



July 2023

Metropolitan Region Scheme Amendment 1404/41 (Major Amendment)



Roe 8 Remainder and Roe 9 (Removal of Primary Regional Roads Reservation)

Amendment Report

City of Fremantle
City of Cockburn

Volume 2 of 2

**Metropolitan Region Scheme
Amendment 1404/41
(Major Amendment)**

**Roe 8 Remainder and Roe 9
(Removal of Primary Regional Roads Reservation)**

Amendment Report

City of Fremantle
City of Cockburn

Volume 2 of 2



July 2023

The Western Australian Planning Commission acknowledges the traditional owners and custodians of this land. We pay our respect to Elders past and present, their descendants who are with us today, and those who will follow in their footsteps.

Disclaimer

This document has been published by the Western Australian Planning Commission. Any representation, statement, opinion or advice expressed or implied in this publication is made in good faith and on the basis that the government, its employees and agents are not liable for any damage or loss whatsoever which may occur as a result of action taken or not taken, as the case may be, in respect of any representation, statement, opinion or advice referred to herein. Professional advice should be obtained before applying the information contained in this document to particular circumstances.

© State of Western Australia

Published by the
Western Australian Planning Commission
Gordon Stephenson House
140 William Street
Perth WA 6000

Locked Bag 2506
Perth WA 6001

MRS Amendment 1404/41 Amendment Report
File 809-2-1-102 Pt 1 (Vol 2 of 2)

Published July 2023

Internet: www.wa.gov.au/dplh
Email: info@dplh.wa.gov.au
Phone: (08) 6551 8002
Fax: (08) 6551 9001
National Relay Service: 13 36 77

This document is available in alternative formats on application to the Department of Planning, Lands and Heritage Communications Branch.

Contents

Volume 2 - Appendices

- Appendix G Environmental Assessment Study
- Appendix H Bushfire Management Plan
- Appendix I Main Roads WA Transport Modelling
- Appendix J Preliminary Engagement Summary Report

Volume 1 - Published under separate cover

- Amendment Report
- Amendment Figures (Proposals 1 - 3)
- Appendix A Notice of environmental assessment
- Appendix B List of detail plans supporting the amendment
- Appendix C Your property and the planning system – region schemes
- Appendix D Preparing a submission and hearings committees
- Appendix E Submission form for this amendment (form 41)
- Appendix F Indicative Concept Plans and Potential Green Linkage Plan (March 2023)

Appendix G
Environmental Assessment Study

Our ref: EP3587.001 DPLH Roe 8 and 9 Ecological Studies

Level 3, 500 Hay Street
Subiaco, WA 6008
T +61 8 9211 1111

Date: 08 March 2023

Scott Haine
Department of Planning, Lands and Heritage
140 William Street
Perth WA 6000

Dear Scott,

Roe 8 (West) and Roe 9 – environmental assessment study

This report has been prepared to provide a summary of the ecological values associated with the Roe 8 (West) and Roe 9 project. The study area incorporates a 104.5 hectare east–west corridor of land situated in the City of Cockburn, approximately 15 kilometres south-south-west of the Perth Central Business District (Figure 1).



Figure 1: Roe 8 (West) and Roe 9 study area

Three separate ecological surveys were undertaken to assess existing flora, vegetation and fauna values of the study area:

Our ref: EP3587.001 DPLH Roe 8 and 9 Ecological Studies

1. Detailed flora and vegetation survey (RPS 2023¹; Appendix A)
2. Black cockatoo habitat assessment and basic fauna survey (Phoenix Environmental Sciences 2023²; Appendix B)
3. *Phytophthora* dieback occurrence assessment (Glevan Consulting 2023³; Appendix C)

The three ecological survey reports have been provided as appendices.

Objectives

The objectives of this report are to:

- Summarise of the key findings of the ecological surveys.
- Identify the higher order ecological values (e.g. conservation significant flora, ecological communities and fauna) and lower order ecological values (e.g. cleared areas, completely degraded vegetation).
- Map the ecological values within the study area.

Ecological survey summary

- Detailed flora and vegetation survey:
 - No Threatened flora species listed under the state *Biodiversity Conservation Act 2016* (BC Act), or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) were recorded
 - One Department of Biodiversity, Conservation and Attractions (DBCA) listed Priority flora species, *Dodonaea hackettiana* (Priority 4), was identified. Three hundred and forty-six individuals were recorded proximate to the Forrest Road–Stock Road intersection
 - No flora species of other conservation significance were recorded
 - Five remnant native vegetation units were described and mapped:
 - EgBaXp – *Eucalyptus gomphocephala* mid woodland to open woodland over *Banksia attenuata* low open woodland over *Xanthorrhoea preissii* sparse shrubland over **Freesia alba* × *leichtlinii*, **Oxalis pes-caprae* forbland, **Ehrharta longiflora*, **E. calycina* tussock grassland
 - (Eg)EmCcBam – *Eucalyptus gomphocephala* mid isolated trees, *Eucalyptus marginata*, *Corymbia calophylla* mid woodland over *Banksia attenuata*, *B. menziesii*, *Allocasuarina fraseriana* low (open) woodland over *Xanthorrhoea preissii* sparse shrubland over **Freesia alba* × *leichtlinii*, **Oxalis pes-caprae* forbland, **Ehrharta calycina*, **E. longiflora* (sparse) grassland
 - JfKg (Rehab) – *Corymbia calophylla* isolated to sparse mid trees over *Jacksonia furcellata*, *Kunzea glabrescens* tall sparse shrubland over *Acacia pulchella* var. *glaberrima* mid sparse shrubs over *Gompholobium tomentosum* low sparse shrubs over **Hypochaeris glabra* isolated forbs, **Ehrhart longiflora* isolated grasses
 - ArBss – *Acacia rostelifera*, *Banksia sessilis* var. *sessilis* tall shrubland over **Ehrharta calycina*, **E. longiflora* sparse grassland over **Oxalis pes-caprae* forbland on limestone outcrop

¹ RPS. 2023. Detailed flora and vegetation assessment, Roe 8 (West) and Roe 9. Unpublished report prepared for the Department of Planning, Lands and Heritage.

² Phoenix Environmental Sciences. 2023. Black cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 project. Unpublished report prepared for the Department of Planning, Lands and Heritage.

³ Glevan Consulting. 2023. Roe Highway Stages 8/9, *Phytophthora* dieback occurrence assessment – version 1.2. Unpublished report prepared for the Department of Planning, Lands and Heritage.

Our ref: EP3587.001 DPLH Roe 8 and 9 Ecological Studies

- EgD - *Eucalyptus gomphocephala* mid woodland over *Acacia rostellifera*, **Schinus terebinthifolia* low open shrubland over **Oxalis pes-caprae* closed forbland
- Two ecological communities of conservation significance were identified:
 - State-listed Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain (Priority 3) ecological community / Commonwealth-listed Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain ecological community (Critically Endangered)
 - State-listed Banksia dominated woodlands of the Swan Coastal Plain IBRA region (Priority 3) ecological community / Commonwealth-listed Banksia Woodlands of the Swan Coastal Plain ecological community (Endangered)
- One vegetation unit, ArBss, shows floristic and landform affinity to a state listed Priority 3 ecological community; coastal shrublands on shallow sands, southern Swan Coastal Plain (floristic community type 29a)
- Forty-eight per cent of the study area was assessed to be in Completely Degraded condition, and 51% assessed as Good to Degraded condition.

The flora and vegetation values identified by RPS (2023) have been mapped in relation to the study area in Figure A.

- Black cockatoo habitat assessment and basic fauna survey:
 - Four broad fauna habitats were identified:
 - Banksia and eucalypt woodland
 - Tuart Woodland
 - Shrubland
 - Parkland cleared
 - Four conservation significant vertebrate species were identified:
 - Carnaby's cockatoo (*Zanda latirostris*) – Endangered (BC and EPBC Acts)
 - Forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*) – Vulnerable (BC and EPBC Acts)
 - Perth slider (*Lerista lineata*) - DBCA-listed Priority 4
 - Quenda / southern brown bandicoot (*Isoodon fusciventer*) – DBCA-listed Priority 4
 - Evidence of black cockatoo foraging activity was identified within the Banksia and eucalypt woodland and shrubland, however no breeding or roosting activity was observed. Two hundred and ninety-five potential habitat trees were recorded, with ten having suitable hollows to support current nesting. The remnant native vegetation was assessed as being high quality black cockatoo foraging habitat
 - Quenda / southern brown bandicoot was sighted, and diggings recorded in the Tuart Woodland. Diggings were also recorded in the Banksia and Eucalypt Woodland
 - The Perth slider was not sighted, however was considered likely to occur based on previous records and habitat suitability. The remnant native vegetation was considered to be potential habitat for this species.

The fauna values identified by Phoenix Environmental Sciences (2023) have been mapped in relation to the study area in Figure B.

- *Phytophthora* dieback occurrence assessment
 - No *Phytophthora* dieback infestations were recorded:
 - Most of the study area (64%) was excluded from assessment due to being either degraded or devoid of vegetation
 - 24% of the study area was identified as uninfested

Our ref: EP3587.001 DPLH Roe 8 and 9 Ecological Studies

- 12% of the study area was uninterpretable-temporarily uninterpretable due to a lack of reliable indicator species-recent disturbance.
- No *Phytophthora* dieback mapping has been undertaken as no infestations were reported by Glevan Consulting (2023).

Ecological value assessment

Consideration was provided for the importance of each identified attribute relative to its conservation significance under state and Commonwealth legislation, assessed condition, habitat potential or connectivity. A qualitative ranking system was developed by RPS to assign a numerical value (or score) to ecological criteria to allow for the higher order values to be distinguished from the lower order values. The ecological criteria selected relate to the key attributes of the native vegetation and fauna habitat within the study area, as identified by the three field surveys (i.e. RPS 2023, Phoenix Environmental Sciences 2023, Glevan Consulting 2023).

The ranking system, and subsequent assigning of scores, affords those attributes which have statutory protection (e.g. Threatened under either BC Act or EPBC Act), and hence are of higher ecological significance, with higher individual ranking scores. Attributes which are of conservation significance but are not afforded statutory protection (e.g. DBCA listed Priority species or communities) have been assigned a moderate individual ranking score. Attributes which are comparatively of lower order significance have been assigned lower ranking scores. In following this approach, the threat categories relevant to state and Commonwealth listings have been grouped (i.e. Threatened species / ecological communities identified in Tables A-1, A-2, A-3 and A-5 of RPS (2023) are all grouped as Threatened; Priority species / ecological communities codes identified in Tables A-1 and A-4 of RPS (2023) are grouped as Priority).

The scores have been indicatively applied as follows:

- Four to five. Denotes the higher order ecological criteria that are typically subject to statutory protection (e.g. Threatened species / ecological communities)
- Three. Denotes ecological criteria that have a moderate level of importance but lack statutory protection (e.g. Priority species / ecological communities)
- Two to one. Denotes the lower order ecological criteria (e.g. direct connection to adjacent vegetation, absence of *Phytophthora* dieback).

The ecological criteria and ranking scores used for this assessment are identified in Table 1.

Table 1: Ecological criteria and ranking scores

Ecological criteria	Ranking score
Conservation significant flora record	
Threatened flora	+5
Priority flora	+3
Conservation significant ecological community record	
Threatened ecological community	+5
Priority ecological community	+3
Vegetation condition	
Pristine	+5
Excellent	+4
Very Good	+3
Good	+2
Degraded	+1
Complexly degraded	0
Conservation significant fauna record	
Threatened	+5
Priority	+3

Ecological criteria	Ranking score
Conservation significant fauna potential habitat	
Threatened	+5
Priority	+3
Ecological connectivity to adjacent vegetation	
Direct connection	+2
No connection	0
Phytophthora dieback	
Present	-2
Absent	+2

The ranking scores for each ecological criteria were assigned to the vegetation and fauna habitat types identified within the study area. The ranking scores were then tallied based on the presence / absence of a particular criterion to produce an overall 'ecological value score' for each vegetation and fauna habitat type. The outcomes of this assessment have been indicatively presented in Table 2.

The flora and vegetation values identified in Figure A and the fauna values identified in Figure B along with their overall ecological value scores identified in Table 2 have been combined in a GIS based analysis to identify representative areas of high, medium and low ecological values. Based on Table 2, the theoretical spectrum of combined flora and vegetation and fauna habitat ecological value scores ranges from an upper limit of 31 (i.e. (Eg)EmCcBam + Banksia and eucalypt woodland) to a lower limit of 0 (i.e. Parkland Cleared⁴ + Cleared). However when the flora, vegetation and fauna values analysed using GIS, the actual spectrum of combined flora and vegetation and fauna habitat ecological value scores ranges from an upper limit of 29 (i.e. (Eg)EmCcBam + Banksia and eucalypt woodland) to a lower limit of 0 (i.e. Parkland Cleared⁴ + Cleared).

Areas of high, medium and low ecological values were identified based on the actual spectrum of combined flora and vegetation and fauna habitat ecological value scores:

- High ecological value areas have a combined ecological value score between 20 to 29.
- Medium ecological value areas have a combined ecological value score between 10 and 19.
- Low ecological value areas have a combined ecological value score of less than 10.

The areas of high, medium and low ecological values are mapped in Figure C.

⁴ Parkland, Cleared and Plantings vegetation types are also applicable.

Table 2: Key ecological value rankings and scores

Habitat type	Conservation significant flora / ecological community record			Vegetation condition					Conservation significant fauna record		Conservation significant fauna potential habitat				Phytophthora dieback	Connectivity to vegetation	Ecological value score
	Threatened flora	TEC	Priority flora	PEC	Pristine	Excellent	Very good	Good	Degraded	Completely degraded	Threatened	Priority	Threatened	Priority	Presence / absence	Direct connection/ no connection	
Vegetation type																	
EgBaXp	0	5	3	0	0	0	0	2	1	-	-	-	-	-	-	2	13
(Eg)EmCcBam	0	5	3	0	0	0	3	2	1	-	-	-	-	-	-	2	16
JfKg (Rehab)	0	0	3	0	0	0	0	-	1	-	-	-	-	-	-	2	6
ArBss	0	0	0	3	0	0	0	-	1	-	-	-	-	-	-	2	6
EgD	0	0	0	0	0	0	0	-	-	0	-	-	-	-	-	0	0
Inf	0	0	0	0	-	-	-	-	-	0	-	-	-	-	-	0	0
PC (Parkland Cleared))	0	0	0	0	-	-	-	-	-	0	-	-	-	-	-	0	0
Pk (Parkland)	0	0	0	0	-	-	-	-	-	0	-	-	-	-	-	0	0
C (Cleared)	0	0	0	0	-	-	-	-	-	0	-	-	-	-	-	0	0
P (Plantings)	0	0	0	0	-	-	-	-	-	0	-	-	-	-	-	0	0
Fauna habitat type																	
Banksia and eucalypt woodland	-	-	-	-	-	-	-	-	-	-	5	-	5	3	2	-	15
Tuart Woodland	-	-	-	-	-	-	-	-	-	-	-	3	5	3	2	-	13
Shrubland	-	-	-	-	-	-	-	-	-	-	-	-	5	3	2	-	10
Parkland cleared	-	-	-	-	-	-	-	-	-	-	-	-	5	0	0	-	5
Cleared	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	-	0

Key assumptions

The assigning of ranking scores to vegetation and fauna habitat types, derivation of an overall 'ecological value score' and GIS analysis has been underpinned by the following key assumptions:

- Where ecological values are shared the higher order value has been adopted to avoid double counting. For instance:
 - EgBaXp is associated with the Tuart Woodlands and Forests Threatened Ecological Community (TEC) and Priority Ecological Community (PEC). The ranking score for the higher order value (i.e. Tuart Woodlands and Forests TEC) has been used
 - (Eg)EmCcBam is associated with the Banksia Woodlands TEC and PEC. The ranking score for the higher order value (i.e. Banksia Woodlands TEC) has been used
 - Vegetation of the Tuart Woodlands and Forests TEC / PEC and Banksia Woodlands TEC / PEC has been assessed to be in Good to Degraded condition. The ranking score for the higher order value (i.e. good condition vegetation) has been used
 - Potential occurrence of the Coastal shrublands on shallow sands, southern Swan Coastal Plain (floristic community type 29a) (Priority 3) ecological community is assumed to be the PEC. The ranking score for the higher order value (i.e. PEC) has been used
- Differentiation between the condition of the vegetation type patches to determine presence / absence of the TECs / PECs is not readily identifiable in tabular format, however this has been accounted for when running the GIS based analysis (i.e. extents of vegetation types aligned with TECs / PECs have not been scored as such if in a Completed Degraded condition)
- Presence or absence of Priority flora across vegetation type patches is not readily identifiable in tabular format, however this has been accounted for when running the GIS based analysis (i.e. ranking score has been assigned only when Priority flora has been recorded)
- Presence of conservation significant fauna has been determined by a physical sighting (i.e. Quenda / southern brown bandicoot) or foraging evidence (Forest red-tailed black cockatoo). The habitat types and trees are considered to be potential habitat for black cockatoos species due to their broader range across the local Cockburn and regional Swan Coastal Plain environments
- Presence or absence of potential conservation significant fauna habitat across habitat type patches is not readily identifiable in tabular format, however this has been accounted for when running the GIS based analysis (i.e. ranking score has been assigned only when potential habitat for a conservation significant fauna species is present)
- Habitat types have either been identified as providing potential habitat for conservation significant fauna species or not. Multiple fauna species with potential to use the same habitat type (e.g. black cockatoos, quenda and Perth slider) have not been individually accounted for.
- Vegetation type patches that are directly connected to adjacent vegetation type patches are not readily identifiable in tabular format, however this has been accounted for when running the GIS based analysis (i.e. connectivity score for vegetation type patches has been assigned to those patches only that are directly connected to patches of adjacent vegetation)
- *Phytophthora dieback* is assumed to be absent from the study area.

Discussion

High ecological value areas

The areas of high ecological value within the study area are correlated with the presence of native vegetation, primarily in Good to Degraded condition, comprised of:

- Tuart Woodlands and Forests TEC (Critically Endangered) / PEC (Priority 3) and Banksia Woodlands TEC (Endangered) / PEC (Priority 3)
- *Dodonaea hackettiana* (Priority 4) populations

Our ref: EP3587.001 DPLH Roe 8 and 9 Ecological Studies

- Black cockatoo foraging and potential breeding habitat
- Quenda / southern brown bandicoot (Priority 4) and Perth slider (Priority 3) habitat.

These areas directly align with rehabilitation areas identified by Rehabilitation Management Plan (Emerge Associates 2018)⁵, which was prepared to inform the restoration of cleared areas within the Roe 8 alignment over a ten-year period. Consistent with the higher order ecological values identified by this assessment, and the management intent of the Rehabilitation Management Plan (Emerge Associates 2018), these areas should be protected and managed to enhance their identified values.

Medium ecological value areas

The areas of medium ecological value within the study area are correlated with the presence of native vegetation, primarily in Degraded condition, comprised of:

- Potential Coastal shrublands on shallow sands, southern Swan Coastal Plain (floristic community type 29a) (Priority 3) ecological community
- Black cockatoo foraging and potential breeding habitat
- Quenda / southern brown bandicoot (Priority 4) and Perth slider (Priority 3) habitat.

Native vegetation to the east of the Southwell Crescent is primarily comprised of high ecological value areas with ongoing rehabilitation of medium and low ecological value areas proposed under the Rehabilitation Management Plan (Emerge Associates 2018).

The medium ecological value patches to the west of Southwell Crescent provide ecosystem service functions for conservation significant fauna species and represent degraded remnants of the broader Cottesloe Complex Central and South vegetation complex within the Perth metropolitan region. Significant revegetation effort will be required to re-establish vegetation assemblages within these degraded areas. Specifically, the:

- Medium ecological value patch between Ely Street and Southwell Crescent has direct linkages with native vegetation extents suited within Lots 1 and 172 Southwell Crescent and Lot 800 Ely Street and lies directly adjacent to the high ecological value areas to the east. Rehabilitation of the native vegetation extents within the study area and adjacent lots could be considered to provide a relatively contiguous link to the high value areas. Lots 62, 133, 148 and 161 Blackwood Avenue appear to be already used for urban land uses and may provide redevelopment opportunity.
- A medium ecological value patch proximate to the Rockingham and Forrest roads intersection is isolated by areas of lower environmental value. This area could be considered as ecological 'stepping stone' within the study area specifically facilitating the movement of avian species (e.g. black cockatoos) within the broader landscape.
- Medium ecological value patches in the west are separated from the adjacent vegetation extents outside of the study area by the existing road network. Opportunity exists to aggregate ecological values in the west of the study area. Re-establishing direct connection for ground dwelling species is unlikely to be feasible given the network of existing roads. The vegetation is relatively intact, considered to be a potential PEC and could be considered for rehabilitation.

Low ecological value areas

The areas of low ecological value within the study area are correlated with the cleared or parkland cleared environments. These environments generally provide minimal functionality to flora or fauna species; however the standalone trees do represent potential habitat for black cockatoo species.

These areas also contain significant built infrastructure assets (e.g. roads) that permanently fragment areas of high and medium ecological values. East of Southwell Crescent, these areas will be subject to ongoing rehabilitation proposed under the Rehabilitation Management Plan (Emerge Associates 2018). West of Southwell Crescent opportunity exists for these areas to be considered for future development.

⁵ Emerge Associates. 2018. Rehabilitation Management Plan, Roe 8 Cleared Areas. Unpublished report prepared for Rehabilitating Roe 8 Steering Committee.

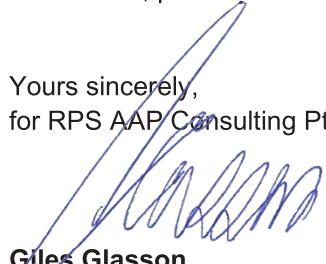
Environmental approval implications

If a significant impact to any Matter of National Environmental Significance listed under the EPBC Act (e.g. Tuart Woodlands and Forests TEC, Banksia Woodlands TEC, black cockatoos) is anticipated from a future action, a Commonwealth referral under the EPBC Act will be required. Should native vegetation be proposed to be cleared, a clearing permit will be required unless an exemption either under Schedule 6 of the *Environmental Protection Act 1986* or Environmental Protection (Clearing of Native Vegetation) Regulations 2004 is applicable. Ministerial authorisation under the state BC Act will be required if a threatened species (e.g. black cockatoos) is proposed to be taken. Ministerial authorisation under the BC Act may also be required if a threatened species is proposed to be disturbed.

Concluding remarks

We trust this information is sufficient for your purposes; however should you require further details or clarification, please do not hesitate to contact the writer by telephone.

Yours sincerely,
for RPS AAP Consulting Pty Ltd



Giles Glasson
Principal Scientist
giles.glasson@rpsgroup.com.au
+61 8 9288 0834

enc: Figures
 Appendix A: Detailed flora and vegetation survey
 Appendix B: Black cockatoo habitat assessment and basic fauna survey
 Appendix C: *Phytophthora* dieback occurrence assessment

Figures



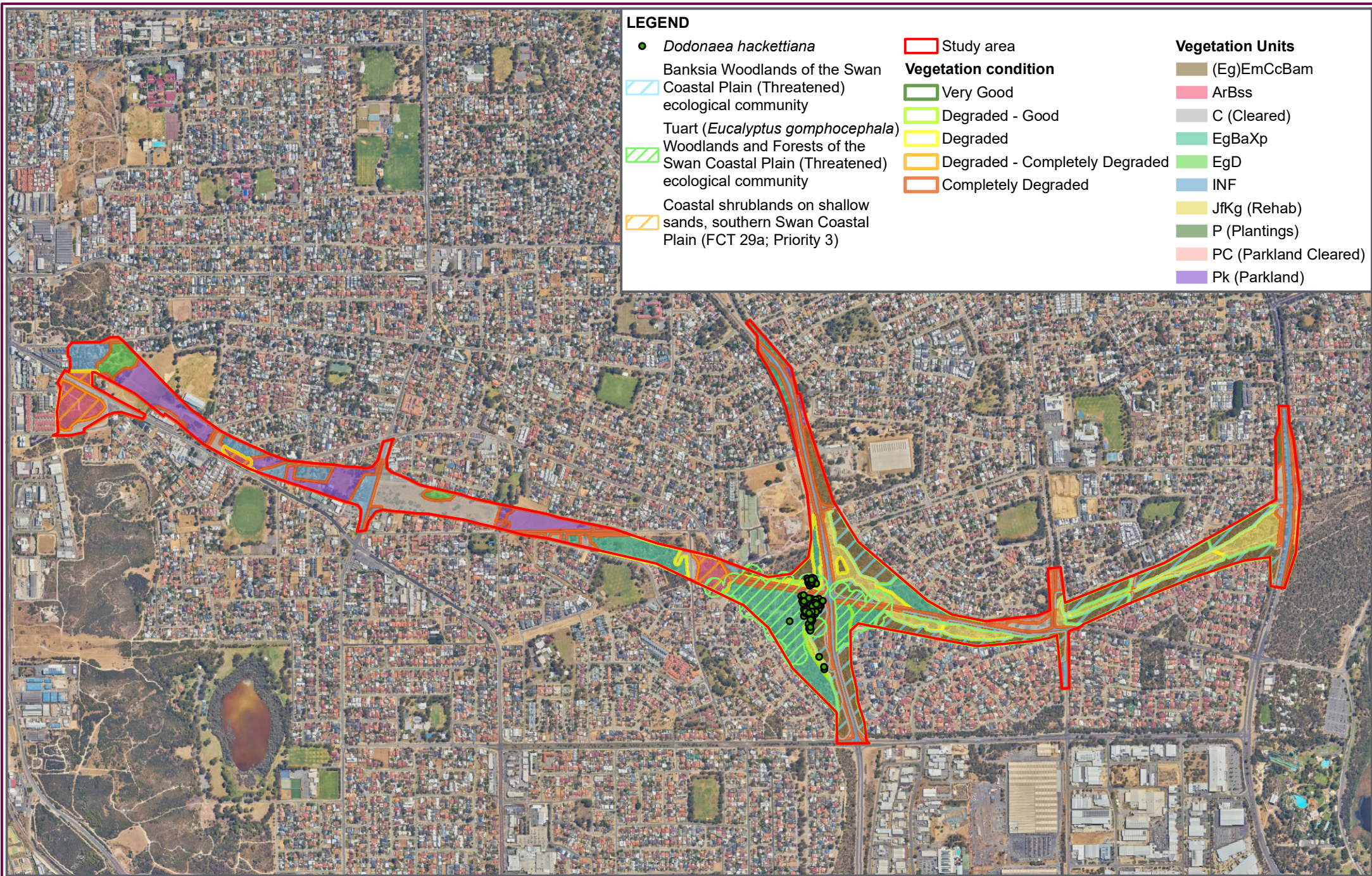


Figure A

Flora and vegetation values



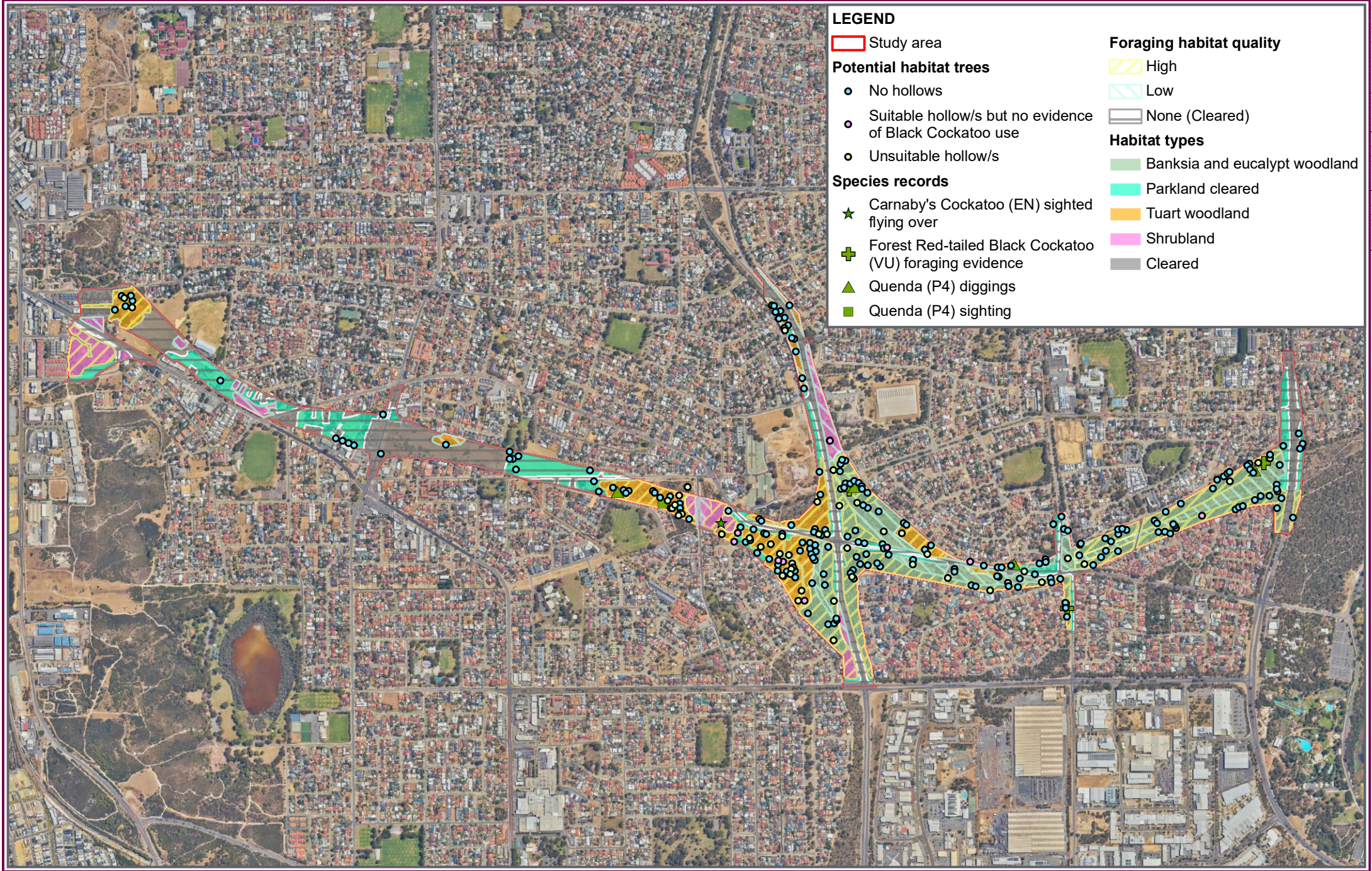
GDA 1994 MGA Zone 50



Project Number: EP3587.001
 Date: 07.03.23
 Scale: 1:20,000 @ A4
 Created by: QS



Source: Cadastre - Landgate, 2022 Orthophoto - Landgate, 2022



LEGEND

Study area

Potential habitat trees

- No hollows
- Suitable hollow/s but no evidence of Black Cockatoo use
- Unsuitable hollow/s

Species records

- ★ Carnaby's Cockatoo (EN) sighted flying over
- ✚ Forest Red-tailed Black Cockatoo (VU) foraging evidence
- ▲ Quenda (P4) diggings
- Quenda (P4) sighting

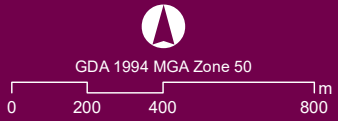
Foraging habitat quality

- ▨ High
- ▨ Low
- ▨ None (Cleared)

Habitat types

- Banksia and eucalypt woodland
- Parkland cleared
- Tuart woodland
- Shrubland
- Cleared

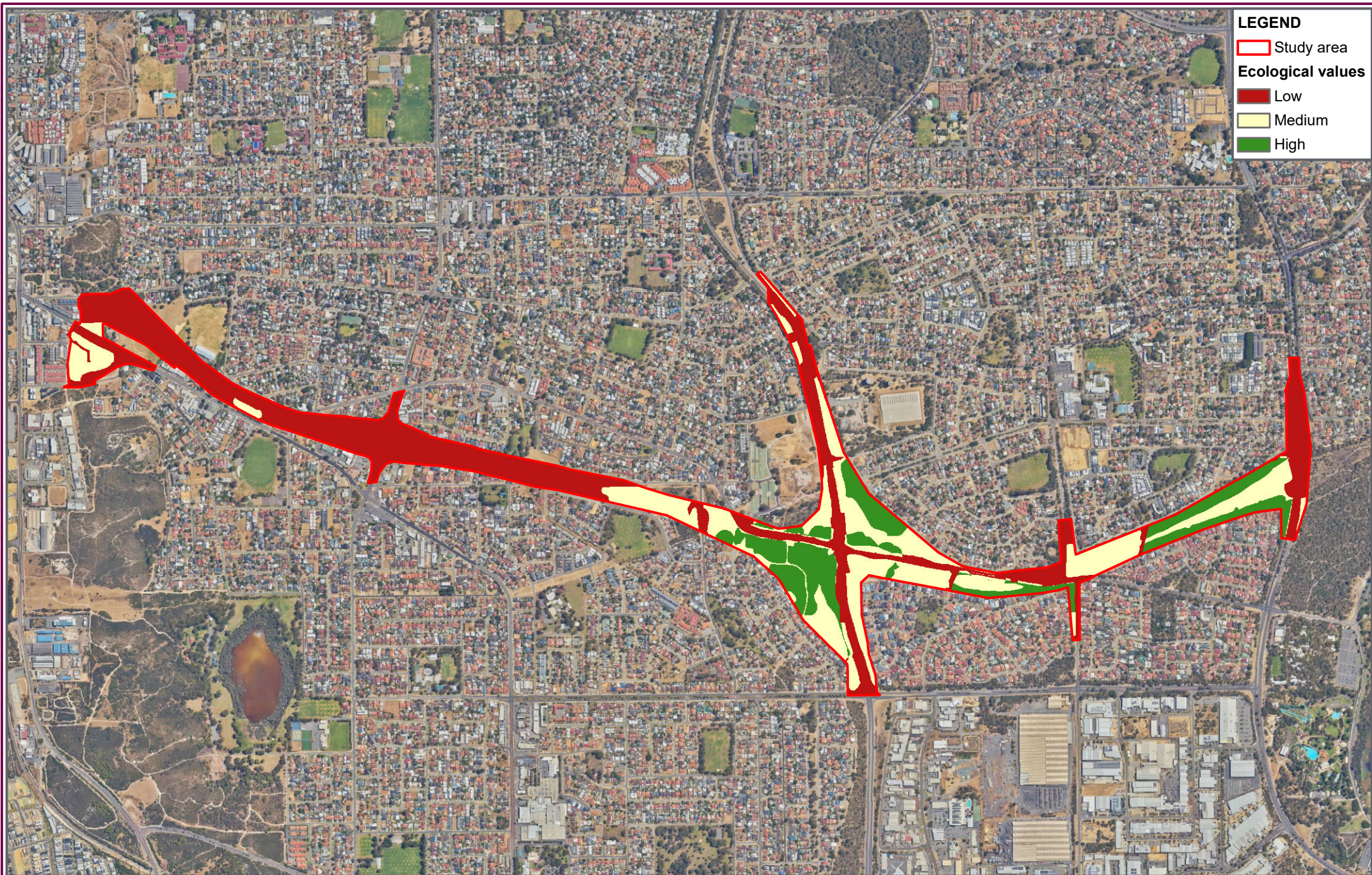
Figure B
Fauna values



Project Number: EP3587-001
Date: 29.11.22
Scale: Map 1:20,000 @ A4
Created by: QS



Source: Cadastre - Landgate, 2022 Orthophoto - Landgate, 2022



LEGEND

- Study area
- Ecological values**
- Low
- Medium
- High

Figure C

Ecological values



GDA 1994 MGA Zone 50



Project Number: EP3587.001
Date: 07.03.23
Scale: Map 1:20,000 @ A4
Created by: QS



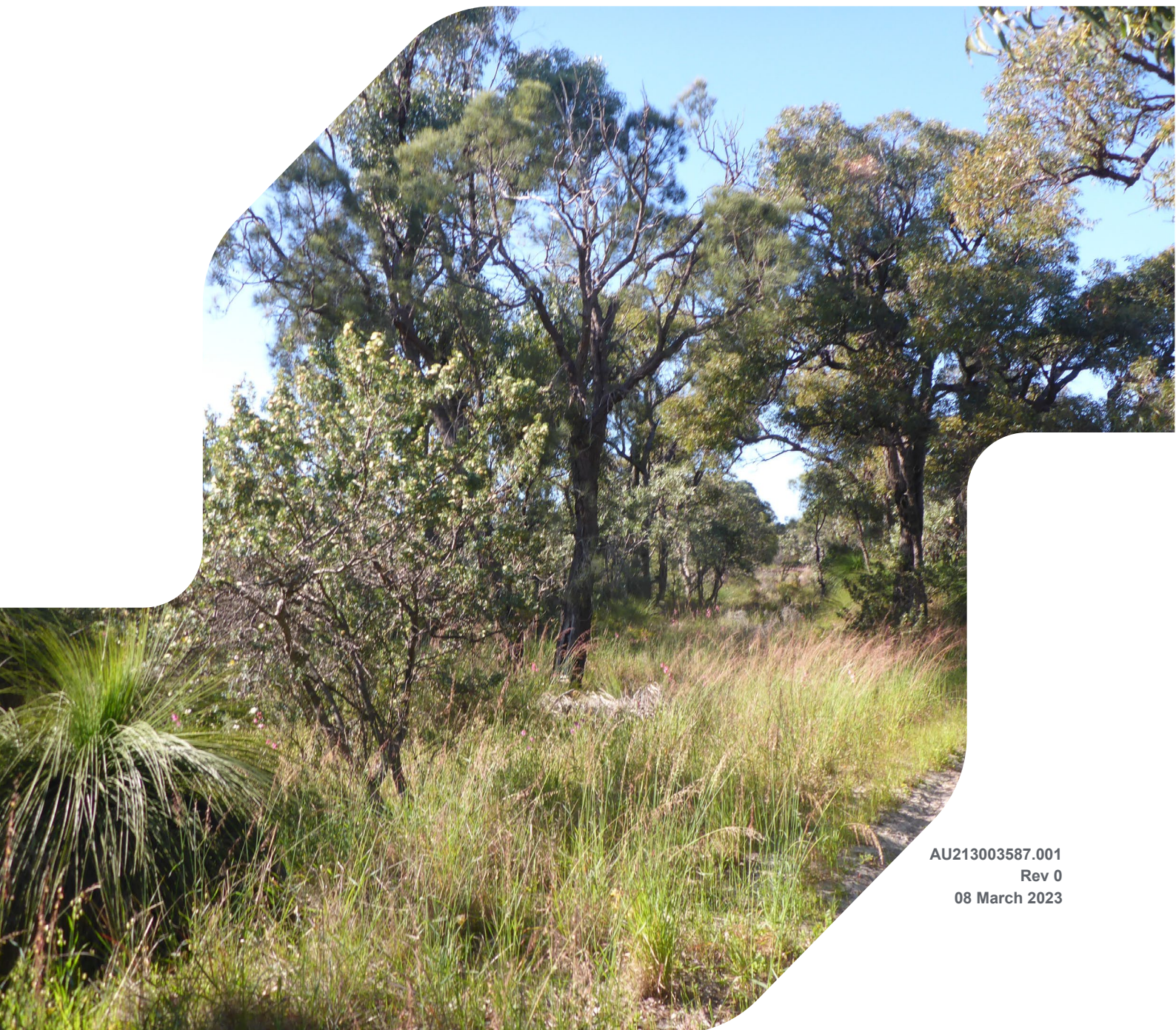
Source: Cadastre - Landgate, 2022 Orthophoto - Landgate, 2022

Appendix A

Detailed flora and vegetation survey

DETAILED FLORA AND VEGETATION ASSESSMENT

Roe 8 (West) and Roe 9



AU213003587.001
Rev 0
08 March 2023

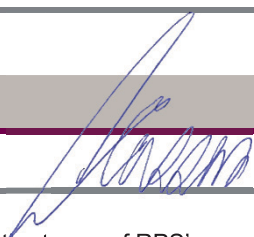
REPORT

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
Draft A	Draft for client review	MarHen	GilGla	NA	11/11/2022
Rev 0	Final for issue	MarHen	GilGla	GilGla	01/03/2003

Approval for issue

G. Glasson



8 March 2023

This report was prepared by RPS within the terms of RPS' engagement with its client and in direct response to a scope of services. This report is supplied for the sole and specific purpose for use by RPS' client. The report does not account for any changes relating the subject matter of the report, or any legislative or regulatory changes that have occurred since the report was produced and that may affect the report. RPS does not accept any responsibility or liability for loss whatsoever to any third party caused by, related to or arising out of any use or reliance on the report.

Prepared by:

RPS

Martin Henson
Lead Botanist

Level 3, 500 Hay Street
Subiaco, WA 6008

T +61 8 9211 1111
E martin.henson@rpsgroup.com.au

Prepared for:

Department of Planning, Lands and Heritage

Scott Haine
Principal Planning Officer

140 William Street
Perth WA 6000

T +61 8 6551 9403
E scott.haine@dplh.wa.gov.au

Contents

EXECUTIVE SUMMARY	1
Survey objectives and scope of works	1
Detailed flora and vegetation survey findings	1
1 INTRODUCTION	3
1.1 Objectives	3
1.2 Scope of work	4
1.2.1 Detailed flora and vegetation survey	4
1.2.2 Targeted conservation significant flora survey	4
1.3 Guiding principles and legislative framework	4
1.3.1 Flora of conservation significance defined in the legislative framework	4
1.3.2 Vegetation of conservation significance	5
1.3.3 Other significant flora and vegetation	5
1.3.4 Introduced species	5
2 METHODS	7
2.1 Desktop review	7
2.1.1 Literature review	7
2.1.2 State and Commonwealth Government database searches	7
2.2 Field surveys	8
2.2.1 Detailed flora and vegetation survey	8
2.2.2 Data analysis	9
2.2.3 Limitations	10
3 EXISTING ENVIRONMENT	11
3.1 Interim Biogeographical Regionalisation of Australia	11
3.2 Climate and weather	11
3.3 Soils and geology	11
3.4 Beard vegetation complexes	12
3.5 Heddle vegetation complex mapping	12
3.6 Bush Forever	13
3.7 Environmentally Sensitive Areas	13
4 RESULTS	15
4.1 Desktop review	15
4.1.1 Flora	15
4.1.2 Vegetation	17
4.2 Field surveys	18
4.2.1 Flora	18
4.2.2 Vegetation	23
4.3 Vegetation extrapolation	32
4.4 Analysis of survey completeness	32
5 DISCUSSION	34
5.1 Flora	34
5.1.1 Significant flora	34
5.1.2 Introduced flora	34
5.2 Vegetation	34
5.2.1 Significant vegetation	34
6 REFERENCES	35

Tables

(contained within report text)

Table 1:	Flora and ecological communities databases searched and corresponding search areas	7
Table 2:	Botanical team personnel.....	8
Table 3:	Survey limitations	10
Table 4:	Soil types within the study area.....	12
Table 5:	Pre-European vegetation associations, remnant extent and reservation status	12
Table 6:	Heddl et al. (1980) vegetation complexes, remnant extent and reservation status.....	14
Table 7:	Conservation significant species recorded by AECOM (2011) within the study area.....	15
Table 8:	DBCAs flora database search results	15
Table 9:	Protected Matters database search results	16
Table 10:	Declared pests and weeds of national significance	21
Table 11:	Declared pests legal status	21
Table 12:	Likelihood of occurrence of conservation significant species	22
Table 13:	Dominant species listing by dendrogram grouping	24
Table 14:	Vegetation units mapped for the study area	25
Table 15:	Species present in FCT 29a.....	28
Table 16:	Condition categories and thresholds for identifying Tuart woodland TEC	30
Table 17:	<i>Eucalyptus gomphocephala</i> patches and relationship to Tuart woodland TEC	31
Table 18:	Vegetation condition rankings	32

Plates

(contained within report text)

Plate 1:	<i>Dodonaea hackettiana</i>	19
Plate 2:	<i>Eryngium pinnatifidum</i> (sens. lat.).....	20
Plate 3:	<i>Jacksonia gracillima</i>	20

Figures

(contained within report text)

Figure 1:	Roe 8 (West) and Roe 9 study area	3
-----------	---	---

(compiled at rear of report)

Figure A	Geology
Figure B	Pre-European vegetation
Figure C	Heddl vegetation complexes
Figure D	ESAs and Bush Forever sites
Figure E	Conservation significant species recorded within 5 km of the study area
Figure F	DBCAs database results: PECs/TECs intersecting the study area
Figure G	Survey sites
Figure H	Track logs showing survey effort
Figure I	Conservation significant species recorded in the study area
Figure J	Vegetation units – map book
Figure K	Vegetation condition – map book
Figure L	Tuart patches in the study area
Figure M	Tuart patches condition
Figure N	Tuart (<i>Eucalyptus gomphocephala</i>) woodlands and forests of the Swan Coastal Plain ecological community

- Figure O Vegetation unit extrapolation 500 m
- Figure P Conservation significant flora and vegetation

Graphs

(contained within report text)

Graph 1:	Average and actual temperature and rainfall for the study area prior to and during the fieldwork	11
Graph 2:	Dendrogram following Primer analysis after singletons and annuals were removed	23
Graph 3:	Relevant dendrogram section from FCT Supergroup 4 and survey data analysis	27
Graph 4:	Species accumulation curve for the survey data	33

Appendices

- Appendix A: Conservation category definitions
- Appendix B: MNES database search results
- Appendix C: Survey site records
- Appendix D: Site species list
- Appendix E: Introduced species list

EXECUTIVE SUMMARY

RPS AAP Consulting Pty Ltd was commissioned by Department of Planning, Lands and Heritage to undertake a detailed flora and vegetation assessment for the Roe 8 (West) and Roe 9 project, incorporating a 104.5 hectare east–west corridor of land (the study area) and situated in the City of Cockburn, approximately 15 kilometres south-south-west of the Perth Central Business District.

Survey objectives and scope of works

The objectives of this detailed flora and vegetation assessment were to:

- Identify and characterise the flora and vegetation within the study area, via provision of a comprehensive flora inventory and vegetation unit and condition mapping.
- Identify the presence and extent of conservation significant flora and ecological communities that are currently listed under the state *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) within the study area.
- Describe the flora and vegetation values present, or likely to be present within the study area that may be directly or indirectly impacted by the implementation of the Roe 8 (West) and Roe 9 project, including an analysis of the significance of flora and vegetation in local, regional and state contexts.
- Map the location and extent of conservation significant flora and vegetation within the study area.

This flora and vegetation assessment included:

- A two-phase detailed flora and vegetation survey:
 - Supplementary winter survey was carried out over four days (22 to 25 August 2022)
 - Primary spring survey was carried out over four days (27 to 30 September 2022)
- Targeted Threatened flora (TF) and Priority flora (PF) survey of known or potentially suitable habitat for each of the target species within the study area at the appropriate time (the documented peak flowering time).

This report documents the methods and outcomes of the desktop study and detailed flora and vegetation assessment undertaken between August and September 2022.

Detailed flora and vegetation survey findings

- One hundred and forty-seven taxa were recorded during this survey, from 44 families. Of these, 46 were introduced, making 31.5% of the total list introduced taxa
- No TF species listed under the BC Act or the EPBC Act were recorded within the study area
- One PF species, *Dodonaea hackettiana* (Priority 4), was identified within the study area. Three hundred and forty-six individuals were recorded proximate to the Forrest Road–Stock Road intersection
- No flora species of other conservation significance based on one or more criteria listed in the EPA's environmental factor guideline for flora and vegetation were recorded within the study area
- The Western Australian Organism List database was searched to determine the legal status of each weed recorded, and any control requirements that may apply under the *Biosecurity and Agriculture Management Act 2007*. Four weed species recorded were determined to either be Declared Pests or Weeds of National Significance
- A total of five remnant native vegetation units were described and mapped for the study area:
 - EgBaXp – *Eucalyptus gomphocephala* mid woodland to open woodland over *Banksia attenuata* low open woodland over *Xanthorrhoea preissii* sparse shrubland over **Freesia alba* × *leichtlinii*, **Oxalis pes-caprae* forbland, **Ehrharta longiflora*, **E. calycina* tussock grassland

- (Eg)EmCcBam – *Eucalyptus gomphocephala* mid isolated trees, *Eucalyptus marginata*, *Corymbia calophylla* mid woodland over *Banksia attenuata*, *B. menziesii*, *Allocasuarina fraseriana* low (open) woodland over *Xanthorrhoea preissii* sparse shrubland over **Freesia alba* × *leichtlinii*, **Oxalis pes-caprae* forbland, **Ehrharta calycina*, **E. longiflora* (sparse) grassland
- JfKg (Rehab) – *Corymbia calophylla* isolated to sparse mid trees over *Jacksonia furcellata*, *Kunzea glabrescens* tall sparse shrubland over *Acacia pulchella* var. *glaberrima* mid sparse shrubs over *Gompholobium tomentosum* low sparse shrubs over **Hypochaeris glabra* isolated forbs, **Ehrharta longiflora* isolated grasses
- ArBss – *Acacia rostellifera*, *Banksia sessilis* var. *sessilis* tall shrubland over **Ehrharta calycina*, **E. longiflora* sparse grassland over **Oxalis pes-caprae* forbland on limestone outcrop
- EgD - *Eucalyptus gomphocephala* mid woodland over *Acacia rostellifera*, **Schinus terebinthifolia* low open shrubland over **Oxalis pes-caprae* closed forbland
- Two ecological communities of conservation significance were identified within the study area:
 - State-listed Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain (Priority 3) ecological community / Commonwealth-listed Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain ecological community (Critically Endangered)
 - State-listed Banksia dominated woodlands of the Swan Coastal Plain IBRA region (Priority 3) ecological community / Commonwealth-listed Banksia Woodlands of the Swan Coastal Plain ecological community (Endangered)
- One vegetation unit, ArBss, shows floristic and landform affinity to a state listed Priority3 ecological community; coastal shrublands on shallow sands, southern Swan Coastal Plain ('floristic community type 29a')
- Forty-eight per cent of the study area was assessed to be in Completely Degraded condition, and 51% assessed as Good to Degraded condition.

1 INTRODUCTION

RPS AAP Consulting Pty Ltd (RPS) was commissioned by Department of Planning, Lands and Heritage (DPLH) to undertake a detailed flora and vegetation assessment for the Roe 8 (West) and Roe 9 project, incorporating a 104.5-hectare (ha) east-west corridor of land currently reserved for Primary Regional Roads (PRR) purposes under the Metropolitan Region Scheme (MRS) (hereafter referred to as ‘the study area’).

The study area is located approximately 15 kilometres (km) south-south-west of the Perth Central Business District in the City of Cockburn. The study area is a narrow easement linking North Lake Road in Bibra Lake almost to Hampton Road in Hamilton Hill, with some extension north and south along crossing roads (Figure 1).



Figure 1: Roe 8 (West) and Roe 9 study area

1.1 Objectives

The objectives of this detailed flora and vegetation assessment were to:

- Identify and characterise the flora and vegetation within the study area, via provision of a comprehensive flora inventory and vegetation unit and condition mapping.
- Identify the presence and extent of conservation significant flora and ecological communities that are currently listed under the state *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) within the study area.
- Describe the flora and vegetation values present, or likely to be present within the study area that may be directly or indirectly impacted by the implementation of the Roe 8 (West) and Roe 9 project, including an analysis of the significance of flora and vegetation in local, regional and state contexts.
- Map the location and extent of conservation significant flora and vegetation within the study area.

1.2 Scope of work

This detailed flora and vegetation assessment included a:

- Detailed flora and vegetation survey
- Targeted Threatened flora (TF) and Priority flora (PF) survey of known or potentially suitable habitat for each of the target species within the study area at the appropriate time (the documented peak flowering time).

This report documents the methods and outcomes of the desktop study and detailed flora and vegetation assessment undertaken between August and September 2022.

1.2.1 Detailed flora and vegetation survey

The detailed survey was undertaken over two phases:

- Supplementary winter survey was conducted over four days (22 to 25 August 2022)
- Primary spring survey was conducted over four days (27 to 30 September 2022).

The detailed survey involved the sampling of the full range of vegetation communities and flora within the study area. A total of ten 10 metre (m) × 10 m (or equivalent) floristic quadrats and 16 relevés (unbounded) were sampled.

1.2.2 Targeted conservation significant flora survey

A targeted survey was undertaken concurrently with the Primary spring survey and involved searches of all potentially suitable habitats for target species within the study area. Significant flora taxa identified as having a moderate or higher likelihood of occurring within the study area (based on proximity of known records and / or presence of suitable habitat) were the focus of the targeted searches. The targeted searches were undertaken during the documented flowering time of the target species.

1.3 Guiding principles and legislative framework

Commonwealth and state legislation pertaining to the conservation of native flora and vegetation include the EPBC Act, BC Act and *Environment Protection Act 1986* (EP Act).

The EP Act governs environmental impact assessment and protection in Western Australia. The aim of the EP Act is “to provide for an EPA, for the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with foregoing”.

The EP Act states that the following principles, applicable to native flora and vegetation should be adhered to for protection of the environment of Western Australia:

1. The precautionary principle – where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
2. The principle of intergenerational equity – the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.
3. The principle of the conservation of biological diversity and ecological integrity – conservation of biological diversity and ecological integrity should be a fundamental consideration.

1.3.1 Flora of conservation significance defined in the legislative framework

Within Western Australia, TF are listed if they are considered to be in danger of extinction, rare or otherwise in need of special protection. These taxa are legally protected under the BC Act. The removal of these taxa or impact to their surroundings is not permitted without prior Ministerial approval.

The Department of Biodiversity Conservation and Attractions (DBCA) maintains a list of PF species that may be rare or Threatened, but for which there are either insufficient survey data to determine accurately their status, or which are rare but not currently considered to be Threatened. A PF taxon is assigned to one of four priority categories. TF and PF categories are defined in Appendix A, Table A-1.

Many taxa listed as TF under the BC Act have additional protection as they are also listed as TF under one of five threat categories (Extinct, Extinct in the wild, Critically Endangered, Endangered or Vulnerable) under the EPBC Act.

TF taxa are defined as Matters of National Environmental Significance (MNES) under the EPBC Act and penalties apply for any damage to individuals, populations or habitats of these flora.

The EPBC Act conservation category codes are defined in Appendix A, Table A-2.

1.3.2 Vegetation of conservation significance

Under the BC Act and the EP Act, Threatened Ecological Communities (TECs), classified by DBCA in one of the TEC categories (Appendix A, Table A-3) have limited protection. Other ecological communities are classified by DBCA in the category of Priority Ecological Communities (PECs) (Appendix A, Table A-4) pending further survey and/or definition.

State listing of TECs and Commonwealth listing of TECs have separate and independent listing processes. The EPBC Act threat categories for TECs are defined in Appendix A, Table A-5.

1.3.3 Other significant flora and vegetation

Under the Environmental Protection Authority's (EPA) environmental factor guideline, flora and vegetation may be considered significant for a range of reasons, other than listing as a Threatened or Priority species or ecological community, including:

- Flora may be significant for:
 - Local endemism or association with a restricted habitat type (e.g. surface water or Groundwater Dependent Ecosystems)
 - New species or anomalous features that indicate a potential new species
 - Representing the range of a species (particularly at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)
 - Being unusual species, including restricted subspecies, varieties or naturally occurring hybrids
 - Having relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.
- Vegetation may be significant for:
 - Having restricted distribution
 - Being subject to a degree of historical impact from threatening processes
 - Having a role as a refuge
 - Providing an important function required to maintain ecological integrity of a significant ecosystem.

1.3.4 Introduced species

Introduced flora (weeds) are plants that require action to reduce their negative effects on the economy, environment and human health or amenity. Weeds can reduce the quality of Australia's agricultural, horticultural and forestry industries. They can affect the structure and function of ecosystems, posing threats to biodiversity and natural values by successfully out-competing native species for available nutrients, water, space and sunlight. Weeds can also increase the biomass of ecosystems, leading to more intense bushfires and changing the composition and structure of native vegetation (Invasive Plants and Animals Committee 2016).

Management of some weed species is required under Commonwealth or state frameworks. Key classifications for significant introduced flora that are relevant to this report are:

REPORT

- Declared Pest – the *Biosecurity and Agriculture Management Act 2007* (BAM Act), Section 22 makes provision for a plant taxon to be listed as a Declared Pest organism in parts of, or the entire state. Under the Biosecurity and Agriculture Management Regulations 2013, Declared Pests are assigned to one of three control categories that dictate the level of management required (Department of Primary Industries and Regional Development (DPIRD) 2022)
- Weed of National Significance (WoNS) – high impact, established introduced flora causing major economic, environmental, social and/or cultural impacts in a number of states/territories, and which have strong potential for further spread (Invasive Plants and Animals Committee 2016). Management is required in accordance with DPIRD guidelines for particular WoNS. Not all WoNS are recognised as Declared Pests in WA.

Throughout this report, introduced flora species are indicated with an asterisk (*) and non-locally native species (often planted) are indicated with an octothorp (#).

2 METHODS

2.1 Desktop review

As a component of the detailed flora and vegetation assessment, desktop review was undertaken prior to the field surveys to make the best possible use of existing data from the area and to identify specific flora and vegetation values which may occur within, or proximate to, the study area. This involved a review of:

- High resolution aerial imagery
- Available literature including previous flora and vegetation survey reports and spatial datasets
- Search results of Commonwealth Government databases for TF and TECs protected under the EPBC Act
- DBCA databases and mapping for TF and PF.

2.1.1 Literature review

A selection of available literature was reviewed to provide context to the study area. This included:

- Approved Conservation Advice (incorporating listing advice) for the Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain ecological community (Threatened Species Scientific Committee 2019)
- Tuart Woodlands and Forests of the Swan Coastal Plain: A Nationally Significant Ecological Community (Department of the Environment and Energy 2019)
- Target Ecosystem Identification and Baseline Inventory Report, Roe 8 Cleared Areas (Emerge Associates 2018)
- Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community (Department of the Environment and Energy 2016)
- Roe Highway Extension Kwinana Freeway to Stock Road: Vegetation and Flora Assessment Phase 2 (AECOM 2011)
- Tuart (*Eucalyptus gomphocephala*) and Tuart Communities (Perth Branch Wildflower Society of Western Australia (Inc) 2002)
- Environmental values associated with the alignment of Roe Highway (Stage 8), A report by the Environmental Protection Authority under Section 16(j) of the *Environmental Protection Act 1986*, Bulletin 1088 (EPA 2003)
- Bush Forever: Volumes 1 and 2 (Government of Western Australia 2000).

2.1.2 State and Commonwealth Government database searches

Database searches were conducted to determine a list of conservation significant flora and ecological communities (i.e., those protected under the BC Act and / or the EPBC Act or considered Priority species / communities by the DBCA) that may occur within the study area. The searches were centred on the point 32.0852 S, 115.7873 E. The databases searched and the corresponding search areas are provided in Table 1.

Table 1: Flora and ecological communities databases searched and corresponding search areas

Database name	Governing organisation	Search area defined
Western Australian DBCA Threatened and Priority Flora database Western Australian Herbarium (WAH) Specimen database	DBCA	Study area plus 10 km buffer
Western Australian DBCA TEC/PEC database Protected Matters database for MNES	DBCA Department of Climate Change, Energy, the Environment and Water (DCCEEW)	Study area plus 10 km buffer Circle search within a 50 km of the study area

Conservation significant flora species reported by the database searches were reviewed on FloraBase (WAH 1998-). Conservation significant ecological communities reported by the database searches were studied by reference to relevant conservation advice.

2.2 Field surveys

The field surveys were coordinated by RPS' Managing Botanist Martin Henson and conducted by him and consultant botanist Frank Obbens (Table 2).

Table 2: Botanical team personnel

Personnel	Role	Licence
Martin Henson	Lead botanist, taxonomy	FB62000110-2, TFL 2223-0050
Frank Obbens	Field botanist, taxonomy	

2.2.1 Detailed flora and vegetation survey

A detailed (plot-based) flora and vegetation survey was undertaken in accordance with Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016). Detailed surveys are required if the study area supports a high diversity of flora or vegetation, restricted landforms or vegetation types or significant flora or vegetation (amongst other criteria). A targeted survey was also undertaken to search for known conservation significant species within the study area and for occurrences of taxa assessed as potentially occurring following the results of the desktop review.

The purpose of the detailed and targeted surveys was to provide adequate local and regional context for the flora and vegetation values of the study area across multiple sampling visits in different seasons.

Field methods for the surveys included:

- Surveying of quadrats and relevés
- Targeted searches
- Vegetation type and condition mapping
- TEC/PEC assessment.

Prior to the commencement of the field survey, data including satellite imagery, survey boundary, and pre-selected vegetation quadrats were loaded onto electronic field devices. The field survey involved assessing and mapping vegetation boundaries, conducting quadrat and relevé sampling and collecting opportunistic flora specimens. GPS locations of vegetation and condition boundaries, survey sites and flora specimen data were recorded digitally

2.2.1.1 Surveying of quadrats and relevés

Quadrat locations were chosen to ensure adequate coverage of the major vegetation types (as assessed from aerial photography) present in the study area. Quadrats were pre-selected in this manner, but final placement was determined in the field during the supplementary survey. Relevés were used to provide context in vegetation like that described by quadrat. Occasionally a simple vegetation note was made with a GPS waypoint for reference.

In total ten quadrats and 16 relevés (unbounded) were surveyed across the study area. Relevés were floristically described to the same standard as quadrats without the edaphic data. Quadrats were revisited and rescored during the primary spring survey.

A minimum of three quadrats should be sampled in each vegetation type to allow a measure of statistical accuracy. Due to the overall disturbed nature of the vegetation in the study area, with a lot of lower stratum species missing, it was considered that there was minimal value to the establishment of new quadrats once the vegetation type had been defined. Relevés were used to provide supporting data - while each relevé is unbounded, as opposed to the defined 10 m × 10 m quadrat, the data was collected with the same rigour. In the case of the ArBss vegetation unit, its degraded nature meant that there were very few species present, and the density of the Acacia thicket made establishing quadrats extremely difficult. Relevés were preferred, in this instance. Due to the relatively small extent of the EgD vegetation unit, one quadrat site was sampled.

Quadrats were established at 10 m × 10 m as required in the Swan Coastal Plain bioregion (EPA 2016). Information collected included:

- Location: Waypoints were taken of each quadrat corner using a hand-held GPS unit in GDA94 datum
- Vegetation description: A broad description of the vegetation using the National Vegetation Information System (NVIS) framework (Department of the Environment and Energy 2017)
- Geology: A broad description of soil and rock type
- Disturbance: Observed disturbances (e.g. weed invasion, tracks, rubbish dumping)
- Vegetation condition: Using the scale of Keighery (1994) as required for the Swan Coastal Plain bioregion (EPA 2016)
- Comprehensive species list of flora in quadrat, with height and percentage foliar cover estimates
- Digital photograph taken from the north-west corner of the quadrat.

Collections were made of all species not known to the botanists. All collections were pressed and later identified using the resources of the WAH, relevant keys and literature.

2.2.1.2 Targeted searches

Spring targeted searches were undertaken for conservation significant flora. Vegetation was traversed on foot in meandering transects concentrated on habitat likely to support significant flora. Where an individual or population was recorded, a GPS point was taken and a count made of individuals within a 5 m radius of the point. Waypoints were then mapped.

2.2.1.3 Vegetation and condition mapping

Vegetation mapping was undertaken at a scale of 1:10,000 using NVIS sub-association (Level 5) for structural descriptions (Department of the Environment and Energy 2017) (Appendix A, Table A-6 and Table A-7).

The condition of the vegetation across the study area was mapped using the appropriate condition scale recommended by EPA (2016) for the Swan Coastal Plain (i.e. adapted from Keighery (1994) and Trudgen (1988); Appendix A, Table A-8). Vegetation condition rankings are defined by the integrity of the vegetation structure, the level of disturbance from various sources with the most common being weed presence/cover, and an assessment of the vegetation's ability to regenerate. Condition ranges from Pristine, meaning that there are no obvious signs of disturbance, to Completely Degraded in which only a few native trees or shrubs may be present with most of the flora introduced.

2.2.1.3.1 TEC/PEC assessment

Assessment of TEC/PEC not reported in the study area because the DBCA database search is based on the description and key diagnostics of the ecological community in relevant conservation advice or referral guidelines.

2.2.2 Data analysis

2.2.2.1 Vegetation types

Data analysis was used to support definition of vegetation types based on species presence/absence in each quadrat and relevé. Data was entered into an Access database then exported to Excel and entered into a Primer 7 (Clarke and Gorley 2015) worksheet. Data was 'cleaned' by removing annuals and singletons (species that only appear once but may affect the analysis) from the site/species matrix. A cluster analysis was performed on the remaining data. Data was pre-treated using a square root transformation then Bray-Curtis association for resemblance. The resulting dendrogram illustrated the similarities in the vegetation types identified, showing structurally different units at the local scale. As comparison, similar analysis was conducted using the dataset with introduced species also removed without producing materially different results. This approach however left some relevés without a species list for descriptive purposes.

EPA (2016) indicates that ephemeral species should be included in analysis when surveying the Swan Coastal Plain. However, as most ephemeral species recorded during this survey are introduced, and widely spread in differing vegetation types, their presence reduced distinctions between vegetation types.

2.2.2.2 Analysis of survey completeness

Using the routine available in the Primer 7 (Clarke and Gorley 2015) statistical package, a species accumulation curve was produced of the data collected during this survey. The accumulation curve provides an indication of whether the number of samples taken has adequately represented the available diversity in the study area. As the curve reaches its theoretical asymptote it flattens out, indicating that most of the species in the study area have been sampled.

2.2.2.3 Vegetation extrapolation

EPA (2016) indicates that surveys of linear corridors ‘should incorporate vegetation unit characterisation of an area from 500 m to 1,000 m on both sides’ to provide context for impact assessments. To fulfil this requirement, aerial photography was used to examine 500 m to either side of the study area. Vegetation units present within this corridor were extrapolated from those present within the study area, with a brief site visit to assess the accuracy of the extrapolation.

2.2.3 Limitations

Botanists who conduct flora and vegetation surveys for environmental impact assessment in Western Australia are obliged to report on the limitations and constraints in such studies. Some potential limitations / constraints on surveys may adversely impact on the scientific rigour, completeness or validity of the survey results. EPA (2016) identifies standard limitations that can limit and constrain the validity of flora and vegetation surveys. These limitations / constraints and their relevance to this assessment are presented in Table 3.

Table 3: Survey limitations

Constraint	Limitation
Availability of contextual information at a regional and local scale	No. The Swan Coastal Plain is well surveyed, and contextual information relevant to the study area was readily available.
Competence and experience of the field team	No. The botanists undertaking this work each have over 20 years’ experience in Western Australia and the Swan Coastal Plain.
Proportion of flora recorded and/or collected, and problems with taxonomic determinations	No. The Species Accumulation Curve (SAC) shows that a high proportion of the flora was recorded. There were no problems with taxonomic determination of collected specimens,
The effort and extent of the survey	No. Given that the SAC showed a high proportion of the flora was collected, and that all parts of the study area were visited, the extent and effort is considered adequate.
Survey timing, rainfall, season of survey	No. The survey was conducted in two seasons as required for a detailed survey, including spring. Graph 1 shows that while the first two months of winter had been drier than average the two months in which the survey was conducted were above average in rainfall.
Disturbances that may have affected the results of survey such as fire, flood or clearing	No. Recent disturbance was confined to areas that had been cleared in 2017 in preparation for roadworks; these areas are now under rehabilitation after being replanted and were mapped as such. Other disturbances, such as weed invasion and infrastructure, are historical.
Access restrictions within the study area	No. All parts of the study area containing native vegetation were accessible to survey thanks to the DPLH. Private property with infrastructure and housing was not accessible but as native vegetation had been cleared in these areas there was no need to survey.

3 EXISTING ENVIRONMENT

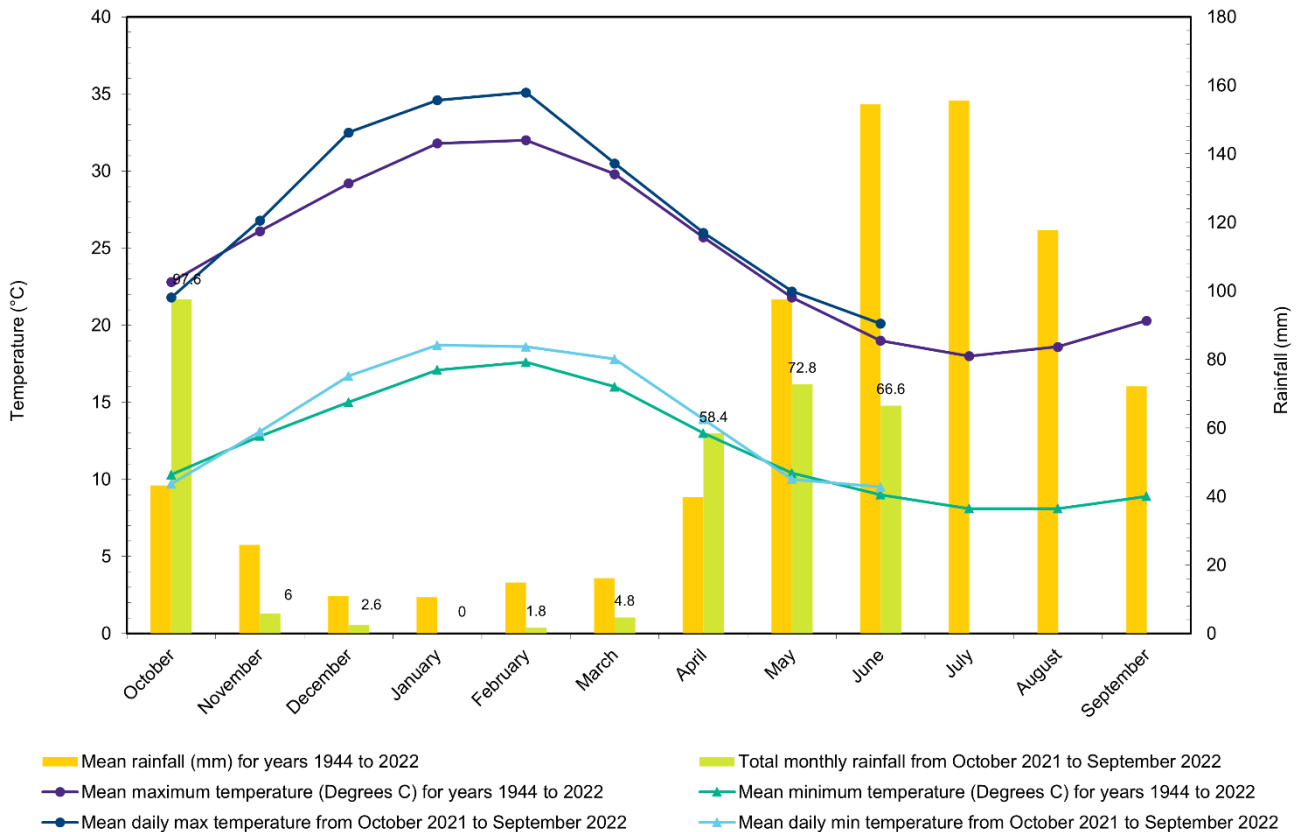
3.1 Interim Biogeographical Regionalisation of Australia

The Interim Biogeographical Regionalisation of Australia (IBRA) currently recognises 89 bioregions based on common climate, geology, landform native vegetation and species information. These bioregions are further split into 419 subregions – units that are more localised and geomorphologically homogenous within the bioregions. The study area is situated in the Perth subregion (SWA02) of the Swan Coastal Plain bioregion (DCCEEW 2021).

The Swan Coastal Plain is a low-lying coastal plain once mainly covered by woodlands. The Perth subregion is composed of colluvial and aeolian sands, alluvial river flats and coastal limestone (Mitchell et al. 2002). Rainfall ranges from between 600 millimetres (mm) annually in the north to 1,000 mm annually in the south, with the subregion covering 1,142,330 ha.

3.2 Climate and weather

The climate is classified as Warm Mediterranean (Mitchell et al. 2002), experiencing warm and dry summers and mild, wet winters. Graph 1 shows the mean climatic conditions for the survey area and the actual conditions for the 12 months preceding and over the survey, taken from the closest Bureau of Meteorology (BoM) recording station at the Perth Airport (No. 009021).



(Source: BoM 2022)

Graph 1: Average and actual temperature and rainfall for the study area prior to and during the fieldwork

3.3 Soils and geology

The study area is located on the Spearwood Dune system of the Swan Coastal Plain (Geological Survey of Western Australia, 1986). The Spearwood dunal system formed during the Pleistocene glacial and interglacial periods around 40,000 years ago and is made up of yellow brown sands of varying thickness over Tamala limestone. The two soil types within the study area are identified and described in Table 4.

Table 4: Soil types within the study area

Code	Soil type	Description	Area (%)
Ls1	Limestone	Pale yellowish brown fine-grained angular and medium-grained rounded quartz and calcite cross-bedding minor heavy minerals	20.457 (19.75)
S7	Sand	Pale and olive-yellow medium to coarse-grained sub-angular quartz moderately sorted of residual origin modified by marine inundation	84.095 (80.43)

(Source: Department of Mines, Industry Regulation and Safety 2022)

The soil type mapping for the study area is presented in Figure A.

3.4 Beard vegetation complexes

Regional scale pre-European vegetation mapping for Western Australia (Beard et al. 2013; DPIRD 2018) identifies two mapped vegetation associations in the study area. Table 5 identifies the remnant extent and reservation status of these vegetation associations within the Swan Coastal Plain bioregion / Perth (SWA02) subregion.

Table 5: Pre-European vegetation associations, remnant extent and reservation status

Vegetation association	Pre-European extent (ha)	2018 extent (ha)	% remaining	% of present extent in secure tenure
6 Medium Woodland; Tuart and Jarrah	56,343.01	13,362.25	23.72	3.30
998 Medium Woodland Tuart	50,867.50	18,492.32	36.35	13.30

(Source: Government of Western Australia 2019)

Vegetation Association 6 – Medium Woodland; Tuart and Jarrah has between 10% and 30% of its pre-European extent remaining within the Perth (SWA02) subregion. While the EPA’s objective is to retain at least 30% of the pre-clearing extent of each ecological community, the EPA also has a modified objective to retain at least 10% of the pre-clearing extent of each ecological community within defined constrained (intensely developed) areas in the Perth Metropolitan Region (PMR) portion of the Swan Coastal Plain.

The pre-European vegetation association mapping for the study area is presented in Figure B.

3.5 Heddle vegetation complex mapping

Vegetation complexes are vegetation associations that are characteristic of various combinations of soil, landform and rainfall. A large part of the Swan Coastal Plain has been mapped for vegetation complexes by Heddle et al. (1980). These complexes are closely related to the Swan Coastal Plain dune systems (Quindalup, Spearwood, Bassendean, and Pinjarra Plain) and north to south variations in climate and rainfall.

Heddle et al. (1980) mapped the vegetation within the survey area as:

- Karrakatta Complex Central and South: Predominantly open forest of *Eucalyptus gomphocephala*, *E. marginata*, *Corymbia calophylla* commonly with *Banksia menziesii*, *B. attenuata* (north of Mandurah) and *Allocasuarina fraseriana*
- Cottesloe Complex Central and South: Mosaic of woodland of *Eucalyptus gomphocephala* and open forest of *E. gomphocephala*, *E. marginata*, *Corymbia calophylla*; closed heath on the Limestone outcrops
- Bassendean Complex Central and South: Woodland of *Eucalyptus marginata* – *Corymbia calophylla* with well-defined second storey of *Allocasuarina fraseriana* and *Banksia grandis* on deeper soils and a closed scrub on the moister sites. The understorey species reflect similarities with the adjacent vegetation complexes.

The remnant extent and reservation status of these vegetation complexes on the Swan Coastal Plain and Perth Peel region is presented in Table 6. The remnant extent and reservation status has been taken from the EPA's Section 16 interim strategic advice on Perth and Peel @3.5 million (EPA 2015), which is the most current published dataset for Heddle vegetation complexes. Vegetation complex mapping is presented in Figure C.

The Cottesloe Complex Central and South vegetation complex has greater than 30% of its pre-European extent remaining on the Swan Coastal Plain and Perth Peel region. However, there is between 10% and 30% of the pre-European extent remains of the Karrakatta Complex Central and South and Bassendean Complex Central and South across the Swan Coastal Plain and Perth Peel region. The extents remaining of the Karrakatta Complex Central and South and Bassendean Complex Central and South do not meet the EPA's target to retain at least 30% of the pre-clearing extent of each ecological community, consistent with recognised retention levels (EPA 2015). The EPA has a modified objective to seek to retain at least 10% of pre-clearing extent of each ecological community for defined constrained areas (intensely developed) in the Perth Metropolitan and Bunbury regions (EPA 2015). The extents remaining of the Karrakatta Complex Central and South and Bassendean Complex Central and South meet the EPA's modified 10% retention target for constrained (intensely developed) areas in the Perth Metropolitan Region.

3.6 Bush Forever

The Perth Metropolitan Region portion of the Perth (SWA02) subregion has had a comprehensive study made of the reservation status, resulting in areas set aside for protection by reservation as a Bush Forever site. No Bush Forever sites intersect the study area, although Bush Forever Site 244: North Lake and Bibra Lake, North Lake/Bibra Lake, is situated adjacent to its eastern boundary. Bush Forever sites are mapped in relation to the study area in Figure D using the latest state government datasets.

3.7 Environmentally Sensitive Areas

Under section 51B of the EP Act the Minister for Environment may declare by notice either a specified area of the state or a class of areas of the state to be an Environmentally Sensitive Area (ESA). ESAs are declared in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*, which was gazetted on 8 April 2005.

The following areas are declared to be ESAs:

- Declared World Heritage property as defined in section 13 of the EPBC Act
- Area that is included on the Register of the National Estate, because of its natural heritage value, under the *Australian Heritage Council Act 2003*
- Defined wetland and the area within 50 m of the wetland. Defined wetlands include Ramsar wetlands, Conservation Category Wetlands and nationally important wetlands
- Area covered by vegetation within 50 m of rare flora, to the extent to which the vegetation is continuous with the vegetation in which the rare flora is located
- Area covered by a TEC
- Bush Forever site listed in Bush Forever: Volumes 1 and 2 (Government of Western Australia 2000), except to the extent to which the site is approved to be developed by the Western Australian Planning Commission.

ESAs are mapped in relation to the study area in Figure D using the latest state government datasets. Figure D shows association between the Bush Forever and ESA mapping

Table 6: Heddle et al. (1980) vegetation complexes, remnant extent and reservation status

Vegetation complex	Description	Swan Coastal Plain bioregion			Perth Peel region		
		Pre-European extent (ha)	2015 extent (ha)	% remaining	Pre-European extent (ha)	2015 extent (ha)	% remaining
Karrakatta Complex Central and South	Predominantly open forest of <i>Eucalyptus gomphocephala</i> , <i>E. marginata</i> , <i>Corymbia calophylla</i> commonly with <i>Banksia menziesii</i> , <i>B. attenuata</i> (north of Mandurah) and <i>Allocasuarina fraseriana</i>	50,080	11,518	23	38,436	6,461	16.8
Cottesloe Complex Central and South	Mosaic of woodland of <i>Eucalyptus gomphocephala</i> and open forest of <i>E. gomphocephala</i> , <i>E. marginata</i> , <i>Corymbia calophylla</i> ; closed heath on the Limestone outcrops.	45,226	15,180	33.6	43,894	14,621	33.3
Bassendean Complex Central and South	Woodland of <i>Eucalyptus marginata</i> – <i>Corymbia calophylla</i> with well-defined second storey of <i>Allocasuarina fraseriana</i> and <i>Banksia grandis</i> on deeper soils and a closed scrub on the moister sites. The understorey species reflect similarities with the adjacent vegetation complexes.	87,416	22,846	26.1	63,451	13,486	21.3

(Source: EPA 2015)

4 RESULTS

4.1 Desktop review

4.1.1 Flora

4.1.1.1 Literature review

AECOM (2011) recorded a total of 435 taxa, from 80 families and 244 genera, from their 2011 survey area, which included a portion of the study area (indicatively between Southwell Crescent and North Lake Road) within its extent. One hundred and thirty-eight taxa were introduced, comprising 31% of the species list.

AECOM (2011) recorded three conservation significant species in the eastern part of the study area (Table 7).

Table 7: Conservation significant species recorded by AECOM (2011) within the study area

Taxon	State status	Common name	Habitat	Location
<i>Dodonaea hackettiana</i>	Priority 4	Hackett's hopbush	Sand, outcropping limestone	One individual recorded near the Forrest Road–Stock Road intersection
<i>Eryngium pinnatifidum</i> subsp. <i>palustre</i> (GJ Keighery 13459)	Priority 3	Blue devils	Clay, sandy clay and grey or black peaty sand, or occasionally sandy rises	<ul style="list-style-type: none"> Three populations recorded between North Lake Road and Southwell Crescent One population was recorded along Stock Road to the south of Phoenix Road
<i>Jacksonia gracillima</i>	Priority 3		Sandplain, winter-wet flats, sand dunes, grey sand, exposed limestone	One population of recorded to the west of Southwell Crescent

4.1.1.2 DBCA flora database searches

Searches of the DBCA Threatened and Priority Flora database and the WAH specimen database were undertaken within a 10 km radius of the study area.

A total of 28 species of conservation significance were found to occur within the search radius comprising three Threatened, three Priority 1, two Priority 2, 13 Priority 3 and seven Priority 4 flora taxa. The list of conservation significant species identified by the DBCA flora database searches is presented in Table 8. The TF/PF records are mapped in relation to the study area in Figure E.

Table 8: DBCA flora database search results

Taxon	BC Act / state status	Common name	Habitat	Closest record
<i>Acacia lasiocarpa</i> var <i>bracteolata</i> long peduncle variant (GJ Keighery 5026)	Priority 1		Grey or black sand over clay, swampy areas, winter wet lowlands	0.88 km to SE
<i>Angianthus micropodioides</i>	Priority 3		Saline, sandy soils, river edges, claypans	5.7 km to N
<i>Austrostipa mundula</i>	Priority 3		Grey sand with outcropping limestone	5.6 km to N
<i>Beyeria cinerea</i> subsp. <i>cinerea</i>	Priority 3		Grey sand over limestone	6.7 km to N
<i>Bossiaea modesta</i>	Priority 2			Incorrect location given
<i>Caladenia huegellii</i>	T (CR)	Grand spider orchid	Grey/brown sand, clay loam	3.7 km to SSE
<i>Calothamnus graniticus</i> subsp. <i>leptophyllus</i>	Priority 4	Hawkeswood	Clay over granite, lateritic soils, sand over limestone	14.3 km to N, Kings Park (possibly cultivated)

REPORT

Taxon	BC Act / state status	Common name	Habitat	Closest record
<i>Cyathochaeta teretifolia</i>	Priority 3		Grey sand, sandy clay, swamps, creek edges	3.9 km to NE
<i>Dampiera triloba</i>	Priority 3		Wetland	1.4 km to E, Roe Swamp
<i>Dodonaea hackettiana</i>	Priority 4	Hackett's hopbush	Sand, outcropping limestone	In study area
<i>Diuris drummondii</i>	T (VU)	Tall donkey orchid	Low lying depressions, swamps	5.1 km to ESE
<i>Eucalyptus foecunda</i> subsp. <i>foecunda</i>	Priority 4	Fremantle mallee	Shallow sand over limestone on hills	1.8 km to NW
<i>Grevillea olivacea</i>	Priority 4	Olive grevillea	Coastal dunes, limestone	5.9 km to SW. Planted
<i>Grevillea thelemanniana</i>	T (CR)	Spider net grevillea	Sand, sandy clay. Winter-wet low-lying flats	5.8 km to N (probably cultivated)
<i>Hibbertia leptotheca</i>	Priority 3		Dunes, sand over limestone	3.3 km to NW
<i>Hydrocotyle lemnoides</i>	Priority 4	Aquatic pennywort	Floating in pools	6.7 km to NE
<i>Hydrocotyle striata</i>	Priority 1		Winter-wet, creekline	5.3 km to NE
<i>Jacksonia gracillima</i>	Priority 3		Well drained sand	1.6 km to E, near Roe Swamp
<i>Jacksonia sericea</i>	Priority 4	Waldjumi	Calcareous and sandy soils	1.8 km to NW
<i>Levenhookia preissii</i>	Priority 1	Preiss's stylewort	Grey or black peaty sand, swamps	6.6 km to E
<i>Microtis quadrata</i>	Priority 4		Black peaty soil	3.5 km to SSE
<i>Phlebocarya pilosissima</i> subsp. <i>pilosissima</i>	Priority 3		White or grey sand, lateritic gravel	3.8 km to SE
<i>Pimelea calcicola</i>	Priority 3		Coastal limestone ridges	0.27 to S
<i>Stylidium longitubum</i>	Priority 3	Jumping jacks	Seasonal wetlands	3.5 km to SSE
<i>Stylidium maritimum</i>	Priority 3		Sand over limestone, dune slopes and flats	4.4 km to N
<i>Stylidium paludicola</i>	Priority 3		Winter-wet habitats	4.9 km to ESE
<i>Styphelia filifolia</i>	Priority 3		Grey sand, Banksia woodland	3 km to ESE
<i>Thelymitra variegata</i>	Priority 2	Queen of Sheba	Sand, sandy clay, laterite	4.5 km to N

4.1.1.3 Protected Matters database for MNES

The 15 TF species identified by the Protected Matters database search are presented in Table 9. The EPBC Act Protected Matters Report is provided in Appendix B.

Table 9: Protected Matters database search results

Taxon	EPBC Act status	Common name	Habitat	Closest record
<i>Andersonia gracilis</i>	Endangered	Slender andersonia	Sand, sandy clay, gravelly loam in winter-wet areas	12.3 km to ENE
<i>Caladenia huegelii</i>	Endangered	King spider-orchid, grand spider-orchid, rusty spider-orchid	Grey or brown sand, clay loam	3.6 km to ENE
<i>Conospermum undulatum</i>	Vulnerable	Wavy-leaved smokebush	Grey or yellow/orange clayey sands	16 km to ENE
<i>Diuris drummondii</i>	Vulnerable	Tall donkey orchid	Depressions and winter-wet areas	4.9 km to ESE
<i>Diuris micrantha</i>	Vulnerable	Dwarf bee-orchid	Winter-wet swamps	17.5 km to S
<i>Diuris purdiei</i>	Endangered	Purdie's donkey-orchid	Winter-wet swamps	9.5 km to E
<i>Drakaea elastica</i>	Endangered	Glossy-leafed hammer orchid	Low lying areas adjoining winter-wet swamps	14 km to SSE

REPORT

Taxon	EPBC Act status	Common name	Habitat	Closest record
<i>Drakaea micrantha</i>	Vulnerable	Dwarf hammer-orchid	White-grey sand	9.8 km to E
<i>Eleocharis keigheryi</i>	Vulnerable	Keighery's eleocharis	Clay, sandy loam, emergent in fresh water	15.6 km to ENE
<i>Eremophila glabra</i> subsp. <i>chlorella</i>	Endangered		Winter-wet depressions	9.57 km to ENE
<i>Eucalyptus</i> × <i>balanites</i>	Endangered	Cadda road mallee	Sandy soils with lateritic gravel	21 km to SE
<i>Lepidosperma rostratum</i>	Endangered	Beaked lepidosperma	Poorly drained, peaty, sandy clay	15 km to SE
<i>Macarthuria keigheryi</i>	Endangered	Keighery's macarthuria	White to grey sand	12.1 km to NE
<i>Synaphea</i> sp. <i>fairbridge farm</i> (D. Papenfus 696)	Critically Endangered	Selena's synaphea	Winter wet flats, gravelly clay loam	34.6 km to ESE
<i>Thelymitra stellata</i>	Endangered	Star sun-orchid	Sand, gravel, lateritic loam	17.5 km to E

4.1.2 Vegetation

4.1.2.1 Literature review

AECOM (2011) broadly mapped five vegetation types within the study area:

1. Open Woodland of *Eucalyptus gomphocephala* and *Eucalyptus marginata* over a Low Open Woodland of *Banksia attenuata* over a Tall Open Shrubland of *Xanthorrhoea preissii* over an Open Sedgeland of *Mesomelaena pseudostygia* on yellow sand (EgXps)
2. Woodland to Open Woodland of *Eucalyptus marginata* and *Corymbia calophylla* over an Open to Low Shrubland of *Xanthorrhoea preissii*, *Macrozamia riedlei* and *Hibbertia hypericoides* over an Open Herbland of **Oxalis pes-caprae* and *Sowerbaea laxiflora* over an Open Grassland of **Briza maxima* and **Ehrharta calycina* on brown sandy loam (CcXpMrS)
3. Open Woodland to Low Open Woodland of *Eucalyptus marginata* and *Banksia attenuata* over Low Shrubland of *Acacia pulchella*, *Hibbertia hypericoides*, *Macrozamia riedlei* and *Xanthorrhoea preissii* over **Briza maxima* on yellow sand (EmApS)
4. Planted Low Open Woodland of *#Eucalyptus attenuata*, *#Eucalyptus erythrocorys* and *#Eucalyptus platypus* with scattered *Corymbia calophylla* and *Eucalyptus marginata* over a Tall Open Shrubland of *#Melaleuca nesophila*, **Acacia iteaphylla*, *Jacksonia furcellata* and *#Callistemon phoeniceus* with scattered **Callitris* sp. and occasional thickets of **Leptospermum laevigatum* over introduced grasses dominated by **Cynodon dactylon*, **Ehrharta calycina* and **Eragrostis curvula* on brown sand (R2)
5. Cleared parkland consisting mainly of **Araucaria heterophylla*, *Eucalyptus gomphocephala*, *Melaleuca viminea*, *Xanthorrhoea preissii*, *#Melaleuca nesophila* and *#Callistemon phoeniceus* over grasses dominated mainly by **Cynodon dactylon* and **Pennisetum clandestinum* (Pa1).

AECOM (2011) assessed most of the vegetation within the study area as being in Degraded or worse condition, with minor extents in Good condition.

No state or Commonwealth listed TECs or PECs were recorded by AECOM (2011). This survey was undertaken prior to the listing of the Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain TEC (2019) and the *Banksia* Woodlands of the Swan Coastal Plain ecological community (2016) under the EPBC Act.

4.1.2.2 DBCA database searches

A search of DBCA's TEC/PEC database for known TEC and PEC records within a 10 km radius of the study area returned two records:

1. Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain is listed by the DBCA as a Priority 3 ecological community.

This ecological community is equivalent to Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain TEC (Tuart woodlands TEC), listed as Critically Endangered under the EPBC Act in 2019. The description, area and condition thresholds that apply to the Tuart woodlands TEC also apply to the Priority 3 PEC.

The ecological community occurs as woodlands and forests, or other structural forms where the primary defining feature is the presence of *Eucalyptus gomphocephala* (tuart) in the uppermost canopy layer and has a discontinuous distribution in the western part of the Swan Coastal Plain.

Two records of the PEC/TEC were shown to intersect with the study area.

2. Banksia dominated woodlands of the Swan Coastal Plain IBRA region is listed by the DBCA as a Priority 3 ecological community.

This ecological community is a component of the Banksia Woodlands of the Swan Coastal Plain TEC (Banksia woodlands TEC), listed as Endangered under the EPBC Act in 2016. The description, area and condition thresholds that apply to the Banksia woodlands TEC, also apply to the Priority 3 PEC.

It typically has a prominent tree layer of *Banksia* with scattered eucalypts and other tree species (including *Allocasuarina fraseriana*) often present among or emergent above the *Banksia* canopy. The TEC varies across the Swan Coastal Plain region, with community structure (height, cover and density) and species composition of the tree layer and understorey sometimes varying over small distances. The woodlands are defined however by a generally dominant *Banksia* component which can include four key species:

- a. *Banksia attenuata* (candlestick banksia)
- b. *B. menziesii* (firewood banksia)
- c. *B. prionotes* (acorn banksia)
- d. *B. ilicifolia* (holly-leaved banksia).

Other *Banksia* species may be co-dominant in some areas, for example *B. littoralis* in seasonally damper locations or *B. burdettii* in sandplain shrublands north of Perth. These species, however, form other communities that are not considered to be the Banksia woodlands TEC.

Thirteen records of the PEC/TEC were shown to intersect with the study area.

The PEC/TEC records are mapped in relation to the study area in Figure F.

4.1.2.3 Protected Matters database for MNES

Two TECs were identified by the Protected Matters database search as being likely to occur in the study area:

1. Tuart woodlands TEC (Critically Endangered)
2. Banksia woodlands TEC (Endangered).

A third TEC, Subtropical and Temperate Coastal Saltmarsh was identified as likely to occur in the buffer area only of the search.

The EPBC Act Protected Matters Report is provided in Appendix B.

4.2 Field surveys

4.2.1 Flora

Ten 10 m × 10 m quadrats and 16 relevés (unbounded) were described during this survey. Vegetation notes were also taken to support vegetation type mapping (Figure G). Site records are included as Appendix C.

One hundred and forty-seven taxa were recorded during this survey, from 44 families. Of these, forty-six were introduced, making 31.5% of the total list introduced taxa.

The most common family was Fabaceae with 25 taxa, followed by Myrtaceae with 12 taxa and Asparagaceae and Proteaceae with ten each. A complete species list is included as Appendix D.

4.2.1.1 Significant flora

A spring targeted survey was undertaken to search for known conservation significant species within the study area and for occurrences of taxa assessed as potentially occurring following the results of the desktop review. Figure H records the tracks of both elements of the survey to show survey coverage, although unfortunately the westernmost survey tracks were lost in the transfer process. No targeted searching was conducted in the western end of the study area due to lack of suitable habitat and vegetation condition. One conservation significant species was recorded during this survey, *Dodonaea hackettiana* (P4).

4.2.1.1.1 *Dodonaea hackettiana* (Priority 4)

Three hundred and forty-six *Dodonaea hackettiana* (P4) individuals were recorded proximate to the Forrest Road–Stock Road intersection (Figure I), with individuals recorded primarily in disturbed areas at this location. The species was not recorded at other locations.

Dodonaea hackettiana (P4) is an erect shrub or small tree to 5 m tall. It flowers yellow–green in July to October, turning red as the fruit develops, and is found on grey calcareous sand, sometimes with outcropping limestone. It is known mainly from locations between Perth and Rockingham, with four records occurring north of Perth near the Moore River National Park (WAH 1998–).



Plate 1: *Dodonaea hackettiana*

(Source: WA Herbarium 1998-)

4.2.1.1.2 *Eryngium pinnatifolia* subsp. *Palustre* (GJ Keighery 13459) (Priority 3)

Eryngium pinnatifolia subsp. *Palustre* (GJ Keighery 13459) (P3) was recorded by AECOM (2011) within the study area. Four populations were recorded proximate to the Forrest Road–Stock Road intersection.

A perennial herb to 0.5 m, flowers blue/white August to November and occurs on clay, sandy clay and grey or black peaty sand, or occasionally sandy rises (WAH 1998–). FloraBase has 11 records of this species. These records show that it occurs primarily in wetlands and seasonal damplands. The intraspecific epithet 'Palustre' is Italian, meaning swamp or marsh (Cambridge Dictionary 2022). Examination of specimens of this taxon led to the conclusion, particularly considering habitat, that the taxon *Eryngium pinnatifidum* subsp. *pinnatifidum* had been misidentified as the conservation significant subspecies. This taxon does not carry a conservation ranking.



Eryngium pinnatifidum

Photos: K.C. Richardson

(Source: WA Herbarium 1998-)

Plate 2: *Eryngium pinnatifidum* (sens. lat.)

