Desktop Review and Impact Assessment of Short Range Endemic and Conservation Significant Invertebrates for the Byford Rail Extension Project, Western Australia

Report by *Invertebrate Solutions Pty Ltd*
for Public Transport Authority

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Frontispiece: Vegetation from the Lambert Lane Nature Reserve adjacent to the BRE Proposal.

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Executive Summary

The Byford Rail Extension (BRE) (the Proposal) starts approximately 26 km south-east of Perth and travels 7.5 km south to Byford. The BRE connects to the existing electrified network at Armadale as an extension to the existing Perth to Armadale line. The northern section of BRE intersects the City of Armadale before crossing into the Shire of Serpentine - Jarrahdale. The development of the BRE Proposal is being led by the METRONET office, while the Public Transport Authority of Western Australia (PTA) is the project's formal proponent.

The BRE Proposal is likely to require environmental approvals under the State Environmental Protection Act 1986 (EP Act) and the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). To support environmental assessments and gain environmental approvals, METRONET has identified a number of additional technical studies to be undertaken, including for short range endemic (SRE) and conservation significant invertebrate fauna, within the BRE Project area. The Proposal's 164.58 ha Project area extends from the existing Sherwood Station one km north of Armadale Road, Armadale to Abernethy Road Byford.

The Desktop Study Area, an approximate 1,560 km^2 rectangle centred on the BRE Proposal, contains desktop records of seven Confirmed SRE species:

- Three mygalomorph spiders (*Euoplos inornatus, Idiosoma jarrah* and *Idiosoma sigillatum* [DBCA Priority 3]) – Confirmed SRE species.
- Two land snails (*Bothriembryon serpentinus* and *Epinicium restifer*) – Confirmed SRE species.
- One tree cricket (*Throscodectes xiphos)* – Confirmed SRE species / DBCA Priority 1.
- One native bee (*Leioproctus Glossurocolletes bilobatus)* – Confirmed SRE species / DBCA Priority 2.

An additional six species were identified from desktop records within the Desktop Study Area as being Likely SRE species:

- Three slaters (*Buddelundia cinerascens,B. inaequalis* and *B. opaca*) – Likely SRE species.
- Two mygalomorph spiders (*Synothele michalseni, Teyl 'MYG249'*) – Likely SRE species.
- One millipede (*Dinocambala ingens*) – Likely SRE species.

The remaining species identified from desktop resources were found to be widespread. All of the Confirmed or Likely SRE species identified as occurring within the Desktop Study Area had a Low Likelihood of occurring within the study area.

An additional seven conservation significant invertebrates (widespread, non-SRE species) were identified in the desktop assessment:

- A tree cricket– *Kawaniphila pachomai* – DBCA Priority 1.
- A day flying moth – *Synemon gratiosa* - DBCA Priority 4.
- Five native bees:
    - *Hesperocolletes douglasi* - DBCA Critically Endangered / EPBC Critically Endangered.
    - *Hylaeus globuliferus* – DBCA Priority 3.

- *Leioproctus contrarius* – DBCA Priority 3.
- *Leioproctus douglasiellus* – DBCA Critically Endangered / EPBC Endangered.
- *Neopasiphae simplicior* – DBCA Critically Endangered / EPBC Endangered.

Of these seven conservation significant species none are considered as possibly having potential habitat within the study area.

The only direct impact to SRE or conservation significant invertebrates is from vegetation clearing within the study area that will directly remove habitat potentially used by SRE species. This direct impact is, however, considered to be Low as only 1.6 ha of Moderate value and 14.3 ha of Low value SRE habitat comprising 12 separate narrow linear fragments are present within the study area.

Increased local weed incursion into adjacent native bushland can have a significant impact upon SRE species that rely on sometimes small microhabitats within the landscape. This is still considered to be a Low potential impact to SRE fauna. The indirect impact of the clearing of native vegetation causing fragmentation is considered to be negligible as the extremely limited clearing (~16 ha) of largely degraded vegetation represents fragments that are already narrow linear portions alongside an existing rail corridor and unconnected to other urban bushland and have largely Low SRE habitat potential.

At a regional scale across the SCP, the direct and indirect impacts are considered to be Low or Nil due to the narrow linear nature of the BRE Proposal, and the very limited potential SRE habitat both within the study area and immediately adjacent to it. The study area sits within largely a combination of a dense urban landscape or degraded rural areas that is considered to provide Low to Nil habitat for SRE species at a regional scale. No impacts either direct or indirect are considered to be above Low and thus the project is considered to have no cumulative or regional impacts on the SCP.

All other anticipated impacts are generally Low or able to be managed through standard construction and operational management and mitigation measures.

The following recommendations are made with regard to the BRE proposal:

- No further investigation, including field surveys are required to assess the potential impacts to SRE or conservation significant invertebrate fauna by the BRE proposal as virtually no native habitat is present within the study area.

1. Introduction

The Byford Rail Extension (BRE) (the Proposal) starts approximately 26 km south-east of Perth and travels 7.5 km south to Byford. The BRE connects to the existing electrified network at Armadale as an extension to the existing Perth to Armadale line. The northern section of BRE intersects the City of Armadale before crossing into the Shire of Serpentine - Jarrahdale. The Public Transport Authority of Western Australia (PTA) is proposing to develop the Proposal as part of the Western Australian Government's METRONET vision.

The Proposal includes an electrified 7.5 km dual track railway connecting the existing Armadale Station to a new Byford Station. The Proposal utilises the existing rail corridor that is currently used by the Australind passenger train service. A new line will be installed on the eastern side of the existing rail line which in turn will be refurbished. The proposal will also include the installation of associated infrastructure to allow electrification of the route. The Proposal includes the replacement of a number of at-grade line crossings (boom gates) with grade separated crossings, either rail over road or road over rail. The Proposal also includes the construction and operation of a new station at Byford (north of Abernethy Road) with intermodal rail, bus, carpark, and active mode (cycling and walking) facilities.

The Development Envelope which is approximately 165 ha in area extends from the existing Sherwood Station one km north of Armadale Road, Armadale to Abernethy Road Byford. An additional area located adjacent to the railway and Pinebrook Road in Byford will be used to store ballast material and is included within the Development Envelope. The Development Envelope also includes additional areas (oriented east-west) to allow for construction of grade separated crossings to replace existing level crossings. The project footprint will be optimised during the detailed design phase to meet construction requirements and to minimise environmental impacts where practicable.

A planned road over rail grade separation at Thomas Road, Byford will be designed, constructed and delivered separately by Main Roads Western Australia (Main Roads) ahead of the BRE and does not form part of this BRE Proposal referred to the Environmental Protection Authority for assessment. Main Roads expects to commence construction of the grade separation in September 2020 and will obtain all required environmental approvals independently of the Byford Rail Extension proposal.

The PTA requires a number of biological impact assessments to be carried out for the BRE project. The development of the BRE project is being led by the METRONET office, while the Public Transport Authority of Western Australia (PTA) is the project's formal proponent.

The BRE project is likely to require environmental approvals under the State Environmental Protection Act 1986 (EP Act) and the Commonwealth Environment protection and Biodiversity Conservation Act 1999 (EPBC Act). To support environmental assessments and gain environmental approvals, METRONET has identified a number of additional technical studies to be undertaken, including for short range endemic (SRE) and conservation significant invertebrate fauna. The Development Envelope was used to undertake the study (herein referred to as the study area) (refer Figure 1)

1.1. Purpose of this report

Invertebrate Solutions has been requested by PTA to undertake a desktop assessment for SRE invertebrates in the study area and specifically address the following:

- Provide information about the about the potential SRE species and suitable habitats for SRE invertebrates within the desktop study area (approximately 35km square) centred on the study area.
- Impact assessment of the potential direct and indirect impacts to SRE invertebrate fauna as a result of the Proposal only using the project description supplied by PTA.
- Provide an assessment of the significance of these impacts at a local and regional scale
- Provide advice on any management and/or mitigation measures that could be implemented
- Identify any other gaps in the information
- Provide recommendations and any suggested requirements for further work to comply with relevant legislation.
- Provide a written report containing the above items.

1.2. Desktop Study Area

The Desktop Study Area for the desktop report is defined by an approximate 1,560 km^2 rectangle bounded by the northwest corner (31.983515°S 115.813563°E) and the southeast corner (32.376072°S 116.193787°E) centred on the study area. The Desktop Study Area boundary and the study area are shown in Figure 1

1.3. Documents examined

The following documents have been examined in the compilation of this report, along with other referenced scientific papers used to provide general background:

- Invertebrate Solutions (2019a). Conservation Significant and Short Range Endemic invertebrate desktop habitat assessment Thornlie-Cockburn Link Proposal, Perth, Western Australia. Technical memorandum to the Public Transport Authority, June 2019, 30p.
- AECOM (2020). Metronet – Byford Extension Part 1. Flora and Fauna Assessment. Unpublished report to the Transport Authority, June 2020, 181p.
- GHD (2021). Byford Rail Extension – Flora and Vegetation Assessment. Unpublished report to the Transport Authority, March 2021, 371p.

This report has been prepared with regard to the Technical Guidance – Sampling of short range endemic invertebrate fauna (EPA 2016).

1.4. Introduction to SRE invertebrate fauna

Short range endemic invertebrates are species with restricted distributions. The isolation of invertebrates in specific habitats or bioregions leads to endemism at various spatial scales. The vast majority of invertebrates are capable of dispersing substantial distances at some phase of their life cycle. Some groups, however, are susceptible to short-range endemism which describes endemic species with restricted ranges, arbitrarily defined in Western Australia as less than 10,000 km^2 (100

km x 100 km) (Harvey, 2002). Taxa that have been more commonly found to contain SRE invertebrate representatives include:

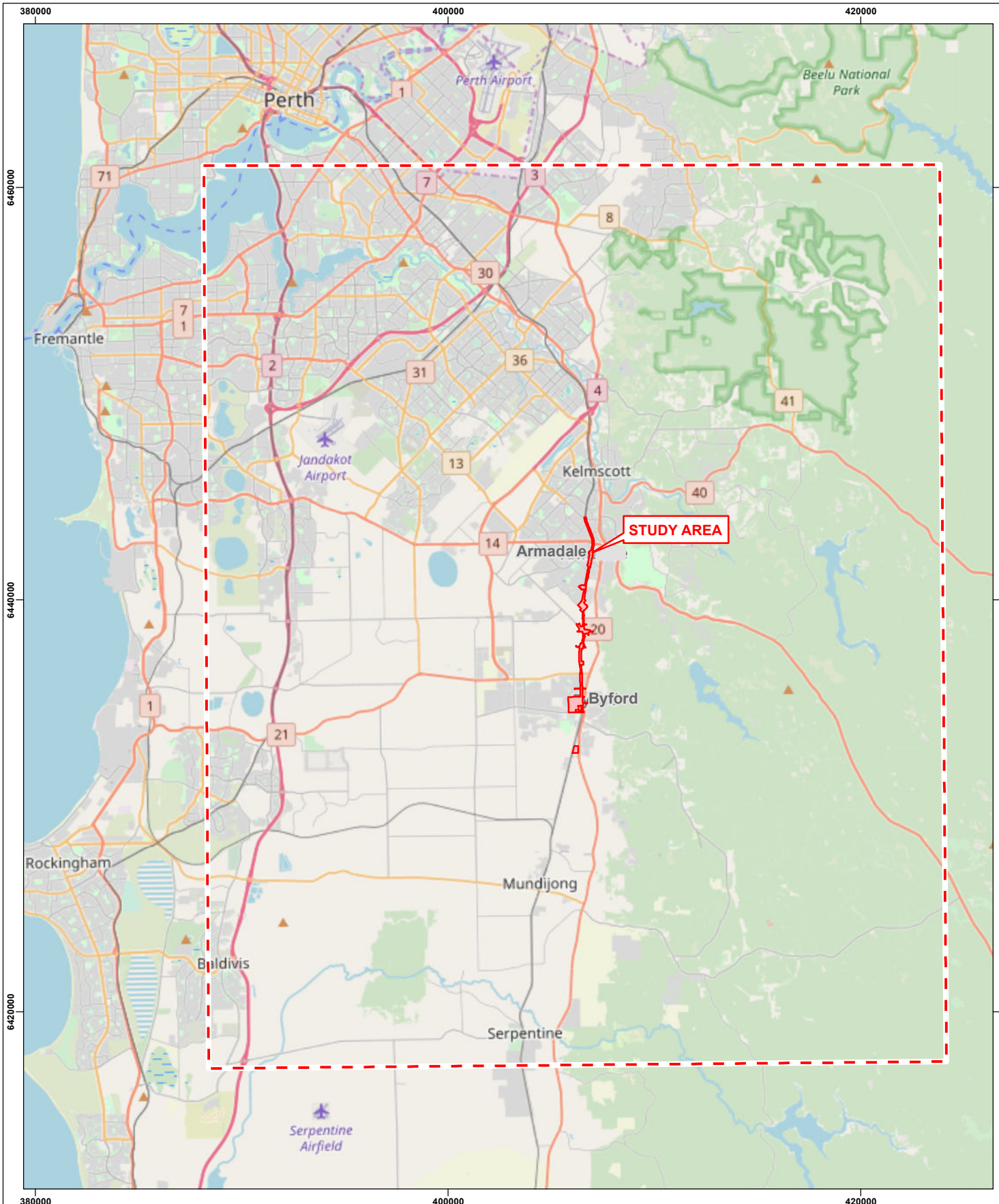
- Onychophorans (velvet worms);
- Crustaceans (Isopoda);
- Arachnids (mygalomorph spiders, pseudoscorpions, opiliones, scorpions, schizomids);
- Myriapods (millipedes and centipedes);
- Molluscs (land snails); and
- Insects (hemipterans, grasshoppers, bees and butterflies).

Short range endemic invertebrate fauna taxa are generally found in sheltered, relatively mesic environments such as isolated habitats (e.g. boulder piles, isolated hills, dense patches of vegetation, gullies) and can include microhabitats within these environments such as deep leaf litter accumulation, large logs, under bark, cave areas, springs and permanent water bodies. Many processes contribute to taxa being susceptible to short range endemism. Generally, these factors are related to the isolation of a species which can include the ability and opportunity to disperse, life history, physiology, habitat requirements, and habitat availability. Taxa that exhibit short range endemism generally exhibit poor dispersal, low growth rates, low fecundity and reliance on habitat types that are discontinuous (Harvey, 2002). Taxa that reside within easily isolated habitats surrounded by physical barriers such as islands, mountains, aquifers, lakes and caves are also more susceptible to becoming SRE species often including additional taxa not otherwise generally forming SREs.

Taxa that exhibit short range endemism are particularly vulnerable to disturbance, either natural or anthropogenic, as they are reliant upon specialised and often restricted habitats (often moist) (Framenau, *et al*., 2008). Short range endemic taxa are unable to disperse to *refugia* when their habitats are threatened or destroyed, thus making them a priority for conservation efforts.

The allocation of short range endemism status can be difficult due to the often incomplete taxonomic framework of many invertebrate groups and the often frequent need for substantial revision to enable accurate identification. Short Range Endemic status is assigned using the categories described in Table 1, based upon the available information from the Western Australian Museum (WAM) database and discussion with appropriate taxonomic authorities for various invertebrate groups. Insufficient information exists for many invertebrate species due to specimens being juvenile, the wrong sex to allow identification, damaged, or inadequate taxonomic frameworks, precluding the assignment of SRE status.

It should be noted that only WAM records from the Arachnida/Myriapoda, Crustacean and Mollusc databases are available to determine SRE status and does not include records of Insects as the WAM Insect database is unavailable for database searches. For insects to be determined as SREs, records from the *Atlas of Living Australia* (www.ala.org.au) were examined along with original literature where available.



