mapped for the survey area are illustrated in Figure 5, Appendix A

Table 9 Vegetation types within the survey area

Vegetation Types	Vegetation description	Landform and substrate	Extent within the survey area (ha)	Sample locations (quadrat/relevé) and FCT alignment	Representative photograph
Corymbia calophylla woodland (VT1)	*Corymbia calophylla* tall woodland over *Jacksonia floribunda* tall open shrubland over *Xanthorrhoea preissii* and *X. gracilis* low open shrubland over *Dasypogon bromeliifolius* and *Phelbocarya ciliata* herbland	White/grey sand on plain	1.09	Quadrat 2 Long unburnt, minimal mid-storey; dense patches of native groundcover species (Possible SCP3a)	
Banksia low woodland (VT2)	*Banksia menziesii* and *Eucalyptus marginata* low woodland over *Scholtzia involucrata* low sparse shrubland over mixed open sedgeland and/ or herbaceous weeds	White/grey sand on plain	0.26	Quadrat 1 Very limited understorey species. Aligns with Banksia Woodland PEC.	

Vegetation Types	Vegetation description	Landform and substrate	Extent within the survey area (ha)	Sample locations (quadrat/relevé) and FCT alignment	Representative photograph
Melaleuca preissiana low woodland (VT3)	*Melaleuca preissiana* low woodland over *Xanthorroea preissii* sparse shrubland over introduced herbland	White/grey sand in low lying areas	1.06	Some areas have been planted with additional dampland species.	
Mixed, introduced trees and shrubs (VT4)	Mostly introduced, planted or naturalised species of tall trees and tall shrubs including: *Eucalyptus cladocalyx, Euc*alyptus sp. *Ficus* sp., *Melia azedarach, Erythrina indica, Lantana camera, Leptospermum laevigatum* and *Callistemon* sp., over introduced grasses and herbs.	Low lying area adjacent to drain. Grey sand.	2.43	Very dense in patches with tall eucalypts and dense, weedy understorey.	

Vegetation Types	Vegetation description	Landform and substrate	Extent within the survey area (ha)	Sample locations (quadrat/relevé) and FCT alignment	Representative photograph
Scattered natives over weeds (VT5)	Mixed native species such as *Macrozamia reidlei, Acacia saligna, Agonis flexuosa* over introduced grasses and herbs.	White/grey sand on plain	1.32	Some introduced scattered species as well as natives.	
Mixed shrubs and sedges/grasses (VT6)	Isolated *Melaleuca preissiana* over *Cortaderia selloana* (Pampas grass) and Typha dense tall shrubland over *Juncus pallidus* and *Baumea articulata* closed low sedgeland with *Azolla rubra* and *Lemna disperma* water plants associated with an artificial/modified wetland.	Artificial wetland edges and drains. Sandy silt.	0.68	Mixed introduced and native species. Native water plants dominating open water.	

Vegetation Types	Vegetation description	Landform and substrate	Extent within the survey area (ha)	Sample locations (quadrat/relevé) and FCT alignment	Representative photograph
Adenanthos cynorum tall shrubland (VT7)	*Adenanthos cygnorum* tall shrubland with isolated *Allocasuarina fraseriana* over closed introduced herbs and grasses.	White/grey sand on plain	0.19	Releve 1	

Eucalyptus rudis forest (VT8)	*Eucalyptus rudis* tall forest and scattered *Melaleuca preissiana* and *Kunzea glabrescens* over scattered introduced herbs. Understorey mostly absent, potentially winter wet.	Low lying, sandy silt.	0.5	N/A	 

Vegetation Types	Vegetation description	Landform and substrate	Extent within the survey area (ha)	Sample locations (quadrat/relevé) and FCT alignment	Representative photograph
					
Cleared areas	Areas with only isolated shrubs and with a groundcover of weedy grasses and herbs.	Various	9.96	N/A	

Vegetation Types	Vegetation description	Landform and substrate	Extent within the survey area (ha)	Sample locations (quadrat/relevé) and FCT alignment	Representative photograph
Water	N/A		0.33	Supports native and introduced seges with floating plant species	

4.1.2 Conservation significant ecological communities

Banksia dominated woodlands of the SCP IBRA region (PEC)

The field assessment confirmed the presence of the *Banksia* dominated woodlands of the SCP IBRA region PEC, listed as Priority 3 by DBCA. The PEC differs from the EPBC Act listed Banksia woodlands of the SCP TEC in that it has no minimum condition and patch size thresholds. This PEC is associated with VT02, there was 0.26 ha recorded within the survey area Figure 5, Appendix A

4.1.3 Vegetation condition

The condition of the vegetation within the survey area ranged from Very Good to Completely Degraded. The extents of the vegetation condition within the survey area are detailed in Table 10 and mapped in Figure 6 Appendix A

A large proportion of the survey area is in Degraded or worse condition (5.05 ha, 58.3 %). Areas which have been previously cleared of native vegetation and/or selected pruning under existing powerlines have been assigned a condition of Degraded. Disturbance factors include weed invasion, soil dumping and proliferation of informal tracks.

Table 10 Vegetation conidition ratings within the survey area

Vegetation Condition	Extent in the survey area (ha)
Completely Degraded (inc. cleared)	13.03
Degraded	1.82
Good	1.46
Very Good	1.00
Total	17.31

4.1.4 Flora diversity

101 flora taxa (including subspecies and varieties) representing 42 families and 84 genera were recorded from the survey area during the field survey. This total comprosed 52 native taxa and 49 introduced taxa.

Dominant families recorded from the survey area included:

- Fabaceae (17 taxa)
- Myrtaceae (17 taxa)
- Poaceae (10 taxa)

Average species diversity is 12 taxa per Quadrat.

The full list of flora identified within the survey area compiled by quadrat and species inventory by family is provided in Appendix D.

4.1.5 Introduced flora

Forty-five introduced flora species were recorded from the survey area. One introduced species recorded, *Asparagus asparagoides* (Bridal creeper), is listed as a Declared Pest under the *Biosecurity and Management Act 2007* and a WoNS. Five of the introduced plants are recorded as native to WA. The remaining introduced flora species recorded are considered environmental weeds and all have been previously recorded on the Swan Coastal Plain.

4.1.6 Conservation significant flora

No EPBC Act, BC Act listed Threatened flora or Priority flora listed by DBCA were recorded within the survey area.

Likelihood of occurrence assessment

A likelihood of occurrence assessment was conducted post-field survey for all conservation significant flora taxa identified in the desktop assessment (Appendix D). 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 post-field survey concluded that the majority pf species are considered highly unlikely or unlikely to occur in the survey area. A number of potential species are known to occur in dampland habitats, which are present in the survey area, but these are altered and highly weed infested, reducing the likelihood of the presence of these species.

One possible Threatened flora species *Macarthuria keigheryi* was identified on NM, PMST, waHERB and TPFL databases as being located within the survey area. It has also been historically recorded within the Queens Park Regional Regional Open Space.

It was not identified GHD 2019 survey. Possible reasons for this include:

- The previous sightings (Ecoscape 2010) are not within the current survey area
- *Macarthuria keigheryi* can be described as a 'cryptic species'. This is due to its presence primarily after fire, and rapid die-down within 2-3 years following fire.

Conostlyis bracteata (Priority 3) has been previously recorded in the *Corymbia calophylla* woodland vegetation type by Ecoscape (2010). The *Conostylis* species identified in the current survey did not match *C. bracteata* in some key features, and the species is only shown to be recorded in the northern Perth suburbs on sand and limestone (WA Herbarium 1998 -).

5. Conclusion

The vegetation and flora assessment was undertaken in Spring, and the survey area was well surveyed. Much of the area has been significantly altered over many years, although there have been attempts in the last few years to reduce weed cover and replant some parts with local, native species. In summary, the survey identified:

- Seven vegetation types and one water area, of which four patches are in Good or better condition
- One Priority 3 PEC – Banksia domnated woodlands of the SCP IBRA region – in two small areas of Good condition
- Most areas are in Degraded condition or have been cleared
- No EPBC Act/ BC Act listed Threatened flora or Priority flora listed by DBCA were recorded within the survey area
- One plant listed as a Declared Pest and WONs (Bridal Creeper) was recorded
- Species diversity is relatively low, with a large number of introduced species
- The artificial wetland area associated with VT6 includes dense sedge and reed vegetation, which is not diverse and has been previously modified, but provides useful bird habitat.

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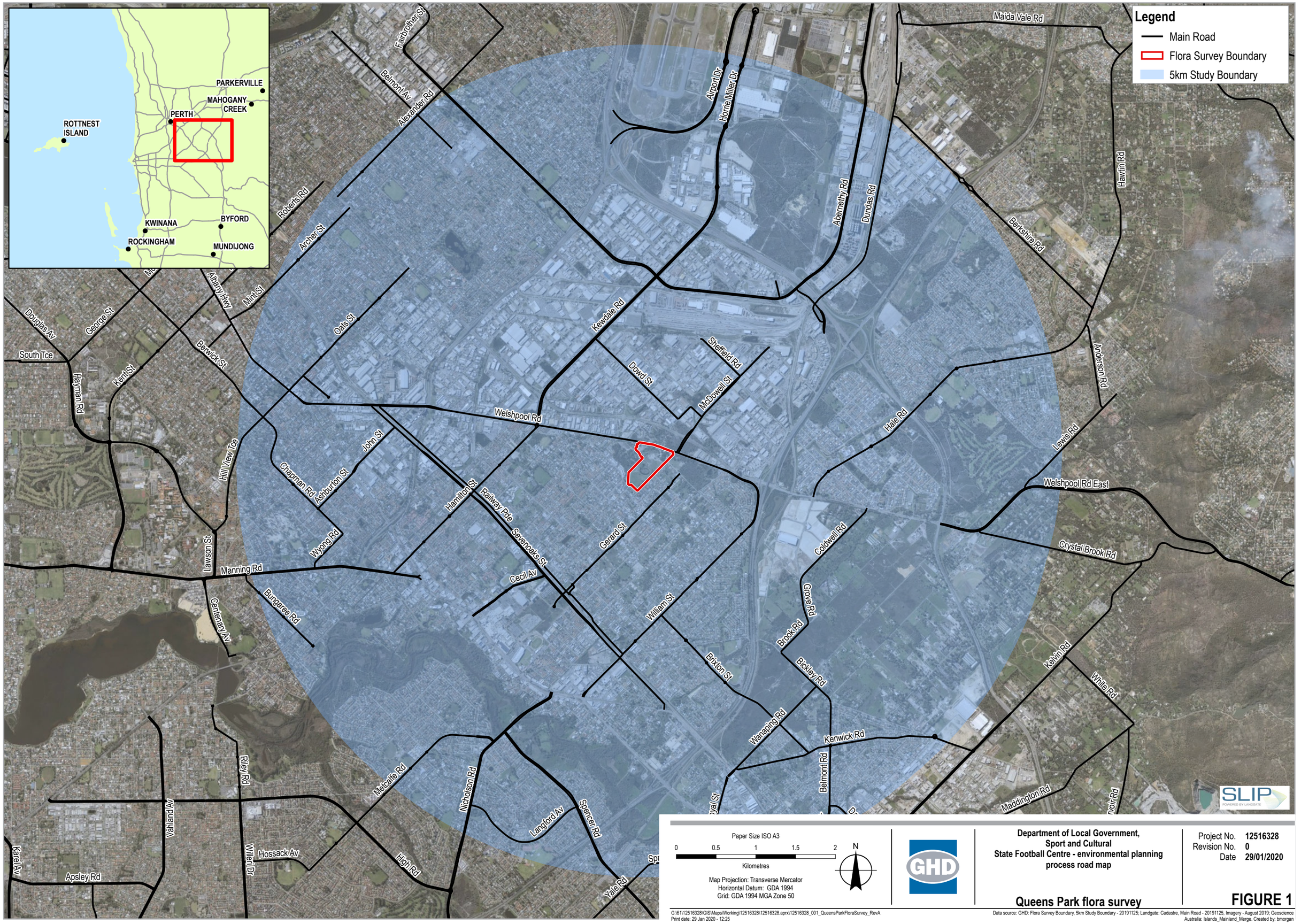
Appendices

