BORR Team

Bunbury Outer Ring Road
Southern Section

Offset Strategy

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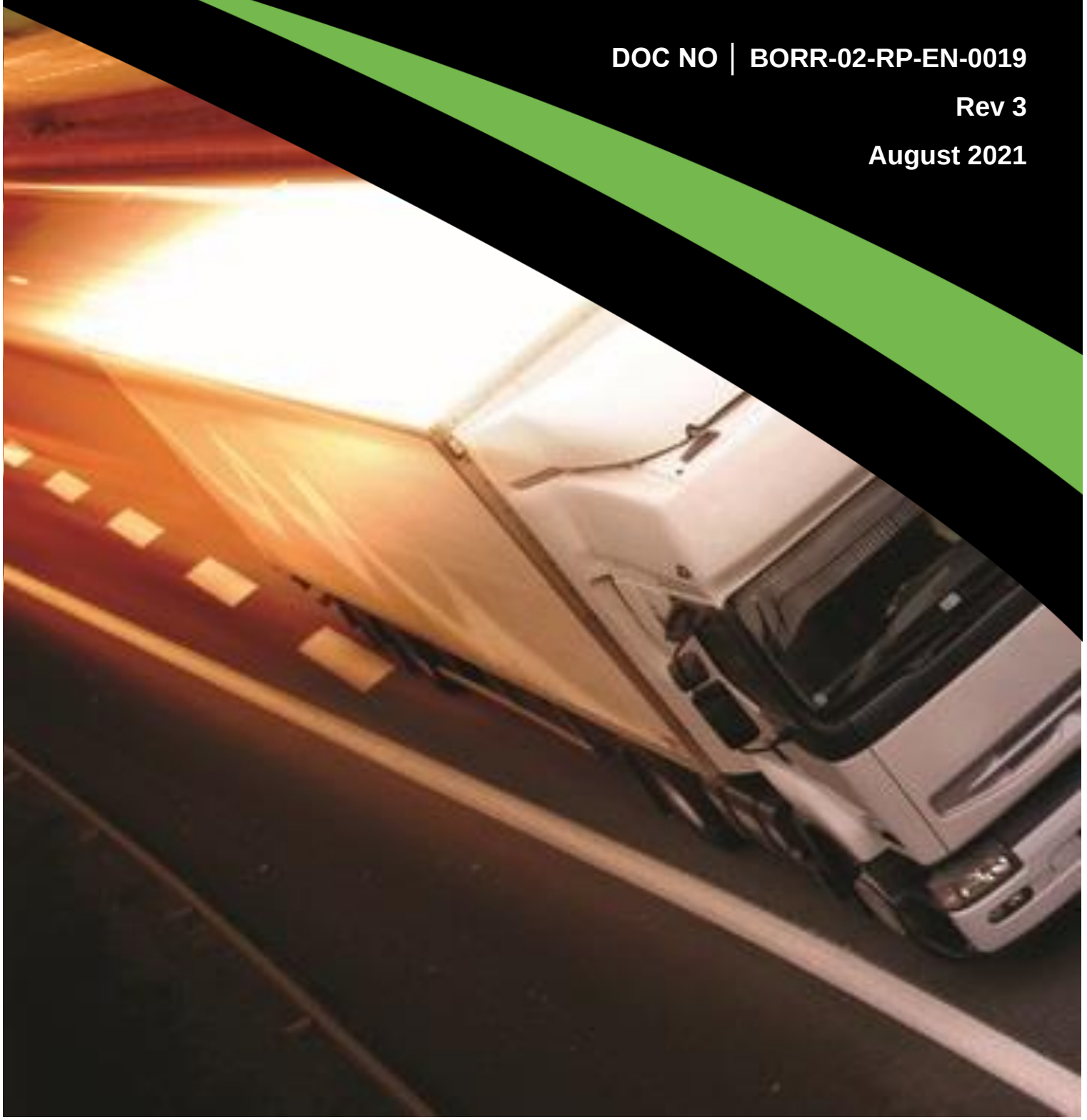

CONTENTS

TABLE INDEX

FIGURES INDEX

APPENDICES

Document *Control*

Revision	Date	Description	Prepared	Reviewed	Approved
A	16/07/2020	Draft	Main Roads	Main Roads	Main Roads
B	23/07/2020	Draft	Main Roads	BORR IPT	FH
0	09/10/20	Final	BORR IPT	Main Roads	FH
1	05/03/2021	Revised Final	Main Roads	Main Roads	FH
2	31/03/2021	Updated Revised Final	Main Roads	Main Roads	FH
3	04/08/2021	Updated Revised Final	Main Roads	Main Roads	Client

1 INTRODUCTION

1.1 Proposal background

The Commissioner of Main Roads Western Australia (Main Roads) is proposing to construct and operate the Southern Section of the Bunbury Outer Ring Road (BORR) project. BORR is a planned Controlled Access Highway linking the Forrest Highway and Bussell Highway. The completed project will provide a high standard route for access to the Bunbury Port, improve road user safety and facilitate proposed development to the east of the City of Bunbury. BORR also provides an effective bypass of Bunbury for inter-regional traffic. The proposed BORR comprises three sections:

- 'BORR Northern Section' – Forrest Highway to Boyanup-Picton Road
- 'BORR Central Section' – Boyanup-Picton Road to South Western Highway
- 'BORR Southern Section' – South Western Highway (near Bunbury Airport) to Bussell Highway.

This Offset Strategy relates to the residual environmental impacts of the BORR Southern Section (the Proposal).

1.2 Proposal description

The Proposal includes the construction and operation of 10.5 km of new freeway standard dual carriageway, associated bridges, interchanges and other road infrastructure including, but not limited to, culverts, lighting, noise barriers, fencing, landscaping, road safety barriers and signs.

The Proposal is located approximately 200 km south of Perth and, at its closest point, approximately six km south-east of Bunbury. The 200 hectares (ha) Proposal Area is within the City of Bunbury and Shire of Capel. Approximately 62 % of land within the Proposal Area is cleared for agriculture. The Proposal Area comprises 76 ha of native vegetation and 124 ha of cleared agricultural land. Construction of the Proposal is anticipated to commence in quarter four 2021 and continue for a period of 2-3 years. The Proposal Area is shown in Figure 1 (Appendix A).

1.3 Purpose of this strategy

In September 2019, Main Roads referred the Proposal to the Environmental Protection Authority (EPA) for assessment under Section 38 of the *Environmental Protection Act 1986* (WA) (EP Act). The Proposal information submitted included an Environmental Referral Supporting Document (BORR IPT, 2019a) which described the Proposal, the local environmental values present, the potential environmental impacts of the Proposal, and the management and mitigation strategies to address the identified impacts. In October 2019, the EPA determined that the Proposal would be subject to an environmental assessment under the EP Act at the level of 'Referral Information'.

In October 2019, in accordance with s40(2)(a) of the EP Act, the EPA requested Main Roads provide additional information to inform the environmental assessment of the Proposal, including the provision of an Offset Strategy. Since submission of the Updated Environmental Referral Supporting Document and Additional Information and Offset Strategy in October 2020, Main Roads has further reduced the impact of the Proposal on Western Ringtail Possum and Black Cockatoo habitat within the BORR South Proposal corridor in Gelorup by 4.5 ha, from an impact of 65.4 ha to 60.9 ha of habitat. The impact to Banksia Woodlands of the Swan Coastal Plain Threatened ecological community has also been reduced from 24.9 ha to 23.4 ha. These reductions in impact will be formalised through an application under section 43A

(Part IV Division I) of the *Environmental Protection Act 1986*. This Offset Strategy was subsequently updated in accordance with these changes.

This Offset Strategy has been prepared to address the EPA's Section 40(2)(a) request and will:

- Identify, describe and quantify the potential residual impacts (direct, indirect and cumulative) on the identified key environmental factors (Flora and Vegetation and Terrestrial Fauna) that will occur following implementation of the Proposal after consideration and applying avoidance and minimisation measures
- Determine the significance of any residual impacts on the identified key environmental factors using the *WA Environmental Offsets Guidelines* and application of the Residual Impact Assessment Model
- Where significant residual impacts remain, propose an offset strategy to counterbalance the residual impacts of the proposal that is consistent with the *WA Environmental Offsets Policy* (GoWA, 2011) and *WA Environmental Offset Guidelines* (GoWA, 2014) and where residual impacts relate to threatened species or communities the *Environmental Protection and Biodiversity Conservation Act 1999* Environmental Offsets Policy (DSEWPaC, 2012).

The proposed offsets detailed in this Offset Strategy are submitted for approval from DAWE and WA EPA.

1.4 Impact avoidance

The *WA Environmental Offsets Policy* notes that environmental offsets will only be considered after avoidance and mitigation options have been pursued. Since the referral of the Proposal in September 2019, Main Roads has undertaken a comprehensive review of the design and amended the Proposal Area to reduce the potential impacts on key environmental features including:

- Western Ringtail Possum (WRP)
- South-western Brush-tailed Phascogale (BTP)
- Black Cockatoos
- Banksia Woodland Threatened Ecological Community (TEC) / Priority Ecological Community (PEC) (Banksia Woodlands TEC / PEC)
- Tuart Woodlands TEC / PEC
- Tuart-Peppermint Woodland PEC.

Following referral of the Proposal to the EPA under s38 of the EP Act in September 2019 (BORR IPT, 2019a), Main Roads undertook a comprehensive review of the design and revised the infrastructure components and the Proposal Area with the objective of further reducing the potential impacts to key environmental values, including:

- Conservation significant fauna taxa, specifically WRP, Black-stripe Minnow (BSM) and BTP
- TECs and PECs, specifically Banksia Woodlands TEC / PEC, Tuart Woodlands TEC / PEC, and Tuart-Peppermint Woodland PEC.

Table 1-1 provides a summary of the design improvements to the Proposal. These improvements resulted in a reduction in the potential environmental impact to native vegetation, ecological communities, flora taxa and fauna taxa. The extent to which the design improvements to the Proposal has reduced potential impacts is further outlined in Sections 2 and 3.

In March 2020, Main Roads (2020) submitted an application to the EPA under s43A of the EP Act to amend the Proposal in light of the design improvements. On 28 April 2020, the EPA (2020) granted its consent to

Main Roads to amend the Proposal. This document provides an assessment of the environmental impact of the Proposal, as amended.

Table 1-1 Summary of design changes and benefits

DESIGN CHANGE	FAUNA SPECIES AND COMMUNITIES REDUCED IMPACT				
	BC	WRP	BTP	BSM	TEC & PEC
Whole of alignment					
A combination of permanent and temporary fauna fences will be installed adjacent to known habitat areas to limit WRP access to the Proposal Area. The fence will be 1.5 - 1.8 m high and constructed to prevent WRP being able to climb it or dig under it.	X	X	X		X
The median widths have been reduced where the BORR alignment is on high fill embankments to mitigate the environmental impacts	X	X	X		X
All bridge designs have been modified to avoid the need for piers or abutments within watercourse, mitigating environmental and heritage impacts					
Install 22 fauna crossings to maintain and enhance existing movement pathways consisting of: • Eight rope bridges • Seven fauna underpasses • Seven fauna culverts		X	X	X	
Centenary Road to Lilydale Road					
BORR main alignment amended to further minimise impacts on vegetation and fauna habitat	X	X	X	X	X
Reduced median width on BORR to minimise impacts on vegetation	X	X	X		X
Batter slopes steepened to minimise width of clearing	X	X	X		X
Access track off Centenary Road designed in a cleared area	X	X	X		X
Jules Road connection redesigned to reduce clearing impacts	X	X	X		X
Centenary Road / Lilydale Road Interchange					
BORR main alignment amended to further minimise impacts on vegetation	X	X	X		X
Reduced median width on BORR to minimise impacts on vegetation	X	X	X		X
Batter slopes steepened to minimise width of clearing	X	X	X		X
Hasties Road to Jilley Road					
BORR main alignment amended to further minimise impacts on vegetation	X	X	X		X

DESIGN CHANGE	FAUNA SPECIES AND COMMUNITIES REDUCED IMPACT				
	BC	WRP	BTP	BSM	TEC & PEC
Reduced median width on BORR to minimise impacts on vegetation	X	X	X		X
Batter slopes steepened to minimise width of clearing	X	X	X		X
Jilley Road (Gelorup section)					
Design amended to reduce amount of clearing required for project by shifting footprint further into cleared areas	X	X	X	X	X
Noise wall alignment designed to mitigate environmental impacts by building the noise wall along an existing cleared tracks through the constrained Gelorup area.	X	X	X		X
Jilley Road was redesigned closer to the main line in order to reduce the clearing footprint.	X	X	X		X
Bussell Highway					
Design amended to reduce amount of clearing required for project by modifying connections to existing carriageways.	X	X	X		X
Retaining walls designed at the interchange to minimise the design footprint and hence clearing impacts.	X	X	X		X
Design of the mainline and local access roads at the southern tie in to Bussell Highway (Capel Golf Course) have been amended to decrease the extent of works and hence a reduction in clearing area.	X	X	X		X
Bridge designs					
Bridge designs revised to long-span to avoid the need for piers and abutments within watercourse	X	X	X		

These design improvements have resulted in reducing the clearing area of native vegetation from 98 ha to 71.5 ha.

1.5 Summary of offset requirement

Offset requirements have been determined through assessment of the direct residual impacts of the Proposal based on the revised design, field survey and site assessment. Details of the residual impacts are included in the *Bunbury Outer Ring Road Southern Section – Response to EPA Notice of Decision* (BORR IPT, 2020a) and are summarised in Sections 2 and 3 below. Table 1-2 presents a summary of the residual impacts this Offset Strategy proposes to offset.

Table 1-2 Offset Requirements

ITEM	DETAILS
Title of proposal	Bunbury Outer Ring Road Southern Section
Proponent name	Commissioner for Main Roads Western Australia
EPA Assessment No.	2225 / CMS 17691
Purpose of this strategy	This strategy is submitted to address the EPA request for additional information in respect to environmental offsets.
Environmental Offset Requirements	To counterbalance the significant residual impacts to: • 23.4 ha of vegetation representative of Banksia Woodlands TEC / PEC • 4.4 ha of vegetation representative of Tuart Woodlands TEC / PEC that also comprises Tuart-Peppermint Woodland PEC • An additional 0.1 ha of Tuart-Peppermint Woodland PEC • 60.9 ha of Western Ringtail Possum habitat comprising impacts to the home range of 49 - 72 individuals • 39.2 ha of Southern Brush-tailed Phascogale habitat • 60.9 ha of potential habitat for Black Cockatoo species (Baudin's Cockatoo (*Calyptorhynchus baudinii*), Carnaby's Cockatoo (*Calyptorhynchus latirostris*) and Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*).

1.6 Consultation

The proposed offset measures and approach detailed in this Offset Strategy were discussed with officers from the Department of Water and Environmental Regulation (DWER), Department of Biodiversity Conservation and Attractions (DBCA) and Commonwealth Department of the Environment and Energy during a workshop with Main Roads on 19 November, 2020.

2 FLORA AND VEGETATION ASSESSMENT AND IMPACTS

2.1 Environmental surveys

The flora and vegetation studies and surveys undertaken within, or are relevant to, the Proposal are shown in Table 2-1. These investigations and the refinement of the Proposal design have been used to define the residual environmental impacts, and consequently used as the basis for determining the environmental offset requirements.

Table 2-1 Studies and surveys relevant to the Proposal

SURVEY / REPORT NAME	LOCATION / EXTENT IN SURVEY AREA	METHODOLOGY
Bennett Environmental Consulting Pty Ltd (2003)	Vegetation and flora assessment of selected areas along the Bunbury Outer Ring Road and Port Access Road	Vegetation and flora assessment
Bennett Environmental Consulting Pty Ltd (2008)	Assessment of significant flora along the proposed Bunbury Ring Road	Targeted significant flora assessment
Report for Bunbury Outer Ring Road (Stage 1) and Port Access Road (Stage 2) – Flora and Vegetation Spring Survey (GHD, 2009)	Flora and vegetation survey within the Bunbury Outer Ring Road (Stage 1) and Port Access Road (Stage 2) survey areas	Vegetation and flora assessment
Lot 1 Ducane Road Environmental Values Assessment (GHD, 2014)	Flora and vegetation assessment of Lot 1 Ducane Road conducted on 13 June 2013. The area assessed vegetation types and floristic diversity for Lot 1 Ducane Road, which is partly located within the Proposal Area.	The assessment described the vegetation types present and their conditions and also searched for conservation significant flora
Waterloo Urban and Industrial Expansion Flora and Fauna Survey (GHD, 2015c)	Approximately 2,700 ha between Collie River and approximately Boyanup Picton Road. The study boundaries overlap the current Surveyed Area	Two season flora survey in accordance with EPA guidelines at the time of survey (EPA, 2004b). Late winter (13 – 14 August 2014) and mid-spring (30 – 31 October 2014). Vegetation type and condition mapping based on quadrats and opportunistic records. Searches for conservation significant flora.
BORR South Flora Survey (GHD, 2015b)	Survey for BORR South Proposal Area. This occurs immediately south of the current Surveyed Area and is used to provide context. Two quadrats are within the current Surveyed Area.	Survey completed on 21 – 23 September 2011 and 16 – 18 June 2014. Level 2 flora and vegetation survey including quadrat sampling, targeted searches and vegetation type / condition mapping.