Legend

- Desktop Study Area
- Study Area

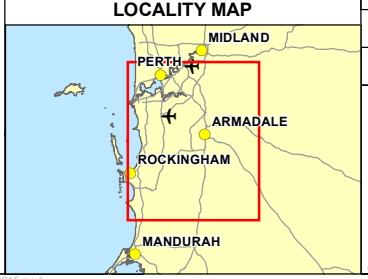
0 1.25 2.5 5 km

Scale: 1:250,000 @ A4

N

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

LOCALITY MAP



- LOCALITY MAP SOURCED FROM LANDGATE 2006
- STREET DIRECTORY MAP OPEN SOURCE DATA

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PROJECT ID	DATE
BREP	15/02/2021

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
ENVIRONMAPS	TM	TM	0

Byford Rail Extension
Short Range Endemic Invertebrate Survey

Figure 1

Byford Rail Extension Study Area and Desktop Study Area

C:\GIS\Jobs\Invertebrate Solutions\Byford Rail Extension Project\Figures\BREP_F01 Byford Rail Extension Development Envelope and Desktop Study Area_210215.mxd

Table 1 Short Range Endemic Status of Species

SRE Status	Definition
Confirmed	A confirmed SRE species. A known distribution of < 10,000 km^2 (after Harvey 2002). Taxonomy of the group is well known. The group is well represented in collections, or via comprehensive sampling.
Likely	Likely to be a SRE species based upon knowledge of the family/genus, where other closely related species show evidence of short range endemism. Where habitats containing the specimens show discontinuity within the landscape.
Possible	Based upon existing knowledge of the genus / family there is a possibility that the species may have a restricted range. Where habitats containing the specimens may show discontinuity within the landscape. Possible SRE species may be assigned one of the sub categories below: A. Data deficient i.e. new species, lack of distribution, taxonomic or collecting knowledge, juvenile specimens, wrong sex for identification B. Habitat indicators C. Morphology indicators D. Molecular evidence E. Research and expertise of WAM staff/taxonomic specialists
Widespread	Not a SRE, a wide ranging distribution of > 10,000 km^2

1.5. Conservation Legislation and Guidance Statements

Terrestrial SRE species are protected under state legislation via the newly enacted Biodiversity Conservation (BC) Act (2016) which came into force on 1st January 2019, replacing the outdated Wildlife Conservation (WC) Act (1950). The BC Act is aligned with the federal Environment Protection and Biodiversity Conservation (EPBC) Act (1999). The assessment of SRE fauna for environmental impact assessment (EIA) is undertaken in Western Australia with regard to Technical Guidance – Sampling of short range endemic invertebrate fauna (EPA 2016).

At the State level, the BC Act provides a list of species that have special protection as species listed under Part 2 of Biodiversity Conservation Act, 2016. This notice is updated periodically by the Department of Biodiversity, Conservation and Attractions (DBCA) (formerly the Department of Parks and Wildlife (DPaW)) and the current list (November 2018) includes numerous SRE species from the Wheatbelt, South Coast, Murchison and Pilbara regions. Included in the list are crustaceans, arachnids and myriapods that are considered to be "rare or likely to become extinct, as critically endangered fauna, or are declared to be fauna that is in need of special protection" (DPaW 2015). In addition to the specially protected fauna, DBCA also maintains a list of Priority fauna that are considered to be of conservation significance but do not meet the criteria for formal listing under the BC Act. The Priority fauna list is irregularly updated by DBCA and is now part of the BC Act.

The Biodiversity Conservation Act now provides the ability for the state government of Western Australia to formally list Threatened Ecological Communities (TECs), along with threatening processes.

The federal EPBC Act protects both species and ecological communities. The most relevant listing for SRE fauna is the mygalomorph spider *Idiosoma nigrum* that occurs in the Wheatbelt region and is listed as Vulnerable. No terrestrial SRE species are currently listed under the EPBC Act.

1.6. Report Limitations and Exclusions

This study was limited to the written scope provided the proposal provided by Invertebrate Solutions (13th August 2020) and in Section 1.1. This study was limited to the extent of information made available to Invertebrate Solutions at the time of undertaking the work. Information not made available to this study, or which subsequently becomes available may alter the conclusions made herein.

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. Invertebrate Solutions has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by Invertebrate Solutions described in this report (this section and throughout this report). Invertebrate Solutions disclaims liability arising from any of the assumptions being incorrect.

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

Searches of the Western Australian Museum's database records may not return all species present in a search area as database records are sometimes incomplete, or missing. Invertebrate Solutions does not accept liability in connection with such omissions.

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

1.7. Assumptions

Invertebrate Solutions has made the following assumptions in the writing of this report and its subsequent conclusions:

- The potential impacts identified and assessed in Section 4 and otherwise throughout this report are not necessarily exhaustive and may change with additional detail regarding the potential development.

2. Desktop Methods

The SRE invertebrate desktop review comprises of two distinct sections:

- An assessment of the likelihood that SRE invertebrate species are present in the habitats located within the study area, followed by a site inspection to confirm overall habitat values and further inform the likelihood of occurrence of individual species.
- Consideration of the potential impacts to SRE invertebrate species that may occur as a result of the BRE Proposal.

2.1 Likelihood of SRE invertebrate occurrence

The likelihood of SRE invertebrate species occurring in the Desktop Study Area was assessed using a combination of regional and local botanical and landform information and database searches including:

- Analysis of published and unpublished reports concerning SRE invertebrate from the region.
- Botanical and vegetation mapping and other information available for the study area.
- A site visit to inspect the study area from outside of the existing operational rail corridor.
- Results of a Protected Matters Search from the Federal Government's Department of the Environment and Energy (DEE) website.
- Records of fauna held by the WAM.

When considering the likelihood of SRE invertebrates at the local scale the BRE Proposal was specifically investigated whilst assessments at the regional scale included the entire Swan Coastal Plain. The likelihood that a particular vegetation unit potentially contains or supports SRE species is defined in Table 3.

Based on the analysis of all available information the Desktop Study Area was assigned a level of likelihood to support SRE invertebrates of either 'Very Low', 'Low', 'Moderate', 'High', or 'Definite'.

Table 2 SRE species likelihood of occurrence definitions

SRE Species Likelihood of occurrence	Definition
Definite	The species is confirmed to occur within the Study Area.
High	Habitat for the species is known to occur within the Study Area and known records of the species are within 20 km.
Moderate	Habitat for the species is known to occur within the Study Area and known records of the species are within 50 km.
Low	The species has been recorded from within 50 km, however, no habitat is present for the species within the Study Area.
Very low	No habitat exists for the species within the Study Area and no records of the species are within 50 km or the distribution of the species is known well enough to exclude its presence within the Study Area.

Table 3 SRE habitat suitability definitions

SRE habitat Likelihood of occurrence	Definition
High	The habitat has a High likelihood of containing SRE species as it has at least three microhabitat factors that support the presence of SRE species such as: SE facing slopes, moisture, rocky areas, habitat isolates, deep leaf litter, mountainous areas, deep gullies or gorges, riparian vegetation, or habitats known to contain SRE species.
Moderate	The habitat has a Moderate likelihood of containing SRE species as it has at least two microhabitat factors that support the presence of SRE species such as: SE facing slopes, moisture, rocky areas, habitat isolates, deep leaf litter, mountainous areas, deep gullies or gorges, riparian vegetation or habitats known to contain SRE species.
Low	The habitat has a Moderate likelihood of containing SRE species as it has only a single microhabitat factor that support the presence of SRE species such as: SE facing slopes, moisture, rocky areas, habitat isolates, deep leaf litter, mountainous areas, deep gullies or gorges, riparian vegetation or habitats known to contain SRE species.
Nil	No potential habitat exists for SRE species within the vegetation type / condition area. This includes areas that are totally cleared, completely degraded or urbanised. This also includes areas that are dominated by weeds or exotic vegetation species.

2.2 Potential Impacts to SRE invertebrates

The potential impacts of development on invertebrates may be categorised as:

- Direct impacts; and
- Indirect impacts.

Direct impacts are the obvious and unavoidable destruction or degradation of habitat, generally native vegetation that occurs due to clearing and earthworks (e.g. infrastructure areas etc.). Indirect impacts are generally gradational, and more difficult to predict and manage because they may occur at moderate to large distances from the project footprint. These impacts may be expressed some time after development has begun.

The zone of influence for indirect impacts may be considerably larger than areas of direct impact. Potential indirect impacts of development include:

- Risk of extinction from reduction and/or fragmentation in habitat;
- Dust deposition;
- Alteration of surface hydrology regimes, sedimentation, and water quality (e.g. under and proximal to roads and infrastructure);
- Surface water contamination from plant equipment and infrastructure; and
- Vibration disturbance from operational activities.

This impact assessment is based primarily upon and the project components as outlined by the PTA with the main components of the overall project were reviewed to assess the potential severity of impact to potential SRE habitats. In evaluating the relevance of these factors to the Project,

consideration was given to the magnitude, duration and spatial extent of the impacts, where known. This assessment has taken the approach of considering these broad categories of potential impacts and evaluating their occurrence and relative severity. The impacts were then assigned a level of either 'Low', 'Moderate', or 'High' according to their potential degree to adversely affect the EPA's objective to maintain representation, diversity, viability and ecological function at the species, population and assemblage level for SRE fauna.

Where an impact is designated as 'Low' or 'Nil' no further consideration to this factor is required if all assumptions made throughout this report are correct.

3. Desktop SRE invertebrate Review

3.1 SRE invertebrates of Swan Coastal Plain

Terrestrial invertebrate species on the SCP that are of conservation interest to government and researchers are predominately insects that have been assigned a conservation significance by DBCA. The majority of the conservation significant terrestrial invertebrates on the SCP are insects, with native bees, Katydids (tree crickets) and the Graceful Sun-moth (*Synemon gratiosa*) being the most regularly encountered taxa. Many of these species are also considered SREs under the *sensu stricto* definition of Harvey (2002).

Some conservation significant invertebrates are also considered to be SRE species and some invertebrates are SRE species but have no formal conservation significance. SRE species more commonly encountered on the SCP include mygalomorph spiders, slaters, and millipedes. The SCP has a limited occurrence of invertebrate species considered to be SREs, due to urban sprawl and associated land clearance, much of the habitat for SRE and conservation significant invertebrates that once occurred on the SCP has been lost or is now highly fragmented.

Mygalomorph spiders

Idiosoma sigillatum is the dominant idiopid trapdoor spider on the SCP, where it occurs from Dalyellup north to at least Ledge Point (including Rottnest Island and Garden Island) with the eastern limit of its range along the sandy foothills of the Darling Escarpment, from Boyanup north to at least Gingin (refer WAM 2018b, Rix *et al.* 2018). Many of these records are historical in nature and occur within the Perth metropolitan area. It is highly likely that much of the habitat for this species within the Perth metropolitan area has been cleared for urban development and the species is unlikely to occur through much of its historical distribution in urban areas except in remnant habitats (e.g. Kings Park, Bold Park, and Shenton Park bushland) (Rix et al. 2018).

Several other mygalomorph spiders that are Likely or Potential SRE species are also found on the SCP including the species from the family Barychelidae, *Synothele michaelseni* and *S. taurus and S. lowei* from the northern and north eastern SCP (Raven 1994). There are also several undescribed species of Anamid (formerly Nemesiidae) trapdoor spiders from the genus *Teyl* that occur within remnant bushland along the coastal fringe of the SCP that exhibit short range endemism (Invertebrate Solutions 2018).

Millipedes

Millipedes from the genus *Antichiropus* all have limited powers of dispersal and conservative ecological requirements (Car et al. 2013). In addition, the above-ground activity of most *Antichiropus* species are limited to a very small window of opportunity when there is sufficient moisture for them to forage and mate during wetter winter months (Car et al. 2013). *Antichiropus* species are, consequently, short-range endemics with very small distributions *sensu* Harvey 2002. The millipede *Antichiropus whistleri* is a confirmed SRE species that occurs north of the Swan River, although much of its original habitat has now been cleared for urban development. There are a few disjunct records of the species near Cataby, although following a recent re-examination of these specimens by Dr Cathy Car it is likely that these records represent a distinct and different species (Dr Cathy Car, WAM pers. comm. 2018) and that *Antichiropus whistleri* is restricted to the northern fringe of the SCP. The

genus is currently undoing a major revision and it is expected that this taxonomic issue will be resolved in the coming years.

Katydids (Tree crickets)

The tree cricket *Throscodectes xiphos* is known only from its type locality in the southern Perth suburb of Jandakot where it was originally collected in the axial leaf bases of grass trees (*Xanthorrhoea preissei*) and is a Confirmed SRE species and is currently classified by DBCA as a Priority 1 species (Rentz.1993). Other conservation significant tree crickets include *Autrosaga spinifer* known from the Darling scarp and also a record from Melaleuca, east of Pinjar that is currently a Priority 2 species and *Kawaniphila pachomai* that occurs in the Perth Hills and to the south of Perth.

Moths

Graceful Sun-moths (GSM) are diurnal, and active on warm bright sunny days with low wind. GSM are generally restricted to the SCP but has also been recorded from the Geraldton sandplains and is known from 49 locations (Bishop *et al.* 2010). Extensive survey and genetic work undertaken throughout the SCP between 2010 – 2013 eventually saw their removal from the WC Act and the EPBC fauna list, however due to their limited distribution, small populations and rarity in nature the GSM is listed on the DBCA Priority fauna listing (Priority 4).

Plate 1 The P4 listed Graceful Sun-moth from the Wanneroo Region (Photo by G. Owen).

Native Bees

Native bees are extremely diverse and often poorly known taxonomically, however, many species are present on the SCP (Houston 2019). Native bees often exhibit close floristic associations and are pollinators of individual plant species genera. Two native bees, *Leioproctus douglasiellus and Neopasiphae simplicior* that occur on the SCP are currently listed as Critically Endangered under the Commonwealth EPBC Act. These species are poorly known from very few records.

Snails

Historical records of land snails in Perth record some potential SRE species, however, much of their habitat has now been developed and they are unlikely to persist throughout the metropolitan region. The confirmed SRE species *Bothriembryon serpentinus* occurs along the Darling scarp from near Serpentine south of the Perth metropolitan area.

3.2 Conservation Significant and SRE Invertebrate Fauna in the Desktop Study Area

A desktop survey was undertaken for both conservation significant Invertebrates and SRE invertebrates, followed by a site inspection to confirm overall habitat values and further inform the likelihood of occurrence of individual conservation significant and SRE invertebrate species.

A list of conservation significant fauna for the Desktop Study Area was compiled from the DBCA Wildlife Conservation (Specially Protected Fauna) Notice 2019 (DBCA 2019) and the DEE's Protected Matters Search Tool (PMST). SRE species that are listed under the BC Act and/or the EPBC Act and are likely to occur or have known habitat within the Desktop Study Area are shown in Table 4 along with their conservation code. The PMST results listed three native bee species (*Hesperocolletes douglasi, Leioproctus douglasiellus* and *Neopasiphae simplicior*) as having the potential for habitat based upon bioclimatic modelling to occur within the Desktop Study Area. A full description of the *BC Act* and DBCA conservation codes are shown in Appendix 1. The full list of species obtained from the PMST search is shown in Appendix 2.

A search of the WAM databases for potential SRE taxa occurring in the broader Desktop Study Area centred on the Project was undertaken (WAM 2020a, b, c). The results of these were filtered for SRE species as shown in Table 4. Definitions for SRE status are found in Table 1.

The records held by the WAM are not exhaustive and represent only specimens within the WAM collections that have been databased. The Entomology, Mollusc and Crustacean collections remain largely un-databased. Specimens identified to genus level only have been excluded from the analysis as it is impossible to determine if they represent a SRE taxa.

The Desktop Study Area contains seven Confirmed SRE species, (Table 4). The species are summarised below:

- Three mygalomorph spiders (*Euoplos inornatus, Idiosoma jarrah* and *Idiosoma sigillatum* [DBCA Priority 3]) – Confirmed SRE species.
- Two land snails (*Bothriembryon serpentinus* and *Epinicium restifer*) – Confirmed SRE species.
- One tree cricket (*Throscodectes xiphos)* – Confirmed SRE species / DBCA Priority 1.

- One native bee (*Leioproctus Glossurocolletes bilobatus)* – Confirmed SRE species / DBCA Priority 2.

An additional six species were identified within the Desktop Study Area as being Likely SRE species (Table 4). The species are summarised below:

- Three slaters (*Buddelundia cinerascens,B. inaequalis* and *B. opaca*) – Likely SRE species.
- Two mygalomorph spiders (*Synothele michalseni, Teyl 'MYG249'*) – Likely SRE species.
- One millipede (*Dinocambala ingens*) – Likely SRE species.

The remaining species identified from desktop resources were found to be widespread. None of the Confirmed or Likely SRE species identified as occurring within the Desktop Study Area had a High Likelihood of occurring within the study area (Table 4).

An additional seven conservation significant invertebrates (widespread, non-SRE species) were identified in the desktop assessment:

- A tree cricket– *Kawaniphila pachomai* – DBCA Priority 1.
- A day flying moth – *Synemon gratiosa* - DBCA Priority 4.
- Five native bees:
    - *Hesperocolletes douglasi* - DBCA Critically Endangered / EPBC Critically Endangered.
    - *Hylaeus globuliferus* – DBCA Priority 3.
    - *Leioproctus contrarius* – DBCA Priority 3.
    - *Leioproctus douglasiellus* – DBCA Critically Endangered / EPBC Critically Endangered.
    - *Neopasiphae simplicior* – DBCA Critically Endangered / EPBC Critically Endangered.

Of these seven conservation significant species all have a Low or Very Low likelihood of occurrence within the study area.

Table 4 SRE and conservation significant Invertebrates recorded from the Desktop Study Area.