Appendix A Figures



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Grid: GDA 1994 MGA Zone 50

GHD

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Revision No. **0**
Date **29/01/2020**

Queens Park flora survey

FIGURE 1

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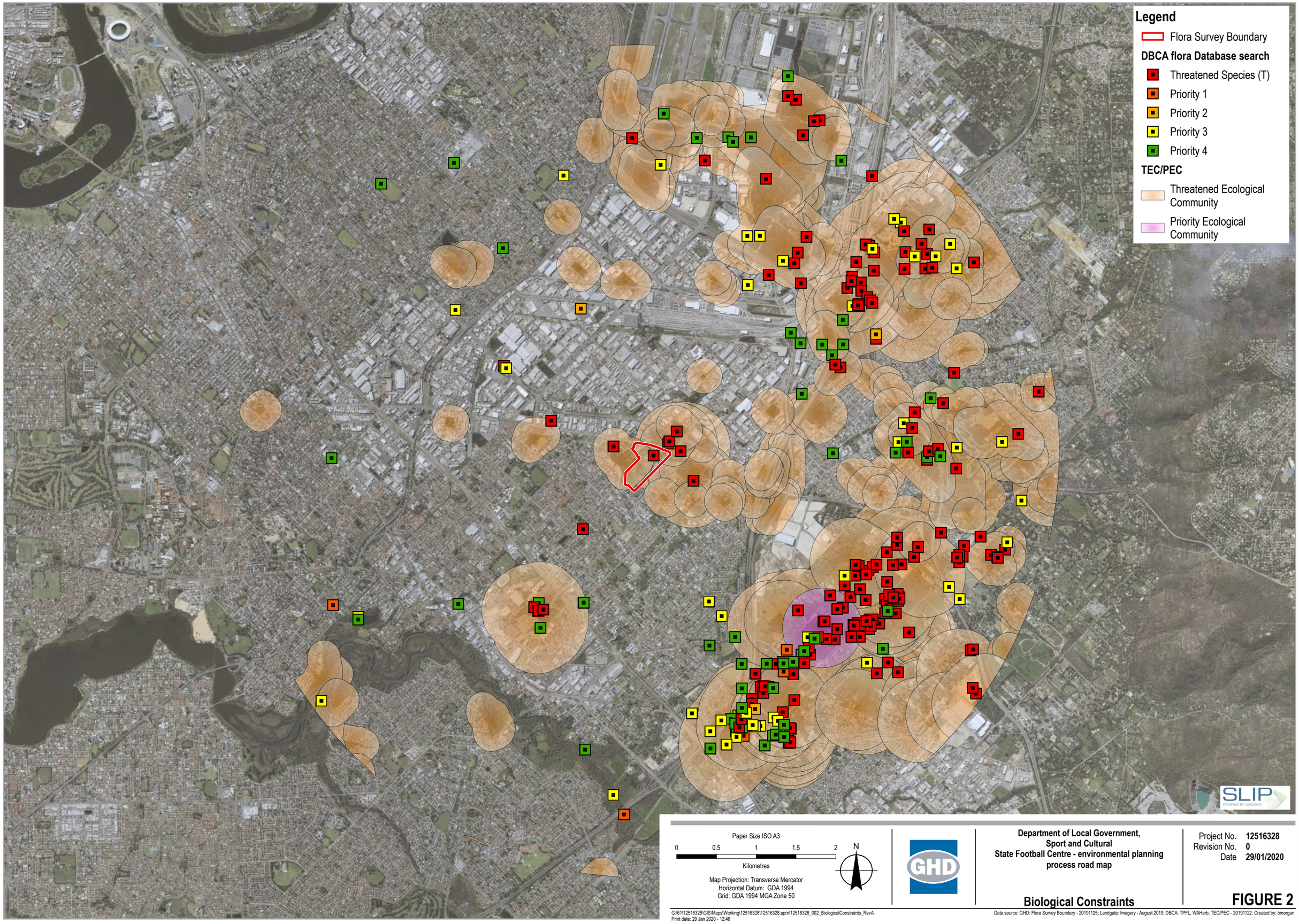

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Biological Constraints

Project No. **12516328**
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FIGURE 2

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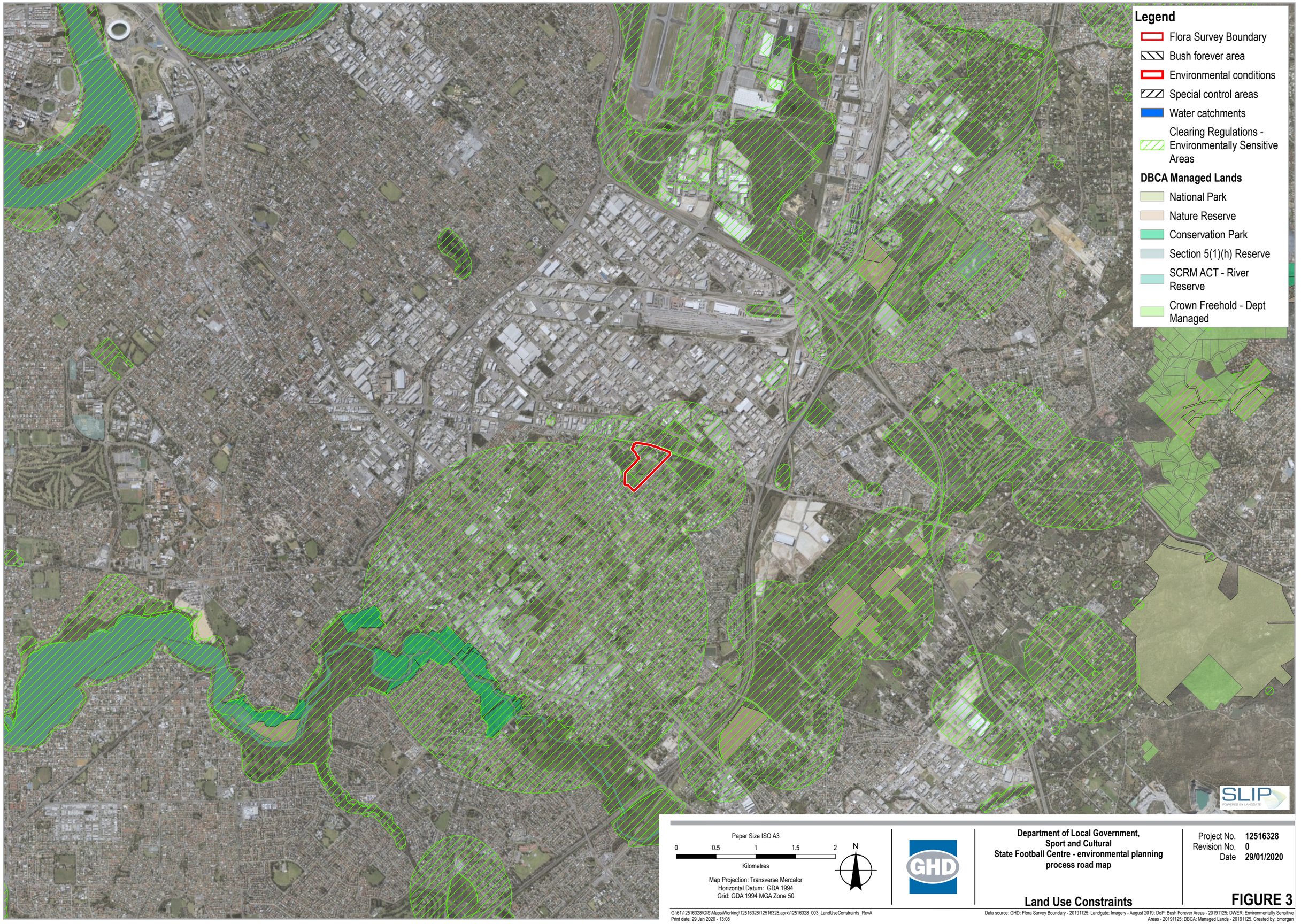

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Grid: GDA 1994 MGA Zone 50

GHD

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Date **29/01/2020**

Land Use Constraints

FIGURE 3

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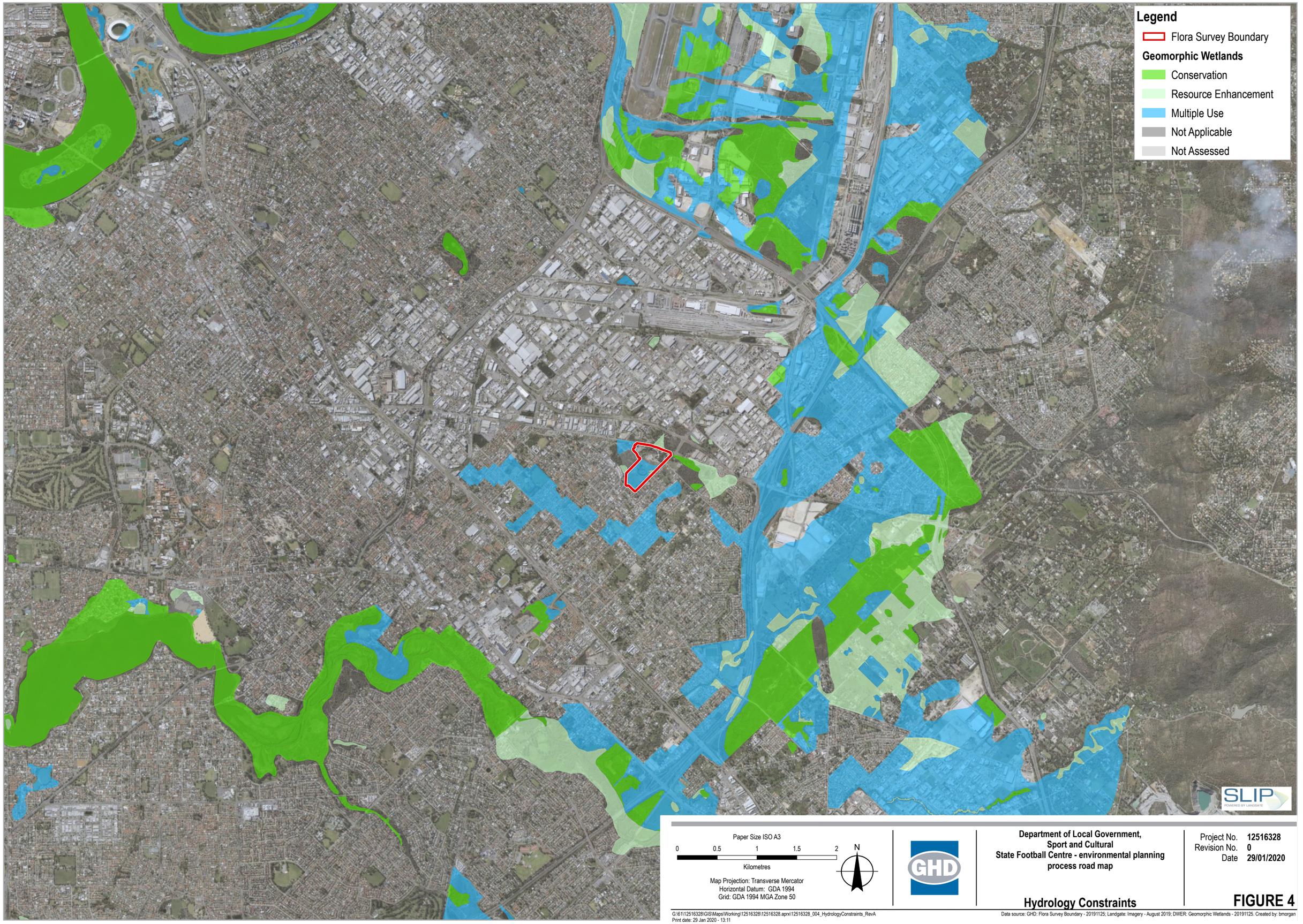