SURVEY / REPORT NAME	LOCATION / EXTENT IN SURVEY AREA	METHODOLOGY
Reassessment of Floristic Communities (Biota, 2016)	Targeted areas within BORR South alignment. Two quadrats are within the current Surveyed Area.	Additional quadrats and re-analysis of the FCTs presented in GHD (GHD, 2015b). Surveys carried out in September 2016.
Report of a Targeted Rare Flora Survey for *Diuris drummondii* along four sections of the Bunbury Outer Ring Road proposed alignment (Ecoedge, 2017)	Targeted assessment on 19 and 30 November 2016 of portions of the BORR South proposed alignment that provide suitable habitat for *Diuris drummondii*. A total of 18.6 ha was searched, however no *D. drummondii* plants were found.	The survey was completed in accordance with the Commonwealth's Draft Survey Guidelines for Australia's Threatened Orchids (Commonwealth of Australia, 2013). A known population of the species nearby was used as a reference to determine when flowering had commenced and optimal timing for the survey.
Banksia TEC Assessment for BORR South (Biota, 2018b)	24 target areas within BORR South area and surrounds. This report also provides context for the Banksia TEC assessment. Three target sites are located south-west of the current Surveyed Area. The closest target site is approximately 3 km south-west of the current Surveyed Area.	Walking transects and quadrats within the target sites conducted in November 2017
A Flora and Vegetation survey on Lot 104 **Willinge Drive Davenport** (Ecoedge, 2018)	Survey of the 83.3 ha within Lot 104 (North east of the Preston River). The study boundary intersects the Proposal Area.	Survey carried out on 30 October and 2 and 3 November 2017. Vegetation type and condition mapping and species lists presented.
Assessment for the presence of *Phytophthora cinnamomi* - Bunbury Outer Ring Road, Stage 2 (Glevan Consulting, 2011)	BORR Southern Section alignment	Visual diagnosis of disease within areas of assessable remnant vegetation
BORR Northern and Central Sections Vegetation and Flora Study (BORR IPT, 2020b)	Detailed flora and vegetation assessment of 1,128 ha, including the Proposal Area. This occurs immediately north of the Proposal Area and is used to provide context.	Detailed vegetation and flora survey conducted from 20 August 2018 to 19 December 2018. Targeted surveys undertaken from 19 to 30 August 2019. The survey included late winter, early spring, mid-spring, late spring and summer survey periods.
Bunbury Outer Ring Road South Alternate Section Vegetation and	Detailed flora and vegetation assessment	Detailed flora and vegetation survey and targeted survey. Surveys conducted from 22-25 October 2018 and on 18 November 2018. Surveys included

SURVEY / REPORT NAME	LOCATION / EXTENT IN SURVEY AREA	METHODOLOGY
Flora Study (BORR IPT, 2019b)		quadrat sampling to determine vegetation types and presence of TEC / PEC, as well as targeted surveys for conservation listed flora and weeds.
Additional surveys undertaken for Proposal following referral, including information requested in Section 40(2)(a) Notice		
Bunbury Outer Ring Road Southern Section Vegetation and Flora Study (BORR IPT, 2020c)	Detailed flora and vegetation assessment	Detailed flora and vegetation survey and targeted survey conducted August (late winter/ early spring) and September 2018 (spring). A targeted orchid survey of selected sites was completed in August and September 2019. A targeted *D. drummondii* (Tall Donkey Orchid) survey was completed in 19 November and 30 November 2016 and 30 November 2019. A targeted survey for TEC / PEC, including Tuart TEC, and confirmation of vegetation types in previously unsurveyed gaps in the survey area, was also undertaken in September 2019.
A Review of the Regional Conservation Status of a Clay-based Wetland Community (Claypans) (Ecoedge, 2019a)	Region defined as on the SCP within Harvey, Bunbury, Capel, Dardanup and Busselton local government areas	Desktop review and targeted field assessments for Claypan TECs conducted in 26 July – 1 August 2019 to provide additional information requested in Section 40(2)(a) Notice.
Memorandum of a Targeted Rare Flora Survey for *Diuris drummondii* within and adjacent to the Bunbury Outer Ring Road South referral area (Ecoedge, 2019b)	Targeted Rare Flora Survey for *D. drummondii* within and adjacent to the Bunbury Outer Ring Road South referral area	Survey conducted in accordance with the Commonwealth's Draft Survey Guidelines for Australia's Threatened Orchids (Commonwealth of Australia, 2013).
Review of Potential Claypan Occurrences in the BORR Southern Section (Ecoedge, 2019c) **– included in** (BORR IPT, 2020c)	Within the locality of the BORR Southern Section alignment	Survey conducted 1 August 2019. Condition, hydrology and species diversity were assessed to confirm whether floristic and condition thresholds of the Claypan TEC were met. Results are documented in an updated revision of the Flora and Vegetation Study for the Proposal to inform avoidance, management, mitigation and monitoring actions to

SURVEY / REPORT NAME	LOCATION / EXTENT IN SURVEY AREA	METHODOLOGY
		provide additional information requested in Section 40(2)(a) Notice.
Phytophthora Dieback Survey Bunbury Outer Ring Road South (Great Southern Bio Logic Pty Ltd, 2020)	Phytophthora dieback survey of the Bunbury Outer Ring Road southern section alignment	Survey undertaken in accordance with DBCA guidelines
Draft Lots 153, 267 and 268 Ducane Road, Banksia Woodlands TEC Assessment (Biota Environmental Sciences, 2021a)	Targeted Banksia Woodlands TEC Assessment of Lots 153, 267 and 268 Ducane Road, Gelorup	Vegetation survey using transects and quadrats conducted in November 2020. The survey was conducted in accordance with EPA (2016),. Field data was analysed against Gibson et al (1994) and DoTEE (2016).
Flora and Vegetation Survey of Lot 156 Marchetti Road, (Stream Environmental, 2021)	Targeted Banksia Woodlands TEC Assessment of Lot 156 Marchetti Road, Gelorup	Vegetation and flora survey using transects and quadrats conducted in October - November 2020. The survey was conducted in accordance with EPA (2016), TSSC (2016), TSSC (2019) conservation advice.
Environmental Site Inspection Report – Indicative Targeted Vegetation Assessment, Lot 27 Tredrea Road (Main Roads WA, 2021)	Targeted Tuart Woodland TEC/PEC assessment of Lot 27 Tredrea Rd, Myalup	Targeted Tuart Woodland TEC/PEC and Tuart Peppermint Woodland PEC assessment conducted on 11 March 2021. The survey was conducted in accordance with EPA (2016) and additional notes taken according to the TSSC (2019) conservation advice.

The assessment of the broader flora and vegetation values of the area are provided in BORR IPT (2019a) and BORR IPT (2020c), with the outcomes of these assessments, as they relate to offsets, summarised below.

2.2 Conservation significant flora

The Proposal will not impact any *Environment Protection and Biodiversity Conservation Act* (EPBC Act) nor *WA Biodiversity Conservation Act* (BC Act) listed flora and will have a minor impact on three DBCA-listed Priority flora.

Main Roads does not propose to provide an environmental offset for expected residual impacts on Priority flora.

2.3 Threatened and Priority ecological communities

The implementation of the Proposal will result in clearing of up to 70.5 ha of vegetation and 1 ha of revegetation within the 200 ha Proposal Area. An estimated 27.9 ha of this vegetation comprises vegetation representative of TECs and / or PECs.

Occurrences of two TECs and three PECs will potentially be impacted by the Proposal, these being:

- 'Banksia Woodlands of the Swan Coastal Plain' TEC / PEC (Banksia Woodlands TEC / PEC)
- 'Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain ecological community' TEC / PEC (Tuart Woodlands TEC / PEC)
- 'Southern Swan Coastal Plain *Eucalyptus gomphocephala* - *Agonis flexuosa* Woodlands (Floristic Community Type 25)' PEC (Tuart-Peppermint Woodland PEC)

Details of the TECs and PECs within the Proposal Area and addressed by this Offset Strategy are provided in Table 2-2. The locations of these occurrences are shown in Figure 2 (Appendix A).

Table 2-2 Area and Condition of TEC / PEC within the Proposal Area

TEC / PEC	CONSERVATION STATUS	EXTENT IN PROPOSAL AREA	VEGETATION CONDITION
Banksia Woodlands TEC / PEC	Endangered TEC – EPBC Act Priority 3 PEC - DBCA listed	23.4 ha	Excellent: 0.49 ha Excellent – Very Good: 4.0 ha Very Good: 2.28 ha Very Good - Good: 2.38 ha Good: 1.47 ha Good – Degraded: 11.58 ha Degraded: 0.71 ha Degraded - Completely Degraded: 0.46 ha Completely Degraded: 0.07 ha
Tuart Woodlands TEC / PEC, Tuart-Peppermint Woodland PEC	Critically Endangered TEC – EPBC Act Priority 3 PEC - DBCA listed	4.4 ha	Very Good: 0.80 ha Good – Degraded: 2.91 ha Degraded - Completely Degraded: 0.01 ha Completely Degraded: 0.68 ha
Tuart-Peppermint Woodland PEC	Priority 3 PEC - DBCA listed	0.1 ha	Degraded - Completely Degraded: 0.10 ha

The residual impacts, impact significance and avoidance on each of the TECs and PECs is discussed in the following sections.

2.3.1 Banksia Woodlands TEC / PEC

'Banksia Woodlands of the Swan Coastal Plain' was listed in September 2016 as an Endangered TEC under the EPBC Act. This community is also listed as Priority 3 PEC by DBCA. Until recently, the PEC used to differ from the TEC in that it had no minimum condition and patch size thresholds. In June 2020, DBCA advised that the Banksia Woodland PEC is considered synonymous with TEC.

The Banksia Woodlands TEC / PEC is largely restricted to the Perth (SWA02) and Dandaragan (SWA01) subregions of the Swan Coastal Plain (SCP) bioregion, from around Jurien Bay in the north to Dunsborough in the south. The TEC / PEC also extends into immediately adjacent areas on the Whicher and Darling escarpments (TSSC, 2016).

2.3.1.1 Impacts

23.4 ha of Banksia Woodlands TEC / PEC vegetation at three locations within the Proposal Area (Figure 2, Appendix A) will be cleared as a result of Proposal implementation.

The composition and condition of these occurrences are detailed in Table 2-3.

Table 2-3 Banksia Woodlands TEC / PEC direct impact sites

SITE	LOCATION	TEC / PEC AREA (PATCH SIZE)	DIRECT IMPACT	VEGETATION COMPOSITION AND CONDITION
BW-S-D-1	Bussell Highway road reserve from Calinup Road and Lakes Road intersection extending north of Woods Road	23.9 ha Banksia Woodlands TEC / PEC	20.0 ha Banksia Woodlands TEC / PEC	VT1 - Open forest of *E. marginata*, *C. calophylla* and *Banksia attenuata* on Karrakatta deep sands VT3 - Scattered *E. marginata*, *C. calophylla* and +/- *A. flexuosa* over a Tall Open Shrubland of *B. attenuata*, *B. ilicifolia*, *Xylomelum occidentale* and *Kunzea glabrescens* over grassland over introduced grasses, VT4 - Open forest of *B. attenuata* and *A. flexuosa* Condition: 2-3 to 7 (Excellent-Very Good to Completely Degraded)
BW-S-D-2	North of Jilley Road	4.6 ha Banksia Woodlands TEC / PEC	2.9 ha Banksia Woodlands TEC / PEC	VT1 - Open forest of *E. marginata, C. calophylla* and *B. attenuata* on Karrakatta deep sands Condition: 2-3 (Excellent-Very Good)
BW-S-D-3	Marchetti Road	0.5 ha Banksia Woodlands TEC / PEC	0.5 ha Banksia Woodlands TEC / PEC	VT2 - Open forest of *E. marginata, C. calophylla, B. attenuata* and *A. flexuosa* on Bassendean dunes Condition: 2 (Excellent)

The clearing of up to 23.4 ha of Banksia Woodlands TEC / PEC associated with the Proposal would result in a reduction of up to 0.007 % of the total extent (> 335,000 ha) and < 0.01 % of the regional extent (> 253,000 ha).

Potential indirect impacts to retained Banksia Woodlands TEC / PEC vegetation adjacent to the Proposal Area include:

- Increased risk of spread or introduction of weeds during construction works
- Introduction and / or spread of *Phytophthora* dieback during construction works
- Potential for fire caused by construction works (in particular, for 'hot works' such as grinding / welding of steel in bridge construction).

Indirect impact to Banksia Woodlands TEC / PEC from fragmentation is not expected, and accordingly, has not been listed above. The Proposal will not remove areas of Banksia Woodlands TEC / PEC occurrences to an extent that the remaining occurrence is no longer representative of the Banksia Woodlands TEC / PEC under the TSSC (2016) criteria.

Indirect impact to Banksia Woodlands TEC / PEC from changes in hydrology is not expected, and accordingly, has not been listed above. Altering existing flow paths has the potential to negatively impact the hydrological regime (most notably drying) of TEC / PEC occurrences. Through implementation of the Drainage Strategy developed for the Proposal (BORR IPT, 2019c), and the management actions listed in BORR IPT (2020a) existing drainage patterns to adjacent TEC / PEC vegetation will be maintained. Impacts from changes to flow paths are therefore not expected to result from the Proposal.

Occurrences of Banksia Woodlands TEC / PEC directly adjacent to the Proposal Area have been identified as part of the proposed Vegetation Monitoring Program. These are detailed in Table 2-4 and shown in Figure 3 (Appendix A).

Table 2-4 Banksia Woodlands TEC / PEC potential indirect impact sites

SITE / OCCURRENCE CODE AND TENURE	TEC / PEC TYPE	LOCATION AND LOT NUMBER
BTW-S-I-3 Road reserve	Banksia Woodlands TEC / PEC	Road reserve along Centenary Road east of Bussell Hwy, east of Site BTW-S-I-2 (No Lot or Location number)
BTW-S-I-4 Reserve	Banksia Woodlands TEC / PEC	West of Bussell Hwy (two land parcels) (Reserve 23000 (land_id_nu: 3415480))
BW-S-I-6 Road reserve	Banksia Woodlands TEC / PEC	Jilley Road north of Woods Road (Road isolation)
BW-S-I-7 Private property	Banksia Woodlands TEC / PEC	East of Yalinda Drive, west of Marchetti Road Lot 156 on Plan 232768

2.3.1.2 Impact Avoidance

As discussed in Section 1.4, substantial improvements to the Proposal design have been made subsequent to referral of the Proposal to the EPA in September 2019 to reduce impacts to Banksia Woodlands TEC / PEC vegetation. As outlined in Table 1-1, these have included a range of refinements, such as reducing median widths and redesigning of interchanges to reduce the area of native vegetation proposed to be cleared.

Table 2-5 provides a summary of the impact of the referred Proposal, the impact of the revised Proposal (current Proposal), and the net reduction in the environmental impact to Banksia Woodlands TEC / PEC vegetation. Through the design changes, the area of Banksia Woodlands TEC / PEC that will be cleared as a result of Proposal implementation has been reduced by 3.2 ha.

Table 2-5 Detailed design changes to avoid impacts to Banksia Woodland TEC / PEC Vegetation

TEC / PEC TYPE	SEPTEMBER 2019 s38 REFERRAL	REVISED PROPOSAL (AUGUST 2021)	REDUCTION IN TEC / PEC CLEARING AREA
Banksia Woodlands TEC / PEC	Clearing of up to 26.6 ha	Clearing of up to 23.4 ha	Reduction in clearing area of 3.2 ha

2.3.1.3 Predicted Outcome

A high level of mitigation and management has been applied to the Proposal, with Main Roads making changes to the Proposal design in order to reduce the potential environmental impacts to flora and

vegetation values, including the Banksia Woodlands TEC / PEC vegetation. The changes have resulted in a reduction in the area of Banksia Woodlands TEC / PEC vegetation contained within the Proposal Area. Management and mitigation actions will be implemented to control both the direct impacts and potential indirect impacts of the Proposal, with the proposal impacting less than 0.007% of the remaining extent of this community. Based on these assessments, it is unlikely that the Proposal will have a significant impact on the Banksia Woodlands TEC / PEC.

Objectives for managing impacts to State environmental factors under the WA EP Act and Commonwealth Matters of National Environmental Significance (MNES) will be met for the Proposal through the implementation of the management and mitigation actions detailed in BORR IPT (2020a).

Main Roads proposes to further address the residual impacts of the Proposal on Banksia Woodlands TEC / PEC through the provision of environmental offsets.

2.3.2 Tuart Woodlands TEC / PEC

The 'Tuart *(Eucalyptus gomphocephala)* Woodlands and Forests of the Swan Coastal Plain ecological community' was listed as a TEC under the EPBC Act in 2019 at the level of 'Critically Endangered' as assessed using the criteria of the IUCN (2015) and guidance of TSSC (2019). This community is also listed as Priority 3 PEC by DBCA. Until recently, the PEC used to differ from the TEC in that it had no minimum condition and patch size thresholds. In June 2020, DBCA advised that the Tuart Woodlands PEC is synonymous with Tuart Woodlands TEC.

Areas that meet the key diagnostic characteristics including the minimum size and condition thresholds comprise the Tuart Woodlands TEC / PEC. Areas that meet the key diagnostic characteristics but do not meet the minimum size and condition thresholds do not form part of the Tuart Woodlands TEC / PEC, however, are acknowledged as contributing to recovering the integrity of the Tuart Woodlands TEC / PEC. Retaining other nearby native vegetation may also be important to the integrity of the ecological community (TSSC, 2019).

The Tuart Woodlands TEC / PEC has a discontinuous distribution in the west of the SCP of south-west Western Australia, with areas either heavily cleared and / or degraded across much of its range. Many remnants are small and isolated, and most have been heavily modified, and are subject to ongoing threats such as weed invasion and frequent burning.

2.3.2.1 Impacts

Within the 71.5 ha of remnant native vegetation to be cleared for the Proposal is one occurrence of Tuart Woodlands TEC / PEC totalling 4.4 ha. The composition and condition of this occurrence is detailed in Table 2-6. The clearing of up to 4.4 ha of Tuart Woodlands TEC / PEC vegetation associated with the Proposal would result in a reduction of up to 0.03 % of the recorded extent.