Higher Classification	Genus and Species	SRE status	DBCA / BC Act Conservation Status	EPBC Conservation Status	Likely habitat present in the study area	Desktop likelihood of species within the study area
Gastropoda:						
Bothriembryontidae	*Bothriembryon serpentinus*	Confirmed	-	-	Not Present	Low
Charopidae	*Epinicium restifer*	Confirmed	-	-	Not Present	Low
Crustacea:						
Isopoda						
Armadillidae	*Buddelundia cinerascens*	Likely	-	-	Present	Low
	Buddelundia inaequalis	Likely	-	-	Present	Low
	Buddelundia opaca	Likely	-	-	Present	Low
Arachnida						
Mygalomorphae						
Anamidae	*Teyl `MYG249`*	Likely	-	-	Not Present	Low
Barychelidae	*Synothele michaelseni*	Likely	-	-	Not Present	Low
Idiopidae	*Euoplos inornatus*	Confirmed	-	-	Not present	Low
	Idiosoma jarrah	Confirmed	-	-	Not Present	Low
	Idiosoma sigillatum	Confirmed	Priority 3	-	Not Present	Low
Diplopoda						
Iulomorphidae	*Dinocambala ingens*	Likely	-	-	Not Present	Low
Insecta						
Orthoptera	*Kawaniphila pachomai*	Widespread	P1	-	Not Present	Low
	Throscodectes xiphos	Confirmed	P1	-	Not Present	Very Low
Lepidoptera	*Synemon gratiosa*	Widespread	P4	-	Not Present	Low
Hymenoptera	*Hesperocolletes douglasi*	Widespread	Critically Endangered	Critically Endangered	Not Present	Low
	Hylaeus globuliferus	Widespread	P3	-	Not Present	Low

Higher Classification	Genus and Species	SRE status	DBCA / BC Act Conservation Status	EPBC Conservation Status	Likely habitat present in the study area	Desktop likelihood of species within the study area
	Leioproctus (Glossurocolletes) bilobatus	Confirmed	P2	-	Not Present	Very Low
	Leioproctus contrarius	Widespread	P3	-	Not Present	Low
	Leioproctus douglasiellus	Widespread	Critically Endangered	Critically Endangered	Not Present	Low
	Neopasiphae simplicior	Widespread	Critically Endangered	Critically Endangered	Not Present	Low

3.3 SRE Habitat in the Study Area

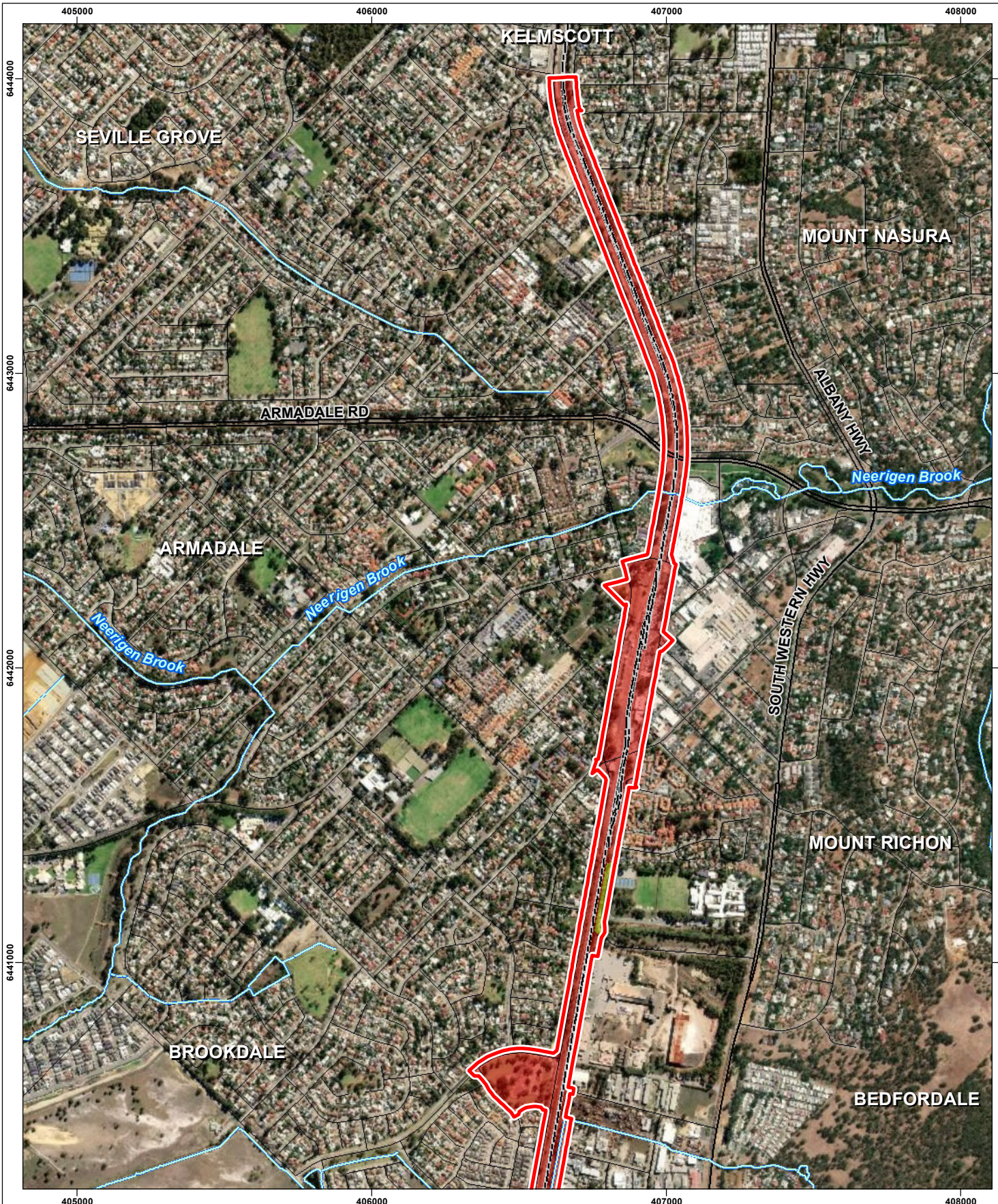
The study area is largely cleared of native vegetation, with minor occurrences of individual trees or clusters of trees along the edge of existing rail corridor but these vegetated areas lack understory and provide Low to Nil SRE or conservation significant invertebrate habitat (Table 3). Whilst the vegetation condition mapping by GHD (2021), identified vegetation as ranging from Excellent to Completely Degraded, all areas that are Excellent and Very Good are restricted to the Lambert Lane Nature Reserve and Fletcher Park that are being retained. All areas within the BRE proposal area range from Good to Completely Degraded with the majority being Cleared or Completely Degraded. The BRE Proposal will overall remove approximately 1.6 ha of Moderate SRE habitat comprising of riparian vegetation along Wungong Brook (Figure 2B) and 14 ha of degraded vegetation considered to be Low SRE habitat, whilst the majority (148.6 ha) of the study area is considered to have nil SRE habitat value (Table 3, Figure 2A – 2C).

A site inspection was undertaken on 8th September 2020 to view accessible parts of the study area without accessing the existing rail corridor. The site inspection informed the SRE habitat suitability mapping shown in Figure 2A – 2C. Examples of the degraded habitats observed within the BRE proposal area, that are considered to have nil or Low SRE habitat values are shown in Plate 2.

The suitability of habitat for SRE species outside of the study area has been mapped in Figure 3 using desktop information and aerial photography only. This habitat mapping is indicative only and has not been ground truthed but it does provide an indication of native vegetation compared with urban and agricultural land. Generally on the SCP native vegetation has a Moderate to Low likelihood of containing an SRE taxa , whilst on the Darling scarp the likelihood increases for high quality vegetation due to the presence of sheltered gullies, rocky granite outcrops and other potential habitat isolates and *refugia*. Although all urban areas have broadly been classified as Nil suitability for SRE fauna, small remnant bushland patches can and do support SRE fauna within the Perth metropolitan area (Rix *et al.* 2018), however, at the scale of the Desktop Study Area mapping in Figure 3, some of these small isolated patches have been ignored for the sake of overall clarity, however, larger remnant areas greater than 10 ha such as Kings Park have been included.

At the regional scale of the Desktop Study Area that encompasses much of the central SCP, the study area is largely within the Nil or Low SRE habitat area and so regional cumulative impacts to SRE species are not anticipated to occur from the minor clearing associated with the Proposal.

Plate 2 Example habitats from within the BRE Proposal area showing largely Completely Degraded habitat with Nil to Low SRE values.



Legend

- Study Area
- Existing Railway Line
- Watercourse

SRE Habitat Suitability

- Moderate
- Low
- Nil

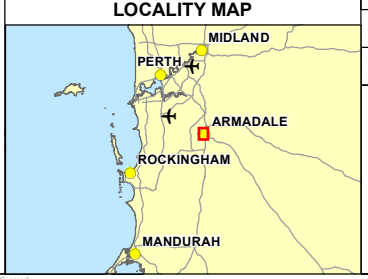
0 125 250 500 m

Scale: 1:17,500 @ A4

N

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

LOCALITY MAP



- LOCALITY MAP SOURCED FROM LANDGATE 2006
- STREET DIRECTORY MAP OPEN SOURCE DATA

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PROJECT ID	DATE
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HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

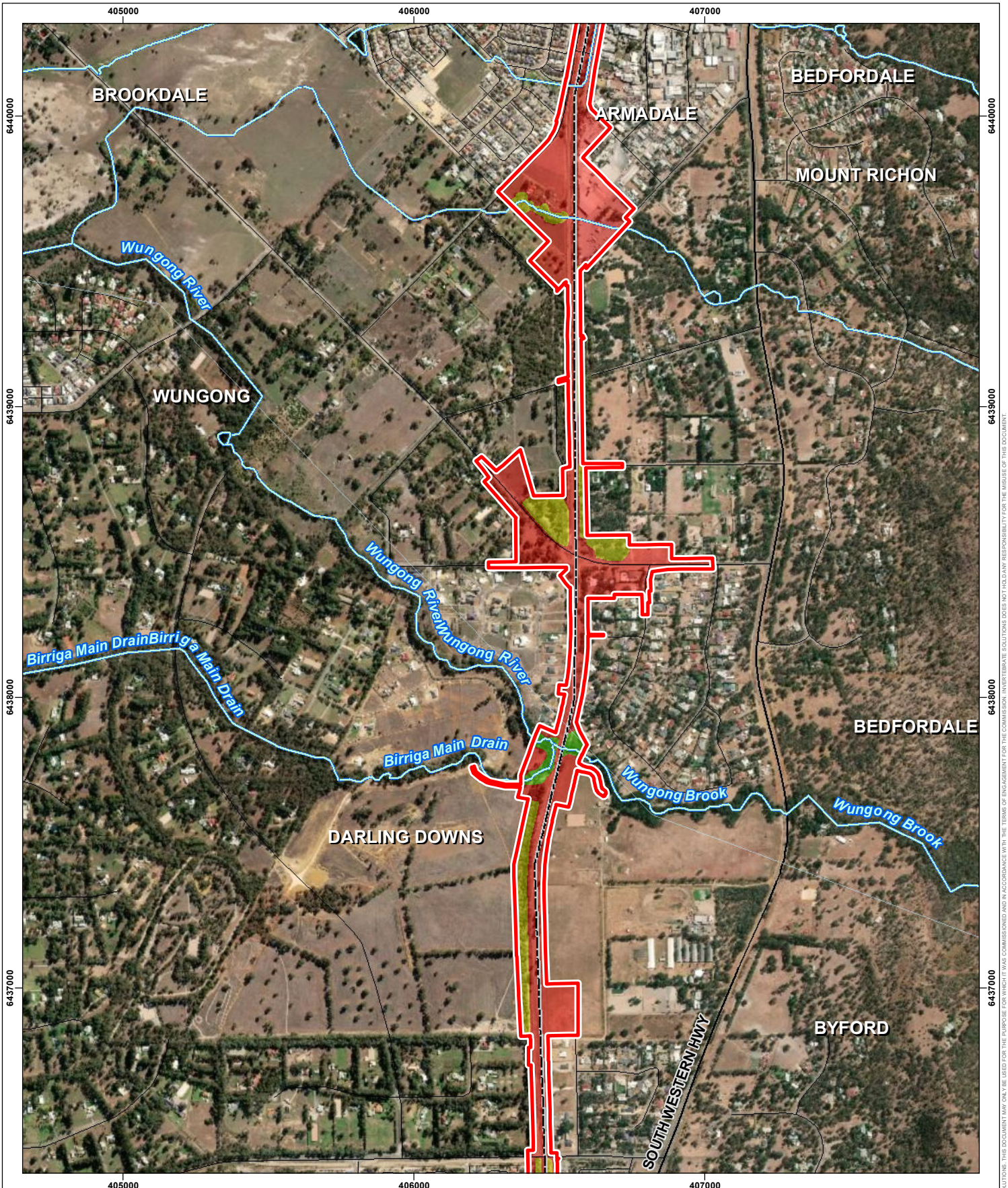
CREATED	CHECKED	APPROVED	REVISION
ENVIRONMAPS	TM	TM	0

Byford Rail Extension
Short Range Endemic Invertebrate Survey

Figure 2A
Byford Rail Extension
Study Area SRE Habitat (North)

ENVIRONMAPS t: 0406 590 006
Environmental Mapping Solutions www.environmaps.com.au

C:\GIS\Jobs\Invertebrate Solutions\Byford Rail Extension Project\Figures\BREP_F02A Byford Rail Extension Development Envelope SRE Habitat (North)_210216.mxd



Legend

- Study Area
- Existing Railway Line
- Watercourse

SRE Habitat Suitability

- Moderate
- Low
- Nil

0 125 250 500
m
Scale: 1:17,500 @ A4
N

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

LOCALITY MAP

- LOCALITY MAP SOURCED FROM LANDGATE 2006
- STREET DIRECTORY MAP OPEN SOURCE DATA

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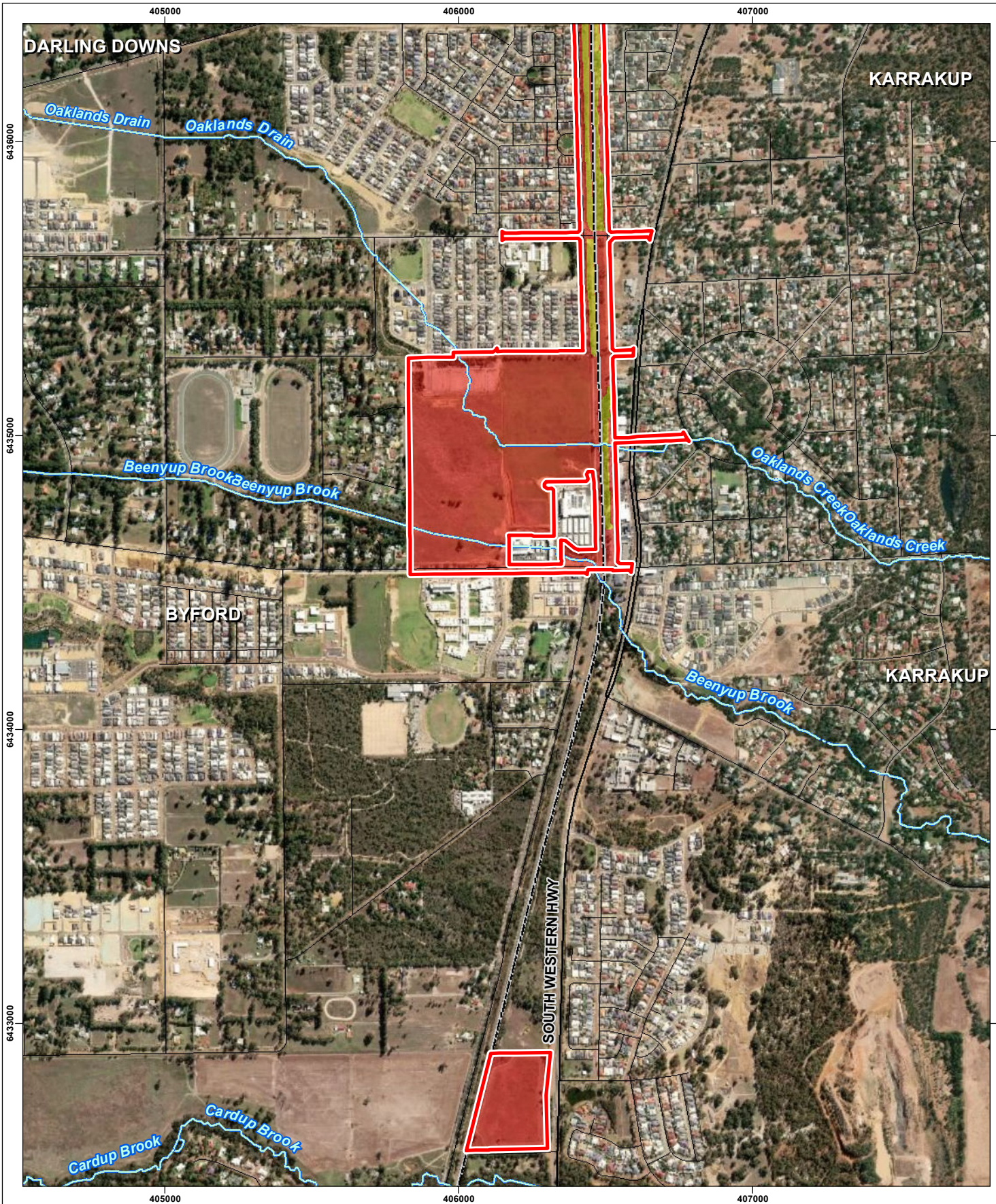
ENVIRONMAPS	TM	TM	0