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Kilometres

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GHD

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Hydrology Constraints

Project No. **12516328**
Revision No. **0**
Date **29/01/2020**

FIGURE 4

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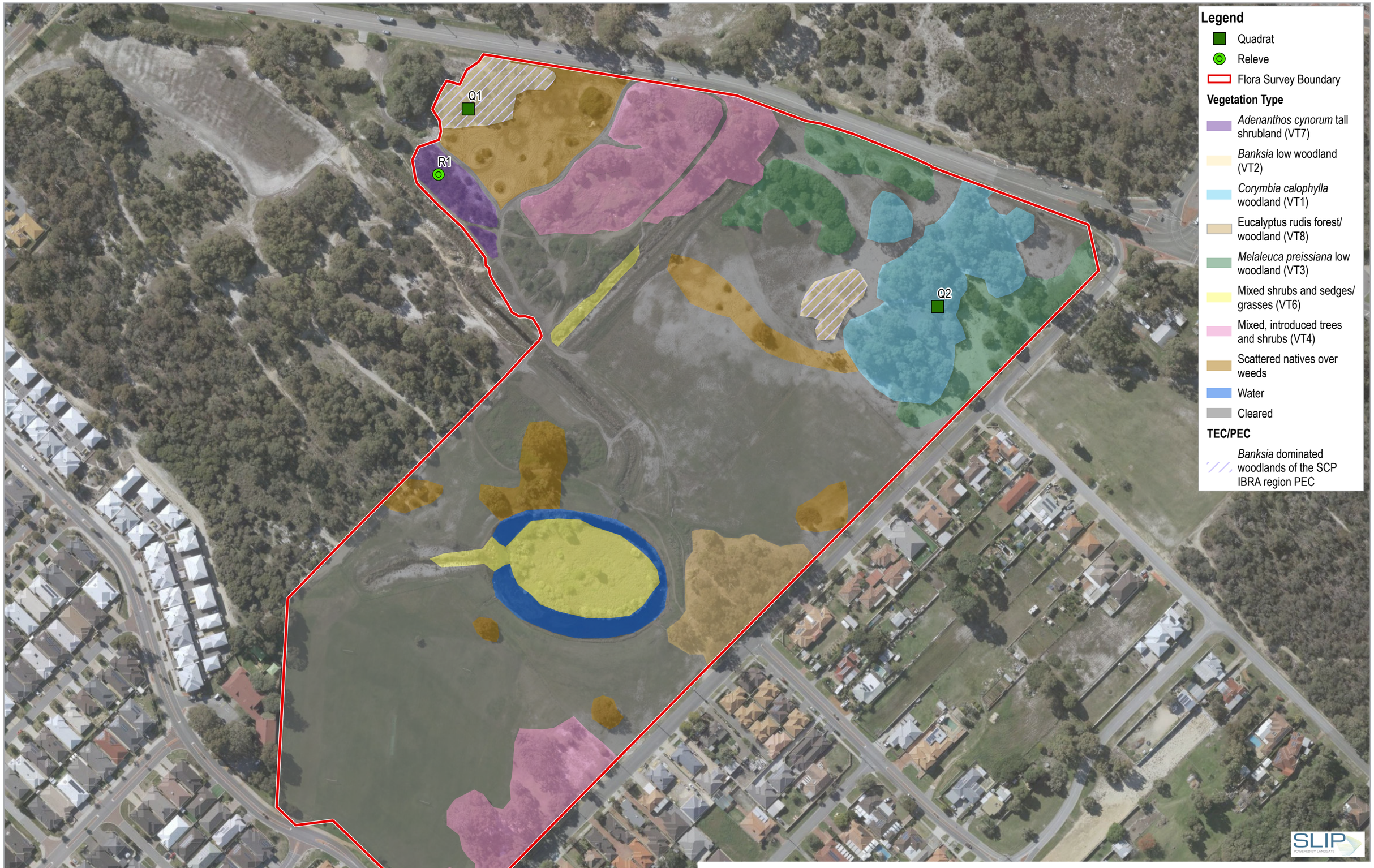

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Metres

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

GHD

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Vegetation types, sample locations and conservation significant community

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Revision No. **0**
Date **29/01/2020**

FIGURE 5

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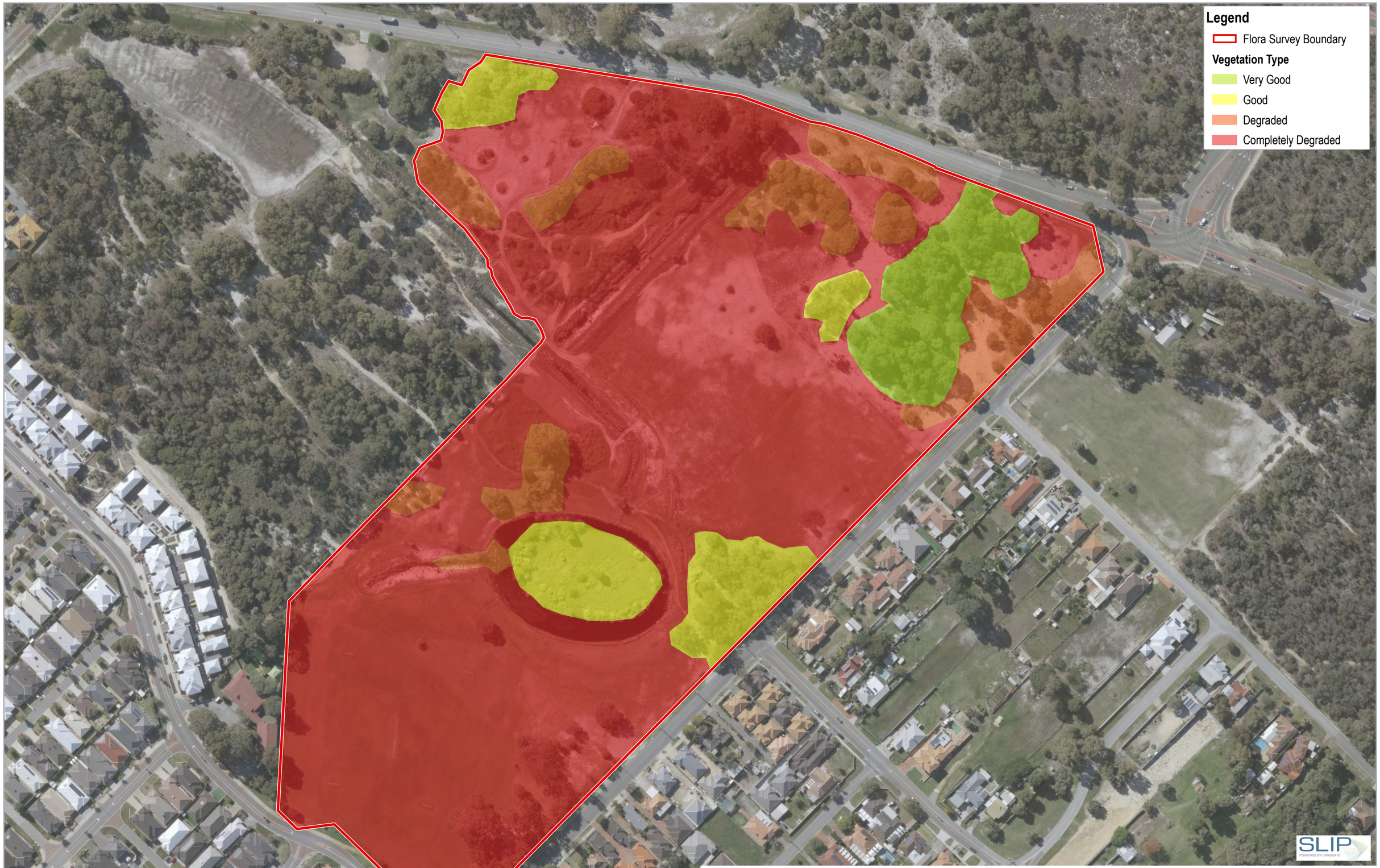

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Metres

Map Projection: Transverse Mercator
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Vegetation Condition

Project No. **12516328**
Revision No. **0**
Date **29/01/2020**

FIGURE 6

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Appendix B Relevant background information and conservation code

Relevant legislation

Federal Environment Protection and Biodiversity Conservation Act 1999

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

The biological aspects listed as MNES include:

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

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

The EPBC Act is administered by the Department of the Environment and Energy (DEE).

State Environmental Protection Act 1986

The *Environmental Protection Act 1986* (EP Act) is the primary legislative Act dealing with the protection of the environment in Western Australia. The Act allows the Environmental Protection Authority (EPA), to prevent, control and abate pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the foregoing. Part IV of the EP Act is administered by the EPA and makes provisions for the EPA to undertake environmental impact assessment of significant proposals, strategic proposals and land use planning schemes.

The Department of Water and Environment Regulation (DWER) is responsible for administering the clearing provisions of the EP Act (Part V). Clearing of native vegetation in Western Australia requires a permit from the DWER, unless exemptions apply. Applications for clearing permits are assessed by the Department and decisions are made to grant or refuse the application in accordance with the Act. When making a decision the assessment considers clearing against the ten clearing principles as specified in Schedule 5 of the EP Act:

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

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

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

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

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

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

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

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

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

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

Exemptions for clearing include clearing that is a requirement of a written law or authorised under certain statutory processes (listed in Schedule 6 of the EP Act) and exemptions for prescribed low

impact day-to-day activities (prescribed in the Environmental Protection (Clearing of Native Vegetation) Regulations 2004); these exemptions do not apply in environmentally sensitive areas (ESAs).

State Biodiversity and Conservation Act 2016

The Biodiversity Conservation Bill 2015 was introduced to State Parliament in November 2015, and passed in September 2016. The Bill became the *Biodiversity Conservation Act 2016* (BC Act) upon receiving Assent on 21 September 2016. The BC Act will eventually fully replace both the *Wildlife Conservation Act 1950* (WC Act) and the *Sandalwood Act 1929* (Sandalwood Act).

Several parts of the BC Act were proclaimed by the State Governor in the Government Gazette and came into effect on 3 December 2016. However, provisions that replace those existing under the WC Act and Sandalwood Act (including threatened species listings and controls over the taking and keeping of native species) and their associated Regulations cannot be brought into effect until the necessary Biodiversity Conservation Regulations have been made.

State Wildlife Conservation Act 1950

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

State Biosecurity and Agriculture Management Act 2007

The *Biosecurity and Agriculture Management Act 2007* (BAM Act) and associated regulations are administered by the Department of Primary Industries and Regional Development (DPIRD) and replace the repealed *Agriculture and Related Resources Protection Act 1976.* The main purposes of the BAM Act and its regulations are to:

- Prevent new animal and plant pests (vermin and weeds) and diseases from entering WA
- Manage the impact and spread of those pests already present in the state
- Safely manage the use of agricultural and veterinary chemicals
- Increased control over the sale of agricultural products that contain violative chemical residues

The Western Australian Organism List (WAOL) provides the status of organisms which have been categorised under the BAM Act. A Declared Pest is a prohibited organism or an organism for which a declaration under Section 22(2) of the Act is in force. Declared Pests may be assigned a control category including: C1 (exclusion), C2 (eradication) and C3 (management). The category may apply to the whole of the State, LGAs, districts, individual properties or even paddocks, and all landholders are obliged to comply with the specific category of control. Categories of control are defined below.

DPIRD Categories for Declared Pests under the BAM Act

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

Background information

Environmentally Sensitive Areas

Environmentally Sensitive Areas (ESAs) are declared by the Minister for Environment under Section 51B of the EP Act. The Table below outlines the aspects of areas declared as ESA in the Environmental Protection (Environmentally Sensitive Areas) Notice 2005.

Aspects of ESAs

Aspects of Environmentally Sensitive Areas
A declared World Heritage property as defined in Section 13 of the EPBC Act.
An area that is included on the Register of the National Estate (RNE), because of its natural values, under the *Australian Heritage Commission Act 1975* of the Commonwealth (the RNE was closed in 2007 and is no longer a statutory list – all references to the RNE were removed from the EPBC Act on 19 February 2012).
A defined wetland and the area within 50 m of the wetland. Defined wetlands include Ramsar wetlands, conservation category wetlands and nationally important wetlands.
The area covered by vegetation within 50 m of rare flora, to the extent to which the vegetation is continuous with the vegetation in which the rare flora is located.
The area covered by a Threatened Ecological Community.
A Bush Forever Site listed in "Bush Forever" Volumes 1 and 2 (2000), published by the Western Australia Planning Commission, except to the extent to which the site is approved to be developed by the Western Australia Planning Commission.
The areas covered by the *Environmental Protection (Gnangara Mound Crown Land) Policy 1992*.
The areas covered by the *Environmental Protection (Western Swamp Tortoise Habitat) Policy 2002*.
The areas covered by the lakes to which the *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992* (EPP Lakes) applies.
Protected wetlands as defined in the *Environmental Protection (South West Agricultural Zone Wetlands) Policy 1998*.