4.2.1.1.3 *Jacksonia gracillima* (Priority 3)

Two specimens of *Jacksonia gracillima* (Priority 3) were recorded by AECOM (2011) within the study area. This taxon is a sprawling shrub growing to almost 1 m with orange or rose-pink flowers in damper areas (WAH 1998-). It was searched for in the area reported by AECOM (2011), but the vegetation condition has deteriorated markedly since 2011, possibly in part due to fire, and the taxon was not found.



Jacksonia gracillima

Photos: R. Davis

(Source: WA Herbarium 1998-)

Plate 3: *Jacksonia gracillima*

4.2.1.2 Other significant flora

No flora species of other conservation significance based on one or more criteria listed in EPA's environmental factor guideline for flora and vegetation were recorded within the study area.

4.2.1.3 Introduced flora

Forty-six species were introduced or native non-endemic. Weeds have several pathways of introduction, including:

- Soil disturbance from vehicle access
- Construction of paths, roads and other facilities
- Dumping of garden waste which can introduce weed seeds or cuttings
- Invasive species from adjoining gardens
- Increased nutrient levels
- Weed seeds introduced by birds or domestic animals.

Four introduced species recorded during the survey are Declared Pests:

1. *Opuntia stricta* (prickly pear)
2. *Asparagus asparagoides* (bridal creeper)
3. *Lycium ferocissimum* (African boxthorn)
4. *Moraea flaccida* (one-leaf Cape tulip).

The Declared Pests status under the BAM Act and WoNS classification is identified in Table 10.

Table 10: Declared pests and weeds of national significance

Species	Common name	Declared pest	WoNS
<i>Asparagus asparagoides</i>	Bridal creeper	X	X
<i>Lycium ferocissimum</i>	African boxthorn	-	X
<i>Moraea flaccida</i>	One leaf Cape tulip	X	-
<i>Opuntia stricta</i>	Prickly pear	X	X

(Source: Centre for Invasive Species Solutions 2022)

The legal status of the Declared Pest species under the BAM Act is identified in Table 11.

Table 11: Declared pests legal status

Species	Common name	Control category	Keeping category	Declared areas
<i>Asparagus asparagoides</i>	Bridal creeper	No control category	Exempt	Whole of state
<i>Moraea flaccida</i>	One-leaf Cape tulip	No control category	Exempt	Whole of state
<i>Opuntia stricta</i>	Prickly pear	C3-organisms that should have some form of management	Restricted	Whole of state

(Source: DPIRD 2022)

Thirty-four other introduced species were recorded during the survey. Not all of these can be considered as weeds because they have been planted and are not naturalised to the extent that they self-propagate, however 26.5% of the recorded species list is introduced, indicating the lower condition of much of the vegetation. A list of introduced species recorded is included as Appendix E.

4.2.1.4 Likelihood of occurrence assessment

Following the field survey, an assessment of the likelihood of conservation significant species reported in the combined DBCA and MNES database searches was conducted. Of 41 taxa recorded in the database searches, one was recorded as present in the study area, 11 were assessed as possibly occurring in the study area, and 29 were assessed as unlikely to occur based on proximity of records and available habitat (Table 12).

Those assessed as possibly occurring include several smaller shrubs that prefer calcareous substrates. The condition of the vegetation in these habitats in the study area may mitigate against their current occurrence, if indeed they were once present.

Many of the taxa assessed as unlikely to occur are listed as preferring winter-wet or damp habitats. As the study area is well drained sand they are assessed as unlikely to occur.

It is noted that observation of perennial, but seasonally emergent, taxa (i.e. geophytes such as terrestrial orchids) is limited by the taxa themselves. For example, in the case of terrestrial orchids, not all or even any individuals may sprout and flower in a given year. At other times when conditions are favourable or after an event such as a fire many may respond by sprouting at almost the same time. The tubers will still be present, dormant, but the plant will not be seen. It is therefore impossible to discount the presence of these taxa if suitable habitat is present and records exist in the vicinity.

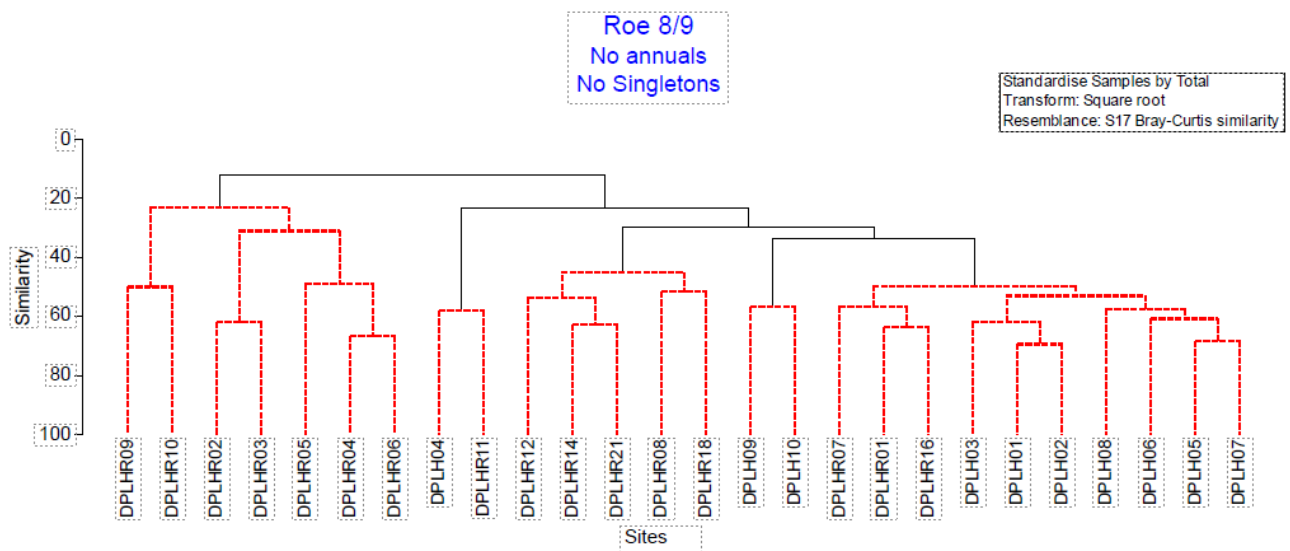
Table 12: Likelihood of occurrence of conservation significant species

Taxon	BC Act / state status	EPBC Act status	Assessment
<i>Andersonia gracilis</i>	T (VU)	Endangered	Unlikely, no suitable habitat
<i>Caladenia huegelii</i>	T (CR)	Endangered	Possible
<i>Conospermum undulatum</i>	T (VU)	Vulnerable	Unlikely, no suitable habitat
<i>Diuris drummondii</i>	T (VU)	Vulnerable	Unlikely, no suitable habitat
<i>Diuris micrantha</i>	T (VU)	Vulnerable	Unlikely, no suitable habitat
<i>Diuris purdiei</i>	T (EN)	Endangered	Unlikely, no suitable habitat
<i>Drakaea elastica</i>	T (CE)	Endangered	Unlikely, no suitable habitat
<i>Drakaea micrantha</i>	T (EN)	Vulnerable	Unlikely, no suitable habitat
<i>Eleocharis keigheryi</i>	T (VU)	Vulnerable	Unlikely, no suitable habitat
<i>Eremophila glabra</i> subsp. <i>chlorella</i>	T (EN)	Endangered	Unlikely, no suitable habitat
<i>Eucalyptus</i> × <i>balanites</i>	T (CE)	Endangered	Unlikely, no suitable habitat
<i>Grevillea thelemanniana</i>	T (CE)	Critically Endangered	Unlikely, no suitable habitat
<i>Lepidosperma rostratum</i>	T (EN)	Endangered	Unlikely, no suitable habitat
<i>Macarthuria keigheryi</i>	T (EN)	Endangered	Unlikely, no suitable habitat
<i>Synaphea</i> sp. Fairbridge Farm (D. Papenfus 696)	T (CE)	Critically Endangered	Unlikely, no suitable habitat
<i>Thelymitra stellata</i>	T (EN)	Endangered	Unlikely, no suitable habitat
<i>Acacia lasiocarpa</i> var. <i>bracteolata</i> long pedicel variant (GJ Keighery 5026)	Priority 1	N/A	Unlikely, no suitable habitat
<i>Angianthus micropodioides</i>	Priority 3	N/A	Unlikely, no suitable habitat
<i>Austrostipa mundula</i>	Priority 3	N/A	Possible
<i>Beyeria cinerea</i> subsp. <i>cinerea</i>	Priority 3	N/A	Possible
<i>Bossiaea modesta</i>	Priority 2	N/A	Unlikely, no suitable habitat
<i>Calothamnus graniticus</i> subsp. <i>leptophyllus</i>	Priority 4	N/A	Unlikely, no suitable habitat
<i>Cyathochaeta teretifolia</i>	Priority 3	N/A	Unlikely, no suitable habitat
<i>Dampiera triloba</i>	Priority 3	N/A	Unlikely, no suitable habitat
<i>Dodonaea hackettiana</i>	Priority 4	N/A	Recorded
<i>Eucalyptus foecunda</i> subsp. <i>foecunda</i>	Priority 4	N/A	Possible

Taxon	BC Act / state status	EPBC Act status	Assessment
<i>Grevillea olivacea</i>	Priority 4	N/A	Unlikely, no suitable habitat
<i>Hibbertia leptotheca</i>	Priority 3	N/A	Possible
<i>Hydrocotyle lemnoides</i>	Priority 4	N/A	Unlikely, no suitable habitat
<i>Hydrocotyle striata</i>	Priority 1	N/A	Unlikely, no suitable habitat
<i>Jacksonia gracillima</i>	Priority 3	N/A	Possible
<i>Jacksonia sericea</i>	Priority 4	N/A	Possible
<i>Levenhookia preissii</i>	Priority 1	N/A	Unlikely, no suitable habitat
<i>Microtis quadrata</i>	Priority 4	N/A	Unlikely, no suitable habitat
<i>Phlebocarya pilosissima</i> subsp. <i>pilosissima</i>	Priority 3	N/A	Unlikely, no suitable habitat
<i>Pimelea calcicola</i>	Priority 3	N/A	Possible
<i>Stylidium longitubum</i>	Priority 3	N/A	Unlikely, no suitable habitat
<i>Stylidium maritimum</i>	Priority 3	N/A	Possible
<i>Stylidium paludicola</i>	Priority 3	N/A	Unlikely, no suitable habitat
<i>Styphelia filifolia</i>	Priority 3	N/A	Possible
<i>Thelymitra variegata</i>	Priority 2	N/A	Unlikely, no suitable habitat

4.2.2 Vegetation

Analysis of the data collected during this survey produced a dendrogram that was used to define vegetation units based on similarity. The analysis was repeated using different reducing combinations of data: initially with the complete site/species matrix, then removing singletons and annuals, and removing the remaining introduced species. The analysis with singletons and annuals removed appeared to give the best association dendrogram (Graph 2).



Graph 2: Dendrogram following Primer analysis after singletons and annuals were removed

The dominant species in each dendrogram grouping that contribute to the vegetation description are identified in Table 13.

Table 13 Dominant species listing by dendrogram grouping

Group	Site numbers	Dominant species	Notes
1	DPLHR09, 10	A mix of plantings, these sites were left depauperate with singletons and annuals removed	-
2	DPLHR 2-6	<i>Acacia rostellifera</i> , limestone sites	-
3	DPLH04, DPLHR11	<i>Kunzea glabrescens</i> , rehabilitated sites	-
4	DPLH09, 10	<i>Acacia rostellifera</i> , <i>Leschenaultia linarioides</i>	DPLH09 has tuart; the other does not
5	DPLHR07, 01, 16	<i>Eucalyptus marginata</i> , <i>Banksia</i> spp., <i>Allocasuarina fraseriana</i>	-
6	DPLH01-03	<i>Eucalyptus marginata</i> , <i>Banksia</i> spp.	DPLH01 has <i>Allocasuarina fraseriana</i> , 02, 03 have <i>Corymbia calophylla</i>
7	DPLH05-08	<i>Banksia</i> spp. common, mix of <i>Eucalyptus gomphocephala</i> , <i>E. marginata</i> .	-

While groups 1, 2, 3 and 5 fit neatly into vegetation types observed during the survey, groups 4, 6 and 7 are mixed in their dominant species. It is conjectured that the Degraded condition of much of the vegetation, and the ubiquitous suite of introduced species, has depleted the ground cover and shrub layers in the various vegetation types present in the study area to the extent that there is difficulty differentiating them from each other at that level.

It was decided to describe vegetation types in the study area based on grouping the dominant species.

Ten mapping units were described for the study area, five of which described remnant native vegetation and the other five covering highly disturbed areas, recreational and infrastructure. During the survey it was found that *Eucalyptus gomphocephala* (tuart) was present throughout the study area albeit with a sparse and scattered representation in the eastern part of the study area. The difficulty in separating this taxon from the *E. marginata*/*Corymbia calophylla*/*Banksia attenuata*, *B. menziesii* also present in the eastern portion led to the combination of the tuart with the other species as an isolated presence. As the study area moves westwards the tuart becomes dominant before the study area becomes more urbanised and large-scale clearing has removed the native vegetation.

A description of the ten mapping units, their extent (ha) within the study area, and the floristic sites representative of them is provided in Table 14. The spatial extent of the remnant native vegetation units and highly disturbed units within the study area is mapped in Figure J.

Table 14: Vegetation units mapped for the study area

Photograph	Code	Vegetation description	Extent (ha/%)	Floristic sites
Remnant native vegetation units				
	EgBaXp	<i>Eucalyptus gomphocephala</i> mid woodland to open woodland over <i>Banksia attenuata</i> low open woodland over <i>Xanthorrhoea preissii</i> sparse shrubland over * <i>Freesia alba</i> × <i>leichtlinii</i> , * <i>Oxalis pes-caprae</i> forbland, * <i>Ehrharta longiflora</i> , * <i>E. calycina</i> tussock grassland	17.62 ha / 16.98%	<ul style="list-style-type: none"> • DPLH06 • DPLH08 • DPLH10 • DPLHR21 • VN23 • VN24 • VN25 • VN29
	(Eg)EmCcBam	<i>Eucalyptus gomphocephala</i> mid isolated trees, <i>Eucalyptus marginata</i> , <i>Corymbia calophylla</i> mid woodland over <i>Banksia attenuata</i> , <i>B. menziesii</i> , <i>Allocasuarina fraseriana</i> low (open) woodland over <i>Xanthorrhoea preissii</i> sparse shrubland over * <i>Freesia alba</i> × <i>leichtlinii</i> , * <i>Oxalis pes-caprae</i> forbland, * <i>Ehrharta calycina</i> , * <i>E. longiflora</i> (sparse) grassland	21.96 ha / 21.15%	<ul style="list-style-type: none"> • DPLH01 • DPLH02 • DPLH03 • DPLH 07 • DPLHR01 • DPLHR07 • DPLHR12 • DPLHR14 • DPLHR15 • DPLHR16 • DPLHR18 • VN17 • VN19 • VN20
	JfKg (Rehab)	<i>Corymbia calophylla</i> isolated to sparse mid trees over <i>Jacksonia furcellata</i> , <i>Kunzea glabrescens</i> tall sparse shrubland over <i>Acacia pulchella</i> var. <i>glaberrima</i> mid sparse shrubs over <i>Gompholobium tomentosum</i> low sparse shrubs over * <i>Hypochaeris glabra</i> isolated forbs, * <i>Ehrharta longiflora</i> isolated grasses	11.36 ha / 10.94%	<ul style="list-style-type: none"> • DPLH04 • DPLHR11
	ArBss	<i>Acacia rostellifera</i> , <i>Banksia sessilis</i> var. <i>sessilis</i> tall shrubland over * <i>Ehrharta calycina</i> , * <i>E. longiflora</i> sparse grassland over * <i>Oxalis pes-caprae</i> forbland on limestone outcrop	5.013 ha / 4.83%	<ul style="list-style-type: none"> • DPLH09 • DPLHR02 • DPLHR04 • DPLHR05 • DPLHR06
	EgD	<i>Eucalyptus gomphocephala</i> mid woodland over <i>Acacia rostellifera</i> , * <i>Schinus terebinthifolia</i> low open shrubland over * <i>Oxalis pes-caprae</i> closed forbland	1.99 ha / 1.92%	-
Highly disturbed units				
No photo available	INF	Infrastructure. Buildings etc. either commercial or residential inc. gardens, car parks, roads, etc.	18.04 ha / 17.37%	-
	PC (Parkland Cleared)	Remnant endemic trees, <i>Eucalyptus gomphocephala</i> , <i>E. marginata</i> subsp. <i>marginata</i> , <i>Corymbia calophylla</i> with understorey composed of introduced species. May contain plantings	1.47 ha / 1.41%	
	Pk (Parkland)	Areas planted to turf, used for sport or recreation. May have cover of planted or remnant endemic trees	11.46 ha / 11.04%	
	C (Cleared)	Areas that are generally devoid of native vegetation and colonised by introduced species, includes managed parkland and road verges that may have some endemic tree species remaining	14.47 ha / 13.94%	
	P (Plantings)	Non-endemic <i>Eucalyptus</i> ? <i>Angophora</i> spp. over planted shrubs over * <i>Oxalis pes-caprae</i> forbland, * <i>Ehrharta</i> spp. grassland/sparse grassland	0.43 ha / 0.41%	

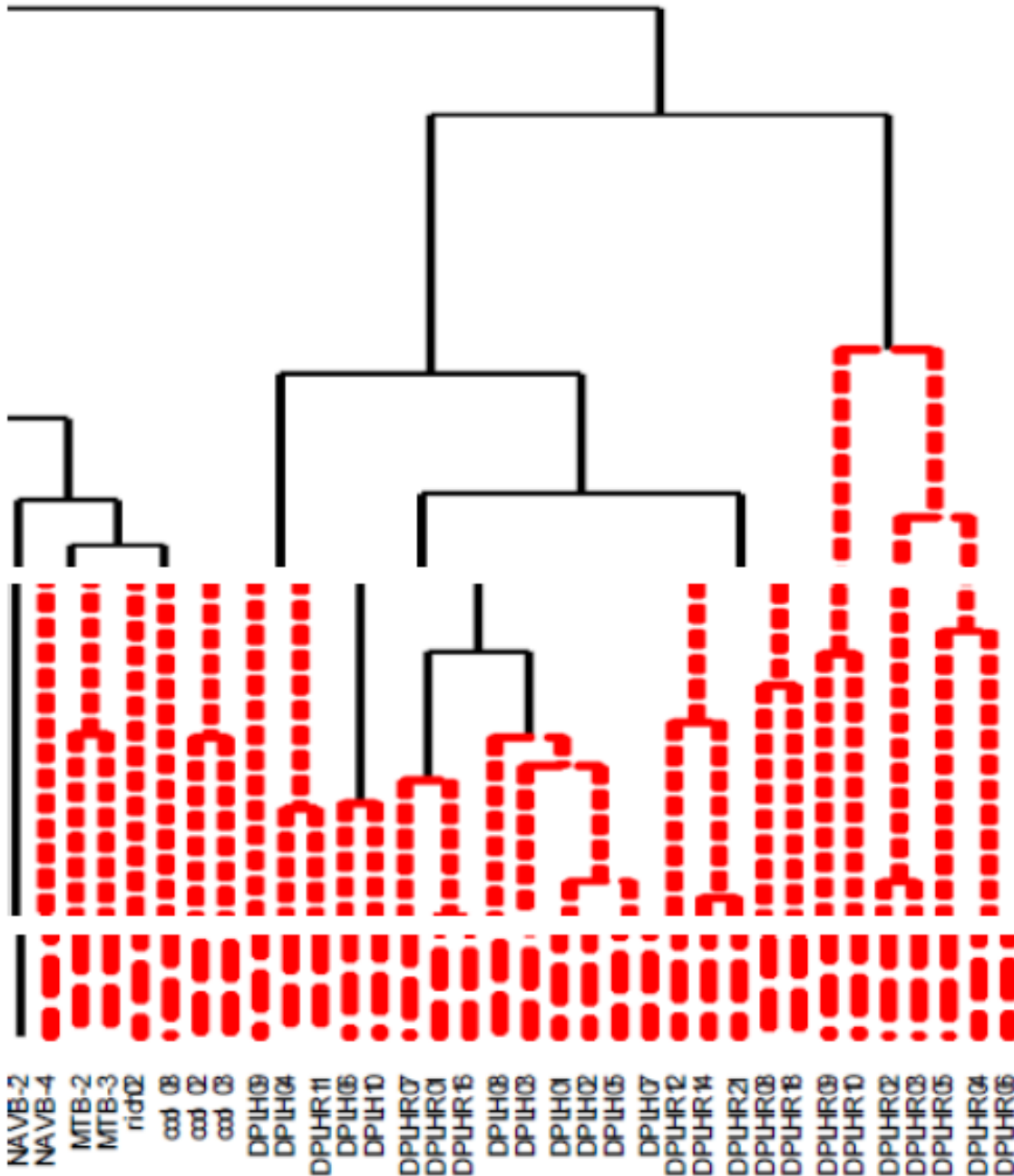
4.2.2.1 Analysis against Gibson et al. Swan Coastal Plain data

Floristic Community Types (FCTs) are based on a survey of the vegetation of the Swan Coastal Plain from Seabird to Dunsborough, completed by Gibson et al. (1994). The purpose of the regional survey was to determine the number and type of vegetation communities present across the southern Swan Coastal Plain and to then assess how much of each remained and whether they are adequately represented and protected within reserves. The Gibson et al. (1994) survey involved the sampling of 508 10 m × 10 m floristic quadrats. The original Gibson et al. (1994) floristic multivariate analysis discussed the site (quadrat) groups at two scales: the 'supergroup' level, which corresponded broadly with four major geomorphological elements, and the finer community group level (FCTs). The supergroups are defined as follows:

- Supergroup 1 – Community types of heavier soils
- Supergroup 2 – Community types of seasonal wetlands
- Supergroup 3 – Community types centred on the Bassendean system
- Supergroup 4 – Community types centred on the Spearwood and Quindalup systems.

Analysis was conducted using the same modified dataset (singletons and annuals removed) against the Gibson et al. (1994) dataset. The survey dataset, after having species names reconciled, was merged with the dataset for Gibson et al. Supergroup 4 (Spearwood and Quindalup systems). The resulting dendrogram is too large to reproduce in this report, however a section of the dendrogram has provided for context (Graph 3). The dendrogram indicated that the survey sites are clustered together and that any association with the Gibson et al. (1994) sites is at a very low level of similarity (i.e. less than 20%). This is not a high enough similarity coefficient to give confidence that the survey sites accord with those described by Gibson et al. (1994).

This outcome is not unusual when undertaking similar data analysis. The analysis of a small dataset against a much larger one can result in the smaller set of sites being deemed statistically closer to each other than to any sites in the larger dataset. This outcome is compounded by the ubiquitous suite of introduced species across the study area, a factor that would result in the closer association of the survey sites.



Graph 3: Relevant dendrogram section from FCT Supergroup 4 and survey data analysis

4.2.2.2 Significant vegetation

4.2.2.2.1 EgBaXp

As with the (Eg)EmCcBam vegetation unit, the presence of *Banksia attenuata* shows an intergrade with the Banksia woodlands PEC/TEC. However, this unit has tuart as dominant and not as an ‘occasional emergent’ above the Banksia and therefore has been classified as a separate vegetation unit.

Most of this vegetation unit, the patch occurring from just east of Stock Road westwards to the patch of ArBss near Southwell Crescent, shares similarities with Tuart woodland PEC/TEC. The approved conservation advice for the Tuart woodlands TEC (Threatened Species Scientific Committee 2019) identifies that if a patch of vegetation meets key diagnostic criteria and is 5 ha or greater in size then it is considered part of the Tuart woodlands TEC. The primary defining feature is the presence of at least two living established tuarts in the uppermost canopy layer, with a gap of no more than 60 m between the canopies of adjacent trees. When these criteria are met (size, composition), then the patch is protected without consideration of the vegetation condition.

There is a gap of over 60 m between tuarts in the above patch and the smaller patch west of Southwell Crescent, defining different patches. This second patch, even allowing for adjacent trees outside the study area, is under 5 ha in size, as are even smaller patches containing only a few trees further to the west before the study area crosses Blackwood Avenue. The vegetation condition here has been assessed as Degraded. The approved conservation advice for the Tuart woodlands TEC (Threatened Species Scientific Committee 2019) identifies that where less than 50% of the understorey cover is native and the patch size is between 0.5 and 2 ha the patch is not considered part of the Tuart woodlands TEC.

4.2.2.2.2 (Eg)EmCcBam

Despite scattered *Eucalyptus gomphocephala* (tuart), the (Eg)EmCcBam vegetation unit is considered to represent the Banksia woodlands PEC / TEC (subject to area and condition thresholds).

The approved conservation advice for the Tuart woodlands TEC (Threatened Species Scientific Committee 2019) identifies intergrades with the Banksia woodlands TEC. Where tuart occurs as an occasional emergent over a stratum dominated or co-dominated by *Banksia* species the patch is likely to meet the diagnostic characteristics for the Banksia woodlands PEC/TEC. It is also noted that this is not a common occurrence, and most likely on Spearwood formation dunes.

4.2.2.2.3 EgD

Like the smaller patches of the EgBaXp vegetation unit, the patches of the EgD vegetation unit are not of a size (i.e. less than 5 ha) to warrant inclusion in the Tuart woodlands TEC. The differentiation between this unit and EgBaXp is based on the condition of the vegetation, with EgD assessed as Completely Degraded with aggressive weeds such as **Asparagus asparagoides* (Bridal Creeper) present.

4.2.2.2.4 ArBss

Vegetation unit ArBss shows floristic and landform affinity to a state listed Priority 3 ecological community; Coastal shrublands on shallow sands, southern Swan Coastal Plain ('floristic community type 29a'), the description of which reads "Mostly heaths on shallow sands over limestone close to the coast. No single dominant but important species include *Spyridium globulosum*, *Rhagodia baccata*, and *Olearia axillaris*".

FCT 29a is reported as occurring primarily on the Spearwood system (five out of nine sites), and the Quindalup system (Gibson et al. 1994), although more have been added as the Swan Coastal Plain study was later expanded. In the context of the current survey this vegetation type occurs on the Spearwood system. An examination of the species recorded in various sites comprising this FCT shows 15 species in common (Table 15) with FCT 29a. The condition of this vegetation unit in the study area is Degraded.

Table 15: Species present in FCT 29a

FCT 29a species
<i>Acacia rostellifera</i>
<i>Acanthocarpus preissii</i>
* <i>Avena barbata</i>
<i>Banksia sessilis</i> var. <i>sessilis</i> (syn. <i>Dryandra sessilis</i> var. <i>sessilis</i>)
* <i>Briza maxima</i>
* <i>Ehrharta longiflora</i>
* <i>Euphorbia terracina</i>
<i>Grevillea crithmifolia</i>
<i>Hardenbergia comptoniana</i>
* <i>Lagurus ovatus</i>
<i>Melaleuca systema</i>
* <i>Pelargonium capitatum</i>
<i>Lysiandra calycina</i> (syn. <i>Phyllanthus calycinus</i>)
<i>Spyridium globulosum</i>
<i>Templetonia retusa</i>

Not all the species in Table 15 occur in all the ArBss sites in the study area, or in every Gibson et al. (1994) site comprising FCT 29a. However, given the commonality of species over the spread of sites it is suggested that the vegetation type represents FCT 29a, albeit in a Degraded condition.

4.2.2.3 Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain ecological community

Tuart trees within the study area were identified by the black cockatoo habitat assessment and basic fauna survey (Phoenix Environmental Services 2023). Consistent with Approved Conservation Advice (incorporating listing advice) for the Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain ecological community (Threatened Species Scientific Committee 2019), 30 metre canopy buffers were applied to each tuart tree to determine the patch boundaries. The tuart patches were mapped and numbered (Figure L). It is noted that some of these occur in the (Eg)EmCcBam vegetation type suggested as the Banksia woodland TEC/PEC. Where occasional emergent tuart occur over a stratum dominated by *Banksia* spp. it is likely to meet the diagnostic criteria for the *Banksia* woodland TEC/PEC (Threatened Species Scientific Committee 2019). Hence the size of the tuart patches is also relevant in differentiating between the Tuart woodland TEC/PEC and the Banksia woodland TEC/PEC.

Individual tuart patches were assessed for correlation to the Tuart woodland TEC,

Table 16 indicates the condition categories and thresholds for identifying Tuart woodland TEC and is reproduced from Threatened Species Scientific Committee (2019) with the addition of a column indicatively correlating the condition scale of Keighery (1994) with the Commonwealth condition threshold criteria. Table 17 uses the thresholds and criteria identified in Table 16 to assess each tuart patch (identified in Figure L) to determine whether it forms part of the Tuart woodlands TEC. This assessment including a review of the understory condition of each tuart patch (Figure M). Patches assessed as being part of the Tuart woodlands TEC are mapped in Figure N.

REPORT

Table 16: Condition categories and thresholds for identifying Tuart woodland TEC

Biotic threshold ↓/ patch size	Keighery scale equivalent	≥2 ha >5 ha	≥0.5 ha <2 ha
<p>Very high condition</p> <ul style="list-style-type: none"> • ≥80% of all understorey vegetation cover is native OR • At least 12 native understorey species per 0.01 ha (10 m × 10 m) plot or equivalent sample unit 	Excellent	Medium sized patches with very high condition understorey. PART OF THE PROTECTED ECOLOGICAL COMMUNITY	Smaller patches with very high condition understorey. PART OF THE PROTECTED ECOLOGICAL COMMUNITY
<p>High condition</p> <ul style="list-style-type: none"> • ≥60% of all understorey vegetation is native OR • At least eight native understorey species per 0.01 ha (10 m × 10 m) plot or equivalent sample unit 	Very Good	Medium sized patches with high condition understorey. PART OF THE PROTECTED ECOLOGICAL COMMUNITY	<ul style="list-style-type: none"> • Smaller patches with high condition understorey AND that either: • Have an important landscape role (≤100 m to native vegetation) <p>OR</p> <ul style="list-style-type: none"> • Have a habitat role (≥2 very large trees per 0.5 ha) <p>OR</p> <ul style="list-style-type: none"> • Show regeneration (≥15 seedlings and/or saplings per 0.5 ha) <p>PART OF THE PROTECTED ECOLOGICAL COMMUNITY</p>
<p>Moderate condition</p> <ul style="list-style-type: none"> • ≥50% of all understorey vegetation cover is native OR • At least four native understorey species per 0.01 ha (10 m × 10 m) plot or equivalent sample unit 	Good	<ul style="list-style-type: none"> • Medium sized patches with moderate condition understorey AND that either: • Have an important landscape role (≤100 m to native vegetation) <p>OR</p> <ul style="list-style-type: none"> • Have a habitat role (≥2 very large trees per 0.5 ha) <p>OR</p> <ul style="list-style-type: none"> • Show regeneration (≤15 seedlings and/or saplings per 0.5 ha) <p>PART OF THE PROTECTED ECOLOGICAL COMMUNITY</p>	NOT PART OF THE PROTECTED ECOLOGICAL COMMUNITY (But may be a focus for local protection or restoration)
<p>Poor condition</p> <p>Has minimal or no native cover and species richness. That is</p> <ul style="list-style-type: none"> • <50% of all understorey cover is native • Less than four native understorey species per 0.01 ha (10 m × 10 m) plot or equivalent sample unit 	Degraded and Completely Degraded	NOT PART OF THE PROTECTED ECOLOGICAL COMMUNITY (but may be a focus for local protection or restoration)	NOT PART OF THE PROTECTED ECOLOGICAL COMMUNITY (But may be a focus for local protection or restoration)

Table 17: *Eucalyptus gomphocephala* patches and relationship to Tuart woodland TEC

Patch no.	Size (ha)	Condition	Condition area (ha)	Mapped unit	TEC?	Rationale
Tuart Patch 1	2.85	Completely Degraded	0.82	(Eg)EmCcBam, JfKg	No	~1.72 ha are in Degraded or worse / Poor condition Moderate condition parts (~0.98 ha) are too small for inclusion as TEC (see ≥ 0.5 ha <2 ha)
		Degraded-Completely Degraded	0.05			
		Degraded	0.85			
		Degraded-Good	0.98			
		Outside site boundary	0.15			
Tuart Patch 2	0.55	Degraded	0.21	(Eg)EmCcBam	No	Moderate condition parts (~0.34 ha) are too small for inclusion as TEC (see ≥ 0.5 ha <2 ha)
		Degraded-Good	0.34			
Tuart Patch 3	0.56	Completely Degraded	0.01	(Eg)EmCcBam, PC	No	Moderate condition parts (~0.22 ha) are too small for inclusion as TEC (<0.5 ha)
		Degraded	0.30			
		Degraded-Good	0.22			
		Outside site boundary	0.04			
Tuart Patch 4	2.30	Completely Degraded	1.10	(Eg)EmCcBam, JfKg	No	~1.33 ha are in Degraded or worse / poor condition Moderate condition parts (~0.90) are too small for inclusion as TEC (see ≥ 0.5 ha <2 ha)
		Degraded	0.23			
		Degraded-Good	0.90			
		Outside site boundary	0.08			
Tuart Patch 5	0.98	Completely Degraded	0.03	EgBaXp	No	Moderate condition parts (~0.61 ha) are too small for inclusion as TEC (see ≥ 0.5 ha <2 ha)
		Degraded	0.32			
		Degraded – Good	0.61			
		Outside site boundary	0.15			
Tuart Patch 6	0.38	Degraded – Good	0.36	EgBaXp	No	Moderate condition parts (~0.36) are too small for inclusion as TEC (<0.5 ha)
		Outside site Boundary	0.03			
Tuart Patch 7	1.87	Completely Degraded	1.67	EgBaXp	No	Poor condition (<0.5 ha)
		Outside site boundary	0.20			
Tuart Patch 8	0.65	Completely Degraded	0.02	EgBaXp	No	Poor condition (see ≥ 0.5 ha <2 ha)
		Degraded	0.46			
		Outside site boundary	0.17			
Tuart Patch 9	9.08	Completely Degraded	0.65	EgBaXp, JfKg	Yes	Moderate condition, >5 ha
		Degraded	1.95			
		Degraded – Good	6.25			
		Outside site boundary	0.25			
Tuart Patch 10	1.93	Completely Degraded	0.15	EgBaXp	No	Poor condition (see ≥ 0.5 ha < 2 ha)
		Degraded	1.14			
		Outside site boundary	0.64			
Tuart Patch 11	1.96	Completely Degraded	0.72	EgBaXp, C, Pk	No	Poor condition (see ≥ 0.5 ha <2 ha)
		Degraded	1.11			
		Outside site boundary	0.13			
Tuart Patch 12	0.64	Completely Degraded	0.64	Pk	No	Poor condition (see ≥ 0.5 ha <2 ha)
Tuart Patch 13	1.37	Completely Degraded	1.35	EgD	No	Poor condition (see ≥ 0.5 ha <2 ha)
		Outside site boundary	0.02			
Tuart Patch 14	3.54	Completely Degraded	0.28	EgBaXp	Yes	Moderate condition parts (~2.83 ha) meet TEC requirements (≥ 2 ha >5 ha) Patch has 13 trees
		Degraded	0.44			
		Degraded – Good	2.83			

4.2.2.4 Vegetation condition

The condition of the remnant vegetation in the study area has been classified into five categories using the adapted Keighery (1994) and Trudgen (1988) scale (Appendix A, Table A-8). The definition of the condition rankings was complicated by variation within the vegetation itself, with some areas having to be ranked as a range due to areas of different rankings occurring in close proximity, and turnover of areas making small patches unmappable within the larger patches.

Table 18 identifies the various condition rankings, the area they cover within the study area and their corresponding percentage. The spatial extent of the vegetation condition rankings within the study area is mapped in Figure K.

Table 18: Vegetation condition rankings

Vegetation condition	Area (ha)	% of study area
Pristine	-	-
Excellent	-	-
Very Good	0.21	0.20
Good – Degraded	30.52	29.31
Degraded	22.85	21.95
Degraded – Completely Degraded	0.68	0.65
Completely Degraded	49.85	47.88

Nearly 50% of the study area is ranked as Completely Degraded. This classification includes roads, other infrastructure, cleared and planted areas. Most of the remaining vegetation, approximately 51%, is in Good to Degraded condition. One small patch was ranked as Very Good condition. This patch is to the east of the Stock Road intersection and surrounded by recent rehabilitation works. Weed invasion is the primary degrading vector within the study area.

The categories Good - Degraded and Degraded - Completely Degraded are not recognised classifications in the Keighery scale but are a commonly used variation. For example, the use of the Good–Degraded classification reflects the fact that there are sections of the vegetation stand in Good condition adjoining sections in Degraded condition. A distinction between these categories cannot always be identified from aerial photography, especially where the site is wooded and the understorey is hidden. To capture each of the changes would be time and labour intensive and involve walking the boundary of each area taking GPS waypoints at each change in direction. Further to that, some would turn out to be so small as to be unmappable at usual scales which would defeat the purpose of the map. A mixed classification has been employed for the study area to simplify the condition classifications.

When vegetation condition is used as a criterion when determining FCT/TECs, the higher value condition classification has been assigned so as not to reduce the condition of the better-quality vegetation in the stand. For example, vegetation assessed as Good–Degraded condition has been assigned Good condition.

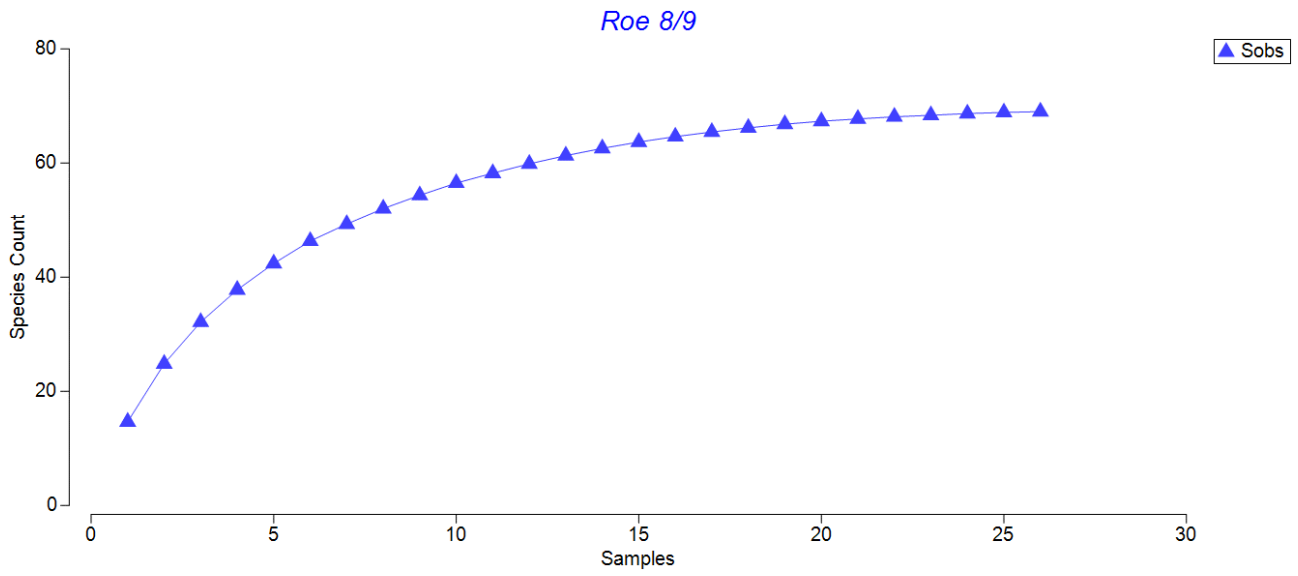
4.3 Vegetation extrapolation

Extrapolation of the vegetation to 500 m either side of the corridor was largely restricted to the western end of the study area around Rockingham Road due to adjacent urban development. Some small patches of remnant vegetation in the urban areas were also assessed as well as along Stock Road to the north and south of the study area.

Vegetation in the extrapolated areas matched the vegetation units mapped in the study area. The spatial extent of the extrapolated vegetation units within the study area is mapped in Figure O.

4.4 Analysis of survey completeness

The species accumulation curve produced by Primer 7 (Clarke and Gorley 2015) indicates that the curve is flattening out with the greater addition of more survey sites. This can be taken as a guide that the survey sampled most of the flora present in the study area.



Graph 4: Species accumulation curve for the survey data

5 DISCUSSION

5.1 Flora

One hundred and forty-seven taxa were recorded during this survey, with over 31% of the total species list introduced. This is likely a reduced species list for an area the size of the study area. The area is disturbed in varying degrees with introduced species and the number of taxa recorded in the ground cover and shrub strata is reduced.

5.1.1 Significant flora

One conservation significant species was recorded during this survey, *Dodonaea hackettiana* (Priority 4). Three hundred and forty-six *Dodonaea hackettiana* (Priority 4) individuals were recorded proximate to the Forrest Road–Stock Road intersection (Figure P), with individuals recorded primarily in disturbed areas at this location. The species was not recorded at other locations.

No further species of conservation significance were recorded in the study area. Two other Priority species, *Eryngium pinnatifolia* subsp. *Palustre* (GJ Keighery 13459) (Priority 3) and *Jacksonia gracillima* (Priority 3), were recorded by AECOM (2011) within the study area. These taxa were searched for in the locations identified by AECOM (2011) however no individuals were recorded.

5.1.2 Introduced flora

Of the total species list, 31.5 per cent comprised introduced species. Due to the urbanised nature of the area directly adjacent to the study area there are several pathways for weed introduction and distribution. Over time introduced species appear to have replaced many of the smaller herbaceous species that would be expected in woodland vegetation, or possibly the density of the weeds during the winter/spring survey may have masked some if they were present.

5.2 Vegetation

5.2.1 Significant vegetation

Two ecological communities of conservation significance were identified within the study area:

1. Tuart woodland PEC/TEC
2. Banksia woodland PEC/TEC.

These PEC/TECs are reported between North Lake Road and Stock Road. This survey also indicates that the Tuart woodland PEC/TEC occurs to the west of the Stock Road-Forrest Road intersection (Figure P).

One vegetation unit, ArBss, shows floristic and landform affinity to a state-listed Priority 3 ecological community; Coastal shrublands on shallow sands, southern Swan Coastal Plain ('floristic community type 29a').

Gibson et al. (1994) shows that this FCT is more common on the Spearwood dunes, and examination of the combined species list for the community shows four species in common between the FCT and this survey's vegetation unit ArBss.

The landform affinity comes from the description of the FCT as occurring on limestone, as the ArBss vegetation unit also occurs on limestone.

The condition of the ArBss vegetation unit is mapped as Degraded. As mentioned previously the overall degraded nature of the sites in this survey appears to have contributed to a loss of species in the lower strata, which may provide an explanation of the low species count.

Unless shown to be otherwise, this vegetation unit is assumed to be the PEC albeit in a Degraded condition. Similar vegetation is also present in Manning Park and on Clontarf Hill as shown in the extrapolation (Figure P).

6 REFERENCES

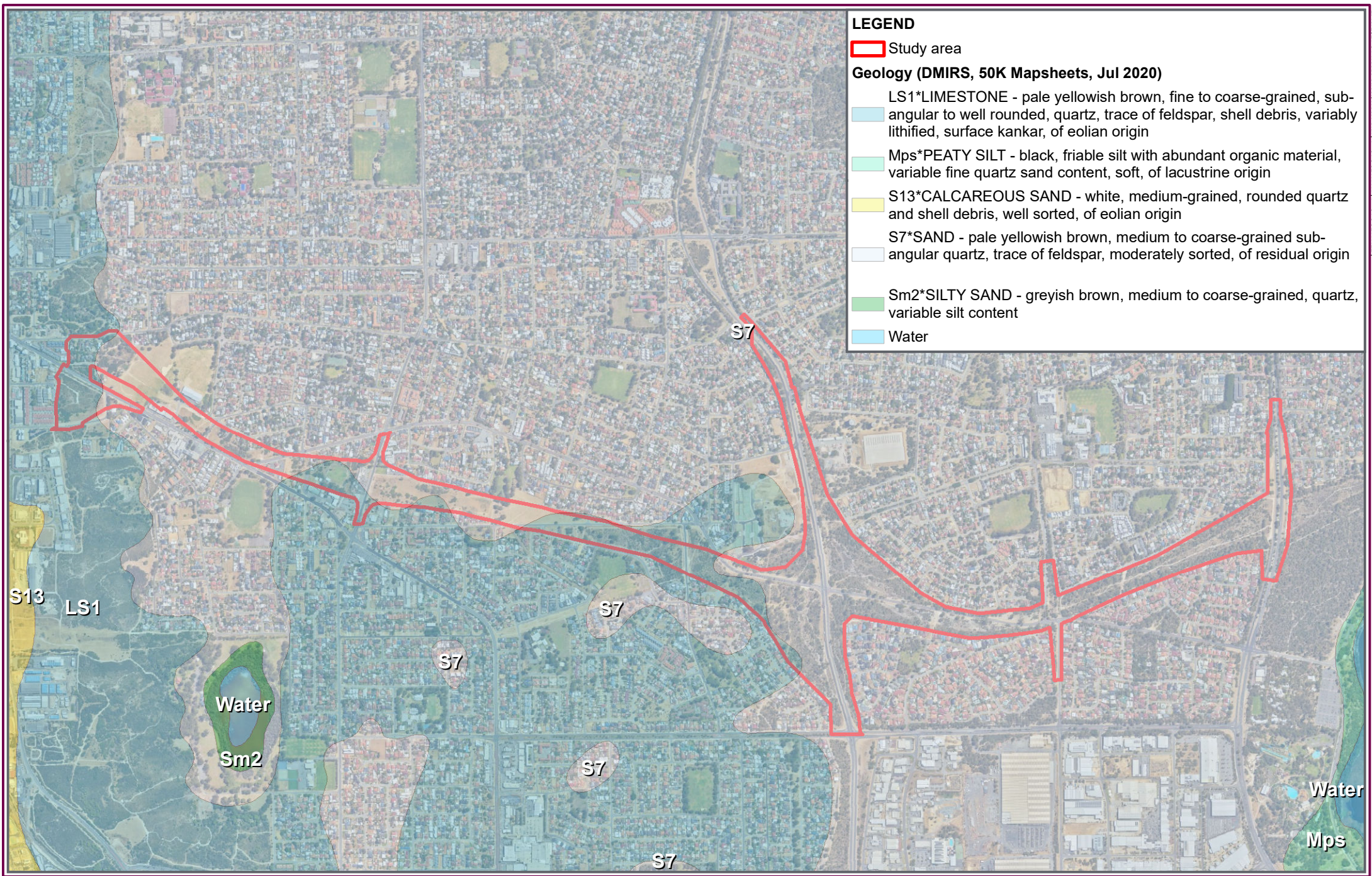
- AECOM. 2011. Roe Highway Extension Kwinana Freeway to Stock Road: Vegetation and Flora Assessment Phase 2. Unpublished report prepared for South Metro Connect. Perth, Western Australia.
- Beard, J.S., Beeston, G.R., Harvey, J.M., Hopkins, A.J.M. and D.P. Shepherd, D. 2013. The vegetation of Western Australia at the 1:3,000,000 scale. Explanatory memoir. Second edition. Conservation Science W. Aust. 9 (1): 1–152.
- Bureau of Meteorology. 2022. Bureau of Meteorology Weather and Climate Data. Accessed September 2022 <http://www.bom.gov.au/climate/data>.
- Cambridge Dictionary. 2022. Palustre. Accessed September 2022 <https://dictionary.cambridge.org/dictionary/italian-english/palustre>.
- Centre for Invasive Species Solutions. 2022. Weeds Australia. Accessed September-October 2022 <https://weeds.org.au/weeds-profiles/>.
- Clarke, K.R. and R.N Gorley. 2015. Primer v7: User manual/tutorial Primer-E Ltd, Ivybridge, Devon, United Kingdom.
- Department of Agriculture, Water and the Environment. 2017. Guidelines for nominating and assessing the eligibility for listing of ecological communities as threatened according to the *Environment Protection and Biodiversity Conservation Act 1999* and the EPBC Regulations 2000. Accessed 20 December 2022 <https://www.dcceew.gov.au/sites/default/files/env/pages/d72dfd1a-f0d8-4699-8d43-5d95bbb02428/files/guidelines-ecological-communities.pdf>
- Department of Biodiversity, Conservation and Attractions. 2020. Conservation Codes for Western Australian Fauna and Flora. Accessed 20 December 2022 <https://www.dpaw.wa.gov.au/images/Conservation%20codes%20for%20Western%20Australian%20Flora%20and%20Fauna%20179KB.pdf>
- Department of Climate Change, Energy, the Environment and Water. 2021. Interim Biogeographic Regionalisation for Australia, Version 7. Accessed September 2022 <https://www.dcceew.gov.au/sites/default/files/env/pages/5b3d2d31-2355-4b60-820c-e370572b2520/files/ibra-subregions.pdf>.
- Department of Environment and Conservation. 2013. Definitions, Categories and Criteria for Threatened and Priority Ecological Communities. Accessed 20 December 2022 https://www.dpaw.wa.gov.au/images/plants-animals/threatened-species/definitions_categories_and_criteria_for_threatened_and_priority_ecological_communities.pdf
- Department of Mines, Industry Regulation and Safety. 2022. Interactive geological map (GeoVIEW.WA). Accessed September-October 2022 <https://www.dmp.wa.gov.au/GeoView-WA-Interactive-1467.aspx>.
- Department of Primary Industries and Regional Development. 2018. Pre-European Vegetation – Western Australia (NVIS Compliant version 20110715). South Perth, Western Australia.
- Department of Primary Industries and Regional Development. 2022. Western Australian Organism List (WAOL) Accessed September-October 2022 <https://www.agric.wa.gov.au/bam/western-australian-organism-list-waol>.
- Department of the Environment and Energy. 2016. Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community. Canberra, Australian Capital Territory.
- Department of the Environment and Energy. 2017. Australian Vegetation Attribute Manual (Version 7.0). Canberra, Australian Capital Territory.
- Department of the Environment and Energy. 2019. Tuart Woodlands and Forests of the Swan Coastal Plain: A Nationally Significant Ecological Community. Canberra, Australian Capital Territory.
- Emerge Associates. 2018. Target Ecosystem Identification and Baseline Inventory Report Roe 8 Cleared Areas. Unpublished report prepared for the Rehabilitating Roe 8 Steering Committee.

REPORT

- English, V. and Blyth, J. 1997. Identifying and Conserving Threatened Ecological Communities in the South West Botanical Province. Project N702, Final Report to Environment Australia. Department of Conservation and Land Management. Perth, Western Australia.
- Environmental Protection Authority. 2003. Environmental values associated with the alignment of Roe Highway (Stage 8), A report by the Environmental Protection Authority under Section 16(j) of the Environmental Protection Act 1986. Perth, Western Australia.
- Environmental Protection Authority. 2015. Perth and Peel @3.5 million Environmental impacts, risks and remedies Interim strategic advice of the Environmental Protection Authority to the Minister for Environment under section 16(e) of the *Environmental Protection Act 1986*. Perth, Western Australia.
- Environmental Protection Authority. 2016. Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment. Perth, Western Australia.
- Gibson, N., Keighery, B., Keighery, G., Burbidge, A. and M. Lyons. 1994. A Floristic Survey of the southern Swan Coastal Plain. Unpublished report for the Australian Heritage Commission, prepared by the Department of Conservation and Land Management and the Conservation Council of Western Australia (Inc.).
- Government of Western Australia. 2000. Bush Forever: Volumes 1 and 2. Perth, Western Australia.
- Government of Western Australia. 2019. 2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report). Current as of March 2019. WA Department of Biodiversity, Conservation and Attractions, Perth <https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics>.
- Hedde, E.M., Loneragan, O.W. and J.J. Havel. 1980. Vegetation of the Darling System in Atlas of Natural Resources, Darling System Western Australia. Department of Conservation and Environment.
- Invasive Plants and Animals Committee. 2016. Invasive Weeds Strategy 2017-2027. Canberra, Australian Capital Territory.
- IUCN Species Survival Commission. 2020. IUCN Red List Categories and Criteria. Version 3.1. Second edition. Gland, Switzerland.
- Keighery, B.J. 1994. Bushland Plant Survey: A Guide to Plant Community Survey for the Community, Wildflower Society of WA (Inc.). Nedlands, Western Australia.
- Mitchell, D., Williams, K. and A. Desmond. 2002. Swan Coastal Plain (SWA02 – Swan Coastal Plain subregion). Accessed June 2022 https://www.dpaw.wa.gov.au/images/documents/about/science/projects/waaudit/swan_coastal_plain02_p606-623.pdf.
- NVIS Technical Working Group. 2017. Australian Vegetation Attribute Manual Version 7.0. Canberra, Australian Capital Territory.
- Perth Branch Wildflower Society of Western Australia (Inc). 2002. Tuart (*Eucalyptus gomphocephala*) and Tuart Communities. Nedlands, Western Australia.
- Phoenix Environmental Services. 2023. Black Cockatoo Habitat Assessment and Basic Fauna Survey for the Roe 8 (West) and Roe 9 Project. Unpublished report prepared for RPS AAP Consulting Pty Ltd.
- Threatened Species Scientific Committee. 2019. Approved Conservation Advice (incorporating listing advice) for the Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain ecological community.
- Trudgen, M.E. 1988. A Report on the Flora and Vegetation of the Port Kennedy Area. Unpublished report prepared for Bowman Bishaw and Associates. West Perth, Western Australia.
- Western Australian Herbarium. 1998–. FloraBase—the Western Australian Flora. Accessed various June–October 2022 <https://florabase.dpaw.wa.gov.au/>.

Figures





LEGEND

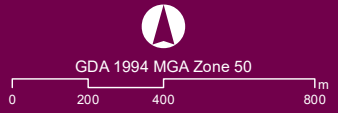
Study area

Geology (DMIRS, 50K Mapsheets, Jul 2020)

- LS1*LIMESTONE - pale yellowish brown, fine to coarse-grained, sub-angular to well rounded, quartz, trace of feldspar, shell debris, variably lithified, surface kankar, of eolian origin
- Mps*PEATY SILT - black, friable silt with abundant organic material, variable fine quartz sand content, soft, of lacustrine origin
- S13*CALCAREOUS SAND - white, medium-grained, rounded quartz and shell debris, well sorted, of eolian origin
- S7*SAND - pale yellowish brown, medium to coarse-grained sub-angular quartz, trace of feldspar, moderately sorted, of residual origin
- Sm2*SILTY SAND - greyish brown, medium to coarse-grained, quartz, variable silt content
- Water

Figure A

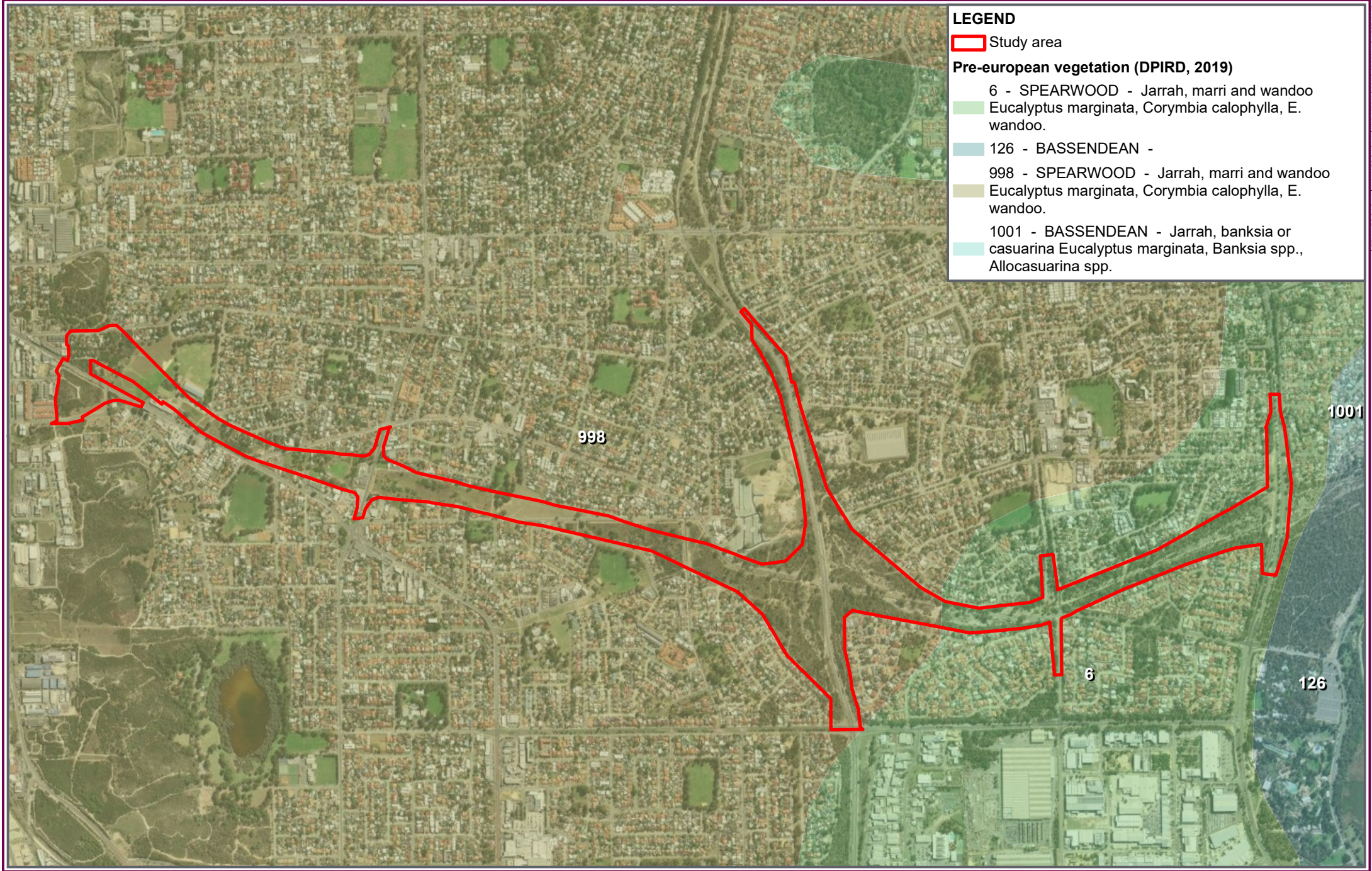
Geology




Project Number: EP3587-001
 Date: 20.10.22
 Scale: 1:20,000 @ A4
 Created by: QS



Source: Cadastre - Landgate, 2022 Orthophoto - Landgate, 2022



LEGEND

 Study area

Pre-european vegetation (DPIRD, 2019)

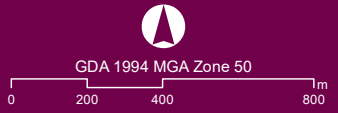
6 - SPEARWOOD - Jarrah, marri and wandoo
Eucalyptus marginata, Corymbia calophylla, E. wandoo.

126 - BASSENDEAN -

998 - SPEARWOOD - Jarrah, marri and wandoo
Eucalyptus marginata, Corymbia calophylla, E. wandoo.

1001 - BASSENDEAN - Jarrah, banksia or casuarina
Eucalyptus marginata, Banksia spp., Allocasuarina spp.

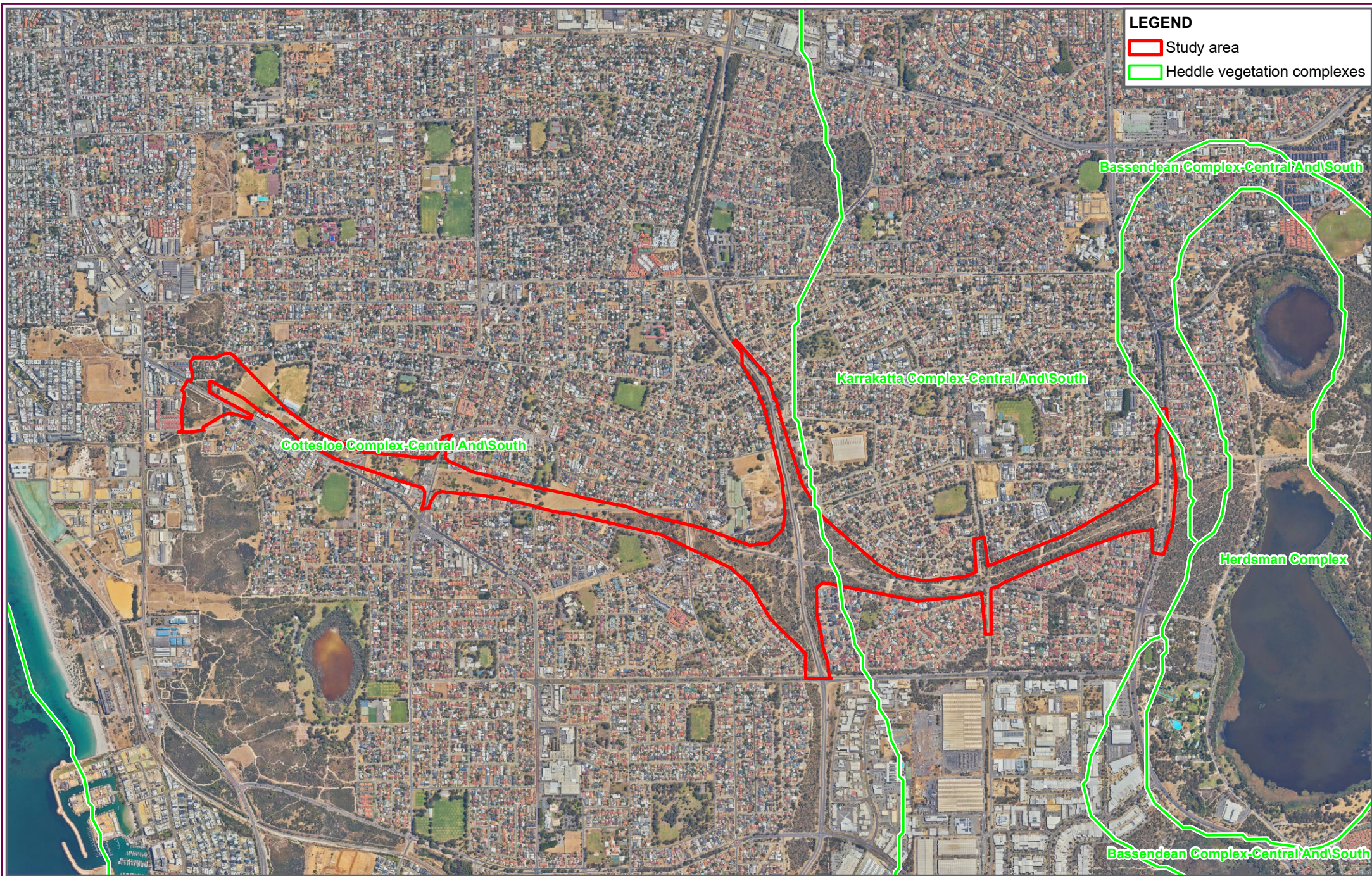
Figure B
Pre-European vegetation



Project Number: EP3587-001
Date: 20.10.22
Scale: 1:20,000 @ A4
Created by: QS



Source: Cadastre - Landgate, 2022 Orthophoto - Landgate, 2022

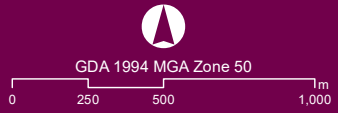


LEGEND

- Study area
- Heddle vegetation complexes

Figure C

Heddle vegetation complexes



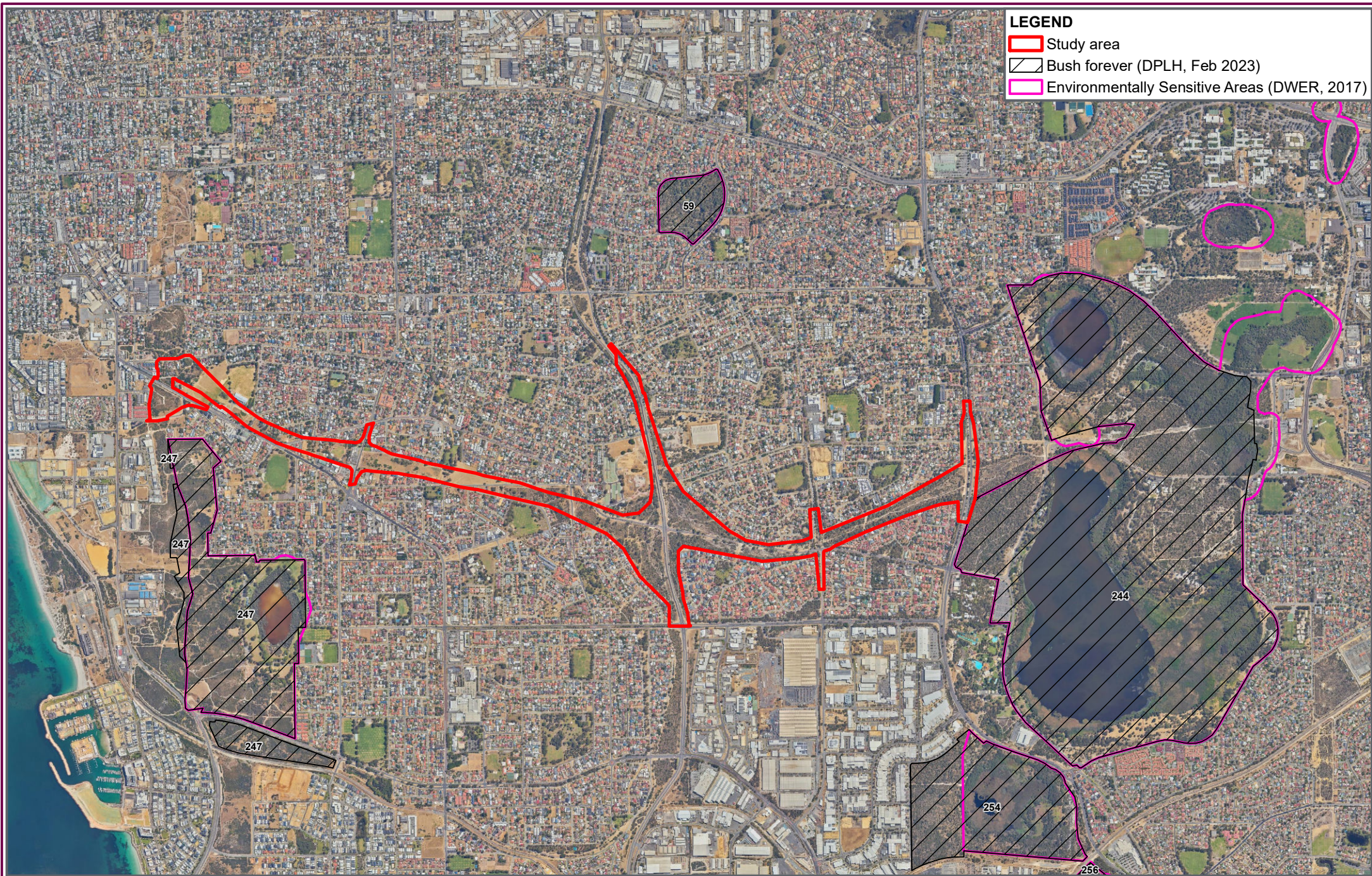
Project Number: EP3587-001
 Date: 20.10.22
 Scale: 1:25,000 @ A4
 Created by: QS



Source: Cadastre - Landgate, 2022 Orthophoto - Landgate, 2022

Document Path: G:\Jobs\IEP_Jobs\IEP3587_DPLH Roe 8 and 9 Ecological Studies\Figures\EP3587_001_G_FigC Heddle veg complexes_A4L_221020.mxd

Level 2, 2/31 Troopas Street, West Perth, WA 6005 Australia. Tel: +61 8 92111111. Fax: +61 8 92111221



LEGEND

- Study area
- Bush forever (DPLH, Feb 2023)
- Environmentally Sensitive Areas (DWER, 2017)

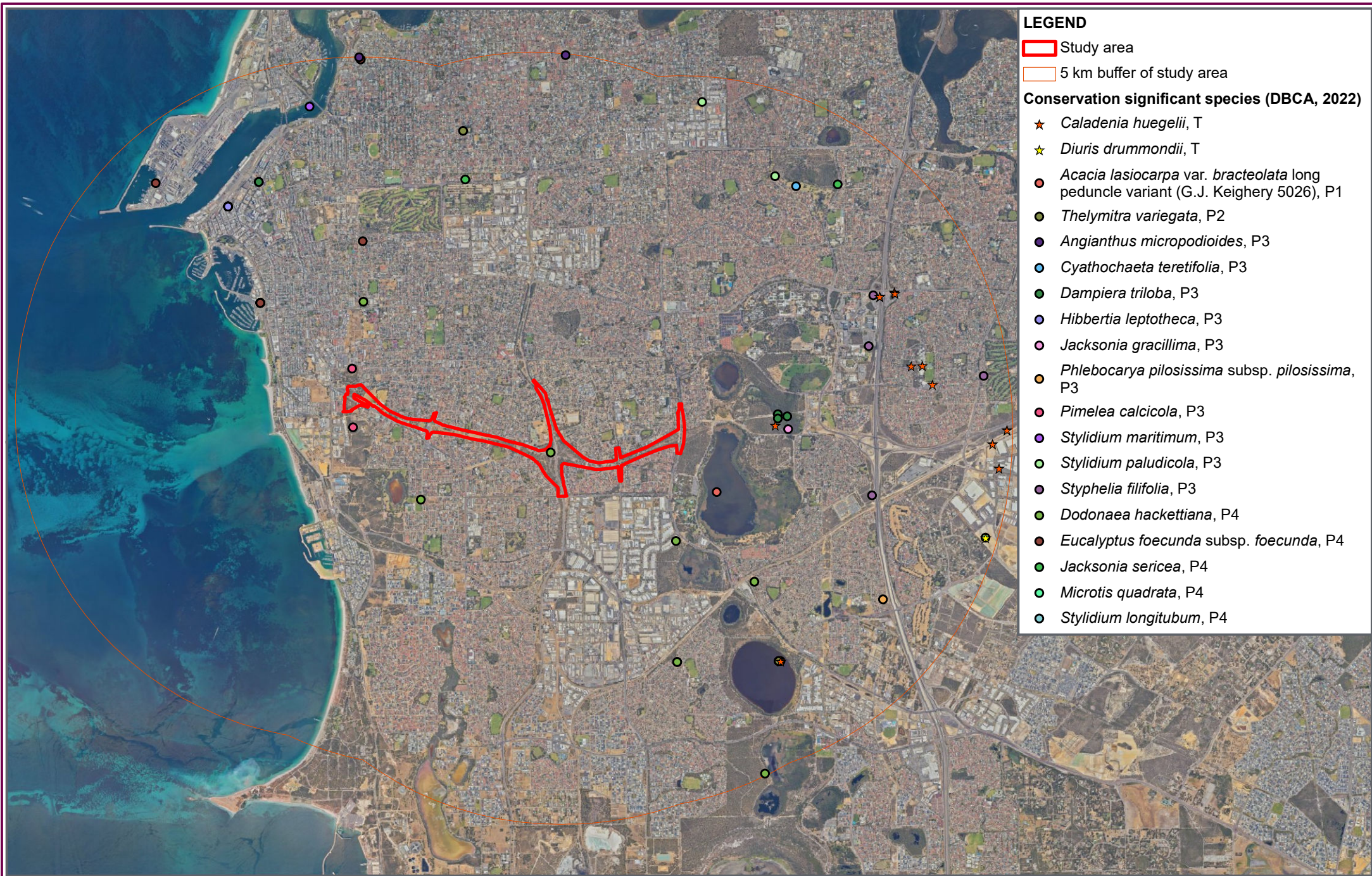
Level 2, 2/31 Troop Street, West Perth, WA | P: +61 8 92111111 | F: +61 8 92111121

Figure D
ESAs and Bush Forever sites



Project Number: EP3587-001
 Date: 20.10.22
 Scale: 1:30,000 @ A4
 Created by: QS
 Source: Orthophoto - Landgate, 2022





LEGEND

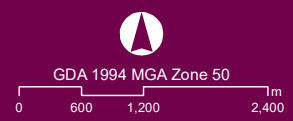
Study area

5 km buffer of study area

Conservation significant species (DBCAs, 2022)

- ★ *Caladenia huegelii*, T
- ★ *Diuris drummondii*, T
- *Acacia lasiocarpa* var. *bracteolata* long peduncle variant (G.J. Keighery 5026), P1
- *Thelymitra variegata*, P2
- *Angianthus micropodioides*, P3
- *Cyathochaeta teretifolia*, P3
- *Dampiera triloba*, P3
- *Hibbertia leptotheca*, P3
- *Jacksonia gracillima*, P3
- *Phlebocarya pilosissima* subsp. *pilosissima*, P3
- *Pimelea calcicola*, P3
- *Stylidium maritimum*, P3
- *Stylidium paludicola*, P3
- *Styphelia filifolia*, P3
- *Dodonaea hackettiana*, P4
- *Eucalyptus foecunda* subsp. *foecunda*, P4
- *Jacksonia sericea*, P4
- *Microtis quadrata*, P4
- *Stylidium longitubum*, P4


Figure E
Conservation significant species recorded within 5 km of the study area




Project Number: EP3587-001
 Date: 20.10.22
 Scale: 1:73,000 @ A4
 Created by: QS
 Source: Orthophoto - Landgate, 2022




LEGEND

 Study area

PECs/TECs (DBCA, June 2022)

 Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region (Priority 3) ecological community / Banksia Woodland of the Swan Coastal Plain (Threatened) ecological community

 Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain (Priority 3) ecological community / Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain (Threatened) ecological community

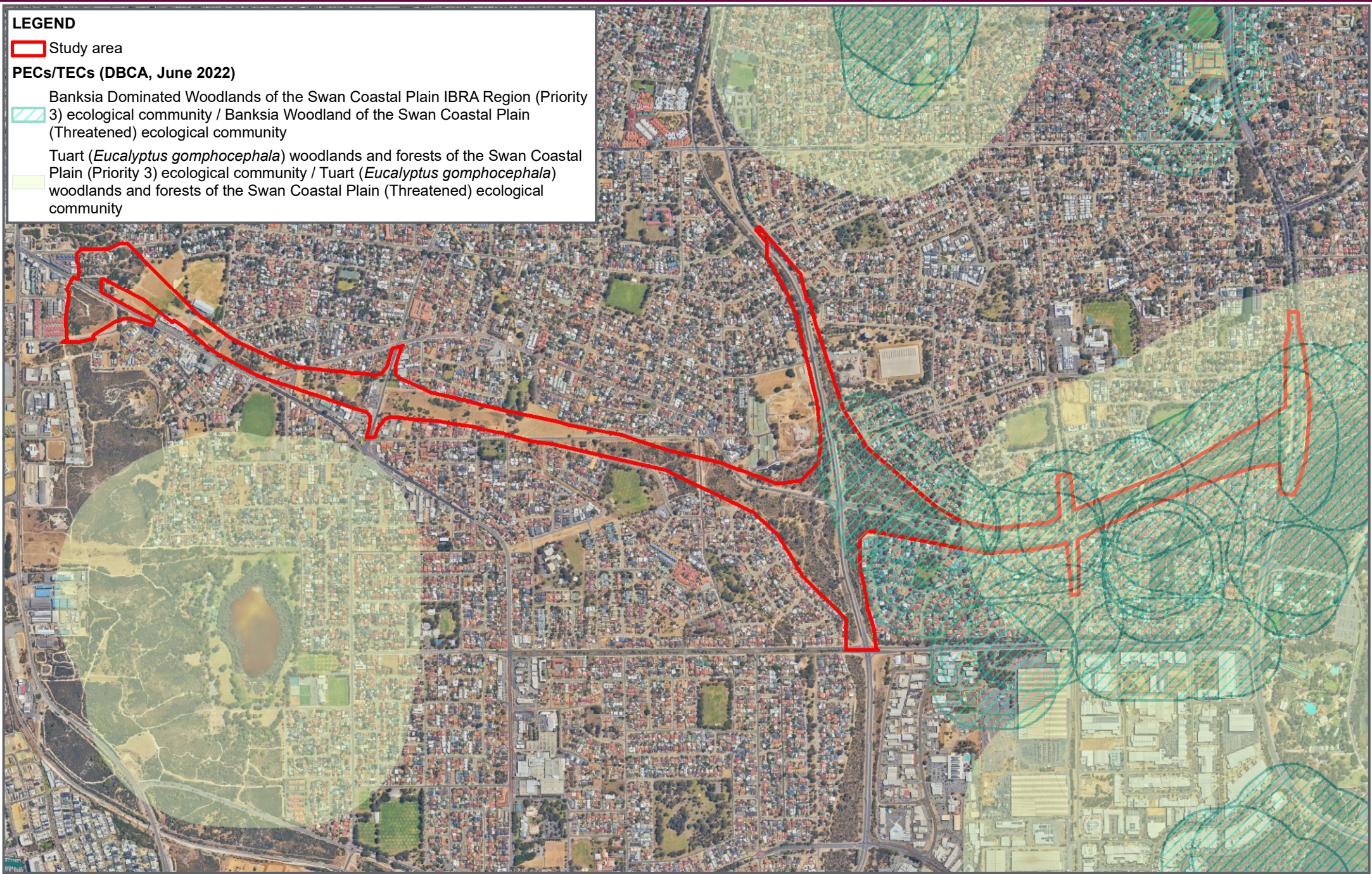


Figure F
DBCA database results:
PECs/TECs intersecting the study area



GDA 1994 MGA Zone 50



Project Number: EP3587-001

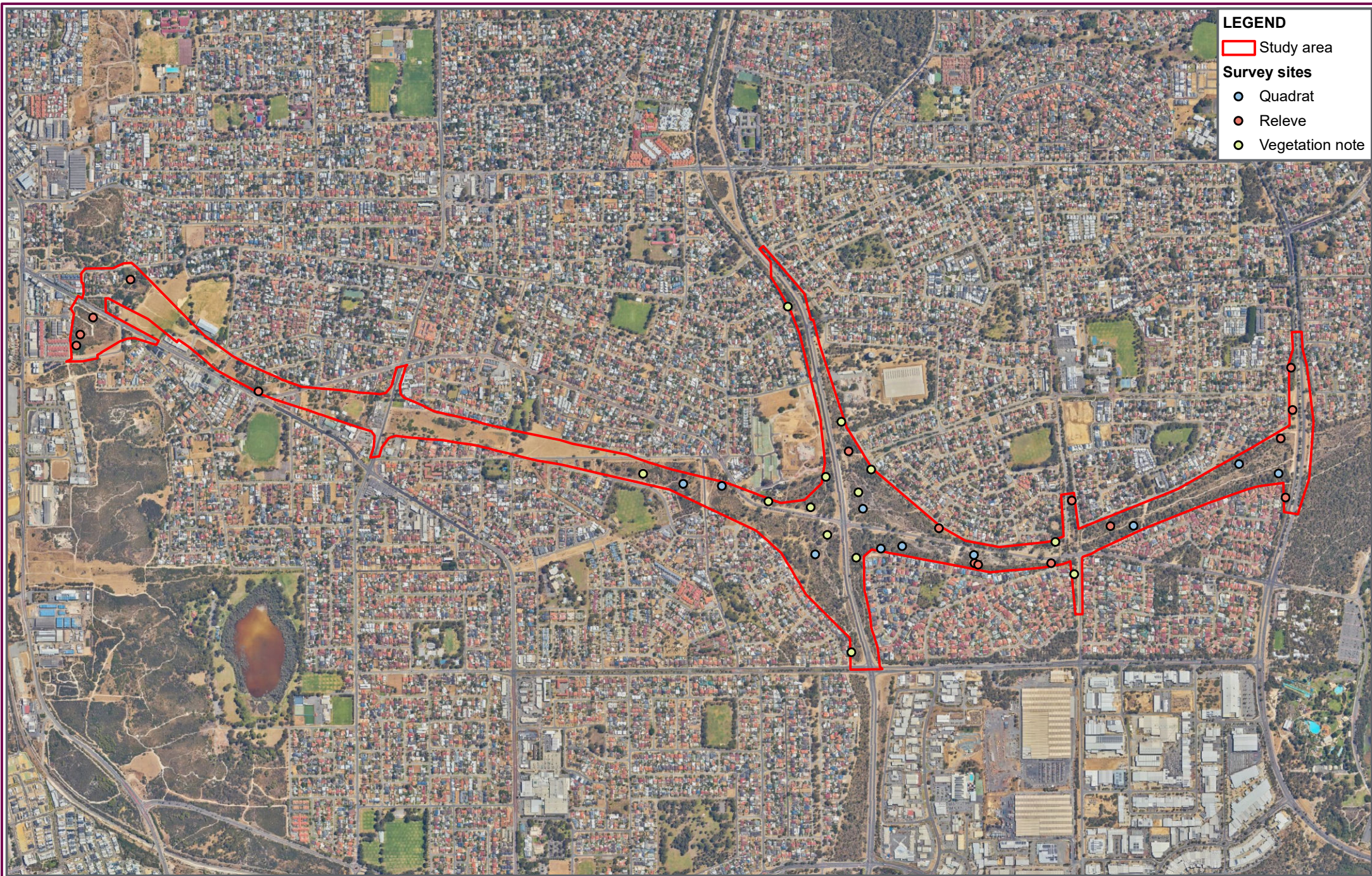
Date: 13.10.22

Scale: Map 1:20,000 @ A4

Created by: QS

Source: Cadastre - Landgate, 2022 Orthophoto - Landgate, 2022





LEGEND

- Study area
- Survey sites**
- Quadrat
- Releve
- Vegetation note

Level 2, 2/31 Troop Street, West Perth, WA 6005, Australia. Tel: +61 8 92111111. Fax: +61 8 92111221

Figure G

Survey sites



GDA 1994 MGA Zone 50



Project Number: EP3587-001
 Date: 01.11.22
 Scale: Map 1:20,000 @ A4
 Created by: QS



Source: Cadastre - Landgate, 2022 Orthophoto - Landgate, 2022

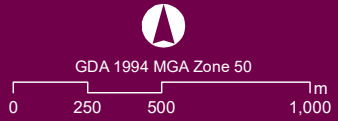


LEGEND

- Track logs
- Study area

Level 2, 2/31 Troop Street, West Perth, WA | +61 8 92111111 | F +61 8 92111221

Figure H
Track logs showing survey effort



Project Number: EP3587-001
 Date: 24.02.23
 Scale: Map 1:25,532 @ A4
 Created by: QS



Source: Cadastre - Landgate, 2022 Orthophoto - Landgate, 2022

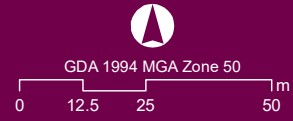
Document Path: G:\Jobs\EP_Jobs\EP3587\DP\H Roe 8 and 9 Ecological Studies\Figures\EP3587_001_G_FigH Track logs showing survey effort_A4L_230224.mxd



LEGEND


- *Dodonaea hackettiana*
- StudyArea
- Cadastre

Figure I
Conservation significant species
recorded in the study area



Project Number: EP3587-001
 Date: 12.10.22
 Scale: Overview 1:80,000 Map 1:1,500 @ A4
 Created by: QS

Source: Cadastre - Landgate, 2022 Orthophoto - Landgate, 2022



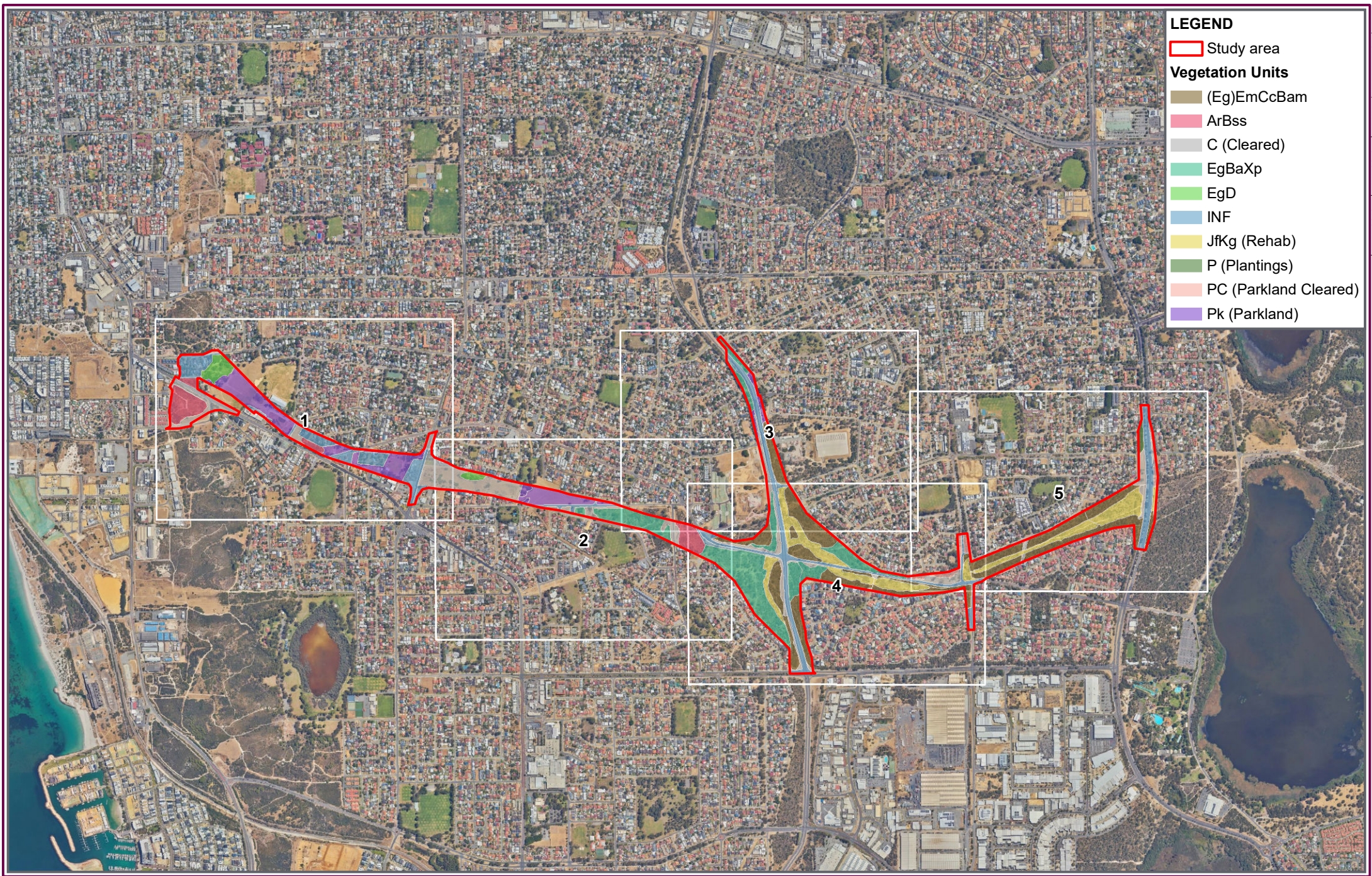
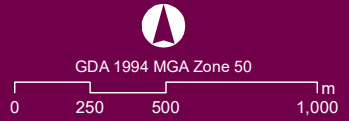


Figure J
Vegetation units - map book index



Project Number: EP3587-001
Date: 13.10.22
Scale: Map 1:25,000 @ A4
Created by: RL

Source: Cadastre - Landgate, 2022 Orthophoto - Landgate, 2022

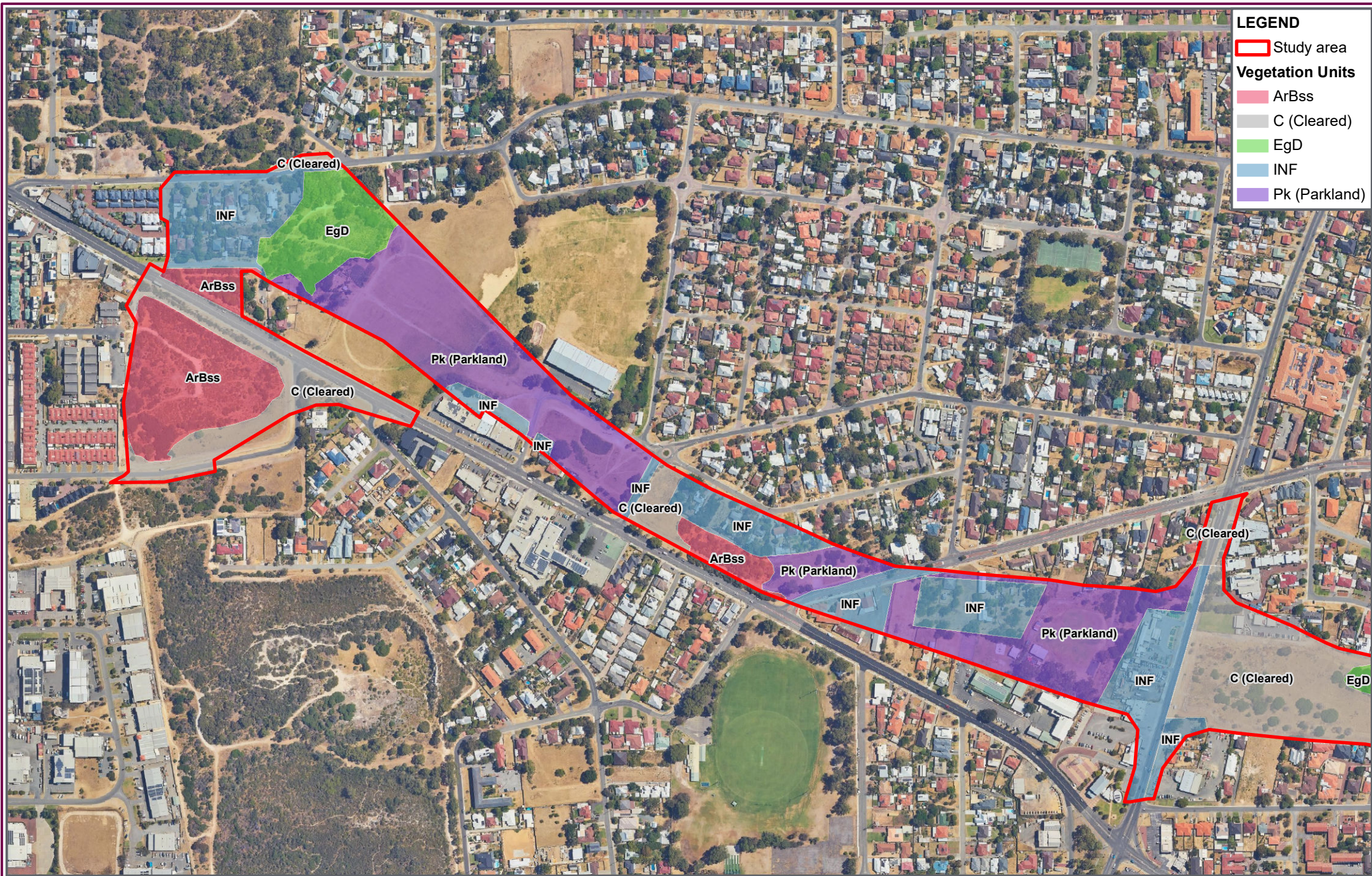
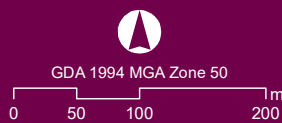


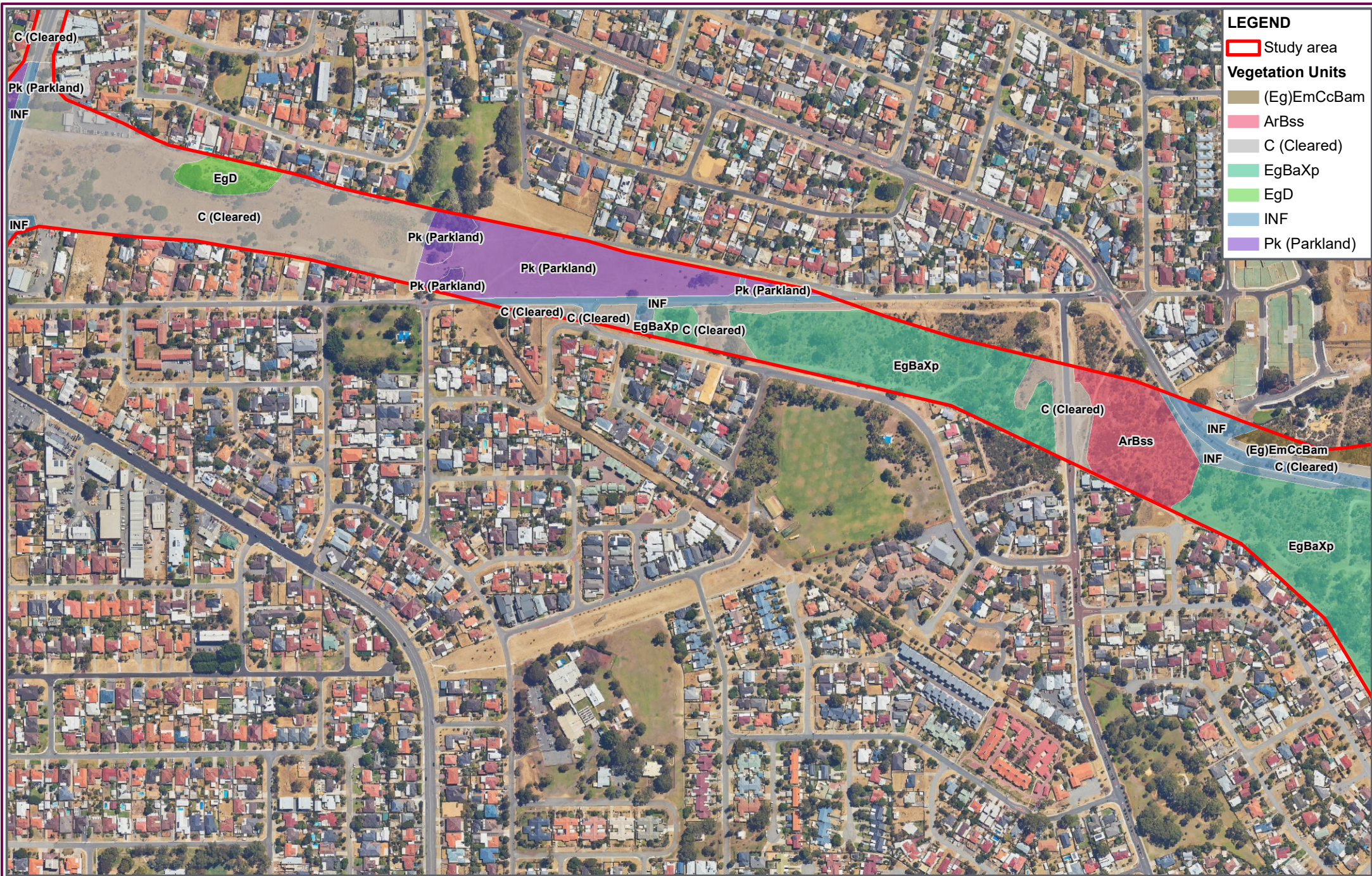
Figure J
Sheet 1 of 5
Vegetation units – map book



Project Number: EP3587-001
Date: 13.10.22
Scale: Map 1:6,000 @ A4
Created by: RL

Source: Cadastre - Landgate, 2022 Orthophoto - Landgate, 2022





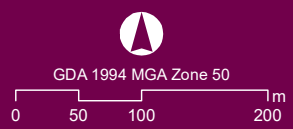
LEGEND

Study area

Vegetation Units

- (Eg)EmCcBam
- ArBss
- C (Cleared)
- EgBaXp
- EgD
- INF
- Pk (Parkland)

Figure J
Sheet 2 of 5
Vegetation units – map book



Project Number: EP3587-001
 Date: 13.10.22
 Scale: Map 1:6,000 @ A4
 Created by: RL