The occurrence of Tuart Woodlands TEC / PEC within the Proposal Area is shown in Figure 2 (Appendix A).

Table 2-6 Tuart Woodlands TEC / PEC direct impact site

SITE	LOCATION	TEC / PEC AREA (PATCH SIZE)	DIRECT IMPACT	VEGETATION COMPOSITION AND CONDITION
TW-S-D-2	Eastern side of Bussell Highway at the intersection of Bussell Highway and Centenary Road	> 7.3 ha Tuart Woodlands TEC / PEC Note, patch extends north and south beyond the Surveyed Area (total extent > 25 ha)	4.4 ha of Tuart Woodlands TEC / PEC	VT1b – Open forest of *Eucalyptus gomphocephala* with occasional *E. marginata* over *Agonis flexuosa* and *Banksia attenuata* on yellow sand over limestone. Condition: 4-6 (Majority Good to Degraded with parts Very Good and Completely Degraded)

Potential indirect impacts to retained Tuart Woodlands TEC / PEC vegetation adjacent to the Proposal include:

- Increased risk of spread or introduction of weeds during construction works
- Introduction and / or spread of *Phytophthora* dieback during construction works
- Potential for fire caused by construction works (in particular, for 'hot works' such as grinding / welding of steel in bridge construction).

Indirect impact to Tuart Woodlands TEC / PEC from fragmentation is not expected, and accordingly, has not been listed above. The Proposal is not expected to remove areas of Tuart Woodlands TEC / PEC to an extent that the remaining area is no longer representative of the TEC under the TSSC (2019) criteria.

Indirect impact to Tuart Woodlands TEC / PEC from changes in hydrology is not expected, and accordingly, has not been listed above. Altering existing flow paths has the potential to negatively impact the hydrological regime (most notably drying) of TEC / PEC occurrences. Through implementation of the Drainage Strategy developed for the Proposal (BORR IPT, 2019c), existing drainage patterns to adjacent TEC / PEC vegetation will be maintained. Impacts from changes to flow paths are therefore not expected to result from the Proposal.

Occurrences of Tuart Woodlands TEC / PEC communities directly adjacent to the Proposal Area have been identified as part of the proposed Vegetation Monitoring Program. These are detailed in Table 2-7 and shown in Figure 3 (Appendix A).

Table 2-7 Tuart Woodlands TEC / PEC potential indirect impact sites

SITE / OCCURRENCE CODE AND TENURE	TEC / PEC TYPE	LOCATION AND LOT NUMBER
BTW-S-I-2 Road reserve and Reserve	Tuart Woodlands TEC / PEC and Tuart-Peppermint Woodland PEC	Road reserve on the north side of Centenary Road east of Bussell Hwy, and extending into the adjacent reserve to the north (Road reserve, and P061603 / 9000)
TW-S-I-3 Private property		East of Bussell Highway (P023258 / 100)
TW-S-I-4 Private property		East of Jules Road (P023258 / 101)

2.3.2.2 Impact avoidance

The *WA Environmental Offsets Policy* (GoWA, 2011) notes that environmental offsets will only be considered after avoidance and mitigation options have been pursued. In accordance with this, substantial improvements to the Proposal design have been made subsequent to referral of the Proposal in September 2019 to reduce impacts to Tuart Woodlands TEC / PEC vegetation. As outlined in Table 1-1, these have included a range of refinements, such as the steepening of batter slopes along Centenary Road, where the Tuart Woodlands TEC / PEC occurs, in order to reduce the clearing requirement.

A summary of the impact of the referred Proposal, the impact of the revised Proposal (current Proposal), and the net reduction in the environmental impact to Tuart Woodlands TEC / PEC vegetation is presented in Table 2-8. Through the design changes, the area of Tuart Woodlands TEC / PEC that will be removed as a result of the Proposal implementation has been reduced by 0.5 ha (10 %).

Table 2-8 Detailed design changes to avoid impacts to Tuart Woodlands TEC / PEC Vegetation

TEC	SEPTEMBER 2019 s38 REFERRAL	REVISED PROPOSAL (MARCH 2020)	REDUCTION IN TEC / PEC CLEARING AREA
Tuart Woodlands TEC / PEC	Clearing of 4.9 ha	Clearing of 4.4 ha	Reduction in clearing of 0.5 ha

2.3.2.3 Predicted Outcome

A high level of mitigation and management has been applied to the Proposal, with Main Roads making changes to the Proposal design in order to reduce the potential environmental impact to Tuart Woodlands TEC / PEC vegetation. These have resulted in a reduction in the area of Tuart Woodlands TEC / PEC vegetation contained within the Proposal Area. Management and mitigation actions will be implemented to control both the direct and potential indirect impacts of the Proposal. Based on the above assessment, it is considered unlikely that the Proposal will have a significant impact on the Tuart Woodlands TEC / PEC.

Objectives for managing impacts to State environmental factors under the WA EP Act and Commonwealth MNES will be met for the Proposal through the implementation of the management and mitigation actions detailed in BORR IPT (2020a).

Main Roads proposes to further address the residual impacts of the Proposal on Tuart Woodlands TEC / PEC through the provision of environmental offsets.

2.3.3 Tuart-Peppermint Woodland PEC

The 'Southern Swan Coastal Plain *Eucalyptus gomphocephala* - *Agonis flexuosa* Woodlands (Floristic Community Type 25)' ecological community has been classified by DBCA as a Priority 3 PEC (DBCA, 2019). The Tuart-Peppermint Woodland PEC may form a component of both the Tuart Woodlands TEC / PEC and the Banksia Woodlands TEC / PEC (both assessed above) (DBCA, 2019).

There are two occurrences of Tuart-Peppermint Woodlands PEC within the Proposal Area; one of 4.4 ha which overlaps entirely with the occurrence of Tuart Woodlands TEC / PEC assessed above, and one of 0.1 ha which does not meet the diagnostic criteria for the Tuart Woodlands TEC / PEC.

2.3.3.1 Impacts

Within the 71.5 ha of remnant native vegetation to be cleared for the Proposal is 4.5 ha of Tuart-Peppermint Woodland PEC vegetation, all of which will be cleared under the Proposal. This area comprises two occurrences, as detailed in Table 2-9 and shown in Figure 2 (Appendix A).

The regional and local extent of the Tuart-Peppermint Woodland PEC has not been mapped, however is likely to be similar to that of the Tuart Woodlands TEC / PEC. In the absence of extent remaining data for the Tuart-Peppermint Woodland PEC, the figures available for Tuart Woodlands TEC / PEC (as provided in TSSC (2019)) are the best available alternative and are therefore used as a proxy.

The clearing of up to 4.5 ha of Tuart-Peppermint Woodland PEC vegetation associated with the Proposal would result in a reduction of up to 0.03 % of the recorded extent of the Tuart Woodlands TEC / PEC.

Table 2-9 Tuart-Peppermint Woodland PEC direct impact sites

SITE	LOCATION	PEC AREA (PATCH SIZE)	DIRECT IMPACT	VEGETATION COMPOSITION AND CONDITION
TW-S-D-1	Western side of Bussell Highway at the intersection of Bussell Highway and Centenary Road	0.1 ha Tuart-Peppermint Woodland PEC Patch extends north and south beyond the Surveyed Area (total extent > 0.5 ha)	0.1 ha of Tuart-Peppermint Woodland PEC	VT1b – Open forest of *Eucalyptus gomphocephala* with occasional *E. marginata* over *Agonis flexuosa* and *Banksia attenuata* on yellow sand over limestone. Condition: 4-6 (Majority Good to Degraded with parts Very Good and Completely Degraded)
TW-S-D-2	Eastern side of Bussell Highway at the intersection of Bussell Highway and Centenary Road	> 7.3 ha Tuart-Peppermint Woodland PEC Patch extends north and south beyond the Surveyed Area (total extent > 25 ha)	4.4 ha of Tuart-Peppermint Woodland PEC (Also Tuart Woodlands TEC / PEC, and assessed in section 2.3.2 above)	VT1b – Open forest of *Eucalyptus gomphocephala* with occasional *E. marginata* over *Agonis flexuosa* and *Banksia attenuata* on yellow sand over limestone. Condition: 4-6 (Majority Good to Degraded with parts Very Good and Completely Degraded)

Potential indirect impacts to Tuart-Peppermint Woodland PEC vegetation adjacent to the Proposal include:

- Increased risk of spread or introduction of weeds during construction works
- Introduction and / or spread of *Phytophthora* dieback during construction works
- Potential for fire caused by construction works (in particular, for 'hot works' such as grinding / welding of steel in bridge construction).

Indirect impact to Tuart-Peppermint Woodland PEC vegetation from fragmentation is not expected, and accordingly, has not been listed above. The Proposal is not expected to remove areas of the Tuart-Peppermint Woodland PEC to an extent that the remaining area is no longer representative of the PEC.

Indirect impact to the Tuart-Peppermint Woodland PEC from changes in hydrology is not expected, and accordingly, has not been listed above. Altering existing flow paths has the potential to negatively impact the hydrological regime (most notably drying) of the PEC occurrences. Through implementation of the Drainage Strategy developed for the Proposal (BORR IPT, 2019c), and the management actions listed in BORR IPT (2020a), existing drainage patterns to adjacent PEC vegetation will be maintained. Impacts from changes to flow paths are therefore not expected to result from the Proposal.

Occurrences of Tuart-Peppermint Woodland PEC directly adjacent to the Proposal Area have been identified as part of the proposed monitoring program. These are detailed in Table 2-10 and shown in Figure 3 (Appendix A). Three of these overlap entirely with the Tuart Woodlands TEC / PEC sites identified in Table 2-7.

Table 2-10 Tuart-Peppermint Woodland PEC potential indirect impact sites

SITE / OCCURRENCE CODE AND TENURE	TEC / PEC TYPE	LOCATION AND LOT NUMBER
BTW-S-I-1 Private property	Tuart-Peppermint Woodland PEC	North side of Centenary Rd west of Bussell Hwy, north westernmost part of Proposal Area (P183835 / 632)
BTW-S-I-2 Road reserve and Reserve	Tuart-Peppermint Woodland PEC (also comprising Tuart Woodlands TEC / PEC)	Road reserve on the north side of Centenary Road east of Bussell Hwy, and extending into the adjacent reserve to the north (Road reserve, and P061603 / 9000)
TW-S-I-3 Private property		East of Bussell Highway (P023258 / 100)
TW-S-I-4 Private property		East of Jules Road (P023258 / 101)

2.3.3.2 Impact avoidance

The *WA Environmental Offsets Policy* (GoWA, 2011) notes that environmental offsets will only be considered after avoidance and mitigation options have been pursued. In accordance with this, substantial improvements to the Proposal design have been made subsequent to referral of the Proposal in September 2019 to reduce impacts to Tuart-Peppermint Woodland PEC vegetation. As outlined in Table 1-1, these have included a range of refinements, such as the steepening of batter slopes along Centenary Road, where the Tuart-Peppermint Woodland PEC occurs, in order to reduce the clearing requirement.

Design improvements to avoid part of the Tuart Woodlands TEC / PEC occurrence, as detailed in Table 2-8, are also applicable to the Tuart-Peppermint Woodland PEC.

2.3.3.3 Predicted outcome

A high level of mitigation and management has been applied to the Proposal, with Main Roads making changes to the Proposal design in order to reduce the potential environmental impact to Tuart-Peppermint Woodland PEC vegetation. These have resulted in a reduction in the area of Tuart-Peppermint Woodland PEC contained within the Proposal Area. Management and mitigation actions will be implemented to control both the direct and potential indirect impacts of the Proposal. Based on the above assessment, it is considered unlikely that the Proposal will have a significant impact on the Tuart-Peppermint Woodland PEC.

Objectives for managing impacts to State environmental factors under the WA EP Act and Commonwealth MNES will be met for the Proposal through the implementation of the management and mitigation actions detailed in BORR IPT (2020a).

Main Roads proposes to further address the residual impacts of the Proposal on Tuart-Peppermint Woodland PEC through the provision of environmental offsets.

3 FAUNA ASSESSMENT AND IMPACTS

Six conservation significant fauna species were identified in the 2019 referral document as occurring or likely to occur within the Proposal area. These species include:

- Western Ringtail Possum (*Pseudocheirus occidentalis*) (Critically Endangered, Schedule 1)
- Baudin's Cockatoo (*Calyptorhynchus baudinii*) (Endangered, Schedule 2)
- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) (Endangered, Schedule 2)
- Black-stripe Minnow (*Galaxiella nigrostriata*) (Endangered, Schedule 2)
- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) (Vulnerable, Schedule 3)
- Brush-tailed Phascogale (*Phascogale tapoatafa wambenger*) (Schedule 6)

3.1 Environmental surveys

Following referral of the Proposal in September 2019, additional surveys targeting threatened fauna species identified as occurring within the Proposal area (and of key concern to stakeholders) were undertaken.

The following sections consider the results of these studies where they are relevant to those threatened fauna species.

In addition to studies undertaken to determine the sizes and densities of local WRP populations and assess habitat quality, studies were also undertaken to inform habitat clearing regimes and the design of engineered fauna movement (connectivity) structures.

Fauna field surveys and investigations undertaken relevant to the Proposal are listed in Table 3-1.

Table 3-1 Fauna investigations undertaken for the purpose of this proposal

SURVEY / REPORT NAME	LOCATION / EXTENT IN SURVEYED AREA	METHODOLOGY
Surveys undertaken for the Proposal prior to referral		
Bunbury Outer Ring Road Southern Section, South Western to Bussell Highways Fauna Assessment (GHD, 2012)	Bunbury Outer Ring Road Southern Section, between South Western Highway and Bussell Highway	Trees within the study area were assessed for their significance to Black Cockatoo species.
Bunbury Outer Ring Road Western Ringtail Possum Assessment (GHD, 2013)	Survey area contained within the current BORR Southern Section alignment	Assessment of 27 ha of native vegetation within the wider 95 ha survey area, plus approx. 14 ha of WRP habitat within nearby Reserve 23000. The survey provided a WRP population density estimate using distance sampling.

SURVEY / REPORT NAME	LOCATION / EXTENT IN SURVEYED AREA	METHODOLOGY
Lot 1 Ducane Road Environmental Values Assessment (GHD, 2014)	A portion of the survey area is contained within the current BORR Southern Section alignment	Within the wider scope of works, in relation to fauna the assessment included: • literature review of previous investigations and reports of the offset site and the surrounding areas • desktop assessment of environmental attributes • Level 1 fauna survey (EPA, 2004a).
Bunbury Outer Ring Road Southern Section Fauna Study (GHD, 2015a)	Survey area largely contained within the current BORR Southern Section alignment	Level 1 fauna survey in accordance with EPA Guidance Statement No. 56 (EPA, 2004a) was conducted within the BORR southern section Project Area for fauna conservation significance and any likely fauna constraints and potential impacts that may arise from the Proposal's then design.
Bunbury Outer Ring Road (Southern Section) Black Cockatoo Tree Survey. Biota Environmental Sciences (Biota) (2018a)	Bunbury Outer Ring Road (BORR) southern section extending from South Western Highway to Bussell Highway	Updated assessment of Black cockatoo habitat values assessed by GHD in 2011 (GHD, 2012), and comparison of new data with the 2011 data. Including: • Reassessment of the Black Cockatoo breeding habitat trees previously identified in 2011 by GHD (2012) and confirming whether they remain standing and intact • Reassessment of trees previously identified as containing hollows • reassessment of previously identified breeding habitat trees • marking trees with paint, based on presence of suitable nesting hollows and Black Cockatoo use.
Bunbury Outer Ring Road Southern Section Western Ringtail Possum Assessment (Biota, 2018c)	Bunbury Outer Ring Road Southern Section alignment.	Survey for WRP. Sampling undertaken over four nights between 10/07/2018 – 13/07/2018 and comprised walking 38 transects, totalling 7.87 km in the BORR (southern section). No transects were repeat sampled.
Additional surveys undertaken for Proposal following referral, including information requested in Section 40(2)(a) Notice		
Western Ringtail Possum: *Pseudocheirus*	Local vicinity of Northern, Central, and Southern Section alignments and buffering context area	Focussed Regional surveys from December of 2019 through December 2020. Surveys including radio tagging for home range assessments, trapping and survey of potential offset areas and other local

SURVEY / REPORT NAME	LOCATION / EXTENT IN SURVEYED AREA	METHODOLOGY
***occidentalis* Regional Surveys (Biota, 2020b)**		context sites to better define local movement of populations.
Bunbury Outer Ring Road South Section Targeted Fauna Assessment (Biota, 2020a)	Targeted habitat survey encompassing the 200 ha Proposal Area and approximately 97 ha buffering context area	Targeted field surveys conducted in five phases over the course of spring and summer 2018, and winter 2019 for conservation significant Black Cockatoo species, WRP and BSM survey
Bunbury Outer Ring Road Southern Investigation Area: Targeted Conservation Significant Aquatic Fauna Survey (WRM, 2020a)	Targeted aquatic fauna survey within seasonal wetlands and creeks within the Proposal Area	Winter (19 - 23 August 2019) targeted conservation significant aquatic fauna survey
Targeted Fauna Survey - Lot 1 Ducane Road, Lot 156 Marchetti Road and Lot 167 Jilley Road – Targeted Western Ringtail Possum and Black Cockatoo Assessment (Biota Environmental Sciences, 2021b)	Targeted WRP, BTP and Black Cockatoo Habitat Assessment of 122.4 ha at the subject properties	Targeted fauna survey and habitat assessment for WRP, BTP and Black Cockatoos conducted in June and July 2019.