Reserves and conservation areas

Bush Forever

Bush Forever, which was released in December 2000 and proclaimed in 2010, is a Government initiate aimed to retain and protect regionally significant bushland on the Swan Coastal Plain within the Perth Metropolitan Region. Bush Forever aims to protect more than 51,000 hectares of regionally significant bushland within 287 sites across the metropolitan portion of the Swan Coastal Plain (Government of Western Australia (GoWA) 2000). Bush Forever sites constitute ESAs as declared by a notice under Section 51B of the EP Act.

Department of Biodiversity, Conservation and Attractions managed lands and waters

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

changes and development proposals that abut DBCA managed lands will generally be referred to DBCA throughout the assessment process.

Wetlands

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

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

Ramsar Listed Wetlands

The Convention of Wetlands of International Importance was signed in 1971 at the Iranian town of Ramsar. The Convention has since been referred to as the Ramsar Convention. Ramsar Listed wetlands are “sites containing representative, rare or unique wetlands, or wetlands that are important for conserving biological diversity … because of their ecological, botanical, zoological, limnological or hydrological importance” (DEE 2018b). Once a Ramsar Listed Wetland is designated, the country agrees to manage its conservation and ensure its wise use. Under the Convention, wise use is broadly defined as “maintaining the ecological character of a wetland” (DEE 2018b).

Nationally important wetlands

Wetlands of national significance are listed under the Directory of Important Wetlands in Australia. Nationally important wetlands are wetlands which meet at least one of the following criteria (DEE 2018a):

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

Geomorphic wetlands

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

Vegetation extent and status

The National Objectives and Targets for Biodiversity Conservation 2001–2005 (Commonwealth of Australia 2001) recognise that the retention of 30 percent or more of the pre-clearing extent of each ecological community is necessary if Australia’s biological diversity is to be protected. This is the threshold level below which species loss appears to accelerate exponentially and loss below this level

should not be permitted. This level of recognition is in keeping with the targets recommended in the review of the National Strategy for the Conservation of Australia's Biological Diversity (ANZECC 2000).

The extent of remnant native vegetation in WA has been assessed by Shepherd et al. (2002) and the GoWA (2018), based on broadscale vegetation association mapping by Beard (various publications). The GoWA produces Statewide Vegetation Statistics Reports that are used for a number of purposes including conservation planning, land use planning and when assessing development applications. The reports are updated at least every two years.

Vegetation condition

The vegetation condition can be assessed in accordance with the vegetation condition rating scale for the South West and Interzone Botanical Provinces (EPA 2016a). The scale recognises the intactness of vegetation and consists of six rating levels as outlined below.

Vegetation condition rating scale for the South West and Interzone Botanical Provinces

Condition	South West and Interzone Botanical Provinces description
Pristine	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.
Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.
Completely Degraded	The structure of vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

Conservation codes

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

Ecological communities

Conservation significant communities

Ecological communities are defined as naturally occurring biological assemblages that occur in a particular type of habitat (English and Blyth 1997). Federally listed Threatened Ecological

Communities (TECs) are protected under the EPBC Act. The DBCA also maintains a list of TECs for Western Australia; some of which are also protected under the EPBC Act. TECs are ecological communities that have been assessed and assigned to one of four categories related to the status of the threat to the community, i.e. Presumed Totally Destroyed, Critically Endangered, Endangered and Vulnerable.

Possible TECs that do not meet survey criteria are added to the DBCA Priority Ecological Community (PEC) List under Priorities 1, 2 and 3. These are ecological communities that are adequately known; are rare but not threatened, or meet criteria for Near Threatened. PECs that have been recently removed from the threatened list are placed in Priority 4. These ecological communities require regular monitoring. Conservation dependent ecological communities are placed in Priority 5. PECs are not listed under any formal Federal or State legislation, however, may be listed as TECs under the EPBC Act.

Conservation codes and definitions for TECs listed under the EPBC Act or endorsed by the WA Minister for the Environment

Categories	Definition
Federal Government Conservation Categories (EPBC Act)	
Critically Endangered (CR)	An ecological community if, at that time, is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000)
Endangered (EN)	An ecological community if, at that time: A) is not critically endangered; and B) is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000)
Vulnerable (VU)	An ecological community if, at that time: A) is not critically endangered or endangered; and B) is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000)
Western Australia Conservation Categories	
Presumed Totally Destroyed (PD)	An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.
Categories	Definition
Critically Endangered (CR)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.
Endangered (EN)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.

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

Conservation categories and definitions for PECS as listed by the DBCA

Category	Description
Priority 1	Poorly known ecological communities. Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤100 ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
Priority 2	Poorly known ecological communities. Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200 ha). At least some occurrences are not believed to be under immediate threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
Priority 3	Poorly known ecological communities. (i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; (iii) communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.
Category	Description
Priority 4	Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring. (i) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands. (ii) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (iii) Ecological communities that have been removed from the list of threatened communities during the past five years.

Priority 5	Conservation Dependent ecological communities. Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Other significant vegetation

Vegetation may be significant for a range of reasons other than a statutory listing. The EPA (2016b) states that significant vegetation may include vegetation that includes the following:

- Restricted distribution
- Degree of historical impact from threatening processes
- Local endemism in restricted habitats
- Novel combinations of taxa
- A role as a refuge
- A role as a key habitat for Threatened species or large population representing a significant proportion of the local to regional total population of a species
- Being representative of a vegetation unit in 'pristine' condition in a highly cleared landscape, recently discovered range extensions, or isolated outliers of the main range)
- Being poorly reserved

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

Flora and fauna

Conservation significant flora and fauna

Species of significant flora are protected under both Federal and State legislation. Any activities that are deemed to have a significant impact on species that are recognised by the EPBC Act, and/or the WC Act can warrant referral to the DEE and/or the EPA.

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

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

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

The State conservation level of Threatened flora and fauna has been published as Specially Protected under the WC Act, and listed under Schedules 1 to 7 of the Wildlife Conservation (Specially Protected Fauna) Notice 2015 for Threatened Fauna and under Schedules 1 to 4 of the Wildlife Conservation (Rare Flora) Notice 2015 for Threatened (Declared Rare) Flora. The schedules align with the categories of the EPBC Act Threatened Fauna and Threatened Flora Lists. Threatened species are those are species which have been adequately searched for and are deemed to be, in the wild, either rare, under identifiable threat of extinction, or otherwise in need of special protection, and have been gazetted as such.

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

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

Conservation categories and definitions for EPBC Act listed flora and fauna species

Conservation category	Definition
Extinct	There is no reasonable doubt that the last member of the species has died.
Extinct in the Wild	A) A species known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or B) A species that has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered	A species facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000).
Endangered	A) A species not critically endangered; and B) A species facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Conservation category	**Definition**
Vulnerable	A) A species not critically endangered or endangered; and B) A species facing a high risk of extinction in the wild in the medium-term, as determined in accordance with the prescribed criteria.
Conservation Dependent	A) The species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or B) The following subparagraphs are satisfied: (i) the species is a species of fish; (ii) the species is the focus of a plan of management that Section 180 provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species.

Conservation codes and descriptions for WC Act listed flora and fauna species

Conservation category	Schedule and definition

Threatened species (T)	Published as Specially Protected under the WC Act, and listed under Schedules 1 to 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora. **Threatened fauna** is that subset of 'Specially Protected Fauna' declared to be 'likely to become extinct' pursuant to section 14(4) of the WC Act. **Threatened flora** is flora that has been declared to be 'likely to become extinct or is rare, or otherwise in need of special protection', pursuant to section 23F(2) of the WC Act.
Critically Endangered (CR)	Schedule 1: Threatened species considered to be facing an extremely high risk of extinction in the wild.
Endangered (EN)	Schedule 2: Threatened species considered to be facing a very high risk of extinction in the wild.
Vulnerable (VU)	Schedule 3: Threatened species considered to be facing a high risk of extinction in the wild.
Presumed Extinct (EX)	Schedule 4: Species which have been adequately searched for and there is no reasonable doubt that the last individual has died.
International Agreement (IA)	Schedule 5: Migratory birds protected under an international agreement
Conservation Dependent (CD)	Schedule 6: Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened.
Other Specially Protected (OS)	Schedule 7: Fauna otherwise in need of special protection to ensure their conservation.

Conservation codes for DBCA listed Priority flora and fauna

Priority category	Definition
Priority 1	Poorly-known taxa Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
Priority 2	Poorly-known taxa Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

Priority 3	Poorly-known taxa Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
Priority 4	Rare, Near Threatened and other taxa in need of monitoring A. Rare: Taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands. B. Near Threatened. Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. C. Taxa that have been removed from the list of threatened taxa during the past five years for reasons other than taxonomy.

Other significant flora

Flora species, subspecies, varieties, hybrids and ecotypes may be significant for a range of reasons, other than a statutory listing. The EPA (2016b) states that significant flora may include taxa that have:

- A keystone role in a particular habitat for threatened or Priority flora or fauna species, or large populations representing a considerable proportion of the local or regional total population of a species
- Relictual status, being representation of taxonomic or physiognomic groups that no longer occur widely in the broader landscape
- Anomalous features that indicate a potential new discovery
- Being representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)
- The presence of restricted subspecies, varieties, or naturally occurring hybrids
- Local endemism (a restricted distribution) or association with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems)
- Being poorly reserved

Other significant fauna

Fauna species may be significant for a range of reasons other than those protected by international agreement or treaty, Specially Protected or Priority Fauna. Significant fauna may include short-range endemic species, species that have declining populations or declining distributions, species at the extremes of their range, or isolated outlying populations, or species which may be undescribed (EPA 2010).

Introduced plants (weeds)

Declared Pests

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

Weeds of National Significance

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

- Invasiveness

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

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

Appendix C Desktop searches

NatureMap
Mapping Western Australia's biodiversity

NatureMap Flora Stats Report

Created By Guest user on 29/10/2019

Kingdom	Plantae
Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	115° 57' 26" E,32° 00' 02" S
Buffer	5km
Group By	Family

Area (ha)		7851.91
Taxa:	Naturalised	221
	Native	837
Endemics:		9
Families:		116
Genera:		404
Conservation Status:	-	999
	1	5
	3	24
	T	16
	4	10
	2	4
MS Status:	-	1040
	PN	16
	MS	2
Rank:	-	929
	forma	4
	subsp.	81
	var.	44

Top Ten Families

		Species	Records
1.	Fabaceae	86	276
2.	Cyperaceae	79	354
3.	Myrtaceae	75	344
4.	Proteaceae	74	395
5.	Poaceae	72	230
6.	Asteraceae	57	200
7.	Orchidaceae	57	142
8.	Asparagaceae	34	135
9.	Stylidiaceae	34	193
10.	Haemodoraceae	30	147

Top Ten Genera

		Species	Records
1.	*Schoenus*	33	118
2.	*Stylidium*	31	184
3.	*Drosera*	21	99
4.	*Melaleuca*	19	71
5.	*Acacia*	19	70
6.	*Banksia*	17	61
7.	*Hakea*	14	69
8.	*Thysanotus*	13	43
9.	*Hibbertia*	13	37
10.	*Verticordia*	11	86

[1]Endemic To Query Area

Name ID	Species	Conservation Status
	Avena sp. Yule5	
	Cassytha sp. scps	
	Comesperma sp. Brix1R (possibly virigatum)	
	Conyza sp. Brix1R	
	Conyza sp. Brix4	
48633	*Erythrina crista-galli*	
2753	*Ptilotus pyramidatus*	T
	Triglochin sp.Brixton 04 (possibly T. mullerii)	
29491	*Vicia tetrasperma*	

Conservation Codes
T - Rare or likely to become extinct

X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

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

NatureMap
Mapping Western Australia's biodiversity

NatureMap Fauna Stats report

Created By Guest user on 29/10/2019

Kingdom	Animalia
Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	115° 57' 26" E,32° 00' 02" S
Buffer	5km
Group By	Species Group

Area (ha)		7851.91
Taxa:	Naturalised	11
	Native	323
Endemics:		4
Families:		121
Genera:		243
Conservation Status:	-	309
	3	4
	T	8
	IA	6
	2	1
	4	4
	S	2
MS Status:	-	333
	PN	1
Rank:	-	304
	subsp.	30

Top Ten Families

		Species	Records
1.	Scincidae	17	118
2.	Anatidae	15	4268
3.	Psittacidae	14	3738
4.	Meliphagidae	12	3996
5.	Lycosidae	12	70
6.	Accipitridae	11	360
7.	Elapidae	10	139
8.	Rallidae	10	2925
9.	Araneidae	8	57
10.	Ardeidae	6	431

Top Ten Genera

		Species	Records
1.	*Anas*	6	2140
2.	*Falco*	5	216
3.	*Phalacrocorax*	4	364
4.	*Ctenotus*	4	25
5.	*Cracticus*	4	1532
6.	*Cacatua*	4	264
7.	*Calyptorhynchus*	4	1850
8.	*Cormocephalus*	4	15
9.	*Tiliqua*	4	19
10.	*Crinia*	3	48

[1] Endemic To Query Area

Name ID	Species	Conservation Status
	Eurytion incisunguis	
	Holasteron wamuseum	
	Phryganoporus gausapatus subsp. occidentalis	
	Tegenaria atrica	

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
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1 - Priority 1
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3 - Priority 3
4 - Priority 4
5 - Priority 5

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

to the query area.