Source: Cadastre - Landgate, 2022 Orthophoto - Landgate, 2022



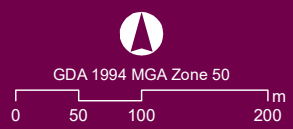
LEGEND

Study area

Vegetation Units

- (Eg)EmCcBam
- ArBss
- C (Cleared)
- EgBaXp
- INF
- JfKg (Rehab)
- Pk (Parkland)

Figure J
Sheet 3 of 5
Vegetation units – map book



Project Number: EP3587-001
 Date: 13.10.22
 Scale: Map 1:6,000 @ A4
 Created by: RL



Source: Cadastre - Landgate, 2022 Orthophoto - Landgate, 2022

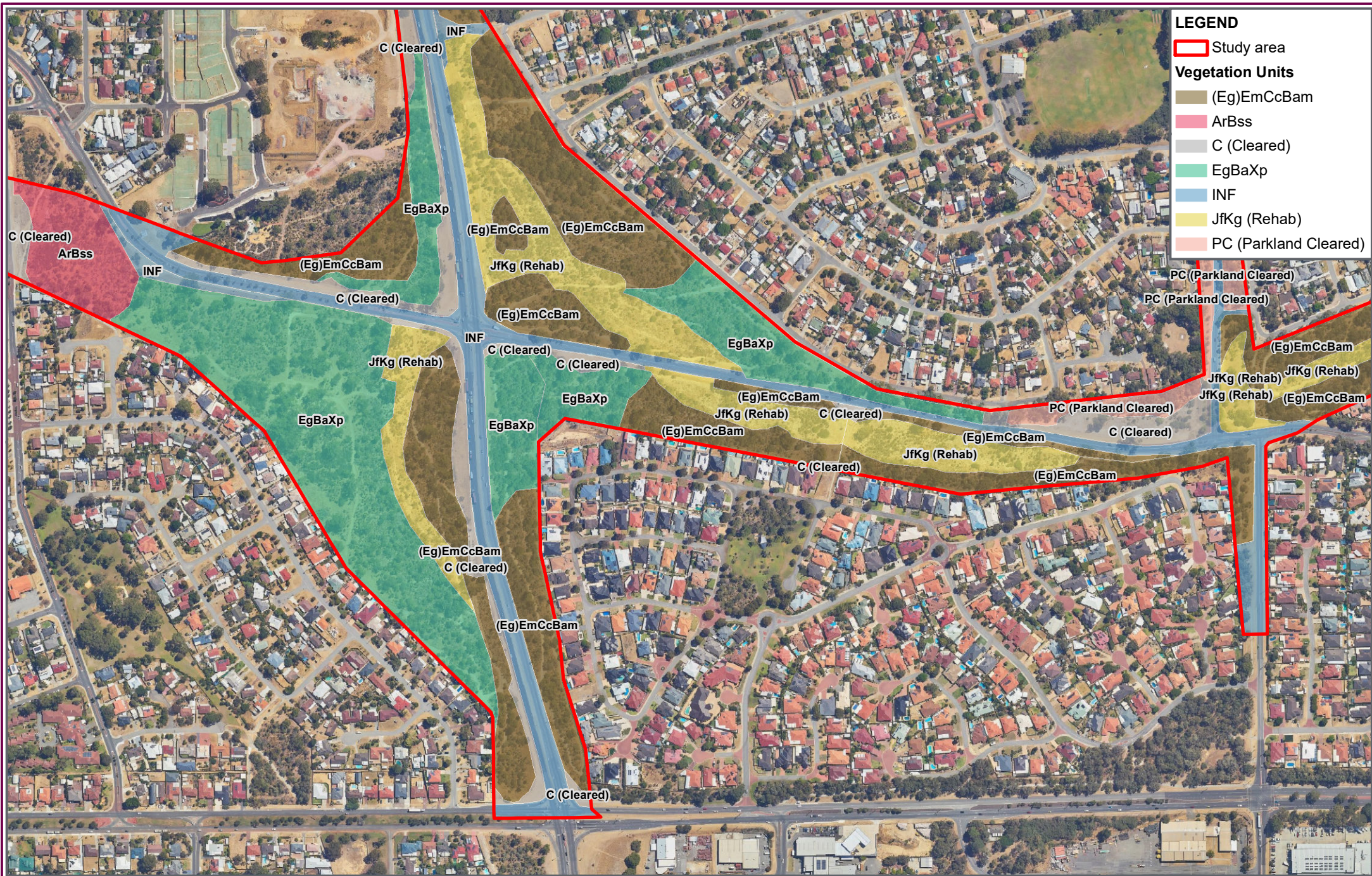
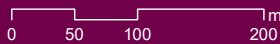


Figure J
Sheet 4 of 5
Vegetation units – map book



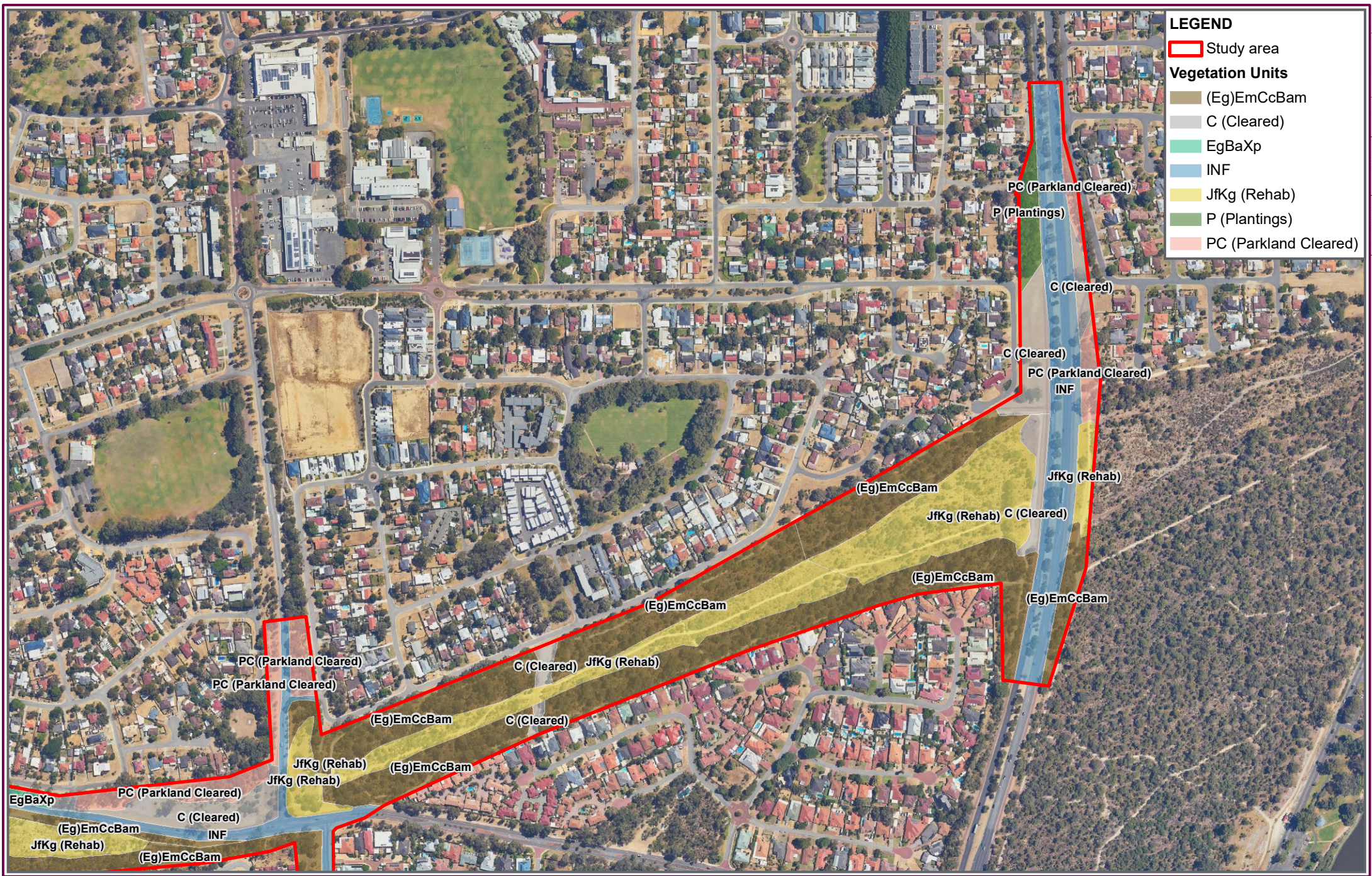
GDA 1994 MGA Zone 50



Project Number: EP3587-001
 Date: 13.10.22
 Scale: Map 1:6,000 @ A4
 Created by: RL



Source: Cadastre - Landgate, 2022 Orthophoto - Landgate, 2022



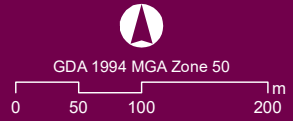
LEGEND

Study area

Vegetation Units

- (Eg)EmCcBam
- C (Cleared)
- EgBaXp
- INF
- JfKg (Rehab)
- P (Plantings)
- PC (Parkland Cleared)

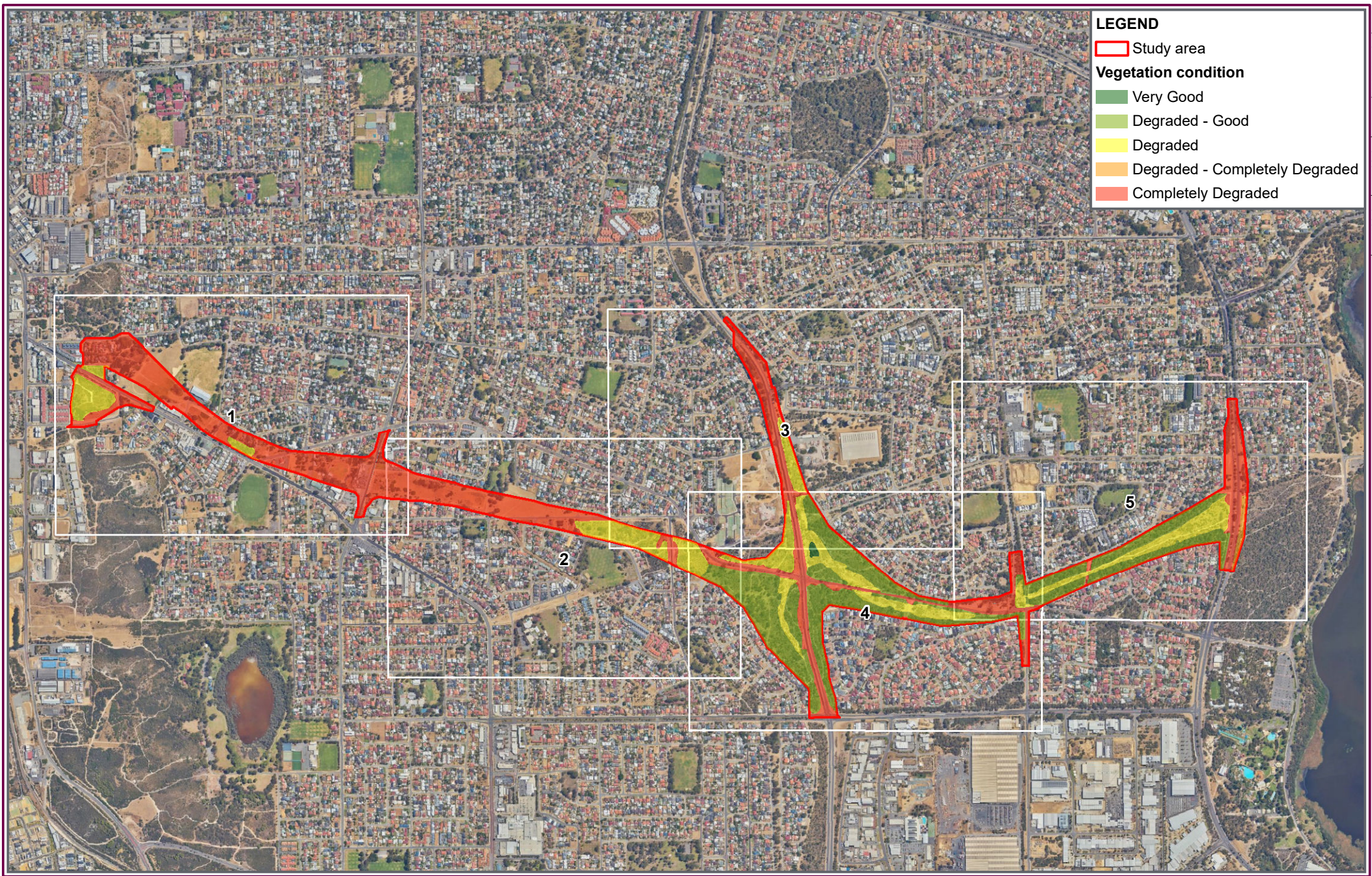
Figure J
Sheet 5 of 5
Vegetation units – map book



Project Number: EP3587-001
 Date: 13.10.22
 Scale: Map 1:6,000 @ A4
 Created by: RL



Source: Cadastre - Landgate, 2022 Orthophoto - Landgate, 2022



LEGEND

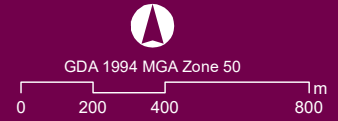
- Study area

Vegetation condition

- Very Good
- Degraded - Good
- Degraded
- Degraded - Completely Degraded
- Completely Degraded

Figure K

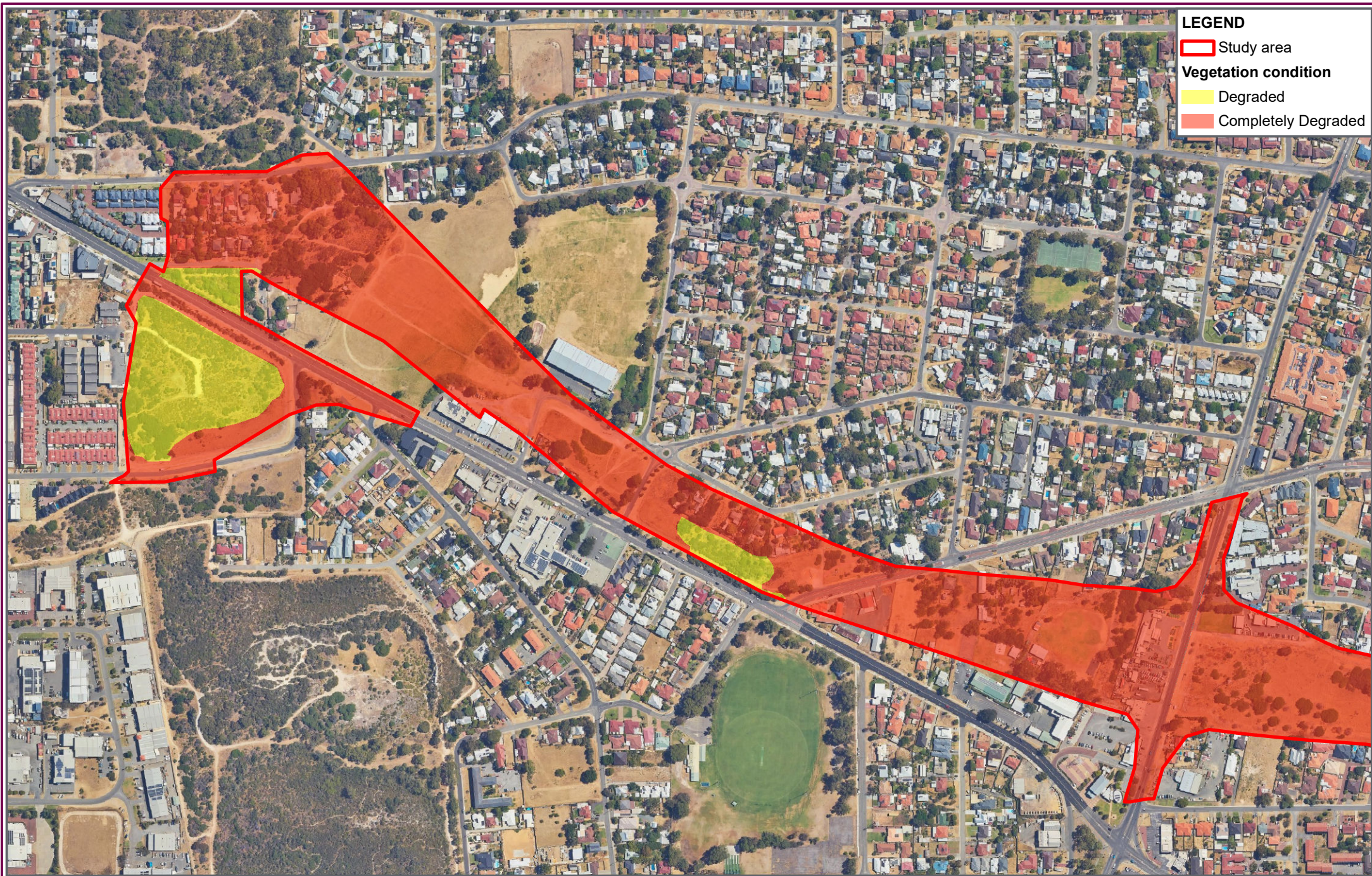
Vegetation condition - map book index



Project Number: EP3587-001
Date: 24.10.22
Scale: Map 1:21,000 @ A4
Created by: QS



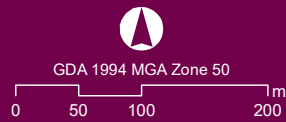
Source: Cadastre - Landgate, 2022 Orthophoto - Landgate, 2022



LEGEND

- Study area
- Vegetation condition**
- Degraded
- Completely Degraded

Figure K
Sheet 1 of 5
Vegetation condition – map book



Project Number: EP3587-001
 Date: 24.10.22
 Scale: Map 1:6,000 @ A4
 Created by: QS



Source: Cadastre - Landgate, 2022 Orthophoto - Landgate, 2022



LEGEND

Study area

Vegetation condition

Degraded - Good

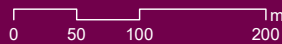
Degraded

Completely Degraded

Figure K
Sheet 2 of 5
Vegetation condition – map book



GDA 1994 MGA Zone 50



Project Number: EP3587-001
 Date: 24.10.22
 Scale: Map 1:6,000 @ A4
 Created by: QS



Source: Cadastre - Landgate, 2022 Orthophoto - Landgate, 2022



LEGEND

Study area

Vegetation condition

- Very Good
- Degraded - Good
- Degraded
- Completely Degraded

Level 2, 22/31 Troopie Street, West Perth, WA | +61 8 92111111, F: +61 8 92111121

Figure K
Sheet 3 of 5
Vegetation condition – map book



GDA 1994 MGA Zone 50



Project Number: EP3587-001
 Date: 24.10.22
 Scale: Map 1:6,000 @ A4
 Created by: QS



Source: Cadastre - Landgate, 2022 Orthophoto - Landgate, 2022



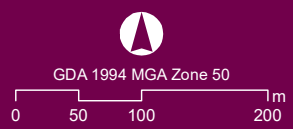
LEGEND

Study area

Vegetation condition

- Very Good
- Degraded - Good
- Degraded
- Completely Degraded

Figure K
Sheet 4 of 5
Vegetation condition – map book



Project Number: EP3587-001
 Date: 24.10.22
 Scale: Map 1:6,000 @ A4
 Created by: QS



Source: Cadastre - Landgate, 2022 Orthophoto - Landgate, 2022



LEGEND

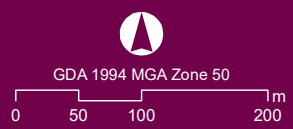
Study area

Vegetation condition

- Degraded - Good
- Degraded
- Degraded - Completely Degraded
- Completely Degraded

Leaflet | Map data © OpenStreetMap contributors, Imagery © Mapbox

Figure K
Sheet 5 of 5
Vegetation condition – map book



Project Number: EP3587-001
 Date: 24.10.22
 Scale: Map 1:6,000 @ A4
 Created by: QS



Source: Cadastre - Landgate, 2022 Orthophoto - Landgate, 2022

Document Path: G:\Jobs\EP_3587\001\09 Ecological Studies\Figures\EP3587_001_G_FigK Veg Condition Mapbook_A4L_221024.mxd

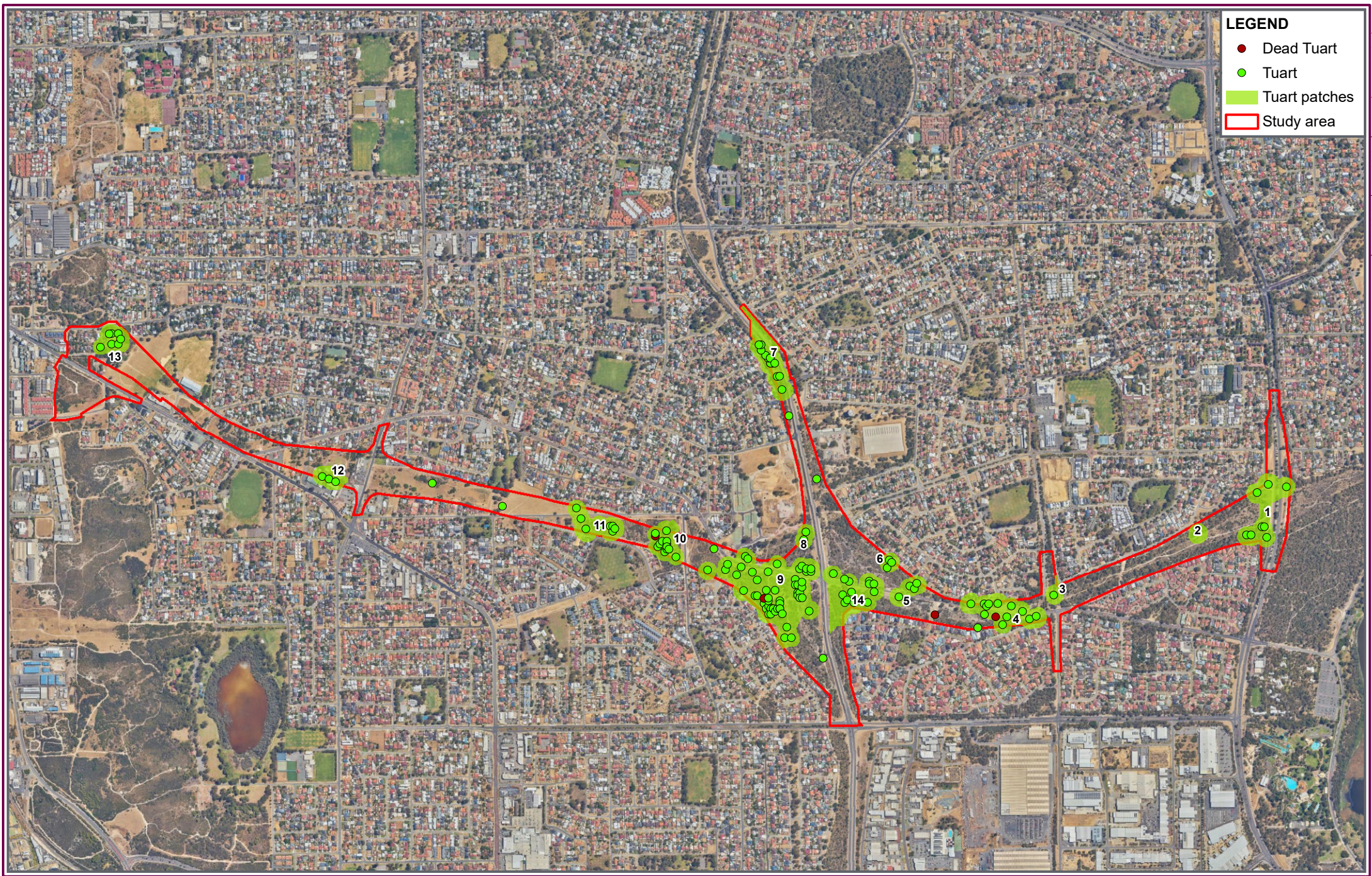


Figure L
Tuart patches in the study area



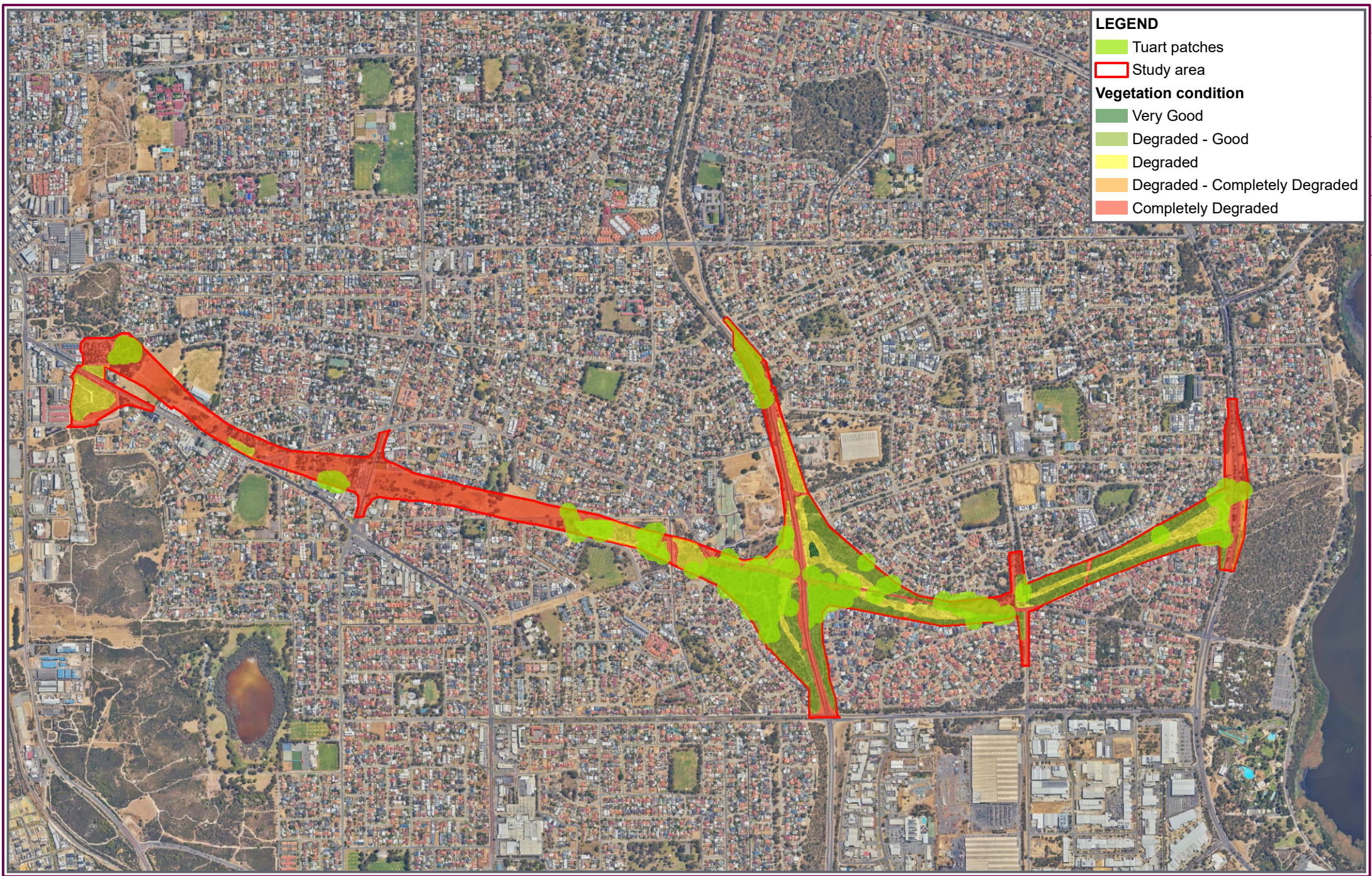
GDA 1994 MGA Zone 50



Project Number: EP3587-001
Date: 24.02.23
Scale: Map 1:20,000 @ A4
Created by: QS

Source: Cadastre - Landgate, 2022 Orthophoto - Landgate, 2022





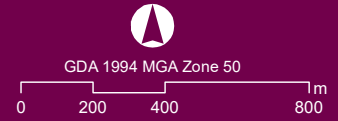
LEGEND

- Tuart patches
- Study area

Vegetation condition

- Very Good
- Degraded - Good
- Degraded
- Degraded - Completely Degraded
- Completely Degraded

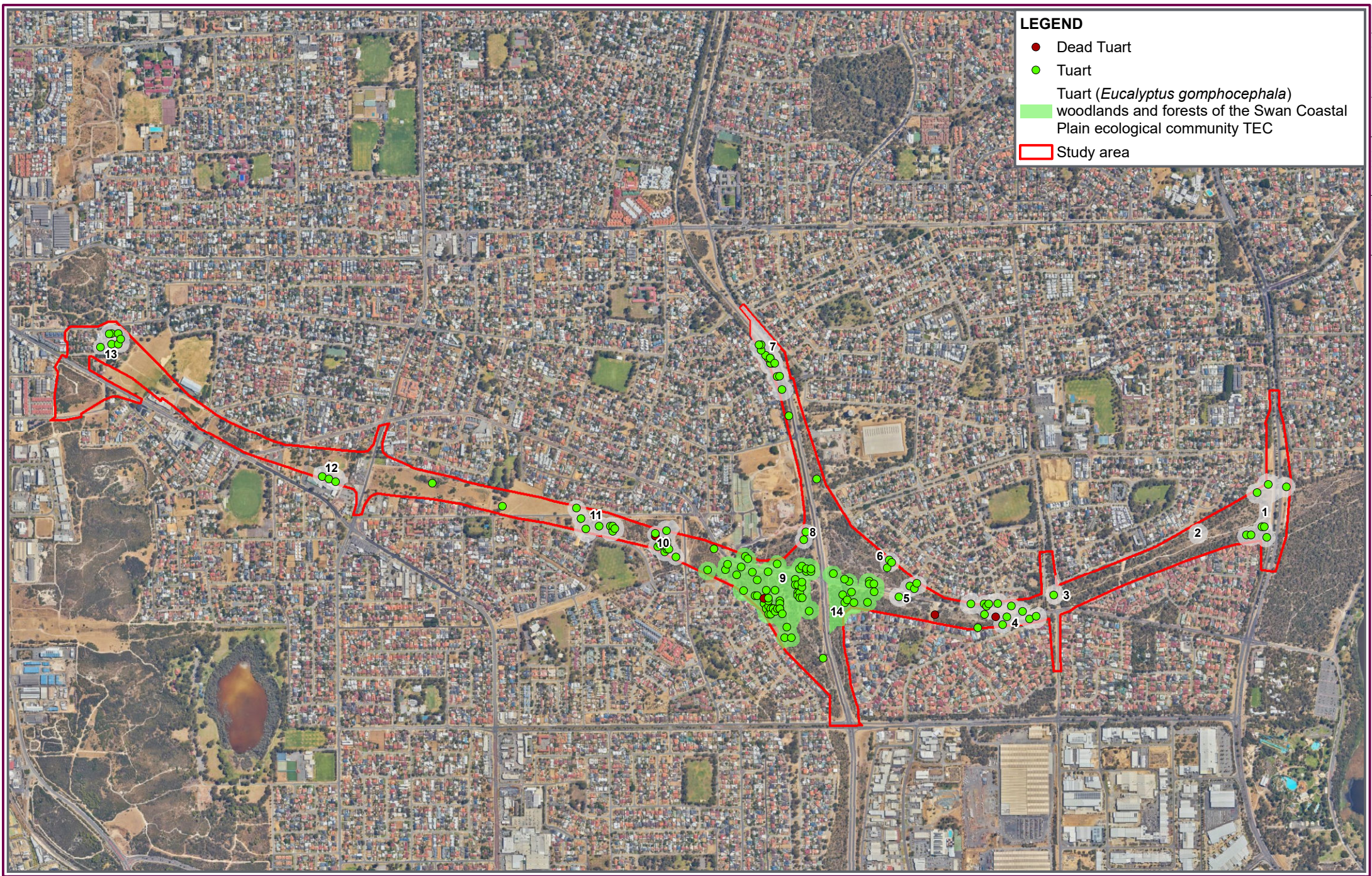
Figure M
Tuart patches condition



Project Number: EP3587.001
Date: 07.03.23
Scale: Map 1:21,000 @ A4
Created by: QS



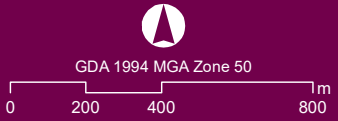
Source: Cadastre - Landgate, 2022 Orthophoto - Landgate, 2022



LEGEND

- Dead Tuart
- Tuart
- Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain ecological community TEC
- ▭ Study area

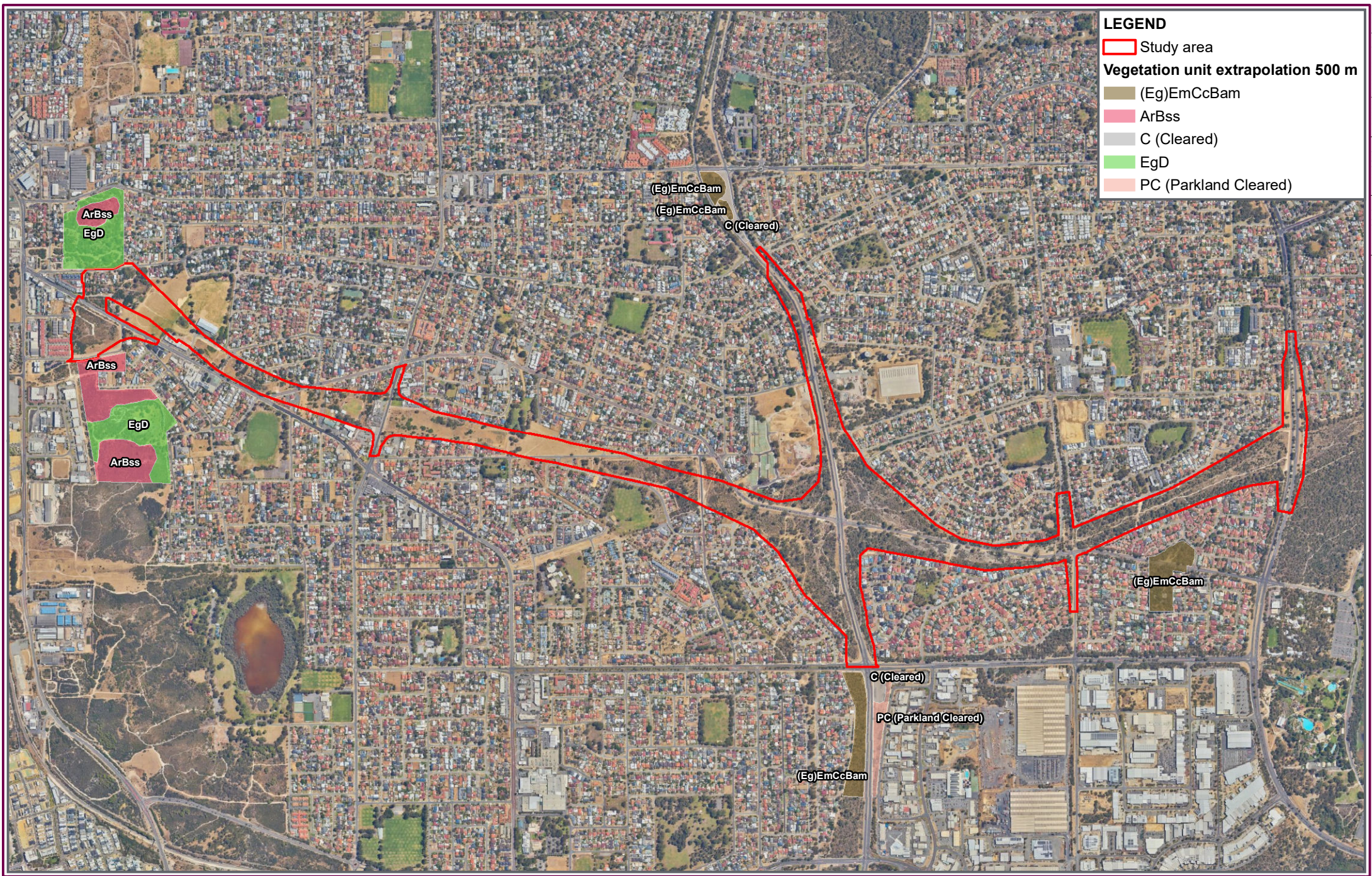
Figure N
Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain ecological community



Project Number: EP3587-001
Date: 07.03.23
Scale: Map 1:20,000 @ A4
Created by: QS



Source: Cadastre - Landgate, 2022 Orthophoto - Landgate, 2022



Level 2, 22/31 Troop Street, West Perth, WA 6005, Australia. Phone: +61 8 92111121. Fax: +61 8 92111121

Figure O

Vegetation unit extrapolation 500 m



GDA 1994 MGA Zone 50

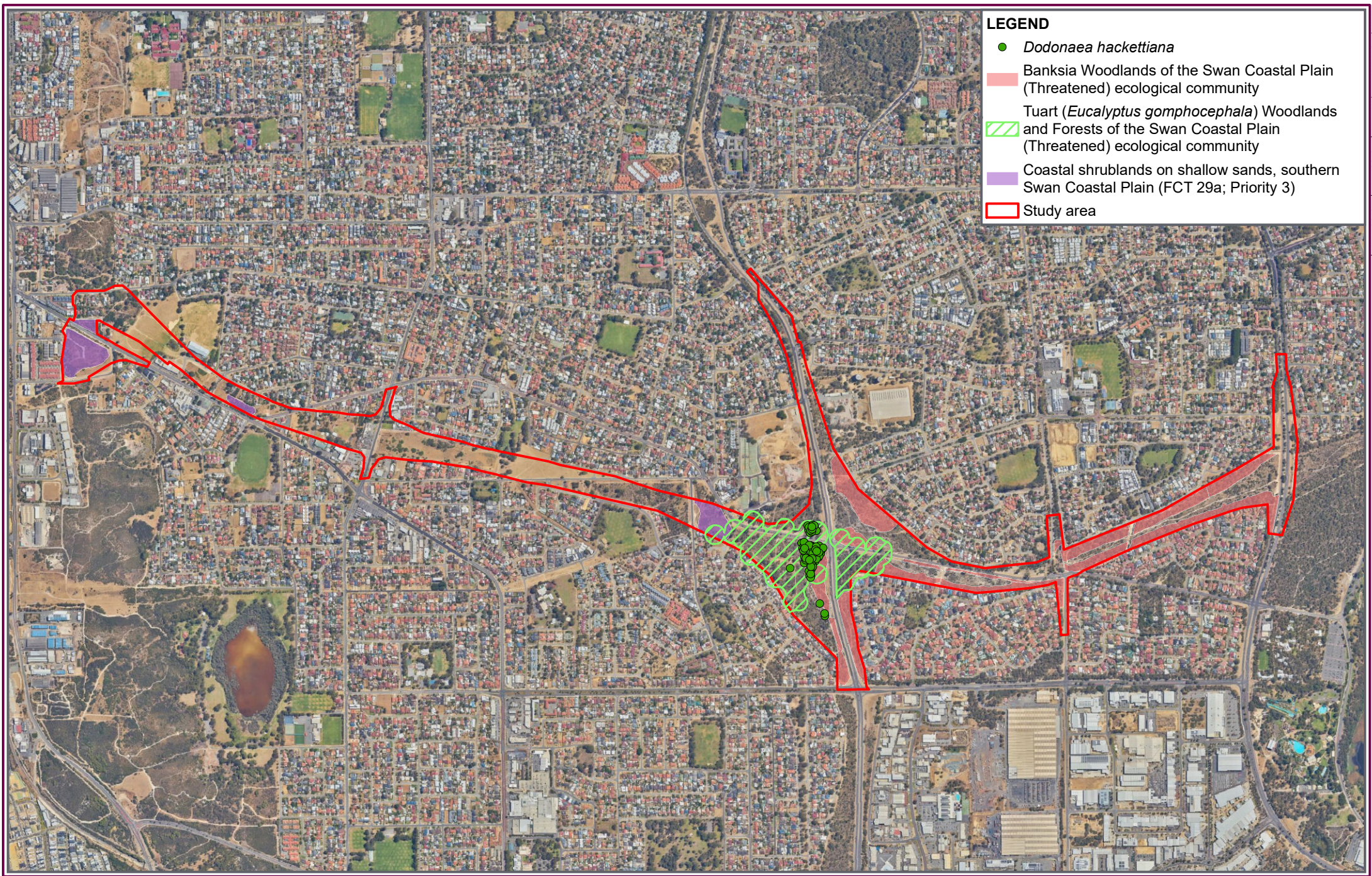


Project Number: EP3587-001
 Date: 07.03.23
 Scale: Map 1:20,000 @ A4
 Created by: QS



Source: Cadastre - Landgate, 2022 Orthophoto - Landgate, 2022

Document Path: G:\Jobs\IEP_Jobs\IEP3587_DPLH Roe 8 and 9 Ecological Studies\Figures\EP3587_001_G_FigO Vegetation unit extrapolation 500 m_A4L_221031.mxd



LEGEND

- *Dodonaea hackettiana*
- Banksia Woodlands of the Swan Coastal Plain (Threatened) ecological community
- ▨ Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain (Threatened) ecological community
- Coastal shrublands on shallow sands, southern Swan Coastal Plain (FCT 29a; Priority 3)
- ▭ Study area

Document Path: G:\Jobs\EP_Jobs\EP3587_DPLH Roe 8 and 9 Ecological Studies\Figures\EP3587_001_G_FigO Conservation significant flora and vegetation_A4L_221129.mxd

Appendix A

Conservation category definitions



APPENDIX A: CONSERVATION CATEGORY DEFINITIONS

Table A-1: Conservation codes for Western Australian flora

Category Definition	
Threatened species	
T	<p>Threatened species</p> <p>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 <i>Biodiversity Conservation Act 2016</i> (BC Act).</p> <p>Threatened flora is the species of flora that are listed as critically endangered, endangered or vulnerable threatened species.</p>
CR	<p>Critically endangered species</p> <p>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”.</p>
EN	<p>Endangered species</p> <p>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”.</p>
VU	<p>Vulnerable species</p> <p>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”.</p>
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	<p>Extinct species</p> <p>Species where “there is no reasonable doubt that the last member of the species has died”.</p>
EW	<p>Extinct in the wild species</p> <p>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”.</p>
Priority species	
P	<p>Species that may possibly be threatened species that do not meet the criteria for listing under the BC Act because of insufficient survey or are otherwise data deficient, are added to the Priority Flora list under Priorities 1, 2 or 3. These three categories are ranked in order of prioritisation for survey and evaluation of conservation status so that consideration can be given to potential listing as threatened.</p> <p>Species that are adequately known, meet criteria for near threatened, or are rare but not threatened, or that have been recently removed from the threatened species list for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.</p>
P1	<p>Priority 1: Poorly-known species – known from few locations, none on conservation lands</p> <p>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.</p> <p>Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements for threatened listing and appear to be under immediate threat from known threatening processes. These species are in urgent need of further survey.</p>
P2	<p>Priority 2: Poorly-known species – known from few locations, some on conservation lands</p> <p>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.</p>

Category	Definition
P3	<p>Priority 3: Poorly known species – known from several locations</p> <p>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.</p> <p>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. These species need further survey.</p>
P4	<p>Priority 4: Rare, near threatened and other species in need of monitoring</p> <p>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.</p> <p>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 a conservation dependent specially protected species.</p> <p>c. Species that have been removed from the list of threatened species or lists of conservation dependent or other specially protected species, during the past five years for reasons other than taxonomy.</p> <p>d. Other species in need of monitoring.</p>

(Source: DBCA 2020)

Table A-2: EPBC Act conservation codes

Category	Definition
EX	<p>Extinct</p> <p>A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual) throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.</p>
EW	<p>Extinct in the Wild</p> <p>A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalised population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual) throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.</p>
CR	<p>Critically Endangered</p> <p>A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria for Critically Endangered, and it is therefore considered to be facing an extremely high risk of extinction in the wild.</p>
EN	<p>Endangered</p> <p>A taxon is Endangered when the best available evidence indicates that it meets any of the criteria for Endangered, and it is therefore considered to be facing a very high risk of extinction in the wild.</p>
VU	<p>Vulnerable</p> <p>A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria for Vulnerable, and it is therefore considered to be facing a high risk of extinction in the wild.</p>

(Source: IUCN Species Survival Commission 2020)

Table A-3: Threatened ecological communities category of threat

Category	Definition
Presumed Totally Destroyed (PD)	<p>An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies:</p> <ul style="list-style-type: none"> a. Records within the last 50 years have not been confirmed despite thorough searches or known or likely habitats or b. All occurrences recorded within the last 50 years have since been destroyed.
Critically Endangered (CR)	<p>An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.</p> <p>An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (a, b or c):</p> <ul style="list-style-type: none"> a. The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii): <ul style="list-style-type: none"> i. Geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately ten years) ii. Modification throughout its range is continuing such that in the immediate future (within approximately ten years) the community is unlikely to be capable of being substantially rehabilitated. b. Current distribution is limited, and one or more of the following apply (i, ii or iii): <ul style="list-style-type: none"> i. Geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately ten years) ii. There are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes iii. There may be many occurrences, but total area is very small, and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes. c. The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately ten years).
Endangered (EN)	<p>An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.</p> <p>An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (a, b, or c):</p> <ul style="list-style-type: none"> a. The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply (i or ii): <ul style="list-style-type: none"> i. The estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short-term future (within approximately 20 years) ii. Modification throughout its range is continuing such that in the short-term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated. b. Current distribution is limited, and one or more of the following apply (i, ii or iii): <ul style="list-style-type: none"> i. Geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short-term future (within approximately 20 years) ii. There are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes; iii) there may be many occurrences, but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes. c. The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).

Category	Definition
Vulnerable (VU)	<p>An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.</p> <p>An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium (within approximately 50 years) to long-term future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (a, b or c):</p> <ol style="list-style-type: none"> The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated. The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations. The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long-term future because of existing or impending threatening processes.

(Source: Department of Environment and Conservation 2013)

Table A-4: Priority ecological communities category of threat

Category	Definition
P1	<p>Priority one: Poorly known ecological communities</p> <p>Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤100 ha). Occurrences are believed to be under threat either due to limited extent or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.</p>
P2	<p>Priority two: Poorly known ecological communities</p> <p>Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200 ha). At least some occurrences are not believed to be under immediate threat (within approximately ten years) of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.</p>
P3	<p>Priority three: Poorly known ecological communities</p> <p>Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or:</p> <p>Communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (within approximately ten years), or</p> <p>Communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change, etc.</p> <p>Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.</p>
P4	<p>Priority four: Ecological communities that are adequately known, rare but not threatened or meet criteria for near threatened or that have been recently removed from the threatened list. These communities require regular monitoring</p> <p>Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These communities are usually represented on conservation lands.</p> <p>Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for a higher threat category.</p> <p>Ecological communities that have been removed from the list of threatened communities during the past five years.</p>
P5	<p>Priority five: Conservation dependent ecological communities</p> <p>Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.</p>

(Source: Department of Environment and Conservation 2013)

Table A-5: EPBC Act listed threatened ecological communities category of threat

Category	Definition
CE	Critically endangered Extremely high risk of extinction in the next ten years, or three generations of any long-lived or key species believed to play a major role in sustaining the community (whichever is the longer), up to a maximum of 60 years.
E	Endangered Extremely high risk of extinction the next 20 years, or five generations of any long-lived or key species believed to play a major role in sustaining the community (whichever is the longer), up to a maximum of 100 years.
V	Vulnerable Extremely high risk of extinction in the next 50 years, or within ten generations of any long-lived or key species believed to play a major role in sustaining the community (whichever is the longer), up to a maximum of 100 years.

(Source: Department of Agriculture, Water and the Environment 2017)

Table A-6: NVIS vegetation structure classes

Growth form	Height	Structural formation classes (% cover)					
		80–100	50–80	20–50	0.25–20	0–0.25	Unknown
Tree, palm	Tall; Mid; Low	Closed forest	Open forest	Woodland	Open woodland	Isolated trees	Isolated clumps of trees
Tree mallee	Tall; Mid; Low	Closed mallee forest	Open mallee forest	Mallee woodland	Open mallee woodland	Isolated mallee trees	Isolated clumps of mallee trees
Shrub, cycad, grass-tree, tree-fern	Tall; Mid; Low	Closed shrubland	Shrubland	Open shrubland	Sparse shrubland	Isolated shrubs	Isolated clumps of shrubs
Mallee shrub	Tall; Mid; Low	Closed mallee shrubland	Mallee shrubland	Open mallee shrubland	Sparse mallee shrubland	Isolated mallee shrubs	Isolated clumps of mallee shrubs
Heath shrub	Tall; Mid; Low	Closed heathland	Heathland	Open heathland	Sparse heathland	Isolated heath shrubs	Isolated clumps of heath shrubs
Chenopod shrub	Tall; Mid; Low	Closed chenopod shrubland	Chenopod shrubland	Open chenopod shrubland	Sparse chenopod shrubland	Isolated chenopod shrubs	Isolated clumps of chenopod shrubs
Samphire shrub	Mid; Low	Closed samphire shrubland	Samphire shrubland	Open samphire shrubland	Sparse samphire shrubland	Isolated samphire shrubs	Isolated clumps of samphire shrubs
Hummock grass	Mid; Low	Closed hummock grassland	Hummock grassland	Open hummock grassland	Sparse hummock grassland	Isolated hummock grasses	Isolated clumps of hummock grasses
Tussock grass	Mid; Low	Closed tussock grassland	Tussock grassland	Open tussock grassland	Sparse tussock grassland	Isolated tussock grasses	Isolated clumps of tussock grasses
Other grass	Mid; Low	Closed grassland	Grassland	Open grassland	Sparse grassland	Isolated grasses	Isolated clumps of grasses
Sedge	Mid; Low	Closed sedgeland	Sedgeland	Open sedgeland	Sparse sedgeland	Isolated sedges	Isolated clumps of sedges
Rush	Mid; Low	Closed rushland	Rushland	Open rushland	Sparse rushland	Isolated rushes	Isolated clumps of rushes
Forb (herb)	Mid; Low	Closed forbland	Forbland	Open forbland	Sparse forbland	Isolated forbs	Isolated clumps of forbs
Fern		Closed fernland	Fernland	Open fernland	Sparse fernland	Isolated ferns	Isolated clumps of ferns

(Source: NVIS Technical Working Group 2017)

Table A-7: NVIS vegetation height classes

Height class	Height range (m)	Growth form	Tree, vine (m and u), palm (single-stemmed)	Shrub, heath shrub, chenopod shrub, ferns, samphire shrub, cycad, tree-fern, grass-tree, palm (multi-stemmed)	Tree mallee, mallee shrub	Tussock grass, hummock grass, other grass, sedge, rush, forbs, vine (g)
8	>30	Tall				
7	10–30	Mid			Tall	
6	<10	Low			Mid	
5					Low	
4	>2		Tall			Tall
3	1–2		Mid			Tall
2	0.5–1		Low			Mid
1	<0.5		Low			Low

(Source: NVIS Technical Working Group 2017)

Table A-8: Vegetation condition scale

Condition	South West and Interzone Botanical provinces	Eremaean and Northern Botanical provinces
P Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.	NA
E Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.
V Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.	Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks.
G Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.
Poor	NA	Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds.
D Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species.
C Completely Degraded	The structure of the vegetation is no longer intact, and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees and shrubs.	Areas that are completely or almost completely without native species in the structure of their vegetation; i.e. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs.

(Source: EPA 2016)

Appendix B

MNES database search results





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. Please see the caveat for interpretation of information provided here.

Report created: 02-Sep-2022

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)

Summary

Matters of National Environment 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:	1
National Heritage Places:	1
Wetlands of International Importance (Ramsar)	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	63
Listed Migratory Species:	72

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

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 Lands:	125
Commonwealth Heritage Places:	2
Listed Marine Species:	106
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	25
Regional Forest Agreements:	None
Nationally Important Wetlands:	4
EPBC Act Referrals:	84
Key Ecological Features (Marine):	None
Biologically Important Areas:	14
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

World Heritage Properties [\[Resource Information \]](#)

Name	State	Legal Status	Buffer Status
Australian Convict Sites (Fremantle Prison)	WA	Declared property	In buffer area only

National Heritage Places [\[Resource Information \]](#)

Name	State	Legal Status	Buffer Status
Historic			
Fremantle Prison (former)	WA	Listed place	In buffer area only

Wetlands of International Importance (Ramsar Wetlands) [\[Resource Information \]](#)

Ramsar Site Name	Proximity	Buffer Status
Forrestdale and thomsons lakes	Within Ramsar site	In feature area

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.

Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area	In feature area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area	In buffer area only
Tuart (<i>Eucalyptus gomphocephala</i>) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered	Community likely to occur within area	In feature area

Listed Threatened Species [\[Resource Information \]](#)

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.

Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area	In buffer area only
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area	In buffer area only
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area	In buffer area only
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area	In buffer area only
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area	In feature area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area	In feature area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Zanda baudinii listed as Calyptorhynchus baudinii Baudin's Black-Cockatoo, Long-billed Black-cockatoo [87736]	Endangered	Roosting known to occur within area	In buffer area only
Zanda latirostris listed as Calyptorhynchus latirostris Carnaby's Black Cockatoo, Short-billed Black-cockatoo [87737]	Endangered	Breeding known to occur within area	In feature area
FISH			
Thunnus maccoyii Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat likely to occur within area	In buffer area only
INSECT			
Hesperocolletes douglasi Douglas' Broad-headed Bee, Rottnest Bee [66734]	Critically Endangered	Species or species habitat may occur within area	In buffer area only
MAMMAL			
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat known to occur within area	In buffer area only
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
OTHER			
Westralunio carteri Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat may occur within area	In buffer area only
PLANT			
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat likely to occur within area	In feature area
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat known to occur within area	In feature area
Conospermum undulatum Wavy-leaved Smokebush [24435]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Diuris drummondii Tall Donkey Orchid [4365]	Vulnerable	Species or species habitat known to occur within area	In feature area
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat known to occur within area	In feature area
Diuris purdiei Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat known to occur within area	In feature area
Drakaea elastica Glossy-leaved Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat known to occur within area	In feature area
Eleocharis keigheryi Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat may occur within area	In feature area
Eremophila glabra subsp. chlorella [84927]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Eucalyptus x balanites Cadda Road Mallee, Cadda Mallee [87816]	Endangered	Species or species habitat may occur within area	In buffer area only
Lepidosperma rostratum Beaked Lepidosperma [14152]	Endangered	Species or species habitat may occur within area	In buffer area only
Macarthuria keigheryi Keighery's Macarthuria [64930]	Endangered	Species or species habitat may occur within area	In buffer area only
Synaphea sp. Fairbridge Farm (D. Papenfus 696) Selena's Synaphea [82881]	Critically Endangered	Species or species habitat likely to occur within area	In buffer area only
Thelymitra stellata Star Sun-orchid [7060]	Endangered	Species or species habitat may occur within area	In buffer area only
REPTILE			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only

SHARK

Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area	In feature area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Sphyrna lewini Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat known to occur within area	In buffer area only

Listed Migratory Species

[[Resource Information](#)]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area	In buffer area only
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Ardenna pacifica Wedge-tailed Shearwater [84292]		Breeding known to occur within area	In buffer area only
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area	In buffer area only
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area	In buffer area only
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In buffer area only
Hydroprogne caspia Caspian Tern [808]		Breeding known to occur within area	In buffer area only
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Onychoprion anaethetus Bridled Tern [82845]		Breeding known to occur within area	In buffer area only
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Migratory Marine Species			
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In buffer area only
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area	In buffer area only
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area	In buffer area only
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Breeding known to occur within area	In buffer area only
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area	In buffer area only
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area	In buffer area only
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat may occur within area	In buffer area only
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat may occur within area	In buffer area only
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In buffer area only
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Migratory Terrestrial Species			
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area	In buffer area only
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area	In feature area
Calidris alba Sanderling [875]		Roosting known to occur within area	In buffer area only
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area	In feature area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area	In buffer area only
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area	In buffer area only
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area	In buffer area only
Charadrius dubius Little Ringed Plover [896]		Species or species habitat known to occur within area	In buffer area only
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area	In buffer area only
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area	In buffer area only
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area	In buffer area only
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area	In buffer area only
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area	In buffer area only
Pandion haliaetus Osprey [952]		Breeding known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Phalaropus lobatus Red-necked Phalarope [838]		Roosting known to occur within area	In buffer area only
Philomachus pugnax Ruff (Reeve) [850]		Species or species habitat known to occur within area	In buffer area only
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area	In buffer area only
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area	In buffer area only
Thalasseus bergii Greater Crested Tern [83000]		Breeding known to occur within area	In buffer area only
Tringa brevipes Grey-tailed Tattler [851]		Roosting known to occur within area	In buffer area only
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area	In feature area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area	In buffer area only
Tringa totanus Common Redshank, Redshank [835]		Roosting known to occur within area	In buffer area only
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Commonwealth Lands

[\[Resource Information \]](#)

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.

Commonwealth Land Name	State	Buffer Status
Defence		
Defence - ARTILLERY BARRACKS - FREMANTLE [50155]	WA	In buffer area only
Defence - EAST FREMANTLE SMALL CRAFT BASE [50118]	WA	In buffer area only
Defence - LEEUWIN BARRACKS - EAST FREMANTLE [50148]	WA	In buffer area only
Defence - LEEUWIN BARRACKS - EAST FREMANTLE [50146]	WA	In buffer area only
Defence - LEEUWIN BARRACKS - EAST FREMANTLE [50147]	WA	In buffer area only
Defence - LEEUWIN BARRACKS - EAST FREMANTLE [50149]	WA	In buffer area only
Defence - LEEUWIN BARRACKS - EAST FREMANTLE [50150]	WA	In buffer area only
Defence - LEEUWIN BARRACKS - EAST FREMANTLE [50153]	WA	In buffer area only
Defence - LEEUWIN BARRACKS - EAST FREMANTLE [50151]	WA	In buffer area only
Defence - LEEUWIN BARRACKS - EAST FREMANTLE [50154]	WA	In buffer area only
Defence - LEEUWIN BARRACKS - EAST FREMANTLE [50152]	WA	In buffer area only
Defence - PRESTON POINT TRAINING DEPOT [50172]	WA	In buffer area only
Defence - PRESTON POINT TRAINING DEPOT [50173]	WA	In buffer area only
Defence - PRESTON POINT TRAINING DEPOT [50174]	WA	In buffer area only
Unknown		
Commonwealth Land - [51900]	WA	In buffer area only
Commonwealth Land - [51981]	WA	In buffer area only
Commonwealth Land - [50683]	WA	In buffer area only
Commonwealth Land - [50687]	WA	In buffer area only
Commonwealth Land - [51128]	WA	In buffer area only
Commonwealth Land - [51901]	WA	In buffer area only
Commonwealth Land - [50673]	WA	In buffer area only
Commonwealth Land - [51149]	WA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [50686]	WA	In buffer area only
Commonwealth Land - [51494]	WA	In buffer area only
Commonwealth Land - [50685]	WA	In buffer area only
Commonwealth Land - [50672]	WA	In buffer area only
Commonwealth Land - [50684]	WA	In buffer area only
Commonwealth Land - [51975]	WA	In buffer area only
Commonwealth Land - [50751]	WA	In buffer area only
Commonwealth Land - [50779]	WA	In buffer area only
Commonwealth Land - [50809]	WA	In buffer area only
Commonwealth Land - [51115]	WA	In buffer area only
Commonwealth Land - [51116]	WA	In buffer area only
Commonwealth Land - [50774]	WA	In buffer area only
Commonwealth Land - [51438]	WA	In buffer area only
Commonwealth Land - [50755]	WA	In buffer area only
Commonwealth Land - [50750]	WA	In buffer area only
Commonwealth Land - [50647]	WA	In buffer area only
Commonwealth Land - [50754]	WA	In buffer area only
Commonwealth Land - [50756]	WA	In buffer area only
Commonwealth Land - [50741]	WA	In buffer area only
Commonwealth Land - [51152]	WA	In buffer area only
Commonwealth Land - [50740]	WA	In buffer area only
Commonwealth Land - [50743]	WA	In buffer area only
Commonwealth Land - [51150]	WA	In buffer area only
Commonwealth Land - [50742]	WA	In buffer area only
Commonwealth Land - [51151]	WA	In buffer area only
Commonwealth Land - [50670]	WA	In buffer area only
Commonwealth Land - [50671]	WA	In feature area

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [51148]	WA	In buffer area only
Commonwealth Land - [50745]	WA	In buffer area only
Commonwealth Land - [50676]	WA	In buffer area only
Commonwealth Land - [51160]	WA	In buffer area only
Commonwealth Land - [51153]	WA	In buffer area only
Commonwealth Land - [51498]	WA	In buffer area only
Commonwealth Land - [51155]	WA	In buffer area only
Commonwealth Land - [50729]	WA	In buffer area only
Commonwealth Land - [50725]	WA	In buffer area only
Commonwealth Land - [50517]	WA	In buffer area only
Commonwealth Land - [50721]	WA	In buffer area only
Commonwealth Land - [50663]	WA	In buffer area only
Commonwealth Land - [50722]	WA	In buffer area only
Commonwealth Land - [50516]	WA	In buffer area only
Commonwealth Land - [50749]	WA	In buffer area only
Commonwealth Land - [50785]	WA	In buffer area only
Commonwealth Land - [51514]	WA	In buffer area only
Commonwealth Land - [50669]	WA	In buffer area only
Commonwealth Land - [50665]	WA	In buffer area only
Commonwealth Land - [50664]	WA	In buffer area only
Commonwealth Land - [50666]	WA	In buffer area only
Commonwealth Land - [51425]	WA	In buffer area only
Commonwealth Land - [51421]	WA	In buffer area only
Commonwealth Land - [51122]	WA	In buffer area only
Commonwealth Land - [51426]	WA	In buffer area only
Commonwealth Land - [50762]	WA	In buffer area only
Commonwealth Land - [50690]	WA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [51416]	WA	In buffer area only
Commonwealth Land - [51125]	WA	In buffer area only
Commonwealth Land - [51126]	WA	In feature area
Commonwealth Land - [50784]	WA	In buffer area only
Commonwealth Land - [50710]	WA	In buffer area only
Commonwealth Land - [50688]	WA	In buffer area only
Commonwealth Land - [50791]	WA	In buffer area only
Commonwealth Land - [50707]	WA	In buffer area only
Commonwealth Land - [50709]	WA	In buffer area only
Commonwealth Land - [50708]	WA	In feature area
Commonwealth Land - [50761]	WA	In buffer area only
Commonwealth Land - [50763]	WA	In buffer area only
Commonwealth Land - [50786]	WA	In buffer area only
Commonwealth Land - [50787]	WA	In buffer area only
Commonwealth Land - [51412]	WA	In buffer area only
Commonwealth Land - [51413]	WA	In buffer area only
Commonwealth Land - [50677]	WA	In buffer area only
Commonwealth Land - [51417]	WA	In buffer area only
Commonwealth Land - [51414]	WA	In buffer area only
Commonwealth Land - [51415]	WA	In buffer area only
Commonwealth Land - [51147]	WA	In buffer area only
Commonwealth Land - [50781]	WA	In buffer area only
Commonwealth Land - [50788]	WA	In buffer area only
Commonwealth Land - [51146]	WA	In buffer area only
Commonwealth Land - [51143]	WA	In buffer area only
Commonwealth Land - [50789]	WA	In buffer area only
Commonwealth Land - [50782]	WA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [51142]	WA	In buffer area only
Commonwealth Land - [50780]	WA	In buffer area only
Commonwealth Land - [50794]	WA	In buffer area only
Commonwealth Land - [50797]	WA	In buffer area only
Commonwealth Land - [50798]	WA	In buffer area only
Commonwealth Land - [50795]	WA	In buffer area only
Commonwealth Land - [51144]	WA	In buffer area only
Commonwealth Land - [50792]	WA	In buffer area only
Commonwealth Land - [50793]	WA	In buffer area only
Commonwealth Land - [50790]	WA	In buffer area only
Commonwealth Land - [51899]	WA	In buffer area only
Commonwealth Land - [50796]	WA	In buffer area only
Commonwealth Land - [50736]	WA	In buffer area only
Commonwealth Land - [50735]	WA	In buffer area only
Commonwealth Land - [50734]	WA	In buffer area only
Commonwealth Land - [51894]	WA	In buffer area only
Commonwealth Land - [51895]	WA	In buffer area only
Commonwealth Land - [50799]	WA	In buffer area only
Commonwealth Land - [50732]	WA	In buffer area only
Commonwealth Land - [50733]	WA	In buffer area only
Commonwealth Land - [50730]	WA	In buffer area only
Commonwealth Land - [50731]	WA	In buffer area only

Commonwealth Heritage Places			[Resource Information]
Name	State	Status	Buffer Status
Historic			
Artillery Barracks	WA	Listed place	In buffer area only
Claremont Post Office	WA	Listed place	In buffer area only

Listed Marine Species	[Resource Information]
-----------------------	--------------------------

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area	In buffer area only
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Ardenna pacifica as Puffinus pacificus Wedge-tailed Shearwater [84292]		Breeding known to occur within area	In buffer area only
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area	In buffer area only
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area	In feature area
Calidris alba Sanderling [875]		Roosting known to occur within area	In buffer area only
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area overfly marine area	In feature area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area overfly marine area	In buffer area only
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area overfly marine area	In buffer area only
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area overfly marine area	In buffer area only
Charadrius dubius Little Ringed Plover [896]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area	In buffer area only
Charadrius ruficapillus Red-capped Plover [881]		Roosting known to occur within area overfly marine area	In buffer area only
Chroicocephalus novaehollandiae as Larus novaehollandiae Silver Gull [82326]		Breeding known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area	In buffer area only
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area	In buffer area only
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In buffer area only
Eudyptula minor Little Penguin [1085]		Breeding known to occur within area	In buffer area only
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area overfly marine area	In buffer area only
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area overfly marine area	In buffer area only
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Roosting known to occur within area overfly marine area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hydroprogne caspia as Sterna caspia Caspian Tern [808]		Breeding known to occur within area	In buffer area only
Larus pacificus Pacific Gull [811]		Foraging, feeding or related behaviour may occur within area	In buffer area only
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
Limosa limosa Black-tailed Godwit [845]		Roosting known to occur within area overfly marine area	In buffer area only
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area overfly marine area	In buffer area only
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area	In buffer area only
Onychoprion anaethetus as Sterna anaethetus Bridled Tern [82845]		Breeding known to occur within area	In buffer area only
Onychoprion fuscatus as Sterna fuscata Sooty Tern [90682]		Breeding known to occur within area	In buffer area only
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area	In feature area
Pandion haliaetus Osprey [952]		Breeding known to occur within area	In feature area
Phalaropus lobatus Red-necked Phalarope [838]		Roosting known to occur within area	In buffer area only
Philomachus pugnax Ruff (Reeve) [850]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area	In buffer area only
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area overfly marine area	In buffer area only
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Puffinus assimilis Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Recurvirostra novaehollandiae Red-necked Avocet [871]		Roosting known to occur within area overfly marine area	In buffer area only
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Stercorarius skua as Catharacta skua Great Skua [823]		Species or species habitat may occur within area	In buffer area only
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Sternula albifrons as Sterna albifrons Little Tern [82849]		Species or species habitat may occur within area	In feature area
Sternula nereis as Sterna nereis Fairy Tern [82949]		Breeding known to occur within area	In buffer area only
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalasseus bergii as Sterna bergii Greater Crested Tern [83000]		Breeding known to occur within area	In buffer area only
Thinornis cucullatus as Thinornis rubricollis Hooded Plover, Hooded Dotterel [87735]		Species or species habitat known to occur within area overfly marine area	In feature area
Tringa brevipes as Heteroscelus brevipes Grey-tailed Tattler [851]		Roosting known to occur within area	In buffer area only
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area overfly marine area	In feature area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area overfly marine area	In buffer area only
Tringa totanus Common Redshank, Redshank [835]		Roosting known to occur within area overfly marine area	In buffer area only
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area overfly marine area	In buffer area only
Fish			
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area	In buffer area only
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area	In buffer area only
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area	In buffer area only
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area	In buffer area only
Hippocampus subelongatus West Australian Seahorse [66722]		Species or species habitat may occur within area	In buffer area only
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area	In buffer area only
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area	In buffer area only
Lissocampus fatiloquus Prophet's Pipefish [66250]		Species or species habitat may occur within area	In buffer area only
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area	In buffer area only
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area	In buffer area only
Mitotichthys meraculus Western Crested Pipefish [66259]		Species or species habitat may occur within area	In buffer area only
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area	In buffer area only
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area	In buffer area only
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area	In buffer area only
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area	In buffer area only
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area	In buffer area only
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area	In buffer area only
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area	In buffer area only
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area	In buffer area only
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area	In buffer area only
Vanacampus poecilolaemus Longsnout Pipefish, Australian Longsnout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area	In buffer area only
Mammal			
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area	In buffer area only
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat known to occur within area	In buffer area only

Reptile

Scientific Name	Threatened Category	Presence Text	Buffer Status
Aipysurus pooleorum Shark Bay Seasnake [66061]		Species or species habitat may occur within area	In buffer area only
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area	In buffer area only
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area	In buffer area only

Whales and Other Cetaceans			[Resource Information]
Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area	In buffer area only
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In buffer area only
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In buffer area only

Current Scientific Name	Status	Type of Presence	Buffer Status
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area	In buffer area only
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area	In buffer area only
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area	In buffer area only
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In buffer area only
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area	In buffer area only
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In buffer area only
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area	In buffer area only
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In buffer area only
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In buffer area only

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Alfred Cove	Nature Reserve	WA	In buffer area only
Canning River	Management Area	WA	In buffer area only
Carnac Island	Nature Reserve	WA	In buffer area only

Protected Area Name	Reserve Type	State	Buffer Status
Cottesloe Reef	Fish Habitat Protection Area	WA	In buffer area only
Harry Waring Marsupial Reserve	Nature Reserve	WA	In buffer area only
Keanes Point Reserve	5(1)(g) Reserve	WA	In buffer area only
Matilda Bay Reserve	5(1)(g) Reserve	WA	In buffer area only
Milyu	Nature Reserve	WA	In buffer area only
Swan Estuary	Marine Park	WA	In buffer area only
Swan Estuary - Alfred Cove	Marine Park	WA	In buffer area only
Swan Estuary - Milyu	Marine Park	WA	In buffer area only
Swan Estuary - Pelican Point	Marine Park	WA	In buffer area only
Swan River	Management Area	WA	In buffer area only
Thomsons Lake	Nature Reserve	WA	In buffer area only
Unnamed WA39584	Conservation Park	WA	In buffer area only
Unnamed WA39752	Conservation Park	WA	In buffer area only
Unnamed WA42469	Nature Reserve	WA	In buffer area only
Unnamed WA44414	5(1)(g) Reserve	WA	In buffer area only
Unnamed WA48291	Conservation Park	WA	In buffer area only
Unnamed WA49220	Conservation Park	WA	In buffer area only
Unnamed WA49362	Nature Reserve	WA	In buffer area only
Unnamed WA49363	Conservation Park	WA	In buffer area only
Unnamed WA49561	Conservation Park	WA	In buffer area only
Unnamed WA53313	Conservation Park	WA	In buffer area only
Unnamed WA53632	Conservation Park	WA	In buffer area only

Nationally Important Wetlands		[Resource Information]
Wetland Name	State	Buffer Status
Booragoon Swamp	WA	In buffer area only
Gibbs Road Swamp System	WA	In buffer area only

Wetland Name	State	Buffer Status
Swan-Canning Estuary	WA	In buffer area only
Thomsons Lake	WA	In buffer area only

EPBC Act Referrals [[Resource Information](#)]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Cockburn Surf Park	2022/09267		Completed	In buffer area only
Controlled action				
Alcoa Bauxite Residue Storage Area Extension	2011/5878	Controlled Action	Further Information Request	In buffer area only
Clearing of Lots 2 and 10 Rowley Road, Mandogalup WA	2018/8182	Controlled Action	Assessment Approach	In buffer area only
Construction of Fiona Stanley Hospital	2008/3970	Controlled Action	Post-Approval	In buffer area only
Development of Kwinana Quay port facility	2008/4387	Controlled Action	Completed	In buffer area only
Extension of Beeliar Drive between the junction of Mayor and Fawcett Roads an...	2003/1029	Controlled Action	Completed	In buffer area only
Hammond Park Secondary School development, WA	2016/7741	Controlled Action	Post-Approval	In buffer area only
Jandakot Airport Expansion, Commercial Development and Clearing of Vegetation	2009/4796	Controlled Action	Post-Approval	In buffer area only
Latitude 32-industrial development of various lots, Ashley and Sayer Roads, Hope Valley, WA	2016/7695	Controlled Action	Post-Approval	In buffer area only
Lots 13, 14 & 18 Barfield Rd & Lots 48-51 Rowley Rd, Hammond Park	2012/6524	Controlled Action	Post-Approval	In buffer area only
Ranford Road Residential Development	2002/549	Controlled Action	Post-Approval	In buffer area only
Residential Development, Wattleup Road, Hammond Park, WA	2021/8933	Controlled Action	Direction to Publish	In buffer area only
Residential Development Lot 131 Jandakot Road, Treeby WA	2018/8205	Controlled Action	Further Information Request	In buffer area only
Residential developmnt, Lots 11 and 74 Beenyup Road, Banjup, WA	2017/7923	Controlled Action	Post-Approval	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Residential Estate Development, Lot 682 Rowley Road, Mandogalup, Western Australia	2014/7126	Controlled Action	Post-Approval	In buffer area only
Roe Highway extension, Kwinana Freeway to Stock Road, WA	2009/5031	Controlled Action	Post-Approval	In feature area
Roe Hwy Extension	2003/972	Controlled Action	Post-Approval	In buffer area only
Shark Hazard Mitigation Drum Line Program, WA	2014/7174	Controlled Action	Completed	In buffer area only
Shenton Park Subdivision	2004/1479	Controlled Action	Completed	In buffer area only
Thornlie-Cockburn Link Project, WA	2018/8188	Controlled Action	Post-Approval	In buffer area only
Vegetation clearing (Cwlth land), Jandakot Airport, Cockburn, WA	2013/7032	Controlled Action	Post-Approval	In buffer area only
Warders Hotel, Block 1 Warders Cottages, Fremantle, WA	2018/8144	Controlled Action	Post-Approval	In buffer area only
Not controlled action				
'Looping 10' gas transmission pipeline from Kwinana to Hopelands	2005/2212	Not Controlled Action	Completed	In buffer area only
Armadale Road Duplication - Tapper to Anstey Road	2017/7972	Not Controlled Action	Completed	In buffer area only
Armadale Road to North Lake Road Bridge development, Jandakot, WA	2018/8284	Not Controlled Action	Completed	In buffer area only
Bibra Lake Aboriginal Cultural Centre Development	2020/8642	Not Controlled Action	Completed	In feature area
Bushfire hazard reduction, Lot 37 Barfield Road, Hammond Park, WA	2018/8204	Not Controlled Action	Completed	In buffer area only
Calleya Residential Development, Banjup, WA	2016/7708	Not Controlled Action	Completed	In buffer area only
Clearing and development of 220 and 234 Wattleup Rd, Wattleup, WA	2016/7738	Not Controlled Action	Completed	In buffer area only
Clearing of Native Vegetation, Hammond Park, WA	2011/6041	Not Controlled Action	Completed	In buffer area only
Commercial development of Lot 106 Wright Road, Forrestdale WA	2003/1255	Not Controlled Action	Completed	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Construction and operation of an 8 turbine wind farm at Rous Head Harbour, Fremantle	2003/933	Not Controlled Action	Completed	In buffer area only
Construction of Hammond Road Primary School, Hammond Park, WA	2012/6619	Not Controlled Action	Completed	In buffer area only
Construction of international rowing course and commercial/residential areas	2003/1034	Not Controlled Action	Completed	In buffer area only
Development of Lots 100-101 Sayer Road, Hope Valley, WA	2019/8399	Not Controlled Action	Completed	In buffer area only
Disposal of residential properties, Fremantle, WA	2019/8593	Not Controlled Action	Completed	In buffer area only
Eradication of the European House Borer, Perth metropolitan area, WA	2009/5027	Not Controlled Action	Completed	In buffer area only
Expansion of berthing facilities at Kwinana Bulk Terminal	2006/2509	Not Controlled Action	Completed	In buffer area only
Expansion of existing Ammonium Nitrate Production Facility	2005/1941	Not Controlled Action	Completed	In buffer area only
Frankland Parks Oval project, Hammond Park, WA	2018/8369	Not Controlled Action	Completed	In buffer area only
Fremantle Ports Inner Harbour Capital Dredging Proposal	2005/2477	Not Controlled Action	Completed	In feature area
Gas-fired Power Station	2005/2213	Not Controlled Action	Completed	In buffer area only
Hammond West Urban Development, Hammond Park, WA	2017/7917	Not Controlled Action	Completed	In buffer area only
Hazard reduction and site access, Lot 682 Rowley Road, Mandogalup, WA	2018/8186	Not Controlled Action	Completed	In buffer area only
High Street Upgrade, Fremantle, WA	2018/8315	Not Controlled Action	Completed	In buffer area only
Hope Valley-Wattleup Redevelopment Project	2020/8644	Not Controlled Action	Completed	In buffer area only
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed	In feature area
Industrial development 105 Sayer Road, Hope Valley, WA	2014/7261	Not Controlled Action	Completed	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Industrial Development Lot 64 Ashley Road, Hope Valley, WA	2014/7238	Not Controlled Action	Completed	In buffer area only
Jandakot Road Widening, Solomon Road to Berrigan Drive, Jandakot, WA	2020/8728	Not Controlled Action	Completed	In buffer area only
Kwinana Fwy southbound widening Roe Hwy to Armadale Rd and construction of farrington Rd off-ramp	2013/7062	Not Controlled Action	Completed	In buffer area only
Kwinana Gas-Fired Power Station	2005/2101	Not Controlled Action	Completed	In buffer area only
Latitude 32 industrial development 6A, Cockburn, WA	2018/8193	Not Controlled Action	Completed	In buffer area only
Lot 170 Hope Valley Road, Hope Valley	2020/8830	Not Controlled Action	Completed	In buffer area only
Lot 28 157 Barfield Road, Hammond Park - Proposed Residential Development	2021/9063	Not Controlled Action	Completed	In buffer area only
Lot 29 Barfield Road, Hammond Park	2017/7948	Not Controlled Action	Completed	In buffer area only
Lots 12, 13 and 18 Hammond Road, Lot 80 Beeliar Drive and Lot 500 Hird Road	2012/6576	Not Controlled Action	Completed	In buffer area only
Murdoch University Sports Precinct, Melville, WA	2016/7823	Not Controlled Action	Completed	In buffer area only
Perth Seawater Desalination Project: Thomsons Lake to Kogolup Pipeline	2005/1971	Not Controlled Action	Completed	In buffer area only
Redevelopment of Purvis Street school site, Hamilton Hill, WA	2018/8255	Not Controlled Action	Completed	In feature area
Residential Development, Lot 12 Lyon Road, Aubin Grove, WA	2013/6852	Not Controlled Action	Completed	In buffer area only
Residential development, Lot 13 Lyon Road, Aubin Grove, WA	2014/7151	Not Controlled Action	Completed	In buffer area only
Residential development, Lot 33 Barfield Road, Hammond Park, WA	2015/7548	Not Controlled Action	Completed	In buffer area only
Residential development, Lot 74 Wattleup Road, Hammond Park, WA	2018/8273	Not Controlled Action	Completed	In buffer area only
Residential development, Lots 124 and 125, Wattleup Road, Hammond Park, WA	2015/7519	Not Controlled Action	Completed	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Residential Development Lot 4225 North Lake Road, Kardinya, WA	2015/7505	Not Controlled Action	Completed	In buffer area only
Residential Development of Lots 76 and 107 Wattleup Road, Hamond Park	2020/8865	Not Controlled Action	Completed	In buffer area only
Residential development on part of Lot 2 Fanstone Avenue, Beeliar, WA	2016/7726	Not Controlled Action	Completed	In buffer area only
Roe Highway - Karel Avenue to Hope Road Bridge Project	2005/2061	Not Controlled Action	Completed	In feature area
South Metropolitan Crop Research Hub, Murdoch WA	2018/8201	Not Controlled Action	Completed	In buffer area only
Stages 2-5 of primary school and assoc facilities development, Hammond Park, WA	2015/7407	Not Controlled Action	Completed	In buffer area only
Translocation of orchids (Caladenia huegelii) from Roe Hwy Reserve	2002/781	Not Controlled Action	Completed	In buffer area only
Urban development, Lot 109 Wattleup Road, Hammond Park, WA	2015/7425	Not Controlled Action	Completed	In buffer area only
Urban development of Lot 107 Wattleup Road, Hammond Park, WA	2017/7890	Not Controlled Action	Completed	In buffer area only
Urban developmnet & associated infrastructure, Lot 4 Armadale Road, Banjup WA	2013/7049	Not Controlled Action	Completed	In buffer area only
Warders' Cottages Block 2 'W2'	2022/9148	Not Controlled Action	Completed	In buffer area only
Warders' Cottages W2 minor works, Fremantle, WA	2018/8185	Not Controlled Action	Completed	In buffer area only
Wentworth West residential development, Bartram Road, Success, WA	2014/7245	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
City of Cockburn Sporting Facilities	2005/2139	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Extension of Spearwood Ave, from Barrington Rd to Miguel Rd	2009/5140	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action (particular manner)				
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
South West Metropolitan Railway Project	2003/1175	Not Controlled Action (Particular Manner)	Post-Approval	In feature area

Referral decision

Rezoning of Crown Reserve 39181 to facilitate future residential development	2005/2096	Referral Decision	Completed	In buffer area only
--	-----------	-------------------	-----------	---------------------

Biologically Important Areas

Scientific Name	Behaviour	Presence	Buffer Status
Seabirds			
Ardenna carneipes Flesh-footed Shearwater [82404]	Aggregation	Known to occur	In buffer area only
Ardenna pacifica Wedge-tailed Shearwater [84292]	Foraging (in high numbers)	Known to occur	In buffer area only
Eudyptula minor Little Penguin [1085]	Foraging (provisioning young)	Known to occur	In buffer area only
Hydroprogne caspia Caspian Tern [808]	Foraging (provisioning young)	Known to occur	In buffer area only
Larus pacificus Pacific Gull [811]	Foraging (in high numbers)	Former Range	In buffer area only
Onychoprion anaethetus Bridled Tern [82845]	Foraging (in high numbers)	Known to occur	In buffer area only
Puffinus assimilis tunneyi Little Shearwater [59363]	Foraging (in high numbers)	Known to occur	In buffer area only
Sterna dougallii Roseate Tern [817]	Foraging	Known to occur	In feature area

Scientific Name	Behaviour	Presence	Buffer Status
Sternula nereis Fairy Tern [82949]	Foraging (in high numbers)	Known to occur	In buffer area only
Seals			
Neophoca cinerea Australian Sea Lion [22]	Foraging (male)	Likely to occur	In buffer area only
Whales			
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Distribution	Known to occur	In buffer area only
Eubalaena australis Southern Right Whale [40]	Calving buffer	Known to occur	In buffer area only
Eubalaena australis Southern Right Whale [40]	Seasonal calving habitat	Known to occur	In buffer area only
Megaptera novaeangliae Humpback Whale [38]	Migration (north and south)	Known to occur	In buffer area only

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and 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

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

Where little information is available for a 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 detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

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.

Appendix C

Survey site records



Roe 8 west/9

Site DPLH01

Described by MJH

Date 23/08/2022 **Type** Q

10x10

Season E

Uniformity

Location West end

MGA Zone 50 388619 mE 6449408 mN 115.819741 E -32.086018 S

Habitat Woodland

Soil Grey brown sand

Rock Type

Vegetation Eucalyptus marginata subsp. marginata tall woodland over Xanthorrhoea preissii mid open shrubland over Hibbertia hypericoides low shrubland

Veg Condition Upper end of Good

Fire Age 10+

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Allocastrum fraseriana	2		4		
Banksia attenuata	6		8	adj	
Banksia dallanneyi subsp. dallanneyi var. dallanneyi	1		0.1		
Bossiaea eriocarpa	+		0.3		
Briza maxima	+		0.15		
Burchardia congesta	+		0.5		
Caladenia flava	+		0.1		
Chamaescilla corymbosa var. corymbosa	+		0.3	06	
Conostephium preissii					=DPLH02
Daviesia nudiflora	+		1		
Desmodium flexuosum	1		1		
Dianella revoluta var. divaricata	+		0.7		
Diuris magnifica	+		0.3	03	
Drosera macrantha	+		1	05	
Ehrharta calycina	2		1		
Ehrharta longiflora	1		0.15		
Eucalyptus marginata subsp. marginata	70		12		
Freesia alba x leichtlinii	+		0.3		
Gladiolus caryophyllaceus	1		0.8		
Gompholobium tomentosum	1		1		
Hardenbergia comptoniana	1				
Hibbertia hypericoides	45		1	01	
Hovea pungens	0.3		+		
Hypocalymma robustum	1		1		
Hypochaeris glabra	2		0.01		
Lagenophora huegelii	+		0.15		
Lepidosperma pubisquamum	+		0.5	07	
Morelotia octandra	1		0.3	04	
Philoteca spicata	+		0.8		
Pterostylis vittata	+		0.4		
Sowerbaea laxiflora	+		0.4	02	
Ursinia anthemoides	1		0.25		
Xanthorrhoea preissii	10		1.7		

Roe 8 west/9

Site DPLH02

Described by MJH

Date 22/08/2022 Type Q

10x10

Season E

Uniformity

Location**MGA Zone** 50 387728 mE 6449151 mN 115.810271 E -32.088248 S**Habitat** Woodland**Soil** grey sand**Rock Type****Vegetation** Corymbia calophylla, Eucalyptus marginata tall open woodland over Xylomelum occidentale mid woodland over Xanthorrhoea preissii tall open shrubland over Oxalis pes-caprae open forbland**Veg Condition** Upper end of Good**Fire Age** 5-10?**Notes****SPECIES LIST:**

Name	Cover	C Class	Height	Specimen	Notes
Banksia attenuata	1		2.5		
Bossiaea eriocarpa	0.5		1		
Briza maxima	+		0.4		
Burchardia congesta	+		0.8		
Conostephium preissii	1		0.3	04	
Conostylis aculeata subsp. aculeata	0.25		+		
Corymbia calophylla	20		12		
Daviesia aphylla	0.3		+		
Dianella revoluta var. divaricata	1		0.8		
Ehrharta calycina	2		1		
Ehrharta longiflora	0.3		1		
Eucalyptus marginata subsp. marginata	5		10		
Freesia alba x leichtlinii	5		0.5		
Gladiolus caryophyllaceus	1		+		
Gompholobium tomentosum	+		0.8	05	
Hardenbergia comptoniana	+				
Hibbertia hypericoides subsp. hypericoides	5		1.1		
Hypocalymma robustum	1		1		
Hypochaeris glabra	+		0.01		
Jacksonia furcellata	1		2.5		
Lyginia imberbis	+		0.5	01	
Lyginia imberbis	+		0.6	03	
Macrozamia riedlei	+		1.5		
Mesomelaena pseudostygia	+		1		
Oxalis pes-caprae	20		0.3		
Pterostylis vittata	+		0.4	06	
Sowerbaea laxiflora	0.5		+		
Trifolium campestre	0.1		+		
Ursinia anthemoides	+		0.15		
Vicia sativa subsp. sativa	+		0.5	02	
Xanthorrhoea preissii	20		2.2		
Xylomelum occidentale	40		6		

Roe 8 west/9

Site DPLH03

Described by MJH

Date 23/08/2021 Type Q

10x10

Season E

Uniformity

Location North Lake - Stock Road

MGA Zone 50 388337 mE 6449374 mN 115.816750 E -32.086297 S

Habitat

Soil grey brown sand

Rock Type**Vegetation** Eucalyptus marginata, Corymbia calophylla tall woodland over Banksia attenuata mid sparse trees over Xanthorrhoea preissii mid open shrubland**Veg Condition** Upper end of Good**Fire Age** 10+?**Notes****SPECIES LIST:**

Name	Cover	C Class	Height	Specimen Notes
Acacia applanata	+		0.3	07
Banksia attenuata	4		4	
Bossiaea eriocarpa	+		0.5	
Briza maxima	+		0.3	
Burchardia congesta	+		0.3	
Caladenia flava	+		0.25	
Chamaescilla corymbosa var. corymbosa	+		0.25	
Conostylis candicans subsp. candicans	+		0.3	08
Corymbia calophylla	5		12	
Daviesia divaricata	+		1	01
Daviesia nudiflora	1		1	
Drosera stolonifera	+		0.15	05
Ehrharta calycina	2		1.5	
Eryngium pinnatifidum subsp. pinnatifidum	+		0.3	02
Eucalyptus marginata subsp. marginata	55		12	
Euphorbia terracina	0.3		+	
Freesia alba x leichtlinii	30		0.3	
Gompholobium tomentosum	+		0.8	
Hakea prostrata	4		2.5	
Hardenbergia comptoniana	1			
Hibbertia hypericoides subsp. hypericoides	2		1	
Hypocalymma robustum	+		1	
Hypochaeris glabra	2		0.01	
Jacksonia sternbergiana	1.5		+	
Lachenalia reflexa	+		0.25	04
Lepidosperma pubisquameum	+		0.8	
Macrozamia riedlei	4		2	
Mesomelaena pseudostygia	+		1	
Nemcia capitata	+		0.3	
Opercularia vaginata	+		0.25	03
Oxalis pes-caprae	2		0.25	
Pelargonium capitatum	+		0.3	
Pimelea rosea	+		0.5	06
Pterostylis vittata	+		0.3	
Sonchus oleraceus	1		+	
Sowerbaea laxiflora	+		0.6	
Styphelia propinqua	+		0.3	
Ursinia anthemoides	+		0.25	
Xanthorrhoea preissii	12		2	

Roe 8 west/9

Site DPLH04

Described by MJH

Date 23/08/2022 Type Q

10x10

Season E

Uniformity

Location

MGA Zone 50 387055 mE 6449026 mN 115.803126 E -32.089309 S

Habitat

Soil grey sand

Rock Type**Vegetation** Kunzea glabrescens, Jacksonia furcellata tall open shrubland over Acacia pulchella v open mid shrubland over Acacia lasiocarpa, Gompholobium tomentosum low sparse shrubs**Veg Condition** Degraded**Fire Age** 10+?**Notes** Area previously cleared, has regrown and been planted - obvious plantings ignored**SPECIES LIST:**

Name	Cover	C Class	Height	Specimen	Notes
Acacia lasiocarpa	2		0.5		
Acacia pulchella var. glaberrima	4		1.8		
Conostylis aculeata subsp. aculeata	+		0.2	01	
Corymbia calophylla	+		1		
Drosera porrecta	+				
Ehrharta calycina	+		1		
Ehrharta longiflora	1		0.25		
Euphorbia terracina	+		0.3		
Gladiolus caryophyllaceus	+		0.3		
Gompholobium tomentosum	3		0.5		
Hardenbergia comptoniana	+				
Hibbertia subvaginata	+		0.3		
Hypochaeris glabra	3		0.01		
Jacksonia furcellata	15		6		
Kunzea glabrescens	4		5		
Lysimachia arvensis	+		0.1		
Monoculus monstrosus	+		.03	02	
Patersonia occidentalis	+		0.3		
Petrorhagia dubia	+		0.2		
Pimelea leucantha	+		0.3		
Romulea rosea	+		0.15		
Senecio pinnatifolius	+		0.25		
Sonchus oleraceus	+		04		
Ursinia anthemoides	1		0.1		
Vicia sativa subsp. sativa	+				

Roe 8 west/9

Site DPLH05

Described by MJH

Date 24/08/2022 Type Q

10x10

Season E

Uniformity

Location**MGA Zone** 50 386762 mE 6449066 mN 115.800027 E -32.088918 S**Habitat** WOOLAND**Soil** grey sand**Rock Type****Vegetation** Eucalyptus marginata tall woodland over Banksia menziesii, B. attenuata mid open woodland over Xanthorrhoea preissii mid open shrubland**Veg Condition** Upper end of Good**Fire Age** 01+**Notes****SPECIES LIST:**

Name	Cover	C Class	Height	Specimen	Notes
Allocastrum fraseriana	1.5		3		
Banksia attenuata	10		10		
Banksia menziesii	8		2.5		
Brachyscome iberidifolia	+		0.1		
Briza maxima	+		0.3		
Burchardia congesta	+		0.3		
Caladenia flava	+		0.3		
Conostylis aculeata subsp. aculeata	+		0.2	01	
Desmodium flexuosum	1		0.15		
Dianella revoluta var. divaricata	+		0.8		
Drosera bulbosa	+		0.01		
Drosera glanduligera	+		0.01		
Ehrharta calycina	1		1		
Eucalyptus gomphocephala	1		2		
Eucalyptus marginata subsp. marginata	40		12		
Freesia alba x leichtlinii	+		0.3		
Gladiolus caryophyllaceus	+		0.3		
Gompholobium tomentosum	1		1	04	
Hardenbergia comptoniana	+				
Hypochaeris glabra	+		0.01		
Kennedia prostrata	2		0.1		
Lagenophora huegelii	+		0.1		
Lepidosperma pubisquamum	+		1		
Lomandra hermaphrodita	+		0.2		
Macrozamia riedlei	+		1		
Mesomelaena pseudostygia	+		1		
Morelotia octandra	+		0.3		
Pelargonium capitatum	+		0.25		
Pterostylis vittata	+		0.3		
Romulea rosea	+		0.15		
Sowerbaea laxiflora	+		0.4		
Styphelia propinqua	1		0.2		
Trachymene pilosa	+		0.1		
Ursinia anthemoides	+		0.1		
Xanthorrhoea preissii	20		1.8		

Roe 8 west/9

Site DPLH06

Described by MJH

Date 24/08/2022 Type Q

10x10

Season E

Uniformity

Location

MGA Zone 50 386676 mE 6449042 mN 115.799113 E -32.089126 S

Habitat Woodland

Soil Grey sand

Rock Type**Vegetation** Eucalyptus gomphocephala tall woodland over Eucalyptus marginata mid sparse trees over Xanthorrhoea preissii mid shrubland over Oxalis pes-caprae, Freesia albaxleichtlinii forbland**Veg Condition** G-D**Fire Age** 10+?**Notes****SPECIES LIST:**

Name	Cover	C Class	Height	Specimen	Notes
Acacia cyclops	+		1		
Banksia menziesii	5		4		
Briza maxima	+		0.2		
Dianella revoluta var. divaricata	+		0.4		
Ehrharta calycina	1		1		
Eucalyptus gomphocephala	60		20		
Eucalyptus marginata subsp. marginata	5		8		
Freesia alba x leichtlinii	2		0.3		
Fumaria capreolata	+		0.3		
Gompholobium tomentosum	+		1	01	
Hardenbergia comptoniana	+				
Hypochaeris glabra	+		0.01		
Lomandra caespitosa	+		0.3		
Lomandra hermaphrodita	+		0.3		
Macrozamia riedlei	+		0.4		
Mesomelaena pseudostygia	+		0.6		
Morelotia octandra	1		0.3		
Oxalis pes-caprae	20		0.3		
Pelargonium capitatum	+		0.3		
Romulea rosea	+		0.3		
Sowerbaea laxiflora	+		0.5		
Styphelia propinqua	2		0.3		
Trachymene pilosa	+		0.1		
Ursinia anthemoides	+		0.1		
Xanthorrhoea preissii	40		2.5		

Roe 8 west/9

Site DPLH07

Described by MJH

Date 24/08/2022 Type Q

10x10

Season E

Uniformity

Location

MGA Zone 50 386592 mE 6449228 mN 115.798245 E -32.087440 S

Habitat Jarrah woodland

Soil grey sand

Rock Type

Vegetation Eucalyptus marginata closed mid woodland over Banksia attenuata mid very open woodland over Xanthorrhoea preissii tall open shrubland over *Ehrharta calycina very open grassland

Veg Condition G-D

Fire Age 10+?