Byford Rail Extension
Short Range Endemic Invertebrate Survey

Figure 2B
Byford Rail Extension
Study Area SRE Habitat (Central)

C:\GIS\Jobs\Invertebrate Solutions\Byford Rail Extension Project\Figures\BREP_F02B Byford Rail Extension Development Envelope SRE Habitat (Central)_210216.mxd



Legend

- Study Area
- Existing Railway Line
- Watercourse

SRE Habitat Suitability

- Moderate
- Low
- Nil

0 125 250 500
m
Scale: 1:17,500 @ A4
N

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

LOCALITY MAP

- LOCALITY MAP SOURCED FROM LANDGATE 2006
- STREET DIRECTORY MAP OPEN SOURCE DATA

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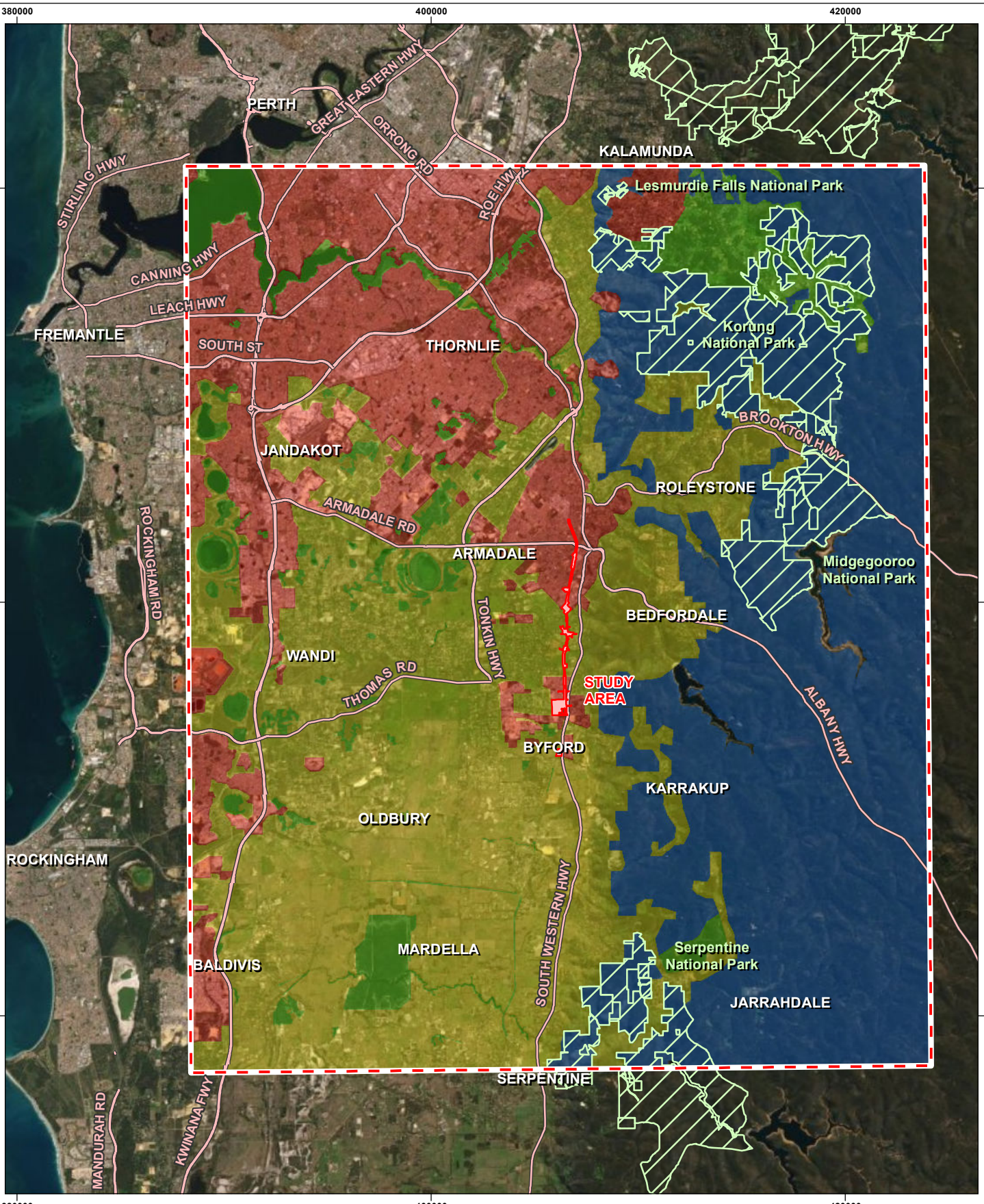
ENVIRONMAPS	TM	TM	0

Byford Rail Extension
Short Range Endemic Invertebrate Survey

Figure 2C
Byford Rail Extension
Study Area SRE Habitat (South)

C:\GIS\Jobs\Invertebrate Solutions\Byford Rail Extension Project\Figures\BREP_F02C Byford Rail Extension Development Envelope SRE Habitat (South)_210216.mxd



Legend

- Desktop Study Area
- Study Area
- National Park

SRE Habitat Suitability

- High
- Moderate
- Low
- Nil

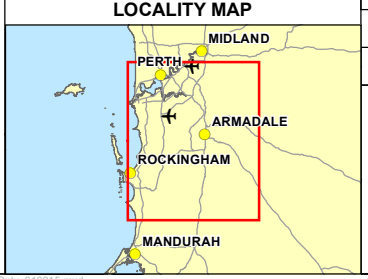
0 1.25 2.5 5 km

Scale: 1:250,000 @ A4

N

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

LOCALITY MAP



- LOCALITY MAP SOURCED FROM LANDGATE 2006
- STREET DIRECTORY MAP OPEN SOURCE DATA

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CREATED	CHECKED	APPROVED	REVISION
ENVIRONMAPS	TM	TM	0

Byford Rail Extension
Short Range Endemic Invertebrate Survey

Figure 3

SRE Habitat Suitability in the Desktop Study Area Based on Aerial Images Only

ENVIRONMAPS t: 0406 590 006 Environmental Mapping Solutions www.environmaps.com.au
C:\GIS\Jobs\Invertebrate Solutions\Byford Rail Extension Project\Figures\BREP_F03 SRE Habitat Suitability in the Desktop Study Area Based on Aerial Images Only_210215.mxd

3.4 Assessment of habitat and likely occurrence of Confirmed SRE species within the Study Area

3.4.1 Gastropoda

Bothriembryon serpentinus – Confirmed SRE

The land snail *Bothriembryon serpentinus* occurs on the Darling Scarp from Perth south to near Dwellingup (refer Figure 4 and Figure 5, WAM 2020c). There are no records of the species from within or adjacent to the study area. The species occurs on the Darling Scarp to the east of the study area and does not occur on the SCP and therefore has a Low likelihood of occurrence within the study area. There no records of this species in the vicinity of the study area and hence no impacts are expected to this species as a result of the Proposal.

Epinicium restifer – Confirmed SRE

The land snail *Epinicium restifer* is known from the Darling Scarp at Serpentine and from a single record at Peppermint Grove, whose identity is in question and may represent a different species (WAM 2020c). The species inhabits wet sclerophyll forest where it lives under logs (Stanisic et al. 2017). There are no records of the species from within or immediately adjacent to the study area (refer Figure 4, Figure 5 and WAM 2020c). The closest records are from Serpentine Falls, 15 km to the south of the study area. The species has a Low probability of occurring within the study area due to a lack of available habitat, and hence no impacts to this species are anticipated as a result of the Proposal.

3.4.2 Araneae: Mygalomorphae

Euoplos inornatus – Confirmed SRE

The trapdoor spider *Euoplos inornatus* occurs on the eastern edge of the SCP, although most records are from the Darling Scarp and the jarrah forest to the east (refer Figure 6, Figure 7 and WAM 2020b). There are records of the species from the Darling Scarp at Bedfordale, however, no records are on the SCP within or adjacent to the study area. The species has a Low probability of occurring within the study area and as its distribution is reasonably well known and restricted to the Jarrah forest bioregion there is expected to be no impact to this species as a result of the Proposal.

Idiosoma jarrah – Confirmed SRE

The trapdoor spider *Idiosoma jarrah* is endemic to the Jarrah Forest bioregion, where it occurs east of the Darling Escarpment, from Bullsbrook south to at least Boddington and Arthur River (refer Figure 6, Figure 7) (WAM 2020b, Rix *et al.* 2018). There are no records of the species from within or adjacent to the study area. *Idiosoma jarrah* has a known range of 3,907 km^2, making the species a short range endemic accordingly to the definition by Harvey (2002), although the known range is likely to be an underestimate due to the paucity of records throughout the south of its range (Rix *et al.* 2018). *Idiosoma jarrah* is known to occur in at least two conservation estates; Walyunga National Park and John Forrest National Park (Figure 7). This species has a Low probability of occurring within the study area as its distribution is reasonably well known and restricted to the Jarrah forest bioregion and as such there is expected to be no impact to *Idiosoma jarrah* from the Proposal.

Idiosoma sigillatum – Priority 3/Confirmed SRE

Idiosoma sigillatum is the dominant idiopid trapdoor spider on the Swan Coastal Plain, where it occurs from Dalyellup north to at least Ledge Point (including Rottnest Island and Garden Island) with the eastern limit of its range along the sandy foothills of the Darling Escarpment, from Boyanup north to at least Gingin (refer Figure 6, Figure 7) (WAM 2018b, Rix *et al.* 2018). Many of these records are historical in nature and occur within the Perth metropolitan area. It is highly likely that much of the habitat for this species within the Perth metropolitan area has been cleared for urban development and the species is unlikely to occur through much of its historical distribution in urban areas except in remnant habitats (e.g. Kings Park, Bold Park, and Shenton Park bushland) (Rix et al 2018).

Idiosoma sigillatum was assessed as Vulnerable according to IUCN criteria (Rix *et al.* 2017). It has a known range of 7,100 km^2, and an area of occupancy within that range of < 3,000 km^2 (Rix *et al.* 2017). It is considered to be locally extinct throughout most of its range due to extensive land clearing (Rix *et al.* 2018).

Burrows of *Idiosoma sigillatum* usually occur in *Banksia* woodland and heathland on sandy soils (Rix *et al.* 2018), that do not occur within the study area although habitat does occur in the adjacent Lambert Lane Nature Reserve, however, given that the majority of the study area is almost entirely cleared the species is considered to have a Low likelihood of occurring within the Proposal.

3.4.3 Insecta:

Throscodectes xiphos – Priority 1/Confirmed SRE

The tree cricket *Throscodectes xiphos* is known only from its type locality in the southern Perth suburb of Jandakot (refer Figure 6 and Figure 7) where it was originally collected in the axial leaf bases of grass trees (X*anthorrhoea preissei*). The species is currently classified by DBCA as Priority 1 as it known only from the type locality that has now been developed. There are no records of the species from within or adjacent to the study area. The species is currently classified by DBCA as Priority 1 (refer Table 4). It is not anticipated that *Throscodectes xiphos* will be impacted by the BRE Proposal as no other records of this species have historically been recorded within the study area.

Leioproctus (Glossurocolletes) bilobatus – Priority 1/Confirmed SRE

The native bee *Leioproctus* (*Glossurocolletes*) *bilobatus*, is associated with Jarrah/Wandoo Forest nominally to the east of the Swan Coastal Plain (Houston 2018), and the species has a distribution from as far east as Christmas Tree Well off Brookton Highway and on the South Coast within the Stirling Ranges (Phoenix 2010). *Leioproctus* (*Glossurocolletes*) *bilobatus* has so far been collected solely from the yellow flowering pea, *Gompholobium aristatum* which does not occur within the study area (AECOM 2020). It is therefore a Low probability that *Leioproctus* (*Glossurocolletes*) *bilobatus* is present within the study area and therefore no significant impacts are anticipated to occur to this species.

3.5 Assessment of habitat and likely occurrence of Likely SRE species within the Study Area.

3.5.1 Crustacea: Armadillidae

Buddelundia opaca – Likely SRE

This species is known principally from rocky areas of the Northern Jarrah Forest Sub Bioregion (Invertebrate Solutions 2019b). Within the Desktop Study Area the species is known from the Darling scarp from Lesmurdie south to Roleystone and shows only historical records further west in the sandier habitats of the Swan Coastal Plain (refer Figure 7 and Figure 8, WAM 2020a, Invertebrate Solutions 2019b). There no records of this species or suitable habitat within or immediately adjacent to the study area and hence no impacts are expected to this species as a result of the Proposal.

Buddelundia cinerascens/inaequalis – Likely SRE

The species is known from the Perth area of the Swan Coastal Plain (refer Figure 7 and Figure 8). Two species of *Buddelundia* described by Budde-Lund (*B. cinerascens & B. inaequalis*) from near coastal parts of the Swan Coastal Plain are indistinguishable from both the descriptions (which are incomplete) and from the type material (Budde-Lund 1912, Invertebrate Solutions 2019b). It is likely that they are the same species. *Buddelundia cinercascens* exhibits a restricted distribution and much of its natural habitat has been urbanised and as such, combined with the degree of taxonomic uncertainty, the species is a likely SRE species (Invertebrate Solutions 2019b).

The species has recently been recorded near Neerabup National Park during the October/November 2018 at four locations spread throughout a variety of habitats indicating that the species is locally widespread and relatively abundant (Invertebrate Solutions 2019b). The development of the Proposal is not anticipated to a significant impact as no habitat is present within the study area for *Buddelundia cinercascens.*

3.5.2 Araneae: Mygalomorphae

Synothele michaelseni – Likely SRE

The trapdoor spider *Synothele michaelseni* occurs on the SCP from Bibra Lake to near Hillarys Boat Harbour and on the Darling Scarp from Serpentine to north of Bindoon (refer Figure 10, Figure 11, WAM 2020b). There are no records of the species from within or adjacent to the study area. Many of these records are historical in nature and occur within the Perth metropolitan area. It is highly likely that much of the habitat for this species within the Perth metropolitan area has been cleared for urban development and the species is unlikely to occur through much of its historical distribution in urban areas except in remnant habitats. The species has a Low probability of occurring within the study area due to a lack of available habitat, and hence no impacts to this species are anticipated as a result of the Proposal.

Teyl 'MYG249' – Likely SRE

The trapdoor spider *Teyl '*MYG249' occurs on the SCP and Rottnest Island from Cardup near the Darling Scarp to Woodman Point and Trigg Bushland along the coast. (refer Figure 10, Figure 11, WAM 2020b). The closest record of the species is over five kilometres to the south in large patch of bushland and no records are from within or adjacent to the study area. It is highly likely that much of

the habitat for this species within the Perth metropolitan area has been cleared for urban development and the species is unlikely to occur through much of its historical distribution in urban areas except in remnant habitats. The species has a Low probability of occurring within the study area due to a lack of available habitat, and hence no impacts to this species are anticipated as a result of the Proposal.

3.5.3 Diplopoda: Iulomorphidae

Dinocambala ingens – Likely SRE

The millipede *Dinocambala ingens* occurs mainly in the Darling Scarp and adjacent jarrah forests, although its historical distribution does encompass some central Perth suburbs and Garden Island (refer Figure 8, Figure 9 and WAM 2020b). There are no records of the species from within or adjacent to the study area. There are numerous records of this species from forest areas on the Darling Scarp. The species has a Low probability of occurring within the study area due to a lack of available habitat, and hence no impacts to this species are anticipated as a result of the Proposal.

3.6 Assessment of habitat and likely occurrence of Conservation Significant Invertebrate species within the Study Area

3.6.1 Insecta: Orthoptera

Kawaniphila pachomai – Priority 1

The orthopteran family Tettigoniidae are commonly known as Katydids inhabit tree and shrubs and can be found mostly in the southern half of Australia in heath or mixed woodland and often host plant species or genus specific (Rentz 1993). The orthopteran *Kawaniphila pachomai* occurs in heathland under tall eucalypts in SW Western Australia with records near Karragullen (Kelmscott) on Brookton Highway and south of the townsite of Margaret River (refer Figure 7 and Figure 8, Rentz 1993) and is listed by DBCA as a Priority 1 species in Western Australia. The species has a Low probability of occurring within the study area due to a lack of available habitat, and hence no impacts to this species are anticipated as a result of the Proposal.