NatureMap
Mapping Western Australia's biodiversity

NatureMap CS Flora report

Created By Guest user on 29/10/2019

Kingdom	Plantae
Conservation Status	Conservation Taxon (T, X, IA, S, P1-P5)
Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	115° 57' 26" E,32° 00' 02" S
Buffer	5km
Group By	Family

Family	Species	Records
Amaranthaceae	2	5
Apiaceae	3	12
Aponogetonaceae	1	16
Araliaceae	1	11
Asparagaceae	1	2
Asteraceae	1	1
Byblidaceae	1	14
Cyperaceae	12	78
Dasypogonaceae	1	2
Dilleniaceae	1	1
Droseraceae	1	7
Ericaceae	2	10
Fabaceae	2	2
Haemodoraceae	1	3
Haloragaceae	2	3
Macarthuriaceae	1	24
Malvaceae	2	11
Menyanthaceae	1	7
Montiaceae	1	5
Myrtaceae	4	74
Orchidaceae	2	8
Poaceae	1	7
Polygalaceae	2	4
Proteaceae	6	144
Restionaceae	1	1
Rutaceae	1	1
Scrophulariaceae	1	17
Stylidiaceae	3	12
Xanthorrhoeaceae	1	1
TOTAL	**59**	**483**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Amaranthaceae					
1.	2753	*Ptilotus pyramidatus*		T	Y
2.	11615	*Ptilotus sericostachyus subsp. roseus*		P1	
Apiaceae					
3.	41801	*Eryngium pinnatifidum subsp. Palustre (G.J. Keighery 13459)*		P3	
4.	41810	*Eryngium sp. Subdecumbens (G.J. Keighery 5390)*		P3	
5.	11132	*Platysace ramosissima*		P3	
Aponogetonaceae					
6.	141	*Aponogeton hexatepalus (Stalked Water Ribbons)*		P4	
Araliaceae					
7.	6233	*Hydrocotyle lemnoides (Aquatic Pennywort)*		P4	
Asparagaceae					
8.	1317	*Thysanotus anceps*		P3	
Asteraceae					
9.	7831	*Angianthus micropodioides*		P3	
Byblidaceae					
10.	3178	*Byblis gigantea (Rainbow Plant)*		P3	
Cyperaceae					
11.	48689	*Bolboschoenus fluviatilis*		P1	
12.	759	*Carex tereticaulis*		P3	

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
13.	17605	*Eleocharis keigheryi*		T	
14.	942	*Lepidosperma rostratum*		T	
15.	974	*Schoenus benthamii*		P3	
16.	980	*Schoenus capillifolius*		P3	
17.	999	*Schoenus loliaceus*		P2	
18.	1003	*Schoenus natans (Floating Bog-rush)*		P4	
19.	1008	*Schoenus pennisetis*		P3	
20.	16280	*Schoenus sp. Beaufort (G.J. Keighery 6291)*		P1	
21.	17731	*Schoenus sp. Waroona (G.J. Keighery 12235)*		P3	
22.	1033	*Tetraria australiensis*		T	
Dasypogonaceae					
23.	1213	*Calectasia cyanea (Blue Tinsel Lily)*		T	
Dilleniaceae					
24.	5146	*Hibbertia montana*		P4	
Droseraceae					
25.	3115	*Drosera occidentalis (Western Sundew)*		P4	
Ericaceae					
26.	6309	*Andersonia gracilis*		T	
27.	48297	*Styphelia filifolia*		P3	
Fabaceae					
28.	16317	*Isotropis cuneifolia subsp. glabra*		P3	
29.	20462	*Jacksonia gracillima*		P3	
Haemodoraceae					
30.	1469	*Haemodorum loratum*		P3	
Haloragaceae					
31.	6178	*Haloragis scoparia*		P1	
32.	6193	*Myriophyllum echinatum*		P3	
Macarthuriaceae					
33.	17106	*Macarthuria keigheryi*		T	
Malvaceae					
34.	5025	*Lasiopetalum bracteatum (Helena Velvet Bush)*		P4	
35.	45081	*Lasiopetalum glutinosum subsp. glutinosum*		P3	
Menyanthaceae					
36.	36200	*Ornduffia submersa*		P4	
Montiaceae					
37.	20096	*Calandrinia sp. Piawaning (A.C. Beauglehole 12257)*		P1	
Myrtaceae					
38.	45402	*Babingtonia urbana (Coastal Plain Babingtonia)*		P3	
39.	13653	*Calytrix breviseta subsp. breviseta*		T	
40.	37683	*Melaleuca viminalis*		P2	
41.	14714	*Verticordia lindleyi subsp. lindleyi*		P4	
Orchidaceae					
42.	1596	*Caladenia huegelii (Grand Spider Orchid)*		T	
43.	1637	*Diuris purdiei (Purdie's Donkey Orchid)*		T	
Poaceae					
44.	38480	*Austrostipa bronwenae*		T	
Polygalaceae					
45.	14663	*Comesperma griffinii*		P2	
46.	4560	*Comesperma rhadinocarpum (Slender-fruited Comesperma)*		P3	
Proteaceae					
47.	32211	*Banksia mimica (Summer Honeypot)*		T	
48.	32138	*Banksia pteridifolia subsp. vernalis*		P3	
49.	13999	*Conospermum undulatum*		T	
50.	2107	*Grevillea thelemanniana (Spider Net Grevillea)*		T	
51.	29775	*Isopogon drummondii*		P3	
52.	18590	*Synaphea sp. Fairbridge Farm (D. Papenfus 696)*		T	
Restionaceae					
53.	19241	*Lepyrodia curvescens*		P2	
Rutaceae					
54.	4444	*Boronia tenuis (Blue Boronia)*		P4	

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Scrophulariaceae					
55.	17150	*Eremophila glabra subsp. chlorella*		T	
Stylidiaceae					
56.	18564	*Stylidium aceratum*		P3	
57.	7756	*Stylidium longitubum (Jumping Jacks)*		P4	
58.	7771	*Stylidium periscelianthum (Pantaloon Triggerplant)*		P3	
Xanthorrhoeaceae					
59.	19338	*Chamaescilla gibsonii*		P3	

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

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

NatureMap
Mapping Western Australia's biodiversity

NatureMap CS Fauna report

Created By Guest user on 29/10/2019

Kingdom	Animalia
Conservation Status	Conservation Taxon (T, X, IA, S, P1-P5)
Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	115° 57' 26" E,32° 00' 02" S
Buffer	5km
Group By	Species Group

Species Group	Species	Records
Bird	11	1265
Invertebrate	6	16
Mammal	5	45
Reptile	3	9
TOTAL	**25**	**1335**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Bird					
1.	41323	*Actitis hypoleucos (Common Sandpiper)*		IA	
2.	24731	*Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black Cockatoo)*		T	
3.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)*		T	
4.	48400	*Calyptorhynchus sp. (white-tailed black cockatoo)*		T	
5.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
6.	48587	*Hydroprogne caspia (Caspian Tern)*		IA	
7.	24328	*Oxyura australis (Blue-billed Duck)*		P4	
8.	48591	*Pandion cristatus (Osprey, Eastern Osprey)*		IA	
9.	48597	*Thalasseus bergii (Crested Tern)*		IA	
10.	24806	*Tringa glareola (Wood Sandpiper)*		IA	
11.	24808	*Tringa nebularia (Common Greenshank, greenshank)*		IA	
Invertebrate					
12.	48574	*Australotomurus morbidus (cemetery springtail, Guildford springtail)*		P3	
13.	48581	*Glossurocolletes bilobatus (a short-tongued bee (southwest), short-tongued bee)*		P2	
14.	48935	*Idiosoma sigillatum (Swan Coastal Plain shield-backed trapdoor spider)*		P3	
15.	33983	*Leioproctus douglasiellus (a short-tongued bee)*		T	
16.	33984	*Neopasiphae simplicior (a short-tongued bee)*		T	
17.	34113	*Westralunio carteri (Carter's Freshwater Mussel)*		T	
Mammal					
18.	24092	*Dasyurus geoffroii (Chuditch, Western Quoll)*		T	
19.	24215	*Hydromys chrysogaster (Water-rat, Rakali)*		P4	
20.	48588	*Isoodon fusciventer (Quenda, southwestern brown bandicoot)*		P4	
21.	48022	*Notamacropus irma (Western Brush Wallaby)*		P4	
22.	48070	*Phascogale tapoatafa subsp. wambenger (South-western Brush-tailed Phascogale, Wambenger)*		S	
Reptile					
23.	25147	*Lerista lineata (Perth Slider, Lined Skink)*		P3	
24.	25249	*Neelaps calonotos (Black-striped Snake, black-striped burrowing snake)*		P3	
25.	25345	*Pseudemydura umbrina (Western Swamp Tortoise, Western Swamp Turtle)*		T	

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.

Australian Government
Department of the Environment and Energy

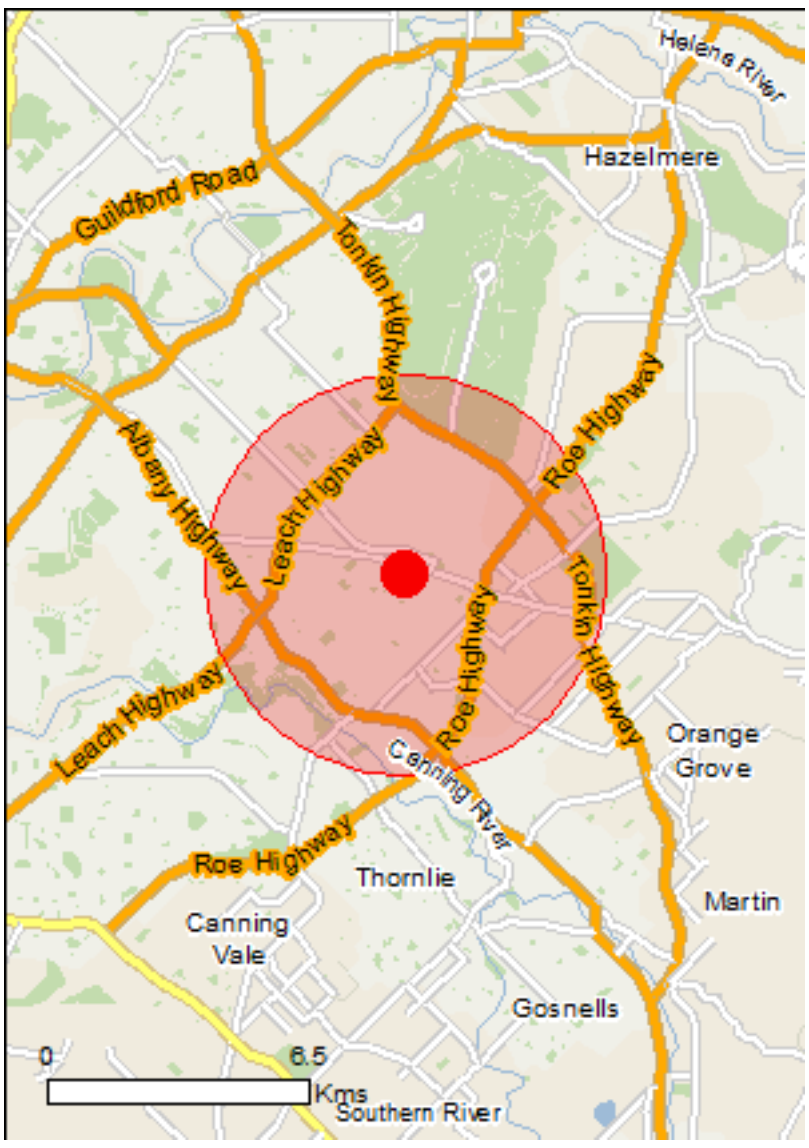
EPBC Act Protected Matters Report

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.