Notes**SPECIES LIST:**

Name	Cover	C Class	Height	Specimen	Notes
Acacia pulchella var. glaberrima	+		0.5		
Banksia attenuata	10		6		
Bossiaea eriocarpa	+		0.3		
Briza maxima	+		0.25		
Burchardia congesta	+		0.5		
Conostylis aculeata subsp. aculeata	+		0.25		
Desmocladus flexuosus	+		0.15		
Dianella revoluta var. divaricata	+		1		
Drosera bulbosa	+		0.01		
Drosera porrecta	+		0.3	02	
Ehrharta calycina	5		1		
Eucalyptus marginata subsp. marginata	70		12		
Freesia alba x leichtlinii	+		0.2		
Fumaria capreolata	+		0.3		
Gladiolus caryophyllaceus	+		0.5		
Gompholobium tomentosum	+		1		
Hardenbergia comptoniana	+				
Hypochaeris glabra	+		0.01		
Jacksonia furcellata	+		2		
Lagenophora huegelii	+		0.01		
Lomandra caespitosa	+		0.3		
Lomandra hermaphrodita	+		0.3		
Lupinus angustifolius	+		0.3		
Lysimachia arvensis	+		0.1		
Morelotia octandra	+		0.2		
Opercularia vaginata	+		0.3		
Pelargonium capitatum	+		0.3		
Petrorhagia dubia	+		0.3		
Romulea rosea	+		0.2		
Sonchus oleraceus	+		0.3		
Sowerbaea laxiflora	+		0.4		
Stirlingia latifolia	2		1		
Thysanotus manglesianus	+				
Trifolium campestre	+		0.25	01	
Ursinia anthemoides	+		0.15		
Xanthorrhoea preissii	40		2.5		

Roe 8 west/9

Site DPLH08

Described by MJH

Date 24/08/2022 Type Q

10x10

Season E

Uniformity

Location**MGA Zone** 50 386393 mE 6449031 mN 115.796113 E -32.089197 S**Habitat** Woodland**Soil** Grey sand**Rock Type****Vegetation** Eucalyptus gomphocephala tall woodland over Banksia attenuata mid very open woodland over Xanthorrhoea preissii mid very open dhrubland over Freesia albaxleichtlinii, Ursinia anthemoides sparse forbland**Veg Condition** Good**Fire Age** 10+?**Notes****SPECIES LIST:**

Name	Cover	C Class	Height	Specimen	Notes
Acanthocarpus preissii	+		0.3		
Anigozanthos humilis	+		0.3		
Banksia attenuata	12		8		
Banksia sessilis var. sessilis	+		0.3	adj	
Briza maxima	+		0.2		
Burchardia congesta	+		0.5		
Caladenia arenicola	+		0.4		
Corynotheca micrantha	+		0.3	02	
Dianella revoluta var. divaricata	+		0.3		
Drosera porrecta	+		0.3		
Ehrharta calycina	2		1		
Eryngium pinnatifidum subsp. pinnatifidum	+		0.3		
Eucalyptus gomphocephala	60		15		
Freesia alba x leichtlinii	3		0.3		
Gladiolus caryophyllaceus	+		0.8		
Gompholobium aristatum	+		0.8		
Gompholobium tomentosum	2		1		
Hakea prostrata	1		1		
Hardenbergia comptoniana	+				
Hypochaeris glabra	+		0.01		
Isotropis cuneifolia subsp. cuneifolia	+		0.3		
Jacksonia furcellata	1		2		
Lomandra caespitosa	+		0.5		
Lupinus angustifolius	+		0.3		
Macrozamia riedlei	+		1		
Monoculus monstrosus	+		0.5		
Pelargonium capitatum	+		0.2		
Pimelea rosea	+		0.3	01	
Pterostylis vittata	+		0.25		
Romulea rosea	+		0.15		
Romulea rosea	1		0.1		
Sowerbaea laxiflora	+		0.8		
Styphelia propinqua	+		0.2		
Thysanotus multiflorus	+		0.15	03	
Ursinia anthemoides	+		0.1		
Xanthorrhoea preissii	10		2		

Roe 8 west/9

Site DPLH09

Described by MJH

Date 24/08/2022 Type Q

10x10

Season E

Uniformity

Location

MGA Zone 50 386013 mE 6449290 mN 115.792118 E -32.086823 S

Habitat Shrubland

Soil yellow/orange sandy loam

Rock Type Limestone, numerous outcrops

Vegetation Banksian sessilis, Acacia rostellifera shrubland over *Oxalis pes-caprae, *Freesia albaxleichtlinii forbland, *Ehrharta calycina sparse grasses

Veg Condition CD

Fire Age 10+

Notes**SPECIES LIST:**

Name	Cover	C Class	Height	Specimen	Notes
Acacia rostellifera	10		4		
Avena barbata	1		5		
Banksia sessilis var. sessilis	30		4		
Brassica tournefortii	+		0.8		
Briza maxima	+		0.3		
Calothamnus quadrifidus	2		1.5		
Ehrharta calycina	5		1		
Euphorbia terracina	1		0.5		
Freesia alba x leichtlinii	2		0.3		
Gladiolus caryophyllaceus	+		0.5		
Hakea prostrata	+		1		
Hardenbergia comptoniana	+				
Lagurus ovatus	+		0.3		
Lechenaultia linarioides	+		0.3	01	
Lupinus angustifolius	1		0.5		
Oxalis pes-caprae	50		0.3		
Pelargonium capitatum	+		0.3		
Phyllanthus calycinus	+		1		
Romulea rosea	+		0.15		
Senecio pinnatifolius	+		0.3		
Trifolium campestre	+		0.1		
Vicia sativa subsp. sativa	+		0.3		

Roe 8 west/9

Site DPLH10

Described by MJH

Date 24/08/2022 Type Q

10x10

Season E

Uniformity

Location

MGA Zone 50 385846 mE 6449339 mN 115.790354 E -32.086364 S

Habitat Woodland

Soil yellow orange sandy loam

Rock Type

Vegetation Eucalyptus gomphocephala mid very open woodland over Acacia rostellifera tall open shrubland over Hakea prostrata, Xanthorrhoea preissii mid sparse shrubs over *Freesia albaxleichtinii, *Oxalis pes-caprae forbland, *Ehrharta calycina very open grassland

Veg Condition D

Fire Age**Notes****SPECIES LIST:**

Name	Cover	C Class	Height	Specimen Notes
Acacia rostellifera	25		3	
Acacia saligna	1		0.5	
Briza maxima	+		0.2	
Desmodium flexuosus	+		0.2	
Dianella revoluta var. divaricata	+		1	
Ehrharta calycina	10		1	
Eucalyptus gomphocephala	15		12	
Euphorbia terracina	+		0.3	
Freesia alba x leichtlinii	10		0.3	
Fumaria capreolata	+		0.2	
Gladiolus caryophyllaceus	+		0.3	
Hakea prostrata	3		1.8	
Hardenbergia comptoniana	+			
Hypochaeris glabra	+		0.01	
Lagurus ovatus	+		0.3	
Lechenaultia linarioides	+		0.3	
Lomandra caespitosa	1		0.2	
Lupinus angustifolius	+		0.3	
Lysimachia arvensis	+		0.1	
Oxalis pes-caprae	20		0.25	
Pelargonium capitatum	+		0.3	
Romulea rosea	+		0.15	
Sowerbaea laxiflora	+		0.3	
Thysanotus manglesianus	+			
Tricoryne elatior	2		0.3	
Xanthorrhoea preissii	3		2	

Roe 8 west/9

Site DPLHR01

Described by MJH

Date 23/08/2022 Type R

Season E

Uniformity

Location

MGA Zone 50 387063 mE 6448995 mN 115.803207 E -32.089589 S

Habitat woodland

Soil grey sand

Rock Type**Vegetation** Eucalyptus marginata, Banksia attenuata tall open woodland over Allocasuarina fraseriana, Banksia menziesii mid very open woodland over Xanthorrhoea preissii mid shrubland over mixed forbs**Veg Condition** Upper end of G**Fire Age** 10+?**Notes****SPECIES LIST:**

Name	Cover	C Class	Height	Specimen	Notes
Allocasuarina fraseriana	5		8		
Anigozanthos humilis	+		0.105		
Banksia attenuata	10		10		
Banksia menziesii	5		6		
Burchardia congesta	+		0.3		
Desmocladius flexuosus	2		0.15	01	
Ehrharta longiflora	+		0.15		
Eucalyptus marginata subsp. marginata	10		15		
Freesia alba x leichtlinii	2		0.25		
Gladiolus caryophyllaceus	+		0.8		
Gompholobium tomentosum	+		1		
Hypochaeris glabra	+		0.01		
Macrozamia riedlei	2		1.8		
Mesomelaena pseudostygia	1		0.7		
Petrophile linearis	+		0.3		
Romulea rosea	+		0.15		
Sowerbaea laxiflora	+		0.8		
Ursinia anthemoides	1		0.2		
Xanthorrhoea preissii	40		2		

Roe 8 west/9

Site DPLHR02

Described by MJH

Date 25/08/2022 **Type** R

Season E

Uniformity

Location

MGA Zone 50 384074 mE 6449713 mN 115.771626 E -32.082810 S

Habitat

Soil grey sand

Rock Type

Vegetation Pinus radiata over Leptospermum laevigatum, Schinus terebinthifolius, Acacia rostellifera

Veg Condition CD

Fire Age

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen Notes
Acacia rostellifera	40		4	
Asparagus asparagoides	+			
Ehrharta calycina	10		1	
Ehrharta longiflora	50		0.4	
Leptospermum laevigatum	20		4	
Pinus radiata	5		8	
Schinus terebinthifolia	10		5	

Roe 8 west/9

Site DPLHR03

Described by MJH

Date 25/08/2022 **Type** R

Season E

Uniformity

Location

MGA Zone 50 383540 mE 6451079 mN 115.766134 E -32.070434 S

Habitat shrubland on hillside

Soil grey sand

Rock Type limestone outcrop

Vegetation Eucalyptus gomphocephala woodland over Acacia rostellifera open shrubland over *Oxalis pes-caprae forbland

Veg Condition CD

Fire Age

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen Notes
Acacia rostellifera	20		4	
Asparagus asparagoides	1			
Clematis linearifolia	1			
Eucalyptus gomphocephala	40		12	
Leptospermum laevigatum	5		3	
Oxalis pes-caprae	80		0.3	
Schinus terebinthifolia	10		4	

Roe 8 west/9**Site** DPLHR04**Described by** MJH**Date** 25/08/2022 **Type** R**Season** E**Uniformity****Location****MGA Zone** 50 383331 mE 6449950 mN 115.763783 E -32.080596 S**Habitat** limestone shrubland**Soil** yellow sandy loam**Rock Type** limestone outcrop**Vegetation** Banksia sessilis var. sessilis, Acacia rostellifera shrubland over Templetonia retusa sparse mid shrubs over *Oxalis pes-caprae forbland**Veg Condition****Fire Age****Notes****SPECIES LIST:**

Name	Cover	C Class	Height	Specimen Notes
Acacia rostellifera	10		4	
Acanthocarpus preissii	+		0.3	
Banksia sessilis var. sessilis	40		2.5	
Ehrharta calycina	+		1	
Ehrharta longiflora	+		0.3	
Euphorbia terracina	+		0.4	
Foeniculum vulgare	+		1	
Oxalis pes-caprae	80		0.3	
Templetonia retusa	6		1.5	

Roe 8 west/9**Site** DPLHR05**Described by** MJH**Date** 25/08/2022 **Type** R**Season** E**Uniformity****Location****MGA Zone** 50 383314 mE 6449904 mN 115.763598 E -32.081009 S**Habitat** limestone shrubland**Soil** yellow sandy loam**Rock Type** limestone outcrop**Vegetation** Acacia rostellifera tall shrubland over *Ehrharta longiflora gressland, *Oxalis pes-caprae, *Euphorbia terracina forbland**Veg Condition** CD**Fire Age****Notes****SPECIES LIST:**

Name	Cover	C Class	Height	Specimen	Notes
Acacia rostellifera	60		4		
Ehrharta longiflora	40		0.3		
Euphorbia terracina	20		0.5		
Grevillea crithmifolia	+		1		
Oxalis pes-caprae	40		0.3		

Roe 8 west/9**Site** DPLHR06**Described by** MJH**Date** 25/08/2022 **Type** R**Season** E**Uniformity****Location****MGA Zone** 50 383383 mE 6450020 mN 115.764343 E -32.079970 S**Habitat** limestone shrubland**Soil** yellow sandy loam**Rock Type** limestone outcrop**Vegetation** Banksia sessilis, Acacia rostellifera, Spyridium globulosum tall shrubland over *Ehrharta calycina grassland, *Oxalis pes-caprae, Fressis albaxliechtinii open forbland**Veg Condition** D**Fire Age****Notes****SPECIES LIST:**

Name	Cover	C Class	Height	Specimen	Notes
Acacia rostellifera	10		5		
Banksia sessilis var. sessilis	30		2.5		
Ehrharta calycina	30		1		
Freesia alba x leichtlinii	1		0.3		
Fumaria capreolata	1		0.3		
Lagurus ovatus	+		0.3		
Melaleuca systema	+		0.6		
Oxalis pes-caprae	5		0.3		
Phyllanthus calycinus	+		0.4		
Spyridium globulosum	10		3		

Roe 8 west/9

Site DPLHR07

Described by MJH

Date 28/09/2022 Type

Season E

Uniformity

Location

MGA Zone 50 388362 mE 6449269 mN 115.817002 E -32.087247 S

Habitat**Soil****Rock Type**

Vegetation Eucalyptus marginata subsp. marginata, Banksia attenuata low-mid woodland over Xanthorrhoea preissii, Hakea prostrata tall sparse shrubland over Hibbertia hypericoides subsp. hypericoides sparse low shrubland over *Ehrharta calycina, *Briza maxima sparse grassland

Veg Condition D-G**Fire Age****Notes SPECIES LIST:**

Name	Cover	C Class	Height	Specimen Notes
Banksia attenuata	20		7	
Briza maxima	5		0.3	
Burchardia congesta	+		0.8	
Dianella revoluta var. divaricata	+		0.8	
Drosera erythrorhiza	+		0.3	
Ehrharta calycina	10		1.2	
Eucalyptus marginata subsp. marginata	20		10	
Gladiolus caryophyllaceus	+		1	
Gompholobium tomentosum	+		1	
Hakea prostrata	5		4	
Hibbertia hypericoides subsp. hypericoides	5		0.8	
Hypochaeris glabra	1		0.1	
Isotropis cuneifolia subsp. cuneifolia	+		0.3	
Macrozamia riedlei	1		2	
Mesomelaena pseudostygia	+		0.7	
Sowerbaea laxiflora	+		0.4	
Trifolium campestre	+		0.1	
Ursinia anthemoides	1		0.3	
Xanthorrhoea preissii	10		2	

Roe 8 west/9

Site DPLHR08

Described by MJH

Date 28/09/2022 **Type** R

Season E

Uniformity

Location

MGA Zone

mE

mN

E

S

Habitat

Soil

Rock Type

Vegetation Eucalyptus gomphocephala, Corymbia calophylla mid closed forest over Eucalyptus marginata subsp. marginata, Allocasuarina fraseriana mid sparse woodland over *Oxalis pes-caprae, Fumaria capreolata low open forbland, *Ehrharta longiflora, *E. calycina grassland

Veg Condition D-CD

Fire Age

Notes next to rehab, check boundaries

SPECIES LIST:

Name	Cover	C Class	Height	Specimen Notes
Allocasuarina fraseriana	2		8	
Corymbia calophylla	20		20	
Ehrharta calycina	10		1.05	
Ehrharta longiflora	40		0.6	
Eucalyptus gomphocephala	80		20	
Eucalyptus marginata subsp. marginata	10		10	
Euphorbia terracina	5		1.5	
Fumaria capreolata	15		0.5	
Oxalis pes-caprae	20		0.3	
Xanthorrhoea preissii	2		2	

Roe 8 west/9

Site DPLHR09

Described by MJH

Date 28/09/2022 **Type** R

Season E

Uniformity

Location

MGA Zone 50 338385 mE 6449811 mN 115.287672 E -32.076309 S

Habitat

Soil

Rock Type

Vegetation Malia azaderach over weeds

Veg Condition CD

Fire Age

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Arctotheca calendula	+				
Ehrharta calycina	20				
Melia azedarach	5		10		
Trifolium campestre	30				
Vicia sativa subsp. sativa	50				

Roe 8 west/9

Site DPLHR10

Described by MJH

Date 28/09/2022 **Type** R

Season E

Uniformity

Location

MGA Zone 50 388385 mE 6449811 mN 115.817309 E -32.082360 S

Habitat

Soil

Rock Type

Vegetation Planted

Veg Condition Completely Degraded

Fire Age

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen Notes
Callistemon citrinus	1		3	
Ehrharta calycina	10		1	
Ehrharta longiflora	1		0.3	
Eucalyptus camaldulensis	80		20	
Eucalyptus sideroxylon 'Rosea'	5		10	
Melaleuca nesophila	5		3	
Oxalis pes-caprae	30		0.3	

Roe 8 west/9

Site DPLHR11

Described by MJH

Date 28/09/2022 Type R

Season E

Uniformity

Location

MGA Zone 50 387361 mE 6449149 mN 115.806383 E -32.088230 S

Habitat**Soil****Rock Type****Vegetation** Corymbia calophylla mid sparse trees over Jacksonia furcellata, Kunzea glabrescens, Acacia pulchella var. glaberrima mid-tall sparse shrubland over mixed weeds**Veg Condition D****Fire Age****Notes** REHAB**SPECIES LIST:**

Name	Cover	C Class	Height	Specimen	Notes
Acacia pulchella var. glaberrima	2		2		
Anigozanthos manglesii	+		0.6		
Briza maxima	+		0.5		
Calothamnus quadrifidus	1		1.5		
Corymbia calophylla	15		15		
Freesia alba x leichtlinii	1		0.15		
Hardenbergia comptoniana	1				
Jacksonia furcellata	3		4		
Jacksonia sternbergiana	+		1		
Kunzea glabrescens	2		4		
Lagenophora huegelii	+		0.05		
Lagurus ovatus	+		0.3		
Patersonia occidentalis	+		1		
Pelargonium capitatum	+		0.1		
Pimelea rosea	+		1		
Romulea rosea	1		0.25		
Senecio pinnatifolius	+		0.3		
Trifolium campestre	+		0.1		
Ursinia anthemoides	1		0.3		

Roe 8 west/9

Site DPLHR12

Described by MJH

Date 28/09/2022 Type R

Season E

Uniformity

Location

MGA Zone 50 387470 mE 6449257 mN 115.807550 E -32.087266 S

Habitat**Soil****Rock Type**

Vegetation Eucalyptus marginata subsp. marginata mid sparse trees over Corymbia calophylla, Banksia attenuata low closed forest over Xanthorrhoea preissii, Macrozamia riedlii sparse shrubs over *Trifolium campestre, *Oxalis pes-caprae low forbland, *Ehrharta calycina, *Bromus hordeaceus, *Ehrharta longiflora grassland

Veg Condition CD**Fire Age****Notes****SPECIES LIST:**

Name	Cover	C Class	Height	Specimen Notes
Arctotheca calendula	2		0.15	
Banksia attenuata	10		8	
Bromus hordeaceus	10		0.3	
Calothamnus quadrifidus	+		1	
Corymbia calophylla	70		8	
Ehrharta calycina	10		1	
Ehrharta longiflora	1		0.3	
Eucalyptus marginata subsp. marginata	10		15	
Hardenbergia comptoniana	2			
Macrozamia riedlei	2		2	
Oxalis pes-caprae	10		0.3	
Schinus terebinthifolia	1		2	
Trifolium campestre	20		0.1	
Xanthorrhoea preissii	5		2	

Roe 8 west/9

Site DPLHR14

Described by MJH

Date 28/09/2022 Type R

Season E

Uniformity

Location

MGA Zone 50 387383 mE 6448994 mN 115.806598 E -32.089630 S

Habitat**Soil****Rock Type**

Vegetation Eucalyptus gomphocephala, E. marginata subsp. marginata mid sparse trees over Banksia menziesii, B. attenuata low sparse trees over Xanthorrhoea preissii, Hakea prostrata tall sparse shrubs over *Oxalis pes-caprae low forbland, *Ehrharta calycina mid grassland

Veg Condition D-CD**Fire Age****Notes****SPECIES LIST:**

Name	Cover	C Class	Height	Specimen Notes
Banksia attenuata	5		5	
Banksia menziesii	10		6	
Ehrharta calycina	25		1	
Eucalyptus gomphocephala	5		20	
Eucalyptus marginata subsp. marginata	2		12	
Euphorbia terracina	2		0.4	
Freesia alba x leichtlinii	2		0.15	
Fumaria capreolata	2		0.15	
Hakea prostrata	2		3	
Hardenbergia comptoniana	1			
Hibbertia hypericoides subsp. hypericoides	+		0.5	
Macrozamia riedlei	2		2	
Moraea flaccida	+		0.5	
Olea europaea	+		3	
Oxalis pes-caprae	40		0.3	
Vicia sativa subsp. sativa	+			
Xanthorrhoea preissii	5		2	

Roe 8 west/9

Site DPLHR16

Described by MJH

Date 29/09/2022 Type R

Season E

Uniformity

Location

MGA Zone 50 387080 mE 6448988 mN 115.803387 E -32.089654 S

Habitat**Soil****Rock Type**

Vegetation Eucalyptus marginata subsp. Marginata, Banksia attenuata, B. menziesii low open woodland over
 Acacia saligna tall sparse shrubs, Xanthorrhoea preissii, Macrozamia riedlii mid sparse shrubs over
 *Ehrharta calycina mid sparse grasses, *E. longiflora low sparse grasses

Veg Condition Upper end of G**Fire Age****Notes****SPECIES LIST:**

Name	Cover	C Class	Height	Specimen	Notes
Acacia saligna	2		3		
Allocastrum fraseriana	5		7		
Anigozanthos humilis	+		0.15		
Banksia attenuata	10		6		
Banksia menziesii	10		6		
Bossiaea eriocarpa	+		0.3		
Brachyscome iberidifolia	+		0.15		
Burchardia congesta	+		1		
Conostylis aculeata subsp. aculeata	+		0.15		
Daviesia divaricata	+		1		
Ehrharta calycina	5		1		
Ehrharta longiflora	10		0.3		
Eryngium pinnatifidum subsp. pinnatifidum	+		0.15		
Eucalyptus marginata subsp. marginata	30		10		
Gladiolus caryophyllaceus	+		1		
Gompholobium tomentosum	1		1		
Hardenbergia comptoniana	+				
Macrozamia riedlei	2		1.5		
Mesomelaena pseudostygia	+		0.7		
Opercularia vaginata	+		0.3		
Romulea rosea	+		0.15		
Scaevola canescens	+		0.2		
Senecio pinnatifolius	+		0.3		
Sowerbaea laxiflora	+		0.5		
Trachymene pilosa	+		0.1		
Ursinia anthemoides	1		0.1		
Xanthorrhoea preissii	5		2		

Roe 8 west/9

Site DPLHR18

Described by MJH

Date 29/08/2022 **Type** R

Season E

Uniformity

Location

MGA Zone 50 386538 mE 6449426 mN 115.797696 E -32.085649 S

Habitat

Soil

Rock Type

Vegetation

Veg Condition D

Fire Age

Notes From Eg1 on StockRoad East road verge, Degraded, plantings

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Corymbia calophylla	80		20		
Ehrharta calycina	30		1		
Hypochaeris glabra	1		0.02		
Macrozamia riedlei	5		2		
Oxalis pes-caprae	2		0.3		
Romulea rosea	+		0.15		
Trifolium campestre	10		0.1		
Vicia sativa subsp. sativa	+				
Xanthorrhoea preissii	60		2		

Roe 8 west/9

Site DPLHR21

Described by MJH

Date 29/09/2022 Type R

Season E

Uniformity

Location

MGA Zone 50 386915 mE 6449141 mN 115.801657 E -32.088257 S

Habitat

Soil

Rock Type

Vegetation Eucalyptus gomphocephala mid woodland over Allocasuarina fraseriana, Banksia attenuata, B. menziesii low sparse trees over Banksia sessilis var. sessilis, Xanthorrhoea preissii sparse tall shrubs over *Ehrharta calycina tall grassland, *Oxalis pes-caprae low sparse forbland

Veg Condition D-CD

Fire Age

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen Notes
Acacia saligna	+		2.5	
Allocasuarina fraseriana	3		8	
Arctotheca calendula	+		0.15	
Banksia attenuata	5		6	
Banksia menziesii	5		6	
Banksia sessilis var. sessilis	5		3	
Briza maxima	+		0.5	
Ehrharta calycina	60		1.0	
Eucalyptus gomphocephala	30		25	
Freesia alba x leichtlinii	1		0.15	
Lupinus angustifolius	+		0.5	
Macrozamia riedlei	+		1	
Oxalis pes-caprae	10		0.25	
Trifolium campestre	2		0.1	
Watsonia sp.	+		0.5	
Xanthorrhoea preissii	1		2	

Roe 8 west/9**Described by****Date****Site****OPP****Type O****Season****Uniformity****Location****MGA Zone**

mE

mN

E

S

Habitat**Soil****Rock Type****Vegetation****Veg Condition****Fire Age****Notes****SPECIES LIST:**

Name	Cover	C Class	Height	Specimen	Notes
Agave americana					
Allocauarina humilis					
Briza minor					
Caladenia latifolia					
Chamaecytisus palmensis					
Diuris longifolia					
Eragrostis curvula					
Erodium cicutarium					
Gazania linearis					
Laxmannia squarrosa					
Lupinus cosentinii					
Lycium ferocissimum					
Microtis media					
Nuytsia floribunda					
Opuntia stricta					
Petrophile macrostachya					
Plumbago auriculata					
Ptilotus polystachyus					
Ricinus communis					
Stylidium neurophyllum					
Stylidium schoenoides					
Styphelia pallida					
Trifolium angustifolium					

Roe 8 west/9**Site** VN13**Described by** MJH**Date** 28/09/2022 **Type** R**Season** E**Uniformity****Location****MGA Zone** 50 387400 mE 6449083 mN 115.806788 E -32.088829 S**Habitat****Soil****Rock Type****Vegetation** Corymbia calophylla, Euc. marginata, Banksia attenuata, Allocasuarina fraseriana over Xanthorrhoea preissii, Macrozamia riedlii over *Ehrharta calycina, *oxalis pes-caprae, *Watsonia sp.**Veg Condition** D-CD**Fire Age****Notes** VEGNOTE

Trees remain but understorey virtually all gone

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
------	-------	---------	--------	----------	-------

Roe 8 west/9

Site VN15

Described by MJH

Date 29/09/2022 **Type** V

Season E

Uniformity

Location

MGA Zone 50 387480 mE 6448949 mN 115.807620 E -32.090046 S

Habitat

Soil

Rock Type

Vegetation Euc marginata, over Banksia attenuata, Xylomelum occidentale over *Ehrharta calycina, *Oxalis pes-caprae

Veg Condition Completely Degraded

Fire Age

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
------	-------	---------	--------	----------	-------

Roe 8 west/9

Site VN17

Described by MJH

Date 29/09/2022 **Type** V

Season E

Uniformity

Location

MGA Zone 50 386578 mE 6449290 mN 115.798104 E -32.086879 S

Habitat

Soil

Rock Type

Vegetation Jarrah over Banksia attenuata, B menziesii over Xanthorrhoea preissii

Veg Condition G-VG

Fire Age

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
------	-------	---------	--------	----------	-------

Roe 8 west/9

Site VN19

Described by MJH

Date 29/09/2022 **Type** V

Season E

Uniformity

Location

MGA Zone 50 386508 mE 6449586 mN 115.797397 E -32.084203 S

Habitat

Soil

Rock Type

Vegetation Jarrah/Banksia woodland

Veg Condition Degraded

Fire Age

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
------	-------	---------	--------	----------	-------

Roe 8 west/9

Site VN20

Described by MJH

Date 29/09/2022 **Type** V

Season E

Uniformity

Location

MGA Zone 50 mE mN E S

Habitat

Soil

Rock Type

Vegetation Jarrah/Marri over Banksia attenuata, B menziesii over Xanthorrhoea preissii.

*Ehrharta calycina, *Briza maxima, *Oxalis pes-caprae

Veg Condition D

Fire Age

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
------	-------	---------	--------	----------	-------

Roe 8 west/9**Site** VN22**Described by** MJH**Date** 29/09/2022 **Type** V**Season** E**Uniformity****Location****MGA Zone** 50 386570 **mE** 6449018 **mN** 115.797987 **E** -32.089332 **S****Habitat****Soil****Rock Type****Vegetation** Tuart and Allocasuarina over Banksia attenuata and B menziesii, B sessilis**Veg Condition** Point taken at veg condition boundary, to N G (close to VG). To S D-CD**Fire Age****Notes** As slope rises Tuart drops out and Jarrah comes in over the Banksia (Degraded)**SPECIES LIST:**

Name	Cover	C Class	Height	Specimen	Notes
------	-------	---------	--------	----------	-------

Roe 8 west/9**Site** VN23**Described by** MJH**Date** 30/08/2022 **Type** V**Season** E**Uniformity****Location****MGA Zone** 50 386549 mE 6448623 mN 115.797718 E -32.092893 S**Habitat****Soil****Rock Type****Vegetation** Track here.
To east and Stock Road is Jarrah/Banksia
TO west is Tuart/Banksia**Veg Condition****Fire Age****Notes****SPECIES LIST:**

Name	Cover	C Class	Height	Specimen	Notes
------	-------	---------	--------	----------	-------

Roe 8 west/9

Site VN24

Described by MJH

Date 30/09/2022 **Type** V

Season E

Uniformity

Location

MGA Zone 50 386449 mE 6449113 mN 115.796716 E -32.088463 S

Habitat

Soil

Rock Type

Vegetation

Veg Condition

Fire Age

Notes Track here
to E between Stock Road is Jarrah/Banksia
to W is Tuart

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
-------------	--------------	----------------	---------------	-----------------	--------------

Roe 8 west/9

Site VN25

Described by MJH

Date 30/09/2022 **Type** V

Season E

Uniformity

Location

MGA Zone 50 385679 mE 6449367 mN 115.788588 E -32.086094 S

Habitat

Soil

Rock Type

Vegetation Tuart/scattered Banksia attenuata and B menziesii - Jarrah is creeping in

Veg Condition

Fire Age

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
------	-------	---------	--------	----------	-------

Roe 8 west/9**Site** VN26**Described by** MJH**Date** 30/09/2022 **Type** V**Season** E**Uniformity****Location****MGA Zone**

mE

mN

E

S

Habitat**Soil****Rock Type****Vegetation** Tuart over Jarrah (occasional Marri)

Chamaelaucium uncinatum

Leptospermum laevigatum

Veg Condition**Fire Age****Notes**

From cleared part, continues cleared with Marri/Jarrah scattered trees

From PLANT waypoint there are plantings of

Eucalyptus ficifolia

Acacia iteaphylla

Calothamnus quadrifidus

Chamaecytisus palmensis (Tagasaste)

Vegetation between Curven Rd and Stock Rd

Tuart, Jarrah, Marri and plantings (Euc sideroxylon rosea, E. platypus).

See VN 27

SPECIES LIST:**Name****Cover****C Class****Height****Specimen Notes**

Roe 8 west/9

Site VN27

Described by MJH

Date 30/09/2022 **Type** V

Season E

Uniformity

Location

MGA Zone 50 386284 mE 6450066 mN 115.795081 E -32.079851 S

Habitat

Soil

Rock Type

Vegetation Grove of Tuart, couple of Marri continues to N
Plantings on Curven Rd side of fence
*Ehrharta calycina, *Oxalis pes-caprae, *Ehrharta longiflora, *Eragrostis curvula

Veg Condition

Fire Age

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
------	-------	---------	--------	----------	-------

Roe 8 west/9**Site** VN28**Described by** MJH**Date** 30/09/2022 **Type** V**Season** E**Uniformity****Location** VN**MGA Zone** 50 386380 mE 6449229 mN 115.795999 E -32.087410 S**Habitat****Soil****Rock Type****Vegetation** A pocket of Jarrah/Marri surrounded by Tuart**Veg Condition** Good**Fire Age****Notes****SPECIES LIST:**

Name	Cover	C Class	Height	Specimen	Notes
------	-------	---------	--------	----------	-------

Roe 8 west/9

Site VN29

Described by MJH

Date 30/09/2022 **Type** V

Season E

Uniformity

Location

MGA Zone 50 386203 mE 6449251 mN 115.794126 E -32.087193 S

Habitat

Soil

Rock Type

Vegetation Tuarts replace Jarrah, to west

Veg Condition Degraded

Fire Age

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
------	-------	---------	--------	----------	-------

Appendix D

Site species list



APPENDIX D: SITE SPECIES LIST

Family name	Binomial name
Amaranthaceae	<i>Ptilotus polystachyus</i> (Gaudich.) F.Muell.
Anacardiaceae	* <i>Schinus terebinthifolia</i> Raddi
Anarthriaceae	<i>Lyginia imberbis</i> R.Br.
Apiaceae	<i>Eryngium pinnatifidum</i> Bunge subsp. <i>pinnatifidum</i>
	* <i>Foeniculum vulgare</i> Mill.
Araliaceae	<i>Trachymene pilosa</i> Sm.
Asparagaceae	* <i>Agave americana</i> L.
	* <i>Lachenalia reflexa</i> Thunb.
	* <i>Asparagus asparagoides</i> (L.) Wight
	<i>Thysanotus multiflorus</i> R.Br.
	<i>Thysanotus manglesianus</i> Kunth
	<i>Sowerbaea laxiflora</i> Lindl.
	<i>Lomandra hermaphrodita</i> (C.R.P.Andrews) C.A.Gardner
	<i>Lomandra caespitosa</i> (Benth.) Ewart
	<i>Chamaescilla corymbosa</i> (R.Br.) Benth. var. <i>corymbosa</i>
	<i>Acanthocarpus preissii</i> Lehm.
	<i>Laxmannia squarrosa</i> Lindl.
Asteraceae	<i>Senecio pinnatifolius</i> A.Rich.
	* <i>Monoculus monstrosus</i>
	* <i>Gazania linearis</i> (Thunb.) Druce
	* <i>Arctotheca calendula</i> (L.) Levyns
	* <i>Sonchus oleraceus</i> L.
	* <i>Hypochaeris glabra</i> L.
	<i>Lagenophora huegelii</i> Benth.
	<i>Brachyscome iberidifolia</i> Benth.
	* <i>Ursinia anthemoides</i> (L.) Poir.
Brassicaceae	* <i>Brassica tournefortii</i> Gouan
Cactaceae	* <i>Opuntia stricta</i> (Haw.) Haw.
Caryophyllaceae	* <i>Petrohragia dubia</i> (Raf.) G.Lopez & Romo
Casuarinaceae	<i>Allocasuarina humilis</i> (Otto & F.Dietr.) L.A.S.Johnson
	<i>Allocasuarina fraseriana</i> (Miq.) L.A.S.Johnson
Colchicaceae	<i>Burchardia congesta</i> Lindl.
Cyperaceae	<i>Mesomelaena pseudostygia</i> (Kuek.) K.L.Wilson
	<i>Morelotia octandra</i>
	<i>Lepidosperma pubisquameum</i> Steud.
Dilleniaceae	<i>Hibbertia subvaginata</i> (Steud.) F.Muell.
	<i>Hibbertia hypericoides</i> subsp. <i>hypericoides</i>
	<i>Hibbertia hypericoides</i> (DC.) Benth.
Droseraceae	<i>Drosera porrecta</i>
Droseraceae	<i>Drosera bulbosa</i> Hook.
	<i>Drosera erythrorhiza</i> Lindl.
	<i>Drosera glanduligera</i> Lehm.
	<i>Drosera macrantha</i> Endl.
	<i>Drosera stolonifera</i> Endl.
Ericaceae	<i>Styphelia pallida</i>
	<i>Conostephium preissii</i> Sond.
	<i>Styphelia propinqua</i>
Euphorbiaceae	* <i>Ricinus communis</i> L.

APPENDIX

Family name	Binomial name
	* <i>Euphorbia terracina</i> L.
Fabaceae	<i>Jacksonia sternbergiana</i> Huegel
	<i>Hardenbergia comptoniana</i> (Andrews) Benth.
	<i>Jacksonia furcellata</i> (Bonpl.) DC.
	<i>Bossiaea eriocarpa</i> Benth.
	<i>Kennedia prostrata</i> R.Br.
	<i>Nemcia capitata</i> (Benth.) Domin
	<i>Isotropis cuneifolia</i> (Sm.) Heynh. subsp. <i>cuneifolia</i>
	<i>Gompholobium aristatum</i> Benth.
	<i>Daviesia divaricata</i> Benth.
	<i>Templetonia retusa</i> (Vent.) R.Br.
	<i>Acacia saligna</i> (Labill.) H.L.Wendl.
	<i>Acacia rostellifera</i> Benth.
	<i>Acacia pulchella</i> var. <i>glaberrima</i> Meisn.
	<i>Acacia lasiocarpa</i> Benth.
	<i>Acacia cyclops</i> G.Don
	<i>Acacia applanata</i> Maslin
	<i>Daviesia aphylla</i> (F.Muell.) Benth.
	<i>Hovea pungens</i> Benth.
	<i>Daviesia nudiflora</i> Meisn.
	* <i>Lupinus angustifolius</i> L.
	* <i>Lupinus cosentinii</i> Guss.
	* <i>Trifolium angustifolium</i> L.
	* <i>Trifolium campestre</i> Schreb.
	* <i>Vicia sativa</i> L. subsp. <i>sativa</i>
	* <i>Chamaecytisus palmensis</i> (H.Christ) F.A.Bisby & K.W.Nicholls
	<i>Gompholobium tomentosum</i> Labill.
Geraniaceae	* <i>Erodium cicutarium</i> (L.) L'Her.
	* <i>Pelargonium capitatum</i> (L.) L'Her.
Goodeniaceae	<i>Lechenaultia linarioides</i> DC.
	<i>Scaevola canescens</i> Benth.
Haemodoraceae	<i>Anigozanthos manglesii</i> D.Don
	<i>Conostylis candicans</i> Endl. subsp. <i>candicans</i>
	<i>Anigozanthos humilis</i> Lindl.
	<i>Conostylis aculeata</i> R.Br. subsp. <i>aculeata</i>
Hemerocallidaceae	<i>Dianella revoluta</i> var. <i>divaricata</i> (R.Br.) R.J.F.Hend.
	<i>Tricoryne elatior</i> R.Br.
	<i>Corynotheca micrantha</i> Druce
Iridaceae	* <i>Romulea rosea</i> (L.) Eckl.
	<i>Patersonia occidentalis</i> R.Br.
	* <i>Watsonia</i> sp.
	* <i>Freesia alba</i> x <i>leichtlinii</i>
	* <i>Moraea flaccida</i> Sweet
	* <i>Gladiolus caryophyllaceus</i> (Burm.f.) Poir.
Loranthaceae	<i>Nuytsia floribunda</i> (Labill.) Fenzl
Meliaceae	* <i>Melia azedarach</i> L.
Myrtaceae	* <i>Angophora costata</i>
	<i>Melaleuca systema</i> Craven
	* <i>Leptospermum laevigatum</i> (Gaertn.) F.Muell.
	* <i>Callistemon citrinus</i>
	<i>Melaleuca nesophila</i> F.Muell.

APPENDIX

Family name	Binomial name
	<i>Kunzea glabrescens</i> Toelken
	<i>Hypocalymma robustum</i> (Endl.) Lindl.
	<i>Eucalyptus marginata</i> Sm. subsp. <i>marginata</i>
	<i>Eucalyptus gomphocephala</i> DC.
	<i>Eucalyptus camaldulensis</i> Dehnh.
	<i>Corymbia calophylla</i> (Lindl.) K.D.Hill & L.A.S.Johnson
	<i>Calothamnus quadrifidus</i> R.Br.
	* <i>Eucalyptus sideroxylon</i> 'Rosea'
Oleaceae	* <i>Olea europaea</i> L.
Orchidaceae	<i>Caladenia flava</i> R.Br.
	<i>Pterostylis vittata</i> Lindl.
	<i>Microtis media</i> R.Br.
	<i>Diuris magnifica</i> D.Jones
	<i>Caladenia latifolia</i> R.Br.
	<i>Caladenia arenicola</i> Hopper & A.P.Brown
	<i>Diuris longifolia</i> R.Br.
Oxalidaceae	* <i>Oxalis pes-caprae</i> L.
Papaveraceae	* <i>Fumaria capreolata</i> L.
Phyllanthaceae	<i>Phyllanthus calycinus</i> Labill.
Pinaceae	* <i>Pinus radiata</i> D.Don
Plumbaginaceae	* <i>Plumbago auriculata</i> Lam.
Poaceae	* <i>Briza minor</i> L.
	* <i>Ehrharta longiflora</i> Sm.
	* <i>Avena barbata</i> Link
	* <i>Eragrostis curvula</i> (Schrad.) Nees
	* <i>Ehrharta calycina</i> Sm.
	* <i>Bromus hordeaceus</i> L.
	* <i>Briza maxima</i> L.
	* <i>Lagurus ovatus</i> L.
Primulaceae	* <i>Lysimachia arvensis</i>
Proteaceae	<i>Banksia dallanneyi</i> subsp. <i>dallanneyi</i> var. <i>dallanneyi</i>
	<i>Xylomelum occidentale</i> R.Br.
	<i>Stirlingia latifolia</i> (R.Br.) Steud.
	<i>Petrophile macrostachya</i> R.Br.
	<i>Petrophile linearis</i> R.Br.
	<i>Hakea prostrata</i> R.Br.
	<i>Grevillea crithmifolia</i> R.Br.
	<i>Banksia menziesii</i> R.Br.
	<i>Banksia attenuata</i> R.Br.
	<i>Banksia sessilis</i> var. <i>sessilis</i>
Ranunculaceae	<i>Clematis linearifolia</i> Steud.
Restionaceae	<i>Desmocladius flexuosus</i> (R.Br.) L.A.S.Johnson & B.G.Briggs
Rhamnaceae	<i>Spyridium globulosum</i> (Labill.) Benth.
Rubiaceae	<i>Opercularia vaginata</i> Juss.
Rutaceae	<i>Philothea spicata</i> (A.Rich.) Paul G.Wilson
Solanaceae	* <i>Lycium ferocissimum</i> Miers
Stylidiaceae	<i>Stylidium schoenoides</i> DC.
	<i>Stylidium neurophyllum</i>
Thymelaeaceae	<i>Pimelea rosea</i> R.Br.
	<i>Pimelea leucantha</i> Diels
Xanthorrhoeaceae	<i>Xanthorrhoea preissii</i> Endl.
Zamiaceae	<i>Macrozamia riedlei</i> (Gaudich.) C.A.Gardner

Appendix E

Introduced species list



APPENDIX E: INTRODUCED SPECIES LIST

Family	Name
Anacardiaceae	* <i>Schinus terebinthifolia</i>
Apiaceae	* <i>Foeniculum vulgare</i>
Asparagaceae	* <i>Agave americana</i>
	* <i>Asparagus asparagoides</i>
	* <i>Lachenalia reflexa</i>
Asteraceae	* <i>Arctotheca calendula</i>
	* <i>Gazania linearis</i>
	* <i>Hypochaeris glabra</i>
	* <i>Monoculus monstrosus</i>
	* <i>Sonchus oleraceus</i>
	* <i>Ursinia anthemoides</i>
Brassicaceae	* <i>Brassica tournefortii</i>
Cactaceae	* <i>Opuntia stricta</i>
Caryophyllaceae	* <i>Petrorhagia dubia</i>
Euphorbiaceae	* <i>Euphorbia terracina</i>
	* <i>Ricinus communis</i>
Fabaceae	* <i>Chamaecytisus palmensis</i>
	* <i>Lupinus angustifolius</i>
	* <i>Lupinus cosentinii</i>
	* <i>Trifolium angustifolium</i>
	* <i>Trifolium campestre</i>
	* <i>Vicia sativa</i> subsp. <i>sativa</i>
Geraniaceae	* <i>Erodium cicutarium</i>
	* <i>Pelargonium capitatum</i>
Iridaceae	* <i>Freesia alba</i> x <i>leichtlinii</i>
	* <i>Gladiolus caryophyllaceus</i>
	* <i>Moraea flaccida</i>
	* <i>Romulea rosea</i>
	* <i>Watsonia</i> sp.
Meliaceae	* <i>Melia azedarach</i>
Myrtaceae	* <i>Angophora costata</i>
	* <i>Callistemon citrinus</i>
	* <i>Eucalyptus sideroxylon</i> "Rosea"
	* <i>Leptospermum laevigatum</i>
Oleaceae	* <i>Olea europaea</i>
Oxalidaceae	* <i>Oxalis pes-caprae</i>
Papaveraceae	* <i>Fumaria capreolata</i>
Pinaceae	* <i>Pinus radiata</i>
Plumbaginaceae	* <i>Plumbago auriculata</i>
Poaceae	* <i>Avena barbata</i>
	* <i>Briza maxima</i>
	* <i>Briza minor</i>
	* <i>Bromus hordeaceus</i>
	* <i>Ehrharta calycina</i>
	* <i>Ehrharta longiflora</i>
	* <i>Eragrostis curvula</i>
	* <i>Lagurus ovatus</i>
Primulaceae	* <i>Lysimachia arvensis</i>
Solanaceae	* <i>Lycium ferocissimum</i>

Appendix B
**Black cockatoo habitat assessment and
basic fauna survey**



PHOENIX

ENVIRONMENTAL SCIENCES

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project

Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

February 2023

Final



**Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage**

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
Project

Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Version history

Author/s	Reviewer/s	Version	Version number	Date submitted	Submitted to
J. Larkman	J. Scanlon	Draft for client comments	0.1	03-Nov-22	Martin Henson
J. Larkman	J. Scanlon	Draft for client comments	0.2	08-Nov-22	Martin Henson
A. Jacks		Final	1.0	20-Feb-22	Martin Henson

© Phoenix Environmental Sciences Pty Ltd 2023

The use of this report is solely for the client for the purpose in which it was prepared. Phoenix Environmental Sciences accepts no responsibility for use beyond this purpose.

All rights are reserved and no part of this report may be reproduced or copied in any form without the written permission of Phoenix Environmental Sciences or the client.

Phoenix Environmental Sciences Pty Ltd
2/3 King Edward Road OSBORNE PARK WA 6017
P: 08 6323 5410
E: admin@phoenixenv.com.au
Project code: 1522-RO89-RPS-VER

EXECUTIVE SUMMARY

The Roe 8 (West) and Roe 9 Project (the Project) is located approximately 15 km southwest of Perth in the Swan Coastal Plain bioregion of Western Australia. In May 2022, Phoenix Environmental Sciences Pty Ltd (Phoenix) was commissioned by RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage (The Department) to undertake a Black Cockatoo habitat assessment and basic fauna survey for the Project.

Previous surveys have been undertaken for the Project; however, they do not fully align with the current study area. The purpose of the survey was to assess the fauna and black cockatoo habitat values in the study area in order to assist the Department in investigating appropriate land use changes and support a Primary Regional Roads rezoning. Two zoologists conducted a two-day survey in August 2022, with a follow up single day survey to assess the occupancy of suitable black cockatoo hollows in October.

Four broad fauna habitat types exist within the study area. *Banksia/eucalypt* woodland (including 11.5 ha of rehabilitation) and Tuart woodland are the dominant remnant habitats, while 27.5% of the study area has been cleared.

Eighty vertebrate species of conservation significance were identified in the desktop review, comprising 18 species listed as Threatened, Conservation Dependent or Specially Protected under the Environment Protection and Biodiversity Conservation (EPBC) Act and/or Biodiversity Conservation (BC) Act, 45 avifauna species listed as Migratory under the EPBC Act and BC Act, and 17 species listed as Priority by the Department of Biodiversity, Conservation and Attractions (DBCA).

Four conservation significant vertebrate species have previously been recorded within the study area: Carnaby's Cockatoo (EN), Forest Red-tailed Black Cockatoo (VU), Perth Slider (P3) and Quenda (P4).

One species was identified as likely to occur (Perth Slider, P3) and four species were identified as possibly occurring (Black-striped Burrowing Snake, P3; Baudin's Black Cockatoo, EN; Peregrine Falcon, OS and Fork-tailed Swift, Mig.).

The remaining significant species are considered unlikely to occur due to the absence of suitable habitat.

Two species were included in the black cockatoo habitat assessment: Carnaby's Cockatoo (EN) and Forest Red-tailed Black Cockatoo (VU). Evidence of foraging activity from both species was recorded, however no breeding or roosting activity was observed. A total of 295 potential habitat trees were recorded, with ten have suitable hollows for Black Cockatoos. Strong competition from other species and a low number of suitable hollows suggests that it is unlikely either black cockatoo species will breed in the suitable hollows within study area. The remnant native vegetation in the study area was assessed as being high-quality foraging habitat for both species, whereas the cleared and rehabilitated habitats are of lower foraging value.

CONTENTS

Executive summary.....	ii
Contents.....	iii
Acronyms and abbreviations	v
1 Introduction.....	6
1.1 Background	6
1.2 Scope of work.....	6
2 Legislative context.....	8
2.1 Commonwealth.....	8
2.2 State	8
2.2.1 Threatened and Priority species	8
2.2.2 Critical habitat.....	9
2.2.3 Other significant fauna.....	9
2.2.4 Environmentally Sensitive Areas.....	9
3 Existing environment.....	11
3.1 Interim Biogeographic Regionalisation of Australia	11
3.2 Land systems and surface geology	11
3.3 Climate and weather.....	14
3.4 Conservation reserves and ESAs.....	15
4 Methods.....	16
4.1 Desktop review.....	16
4.2 Field survey	17
4.2.1 Survey timing	17
4.2.2 Terrestrial vertebrate fauna	17
4.2.3 Survey personnel.....	19
5 Results.....	21
5.1 Desktop review.....	21
5.1.1 Black Cockatoos.....	33
5.2 Field survey	35
5.2.1 Habitats	35
5.2.2 Assemblage.....	38
5.2.3 Significant vertebrate fauna	38
5.2.4 Black Cockatoos.....	44
5.3 Survey limitations	48
6 Discussion.....	49
6.1 Terrestrial vertebrate fauna.....	49
6.2 Black Cockatoos.....	49
6.2.1 Habitat trees	49
6.2.2 Foraging habitat	50
6.3 Conclusion.....	50
References.....	51

LIST OF FIGURES

Figure 1-1	Project location and study area	7
Figure 3-1	Study area in relation to IBRA bioregions and subregions.....	12
Figure 3-2	Land systems and surface geology in the study area	13
Figure 3-3	Annual climate and weather data for Jandakot Aero (no. 009172) and mean monthly data for the 12 months preceding the survey (BoM 2022)	14
Figure 4-1	Terrestrial fauna survey sites.....	20
Figure 5-1	Desktop records of significant reptile species within 10 km	30
Figure 5-2	Desktop records of significant bird species within 10 km.....	31
Figure 5-3	Desktop records of significant mammal species within 10 km.....	32
Figure 5-4	Desktop records of Black Cockatoos and known breeding sites	34
Figure 5-5	Fauna habitats and significant fauna records from the field survey.....	37
Figure 5-6	Potential black cockatoo habitat trees	46
Figure 5-7	Black Cockatoo foraging habitat quality	47

LIST OF TABLES

Table 3-1	Surface geology of the study area, extent by deposit type.....	11
Table 4-1	Database searches conducted for the desktop review.....	16
Table 4-2	Survey reports included in the desktop review	16
Table 4-3	Survey dates.....	17
Table 4-4	Survey personnel.....	19
Table 5-1	Summary of vertebrate fauna desktop results	21
Table 5-2	Significant vertebrate fauna identified in the desktop review.....	22
Table 5-3	Extent and description of each fauna habitat in the study area.....	35
Table 5-4	Number of vertebrate species recorded in survey in comparison to desktop results, by group.....	38
Table 5-5	Details of significant vertebrate fauna recorded during the field survey.....	38
Table 5-6	Likelihood of occurrence for significant vertebrate fauna identified in the desktop review	39
Table 5-7	Summary of potentially significant habitat trees recorded	44
Table 5-8	Foraging habitat quality scoring for the remnant native vegetation in the study area ..	44
Table 5-9	Plants recorded in this survey that are important to the two species of black cockatoo	45
Table 5-10	Consideration of potential survey limitations	48

LIST OF APPENDICES

Appendix 1	Terrestrial fauna survey site descriptions
Appendix 2	Terrestrial vertebrate fauna desktop and field survey results
Appendix 3	Fauna species by site matrix
Appendix 4	Black Cockatoo habitat trees
Appendix 5	Black Cockatoo foraging habitat scoring tool (DAWE 2022b)

ACRONYMS AND ABBREVIATIONS

BC Act	Biodiversity Conservation Act (2016), Western Australia
BoM	Bureau of Meteorology
CD	Conservation Dependent
DAWE	Department of Agriculture, Water and the Environment (now DCCEEW)
DBCA	Department of Biodiversity, Conservation and Attractions
DBH	Diameter at breast height
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DPaW	Department of Parks and Wildlife (now DBCA)
EN	Endangered
EPA	Environmental Protection Agency
EP Act	Environmental Protection Act (1950), Western Australia
EPBC	Environment Protection and Biodiversity Conservation Act (1999)
IBRA	Interim Biogeographic Regionalisation of Australia
LOO	Likelihood of Occurrence
NES	National Environmental Significance
OS	Other Specially Protected
PRR	Primary Regional Roads
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement
TEC	Threatened Ecological Community
VU	Vulnerable
WA	Western Australia

1 INTRODUCTION

The Department of Planning, Lands and Heritage (the Department) requires a detailed Environmental Assessment Study as part of the Roe 8 (West) and Roe 9 Project (the Project). The study area comprises an east-west corridor of land currently reserved for Primary Regional Roads (PRR) purposes under the Metropolitan Region Scheme, in the City of Cockburn. It is approximately 104.5 ha and is located 15 km southwest of Perth, in the South-West Botanical Province as defined by EPA (2016b) (Figure 1-1). In May 2022, Phoenix Environmental Sciences Pty Ltd (Phoenix) was commissioned by the Department to undertake a Black Cockatoo habitat assessment and basic fauna survey for the Project. The results of the assessment will assist the Department in investigating appropriate land use changes and support a PRR rezoning.

1.1 BACKGROUND

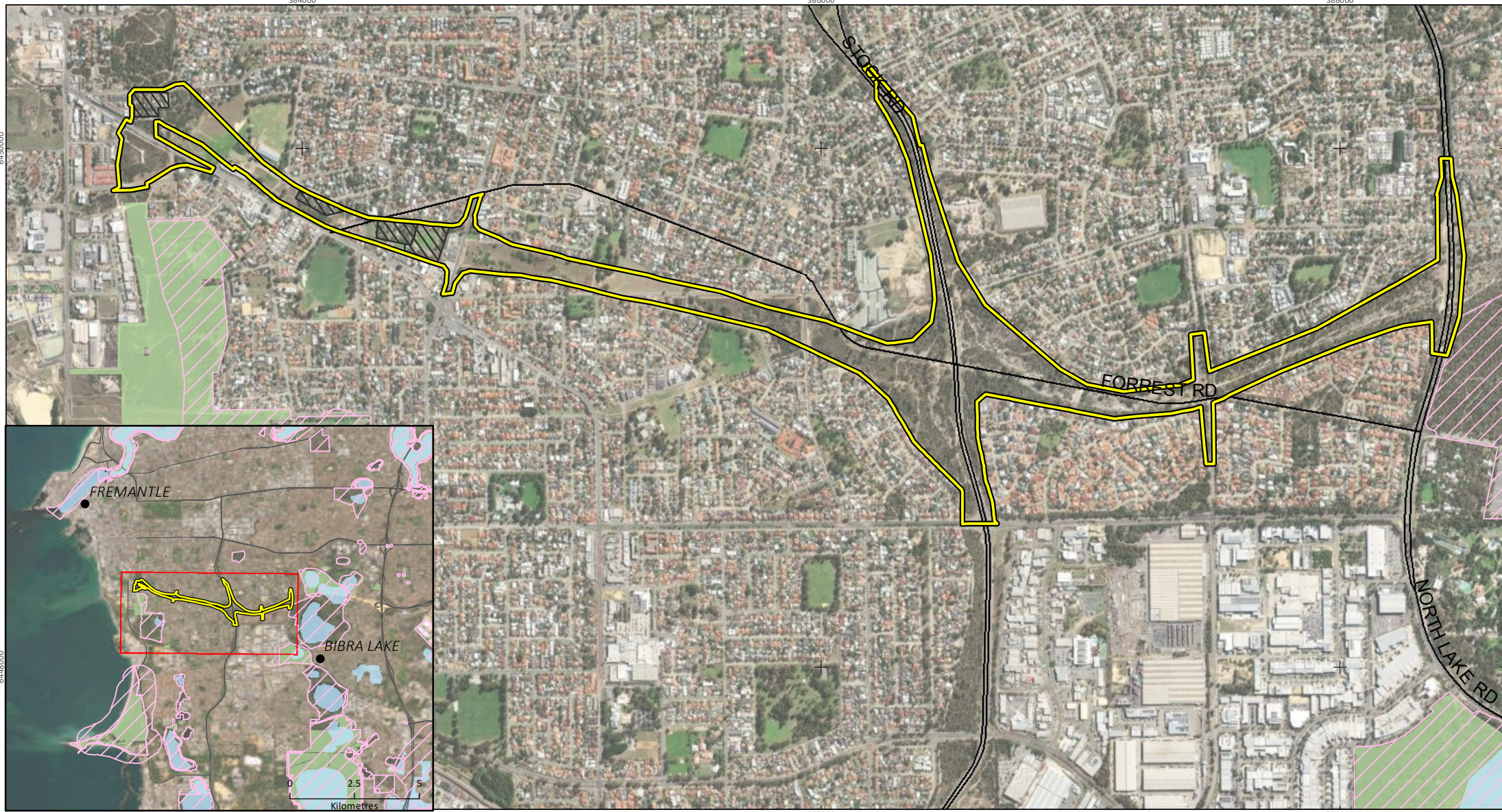
Numerous Environmental Assessments have been undertaken in the past to investigate the areas of environmental significance within the study area (Bamford 2020; Western Wildlife 2010). However, some of these investigations are either dated or do not fully align with the current area requiring investigation. Phoenix has previously undertaken a black cockatoo, vertebrate fauna, and short-range endemic invertebrate survey, Southern Brown Bandicoot (Quenda) monitoring, and targeted Graceful Sunmoth surveys for the Project (Phoenix 2011a, b, c).

In 2016 and 2017, 18 ha of vegetation was cleared within the study area in preparation for the Roe 8 Project. However, construction of the Project was suspended in 2017 following the election of a new State Government. A rehabilitation program was developed in which aims to restore the native vegetation and fauna habitat that was cleared (Emerge Associates 2018). A number of community planting events have since occurred and as of 2021, over 87,000 plants have been planted (Streckhardt & Metz 2021).

1.2 SCOPE OF WORK

The scope of work for the Black Cockatoo habitat assessment and basic fauna survey was as follows:

- desktop study – to gather contextual information on the study area
- black cockatoo habitat and breeding assessment, including:
 - assessment of potential habitat trees
 - assessment of foraging habitat quality
- basic fauna survey – to collect broad fauna and habitat information on the study area, including:
 - habitat assessment and mapping
 - opportunistic fauna sampling.



The Department of Planning, Lands and Heritage
 Roe 8 (West) and Roe 9

Project No	1522
Date	20/02/2023
Drawn by	BK
Map author	JL

0 0.5 1
 Kilometres

1:20,000 (at A4) GDA 1994 MGA Zone 50

- Study area
- Unsurveyed area (school and residential property), observations and assessments made from property boundary
- Environmentally sensitive areas
- Lake
- DBCA managed land
- Road

Figure 1-1
 Project location and study area



All information within this map is current as of 19-Feb-23. This product is subject to COPYRIGHT and is property of Phoenix Environmental Sciences (Phoenix). While Phoenix has taken care to ensure the accuracy of this product, Phoenix make no representations or warranties about its accuracy, completeness or suitability for any particular purpose.
 © 2023 Phoenix Environmental Sciences 1522-2023-Roe 8 & 9 Environmental Management Plan Document 1-1 Project location v2.mxd

2 LEGISLATIVE CONTEXT

The protection of flora and fauna in WA is principally governed by three acts:

- Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)
- State Biodiversity Conservation Act 2016 (BC Act)
- State Environmental Protection Act 1986 (EP Act).

The BC Act came into full effect on 1 January 2019 and replaced the functions of the *Wildlife Conservation Act 1950* (WC Act).

2.1 COMMONWEALTH

The EPBC Act is administered by the Department of Climate Change, Energy, the Environment and Water (DCCEEW). The EPBC Act provides for the listing of Threatened fauna as matters of National Environmental Significance (NES). Under the EPBC Act, actions that have, or are likely to have, a significant impact on a matter of NES, require approval from the Australian Government Minister for the Environment through a formal referral process.

Conservation categories applicable to fauna species under the EPBC Act are as follows:

- Extinct (EX)¹ – there is no reasonable doubt that the last individual has died
- Extinct in the Wild (EW) – taxa known to survive only in captivity
- Critically Endangered (CR) – taxa facing an extremely high risk of extinction in the wild in the immediate future
- Endangered (EN) – taxa facing a very high risk of extinction in the wild in the near future
- Vulnerable (VU) – taxa facing a high risk of extinction in the wild in the medium term
- Conservation Dependent (CD)¹ – taxa whose survival depends upon ongoing conservation measures; without these measures, a conservation dependent taxon would be classified as Vulnerable, Endangered or Critically Endangered.

The EPBC Act is also the enabling legislation for protection of Migratory species as matters of NES under several international agreements:

- Japan-Australia Migratory Bird Agreement (JAMBA)
- China-Australia Migratory Bird Agreement (CAMBA)
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn)
- Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).

2.2 STATE

2.2.1 Threatened and Priority species

In WA, the BC Act provides for the listing of Threatened fauna species (Government of Western Australia 2018a, b)² in the following categories:

¹ Species listed as Extinct and Conservation Dependent are not matters of NES and therefore do not trigger the EPBC Act.

² 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 BC Act.

- Critically Endangered (CR) – species facing an extremely high risk of extinction in the wild in the immediate future³
- Endangered (EN) – species facing a very high risk of extinction in the wild in the near future³
- Vulnerable (VU) – species facing a high risk of extinction in the wild in the medium term future³.

Species may also be listed as specially protected under the BC Act in one or more of the following categories:

- species of special conservation interest (conservation dependent fauna, CD) – species with a naturally low population, restricted natural range, of special interest to science, or subject to or recovering from a significant population decline or reduction in natural range
- Migratory species (Mig.), including birds subject to international agreement
- species otherwise in need of special protection (OS).

The DBCA administers the BC Act and also maintains a non-statutory list of Priority fauna. Priority species are still considered to be of conservation significance – that is they may be Threatened – but cannot be considered for listing under the BC Act until there is adequate understanding of threat levels imposed on them. Species on the Priority fauna lists are assigned to one of four Priority (P) categories, P1 (highest) – P4 (lowest), based on level of knowledge/concern.

2.2.2 Critical habitat

Under the BC Act, habitat is eligible for listing as critical habitat if it is critical to the survival of a Threatened species or a TEC and its listing is otherwise in accordance with the ministerial guidelines.

2.2.3 Other significant fauna

Under the EPA's environmental factor guidelines fauna may be considered significant for a range of reasons other than listing as a Threatened or Priority species.

In addition to listing as Threatened or Priority, EPA (2016a) identifies the following attributes that constitute significant fauna:

- species with restricted distribution
- species subject to a degree of historical impact from threatening processes
- providing an important function required to maintain the ecological integrity of a significant ecosystem.

2.2.4 Environmentally Sensitive Areas

Under section 51B of the EP Act the Minister for Environment may declare by notice either a specified area of the State or a class of areas of the State to be an Environmentally sensitive area (ESA). ESAs are declared in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*, which was gazetted on 8 April 2005 (Government of Western Australia 2005).

ESAs are areas where the vegetation has high conservation value. Several types of areas are declared ESAs including:

- the area covered by vegetation within 50 metres (m) of Threatened flora, to the extent to which the vegetation is continuous with the vegetation in which the Threatened flora is located

³ As determined in accordance with criteria set out in the ministerial guidelines.

**Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage**

- the area covered by a TEC
- a defined wetland (Ramsar wetlands, conservation category wetlands and nationally important wetlands) and the area within 50 m of the wetland
- Bush Forever sites.

3 EXISTING ENVIRONMENT

3.1 INTERIM BIOGEOGRAPHIC REGIONALISATION OF AUSTRALIA

The Interim Biogeographic Regionalisation of Australia (IBRA) classifies Australia’s landscapes into large ‘bioregions’ and ‘subregions’ based on climate, geology, landform, native vegetation and species information (DoEE 2016). The study area is located in the Perth subregion (SWA2) of the Swan Coastal Plain bioregion (Figure 3-1) which is characterised by (Mitchell *et al.* 2002):

- a low lying coastal plain, mainly covered with woodlands,
- colluvial and aeolian sands, alluvial river flats and coastal limestone,
- Heath and/or Tuart woodlands on limestone, *Banksia* and Jarrah-*Banksia* woodlands on Quaternary marine dunes of various ages, Marri on colluvial and alluvials.

3.2 LAND SYSTEMS AND SURFACE GEOLOGY

DPIRD undertakes land system mapping for WA using a nesting soil-landscape mapping hierarchy (Schoknecht & Payne 2011). While the primary purpose of the mapping is to inform pastoral and agricultural land capability, it is also useful for informing biological assessments. Under this hierarchy, land systems are defined as areas with recurring patterns of landforms, soils, vegetation and drainage (Payne & Leighton 2004).

The study area intersects one land system, the Spearwood system which is described as Sand dunes and plains. Yellow deep sands, pale deep sands and yellow/brown shallow sands (Figure 3-2).

According to the Surface Geology of Australia 1:1,000,000 scale, Western Australia database (Stewart *et al.* 2008), the study area intersects two geological formations and is dominated by Tamala Limestone (Table 3-1; Figure 3-2).

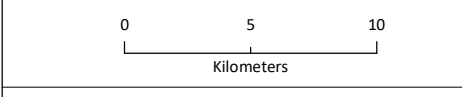
Table 3-1 Surface geology of the study area, extent by deposit type

Surface geology	Abbreviation	Description	Area of study area (ha)	% of study area
Coastal dunes 38488	Qdc	Beach sand, sand dunes, coastal dunes, beaches, and beach ridges; calcareous and siliceous, locally shelly and/or cemented (beach rock); locally reworked.	19.9	19.1
Tamala Limestone	Qdct	Unconsolidated to strongly lithified calcarenite with calcrete/kankar soils; aeolian. Locally quartzose, feldspathic, or heavy-mineral-bearing.	84.6	80.9



The Department of Planning, Lands and Heritage
Roe 8 (West) and Roe 9 Extension

Project No	1522
Date	14/10/2022
Drawn by	BK
Map author	JL



1:300,000 (at A4) GDA 1994 MGA Zone 50

 Study area

Region, subregion

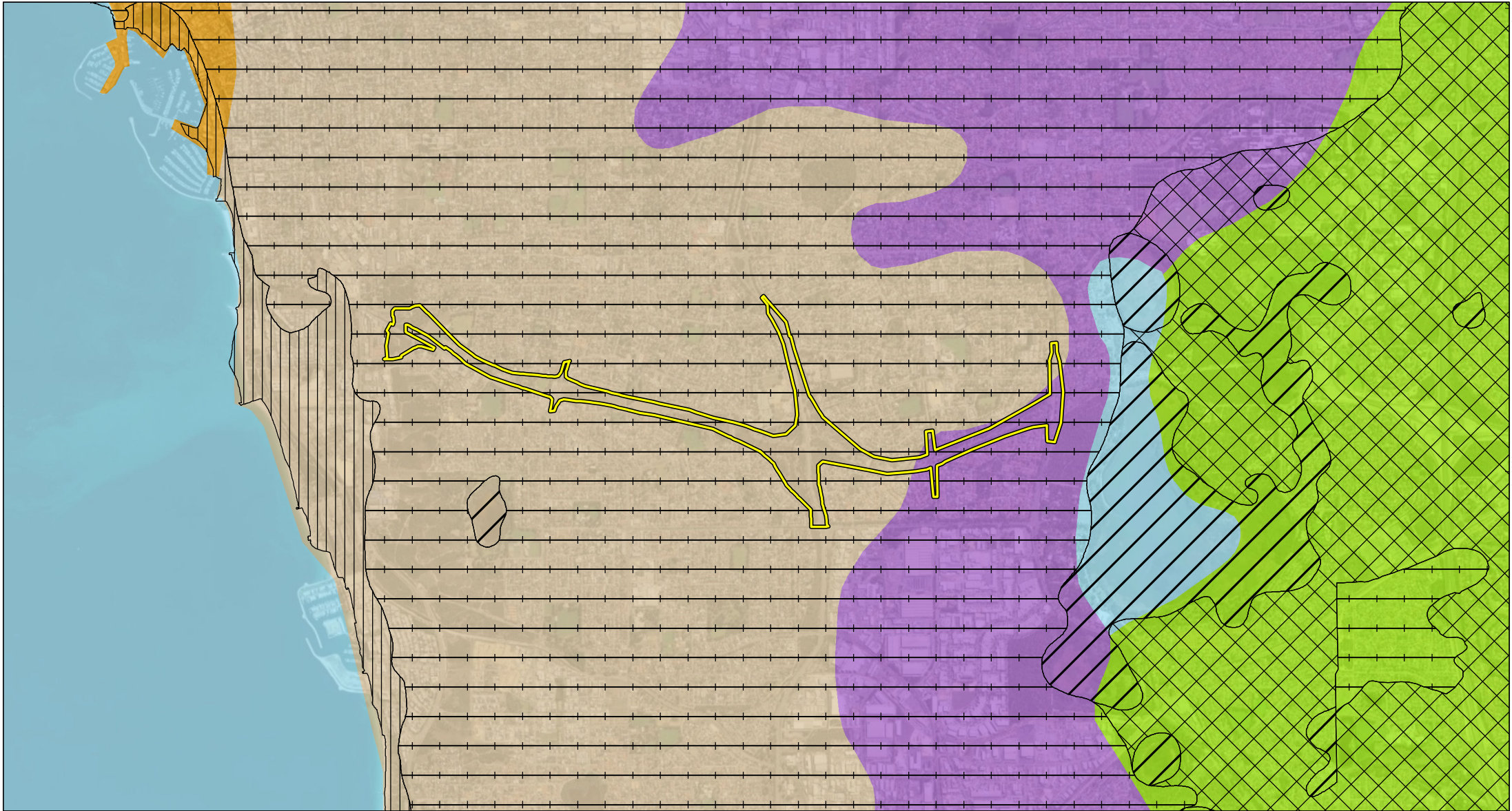
-  Jarrah Forest, Northern Jarrah Forest
-  Swan Coastal Plain, Perth

Figure 3-1

Study area in relation to IBRA bioregions and subregions



All information within this map is current as of 14/10/2022. This product is subject to COPYRIGHT and is property of Phoenix Environmental Sciences (Phoenix). While Phoenix has taken care to ensure the accuracy of this product, Phoenix make no representations or warranties about its accuracy, completeness or suitability for any particular purpose.



The Department of Planning, Lands and Heritage
Roe 8 (West) and Roe 9 Extension

Project No	1522
Date	14/10/2022
Drawn by	BK
Map author	JL

0 1 2
Kilometers

1:40,000 (at A4) GDA 1994 MGA Zone 50

Study area

Land systems

- Bassendean System
- Pinjarra System
- Quindalup South System
- Spearwood System

Surface geology

- Qdc
- Qdcb
- Qdct
- Qrc
- water

Figure 3-2

Land systems and surface geology in the study area

PHOENIX
ENVIRONMENTAL SCIENCES

All information within this map is current as of 14/10/2022. This product is subject to COPYRIGHT and is property of Phoenix Environmental Sciences (Phoenix). While Phoenix has taken care to ensure the accuracy of this product, Phoenix make no representations or warranties about its accuracy, completeness or suitability for any particular purpose.

3.3 CLIMATE AND WEATHER

The climate of the Perth subregion is described as Mediterranean (Mitchell *et al.* 2002), with cool wet winters and warm dry summers. The nearest Bureau of Meteorology (BoM) weather station with comprehensive data collection and recent historic climate data is Jandakot Aero (no. 009172), Latitude: 31.20°S Longitude 115.88°E, located 8.3 km east of the study area.

Jandakot Aero records the highest mean maximum monthly temperature (31.6°C) in February (lowest in July, 18°C) and the lowest minimum mean monthly temperature (7.1°C) in July (highest in February, 17.2°C) (BoM 2022) (Figure 3-3). Median annual rainfall is 816.8 mm with July and June recording the highest monthly median (173.7 and 153.2 mm respectively; Figure 3-3).

Daily mean temperatures at Jandakot Aero preceding the surveys were generally above average, with December to February being warmer than expected. In the three months prior to the survey, mean temperatures were slightly above the long-term average (Figure 3-3). Temperatures during the survey were consistent with August mean temperatures.

Records from Jandakot Aero show the total rainfall over the 12 months preceding the survey was slightly below (-17.6 mm) the long-term median annual rainfall. In the three months prior to the survey, rainfall levels were lower than average for June and July, however August received 68.2 mm more rainfall than expected. Conditions during the survey were wet, with the area receiving 32.4 mm of rain the day before the survey and 8.4 mm during the survey (Figure 3-3).

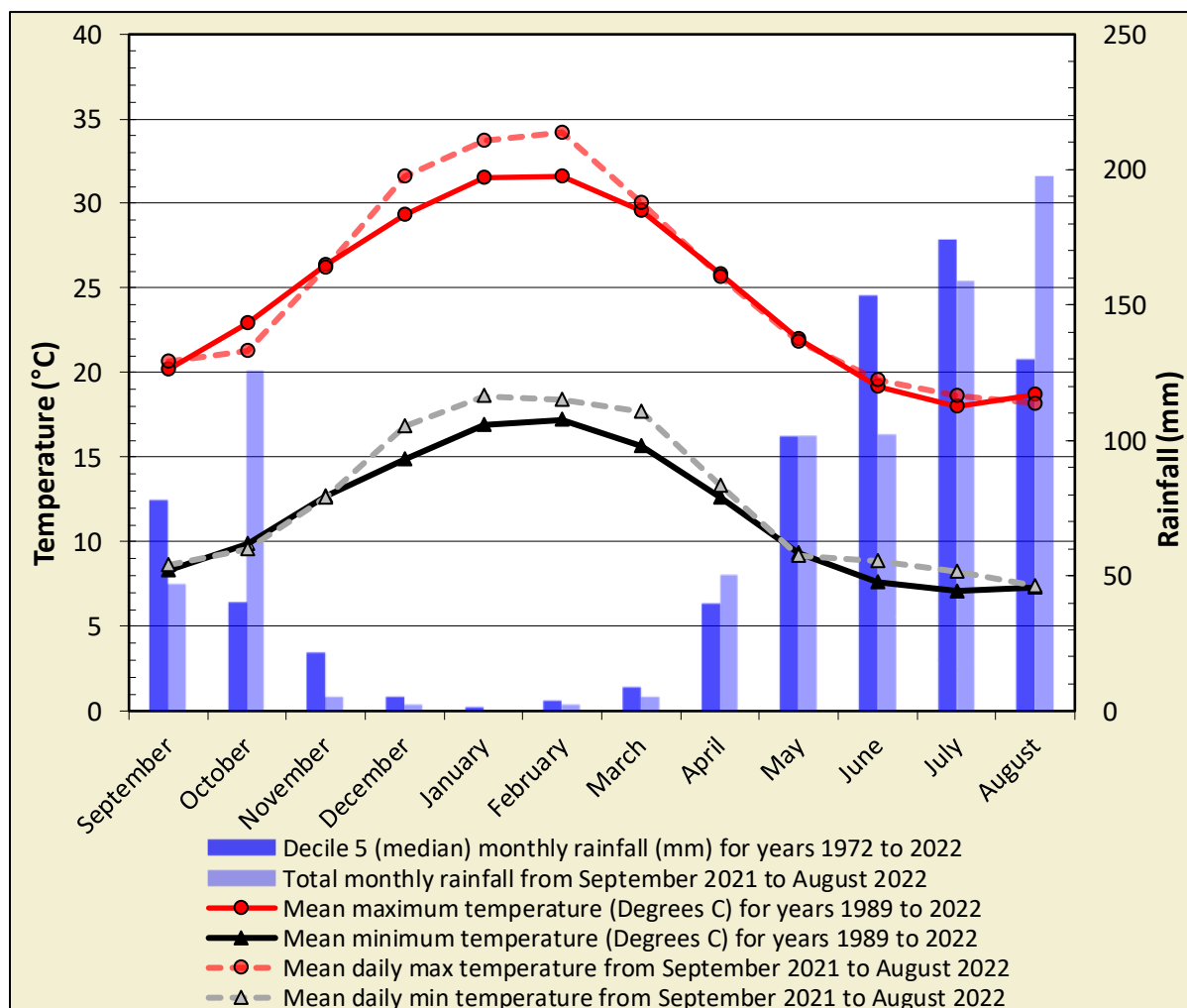


Figure 3-3 Annual climate and weather data for Jandakot Aero (no. 009172) and mean monthly data for the 12 months preceding the survey (BoM 2022)

3.4 CONSERVATION RESERVES AND ESAS

North Lake and Bibra Lake, part of the Beeliiar Regional Park, are located 1 km east of the eastern end of the study area. A DBCA managed reserve lies immediately south (approximately 50 m away) of the western end of the study area. The two nearest ESAs are Bibra Lake Reserve (adjacent to the eastern border of the study area) and Manning Park (Figure 1-1).

4 METHODS

The black cockatoo habitat assessment and basic fauna survey was conducted in accordance with relevant survey guidelines and guidance, including:

- EPA Environmental Factor Guideline: Terrestrial fauna (EPA 2016a)
- EPA Technical Guidance: Terrestrial fauna surveys (EPA 2016d)
- EPA Technical Guidance: Sampling methods for terrestrial vertebrate fauna (EPA 2016c)
- Referral guideline for 3 WA Threatened black cockatoo species: Carnaby’s Cockatoo (*Zanda latirostris*), Baudin’s Cockatoo (*Zanda baudinii*) and the Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) (DAWE 2022b)

4.1 DESKTOP REVIEW

Searches of several biological databases were undertaken to identify and prepare lists of significant fauna that may occur within the study area (Table 4-1). A literature search was conducted for accessible reports for biological surveys conducted within 10 km of the study area to build on the lists developed from the database searches (Table 4-2).

Table 4-1 Database searches conducted for the desktop review

Database	Target group/s	Search coordinates and extent
Protected Matters Search Tool (DCCEEW 2022)	EPBC Act Threatened fauna	Study area plus a 40 km buffer
DBCA Threatened and Priority Fauna Database (DBCA 2022b)	Threatened and Priority fauna	Study area plus a 10 km buffer
DBCA NatureMap Database (DBCA 2022a)	Fauna records	Study area plus a 40 km buffer

Table 4-2 Survey reports included in the desktop review

Report author	Survey description	Project
Bamford (2000)	Vertebrate fauna assessment	Amcor Bushland
Bamford (2020)	Terrestrial vertebrate fauna survey	Rehabilitating Roe 8
Bamford and Wilcox (2005)	Terrestrial vertebrate fauna survey	City of Cockburn
Cornwell (2004)	Species richness assessment	Beeliar Regional Park
GHD (2006)	Fauna assessment	Fiona Stanley Health Precinct
Phoenix (2011a)	Black Cockatoo breeding survey	Roe Highway Project
Phoenix (2011b)	Southern Brown Bandicoot monitoring	Roe Highway Project
Phoenix (2011c)	Vertebrate fauna survey	Roe Highway Project
Western Wildlife (2010)	Wetland and migratory bird survey	Roe Highway Project

4.2 FIELD SURVEY

4.2.1 Survey timing

Field survey dates are provided in Table 4-3.

Table 4-3 Survey dates

Survey type	Season	Dates
Black Cockatoo habitat assessment and basic fauna survey	Winter	10 – 11 August 2022
Checking use of suitable hollows	Spring	18 October 2022

4.2.2 Terrestrial vertebrate fauna

Field methods for the fauna survey of the survey area included:

- habitat assessment (see 4.2.2.1)
- Black Cockatoo habitat tree assessment (4.2.2.2)
- Black cockatoo foraging habitat quality assessment (4.2.2.3)
- opportunistic fauna sampling (4.2.2.4)

4.2.2.1 Habitat assessment

Initial habitat characterisation was undertaken using various remote geographical tools, including aerial photography (Google Earth®), land system maps and topographic maps. Habitats with the potential to support significant terrestrial fauna species were identified based on known habitats of such species within the Swan Coastal Plain bioregion. Habitat descriptions and characteristics were recorded at ten sites throughout the study area (Figure 4-1; Appendix 1).

4.2.2.2 Black Cockatoo habitat tree assessment

The study area is within the modelled distribution for Carnaby's Cockatoo (*Calyptorhynchus latirostris*; Endangered) and Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*; Vulnerable). Breeding habitat for the two black cockatoo species consists of woodland or forest; however, they will also breed in areas of former woodland or forest habitats which consist of now fragmented patches of habitat and/or isolated trees. Breeding habitat is defined in DAWE (2022b) as "habitat that contains known, suitable or potential nesting trees." Potential nesting trees may have a suitable diameter at breast height (DBH) to develop nest hollows, but do not necessarily have hollows. Depending on the tree species, the suitable DBH ranges between 300 (*Eucalyptus salmonophloia* salmon gum, *E. wandoo* wandoo) and 500 mm (all other eucalypt species). Known breeding tree species in the Swan Coastal Plain bioregion include *Corymbia calophylla* Marri, *E. accedens* Powderbark, *E. loxophleba* subsp. *loxophleba* York Gum, *E. marginata* Jarrah, *E. rudis* Flooded Gum, *E. gomphocephala* Tuart, *E. megacarpa* Bullich, *E. patens* Blackbutt, and *E. wandoo* Wandoo.

The location of all potential breeding trees for Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo were recorded on GPS. Tree species identifications were conducted in the field using tree descriptors and photographs. Trees that met the required DBH measurement were inspected for hollows and were assessed for any suitability of nesting and/or roosting.

Where hollows could be observed, they were considered 'suitable' where the hollow entrance was estimated to be >100 mm in diameter, >300 mm deep and aligned near-vertical (typically the main

trunk). Hollows that clearly did not meet the criteria were identified as unsuitable hollow; however, were still recorded as meeting the minimum DBH. Trees with hollows suitable for current breeding were inspected for evidence of use by the species such as wear and/or chew marks around hollow entrance.

4.2.2.3 Black cockatoo foraging habitat quality assessment

The Department of Agriculture, Water and the Environment (DAWE) released referral guidelines for three Threatened Black Cockatoo species (Carnaby's Cockatoo, *Calyptorhynchus latirostris*; Baudin's Cockatoo, *C. baudinii*; and Forest Red-tailed Black Cockatoo, *C. banksii naso*) in 2022 (DAWE 2022b). Accordingly, each habitat within the study area was assessed for black cockatoo species using the foraging habitat quality scoring tool in the guidelines (Appendix 5) to determine the quality of foraging habitat present for each species. The scoring tool considers the following:

- Presence of feeding evidence
- Vegetation present in the surrounding area, i.e. within 12 km, including proximity to any breeding habitat, roosting sites or watering points
- Presence of disease, such as dieback (*Phytophthora* spp.) or Marri canker.

DAWE (2022b) states that the scoring tool for foraging habitat quality assessment should be applied once to the entire impact area of a proposed action, except where the impact area includes more than one location.

Observations of foraging habitat quality and feeding residues were recorded during the survey. This information, together with the fauna habitat mapping was used to define quality foraging habitat areas for each black cockatoo species. Assessment of quality of foraging habitat considered the importance of food plants present based on current available information on food preferences of each species. Based on the scoring tool, sites are classified as high-quality foraging habitat (5-10) or low-quality foraging habitat (0-4) (DAWE 2022b).

4.2.2.4 Opportunistic fauna sampling

Any opportunistic observations of terrestrial fauna species were recorded during the survey. All sightings of vertebrate fauna species and observations of secondary evidence (e.g., diggings, tracks) were recorded while undertaking black cockatoo habitat assessments.

4.2.2.5 Likelihood of occurrence assessment

Following the field survey, the likelihood of occurrence for each significant fauna species identified in the desktop review was assessed and assigned to one of four ratings:

- recorded – species recorded within the study area by previous or current survey
- likely – study area within current known range of species, suitable habitat within the study area and home range of species intersects study area based on known records
- possible – study area within current known range of species, suitable habitat within the study area and home range of species does not intersect study area based on known records
- unlikely – study area outside current known range of species or no suitable habitat present in study area.

4.2.3 Survey personnel

The personnel involved in the surveys are listed in Table 4-4. No licences were required to carry out the survey work.

Table 4-4 Survey personnel

Name	Qualifications	Role/s
Anna Jacks	Bachelor of Science (Hons Environmental Science)	Project management
John Scanlon	Bachelor of Science (Hons Zoology), PhD (Zoology)	Field survey, habitat mapping, reporting
Jade Larkman	Bachelor of Science (Environmental Management)	Field survey, reporting
Brigitte Kovar	Master of Geospatial Intelligence	GIS map production



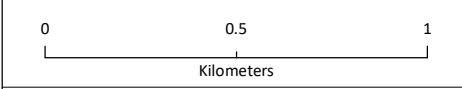
6450370

6448400



The Department of Planning, Lands and Heritage
 Roe 8 (West) and Roe 9 Extension

Project No	1522
Date	14/10/2022
Drawn by	BK
Map author	JL



1:19,800 (at A4) GDA 1994 MGA Zone 50

- Study area
- Survey sites

Figure 4-1
Terrestrial fauna survey sites

All information within this map is current as of 14/10/2022. This product is subject to COPYRIGHT and is property of Phoenix Environmental Sciences (Phoenix). While Phoenix has taken care to ensure the accuracy of this product, Phoenix make no representations or warranties about its accuracy, completeness or suitability for any particular purpose.

5 RESULTS

5.1 DESKTOP REVIEW

The desktop review identified records of 395 vertebrate taxa within the desktop search extent. The list comprised 15 frogs, 83 reptiles (including one introduced species), 260 birds (including 11 naturalised species) and 37 mammals (including 11 introduced) (Table 5-1; Appendix 2).

A number of species returned by the NatureMap search are not native to the locality, and while some of these are known feral populations, others would represent escaped captives, accidentally transported animals, rare vagrants, and records with erroneous spatial data (e.g. species restricted to northern Australia). In the case of several frog species, populations on the eastern margin of the coastal plain are sufficiently remote from the current study area that they are not expected to occur. Most such cases (none of which are listed in conservation categories) are indicated as ‘extralimital’ in Appendix 2, and will not be considered further in the text.

Phoenix previously conducted a detailed vertebrate fauna survey for the Roe Highway Project where 13 mammals, 88 birds, 21 reptiles and six amphibians were recorded (Phoenix 2011c). Eight conservation significant species were recorded during that survey: Carnaby’s Cockatoo (EN), Forest Red-tailed Black Cockatoo (VU), Perth Slider (P3), Quenda (P4), Rainbow Bee-eater (No longer listed; previously Mig.), Eastern Osprey (Mig.), Eastern Great Egret (No longer listed; previously Mig.) and Glossy Ibis (Mig.) (Phoenix 2011c).

Table 5-1 Summary of vertebrate fauna desktop results

Class	Native	Introduced	Total
Amphibians	15	0	15
Reptiles	82	1	83
Birds	249	11	260
Mammals	26	11	37
Total	372	23	395

Four significant vertebrate species have previously been recorded within the study area (Figure 5-1, Figure 5-2, Figure 5-3).

- *Calyptorhynchus latirostris*, Carnaby’s Cockatoo (EN)
- *Calyptorhynchus banksii naso*, Forest Red-tailed Black Cockatoo (VU)
- *Lerista lineata*, Perth Slider (P3)
- *Isoodon fusciventer*, Quenda (P4).

Eighty significant vertebrate species were identified in the desktop review, comprising 18 species listed as Threatened, Conservation Dependent or Specially Protected under the EPBC Act and/or BC Act (Table 5-2). Forty-five avifauna species are listed as Migratory under the EPBC Act and BC Act (Table 5-2). A further 17 species are listed as Priority by DBCA (Table 5-2).

Table 5-2 Significant vertebrate fauna identified in the desktop review

Species	Status	Proximity to study area	Habitat
Reptiles (6)			
<i>Acanthophis antarcticus</i> Common Death Adder	P3 (DBCA list)	*	Inhabits a range of habitats from rainforests and woodlands to grasslands and heath (Wilson & Swan 2021).
<i>Ctenotus delli</i> Dell's Ctenotus	P4 (DBCA list)	*	Occurs in Jarrah and Marri forests and woodlands on lateritic, clay and sandy soils (Wilson & Swan 2021).
<i>Ctenotus ora</i> Coastal Plains Skink	P3 (DBCA list)	*	Occurs in open eucalypt woodlands on sandy coastal plains and dunes (Wilson & Swan 2021).
<i>Lerista lineata</i> Perth Slider	P3 (DBCA list)	Within study area	This skink species is restricted to the south of the Swan River on the Swan Coastal Plain, and is found in habitats with pale sands, <i>Banksia</i> and Eucalypts, and in coastal dunes with well-developed litter ground cover (Maryan <i>et al.</i> 2015).
<i>Neelaps calonotos</i> Black-striped Burrowing Snake	P3 (DBCA list)	5.4 km NE	Occurs in heathlands and woodlands on dunes and sand plains (Wilson & Swan 2021).
<i>Pseudemydura umbrina</i> Western Swamp Tortoise	CR (EPBC & BC Acts)	*	Inhabits shallow, ephemeral, winter-wet swamps on clay or sand-over-clay soils with nearby suitable aestivating refuges (Burbidge <i>et al.</i> 2010).
Non-migratory birds (17)			
<i>Anous tenuirostris</i> subsp. <i>melanops</i> Australian Lesser Noddy	VU/EN (EPBC Act; BC Act)	*	Endemic to Australia and nests on the Houtman Abrolhos Islands and, possibly, Ashmore Reef. Birds remain near breeding islands throughout the year (DAWE 2022c).
<i>Botaurus poiciloptilus</i> Australasian Bittern	EN (EPBC & BC Acts)	9.5 km E	Found in freshwater or brackish swamps with dense vegetation (McKilligan 2005).
<i>Calyptorhynchus banksii</i> subsp. <i>naso</i> Forest Red-tailed Black Cockatoo	VU (EPBC & BC Acts)	Within study area	Occurs in woodlands or forest but may also breed in partially clear habitat with isolated trees (DAWE 2022c). Forages primarily on seeds of Jarrah and Marri. Tall hollow-forming trees important for breeding and roosting. This subspecies occurs in the south-west of WA (Johnstone <i>et al.</i> 2017).
<i>Calyptorhynchus baudinii</i> Baudin's Black Cockatoo	EN (EPBC & BC Acts)	1.8 km N	Occurs mainly occurs in eucalypt forests, especially Jarrah, Marri and karri forest. Breeding generally occurs in woodland or forest, but may also occur in former woodland or forest now present as isolated trees (Department of Agriculture 2021).

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Species	Status	Proximity to study area	Habitat
<i>Calyptorhynchus latirostris</i> Carnaby's Cockatoo	EN (EPBC & BC Acts)	Within study area	Occurs in uncleared or remnant native eucalypt woodlands, and in shrublands or kwongan heathlands dominated by hakea, dryandra, Banksia and grevillea species (DAWE 2022c; Garnett & Crowley 2000; Weerheim 2008). Tall hollow-forming Eucalypt trees are important for nesting (DAWE 2022c).
<i>Elanus scriptus</i> Letter-winged Kite	P4 (DBC list)	9.4 km E	Occurs in open areas, grasslands, tree-lined streams. The species is irruptive and distribution depends on rodent outbreaks.
<i>Falco hypoleucos</i> Grey Falcon	VU (BC Act)	*	The Grey Falcon is a widespread but rare species inhabiting much of the semi-arid interior of Australia. Its distribution is centred on inland drainage systems. It has a large foraging range extending from timbered plains, such as acacia shrublands, into open grasslands (Garnett & Crowley 2000).
<i>Falco peregrinus</i> Peregrine Falcon	OS (BC Act)	1 km SE	Preferred habitat includes cliffs and wooded watercourses. Nesting occurs mainly on cliff ledges, granite outcrops, quarries and in trees with old raven or Wedge-tailed Eagle nests (Johnstone & Storr 1998).
<i>Ixobrychus dubius</i> Australian Little Bittern	P4 (DBC list)	1.6 km SE	Found in freshwater wetlands with dense reeds and sedges, and inundated shrub thickets (Marchant & Higgins 1990).
<i>Ixobrychus flavicollis</i> subsp. <i>australis</i> Black bittern (southwest subpop.)	P2 (DBC list)	*	Only a small population in the south-west, this species inhabits densely vegetated wetlands (McKilligan 2005).
<i>Leipoa ocellata</i> Malleefowl	VU (EPBC & BC Acts)	*	Malleefowl occur mainly in scrubs and thickets of mallee (<i>Eucalyptus</i> spp.), boree (<i>Melaleuca lanceolata</i>) and bowgada (<i>Acacia linophylla</i>), and other dense litter-forming shrublands including Mulga Shrublands (Johnstone & Storr 2004). Nest mounds require sandy soil as well as abundant litter (Benshemesh 2007).
<i>Ninox connivens</i> subsp. <i>connivens</i> Barking owl (southwest subpop.)	P3 (DBC list)	1.2 km E	Occur in forested riparian vegetation, where they nest in tree hollows.
<i>Oxyura australis</i> Blue-billed Duck	P4 (DBC list)	~ 120 m E	Endemic to Australia's temperate regions, inhabiting terrestrial wetlands (fresh or saline) with extensive bordering vegetation, including artificial wetland, such as sewage ponds (Birdlife International 2015; del Hoyo <i>et al.</i> 2014).
<i>Rostratula australis</i> Australian Painted Snipe	EN (EPBC & BC Acts)	*	Generally, inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. Typical sites include those with rank

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Species	Status	Proximity to study area	Habitat
			emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum <i>Muehlenbeckia</i> or canegrass or sometimes tea-tree (<i>Melaleuca</i>) (DAWE 2022c).
<i>Sternula nereis</i> subsp. <i>nereis</i> Fairy Tern	VU (EPBC & BC Acts)	6.6 km N	In WA, the species is present along the entire coastline, with rare records from the far north (Kimberley) and off the Nullarbor Plain (Spineless Wonders 2015). It nests on sheltered sandy beaches, spits and banks above the high tide line and below vegetation.
<i>Thinornis rubricollis</i> Hooded Plover	P4 (DBCAs list)	0.9 km SE	In Western Australia, this species is found on ocean beaches but can also be seen at inland salt lakes, however they are not abundant (Birdlife Australia N.D.).
<i>Tyto novaehollandiae</i> subsp. <i>novaehollandiae</i> Masked Owl (southwest)	P3 (DBCAs list)	4.4 km S	Masked Owls have a preference for woodlands with large old trees in the proximity to open grasslands where they can hunt for mammals.
Migratory birds (45)			
<i>Actitis hypoleucos</i> Common Sandpiper	Mig. (EPBC & BC Acts)	7.4 km N	Found across all Australian states, the Common Sandpiper never occurs in large flocks, mostly singly. In WA, the species is mostly coastal with some inland records (Geering <i>et al.</i> 2007). They are found across a wide range of wetlands: small ponds, large inlets and mudflats where they forage on the shore usually close to the vegetation (DAWE 2022c).
<i>Apus pacificus</i> Fork-tailed Swift	Mig. (EPBC & BC Acts)	~ 1 km W	The Fork-tailed Swift is a non-breeding visitor to all states and territories of Australia (Higgins 1999). It occurs in a wide range of dry or open habitats across most of WA and is uncommon to moderately common in the north-west (DAWE 2022c).
<i>Arenaria interpres</i> Ruddy Turnstone	Mig. (EPBC & BC Acts)	~ 1 km W	Usually found on ocean coasts with exposed rock, stones, or shell beaches (Morcombe 2004). Can be found on sand, coral or shell beaches, shoals, cays and dry ridges of sand or coral.
<i>Calidris acuminata</i> Sharp-tailed Sandpiper	Mig. (EPBC & BC Acts)	~ 350 m E	The Sharp-tailed Sandpiper is one of the most common Australian shorebirds. It occurs on saline wetlands such as coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands (DAWE 2022c).
<i>Calidris alba</i> Sanderling	Mig. (EPBC & BC Acts)	~ 1 km W	Found on the coast, usually on open sandy beaches and exposed sandbars or spits (DAWE 2022c).
<i>Calidris canutus</i> Red Knot	EN/Mig./EN (EPBC Act; BC Act)	~ 1 km W	The species is widespread across coastal Australia often found in intertidal mudflats, sandbars, estuaries, harbours, lagoons, beaches, and reefs.