The Proposal Area covers approximately 200 ha, including 76 ha (38 %) of vegetation, comprising 75 ha of remnant native vegetation and 1 ha of revegetation. The vegetation provides habitat for a variety of native fauna taxa. The remaining 124 ha (62 %) of the Proposal Area comprises cleared / disturbed agricultural land.

The assessment of the broader fauna values of the area are provided in BORR IPT (2019a) and BORR IPT (2020a), with the outcomes of these assessments, as they relate to offsets, summarised below.

3.2 Western Ringtail Possum

The WRP was once widely distributed across the south and south-west of the state (from north of Perth to east of Albany) but are now restricted to the southern Swan Coastal Plain, the Jarrah forests near Manjimup and the south coast between Walpole and Albany. WRP was first listed as threatened under the Western Australian *Wildlife Conservation Act 1950* in 1983, and under the Commonwealth EPBC Act in 2000. Its status was reassessed to critically endangered under the BC Act in 2016 and EPBC Act in 2018.

The Proposal Area contains 60.9 ha of WRP habitat. This habitat comprises of the following Shedley and Williams (2014) habitat classes:

- 11.5 % of Habitat Quality Class B (High) (7.0 ha)

- 52 % of Habitat Quality Class C (Medium) (31.9 ha)
- < 1 % of Habitat Quality Class D (Low) (0.3 ha)
- 35.5 % of habitat not assessed (21.6 ha)

This habitat represents approximately 0.6 % of the recorded WRP habitat across the SCP management zone and 0.97 % of the local extent (within the Bunbury Management Zone of Shedley and Williams (2014)).

Based on the results of their regional WRP surveys, Biota estimate the 2019 regional WRP population within the SCP management zone to be approximately 9,720 individuals (Biota, 2020b).

3.2.1 Impacts

To reflect the seasonal and transient fluctuations in population size, the potential impact of the Proposal on individual WRP home ranges is presented as a range rather than a discrete figure. Based on this data, it is estimated that between 49 and 72 WRPs within the Proposal Area will potentially have their home ranges disturbed by the Proposal (Biota, 2020a). This indicates that approximately up to 0.50 % and 0.74 % of the 2019 estimated regional population could potentially be impacted (Biota, 2020b). A summary of the potential impact is presented in Table 3-2.

Table 3-2 Summary of Potential Direct Impacts to WRP

FACTOR IMPACTED	LOSS (HA OR NUMBER)	LOSS (%)
WRP Habitat	60.9 ha	Up to 0.97 % of habitat in the Bunbury management zone of Shedley and Williams (2014)
WRP home ranges disturbed	49 to 72	0.50 % - 0.74 % of the estimated 2019 regional population

No WRP mortalities are expected as a direct result of the Proposal.

The Proposal Area is a relatively long and narrow road corridor. Based on site surveys between 49 and 72 WRP home ranges may be disturbed to some degree but WRP utilising habitat within the alignment are very likely to be familiar with adjacent habitat areas. As such, the impact of the Proposal on the local WRP population is not expected to be substantial.

The Proposal Area is situated in a landscape of multiple land uses including agriculture, mining, residential development, and conservation reserves. It comprises a discontinuous ‘patchwork’ of WRP habitats of varying sizes and with varying levels of connectivity between them. Existing obstacles to habitat connectivity in the Proposal Area include both the Bussell Highway (dual carriageway) and local roads (single carriageway). The Bussell Highway presents a wider obstacle to habitat connectivity, while local roads present a narrower obstacle, but are significantly more numerous.

The maintenance of existing movement pathways and connectivity along either side of the alignment has been a priority during Proposal planning. In order to maintain connectivity between habitat areas and across the local landscape, the Proposal design incorporates a series of underpasses / rope bridges (engineered movement structures) to maintain connection between the habitat areas.

Connectivity and suitability of cleared areas remaining within the Proposal Area will be further enhanced with targeted revegetation post construction.

The targeted fauna assessment to support the assessment of the Proposal, mapped and surveyed fauna habitats within a study area of approximately 297 ha including the current Proposal Area and adjoining remnant vegetation (Biota, 2020a).

Key information that has resulted from the additional investigations and surveys for WRP are summarised below:

- That the regional WRP population is substantially greater than previously understood
- WRP presence, population trends and movement pathways within and around the Proposal Area
- Habitat areas adjacent to the Proposal Area have been confirmed to consistently support populations of WRP
- The importance of maintaining connectivity between habitat areas
- That there are low WRP densities in habitat areas within and adjacent to the Proposal Area compared to those along the 'Holy Mile' in Busselton where possum rope bridges have been the most successful.

None of the habitat areas that are currently known to support WRP (from the surveys undertaken by Biota) are anticipated to become unviable as WRP habitat as a result of Proposal implementation.

3.2.2 Impact avoidance

In consideration of the predicted impact of the original proposal as submitted in September 2019, Main Roads has gone to significant lengths to avoid and mitigate impacts to WRP habitat and home ranges, including extensive consultation with technical experts Ms. Barbara Jones (independent consultant) and Mr. Roy Teale (Biota Environmental Sciences Pty Ltd). This has resulted in substantial changes to the Proposal design, as summarised in Table 1-1.

Through these design changes, the area of WRP habitat that will be cleared as a result of Proposal implementation has been reduced by 19.1 ha (24 %), with the retained areas comprising intact habitat and known WRP movement pathways. Based on field survey data, in regards to the number of displaced WRP, this equates to up to 24 individuals no longer likely to have their home ranges disturbed / reduced as a result of this Proposal (Table 3-3).

Table 3-3 Detailed design changes to avoid impacts to WRP

WRP	SEPTEMBER 2019 s38 REFERRAL	REVISED PROPOSAL (MARCH 2020)	REVISED PROPOSAL (AUGUST 2021)	REDUCTION IN ENVIRONMENTAL IMPACT
Habitat extent (ha)	Clearing of up to 80.0 ha of WRP habitat	Clearing of up to 65.4 ha of WRP habitat	Clearing of up to 60.9 ha of WRP habitat	Minimum of 19.1 ha of WRP habitat or approximately 24 % of expected habitat loss saved through detailed design
Home ranges	Disturbance of up to 73 WRP individual home ranges	Disturbance of up to 53 to 79 WRP individual home ranges	Disturbance of up to 49 to 72 WRP individual home ranges	Avoidance of disturbance to up to 24 WRP individual home ranges

3.2.3 Predicted outcome

A high level of mitigation and management has been applied to the Proposal, with Main Roads making changes to the Proposal design in order to reduce potential impacts to WRP.

As a result of these changes, a maximum of up to 60.9 ha of WRP habitat will be cleared and the home range of an estimated 49 to 72 individuals potentially disturbed, compared to the conservatively estimated abundance of 9,270 individuals within the SCP management zone.

Given the nature of the clearing, no areas of WRP habitat will be cleared in their entirety. Connectivity of WRP habitat along and across the Proposal Area will be maintained through retaining key habitat areas and installing fauna underpasses and / or rope bridges.

Proposed construction management and mitigation measures during operation of the Proposal are detailed in BORR IPT (2019a; 2020a; 2020d) and include:

- Timing of clearing
- Staging of clearing
- Shepherding of WRP from the clearing footprint
- WRP exclusion fencing and monitoring.

Objectives for managing impacts to State environmental factors under the WA EP Act and Commonwealth MNES will be met for the Proposal through the implementation of the management and mitigation actions detailed in BORR IPT (2020a; 2020d).

Main Roads proposes to further address the residual impacts of the Proposal on WRP through the provision of environmental offsets.

3.3 Black Cockatoo

Three species of threatened black cockatoo were identified as occurring (foraging evidence) within the Proposal Area during detailed fauna assessments:

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

The Proposal Area is located in what is generally considered to be the typical breeding distribution of the Forest Red-tailed Black Cockatoo, however, all three cockatoo species have breeding areas overlapping the Proposal Area (Biota, 2020a).

All trees and areas of potential Black Cockatoo habitat within the Proposal Area were included in field surveys. Evidence of foraging by all three species was recorded within and adjacent to the Proposal Area, and either Baudin's or Carnaby's Cockatoo were observed flying overhead during field surveys (Biota, 2020a). All three species were identified as occurring within the Proposal Area with suitable habitat for foraging and potentially breeding also identified in targeted surveys (Biota, 2020a).

Within the Proposal Area, Black Cockatoo foraging habitat was comprised of two mapped habitat types: 'Marri / *Eucalyptus* woodland' and 'Marri / *Eucalyptus* in paddocks and road reserves'.

3.3.1 Impacts

The Proposal will result in the clearing of up to 60.9 ha of Black Cockatoo foraging habitat and up to 1,088 trees with a Diameter Breast Height (DBH) of 50 cm or greater (potential nesting trees). Of these, 11

contain a hollow potentially suitable for nesting by Black Cockatoos. No trees contain known breeding hollows.

Assessment of the potential impacts on Black Cockatoo habitat using the vegetation complexes within a 12 km radius indicated that the vegetation complexes which provided the highest quality foraging habitat (e.g. Bassendean Central and South, Karrakatta Complex-Central and South and the Southern River vegetation complexes) were, in general, well represented outside of the Proposal Area (Biota, 2020a). The clearing of 60.9 ha of potential habitat represents a 0.8 % reduction in potential foraging and breeding habitat (> 8,000 ha) for the Black Cockatoo species within the local area (within 12 km of the study area).

No known breeding trees will be cleared in the Proposal Area and availability of suitable breeding hollows is not considered to be a limitation for the survival of Black Cockatoos within the Proposal Area. In surveyed areas adjacent to the Proposal Area, Biota (2020a) located 25 trees with a potentially suitable hollow(s) for Black Cockatoo nesting, none of which showed evidence of previous nesting use.

3.3.2 Impact avoidance

Substantial changes to the Proposal design have been made in order to avoid impacts to Black Cockatoos. Changes relating to the extent of Black Cockatoo habitat to be impacted are detailed in Table 3-4.

Table 3-4 Detailed design changes to avoid impacts to Black Cockatoo habitat

HABITAT TYPE	SEPTEMBER 2019 s38 REFERRAL	REVISED PROPOSAL (MARCH 2020)	REVISED PROPOSAL (AUGUST 2021)	REDUCTION IN IMPACT
Foraging habitat area	80.0 ha	65.4 ha	60.9 ha	19.1 ha
Suitable DBH trees[1]	538	Up to 1,098[2]	Up to 1,088[3]	Increase due to further survey and more knowledge of the Proposal area
Trees with a Suitable Nest Hollow	Minimum of 18 large trees (DBH > 500 mm) containing a suitable hollow for breeding of Black Cockatoos	Up to 13 large trees (DBH > 500 mm) containing a suitable nest hollow for breeding of Black Cockatoos	Up to 11 large trees (DBH > 500 mm) containing a suitable nest hollow for breeding of Black Cockatoos	7 large trees (DBH > 500 mm) containing a suitable nest hollow for breeding of Black Cockatoos

[1] Surveys conducted in response to the EPA's request for additional information confirmed and quantified the extent of Black Cockatoo habitat within the Proposal Area, including in areas previously unsurveyed. The number of suitable DBH trees has increased since the September referral because all areas have now been surveyed.

[2] Surveys conducted in response to DAWE's request for additional information confirmed and quantified the extent of Black Cockatoo habitat within the Proposal Area, including in areas previously unsurveyed. The number of suitable DBH trees has increased since the September referral because all areas have now been surveyed.

[3] Surveys conducted in response to DAWE's request for additional information confirmed and quantified the extent of Black Cockatoo habitat within the Proposal Area, including in areas previously unsurveyed. The number of suitable DBH trees has increased since the September referral because all areas have now been surveyed.

HABITAT TYPE	SEPTEMBER 2019 s38 REFERRAL	REVISED PROPOSAL (MARCH 2020)	REVISED PROPOSAL (AUGUST 2021)	REDUCTION IN IMPACT
Known nesting trees		Two of the 13 trees within the Proposal Area indicated some evidence of previous nesting use however no direct signs of Black Cockatoo breeding were observed.	Two of the 11 trees within the Proposal Area indicated some evidence of previous nesting use however no direct signs of Black Cockatoo breeding were observed.	Not applicable

Changes to the Proposal have resulted in the reduction in the area of Black Cockatoo foraging habitat being cleared by 19.1 ha (24 %). Eleven trees with hollows that are potentially suitable for breeding by Black Cockatoos will be impacted by the Project. Site investigatoions have not indicated any signs of the hollows within these 11 trees as having been used for Black Cockatoo breeding.

3.3.3 Predicted outcome

A high level of mitigation and management has been applied to the Proposal, with Main Roads making substantial and costly changes to the Proposal design in order to mitigate potential impacts on terrestrial fauna including black cockatoos. The changes made have resulted in the reduction in the area of Black Cockatoo habitat impacted to 60.9 ha, and a reduction of 39 % in the number of trees with a potentially suitable nest hollow(s) impacted. Connectivity of habitat will be maintained and enhanced through revegetation of additional areas within the Proposal Area.

Objectives for managing impacts to State environmental factors under the WA EP Act and Commonwealth MNES will be met for the Proposal through the implementation of the management and mitigation actions detailed in BORR IPT (2020a; 2020d).

Main Roads intends to further counterbalance the residual impacts of the Proposal through implementation of this environmental offset strategy.

3.4 Southern-western Brush-tailed Phascogale

The BTP is a small (100 – 300g), strongly arboreal marsupial. They are carnivorous, short-lived and nocturnal and listed as Conservation Dependent (Schedule 6) under the BC Act.

3.4.1 Impacts

Based upon the environmental surveys, the Proposal will result in the clearing of up to 39.2 ha of BTP foraging / breeding habitat.

Phascogale habitat is closely correlated with both WRP habitat and Black Cockatoo habitat. Biota (2020a) estimated > 8,000 ha of suitable potential Black Cockatoo habitat with a 12 km radius of the Proposal Area. A large proportion of this habitat is also likely to comprise habitat for BTP.

No BTP mortalities are expected as a direct result of Proposal implementation.

BTP have large home ranges of up to 20 ha (Biota, 2020a). The Proposal Area is a long and narrow road corridor, generally between approximately 70 m to 180 m in width and 10.5 km in length. As such, it is highly unlikely that any entire BTP home ranges are entirely contained within the Proposal Area.

The Proposal is situated in a landscape of multiple land uses, which include lands for agriculture, mining, residential development, and conservation reserves. It comprises a discontinuous 'patchwork' of BTP habitats of varying sizes and with varying levels of connectivity between them. The potential for an impact to the movement of BTP individuals between habitat areas is expected to vary between the land use types, the distance between the habitat patches, and the size of the habitat patches.

In order to maintain connectivity between habitat areas and across the local landscape, the Proposal design incorporates a series of underpasses and rope bridges (engineered movement structures) to maintain connections between habitat areas. Whilst acknowledging the Proposal will present a new obstacle to habitat connectivity, these underpasses and rope bridges will seek to maintain connectivity between habitat areas as far as practicable.

3.4.2 Impact avoidance

Refinement to the Proposal design subsequent to referral of the Proposal in September 2019 has reduced the impact to BTP habitat. Through these design changes, the area of BTP habitat to be cleared as a result of the Proposal implementation has been reduced by 23.8 ha (38 %) (Table 3-5).

Table 3-5 Design changes to avoid BTP habitat

SEPTEMBER 2019 s38 REFERRAL	REVISED PROPOSAL (MARCH 2020)	REVISED PROPOSAL (AUGUST 2021)	REDUCTION IN ENVIRONMENTAL IMPACT
Clearing of up to 63.0 ha of BTP foraging / breeding habitat	Clearing of up to 43.7 ha of BTP foraging / breeding habitat	Clearing of up to 39.2 ha of BTP foraging / breeding habitat	Reduction in clearing of 23.8 ha (38%) of BTP foraging / breeding habitat

3.4.3 Predicted outcome

A high level of mitigation and management has been applied to the Proposal, with Main Roads making substantial changes to the Proposal design in order to mitigate potential impacts on conservation significant fauna including the BTP. As a result of the changes made to the Proposal, a maximum of 39.2 ha of BTP habitat will be cleared. No areas of habitat will be cleared in their entirety and it is also highly unlikely that any entire home ranges will be impacted. Connectivity along and across the Proposal Area will be retained through a combination of a retention of key habitat areas where possible and through the installation of a series of fauna underpasses and / or rope bridges. Impacts of the Proposal on BTP will be minor and manageable.

Objectives for managing impacts to State environmental factors under the WA EP Act and Commonwealth MNES will be met for the Proposal through the implementation of the management and mitigation actions detailed in BORR IPT (2020a; 2020d).

Main Roads intends to further counterbalance the residual impacts of the Proposal on BTP through implementation of this environmental offset strategy.

3.5 Black-stripe Minnow

BSM is listed as Endangered under both the EPBC Act and the BC Act.

BSM occurs predominantly in shallow, low pH, tannin stained ephemeral wetlands with peat rich soils including isolated populations on the SCP and on the south coast between Augusta and Albany. The populations on the SCP are thought to be remnants of a much wider distribution that has been impacted by widespread urban and rural development.

Due to the high mobility of the species and connectivity between wetlands in wetter years, it is possible that BSM migrate between wetlands within the local area.

3.5.1 Impacts

The Proposal will result in the clearing of up to 5.5 ha of BSM potential habitat, as identified in Table 3-6 (WRM, 2020a). Noting the number of individuals in the population of BSM is unknown (TSSC, 2018), it is not possible to estimate the number of individuals of BSM which may be affected by the Proposal.

The regional extent of BSM habitat has not been modelled. Known populations within at least a 2 km buffer include one location in a wetland within Manea Park north of the Proposal Area and six locations in wetlands to the south of the Proposal Area (WRM, 2020a; WRM, 2019). An additional three wetland locations within Manea Park are also known to contain BSM (WRM, 2020b).