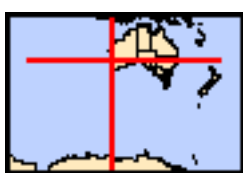
Report created: 29/10/19 14:20:42



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates

Buffer: 5.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	56
Listed Migratory Species:	25

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:	2
Commonwealth Heritage Places:	None
Listed Marine Species:	32
Whales and Other Cetaceans:	None
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:	5
Regional Forest Agreements:	None
Invasive Species:	46
Nationally Important Wetlands:	2
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

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
Clay Pans of the Swan Coastal Plain	Critically Endangered	Community likely to occur within area
Corymbia calophylla - Kingia australis woodlands on heavy soils of the Swan Coastal Plain	Endangered	Community known to occur within area
Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered	Community may 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 likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
Calyptorhynchus baudinii Baudin's Cockatoo, Long-billed Black-Cockatoo [769]	Endangered	Roosting 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
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, 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 may occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to 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	Species or species habitat may occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Species or species habitat 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
Insects		
Leioproctus douglasiellus a short-tongued bee [66756]	Critically Endangered	Species or species habitat known to occur within area
Mammals		
Dasyurus geoffroii Chuditch, Western Quoll [330]	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 may occur within area
Setonix brachyurus Quokka [229]	Vulnerable	Species or species habitat may occur within area
Other		
Westralunio carteri Carter's Freshwater Mussel, Freshwater Mussel	Vulnerable	Species or species

Name	Status	Type of Presence
[86266]		habitat known to occur within area
Plants		
Acacia anomala Grass Wattle, Chittering Grass Wattle [8153]	Vulnerable	Species or species habitat may occur within area
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat known to occur within area
Austrostipa bronwenae [87808]	Endangered	Species or species habitat known to occur within area
Banksia mimica Summer Honeypot [82765]	Endangered	Species or species habitat likely to occur within area
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat likely to occur within area
Calytrix breviseta subsp. breviseta Swamp Starflower [23879]	Endangered	Species or species habitat known to occur within area
Chamelaucium sp. Gingin (N.G.Marchant 6) Gingin Wax [88881]	Endangered	Species or species habitat may occur within area
Conospermum undulatum Wavy-leaved Smokebush [24435]	Vulnerable	Species or species habitat likely to occur within area
Diplolaena andrewsii [6601]	Endangered	Species or species habitat likely to occur within area
Diuris drummondii Tall Donkey Orchid [4365]	Vulnerable	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 known to 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
Eleocharis keigheryi Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat known to occur within area
Eremophila glabra subsp. chlorella [84927]	Endangered	Species or species habitat known to occur within area
Eucalyptus x balanites Cadda Road Mallee, Cadda Mallee [87816]	Endangered	Species or species habitat may occur within area
Grevillea curviloba subsp. incurva Narrow curved-leaf Grevillea [64909]	Endangered	Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Grevillea thelemanniana Spider Net Grevillea [32835]	Critically Endangered	Species or species habitat known to occur within area
Lepidosperma rostratum Beaked Lepidosperma [14152]	Endangered	Species or species habitat likely to occur within area
Macarthuria keigheryi Keighery's Macarthuria [64930]	Endangered	Species or species habitat likely to occur within area
Ptilotus pyramidatus Pyramid Mulla-mulla [18216]	Critically Endangered	Species or species habitat known to occur within area
Synaphea sp. Fairbridge Farm (D. Papenfus 696) Selena's Synaphea [82881]	Critically Endangered	Species or species habitat known to occur within area
Thelymitra dedmaniarum Cinnamon Sun Orchid [65105]	Endangered	Species or species habitat may occur within area
Thelymitra stellata Star Sun-orchid [7060]	Endangered	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
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
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat 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*	Species or species habitat likely to occur within area
Migratory Marine Species		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
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
Natator depressus Flatback Turtle [59257]	Vulnerable	Species or species habitat known to 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
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Pandion haliaetus		
Osprey [952]		Breeding known to occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name
Commonwealth Land -
Defence - AIRTC CANNINGTON

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 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
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat likely to occur within area
Diomedea amsterdamensis		
Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Species or species habitat likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely 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 may occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Species or species habitat 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*	Species or species habitat likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Mammals		

Name	Threatened	Type of Presence
[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	Species or species habitat known to occur within area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Species or species habitat known to occur within area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
[Natator depressus](#) Flatback Turtle [59257]	Vulnerable	Species or species habitat known to occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Canning River	WA
Dundas Road	WA
Kenwick Wetlands	WA
Unnamed WA37997	WA
Unnamed WA49363	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

Name	Status	Type of Presence
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
Capra hircus Goat [2]		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
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		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

Name	Status	Type of Presence within area
Asparagus declinatus Bridal Veil, Bridal Veil Creeper, Pale Berry Asparagus Fern, Asparagus Fern, South African Creeper [66908]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		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 monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		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 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

Name	Status	Type of Presence
		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

Nationally Important Wetlands

[Resource Information]

Name	State
Brixton Street Swamps	WA
Perth Airport Woodland Swamps	WA

Caveat

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

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

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

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

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

-32.00046 115.95661

Appendix D Flora data

Flora species list by site

Quadrat data

Flora likelihood of occurrence

Flora species list

Species	Status	Q1	Q2	Opportunistic
Acacia iteaphylla	*Planted			X
Acacia pulchella				X
Acacia saligna				X
Acacia wildenowiana				X
Adenanthos cygnorum	Planted			X
Agonis flexuosa	Planted			X
Allocasuarina fraseriana				X
Arctotheca calendula	*			X
Asparagus asparagoides	*DP & WoNS	X		
Astartea scoparia				X
Avena barbata	*			X
Azolla rubra				X Water plant
Banksia attenuata		X		
Banksia menziesii		X		
Baumea articulata				X
Bossiaea eriocarpa				X
Briza maxima	*	X	X	
Briza minor	*			X
Bromus diandrus	*			X
Burchardia congesta			X	
Callistemon sp.	Planted			X
Callitris sp.	Planted			X
Centella asiastica				X
Chamaecytisys palmensis	*			X
Citharexylum spinosum	*Planted			X
Constylis sp.				X
Cortaderia selloana	*			X
Corymbia calophylla		X	X	
Corynotheca micrantha var. micrantha				X
Cynodon dactylon	*			X
Dasypogon bromeliifolius		X	X	
Daviesia incrassata				X
Daviesia physodes				X
Desmocladus fasciculatus				X
Desmocladus flexuosa			X	
Eragrostis curvula	*			X
Erharta calycinus	*	X		
Erythrina indica	*Planted			X
Eucalyptus cladocalyx	*Planted			X
Eucalyptus marginata				X
Eucalyptus rudis				X
Eucalyptus sp.	*Planted			X
Eucalyptus todtiana				X
Euphorbia terracina	*			X
Ficinia nodosa				X
Ficus sp.	* Planted			X

Species	Status	Q1	Q2	Opportunistic
Freesia sp.	*			X
Fumaria capreolata	*			X
Gladiolus cayophyllaceus	*		X	
Gompholobium tomentosum				X
Grevillea robusta	*Planted			X
Hibbertia hypericoides		X		
Hypocalymma robustum				X
Hypochaeris glabra	*			X
Ipomoea sp.	*			X
Isolepis cyperoides				X
Jacksonia floribunda				X
Jacksonia furcellata			X	
Jacksonia sternbergiana				X
Juncus pallidus				X
Kennedia prostrata				X
Kunzea glabrescens		X		
Lantana camera	*			X
Laxmannia squarrosa	*			X
Lechenaultia floribunda				X
Lemna disperma				X water plant
Lepidosperma pubisquameum		X		X
Leptospermum laevigatum	*	X		X
Lolium sp.	*			X
Lomandra sp.				X
Lophostomon confertus	*Planted			X
Macrozamia reidlei		X		
Melaleuca lateritia	Planted			X
Melaleuca preissiana				X
Melia azedarach	*Planted			X
Mesomelaena pseudostygia				X
Microtis media subsp media				X
Oenothera sp.	*			X
Olea europea	*Planted			X
Patersonia occidentalis			X	X
Pelargonium capitatum	*			X
Pennisetum clandestinum	*			X
Phlebocarya ciliata				X
Poranthera microphylla				X
Protea sp.	*			X
Ricinus communis	*			X
Romulea rosea	*			
Schinus terebinthifolia	*			X
Scholtzia involucrata				X
Sonchus sp.	*			X
Trachyandra divaricata	*			X
Tricoryne elatior			X	
Trifolium avense	*			X
Typha orientalis	*			

Species	Status	Q1	Q2	Opportunistic
Ursinia anthemoides	*			X
Verticordia densiflora subsp. densiflora				X
Viminaria juncea				X
Wahlenbergia capensis	*			X
Watsonia sp.		X		
Xanthorrhoea ?brunonis				X
Xanthorrhoea preissii			X	

* Introduced species

Quadrat data

Site ID: Queen's Park	Q01	VT: Banksia woodland	VT02
Type:	Quadrat	Size: 10 x 10 m	
Date:	22/10/19	Described by: Anna Napier GHD	
Co-ordinates:			N/A
Landform and slope:	Plain, negliable		
Drainage:	Good		
Soil colour & type:	Grey sand		
Surface Component	Loose soil 5% Humus/litter 60%		
Vegetation condition:	Degraded		
Fire age & intensity:	Old, negligible fire damage		
Disturbances:	Weeds		
Leaf litter:	Plentiful		
Wood litter:	N/A		

Family	Taxon	Status	Cover (%)	Height (m)
Asparagaceae	*Asparagus asparagoides*	*DP & WoNS	<2T<10	0.4
Protaceae	*Banksia attenuata*		<10	7.0
Protaceae	*Banksia menziesii*		70-30	7.0
Poaceae	*Briza maxima*	*	<2N	0.25
Poaceae	*Cynodon dactylon*	*	<2T<10	0.15
Dasypogonaceae	*Dasypogon bromelifolius*		<2T<10	0.3
Poaceae	*Ehrharta calycinus*	*	<2N	0.6
Dillaniaceae	*Hibbertia hypericoides*		<2T<10	0.6
Myrtaceae	*Kunzea glabrescens*		30-10	2.0
Myrtaceae	*Leptospermum laevigatum*	*	<2T<10	2.0
Fabaceae	*Macrozamia reidlei*		<10	1.4
Iridaceae	*Watsonia sp.*	*	70-30	0.8

Photo Q1

Site ID: Queen's park	Q02	VT: Marri woodland	VT0?
Type:	Quadrat	Size: 10 x 10 m	
Date:	22/10/2019	Described by:Anna Napier,GHD	
Co-ordinates:	MGA 50	392866.3 mE	6449146 mN
Landform and slope:	Plain, negliable		
Drainage:	Good		
Soil colour & type:	Sandy loam, grey		
Surface Component	Humus/litter 10%		
Vegetation condition:	Very good		
Fire age & intensity:	Old, negligible fire damage		
Disturbances:	Weeds		
Leaf litter:	Plentiful		
Wood litter:	Sparse		