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Species	Status	Proximity to study area	Habitat
<i>Calidris ferruginea</i> Curlew Sandpiper	CR/Mig./CR (EPBC Act; BC Act)	~ 350 m E	In Australia the species is strictly migratory and occurs in large numbers. Mainly occur on intertidal mudflats in sheltered coastal areas, also around non-tidal swamps, lakes, and lagoons near the coast. Less often inland around ephemeral and permanent lakes and waterholes, usually with bare edges of mud or sand (DAWE 2022c).
<i>Calidris melanotos</i> Pectoral Sandpiper	Mig. (EPBC & BC Acts)	~ 1 km W	The Pectoral Sandpiper is an uncommon solitary shorebird found in wetlands, inland as well as on the coast. Occurs on shallow fresh to saline wetlands, usually coastal or near-coastal but occasionally further inland. Prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation (DAWE 2022c).
<i>Calidris minuta</i> Little Stint	Mig. (EPBC Act)	*	Occurs on edges of inland lakes, reservoirs, sewage farms and coastal mudflats (IUCN 2019).
<i>Calidris ruficollis</i> Red-necked Stint	Mig. (EPBC & BC Acts)	~ 350 m E	Mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores.
<i>Calidris subminuta</i> Long-toed Stint	Mig. (EPBC & BC Acts)	~ 1 km W	Occurs in wetlands, including lakes, swamps, floodplains, streams, lagoons and sewage ponds (DAWE 2022c).
<i>Calidris tenuirostris</i> Great Knot	CR/Mig./CR (EPBC Act; BC Act)	~ 1 km W	Occurs in sheltered coastal habitats with large intertidal mudflats or sandflats (DAWE 2022c).
<i>Charadrius bicinctus</i> Double-banded Plover	Mig. (EPBC & BC Acts)	*	Found on fresh or saline wetlands, also saltmarshes, grasslands and pastures. It can also occur on beaches, inlets, and margins of wetlands (DAWE 2022c).
<i>Charadrius dubius</i> Little Ringed Plover	Mig. (EPBC & BC Acts)	1.7 km E	Coastal mudflats, freshwater wetlands, estuaries, lakes and lagoons.
<i>Charadrius leschenaultii</i> Greater Sand Plover	VU/Mig./VU (EPBC Act; BC Act)	~ 1 km W	Occur mostly in coastal habitats, including littoral and estuarine habitats such as mudflats, sandbanks, and lagoons (DAWE 2022c).
<i>Charadrius mongolus</i> Lesser Sand Plover	EN/Mig. (EPBC & BC Acts)	~ 1 km W	Occurs in coastal littoral and estuarine environments, inhabiting sandflats, mudflats, harbours and estuaries (DAWE 2022c).
<i>Chlidonias leucopterus</i> White-winged Black Tern	Mig. (EPBC & BC Acts)	~ 850 m SE	Inhabits fresh or saline wetlands, and tidal wetlands and their associated sandflats and mudflats (DAWE 2022c).

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Species	Status	Proximity to study area	Habitat
<i>Gallinago hardwickii</i> Latham's Snipe	Mig. (EPBC & BC Acts)	*	Low vegetation around wetlands, sedges, reeds, heath and saltmarshes.
<i>Gallinago megala</i> Swinhoe's Snipe	Mig. (EPBC & BC Acts)	*	Occurs at the edges of wetlands and is also known to occur in grasslands (DAWE 2022c).
<i>Gallinago stenura</i> Pin-tailed Snipe	Mig. (EPBC & BC Acts)	*	Occurs at the edges of freshwater wetlands, and also commonly seen at sewage ponds (DAWE 2022c).
<i>Gelochelidon nilotica</i> Gull-billed Tern	Mig. (BC Act)	*	Occur in freshwater swamps, salt lakes, beaches, mudflats and sewage farms, and are rarely found over the ocean
<i>Glareola maldivarum</i> Oriental Pratincole	Mig. (EPBC & BC Acts)	~ 1 km W	Inhabits open plains, flood plains or bare grasslands, often occurring near wetlands (DAWE 2022c).
<i>Hydroprogne caspia</i> Caspian Tern	Mig. (EPBC & BC Acts)	7.5 km N	In WA, the species occurs almost exclusively on the coast, in estuaries, inlets, bays, lagoons with muddy or sandy shores. Other habitats include near-coastal or inland terrestrial wetlands that are either fresh or saline, especially lakes (including ephemeral lakes), waterholes, reservoirs, rivers and creeks (DAWE 2022c).
<i>Limicola falcinellus</i> Broad-billed Sandpiper	Mig. (BC Act)	~ 1 km W	Occurs in sheltered coastal habitats such as saltmarshes, lagoons, sewage farms and mudflats (DAWE 2022c).
<i>Limosa lapponica</i> Bar-tailed Godwit	Mig. (EPBC & BC Acts)	~ 1 km W	Found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays (DAWE 2022c).
<i>Limosa limosa</i> Black-tailed Godwit	Mig. (BC Act)	~ 1 km W	Occurs in coastal habitats, such as sheltered bays, estuaries, lagoons, mudflats and sandflats, and is also found in near-coastal wetlands (DAWE 2022c).
<i>Motacilla cinerea</i> Grey Wagtail	Mig. (EPBC & BC Acts)	*	Vagrant visitor to Australia that inhabits fast flowing streams and rivers (IUCN 2019).
<i>Numenius madagascariensis</i> Eastern Curlew	CR/Mig./CR (EPBC Act; BC Act)	~ 1 km W	Occurs mainly on intertidal mudflats, on exposed seagrass beds or mudflats (Geering <i>et al.</i> 2007). Also utilises sand spits of estuaries, mangroves, lake shores and ocean beaches.
<i>Numenius minutus</i> Little Curlew	Mig. (EPBC & BC Acts)	*	Found on short, dry grasslands and dry grass edges of freshwater inland (Geering <i>et al.</i> 2007).

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Species	Status	Proximity to study area	Habitat
<i>Numenius phaeopus</i> Whimbrel	Mig. (EPBC & BC Acts)	~ 1 km W	Forages on intertidal mudflats, estuaries and lagoons, occasionally foraging on beaches and on rock platforms (DAWE 2022c).
<i>Pandion cristatus</i> Osprey	Mig. (EPBC & BC Acts)	~ 115 m E	Occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. Occur in a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes (DAWE 2022c).
<i>Phalaropus lobatus</i> Red-necked Phalarope	Mar/Mig. (EPBC Act; BC Act)	*	In Australia, this species occurs at lakes and swamps, both inland and coastal (DAWE 2022c).
<i>Philomachus pugnax</i> Ruff	Mig. (EPBC & BC Acts)	~ 1 km W	In Australia the Ruff is found on generally fresh, brackish or saline wetlands with exposed mudflats at the edges (DAWE 2022c).
<i>Plegadis falcinellus</i> Glossy Ibis	Mig. (EPBC & BC Acts)	~ 115 m E	Predominantly inhabit terrestrial wetlands, foraging in shallow water over soft substrate or on grassy or muddy verges of wetlands providing a variety of water depths (Marchant & Higgins 1990).
<i>Pluvialis fulva</i> Pacific Golden Plover	Mig. (EPBC & BC Acts)	~ 1 km W	Australia this species usually inhabits coastal habitats, on beaches, mudflats and sandflats (DAWE 2022c).
<i>Pluvialis squatarola</i> Grey Plover	Mig. (EPBC & BC Acts)	~ 1 km NE	Occurs on intertidal mudflats, saltmarshes, sandflats and beaches of oceanic coastlines, bays and estuaries. During migration it may also be found inland on lakes, pools or grasslands (del Hoyo <i>et al.</i> 2014; IUCN 2019).
<i>Sterna albifrons</i> Little Tern	Mig. (BC Act)	*	In Australia, they inhabit sheltered coastal environments, including lagoons, estuaries, river mouths and deltas, lakes, bays, harbours and inlets (DAWE 2022c).
<i>Sterna dougallii</i> Roseate Tern	Mig. (EPBC & BC Acts)	~ 1 km W	Occurs in coastal and marine areas in subtropical and tropical seas. The species inhabits rocky and sandy beaches, coral reefs, sand cays and offshore islands (DAWE 2022c).
<i>Thalasseus bergii</i> Crested Tern	Mig. (BC Act)	~ 380 m W	Inhabits tropical and subtropical coastlines. Found along the entire Australian coast (IUCN 2019).
<i>Tringa brevipes</i> Grey-tailed Tattler	(Mig. EPBC & BC Acts; P4 DBCA list)	*	Occurs on sheltered coasts with reefs and rock platforms or mudflats, and can also be found on reefs or platforms that are exposed at low tide (DAWE 2022c).
<i>Tringa glareola</i> Wood Sandpiper	Mig. (EPBC & BC Acts)	~ 340 m E	Prefers the shallows of wooded lakes or swamps with trees. It also inhabits freshwater swamps, lakes, flooded pastures and occasionally, mangroves (Morcombe 2004).

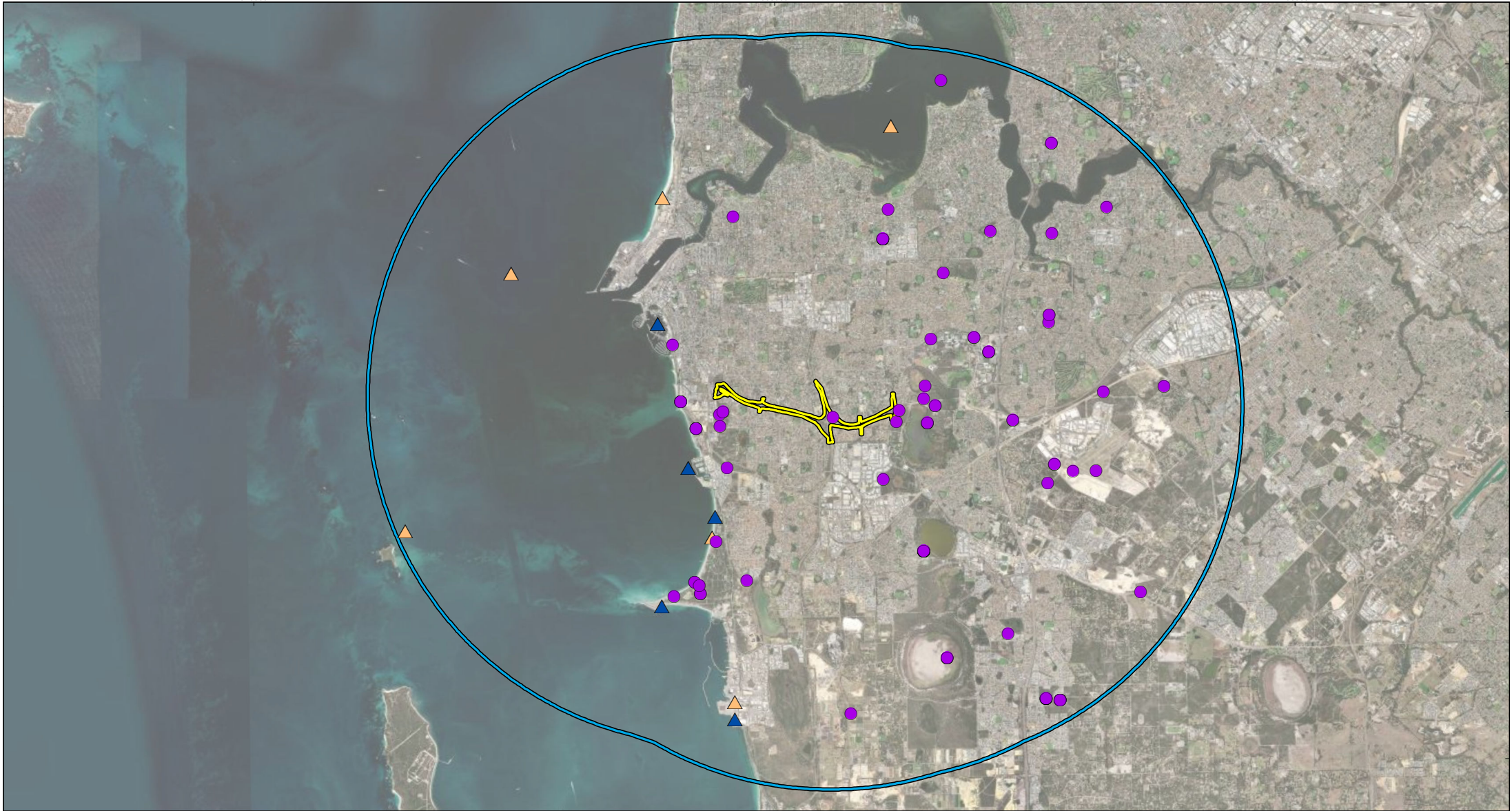
Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Species	Status	Proximity to study area	Habitat
<i>Tringa nebularia</i> Common Greenshank	Mig. (EPBC & BC Acts)	~ 340 m E	Mostly on the coast but sometimes inland; uses permanent and ephemeral terrestrial wetlands, including rivers and creeks (DAWE 2022c).
<i>Tringa stagnatilis</i> Marsh Sandpiper	Mig. (EPBC & BC Acts)	~ 590 m SE	Inhabits coastal and inland wetlands, estuarine and mangrove mudflats, beaches, swamps, lakes and several other types of wetlands (Morcombe 2004).
<i>Tringa totanus</i> Common Redshank	Mig. (EPBC & BC Acts)	*	Occurs in sheltered coastal wetlands, also around salt lakes, lagoons, saltworks and sewage farms (DAWE 2022c).
<i>Xenus cinereus</i> Terek Sandpiper	Mig. (EPBC & BC Acts)	*	Inhabits coastal mudflats, sheltered estuaries and lagoons. In Australia, it has a primarily coastal distribution, with occasional records inland (Morcombe 2004).
Mammals (12)			
<i>Bettongia penicillata</i> subsp. <i>ogilbyi</i> Woylie	EN/CR (EPBC/BC Act)	*	Found in dry sclerophyll forests and woodlands dominated by Jarrah and Wandoo with well drained sandy soils and is now only known from two areas: Upper Warren and Dryandra Woodlands (DBCA 2017b).
<i>Dasyurus geoffroii</i> Chuditch	VU (EPBC & BC Acts)	4.1 km NE	Formerly widespread in very diverse habitats, now mostly in Jarrah forest and woodland of the southwest, also heath and mallee habitats along the south coast; uses horizontal hollow logs or earth burrows as refugia and dens (DEC 2012b).
<i>Falsistrellus mackenziei</i> Western False Pipistrelle	P4 (DBCA list)	8.8 km SE	Occur in wet forests of Karri, Jarrah and Tuart eucalypts, where they roost in tree hollows (IUCN 2019).
<i>Hydromys chrysogaster</i> Water-rat	P4 (DBCA list)	4.2 km NW	Occurs in a wide variety of freshwater habitats, from inland waterways to lakes, swamps and farm dams, can also occur in mangrove and estuarine areas (IUCN 2019).
<i>Isoodon fusciventer</i> Quenda	P4 (DBCA list)	Within study area	Occur in dense shrublands and forests, and also found in parks and gardens throughout Perth (DBCA 2018).
<i>Macroderma gigas</i> Ghost Bat	VU (EPBC & BC Acts)	*	Roost sites include caves, rock crevices and disused mine adits. Foraging habitat in areas surrounding roost sites, mostly woodlands and watercourses (Bullen 2021).
<i>Myrmecobius fasciatus</i> Numbat	EN (EPBC & BC Acts)	5 km ESE	Inhabits eucalypt woodland and forests with abundant termites, and hollow logs for shelter (DPaW 2017).
<i>Notamacropus eugenii</i> subsp. <i>derbianus</i> Tamar wallaby	P4 (DBCA list)	8.6 km SE	Found in coastal scrub, heath, forest, or woodland with dense, low vegetation for shelter (DEC 2012d).

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage


Species	Status	Proximity to study area	Habitat
<i>Notamacropus irma</i> Western Brush Wallaby	P4 (DBCA list)	4.8 km ESE	Grazing species, occurs in open forest or woodland with low grasses and scrubby thickets, and also found in some areas of mallee and heathland (DEC 2012e).
<i>Phascogale tapoatafa</i> subsp. <i>wambenger</i> Southwestern Brush-tailed Phascogale	CD (BC Act)	8.5 km SE	This subspecies has been observed in dry sclerophyll forests and open woodlands that contain hollow-bearing trees. These nocturnal, arboreal carnivores forage for food under the bark of trees (DEC 2012a).
<i>Pseudocheirus occidentalis</i> Western ringtail possum	CR (EPBC & BC Acts)	4.5 km N	This species is found on the southern extremity of the Swan Coastal Plain in Peppermint woodlands and Peppermint/Tuart forests (DBCA 2017a).
<i>Setonix brachyurus</i> Quokka	VU (EPBC & BC Acts)	*	A habitat specialist, the Quokka prefers dense riparian vegetation, but they also use a range of other habitats on the mainland such as heath and shrublands, swamps, and forests (DAWE 2022c).

* EPBC Protected Matters Search does not return species record locations and includes instances where suitable habitat may occur but the species has not necessarily been observed.




The Department of Planning, Lands and Heritage
Roe 8 (West) and Roe 9 Extension

Project No	1522
Date	31/10/2022
Drawn by	BK
Map author	JL



0 3 6
Kilometers

1:150,300(at A4) GDA 1994 MGA Zone 50

 Study area

Status





-  EN/Mig./EN (EPBC Act; BC Act)
-  EN/Mig./VU (EPBC Act; BC Act)
-  P3 (DBC list)

Figure 5-1

Desktop records of significant reptile species within 10 km

(Only records with associated coordinates are displayed)



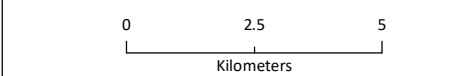
PHOENIX
ENVIRONMENTAL SCIENCES

All information within this map is current as of 31/10/2022. This product is subject to COPYRIGHT and is property of Phoenix Environmental Sciences (Phoenix). While Phoenix has taken care to ensure the accuracy of this product, Phoenix make no representations or warranties about its accuracy, completeness or suitability for any particular purpose.



The Department of Planning, Lands and Heritage
Roe 8 (West) and Roe 9 Extension

Project No	1522
Date	31/10/2022
Drawn by	BK
Map author	JL



1:148,000 (at A4) GDA 1994 MGA Zone 50

- | | |
|------------------------------------|------------------------------------|
| Study area | Mig. (EPBC & BC Acts) |
| Status | OS (BC Act) |
| CD (BC Act) | P3 (DBC list) |
| CR/Mig./CR (EPBC Act; BC Act) | P4 (DBC list) |
| EN (EPBC & BC Acts) | VU (EPBC & BC Acts) |
| EN-VU (EPBC and BC Acts) | VU/Mig. (BC Act) |
| EN/Mig. (EPBC & BC Acts) | VU/Mig. (EPBC & BC Acts) |
| EN/Mig./EN (EPBC Act; BC Act) | VU/Mig./EN/Mig. (EPBC Act; BC Act) |
| EN/Mig./VU/Mig. (EPBC Act; BC Act) | VU/Mig./VU (EPBC Act; BC Act) |
| Mig. (BC Act) | |

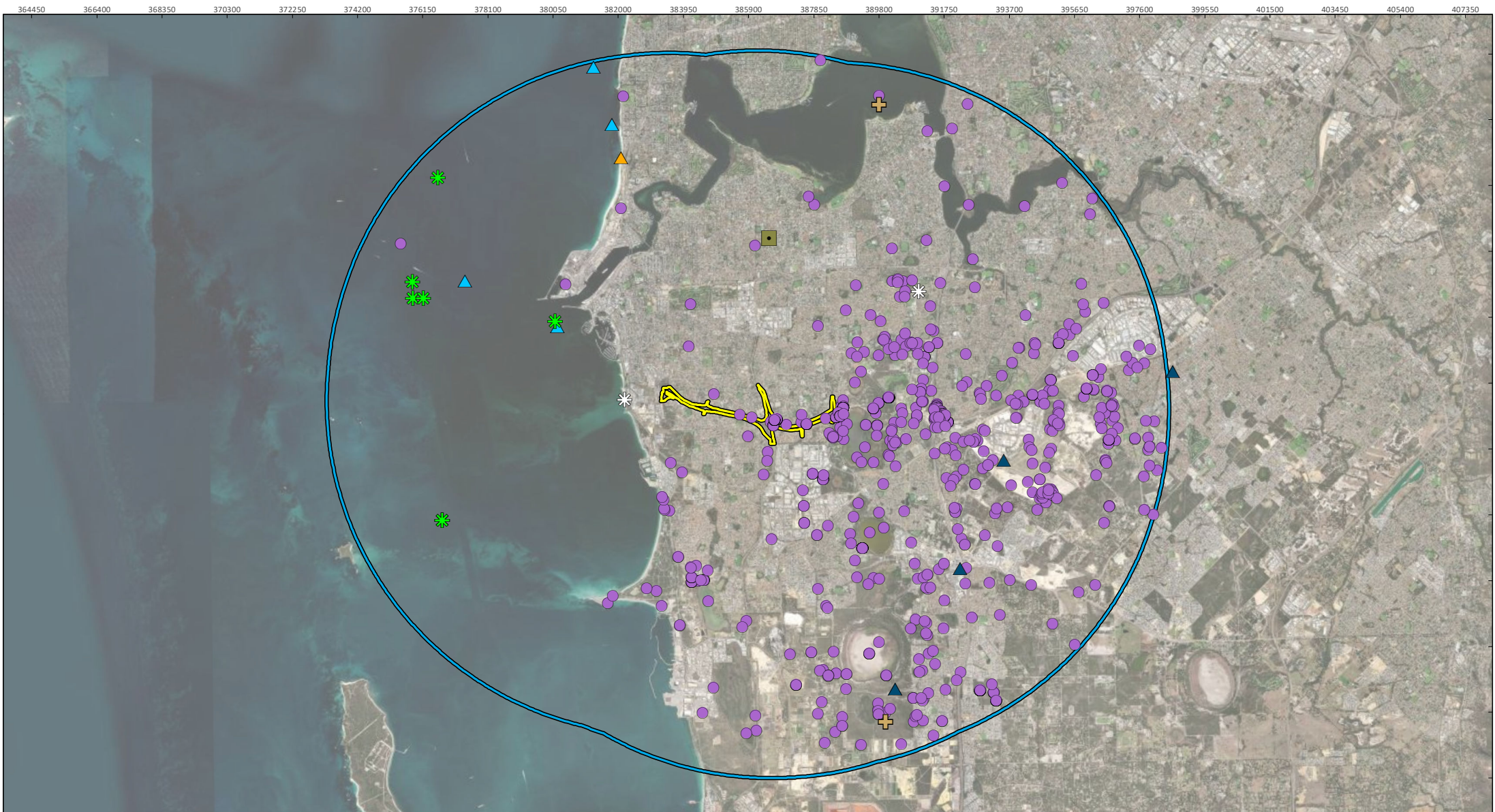
Figure 5-2

Desktop records of significant bird species within 10 km

(Only records with associated coordinates are displayed)

PHOENIX
ENVIRONMENTAL SCIENCES

All information within this map is current as of 31/10/2022. This product is subject to COPYRIGHT and is property of Phoenix Environmental Sciences (Phoenix). While Phoenix has taken care to ensure the accuracy of this product, Phoenix make no representations or warranties about its accuracy, completeness or suitability for any particular purpose.



The Department of Planning, Lands and Heritage
Roe 8 (West) and Roe 9 Extension

Project No	1522
Date	31/10/2022
Drawn by	BK
Map author	JL

0 2.5 5
Kilometers

1:154,300 (at A4) GDA 1994 MGA Zone 50

- Study area
- Status**
- CD (BC Act)
- CR (EPBC & BC Acts)
- EN (EPBC & BC Acts)
- EN/Mig./VU (EPBC Act; BC Act)
- EN/VU (EPBC Act; BC Act)

- P4 (DBCA list)
- VU (EPBC & BC Acts)
- VU/CD (EPBC Act; BC Act)

Figure 5-3
Desktop records of significant mammal species within 10 km
(Only records with associated coordinates are displayed)



All information within this map is current as of 31/10/2022. This product is subject to COPYRIGHT and is property of Phoenix Environmental Sciences (Phoenix). While Phoenix has taken care to ensure the accuracy of this product, Phoenix make no representations or warranties about its accuracy, completeness or suitability for any particular purpose.

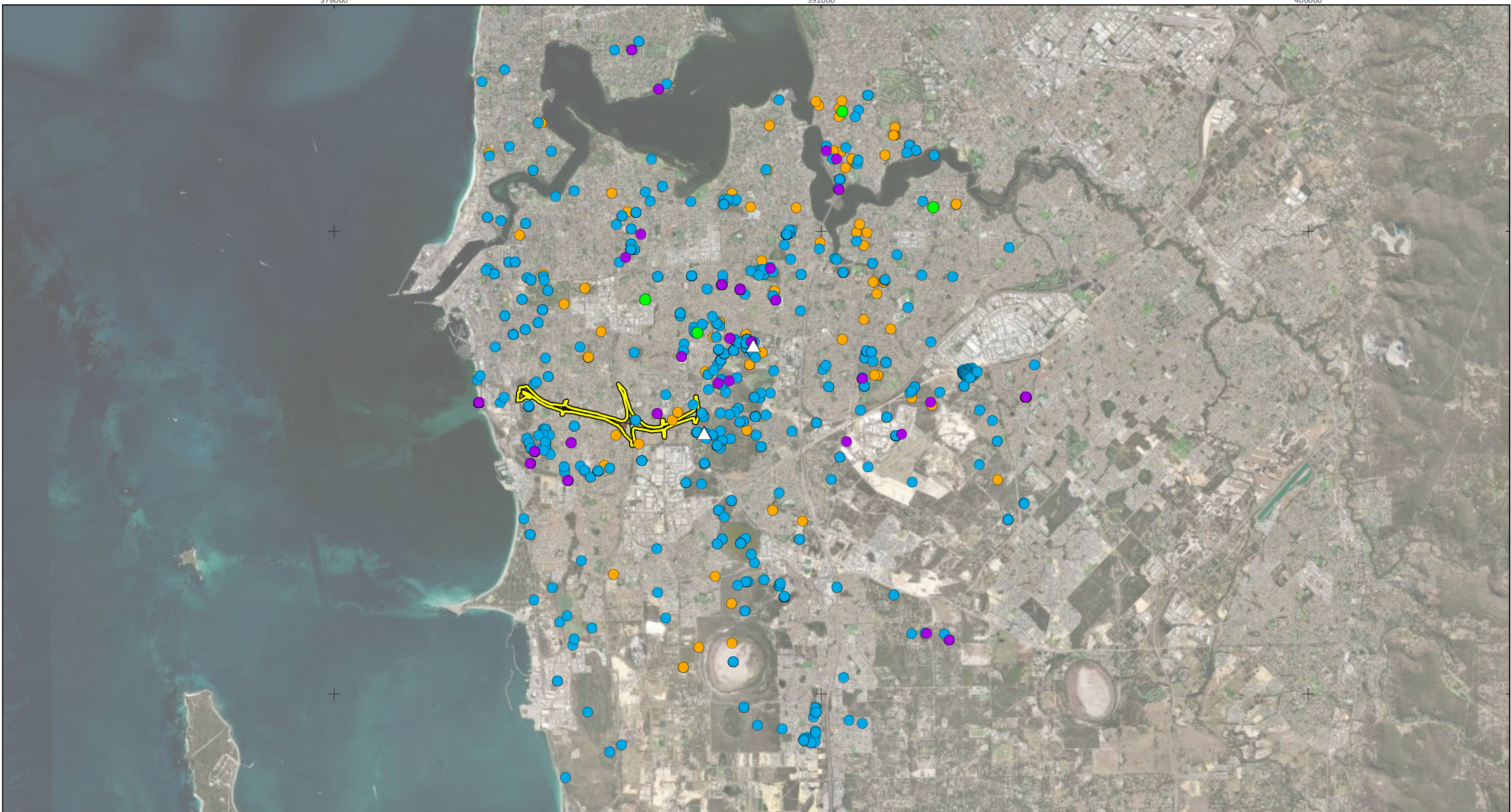
5.1.1 Black Cockatoos

No black cockatoo breeding activity has previously been observed within the study area.

Phoenix (2011c) recorded 520 potential black cockatoo breeding trees, of which 328 fall within the study area. Of the trees within the current study area, 69 had hollows and 35 of these were potentially suitable for Black Cockatoos. Although both the Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo were recorded during this survey, no evidence of breeding or use of hollows by black cockatoo species was observed (Phoenix 2011c). Many hollows identified were occupied by other species such as Rainbow Lorikeets, Galahs and bees.

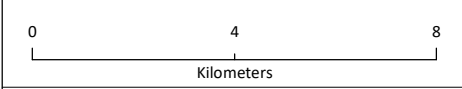
Bamford (2020) reported a total of 281 significant habitat trees were recorded within the current study area, including one with a suitable hollow that had evidence of breeding (recent chew marks), however unconfirmed if this was black cockatoo. Two Forest Red-tailed Black Cockatoos were recorded; however, no Carnaby's Cockatoos were sighted during this survey. No evidence of roosting activity was recorded.

In 2020, Forest Red-tailed Black Cockatoo breeding activity was observed at a natural hollow approximately 500 m away from the eastern end of the study area at Bibra Lake (Birdlife Australia 2021; Pers. comm. T. Kirkby). Prior to this, the only breeding recorded within the area was from 2013 at an artificial hollow approximately 2.5 km away at Murdoch University (Birdlife Australia 2021) (Figure 5-4).



The Department of Planning, Lands and Heritage
 Roe 8 (West) and Roe 9 Extension

Project No	1522
Date	8/11/2022
Drawn by	BK
Map author	JL



1:150,000 (at A4) GDA 1994 MGA Zone 50

- Study area
- Black cockatoo records**
- Baudin's Black Cockatoo
- Carnaby's Black Cockatoo
- Forest Red-tailed Black Cockatoo
- White-tailed black cockatoo (indeterminate species, most likely Carnaby's)
- Forest Red-tailed Black Cockatoo breeding tree

Figure 5-4
Desktop records of Black Cockatoos and known breeding sites



All information within this map is current as of 8/11/2022. This product is subject to COPYRIGHT and is property of Phoenix Environmental Sciences (Phoenix). While Phoenix has taken care to ensure the accuracy of this product, Phoenix make no representations or warranties about its accuracy, completeness or suitability for any particular purpose.
 File: D:\GIS\Projects\Bec-1522\1522-10262-000-1\Final\Map\Documents\Figure_5_4_Black_Cockatoo_breeding.mxd

5.2 FIELD SURVEY



5.2.1 Habitats

Four fauna habitat types accounting for 72.5% of the study area were identified, with *Banksia* and eucalypt woodland being the dominant habitat present (30.4%), followed by parkland (18.5%), Tuart woodland (16.2%) and Shrubland (8.5%) (Table 5-3; Figure 5-5). The remaining 27.5% has been cleared for construction of infrastructure (e.g. roads) and buildings.




Generally speaking, the majority of the study area was considered to be poor quality habitat for fauna, with 63.5% being cleared, rehabilitation, or highly disturbed native vegetation. This includes 11.5 ha of *Banksia* and eucalypt woodland which is in the early stages of native rehabilitation and not yet providing adequate food and/or shelter resources for most fauna species.

Of the remnant native vegetation within the study area, 38.3 ha (66.4%) is considered to be good quality habitat as many disturbances are present, however the basic vegetation structure remains. Disturbances throughout the study area include clearing, vehicle tracks, weeds, introduced fauna, and fire.

Table 5-3 Extent and description of each fauna habitat in the study area

Habitat type	Site/s	Description	Extent in study area and % of study area	Representative photograph
<i>Banksia</i> and eucalypt woodland	Site01 Site02 Site05	<i>Eucalyptus gomphocephala</i> mid isolated trees, <i>Eucalyptus marginata</i> , <i>Corymbia calophylla</i> mid woodland over <i>Banksia attenuata</i> , <i>B. menziesii</i> , <i>Allocasuarina fraseriana</i> low (open) woodland over <i>Xanthorrhoea preissii</i> sparse shrubland over <i>*Freesia alba x leichtlinii</i> , <i>*Oxalis pes-caprae</i> forbland, <i>*Ehrharta calycina</i> , <i>*E. longiflora</i> (sparse) grassland.	31.8 ha, 30.4% (incl. 11.5 ha of native rehab)	
Cleared	Site08 Site09	Areas that are generally devoid of native vegetation and colonized by introduced species, includes managed parkland and road verges which may have some endemic tree species remaining.	27.5 ha, 26.3%	

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Habitat type	Site/s	Description	Extent in study area and % of study area	Representative photograph
Parkland cleared	Site03	Areas planted to turf, used for sport or recreation. May have cover of planted or remnant endemic trees.	19.4 ha, 18.5%	
Shrubland	Site10	<i>Acacia rostelifera</i> , <i>Banksia sessilis</i> var. <i>sessilis</i> tall shrubland over * <i>Ehrharta calycina</i> , * <i>E. longiflora</i> sparse grassland over * <i>Oxalis pes-caprae</i> forbland.	8.9 ha, 8.5%	
Tuart woodland	Site04 Site06 Site07	<i>Eucalyptus gomphocephala</i> mid woodland to open woodland over <i>Banksia attenuata</i> low open woodland over <i>Xanthorrhoea preissii</i> sparse shrubland over * <i>Freesia alba x leichtlinii</i> , * <i>Oxalis pes-caprae</i> forbland, * <i>Ehrharta longiflora</i> , * <i>E. calycina</i> tussock grassland	16.9 ha, 16.2%	



Habitat

- Banksia and eucalypt woodland
- Cleared
- Parkland cleared
- Shrubland
- Tuart woodland



The Department of Planning, Lands and Heritage
Roe 8 (West) and Roe 9 Extension

Project No	1522
Date	3/11/2022
Drawn by	BK
Map author	JL

0 0.5 1
Kilometers

1:19,800(at A4) GDA 1994 MGA Zone 50

- Study area
- Rehabilitation area

Species, (status), record type

- Carnaby's Cockatoo (EN) sighted flying over
- Forest Red-tailed Black Cockatoo (VU) foraging evidence
- Quenda (P4) diggings
- Quenda (P4) sighting

Figure 5-5

Fauna habitats and significant fauna records from the field survey

PHOENIX
ENVIRONMENTAL SCIENCES

All information within this map is current as of 3/11/2022. This product is subject to COPYRIGHT and is property of Phoenix Environmental Sciences (Phoenix). While Phoenix has taken care to ensure the accuracy of this product, Phoenix make no representations or warranties about its accuracy, completeness or suitability for any particular purpose.

5.2.2 Assemblage

A total of 36 terrestrial vertebrate species representing 19 families and 32 genera were recorded in the study area during the field survey (Table 5-4; Appendix 3). The assemblage included 29 native species and seven introduced species.

Table 5-4 Number of vertebrate species recorded in survey in comparison to desktop results, by group


Group	No. species identified in desktop review	No. species recorded in survey
Amphibians	15	0
Reptiles	83 (inc. 1 introduced)	3
Birds	260 (inc. 11 introduced)	28 (inc. 3 introduced)
Mammals	37 (inc. 11 introduced)	5 (inc. 4 introduced)
Total	395	36

5.2.3 Significant vertebrate fauna


Two Threatened and one Priority vertebrate fauna were recorded in the survey, Carnaby's Cockatoo (EN), Forest Red-tailed Black Cockatoo (VU) and Quenda (P4). (Table 5-5; Figure 5-5).

Threatened and Priority fauna records were reported to DBCA via the licencing return system.

Table 5-5 Details of significant vertebrate fauna recorded during the field survey

Species	Status	Distribution and ecology	Survey records
<i>Calyptorhynchus latirostris</i> Carnaby's Cockatoo	EN (EPBC & BC Acts)	The distribution of this species extends as far north as Kalbarri, however the northern limit of their breeding range is inland from Dongara (DAWE 2022b). The species breeds in woodlands, forests and isolated trees in partially cleared habitats (DAWE 2022b). Roosts in tall trees in or near riparian environments. Primarily feeds on native proteaceous plants such as <i>Banksia</i> , <i>Hakea</i> and <i>Grevillea</i> . Also may forage on introduced pines.	Foraging evidence on <i>Banksia</i> recorded throughout the study area. A small group of birds observed flying over.
<i>Calyptorhynchus banksii</i> subsp. <i>naso</i> Forest Red-tailed Black Cockatoo	VU (EPBC & BC Acts)	The distribution of this species ranges from the south-west corner of WA up to Gingin in the north (DAWE 2022b). Breeds in woodlands or forests, including partially cleared woodlands and isolated trees (DAWE 2022b). Roosts in tall eucalypt trees. Primarily forages on the seeds of Jarrah and Marri. On the Swan Coastal Plain, this species may also feed on Cape Lilac, Lemon-scented Gum and Kaffir Plum (DAWE 2022b).	Foraging evidence on Marri fruit recorded (pictured below). 
<i>Isoodon fusciventer</i> Quenda	P4 (DBCA list)	This species occurs in the south-west corner of WA and is found in habitats with scrubby vegetation, often associated with wetlands (DEC 2012c).	Diggings recorded throughout study area (pictured below). One individual sighted at Site07.

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Species	Status	Distribution and ecology	Survey records
		This species feeds on seeds, fungi, insects and plant roots. When searching for food underground, they produce conical digging holes. This generalist species has been known to be a common resident of remnant bushland areas across Perth.	

The likelihood of occurrence assessment (section 4.2.2.4) for the remaining significant species identified in the desktop review determined one species was likely to occur in the study area, four may possibly occur and 72 are unlikely to occur (Table 5-6). There are a large number of coastal bird species that have been recorded nearby due to the western boundary of the study area being approximately 1 km away from the coast. It is unlikely that these species would occur within the study area, however they may possibly visit the nearby coastline.

Table 5-6 Likelihood of occurrence for significant vertebrate fauna identified in the desktop review

Species	Status	Likelihood of occurrence	Comment
Reptiles			
<i>Acanthopis antarcticus</i> Common Death Adder	P3 (DBCA list)	Unlikely	Outside of known range and no nearby records.
<i>Ctenotus delli</i> Dell's Ctenotus	P4 (DBCA list)	Unlikely	Found mainly in the Darling Ranges.
<i>Ctenotus ora</i> Coastal Plains Skink	P3 (DBCA list)	Unlikely	Known only in low numbers between Dunsborough and Mandurah.
<i>Lerista lineata</i> Perth Slider	P3 (DBCA list)	Likely	Suitable habitat present and previously recorded in study area.
<i>Neelaps calonotos</i> Black-striped Burrowing Snake	P3 (DBCA list)	Possible	Suitable woodland habitat present however has not previously been recorded in study area.
<i>Pseudemydura umbrina</i> Western Swamp Tortoise	CR (EPBC & BC Acts)	Unlikely	No swamp habitat present, remnant populations restricted to a strip along the eastern Swan Coastal Plain from Redcliffe to Bullsbrook
Non-migratory birds			
<i>Anous tenuirostris</i> subsp. <i>melanops</i> Australian Lesser Noddy	VU/EN (EPBC Act; BC Act)	Unlikely	No coastal island habitat present.
<i>Botaurus poiciloptilus</i> Australasian Bittern	EN (EPBC & BC Acts)	Unlikely	No swamp habitat present.

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Species	Status	Likelihood of occurrence	Comment
<i>Calyptorhynchus baudinii</i> Baudin's Black Cockatoo	EN (EPBC & BC Acts)	Possible	Suitable habitat present, and a few nearby records, however outside usual distribution, unlikely to provide core habitat.
<i>Elanus scriptus</i> Letter-winged Kite	P4 (DBCAs list)	Unlikely	No suitable open grassland habitat present.
<i>Falco hypoleucos</i> Grey Falcon	VU (BC Act)	Unlikely	Rare in the south-west and no suitable habitat present.
<i>Falco peregrinus</i> Peregrine Falcon	OS (BC Act)	Possible	Unlikely to be a resident, however, has previously been recorded 1 km SE.
<i>Ixobrychus dubius</i> Australian Little Bittern	P4 (DBCAs list)	Unlikely	No wetland habitat present. Nearby record associated with Bibra Lake.
<i>Ixobrychus flavicollis</i> subsp. <i>australis</i> Black bittern (southwest subpop.)	P2 (DBCAs list)	Unlikely	No wetland habitat present.
<i>Leipoa ocellata</i> Malleefowl	VU (EPBC & BC Acts)	Unlikely	No suitable mallee shrubland habitat present.
<i>Ninox connivens</i> subsp. <i>connivens</i> Barking owl (southwest subpop.)	P3 (DBCAs list)	Unlikely	No riparian habitat present. Nearby record associated with Bibra Lake.
<i>Oxyura australis</i> Blue-billed Duck	P4 (DBCAs list)	Unlikely	No wetland habitat present. Nearby record associated with Bibra Lake.
<i>Rostratula australis</i> Australian Painted Snipe	EN (EPBC & BC Acts)	Unlikely	No wetland habitat present.
<i>Sternula nereis</i> subsp. <i>nereis</i> Fairy Tern	VU (EPBC & BC Acts)	Unlikely	No coastal habitat present. Nearby record associated with the Swan River.
<i>Thinornis rubricollis</i> Hooded Plover	P4 (DBCAs list)	Unlikely	No beach habitat present.
<i>Tyto novaehollandiae</i> subsp. <i>novaehollandiae</i> Masked Owl (southwest)	P3 (DBCAs list)	Unlikely	Potentially suitable habitat present, however likely locally extinct.
Migratory birds			
<i>Actitis hypoleucos</i> Common Sandpiper	Mig. (EPBC & BC Acts)	Unlikely	No beach habitat present. Nearby record associated with the Swan River.
<i>Apus pacificus</i> Fork-tailed Swift	Mig. (EPBC & BC Acts)	Possible	Not limited by terrestrial habitat type, may be a visitor to the area.
<i>Arenaria interpres</i> Ruddy Turnstone	Mig. (EPBC & BC Acts)	Unlikely	No beach habitat present.
<i>Calidris acuminata</i> Sharp-tailed Sandpiper	Mig. (EPBC & BC Acts)	Unlikely	No beach or wetland habitat present.
<i>Calidris alba</i> Sanderling	Mig. (EPBC & BC Acts)	Unlikely	No beach or wetland habitat present.

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Species	Status	Likelihood of occurrence	Comment
<i>Calidris canutus</i> Red Knot	EN/Mig./EN (EPBC Act; BC Act)	Unlikely	No beach or wetland habitat present.
<i>Calidris ferruginea</i> Curlew Sandpiper	CR/Mig./CR (EPBC Act; BC Act)	Unlikely	No beach or wetland habitat present.
<i>Calidris melanotos</i> Pectoral Sandpiper	Mig. (EPBC & BC Acts)	Unlikely	No beach or wetland habitat present.
<i>Calidris minuta</i> Little Stint	Mig. (EPBC Act)	Unlikely	No wetland or wetland habitat present and no nearby records.
<i>Calidris ruficollis</i> Red-necked Stint	Mig. (EPBC & BC Acts)	Unlikely	No beach or wetland habitat present.
<i>Calidris subminuta</i> Long-toed Stint	Mig. (EPBC & BC Acts)	Unlikely	No beach or wetland habitat present.
<i>Calidris tenuirostris</i> Great Knot	CR/Mig./CR (EPBC Act; BC Act)	Unlikely	No beach or wetland habitat present.
<i>Charadrius bicinctus</i> Double-banded Plover	Mig. (EPBC & BC Acts)	Unlikely	No wetland habitat present and no nearby records.
<i>Charadrius dubius</i> Little Ringed Plover	Mig. (EPBC & BC Acts)	Unlikely	No beach habitat present.
<i>Charadrius leschenaultii</i> Greater Sand Plover	VU/Mig./VU (EPBC Act; BC Act)	Unlikely	No beach habitat present.
<i>Charadrius mongolus</i> Lesser Sand Plover	EN/Mig. (EPBC & BC Acts)	Unlikely	No beach habitat present.
<i>Chlidonias leucopterus</i> White-winged Black Tern	Mig. (EPBC & BC Acts)	Unlikely	No wetland habitat present. Nearby record associated with Bibra Lake.
<i>Gallinago hardwickii</i> Latham's Snipe	Mig. (EPBC & BC Acts)	Unlikely	No wetland habitat present and no nearby records.
<i>Gallinago megala</i> Swinhoe's Snipe	Mig. (EPBC & BC Acts)	Unlikely	No wetland habitat present and no nearby records.
<i>Gallinago stenura</i> Pin-tailed Snipe	Mig. (EPBC & BC Acts)	Unlikely	No wetland habitat present and no nearby records.
<i>Gelochelidon nilotica</i> Gull-billed Tern	Mig. (BC Act)	Unlikely	No wetland habitat present and no nearby records.
<i>Glareola maldivarum</i> Oriental Pratincole	Mig. (EPBC & BC Acts)	Unlikely	No beach habitat present.
<i>Hydroprogne caspia</i> Caspian Tern	Mig. (EPBC & BC Acts)	Unlikely	No wetland habitat present. Nearby record associated with Swan River.
<i>Limicola falcinellus</i> Broad-billed Sandpiper	Mig. (BC Act)	Unlikely	No beach habitat present.
<i>Limosa lapponica</i> Bar-tailed Godwit	Mig. (EPBC & BC Acts)	Unlikely	No beach habitat present.
<i>Limosa limosa</i> Black-tailed Godwit	Mig. (BC Act)	Unlikely	No beach habitat present.

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Species	Status	Likelihood of occurrence	Comment
<i>Motacilla cinerea</i> Grey Wagtail	Mig. (EPBC & BC Acts)	Unlikely	No suitable watercourse habitat present.
<i>Numenius madagascariensis</i> Eastern Curlew	CR/Mig./CR (EPBC Act; BC Act)	Unlikely	No beach habitat present.
<i>Numenius minutus</i> Little Curlew	Mig. (EPBC & BC Acts)	Unlikely	No beach habitat present and no nearby records.
<i>Numenius phaeopus</i> Whimbrel	Mig. (EPBC & BC Acts)	Unlikely	No beach habitat present.
<i>Pandion cristatus</i> Osprey	Mig. (EPBC & BC Acts)	Unlikely	No beach or wetland habitat present. Nearby record associated with Bibra Lake.
<i>Phalaropus lobatus</i> Red-necked Phalarope	Mar/Mig. (EPBC Act; BC Act)	Unlikely	No beach habitat present and no nearby records.
<i>Philomachus pugnax</i> Ruff	Mig. (EPBC & BC Acts)	Unlikely	No beach habitat present.
<i>Plegadis falcinellus</i> Glossy Ibis	Mig. (EPBC & BC Acts)	Unlikely	No wetland habitat present. Nearby record associated with Bibra Lake.
<i>Pluvialis fulva</i> Pacific Golden Plover	Mig. (EPBC & BC Acts)	Unlikely	No beach habitat present.
<i>Pluvialis squatarola</i> Grey Plover	Mig. (EPBC & BC Acts)	Unlikely	No beach habitat present.
<i>Sterna albifrons</i> Little Tern	Mig. (BC Act)	Unlikely	No wetland habitat present and no nearby records.
<i>Sterna dougallii</i> Roseate Tern	Mig. (EPBC & BC Acts)	Unlikely	No beach habitat present.
<i>Thalasseus bergii</i> Crested Tern	Mig. (BC Act)	Unlikely	No beach habitat present.
<i>Tringa brevipes</i> Grey-tailed Tattler	(Mig. EPBC & BC Acts; P4 DBCA list)	Unlikely	No beach habitat present and no nearby records.
<i>Tringa glareola</i> Wood Sandpiper	Mig. (EPBC & BC Acts)	Unlikely	No beach or wetland habitat present.
<i>Tringa nebularia</i> Common Greenshank	Mig. (EPBC & BC Acts)	Unlikely	No wetland habitat present. Nearby record associated with Bibra Lake.
<i>Tringa stagnatilis</i> Marsh Sandpiper	Mig. (EPBC & BC Acts)	Unlikely	No wetland habitat present. Nearby record associated with Bibra Lake.
<i>Tringa totanus</i> Common Redshank	Mig. (EPBC & BC Acts)	Unlikely	No wetland habitat present and no nearby records.
<i>Xenus cinereus</i> Terek Sandpiper	Mig. (EPBC & BC Acts)	Unlikely	No beach habitat present and no nearby records.
Mammals			
<i>Bettongia penicillata</i> subsp. <i>ogilbyi</i> Woylie	EN/CR (EPBC/BC Act)	Unlikely	Study area is outside of current known range.

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Species	Status	Likelihood of occurrence	Comment
<i>Dasyurus geoffroii</i> Chuditch	VU (EPBC & BC Acts)	Unlikely	Potentially suitable habitat present, however likely locally extinct.
<i>Falsistrellus mackenziei</i> Western False Pipistrelle	P4 (DBCA list)	Unlikely	No suitable forest habitat present.
<i>Hydromys chrysogaster</i> Water-rat	P4 (DBCA list)	Unlikely	No freshwater habitat present. Nearby record associated with Swan River.
<i>Macroderma gigas</i> Ghost Bat	VU (EPBC & BC Acts)	Unlikely	No suitable cave or foraging habitat present; restricted to Pilbara and Kimberley in WA.
<i>Myrmecobius fasciatus</i> Numbat	EN (EPBC & BC Acts)	Unlikely	No recent records in the region and outside of current known range.
<i>Notamacropus eugenii</i> subsp. <i>derbianus</i> Tammar wallaby	P4 (DBCA list)	Unlikely	Only one nearby record from 1971.
<i>Notamacropus irma</i> Western Brush Wallaby	P4 (DBCA list)	Unlikely	Suitable habitat present, however likely locally extinct.
<i>Phascogale tapoatafa</i> subsp. <i>wambenger</i> Southwestern Brush-tailed Phascogale	CD (BC Act)	Unlikely	Very few recent records on the Swan Coastal Plain.
<i>Pseudocheirus occidentalis</i> Western ringtail possum	CR (EPBC & BC Acts)	Unlikely	No suitable habitat present and only found at the southern end of the Swan Coastal Plain.
<i>Setonix brachyurus</i> Quokka	VU (EPBC & BC Acts)	Unlikely	Small, isolated populations occur between Perth and Albany.

5.2.4 Black Cockatoos

5.2.4.1 Significant habitat tree assessment

A total of 295 significant habitat trees were recorded in the study area during this survey, including 63 that contained hollows of any size or orientation (21.4%) (Table 5-7, Figure 5-6). Of these, ten (15.9%) contained hollows that were assessed as suitable for current breeding, i.e. with an estimated opening diameter of >100 mm and with suitable depth or orientation. Tuart (*Eucalyptus gomphocephala*) was the most common tree species recorded. Seven out of the ten suitable hollows were occupied either by bees or another bird species (Rainbow Lorikeet, Corella, Galah) (Appendix 4).

No nesting or roosting by any black cockatoo species was observed during the survey.

Table 5-7 Summary of potentially significant habitat trees recorded

Tree species	No. of records	No. with hollows	No. with suitable hollows	
			Yes	No
<i>Eucalyptus marginata</i> (Jarrah)	46	15	1	14
<i>Corymbia calophylla</i> (Marri)	81	1	1	0
<i>Eucalyptus gomphocephala</i> (Tuart)	153	38	6	32
Dead unknown	13	9	2	7
<i>Eucalyptus</i> sp.	2	0	0	0
Total	295	63	10	53

5.2.4.2 Foraging habitat quality assessment

The remnant native vegetation in the study area was determined to be of high foraging quality for both Carnaby's Cockatoo (score of 8) and Forest Red-tailed Black Cockatoo (score of 10) (Table 5-8). The study area comprises approximately 38.3 ha of high-quality native foraging habitat within areas of remnant native vegetation (*Banksia* and eucalypt woodland, Tuart woodland and Shrubland habitats) and 19.3 ha of low-quality foraging habitat (rehabilitated or degraded vegetation) (Figure 5-7). The remaining areas are cleared and provide negligible foraging value, however there are still isolated foraging plant species present.

A dieback assessment conducted for the Project found no *Phytophthora* Dieback or Marri Canker present within the study area (Pers. comm. S. Robinson (Glewan)).

Table 5-8 Foraging habitat quality scoring for the remnant native vegetation in the study area

Attribute	Carnaby's Cockatoo	Forest Red-tailed Black Cockatoo
Starting score	10	10
Foraging potential	-	-
Connectivity	-	-
Proximity to breeding	-2	-
Proximity to roosting	-	-
Impact from significant plant disease	-	-
Total score	8	10

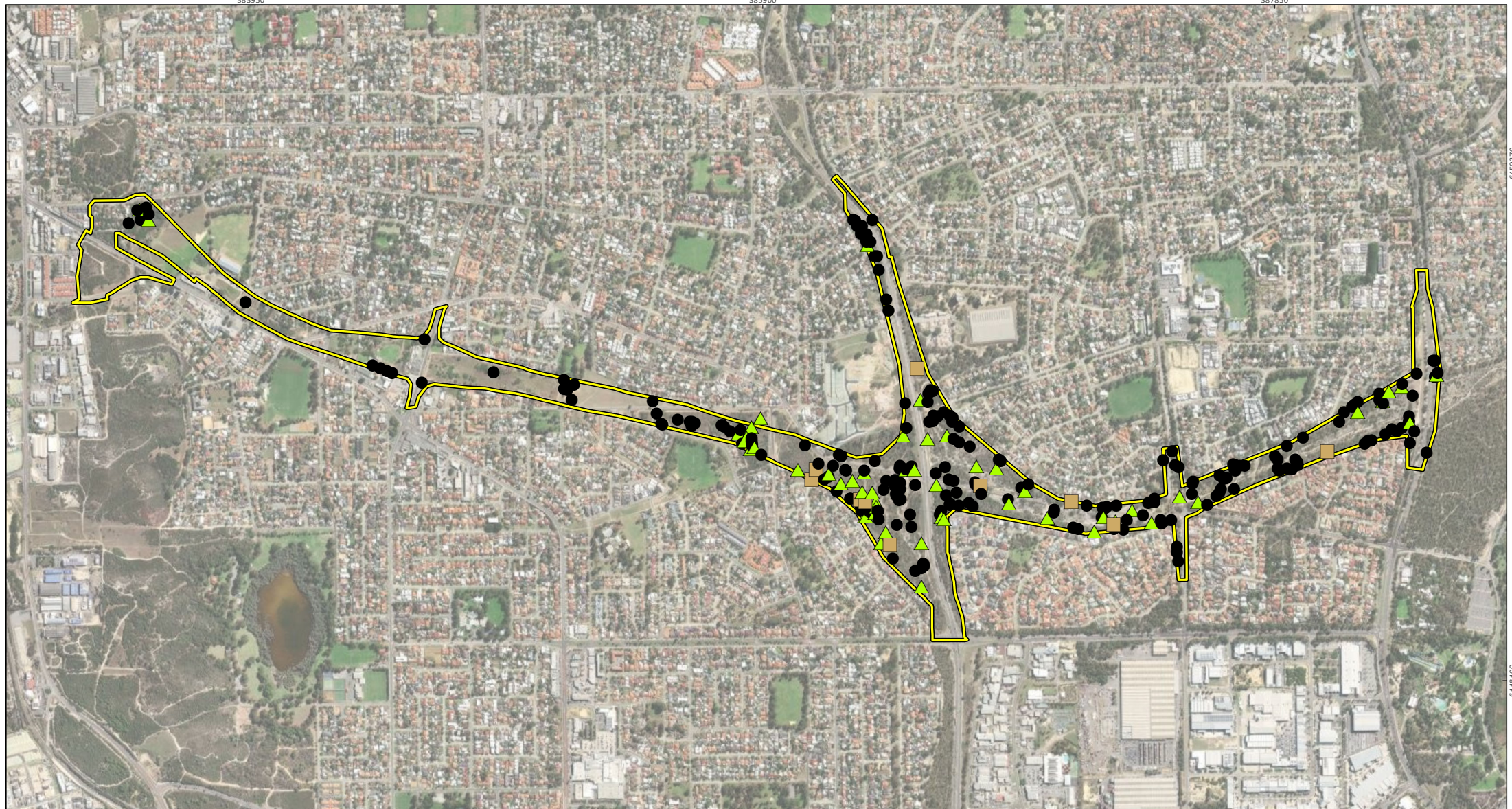
The most commonly foraged species within the study area are Marri (*Corymbia calophylla*), Jarrah (*Eucalyptus marginata*), *Banksia menziesii*, *B. attenuata* and *Allocasuarina fraseriana*. Nearly all remnant vegetation within the study area contains potential foraging species for Black Cockatoos. Based on the data from the vegetation survey, 13 plant species that are known to be food sources for

Carnaby’s Cockatoo were recorded in the study area (Table 5-9). Six of these species are also important food sources for the Forest Red-tailed Black Cockatoo.

Table 5-9 Plants recorded in this survey that are important to the two species of black cockatoo

Plant species		Black Cockatoo species ¹	
Scientific name	Common name	Carnaby’s Cockatoo	Forest Red-tailed Black Cockatoo
<i>Allocasuarina fraseriana</i>	Sheoak	F	F
<i>Banksia attenuata</i>	Slender Banksia	F	
<i>Banksia menziesii</i>	Firewood Banksia	F	
<i>Banksia sessilis</i>	Parrot Bush	F	
<i>Banksia sessilis</i> var. <i>sessilis</i>		F	
<i>Corymbia calophylla</i>	Marri	F, N, R	F, N, R
<i>Corymbia citriodora</i>	Lemon-scented Gum	F, R	F
<i>Eucalyptus gomphocephala</i>	Tuart	F, N, R	F, N, R
<i>Eucalyptus marginata</i>	Jarrah	F, R	F, N, R
<i>Hakea prostrata</i>	Harsh Hakea	F	
<i>Melia azedarach</i>	Cape Lilac	F	F
<i>Raphanus raphanistrum</i>	Wild Radish	F	
<i>Xanthorrhoea preissii</i>	Grass tree	F	
	Food	13	6
	Nesting	2	3
	Roosting	4	3
	Total	13	6

¹ F = food, N = nesting, R = roosting from (DAWE 2022a; DEC 2011; Johnstone et al. 2010)

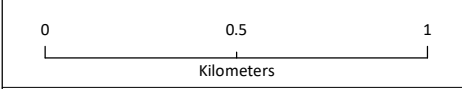


6450370
6448400



The Department of Planning, Lands and Heritage
 Roe 8 (West) and Roe 9 Extension

Project No	1522
Date	24/10/2022
Drawn by	BK
Map author	JL



1:19,800(at A4) GDA 1994 MGA Zone 50

Study area

Potential habitat trees

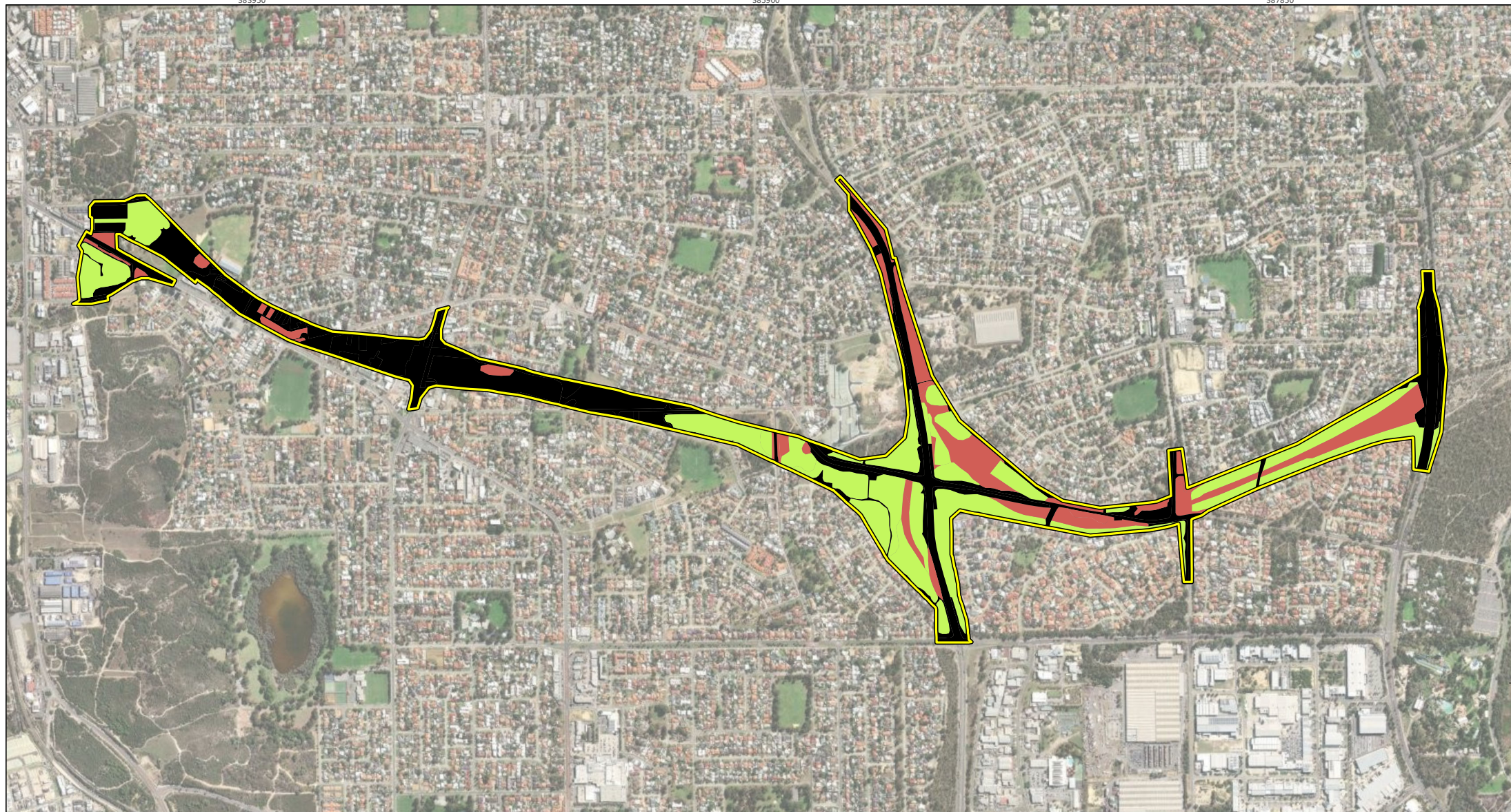
- No hollows
- Suitable hollow/s but no evidence of Black Cockatoo use
- Unsuitable hollow/s

Figure 5-6

Potential Black Cockatoo habitat trees

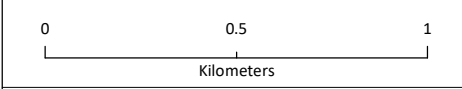


All information within this map is current as of 24/10/2022. This product is subject to COPYRIGHT and is property of Phoenix Environmental Sciences (Phoenix). While Phoenix has taken care to ensure the accuracy of this product, Phoenix make no representations or warranties about its accuracy, completeness or suitability for any particular purpose.



The Department of Planning, Lands and Heritage
Roe 8 (West) and Roe 9 Extension

Project No	1522
Date	31/10/2022
Drawn by	BK
Map author	JL



1:19,800(at A4) GDA 1994 MGA Zone 50

- Study area
- Foraging habitat quality**
- None (Cleared)
- High
- Low

Figure 5-7
Black Cockatoo foraging habitat quality



All information within this map is current as of 31/10/2022. This product is subject to COPYRIGHT and is property of Phoenix Environmental Sciences (Phoenix). While Phoenix has taken care to ensure the accuracy of this product, Phoenix make no representations or warranties about its accuracy, completeness or suitability for any particular purpose.

5.3 SURVEY LIMITATIONS

The limitations of the Black Cockatoo habitat assessment and basic fauna survey have been considered in accordance with EPA (2016b, d) (Table 5-10).

Table 5-10 Consideration of potential survey limitations

Limitations	Comments
Availability of contextual information at a regional and local scale	Not a limitation. All previous report data was available. Vegetation mapping and Dieback assessment results provided.
Competency/experience of the team carrying out the survey	Not a limitation. The field personnel have experience in fauna surveys and black cockatoo surveys within WA.
Scope and completeness	Not a limitation. The survey was completed in accordance with the scope.
Proportion of fauna recorded and any identification issues	Not a limitation. All fauna was identified to species level in the field. Proportion of fauna recorded is appropriate for level of survey.
Access within the study area	Partially a limitation. Portions of the study area, including potential habitat trees, were within private properties (school, residential) and were not accessible to assess hollows.
Timing, rainfall, season	Not a limitation. Weather prior to and during the survey was consistent with long-term averages.
Disturbance that may have affected the results of the survey	Not a limitation. No disturbances occurred during the field survey which are considered to have impacted the results.

6 DISCUSSION

6.1 TERRESTRIAL VERTEBRATE FAUNA

A total of 36 species (including seven introduced) were recorded during the field survey. Evidence of three conservation significant fauna (one mammal and two black cockatoo species) was recorded. Only one significant species identified in the desktop review is likely to occur, while four may possibly occur and 72 are unlikely to occur.

Secondary evidence (diggings) and one sighting of Quenda (P4) was recorded opportunistically throughout the study area. This species was recorded in both remnant and rehabilitated areas within two different habitat types: *Banksia* and eucalypt woodland, and Tuart woodland. This is consistent with the findings of Bamford (2020) where Quenda diggings were observed in the rehabilitation areas, as well as in the remnant habitats. Quenda are known to inhabit highly disturbed habitats, such as residential gardens, so it is not unexpected that this species was recorded extensively across the study area. The level of this survey did not allow for the analysis of population estimates; however, it seems a resident population of Quenda continue to occupy the study area.

The Perth Slider (*Lerista lineata*; P3) is a small species of skink that is restricted to the Swan Coastal Plain. Although it was not recorded during this survey, it is considered likely to occur within the study area due to numerous previous records and the presence of suitable sandy soils and *Banksia* shrublands. This species was likely not recorded due to the cooler temperatures being unfavourable for low intensity searches for reptiles.

The Black-striped Burrowing Snake (P3) was assessed as possibly occurring based on the presence of potentially suitable *Banksia* woodland habitat. Although the study area is within the range of this species, it has not been detected in previous surveys.

Two bird species (Peregrine Falcon, OS and Fork-tailed Swift, Mig.) were considered to possibly occur due to their widespread distribution and diverse habitat preferences. Both species have previously been recorded near the study area and may opportunistically visit the remnant habitat types present.

The study area is located outside of the limits of the known distribution of Baudin's Black Cockatoo (EN). This species was considered a possible visitor to the study area, as there have been four records within 8 km, however it is unlikely to be a resident or breed within the study area and was not included in the black cockatoo habitat assessment.

There are a number of mammal species identified in the desktop review (e.g. Chuditch, VU; Western False Pipistrelle, P4; Western Brush Wallaby, P4; Southwestern Brush-tailed Phascogale, CD; Western Ringtail possum, CR and Quokka, VU) that are likely to be locally extinct in the study area. Although these species may occur within the wider region, this survey and previous surveys have failed to detect them in the study area. The study area represents a small, isolated patch of habitat that has been highly fragmented, and it is likely that this has led to this localised extinction Bamford (2020).

6.2 BLACK COCKATOOS

6.2.1 Habitat trees

Although the species has not previously been recorded breeding in the area, shifts in the breeding range of Black Cockatoos (particularly Forest Red-tailed Cockatoo westward) raise the possibility that breeding activity may occur in the Perth Metropolitan Area. However, no black cockatoo breeding activity or use of hollows was observed during the survey. Of the 295 habitat trees recorded, only ten had hollows suitable for Black Cockatoos, of which only three were not occupied by bees or other bird species. The majority of trees that met the minimum DBH did not have hollows. For the trees that did

have hollows, most were unsuitable for black cockatoo breeding due to being either too small, too low, at an unsuitable angle or burnt out.

The presence of birds and bees in many suitable or potentially suitable hollows indicates that competition is likely a major deterrent for Black Cockatoos. Rainbow Lorikeets and Galahs were abundant throughout most habitat types and were not only present in potential habitat trees, but also observed using hollows.

Although there are nearby Forest Red-tailed Black Cockatoo breeding records, of which one is a natural hollow, and one is an artificial hollow, it is unlikely that the study area will be a breeding site due to the low number of suitable habitat trees and competition from other species.

6.2.2 Foraging habitat

Foraging evidence was recorded for both black cockatoo species within the study area. The remnant native vegetation in the study area was assessed as being high-quality foraging habitat. The habitats present provide important food sources for both species, with *Banksia* woodlands being of more importance to Carnaby's Cockatoo, and Jarrah and Marri woodlands being important for Forest Red-tailed Black Cockatoo. A significant portion of the study area was previously cleared and has since been rehabilitated but is still considered to be in a degraded condition in comparison to the remnant vegetation. Bamford (2020) observed that the rehabilitated areas were of lower foraging value than the remnant habitats, however many foraging plant species are becoming established in the rehabilitation sites and foraging evidence was recorded on younger trees that will likely increase in value as they mature.

6.3 CONCLUSION

The study area is highly fragmented and has suffered varying levels of degradation due to development of infrastructure, clearing, and human disturbance. This has resulted in changes to fauna abundance and local extinction of species. However, the remaining native vegetation provides important habitats and high-quality food resources for a number of significant species, including Carnaby's Cockatoo, Forest Red-tailed Black Cockatoo, Quenda, and Perth Slider.

Strong competition and a lack of suitable hollows suggests that Black Cockatoos are unlikely to breed within the suitable habitat trees within the study area. The study area presents 38.3 ha of high-quality foraging habitat for both the Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo; however this is limited to remnant vegetation.

REFERENCES

- ABARES. 2018. *Catchment Scale Land Use Mapping for Western Australia 2018* in Commonwealth of Australia Department of Agriculture and Water Resources, ed.
- Bamford. 2000. *The vertebrate fauna of the Amcor Bushland, Cockburn*. Bamford Consulting Ecologists, Kingsley, WA. Unpublished report prepared for Landcorp.
- Bamford. 2020. *Terrestrial Vertebrate Fauna Survey: Rehabilitating Roe 8*. Bamford Consulting Ecologists, Kingsley, WA.
- Bamford, M. J. & Wilcox, J. A. 2005. *The amphibians, reptiles and mammals of three reserves in the City of Cockburn: Bibra Lake, Yangebup Lake, Little Rush Lake*. Unpublished report prepared for the City of Cockburn.
- Benshemesh, J. 2007. *National Recovery Plan for Malleefowl *Leipoa ocellata**. South Australian Department of Environment and Heritage, South Australia.
- Birdlife Australia. 2021. *Cocky Notes*. Birdlife Australia, Western Australia.
- Birdlife Australia. N.D. *Hooded Plover *Thinornis rubricollis**. Available at: <https://birdlife.org.au/bird-profile/hooded-plover>
- Birdlife International. 2015. *Species fact sheet: Blue-billed Duck (*Oxyura australis*)*. Birdlife International. Available at: <http://www.birdlife.org/datazone/speciesfactsheet.php?id=362>
- BoM. 2022. *Climate statistics for Australian locations*. Commonwealth of Australia, Bureau of Meteorology. Available at: <http://www.bom.gov.au/climate/data/>
- Bullen, R. D. 2021. *A review of ghost bat ecology, threats and survey requirements*. Prepared for the Department of Agriculture, Water and Environment.
- Burbidge, A. A., Kuchling, G., Olejnik, C. & Mutter, L. 2010. *Western Swamp Tortoise (*Pseudemydura umbrina*) Recovery Plan*.
- Cornwell, T. 2004. *A species richness study in Beeliar Regional Park, Perth, WA*. Unpublished report prepared for School of Biological Sciences, Murdoch University, Perth.
- DAWE. 2022a. *Black cockatoos and development in South-West Western Australia*. Department of Agriculture, Water and the Environment, Canberra.
- DAWE. 2022b. *Referral guideline for 3 WA threatened black cockatoo species: Carnaby's Cockatoo (*Zanda latirostris*), Baudin's Cockatoo (*Zanda baudinii*) and the Forest Red-tailed Black-cockatoo (*Calyptorhynchus banksii naso*)*. Department of Agriculture, Water and the Environment, Canberra, Canberra.
- DAWE. 2022c. *Species Profile and Threats Database*. Department of Agriculture, Water and Environment, Canberra, ACT. Available at: <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>
- DBCA. 2017a. *Fauna Profile - Western Ringtail Possum *Pseudocheirus occidentalis**. Department of Biodiversity, Conservation and Attractions, Kensington, WA.
- DBCA. 2017b. *Fauna Profile - Woylie Bettongia *penicillata ogilbyii**. Department of Biodiversity, Conservation and Attractions, Kensington, WA.
- DBCA. 2018. *Fauna Facts: Quenda*. Department of Biodiversity, Conservation and Attractions.
- DBCA. 2022a. *NatureMap database*. Department of Biodiversity and Attractions, Perth, WA.
- DBCA. 2022b. *Threatened and Priority fauna database*. Department of Biodiversity, Conservation and Attractions, Kensington, WA.
- DCCEEW. 2022. *Protected Matters Search Tool*. Department of Climate Change, Energy, the Environment and Water, Canberra, ACT. Available at: <https://pmst.awe.gov.au>
- DEC. 2011. *Plants Used by Carnaby's Black Cockatoo*. Department of Environment and Conservation, Perth. Available at: http://www.dpaw.wa.gov.au/images/documents/plants-animals/animals/p4c_plantlist_20110415.pdf
- DEC. 2012a. *Brush-tailed Phascogale *Phascogale tapoatafa* (Meyer, 1793)*. Department of Environment and Conservation, Kensington, WA.

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

- DEC. 2012b. *Chuditch (Dasyurus geoffroii) national recovery plan*. Government of Western Australia, Department of Environment and Conservation, Australian Government.
- DEC. 2012c. *Quenda Isoodon obesulus (Shaw, 1797)*. Department of Environment and Conservation, Kensington, WA. Available at: https://www.dpaw.wa.gov.au/images/documents/conservation-management/pests-diseases/quenda_2012.pdf
- DEC. 2012d. *Tammar Wallaby Macropus eugenii (Desmarest, 1817)*. Department of Environment and Conservation, Kensington, WA.
- DEC. 2012e. *Western Brush Wallaby Macropus irma (Jourdan, 1837)*. Department of Environment and Conservation, Kensington, WA.
- del Hoyo, J., Elliott, A., Sargatal, J., Christie, D. A. & de Juana, E. 2014. *Handbook of the Birds of the World Alive*. Lynx Edicions, Barcelona.
- Department of Agriculture, W. a. t. E. 2021. *Zanda baudinii — Baudin's Black-Cockatoo, Long-billed Black-cockatoo*. Department of Agriculture, Water and the Environment, Species Profile and Threats Database. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=87736
- DoEE. 2016. *Maps: Australia's bioregions (IBRA)*. Department of the Environment and Energy, Canberra, ACT. Available at: <http://www.environment.gov.au/topics/land/national-reserve-system/science-maps-and-data/australias-bioregions-ibra>
- DPaW. 2017. *Numbat (Myrmecobius fasciatus) Recovery Plan*. Department of Parks and Wildlife, Perth, WA.
- Emerge Associates. 2018. *Rehabilitation Management Plan Roe 8 Cleared Areas*. Emerge Associates, Subiaco, WA.
- EPA. 2016a. *Environmental Factor Guideline: Terrestrial fauna*. Environmental Protection Authority, Perth, WA. Available at: http://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/Guideline-Terrestrial-Fauna-131216_3.pdf
- EPA. 2016b. *Technical Guidance: Flora and vegetation surveys for Environmental Impact Assessment*. Environmental Protection Authority, Perth, WA. Available at: http://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/EPA%20Technical%20Guidance%20-%20Flora%20and%20Vegetation%20survey_Dec13.pdf
- EPA. 2016c. *Technical Guidance: Sampling methods for terrestrial vertebrate fauna*. Environmental Protection Authority, Perth, WA. Available at: http://epa.wa.gov.au/sites/default/files/Policies_and_Guidance/Tech%20guidance-%20Sampling-TV-fauna-Dec2016.pdf
- EPA. 2016d. *Technical Guidance: Terrestrial fauna surveys*. Environmental Protection Authority, Perth, WA. Available at: http://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/Tech%20guidance-%20Terrestrial%20Fauna%20Surveys-Dec-2016.pdf
- Garnett, S. T. & Crowley, G. M. 2000. *The action plan for Australian birds 2000*. Birds Australia, Environment Australia, Canberra, ACT. Available at: www.environment.gov.au/biodiversity/threatened/publications/action/birds2000/
- Geering, A., Agnew, L. & Harding, S. 2007. *Shorebirds of Australia*. CSIRO Publishing, Collingwood, Vic.
- GHD. 2006. *Fiona Stanley Health Precinct site investigation: fauna assessment*. GHD, Perth, WA. Unpublished report prepared for Department of Housing and Works.
- Government of Western Australia. 2005. *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*. Government of Western Australia, Perth, Western Australia.
- Government of Western Australia. 2018a. *Wildlife Conservation Act 1950 Wildlife Conservation (Rare Flora) Notice 2018*. Government Gazette, WA. Government of Western Australia, Perth, WA.
- Government of Western Australia. 2018b. *Wildlife Conservation Act 1950, Wildlife Conservation (Specially Protected Fauna) Notice 2018*. Government Gazette, WA, Perth, WA.

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

- Higgins, P. J. (ed.) 1999. *Handbook of Australian, New Zealand and Antarctic birds. Volume 4: Parrots to Dollarbird*. Oxford University Press, Melbourne, Vic.
- IUCN. 2019. *The IUCN Red List of Threatened Species*.
- Johnstone, R. E., Johnstone, C. & Kirkby, T. 2010. *Carnaby's Cockatoo (Calyptorhynchus latirostris), Baudin's Cockatoo (Calyptorhynchus baudinii) and the Forest Red-tailed Black Cockatoo (Calyptorhynchus banksii naso) on the Swan Coastal Plain (Lancelin–Dunsborough), Western Australia. Studies on distribution, status, breeding, food, movements and historical changes*. Perth, WA. Unpublished report prepared for the Department of Planning, WA.
- Johnstone, R. E., Kirkby, T. & Sarti, K. 2017. The distribution, status movements and diet of the Forest Red-tailed Black Cockatoo in the south-west with emphasis on the greater Perth region, Western Australia. *The Western Australian Naturalist* **30**: 193-219.
- Johnstone, R. E. & Storr, G. M. 1998. *Handbook of Western Australian birds. Volume 1: Non-passerines (Emu to Dollarbird)*. Western Australian Museum, Perth, WA.
- Johnstone, R. E. & Storr, G. M. 2004. *Handbook of Western Australian birds. Volume 2: Passerines (Blue-winged Pitta to Goldfinch)*. West Australian Museum, Perth, WA.
- Kirkby, T. 2022. *Location of Forest Red-Tailed Black Cockatoo breeding site in Jacks, A.*, ed.
- Marchant, S. & Higgins, P. J. (eds). 1990. *Handbook of Australian, New Zealand and Antarctic birds. Volume 1: Ratites to ducks*. Oxford University Press, Melbourne, Vic.
- Maryan, B., Gaikhorst, G., O'Connell, M. & Callan, S. 2015. Notes on the distribution and conservation status of the Perth lined skink, *Lerista lineata*: a small lizard in a big city. *Western Australian Naturalist* **30**: 12-29.
- McKilligan, N. (ed.) 2005. *Herons, egrets and bitterns*. CSIRO Publishing, Collingwood, Vic.
- Mitchell, D., Williams, K. & Desmond, A. 2002. Swan Coastal Plain 2 (SWA2—Swan Coastal Plain subregion). In: May, J. E. & McKenzie, N. L. (eds) *A biodiversity audit of Western Australia's 53 biogeographical subregions in 2002*. Department of Conservation and Land Management, Perth, WA, pp. 606–623.
- Morcombe, M. 2004. *Field guide to Australian birds. Complete compact edition*. Steve Parish Publishing, Archerfield, QLD.
- Payne, A. L. & Leighton, K. A. 2004. Land systems. In: van Vreeswyk, A. M. E., Payne, A. L., Leighton, K. A. & Hennig, P. (eds) *Technical Bulletin 9. An inventory and condition survey of the Pilbara region, Western Australia*. Department of Agriculture, Government of Western Australia, South Perth, WA, pp. 175–384.
- Phoenix. 2011a. *Black cockatoo survey for Roe Highway Extension project*. Phoenix Environmental Sciences Pty Ltd, Balcatta, WA. Unpublished report prepared for South Metro Connect.
- Phoenix. 2011b. *Southern Brown Bandicoot monitoring program for the Roe Highway Extension project*. Phoenix Environmental Sciences Pty Ltd, Balcatta, WA. Unpublished report prepared for South Metro Connect.
- Phoenix. 2011c. *Vertebrate fauna survey for the Roe Highway Extension project*. Phoenix Environmental Sciences Pty Ltd, Balcatta, WA. Unpublished report prepared for South Metro Connect.
- Robinson, S. 2022. *Email: Roe 8/9 Dieback assessment results in Jacks, A.*, ed.
- Schoknecht, N. R. & Payne, A. L. 2011. *Land systems of the Kimberley region, Western Australia*. Department of Agriculture and Food, Western Australia, Perth.
- Spineless Wonders. 2015. *Bullsbrook Nature Reserve. Macroinvertebrate and herpetofauna inventory survey*. Spineless Wonders, Balga, WA. Unpublished report prepared for DPaW, Perth Hills District.
- Streckhardt, I. & Metz, L. 2021. *Rehabilitating Roe 8 Annual Report 2020/2021*. City of Cockburn.
- Weerheim, M. S. 2008. *Distribution patterns and habitat use of black cockatoos (Calyptorhynchus spp.) in modified landscapes in the south-west of Western Australia*. Master of Science (Environmental Management) thesis. School of Natural Sciences, Edith Cowan University, Perth, WA.

**Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage**

Western Wildlife. 2010. *Roe Highway Extension: Wetland and migratory bird study, 2009-2010.*

Western Wildlife. Unpublished report prepared for South Metro Connect.

Wilson, S. & Swan, G. 2021. *A Complete Guide to Reptiles of Australia.* New Holland, Wahroonga, NSW.