3.5.2 Impact avoidance

Substantial changes to the Proposal design have been made subsequent to referral of the Proposal to the EPA in September 2019, to reduce impacts to BSM habitat. Through these design changes, the area of BSM habitat that will be removed as a result of Proposal implementation has been reduced by 4.1 ha (40 %) (Table 3-6).

Clearing and disturbance of habitat will be carefully managed throughout construction through mechanisms outlined in BORR IPT (2019a; 2020a; 2020d) and through the implementation of a Construction Environmental Management Plan (CEMP).

Table 3-6 Design changes to avoid BSM habitat

SEPTEMBER 2019 s38 REFERRAL	REVISED PROPOSAL (MARCH 2020)	REVISED PROPOSAL (AUGUST 2021)	REDUCTION IN IMPACT
Clearing of up to 9.6 ha of BSM habitat	Clearing of up to 5.5 ha of BSM habitat	No change	Reduction in clearing of 4.1 ha of BSM habitat

3.5.3 Predicted outcome

In consideration of the broader distribution of BSM potential habitat at a local scale and the area of potential habitat required to be cleared for the Proposal, the impact of the Proposal to BSM habitat is not expected to be significant. Direct loss of habitat will be limited to 5.5 ha and other potential impacts will be mitigated through implementation of appropriate drainage and management. No residual impact is anticipated.

Objectives for managing impacts to State environmental factors under the WA EP Act and Commonwealth MNES will be met for the Proposal through the implementation of the management and mitigation actions detailed in BORR IPT (2020a; 2020d).

Main Roads does not propose an environmental offset for BSM.

3.6 Residual fauna impacts

The alignment selected for the Proposal minimises impacts to fauna and with implementation of the mitigation measures proposed to address the potential impacts of the Proposal, objectives for managing impacts to State environmental factors under the WA EP Act and Commonwealth MNES will be met for the Proposal. Table 3-7 provides a summary of the key residual impacts to fauna. Impacts set out in the table represent the maximum possible impacts associated with the Proposal.

Main Roads intends to further counterbalance the residual impacts of the Proposal through provision of environmental offsets addressing residual impacts to WRP, Black Cockatoos and BTP.

Table 3-7 Predicted residual impacts to fauna

ISSUE	SUMMARY DISCUSSION OF RESIDUAL / CUMULATIVE IMPACTS	OUTCOME
Western Ringtail Possums	Up to 60.9 ha of suitable Western Ringtail Possum habitat will potentially be cleared, and between 49 and 72 individual home ranges may be disturbed. Based on the results of regional surveys, this is estimated to represent 0.50 % to 0.74 % of the estimated 2019 regional population.	The clearing of Western Ringtail Possum habitat and disturbance of 0.50 % to 0.74 % of the estimated 2019 regional population will result in a minor residual impact associated with the Proposal.
Black Cockatoos	The Proposal may potentially result in loss of up to 60.9 ha of suitable Black Cockatoo habitat. The clearing of 60.9 ha of potential habitat represents a < 1 % reduction in potential foraging and breeding habitat for the Black Cockatoo species within the local area (suitable remnant vegetation within a 12 km radius).	The reduction in foraging and potential breeding habitat for Black Cockatoo species will result in a minor residual impact associated with the Proposal.
South-western Brush-tailed Phascogale	Up to 39.2 ha of suitable South-western Brush-tailed Phascogale habitat will potentially be cleared as a result for the Proposal. Brush-tailed Phascogales maintain relatively large ranges (> 20 ha) and densities therefore tend to be low (Biota, 2020a).	The impact to the South-western Brush-tailed Phascogale are unlikely to be significant.
Black-stripe Minnow	Loss of up to 5.5 ha of BSM habitat.	The impact to the BSM is unlikely to be significant.

3.7 Cumulative impacts to fauna

The assessment of impacts for the BORR Southern Section has been considered at both local and regional levels. Additional regard to the cumulative context of the project with the BORR Northern and Central Sections has also been considered. A summary of the potential cumulative direct impacts of both proposals on fauna is included in Table 3-8.

Table 3-8 Potential cumulative impacts of BORR Proposals on fauna

FAUNA	BORR SOUTHERN SECTION	BORR NORTHERN AND CENTRAL SECTIONS	CUMULATIVE IMPACT
Western Ringtail Possum habitat extent	Clearing of up to 60.9 ha	Clearing of up to 43.9 ha	Clearing of up to 104.8 ha
% of Western Ringtail Possum habitat within Bunbury Management Zone	1.0 %	0.7 %	1.7 %
Western Ringtail Possum home ranges impacted	49 to 72 WRP individual home ranges	15 to 25 WRP individual home ranges	64 to 99 WRP individual home ranges
% of Western Ringtail Possum population within Southern SCP Management Zone	0.50-0.74 %	0.11-0.26 %	0.61-1.0 %
Black Cockatoo foraging habitat extent	Clearing of up to 60.9 ha	Clearing of up to 37.8 ha	Clearing of up to 98.7 ha
% of Black Cockatoo foraging habitat within 12 km of the Proposal(s)	0.8 %	0.5 %	0.7 %
Trees with potentially suitable hollows for Black Cockatoo	11	3	14
Brush-tailed Phascogale Habitat extent	Clearing of up to 39.2 ha	Clearing of up to 17.7 ha	Clearing of up to 56.9 ha
Black-striped Minnow habitat extent	Clearing of up to 5.5 ha	Clearing of up to 0.55 ha	Clearing of up to 6.05 ha

Cumulatively, up to 104.8 ha of WRP habitat will be cleared, approximately 0.7 % of the foraging habitat within 12 km of the Proposals (approximately 14,628.5 ha) and consistent with the individually assessed potential impacts of each proposal. Neither Proposal will impact any known nesting hollows. The removal of 14 trees containing potentially suitable hollow(s) for Black Cockatoo nesting across the cumulative 825 ha (625 ha Northern and Central Sections, 200 ha Southern Section) comprising both Proposals (including 148 ha of native vegetation) is not anticipated to be significant.

4 ENVIRONMENTAL OFFSETS

4.1 Background

Environmental offsets are conservation actions that provide environmental benefits intended to counterbalance the significant residual environmental impacts associated with a proposal (GoWA, 2014). Main Roads intend to counterbalance the residual impact of the Proposal through implementation of an environmental offset strategy. The strategy will be prepared in accordance with the WA Government's Environmental Offset Policy (GoWA, 2011), WA Offset Guideline (GoWA, 2014) and the Australian Government's EPBC Act Environmental Offset Policy (DSEWPaC, 2012). The offset will be proportionate to the level of impact and significance of the environmental impact.

Main Roads operates on a hierarchy of avoid, minimise, reduce, rehabilitate and offset environmental impacts. This hierarchy is achieved primarily through changes in scope and design, development and implementation of the EMP and finally, an offset proposal. Application of the management hierarchy has been summarised in this Offset Strategy and is detailed in BORR IPT (2019a).

The proposed environmental offsets detailed in this Offset Strategy are submitted for approval from DAWE and WA EPA.

4.2 EPBC Act Environmental Offsets Policy (DSEWPaC, 2012)

The EPBC Environmental Offsets Policy (DSEWPaC, 2012) requires the following Principles are met by an offset:

- Suitable offsets must deliver an overall conservation outcome that improves or maintains the viability of the protected matter
- Suitable offsets must be built around direct offsets but may include other compensatory measures
- Suitable offsets must be in proportion to the level of statutory protection that applies to the protected matter
- Suitable offsets must be of a size and scale proportionate to the residual impacts on the protected matter
- Suitable offsets must effectively account for and manage the risks of the offset not succeeding
- Suitable offsets must be additional to what is already required, determined by law or planning regulations, or agreed to under other schemes or programs
- Suitable offsets must be efficient, effective, timely, transparent, scientifically robust and reasonable
- Suitable offsets must have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.

4.3 WA Environmental Offset Policy (GoWA, 2011)

The WA Environmental Offsets Policy (GoWA, 2011) requires the following Principles are considered when developing an offset proposal:

- Environmental offsets will only be considered after avoidance and mitigation options have been pursued
- Environmental offsets are not appropriate for all projects
- Environmental offsets will be cost-effective, as well as relevant and proportionate to the significance of the environmental value being impacted
- Environmental offsets will be based on sound environmental information and knowledge
- Environmental offsets will be applied within a framework of adaptive management
- Environmental offsets will be focussed on longer term strategic outcomes.

4.4 Residual Impact

Residual impacts associated with the Proposal have been determined through application of the residual impact significance model detailed in the WA Environmental Offsets Guidelines (GoWA, 2014). Residual impacts for which Main Roads proposes environmental offsets are detailed in Table 4-1.

Table 4-1 Residual impact significance model

Part IV Environmental Factors	Vegetation and Flora							All factors
				Subterranean Fauna				
				Marine Fauna				
	Benthic Habitat and Communities			Benthic Habitat and Communities				
				Terrestrial Fauna				
	Rare flora	**Threatened ecological communities**	**Remnant vegetation**	**Wetlands & waterways**	**Conservation areas**	**High biological diversity**	**Habitat for fauna**	**Other**
Residual impact that is environmentally unacceptable or cannot be offset	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Significant residual impacts that will require an offset – All significant residual impacts to species and ecosystems protected by statute or where the cumulative impact is already at a critical level	N/A	Loss of 23.4 ha of Banksia Woodlands TEC / PEC Loss of 4.4 ha of Tuart Woodlands TEC / PEC (also comprising Tuart-Peppermint Woodland PEC) Loss of 0.1 ha of Tuart-Peppermint Woodland PEC (not also comprising Tuart Woodlands TEC / PEC)	N/A	N/A	N/A	N/A	Loss of 60.9 ha of WRP habitat Loss of 60.9 ha of Black Cockatoo habitat The loss of 39.2 ha of Brush-tailed Phascogale habitat	N/A
Significant residual impacts that may require an offset – Any significant residual impact to potentially threatened species and ecosystems, areas of high environmental value or where the cumulative impact may reach critical levels if not managed	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Residual impacts that are not significant	No impacts to conservation significant flora are associated within the Proposal.	N/A	The implementation of the Proposal will result in the loss of up to 71.5 ha of vegetation within the 195.5 ha Proposal area. No significant residual impacts are anticipated as a consequence of the Proposal.	Implementation of the Proposal will result in the loss of 9.4 ha of riparian vegetation (associated with watercourses or wetlands), including 0.16 ha associated with a Conservation Category wetland within the Proposal Area is not expected to result in significant residual impacts.	No residual impacts to conservation areas are expected within the Proposal.	Significant residual impacts to areas of high biological diversity are addressed through the proposed offsets for TEC/PEC and threatened fauna. No further significant residual impacts are expected within the Proposal.	The loss of 5.5 ha of potential habitat for Black-striped minnow (Endangered) and 71.5 ha habitat for Quenda (Priority 4) is not expected to result in significant residual impacts.	Temporary impacts during construction of the Proposal. Visual amenity, traffic noise and light spill will managed and mitigated. No significant residual impact on the wider environment is anticipated.

Main Roads has pursued a number of options in developing a package of offsets to counterbalance these residual impacts. The options investigated have comprised acquisition of land providing TEC / PEC vegetation, fauna habitat, creation of fauna habitat by on-ground rehabilitation. Three of the proposed offset sites will address the requirement for more than one offset attribute i.e. TEC and provision of habitat for WRP, Black Cockatoos and BTP at a single site (Offsets 1, 2 and 3). BTP habitat is closely correlated with both WRP habitat and Black Cockatoo habitat and as such the approach for environmental offsets is that habitat for WRP and Black Cockatoo is also suitable for BTP.

Main Roads will be responsible for the governance and funding of all of the proposed environmental offsets. Where the land ownership of an environmental offset is altered from its current status as detailed in the Offset Strategy Main Roads will be responsible to manage and maintain the offset until such change occurs.

Table 4-2 provides an overview of the offset package under consideration, with offset property locations presented in Figure 6, Figure 7 and Figure 8.

Table 4-2 Overview of proposed offset package

NO.	OFFSET TYPE	OFFSET SUMMARY	PROPERTY LOCATION	EXISTING TENURE
1	Land Acquisition	140.0 ha of native vegetation. 22.5 ha of the 162.7 ha property is set aside as under an existing Conservation Covenant. The areas below are those environmental values external to the covenanted area. • 124.1 ha of Banksia Woodlands TEC / PEC (confirmed) • 126.0 ha of WRP habitat (confirmed) • 126.0 ha of BTP habitat (confirmed) • 124.1 ha of Black Cockatoo habitat (confirmed)	Lots 153, 267 and 268 Ducane Road, Gelorup	Main Roads has funded the purchase of these properties by DBCA. The properties are now owned by the State of Western Australia. 22.5 ha of the property is set aside as under an existing Conservation Covenant under Section 30B of the *Soil and Land Conservation Act, 1945* Lots 153, 267 and 268 are currently zoned as Rural under the Greater Bunbury Region Scheme.

NO.	OFFSET TYPE	OFFSET SUMMARY	PROPERTY LOCATION	EXISTING TENURE
2	Land Acquisition	38.9 ha property providing: • 38.5 ha of WRP habitat (confirmed) • 38.5 ha of BTP habitat (confirmed) • 37.7 ha of Black Cockatoo habitat (confirmed)	Lot 1 Ducane Rd, Gelorup	Main Roads is in the process of acquiring the property from the West Australian Planning Commission. The property is currently zoned as Rural under the Greater Bunbury Region Scheme.
3	Land Acquisition	16 ha property providing: • 8.5 ha of Banksia Woodlands TEC / PEC (confirmed) • 14.2 ha of WRP habitat (confirmed) • 14.2 ha of BTP habitat (confirmed) • 9.7 ha of Black Cockatoo habitat (confirmed)	Lot 156 Marchetti Rd, Gelorup	Main Roads is in the final stages of negotiations regarding the purchasing of the western portion of this private property. The property is currently privately owned and zoned as Rural under the Greater Bunbury Region Scheme.
4	On-ground management	35 ha of revegetation to provide habitat for WRP, BTP and Black Cockatoo	Lot 104 (north) Willinge Drive Davenport	Purchased and owned by the Commissioner of Main Roads.
5	On-ground Management	185 ha of revegetation to provide habitat for WRP, BTP and Black Cockatoo	Ludlow State Forest (LSF) (also referred to as State Forest No. 2)/ /Tuart Forest National Park (TFNP)	Vested in the Conservation and Parks Commission. DBCA have confirmed 185 ha is available for revegetation.
6	On-ground Management	Establishment of 1 ha Peppermint orchard	Lot 12 on Plan 414806	State of WA. Purchased and managed by DBCA.
7	Financial contribution	$200,000 contribution to DBCA to enhance on-ground feral animal baiting to manage predation of WRP	Within DBCA managed lands.	Vested in the Conservation and Parks Commission.

NO.	OFFSET TYPE	OFFSET SUMMARY	PROPERTY LOCATION	EXISTING TENURE
8	Land acquisition and management	40 ha property providing 20 ha of Tuart Woodlands TEC / PEC (confirmed)	Lot 27 Tredrea Rd, Myalup	Purchased and owned by the Commissioner of Main Roads

4.5 Description of offsets

The various components of the proposed offset package are described below.

4.5.1 Offset 1 – Lots 153, 267 and 268 Ducane Road, Gelorup

Offset 1 comprises Lots 153, 267 and 268 Ducane Road, Gelorup which have a total area of 162.6 ha. The previous owner set aside 22.5 ha of the property under a Conservation Covenant through Section 30B of the *Soil and Land Conservation Act, 1945*. The remaining 140.1 ha is proposed as Offset 1.

Offset 1 is located as shown at Figure 6 (Appendix A) and occurs 2 km east of the BORR Southern Section alignment.

Main Roads agreed to purchase these privately owned properties with DBCA with the intention of utilising the site vegetation as an environmental offset for the BORR Southern Section project. DBCA supported the purchase of the land for addition to the conservation estate. Main Roads then funded the purchase by DBCA and the properties are now owned by the State of Western Australia.

Offset 1 is currently zoned as rural under the Greater Bunbury Region Scheme (GBRS). DBCA has indicated that the properties will be rezoned to Regional Open Space or Conservation under the scheme in the future and managed as part of the Conservation Estate. Main Roads supports the rezoning of the properties and will assist with the rezoning, as required.

The previous landowner was a commercial construction materials supplier.

Site assessment in spring 2020 (Biota, 2021a) confirmed 124.1 ha of the properties, outside of the covenanted area, conforms to Banksia woodlands TEC / PEC. Main Roads proposes that 92 ha of these properties address the offset requirement for Banksia Woodland TEC/PEC for the BORR Southern Section.

A targeted Fauna Survey of Lots 267, 268 and 153 Ducane Road, Gelorup (Biota, 2019a) confirmed the occurrence of WRP and BTP animals and habitat within these properties, and the occurrence of high quality Black Cockatoo foraging habitat within the Jarrah-Banksia habitat areas.

Offset 1 provides the following offset values for the BORR Southern Section:

- 92 ha of Banksia Woodland TEC / PEC (Biota, 2021a)
- 126.0 ha of WRP and BTP habitat (Biota, 2019a)
- 124.1 ha of high quality foraging habitat for Forest Red-tailed Black Cockatoo and Carnaby's Cockatoo

These properties form a component of the 'Dalyellup/Gelorup/Crooked Brook Ecological Linkage' identified by the EPA in their assessment of the GBRS (EPA, 2003). The South West Regional Ecological Linkage (SWREL) project further refined the ecological linkages identified by the EPA (Molloy, Wood, Wallrodt, & Whisson, 2009). Offset 1 is traversed by an axis line and buffer of a SWREL mapped ecological linkage.

Main Roads proposes the following ongoing site management for long term conservation (maximum 20 years) of the above environmental values:

- The repair and installation of fencing on the property boundaries to manage unauthorised property access
- On-going feral animal control – foxes and rabbits
- Selective weed control to improve the site vegetation quality in the long term.