Family	Taxon	Status	Cover (%)	Height (m)
Cochiacaceae	*Burchardia congesta*			0.4
Haemodoraceae	*Conostylis sp.*			0.2
Myrtaceae	*Corymbia calophylla*		70-30	14
Dasypogonaceae	*Dasypogon bromeliifolius*		70-30	0.3
Restionaceae	*Desmocladus fasciculatus*			0.2
Restionaceae	*Desmocladus flexuosa*		100-70	0.15
Iridaceae	*Gladiolus cayophyllaceus*		<2T<10	0.6
Fabaceae	*Jacksonia furcellata*		<2T<10	0.6
Iridaceae	*Patersonia occidentalis*		<2T<10	0.3
Araliaceae	*Tricoryne elatior*		<2T<10	0.3
Xanthorrhoeaceae	*Xanthorrhoea preissii*		<10	<1.8

Photo Q2

Flora likelihood of occurrence assessment guidelines

Likelihood of occurrence	Guideline
Known	Species recorded within survey area from field survey results.
Likely	Species previously recorded within 5 km and large areas of suitable habitat occur in the project area.
Possible	Species previously recorded within 5 km and areas of suitable habitat occur/may occur in the project area.
Unlikely	Species previously recorded within 5 km, but suitable habitat does not occur in the project area.
Highly unlikely	Species not previously recorded within 5 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	Intensity of survey, availability of access, growth form type, recorded flowering times, cryptic nature of species

Source information - desktop searches

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

TPFL and WAHERB – records of threatened flora from TPFL and WAHERB database searches within the study area

NM – DBCA *NatureMap* (accessed May 2018)

Flora likelihood of occurrence assessment

Taxa	Common name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		State	Federal	NM	WAHerb/ TPFL	PMST		
Acacia anomala		T	VU	x	x	x	Slender, rush-like shrub, 0.2-0.5 m high. Fl. yellow, Aug to Sep. Lateritic soils. Slopes.	Highly unlikely- suitable habitat does not occur in the project area
Acacia benthamii		P2			x		Shrub, ca 1 m high. Fl. yellow, Aug to Sep. Sand. Typically on limestone breakaways.	Highly unlikely- suitable habitat does not occur in the project area
Acacia horridula		P3			x		Harsh, slender, single-stemmed shrub, 0.3-0.6(-1) m high. Fl. yellow, May to Aug. Gravelly soils over granite, sand. Rocky hillsides.	Highly unlikely- suitable habitat does not occur in the project area

Taxa	Common name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		State	Federal	NM	WAHerb/ TPFL	PMST		
Acacia lasiocarpa var. *bracteolata long peduncle variant* (G.J. eighery 5026)		P1			x		Shrub, 0.4-1.5 m high. Fl. yellow, May or Aug. Grey or black sand over clay. Swampy areas, winter wet lowlands.	Unlikely- suitable habitat is highly altered in the project area
Acacia oncinophylla subsp. *patulifolia*		P4			x		Shrub, 0.5-2.5(-3) m high, 'minni-ritchi' bark, phyllodes 4-9 cm long, 3-6 mm wide. Fl. yellow, Aug to Nov or Nov to Dec. Granitic soils, occasionally on laterite.	Highly unlikely- suitable habitat does not occur in the project area
Amanita preissii		P3			x		No habitat description	Unlikely – suitable habitat in the project area is highly degraded
Amanita quenda		P1			x		No habitat description	Unlikely – suitable habitat in the project area is highly degraded
Amanita wadjukioru		P3			x			Unlikely – suitable habitat in the project area is highly degraded
Andersonia gracilis		T	EN	x	x	x	Slender erect or open straggly shrub, 0.1-0.5(-1) m high. Fl. white-pink-purple, Sep to Nov. White/grey sand, sandy clay, gravelly loam. Winter-wet areas, near swamps.	Unlikely – suitable habitat in yhe project area is highly degraded
Andersonia sp. *Blepharifolia (*F. & J. Hort 1919)		P2			x		No habitat description	Unlikely - suitable habitat in the project area is highly degraded

Taxa	Common name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		State	Federal	NM	WAHerb/ TPFL	PMST		
Angianthus micropodioides		P3		x			Erect or decumbent annual, herb, 0.03-0.15 m high. Fl. yellow-white, Nov to Dec or Jan to Feb. Saline sandy soils. River edges, saline depressions, claypans.	Unlikely – suitable habitat does not occur within the project area
Aponogeton hexatepalus	Stalked Water Ribbons	P4		x	x		Rhizomatous or cormous, aquatic perennial, herb, leaves floating. Fl. green-white, Jul to Oct. Mud. Freshwater: ponds, rivers, claypans.	Possible – suitable habitat occurs within the project area
Anthocercis gracilis		T	EN		x		Erect, spindly shrub, to 0.6(-1) m high. Fl. yellow-green, Sep to Oct. Sandy or loamy soils. Granite outcrops.	Unlikely – suitable habitat does not occur within the project area
Austrostipa bronwenae		T	EN	x	x	x	No description available	Unlikely – the project area is mostly degraded
Babingtonia urbana	Coastal Plain Babingtonia	P3		x	x		Shrub 0.4 to 0.7 m high with erect stems. Fl. White to pale pink. Jan to March. Sandy soils in damp, swampy areas.	Possible – suitable habitat occurs within the project area
Banksia mimica	Summer Honeypot	T	EN	x	x	x	Prostrate, lignotuberous shrub, 0.15-0.4 m high. Fl. yellow-brown, Dec or Jan to Feb. White or grey sand over laterite, sandy loam.	Unlikely – suitable habitat not present.
Banksia pteridifolia subsp. *vernalis*		P3		x	x		Prostrate, lignotuberous shrub, to 0.4 m high. Fl. cream-white/yellow, Sep to Oct. White/grey sand over laterite.	Unlikely – suitable habitat not present.

Taxa	Common name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		State	Federal	NM	WAHerb/ TPFL	PMST		
Bolboschoenus fluviatilis		P1		x	x		No description available	Unlikely – suitable habitat in the area is highly degraded
Boronia tenuis	Blue Boronia	P4		x	x		Procumbent or erect & slender shrub, 0.1-0.5 m high. Fl. blue/pink-white, Aug to Nov. Laterite, stony soils, granite.	Unlikely – suitable habitat not present within the project area
Byblis gigantea	Rainbow Plant	P3		x	x		Small, branched perennial, herb (or sub-shrub), to 0.45 m high. Fl. pink-purple/white, Sep to Dec or Jan. Sandy-peat swamps. Seasonally wet areas	Unlikely – suitable habitat is highly degraded within the project area
Caladenia huegelii	Grand Spider Orchid	T	EN	x	x	x	Tuberous, perennial, herb, 0.25-0.6 m high. Fl. green & cream & red, Sep to Oct. Grey or brown sand, clay loam.	Unlikely – suitable habitat is highly degraded within the project area
Calandrinia sp. *Piawaning* (A.C. Beauglehole 12257)		P1		x	x		Decumbent to erect annual, herb, to 0.08 m high. Fl. pink, Oct. Brown/gey silty sandy loam over granite. Near pools, small rise within large saline valley flats, disturbed shrubland.	Highly Unlikely – suitable habitat does not occur within the project area
Calothamnus accedens		P4			x		Erect & slender shrub, to 1.8 m high. Fl. pink-red. Sandy soils over laterite. Road verge.	Highly unlikely- suitable habitat does not occur in the project area
Calytrix breviseta subsp. *breviseta*		T	EN	x	x	x	Shrub, 0.4-1 m high. Fl. purple-blue, Oct to Nov. Sandy clay. Swampy flats.	Unlikely – suitable habitat is highly degraded within the project area
Carex tereticaulis		P3		x	x		Monoecious, rhizomatous, tufted perennial, grass-like or herb (sedge), 0.7 m high. Fl.	Unlikely – suitable habitat is highly degraded within the project area

Taxa	Common name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		State	Federal	NM	WAHerb/ TPFL	PMST		
							brown, Sep to Oct. Black peaty sand.	
Chamaescilla gibsonii		P3		x	x		Clumped tuberous, herb. Fl. blue, Sep. Clay to sandy clay. Winter-wet flats, shallow water-filled claypans.	Unlikely – suitable habitat is highly degraded within the project area
Chamelaucium sp. Gingin (N.G.Marchant 6)		T	EN	x	x		No description available.	Highly unlikely- known location is in a different habitat
Comesperma griffinii		P2		x	x		Annual or perennial, herb, to 0.15 m high. Fl. white, Oct. Yellow or grey sand. Plains.	Unlikely – suitable habitat is highy degraded within the project area
Comesperma rhadinocarpum	Slender-fruited Comesperma	P3		x	x		Perennial, herb. Fl. blue, Oct to Nov. Sandy soils.	Unlikely – suitable habitat is highly degraded within the project area
Conospermum undulatum		T	VU	x	x	x	Erect, compact shrub, 0.6-2 m high. Fl. white-other, May to Oct. Grey or yellow-orange clayey sand.	Possaible – suitable habitat occurs within the project area
Darwinia apiculata					x		Densely branched shrub, 0.4-0.5 m high. Fl. green & yellow/red, Oct. Lateritic soils.	Highly unlikely- suitable habitat does not occur in the project area
Diplolaena andrewsii		T	EN			x	Erect shrub, 0.5-1 m high, inner involucral bracts glabrous, leaves broadly cordate. Fl. red, Jul to Oct. Loam, clay. Granite outcrops & hillsides.	Highly unlikely- suitable habitat does not occur in the project area
Diuris drummondii		T	VU			x	Tuberous, perennial, herb, 0.5-1.05 m high. Fl. yellow, Nov to	Unlikely – suitable habitat is highly degraded within the project area

Taxa	Common name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		State	Federal	NM	WAHerb/ TPFL	PMST		
							Dec or Jan. Low-lying depressions, swamps.	
Diuris micrantha		T	VU	x		x	Tuberous, perennial, herb, 0.3-0.6 m high. Fl. yellow & brown, Sep to Oct. Brown loamy clay. Winter-wet swamps, in shallow water.	Unlikely – suitable habitat is highly degraded within the project area
Diuris purdiei	Purdie's Donkey Orchid	T	EN		x	x	Tuberous, perennial, herb, 0.15-0.35 m high. Fl. yellow, Sep to Oct. Grey-black sand, moist. Winter-wet swamps	Unlikely – suitable habitat is highly degraded within the project area
Drakaea elastica		T	EN	x		x	Tuberous, perennial, herb, 0.12-0.3 m high. Fl. red & green & yellow, Oct to Nov. White or grey sand. Low-lying situations adjoining winter-wet swamps.	Unlikely – suitable habitat is highly degraded within the project area
Drosera occidentalis	Western Sundew	P4		x	x		Fibrous-rooted, rosetted perennial, herb, to 0.025 m high. Fl. pink/white, Oct to Dec or Jan.	Unlikely – suitable habitat is highly degraded within the project area
Eleocharis keigheryi		T	VU	x	x	x	Rhizomatous, clumped perennial, grass-like or herb (sedge), to 0.4 m high. Fl. green, Aug to Nov. Clay, sandy loam. Emergent in freshwater: creeks, claypans	Unlikely – suitable habitat is highly degraded within the project area
Eremophila glabra subsp. *chlorella*		T	EN	x	x	x	Prostrate & spreading or sprawling shrub, 0.2-1 m high. Fl. green-yellow, Jul to Nov. Sandy clay. Winter-wet depressions.	Unlikely – suitable habitat is highly degraded within the project area