Appendix 1 Terrestrial fauna survey site descriptions

Site details			
Site	Site01	Position (WGS84)	-32.085621, 115.817105
Topography	Sand dune	Soil texture	Sandy loam
Slope	Gentle	Rock type	nil
Soil colour	Grey, whitish	Rock cover (%)	0

Site description			
Rehabilitated area. Jarrah and Marri over mixed shrubland on grey sandy loam soil.			
Habitat	Open woodland		
Disturbance	historic clearing, litter, revegetation, vehicle tracks		
Vegetation condition	Degraded	Total veg. cover (%)	50
Tree cover %	15	Fire age	>5 years
Shrub cover (%)	20	Litter distribution	Under vegetation
Grass cover (%)	10	Litter depth (cm)	3
Herb cover (%)	5	Litter cover (%)	50



Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Site details			
Site	Site02	Position (WGS84)	-32.085712, 115.815977
Topography	Sand dune	Soil texture	sand, sandy loam
Slope	Moderate	Rock type	nil
Soil colour	Grey, whitish	Rock cover (%)	0

Site description			
Jarrah and Marri woodland over <i>Xanthorrhoea</i> dominant shrubland over dense grass and * <i>Oxalis</i> cover on sandy loam soil.			
Habitat	Woodland		
Disturbance	historic clearing, litter, revegetation, vehicle tracks		
Vegetation condition	Good	Total veg. cover (%)	90
Tree cover %	50	Fire age	>5 years
Shrub cover (%)	40	Litter distribution	Even
Grass cover (%)	80	Litter depth (cm)	3
Herb cover (%)	10	Litter cover (%)	80



Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Site details			
Site	Site03	Position (WGS84)	-32.08915, 115.805511
Topography	Undulating plain	Soil texture	sand, sandy loam
Slope	Gentle	Rock type	nil
Soil colour	Grey, whitish	Rock cover (%)	0

Site description			
Roadside vegetation with pockets of eucalypt trees over <i>Xanthorrhoea</i> and <i>Banksia</i> shrubland and * <i>Oxalis</i> cover, between cleared, grassed patches and paths.			
Habitat	Parkland/woodland		
Disturbance	historic clearing, litter, revegetation, vehicle tracks		
Vegetation condition	Degraded	Total veg. cover (%)	90
Tree cover %	20	Fire age	>5 years
Shrub cover (%)	15	Litter distribution	Under vegetation
Grass cover (%)	90	Litter depth (cm)	2
Herb cover (%)	10	Litter cover (%)	50



Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Site details			
Site	Site04	Position (WGS84)	-32.080318, 115.795454
Topography	Depression	Soil texture	sand, sandy loam
Slope	Moderate	Rock type	nil
Soil colour	yellow, whitish	Rock cover (%)	0

Site description			
Roadside strip of dense vegetation. Eucalypt woodland over <i>Xanthorrhoea</i> shrubland over grasses and dense <i>Oxalis</i> cover.			
Habitat	Woodland		
Disturbance	litter, weed infestation		
Vegetation condition	Degraded	Total veg. cover (%)	95
Tree cover %	30	Fire age	>5 years
Shrub cover (%)	15	Litter distribution	Even
Grass cover (%)	80	Litter depth (cm)	1
Herb cover (%)	80	Litter cover (%)	50



Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Site details			
Site	Site05	Position (WGS84)	-32.085967, 115.79815
Topography	Dune	Soil texture	Loamy sand
Slope	Gentle	Rock type	nil
Soil colour	Brown	Rock cover (%)	0

Site description			
Eucalypt woodland over <i>Xanthorrhoea</i> and * <i>Oxalis</i> /mixed grass cover on brown sandy soil. Scattered non-local species such as <i>Acacia</i> and Kangaroo Paw. Lots of litter and disturbance.			
Habitat	Woodland		
Disturbance	litter, vehicle tracks		
Vegetation condition	Good	Total veg. cover (%)	80
Tree cover %	40	Fire age	>5 years
Shrub cover (%)	40	Litter distribution	Even
Grass cover (%)	50	Litter depth (cm)	2
Herb cover (%)	75	Litter cover (%)	90



Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Site details			
Site	Site06	Position (WGS84)	-32.088873, 115.795075
Topography	Dune	Soil texture	sand, sandy loam
Slope	Moderate	Rock type	Limestone
Soil colour	Brown, grey	Rock cover (%)	5

Site description			
Tuart woodland over shrubland with <i>Xanthorrhoea</i> and <i>Macrozamia</i> . A sandy limestone hill with limestone boulders. Continuous grass cover.			
Habitat	Woodland		
Disturbance	litter, vehicle tracks, weed infestation		
Vegetation condition	Good	Total veg. cover (%)	90
Tree cover %	50	Fire age	>5 years
Shrub cover (%)	15	Litter distribution	Under vegetation
Grass cover (%)	90	Litter depth (cm)	2
Herb cover (%)	10	Litter cover (%)	80



Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Site details			
Site	Site07	Position (WGS84)	-32.086192, 115.790217
Topography	Undulating plain	Soil texture	loamy sand
Slope	Negligible	Rock type	nil
Soil colour	brown, grey	Rock cover (%)	0

Site description			
Eucalypt woodland with scattered large tuarts and smaller eucalypts, over mixed shrubs (<i>Xanthorrhoea</i> , <i>Hakea</i> etc) over dense grass and weed cover on brown loamy sand.			
Habitat	Woodland		
Disturbance	historic clearing, litter, vehicle tracks, weed infestation		
Vegetation condition	Good	Total veg. cover (%)	95
Tree cover %	15	Fire age	>5 years
Shrub cover (%)	40	Litter distribution	Under vegetation
Grass cover (%)	90	Litter depth (cm)	1
Herb cover (%)	5	Litter cover (%)	50



Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Site details			
Site	Site08	Position (WGS84)	-32.085286, 115.786445
Topography	Dune	Soil texture	Loamy sand
Slope	Moderate	Rock type	nil
Soil colour	Brown	Rock cover (%)	0

Site description			
Grassed parkland. Couple of big Eucalypt trees and planted Eucalypt seedlings.			
Habitat	Parkland		
Disturbance	historic clearing, revegetation		
Vegetation condition	Completely degraded	Total veg. cover (%)	100
Tree cover %	2	Fire age	>5 years
Shrub cover (%)	0	Litter distribution	Under vegetation
Grass cover (%)	95	Litter depth (cm)	1
Herb cover (%)	0	Litter cover (%)	5



Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Site details			
Site	Site09	Position (WGS84)	-32.084474, 115.777597
Topography	Dune	Soil texture	Sand
Slope	Moderate	Rock type	nil
Soil colour	Brown	Rock cover (%)	0

Site description			
Completely degraded and overrun by weeds, grasses, crops and exotics. A few eucalypt trees.			
Habitat	Shrubland		
Disturbance	firebreak, historic clearing, litter, vehicle tracks, weed infestation		
Vegetation condition	Completely degraded	Total veg. cover (%)	100
Tree cover %	15	Fire age	>5 years
Shrub cover (%)	20	Litter distribution	Under vegetation
Grass cover (%)	80	Litter depth (cm)	1
Herb cover (%)	50	Litter cover (%)	10



Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Site details			
Site	Site10	Position (WGS84)	-32.08009, 115.764398
Topography	Hillslope	Soil texture	sandy loam, peat
Slope	Moderate	Rock type	limestone
Soil colour	brown, black	Rock cover (%)	0.1

Site description			
Semi-closed mid shrubland of spiny <i>Banksia</i> , <i>Acacia</i> spp., and mixed native (+exotic??) shrubs over misc. weedy herbs and grasses.			
Habitat	Shrubland		
Disturbance	evidence of feral animals, litter, vehicle tracks, weed infestation		
Vegetation condition	Good	Total veg. cover (%)	95
Tree cover %	60	Fire age	>5 years
Shrub cover (%)	10	Litter distribution	Under vegetation
Grass cover (%)	70	Litter depth (cm)	2
Herb cover (%)	5	Litter cover (%)	30



Appendix 2 Terrestrial vertebrate fauna desktop and field survey results

Family	Species	Common name	Status	Introduced	Source				This survey
					EPBC	NatreMap	DBCA TFA	Reports	
Amphibians									
Hylidae	<i>Litoria adelaidensis</i>	Slender Tree Frog				•		•	
	<i>Litoria moorei</i>	Motorbike Frog				•		•	
Limnodynastidae	<i>Heleioporus albopunctatus</i>	Western Spotted Frog	Extralimital, nearest Midland			•			
	<i>Heleioporus barycragus</i>	Hooting Frog	Extralimital, nearest Forrestfield			•			
	<i>Heleioporus eyrei</i>	Moaning Frog				•		•	
	<i>Heleioporus inornatus</i>	Whooping Frog	Extralimital, nearest Roleystone			•			
	<i>Heleioporus psammophilus</i>	Sand Frog	Extralimital, nearest Thornlie			•			
	<i>Limnodynastes dorsalis</i>	Western Banjo Frog				•		•	
	<i>Neobatrachus pelobatoides</i>	Humming Frog	Extralimital, nearest Attadale			•			
Myobatrachidae	<i>Crinia georgiana</i>	Quacking Frog				•		•	
	<i>Crinia glauerti</i>	Clicking Frog				•		•	
	<i>Crinia insignifera</i>	Squelching Froglet				•		•	
	<i>Crinia pseudinsignifera</i>	Bleating Froglet				•			
	<i>Geocrinia leai</i>	Ticking Frog	Extralimital, nearest Beeliar			•			
	<i>Myobatrachus gouldii</i>	Turtle Frog				•		•	
Birds									
Acanthizidae	<i>Acanthiza apicalis</i>	Broad-tailed Thornbill				•		•	
	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill				•		•	
	<i>Acanthiza inornata</i>	Western Thornbill				•		•	
	<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill				•			
	<i>Gerygone fusca</i>	Western Gerygone				•		•	•
	<i>Gerygone magnirostris subsp. magnirostris</i>	Large-billed Gerygone	Extralimital (Kimberley sp.)			•			
	<i>Hylacola cauta subsp. whitlocki</i>		Extralimital, 1 record Canning Vale			•			
	<i>Sericornis frontalis</i>	White-browed Scrubwren						•	

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Family	Species	Common name	Status	Introduced	Source				This survey
					EPBC	NatreMap	DBCA TFA	Reports	
	<i>Smicrornis brevirostris</i>	Weebill						•	•
Accipitridae	<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk				•			
	<i>Accipiter fasciatus</i>	Brown Goshawk				•		•	•
	<i>Aquila audax</i>	Wedge-tailed Eagle				•		•	
	<i>Circus approximans</i>	Swamp Harrier				•		•	
	<i>Circus assimilis</i>	Spotted Harrier				•			
	<i>Elanus caeruleus</i>	Black-shouldered Kite				•		•	
	<i>Elanus scriptus</i>	Letter-winged Kite	P4 (DBCA list)				•		
	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle					•	•	
	<i>Haliastur indus</i>	Brahminy Kite					•		
	<i>Haliastur sphenurus</i>	Whistling Kite					•	•	
	<i>Hamirostra isura</i>	Square-tailed Kite					•		
	<i>Hieraaetus morphnoides</i>	Little Eagle					•		
	<i>Milvus migrans</i>	Black Kite					•		
	<i>Pandion cristatus</i>	Osprey	Mig. (EPBC & BC Acts)		•		•	•	
Aegothelidae	<i>Aegotheles cristatus</i>	Australian Owlet-nightjar				•		•	
Anatidae	<i>Anas castanea</i>	Chestnut Teal				•		•	
	<i>Anas clypeata</i>	Northern Shoveler	Vagrant			•			
	<i>Anas gracilis</i>	Grey Teal				•		•	
	<i>Anas platyrhynchos</i>	Mallard				•		•	
	<i>Anas rhynchotis</i>	Australasian Shoveler				•		•	
	<i>Anas superciliosa</i>	Pacific Black Duck				•		•	
	<i>Aythya australis</i>	Hardhead				•		•	
	<i>Biziura lobata</i>	Musk Duck				•		•	
	<i>Chenonetta jubata</i>	Australian Wood Duck				•		•	
	<i>Cygnus atratus</i>	Black Swan				•		•	

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Family	Species	Common name	Status	Introduced	Source				This survey
					EPBC	NatreMap	DBCA TFA	Reports	
	<i>Cygnus olor</i>	Mute Swan		*		•			
	<i>Dendrocygna arcuata</i>	Wandering Whistling Duck				•			
	<i>Dendrocygna eytoni</i>	Plumed Whistling Duck				•			
	<i>Malacorhynchus membranaceus</i>	Pink-eared Duck				•		•	
	<i>Oxyura australis</i>	Blue-billed Duck	P4 (DBCA list)				•	•	
	<i>Stictonetta naevosa</i>	Freckled Duck						•	
	<i>Tadorna radjah</i>	Radjah Shelduck						•	
	<i>Tadorna tadornoides</i>	Australian Shelduck						•	•
Anhingidae	<i>Anhinga novaehollandiae</i>	Australasian Darter				•		•	
Apodidae	<i>Apus pacificus</i>	Fork-tailed Swift	Mig. (EPBC & BC Acts)		•	•	•		
Ardeidae	<i>Ardea garzetta</i>	Little Egret				•		•	
	<i>Ardea ibis</i>	Cattle Egret				•		•	
	<i>Ardea intermedia</i>	Intermediate Egret				•		•	
	<i>Ardea modesta</i>	Great Egret				•		•	
	<i>Ardea novaehollandiae</i>	White-faced Heron				•		•	
	<i>Ardea pacifica</i>	White-necked Heron				•		•	
	<i>Ardea sacra</i>	Eastern Reef Egret				•			
	<i>Botaurus poiciloptilus</i>	Australasian Bittern	EN (EPBC & BC Acts)		•	•	•	•	
	<i>Butorides striata</i>	Striated Heron					•		
	<i>Ixobrychus dubius</i>	Australian Little Bittern	P4 (DBCA list)				•	•	•
	<i>Ixobrychus flavicollis subsp. australis</i>	black bittern (southwest subpop.)	P2 (DBCA list)				•		
	<i>Ixobrychus minutus</i>	Little Bittern					•		
<i>Nycticorax caledonicus</i>	Rufous Night Heron					•		•	
Artamidae	<i>Artamus cinereus</i>	Black-faced Woodswallow				•			
	<i>Artamus cyanopterus</i>	Dusky Woodswallow				•		•	
	<i>Artamus personatus</i>	Masked Woodswallow				•			

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Family	Species	Common name	Status	Introduced	Source				This survey	
					EPBC	NatreMap	DBCA TFA	Reports		
Burhinidae	<i>Burhinus grallarius</i>	Bush Stone-curlew				•				
	<i>Esacus magnirostris</i>	Beach Stone-curlew				•				
Cacatuidae	<i>Cacatua galerita</i>	Sulphur-crested Cockatoo		*		•				
	<i>Cacatua leadbeateri</i>	Major Mitchell's Cockatoo				•				
	<i>Cacatua pastinator</i>	Western Long-billed Corella				•				
	<i>Cacatua roseicapilla</i>	Galah				•		•	•	
	<i>Cacatua sanguinea</i>	Little Corella				•		•		
	<i>Cacatua tenuirostris</i>	Eastern Long-billed Corella		*		•		•		
	<i>Calyptorhynchus banksii</i>	Red-tailed Black Cockatoo				•				
	<i>Calyptorhynchus banksii subsp. naso</i>	Forest Red-tailed Black Cockatoo	VU (EPBC & BC Acts)			•	•	•	•	•
	<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo	EN (EPBC & BC Acts)			•	•	•		
	<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo	EN (EPBC & BC Acts)			•	•	•	•	•
Campephagidae	<i>Coracina maxima</i>	Ground Cuckoo-shrike				•				
	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike				•		•	•	
	<i>Lalage tricolor</i>	White-winged Triller				•				
Caprimulgidae	<i>Eurostopodus argus</i>	Spotted Nightjar				•				
Charadriidae	<i>Charadrius bicinctus</i>	Double-banded Plover	Mig. (EPBC & BC Acts)			•				
	<i>Charadrius dubius</i>	Little Ringed Plover	Mig. (EPBC & BC Acts)			•	•	•	•	
	<i>Charadrius leschenaultii</i>	Greater Sand Plover	VU/Mig./VU (EPBC Act; BC Act)			•	•	•		
	<i>Charadrius mongolus</i>	Lesser Sand Plover	EN/Mig. (EPBC & BC Acts)			•	•	•		
	<i>Charadrius ruficapillus</i>	Red-capped Plover				•		•		
	<i>Elseyornis melanops</i>	Black-fronted Dotterel				•		•		
	<i>Erythrogonys cinctus</i>	Red-kneed Dotterel				•		•		
	<i>Pluvialis fulva</i>	Pacific Golden Plover	Mig. (EPBC & BC Acts)			•		•	•	
	<i>Pluvialis squatarola</i>	Grey Plover	Mig. (EPBC & BC Acts)			•		•	•	
	<i>Thinornis rubricollis</i>	Hooded Plover	P4 (DBCA list)				•	•		

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Family	Species	Common name	Status	Introduced	Source				This survey
					EPBC	NatreMap	DBCA TFA	Reports	
	<i>Vanellus miles</i>	Masked Lapwing						•	
Climacteridae	<i>Climacteris rufa</i>	Rufous Treecreeper				•			
Columbidae	<i>Columba livia</i>	Domestic Pigeon		*		•		•	•
	<i>Geopelia cuneata</i>	Diamond Dove				•			
	<i>Ocyphaps lophotes</i>	Crested Pigeon						•	
	<i>Streptopelia chinensis</i>	Spotted Turtle-Dove		*				•	•
	<i>Streptopelia senegalensis</i>	Laughing Turtle-Dove		*				•	•
	<i>Phaps chalcoptera</i>	Common Bronzewing							•
Coraciidae	<i>Eurystomus orientalis</i>	Dollarbird	Vagrant			•			
Corvidae	<i>Corvus bennetti</i>	Little Crow				•			
	<i>Corvus coronoides</i>	Australian Raven				•		•	•
	<i>Corvus orru</i>	Torresian Crow				•			
	<i>Corvus splendens</i>	House Crow	Ship-assisted vagrant	*		•			
Cracticidae	<i>Cracticus nigrogularis</i>	Pied Butcherbird				•			
	<i>Cracticus tibicen</i>	Australian Magpie				•		•	•
	<i>Cracticus torquatus</i>	Grey Butcherbird				•		•	•
Cuculidae	<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo				•			
	<i>Cacomantis pallidus</i>	Pallid Cuckoo				•			
	<i>Chrysococcyx basalis</i>	Horsfield's Bronze Cuckoo				•		•	
	<i>Chrysococcyx lucidus</i>	Shining Bronze Cuckoo				•		•	
Dicaeidae	<i>Dicaeum hirundinaceum</i>	Mistletoebird				•		•	
Dromaiidae	<i>Dromaius novaehollandiae</i>	Emu				•			
Estrildidae	<i>Lonchura castaneothorax</i>	Chestnut-breasted Mannikin		*		•			
	<i>Neochmia temporalis</i>	Red-browed Finch		*		•			
Falconidae	<i>Falco berigora</i>	Brown Falcon				•			
	<i>Falco cenchroides</i>	Australian Kestrel				•		•	

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Family	Species	Common name	Status	Introduced	Source				This survey
					EPBC	NatreMap	DBCA TFA	Reports	
	<i>Falco hypoleucos</i>	Grey Falcon	VU (BC Act)		•	•			
	<i>Falco longipennis</i>	Australian Hobby				•		•	
	<i>Falco peregrinus</i>	Peregrine Falcon	OS (BC Act)			•	•		
	<i>Falco subniger</i>	Black Falcon				•			
Fringillidae	<i>Carduelis carduelis</i>	Goldfinch		*		•			
Glareolidae	<i>Glareola maldivarum</i>	Oriental Pratincole	Mig. (EPBC & BC Acts)		•	•	•		
Haematopodidae	<i>Haematopus fuliginosus</i>	Sooty Oystercatcher				•			
	<i>Haematopus longirostris</i>	Pied Oystercatcher				•			
Halcyonidae	<i>Dacelo novaeguineae</i>	Laughing Kookaburra		*		•		•	•
	<i>Todiramphus sanctus</i>	Sacred Kingfisher						•	
Hirundinidae	<i>Cheramoeca leucosterna</i>	White-backed Swallow				•			
	<i>Hirundo ariel</i>	Fairy Martin				•			
	<i>Hirundo neoxena</i>	Welcome Swallow				•		•	•
	<i>Petrochelidon nigricans</i>	Tree Martin				•		•	
Laridae	<i>Anous tenuirostris subsp. melanops</i>	Australian Lesser Noddy	VU/EN (EPBC Act; BC Act)			•			
	<i>Chlidonias leucopterus</i>	White-winged Black Tern	Mig. (EPBC & BC Acts)			•	•	•	
	<i>Gelochelidon nilotica</i>	Gull-billed Tern	Mig. (BC Act)			•		•	
	<i>Hydroprogne caspia</i>	Caspian Tern	Mig. (EPBC & BC Acts)			•	•		
	<i>Larus crassirostris</i>	Black-tailed Gull				•			
	<i>Larus dominicanus</i>	Kelp Gull				•			
	<i>Larus novaehollandiae</i>	Silver Gull				•		•	•
	<i>Larus pacificus</i>	Pacific Gull				•			
	<i>Sterna albifrons</i>	White-shafted Little Tern	Mig. (BC Act)		•				
	<i>Sterna dougallii</i>	Roseate Tern	Mig. (EPBC & BC Acts)		•		•		
	<i>Sterna hybrida</i>	Whiskered Tern							•
	<i>Sternula nereis subsp. nereis</i>	Fairy Tern	VU (EPBC & BC Acts)		•		•	•	

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Family	Species	Common name	Status	Introduced	Source				This survey
					EPBC	NatreMap	DBCA TFA	Reports	
	<i>Thalasseus bergii</i>	Crested Tern	Mig. (BC Act)		•		•		
Maluridae	<i>Malurus elegans</i>	Red-winged Fairy-wren				•			
	<i>Malurus lamberti</i>	Variigated Fairy-wren				•			
	<i>Malurus leucopterus</i>	White-winged Fairy-wren				•			
	<i>Malurus pulcherrimus</i>	Blue-breasted Fairy-wren				•			
	<i>Malurus splendens</i>	Splendid Fairy-wren					•	•	
Megapodiidae	<i>Leipoa ocellata</i>	Malleefowl	VU (EPBC & BC Acts)		•	•			
Meliphagidae	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater				•			
	<i>Acanthorhynchus superciliosus</i>	Western Spinebill				•		•	
	<i>Anthochaera carunculata</i>	Red Wattlebird				•		•	•
	<i>Anthochaera lunulata</i>	Western Little Wattlebird				•		•	
	<i>Epthianura albifrons</i>	White-fronted Chat				•			
	<i>Epthianura tricolor</i>	Crimson Chat				•			
	<i>Gavicalis virescens</i>	Singing Honeyeater					•	•	•
	<i>Glyciphila melanops</i>	Tawny-crowned Honeyeater					•		
	<i>Lichenostomus flavescens</i>	Yellow-tinted Honeyeater	Extralimital, Kimberley				•		
	<i>Lichenostomus leucotis</i>	White-eared Honeyeater					•		
	<i>Lichenostomus ornatus</i>	Yellow-plumed Honeyeater					•		
	<i>Lichenostomus penicillatus</i>	White-plumed Honeyeater					•		
	<i>Lichenostomus unicolor</i>	White-gaped Honeyeater	Extralimital, Kimberley				•		
	<i>Lichmera indistincta</i>	Brown Honeyeater					•	•	•
	<i>Manorina flavigula</i>	Yellow-throated Miner					•		
	<i>Meliphaga albilineata</i>	White-lined Honeyeater	Extralimital, Kimberley				•		
	<i>Melithreptus brevirostris</i>	Brown-headed Honeyeater					•		
	<i>Melithreptus chloropsis</i>	Western White-naped Honeyeater					•		
<i>Melithreptus cyanotis</i>	Blue-faced Honeyeater	Extralimital, Kimberley				•			

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Family	Species	Common name	Status	Introduced	Source				This survey
					EPBC	NatreMap	DBCA TFA	Reports	
	<i>Melithreptus gularis</i>	Black-chinned Honeyeater	Extralimital, vagrant			•			
	<i>Myzomela erythrocephala</i>	Red-headed Honeyeater	Extralimital, Kimberley			•			
	<i>Phylidonyris niger</i>	White-cheeked Honeyeater						•	•
	<i>Phylidonyris novaehollandiae</i>	New Holland Honeyeater						•	•
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater				•		•	
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark				•		•	
	<i>Myiagra inquieta</i>	Restless Flycatcher				•			
Motacillidae	<i>Anthus australis</i>	Australian Pipit				•			
	<i>Motacilla alba</i>	White Wagtail				•			
	<i>Motacilla cinerea</i>	Grey Wagtail	Mig. (EPBC & BC Acts)		•				
Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella				•		•	
Otididae	<i>Ardeotis australis</i>	Australian Bustard				•			
Pachycephalidae	<i>Colluricincla harmonica</i>	Grey Shrike-thrush				•		•	
	<i>Falcunculus frontatus subsp. leucogaster</i>	Western Shrike-tit				•			
	<i>Pachycephala rufiventris</i>	Rufous Whistler						•	
Pardalotidae	<i>Pardalotus punctatus</i>	Spotted Pardalote						•	
	<i>Pardalotus striatus</i>	Striated Pardalote						•	
Pelecanidae	<i>Pelecanus conspicillatus</i>	Australian Pelican						•	•
Petroicidae	<i>Eopsaltria australis</i>	Yellow Robin				•			
	<i>Eopsaltria georgiana</i>	White-breasted Robin				•			
	<i>Melanodryas cucullata</i>	Hooded Robin				•			
	<i>Microeca fascinans</i>	Jacky Winter				•			
Phalacrocoracidae	<i>Phalacrocorax carbo</i>	Great Cormorant						•	
	<i>Phalacrocorax melanoleucos</i>	Little Pied Cormorant						•	
	<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant						•	
	<i>Phalacrocorax varius</i>	Pied Cormorant						•	

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Family	Species	Common name	Status	Introduced	Source				This survey
					EPBC	NatreMap	DBCA TFA	Reports	
Phasianidae	<i>Coturnix pectoralis</i>	Stubble Quail				•			
	<i>Coturnix ypsilophora</i>	Brown Quail				•			
Podicipedidae	<i>Podiceps cristatus</i>	Great Crested Grebe						•	
	<i>Poliiocephalus poliocephalus</i>	Hoary-headed Grebe						•	
	<i>Tachybaptus novaehollandiae</i>	Australasian Grebe						•	
Psittaculidae	<i>Glossopsitta concinna</i>	Musk Lorikeet	Feral	*		•			
	<i>Glossopsitta porphyrocephala</i>	Purple-crowned Lorikeet				•			
	<i>Melopsittacus undulatus</i>	Budgerigar				•			
	<i>Neophema elegans</i>	Elegant Parrot				•		•	
	<i>Neophema petrophila</i>	Rock Parrot				•			
	<i>Platycercus spurius</i>	Red-capped Parrot						•	
	<i>Platycercus zonarius</i>	Australian Ringneck						•	•
	<i>Trichoglossus haematodus</i>	Rainbow Lorikeet	Feral	*				•	•
Rallidae	<i>Fulica atra</i>	Eurasian Coot				•		•	
	<i>Gallinula tenebrosa</i>	Dusky Moorhen				•		•	
	<i>Gallirallus philippensis</i>	Buff-banded Rail				•		•	
	<i>Porphyrio porphyrio</i>	Purple Swamphen						•	
	<i>Porzana fluminea</i>	Australian Spotted Crake						•	
	<i>Porzana pusilla</i>	Baillon's Crake						•	
	<i>Porzana tabuensis</i>	Spotless Crake						•	
	<i>Tribonyx ventralis</i>	Black-tailed Native-hen					•	•	
Recurvirostridae	<i>Cladorhynchus leucocephalus</i>	Banded Stilt				•		•	
	<i>Himantopus himantopus</i>	Black-winged Stilt				•		•	
	<i>Recurvirostra novaehollandiae</i>	Red-necked Avocet						•	
Rhipiduridae	<i>Rhipidura albiscapa</i>	Grey Fantail						•	
	<i>Rhipidura leucophrys</i>	Willie Wagtail						•	•

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Family	Species	Common name	Status	Introduced	Source				This survey
					EPBC	NatreMap	DBCA TFA	Reports	
Rostratulidae	<i>Rostratula australis</i>	Australian Painted Snipe	EN (EPBC & BC Acts)		•				
Scolopacidae	<i>Actitis hypoleucos</i>	Common Sandpiper	Mig. (EPBC & BC Acts)		•	•	•	•	
	<i>Arenaria interpres</i>	Ruddy Turnstone	Mig. (EPBC & BC Acts)		•	•	•		
	<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Mig. (EPBC & BC Acts)		•	•	•	•	
	<i>Calidris alba</i>	Sanderling	Mig. (EPBC & BC Acts)		•	•	•		
	<i>Calidris canutus</i>	Red Knot	EN/Mig./EN (EPBC Act; BC Act)		•	•	•	•	
	<i>Calidris ferruginea</i>	Curlew Sandpiper	CR/Mig./CR (EPBC Act; BC Act)		•	•	•	•	
	<i>Calidris melanotos</i>	Pectoral Sandpiper	Mig. (EPBC & BC Acts)		•	•	•	•	
	<i>Calidris minuta</i>	Little Stint	Mig. (EPBC Act)			•			
	<i>Calidris ruficollis</i>	Red-necked Stint	Mig. (EPBC & BC Acts)		•	•	•	•	
	<i>Calidris subminuta</i>	Long-toed Stint	Mig. (EPBC & BC Acts)		•	•	•	•	
	<i>Calidris tenuirostris</i>	Great Knot	CR/Mig./CR (EPBC Act; BC Act)		•	•	•	•	
	<i>Gallinago hardwickii</i>	Latham's Snipe	Mig. (EPBC & BC Acts)			•			
	<i>Gallinago megala</i>	Swinhoe's Snipe	Mig. (EPBC & BC Acts)		•				
	<i>Gallinago stenura</i>	Pin-tailed Snipe	Mig. (EPBC & BC Acts)		•	•			
	<i>Limicola falcinellus</i>	Broad-billed Sandpiper	Mig. (BC Act)		•		•		
	<i>Limosa haemastica</i>	Hudsonian Godwit	Vagrant		*	•			
	<i>Limosa lapponica</i>	Bar-tailed Godwit	Mig. (EPBC & BC Acts)		•	•	•	•	
	<i>Limosa limosa</i>	Black-tailed Godwit	Mig. (BC Act)		•	•	•	•	
	<i>Numenius madagascariensis</i>	Eastern Curlew	CR/Mig./CR (EPBC Act; BC Act)		•	•	•		
	<i>Numenius minutus</i>	Little Curlew	Mig. (EPBC & BC Acts)		•				
	<i>Numenius phaeopus</i>	Whimbrel	Mig. (EPBC & BC Acts)		•	•	•		
	<i>Phalaropus lobatus</i>	Red-necked Phalarope	Mar/Mig. (EPBC Act; BC Act)		•				
	<i>Philomachus pugnax</i>	Ruff	Mig. (EPBC & BC Acts)		•		•	•	
<i>Tringa brevipes</i>	Grey-tailed Tattler	(Mig. EPBC & BC Acts; P4 DBCA list)		•			•		
<i>Tringa glareola</i>	Wood Sandpiper	Mig. (EPBC & BC Acts)		•		•	•		

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Family	Species	Common name	Status	Introduced	Source				This survey
					EPBC	NatreMap	DBCA TFA	Reports	
	<i>Tringa nebularia</i>	Common Greenshank	Mig. (EPBC & BC Acts)		•		•	•	
	<i>Tringa stagnatilis</i>	Marsh Sandpiper	Mig. (EPBC & BC Acts)		•		•	•	
	<i>Tringa totanus</i>	Common Redshank	Mig. (EPBC & BC Acts)		•				
	<i>Xenus cinereus</i>	Terek Sandpiper	Mig. (EPBC & BC Acts)		•				
Strigidae	<i>Ninox boobook</i>	Australian Boobook						•	
	<i>Ninox connivens subsp. connivens</i>	Barking Owl (southwest subpop.)	P3 (DBCA list)			•	•		
Sturnidae	<i>Acridotheres tristis</i>	Common Myna		*		•			
Sulidae	<i>Morus serrator</i>	Australasian Gannet				•			
Sylviidae	<i>Acrocephalus australis</i>	Australian Reed Warbler				•		•	
	<i>Cincloramphus cruralis</i>	Brown Songlark				•			
	<i>Cincloramphus mathewsi</i>	Rufous Songlark				•			
	<i>Megalurus gramineus</i>	Little Grassbird				•		•	
Threskiornithidae	<i>Platalea flavipes</i>	Yellow-billed Spoonbill						•	
	<i>Platalea regia</i>	Royal Spoonbill						•	
	<i>Plegadis falcinellus</i>	Glossy Ibis	Mig. (EPBC & BC Acts)				•	•	
	<i>Threskiornis moluccus</i>	Australian White Ibis						•	
	<i>Threskiornis spinicollis</i>	Straw-necked Ibis						•	
Tytonidae	<i>Tyto novaehollandiae subsp. novaehollandiae</i>	Masked Owl (southwest)	P3 (DBCA list)				•		
Zosteropidae	<i>Zosterops lateralis</i>	Grey-breasted White-eye						•	•
Mammals									
Bovidae	<i>Bos taurus</i>	European Cattle		*		•			
	<i>Capra hircus</i>	Goat		*		•			
Burramyidae	<i>Cercartetus concinnus</i>	Western Pygmy-possum				•			
Canidae	<i>Canis familiaris</i>	Dog		*		•			•
	<i>Vulpes vulpes</i>	Red Fox		*				•	•
Dasyuridae	<i>Antechinus flavipes</i>	Yellow-footed Antechinus				•			

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Family	Species	Common name	Status	Introduced	Source				This survey
					EPBC	NatreMap	DBCA TFA	Reports	
	<i>Dasyurus geoffroii</i>	Chuditch	VU (EPBC & BC Acts)		•	•	•		
	<i>Phascogale tapoatafa subsp. wambenger</i>	Southwestern Brush-tailed Phascogale	CD (BC Act)				•		
Equidae	<i>Equus caballus</i>	Horse		*		•			
Felidae	<i>Felis catus</i>	Cat		*		•		•	
Leporidae	<i>Oryctolagus cuniculus</i>	Rabbit		*				•	•
Macropodidae	<i>Macropus fuliginosus</i>	Western Grey Kangaroo				•		•	
	<i>Macropus robustus subsp. erubescens</i>	Euro				•			
	<i>Notamacropus eugenii subsp. derbianus</i>	Tammar wallaby	P4 (DBCA list)			•	•		
	<i>Notamacropus irma</i>	Western Brush Wallaby	P4 (DBCA list)			•	•		
	<i>Setonix brachyurus</i>	Quokka	VU (EPBC & BC Acts)		•		•		
Megadermatidae	<i>Macroderma gigas</i>	Ghost Bat	VU (EPBC & BC Acts)		•				
Molossidae	<i>Austronomus australis</i>	White-striped Free-tailed Bat				•		•	
	<i>Mormopterus planiceps</i>	Southern Freetail-bat				•			
	<i>Ozimops kitcheneri</i>	Southwestern Free-tailed Bat						•	
Muridae	<i>Hydromys chrysogaster</i>	Water-rat	P4 (DBCA list)			•	•		
	<i>Mus musculus</i>	House Mouse		*		•		•	•
	<i>Rattus rattus</i>	Black Rat		*				•	
Mustelidae	<i>Mustela putorius</i>	European Polecat, Ferret		*		•			
Myrmecobiidae	<i>Myrmecobius fasciatus</i>	Numbat	EN (EPBC & BC Acts)			•	•		
Peramelidae	<i>Isodon fusciventer</i>	Quenda	P4 (DBCA list)			•	•	•	•
Phalangeridae	<i>Trichosurus vulpecula</i>	Common Brushtail Possum						•	
Potoroidae	<i>Bettongia penicillata subsp. ogilbyi</i>	Woylie	EN/CR (EPBC/BC Act)		•	•			
Pseudocheiridae	<i>Pseudocheirus occidentalis</i>	Western Ringtail Possum, ngwayir	CR (EPBC & BC Acts)		•		•		
Sciuridae	<i>Funambulus pennanti</i>	Indian Palm Squirrel		*		•			
Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat				•		•	
	<i>Chalinolobus morio</i>	Chocolate Wattled Bat				•			

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Family	Species	Common name	Status	Introduced	Source				This survey
					EPBC	NatreMap	DBCA TFA	Reports	
	<i>Falsistrellus mackenziei</i>	Western False Pipistrelle	P4 (DBCA list)			•	•		
	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat				•		•	
	<i>Nyctophilus gouldi</i>	Gould's Long-eared Bat				•		•	
	<i>Nyctophilus major</i>	Greater Long-eared Bat				•			
	<i>Vespadelus regulus</i>	Southern Forest Bat						•	
Reptiles									
Agamidae	<i>Ctenophorus adelaidensis</i>	Southern Heath Dragon				•			
	<i>Ctenophorus caudicinctus</i>	Ring-tailed Dragon	Extralimital			•			
	<i>Ctenophorus ornatus</i>	Ornate Crevice-Dragon				•			
	<i>Gowidon longirostris</i>	Long-nosed Dragon	Extralimital			•			
	<i>Pogona minor</i>	Dwarf Bearded Dragon						•	
Cheluidae	<i>Chelodina colliei</i>	Southwestern Snake-necked Turtle				•		•	
	<i>Pseudemydura umbrina</i>	Western Swamp Turtle	CR (EPBC & BC Acts)		•				
Diplodactylidae	<i>Crenadactylus ocellatus</i>	Clawless Gecko				•			
	<i>Diplodactylus granariensis</i>	Western Stone Gecko	Extralimital, Darling R/Wheatbelt			•			
	<i>Diplodactylus lateroides</i>	Speckled Stone Gecko	Extralimital, Darling Range			•			
	<i>Diplodactylus polyophthalmus</i>					•			
	<i>Diplodactylus pulcher</i>	Fine-faced gecko	Extralimital, Darling R/Wheatbelt			•			
	<i>Lucasium alboguttatum</i>					•			
	<i>Lucasium stenodactylum</i>		Extralimital			•			
	<i>Lucasium wombeyi</i>		Extralimital, Pilbara			•			
Elapidae	<i>Acanthophis antarcticus</i>	Common Death Adder	P3 (DBCA list)			•			
	<i>Brachyuropis fasciolatus subsp. fasciolatus</i>	Narrow-banded Shovel-nosed Snake				•			
	<i>Brachyuropis semifasciatus</i>	Southern Shovel-nosed Snake				•			
	<i>Demansia psammophis</i>	Yellow-faced Whipsnake				•			
	<i>Echiopsis curta</i>	Bardick					•		

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Family	Species	Common name	Status	Introduced	Source				This survey
					EPBC	NatreMap	DBCA TFA	Reports	
	<i>Elapognathus coronatus</i>	Crowned Snake				•			
	<i>Neelaps bimaculatus</i>	Black-naped Snake				•			
	<i>Neelaps calonotos</i>	Black-striped Snake	P3 (DBCA list)			•	•		
	<i>Notechis scutatus</i>	Tiger Snake				•		•	
	<i>Pseudonaja affinis</i>	Dugite						•	
Gekkonidae	<i>Christinus marmoratus</i>	Marbled Gecko				•		•	
	<i>Gehyra variegata</i>	Variiegated Dtella				•			
	<i>Hemidactylus frenatus</i>	Asian House Gecko		*		•			
	<i>Heteronotia binoei</i>	Bynoe's Gecko				•			
Pygopodidae	<i>Aprasia pulchella</i>	Granite Worm-lizard				•			
	<i>Aprasia repens</i>	Sand-plain Worm-lizard				•		•	
	<i>Delma concinna subsp. concinna</i>	Javelin Legless Lizard				•			
	<i>Delma fraseri</i>	Fraser's Legless Lizard				•			
	<i>Delma grayii</i>					•			
	<i>Delma pax</i>	Peace Delma	Extralimital, Pilbara			•			
	<i>Lialis burtonis</i>	Burton's Legless Lizard				•		•	
	<i>Pletholax gracilis subsp. gracilis</i>	Keeled Legless Lizard						•	
	<i>Pygopus lepidopodus</i>	Common Scaly Foot						•	
Pythonidae	<i>Antaresia childreni</i>	Children's Python	Extralimital			•			
	<i>Morelia spilota</i>	Carpet Python				•			
Scincidae	<i>Acritoscincus trilineatus</i>	Western Three-lined Skink				•		•	
	<i>Carlia munda</i>	Shaded-litter Rainbow Skink	Extralimital, Pilbara			•			
	<i>Cryptoblepharus buchananii</i>					•		•	•
	<i>Cryptoblepharus plagiocephalus</i>	Peron's Snake-eyed Skink	Extralimital			•		•	
	<i>Ctenotus australis</i>					•		•	
	<i>Ctenotus delli</i>	Dell's Ctenotus	P4 (DBCA list)			•			

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Family	Species	Common name	Status	Introduced	Source				This survey
					EPBC	NatreMap	DBCA TFA	Reports	
	<i>Ctenotus fallens</i>					•		•	
	<i>Ctenotus gemmula</i>					•			
	<i>Ctenotus impar</i>					•			
	<i>Ctenotus labillardieri</i>					•			
	<i>Ctenotus ora</i>	Coastal Plains Skink	P3 (DBCA list)			•			
	<i>Ctenotus saxatilis</i>	Rock Ctenotus (ex. <i>C. fallens</i>)				•			
	<i>Cyclodomorphus celatus</i>	Western Slender Blue-tongue				•			
	<i>Egernia kingii</i>	King's Skink				•			
	<i>Egernia napoleonis</i>					•		•	
	<i>Eremiascincus richardsonii</i>	Broad-banded Sand Swimmer	Extralimital, Darling Range			•			
	<i>Glaphyromorphus isolepis</i>		Extralimital, Pilbara			•			
	<i>Hemiergis initialis</i>	Southwestern Earless Skink				•			
	<i>Hemiergis peronii</i>					•			
	<i>Hemiergis quadrilineata</i>					•		•	•
	<i>Lerista christinae</i>					•			
	<i>Lerista distinguenda</i>					•			
	<i>Lerista elegans</i>					•		•	
	<i>Lerista gerrardii</i>	Bold-striped Robust Slider	Extralimital, Wheatbelt			•			
	<i>Lerista jacksoni</i>		Extralimital, Pilbara			•			
	<i>Lerista lineata</i>	Perth Slider	P3 (DBCA list)			•	•	•	
	<i>Lerista lineopunctulata</i>					•			
	<i>Lerista praepedita</i>					•			
	<i>Lissolepis luctuosa</i>	Western Swamp Skink				•		•	
	<i>Menetia greyii</i>	Common Dwarf Skink				•		•	
	<i>Menetia maini</i>	Northern Dwarf Skink	Extralimital, Kimberley			•			
	<i>Menetia surda</i>		Extralimital, Midwest			•			

**Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage**

Family	Species	Common name	Status	Introduced	Source				This survey
					EPBC	NatreMap	DBCA TFA	Reports	
	<i>Morethia adalaidensis</i>		Extralimital, Goldfields			•			
	<i>Morethia boulengeri</i>		Extralimital, Great Vic Desert			•			
	<i>Morethia butleri</i>	Woodland Morethia Skink	Extralimital, Wheatbelt			•			
	<i>Morethia lineocellata</i>					•		•	
	<i>Morethia obscura</i>					•		•	
	<i>Morethia ruficauda</i>		Extralimital, Pilbara			•			
	<i>Morethia storri</i>		Extralimital, Kimberley			•			
	<i>Notoscincus ornatus</i>		Extralimital, Pilbara			•			
	<i>Tiliqua rugosa</i>	Bobtail						•	•
Typhlopidae	<i>Anilius australis</i>					•		•	
Varanidae	<i>Varanus gouldii</i>	Bungarra or Sand Monitor						•	

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Appendix 3 Fauna species by site matrix

Species		Site																	
Scientific name	Common name	Site01	Site02	Site03	Site04	Site05	Site06	Site07	Site08	Site09	Site10	Opp01	Opp02	Opp03	Opp04	Opp05	Opp06	Opp07	Opp08
Birds																			
<i>Gerygone fusca</i>	Western Gerygone									•				•					
<i>Smicronis brevirostris</i>	Weebill	•		•															
<i>Accipiter fasciatus</i>	Brown Goshawk												•					•	
<i>Tadorna tadornoides</i>	Australian Shelduck								•										
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike		•			•													
<i>Columba livia</i>	Domestic Pigeon										•								
<i>Phaps chalcoptera</i>	Common Bronzewing		•																
<i>Streptopelia chinensis</i>	Spotted Turtle-Dove						•												
<i>Streptopelia senegalensis</i>	Laughing Dove									•									
<i>Corvus coronoides</i>	Australian Raven		•		•			•			•								
<i>Cracticus tibicen</i>	Australian Magpie	•							•		•								
<i>Cracticus torquatus</i>	Grey Butcherbird		•						•										
<i>Rhipidura leucophrys</i>	Willie Wagtail							•	•		•	•							
<i>Dacelo novaeguineae</i>	Laughing Kookaburra	•	•				•	•											
<i>Hirundo neoxena</i>	Welcome Swallow			•												•			
<i>Chroicocephalus novaehollandiae</i>	Silver Gull														•				
<i>Anthochaera carunculata</i>	Red Wattlebird		•		•	•		•	•										
<i>Gavicalis virescens</i>	Singing Honeyeater				•		•	•			•	•							
<i>Lichmera indistincta</i>	Brown Honeyeater					•	•	•	•		•								
<i>Phylidonyris niger</i>	White-cheeked Honeyeater															•			

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Species		Site																	
Scientific name	Common name	Site01	Site02	Site03	Site04	Site05	Site06	Site07	Site08	Site09	Site10	Opp01	Opp02	Opp03	Opp04	Opp05	Opp06	Opp07	Opp08
<i>Phylidonyris novaehollandiae</i>	New Holland Honeyeater						•							•					
<i>Pelecanus conspicillatus</i>	Australian Pelican					•													
<i>Barnardius zonarius</i>	Australian Ringneck			•					•		•								
<i>Calyptorhynchus banksii subsp. naso</i>	Forest Red-tailed Black Cockatoo					•											•		
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo						•												
<i>Eolophus roseicapillus</i>	Galah		•	•			•	•		•									
<i>Trichoglossus haematodus</i>	Rainbow Lorikeet	•	•		•		•	•	•										
<i>Zosterops lateralis</i>	Grey-breasted White-eye					•													
Mammals																			
<i>Canis familiaris</i>	Dog										•								
<i>Vulpes vulpes</i>	Red Fox										•								
<i>Oryctolagus cuniculus</i>	Rabbit		•																
<i>Mus musculus</i>	House Mouse							•											
<i>Isodon fusciventer</i>	Quenda		•	•	•			•	•										
Reptiles																			
<i>Cryptoblepharus buchananii</i>	Buchanan's Snake-eyed Skink																		•
<i>Hemiergis quadrilineata</i>	Two-toed Earless Skink														•				
<i>Tiliqua rugosa</i>	Shingleback				•										•				

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Appendix 4 Black Cockatoo habitat trees

Tree number	Recorder	Species	DBH (cm)	Hollows present	Hollows suitable	Notes	Coordinates
R89-T001	JadeL	Marri	60	No	No		115.8071, -32.0875
R89-T002	JadeL	Tuart	55	No	No		115.7875, -32.086
R89-T003	JadeL	Tuart	75	No	No		115.7869, -32.0861
R89-T004	JadeL	Jarraah	55	No	No		115.7869, -32.0861
R89-T005	JadeL	Tuart	100	No	No		115.7865, -32.0853
R89-T006	JadeL	Marri	50	No	No		115.7831, -32.0849
R89-T007	JadeL	Marri	70	No	No	No foraging evidence.	115.7829, -32.0849
R89-T008	JadeL	Marri	70	No	No	Red-capped Parrot foraging evidence.	115.7829, -32.0846
R89-T009	JadeL	Jarraah	70	No	No		115.7701, -32.0818
R89-T010	JadeL	Tuart	60	No	No		115.7654, -32.079
R89-T011	JadeL	Tuart	65	No	No		115.7659, -32.0789
R89-T012	JadeL	Tuart	70	Yes	No	Artificial nest box (not suitable for Black Cockatoos). Bees present.	115.7659, -32.0785
R89-T013	JadeL	Tuart	50	No	No		115.7658, -32.0785
R89-T014	JadeL	Tuart	55	No	No		115.7662, -32.0785
R89-T015	JadeL	Tuart	50	No	No		115.788, -32.086
R89-T016	JadeL	Tuart	50	No	No		115.7881, -32.0862
R89-T017	JadeL	Tuart	50	No	No		115.7881, -32.086
R89-T018	JadeL	Tuart	55	No	No		115.7882, -32.0861
R89-T019	JadeL	Jarraah	50	No	No		115.7893, -32.0862
R89-T020	JadeL	Jarraah	50	No	No		115.7893, -32.0862
R89-T021	JadeL	Jarraah	50	No	No		115.7894, -32.0862
R89-T022	JadeL	Dead unknown	60	No	No		115.7896, -32.0864
R89-T023	JadeL	Dead Tuart	50	Yes	No	Two small hollows, branch and knot hole. No evidence of use.	115.79, -32.0864
R89-T024	JadeL	Tuart	60	No	No		115.79, -32.0863
R89-T025	JadeL	Tuart	60	Yes	No	Rainbow Lorikeets in tree. Two hollows, not suitable.	115.7905, -32.0862

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Tree number	Recorder	Species	DBH (cm)	Hollows present	Hollows suitable	Notes	Coordinates
R89-T026	JadeL	Tuart	95	No	No		115.7939, -32.0885
R89-T027	JadeL	Tuart	60	No	No		115.7944, -32.0887
R89-T028	JadeL	Tuart	50	No	No		115.7945, -32.0887
R89-T029	JadeL	Tuart	50	No	No		115.7948, -32.089
R89-T030	JadeL	Tuart	50	No	No		115.7949, -32.0892
R89-T031	JadeL	Tuart	50	No	No		115.795, -32.0891
R89-T032	JadeL	Tuart	50	No	No		115.795, -32.0889
R89-T033	JadeL	Tuart	55	Yes	No	Small hollow, not suitable. No evidence of use.	115.795, -32.0894
R89-T034	JadeL	Tuart	50	No	No		115.7951, -32.0892
R89-T035	JadeL	Tuart	50	Yes	No	Small hollow, not suitable. No evidence of use.	115.7951, -32.0894
R89-T036	JadeL	Tuart	60	No	No		115.7952, -32.0892
R89-T037	JadeL	Tuart	55	No	No		115.7952, -32.0892
R89-T038	JadeL	Tuart	50	No	No		115.7953, -32.0893
R89-T039	JadeL	Tuart	55	Yes	No	Small hollow, not suitable. No evidence of use.	115.7954, -32.0892
R89-T040	JadeL	Tuart	55	Yes	No	Small hollow, not suitable. No evidence of use.	115.7955, -32.0889
R89-T041	JadeL	Tuart	50	Yes	No	Galabs in tree, however no evidence of hollow use.	115.7955, -32.089
R89-T042	JadeL	Tuart	50	No	No		115.7955, -32.0892
R89-T043	JadeL	Tuart	50	No	No		115.7955, -32.0892
R89-T044	JadeL	Tuart	50	No	No		115.7956, -32.0894
R89-T045	JadeL	Tuart	50	Yes	No	Small hollow, not suitable. No evidence of use.	115.7957, -32.0903
R89-T046	JadeL	Tuart	60	Yes	No	Small hollow, not suitable. No evidence of use.	115.7958, -32.0899
R89-T047	JadeL	Jarraah	50	No	No		115.7961, -32.0908
R89-T048	JadeL	Jarraah	50	No	No		115.7963, -32.0896
R89-T049	JadeL	Tuart	50	No	No		115.7968, -32.0893
R89-T050	JadeL	Jarraah	50	No	No		115.7969, -32.0897
R89-T051	JadeL	Marri	50	No	No		115.797, -32.0912

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Tree number	Recorder	Species	DBH (cm)	Hollows present	Hollows suitable	Notes	Coordinates
R89-T052	JadeL	Jarrah	50	Yes	No	Multiple smaller hollows. No evidence of use.	115.7973, -32.0918
R89-T053	JadeL	Marri	50	No	No		115.7973, -32.0911
R89-T054	JadeL	Dead unknown	50	Yes	No	Not suitable, no evidence of use.	115.7973, -32.0903
R89-T055	JadeL	Marri	50	No	No		115.7973, -32.091
R89-T056	JadeL	Marri	50	No	No		115.7974, -32.091
R89-T057	JadeL	Tuart	50	No	No		115.7974, -32.0911
R89-T058	JadeL	Jarrah	60	Yes	No	Two low hollows	115.7976, -32.0867
R89-T059	JadeL	Marri	60	No	No		115.7977, -32.0861
R89-T060	JadeL	Marri	60	No	No		115.7978, -32.0861
R89-T061	JadeL	Marri	55	No	No		115.7978, -32.0859
R89-T062	JadeL	Tuart	90	No	No		115.7979, -32.0879
R89-T063	JadeL	Marri	55	No	No		115.798, -32.0859
R89-T064	JadeL	Marri	65	No	No		115.7982, -32.0858
R89-T065	JadeL	Jarrah	55	No	No		115.7983, -32.0877
R89-T066	JadeL	Jarrah	70	Yes	No	Not suitable, no evidence of use.	115.7984, -32.0866
R89-T067	JadeL	Marri	50	No	No		115.7985, -32.0859
R89-T068	JadeL	Marri	70	No	No		115.7986, -32.0861
R89-T069	JadeL	Marri	55	No	No		115.7986, -32.086
R89-T070	JadeL	Marri	50	No	No		115.7986, -32.0867
R89-T071	JadeL	Tuart	60	No	No		115.7986, -32.0882
R89-T072	JadeL	Marri	50	No	No		115.7989, -32.0869
R89-T073	JadeL	Marri	60	No	No		115.7989, -32.0863
R89-T074	JadeL	Dead unknown	50	No	No		115.7993, -32.087
R89-T075	JadeL	Tuart	60	No	No		115.7995, -32.0882
R89-T076	JadeL	Tuart	60	No	No		115.7995, -32.0883
R89-T077	JadeL	Dead unknown	60	Yes	No	Not suitable, no evidence of use.	115.7995, -32.0877

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Tree number	Recorder	Species	DBH (cm)	Hollows present	Hollows suitable	Notes	Coordinates
R89-T078	JadeL	Tuart	60	Yes	No	Not suitable, no evidence of use.	115.8003, -32.0877
R89-T079	JadeL	Tuart	70	No	No		115.8004, -32.0874
R89-T080	JadeL	Tuart	60	No	No		115.8005, -32.0875
R89-T081	JadeL	Tuart	75	No	No		115.8013, -32.0884
R89-T082	JadeL	Tuart	60	Yes	No	Not suitable, no evidence of use.	115.8015, -32.0885
R89-T083	JadeL	Tuart	55	No	No		115.8016, -32.0883
R89-T084	JadeL	Tuart	75	No	No		115.804, -32.0891
R89-T085	JadeL	Tuart	70	No	No		115.8046, -32.0891
R89-T086	JadeL	Tuart	60	No	No		115.8047, -32.0892
R89-T087	JadeL	Tuart	65	No	No		115.8048, -32.0891
R89-T088	JadeL	Tuart	60	No	No		115.8052, -32.0891
R89-T089	JadeL	Tuart	95	Yes	No	Two branch hollows. No evidence of use.	115.8058, -32.0892
R89-T090	JadeL	Tuart	90	No	No		115.8063, -32.0894
R89-T091	JadeL	Marri	60	No	No		115.8065, -32.089
R89-T092	JadeL	Marri	80	No	No		115.8067, -32.0889
R89-T093	JadeL	Marri	55	No	No		115.8067, -32.089
R89-T094	JadeL	Jarraah	60	No	No		115.8074, -32.0872
R89-T095	JadeL	Tuart	70	Yes	No	Not suitable, no evidence of use.	115.8077, -32.0888
R89-T096	JadeL	Marri	60	No	No		115.8127, -32.0868
R89-T097	JadeL	Jarraah	75	No	No		115.8142, -32.0863
R89-T098	JadeL	Marri	60	No	No		115.8144, -32.0859
R89-T099	JadeL	Tuart	65	No	No		115.8147, -32.0858
R89-T100	JadeL	Marri	60	No	No		115.8148, -32.0857
R89-T101	JadeL	Marri	90	No	No		115.815, -32.0856
R89-T102	JadeL	Marri	50	No	No		115.8158, -32.0853
R89-T103	JadeL	Dead Marri	55	No	No		115.8158, -32.0856

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Tree number	Recorder	Species	DBH (cm)	Hollows present	Hollows suitable	Notes	Coordinates
R89-T104	JadeL	Dead Jarrah	52	Yes	No	Not suitable, no evidence of use.	115.816, -32.0856
R89-T105	JadeL	Marri	55	No	No		115.816, -32.0857
R89-T106	JadeL	Dead unknown	70	Yes	No	Lorikeets in tree. No evidence of hollow use.	115.8162, -32.0853
R89-T107	JadeL	Jarrah	95	Yes	No	Not suitable, no evidence of use.	115.8167, -32.0851
R89-T108	JadeL	Tuart	80	No	No		115.8168, -32.085
R89-T109	JadeL	Jarrah	75	No	No		115.817, -32.087
R89-T110	JadeL	Marri	55	No	No		115.8172, -32.0854
R89-T111	JadeL	Tuart	80	No	No		115.8173, -32.0847
R89-T112	JadeL	Marri	60	No	No		115.818, -32.0842
R89-T113	JadeL	Marri	95	No	No		115.8181, -32.0842
R89-T114	JadeL	Dead Tuart	50	Yes	Yes	Multiple suitable hollows.	115.7948, -32.0888
R89-T115	JadeL	Tuart	60	Yes	Yes	Lorikeets in hollow.	115.795, -32.0888
R89-T116	JadeL	Tuart	60	Yes	Yes	Multiple suitable hollows. Bees and Corellas in hollows. Rainbow Lorikeets in tree.	115.796, -32.0903
R89-T117	JadeL	Tuart	95	Yes	Yes	Potentially suitable hollow. No evidence of use.	115.7997, -32.0883
R89-T118	JadeL	Dead unknown	80	Yes	Yes	Branches have been cut off, leaving multiple large hollows, although quite open and exposed	115.8034, -32.0889
R89-T119	JadeL	Dead unknown	50	Yes	No	4 branch hollows. Tree has been burnt.	115.815, -32.0859
R89-T120	JadeL	Marri	50	No	No	Smaller, foraging tree.	115.8077, -32.0878
R89-T121	JadeL	Marri	60	No	No	Foraging tree.	115.8076, -32.0877
R89-T122	JadeL	Tuart	50	No	No		115.7955, -32.0804
R89-T123	JadeL	Tuart	50	No	No		115.7957, -32.0809
R89-T124	JadeL	Tuart	50	No	No		115.796, -32.0819
R89-T125	JadeL	Jarrah	50	No	No		115.7961, -32.0823
R89-T126	JadeL	Tuart	50	Yes	No	Multiple smaller branch hollows. Bee hive present in one hollow. Galahs in tree.	115.7908, -32.0859
R89-T127	JohnS	Dead Unknown	50	Yes	Yes	Galah on hollow. Bees in hollow.	115.7929, -32.088

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Tree number	Recorder	Species	DBH (cm)	Hollows present	Hollows suitable	Notes	Coordinates
R89-T128	JohnS	Tuart	50	Yes	Yes	Bees in hollow.	115.7931, -32.0877
R89-T129	JohnS	Tuart	60	No	No		115.7997, -32.0886
R89-T130	JohnS	Tuart	60	No	No		115.7962, -32.0881
R89-T131	JohnS	Tuart	80	No	No		115.7867, -32.0857
R89-T132	JohnS	Tuart	60	No	No		115.7832, -32.0852
R89-T133	JohnS	Marri	80	No	No		115.7833, -32.0847
R89-T134	JohnS	Tuart	50	No	No		115.7801, -32.0843
R89-T135	JohnS	Unknown Euc sp	70	No	No	Multitrunk, exotic eucalypt species.	115.7772, -32.0846
R89-T136	JohnS	Marri	60	No	No	In front yard.	115.7773, -32.0831
R89-T137	JohnS	Tuart	50	No	No		115.7901, -32.0868
R89-T138	JohnS	Tuart	50	Yes	No	Not suitable, no evidence of use.	115.7902, -32.0867
R89-T139	JohnS	Tuart	50	Yes	No	Not suitable, no evidence of use.	115.7903, -32.0866
R89-T140	JohnS	Tuart	50	Yes	No	Not suitable, no evidence of use.	115.7904, -32.087
R89-T141	JohnS	Tuart	50	No	No		115.7905, -32.0867
R89-T142	JohnS	Tuart	50	No	No		115.7905, -32.0866
R89-T143	JohnS	Tuart	50	No	No		115.7905, -32.0869
R89-T144	JohnS	Tuart	50	No	No		115.7905, -32.0868
R89-T145	JohnS	Tuart	50	Yes	No	Not suitable, no evidence of use.	115.7906, -32.0869
R89-T146	JohnS	Tuart	50	No	No		115.7909, -32.0872
R89-T147	JohnS	Tuart	50	Yes	No	Not suitable, no evidence of use.	115.7923, -32.0877
R89-T148	JohnS	Tuart	50	No	No		115.7926, -32.0869
R89-T149	JohnS	Tuart	50	No	No		115.7932, -32.0875
R89-T150	JohnS	Dead Unknown	50	No	No		115.7934, -32.0881
R89-T151	JohnS	Jarrah	50	No	No		115.7936, -32.088
R89-T152	JohnS	Tuart	50	Yes	No	Not suitable, no evidence of use.	115.7936, -32.0879
R89-T153	JohnS	Tuart	50	No	No		115.7938, -32.0876

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Tree number	Recorder	Species	DBH (cm)	Hollows present	Hollows suitable	Notes	Coordinates
R89-T154	JohnS	Tuart	50	No	No		115.794, -32.0872
R89-T155	JohnS	Dead Unknown	50	Yes	No	Not suitable, no evidence of use.	115.7941, -32.0882
R89-T156	JohnS	Tuart	50	No	No		115.7941, -32.0873
R89-T157	JohnS	Jarraah	50	No	No		115.7943, -32.0877
R89-T158	JohnS	Tuart	50	No	No		115.7943, -32.0878
R89-T159	JohnS	Tuart	50	Yes	No	Not suitable, no evidence of use.	115.7945, -32.0881
R89-T160	JohnS	Tuart	50	Yes	No	Not suitable, no evidence of use.	115.7949, -32.0885
R89-T161	JohnS	Jarraah	50	Yes	No	Not suitable, no evidence of use.	115.795, -32.0878
R89-T162	JohnS	Tuart	50	No	No		115.795, -32.0878
R89-T163	JohnS	Tuart	50	Yes	No	Not suitable, no evidence of use.	115.7953, -32.0885
R89-T164	JohnS	Tuart	50	No	No		115.7954, -32.0875
R89-T165	JohnS	Jarraah	50	No	No		115.7958, -32.0884
R89-T166	JohnS	Jarraah	50	No	No		115.7959, -32.0881
R89-T167	JohnS	Tuart	50	No	No		115.7962, -32.0883
R89-T168	JohnS	Tuart	50	No	No		115.7963, -32.0886
R89-T169	JohnS	Tuart	50	No	No		115.7963, -32.0887
R89-T170	JohnS	Tuart	50	No	No		115.7963, -32.0883
R89-T171	JohnS	Tuart	50	No	No		115.7964, -32.0886
R89-T172	JohnS	Jarraah	50	No	No		115.7964, -32.0882
R89-T173	JohnS	Tuart	50	No	No		115.7964, -32.0888
R89-T174	JohnS	Tuart	50	No	No		115.7964, -32.0877
R89-T175	JohnS	Tuart	50	No	No		115.7965, -32.0876
R89-T176	JohnS	Tuart	50	No	No		115.7965, -32.0884
R89-T177	JohnS	Tuart	50	No	No		115.7965, -32.0882
R89-T178	JohnS	Tuart	50	No	No		115.7965, -32.0888
R89-T179	JohnS	Tuart	50	Yes	No	Marginal. No evidence of use.	115.7966, -32.0866

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Tree number	Recorder	Species	DBH (cm)	Hollows present	Hollows suitable	Notes	Coordinates
R89-T180	JohnS	Marri	50	No	No		115.7967, -32.0855
R89-T181	JohnS	Tuart	50	Yes	No	Not suitable, no evidence of use.	115.7967, -32.0878
R89-T182	JohnS	Tuart	50	No	No		115.7967, -32.0877
R89-T183	JohnS	Tuart	50	No	No		115.7967, -32.0863
R89-T184	JohnS	Tuart	50	No	No		115.7969, -32.0878
R89-T185	JohnS	Tuart	50	No	No		115.7969, -32.0877
R89-T186	JohnS	Jarraah	50	Yes	No	Too low to be suitable. No evidence of use.	115.797, -32.0878
R89-T187	JohnS	Jarraah	50	No	No		115.7971, -32.0883
R89-T188	JohnS	Jarraah	50	Yes	No	Not suitable, no evidence of use.	115.7973, -32.0854
R89-T189	JohnS	Marri	50	No	No		115.7976, -32.0854
R89-T190	JohnS	Marri	50	No	No		115.7976, -32.0852
R89-T191	JohnS	Marri	50	No	No		115.7977, -32.085
R89-T192	JohnS	Marri	50	No	No		115.7978, -32.0851
R89-T193	JohnS	Jarraah	50	Yes	No	Too low to be suitable. No evidence of use.	115.7979, -32.0883
R89-T194	JohnS	Jarraah	50	No	No		115.798, -32.0893
R89-T195	JohnS	Jarraah	50	No	No		115.7981, -32.0892
R89-T196	JohnS	Jarraah	50	Yes	No	Not suitable, no evidence of use.	115.7981, -32.0894
R89-T197	JohnS	Tuart	50	No	No		115.7983, -32.0887
R89-T198	JohnS	Tuart	50	No	No		115.7984, -32.089
R89-T199	JohnS	Tuart	50	No	No		115.7985, -32.0889
R89-T200	JohnS	Tuart	50	No	No		115.7987, -32.0886
R89-T201	JohnS	Tuart	50	No	No		115.7988, -32.089
R89-T202	JohnS	Jarraah	50	No	No		115.7992, -32.0889
R89-T203	JohnS	Tuart	50	No	No		115.7994, -32.089
R89-T204	JohnS	Tuart	50	No	No		115.8008, -32.0888
R89-T205	JohnS	Jarraah	50	Yes	No	Too low and shallow to be suitable. No evidence of use.	115.8008, -32.089

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Tree number	Recorder	Species	DBH (cm)	Hollows present	Hollows suitable	Notes	Coordinates
R89-T206	JohnS	Dead Tuart	50	Yes	No	Too low, very open. No evidence of use.	115.8024, -32.0895
R89-T207	JohnS	Marri	50	No	No		115.8026, -32.0893
R89-T208	JohnS	Marri	50	No	No		115.8027, -32.0892
R89-T209	JohnS	Jarrah	50	No	No		115.8034, -32.0898
R89-T210	JohnS	Jarrah	50	No	No		115.8036, -32.0899
R89-T211	JohnS	Tuart	50	Yes	No	Not suitable, no evidence of use.	115.8043, -32.09
R89-T212	JohnS	Tuart	50	No	No		115.8046, -32.0895
R89-T213	JohnS	Dead Jarrah	50	Yes	No	Too Low, close to road and path. No evidence of use.	115.8047, -32.0895
R89-T214	JohnS	Jarrah	50	No	No		115.8051, -32.0899
R89-T215	JohnS	Dead Tuart	50	Yes	No	Not suitable, no evidence of use.	115.8051, -32.0896
R89-T216	JohnS	Tuart	50	No	No		115.8054, -32.0899
R89-T217	JohnS	Tuart	50	No	No		115.8056, -32.0896
R89-T218	JohnS	Tuart	50	Yes	No	Not suitable, no evidence of use.	115.8066, -32.0897
R89-T219	JohnS	Tuart	50	No	No		115.8069, -32.0896
R89-T220	JohnS	Jarrah	50	No	No		115.807, -32.0897
R89-T221	JohnS	Jarrah	50	No	No		115.8074, -32.0896
R89-T222	JohnS	Marri	50	No	No		115.8076, -32.0905
R89-T223	JohnS	Marri	50	No	No		115.8076, -32.0907
R89-T224	JohnS	Marri	50	No	No		115.8076, -32.091
R89-T225	JohnS	Marri	50	No	No		115.8082, -32.0887
R89-T226	JohnS	Marri	50	No	No		115.8083, -32.0883
R89-T227	JohnS	Marri	50	No	No		115.8083, -32.0883
R89-T228	JohnS	Dead Unknown	50	Yes	No	Too shallow and low. No evidence of use.	115.8085, -32.089
R89-T229	JohnS	Marri	50	No	No		115.8088, -32.0891
R89-T230	JohnS	Marri	50	No	No		115.8092, -32.0888
R89-T231	JohnS	Marri	50	No	No		115.8093, -32.0887

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Tree number	Recorder	Species	DBH (cm)	Hollows present	Hollows suitable	Notes	Coordinates
R89-T232	JohnS	Marri	50	No	No		115.8094, -32.0881
R89-T233	JohnS	Marri	50	No	No		115.8094, -32.0885
R89-T234	JohnS	Marri	50	No	No		115.8095, -32.0882
R89-T235	JohnS	Marri	50	No	No		115.8096, -32.0882
R89-T236	JohnS	Marri	50	No	No		115.8099, -32.0877
R89-T237	JohnS	Marri	50	No	No		115.8099, -32.0886
R89-T238	JohnS	Marri	50	No	No		115.81, -32.0879
R89-T239	JohnS	Marri	50	No	No		115.81, -32.0877
R89-T240	JohnS	Marri	50	No	No		115.81, -32.0879
R89-T241	JohnS	Marri	50	No	No		115.8102, -32.0877
R89-T242	JohnS	Marri	50	No	No		115.8104, -32.0878
R89-T243	JohnS	Marri	50	No	No		115.8116, -32.0874
R89-T244	JohnS	Marri	50	No	No		115.8117, -32.0879
R89-T245	JohnS	Marri	50	No	No		115.8117, -32.0875
R89-T246	JohnS	Dead Jarrah	50	No	No		115.8118, -32.0879
R89-T247	JohnS	Marri	50	No	No		115.8121, -32.0871
R89-T248	JohnS	Marri	50	No	No		115.8121, -32.0878
R89-T249	JohnS	Marri	50	No	No		115.8123, -32.0879
R89-T250	JohnS	Marri	50	No	No		115.8124, -32.0876
R89-T251	JohnS	Marri	50	No	No		115.8125, -32.0876
R89-T252	JohnS	Marri	50	No	No		115.8125, -32.0878
R89-T253	JohnS	Marri	50	No	No		115.8152, -32.087
R89-T254	JohnS	Marri	50	No	No		115.8154, -32.087
R89-T255	JohnS	Marri	50	No	No		115.8155, -32.0869
R89-T256	JohnS	Marri	50	No	No		115.8161, -32.0867
R89-T257	JohnS	Tuart	50	No	No		115.8163, -32.0866

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Tree number	Recorder	Species	DBH (cm)	Hollows present	Hollows suitable	Notes	Coordinates
R89-T258	JohnS	Tuart	50	No	No		115.8165, -32.0866
R89-T259	JohnS	Jarrah	50	No	No		115.8167, -32.0865
R89-T260	JohnS	Tuart	50	No	No		115.817, -32.0863
R89-T261	JohnS	Marri	50	No	No		115.817, -32.0861
R89-T262	JohnS	Jarrah	50	No	No		115.817, -32.0863
R89-T263	JohnS	Tuart	50	Yes	No	Not suitable, no evidence of use.	115.8171, -32.0863
R89-T264	JohnS	Tuart	50	No	No		115.8172, -32.0867
R89-T265	JohnS	Marri	50	No	No		115.8177, -32.0874
R89-T266	JohnS	Dead Unknown	50	No	No		115.8181, -32.0848
R89-T267	JohnS	Tuart	50	No	No		115.8181, -32.0848
R89-T268	JohnS	Jarrah	50	Yes	No	Not suitable, no evidence of use.	115.8182, -32.0847
R89-T269	JohnS	Jarrah	50	No	No		115.8182, -32.0846
R89-T270	JohnS	Tuart	50	Yes	Yes	Numerous hollows. Bees in hollow.	115.7972, -32.0843
R89-T271	JohnS	Jarrah	50	Yes	No	Marginally suitable. Tree has been burnt.	115.7982, -32.0895
R89-T272	JohnS	Jarrah	50	Yes	Yes	Marginally suitable. Bees present.	115.8051, -32.0897
R89-T273	JohnS	Dead Marri	50	Yes	Yes	Bees in hollow.	115.8137, -32.0873
R89-T274	JohnS	Unknown Dead	50	Yes	No	Not suitable, no evidence of use.	115.7952, -32.08
R89-T275	JohnS	Tuart	60	No	No		115.7953, -32.0799
R89-T276	JohnS	Tuart	50	No	No		115.7952, -32.0799
R89-T277	JohnS	Tuart	50	No	No		115.7952, -32.0799
R89-T278	JohnS	Tuart	50	No	No		115.7951, -32.0797
R89-T279	JohnS	Tuart	50	No	No		115.795, -32.0796
R89-T280	JohnS	Tuart	50	No	No		115.7948, -32.0794
R89-T281	JohnS	Tuart	50	No	No		115.7948, -32.0792
R89-T282	JohnS	Tuart	50	No	No		115.7947, -32.0792
R89-T283	JohnS	Tuart	80	No	No		115.7952, -32.0797

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Tree number	Recorder	Species	DBH (cm)	Hollows present	Hollows suitable	Notes	Coordinates
R89-T284	JohnS	Tuart	50	No	No		115.7956, -32.0804
R89-T285	JohnS	Marri	75	No	No	Some branches dead.	115.7954, -32.0792
R89-T286	JohnS	Tuart	70	No	No		115.7984, -32.0881
R89-T287	JohnS	Tuart	70	Yes	No	Not suitable, no evidence of use.	115.7662, -32.0789
R89-T288	JohnS	Tuart	50	No	No		115.7663, -32.0787
R89-T289	JohnS	Marri	60	No	No		115.795, -32.0794
R89-T290	JohnS	Tuart	70	No	No		115.7952, -32.0797
R89-T291	JohnS	Tuart	60	No	No		115.7954, -32.0799
R89-T292	JohnS	Tuart	50	No	No		115.7752, -32.084
R89-T293	JohnS	Tuart	50	No	No	Could not access.	115.7755, -32.0841
R89-T294	JohnS	Tuart	70	No	No	Could not access.	115.7758, -32.0842
R89-T295	JohnS	Unknown Euc sp	50	No	No	Exotic eucalypt species.	115.776, -32.0842

Black Cockatoo habitat assessment and basic fauna survey for the Roe 8 (West) and Roe 9 Project
 Prepared for RPS AAP Consulting Pty Ltd, on behalf of The Department of Planning, Lands and Heritage

Appendix 5 Black Cockatoo foraging habitat scoring tool (DAWE 2022b)

Table A1 Foraging quality scoring tool template

Starting score	Baudin's Cockatoo	Carnaby's Cockatoo	Forest Red-tailed Black-Cockatoo
10	Start at a score of 10 if your site is native eucalypt woodlands and forest, and proteaceous woodland and heath, particularly Marri, within the range of the species, including along roadsides and parkland cleared areas. Can include planted vegetation. This tool only applies to sites equal to or larger than 1 hectare in size.	Start at a score of 10 if your site is native shrubland, kwongan heathland or woodland, dominated by proteaceous plant species such as <i>Banksia</i> spp. (including <i>Dryandra</i> spp.), <i>Hakea</i> spp. and <i>Grevillea</i> spp., as well as native eucalypt woodland and forest that contains foraging species, within the range of the species, including along roadsides and parkland cleared areas. Also includes planted native vegetation. This tool only applies to sites equal to or larger than 1 hectare in size.	Start at a score of 10 if your site is Jarrah or Marri woodland and/or forest, or if it is on the edge of Karri forest, or if Wandoo and Blackbutt occur on the site, within the range of the subspecies, including along roadsides and parkland cleared areas. This tool only applies to sites equal to or larger than 1 hectare in size.
Attribute	Sub-tractions	Context adjustor (attributes reducing functionality of foraging habitat)	
Foraging potential	-2	Subtract 2 from your score if there is no evidence of feeding debris on your site.	Subtract 2 from your score if there is no evidence of feeding debris on your site.
Connectivity	-2	Subtract 2 from your score if you have evidence to conclude that there is no other foraging habitat within 12 km of your site.	Subtract 2 from your score if you have evidence to conclude that there is no other foraging habitat within 12 km of your site.
Proximity to breeding	-2	Subtract 2 if you have evidence to conclude that your site is more than 12 km from breeding habitat	Subtract 2 if you have evidence to conclude that your site is more than 12 km from breeding habitat.
Proximity to roosting	-1	Subtract 1 if you have evidence to conclude that your site is more than 20 km from a known night roosting habitat.	Subtract 1 if you have evidence to conclude that your site is more than 20 km from a known night roosting habitat.
Impact from significant plant disease	-1	Subtract 1 if your site has disease present (e.g. <i>Phytophthora</i> spp. or Marri canker) and the disease is affecting more than 50% of the preferred food plants present.	Subtract 1 if your site has disease present (e.g. <i>Phytophthora</i> spp. or Marri canker) and the disease is affecting more than 50% of the preferred food plants present.
Total score		<i>Enter score</i>	<i>Enter score</i>
Appraisal	To support your habitat score, you should provide an overall appraisal of the habitat on the impact site and within 20km of the impact area to clearly explain and justify the score. It should include discussion on the foraging habitat's proximity to other resources (e.g. exact distance to proximate resources), frequency of use of proximate sites, the degree of evidence and description of vegetation type and condition.		

Appendix C
Phytophthora dieback occurrence
assessment

RPS AAP Consulting Pty Ltd

Roe Highway Stages 8/9

Phytophthora Dieback occurrence assessment – Version 2.0



<i>Client</i>	RPS AAP Consulting Pty Ltd
<i>Report name</i>	Roe Highway Stages 8/9

This report has been prepared in accordance with the scope of work agreed between RPS AAP Consulting Pty Ltd and Glevan Consulting and contains results and recommendations specific to the agreement. Results and recommendations in this report should not be referenced for other projects without the written consent of Glevan Consulting.

Procedures and guidelines stipulated in various manuals, particularly Phytophthora dieback Interpreters Manual for lands managed by the Department (DBCA), are applied as the base methodology used by Glevan Consulting in the delivery of the services and products required by this scope of work. These guidelines, along with overarching peer review and quality standards ensure that all results are presented to the highest standard.

Glevan Consulting has assessed areas based on existing evidence presented at the time of assessment. The Phytophthora pathogen may exist in the soil as incipient disease. Methods have been devised and utilised that compensate for this phenomenon; however, very new centres of infestation, that do not present any visible evidence, may remain undetected during the assessment.

Executive Summary

Glevan Consulting conducted an assessment of the study area associated with the proposed Roe Highway Stage 8 and Stage 9 projects for the presence of *Phytophthora* dieback. The Study Area is located between North Lake road, Bibra Lake and Bellion Drive, Hamilton Hill. The study area covers a total of 105 hectares.

The assessment was conducted between the 16-08-2022 and the 07-10-2022 by Simon Robinson and Samuel Williams. No records or evidence of previous *Phytophthora* dieback assessments for the study area were observed.

No *Phytophthora* dieback infestations were identified during the assessment. The majority (67.36 ha) of the study area was excluded from assessment due to being either degraded or devoid of vegetation (Figure 2). A total of 25.01 ha was observed to be uninfested. An additional 11.06 ha of the study area was observed to be uninterpretable due to a lack of reliable indicator species. The remaining 1.57 ha was mapped as temporarily uninterpretable due to recent disturbance factors.

Eight soil and tissue samples were taken during the assessment, all of which produced a negative result.

The assessment is valid for 12 months and will expire in October 2023.

Table of Contents

1	<i>Introduction</i>	1
1.1	Location of Project Area	1
2	<i>Background</i>	3
3	<i>Materials and methods</i>	4
3.1	The Assessment Area	4
3.2	The Assessment Method	5
3.3	Collection of Evidence of Phytophthora Dieback	6
3.4	Sampling	7
4	<i>Results</i>	8
4.1	Disease Distribution	8
4.2	Other Phytophthora Species	8
4.3	Ecosystem Health	8
4.4	<i>Armillaria luteobubalina</i>	8
4.5	Allocation of Categories	9
4.6	Sample Results	9
5	<i>Discussion</i>	11
6	<i>Bibliography</i>	13
7	<i>Appendices</i>	14
7.1	Sample Summary	14
7.2	Phytophthora Dieback Occurrence Map	15
7.3	Mapping Metadata	16
7.4	Shapefile Spatial Data	16

List of Figures

Figure 1 - Study area location.....	2
Figure 2 - Occurrence Map	17

List of Tables

Table 1 - Keighery Vegetation Condition Scale	4
Table 2 - <i>Phytophthora</i> dieback assessment for vegetation condition	5

1 Introduction

Glevan Consulting was commissioned by RPS on behalf of the Department of Planning, Lands and Heritage to conduct an assessment of the study area associated with the proposed Roe Highway Stage 8 and Stage 9 projects for the presence of *Phytophthora* dieback. This *Phytophthora* dieback assessment is part of the baseline environmental surveys required prior to the commencement of disturbance activities.

1.1 Location of Project Area

The study area is located between North Lake Road, Bibra Lake and Bellion Drive, Hamilton Hill. The study area covers a total of 105 hectares (Figure 1).

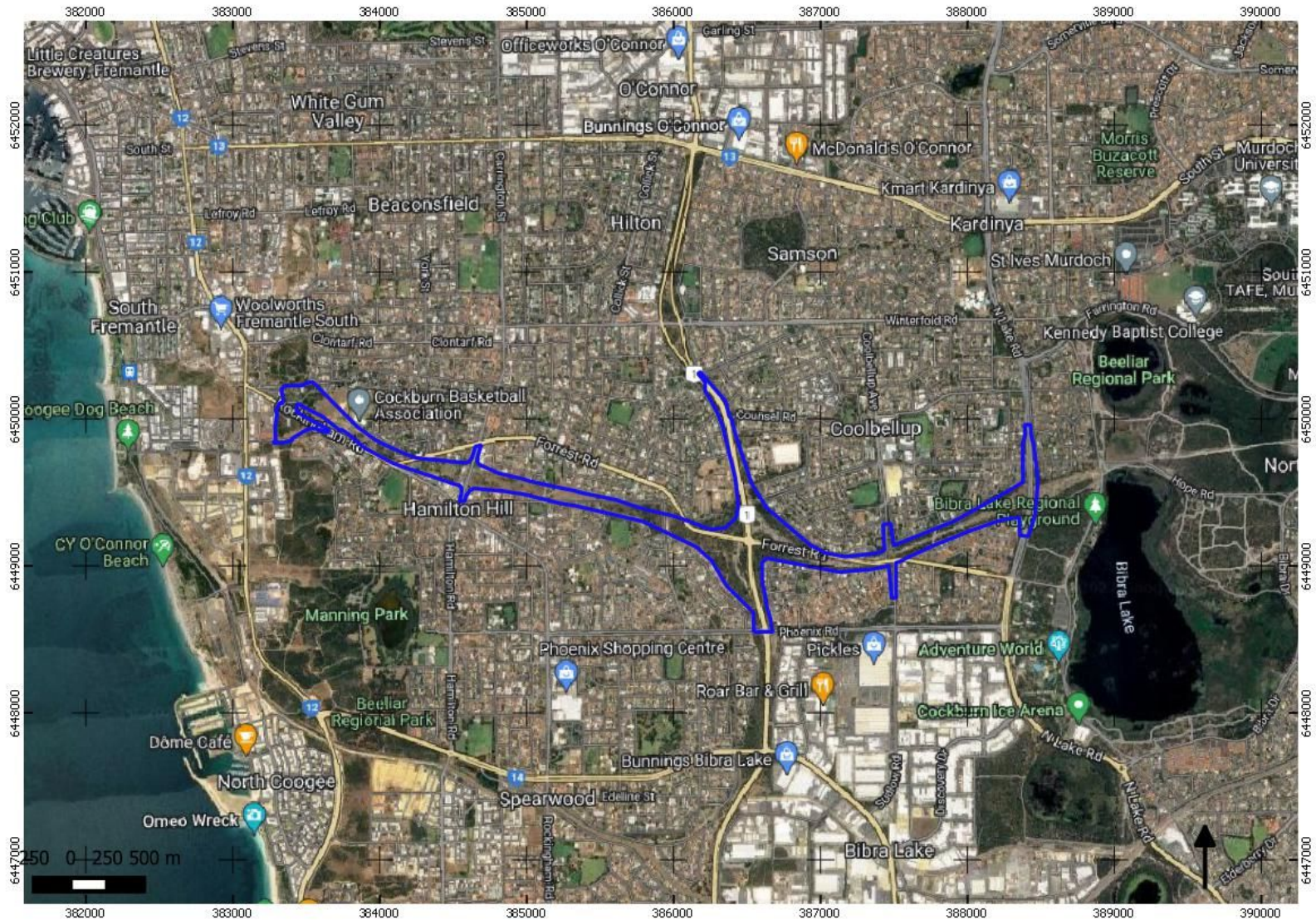


Figure 1 - Study area location

2 Background

Thousands of Australian native plant species are susceptible to *Phytophthora* dieback—a destructive disease caused by the pathogen *Phytophthora cinnamomi* and other *Phytophthora* species. This disease is a major threat to Australia’s biodiversity, placing important plant species at risk of death, local extirpation or even extinction. Its dramatic impact on plant communities can also result in major declines in some insect, bird and animal species due to the loss of shelter, nesting sites and food sources. *Phytophthora* dieback can cause permanent damage to ecosystems. Once an area is infested with the pathogen, eradication is usually impossible. Awareness that human activity can easily spread the pathogen will help prevent an increase in the extent of this disease. (Commonwealth of Australia, 2018)

Phytophthora is a microscopic water mould that belongs to the class Oomycetes. Oomycete organisms are filamentous and absorptive and reproduce both sexually and asexually. *Phytophthoras* are considered parasitic. It behaves largely as a necrotrophic pathogen causing damage to the host plant’s root tissues because of infection and invasion. (Department of Parks and Wildlife, 2015) The pathogen infects a host when it enters at a cellular level and damages the cell structure.

Phytophthora dieback is the result of interaction between three physical components forming a ‘disease triangle’: the pathogen (*Phytophthora* spp.), the environment and the host. All three components are needed for the disease to develop over time.

The relationship between the presence of *Phytophthora* and the development of *Phytophthora* dieback disease is variable based on the susceptibility of native plant species and the different environmental characteristics, landform types and rainfall zones across bioregions.

3 Materials and methods

3.1 The Assessment Area

Areas within the project area will be excluded from assessment if the vegetation is suffering from significant disturbance. This disturbance (Table 1Error! Reference source not found.) is based on Vegetation Condition Scales (Keighery, 1994). The remaining area, including area outside of the project area if necessary, will be categorised post assessment into *Phytophthora* dieback occurrence categories (Table 2).

Table 1 - Keighery Vegetation Condition Scale

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

Table 2 - *Phytophthora* dieback assessment for vegetation condition

Vegetation Condition	<i>Phytophthora</i> occurrence category
Naturally vegetated areas. Keighery disturbance rating of 3 or less <i>Phytophthora</i> occurrence categorisation is possible. Vegetation with rating of 4 may be interpretable – Interpreter discretion required	Infested - Determined to have plant disease symptoms consistent with the presence of <i>Phytophthora cinnamomi</i> .
	Uninfested - Determined to be free of plant disease symptoms that indicate the presence of <i>P. cinnamomi</i>
	Uninterpretable - Undisturbed areas where susceptible plants are absent, or too few to make a determination of the presence or absence of <i>P. cinnamomi</i> .
	Not yet resolved.
Vegetation structure temporarily altered.	Temporarily Uninterpretable - Areas of disturbance where natural vegetation is likely to recover.
Vegetation structure severely altered. Keighery disturbance rating 4 or greater. <i>Phytophthora</i> occurrence assessment is not possible	Excluded.

3.2 The Assessment Method

All *Phytophthora* dieback detection, diagnosis and mapping will be performed to standards and procedures defined in FEM047 *Phytophthora* dieback Interpreter's Manual (DPaW, 2015) Chapter 6. These procedures are grounded on the presence in the vegetation of Indicator Species, and the observance of deaths in these plants. An indicator species is a plant species that is reliably susceptible to *Phytophthora cinnamomi*. Indicator species deaths (ISDs) alone do not necessarily indicate disease presence and it is necessary to consider all environmental and ecological factors that may be present. These other factors (as listed in FEM047) include:

- Chronology of deaths;
- Pattern of deaths;
- Topographical position;
- Vectoring – causal agencies, and;
- Biomass and biological diversity reduction.

Other causes of plant deaths need to be considered when determining the presence of *Phytophthora* dieback, including (from FEM047):

- *Armillaria luteobubalina*;
- various cankers;
- insects;
- drought, wind scorch and frost;
- salinity and waterlogging;
- fire and lightning;
- senescence and competition;
- physical damage, and;
- herbicides and chemical spills.

The assessment type will be either a comprehensive assessment using transects (demarcating all obvious infested areas and then systematically assessing remaining areas using transects) or a linear assessment (when a proposed activity is linear in nature, such as along a utility easement or road) using standards defined by Chapter 8, FEM047.

Prior to assessment, all relevant information relevant to the project will be assembled to assist the interpretation process (as defined in Chapter 7, FEM047). This information may include previous assessments of the area, history of burning and possible other disturbances.

3.3 Collection of Evidence of Phytophthora Dieback

During the assessment process, the collection of evidence to support the field diagnosis is recorded using a tablet running the Field Maps application. Waypoints are recorded at locations to show evidence of:

- where field diagnosis is certain or almost certain of *Phytophthora* dieback infestation;
- healthy indicator species where field diagnosis is almost certain of the site being uninfested;
- sites with too few or devoid of indicator species, thus supporting uninterpretable classification, or
- areas of disturbance, which are temporarily uninterpretable or excluded from assessment.

Additional waypoints recorded include:

- Points located at soil and tissue sample sites with *Phytophthora cinnamomi* result;
- Points located at sites known to be infested by *Phytophthora* species other than *Phytophthora cinnamomi*;
- Points located where field diagnosis is certain or almost certain of *Armillaria*;
- points requiring soil and tissue sampling;
- points located where samples have been taken, results pending;
- points located at ISDs, and
- points that need to be revisited for further examination.

3.4 Sampling

Any soil and tissue samples taken during the assessment will be to standards and prescriptions defined in Chapter 11 of FEM047. All samples are analysed in the Vegetation Health Services (DBCA) laboratory using best-practice techniques.

4 Results

4.1 *Disease Distribution*

No *Phytophthora* dieback infestations were identified during the assessment. The majority (67.36 ha) of the study area was excluded from assessment due to being either degraded or devoid of vegetation (Figure 2). A total of 25.01 ha was observed to be uninfested. An additional 11.06 ha of the study area was observed to be uninterpretable due to a lack of reliable indicator species. The remaining 1.57 ha was mapped as temporarily uninterpretable due to recent disturbance factors (Table 3).

A desktop assessment indicated that *Phytophthora* had not previously been identified within, or in close proximity to the study area.

4.2 *Other Phytophthora Species*

No other species of *Phytophthora* were observed during the assessment.

4.3 *Ecosystem Health*

The vegetation in the uninfested and uninterpretable areas exhibited good health, albeit with varying degrees of weed infestation. The vegetated areas that were excluded from assessment were degraded with little or no understorey.

4.4 *Armillaria luteobubalina*

Evidence of Armillaria Rot Disease (ARD) was observed near the site where sample 2 was taken. The characteristic white mycelium was observed on the roots of a *Banksia menziesii* specimen that had fallen over.

4.5 Allocation of Categories

Table 3 - Assessment area statement

Category	Area (ha)	Protectable Area (ha)	% of Assessed Area
Infested	0.00	0.00	0.00
Uninfested	25.01	4.40	66.00
Uninterpretable	11.06	0.00	29.00
Temporarily Uninterpretable	1.57	0.00	5.00
Assessed Area	37.64		
Excluded	67.36		

4.6 Sample Results

Eight soil and tissue samples were taken during the assessment, all of which produced a negative result (Figure 2).

The following table (Table 4) shows the need for sampling to assist the disease diagnosis process (Department of Parks and Wildlife, 2015)

Table 4 - Determination of requirement for sampling

Observable factors indicating likelihood of <i>Phytophthora cinnamomi</i> presence				
ISD type	Multiple	Cluster	Scattered	Isolated
Species	Some or most indicator species	Any indicator plant	Any indicator plant	Any indicator plant
Pattern development	Obvious			Not obvious
Chronology	Obvious			Not obvious
Topographic situation	Gully/flat	Lower to mid slope	Mid slope to upper slope	Ridge
Causal agent	Obvious			Not obvious
Requirement for soil and tissue sample	Low	High	High	Low

Samples may also be taken for the following strategic reasons:

- Supporting infested field diagnosis;
- Incipient, subtle or cryptic disease in apparent uninfested sites, or
- Altering mapped infested area boundaries.

5 Discussion

The study area is located on the Spearwood dune system, meaning there is a very low likelihood of disease symptoms associated with *Phytophthora cinnamomi* being present. This dune systems is comprised of calcareous sands and has a relatively high pH level. These soils are generally hostile to the pathogen *P. cinnamomi* and it is unable to proliferate and manifest as visible disease symptoms.

Other species of *Phytophthora* can establish successfully as a disease on the soils of the Spearwood dunes, however these species are typically much less virulent and destructive and would likely have little impact if present.

The majority of the study area was comprised of roads and cleared road verge that was excluded from assessment. Small sections of the study area contained remnant vegetation that was degraded and contained little or no understorey/midstorey vegetation. These areas were also excluded from assessment.

The mappable vegetation also exhibited evidence of historical disturbance (and subsequent weed invasion), however there was still a sufficient coverage of reliable indicator species in these areas, allowing the dieback status to be determined. These areas were all observed to be uninfested.

Other areas contained vegetation in very good or excellent condition, however the dieback status could not be determined due to an insufficient coverage / absence of reliable indicator species. These areas were classified as uninterpretable.

Three areas that appeared to have been recently revegetated were classified as temporarily uninterpretable. The vegetation was not yet well enough established for the dieback status to be determined. It is expected that these areas will become interpretable in two to three years.

Due to the very low probability of *Phytophthora* dieback being present in the study area, it is considered unnecessary to have clean on entry (CoE) points on the boundaries between dieback category changes. In terms of the required hygiene measures, ensuring that vehicles and machinery are clean upon arrival to site should be sufficient. The following hygiene measures are recommended:

- Vehicles and machinery, tools and equipment, boots etc. should be clean prior to entering the study area. This is best achieved by cleaning down at the depot prior to departure, which should ensure that vehicles and equipment are clean on arrival to site.
- Soil and plant material should not be transported from the excluded, uninterpretable or temporarily uninterpretable sections of the study area for use at any other protectable area.
- The introduction of soil and plant material of infested or unknown dieback status should be avoided.
- After working in the excluded, uninterpretable or temporarily uninterpretable areas, vehicles and machinery, tools and equipment, boots etc. should be cleaned prior to working at any other sites containing protectable areas.

6 Bibliography

Commonwealth of Australia. (2018). *Threat abatement plan for disease in natural ecosystems caused by Phytophthora cinnamomi*.

Department of Parks and Wildlife. (2015). *FEM047 Phytophthora dieback Interpreter's Manual for lands managed by the department*. Unpublished.

Keighery, B. (1994). *Bushland Plant Survey: a Guide to Plant Community Survey for the Community*. Wildflower Society of WA (Inc.).

7 Appendices

7.1 Sample Summary

Sample	Plant Sampled	Easting	Northing	Result
1	<i>Xanthorrhoea preissii</i>	386431	6449396	Negative
2	<i>Macrozamia riedlei</i>	388327	6449483	Negative
3	<i>Xanthorrhoea preissii</i>	387975	6449483	Negative
4	<i>Xanthorrhoea preissii</i>	387727	6449177	Negative
5	<i>Xanthorrhoea preissii</i>	386988	6449009	Negative
6	<i>Xanthorrhoea gracilis</i>	387050	6449011	Negative
7	<i>Hakea prostrata</i>	386312	6449172	Negative
8	<i>Banksia sessilis</i>	385980	6449242	Negative

7.2 *Phytophthora* Dieback Occurrence Map

The provided map is the *Phytophthora* dieback occurrence map.

The project area is displayed as a blue boundary line. The following categories are also shown (if present in the project area):

- Excluded (shown as uncoloured). Areas of high disturbance where natural vegetation has been cleared and is unlikely to recover to a level that is interpretable.
- Infested (shown as a red). Determined from the assessment to have plant disease *Phytophthora* dieback.
- Uninfested (shown as green). Determined from the assessment to be free of plant disease *Phytophthora* dieback.
- Uninterpretable (shown as a purple). Undisturbed areas where susceptible plants are absent, or too few to decide the presence or absence of *Phytophthora* dieback.
- Not yet resolved (shown as pale blue). *Phytophthora* occurrence diagnosis cannot be made at the time of assessment because of inconsistent or incomplete evidence.
- Temporarily Uninterpretable (shown as grey). Areas of disturbance where natural vegetation is likely to recover.

Additional spatial data that may be shown include:

- Sample location with result, and;

Phytophthora dieback is a dynamic disease with autonomous spread of the pathogen not expected to be more than three metres a year upslope in average conditions. In unusual circumstances, such as heavy spring, summer or autumn rainfall, the spread of the disease may be rapid and breach the buffers. These buffers however provide the best chance of hygienic operating conditions within protectable areas over a set twelve-month period. The information on *Phytophthora* occurrence maps then becomes obsolete.

7.3 Mapping Metadata

DATASET DESCRIPTION	
Title	Roe Hwy Stages 8/9 dieback assessment
Data Created	16-8-2022
Date Last Updated	31-10-2022
Abstract	dieback occurrence and sample location shapefiles associated with the Roe Hwy Stages 8/9 dieback assessment
Purpose	<i>Phytophthora</i> dieback occurrence mapping
Document Number	GC-22-1482
Contact Organisation	Glevan Consulting
Contact Name	Simon Robinson
Contact Position	<i>Phytophthora</i> dieback Interpreter
Contact Phone	0427 113 336
Contact Email	Simon.Robinson@glevan.com.au
Lineage	All field data recorded using ESRI Collector on a GPS enabled tablet.
Datum / Coordinate System	GDA94 Zone 50
Geographic Description	105 hectares of land between North Lake Road, Bibra Lake and Bellion Drive, Hamilton Hill.
Restrictions	None

7.4 Shapefile Spatial Data

The shapefiles associated with the mapping are contained in the attached zip file called Roe Hwy 8-9 dieback shapefiles.zip

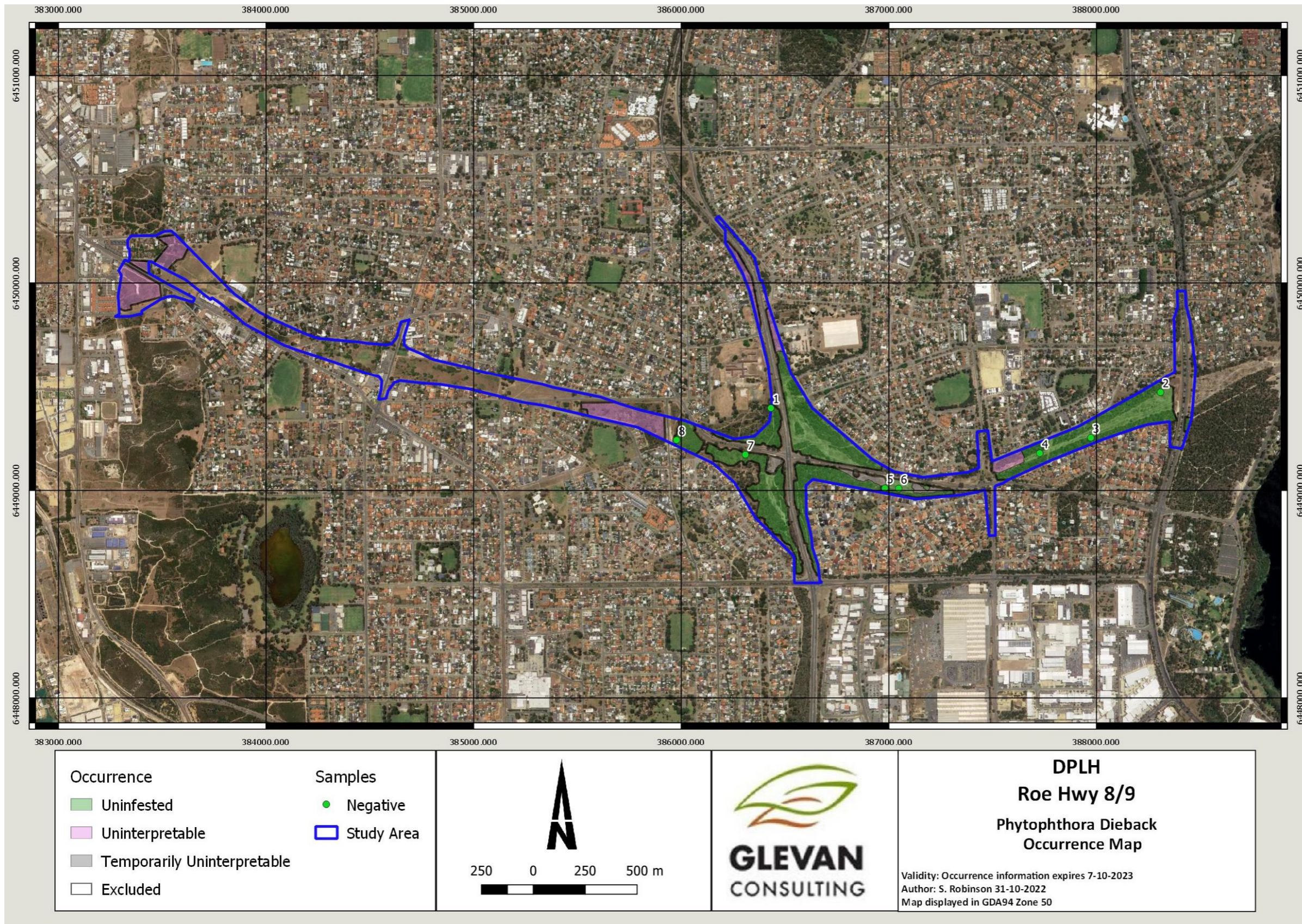


Figure 2 - Occurrence Map

Appendix H

Bushfire Management Plan



Bushfire Management Plan (Bushfire Hazard Level Assessment) Roe 8 West & 9 Corridor Planning Study

Ref 22-065
Version A
February 2023

LUSHFIRE & PLANNING

3 Paterson Rd
Pinjarra WA 6208
0418 954 873
ABN 74 232 678 543



Bushfire Management Plan Coversheet

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

Bushfire Management Plan and Site Details

Site Address / Plan Reference:	Various				
Suburb:	Hamilton Hill, Coolbellup	State:	WA	P/code:	6163
Local government area:	Cockburn				
Description of the planning proposal:	Region Scheme Amendment				
BMP Plan / Reference Number:	22-065	Version:	A	Date of Issue:	7/02/2023
Client / Business Name:	Department of Planning Lands and Heritage				

Reason for referral to DFES

	Yes	No
Has the BAL been calculated by a method other than method 1 as outlined in AS3959 (tick no if AS3959 method 1 has been used to calculate the BAL)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Have any of the bushfire protection criteria elements been addressed through the use of a performance principle (tick no if only acceptable solutions have been used to address all of the BPC elements)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Is the proposal any of the following special development types (see SPP 3.7 for definitions)?

Unavoidable development (in BAL-40 or BAL-FZ)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Strategic planning proposal (including rezoning applications)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Minor development (in BAL-40 or BAL-FZ)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
High risk land-use	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Vulnerable land-use	<input type="checkbox"/>	<input checked="" type="checkbox"/>

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

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

BPAD Accredited Practitioner Details and Declaration

Name	Accreditation Level	Accreditation No.	Accreditation Expiry
Geoffrey Lush	Level 2	BPAD 27682	28/02/2023
Company	Contact No.		
Lush Fire & Planning	0418 954 873		

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

Signature of Practitioner



Date

7/02/2023

Roe 8 West & 9 Corridor Planning Study Summary

This bushfire management plan is a strategic bushfire hazard assessment (BHL) prepared to support and inform the Roe 8 West & 9 Corridor Planning Study and subsequent amendment to the Metropolitan Region Scheme. The subject land is a corridor extending for approximately 5.5kms between from North Lake Road in Coolbellup to Healy Road in Hamilton Hill. The BHL assessment provides a broad brush means of determining the potential intensity of a bushfire for a particular area.

Portions of the corridor are designated as bushfire prone areas. State Planning Policy SPP3.7 Planning in Bushfire Prone Areas (2015) requires that any scheme amendment in a bushfire prone area that results in the introduction or intensification of development or land use should not on completion, have an extreme bushfire hazard level.

The proposed amendment to the Metropolitan Region Scheme will rezone the land from Primary Regional Road to Urban and / or Parks and Recreation. The proposed Parks and Recreation reserve recognises existing vegetation of regional importance, formalising the existing site conditions/land uses with no intensification of land use.

The proposed Urban zone may be developed for a range of uses. A subsequent amendment to the City of Cockburn Town Planning Scheme No 3, will then consider more specific land use classifications in the Urban zone such as, conservation, residential, commercial, local open space, community purposes or a development zone. It is noted that any remnant vegetation within the proposed Urban zone may be retained as local open space in the City's Local Planning Scheme. The Department of Planning Lands and Heritage has also developed an indicative, non-binding draft concept plan for the corridor to inform the subsequent stages of planning.

The corridor is generally between 80 and 100m wide, with wider portions near intersections such as North Lake Road. The eastern portion of the corridor extends along Forrest Road, with the central portion adjacent to Blackwood Avenue and the western portion adjacent to Rockingham Road.

There are over 150 properties within the corridor which are generally freehold lots including land owned by the State Government and Main Roads Western Australia (MRWA). There are multiple land locked properties with no road access. Portions of both Southwell Crescent and Coolbellup Avenue are also located on private land rather than gazetted road reserves.

The western portion of the corridor is predominantly cleared land with adjoining residential, commercial and community development. This area is characterised by introduced plant species and especially the Brazilian Pepper Tree. The eastern portion of the corridor from Blackwood Avenue contains continuous remnant vegetation extending through to North Lake Road.

The topography along the corridor is undulating with slopes of generally up to 5 degrees. The western end of the corridor, between Cardigan and Healy Streets has steeper short slopes.

A detailed flora and vegetation assessment has been undertaken by the RPS Group. While no threatened flora was identified, two ecological communities of conservation significance were identified within the study area being Banksia and Tuart woodlands.

All vegetation within the corridor and a 150m buffer was classified in accordance with Australian Standard AS3959 (2018) Construction of Buildings in Bushfire Prone Areas. Given the size of the site and the generalised nature of the assessment, a conservative approach has been taken with the vegetation classifications noting that:

- The vegetation classifications are based on the predominant vegetation within an area.
- Class A Forest classification is used in preference to Class B Woodland; and
- Class D Scrub classification is used in preference to Class C Shrubland.
- The areas which contain Brazilian pepper-trees (*Schinus terebinthifolius*) have generally been classified as Forest as the pepper trees can range from 5 to 15m in height.