In consultation with DBCA, Main Roads has started to implement management of the offset site by the creation of firebreaks on the boundary of the properties.

Main Roads will develop a maintenance funding agreement with DBCA to address on-going management costs of the offset site for 20 years.

Main Roads proposes Offset 1 to address the partial offset requirements for WRP, BTP and Black Cockatoo habitat. Site 1 fulfils the Banksia Woodlands TEC / PEC offset requirements for the BORR Southern section.

4.5.2 Offset 2 – Lot 1 Ducane Road, Gelorup

Offset 2 comprises the acquisition of the vegetated Lot 1 Ducane Road, Gelorup which is a total of 40.5 ha in area. The construction of BORR Southern Section will require the taking of 1.6 ha of the property along the western boundary. 38.9 ha of the remainder of the property is proposed as Offset 2.

Offset 2 is located as shown at Figure 6 (Appendix A) and occurs immediately abutting the BORR Southern Section alignment.

Lot 1 is currently owned by the West Australian Planning Commission (WAPC) and Main Roads is in the final stages of acquiring the property.

Offset 2 is currently zoned as rural and primary regional road under the GBRS. Main Roads will request WAPC to rezone Lot 1 to Regional Open Space or Conservation under the scheme. Main Roads will discuss long term management options with DBCA and the Shire of Capel. Until an alternative management structure is in place Main Roads will fund and manage the property for the purposes of conservation.

Should the land tenure or on-going management responsibilities change, Main Roads will develop a maintenance funding agreement with DBCA and/or the Shire of Capel to address on-going management costs of the offset site for 20 years from the date of approval.

The property has been assessed by site survey (GHD, 2014; Biota, 2021b) and has been shown have the following environmental values:

- 38.5 ha of WRP and BTP habitat (Biota, 2021b)
- 37.7 ha of potential foraging habitat for Forest Red-tailed Black Cockatoo and Carnaby's Cockatoo (Biota, 2021b)

Offset 2 also forms a component of the 'Dalyellup/Gelorup/Crooked Brook Ecological Linkage' identified by the EPA in their assessment of the GBRS (EPA, 2003). The South West Regional Ecological Linkage (SWREL) project further refined the ecological linkages identified by the EPA (Molloy, Wood, Wallrodt, & Whisson, 2009). Offset 2 is traversed by an axis line and buffer of a SWREL mapped ecological linkage.

Main Roads proposes the following ongoing site management for long term conservation (20 years):

- The installation of firebreaks
- The repair and installation of fencing on the property boundaries to manage unauthorised property access
- On-going feral animal control – foxes and rabbits
- Selective weed control to improve the site vegetation quality in the long term

Main Roads proposes Offset 2, comprising 38.9 ha portion of an existing lot to address the offset requirements for WRP, BTP and Black Cockatoo habitat.

4.5.3 Offset 3 – Lot 156 Marchetti Road

Offset 3 comprises the 16 ha western vegetated portion of Lot 156 Marchetti Road, Gelorup. Offset 3 is located as shown at Figure 6 and Figure 6 (Appendix A) and occurs approximately 150m north of the BORR Southern Section alignment.

Main Roads has acquired the western portion of the property.

Offset 3 is currently zoned as rural under the GBRS. Main Roads will request WAPC to rezone the acquired portion to Regional Open Space or Conservation under the scheme.

Main Roads will discuss long term management options with DBCA and the Shire of Capel. Until an alternative management structure is in place Main Roads will manage the property for the purposes of conservation. Should the land tenure or on-going management responsibilities change, Main Roads will develop a maintenance funding agreement with DBCA and/or Shire of Capel to address on-going management costs of the offset site for 20 years.

The property has been assessed by site survey (Stream Environment and Water, 2021; Biota, 2021b) and has been shown have the following environmental values:

- 8.5 ha of Banksia Woodlands TEC / PEC (Stream Environment and Water, 2021)
- 14.2 ha of WRP and BTP habitat (Biota, 2021b)
- 9.7 ha of foraging habitat for Forest Red-tailed Black Cockatoo and Carnaby's Cockatoo (Stream Environment and Water, 2021)

Furthermore, Offset 3 is traversed by Five Mile Brook which creates a vegetated linkage to LGA managed reserves within the Gelorup area to the north west.

Main Roads proposes the following ongoing site management for long term conservation:

- The installation of firebreaks
- The repair and installation of fencing on the property boundaries to manage unauthorised property access
- On-going feral animal control – foxes and rabbits
- Selective weed control to improve the site vegetation quality in the long term.

Main Roads proposes Offset 3, comprising a 16 ha portion of the existing lot to address the offset requirements for Banksia Woodlands TEC / PEC, WRP, BTP and Black Cockatoo habitat.

4.5.4 Offset 4 – Lot 104 (North) Willinge Drive, Davenport

Offset 4 comprises the revegetation of a 35 ha portion of Lot 104 (north) Willinge Drive. Offset 4 is located as shown at Figure 10 ((Appendix A) and occurs immediately north of the BORR Northern and Central Sections alignment.

Lot 104 is owned freehold by the Commissioner of Main Roads and was purchased as a potential environmental offset site. Lot 104 occurs as two land parcels bisected by the existing BORR central section. Offset 4 comprises a 35 ha area of the 48.3 ha northern portion of the property.

Lot 104 is currently zoned as rural under the GBRS. Main Roads will request WAPC to rezone the entire Lot 104 to Regional Open Space or Conservation under the scheme.

Main Roads will discuss long term management options with DBCA and the Shire of Dardanup. Until an alternative management structure is in place Main Roads will manage the property for the purposes of conservation.

The proposed offset site abuts the Preston River (to the west). The riparian woodland of the Preston River provides a habitat linkage for WRP and BTP. The riverine woodland provides a corridor to a number of widely separated reserve areas occurring outside the Referral Area (e.g. Manea Park and Franklandia Nature Reserve) (Biota, 2019a).

The South West Regional Ecological Linkage (SWREL) project indicates that Offset 4 occurs within the buffer of a SWREL mapped ecological linkage.

Revegetation flora species will be selected to provide habitat and foraging vegetation suitable for these fauna species and will be based on site parameters and selected in consultation with DBCA. This reflects the approach for similar offset revegetation works by Main Roads in the region. Ongoing site management for long term conservation (for 20 years from the date of approval) will include fencing and access management, weed control, firebreaks and feral animal control to maintain/improve habitat quality.

Revegetation completion criteria will be agreed with EPA, based on advice from DBCA.

As noted above, much of Lot 104 was previously used for a commercial Blue Gum operation with the timber being harvested in 2017 and the area now cleared. Main Roads proposes to rehabilitate and revegetate a 35 ha portion of the property to provide habitat for WRP, BTP and Black Cockatoo species.

4.5.5 Offset 5 - State Forest No. 2/Tuart Forest National Park

Offset 5 comprises the proposed revegetation of 185 ha of degraded land within the TFNP and State Forest No. 2 (SF No. 2, also referred to as the Ludlow State Forest). The TFNP and SF No. 2 are located approximately 10-15 km east of the Busselton town centre, and are the focus of an on-going revegetation program. The sites are 12-25 km from the southern end of the Proposal Area and also within the SCP IBRA sub-region.

DBCA have advised that 185 ha of land is available for revegetation as part of the BORR Southern Section offset (B Hagan, Pers. Comm). The locations of the 185 ha revegetation sites have been agreed with DBCA and are shown at Figure 7 (Appendix A). Three sites are proposed, as desribed below:

- Site 2: (SF No. 2) comprises 5 ha of five-year-old revegetation.
- Site 4: (TFNP) comprises 10 ha of revegetation established in winter 2021
- Site 12: (TFNP) comprises 170 ha of revegetation that will be established with works commencing first quarter 2022.

Of the 185 ha to be revegetated in Ludlow State Forest/Tuart Forest National Park, 170 ha (Site 12) is located approximately 13.5 km to the south of the Proposal Area within the Shire of Capel. The remaining 15 ha is located within the Shire of Busselton.

The proposed rehabilitation works are congruent with the objectives of the Tuart Forest National Park Management Plan (TFNPMP) (DPaW, 2014), which are to:

- Protect and enhance the eastern wetland / tall Tuart community transition zone
- Protect and increase habitat for fauna that are highly represented in zones 5 and 6 (for example, Western Ringtail Possum and Common Brushtail Possum)
- Enhance the resilience of this zone to disturbance and threatening processes.

Proposed management actions to achieve these objectives include “Re-establishing native vegetation in cleared areas, adapting management according to results of experimental trials.” Ongoing site management for long term conservation will include fencing and access management, weed control, firebreaks and feral animal control to maintain/improve habitat quality.

Indicative photographs showing these poorly managed, degraded areas prior to revegetation of the WRP, BTP and Black Cockatoo habitat are presented in Plates 1 and 2.

Plates 1 and 2: indicative photographs of proposed SF No. 2 revegetation sites.

The proposed TFNP and SF No. 2 offset described above is congruent with similar environmental offsets within SF No. 2 negotiated by Main Roads with DBCA, DWER and DoEE for other road projects. Plant species will be selected to provide habitat for offset target species based on site parameters. Seed and seedling species will be selected in consultation with DBCA as per similar Main Roads offsets in SF No. 2.

Completion criteria will be determined with EPA based on advice from DBCA in line with existing Main Roads revegetation environmental offset sites of SF No. 2.

Main Roads proposes to rehabilitate and revegetate a total of 185 ha of SF No. 2/TFNP to provide habitat for WRP and Black Cockatoo species for 20 years from the date of approval. All 185 ha Offset revegetation area will provide offset for impacts to WRP, with a subset of 50 ha also offsetting impacts on Black Cockatoos.

The proposed offset areas occur on Crown land that is managed by DBCA under the *Conservation and Land Management Act 1984.* Accordingly, the offset areas have long term tenure protection.

4.5.6 Offset 6 – Peppermint Orchard

For Offset 6 (shown in Figure 7), in consultation with DBCA, Main Roads proposes to establish a one hectare Peppermint orchard (monoculture) on DBCA managed land at Lot 12 Bussell Highway within the Shire of Capel to provide foliage for WRP wildlife carers for use as a WRP food resource. WRP wildlife carers in the southwest currently harvest peppermint foliage from DBCA reserves to provide food resources for rescued WRP. This uncontrolled harvesting could compromise the availability of in-situ food resources for resident WRP. The orchard will be established by Main Roads and managed by DBCA with foliage harvested as necessary by WRP wildlife carers. The orchard will be established in 2021, with foliage expected to be available for harvesting in 2023.

4.5.7 Offset 7 - Financial contribution: Supplementation of DBCA's TFNP fox baiting program

Currently, within SF No. 2 /TFNP, DBCA conduct fox baiting around the perimeter of forest blocks and along selected strip transects in some blocks. For Offset 7, in consultation and cooperation with DBCA, Main Roads will provide a $200,000 contribution to DBCA to enhance on-ground feral animal baiting to manage predation of WRP.

Predation by foxes is listed as a key threat to WRP in the species' recovery plan[4], and relates to Objective 2, which states "Threatening processes that are constraining the recovery of western ringtail possums are mitigated in each key management zone". The proposed supplementation of DBCA's SF No. 2 and TFNP fox

[4] DBCA. (2017). Western Ringtail Possum (*Pseudocheirus occidentalis*) Recovery Plan. Department of Biodiversity, Conservation and Attractions.

baiting program directly addresses this threat and contributes to achievement of Objective 2. It will also address Objective 4, which is to "Improve the effectiveness, target specificity, integration and humaneness of control options for foxes", specifically Action 4.6, which is to "Ensure that habitat rehabilitation and management of potential prey, competitors and predators of foxes are considered in fox control programs".

Supplementation of DBCA's existing initiative provides a cost-effective indirect offset for Proposal impacts to WRP (and BTP). Funding for additional ground-based fox control is expected to be available in Q4 2021.

4.5.8 Offset 8 – Lot 27 Tredrea Road, Myalup

Offset 6 comprises a vegetated portion of the 40 ha Lot 27 Tredrea Road, Myalup. Lot 27 is located as shown at Figure 6 (Appendix A) and is approximately 30 km north of the BORR Southern section.

Lot 27 is zoned a rural under the GBRS and was previously purchased by Main Roads for the purposes of developing a limestone and sand pit. Main Roads will request WAPC to rezone Lot 27 to Regional Open Space or Conservation under the scheme. Main Roads will discuss long term management options with DBCA and the Shire of Harvey. Until an alternative management structure is in place Main Roads will manage the property for the purposes of conservation.

A reconnaissance survey by Main Roads botanists in March 2021 confirmed the presence of more than 20 ha of Tuart Woodlands TEC / PEC on the property (Main Roads Western Australia, 2021).

There are also opportunities to conduct additional revegetation works and infill planting on the property to improve its environmental values as Tuart Woodlands TEC / PEC and / or Tuart-Peppermint Woodland PEC. Any revegetation species will be selected in consultation with DBCA. Improvements in vegetation quality have not been considered as part of the offset calculation.

The property is currently unmanaged with open access. Signs of illegal rubbish dumping and firewood collection is evident on the property. Main Roads proposes the following ongoing site management for long term conservation (for 20 years from the date of approval):

- The repair and installation of fencing on the property boundaries to manage unauthorised property access
- Rubbish removal
- On-going feral animal control – foxes and rabbits
- Selective weed control to improve the site vegetation quality in the long term

Main Roads proposes Offset 6, comprising a 20 ha portion of Lot 27 Tredrea Road, Myalup to address the BORR Southern Section offset requirements for Tuart Woodlands TEC / PEC.

5 OFFSET GUIDE INPUTS AND JUSTIFICATION

Offset calculations have been based on the Commonwealth DoEE Environmental Offset Calculator and EPBC Offset assessment guide. The values used in the offset calculation are consistent with the inputs used for the Bunbury Outer Ring Road Northern and Central sections, which have been approved by the WA Minister for the Environment and DAWE (EPBC 2019/8471) in issuing conditional environmental approval for the project.

The offset values for Offsets 1-3 are based on site survey results. Additional site investigation is proposed to confirm the results of 2021 reconnaissance survey in respect to Tuart Woodlands TEC / PEC and Tuart-Peppermint Woodlands PEC at Offset 6.

BTP habitat is closely correlated with both WRP habitat and Black Cockatoo habitat. For the purposes of environmental offset habitat for WRP is also considered to provide suitable habitat for BTP.

Given the habitat within the Proposal Area is likely to be used by all three Black Cockatoo species, rather than attempting to specify how much each species uses each offset site, for the purposes of calculating the offsets for impacts on the three Black Cockatoo species, the offset calculation was undertaken using the highest value for any of the attributes for any one of the three species i.e. 'endangered'.

Offset calculations are included at Appendix B for reference.

5.1 Western Ringtail Possum

Table 5-1 to Table 5-3 provide inputs used in the EPBC Offset Assessment Guide in relation to WRP and BTP.

Table 5-1 Impact calculator – Western Ringtail Possum

ATTRIBUTE	VALUE	JUSTIFICATION
Area of impact	60.9 ha	Site assessments and the Proposal concept design have been used to identify the quanta of WRP impacted by the project.
Quality	8	
Site Condition		Site supports habitat for, and known population of WRP as identified through field surveys.
Site Context		Habitat values vary over the length of the Proposal from habitat patches up to some 10 ha to individual paddock trees.
Species stocking rate		Site contains evidence of use by WRP as assessed by field survey.

Table 5-2 Offset calculator – WRP Offset 1 (Lot 153, 267 and 268 Ducane Road, Gelorup – Purchase of vegetated land)

ATTRIBUTE	VALUE	JUSTIFICATION
Offset area (ha)	126.0	
Start Quality	8	Site supports known habitat for and a population of WRP as identified through field surveys (Biota, 2020a).

ATTRIBUTE	VALUE	JUSTIFICATION
Future quality without offset	6	The previous owner was a commercial sand supply company. The property has not been managed to maintain its environmental values which would continue to be degraded over time. As a private owned rural zoned property a number of activities including incremental clearing, grazing, off road vehicle use and firewood collection would have continued resulting in increased loss of habitat quality in the long term. Clearing of up to 5 ha per annum of native vegetation may not require a clearing permit under the WA Environmental Protection Act, 1986. Clearing of up to 1 ha per annum was unlikely to be assessed under the EPBC Act. Feral animal control, particularly for foxes was unlikely to be undertaken regularly by the previous owner. The site is relatively remote and shows evidence of unauthorised off road activities.
Future quality with offset	8	The properties have been purchased for addition to the conservation estate to be managed by DBCA. Private landowner activities have now been halted. Site management (fencing and access management, weed control, firebreaks and feral animal control) have been commenced to improve habitat quality. The property will be managed in the long term for conservation purposes.
Time over which loss is averted (years)	20	Site will be managed (risk mitigation) for conservation purposes for the long term (maximum 20 years).
Time until ecological benefit (years)	1	The land has been purchased and is being managed for conservation purposes.
Risk of loss without offset (%)	15	Previous zoning and land use was rural with the property used for farming.
Risk of loss with offset (%)	5	Main Roads has funded the purchase of these properties by DBCA. The properties will have the land zoning amended from rural to Conservation or Regional Open space under the GBRS. The properties will be actively managed for conservation purposes to maintain / improve WRP habitat quality including weed and feral animal control, fencing and the installation of firebreaks.
Confidence in result (%)	80	High level of certainty of habitat attributes being retained and property being managed for conservation purposes in the long term.
% of impact offset	37.4	

Table 5-3 Offset calculator – WRP Offset 2 (Lot 1 Ducane Road, Gelorup - Purchase of vegetated land)

ATTRIBUTE	VALUE	JUSTIFICATION
Offset area (ha)	38.5	
Start Quality	8	Site supports known habitat and a population of WRP in addition to foraging and potential nesting habitat for Black Cockatoo species (Biota, 2021).
Future quality without offset	6	The property is currently unmanaged and has not been managed in the past to maintain its environmental values which would continue to be degraded over time. A number of unauthorised activities such as off road vehicle use, rubbish dumping and illegal firewood collection would have continued resulting in increased loss of habitat quality in the long term. Feral animal control, particularly for foxes was not being undertaken regularly by the previous owner.
Future quality with offset	8	Acquisition of this property is currently being finalised. Main Roads will request WAPC to rezone Lot 1 to Regional Open Space or Conservation under the scheme. Main Roads will implement management actions including: • The installation of firebreaks • The repair and installation of fencing on the property boundaries to manage unauthorised property access • On-going feral animal control – foxes and rabbits • Selective weed control to improve the site vegetation quality in the long term The property will be actively managed in the long term for conservation purposes.
Time over which loss is averted (years)	20	Site will be managed (risk mitigation) for conservation purposes for the long term (maximum 20 years).
Time until ecological benefit (years)	1	It is expected that the acquisition will be completed and initial conservation management actions implemented within 1 year.
Risk of loss without offset (%)	15	The property is zoned as rural under the GBRS. No active management of the property to maintain or improve its environmental values has been implemented.
Risk of loss with offset (%)	5	Main Roads is funding the purchase and management of the property.