3.6.2 Insecta: Lepidoptera

Synemon gratiosa – Priority 4

Graceful Sun-moths (GSM) are diurnal, and active on warm bright sunny days with low wind. GSM are generally restricted to the SCP but has also been recorded from the Geraldton sandplains and is known from 49 locations (Bishop *et al.* 2010). Extensive survey and genetic work undertaken throughout the SCP between 2010 – 2013 eventually saw their removal from the previous Wildlife Conservation Act Schedule 1 category and the EPBC fauna list, however due to their limited distribution, small populations and rarity in nature the GSM is listed on the DBCA Priority fauna listing (Priority 4).

No habitat for the moth occurs within the study area due to a lack of native vegetation, and when considered in combination with the natural rarity of the species in nature and its patchy distribution the species has a Low probability of occurring within the study area, and hence no impacts to this species are anticipated as a result of the Proposal.

3.6.3 Insecta: Hymenoptera

Hesperocolletes douglasi – Critically Endangered/Critically Endangered

This enigmatic native bee was previously known only from Rottnest Island where it was presumed extinct until 2015 when an extant specimen was recorded from near Pinjar on the northern SCP during a general insect research project (Houston 2018, WA Government, 2018). Very little is known of this species and floristic associations are still being determined with the currently known list including *Philotheca spicata, Patersonia occidentalis*, two species of *Stylidium*, a species of *Scaevola* and species from Fabaceae and Myrtaceae and hence whilst it is difficult to completely exclude the species as being present within the study area, it would be anticipated that due to the small area of intact native vegetation to be cleared that the species would have a Low likelihood of occurring within the study area. It is also likely that any potential habitat within the study area is degraded and not critical to the survival of the species and that available habitat is present, and in better condition in the adjacent Lambert Lane Nature Reserve.

Hylaeus globuliferus – Priority 3

This native bee has a wide distribution in Western Australia from north of Eneabba, through the southern Wheatbelt and the SCP, and east along the south coast to the Fitzgerald National Park (ALA 2018). Most records from the SCP are historical in nature, although a single specimen was recorded at Wireless Hill in the suburb of Ardross in 2017 (Prendergast 2020). *Hylaeus globuliferus* is known to be associated with *Adenanthos cygnorum* and *Banksia attenuata* amongst other native plants (Houston 2018) neither of which are present within the study area (AECOM 2020). It therefore has a Low likelihood of occurrence within the study area and it is considered that the implementation of the Proposal will not significantly impact upon the species.

Leioproctus contrarius – Priority 3

The native bee *Leioproctus contrarius* is known to be associated with both *Scaevola sp repens* var. *repens* and *Lechenaultia* spp*.* neither of which occur within the BRE Proposal (AECOM 2020, Houston 2000).It is therefore a Low likelihood that *Leioproctus contrarius* is present within the study area and the species will be not be subject to significant impact by the Proposal

Leioproctus douglasiellus – Critically Endangered /Critically Endangered

The native bee species *Leioproctus douglasiellus*, is known from the SCP where it has been recorded from Kenwick wetlands, Cannington and Forrestdale Lake and near Lithgow in the Blue Mountains of NSW (ALA 2020a). The bee is associated with *Goodenia filiformis* and *Anthotium junctiforme* (Cardno 2005, Houston 2018, Houston 2000). These species were not recorded within the study area (AECOM 2020). It is therefore a Low probability that *Leioproctus douglasiellus* is present within the study area and therefore no significant impacts are anticipated to occur to this species.

Neopasiphae simplicior – Critically Endangered /Critically Endangered

This native bee has a wide distribution in Western Australia from north of Geraldton, through the coastal fringe and along the southern coast to Cape Arid National Park (ALA 2020b). Most available records from the SCP are historical in nature and its current status in the Perth metropolitan area is unknown. This species along with others in the genus are known to use annual plants such as daisies (Asteraceae and Goodenieceae, Houston 2018). Due to the extremely limited native vegetation

within the study area and *Neopasiphae simplicior* being associated with the coastal strip the it is considered to have a Low likelihood of occurrence and therefore no significant impacts are anticipated to occur to this species.

Legend

- Desktop Study Area
- Study Area

SRE Mollusc Species Locations

- Bothriembryontidae: *Bothriembryon serpentinus*
- Charopidae: *Epinicium restifer*

0 5 10 20
km
Scale: 1:1,000,000 @ A4

N

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

LOCALITY MAP

- LOCALITY MAP SOURCED FROM LANDGATE 2006
- BASE DATA SOURCED ESRI NATGEO WORLD MAP

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BREP	15/02/2021

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GDA 1994 MGA Zone 50

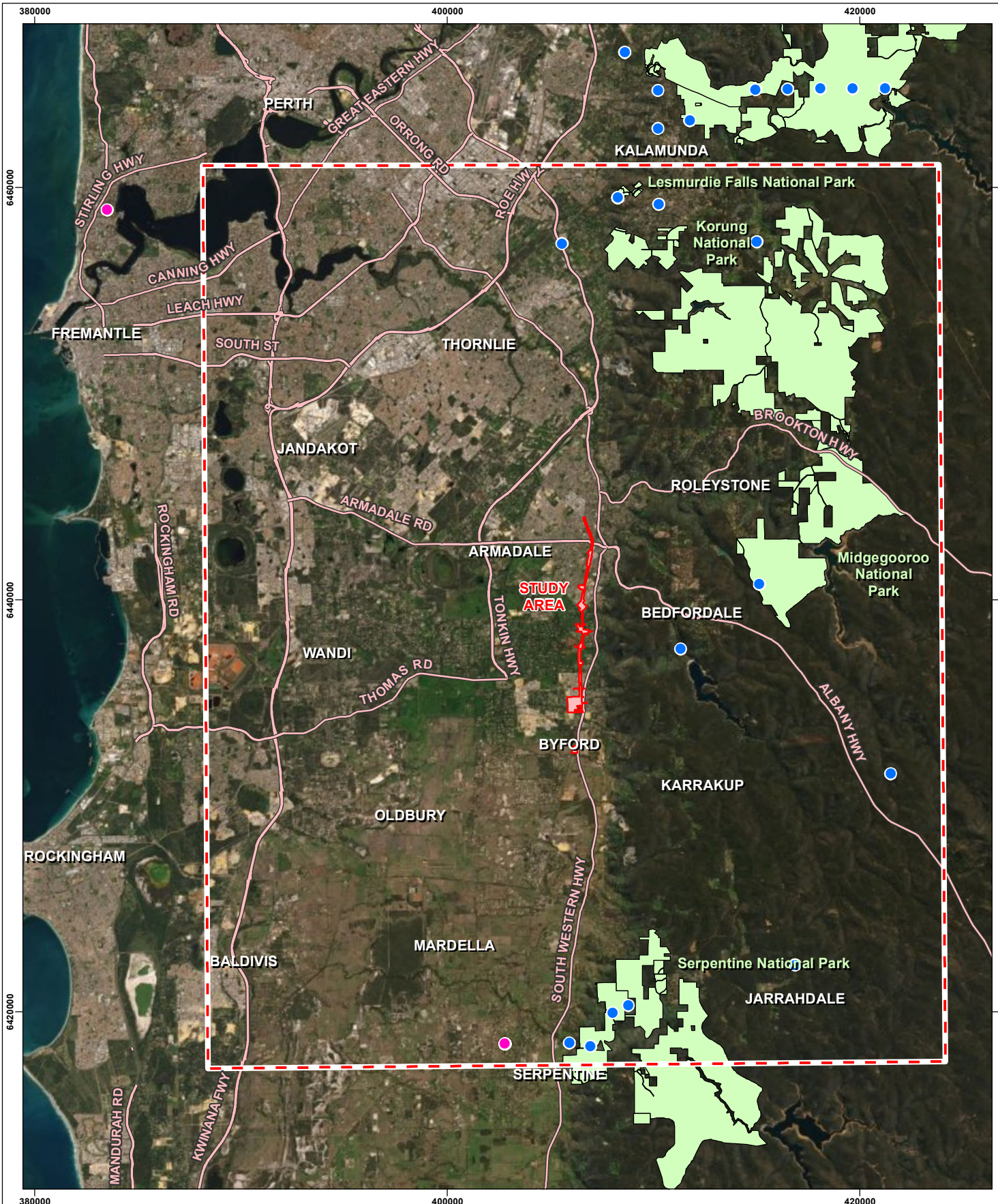
CREATED	CHECKED	APPROVED	REVISION
ENVIRONMAPS	TM	TM	0

Byford Rail Extension
Short Range Endemic Invertebrate Survey

Figure 4

Entire Distribution of the Confirmed SRE Mollusc Species in Relation to the Byford Rail Extension Project

C:\GIS\Jobs\Invertebrate Solutions\Byford Rail Extension Project\Figures\BREP_F04 Entire Distribution of the Confirmed SRE Mollusc Species_210215.mxd



Legend

- Desktop Study Area
- Study Area
- National Park
- Bothriembryontidae: *Bothriembryon serpentinus*
- Charopidae: *Epinicium restifer*

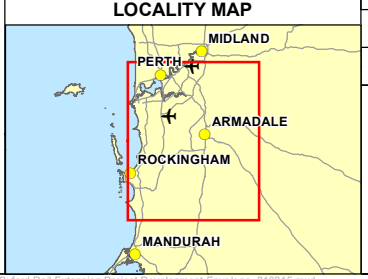
0 1.25 2.5 5 km

Scale: 1:250,000 @ A4

N

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

LOCALITY MAP



- LOCALITY MAP SOURCED FROM LANDGATE 2006
- STREET DIRECTORY MAP OPEN SOURCE DATA

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HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

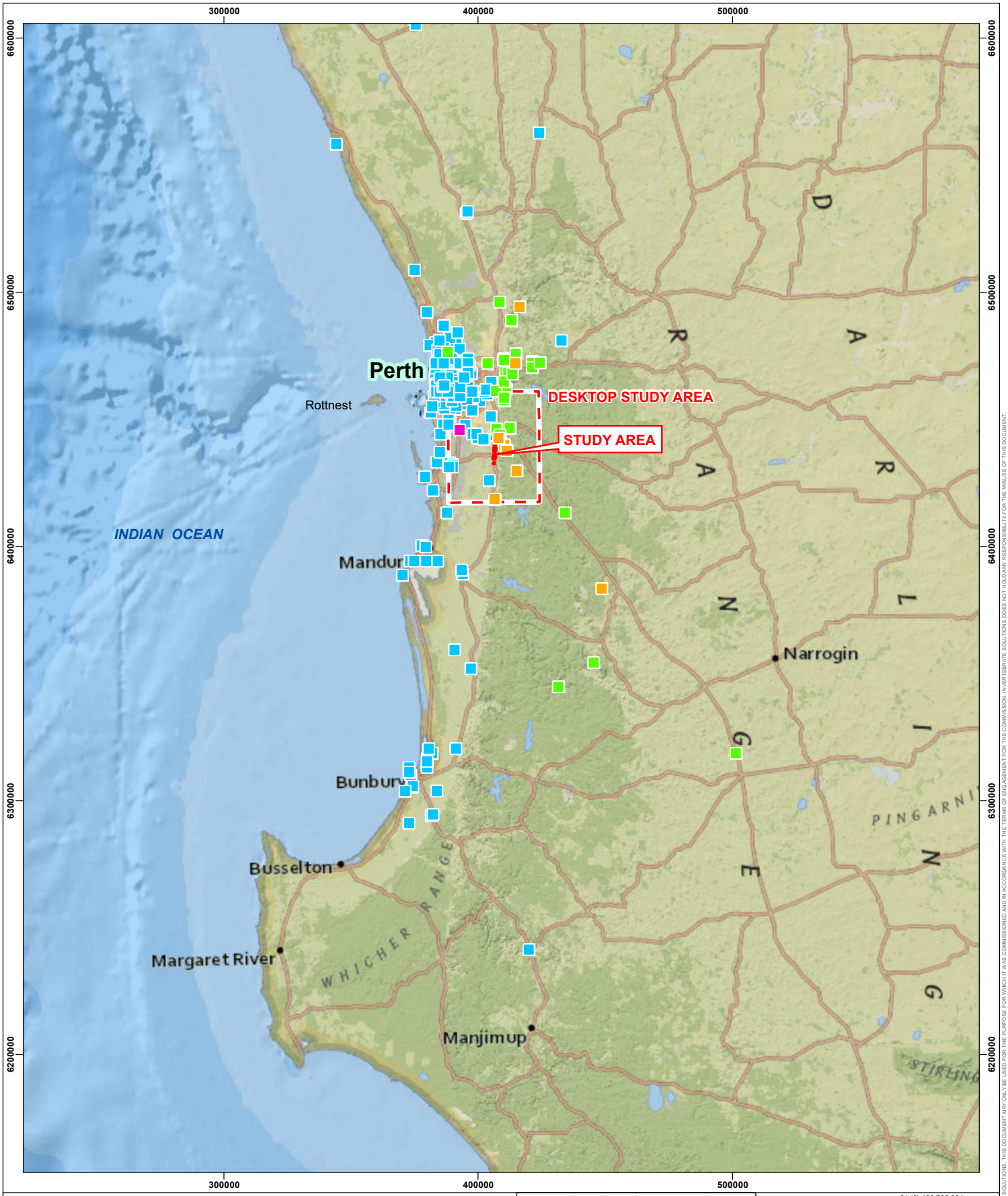
CREATED	CHECKED	APPROVED	REVISION
ENVIRONMAPS	TM	TM	0

Byford Rail Extension
Short Range Endemic Invertebrate Survey

Figure 5

Local Distribution of the Confirmed SRE Mollusc Species in Relation to the Byford Rail Extension Project Study Area

C:\GIS\Jobs\Invertebrate Solutions\Byford Rail Extension Project\Figures\BREP_F05 Local Distribution of the Confirmed SRE Mollusc Species in Relation to the Byford Rail Extension Project Development Envelope_210215.mxd



Legend

- Desktop Study Area
- Study Area

SRE *Mygalomoph* Spiders and Tree Cricket Species Locations

- Idiopidae: *Euoplos inornatus*
- Idiopidae: *Idiosoma jarrah*
- Idiopidae: *Idiosoma sigillatum*
- Tettigonidae: *Throscodectes xiphos*

- LOCALITY MAP SOURCED FROM LANDGATE 2006
- BASE DATA SOURCED ESRI NATGEO WORLD MAP

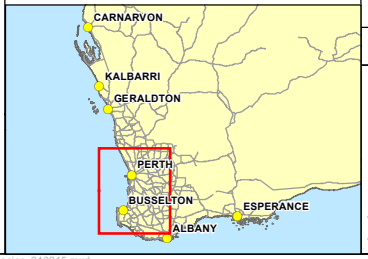
0 12.5 25 50 km

Scale: 1:2,000,000 @ A4

N

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

LOCALITY MAP



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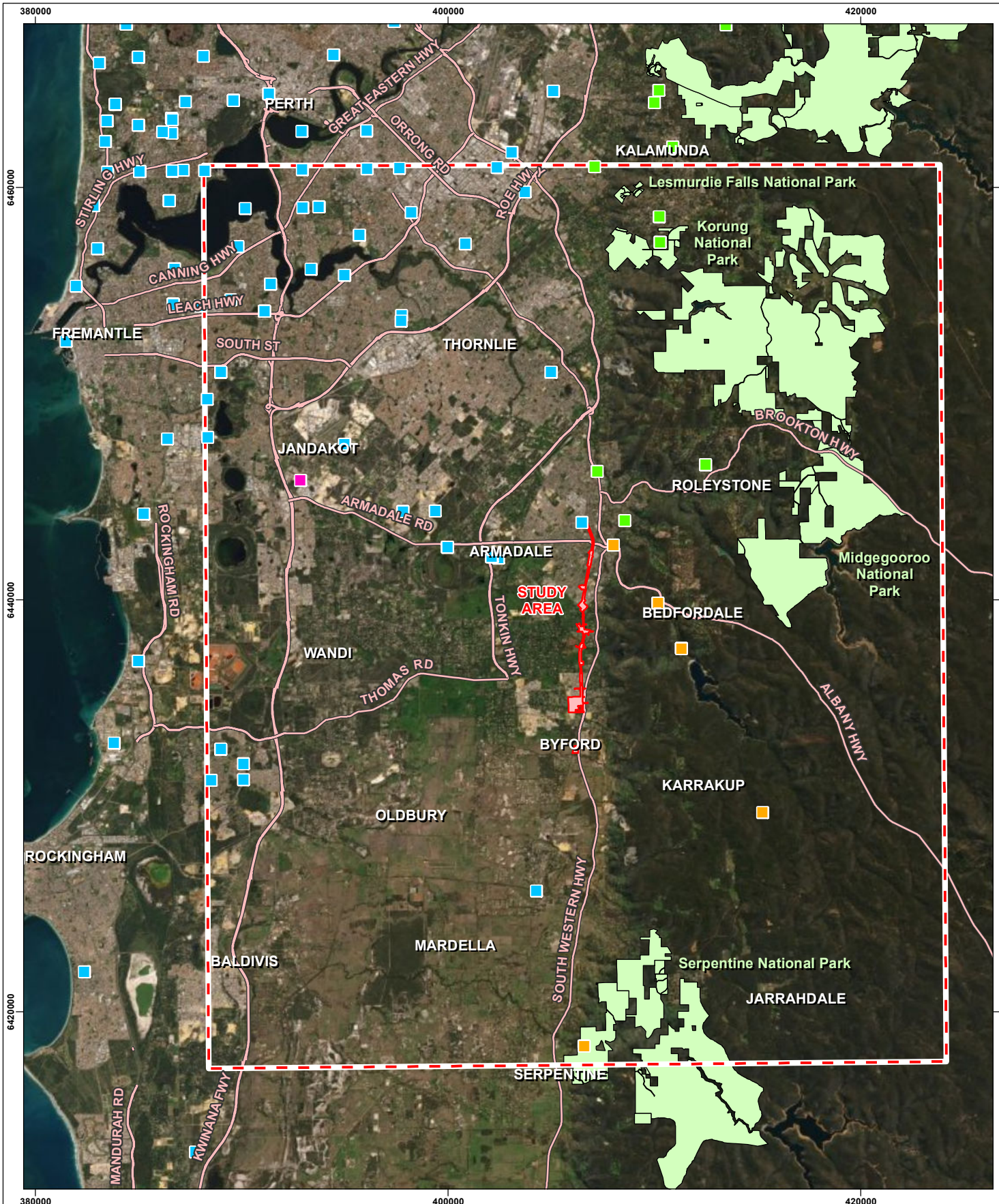
CREATED	CHECKED	APPROVED	REVISION
ENVIRONMAPS	TM	TM	0