Roe 8 West & 9 Corridor Planning Study Summary

The bushfire hazard level assessment for the study area based upon the following assumptions:

- Remnant native vegetation located within proposed Parks and Recreation reserves or local open space (as shown on the draft concept plan) is expected to be retained;
- Lots will be maintained in accordance with the City's Fire Control Order with land less than 4,047m² being required to maintain grassland as low threat vegetation; and
- That classified vegetation, including non-local species such as the Brazilian Pepper Trees, within the Urban zone is likely to be cleared for development or managed as low threat vegetation.

The majority of the proposed Urban zone will have a low bushfire hazard level. The BHL assessment acknowledges areas where it is intended to retain existing vegetation within the Urban zone, such as Local Open Space. However, these are expected to be isolated locations being less than 1 hectare in size and more than 100m from other classified vegetation. Consequently, they are classified as low threat vegetation in accordance with AS3959.

The land to be reserved as Parks and Recreation generally has an extreme bushfire hazard level. This rating is not considerable suitable for development but is appropriate for the proposed reservation.

The most significant regional bushfire hazards are located at each end of the corridor including the Beeliar Regional Park. The corridor along Stock Road and especially the area adjacent to the Forrest Road intersection, contains a large area of bushland which is still reserved for Primary Regional Road.

Local site issues which have been identified include:

- 1) The Guidelines for Planning in Bushfire Prone Areas and SPP3.7 are not applied retrospectively to existing development. This is particularly relevant to the Cardigan Street area which has developed residential lots less than 1,000sqm with sections having a potential extreme hazard level. There is no requirement for existing dwellings to be upgraded, however if the land remains designated as being bushfire prone, then any new dwellings or extensions will have to comply with the bushfire construction provisions of the National Construction Code.
- 2) There are portions of the corridor where existing development backs onto bushland areas with little or no hazard separation. Development on these lots can potentially have a Bushfire Attack Level (BAL) rating of BAL-40/FZ which is contrary to the objectives of SPP3.7 Planning in Bushfire Prone Areas. However, the amendment is simply recognising the existing situation which has occurred for many years.
- 3) The section of the corridor between Carrington and Ahern Streets is designated as being bushfire prone and it contains multiple freehold lots with no direct road access. Development of the existing individual lots should not occur until appropriate access has been provided in accordance with the Acceptable Solutions in SPP3.7.
- 4) The area of bushland adjacent to Blackwood Avenue extends outside of the corridor on to freehold land. The amendment proposes to include the vegetation located within the corridor in the Parks and Recreation reserve. The adjacent bushland is on the freehold land that is currently zoned and this will not change. Any development of this land would have to comply with the Acceptable Solutions in the Guidelines, including the provision of a suitable hazard separation zone.

Roe 8 West & 9 Corridor Planning Study Summary

It is considered that the proposed amendment complies with the objectives of State Planning Policy 3.7 as:

1. It avoids any increase in the threat of bushfire to people, property and infrastructure.

The proposed amendment is reflecting the existing conditions for the proposed Parks and Recreation areas and there will not be any increased fire risk. The proposed Urban zone areas are considered suitable for land use intensification as any proposed development areas will have either a Low or Moderate Bushfire Hazard Rating.

2. It reduces vulnerability to bushfire through the identification and consideration of bushfire risks in the design of the development and the decision-making process.

The bushfire hazard and risks have been identified and assessed in this report at the strategic level and demonstrates how the hazard level can be managed in the subsequent planning stages. The detailed consideration of bushfire risks will occur when the Local Planning Scheme is amended and the local zoning and development provisions are determined for the land proposed to be included in the Urban zone.

3. The design of the subdivision and the development takes into account bushfire protection requirements and includes specific bushfire protection measures.

The proposed amendment complies with the strategic elements of the Bushfire Protection Criteria and:

- ❖ The intention of Element 1 Location is achieved as while there are areas of vegetation with an extreme hazard level, development of land in the Urban zone is expected to be located on cleared land. Unless it is considered to be minor development, any development should have a BAL rating of BAL – 29 or less.
- ❖ The intention of Element 2 Siting and Design will be achieved in the subsequent planning stages as the design of any subdivision or development will respond to the surrounding bushfire issues and incorporates appropriate asset protection zones, defensible spaces and management of the development/vegetation hazard interface.
- ❖ The intention of Element 3 Vehicular Access is achieved as the subject land has multiple access routes which will allow residents to evacuate to a suitable destination before a bushfire arrives at the site.
- ❖ The intention of Element 4 Water is achieved as any developed portions of the corridor will be connected to the adjoining reticulated water supply.

4. Achieves an appropriate balance between bushfire risk management measures and biodiversity, conservation values, and environmental protection.

The proposed amendment achieves a balance between bushfire risk and conservation values by recognising important regional vegetation which will be retained in the Parks and Recreation reserve. Development in the Urban zone will primarily occur on cleared land which is only partially designated as being bushfire prone.

Document Control

Street No	Lot No	Plan	Street Name		
			Roe Highway Corridor		
Locality	Hamilton Hill, Coolbellup		State WA	Postcode	6163
Local Government Area		Cockburn			
Project Description		Region Scheme Amendment			
Prepared for		Department of Planning Lands and Heritage			

Ref No	Revision	Date	Purpose
22-065	Draft	10 January 2023	Draft for Review
	A	7 February 2023	Final

Name	Geoffrey Lush	Company	Lushfire & Planning
BPAD	Level 2 Practitioner	Accreditation No Expiry	27682 February 2023

Disclaimer

The measures contained in this report do not guarantee that a building will not be damaged in a bushfire. The ultimate level of protection will be dependent upon the design and construction of the dwelling and the level of fire preparedness and maintenance under taken by the landowner. The severity of a bushfire will depend upon the vegetation fuel loadings; the prevailing weather conditions and the implementation of appropriate fire management measures.

All information and recommendations made in this report are made in good faith based on information and accepted methodology used at that time. All plans are subject to survey and are not to be used for calculations. Notwithstanding anything contained therein, Lushfire & Planning will not, except as the law may require, be liable for any loss claim, damage, loss or injury to any property and any person caused by fire or by errors or omissions in this report.



Geoffrey Lush
7 February 2023
geoffrey@lushfire.com.au



CONTENTS

1.0	Proposal Details.....	1
1.1	Introduction.....	1
1.2	Existing Conditions	3
1.3	Bushfire Prone Land	10
1.4	Fire Control Order	10
1.5	Proposed Amendment.....	10
2.0	Environmental Considerations.....	13
3.0	Bushfire Assessment Results.....	14
3.1	Assessment Inputs - Vegetation Classification	14
3.2	Assessment Outputs – Bushfire Hazard Level Assessment	22
4.0	Identification of Bushfire Hazard Issues	26
4.1	District Context	26
4.2	Local - Issues.....	26
4.2.1	Retrospective Application of Guidelines (Locations 1 and 7)	26
4.2.2	Hazard Interface/ Separation (Locations 1, 6 and 7)	26
4.2.3	Road Access (Location 4)	29
4.2.4	Isolated Vegetation (Locations 2, 3, 4 and 5)	29
4.2.5	Blackwood Avenue (Location 6)	29
4.3	High Risk Land Uses	30
4.4	Vulnerable Land Uses	30
5.0	Assessment Against the Bushfire Protection Criteria.....	30

FIGURES

Figure 1	Location Plan	2
Figure 2	Cadastral Plan.....	4
Figure 3	Existing Conditions	7
Figure 4	Bushfire Prone Land	11
Figure 5	Proposed Amendment	12
Figure 6	Vegetation Plots.....	17
Figure 7	Vegetation Examples	20
Figure 8	Bushfire Hazard Level Assessment.....	23
Figure 9	District Context	27
Figure 10	Local Issues	28

TABLES

Table 1	Vegetation Units.....	13
Table 2	Vegetation Descriptions	15
Table 3	BPC Compliance	31

APPENDICES

Appendix 1	Vegetation Photographs
------------------	------------------------

1.0 Proposal Details

1.1 Introduction

This bushfire management plan is a strategic bushfire hazard assessment prepared to support and inform the Roe 8 West & 9 Corridor Planning Study and subsequent Amendment to the Metropolitan Region Planning Scheme. The subject land is a corridor extending for approximately 5.5kms between from North Lake Road in Coolbellup to Healy Road in Hamilton Hill as shown in Figure 1.

As a consequence of the Beeliar Wetlands being classified as an A Class conservation reserve, the remainder of the regional road corridor will no longer be developed as a regional road and its reservation in the Metropolitan Region Planning Scheme is no longer appropriate.

The proposed amendment to the Metropolitan Region Scheme will rezone the land from Primary Regional Road to Urban and Parks and Recreation. The proposed amendment is shown in Figure 5 and described in Section 1.5. A subsequent amendment to the City of Cockburn Town Planning Scheme No 3, will then consider more specific land use classifications such as, conservation, residential and commercial development, local open space and community purposes.

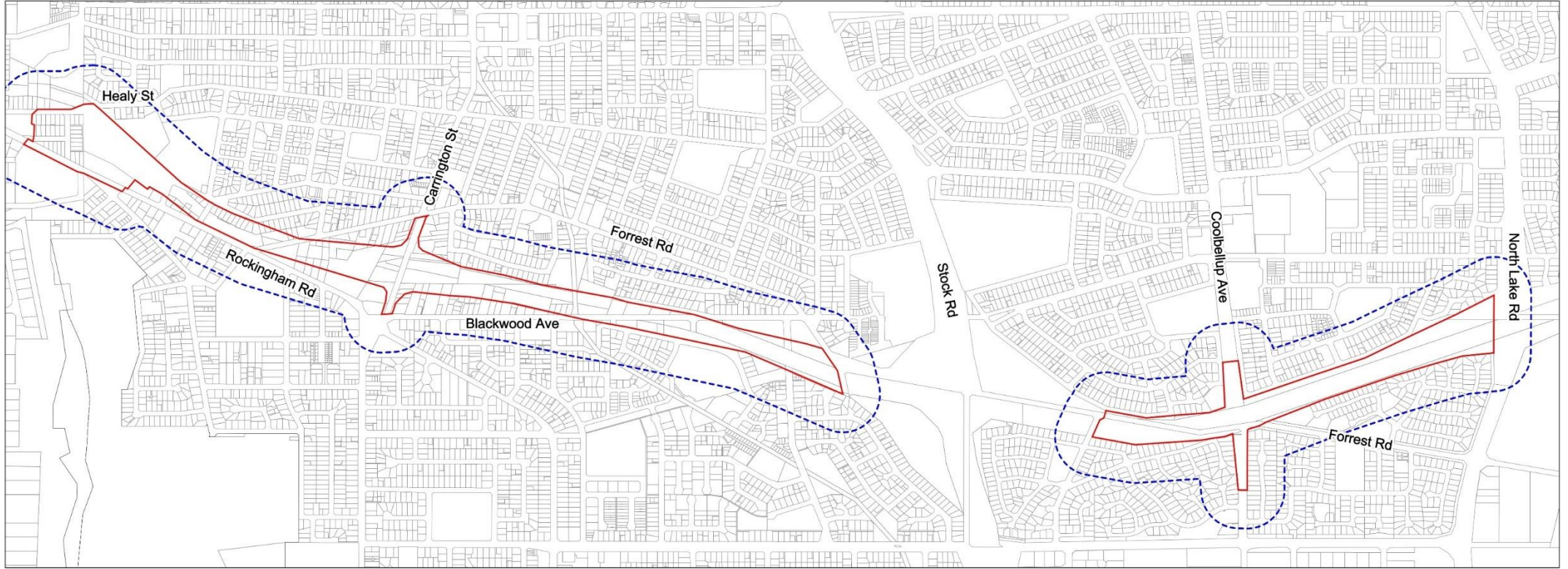
State Planning Policy SPP3.7 Planning in Bushfire Prone Areas, requires that a Bushfire Management Plan (BMP) is to accompany strategic planning proposal in bushfire prone areas. The objectives of this report are to:

- a) Confirm the suitability of the proposed zones and reserves having regard to the objectives of State Planning Policy SPP3.7 Planning in Bushfire Prone Areas.
- b) Identify any bushfire management and spatial issues which should be considered; in the preparation of any local structure plan; subdivision or development applications.
- c) Demonstrate that the Bushfire Protection Criteria contained in the Guidelines for Planning in Bushfire Prone Areas can be achieved now or in the subsequent planning stages.

A Bushfire Hazard Level assessment provides a 'broad brush' means of determining the potential intensity of a bushfire for a particular area. The assessment area includes land within 150m of the corridor. The Bushfire Hazard Level assessment assists in informing the suitability of land contained within strategic planning proposals for future subdivision and development.

This hazard assessment acknowledges in some locations, such as those areas proposed to be reserved as Parks and Recreation, the amendment proposes to formalise existing site conditions/land uses with no proposed intensification of land use. It is also noted that the bushland areas within the proposed Urban zone may be retained as local open space in the City's Local Planning Scheme.

The Department of Planning Lands and Heritage has advertised a draft concept plan for the corridor. This is an indicative and has no formal status. It will be most relevant to any proposed updates to the local planning framework that may arise from the MRS amendment.



LEGEND

SUBJECT LAND —

150m ASSESSMENT BUFFER - - -

FIGURE 1
LOCATION PLAN



Job No 22-065

Rev	Description	Date
A	Preliminary	3/01/2023
B	Review Mods	27/01/2023



1.2 Existing Conditions

The cadastral information for the study area is shown in Figure 2 and the existing site conditions are shown in Figure 3.

The corridor is generally between 80 and 100m wide, with wider portions near intersections such as North Lake Road. The eastern portion of the corridor extends along Forrest Road, with the central portion adjacent to Blackwood Avenue and the western portion adjacent to Rockingham Road.

There are over 150 properties within the corridor comprising of:

- Freehold land;
- Crown allotments;
- Crown reserves; and
- Existing road reserves both constructed and unconstructed.

State Government agencies including MRWA and the State Planning Commission, own multiple freehold lots.

The north western corner of the study area adjoins the City of Fremantle municipal boundary being Healy Road. On the northern side of Healy Road is a large area of remnant vegetation (approximately 7ha) being Clontarf Hill. On the southern side of Rockingham Road is a second area of remnant vegetation being approximately 2.7 hectares. This western section contains multiple single residential lots as well as Aboriginal and European heritage sites. There is commercial development along Rockingham Road with open space areas within the corridor, residential and community development, including schools, within the corridor.

East of Carrington Street, the corridor is predominantly cleared land with adjoining residential development. A 66KV transmission line crosses the corridor near Carrington Road and the BP Oil Pipeline crosses between Wheeler Road and Hyman Street. A second 132KV transmission line crosses the corridor from Southwell Crescent.

The corridor to the south east of Blackwood Avenue then contains continuous remnant vegetation extending through to North Lake Road.

The topography along the corridor is undulating with slopes of generally up to 5 degrees. The western end of the corridor has an elevation of 25m AHD with some local short steep slopes near Cardigan Street. It then falls to 5m AHD near the Wally Hagan Basketball Stadium. From there it gradually increases to east along Blackwood Avenue to over 50m AHD. It then declines gradually towards Coolbellup Avenue before increasing again to 50m AHD adjacent to North Lake Road.

There is a reticulated water supply extending through and adjacent to all of the corridor.

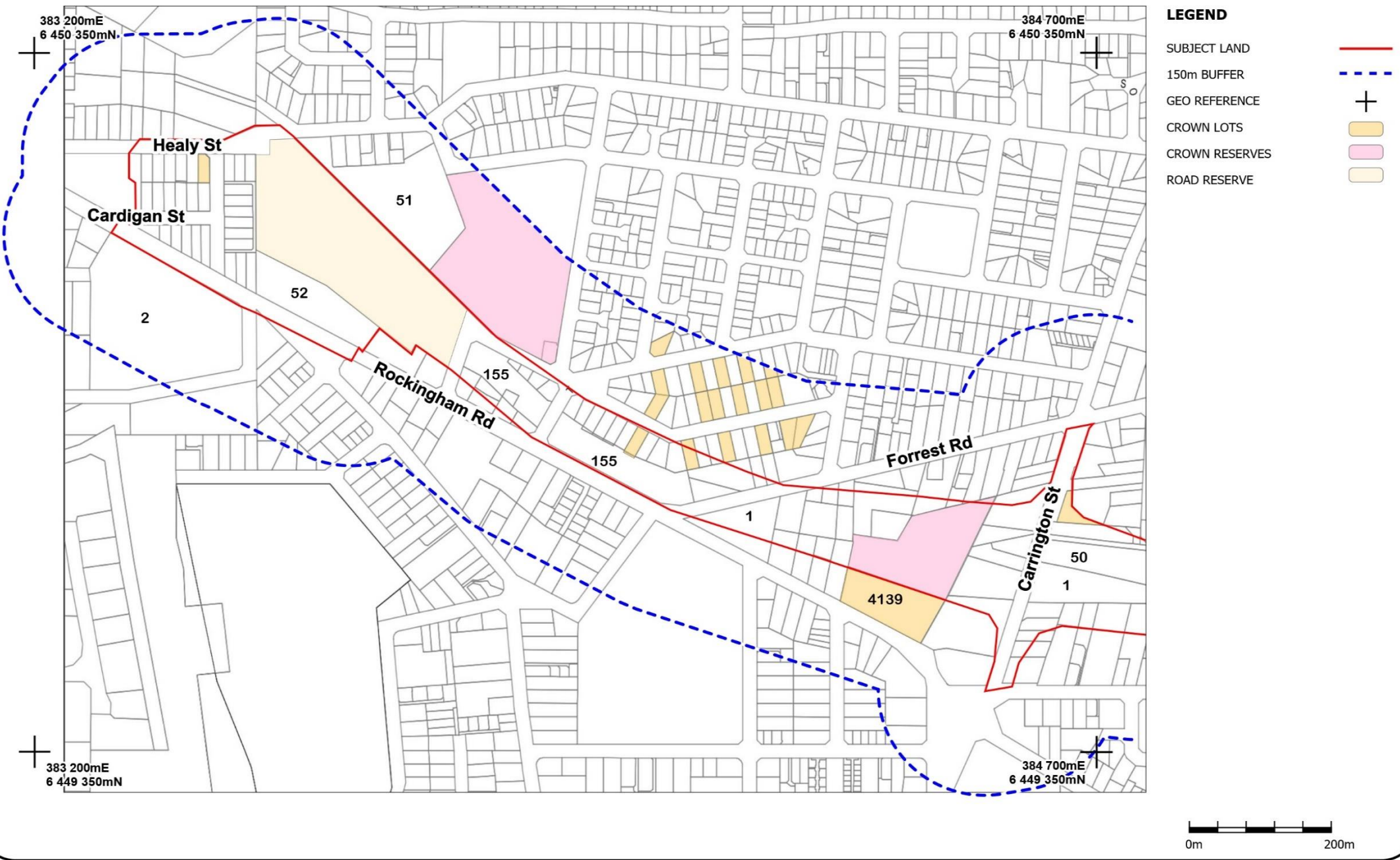


FIGURE 2
CADASTRAL PLAN - Sheet 1



Job No 22-014		Date
Rev A	Description Preliminary	6/05/2022
Rev B	Description Review Mods	27/01/2023



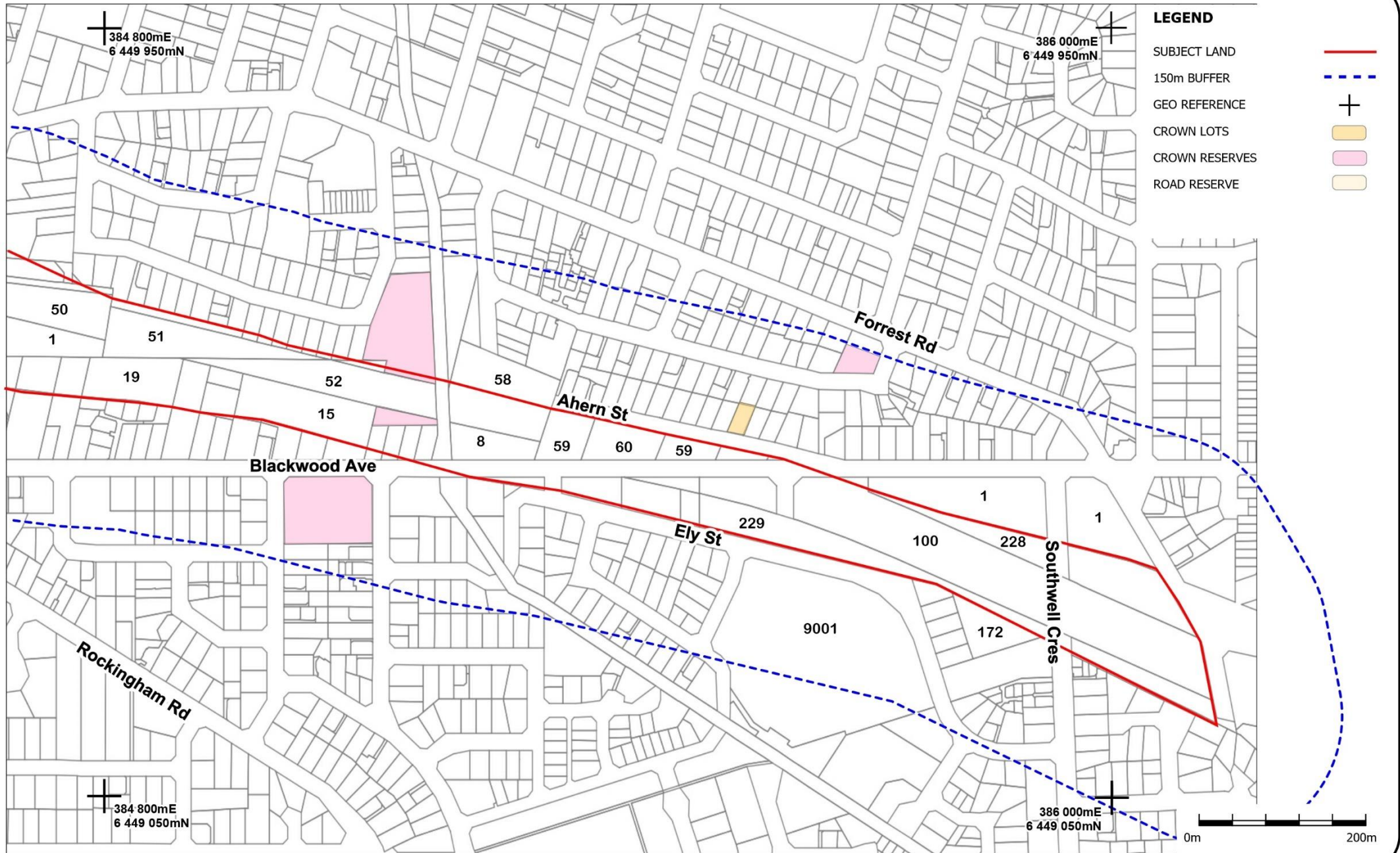


FIGURE 2
CADASTRAL PLAN - Sheet 2

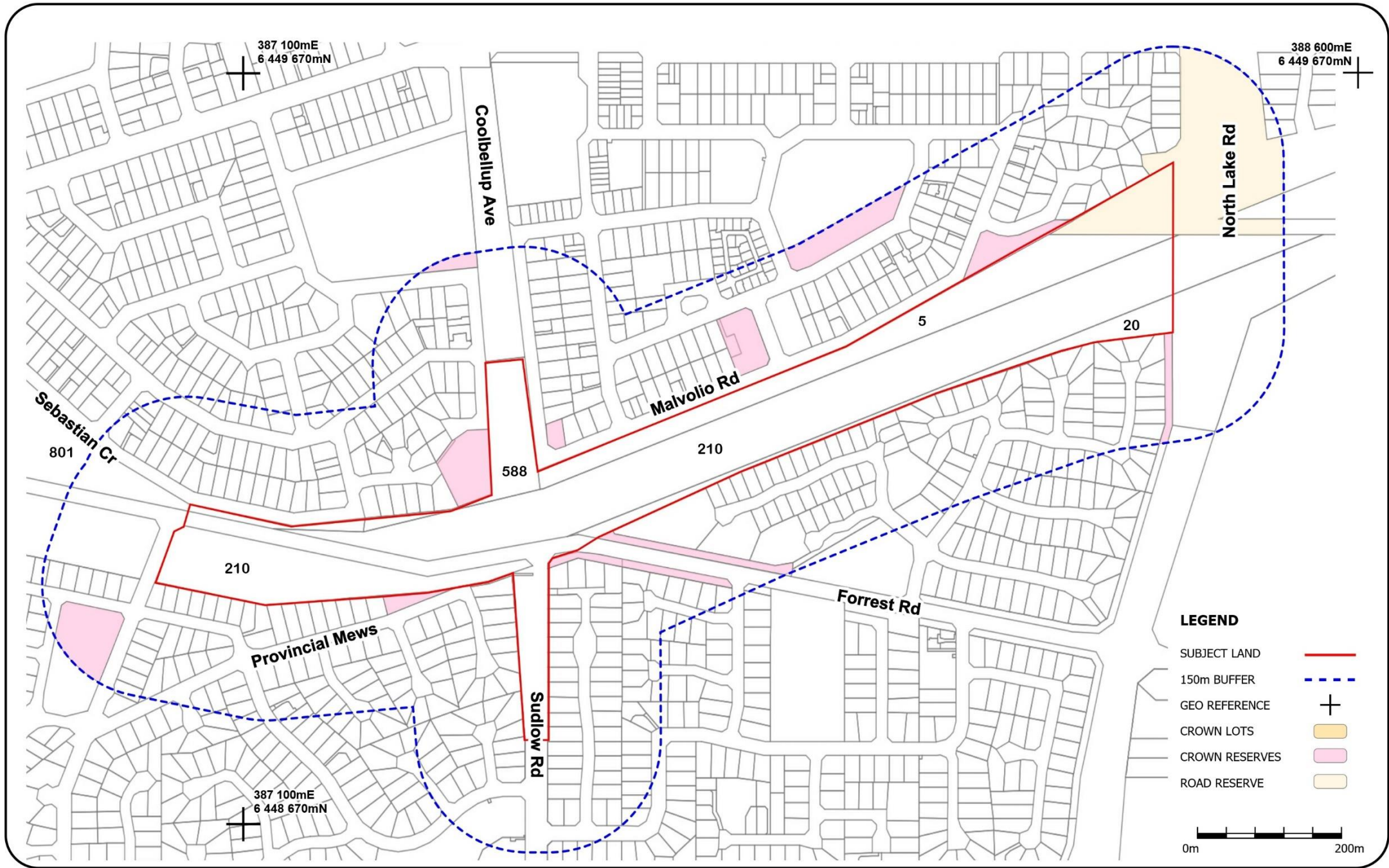


FIGURE 2
 CADASTRAL PLAN - Sheet 3

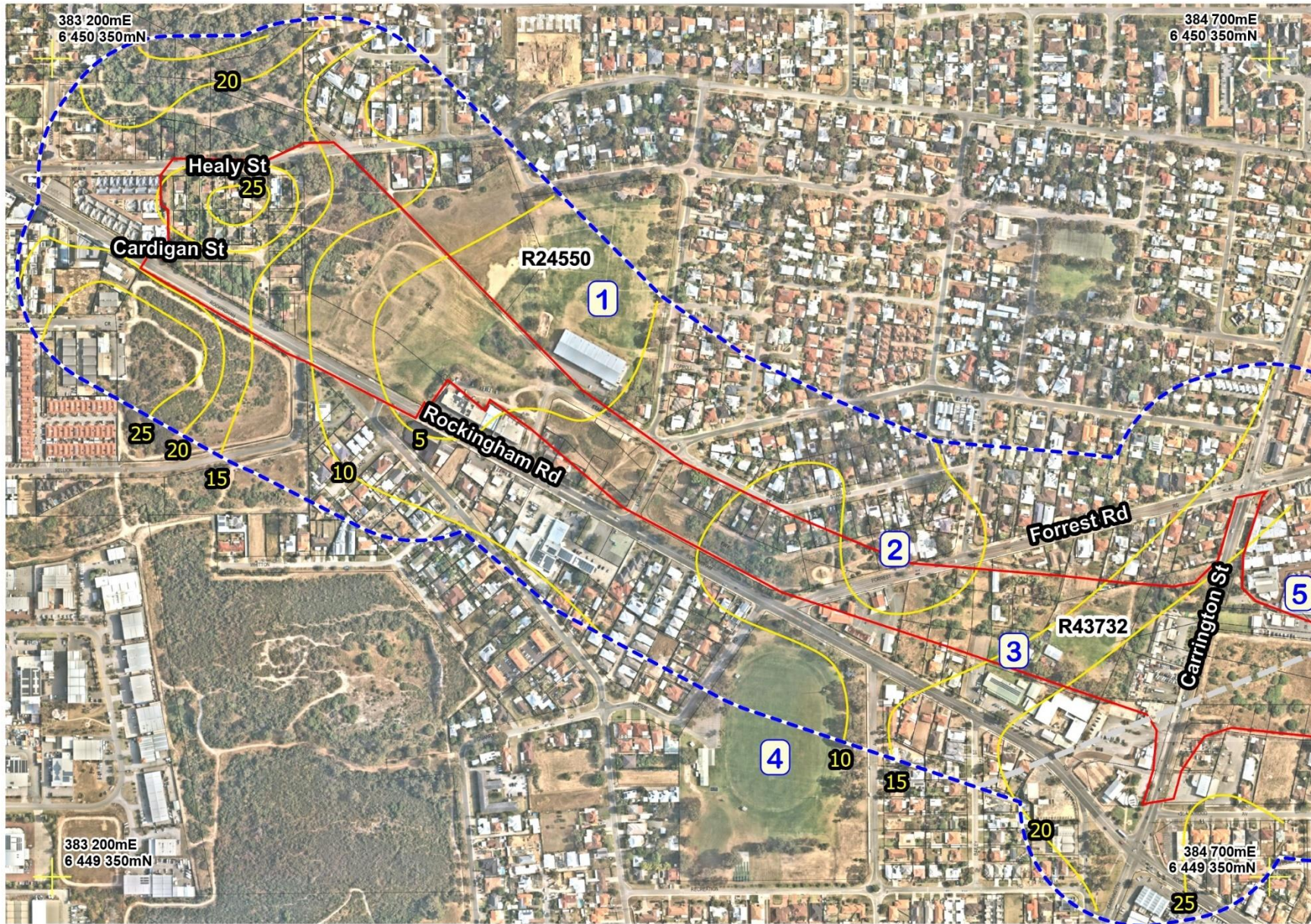


Job No 22-014

Rev	Description	Date
A	Preliminary	6/05/2022
B	Review Mods	27/01/2023

Date
 6/05/2022
 27/01/2023





LEGEND

- SUBJECT LAND —
 - 150m BUFFER - - -
 - GEO REFERENCE +
 - 5m CONTOURS —
 - TRANSMISSION LINE - - -
- FEATURES
- 1) DIXON PARK AND WALLY HAGEN BASKETBALL STADIUM
 - 2) COMMUNITY SCHOOL
 - 3) CHRISTIAN COLLEGE
 - 4) DAVILAK PARK
 - 5) PORT SCHOOL

DATE OF PHOTO - OCTOBER 2022



FIGURE 3
EXISTING CONDITIONS - SHEET 1



Job No 22-014

Rev	Description	Date
A	Preliminary	6/05/2022
B	Review Mods	27/01/2023

Date
6/05/2022
27/01/2023



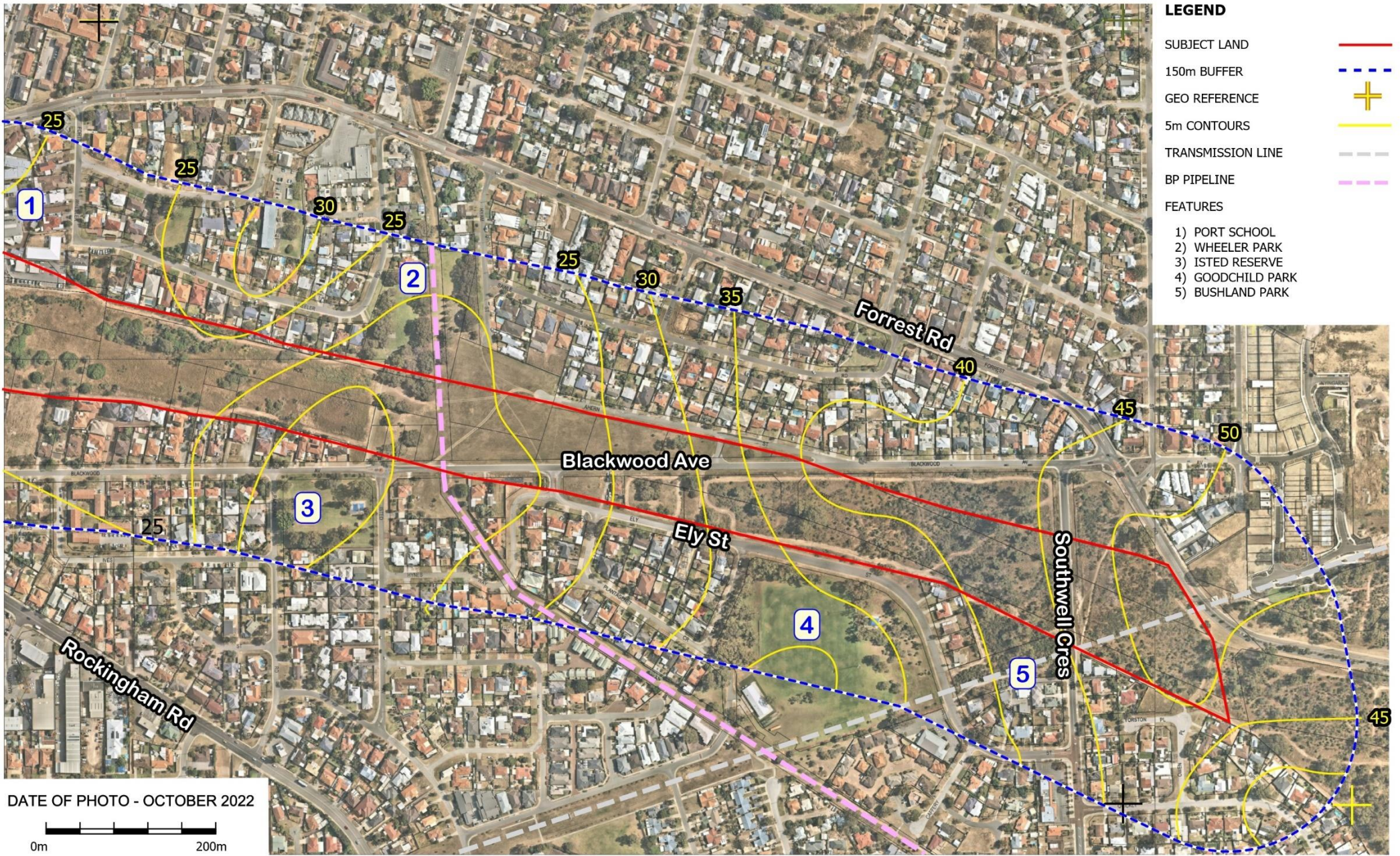


FIGURE 3
EXISTING CONDITIONS - SHEET 2



FIGURE 3
EXISTING CONDITIONS - SHEET 3

1.3 Bushfire Prone Land

Parts of the subject land are designated as being bushfire prone land as shown in Figure 4. This will trigger:

- The application of the bushfire construction provisions in the National Construction Code;
- The provisions of the Planning and Development (Local Planning Schemes) Regulations 2015; and
- The application of State Planning Policy SPP3.7 Planning in Bushfire Prone Areas.

State Planning Policy SPP3.7 Planning in Bushfire Prone Areas provides in Clause 6.2 that any strategic planning proposal, that has or will, on completion, have a moderate BHL and/or where BAL-12.5 to BAL-29 applies, may be considered for approval where it can be undertaken in accordance with the following policy measures.

- a) the results of a bushfire hazard level assessment determining the applicable hazard level(s) across the subject land, in accordance with the methodology set out in the Guidelines.
- b) the identification of any bushfire hazard issues arising from the assessment; and
- c) clear demonstration that compliance with the bushfire protection criteria in the Guidelines can be achieved in subsequent planning stages.

The State Map of Bush Fire Prone Areas is currently being reviewed and is likely to be advertised for public comment within the next few months. Any revisions to the mapping will need to be considered in the subsequent planning stages.

1.4 Fire Control Order

The City's Fire Control Order stipulates that for all property (vacant or developed)

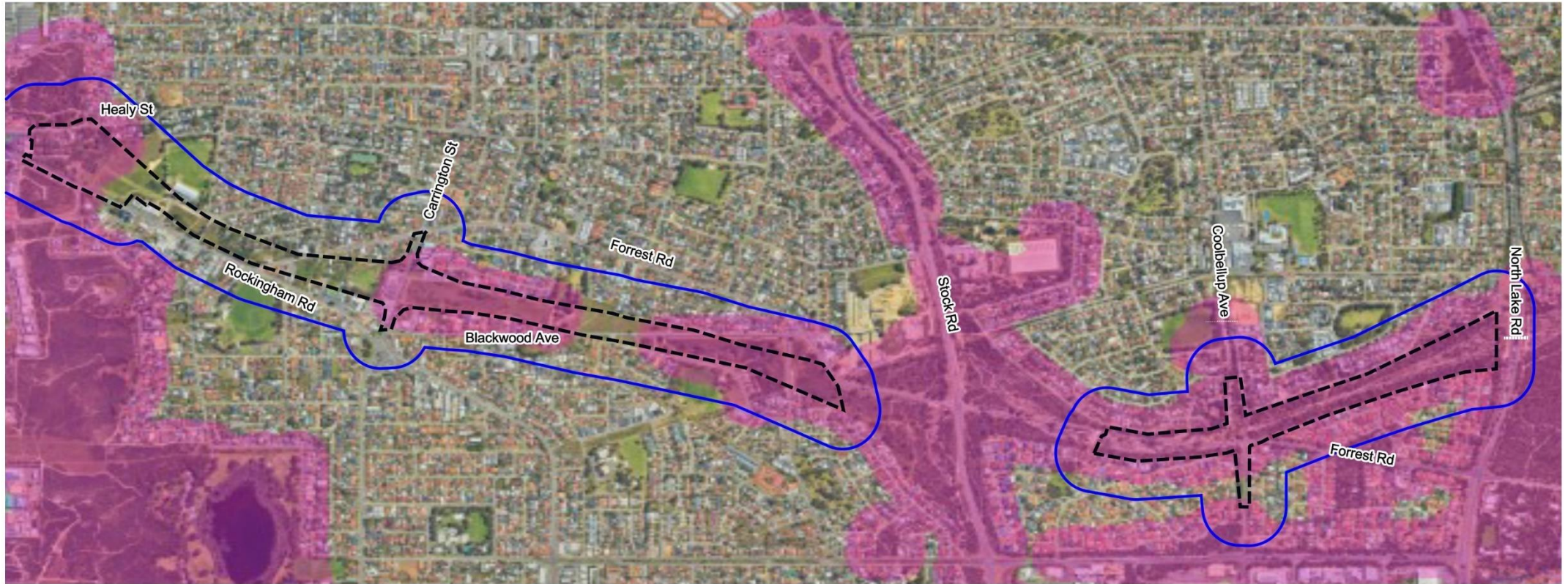
- A) Less than 4,047m², the following measures are required:
 - Have all flammable materials such as dry grass and weeds slashed, mown or trimmed down by other means to a maximum height of 50mm across the entire property for the duration of this Firebreak Time; and
 - Remove all dead vegetation.
- B) 4,047m² or greater, the following measures are required:
 - Construct a firebreak immediately inside all external property boundaries, including those adjacent to roads, drains, rail reserves and any public open space reserves; and
 - Remove all dead vegetation surrounding and over all habitable structures to a radius of 3 metres except living trees, shrubs, maintained grass and gardens under cultivation.

1.5 Proposed Amendment

The proposed amendment to the Metropolitan Region Scheme (MRS) is shown in Figure 5 and this will rezone the land from Primary Regional Road to Urban and Parks and Recreation.

The zones and reservations in the MRS are broad categories that define how land can be used and developed as follows:

- Primary regional roads are the most important of the roads of regional significance in the planned road network, and are currently or proposed to be declared under the Main Roads Act 1930.
- The Urban zone designates land within which a range of activities are undertaken, including residential, commercial, recreational, and light industry.
- The Parks and Recreation reserve is land of regional significance for ecological, recreation or landscape purposes.



LEGEND

- SUBJECT LAND -----
- 150m ASSESSMENT BUFFER —————
- BUSHFIRE PRONE LAND (2022)
Includes bushfire prone vegetation
and a 100m buffer. ■

FIGURE 4
BUSHFIRE PRONE LAND

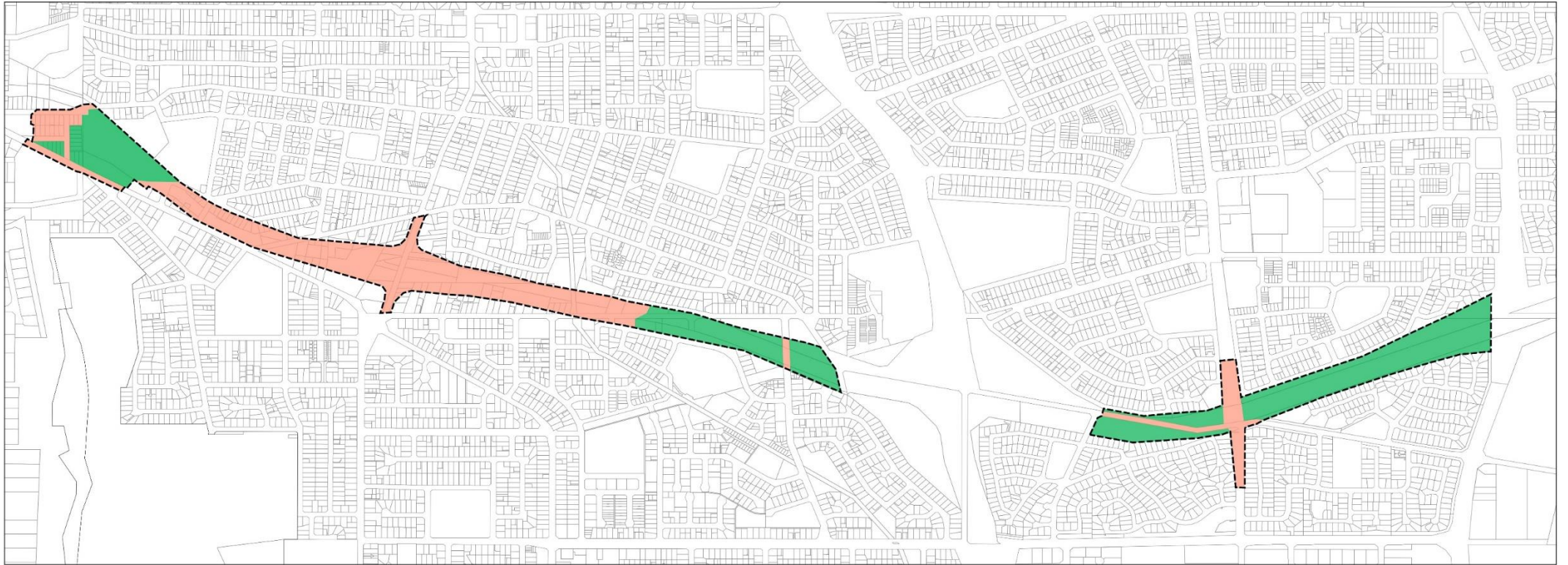


Job No 22-065

Rev	Description
A	Preliminary
B	Review Mods

Date
3/01/2023
27/01/2023





LEGEND

- SUBJECT LAND 
- PROPOSED URBAN ZONE 
- PROPOSED PARKS & RECREATION RESERVE 

FIGURE 5
PROPOSED MRS AMENDMENT



Job No 22-065

Rev	Description	Date
A	Preliminary	3/01/2023
B	Review Mods	27/01/2023



2.0 Environmental Considerations

State Planning Policy 3.7 (SPP3.7) policy objective 5.4 recognises the need to consider bushfire risk management measures alongside environmental, biodiversity and conservation values.

A detailed flora and vegetation assessment (1) for the Roe 8 (West) and Roe 9 project was undertaken by the RPS Group and in summary it found:

- 1) No Threatened flora species listed under the state Biodiversity Conservation Act 2016 (BC Act) or the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) were recorded.
- 2) One Department of Biodiversity, Conservation and Attractions (DBCA) listed Priority flora species, *Dodonaea hackettiana* (Priority 4), was identified near the Forrest Road–Stock Road intersection (outside of the Amendment area).
- 3) No flora species of other conservation significance were recorded
- 4) Five remnant native vegetation units were described and mapped as referenced in Table 1
- 5) Two ecological communities of conservation significance were identified within the study area:
 - State-listed Banksia dominated woodlands of the Swan Coastal Plain IBRA region (Priority 3) ecological community / Commonwealth-listed Banksia Woodlands of the Swan Coastal Plain (Threatened) ecological community
 - State-listed Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain (Priority 3) ecological community / Commonwealth-listed Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain (Threatened) ecological community
- 6) One vegetation unit, ArBss, shows floristic and landform affinity to a state listed Priority3 ecological community; coastal shrublands on shallow sands, southern Swan Coastal Plain ('floristic community type 29a')
- 7) Vegetation condition in the study area is generally low, with 48% assessed to be in Completely Degraded condition and 51% assessed as Good to Degraded condition.

Table 1 Vegetation Units

Reference	Description
EgBaXp	<i>Eucalyptus gomphocephala</i> mid woodland to open woodland over <i>Banksia attenuate</i> low open woodland over <i>Xanthorrhoea preissii</i> sparse shrubland over * <i>Freesia alba</i> × <i>leichtlinii</i> , * <i>Oxalis pes-caprae</i> forbland, * <i>Ehrharta longiflora</i> , * <i>E. calycina</i> tussock grassland
(Eg)EmCcBam	<i>Eucalyptus gomphocephala</i> mid isolated trees, <i>Eucalyptus marginata</i> , <i>Corymbia calophylla</i> mid woodland over <i>Banksia attenuata</i> , <i>B. menziesii</i> , <i>Allocasuarina fraseriana</i> low (open) woodland over <i>Xanthorrhoea preissii</i> sparse shrubland over * <i>Freesia alba</i> × <i>leichtlinii</i> , * <i>Oxalis pescaprae</i> forbland, * <i>Ehrharta calycina</i> , * <i>E. longiflora</i> (sparse) grassland
JfKg (Rehab)	<i>Corymbia calophylla</i> isolated to sparse mid trees over <i>Jacksonia furcellata</i> , <i>unzeaglabrescens</i> tall sparse shrubland over <i>Acacia pulchella</i> var. <i>glaberrima</i> mid sparse shrubs over <i>Gompholobium tomentosum</i> low sparse shrubs over * <i>Hypochaeris glabra</i> isolated forbs, * <i>Ehrharta longiflora</i> isolated grasses
ArBss	<i>Acacia rostellifera</i> , <i>Banksia sessilis</i> var. <i>sessilis</i> tall shrubland over * <i>Ehrharta calycina</i> , * <i>E. longiflora</i> sparse grassland over * <i>Oxalis pes-caprae</i> forbland on limestone outcrop
EgD	<i>Eucalyptus gomphocephala</i> mid woodland over <i>Acacia rostellifera</i> , * <i>Schinus terebinthifolia</i> low open shrubland over * <i>Oxalis pes-caprae</i> closed forbland
	Introduced flora species are indicated with an asterisk (*) and non-locally native species (often planted) are indicated with an octothorp (#).

3.0 Bushfire Assessment Results

3.1 Assessment Inputs - Vegetation Classification

All vegetation within the corridor and a 150m buffer was classified in accordance with:

- Clause 2.2.3 of Australian Standard AS3959 Construction of Buildings in Bushfire Prone Areas;
- The Visual Guide for Bushfire Risk Assessment in Western Australia; and
- Applicable Fire Protection Australia BPAD Practice Notes.

The vegetation classes are generally a function of the vegetation height and foliage coverage. AS3959 contains twenty – eight vegetation types which are categorised into six classes as follows:

- A. Forest – more than 30% foliage cover, between 6 and 30m height.
- B. Woodland – less than 30% foliage cover, 10 to 30m height with grassy understorey;
- C. Shrubland – heath less than 2m in height with more than 30% foliage cover;
- D. Scrub – tall heath and shrubs between 2 and 6m height with more than 30% foliage cover;
- E. Mallee/Mulga – multi stemmed trees more than 2m in height with less than 30% foliage cover;
- F. Rainforest - trees with more than 90% foliage cover not being Eucalypts; and
- G. Grassland – pasture, croplands, tussock, hummock grasses, herb fields. Includes trees and shrubs with foliage cover of less than 10%.

Given the size of the site and the generalised nature of the assessment, a conservative approach has been taken with the vegetation classifications noting that:

- The vegetation classifications are based on the predominant vegetation within an area, which may incorporate smaller areas of vegetation which might otherwise be included in a separate Class.
- Different fire behaviour models are used in AS3959 for the vegetation classes. Forest / Woodland vegetation is grouped together using one model (Noble 1980); while Shrubland / Scrub use a different model (Catchpole 1988). This is recognised in the vegetation classification for the study area with:
- Class A Forest classification is used in preference to Class B Woodland; and
- Class D Scrub classification is used in preference to Class C Shrubland.
- The areas which contain Brazilian pepper-trees (*Schinus terebinthifolius*) have generally been classified as Forest as the pepper trees can range from 5 to 15m in height.

It is also noted that while the vegetation classifications under AS3959 Construction of Buildings in Bushfire Prone Areas appear to be similar to the widely used classifications used for environmental assessments, there are two notable differences being:

- The AS3959 classification of Woodland vegetation stipulates that it is to be over a grassland understorey with only occasional shrubs; and
- There is no minimum height for Forest vegetation.

The following vegetation is referenced in AS3959 Clause 2.2.3.2 as 'excluded vegetation' and not classified:

- (a) Vegetation of any type that is more than 100m from the site.
- (b) Single areas of vegetation less than 1ha in area and not within 100m of other areas of vegetation being classified vegetation.
- (c) Multiple areas of vegetation less than 0.25ha in area and not within 20m of the site, or each other, or other areas of vegetation being classified vegetation.
- (d) Strips of vegetation less than 20m in width (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20m of the site or each other, or other areas of vegetation being classified vegetation.

Roe 8 West & 9 Corridor Planning Study

- (e) Non-vegetated areas, including waterways, roads, footpaths, buildings and rocky outcrops.
- (f) Vegetation regarded as low threat due to factors such as flammability, moisture content or fuel load. This includes grasslands managed in a minimal fuel condition, mangroves and other saline wetlands, maintained lawns, golf courses (such as playing areas and fairways), maintained public reserves and parklands, sporting fields, vineyards, orchards, banana plantations, market gardens (and other non-curing crops), cultivated gardens, commercial nurseries, nature strips and windbreaks.

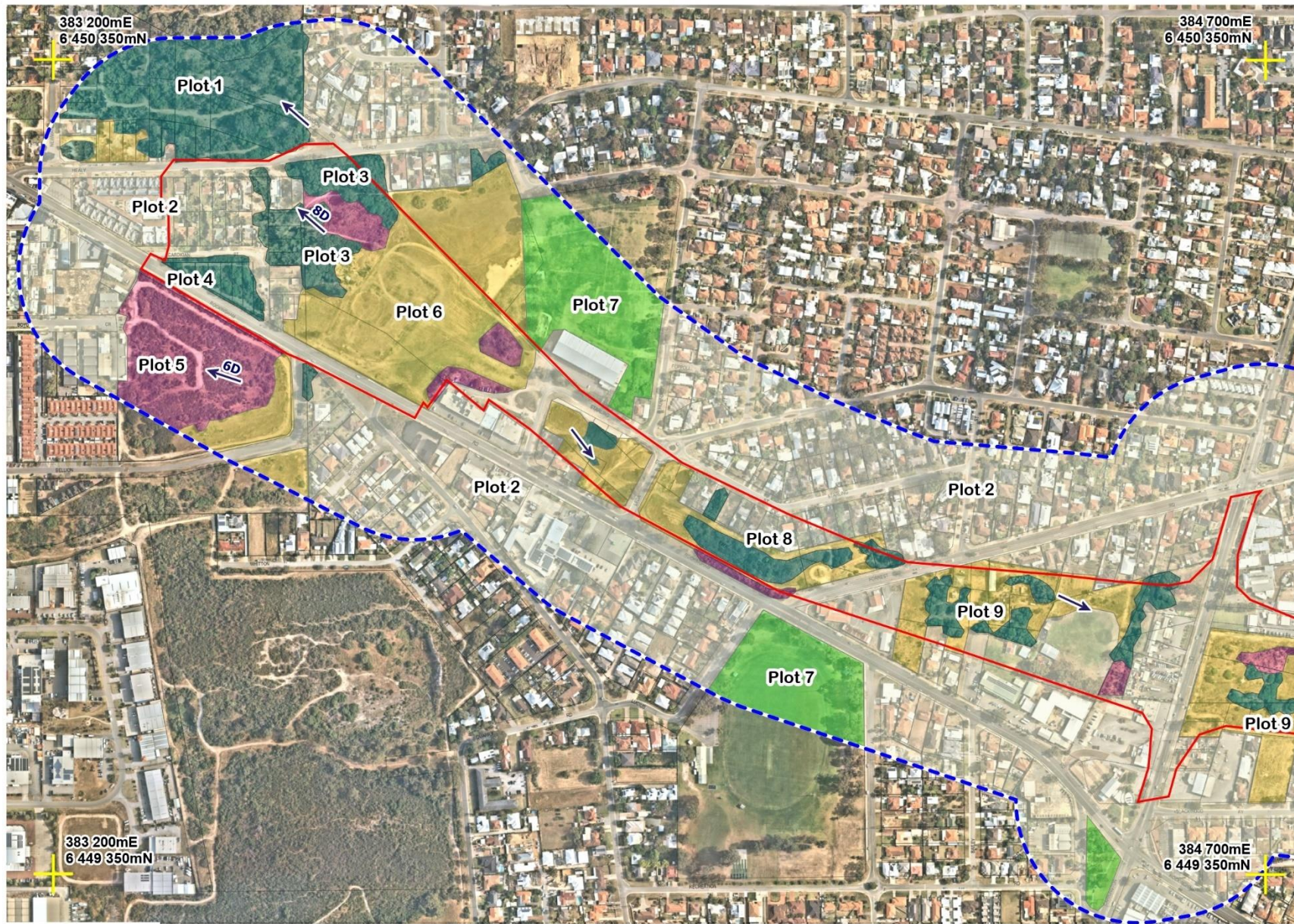
The vegetation classifications are shown in Figure 6, described in Table 2 with vegetation examples shown in Figure 7. Photographs of the vegetation plots and classifications are contained in Appendix 1.

Table 2 Vegetation Descriptions

Plot	Classification	Description
1	Class A - Forest	Mixed forest to 25m over scrub with more than 40% canopy coverage on northern side of Healy Street.
2	Excludable – Clause 2.2.3.2(f)	Managed land predominantly residential and commercial lots being maintained in accordance with the City's Fire Control Order.
3	Class A - Forest	Mixed forest, including Tuarts, on the rocky ridge area south of Healy Street extending into existing residential lots. Approximately 1.7ha including associated scrub.
4	Class A - Forest	Bushland south of Cardigan Street approximately 0.5ha predominantly Brazilian Pepper Trees to 10m with some Acacia foliage coverage more than 40%.
5	Class D Scrub	Acacia scrub in Lot 2 on the southern side of Rockingham Road.
6	Class G Grassland	Unmanaged grassland areas potentially being more than 100mm in height with some areas being 0.75m high.
7	Excludable – Clause 2.2.3.2(f)	Maintained parkland / public open space reserves.
8	Class A - Forest	Existing vegetation to 20m and revegetation planting, total area approximately 0.7ha. Might be potentially retained and includes some Pines with Pepper Trees and Acacia scrub.
9	Class A - Forest	Small areas of mixed vegetation (less than 2,500sqm) predominantly Pepper trees.
10	Class A - Forest	Mixed forest and scrub approximately 0.5ha that includes a Tuart tree and may potentially retained.
11	Class A - Forest	Eucalypts adjacent to Wheeler Park being approximately 0.5ha. Has a woodland appearance with grassland understorey but the canopy coverage exceeds 30%. The same vegetation within Wheeler Park has irrigated managed lawn areas.
12	Class D Scrub	Blackwood Avenue mixed scrub to 3m including Parrot Bush and Grass Trees, Casuarina with thick grassland areas.
13	Class A - Forest	Blackwood Avenue mixed forest to 20m more than 30% canopy coverage with Banksia woodland, over variable understorey.
14	Class A - Forest	Classified vegetation in Orlando Park.
15	Class A - Forest	Revegetation areas within the corridor.
16	Class A - Forest	Mixed Jarrah, Marri forest with some Tuarts with Banksia and mixed shrub understorey.
17	Class A - Forest	Vegetation along the eastern of Coolbellup Avenue varies in width between 17 and 30m. Forest to 20m with more than 40% canopy coverage over mixed shrub understorey.

Roe 8 West & 9 Corridor Planning Study

Plot	Classification	Description
18	Class A - Forest	Vegetation Reserves 43662 and 45513 on either side of Forrest Road. Both are 10m wide and the vegetation coverage varies. Is contiguous with vegetation in Marshwood Park and the corridor vegetation in Lot 210.
19	Class A - Forest	Vegetation along Sudlow Road varying between 12 and 27m wide. Trees to 20m with some grass and shrub understorey.
20	Class A - Forest	Mixed Jarrah, Marri forest with mixed shrub understorey in Sherbrook Garden Reserve.



LEGEND

- SUBJECT LAND —
- VEGETATION ASSESSMENT AREA (150m from the external boundary of the subject land) - - -
- VEGETATION PLOTS —
- UPSLOPE (Less than 5 Deg unless otherwise shown) ➔
- GEO REFERENCE +
- VEGETATION CLASS
- A FOREST ■
- D SCRUB ■
- G GRASSLAND ■
- REVEGETATION □
- EXCLUDED CI 2.2.3.2
- (F) MANAGED LAND □
- (F) POS RESERVE ■

Location Details: Roe Highway Corridor
Hamilton Hill, Coolbellup

Assessment Date: 7 & 8 January 2023

Prepared by: G Lush

Accreditation Level: Level 2

Accreditation Number: BPAD 27682

Accreditation Expiry Date: February 2023

Date of Aerial Photo: October 2022



FIGURE 6
VEGETATION CLASSIFICATION - SHEET 1



Job No 22-014

Rev	Description
A	Preliminary
B	Review Mods

Date
6/05/2022
27/01/2023





LEGEND

- SUBJECT LAND —
- VEGETATION ASSESSMENT AREA (150m from the external boundary of the subject land) - - -
- VEGETATION PLOTS
- UPSLOPE (Less than 5 Deg unless otherwise shown) ➔
- GEO REFERENCE +
- VEGETATION CLASS
- A FOREST
- D SCRUB
- G GRASSLAND
- REVEGETATION
- EXCLUDED CI 2.2.3.2
- (f) MANAGED LAND
- (f) POS RESERVE

Location Details: Roe Hwy Corridor
Hamilton Hill,
Coolbellup

Assessment Date: 7 & 8 January 2023

Prepared by: G Lush

Accreditation Level: Level 2

Accreditation Number: BPAD 27682

Accreditation Expiry Date: February 2023

Date of Aerial Photo: October 2022

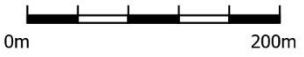


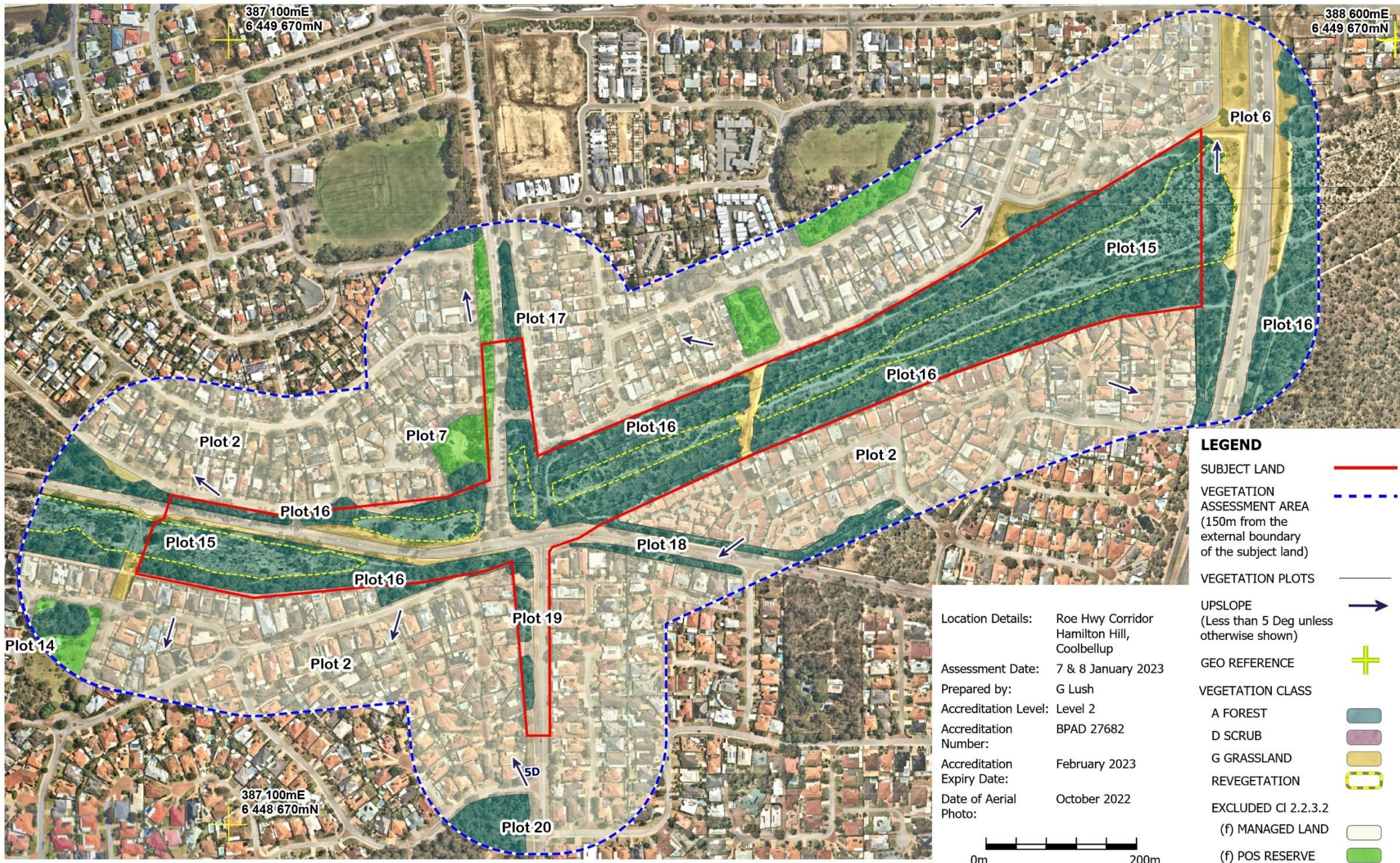
FIGURE 6
VEGETATION CLASSIFICATION - SHEET 2



Job No 22-014

Rev	Description	Date
A	Preliminary	6/05/2022
B	Review Mods	27/01/2023





LEGEND

- SUBJECT LAND —
- VEGETATION ASSESSMENT AREA (150m from the external boundary of the subject land) - - -
- VEGETATION PLOTS —
- UPSLOPE (Less than 5 Deg unless otherwise shown) →
- GEO REFERENCE +
- VEGETATION CLASS
 - A FOREST ■
 - D SCRUB ■
 - G GRASSLAND ■
- REVEGETATION □
- EXCLUDED CI 2.2.3.2
 - (f) MANAGED LAND
 - (f) POS RESERVE ■

Location Details: Roe Hwy Corridor
Hamilton Hill,
Coolbellup

Assessment Date: 7 & 8 January 2023

Prepared by: G Lush

Accreditation Level: Level 2

Accreditation Number: BPAD 27682

Accreditation Expiry Date: February 2023

Date of Aerial Photo: October 2022



FIGURE 6
VEGETATION CLASSIFICATION - SHEET 3



Job No 22-014

Rev	Description	Date
A	Preliminary	6/05/2022
B	Review Mods	27/01/2023





Acacia scrub more than 2m high



Marri/Jarraah forest with dense understorey



Banksia mixed forest with Grass trees



Managed Public Open Space



Parrot Bush scrub



Revegetation planing will be forest



Tuart to 30m



Sheoak/Casuarina



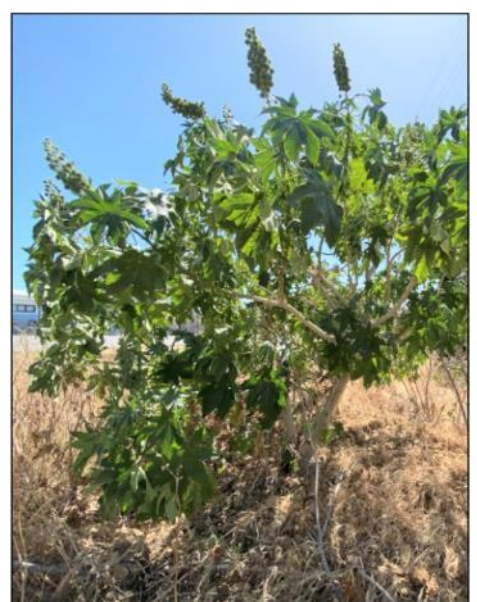
Brazilian Pepper
Tree to 15m



WA Christmas Tree



Unmanaged
Grassland
to 1m



Castor Oil Plant

FIGURE 7
VEGETATION EXAMPLES
(Sheet 2 of 2)



Job No 22-065

Rev Description Date
A Preliminary 3/01/2023



geoffrey@lushfire.com.au
0418 954873

3.2 Assessment Outputs – Bushfire Hazard Level Assessment

The bushfire hazard primarily relates to the vegetation on the site, the type and extent (area) of vegetation and its characteristics. The methodology for determining the bushfire hazard level is contained in the Guidelines for Planning in Bushfire Prone Areas (Section 4.1 and Appendix 2).

The classifications are as follows:

Extreme Hazard	<ul style="list-style-type: none">• Class A Forest• Class B Woodland• Class D Scrub• Any classified vegetation with a greater than 10 degree slope
Moderate Hazard	<ul style="list-style-type: none">• Class B Open Woodland, Low Woodland, Low Open Woodland, Open Shrubland• Class C Shrubland• Class E Mallee/Mulga• Class G Grassland including sown pasture and crops• Vegetation that has a low hazard level but is within 100 metres of vegetation of vegetation classified as a moderate or extreme hazard.
Low Hazard	<ul style="list-style-type: none">• Low threat vegetation, may include the following: areas of maintained lawns, golf courses, public recreation reserves and parklands, vineyards, orchards; cultivated gardens, commercial nurseries, nature strips and windbreaks.• Managed grassland in a minimal fuel condition meaning that there is insufficient fuel available to significantly increase the severity of the bushfire attack, for example short cropped grass to a nominal height of 100mm.• Non vegetated areas including waterways; roads; footpaths; buildings or rock outcrops.

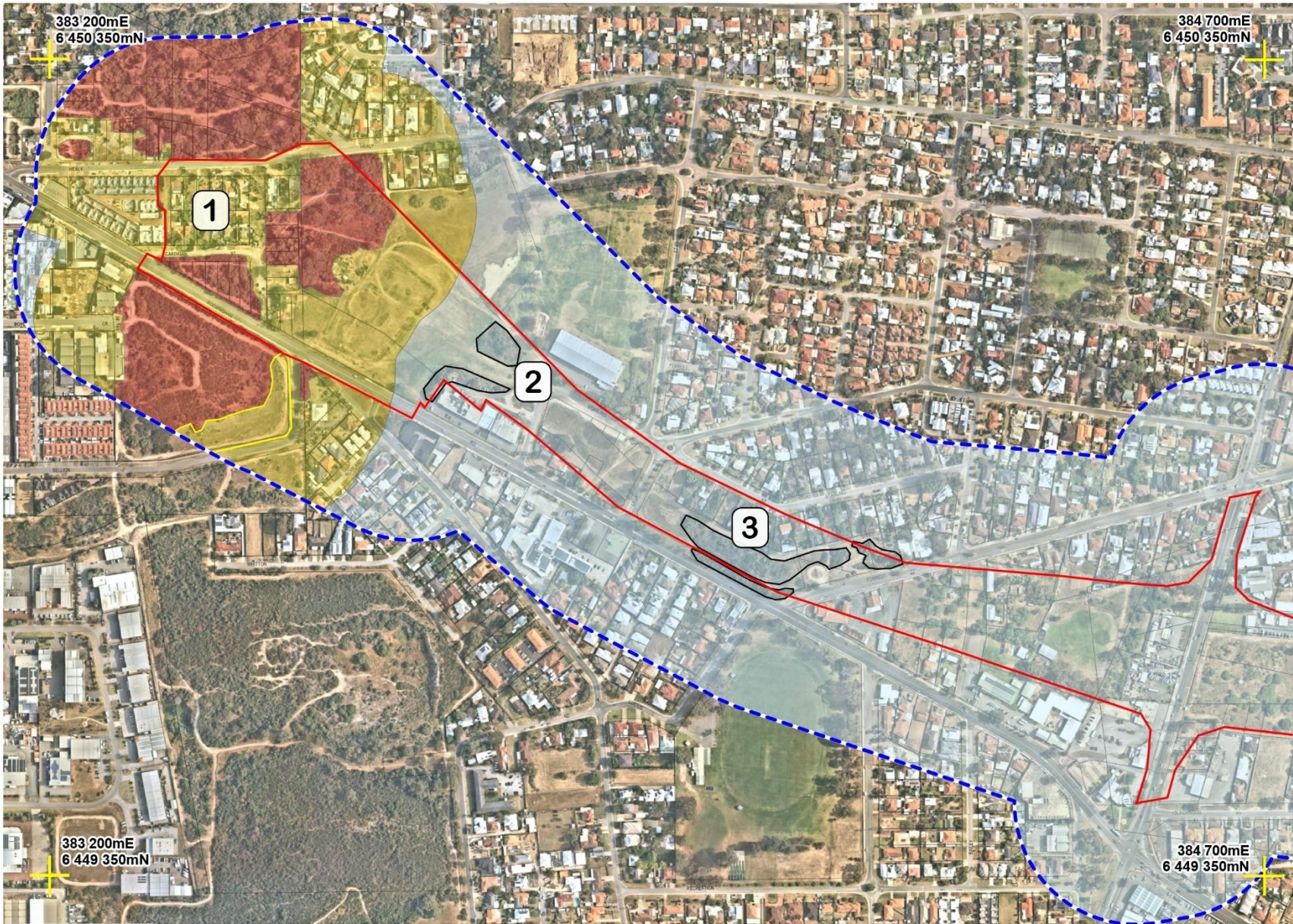
The bushfire hazard level assessment for the study area is shown in Figure 8 and this is based upon the following assumptions:

- Remnant native vegetation located within proposed Parks and Recreation reserves or local open space (as shown on the draft concept plan) is expected to be retained;
- Lots will be maintained in accordance with the City's Fire Control Order with land less than 4,047m² being required to maintain grassland as low threat vegetation;
- That classified vegetation, including non-local species such as the Brazilian Pepper Trees, within the Urban zone is likely to be cleared for development or managed as low threat vegetation; and
- Unmanaged grassland areas are also expected to be modified with any development.

Figure 8 also references local issues which are discussed in Section 4.0.

The majority of the proposed Urban zone will have a moderate or low bushfire hazard level. Where it might be intended to retain existing vegetation within the Urban zone, such as Local Open Space, then this land is likely to have an extreme bushfire hazard level and is not suitable for development.

The land to be reserved as Parks and Recreation generally has an extreme bushfire hazard level. This rating is not considerable suitable for development but is appropriate for the Parks and Recreation reservation.



LEGEND

- SUBJECT LAND
- ASSESSMENT AREA (150m from the external boundary of the subject site)
- BUSHFIRE HAZARD LEVEL
 - EXTREME
 - MODERATE
 - LOW
- ISSUE REFERENCE Refer to report 1
- VEGETATION POTENTIALLY RETAINED Less than 1ha and more than 100m from other classified vegetation.
- MODERATE HAZARD Includes land within 100m of any classified vegetation.

Location Details: Roe Highway Corridor
Hamilton Hill, Coolbellup

Assessment Date: 7 & 8 January 2023

Prepared by: G Lush

Accreditation Level: Level 2

Accreditation Number: BPAD 27682

Accreditation Expiry Date: February 2023

Date of Aerial Photo: October 2022



FIGURE 8
BUSHFIRE HAZARD LEVEL ASSESSMENT -
SHEET 1

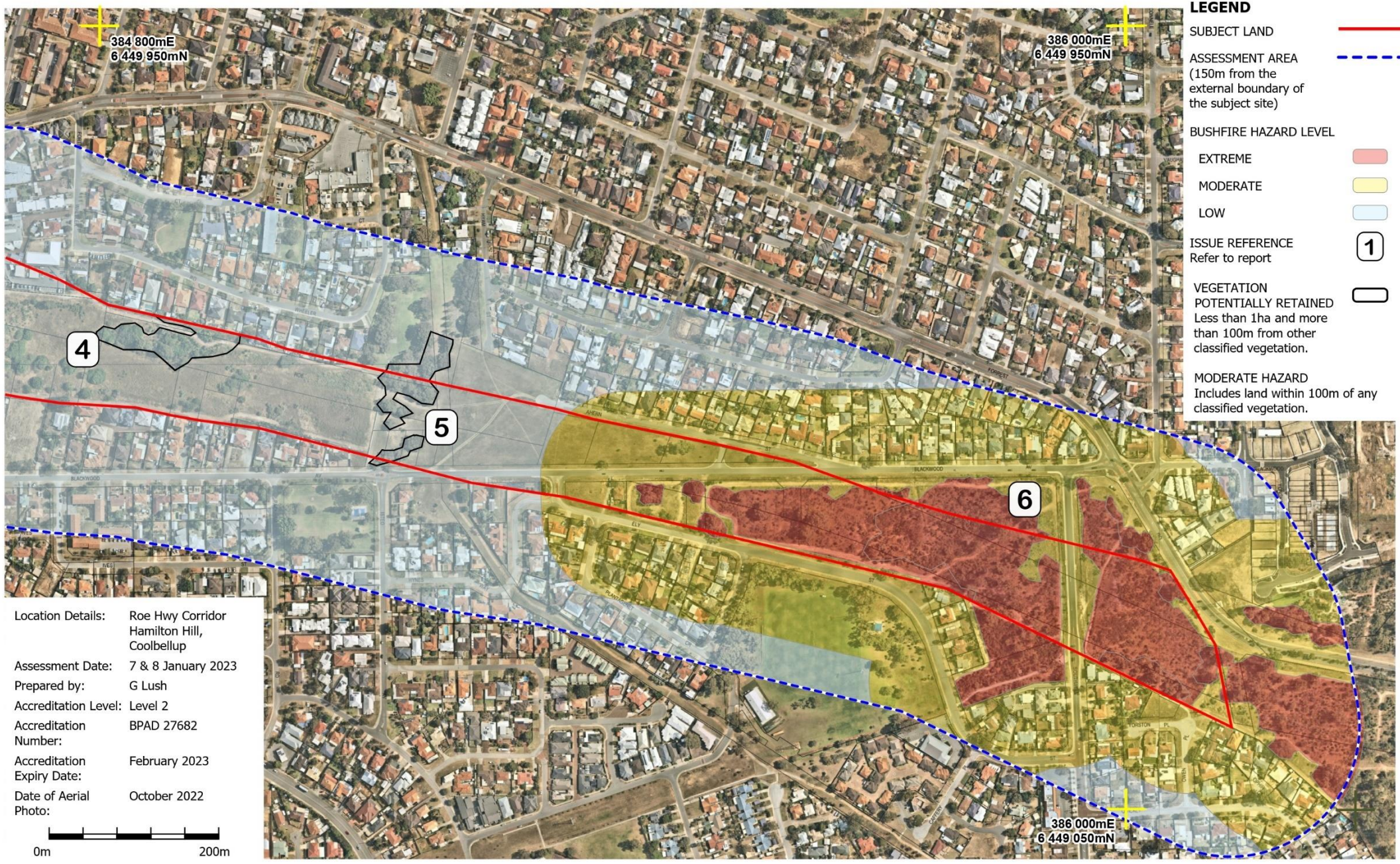


Job No 22-014

Rev	Description
A	Preliminary
B	Review Mods

Date
6/05/2022
27/01/2023





- LEGEND**
- SUBJECT LAND —
 - ASSESSMENT AREA (150m from the external boundary of the subject site) - - -
 - BUSHFIRE HAZARD LEVEL
 - EXTREME ■
 - MODERATE ■
 - LOW ■
 - ISSUE REFERENCE 1
Refer to report
 - VEGETATION POTENTIALLY RETAINED
Less than 1ha and more than 100m from other classified vegetation.
 - MODERATE HAZARD
Includes land within 100m of any classified vegetation.

Location Details: Roe Hwy Corridor
Hamilton Hill,
Coolbellup

Assessment Date: 7 & 8 January 2023

Prepared by: G Lush

Accreditation Level: Level 2

Accreditation Number: BPAD 27682

Accreditation Expiry Date: February 2023

Date of Aerial Photo: October 2022

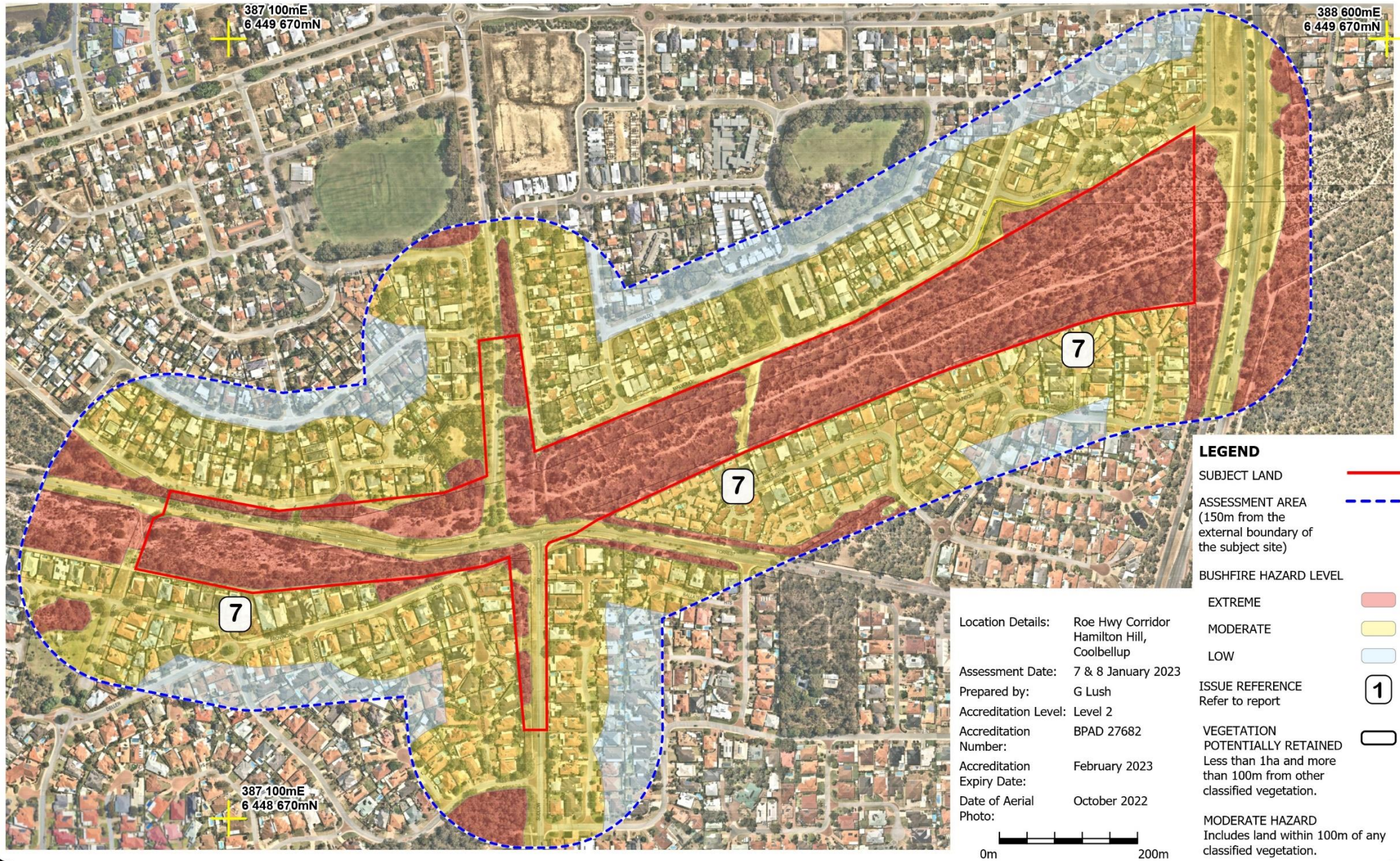


FIGURE 8
BUSHFIRE HAZARD LEVEL ASSESSMENT - SHEET 2



Job No 22-014		
Rev	Description	Date
A	Preliminary	6/05/2022
B	Review Mods	27/01/2023





LEGEND

SUBJECT LAND —

ASSESSMENT AREA (150m from the external boundary of the subject site) - - -

BUSHFIRE HAZARD LEVEL

EXTREME ■

MODERATE ■

LOW ■

ISSUE REFERENCE 1

VEGETATION POTENTIALLY RETAINED

MODERATE HAZARD Includes land within 100m of any classified vegetation.

Location Details: Roe Hwy Corridor
Hamilton Hill,
Coolbellup

Assessment Date: 7 & 8 January 2023

Prepared by: G Lush

Accreditation Level: Level 2

Accreditation Number: BPAD 27682

Accreditation Expiry Date: February 2023

Date of Aerial Photo: October 2022



FIGURE 8
BUSHFIRE HAZARD LEVEL ASSESSMENT - SHEET 3



Job No 22-014

Rev Description
A Preliminary
B Review Mods

Date
6/05/2022
27/01/2023



4.0 Identification of Bushfire Hazard Issues

4.1 District Context

The relationship of the subject land to the surrounding district is shown in Figure 9.

The Buti Inquiry (2) noted that the contextual risk to human life, in a built-up urban area is not the same as largescale heavily vegetated areas given the potential fire intensity, access to an extensive road network and proximity to emergency service response.

The most significant regional bushfire hazards are located at each end of the corridor, including Beelihar Regional Park. Some areas adjoin parts of the site, even though they might be separated by major road reserves. The corridor along Stock Road and especially the area adjacent to the Forrest Road intersection, contains a large area of bushland which is still reserved for Primary Regional Road. The eastern portion of the corridor between Stock and North Lake Road provides a connection of these hazard areas.

The western portion of the corridor, being the proposed Urban zone is more physically separated from these areas of regional hazards by existing roads and urban development with a low hazard level.

4.2 Local - Issues

Relevant local site issues are discussed below and are shown in Figure 10.

4.2.1 Retrospective Application of Guidelines (Locations 1 and 7)

The Guidelines state (page 5) that the policy measures of SPP 3.7 and these Guidelines are not to be applied retrospectively. Existing approvals will not be subject to further bushfire planning requirements; however, this should not preclude landowners/proponents from striving to achieve better outcomes.

The proposed Urban zone will be applied to lots which were created and many have been developed prior to 2015.

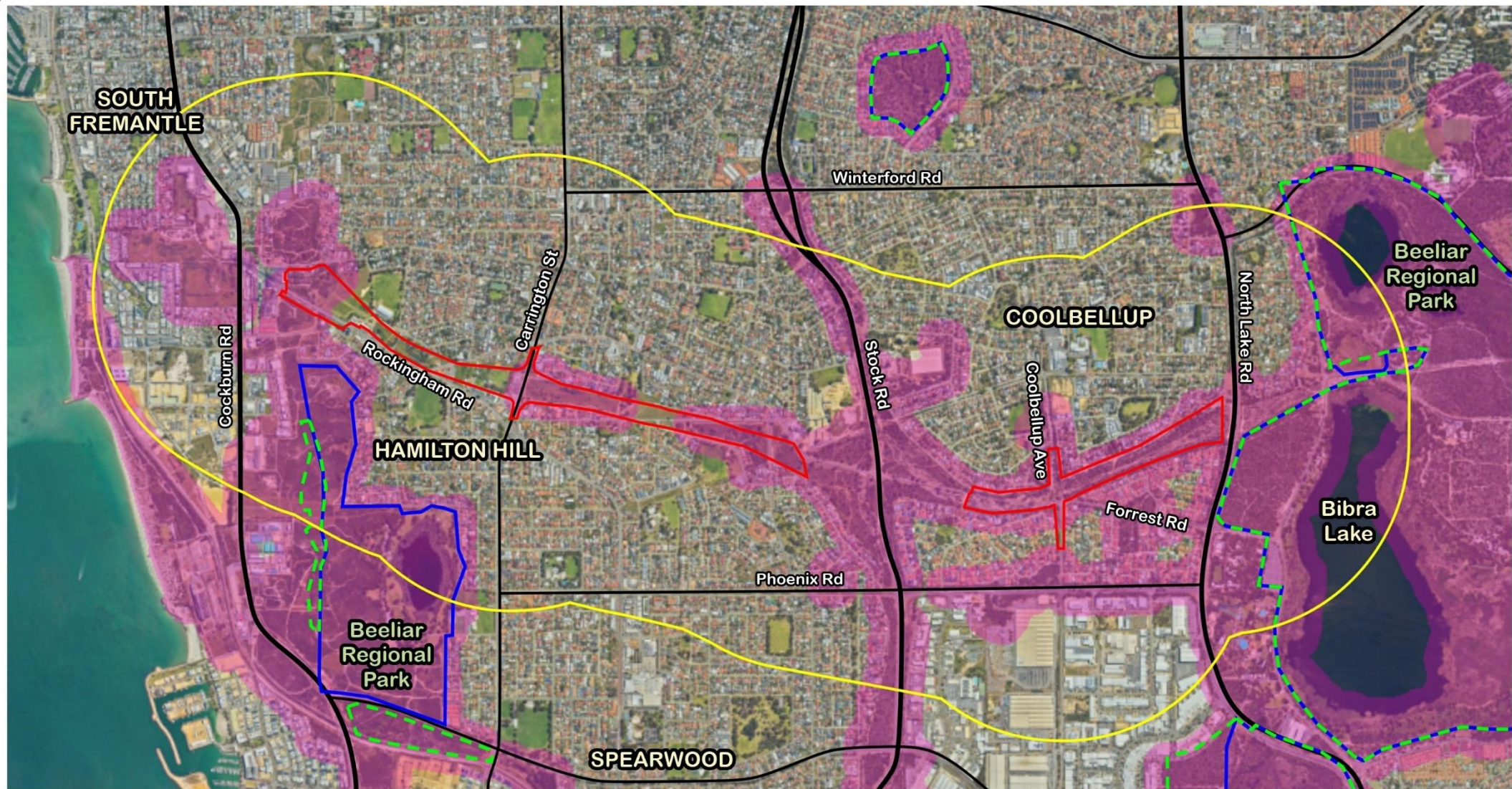
This is particularly relevant to the Cardigan Street area (Location 1). This is shown as having a moderate hazard level on the assumption that the existing vegetation within the lots will be able to be managed appropriately. Otherwise, portions of the lots will have an extreme hazard level and potential BAL-40/FZ rating. There is no requirement for existing dwellings to be upgraded, however if the land remains designated as being bushfire prone, then any new dwellings or extensions will have to comply with the bushfire construction provisions of the National Construction Code.

Similarly, there are existing residential lots in the eastern portion of the study area that directly back onto the proposed Parks and Recreation reserve (Location 7). The implications of this are further discussed in section 4.2.2.

4.2.2 Hazard Interface/ Separation (Locations 1, 6 and 7)

The most efficient and cost effective fire management measure is to separate development from hazard areas. The greater the separation distance the lower the hazard or BAL rating for the development. The preferred option promoted by Guidelines is to have a physical barrier such as a subdivision road separating the development from the hazard areas. Due to the linear nature of the corridor, the adjoining existing development is often only separated by a boundary firebreak. This is evident for the lots between Healy and Cardigan Streets (Location 1) which back onto hazard vegetation. This issue also applies for the land between Blackwood Avenue and Ely Street (Location 6) as the existing hazard vegetation within the corridor is being retained.

This issue is also relevant for the lots on the southern side of the corridor located between Stock and North Lake Roads (Location 7). While there in some parts there is a substantial firebreak of 5m width, many dwellings are located close to the rear boundary. These can potentially have a BAL-40/FZ rating. However, the amendment is simply recognising the existing situation which has occurred for many years.



LEGEND

- | | | | |
|---------------------|--|---------------------------------|--|
| SUBJECT LAND | | ENVIRONMENTALLY SENSITIVE AREAS | |
| 1km BUFFER | | BUSH FOREVER SITE | |
| BUSHFIRE PRONE LAND | | | |

FIGURE 9
DISTRICT CONTEXT



Job No 22-065

Rev	Description	Date
A	Preliminary	3/01/2023
B	Review Mods	27/01/2023



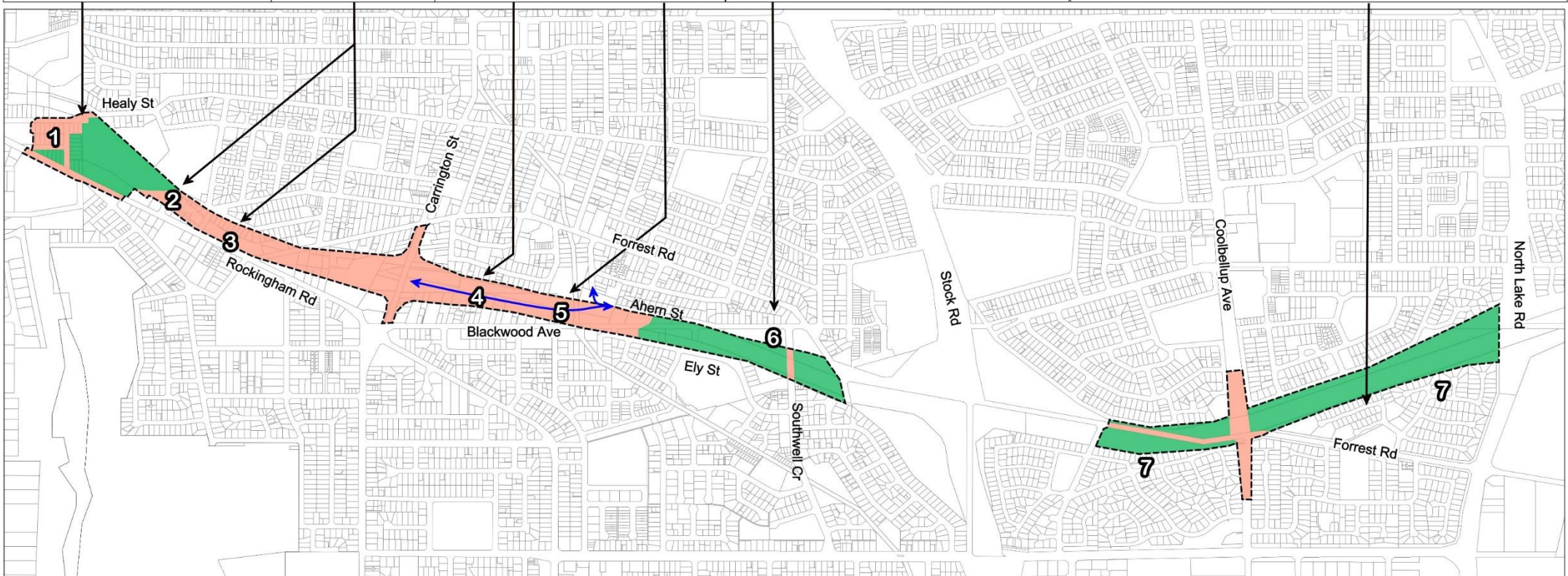
Pre-existing lots <1,000sqm with tree cover and potential BAL-40/FZ rating. Short steep slopes more than 10 Degrees. No hazard separation to vegetation in ROS and existing lots may have BAL-40/FZ ratings. Can be considered as 'minor development.'

Location 2 is a small isolated vegetation. Location 3 is less than 1ha. and not designated as being bushfire prone.

Bushfire prone land with limited access. Multiple freehold lots are land locked with no suitable access. Includes transmission line easement. Locations 4 & 5 have vegetation which may be retained but which is less than 1ha, and more than 100m from other classified vegetation.

Lot 1 is adjacent to the corridor. It is zoned Urban and contains remnant vegetation. Any development would have to provide a hazard separation to the bushland in the corridor. The portion of Southwell Street within the corridor is not a gazetted road reserve.

Existing residential development along the southern boundary, through to Stock Road, with no physical separation from the hazard vegetation in the corridor. Existing dwellings potentially with a BAL-40/FZ rating but most were constructed prior to 2015. The Guidelines do not apply retrospectively. May limit infill unit development.



LEGEND

- SUBJECT LAND
- PROPOSED URBAN ZONE
- PROPOSED PARKS & RECREATION RESERVE
- POTENTIAL ROAD / ACCESS CONNECTION

FIGURE 10
LOCAL ISSUES



Job No 22-065

Rev	Description	Date
A	Preliminary	3/01/2023
B	Review Mods	27/01/2023



4.2.3 Road Access (Location 4)

Ensuring that there is appropriate vehicular access and egress in the event of a bushfire is a key objective of the Bushfire Protection Criteria. In bushfire prone areas multiple access in two different directions to suitable destinations are required. No-through roads should be avoided and should only be considered where there is no alternative road layout exists due to site constraints; and the no-through road is a maximum length of 200 metres.

The section of the corridor between Carrington and Ahern Street (Location 4) extends for approximately 700m with no road access from the side. The lots in this section of the corridor are freehold lots owned by Main Roads WA.

All the lots are designated as being bushfire prone land and ten lots have no gazetted road frontage.

Development of this location will require access to be provided to Carrington Street and Ahern Street / Blackwood Avenue. Development of the existing individual lots should not occur until appropriate access has been provided and the hazard vegetation is managed.

4.2.4 Isolated Vegetation (Locations 2, 3, 4 and 5)

Classified vegetation normally has a minimum area of 1 hectare when it is located more than 100m from other classified vegetation. Where it is less than 100m from other classified vegetation, smaller areas will be classified unless they comply with the requirements for exemption pursuant to Clause 2.2.3.2 of AS3959 Construction of Buildings in Bushfire Prone Areas.

The vegetation at Locations 2, 3, 4 and 5 comprises of vegetation which may be retained but which is less than 1 hectare in size and more than 100m from any other classified vegetation. Assuming that any adjacent grassland areas will become managed land when development occurs the vegetation identified at Locations 2, 3, 4 and 5 will not be a bushfire hazard.

The vegetation at Location 2 comprises of two areas associated with local drainage areas each being approximately 1,600sqm with mixed vegetation and excluded from the hazard assessment on the basis that the surrounding land will be managed land.

The vegetation at Location 3 (Lot 155) is approximately 0.8 hectares in size when the adjoining revegetation planting and roadside vegetation is included.

The vegetation at Location 4 is approximately 0.5 hectares in size. It is mixed forest and scrub that includes a Tuart tree and may potentially retained.