ATTRIBUTE	VALUE	JUSTIFICATION
		The property will have the land zoning amended from rural to Conservation or Regional Open space under the GBRS. The property will be actively managed for conservation purposes to maintain / improve WRP and Black Cockatoo habitat quality including weed and feral animal control, fencing and the installation of firebreaks.
Confidence in result (%)	80	High level of certainty of habitat attributes being retained and property being managed for conservation purposes in the long term.
% of impact offset	11.4	

Table 5-4 Offset calculator – WRP Offset 3 (Lot 156 Marchetti Road, Gelorup)

ATTRIBUTE	VALUE	JUSTIFICATION
Offset area (ha)	14.2	
Start Quality	8	Site supports known habitat for WRP as confirmed through site assessment (Biota, 2021).
Future quality without offset	6	The property was previously privately owned and has not been managed to maintain its environmental values which would continue to be degraded over time. As private owned rural zoned property a number of activities including incremental clearing and firewood collection would have continued resulting in increased loss of habitat quality in the long term. Clearing of up to 5 ha per annum of native vegetation may not require a clearing permit under the WA Environmental Protection Act, 1986. Clearing of up to 1ha per annum was unlikely to be assessed under the EPBC Act. Feral animal control, particularly for foxes was unlikely to be undertaken regularly by the previous owner. Currently the property also has unrestricted public access and shows evidence of unauthorised off road vehicle activities.
Future quality with offset	8	Acquisition of this property is currently being finalised. Main Roads will request WAPC to rezone Lot 1 to Regional Open Space or Conservation under the scheme. Main Roads will implement management actions including: • The installation of firebreaks • The repair and installation of fencing on the property boundaries to manage unauthorised property access • On-going feral animal control – foxes and rabbits

ATTRIBUTE	VALUE	JUSTIFICATION
		• Selective weed control to improve the site vegetation quality in the long term The property will be actively managed in the long term for conservation purposes.
Time over which loss is averted (years)	20	Site will be managed (risk mitigation) for conservation purposes for the long term (maximum 20 years)
Time until ecological benefit (years)	1	It is expected that the land acquisition will be completed and initial conservation management actions implemented within 1 year.
Risk of loss without offset (%)	15	The property was previously privately owned. The previous owners could have taken up rural activities. The property zoned as rural under the GBRS.
Risk of loss with offset (%)	5	Main Roads will fund the purchase of these property by DBCA. The property will have the land zoning amended from rural to Conservation or Regional Open Space under the GBRS. The properties will be actively managed for conservation purposes to maintain / improve WRP and Black Cockatoo habitat quality including weed and feral animal control, fencing and the installation of firebreaks.
Confidence in result (%)	80	High level of certainty of habitat attributes being retained and property being managed for conservation purposes in the long term.
% of impact offset	4.2	

Table 5-5 Offset calculator – WRP Offset 4 (Lot 104 (north) Willinge Drive, Davenport Revegetation)

ATTRIBUTE	VALUE	JUSTIFICATION
Offset area (ha)	35	Revegetation of heavily degraded harvested Blue Gum plantation of Lot 104 (north).
Start Quality	0	Site is currently mainly cleared with patches of remnant native vegetation. The site has low value WRP habitat values.
Future quality without offset	0	The property is zoned as rural under the GBRS and could be sold for rural activities. Site is unlikely to be revegetated by a third party in the short term. Main Roads is proposing to commence revegetation works within 12 months.
Future quality with offset	6	Revegetation with species suitable to create habitat for WRP and provide linkages to existing on-site and adjacent native vegetation.

ATTRIBUTE	VALUE	JUSTIFICATION
		Site management (fencing and access management, weed control, firebreaks and feral animal control) to further improve habitat quality.
Time over which loss is averted (years)	20	Site will be managed (risk mitigation) for conservation purposes for the long term (maximum 20 years)
Time until ecological benefit (years)	10	10 years to allow for revegetation works to provide WRP habitat after planting
Risk of loss without offset (%)	40	The property could be sold for rural activities. Site is unlikely to be revegetated by a third party in the short term.
Risk of loss with offset (%)	5	After revegetation the property will be actively managed to improve habitat quality including weed and feral animal control, fencing and the installation of firebreaks. The properties will have the land zoning amended from rural to Conservation or Regional Open space under the GBRS. Revegetation completion criteria will ensure WRP habitat creation to a suitable standard.
Confidence in result (%)	80	High level of certainty of habitat WRP attributes being created through compliance with completion criteria.
% of impact offset	14.0	

Table 5-6 Offset calculator – WRP Offset 5 (State Forest No. 2 Revegetation)

ATTRIBUTE	VALUE	JUSTIFICATION
Offset area (ha)	185	Revegetation of heavily degraded portions of State Forest No. 2
Start Quality	1	Site is in degraded condition with low value WRP habitat values.
Future quality without offset	1	Site is unlikely to be revegetated by a third party in the short term. Main Roads is proposing to commence revegetation works within 12 months.
Future quality with offset	6	Revegetation with species suitable to create habitat for WRP and provide linkages to existing and adjacent remnant vegetation. Site management (fencing and access control, weed control, firebreaks and feral animal control) to improve habitat quality.
Time over which loss is averted (years)	20	Site will be managed (risk mitigation) for conservation purposes for the long term (maximum 20 years)

ATTRIBUTE	VALUE	JUSTIFICATION
Time until ecological benefit (years)	10	10 years to allow for revegetation works to provide WRP habitat after planting
Risk of loss without offset (%)	30	The site is unlikely to revegetated by a third party in the short term
Risk of loss with offset (%)	5	After revegetation the offset area will be actively managed to improve habitat quality including weed and feral animal control, fencing and the installation of firebreaks. The site will be within the conservation estate. Revegetation completion criteria will ensure WRP habitat creation to a suitable standard.
Confidence in result (%)	80	High level of certainty of habitat WRP attributes being created through compliance with completion criteria.
% of impact offset	67.3	

The proposed combination of WRP (and BTP) offsets achieves well in excess of the 100% offset requirement.

5.2 Black Cockatoo

Table 5- to Table 5- provide the inputs used in the EPBC Offset Assessment Guide in relation to Black Cockatoo.

Table 5-7 Impact calculator – Black Cockatoo

ATTRIBUTE	VALUE	JUSTIFICATION
Impact area (ha)	60.9	Site assessments and the Proposal design have been used to identify the quanta of Black Cockatoo habitat impacted by the project. Offset requirement calculated based on Carnaby's Cockatoo (endangered)
Quality	8	
Site Condition		Site supports known foraging species for Black Cockatoos and potential nest hollows as identified through field surveys (Biota, 2019a).
Site Context		Site occurs within the known range of these species. Habitat values vary over the length of the Proposal from vegetation patches to individual isolated paddock trees.
Species stocking rate		Site contains feeding and potential nesting evidence of use by Black Cockatoos species as determined by field survey

Table 5-8 Offset calculator – Black Cockatoos Offset 1 (Lot 153, 267 and 268 Ducane Road, Gelorup)

ATTRIBUTE	VALUE	JUSTIFICATION
Offset area (ha)	124.1	
Start quality	7	Site supports known foraging and potential breeding habitat for Black Cockatoo as identified through field surveys (Biota, 2020a).
Future quality without offset	5	The previous owner was a commercial sand supply company. The property has not been managed to maintain its environmental values which would continue to be degraded over time. As private owned rural zoned property a number of activities including incremental clearing, grazing and firewood collection would have continued resulting in increased loss of habitat quality in the long term. Clearing of up to 5 ha per annum of native vegetation may not require a clearing permit under the WA Environmental Protection Act, 1986. Clearing of up to 1ha per annum was unlikely to be assessed under the EPBC Act. Feral animal control, particularly for foxes was unlikely to be undertaken regularly by the previous owner. The site is relatively remote and shows evidence of unauthorised off road activities.
Future quality with offset	8	The properties have been purchased for addition to the conservation estate to be managed by DBCA. Private landowner activities have now been halted. Site management (fencing and access management, weed control, firebreaks and feral animal control) have been commenced to improve habitat quality. The property will be managed in the long term for conservation purposes.
Time over which loss is averted (years)	20	Site will be managed (risk mitigation) for conservation purposes for the long term (maximum 20 years).
Time until ecological benefit (years)	1	The land has been purchased and is being managed for conservation purposes.
Risk of loss without offset (%)	15	Previous zoning and land use was rural with the property used for farming.
Risk of loss with offset (%)	5	Main Roads has funded the purchase of these properties by DBCA. The properties will have the land zoning amended from rural to Conservation or Regional Open space under the GBRS.

		The properties will be actively managed for conservation purposes to maintain / improve WRP habitat quality including weed and feral animal control, fencing and the installation of firebreaks.
Confidence in result (%)	80	High level of certainty of habitat attributes being retained and property being managed for conservation purposes in the long term.
% of impact offset	47.1	

Table 5-9 Offset calculator – Black Cockatoos Offset 2 (Lot 1 Ducane Road, Gelorup - Purchase of vegetated land)

ATTRIBUTE	VALUE	JUSTIFICATION
Offset area (ha)	37.7	
Start quality	8	Site supports known foraging and potential breeding habitat for Black Cockatoo as identified through field surveys (Biota, 2021).
Future quality without offset	6	The property is currently unmanaged and has not been managed in the past to maintain its environmental values which would continue to be degraded over time. Clearing of up to 5 ha per annum of native vegetation may not require a clearing permit under the WA Environmental Protection Act, 1986. Clearing of up to 1ha per annum was unlikely to be assessed under the EPBC Act. A number of unauthorised activities such as rubbish dumping and illegal firewood collection would have continued resulting in increased loss of habitat quality in the long term. Feral animal control, particularly for foxes was not being undertaken regularly by the previous owner.
Future quality with offset	8	Acquisition of this property is currently being finalised. Main Roads will request WAPC to rezone Lot 1 to Regional Open Space or Conservation under the scheme. Main Roads will implement management actions including: • The installation of firebreaks • The repair and installation of fencing on the property boundaries to manage unauthorised property access • On-going feral animal control – foxes and rabbits • Selective weed control to improve the site vegetation quality in the long term The property will be actively managed in the long term for conservation purposes.

ATTRIBUTE	VALUE	JUSTIFICATION
Time over which loss is averted (years)	20	Site will be managed (risk mitigation) for conservation purposes for the long term (maximum 20 years).
Time until ecological benefit (years)	1	It is expected that the land acquisition will be completed and initial conservation management actions implemented within 1 year.
Risk of loss without offset (%)	15	The property is zoned as rural under the GBRS and could be sold with the new owners implementing rural activities.
Risk of loss with offset (%)	5	The property is currently zoned as rural under the GBRS. No active management of the property to maintain or improve its environmental values has been implemented.
Confidence in result (%)	80	High level of certainty of habitat attributes being retained and property being managed for conservation purposes in the long term.
% of impact offset	14.3	

Table 5-10 Offset calculator – Black Cockatoo Offset 3 (Lot 156 Marchetti Rd, Gelorup - Purchase of vegetated land)

ATTRIBUTE	VALUE	JUSTIFICATION
Offset area (ha)	9.7	
Start quality	8	Site supports known foraging and potential breeding habitat for Black Cockatoo as confirmed through site assessment (Biota, 2021).
Future quality without offset	6	The property was previously privately owned and has not been managed to maintain its environmental values which would continue to be degraded over time. As private owned rural zoned property a number of activities including incremental clearing and firewood collection would have continued resulting in increased loss of habitat quality in the long term. Clearing of up to 5 ha per annum of native vegetation may not require a clearing permit under the WA Environmental Protection Act, 1986. Clearing of up to 1ha per annum was unlikely to be assessed under the EPBC Act. Feral animal control, particularly for foxes was unlikely to be undertaken regularly by the previous owner. Currently the property also has unrestricted public access and shows evidence of unauthorised off road vehicle activities

ATTRIBUTE	VALUE	JUSTIFICATION
Future quality with offset	8	Acquisition of this property is currently being finalised. Main Roads will request WAPC to rezone Lot 1 to Regional Open Space or Conservation under the scheme. Main Roads will implement management actions including: • The installation of firebreaks • The repair and installation of fencing on the property boundaries to manage unauthorised property access • On-going feral animal control – foxes and rabbits • Selective weed control to improve the site vegetation quality in the long term The property will be actively managed in the long term for conservation purposes.
Time over which loss is averted (years)	20	Site will be managed (risk mitigation) for conservation purposes for the long term (maximum 20 years).
Time until ecological benefit (years)	1	It is expected that the land acquisition will be completed and initial conservation management actions implemented within 1 year.
Risk of loss without offset (%)	15	The property was previously privately owned. The previous owners could have taken up rural activities. The property zoned as rural under the GBRS.
Risk of loss with offset (%)	5	Main Roads will fund the purchase of these property by DBCA. The property will have the land zoning amended from rural to Conservation or Regional Open Space under the GBRS. The properties will be actively managed for conservation purposes to maintain / improve WRP and Black Cockatoo habitat quality including weed and feral animal control, fencing and the installation of firebreaks
Confidence in result (%)	80	High level of certainty of habitat attributes being retained and property being managed for conservation purposes in the long term.
% of impact offset	3.7	

Table 5-11 Offset calculator – Black Cockatoos Offset 4 (State Forest No. 2 Revegetation)

ATTRIBUTE	VALUE	JUSTIFICATION
Offset area (ha)	50	Revegetation of 50 ha of a heavily degraded portion of State Forest No. 2
Start quality	1	Site is likely to have low value Black Cockatoo habitat values.

ATTRIBUTE	VALUE	JUSTIFICATION
Future quality without offset	1	Site is unlikely to be revegetated by a third party in the short term. Main Roads is proposing to commence revegetation works within 12 months.
Future quality with offset	6	Revegetation with species suitable to create habitat for Black Cockatoos. Site management (fencing and access control, weed control, firebreaks and feral animal control) to improve habitat quality.
Time over which loss is averted (years)	20	Site will be managed (risk mitigation) for conservation purposes for the long term (maximum 20 years).
Time until ecological benefit (years)	10	Development of revegetation species to provide foraging habitat 5 years after implementation.
Risk of loss without offset (%)	30	The site is unlikely to revegetated by a third party in the short term.
Risk of loss with offset (%)	5	After revegetation the offset area will be actively managed to improve habitat quality including weed and feral animal control, fencing and the installation of firebreaks. The site will be within the conservation estate. Revegetation completion criteria will ensure Black Cockatoo habitat creation to a suitable standard. Revegetation completion criteria will ensure habitat creation.
Confidence in result (%)	80	High level of certainty of habitat attributes being created through compliance with completion criteria.
% of impact offset	35.2	

The combination of proposed offsets achieves the 100% project offset requirement for Black Cockatoos.

5.3 Banksia Woodlands TEC / PEC

Table 5-12 and Table 5-6 provide inputs used in the EPBC Offset Assessment Guide in relation to Banksia Woodlands TEC / PEC.

Table 5-12 Impact calculator – Banksia Woodlands TEC / PEC

ATTRIBUTE	VALUE	JUSTIFICATION
Area of impact (ha)	23.4	Site assessments and the Proposal design have been used to identify the quanta of Banksia Woodlands TEC / PEC impacted by the project.
Quality	7	
Site Condition		Vegetation condition varies from degraded to excellent as detailed below: • Excellent: 0.49 ha

ATTRIBUTE	VALUE	JUSTIFICATION
		• Excellent – Very Good: 4.00 ha • Very Good: 2.28 ha • Very Good – Good: 2.38 • Good: 1.47 ha • Good – Degraded: 11.58 ha • Degraded: 0.71 ha • Degraded – Completely Degraded: 0.46 ha • Completely Degraded: 0.07 ha 10.6 ha (49%) of the 23.4 ha TEC clearing area rated as in Good or better condition.
Site Context		The Banksia Woodlands TEC / PEC clearing impact occurs at patches that are isolated remnants, the edge of an existing larger patch and a corridor within a larger patch as shown at Figure 2 (Appendix A).
Species stocking rate		The clearing of up to 23.4 ha of Banksia Woodlands TEC / PEC associated with the Proposal would result in a reduction of up to 0.007 % of the total extent (> 335,000 ha) and < 0.01 % of the regional extent (> 253,000 ha) of this TEC / PEC.