Byford Rail Extension
Short Range Endemic Invertebrate Survey

Figure 6

Entire Distribution of the Confirmed SRE *mygalomorph* spider and tree cricket species in Relation to the Byford Rail Extension Project

C:\GIS\Jobs\Invertebrate Solutions\Byford Rail Extension Project\Figures\BREP_F06 Entire Distribution of the Confirmed mygalomorph spider and tree cricket species_210215.mxd



Legend

- Desktop Study Area
- Study Area
- National Park

SRE *Mygalomoph* Spiders and Tree Cricket Species Locations

- Idiopidae: *Euoplos inornatus*
- Idiopidae: *Idiosoma jarrah*
- Idiopidae: *Idiosoma sigillatum*
- Tettigonidae: *Throscodectes xiphos*

- LOCALITY MAP SOURCED FROM LANDGATE 2006
- STREET DIRECTORY MAP OPEN SOURCE DATA

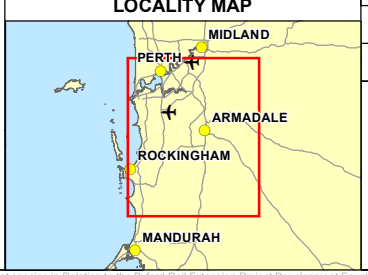
0 1.25 2.5 5 km

Scale: 1:250,000 @ A4

N

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

LOCALITY MAP



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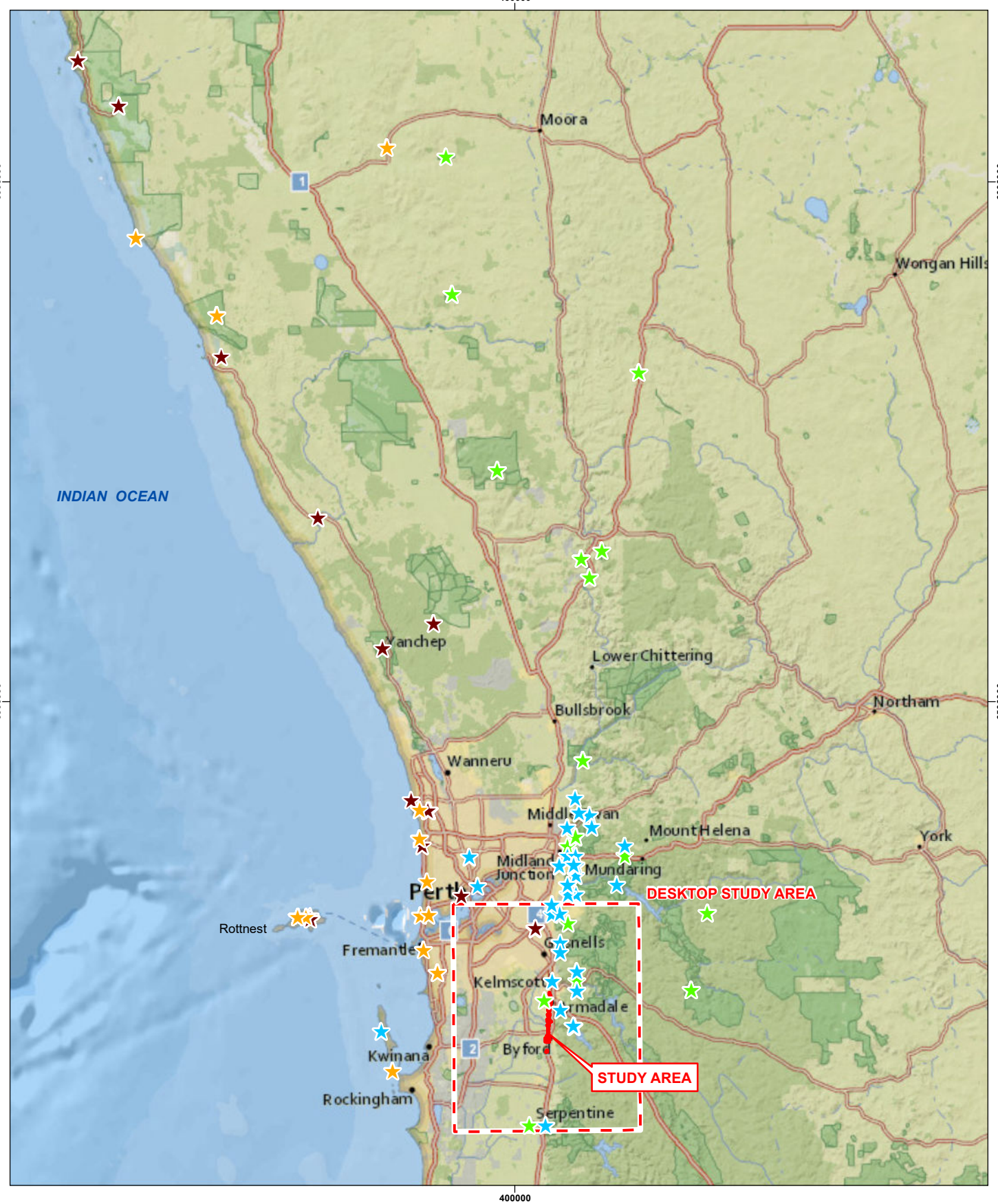
CREATED	CHECKED	APPROVED	REVISION
ENVIRONMAPS	TM	TM	0

Byford Rail Extension
Short Range Endemic Invertebrate Survey

Figure 7

Local Distribution of the Confirmed SRE *mygalomorph* spider, and tree cricket species in Relationto the Byford Rail Extension Project Study Area

C:\GIS\Jobs\Invertebrate Solutions\Byford Rail Extension Project\Figures\BREP_F07 Local Distribution of the Confirmed SRE mygalomorph spider and tree cricket species in Relation to the Byford Rail Extension Project Development Envelope_210215.mxd



Legend

- Desktop Study Area
- Study Area

SRE Slater and Millipede Species Locations

- Armadillidae: *Buddelundia cinerascens*
- Armadillidae: *Buddelundia inaequalis*
- Armadillidae: *Buddelundia opaca*
- Iulomorphidae: *Dinocambala ingens*

- LOCALITY MAP SOURCED FROM LANDGATE 2006
- BASE DATA SOURCED ESRI NATGEO WORLD MAP

0 5 10 20
km

Scale: 1:1,000,000 @ A4

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

LOCALITY MAP

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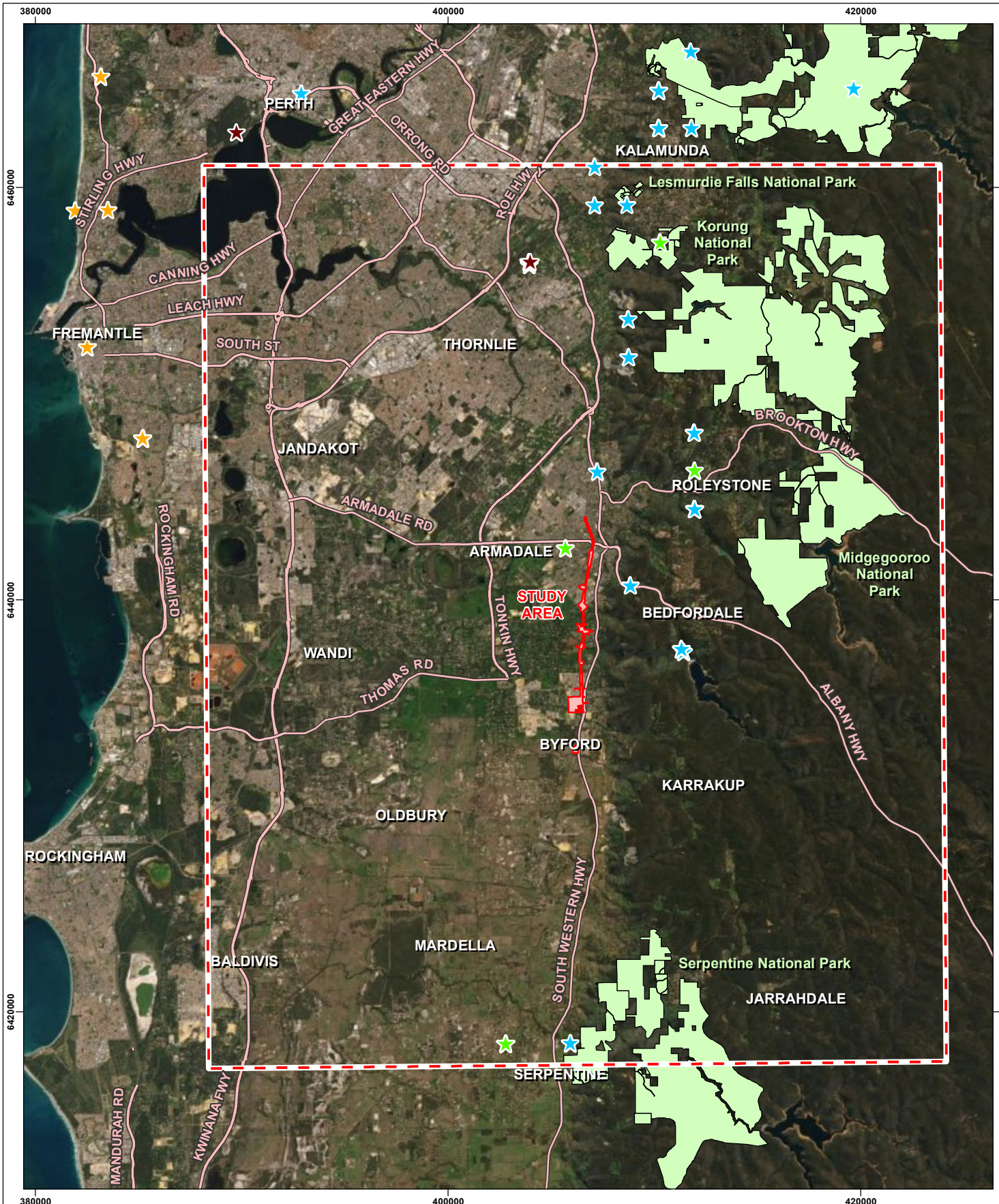
CREATED	CHECKED	APPROVED	REVISION
ENVIRONMAPS	TM	TM	0

Byford Rail Extension
Short Range Endemic Invertebrate Survey

Figure 8

Entire Distribution of the Likely SRE isopod and millipede species in Relation to the Byford Rail Extension Project

C:\GIS\Jobs\Invertebrate Solutions\Byford Rail Extension Project\Figures\BREP_F08 Entire Distribution of the Likely SRE isopod and millipede species_210215.mxd



Legend

- Desktop Study Area
- Study Area
- National Park

SRE Slater and Millipede Species Locations

- Armadillidae: *Buddelundia cinerascens*
- Armadillidae: *Buddelundia inaequalis*
- Armadillidae: *Buddelundia opaca*
- Iulomorphidae: *Dinocambala ingens*

- LOCALITY MAP SOURCED FROM LANDGATE 2006
- STREET DIRECTORY MAP OPEN SOURCE DATA

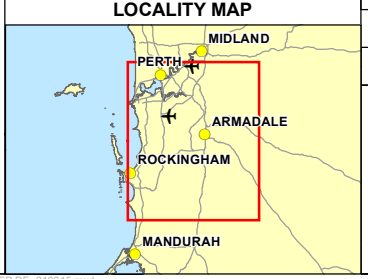
0 1.25 2.5 5 km

Scale: 1:250,000 @ A4

N

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

LOCALITY MAP



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BREP	15/02/2021

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GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
ENVIRONMAPS	TM	TM	0

Byford Rail Extension
Short Range Endemic Invertebrate Survey

Figure 9

Local Distribution of the Likely SRE isopod and millipede species in Relation to the Byford Rail Extension Project Study Area

C:\GIS\Jobs\Invertebrate Solutions\Byford Rail Extension Project\Figures\BREP_F09 Local Distribution of the Likely SRE isopod and millipede species to the BREP DE_210215.mxd

Legend

- Desktop Study Area
- Study Area

SRE *Mygalomorph* Species Locations

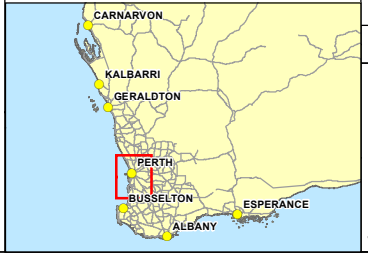
- ▲ Barychelidae: *Synothele michaelseni*
- ▲ Nemesiidae: *Teyl* 'MYG249'