Taxa	Common name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		State	Federal	NM	WAHerb/ TPFL	PMST		
Eryngium pinnatifidum subsp. Palustre (G.J. Keighery 13459)		P3		x	x			Unlikely – suitable habitat does not occur within the project area
Eryngium sp. Subdecumbens (G.J. Keighery 5390)		P3			x		No habitat information.	Unlikely – suitable habitat is highly degraded within the project area
Eucalyptus x balanites		T	EN			x	(Mallee), to 5 m high, bark rough, flaky. Fl. white, Oct to Dec or Jan to Feb. Sandy soils with lateritic gravel.	Highly unlikely- suitable habitat does not occur in the project area
Grevillea curviloba subsp. *incurva*		T	EN	x		x	Prostrate to erect shrub, 0.1-2.5 m high. Fl. white-cream, Aug to Sep. Sand, sandy loam. Winter-wet heath.	Highly unlikely- suitable habitat does not occur in the project area
Grevillea thelemanniana	Spider Net Grevillea	T	CR	x	x	x	Spreading, lignotuberous shrub, 0.3-1.5 m high. Fl. pink-red, May to Nov. Sand, sandy clay. Winter-wet low-lying flats	Unlikely – suitable habitat is highly degraded within the project area
Haemodorum loratum		P3		x	x		Bulbaceous, perennial, herb, 0.45-1.2(-2) m high. Fl. black/brown-black/green, Nov. Grey or yellow sand, gravel	Unlikely- suitable habitat does not occur in the project area
Haloragis scoparia		P1		x			Perennial, herb, 0.3-0.6 m high.	Unlikely – suitable habitat is highly degraded within the project area
Hibbertia montana				x			Erect, straggling or sprawling shrub, 0.1-0.7 m high. Fl. yellow, Jul to Oct. Loam over granite, lateritic soils, gravel.	Highly unlikely- suitable habitat does not occur in the project area

Taxa	Common name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		State	Federal	NM	WAHerb/ TPFL	PMST		
							Granite rocks, lateritic ridges & boulders, hills.	
Hydrocotyle lemnoides	Aquatic Pennywort	P4		x			Aquatic, floating annual, herb. Fl. purple, Aug to Oct. Swamps.	Possible – suitable habitat available
Isopogon drummondii		P4		x	x		Aquatic, floating annual, herb. Fl. purple, Aug to Oct. Swamps.	Unlikely – suitable habitat is highly degraded within the project area
Isotropis cuneifolia subsp. *glabra*		P3		x	x		Prostrate to ascending, spreading perennial, herb or shrub, 0.05-0.15 m high. Fl. yellow/orange & red, Sep. Sand, clay loam. Winter-wet flats.	Unlikely – suitable habitat is highly degraded within the project area
Jacksonia gracillima		P3		x	x		Grey, white sand on flats.	Possible - suitable habitat is present in the project area
Lasiopetalum bracteatum	Helena Velvet Bush	P4		x	x		Erect, open shrub, 0.4-1.5 m high. Fl. pink-purple, Aug to Nov. Sandy clay, clay, lateritic gravel. Along drainage lines, creeks, gullies, granite outcrops.	Highly unlikely- suitable habitat does not occur in the project area
Lasiopetalum glutinosum subsp. *glutinosum*		P3		x	x		No habitat information available.	Possible - suitable habitat may occur in the project area
Lepidosperma rostratum		T	EN	x	x	x	Rhizomatous, tufted perennial, grass-like or herb (sedge), 0.5 m high. Fl. brown. Peaty sand, clay.	Unlikely – suitable habitat is highly degraded within the project area

Taxa	Common name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		State	Federal	NM	WAHerb/ TPFL	PMST		
Lepyrodia curvescens		P2		x	x		Dioecious, shortly creeping, tufted rhizomatous, herb, 0.24-0.4 m high, rhizomes on surface or to 1 cm deep. Fl. Sep to Nov. Sand, laterite. Seasonally inundated swampland.	Unlikely – suitable habitat is highly degraded within the project area
Levenhookia preissii		P1			x		Annual (ephemeral), herb, 0.03-0.17 m high. Fl. pink-red, Sep to Dec or Jan. Grey or black, peaty sand. Swamps.	Unlikely – suitable habitat is highly degraded within the project area
Macarthuria keigheryi		T	EN	x	x	x	Erect or spreading perennial, herb or shrub, 0.2-0.4 m high, 0.3-0.6 m wide. Fl. Sep to Dec or Feb to Mar. White or grey sand	Possible – suitable habitat may occur within the project area. This species was not recorded by GHD 2019
Melaleuca viminalis		P2		x	x		Large shrub or small tree to 10m. Fl. red, most months. Sand and sandstone soils on creek edges.	Unlikely – suitable habitat is highly degraded within the project area
Meionectes tenuifolia		P3			x		No description.	Unlikely – suitable habitat is highly degraded within the project area
Myriophyllum echinatum		P3		x	x		Erect annual, herb, 0.02-0.03 m high. Fl. red, Nov. Clay. Winter-wet flats.	Unlikely – suitable habitat is highly degraded within the project area
Ornduffia submersa		P4		x	x			Unlikely – suitable habitat is highly degraded within the project area
Platysace ramosissima		P3		x	x		Perennial, herb, to 0.3 m high. Fl. white-cream, Oct to Nov. Sandy soils.	Unlikely – suitable habitat is highly degraded within the project area

Taxa	Common name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		State	Federal	NM	WAHerb/ TPFL	PMST		
Ptilotus pyramidatus		T	CR	x	x	x	Small herb. Fl. white.	Unlikely – suitable habitat is highly degraded within the project area
Ptilotus sericostachyus subsp. roseus		P1		x	x		Prostrate to ascending perennial, herb. Fl. pink-white, Sep to Dec.	Unlikely – suitable habitat is unlikely to occur within the project area
Schoenus benthamii		P3		x	x		Tufted perennial, grass-like or herb (sedge), 0.15-0.45 m high. Fl. brown, Oct to Nov. White, grey sand, sandy clay. Winter-wet flats, swamps.	Unlikely – suitable habitat is highly degraded within the project area
Schoenus capillifolius		P3		x	x		Semi-aquatic tufted annual, grass-like or herb (sedge), 0.05 m high. Fl. green, Oct to Nov. Brown mud. Claypans.	Unlikely – suitable habitat does not occur within the project area
Schoenus loliaceus		P2		x	x		Annual, grass-like or herb (sedge), 0.03-0.06 m high. Fl. Aug to Nov. Sandy soils. Winter-wet depressions.	Unlikely – suitable habitat is highly degraded within the project area
Schoenus natans	Floating Bog-rush	P4		x	x		Aquatic annual, grass-like or herb (sedge), 0.3 m high. Fl. brown, Oct. Winter-wet depressions.	Unlikely – suitable habitat is highly degraded within the project area
Schoenus pennisetis		P3		x	x		Tufted annual, grass-like or herb (sedge), 0.05-0.15 m high. Fl. purple-black, Aug to Sep. Grey or peaty sand, sandy clay. Swamps, winter-wet depressions.	Unlikely – suitable habitat does not occur within the project area
Schoenus sp. *Beaufort (G.J. Keighery 6291)*		P1		x	x		Annual, grass-like or herb (sedge), ca 0.05 m high. Fl.	Highly unlikely – suitable habitat does not occur within the project area

Taxa	Common name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		State	Federal	NM	WAHerb/ TPFL	PMST		
							green. Mud. Winter-wet claypans.	
Schoenus sp. *Waroona (G.J. Keighery 12235)*		P3		x	x		Tufted annual, grass-like or herb (sedge), 0.02-0.06 m high. Fl. brown-red-green, Oct to Nov. Clay or sandy clay. Winter-wet flats	Unlikely – suitable habitat does not occur within the project area
Senecio leucoglossus		P4			x		Erect annual, herb, to 1.3 m high. Fl. white, Aug to Dec. Gravelly lateritic or granitic soils. Granite outcrops, slopes.	Highly unlikely- suitable habitat does not occur in the project area
Stenanthemum sublineare		P2			x		Erect shrub, to 0.1 m high. Fl. green, Oct to Dec. Littered white sand. Coastal plain.	Unlikely – suitable habitat is highly degraded within the project area
Stylidium aceratum		P3		x	x		Fibrous rooted annual, herb, 0.05-0.09 m high, leaves spathulate. Fl. pink/white, Oct to Nov. Sandy soils. Swamp heathland.	Unlikely – suitable habitat does not occur within the project area
Stylidium longitubum	Jumping Jacks	P4		x	x		Erect annual (ephemeral), herb, 0.05-0.12 m high. Fl. pink, Oct to Dec. Sandy clay, clay. Seasonal wetlands.	Unlikely – suitable habitat is highly degraded within the project area
Stylidium periscelianthum	Pantaloon Triggerplant	P3		x			Bulb-forming perennial, herb, 0.07-0.15 m high. Fl. pink, Sep to Oct. Loamy clay, moist soils pockets. Wet flats, low granitic hills	Highly unlikely- suitable habitat does not occur in the project area
Stylidium paludicola		P3			x		Reed-like perennial, herb, 0.35-1 m high, Leaves tufted, linear or subulate or narrowly oblanceolate, 0.5-4 cm long, 0.5-1.5 mm wide, apex acute,	Unlikely – suitable habitat is highly degraded within the project area

Taxa	Common name	Status		Source			Description and habitat requirements	Likelihood of occurrence within the survey area
		State	Federal	NM	WAHerb/ TPFL	PMST		
							margin entire, glabrous. Scape mostly glabrous, inflorescence axis glandular. Inflorescence racemose. Fl. pink, Oct to Dec. Peaty sand over clay. Winter wet habitats. Marri and Melaleuca woodland, Melaleuca shrubland	
Stylidium striatum		P4			x		Rosetted perennial, herb, 0.15-0.55 m high, Fl. yellow, Oct to Nov. Brown clay loam over laterite. Hillslopes. Jarrah/Marri forest, Wandoo woodland	Highly unlikely- suitable habitat does not occur in the project area
Styphelia filifolia		P3		x	x		Shrub to 0.9 m high.Fl. white, Mar to May. Sandy soils in low lying Banksia or Jarrah woodland.	Possible – suitable habitat occurs within the project area
Synaphea sp. *Fairbridge Farm (D. Papenfus 696)*		T	CR	x	x	x	Dense, clumped shrub, to 0.3 m high, to 0.4 m wide. Fl. yellow, Oct. Sandy with lateritic pebbles. Near winter-wet flats, in low woodland with weedy grasses.	Unlikely – suitable habitat is highly degraded within the project area
Tetraria australiensis		T			x		Rhizomatous, tufted perennial, grass-like or herb (sedge), to 1 m high. Fl. brown, Nov to Dec.	Unlikely – suitable habitat is unlikely to occur within the project area
Thelymitra dedmaniarum	Cinnamon Sun Orchid	T	EN			x	Tuberous, perennial, herb, to 0.8 m high. Fl. yellow, Nov to Dec or Jan. Granite.	Highly unlikely- suitable habitat does not occur in the project area
Thelymitra magnifica		P1			x		Perennial, herb. Stony ridges.	Highly unlikely- suitable habitat does not occur in the project area

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		State	Federal	NM	WAHerb/ TPFL	PMST		
Thelymitra stellata	Star Sun-orchid	T	EN	x	x	x	Tuberous, perennial, herb, 0.15-0.25 m high. Fl. yellow & brown, Oct to Nov. Sand, gravel, lateritic loam.	Highly unlikely- suitable habitat does not occur in the project area
Thysanotus anceps		P3		x	x		Rhizomatous, leafless perennial, herb, to 0.4 m high. Fl. purple, Oct to Dec. White or grey sand, lateritic gravel, laterite.	Unlikely – suitable habitat is highly degraded within the project area
Thysanotus sp. Badgingarra (E.A. Griffin 2511)		P2			x		Perennial, herb (with tuberous roots), ca 0.35 m high. Fl. blue, Dec. Grey sand with lateritic gravel.	Highly unlikely- suitable habitat does not occur in the project area
Tripterococcus sp. Brachylobus (A.S. George 14234)		P4			x			Unlikely – suitable habitat is highly degraded within the project area
Verticordia lindleyi subsp. *lindleyi*		P4			x		Erect shrub, 0.2-0.75 m high. Fl. pink, May or Nov to Dec or Jan. Sand, sandy clay. Winter-wet depressions.	Unlikely – suitable habitat is highly degraded within the project area

GHD

Level 10
999 Hay Street
T: 61 8 6222 8222 F: 61 8 9463 6012 E: permail@ghd.com

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