The vegetation at Location 5, extending from Blackwood Avenue to Wheeler Park is approximately 0.5 hectares. This has been distinguished from the vegetation in Wheeler Park which is a managed reserve with irrigated lawn areas under the trees.

4.2.5 Blackwood Avenue (Location 6)

Location 6 is the area west of Southwell Crescent and between Blackwood Avenue and Ely Street.

The amendment proposes to include the vegetation located within the corridor in the Parks and Recreation reserve. The land within the corridor is freehold land owned by Main Roads WA.

The adjacent bushland is on freehold land that is currently zoned Urban and this will not change. The adjacent Lot 1 is owned by the State Housing Commission and Lot 172 by the City of Cockburn.

Any development of this land would have to comply with the Acceptable Solutions in the Guidelines (Bushfire Protection Criteria), including the provision of a suitable hazard separation zone.

It is also noted that the portion of Southwell Crescent within the corridor is not a gazetted road reserve.

4.3 High Risk Land Uses

High risk land uses are those uses which may lead to the potential ignition, prolonged duration and/or increased intensity of a bushfire. Such uses may also expose the community, fire fighters and the surrounding environment to dangerous, uncontrolled substances during a bushfire event. Examples of high risk land uses include service stations, landfill sites, bulk storage of hazardous materials, fuel depots.

High risk land uses can potentially be located in the Urban zone which would then be addressed in the local planning scheme provisions.

4.4 Vulnerable Land Uses

Vulnerable land uses are uses where it is considered that occupants have a lesser capacity to respond in the event of a bushfire, and which may present evacuation challenges. These are generally associated with hospitals, nursing homes and retirement villages. However, they also include any form of tourist accommodation, places of assembly, family day care centres, schools etc.

Vulnerable land uses can potentially be located in the Urban zone which would then be addressed in the local planning scheme provisions.

5.0 Assessment Against the Bushfire Protection Criteria

A summary of the compliance with the Bushfire Protection Criteria as contained in Version 1.4 (Dec 2021) of the Guidelines for Planning in Bushfire Prone Areas is documented in Table 3. This demonstrates how the Criteria are expected to be complied with at the various planning stages being:

- An amendment to the Local Planning Scheme;
- Preparation of a Local Development Plan;
- A subdivision application; and
- A development application.

Version 1.4 of the Guidelines applies the Acceptable Solutions based upon the following planning stages:

SP – Strategic planning proposal and structure plan where the lot layout is not known

Sb – Structure plan where the lot layout is known and subdivision application

Dd – Development application for a single dwelling, ancillary dwelling or minor development

Do – Development application for any other development

It is also acknowledged that the subdivision design / concept plan is likely to be refined and evolve at the subsequent planning stages.

Roe 8 West & 9 Corridor Planning Study

Table 3 BPC Compliance

Development Stage Requirement	Region Scheme Amendment	Local Planning Scheme Amendment	Structure Plan / Local Development Plan	Subdivision Application
Element 1 Location				
A1.1 Development Location	Only a portion of the study area is designated as being bushfire prone. This BHL report has considered the district context of the site, noting that in relation to the proposed Parks and Recreation reserve that the Amendment is recognising the existing vegetation and open space areas of regional importance. The proposed Urban zone can be either developed for a range of uses or the existing vegetation can be protected as local open space which will be determined in the subsequent amendment to the Local Planning Scheme.	Following the MRS Amendment, the Local Planning Scheme will have to be amended to be consistent with the MRS. This local amendment will assign local zoning provisions, which will require further justification in a revised BHL report.	Preparation of a bushfire management plan to support any structure plan. The BMP is to confirm compliance with the Bushfire Protection Criteria and in particular: <ul style="list-style-type: none"> • the management and vegetation classification of any local POS areas; • the management of any hazard interface and separation zone; • internal access provisions. 	Prepare a BMP to reflect any subdivision design. Proposed BAL ratings to be confirmed when lot layout is known. Restricting development in portions of land with a BAL-40/FZ rating to be implemented by a Local development Plan or restrictive covenant. Any staging would require interim measures.
Element 2 Siting and Design				
A2.1 Asset Protection zone (APZ).	This is not relevant to the LPS Amendment as there is no detailed subdivision to assess the APZs.	This is not relevant to the LPS Amendment as there is no detailed subdivision to assess the APZs.	The structure plan design needs to ensure that there is a suitable setback between hazard areas and development sites which can contain an appropriate APZ. The APZs are unlikely to be fully contained within each lot and so this will require the use of other land such as a road reserve.	Prepare a BMP to reflect any subdivision design. The revised BMP will confirm the location and size of the APZs based upon a BAL-29 setback.
Element 3 Vehicular Access				
A3.1 Public Road (SP Sb Do)	The existing roads comply with the public road standards.	Some existing roads in the study area are not on gazetted road reserves. This should also consider potential access requirements to land locked lots.	The road design is expected to comply with design requirements in Liveable Neighbourhoods. A structure plan can address	The road design is to comply with design requirements and this will be confirmed in the revised BMP. Interim access for staging is to be

Roe 8 West & 9 Corridor Planning Study

Development Stage Design Requirement	Region Scheme Amendment	Local Planning Scheme Amendment	Structure Plan / Local Development Plan	Subdivision Application
			resubdivision and access issues for land locked areas.	provided by public road connections.
A3.2a Multiple access routes (SP Sb Do)	The study area is located in an existing urban area with district and local access multiple directions.	The site has multiple access routes at both the district and local level.	Any structure plan would have to ensure that multiple internal access routes are to be provided connecting to the external road network.	Would be in accordance with the structure plan and bushfire management plan. Any staging would require interim access measures.
A3.2b Emergency access way (SP Sb Do)	Is not applicable to the Amendment as there is no subdivision design.	Is not applicable to the Amendment as there is no subdivision design.	It may be applicable depending upon the subdivision design.	Would be provided in accordance with the structure plan and bushfire management plan. Any staging would require interim access measures.
A3.3 Through-roads (SP Sb)	Is not applicable to the Amendment as there is no subdivision design.	Is not applicable to the Amendment as there is no subdivision design.	Any Cul-de-sac's and dead-end roads would have to be justified in the BMP as they are to be avoided in bushfire prone areas because they do not provide access in different directions for residents.	Any Cul-de-sac's and dead-end roads would have to be justified in the BMP as they are to be avoided in bushfire prone areas because they do not provide access in different directions for residents.
A3.4a Perimeter roads (SP Sb)	Is not applicable to the Amendment as there is no subdivision design.	Is not applicable to the Amendment as there is no subdivision design.	A structure plan would identify the primary hazard areas and provide justification for not providing a perimeter road.	The requirement for a suitable separation distance may affect the road design width as this could be more than 20m. Would be shown in the revised BMP.
A3.4b Fire service access route (SP Sb)	Is not applicable to the Amendment as there is no subdivision design.	Is not applicable to the Amendment as there is no subdivision design.	Any FSAR would have to be justified as they can only be provided as a link to public roads 'where no alternative exists'.	The BMP would have to provide any information why no alternative exists to providing a public road in place of any proposed EAW's. Any staging would require interim access measures.
A3.5 Battle-axe access legs (Sb)	Is not applicable to the Amendment as there is no subdivision design.	Is not applicable to the Amendment as there is no subdivision design.	Is not applicable unless there is a subdivision design.	Any battle axe lot would have to be justified as these are to be avoided in bushfire prone areas.

Roe 8 West & 9 Corridor Planning Study

Development Stage Design Requirement	Region Scheme Amendment	Local Planning Scheme Amendment	Structure Plan / Local Development Plan	Subdivision Application
A3.6 Private driveways (Dd Do)	Is not applicable to the Amendment as there is no subdivision design.	Is not applicable to the Amendment as there is no subdivision design.	Is unlikely to be applicable in a developed urban area.	Is not applicable.
Element 4 Water				
A4.1 Identification of future water supply (SP)	The land adjacent to the study area has a reticulated water supply with the expected capacity to service the land.	The land adjacent to the study area has a reticulated water supply with the expected capacity to service the land.	Any structure plan would have to demonstrate the ability to provide serviced to proposed lots.	Extension and connection to a reticulated water supply would be expected as a condition of subdivision.
A4.2 Provision of water for firefighting purposes (Sb Dd Do)	The subject land where developed is expected to be provided with fire hydrants.	The land locked lots have no water supply which would have to be extended to service them. Alternatively, any development would require a static water supply for fire fighting.	Any structure plan would have to demonstrate the ability to provide serviced to proposed lots.	The provision of fire hydrants would be expected as a condition of subdivision.
High Risk Land Uses				
Proposed high risk land uses need special consideration.	High risk land uses are more likely to occur in the 'Industrial' zone but some minor ones such as petrol stations can occur in the Urban zone.	Can be controlled through the provisions of Local Planning Scheme zoning and development provisions.	Location issues can be address in any Local Structure Plan / Development Plan, with a detailed Bushfire Management Plan.	Not applicable if addressed in the previous planning stages.
Vulnerable Land Uses				
Proposed vulnerable land uses need special consideration.	These are consistent with the Urban zone and there are several schools within the study area.	Can be controlled through the provisions of Local Planning Scheme zoning and development provisions.	Location issues can be address in any Local Structure Plan / Development Plan, with a detailed Bushfire Management Plan.	Not applicable if addressed in the previous planning stages.

Appendix 1 – Vegetation Photographs

Appendix 1 - Vegetation Photographs



Photograph Locations

Appendix 1 - Vegetation Photographs

Photo No 1 Plot 1

Vegetation Classification

Class A Forest - Open forest A-03

Description

Mixed forest to 25m over scrub with more than 40% canopy coverage on northern side of Healy Street.



Photo No 2 Plot 3

Vegetation Classification

Class A Forest - Open forest A-03

Description

Mixed forest to 20m over scrub with more than 30% canopy coverage on rocky ridge area with more open habitat with shrub sporadic understorey or grassland.



Photo No 3 Plot 3

Vegetation Classification

Class A Forest - Open forest A-03

Description

Mixed forest to 20m over scrub with more than 30% canopy coverage on rocky ridge area with more open habitat with shrub sporadic understorey or grassland.



Photo No 4 Plot 4

Vegetation Classification

Class A Forest - Low open forest A-04

Description

Brazilian Pepper Trees to 10m with some Acacia foliage coverage more than 40%.



Appendix 1 - Vegetation Photographs

Photo No 5 Plot 4

Vegetation Classification

Class A Forest - Low open forest A-04

Description

Brazilian Pepper Trees to 10m with some Acacia foliage coverage more than 40%.



Photo No 6 Plot 5

Vegetation Classification

Class D Scrub - Closed scrub D-13

Description

Acacia scrub to average height of 2m with more than 30% canopy coverage generally over grass weeds. Vertical fuel structure with plenty of dead material and very high near surface fuel loads.



Photo No 7 Plot 5

Vegetation Classification

Class D Scrub - Closed scrub D-13

Description

Acacia scrub to average height of 2m with more than 30% canopy coverage generally over grass weeds. Vertical fuel structure with plenty of dead material and very high near surface fuel loads.



Photo No 8 Plot 6

Vegetation Classification

Class G Grassland – Tussock grassland G-22

Description

Grassland in informal local open space being more than 100mm in height.



Appendix 1 - Vegetation Photographs

Photo No 9 Plot 7

Vegetation Classification

Excludable - 2.2.3.2(f) Low Threat Vegetation

Description

Managed public open space reserve.



Photo No 10

Vegetation Classification

Class A Forest - Low open forest A-04

Description

Brazilian Pepper Tree scrub/forest on vacant land.



Photo No 11 Plot 8

Vegetation Classification

Class A Forest - Open forest A-03

Description

Mixed vegetation including Pines to 20m with Pepper Trees and Acacia scrub.



Photo No 12 Plot 8

Vegetation Classification

Class A Forest - Low open forest A-04

Description

Eucalyptus revegetation planting.



Appendix 1 - Vegetation Photographs

Photo No 13

Vegetation Classification

Class A Forest - Open forest A-03

Description

Pepper trees on vacant block with unmanaged grassland



Photo No 14 Plot 7

Vegetation Classification

Excludable - 2.2.3.2(f) Low Threat Vegetation

Description

Managed public open space reserve



Photo No 15

Vegetation Classification

Class A Forest - Low open forest A-04

Description

Pepper trees on vacant block with unmanaged grassland.



Appendix 1 - Vegetation Photographs

Photo No 16

Vegetation Classification

Class D Scrub - Closed scrub D-13

Description

Castor Oil plants to 1.5m will increase in height if unmanaged.



Photo No 17

Vegetation Classification

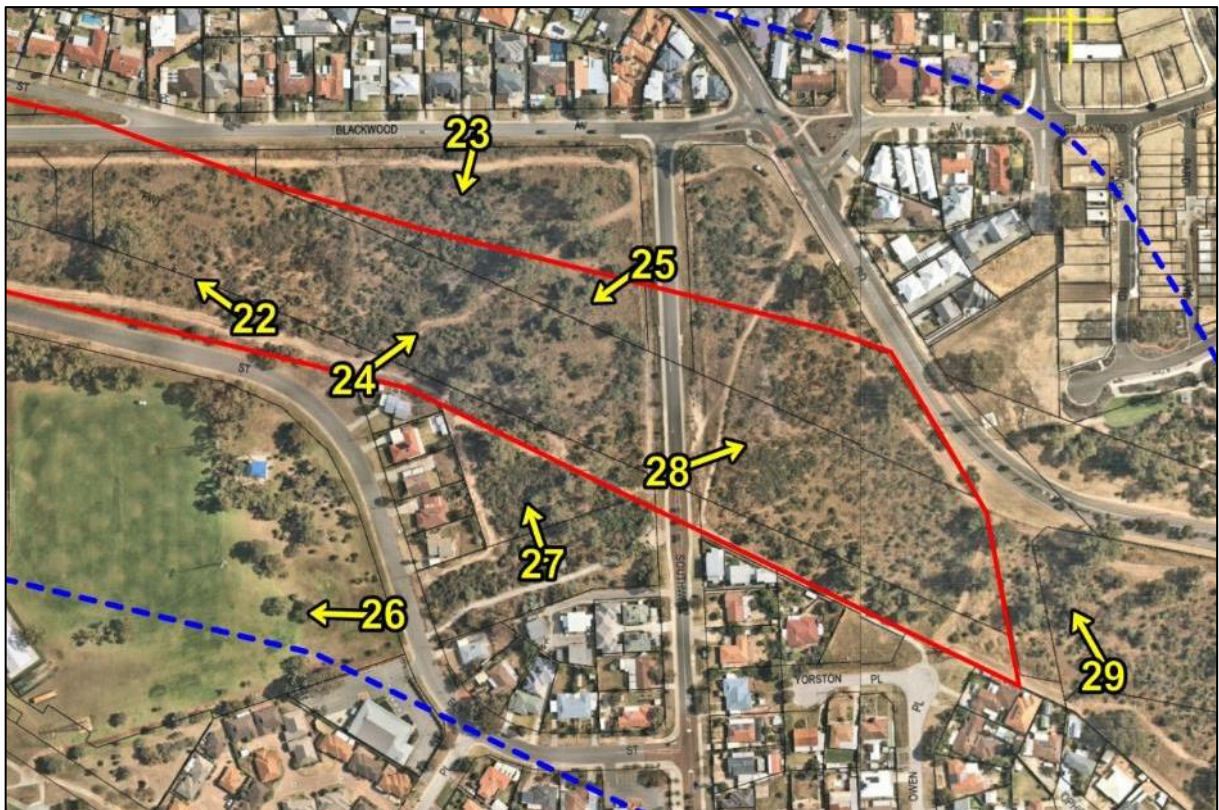
Class D Scrub - Closed scrub D-13

Description

Mixed scrub to 3m height including Pepper trees under the transmission line with unmanaged grassland areas.



Appendix 1 - Vegetation Photographs



Photograph Locations

Appendix 1 - Vegetation Photographs

Photo No 18 Plot 6

Vegetation Classification

Class G Grassland – Tussock grassland G-22

Description

Unmanaged grassland to 1m.



Photo No 19 Plot 10

Vegetation Classification

Class A Forest - Open forest A-03

Description

Mixed Eucalypts and Pepper trees with scrub and Castor Oil plants



Photo No 20 Plot 6

Vegetation Classification

Class G Grassland – Tussock grassland G-22

Description

Unmanaged grassland to 1m with other dead weeds, thistles etc



Photo No 21 Plot 6

Vegetation Classification

Class G Grassland – Tussock grassland G-22

Description

Unmanaged grassland to 200mm between Blackwood Ave and Ahern St. Large lots are only required to have boundary firebreak under the City Fire Control Notice.



Appendix 1 - Vegetation Photographs

Photo No 22 Plot 12

Vegetation Classification

Class D Scrub - Closed scrub D-13

Description

Mixed scrub to 3m including Parrot Bush and Grass Trees, Casuarina with thick grassland areas.



Photo No 23 Plot 13

Vegetation Classification

Class A Forest - Open forest A-03

Description

Mixed forest to 20m more than 30% canopy coverage with Banksia woodland.



Photo No 24 Plot 13

Vegetation Classification

Class A Forest - Open forest A-03

Description

Mixed forest to 20m more than 30% canopy coverage with Banksia woodland.



Photo No 25 Plot 13

Vegetation Classification

Class A Forest - Open forest A-03

Description

Mixed forest to 20m more than 30% canopy coverage with Banksia woodland.



Appendix 1 - Vegetation Photographs

Photo No 26 Plot 7

Vegetation Classification

Excludable - 2.2.3.2(f) Low Threat Vegetation

Description

Managed public open space reserve



Photo No 27 Plot 13

Vegetation Classification

Class A Forest - Open forest A-03

Description

Mixed forest to 20m more than 30% canopy coverage with Banksia woodland.



Photo No 28 Plot 12

Vegetation Classification

Class D Scrub - Closed scrub D-13

Description

Mixed scrub to 3m including Acacia, Parrot Bush and Grass Trees, Casuarina with thick grassland areas.



Photo No 29 Plot 13

Vegetation Classification

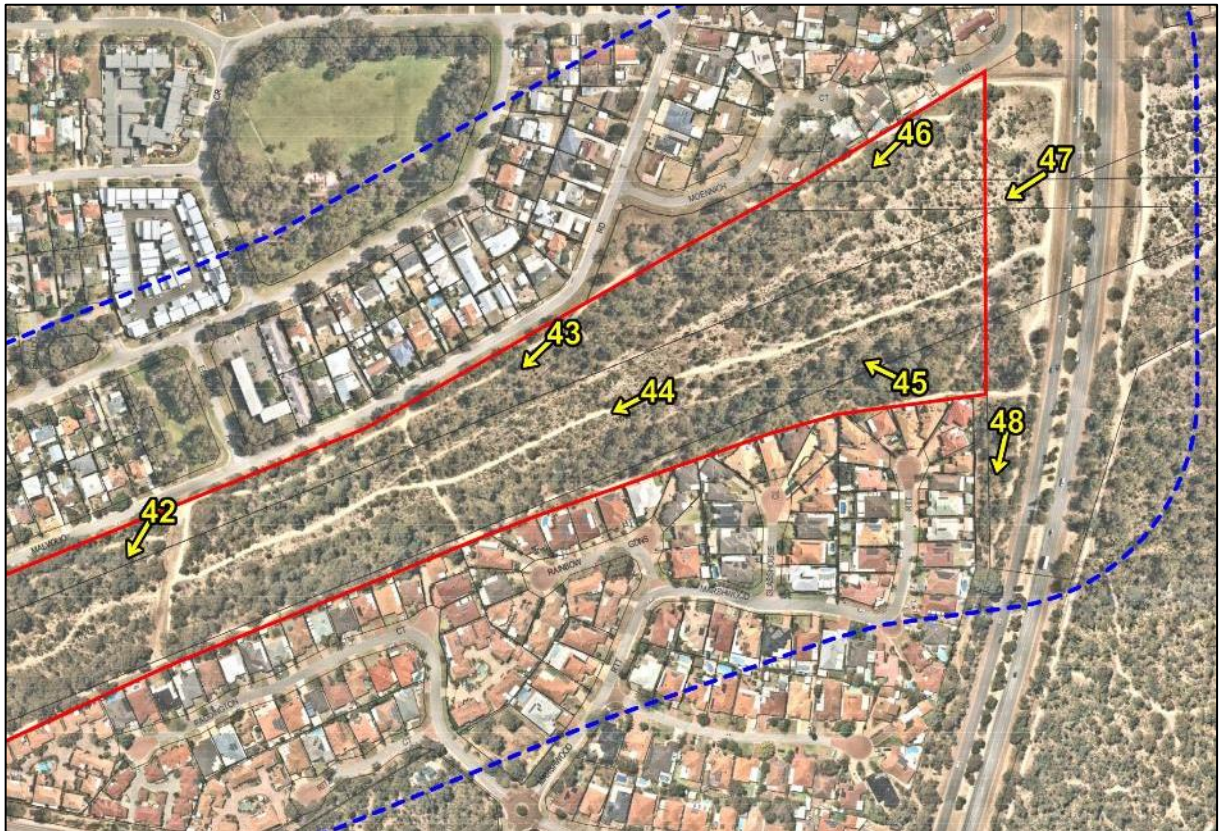
Class A Forest - Open forest A-03

Description

Mixed forest to 20m more than 30% canopy coverage with Banksia woodland.



Appendix 1 - Vegetation Photographs



Photograph Locations

Appendix 1 - Vegetation Photographs

Photo No 30 Plot 16

Vegetation Classification

Class A Forest - Open forest A-03

Description

Mixed Jarrah, Marri forest with some Tuarts to 25m more than 30% canopy coverage with Banksia and mixed shrub understorey with very heavy near surface fuel loads.



Photo No 31 Plot 16

Vegetation Classification

Class A Forest - Open forest A-03

Description

Mixed Jarrah, Marri forest with some Tuarts to 25m more than 30% canopy coverage with Banksia and mixed shrub understorey with very heavy near surface fuel loads.



Photo No 32 Plot 14

Vegetation Classification

Class A Forest - Low open forest A-04

Description

Mixed forest around wetland within Orlando Park, more than 2,500sqm in size and less than 100m from classified vegetation in the corridor.



Photo No 33 Plot 15

Vegetation Classification

Class A Forest - Open forest A-03

Description

Revegetation area within corridor mixed vegetation. Proposed to be Banksia woodland/forest.



Appendix 1 - Vegetation Photographs

Photo No 34 Plot 16

Vegetation Classification

Class A Forest - Open forest A-03

Description

Mixed Jarrah, Marri forest to 20m more than 30% canopy coverage with Banksia, Acacia and mixed shrub understorey with very heavy near surface fuel loads.



Photo No 35 Plot 16

Vegetation Classification

Class A Forest - Open forest A-03

Description

Mixed Jarrah, Marri forest to 20m more than 30% canopy coverage with Banksia, Acacia and mixed shrub understorey with very heavy near surface fuel loads.



Photo No 36 Plot 16

Vegetation Classification

Class A Forest - Open forest A-03

Description

Mixed Jarrah, Marri forest with some Tuarts to 25m more than 30% canopy coverage with Banksia and mixed shrub understorey with very heavy near surface fuel loads.



Photo No 37 Plot 17

Vegetation Classification

Class A Forest - Open forest A-03

Description

Coolbellup Avenue verge vegetation, Eucalypts to 20m with more than 30% canopy coverage over grass trees and low shrubs.



Appendix 1 - Vegetation Photographs

Photo No 38 Plot 18

Vegetation Classification

Class A Forest - Open forest A-03

Description

Forest Road narrow verge vegetation, Eucalypts to 20m with more than 30% canopy coverage over grass trees and low shrubs. Contiguous with classified vegetation in Plot 11.



Photo No 39 Plot 19

Vegetation Classification

Class A Forest - Open forest A-03

Description

Sudlow Road verge vegetation, Eucalypts to 20m with more than 30% canopy coverage over grass trees and grassland.



Photo No 40 Plot 20

Vegetation Classification

Class A Forest - Open forest A-03

Description

Mixed Jarrah, Marri forest to 25m in Sherbooke Reserve with more than 40% canopy coverage with Banksia and mixed shrub understorey with very heavy near surface fuel loads.



Photo No 41 Plot 16

Vegetation Classification

Class A Forest - Open forest A-03

Description

Mixed Jarrah, Marri forest with some Tuarts to 25m more than 30% canopy coverage with Banksia and mixed shrub understorey with very heavy near surface fuel loads.



Appendix 1 - Vegetation Photographs

Photo No 42 Plot 16

Vegetation Classification

Class A Forest - Open forest A-03

Description

Mixed Jarrah, Marri forest with some Tuarts to 25m more than 30% canopy coverage with Banksia and mixed shrub understorey with very heavy near surface fuel loads.



Photo No 43 Plot 16

Vegetation Classification

Class A Forest - Open forest A-03

Description

Mixed Jarrah, Marri forest with some Tuarts to 25m more than 30% canopy coverage with Banksia and mixed shrub understorey with very heavy near surface fuel loads.



Photo No 44 Plot 15

Vegetation Classification

Class A Forest - Open forest A-03

Description

Revegetation area within corridor mixed vegetation. Proposed to be Banksia woodland/forest.



Photo No 45 Plot 16

Vegetation Classification

Class A Forest - Open forest A-03

Description

Mixed Jarrah, Marri forest with some Tuarts to 25m more than 30% canopy coverage with Banksia and mixed shrub understorey with very heavy near surface fuel loads.



Appendix 1 - Vegetation Photographs

Photo No 46 Plot 16

Vegetation Classification

Class A Forest - Open forest A-03

Description

Mixed Jarrah, Marri forest with some Tuarts to 25m more than 30% canopy coverage with Banksia and mixed shrub understorey with very heavy near surface fuel loads.



Photo No 47 Plot 15

Vegetation Classification

Class A Forest - Open forest A-03

Description

Revegetation area within corridor mixed vegetation. Proposed to be Banksia woodland/forest.



Photo No 48 Plot 16

Vegetation Classification

Class A Forest - Open forest A-03

Description

Mixed Jarrah, Marri forest with some Tuarts to 25m more than 30% canopy coverage with Banksia and mixed shrub understorey with very heavy near surface fuel loads.



Appendix I
Main Roads WA Transport Modelling



mainroads
WESTERN AUSTRALIA

*We're working for
Western Australia.*

Roe 8 West / Roe 9 Transport Modelling

Printed copies are uncontrolled unless marked otherwise. Refer to iRoads for current version.

Februarv 2023

Contents

1	BACKGROUND	1
2	EXISTING TRAFFIC VOLUMES	2
3	TRANSPORT MODELLING	2
4	NETWORK ASSESSMENT	3
4.1	Roe 9 arterial road	3
4.2	Roe 8 West.....	4

Document Control

Owner	Main Roads, Road Planning Branch
Custodian	Director Road Planning
Document Number	
Issue Date	February 2023
Review Frequency	

Amendments

Revision Number	Revision Date	Description of Key Changes	Section / Page No.

1 BACKGROUND

The Road Planning Branch of Main Roads is undertaking a network assessment to confirm the future form and function of Stock Road between Leach Highway and Rowley Road. This work includes transport modelling using Main Roads' Regional Operational Model (ROM24) to assess options for an arterial road located within the existing Roe 8 West (North Lake Road to Stock Road) and Roe 9 (Stock Road to Cockburn Road) primary regional road reservations. The current Metropolitan Region Scheme is shown in Figure 1 below, with the primary regional road reservation following existing Forrest Road west and east of Stock Road.

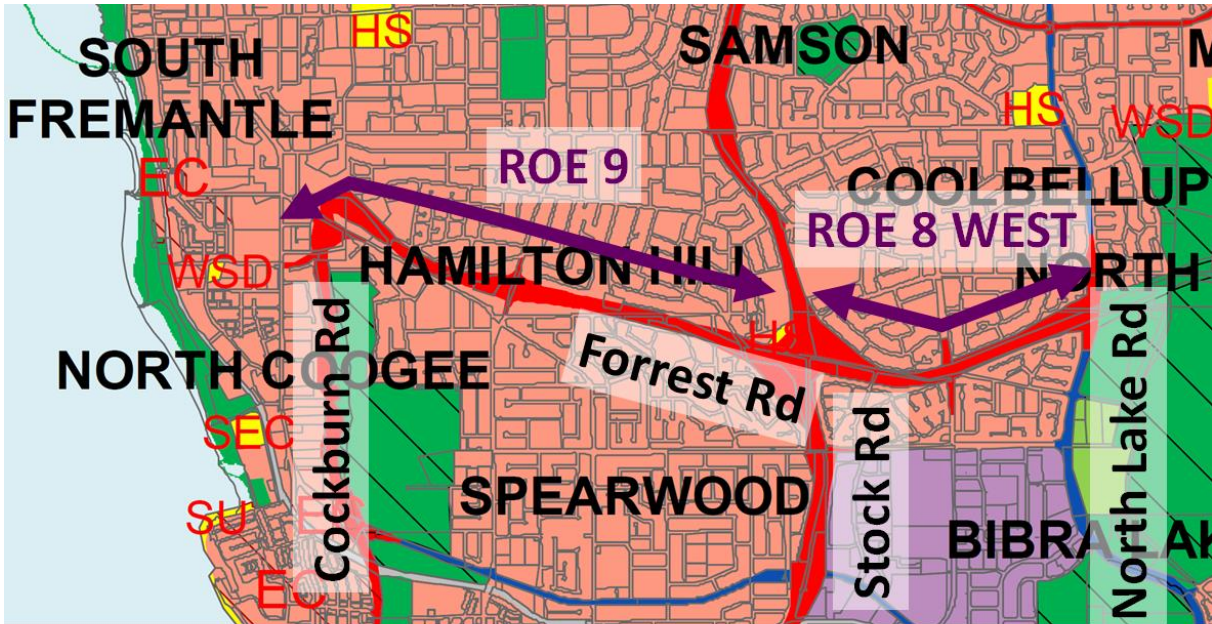


Figure 1: Metropolitan Region Scheme reservations

The former Department of Planning and Infrastructure (DPI) previously undertook a study that recommended the construction of a 4-lane divided arterial road within the Roe 9 road reservation, with new at-grade intersections at Cockburn Road/Rollinson Road, Rockingham Road, Carrington Street and Southwell Crescent. The study was undertaken when Roe 8 was supported by the Government at that time and the proposed concept is shown indicatively in Figure 2.

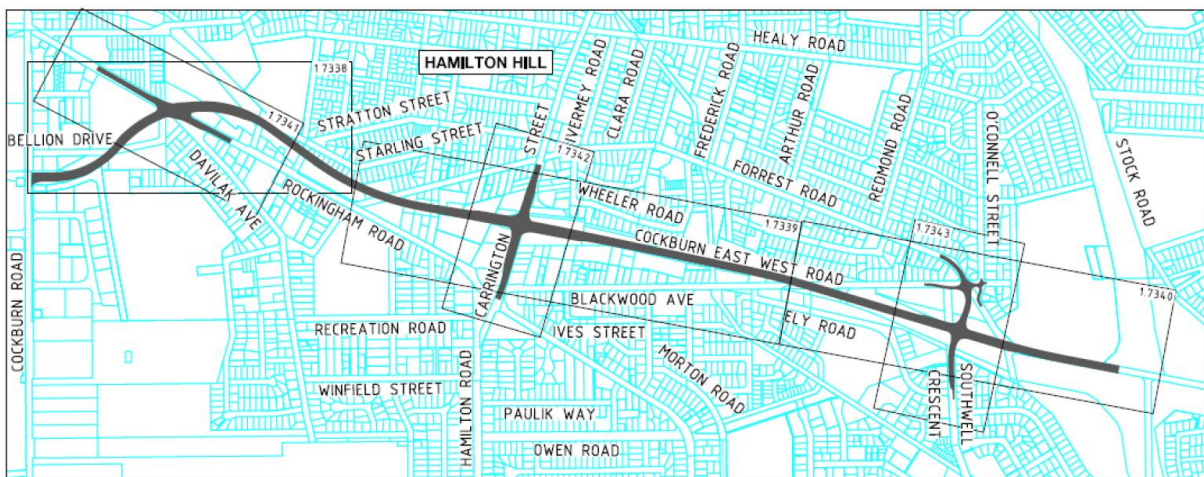


Figure 2: Roe 9 concept alignment

This report provides commentary on the transport modelling for the area with and without an arterial road within the existing Roe 8 West / Roe 9 road reservations.

2 EXISTING TRAFFIC VOLUMES

Weekday traffic volumes for the period 2020/21 are shown in Figure 3 below, sourced from Main Roads' traffic count sites and published on Trafficmap.

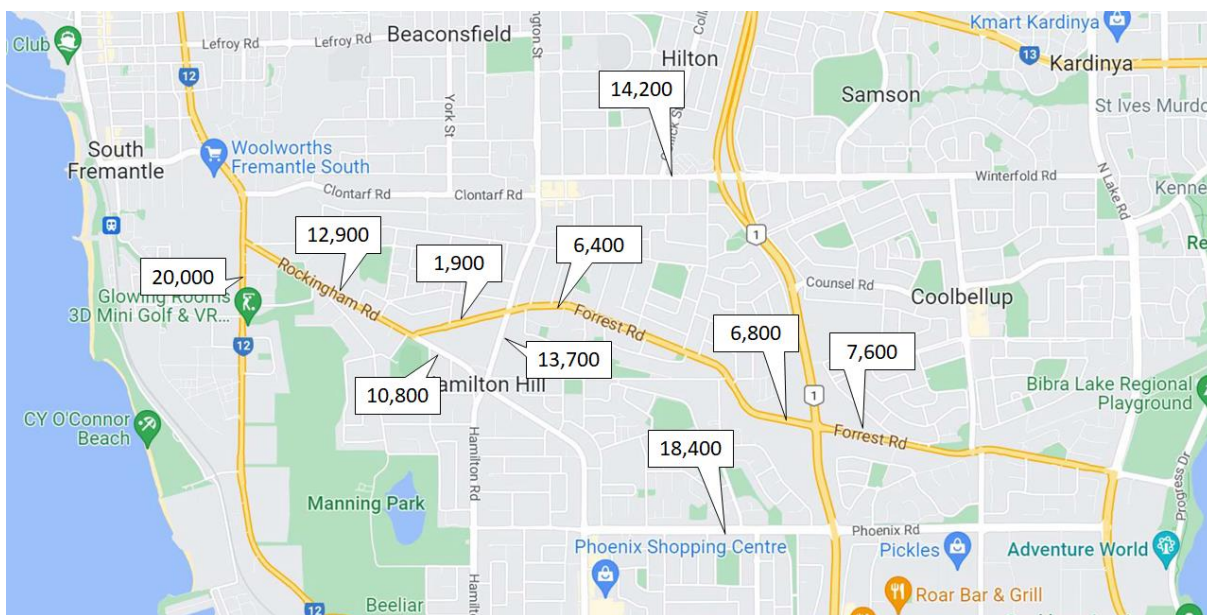


Figure 3: Weekday traffic volumes 2020/21 (source: Main Roads Trafficmap)

Forrester Road east of Stock Road carries in the order of 8,000 vehicles per day (vpd). Forrester Road west of Stock Road carries around 7,000 vpd reducing to 6,000 vpd east of Carrington Street and 2,000 vpd west of Carrington Street. Rockingham Road east of Cockburn Road carries around 13,000 vpd. These volumes are all within the capacity of these roads.

3 TRANSPORT MODELLING

Transport modelling was undertaken using Main Roads' Regional Operational Model (ROM24) for the 2041 time horizon to assess the traffic implications for the area with and without an arterial road within the existing Roe 8 West / Roe 9 road reservations.

Significant land use intensification is planned for the area west of Cockburn Road under the Cockburn Coast District Structure Plan. The development will consist of an additional 4,850 dwellings with a population of approximately 10,000 people. This land use was included for modelling purposes.

Two road networks were modelled:

- Network 1 included a 4-lane divided arterial road within the Roe 9 road reservation, with new at-grade intersections at Cockburn Road/Rollinson Road, Rockingham Road, Carrington Street and Southwell Crescent. The 4-lane divided arterial replaces existing Forrester Road between Stock Road and Southwell Crescent, but existing Forrester Road between Southwell Crescent and Carrington Street is retained as a parallel road providing

neighbourhood and property access. This network also included upgrading Stock Road between South Street and Russell Road to a 6-lane freeway standard with full grade separation as per current planning

- Network 2 excluded the new arterial road within the Roe 9 road reservation but included the Stock Road upgrading to freeway standard.

Forecast 2041 volumes (calibrated for differences between modelled and actual 2021 volumes) for the two networks are shown in Figure 4.

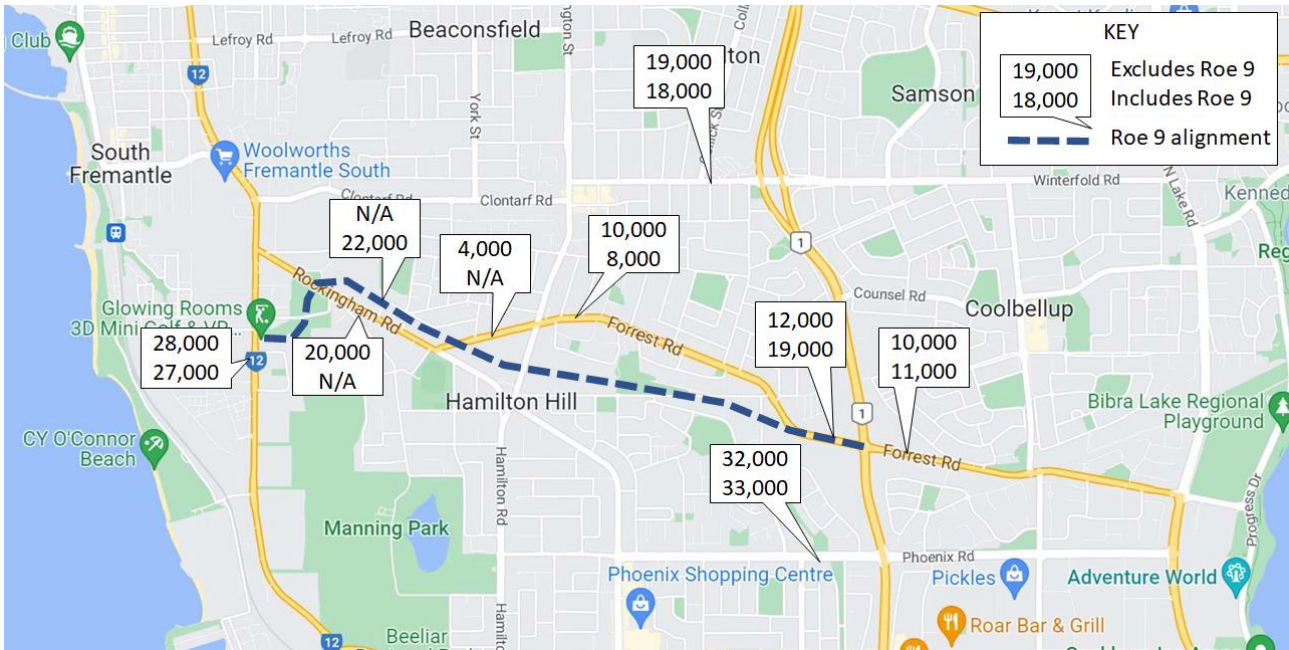


Figure 4: Forecast (calibrated) 2041 traffic volumes

4 NETWORK ASSESSMENT

4.1 Roe 9 arterial road

Not providing a new 4-lane divided arterial road in the Roe 9 reservation

Volumes on Forrest Road west of Stock Road increase from 6,800 vpd (existing) to around 12,000 vpd (2041). This is within capacity considering the standard of this 2-lane road.

Volumes on Forrest Road east of Carrington Street increase from 6,400 vpd (existing) to around 10,000 vpd (2041). This section of Forrest Road provides direct property access and has numerous local road intersections. It is expected that congestion will be experienced at local road intersections during peak periods.

Volumes on Rockingham Road east of Cockburn Road will increase from 12,900 vpd (existing) to around 20,000 vpd (2041). Rockingham Road has been constructed to 4-lane undivided standard and will have adequate capacity to carry the future volume

Providing a 4-lane divided arterial road in the Roe 9 reservation

Volumes on the Forrest Road section west of Stock Road will be in the order of 19,000 vpd, well within the capacity of a 4-lane divided arterial.

Volumes on the Rockingham Road section will be in the order of 22,000 vpd, well within the capacity of a 4-lane divided arterial.

The increase in volumes on the remaining 2-lane section of Forrest Road between Southwell Crescent and Carrington Street will be moderated to 8,000 vpd, improving traffic operation on this section of road that provides direct property access.

The increase in volumes on Winterfold Road and Spearwood Avenue are slightly moderated, improving traffic operation.

Summary

The high-level modelling undertaken for this exercise suggests that providing a 4-lane divided arterial in the Roe 9 reservation will have some local road network benefits. In the absence of this new road, volumes on existing Forrest Road will approach capacity of the 2-lane cross-section and it is expected that moderate congestion will be experienced at intersections during peak periods. It must be noted that if further land use development and intensification eventuates in the area including within the Roe 9 corridor and along the Cockburn coast area, that will create additional pressure on the existing road network.

4.2 Roe 8 West

Future volumes (2041) on Forrest Road east of Stock Road will be in the order of 10,000 vpd, within capacity considering the standard of this 2-lane road. The construction of a road along the Roe 8 West alignment (providing an additional road link to the section of Forrest Road between Sudlow Road and North Lake Road) is not likely to attract significantly greater traffic volumes compared to existing Forrest Road.

Appendix J
Preliminary Engagement Summary Report



Roe 8 West and Roe 9 Corridor Planning Study

Preliminary Engagement Summary Report

March 2023

Contents

Executive Summary	1
Planning Study objectives.....	2
Engagement strategy	2
Engagement methodology	2
Cultural engagement	4
Analysis of feedback received.....	4
Key themes	5
Planning Study objectives and process.....	5
General comments in support of protection of the environment.....	6
Aboriginal heritage	6
Specific bushland areas – Blackwood Avenue and Roe 8 West.....	7
Stock Road and North Lake Road.....	7
Opportunities for development.....	7
Local movement	8
Randwick Stables and Cardigan Street.....	8
Regional transport needs.....	8
Wally Hagan Basketball Stadium	9
Local heritage and social infrastructure.....	9
Local planning.....	9
Roe 8 East.....	10
Out of scope.....	10
Fremantle to Rockingham Access Corridor	10
Clontarf Hill and Dixon Reserve.....	10
Summary of changes to draft concept plan	11
Appendix 1: List of targeted stakeholders invited to meetings.....	12
Appendix 2 – Copy of Cockburn Herald advert.....	13
Appendix 3 – Material on display at community drop-in sessions.....	14
Appendix 4 – Additional submission analysis.....	17
Geo-tag analysis.....	17
Date submission received.....	18
Website analysis.....	18

Executive Summary

Known as the Roe 8 West and Roe 9 Corridor Planning Study (the Planning Study), the Department of Planning, Lands and Heritage (the Department) is investigating Metropolitan Region Scheme (MRS) zonings and reservations for the land currently reserved as Primary Regional Road from North Lake Road, Coolbellup to Healy Road, Hamilton Hill.

Following the State Government's decision in 2017 to not construct Roe 8 and 9, the Planning Study provides an opportunity to identify an appropriate mix of zonings and land uses for the corridor that can provide recognition to sites encompassing environmental and/or heritage values, or with potential to support community or public purposes and urban redevelopment.

A draft concept plan was developed to assist in seeking stakeholder and community feedback on the future of the corridor. While the plan has no formal status, it is intended to guide future planning stages and development in the area and will to continue evolve as more detailed information becomes available.

A comprehensive communications and engagement strategy was developed to support the Planning Study and included an informal, preliminary consultation process focused on seeking early feedback on the MRS project and supporting draft concept plan. This process commenced in October 2022 and concluded on 20 January 2023. The Hon. Peter Tinley MLA, Member for Willagee assisted the Department by representing the State Government throughout the consultation process.

The Department and Member Tinley hosted several community drop-in sessions, in addition to meetings with various stakeholders. A website was also created to provide more information on the Planning Study and provided options for the public to submit their feedback online via the Department's Consultation Hub.

Key themes raised in submissions include general support for the re-purposing of the road corridor and protection of the environment, respecting Aboriginal heritage and incorporating best-practice urban design principles for future residential development. There was also support for the protection of Blackwood Avenue bushland, ongoing use of Randwick Stables and the redevelopment of the Wally Hagan basketball facility.

The outcomes of the Planning Study's preliminary engagement process are summarised in this report and will be used to inform the preparation of an MRS amendment report for consideration by the Western Australian Planning Commission to initiate an amendment to the MRS.

Planning Study objectives

The objectives of the Roe 8 (West) and Roe 9 Corridor Planning Study, are to:

- understand existing values and opportunities to inform longer-term land uses, promote development and revitalisation opportunity for the study area
- facilitate appropriate land uses and development through an MRS amendment
- replace portions of the existing Primary Regional Road reservation with more suitable classifications under the MRS to provide a framework for the local government to update its local planning framework.

A location plan is included at **Figure 1**.

Engagement strategy

A communication and engagement plan was developed to support the Planning Study. The primary purpose of this plan was to raise awareness of the Planning Study and encourage early, high-level feedback on land uses/facilities that could be accommodated within identified areas.

The specific communications objectives were to:

- ensure accurate and relevant information is shared with the community and stakeholders
- undertake effective engagement with key stakeholders
- identify opportunities for the community and stakeholders to provide feedback and ideas during the consultation, encouraging community members and stakeholders to help shape the future the study area
- promote the highest and best use of the area with consideration of existing values.

Engagement methodology

As part of the engagement strategy, invitations to one-on-one meetings with the Department and the Hon. Peter Tinley MLA were sent to relevant local governments, state government agencies and community and advocacy groups (**Appendix 1**).

Three community drop-in sessions were also held at the Hamilton Hill Memorial Hall:

- Wednesday 26 October 2022; 2pm-5pm (approximately 50 people attended)
- Saturday 29 October 2022; 9am-12pm (approximately 70 people attended)
- Wednesday 2 November 2022; 4pm-7pm (approximately 60 people attended)

The drop-in sessions were advertised in the Cockburn Herald on 15 and 22 October 2022 (**Appendix 2**), and on the Department's website, Facebook, Instagram, Twitter and LinkedIn pages to advise the broader community of the project commencing and the engagement program.

Although most of the corridor is owned by the State Government, some properties are in private ownership. All private landowners within or partly within the study boundary were sent a hard copy letter ahead of the drop-in sessions advising about the Planning Study.

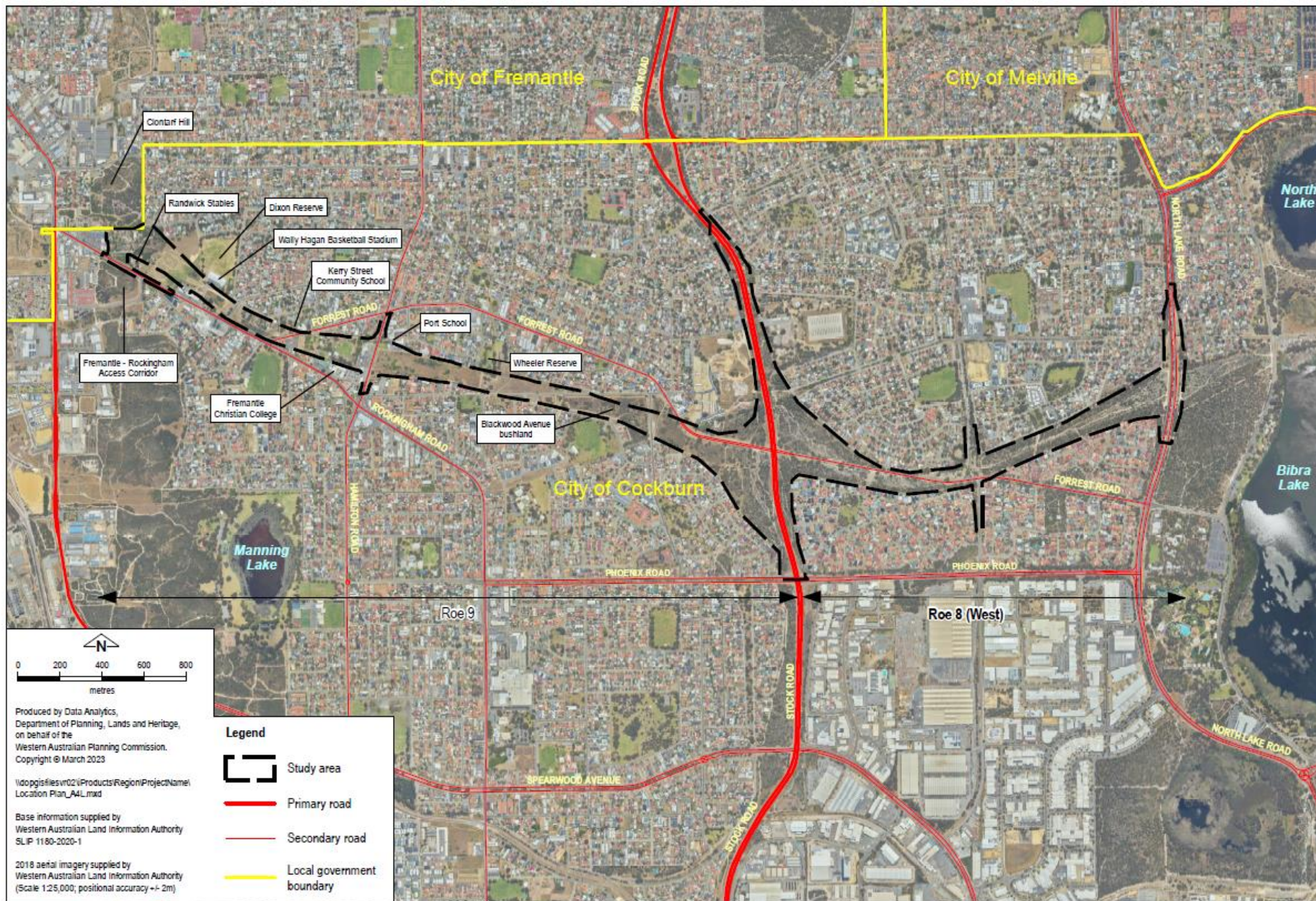


Figure 1: Location Plan

The drop-in sessions provided an opportunity for interested community members to find out more about the Planning Study and ask questions of Departmental staff and Member Tinley .

Hardcopy feedback forms were available upon request. Large A1-sized maps of the current MRS, possible MRS amendment, draft concept plan and aerial photography of the study area were on display. Information was also available on the Planning Study's timeframes which includes the formal MRS amendment process (incorporating assessment by the Environmental Protection Authority ahead of a formal public consultation where the community will be able to provide further feedback). The draft concept plan also included a QR code that directed users to the Department's website. A copy of all materials on display at the drop-in sessions is included at **Appendix 3**.

An option for stakeholders and interested community members to submit feedback online via the Department's Consultation Hub was made available on 26 October 2022, to coincide with the first drop-in session. Initially scheduled to close on 25 November 2022, the public comment period was extended until 20 January 2023 in response to requests for additional time. The online survey prompted users to provide comments on the draft concept plan, and also included a geo-map feature allowing users to drop location 'pins' on a digital version of the draft concept plan.

Cultural engagement

The Department's project team liaised with the City of Cockburn's local Aboriginal Reference Group, the South West Aboriginal Land and Sea Council (SWALSC) and Whadjuk Aboriginal Corporation to ensure that consultation with Traditional Owners, the Whadjuk Noongar people and Aboriginal people from across Western Australia that have a connection to the study area, is undertaken appropriately.

As a result of this engagement, separate meetings with two Traditional Owners with connection to the study area were arranged.

The Department also provided a briefing on the proposed MRS amendment to the Whadjuk Aboriginal Corporation's Cultural Advice Committee at a meeting convened by the South West Aboriginal Land and Sea Council in February 2023. Discussions within the Department are ongoing in regard to the potential for any PRR land to be considered for inclusion in the Noongar Land Estate, as an outcome of the South West Native Title Settlement. The rezoning is being progressed in a consultative manner due to known cultural values and will not preclude any of the land from being considered for inclusion in the Noongar Land Estate.

The Department will continue to work with the local Cockburn Aboriginal Reference Group and Whadjuk Cultural Advisory Committee to ensure First Nations representation is appropriate and acknowledged.

Analysis of feedback received

In total, the Department hosted **33 targeted stakeholder meetings** and received **409 submissions**. As part of the review of submissions, the Department tracked the frequency of all ideas, comments or issues raised. In total, nearly **4,000 individual comments** were tallied, across more than **120 topics**.

The majority of submissions were received from individuals (90 per cent). The remaining 10 per cent of submissions were from local community groups, progress associations, businesses, government agencies and other local organisations.

More than half the submissions were from local residents or property owners (**Figure 2**), with over 150 of these registering their suburb as Hamilton Hill. There were 30 submissions from Coolbellup residents and five from Bibra Lake. Based on information contained in their submission, at least 19 submissions were received from directly impacted individuals with property interests located within or partly within the road reserve.

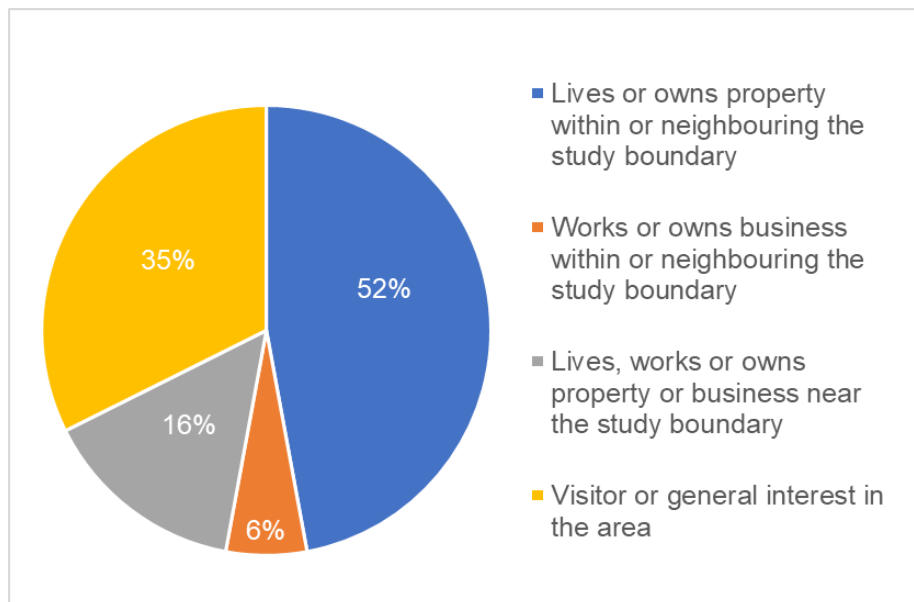


Figure 2: Interest group categories, by location

Submissions contained varying levels of feedback, with some submitters providing very detailed information across many different aspects of the Planning Study and associated process, including 50 (12 per cent) who uploaded an attachment or annotated version of the draft concept plan. Others were very brief and/or singular theme focused.

Some 65 per cent of submitters used the geo tag feature to drop location ‘pins’ on a digital version of the draft concept plan. Eleven submissions registered their personal details and/or dropped ‘pins’, but did not provide any specific commentary. Several submissions sought further clarification, which was subsequently provided by the Department.

Approximately four per cent of submissions were considered ‘proforma’ submissions (that is, they contained a body of text repeated in at least one other submission).

Further submission analysis is provided at **Appendix 4**.

Key themes

The following key themes raised in submissions are ranked in order of prevalence.

Planning Study objectives and process

The majority of submitters expressed explicit or implied support for the planning study’s objectives to remove the Primary Regional Road (PRR) reservation.

Some of these submissions highlighted the need for subsequent stages of planning to adopt a holistic, strategic focus to optimise outcomes on the ground, and the need for a continued, consultative approach.

Many were appreciative of the Department's commitment to undertake preliminary consultation ahead of any formal MRS amendment process, with a minority of submissions indicating that the consultation process was insufficient.

While some supported the draft concept plan, a handful of submissions were critical of the perceived focus on economic outcomes or commented that the plan was representative of poor planning, motivated by political outcomes.

General comments in support of protection of the environment

Nearly 75 per cent of responses provided comments in support of protection of the environment, with more than half also specifically advocating for the protection and enhancement of a wildlife corridor (52 per cent).

Many of the environmentally focused submissions articulated the health, social or community benefits of open space. They cited the scientific importance of biodiversity conservation, significance of the east-west linkage across seven different ecological zones and the need to protect remnant vegetation, including mature trees, Tuart and Banksia threatened ecological communities and habitat for black cockatoos, Quenda's and other endangered fauna. Many submissions also highlighted opportunities to increase ecological value through land care and rehabilitation initiatives. Some commented on the potential value that could be realised through eco-tourism.

Submitters urged the Planning Study to consider the impacts of climate change, the benefits of providing an urban tree canopy and alignment with the City of Cockburn's 10 year plan. The proximity and relationship of the bushland to the Beelie Wetlands and Manning Park was also a strong theme.

Some 25 per cent of all submissions expressed explicit opposition to any clearing and/or any development or housing within the corridor, with many of these of the opinion that there was too much residential land depicted on the draft concept plan.

Ten per cent suggested the entire corridor be reserved as Parks and Recreation. Some submissions encouraged the Planning Study to consider how portions of retained remnant bushland areas align with Bush Forever.

A couple of submissions raised bushfire-related queries. One submission included commentary critical of Government's lack of a Green Growth Plan.

Aboriginal heritage

Of the response, 23 per cent acknowledged the high cultural significance of the corridor to Whadjuk Noongar people, particularly north west portion of Roe 9 (part of Clontarf Hill Registered Aboriginal Heritage Site # 18332, **Figure 3**).

Some submissions suggested that the draft concept plan should include opportunities for interpretative signage and education about the heritage values, encouraged the reinstatement of the wetlands (Dixon Reserve) and stressed the importance of ongoing consultation with Traditional Owners.

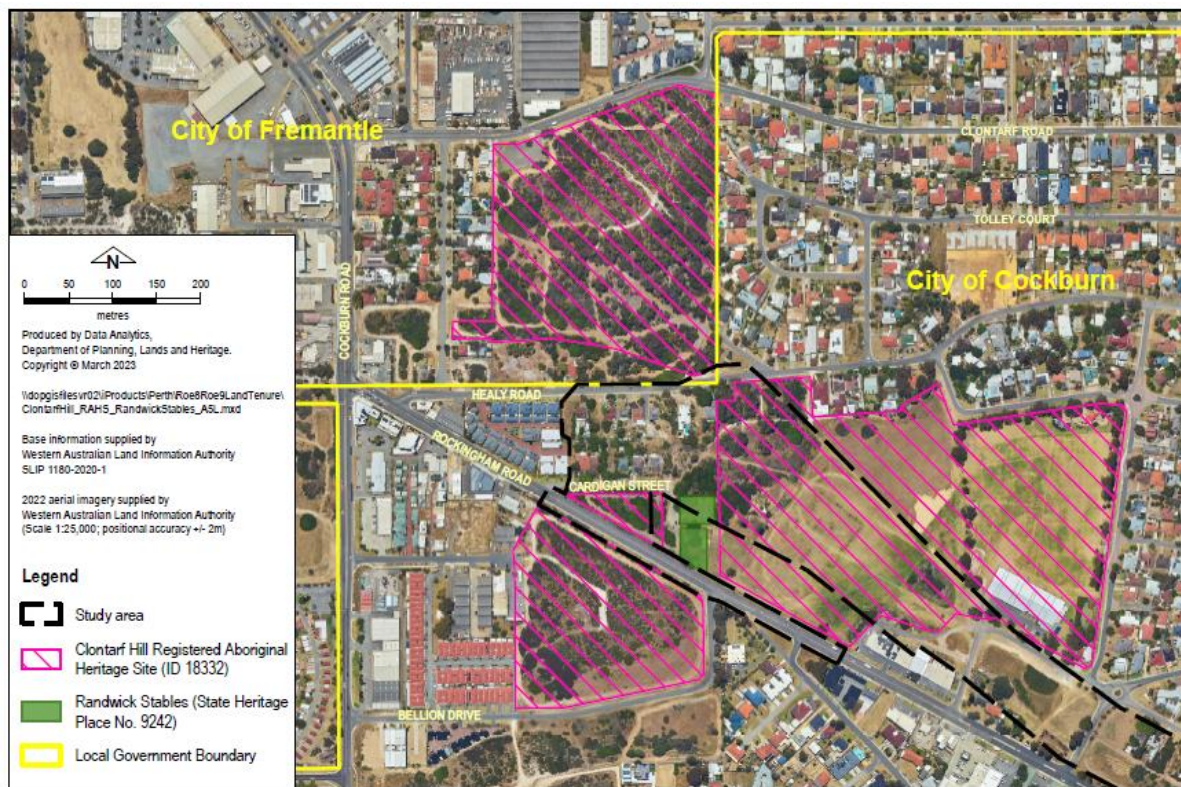


Figure 3 - Clontarf Hill Registered Aboriginal Heritage Site and Randwick Stables

Specific bushland areas – Blackwood Avenue and Roe 8 West

There was strong advocacy for the retention and protection of bushland at Blackwood Avenue (22 per cent of all submissions; and 24 per cent of all ‘pins’ dropped), with many noting the presence of important flora and fauna and active land care efforts. Some submissions contained detailed mapping of Tuart trees.

Just under ten per cent of submissions supported the proposed retention of bushland within the Roe 8 West corridor (from North Lake Road to Stock Road) and many supporting the proposed Parks and Recreation reservation in this area.

Stock Road and North Lake Road

Sixteen per cent of submissions were supportive of retaining bushland within the existing intersection at Stock Road and Forrest Road, with the majority of these opposing the retention of the PRR in the current MRS process. Many commented on existing rehabilitation efforts within the reserve and some noted the conservation values warrant the declaration of a Class A reserve. A small number of submissions commented on the need for Stock Road to be upgraded.

A small number of submissions objected to the proposed retention of the Primary Regional Road reserve at North Lake Road. A couple of submissions suggested this is a potential location for future development.

Opportunities for development

Some submissions (fourteen per cent) noted the importance of incorporating contemporary, best-practice urban design in any future development, with a strong preference for buildings that complement the natural surroundings, adopt sustainable built design practices and provide for enhanced connectivity through residential areas.

A similar portion acknowledged some development within the corridor was needed, with majority of these supporting residential uses on cleared land only. A small portion of submissions supported some housing development within Roe 8 West portion (between North Lake Road and Stock Road, currently proposed to be reserved as Parks and Recreation), with the intention of future-proofing the ability for subsequent governments to reverse the removal of the PRR.

There was some support for the future provision of affordable or social housing within the corridor and mixed views about high density residential, with some acknowledging this would reduce the environmental impact, whilst others were concerned it would adversely impact on the character of the existing, low density suburban neighbourhood. One submission cited their opposition to more social housing in the suburb.

There was some support for commercial activation and/or mixed-use opportunities, although one submission did not support commercial development on both sides of Carrington Street. Another submission opposed the proposed Commercial zone in the draft concept plan. One submission identified the need for an activity centre study to inform future planning.

Local movement

The need for a shared bicycle-pedestrian path that connects from east to west was mentioned in fourteen per cent of submissions, with most commenting that such a path can support complementary uses and environmental outcomes.

Some submissions (five per cent) provided comment on the need for improvements to the local road network, including key intersections and the need for all new development to be pedestrian/bike friendly.

Five per cent of submissions requested consideration of infrastructure to facilitate fauna movements (i.e. a fauna bridge or tunnel).

Some submissions highlighted the need for a pedestrian overpass to be provided over Stock Road.

Randwick Stables and Cardigan Street

Fourteen per cent of responses provided direct support for the State heritage-listed Randwick Stables (refer to previous **Figure 3**), with most articulating the community benefits provided by the stables and also advocating for the need to retain surrounding land as a protective curtilage and protect nearby bushland. Some suggested it is appropriate for the land to be rezoned for conservation or recreation.

Many of the submissions supporting the Stables were targeted responses about the Stables only.

The historic relationship between the Stables and Cardigan Street – as the bridle access to the beach and the home to many long-term residential tenants – was also noted in four per cent of submissions. One submission was critical of the Stables operations.

Regional transport needs

Twelve per cent of submissions explicitly opposed the construction of Roe 8 and 9. A few submissions also rejected the potential for over-engineered road design options.

Notwithstanding the general consensus opposing the road, eight per cent of submissions mentioned the need for alternative road network solutions in the absence of Roe 8 and 9, whilst a smaller portion of submitters (six per cent) were in favour of the construction of a regional or district level road, citing justification based on traffic studies or experiences. Several submissions requested more information in relation to the traffic impacts, including future planning status of Forrest Road.

A small number of submissions suggested the corridor could be repurposed to provide a heavy or light rail connection from Murdoch to Fremantle.

Wally Hagan Basketball Stadium

Eleven per cent of responses provided direct support for the redevelopment of Wally Hagan Basketball Stadium, with most supporting an increase in capacity, citing the inadequacies of the current stadium to fulfil the growing regional demand. Several submissions were also supportive of exploring further opportunities to incorporate mixed use development.

Most of these respondents did not voice any other opinions.

A few individual submissions provided comments opposing the redevelopment (most concerned about traffic impacts), with one suggesting it could be relocated near the city centre and another within an extended Parks and Recreation reserve near its current location on land fronting Rockingham Road.

Local heritage and social infrastructure

Ten per cent of submissions provided general support for the retention and recognition of all heritage places within the Study area, inclusive of Clontarf Hill Aboriginal heritage site, Randwick Stables and other locally-listed places of significance. One submission requested two properties located on Blackwood Avenue be considered for heritage listing, based on their unique character.

Many submissions also suggested need for a community centre and community recreational spaces, including landscaped playgrounds, community gardens, a skate park, fitness facilities and the like.

The retention and enhancement of Dixon Reserve and Wheeler Reserve was also supported, as was the opportunity to facilitate normalisation of existing school uses and/or expansion.

Local planning

Just over five per cent of submissions provided detailed comments relevant to structure planning. Some advocated for the need for the draft concept plan to align with City of Cockburn's 10 Year Plan.

In alignment with the key themes outlined in this summary report, there was general support for all areas marked as regional or local open space.

A number of submissions were supportive of no changes to current land uses. Some responses commented on the need for future planning to discourage anti-social behaviour.

The removal and/or restrictions on development of electricity towers was noted in a few submissions.

Roe 8 East

A small number of submissions featured comments on the potential for remnants of Roe 8 East (located east of North and Bibra Lakes) to be included in the Planning Study (**Figure 4**), citing its inclusion is consistent with the Planning Study's objectives to repurpose the Roe 8 and Roe 9 corridor. Most of these submissions also sought the removal of the Main Roads Western Australia depot on Bibra Drive.

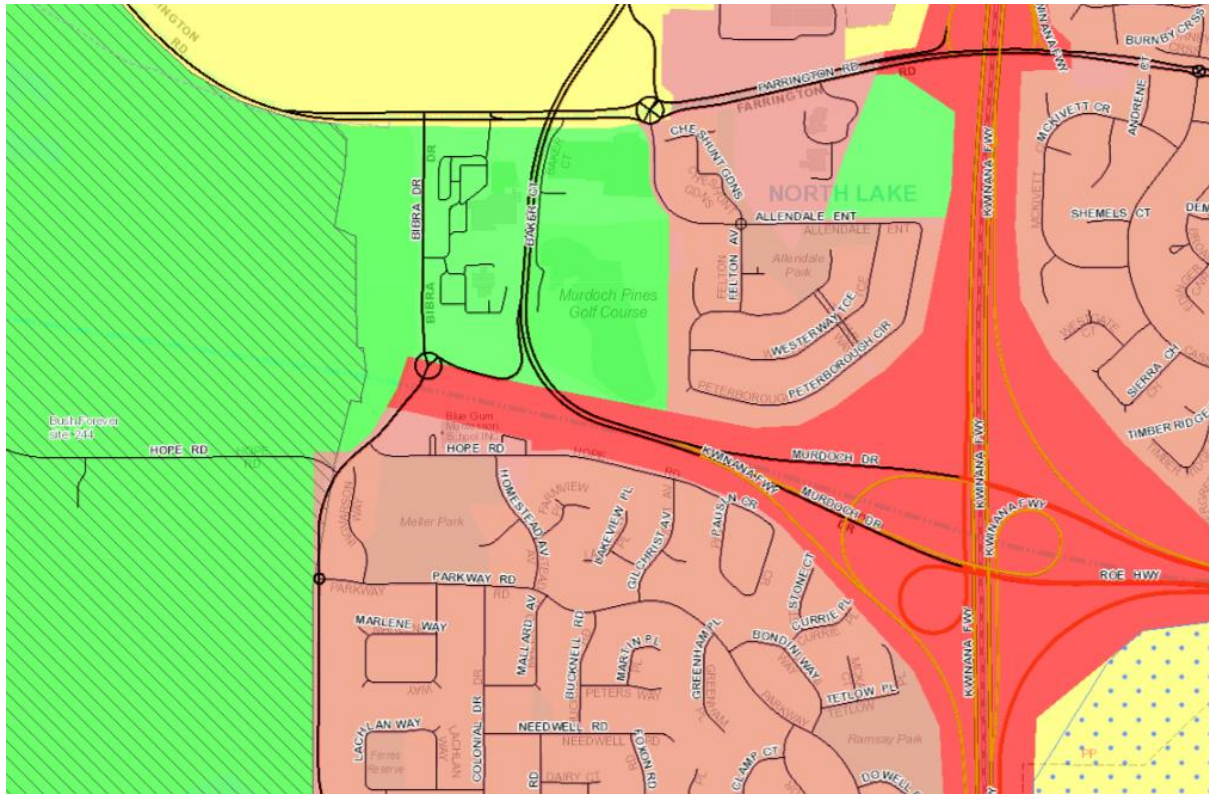


Figure 4: Current MRS zoning in the vicinity of Bibra Drive (Roe 8 East)

Out of scope

Some submissions raised matters which are considered to be out of scope of the Planning Study based on their location outside the study boundary and lack of alignment with the Planning Study's objectives.

Fremantle to Rockingham Access Corridor

Five per cent of submissions called for the protection of bushland located within the Fremantle to Rockingham Access Corridor Primary Regional Road reservation, with many calling for this to be included in the proposed MRS amendment for Roe 8 and Roe 9.

Clontarf Hill and Dixon Reserve

Four submissions, including one from the City of Fremantle, requested Clontarf Hill (part of Aboriginal Heritage Site # 18332) be incorporated in the proposed amendment and reserved as Parks and Recreation.

A small number of submissions also requested Dixon Reserve be included in the study and reserved for Parks and Recreation.

Summary of changes to draft concept plan

Below is a summary of changes made to the draft concept plan, as a result of technical advice, submissions and stakeholder discussions (**Table 1**). The revised indicative concept plan will accompany the proposed MRS amendment. Please refer to the MRS amendment report for further detail.

Table 1: Summary of changes to draft concept plan following consultation

Location	Draft concept plan proposed zoning	Indicative concept plan proposed zoning
Randwick Stables	Proposed Urban/Residential zone	Include whole Stables site, including land within the 'hook' (area between Rockingham Road and the PRR), as a proposed Parks and Recreation reserve
Part of Clontarf Hill Aboriginal Heritage site #18332	Largely proposed Parks and Recreation reserve; small portion proposed Urban/Residential zone	Extend proposed Parks and Recreation reserve to align with the eastern boundary of the Aboriginal Heritage site and include land within the 'hook' (area between Rockingham Road and the PRR)
Wally Hagan redevelopment	Potential redevelopment site	Show as proposed Development zone
Bushland adjacent to Kerry Street Community School	Proposed Residential zone	Show as additional Local Open Space
Carrington Street	Largely shown as proposed Commercial zone	Show as proposed Development zone (can support multiple outcomes, including additional school expansion, commercial, residential, community centre – subject to further planning)
Wheeler Reserve	Proposed Local Open Space	Extend boundary of proposed Local Open Space
Blackwood Avenue bushland	Proposed Local Open Space and Residential zone	Show as proposed Parks and Recreation reserve
Roe 8 East	N/A	Sliver shown as proposed Parks and Recreation, remainder shown as proposed Development zone
Green linkage plan	N/A	Additional plan developed to highlight opportunities to link areas of native vegetation

Appendix 1 – List of targeted stakeholders invited to meetings

Local Government

City of Cockburn
City of Fremantle
City of Kwinana
City of Melville

State Government agencies and utility providers

Department of Biodiversity, Conservation and Attractions
Department of Communities
Department of Planning, Lands and Heritage (internal; other business units)
Department of Local Government, Sport and Cultural Industries
Department of Transport
Department of Water and Environmental Regulation
Development WA
Main Roads Western Australia
Public Transport Authority
Water Corporation
Western Power

Other stakeholders

Beeliar Regional Park Community Advisory Committee
Black Cockatoo Conservation Management Project, Murdoch University
Blue Gum Montessori School
Cockburn Aboriginal Reference Group
Cockburn Basketball Association (Cockburn Cougars)
Cockburn Community and Cultural Council
Cockburn Community Wildlife Corridor
Coolbellup Community Association
Dixon Park Friends
Fremantle Christian College
Friends of Blackwood Avenue
Friends of Clontarf Hill
Friends of Hollis Park
Hamilton Hill Community Group
Hamilton Hill Hub - The Hub 6160
Kerry Street Community School
Kwongan Foundation
NatureLink Perth, Murdoch University
Perth South West Metropolitan Alliance
Port School
Randwick Stables and Community Garden
Save Beeliar Wetlands
South West Aboriginal Land and Sea Council
The Wildflower Society – Murdoch Branch
Urban Bushland Council
Whadjuk Aboriginal Corporation

Appendix 2 – Copy of Cockburn Herald advert

Published 15 and 22 October 2022



Government of **Western Australia**
Department of **Planning, Lands and Heritage**

Community Drop-in Sessions

Roe 8 West and Roe 9 Planning Study

The Department of Planning, Lands and Heritage is seeking community input into a draft concept plan for the western section of the land corridor originally reserved for the Roe Highway extension proposal.

The draft concept plan aims to promote discussion and community feedback about potential land uses for the western corridor – from North Lake Road, Coolbellup to Healy Road, Hamilton Hill (known as Roe 8 West and Roe 9) – which could now be rezoned from its current road reservation for other purposes, subject to stakeholder feedback and environmental investigations.

The eastern portion of the corridor, incorporating Beeliam Wetlands, is now permanently protected and reserved for Parks and Recreation use, and is therefore not part of this planning study.

Interested members of the community are invited to visit any of three drop-in sessions and share their local knowledge, views and interests in the future use of the land with Department officers, who will be on hand to discuss details of the draft concept plan.

The community drop-in sessions will be held at **Hamilton Hill Memorial Hall**,
435 Carrington Street, Hamilton Hill at:

- **2pm–5pm** **Wednesday 26 October 2022**
- **9am–12pm** **Saturday 29 October 2022**
- **4pm–7pm** **Wednesday 2 November 2022**

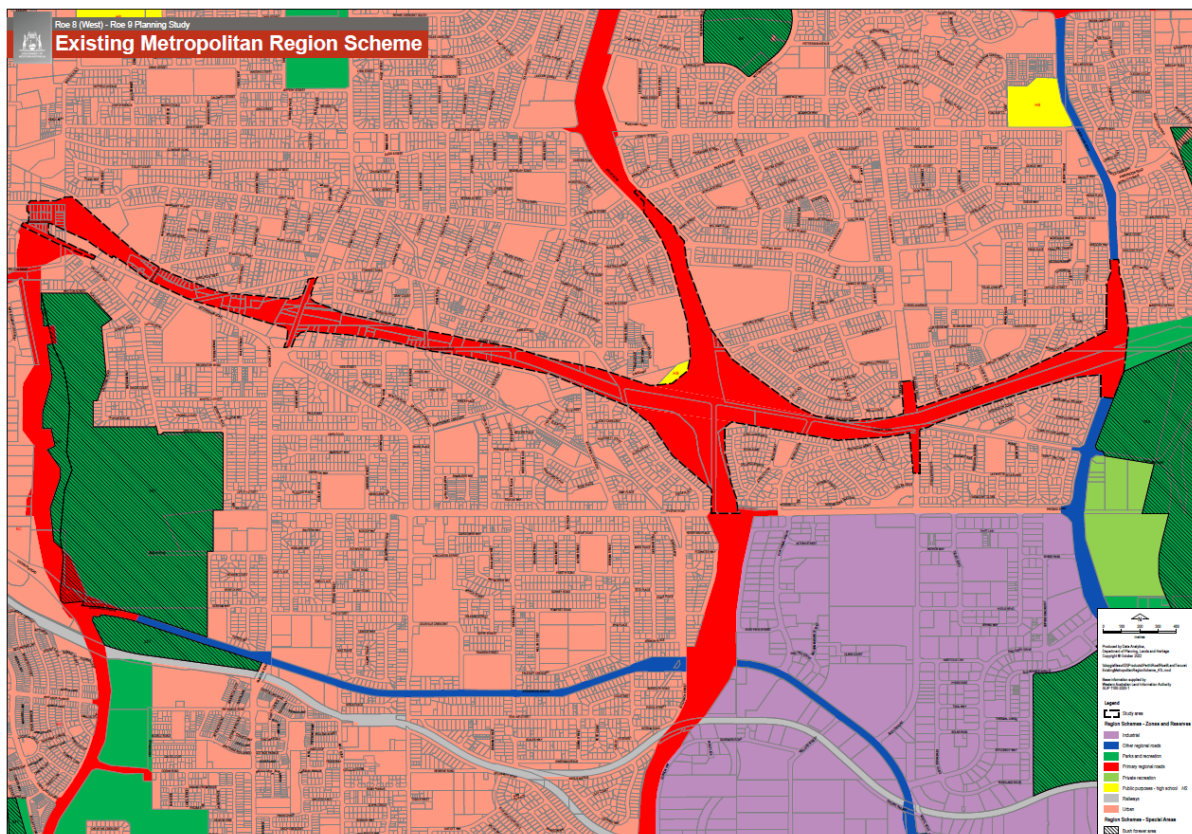
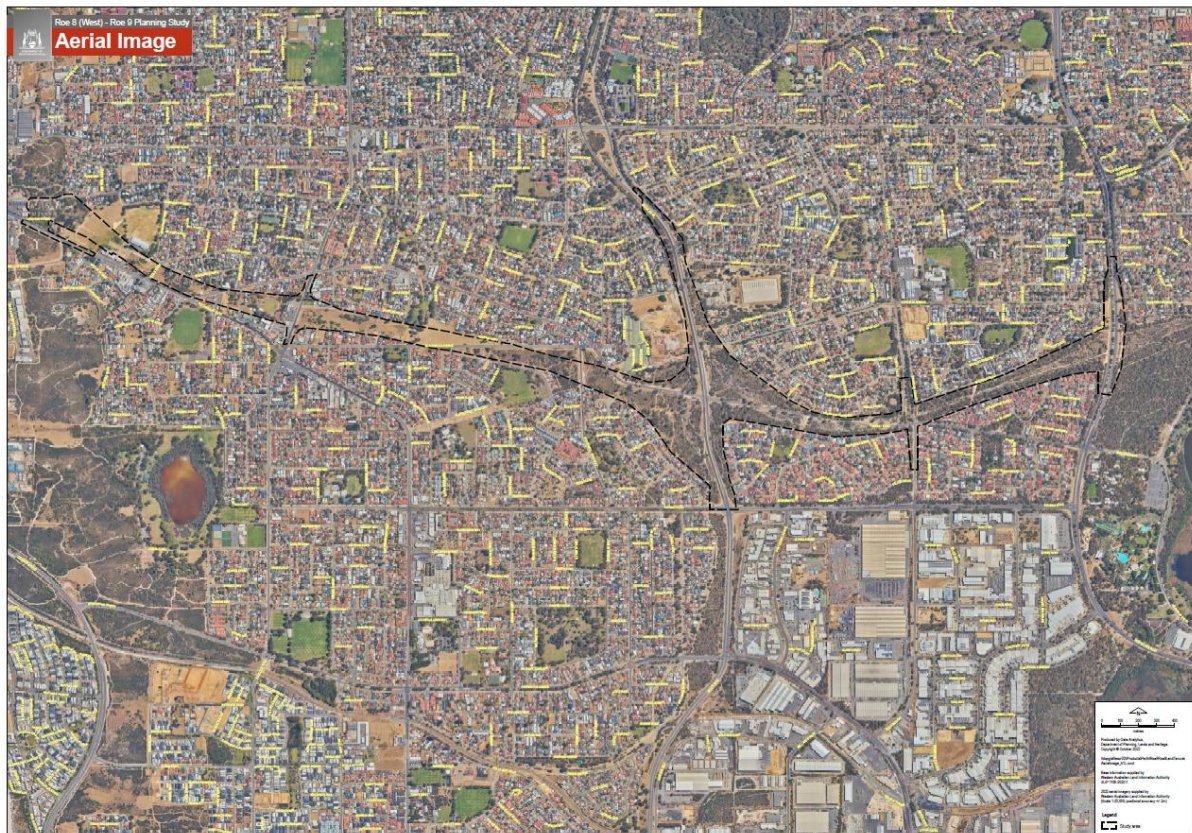
Registration is not required. It is respectfully requested that you do not attend if you are unwell.

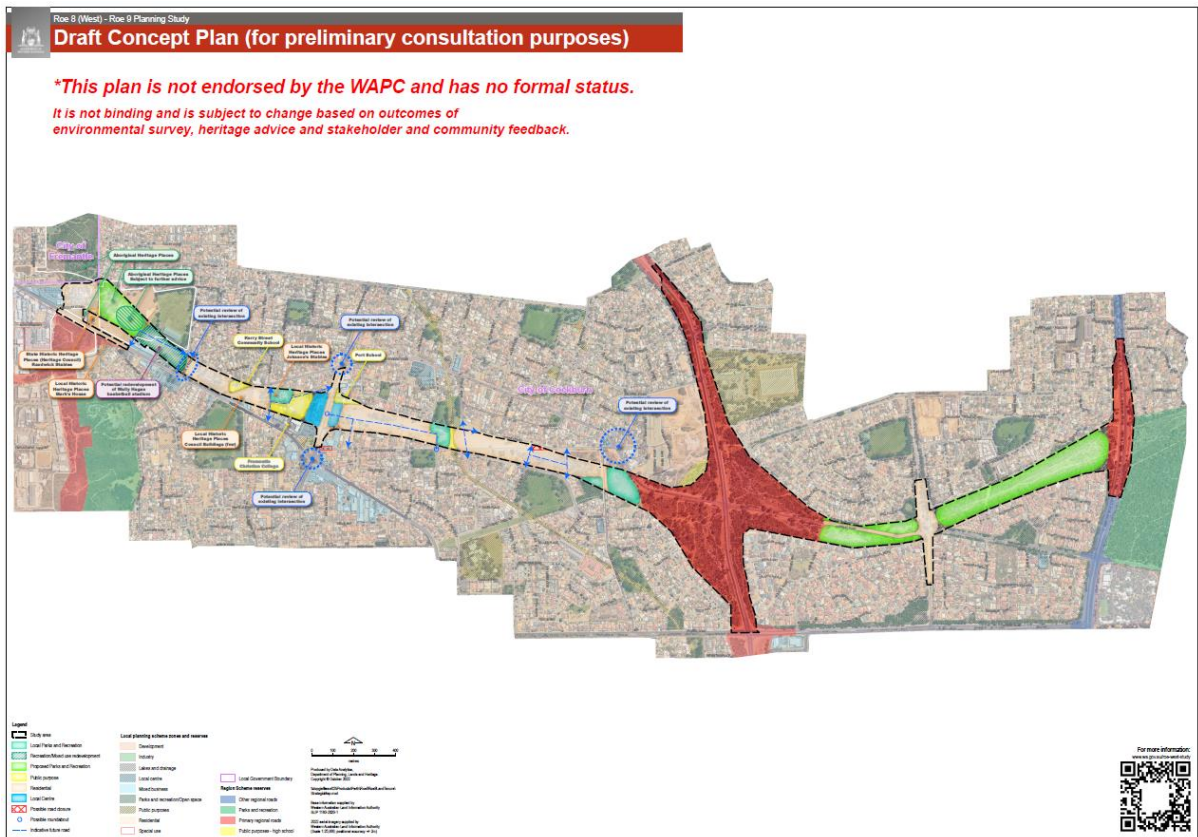
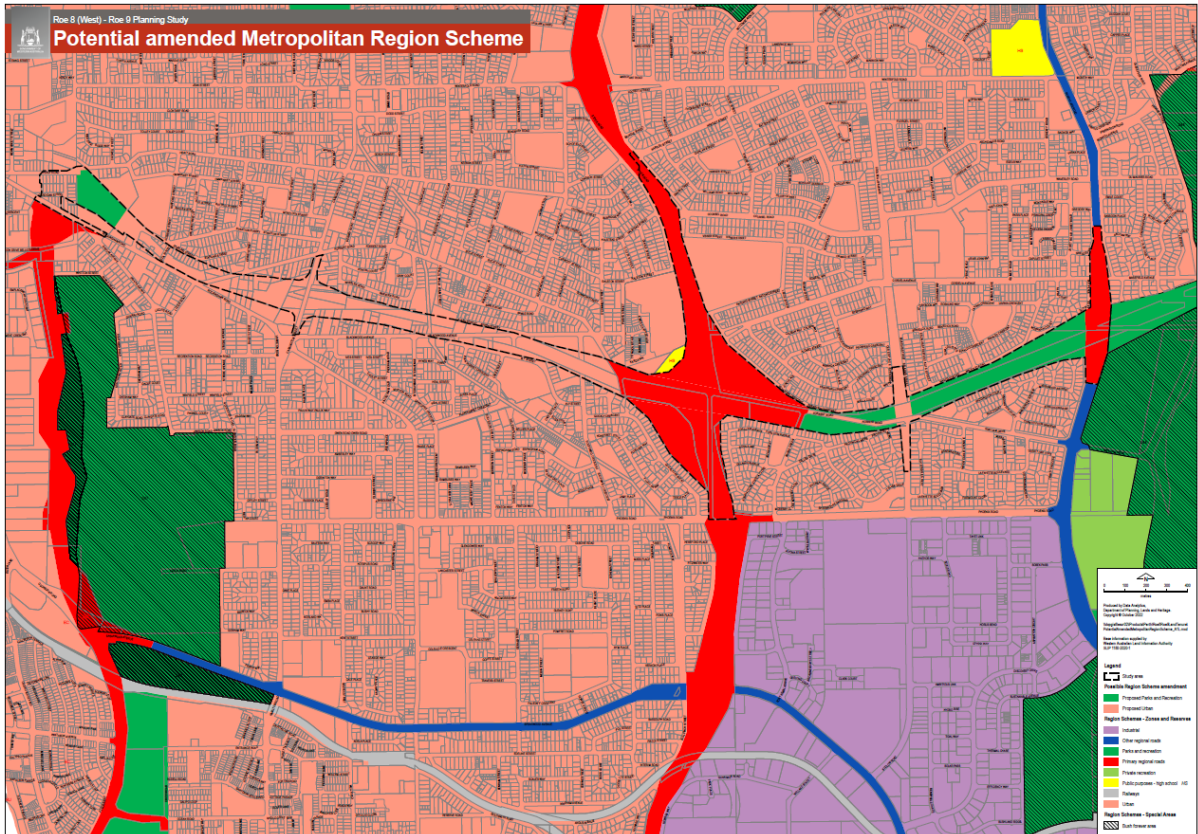
The concept plan may result in an amendment to the Metropolitan Region Scheme. If an amendment is proposed, it would be subject to review by the Environmental Protection Authority and further public consultation.

For more information, please visit www.wa.gov.au/Roe-west-study

DOPLH_11838

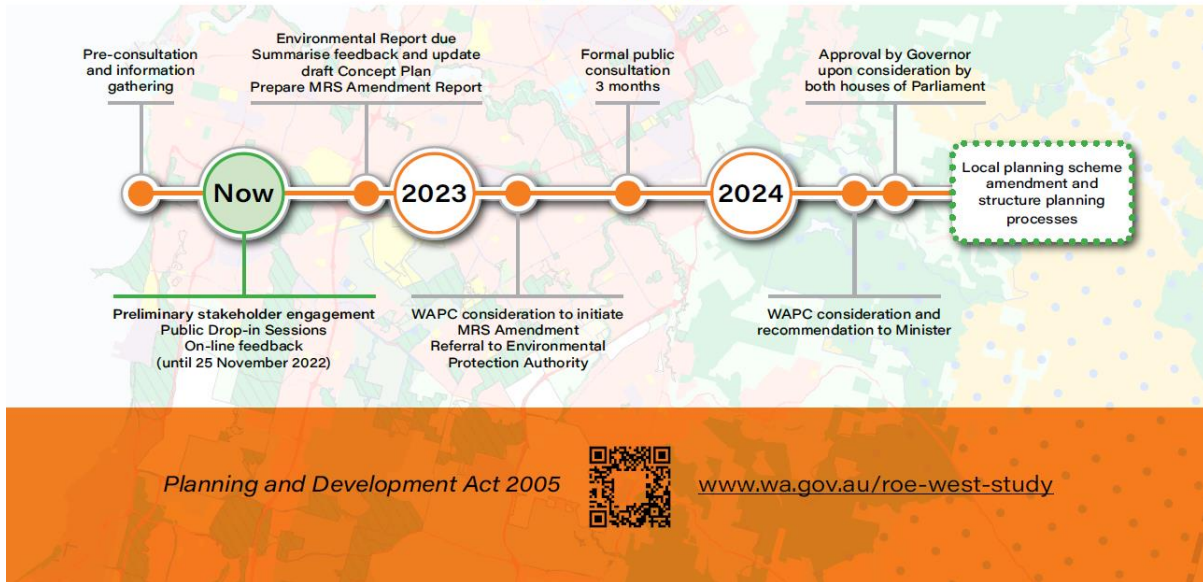
Appendix 3 – Material on display at community drop-in sessions





Roe 8 West and Roe 9 Corridor Planning Study Metropolitan Region Scheme major amendment

Proposed timeline



Appendix 4 – Additional submission analysis

Geo-tag analysis

A new spatial feature of the Department's Consultation Hub was activated for the first time, allowing users to drop up to 10 'pins' on a digital version of the draft concept plan, and then provide targeted comments in relation to their dropped 'pins'.

A total of 266 submitters (65 per cent) dropped 1,217 location 'pins' (refer **Figure 5**). 'Pins' were dropped for many reasons, including support or opposition for proposed zoning on the draft concept plan, indicating particular places of importance or in some instances, a submitter's house. Sixteen per cent of pins were located outside the study boundary.

A few unexplained anomalies were noted, including two 'pins' dropped in the Shire of Manjimup, two isolated 'pins' in southern suburbs and one in the ocean near Fremantle.



Figure 5: Location of dropped 'pins' in the vicinity of the study area

Based on a spatial analysis of dropped 'pins' on the draft concept plan, the highest density of 'pins' were located within the proposed residential zone between Wheeler Reserve and Southwell Street (predominantly containing Blackwood Avenue bushland). This indicates the strong community support for the long-term protection of this bushland.

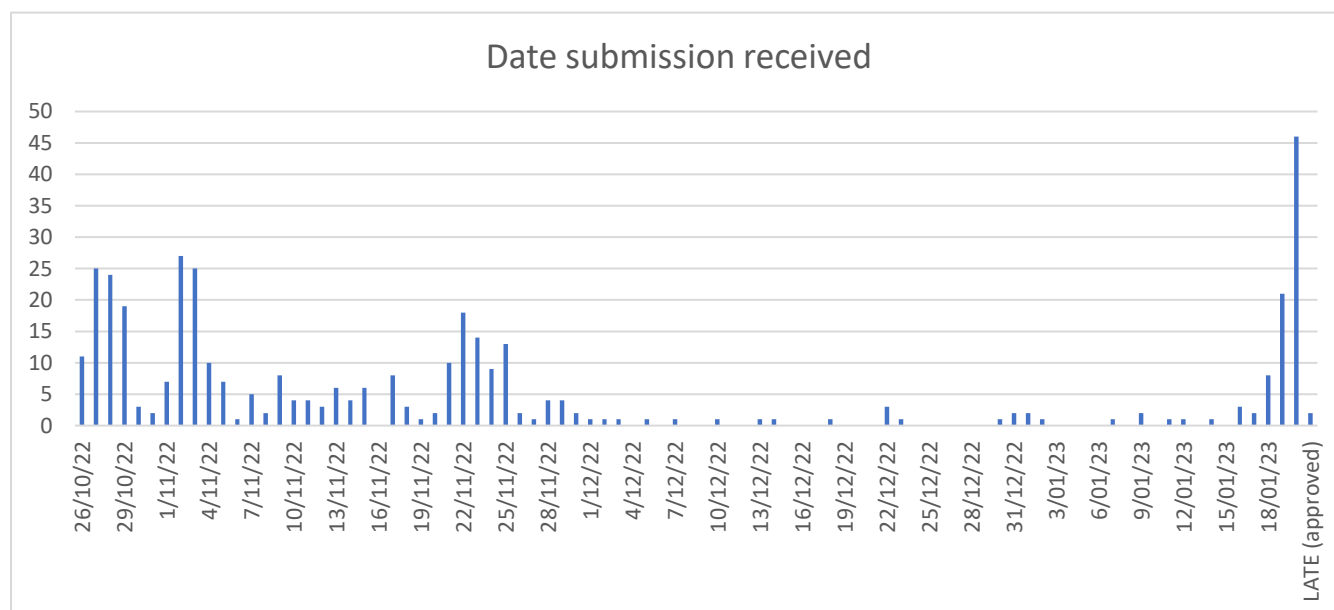
Other frequent 'pin' locations, in ranked order, included bushland surrounding the intersection of Stock and Forrest Road, Roe 8 West bushland, various proposed residential zones, part of Clontarf Hill Aboriginal Heritage site, Randwick Stables and Cardigan Street and Wally Hagan Basketball Stadium. The density of dropped 'pins' strongly correlates with the key themes reported in this Summary Report.

Table 2 outlines the cumulative 'pin' count for each of the proposed zones on the draft concept plan.

Table 2: Number of ‘pins’ within the draft concept plan

Proposed zone on draft concept plan	Cumulative ‘Pin’ count
Proposed Residential zone	454
Proposed Parks and Recreation reserve (MRS)	191
Primary Regional Road (existing MRS)	174
Proposed Local Parks and Recreation	105
Proposed Recreation/Mixed Use redevelopment (potential relocation of Wally Hagan Basketball Stadium)	59
Proposed Public Purpose (possible school expansion/ BHP pipeline)	20
Local centre (adjoining Carrington Street)	17
Outside study area	197
TOTAL	1217

Date submission received



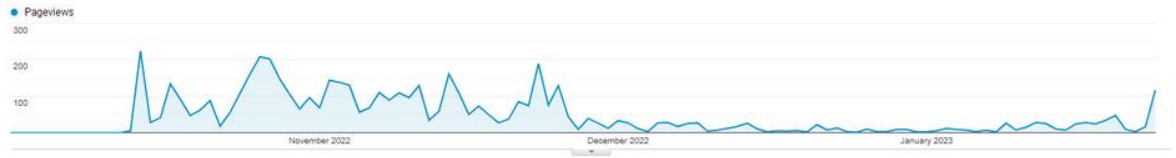
Website analysis

Two websites were created to support the Planning Study:

1. www.wa.gov.au/roe-west-study - this was the main landing page for the Planning Study and was linked on the Department’s home page, and
2. <https://consultation.dplh.wa.gov.au/strategy-and-enagement/roe-8-west-9-corridor-planning-study-draft-concept> - the on line survey page, which was linked on the Department’s Consultation Hub and on the main landing page

The following statistics were current as of 24 January 2023, after the closing of the submission period.

	Page views	Unique views	Average time on page
Main landing page	5,145	2,880	1 min 42 sec
Consultation Hub	2,169	1,664	2 min 37 sec



Main landing page



Consultation hub