0 5 10 20
km
Scale: 1:1,000,000 @ A4

N

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

LOCALITY MAP



- LOCALITY MAP SOURCED FROM LANDGATE 2006
- BASE DATA SOURCED ESRI NATGEO WORLD MAP

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GDA 1994 MGA Zone 50

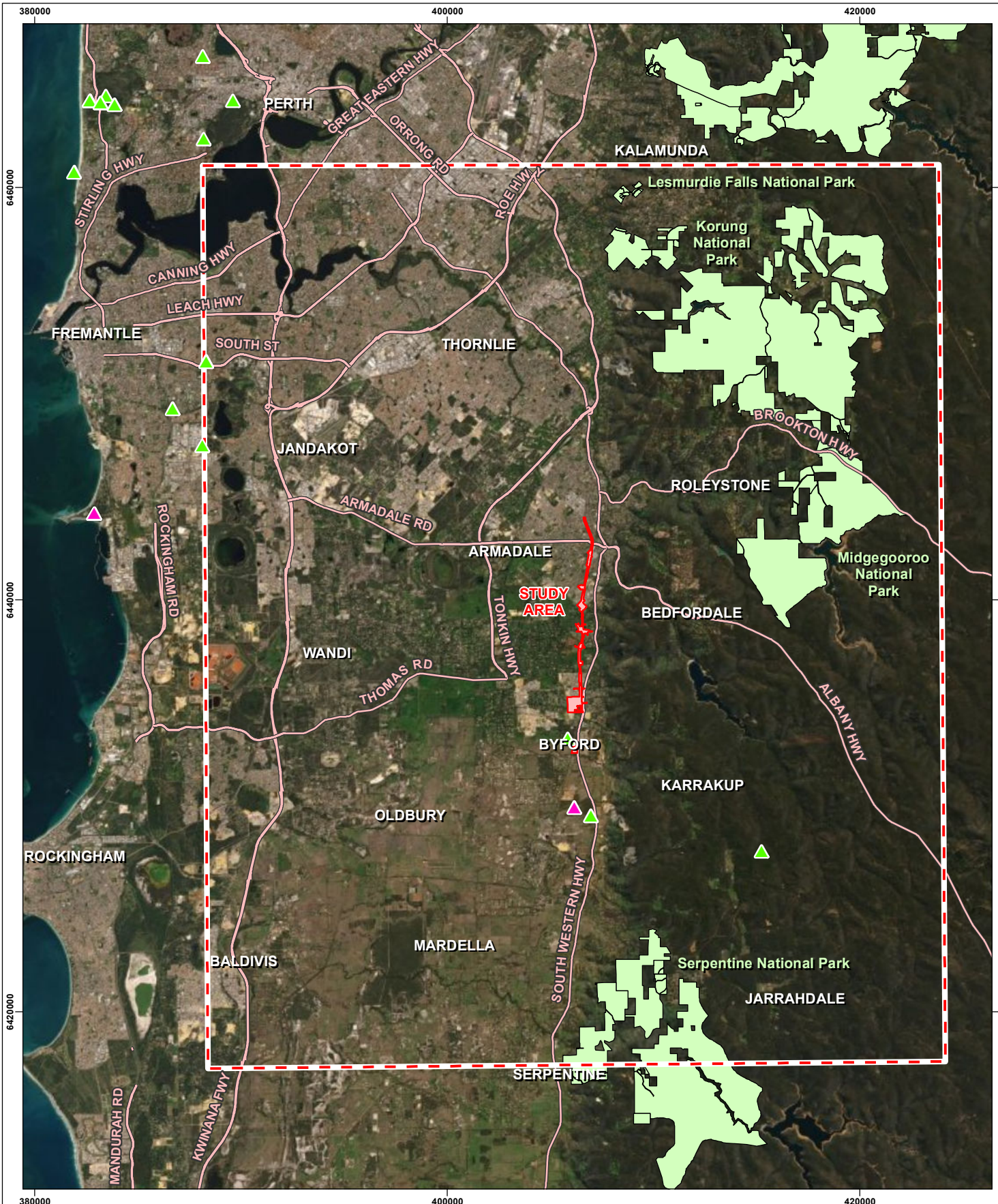
CREATED	CHECKED	APPROVED	REVISION
ENVIRONMAPS	TM	TM	0

Byford Rail Extension
Short Range Endemic Invertebrate Survey

Figure 10

Entire Distribution of the Likely SRE *mygalomorph* species in Relation to the Byford Rail Extension Project

C:\GIS\Jobs\Invertebrate Solutions\Byford Rail Extension Project\Figures\BREP_F10 Entire Distribution of the Likely SRE mygalomorph species_210215.mxd



Legend

- Desktop Study Area
- Study Area
- National Park

SRE *Mygalomorph* Species Locations

- Barychelidae: *Synothele michaelseni*
- Nemesiidae: *Teyl* 'MYG249'

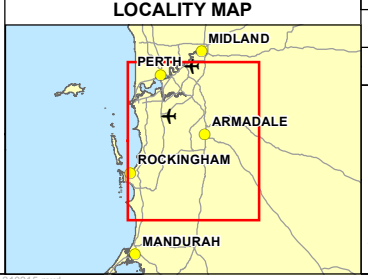
0 1.25 2.5 5 km

Scale: 1:250,000 @ A4

N

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

LOCALITY MAP



- LOCALITY MAP SOURCED FROM LANDGATE 2006
- STREET DIRECTORY MAP OPEN SOURCE DATA

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GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
ENVIRONMAPS	TM	TM	0

Byford Rail Extension
Short Range Endemic Invertebrate Survey

Figure 11

Local Distribution of the Likely SRE *mygalomorph* species in Relation to the Byford Rail Extension Project Study Area

C:\GIS\Jobs\Invertebrate Solutions\Byford Rail Extension Project\Figures\BREP_F11 Local Distribution of the Likely SRE mygalomorph species to the BREP DE_210215.mxd

4. SRE impact assessment

This impact assessment is based primarily upon and the project components as outlined by the PTA with the main components of the overall project consist of the following:

- An electrified 7.5 km dual track railway connecting the existing Armadale Station to a new rail station at Byford (see Figure 1).
- The Proposal utilises the existing rail corridor that is currently used by the Australind passenger train service. A new line will be installed on the eastern side of the existing rail line which in turn will be refurbished.
- The Proposal includes the replacement of a number of at-grade line crossings (boom gates) with grade separated crossings, either rail over road or road over rail.

A planned road over rail grade separation at Thomas Road, Byford will be designed, constructed and delivered separately by Main Roads Western Australia (Main Roads). These construction activities are not part of this Proposal.

4.1 Local impacts during construction and operation

The potential impacts to SRE fauna within the study area are summarised in Table 5 and Table 6. The assessment of the impact to SRE fauna at both the local and regional (SCP) scale from each disturbance mechanism takes into account both the likelihood of the impact occurring, its duration and severity, the potential consequence to SRE fauna and the likelihood of SRE fauna being present within the study area.

Direct impacts

The only direct impact to SRE fauna is from vegetation clearing within the study area that will directly remove habitat potentially used by SRE species. This direct impact is, however, considered to be Low as only 1.6 ha of Moderate value and 14.3 ha of Low value SRE habitat comprising 12 separate, narrow linear fragments are present within the study area (Figure 2A-C). These fragments also contain little or no undergrowth that provides potential SRE habitat. Given the small amount of native vegetation and the low likelihood of any SRE species being present within the study area this direct impact is considered to be Low, resulting in no impacts to SRE fauna.

Table 5 Risk of direct impact to SRE invertebrates from the BRE Proposal

Direct disturbance mechanism	Potential of Impact to SRE Fauna locally	Potential of Impact to SRE Fauna Regionally (SCP)
Vegetation clearing directly removing and/or disturbing SRE habitat	**Low**	**Nil**

Indirect impacts

Increased local weed incursion into adjacent native bushland can have a significant impact upon SRE species that rely on sometimes small microhabitats within the landscape. This is still considered to be a Low potential impact to SRE fauna. This impact can be managed through management and mitigation measures including general ongoing weed control.

The indirect impact of the clearing of native vegetation causing fragmentation of the remaining vegetation may lead to the restriction of genetic flow for SRE species that have limited dispersal capabilities. This indirect impact is considered to be negligible as the extremely limited clearing (~16 ha) of largely degraded vegetation represents fragments that are already narrow linear portions alongside an existing rail corridor and unconnected to other urban bushland and have largely Low SRE habitat potential.

Table 6 Risk of indirect impact to SRE invertebrates from the BRE Proposal

Indirect disturbance mechanism	Potential of Impact to SRE Fauna locally	Potential of Impact to SRE Fauna Regionally (SCP)
Habitat fragmentation and genetic isolation due to vegetation clearing and construction works	**Low**	**Low**
Weed incursion during construction works	**Low**	**Low**
Increased sedimentation during construction works?	**Low**	**Low**
Alteration of surface hydrology during construction works	**Low**	**Low**
Hydrocarbon spills during construction and/or operations	**Low**	**Low**
Vibration disturbance from operational activities	**Low**	**Low**
Vibration disturbance from construction activities	**Low**	**Low**
Noise during construction works	**Low**	**Low**
Noise during operations	**Low**	**Low**

If not managed appropriately, increasing sedimentation and alteration of surface hydrology has the potential to affect SRE fauna such as mygalomorph spiders that live in burrows at ground level in adjacent habitat. Sedimentation can be managed by appropriate stormwater runoff design and during construction via management and mitigation measures.

Contamination of surface and groundwater during construction and operations may also impact significantly upon SRE habitat, but risks of contamination can be minimised by employing management and mitigation measures to minimise and prevent contamination. The potential for contamination during construction is limited to isolated areas of chemical storage and small quantities of hydrocarbons where machinery or generators are working. Risks will be minimised by measures included in a Construction Environment Management Plan (CEMP). The risk of contamination during operations is minimal as the passenger railway will be electrified, running off overhead electrified wires rather than stored fuel on the trains themselves. The trains will contain only small quantities of transmission oil with minimal risk of contamination impacts. Where management measures are implemented, the risk of hydrocarbon contamination to SRE species and habitat is anticipated to be Low, and little habitat for SRE species remains adjacent to the study area.

Vibration and noise from the construction and ongoing operation of the rail line is expected to be minimal, especially beyond the immediate vicinity of the rail line itself. These impacts are considered to be Low.

4.2 Regional significance and cumulative impacts

At a regional scale across the SCP, the direct and indirect impacts are considered to be Low or Nil due to the narrow linear nature of the BRE Proposal, and the very limited potential SRE habitat both within the study area and immediately adjacent to it. The BRE Proposal sits within largely a combination of a dense urban landscape or degraded rural areas that is considered to provide Low to Nil habitat for SRE species at a regional scale (Figure 3). No impacts either direct or indirect are considered to be above Low and thus the project is considered to have no cumulative or regional impacts on the SCP. Due to the BRE Proposal occurring within an existing rail corridor, and its narrow linear nature, no significant cumulative impacts are anticipated to occur to SRE or conservation significant invertebrate species from the development.

5. Conclusions and Recommendations

The Desktop Study Area contains seven Confirmed SRE species (three mygalomorph spiders, two land snails, one tree cricket and one native bee). An additional six species were identified within the Desktop Study Area as being Likely SRE species (three slaters, two mygalomorph spiders and one millipede). The remaining species identified from desktop resources were found to be widespread. All of the Confirmed or Likely SRE species identified as occurring within the Desktop Study Area had a Low Likelihood of occurring within the study area.

An additional seven conservation significant invertebrates (widespread, non-SRE species) were identified in the desktop assessment (a tree cricket, A day flying moth and five native bees). Of these seven conservation significant species none are considered as possibly having potential habitat within the study area due to the extremely limited extent and degraded nature of native vegetation remaining within the BRE Proposal.

The only direct impact to SRE or conservation significant invertebrates is from vegetation clearing within the study area that will directly remove habitat potentially used by SRE species. This direct impact is, however, considered to be Low as only 1.6 ha of Moderate value and 14.3 ha of Low value SRE habitat comprising 12 separate narrow linear fragments are present within the study area.

Increased local weed incursion into adjacent native bushland can have a significant impact upon SRE species that rely on sometimes small microhabitats within the landscape. This is still considered to be a Low potential impact to SRE fauna. The indirect impact of the clearing of native vegetation causing fragmentation is considered to be negligible as the extremely limited clearing (~16 ha) of largely degraded vegetation represents fragments that are already narrow linear portions alongside an existing rail corridor and unconnected to other urban bushland and have largely Low SRE habitat potential.

At a regional scale across the SCP, the direct and indirect impacts are considered to be Low or Nil due to the narrow linear nature of the BRE Proposal, and the very limited potential SRE habitat both within the study area and immediately adjacent to it. The BRE Proposal sits within largely a combination of a dense urban landscape or degraded rural areas that is considered to provide Low to Nil habitat for SRE species at a regional scale. No impacts either direct or indirect are considered to be above Low and thus the project is considered to have no cumulative or regional impacts on the SCP.

All other anticipated impacts are generally Low or able to be managed through standard construction and operational management and mitigation measures.

The following recommendations are made with regard to the BRE Proposal:

- No further investigation, including field surveys are required to assess the potential impacts to SRE or conservation significant invertebrate fauna by the BRE Proposal as virtually no native habitat is present within the study area.

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Appendix 1

Department of Biodiversity, Conservation and Attractions - Conservation Codes (2019)

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

CONSERVATION CODES

For Western Australian Flora and Fauna

Threatened, Extinct and Specially Protected fauna or flora[1] are species[2] which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such.

The *Wildlife Conservation (Specially Protected Fauna) Notice 2018* and the *Wildlife Conservation (Rare Flora) Notice 2018* have been transitioned under regulations 170, 171 and 172 of the *Biodiversity Conservation Regulations 2018* to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the *Biodiversity Conservation Act 2016.*

Categories of Threatened, Extinct and Specially Protected fauna and flora are:

T Threatened species

Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for Threatened Fauna.

Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the *Wildlife Conservation (Rare Flora) Notice 2018* for Threatened Flora.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

CR Critically endangered species

Threatened species considered to be "*facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.

EN Endangered species

Threatened species considered to be "*facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for endangered flora.

VU Vulnerable species

Threatened species considered to be "*facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines*".

Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora.

Extinct species

Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.

EX Extinct species

Species where "*there is no reasonable doubt that the last member of the species has died*", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).

Published as presumed extinct under schedule 4 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for extinct fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for extinct flora.

EW Extinct in the wild species

Species that *"is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form*", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).

Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

Specially protected species

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

MI Migratory species

Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).

Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.

Published as migratory birds protected under an international agreement under schedule 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

CD Species of special conservation interest (conservation dependent fauna)

Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).

Published as conservation dependent fauna under schedule 6 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

OS Other specially protected species

Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).

Published as other specially protected fauna under schedule 7 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

P Priority species

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 fauna or flora.

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.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

1 Priority 1: Poorly-known species

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.

2 Priority 2: Poorly-known species

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.

3 Priority 3: Poorly-known species

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.

4 Priority 4: Rare, Near Threatened and other species in need of monitoring

(a) Rare. Species 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 species are usually represented on conservation lands.
(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent.
(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

[1] The definition of flora includes algae, fungi and lichens
[2]Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).

Appendix 2

Protected Matters Search Tool results

Australian Government
Department of the Environment and Energy

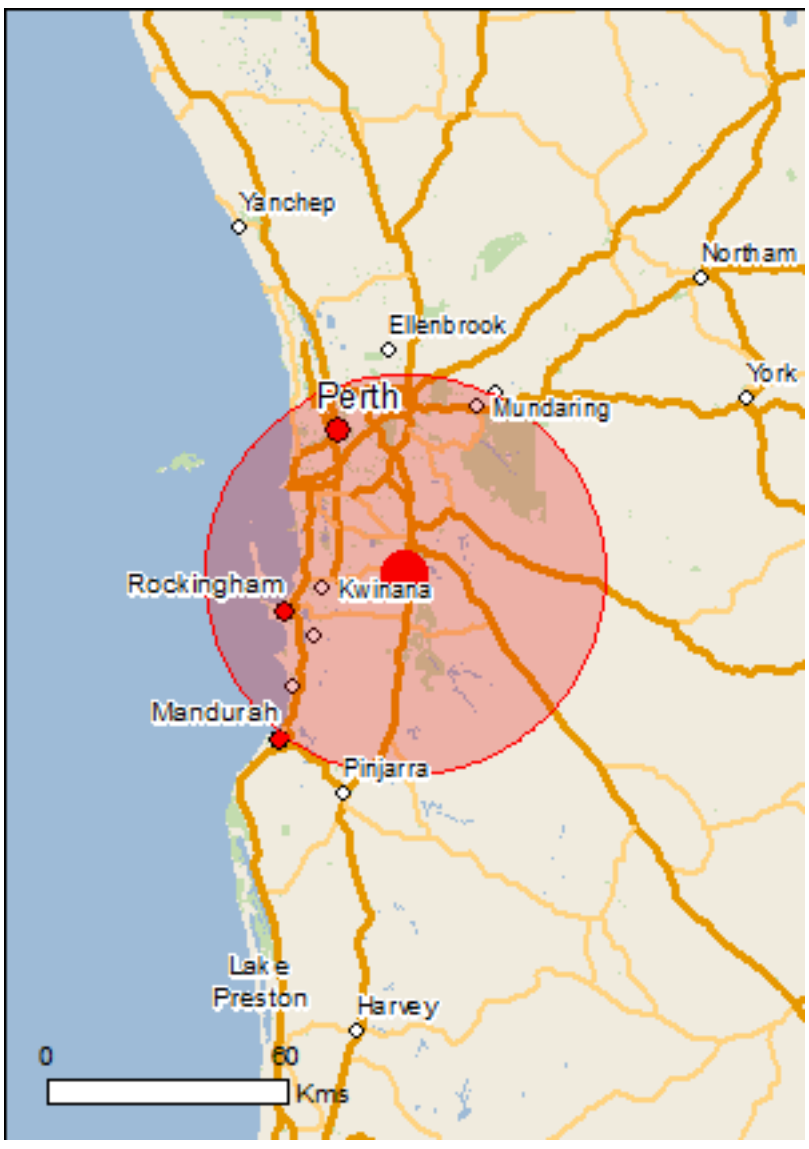
EPBC Act Protected Matters Report

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: 31/08/20 17:07:42



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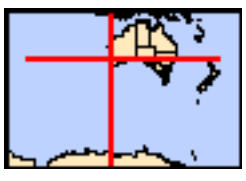

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	2
National Heritage Places:	2
Wetlands of International Importance:	3
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	1
Listed Threatened Ecological Communities:	11
Listed Threatened Species:	101
Listed Migratory Species:	71

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:	17
Commonwealth Heritage Places:	10
Listed Marine Species:	112
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	113
Regional Forest Agreements:	1
Invasive Species:	47
Nationally Important Wetlands:	14
Key Ecological Features (Marine)	2

Details

Matters of National Environmental Significance

World Heritage Properties [Resource Information]

Name	State	Status
Australian Convict Sites (Fremantle Prison Buffer Zone)	WA	Buffer zone
Australian Convict Sites (Fremantle Prison)	WA	Declared property

National Heritage Properties [Resource Information]

Name	State	Status
Historic		
Fremantle Prison (former)	WA	Listed place
Goldfields Water Supply Scheme, Western Australia	WA	Listed place

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Becher point wetlands	Within Ramsar site
Forrestdale and thomsons lakes	Within Ramsar site
Peel-yalgorup system	Within Ramsar site

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

Marine Regions [Resource Information]

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
South-west

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
Assemblages of plants and invertebrate animals of tumulus (organic mound) springs of the Swan Coastal Plain	Endangered	Community known to occur within area
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
Corymbia calophylla - Xanthorrhoea preissii woodlands and shrublands of the Swan Coastal Plain	Endangered	Community known to occur within area
Sedgelands in Holocene dune swales of the southern Swan Coastal Plain	Endangered	Community known to occur within area
Shrublands and Woodlands of the eastern Swan Coastal Plain	Endangered	Community known to occur within area
Shrublands and Woodlands on Muchea Limestone of the Swan Coastal Plain	Endangered	Community known to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area
Thrombolite (microbial) community of coastal freshwater lakes of the Swan Coastal Plain (Lake	Endangered	Community known to occur within area

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

Listed Threatened Species

[Resource Information]

Name	Status	Type of Presence
Birds		
Anous tenuirostris melanops		
Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Botaurus poiciloptilus		
Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris		
Great Knot [862]	Critically Endangered	Roosting known to occur within area
Calyptorhynchus banksii naso		
Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
Calyptorhynchus baudinii		
Baudin's Cockatoo, Long-billed Black-Cockatoo [769]	Endangered	Breeding known to occur within area
Calyptorhynchus latirostris		
Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Breeding known to occur within area
Charadrius leschenaultii		
Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus		
Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Diomedea amsterdamensis		
Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena		
Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora		
Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans		
Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi		
Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Falco hypoleucos		
Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area
Halobaena caerulea		
Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Fish		
Galaxiella nigrostriata Blackstriped Dwarf Galaxias, Black-stripe Minnow [88677]	Endangered	Species or species habitat may occur within area
Insects		
Hesperocolletes douglasi Douglas' Broad-headed Bee, Rottnest Bee [66734]	Critically Endangered	Species or species habitat may occur within

Name	Status	Type of Presence
		area
[Leioproctus douglasiellus](#) a short-tongued bee [66756]	Critically Endangered	Species or species habitat known to occur within area
[Neopasiphae simplicior](#) A native bee [66821]	Critically Endangered	Species or species habitat likely to occur within area
Mammals		
[Balaenoptera musculus](#) Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
[Bettongia penicillata ogilbyi](#) Woylie [66844]	Endangered	Species or species habitat known to occur within area
[Dasyurus geoffroii](#) Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area
[Eubalaena australis](#) Southern Right Whale [40]	Endangered	Breeding known to occur within area
[Megaptera novaeangliae](#) Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
[Myrmecobius fasciatus](#) Numbat [294]	Endangered	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
[Phascogale calura](#) Red-tailed Phascogale, Red-tailed Wambenger, Kenngoor [316]	Vulnerable	Species or species habitat likely to occur within area
[Pseudocheirus occidentalis](#) Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat likely to occur within area
[Setonix brachyurus](#) Quokka [229]	Vulnerable	Species or species habitat known to occur within area
Other		
[Westralunio carteri](#) Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat known to occur within area
Plants		
[Acacia anomala](#) Grass Wattle, Chittering Grass Wattle [8153]	Vulnerable	Species or species habitat known to occur within area
[Acacia aphylla](#) Leafless Rock Wattle [13553]	Vulnerable	Species or species habitat known to occur within area
[Andersonia gracilis](#) Slender Andersonia [14470]	Endangered	Species or species habitat known to occur within area
[Anigozanthos viridis subsp. terraspectans](#) Dwarf Green Kangaroo Paw [3435]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Anthocercis gracilis Slender Tailflower [11103]	Vulnerable	Species or species habitat known to occur within area
Austrostipa bronwenae [87808]	Endangered	Species or species habitat known to occur within area
Austrostipa jacobsiana [87809]	Critically Endangered	Species or species habitat known to occur within area
Banksia aurantia Orange Dryandra [82763]	Critically Endangered	Species or species habitat may 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 known 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
Darwinia apiculata Scarp Darwinia [8763]	Endangered	Species or species habitat known to occur within area
Diplolaena andrewsii [6601]	Endangered	Species or species habitat known to occur within area
Diuris drummondii Tall Donkey Orchid [4365]	Vulnerable	Species or species habitat known to occur within area
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat known 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 known to occur within area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat known to 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

Name	Status	Type of Presence
Eucalyptus argutifolia Yanchep Mallee, Wabling Hill Mallee [24263]	Vulnerable	Species or species habitat may occur within area
Eucalyptus x balanites Cadda Road Mallee, Cadda Mallee [87816]	Endangered	Species or species habitat known to occur within area
Goodenia arthrotricha [12448]	Endangered	Species or species habitat known to occur within area
Grevillea christineae Christine's Grevillea [64520]	Endangered	Species or species habitat known to occur within area
Grevillea curviloba subsp. curviloba Curved-leaf Grevillea [64908]	Endangered	Species or species habitat known to occur within area
Grevillea curviloba subsp. incurva Narrow curved-leaf Grevillea [64909]	Endangered	Species or species habitat likely to occur within area
Grevillea flexuosa Zig Zag Grevillea [2957]	Vulnerable	Species or species habitat likely to occur within area
Grevillea thelemanniana Spider Net Grevillea [32835]	Critically Endangered	Species or species habitat known to occur within area
Lasiopetalum pterocarpum Wing-fruited Lasiopetalum [64922]	Endangered	Species or species habitat known to occur within area
Lepidosperma rostratum Beaked Lepidosperma [14152]	Endangered	Species or species habitat known 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
Synaphea sp. Pinjarra (R. Davis 6578) Club-leafed Synaphea [82880]	Critically Endangered	Species or species habitat known to occur within area
Synaphea sp. Pinjarra Plain (A.S. George 17182) [86878]	Endangered	Species or species habitat likely to occur within area
Synaphea sp. Serpentine (G.R. Brand 103) [86879]	Critically Endangered	Species or species habitat known to occur within area
Synaphea stenoloba Dwellingup Synaphea [66311]	Endangered	Species or species habitat known to occur within area
Tetraria australiensis Southern Tetraria [10137]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
[Thelymitra dedmaniarum](#) Cinnamon Sun Orchid [65105]	Endangered	Species or species habitat likely to occur within area
[Thelymitra stellata](#) Star Sun-orchid [7060]	Endangered	Species or species habitat known to occur within area
[Tribonanthes purpurea](#) Granite Pink [16244]	Vulnerable	Species or species habitat known to occur within area
[Trithuria occidentalis](#) Swan Hydatella [42224]	Endangered	Species or species habitat likely to occur within area
[Verticordia fimbrilepis subsp. fimbrilepis](#) Shy Featherflower [24631]	Endangered	Species or species habitat known to occur within area
[Verticordia plumosa var. ananeotes](#) Tufted Plumed Featherflower [23871]	Endangered	Species or species habitat may occur within area
Reptiles		
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
[Natator depressus](#) Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sharks		
[Carcharias taurus (west coast population)](#) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur within area
[Carcharodon carcharias](#) White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
[Rhincodon typus](#) Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
[Anous stolidus](#) Common Noddy [825]		Species or species habitat likely to occur within area
[Apus pacificus](#) Fork-tailed Swift [678]		Species or species habitat likely to occur within area
[Ardenna carneipes](#) Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Ardenna pacifica Wedge-tailed Shearwater [84292]		Breeding known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Hydroprogne caspia Caspian Tern [808]		Breeding known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Onychoprion anaethetus Bridled Tern [82845]		Breeding known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Sterna dougallii Roseate Tern [817]		Breeding known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Breeding known to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat known to 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 likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris subminuta Long-toed Stint [861]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius dubius Little Ringed Plover [896]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Phalaropus lobatus Red-necked Phalarope [838]		Roosting known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur

Name	Threatened	Type of Presence
		within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Thalasseus bergii Crested Tern [83000]		Breeding known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Roosting known to occur within area
Tringa glareola Wood Sandpiper [829]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Tringa totanus Common Redshank, Redshank [835]		Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name
Commonwealth Land -
Defence - AIRTC CANNINGTON
Defence - ARTILLERY BARRACKS - FREMANTLE
Defence - BUSHMEAD RIFLE RANGE
Defence - BUSHMEAD TRAINING AREA
Defence - CAMPBELL BARRACKS - SWANBOURNE
Defence - EAST FREMANTLE SMALL CRAFT BASE
Defence - HMAS STIRLING-ROCKINGHAM ;HMAS STIRLING - GARDEN ISLAND
Defence - HOLDFAST BARRACKS
Defence - IRWIN BARRACKS - KARRAKATTA
Defence - LEEUWIN BARRACKS - EAST FREMANTLE
Defence - PALMER BARRACKS - SOUTH GUILDFORD
Defence - PRESTON POINT TRAINING DEPOT
Defence - RAAF CAVERSHAM
Defence - ROCKINGHAM - NAVY CPSO
Defence - SWAN BARRACKS
Defence - SWANBOURNE RIFLE RANGE

Commonwealth Heritage Places [Resource Information]

Name	State	Status
Natural		
Garden Island	WA	Listed place
Historic		
Army Magazine Buildings Irwin Barracks	WA	Listed place
Artillery Barracks	WA	Listed place
Claremont Post Office	WA	Listed place
Cliff Point Historic Site	WA	Listed place
Inglewood Post Office	WA	Listed place
J Gun Battery	WA	Listed place
Perth General Post Office	WA	Listed place
South Perth Post Office	WA	Listed place
Victoria Park Post Office	WA	Listed place

Listed Marine Species [Resource Information]		
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris alba Sanderling [875]		Roosting known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Calidris subminuta Long-toed Stint [861]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius dubius Little Ringed Plover [896]		Roosting known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area

Name	Threatened	Type of Presence
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Eudyptula minor Little Penguin [1085]		Breeding known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Roosting known to occur within area
Larus novaehollandiae Silver Gull [810]		Breeding known to occur within area
Larus pacificus Pacific Gull [811]		Breeding known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Roosting known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within

Name	Threatened	Type of Presence
		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 known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Pelagodroma marina White-faced Storm-Petrel [1016]		Breeding known to occur within area
Phalaropus lobatus Red-necked Phalarope [838]		Roosting known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Roosting known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Puffinus assimilis Little Shearwater [59363]		Breeding known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Puffinus pacificus Wedge-tailed Shearwater [1027]		Breeding known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Roosting known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat known to occur within area
Sterna anaethetus Bridled Tern [814]		Breeding known to occur within area
Sterna bergii Crested Tern [816]		Breeding known to occur within area

Name	Threatened	Type of Presence
Sterna caspia Caspian Tern [59467]		Breeding known to occur within area
Sterna dougallii Roseate Tern [817]		Breeding known to occur within area
Sterna fuscata Sooty Tern [794]		Breeding known to occur within area
Sterna nereis Fairy Tern [796]		Breeding known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat known to occur within area
Tringa glareola Wood Sandpiper [829]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Tringa totanus Common Redshank, Redshank [835]		Roosting known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area
Fish		
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Hippocampus subelongatus West Australian Seahorse [66722]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus fatiloquus Prophet's Pipefish [66250]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys meraculus Western Crested Pipefish [66259]		Species or species habitat may occur within area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Vanacampus margaritifer		
Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi		
Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus		
Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri		
Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Neophoca cinerea		
Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Aipysurus pooleorum		
Shark Bay Seasnake [66061]		Species or species habitat may occur within area
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Disteira kingii		
Spectacled Seasnake [1123]		Species or species habitat may occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Pelamis platurus		
Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata		
Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata		
Pygmy Right Whale [39]		Species or species habitat may occur within area
Delphinus delphis		
Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within

Name	Status	Type of Presence
		area
[Eubalaena australis](#) Southern Right Whale [40]	Endangered	Breeding known to occur within area
[Grampus griseus](#) Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
[Megaptera novaeangliae](#) Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
[Orcinus orca](#) Killer Whale, Orca [46]		Species or species habitat may occur within area
[Stenella attenuata](#) Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
[Tursiops aduncus](#) Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
[Tursiops truncatus s. str.](#) Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Alfred Cove	WA
Austin Bay	WA
Balannup Lake	WA
Banksia	WA
Beelu	WA
Bold Park	WA
Canning River	WA
Cardup	WA
Carnac Island	WA
Creery Island	WA
Dundas Road	WA
Forrestdale Lake	WA
Gibbs Road	WA
Goegrup Lake	WA
Gooralong	WA
Gooseberry Hill	WA
Greenmount	WA
Harry Waring Marsupial Reserve	WA
Helena	WA
Helena River	WA
John Forrest	WA
Kalamunda	WA
Karakamia	WA
Karnet	WA
Keanes Point Reserve	WA
Kenwick Wetlands	WA
Kings Park	WA
Korung	WA
Lambkin	WA
Leda	WA
Len Howard	WA
Leschenaultia	WA
Lesmurdie Falls	WA
Matilda Bay Reserve	WA
Midgegooroo	WA
Milyu	WA

Name	State
Modong	WA
Monadnocks	WA
NTWA Bushland covenant (0011)	WA
NTWA Bushland covenant (0014)	WA
NTWA Bushland covenant (0074)	WA
NTWA Bushland covenant (0076)	WA
NTWA Bushland covenant (0077)	WA
NTWA Bushland covenant (0086)	WA
NTWA Bushland covenant (0089)	WA
NTWA Bushland covenant (0157)	WA
North Dandalup	WA
Parkerville	WA
Penguin Island	WA
Perth Zoo	WA
Piara	WA
Port Kennedy Scientific Park	WA
Serpentine	WA
Stinton Cascades	WA
Swan River	WA
Talbot Road	WA
Thomsons Lake	WA
Unnamed WA18130	WA
Unnamed WA1919/893	WA
Unnamed WA21569	WA
Unnamed WA23076	WA
Unnamed WA24657	WA
Unnamed WA29815	WA
Unnamed WA31906	WA
Unnamed WA33618	WA
Unnamed WA35283	WA
Unnamed WA36440	WA
Unnamed WA37997	WA
Unnamed WA38749	WA
Unnamed WA39584	WA
Unnamed WA39752	WA
Unnamed WA39844	WA
Unnamed WA41102	WA
Unnamed WA41184	WA
Unnamed WA42044	WA
Unnamed WA42469	WA
Unnamed WA43903	WA
Unnamed WA44004	WA
Unnamed WA44414	WA
Unnamed WA44853	WA
Unnamed WA44986	WA
Unnamed WA45057	WA
Unnamed WA45089	WA
Unnamed WA45106	WA
Unnamed WA45772	WA
Unnamed WA45773	WA
Unnamed WA46587	WA
Unnamed WA46661	WA
Unnamed WA46756	WA
Unnamed WA46818	WA
Unnamed WA46920	WA
Unnamed WA48291	WA
Unnamed WA48968	WA
Unnamed WA49079	WA
Unnamed WA49220	WA
Unnamed WA49299	WA
Unnamed WA49362	WA
Unnamed WA49363	WA
Unnamed WA49561	WA
Unnamed WA50067	WA
Unnamed WA50069	WA
Unnamed WA50514	WA

Name	State
Unnamed WA50643	WA
Unnamed WA50750	WA
Unnamed WA51658	WA
Unnamed WA51784	WA
Unnamed WA51945	WA
Unnamed WA51946	WA
Unnamed WA51963	WA
Unnamed WA52237	WA
Wandi	WA
Wandoo	WA
Watkins Road	WA

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
South West WA RFA	Western Australia

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
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 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

Name	Status	Type of Presence
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 within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		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		

Name	Status	Type of Presence
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

Nationally Important Wetlands [Resource Information]

Name	State
Barraghup Swamp	WA
Becher Point Wetlands	WA
Booragoon Swamp	WA
Brixton Street Swamps	WA
Forrestdale Lake	WA
Gibbs Road Swamp System	WA
Herdsman Lake	WA
Palmer Barracks, Guildford	WA
Peel-Harvey Estuary	WA
Perth Airport Woodland Swamps	WA
RAAF Caversham	WA
Spectacles Swamp	WA
Swan-Canning Estuary	WA
Thomsons Lake	WA

Key Ecological Features (Marine) [Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
Commonwealth marine environment within and	South-west
Western rock lobster	South-west

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

-32.21855 116.00753

Acknowledgements

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

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

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

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

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