Table 5-6 Offset calculator – Banksia Woodlands TEC / PEC Offset 1 (Lot 153, 267 and 268 Ducane Road, Gelorup)

ATTRIBUTE	VALUE	JUSTIFICATION
Offset area (ha)	92	Targeted vegetation and TEC assessment has been completed on the properties (Biota 2020a) confirming the presence of Banksia Woodlands TEC / PEC.
Start Quality	8	Site supports known Banksia Woodland TEC in very good to excellent condition (Biota, 2021).
Future quality without offset	6	The previous owner was a commercial sand supply company. The property has not been managed to maintain its environmental values which would continue to be degraded over time. As private owned rural zoned property a number of activities including incremental clearing, grazing and firewood collection would have continued resulting in increased loss of habitat quality in the long term. Clearing of up to 5 ha per annum of native vegetation may not require a clearing permit under the WA Environmental Protection Act, 1986. Clearing of up to 1 ha per annum was unlikely to be assessed under the EPBC Act. The site is relatively remote and shows evidence of unauthorised off road activities.

ATTRIBUTE	VALUE	JUSTIFICATION
Future quality with offset	8	The properties have been purchased for addition to the conservation estate to be managed by DBCA. Private landowner activities have now been halted. Site management (fencing and access management, weed control, firebreaks and feral animal control) have been commenced to improve habitat quality. The property will be managed in the long term for conservation purposes.
Time over which loss is averted (years)	20	Site will be managed (risk mitigation) for conservation purposes for the long term (maximum 20 years).
Time until ecological benefit (years)	1	The land has been purchased and is being managed for conservation purposes.
Risk of loss without offset (%)	15	Previous zoning and land use was rural with the property used for farming.
Risk of loss with offset (%)	5	Main Roads has funded the purchase of these properties by DBCA. The properties will have the land zoning amended from rural to Conservation or Regional Open space under the GBRS. The properties will be actively managed for conservation purposes to maintain / improve WRP habitat quality including weed control, fencing and the installation of firebreaks.
Confidence in result (%)	80	High level of certainty of habitat attributes being retained and property being managed for conservation purposes in the long term.
% of impact offset	100.3	

The proposed offset of 92 ha of Banksia Woodland occurring with Lots 153, 267 and 268 Ducane Road, Gelorup achieves the 100% offset requirement for Banksia Woodlands TEC / PEC.

5.4 Tuart Woodlands TEC / PEC and Tuart-Peppermint Woodland PEC

Table 5-7 and Table 5-8 provide inputs used in the EPBC Offset Assessment Guide in relation to Tuart Woodlands TEC / PEC and Tuart-Peppermint Woodland PEC[5].

[5] 4.4 ha of the vegetation comprising the 4.5 ha of Tuart-Peppermint Woodland PEC is synonymous with Tuart Woodlands TEC / PEC vegetation. For simplicity, a single offset assessment based on 4.5 ha area of impact to Tuart Woodlands TEC / PEC has been conducted for these community types.

Table 5-7 Impact calculator - Tuart Woodlands TEC / PEC and Tuart-Peppermint Woodland PEC

ATTRIBUTE	VALUE	JUSTIFICATION
Area of impact (ha)	4.5	Site assessments and the Proposal design have been used to identify the quanta of Tuart Woodlands TEC / PEC and Tuart-Peppermint Woodland PEC impacted by the project (4.4 ha TEC / PEC / Tuart-Peppermint Woodland PEC and 0.1 ha Tuart-Peppermint Woodland PEC)
Quality	6	
Site Condition		Vegetation condition varies from Very Good to Completely Degraded. • Very Good: 0.80 ha • Good – Degraded: 2.91 ha • Degraded - Completely Degraded: 0.01 ha • Completely Degraded: 0.78 ha 0.8 ha (18%) of the 4.5 ha TEC / PEC and Tuart-Peppermint Woodland PEC clearing area rated as in Good or better condition.
Site Context		The Tuart Woodlands TEC / PEC and Tuart-Peppermint Woodland PEC clearing impact occurs at patches that are isolated remnants, the edge of an existing larger patch and a corridor within a larger patch as shown at Figure 2 (Appendix A).
Species stocking rate		The clearing of up to 4.5 ha of Tuart Woodlands TEC / PEC and Tuart-Peppermint Woodland PEC vegetation associated with the Proposal would result in a reduction of up to 0.03 % of the recorded extent.

Table 5-8 Offset calculator – Tuart Woodlands TEC / PEC and Tuart-Peppermint Woodland PEC Offset 1 (Lot 27 Tredrea Rd, Myalup)

ATTRIBUTE	VALUE	JUSTIFICATION
Offset area (ha)	19.0	
Start Quality	7	A targeted assessment to map the presence of Tuart Woodland TEC / PEC identified more than 31.6 ha present on Lot 27 Tredrea Road Myalup (Main Roads, 2021).
Future quality without offset	5	Lot 27 was purchased by Main Roads for the purpose of a limestone and sand pit. Main Roads has conducted investigations at the site in recent years to further progress its development as a materials extraction site. The property is currently unmanaged with open access. Signs of unauthorised rubbish dumping and firewood collection is evident at the property. Main Roads will initiate protection of the property and provide long term security of the Tuart Woodlands TEC / PEC and Tuart-Peppermint Woodland PEC vegetation through a request for rezoning to Regional Open Space.

ATTRIBUTE	VALUE	JUSTIFICATION
		The property will be actively managed for conservation purposes to maintain / improve WRP habitat quality including weed and feral animal control, fencing and the installation of firebreaks.
Future quality with offset	7	Site management (fencing and access management, weed control, firebreaks and feral animal control) have been commenced to improve habitat quality.
Time over which loss is averted (years)	20	Site will be managed (risk mitigation) for conservation purposes for the long term (maximum 20 years).
Time until ecological benefit (years)	1	The land has been purchased and is being managed for conservation purposes.
Risk of loss without offset (%)	15	Main Roads is very unlikely to conduct active management of the site if it were not a proposed environmental offset site.
Risk of loss with offset (%)	5	Main Roads has purchased the property for the purposes of developing a limestone and sand pit. The properties will have the land zoning amended from rural to Conservation or Regional Open space under the GBRS. The properties will be actively managed for conservation purposes to maintain / improve WRP habitat quality including weed and feral animal control, fencing and the installation of firebreaks.
Confidence in result (%)	80	High level of certainty of habitat attributes being retained and property being managed for conservation purposes in the long term.
% of impact offset	100.2	

The proposed offset of 19 ha of Tuart Woodland on Lot 27 Tredrea Rd, Myalup achieves the 100 % offset requirement for Tuart Woodlands TEC / PEC and Tuart-Peppermint Woodland PEC.

6 COUNTERBALANCE OF SIGNIFICANT RESIDUAL IMPACTS

Table 6-1 provides a summary of the offset package to counterbalance the significant residual impacts to Banksia Woodlands TEC / PEC, Tuart Woodlands TEC / PEC, Western Ringtail Possum (and BTP) and Black Cockatoo species.

Table 6-1 is based on preliminary offset calculations using the EPBC Act Offset Assessment Guide, as presented in Section 4 and Appendix B.

The offset package is expected to provide adequate compensation for significant residual impacts to those environmental attributes noted above. Main Roads is currently investigating additional offset options in consultation with DBCA.

Table 6-1 Summary of preliminary offset calculations

PROPOSED OFFSET	OFFSET AREA	% OF OFFSET ACHIEVED
Western Ringtail Possum (and Brush-tailed Phascogale) Impact: 60.9 ha of WRP habitat and 39.2 ha of BTP habitat		
WRP habitat on Lots 153, 267 and 268 Ducane Road (confirmed through site survey)	126.0 ha	37.4
WRP habitat on Lot 1 Ducane Road (confirmed through site survey)	38.5 ha	11.4
WRP habitat on Lot 153 Marchetti Road (confirmed through site survey)	14.2 ha	4.2
Revegetation of Lot 104 (north) Willinge Drive	35.0 ha	14.0
Revegetation of State Forest No. 2 (area confirmed by DBCA)	185 ha	67.3
Total Offset		**134.3**
Black Cockatoo Species Impact: 60.9 ha of Black Cockatoo habitat		
Black Cockatoo foraging habitat on Lots 153, 267 and 268 Ducane Road	124.1 ha	47.1
Black Cockatoo foraging habitat Lot 1 Ducane Road	37.7 ha	14.3
Black Cockatoo foraging habitat on Lot 153 Marchetti Road	9.7 ha	3.7
Revegetation of State Forest No. 2	50 ha	35.2
Total Offset		**100.3**
Banksia Woodlands TEC / PEC Impact: 23.4 ha		
Banksia Woodlands TEC / PEC on Lots 153, 267 and 268 Ducane Road (confirmed through site survey)	92 ha	**100.3**

PROPOSED OFFSET	OFFSET AREA	% OF OFFSET ACHIEVED
Tuart Woodlands TEC / PEC and Tuart-Peppermint Woodland PEC Impact: 4.5 ha of Tuart Woodland TEC/ Tuart-Peppermint Woodland PEC		
Tuart Woodlands TEC / PEC and Tuart-Peppermint Woodland PEC on Lot 27 Tredrea Road, Myalup (confirmed through site survey)	19.0 ha	**100.2**

In developing the proposed offset package, Main Road has taken into account to Principles of the *WA Environmental Offsets Policy* (GoWA, 2011) as summarised in Table 6-2.

Table 6-2 Assessment of offsets against the principles of the WA Environmental Offsets Policy (2011)

PRINCIPLE	ASSESSMENT
Environmental offsets will only be considered after avoidance and mitigation options have been pursued	The potential impacts from the Southern Sections of the BORR have been significantly reduced as a result of the efforts applied during the detailed design phase and during Environmental Assessment. This reduction has been largely achieved through the additional avoidance and mitigation measures that have been developed for the Proposal. Where appropriate, local technical expertise for key species and habitats has been sought to ensure the effectiveness of proposed management measures. Main Roads anticipates that the social and environmental impacts of the Proposal can be appropriately managed through the measures to be implemented in conjunction with the Proposal.
Environmental offsets are not appropriate for all projects	Main Roads operates on a hierarchy of avoid, minimise, reduce, rehabilitate and offset environmental impacts. This hierarchy is achieved primarily through changes in scope and design, development and implementation of the EMP and finally, an offset proposal. Application of the management hierarchy has been summarised in this Offset Strategy and is detailed in BORR IPT (BORR IPT, 2019a). Main Roads has proposed offsets to counterbalance the significant residual impacts to Banksia Woodlands TEC / PEC, Tuart Woodlands TEC / PEC, Tuart-Peppermint Woodland PEC, Western Ringtail Possum (and BTP) and Black Cockatoo species. This decision is based on the quanta of impacts, conservation status, and local context of the ecological communities and faunal habitats impacted by the Proposal.
Environmental offsets will be cost-effective, as well as relevant and proportionate to the significance of the environmental value being impacted	Main Roads has pursued a number of options in developing a package of offsets to counterbalance residual impacts that are relevant and appropriate for the locality and quantum of impact for each environmental value impacted. The options investigated have comprised acquisition of land providing fauna habitat, creation of

PRINCIPLE	ASSESSMENT
	fauna habitat by on ground rehabilitation and provision of research funding. Several of the proposed offset sites will address the requirement for more than one offset attribute i.e. provision / creation of habitat for WRP, Black Cockatoos and BTP at a single site.
Environmental offsets will be based on sound environmental information and knowledge	The offset values for Offsets 1-4 have been based on the available information for each of the proposed offset properties. These sites have been subject to field surveys, with further investigations conducted in spring 2020 to confirm earlier site assessments in respect to Banksia Woodlands TEC / PEC. Offset 1 has been subject to detailed survey which has confirmed the presence of WRP, Black Cockatoo and BTP. Additional surveys were conducted in spring 2020 to confirm the extent of Banksia Woodlands TEC / PEC.
Environmental offsets will be applied within a framework of adaptive management	The proposed offsets will be subject to long term monitoring and ongoing adaptive management, as required, to ensure the anticipated values and effectiveness criteria for each offset is achieved. Where at variance to the objectives of the offset strategy, advice and management consultation with DBCA and other relevant key stakeholders will be undertaken.
Environmental offsets will be focussed on longer term strategic outcomes	In addition to direct conservation offsets, Main Roads has pursued rehabilitation of lands as offsets that will over the longer term increase the areas of habitat provided by the proposed offsets and been judicious in identifying research offsets only where key gaps in knowledge and long terms recovery benefits from the research proposed. Main Roads commissioned a regional WRP population study on its own initiative in order to provide information to both industry and the community regarding the extent and distribution of the species. This information was identified as a high priority in the WRP Recovery Plan (DPaW, 2017). Prior to Main Roads commissioning this work, the species' extent was a recognised knowledge gap, the addressing of which was identified as required in the species' recovery plan (DPaW, 2017). Through addressing this knowledge gap, Main Roads has provided vital information that will assist the long term species' management and recovery.

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APPENDIX A

Figures

COLLEGE GROVE

DALYELLUP

GELORUP

STRATHAM

HENTY PLAINS

Bussell Highway

Western Highway

LEGEND

- Proposal Area
- Retention Vegetation Area
- Clearing Exclusion Areas
- Major Road

HARVEY
BUNBURY
CAPEL
BUSSELTON

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 250 500 750 1,000

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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Proposal Area

Project No. **61-37041**
Revision No. **4**
Date **4/08/2021**

Overview

FIGURE 1

G:\61\37041\19_0_GIS\Maps\Working\BORR South Referral Update\Offset Strategy Update\6137041_001_BORRSouthProposalArea_Overview_Rev4.mxd
Print date: 04 Aug 2021 - 14:13

Data source: Geoscience Australia: GeoData Topo 250k Series III - 2006; Landgate: Roads - 20180501, Imagery - WA Now accessed 20210804; BORR: Proposal Area - 20191212, Vegetated Exclusion Area - 20210513. Created by: slei

LEGEND

- Tuart Woodland TEC/PEC
- Tuart-Peppermint Woodland PEC
- BORR Southern Section Referral Boundary
- Major road

TW-S-D-1
TW-S-D-2
TW-S-D-2
TW-S-D-2
TW-S-D-2
TW-S-D-2

Peppermint Blvd
Possum Way
Peppermint Blvd
Peppermint Blvd
Peppermint Blvd
Peppermint Blvd
Peppermint Blvd
Melaleuca Dr
Merton Av
Lakeside Dr
Lakeside Dr
Lakeside Dr
Somerville Dr
Pembroke St
Darwin Way
St Annes Dr
Centenary Rd
Neslite Rd
Ashberg Link
Starlite Bend
Rutile Lane
Ferndale Av
Ferndale Av
Holly Hill Av
Sleaford Dr
Epidote Loop
Logan Lane
Crystal Bend
Meadow View Rd
Dunmow Rise
Maynard Pde
Jules Rd
Paragon Loop
Dunfield Pl
Berti Ct
Norton Prom

1
2
3
4

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 40 80 120 160

Metres

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

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Threatened and priority ecological community extents within the Proposal Area

Project No. **61-37041**
Revision No. **3**
Date **4/08/2021**

FIGURE 2

G:\61\37041\19_0_GIS\Maps\Working\BORR South Referral Update\Offset Strategy Update\6137041_002_TECPEC_Rev3.mxd
Print date: 04 Aug 2021 - 15:49

Data source: BORR team: North environmental survey area - 20191025, North referral boundary - 20191016, TEC/PEC - 20200630; Landgate: Roads - 201805, Localities - 20180319, Imagery - WA Now accessed 20210804. Created by: slei

LEGEND

- Banksia Woodland TEC/PEC
- Retention Vegetation Areas
- Clearing Exclusion Areas
- BORR Southern Section Referral Boundary
- Major road

BW-S-D-3

BW-S-D-2

Brookview AV
Ridge Pl
Ducane Rd
Tarrock Ct
Zanadu Ct
Jules Rd
Marchetti Rd
Gelorup Rise
Yalinda Dr
Woods Rd
Jilley Rd
Manea Dr

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 40 80 120 160

Metres

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

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Project No. **61-37041**
Revision No. **3**
Date **4/08/2021**

FIGURE 2

G:\61\37041\19_0_GIS\Maps\Working\BORR South Referral Update\Offset Strategy Update\6137041_002_TECPEC_Rev3.mxd
Print date: 04 Aug 2021 - 15:49

Data source: BORR team: North environmental survey area - 20191025, North referral boundary - 20191016, TEC/PEC - 20200630; Landgate: Roads - 201805, Localities - 20180319, Imagery - WA Now accessed 20210804. Created by: slei

LEGEND

- Banksia Woodland TEC/PEC
- Retention Vegetation Areas
- Clearing Exclusion Areas
- BORR Southern Section Referral Boundary
- Major road

BW-S-D-1

Eucalypt Dr
Banksia Rd
Woods Rd
Cockelup Rd
Yalinda Dr
Brockway Dr
St Clair Ct
Manea Dr
Mani Pl
Lakes Rd
Calinup Rd

Paper Size ISO A3

0 50 100 150 200

Metres

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

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Threatened and priority ecological community extents within the Proposal Area

Project No. 61-37041
Revision No. 3
Date 4/08/2021

FIGURE 2

G:\61\37041\19_0_GIS\Maps\Working\BORR South Referral Update\Offset Strategy Update\6137041_002_TECPEC_Rev3.mxd
Print date: 04 Aug 2021 - 15:50

Data source: BORR team: North environmental survey area - 20191025, North referral boundary - 20191016, TEC/PEC - 20200630; Landgate: Roads - 201805, Localities - 20180319, Imagery - WA Now accessed 20210804. Created by: slei

LEGEND

- Banksia Woodland TEC/PEC
- BORR Southern Section Referral Boundary
- Major road

BW-S-D-1

Lakes Rd

Tama Ct

1

2

3

4

SLIP
POWERED BY LANDGATE

Paper Size ISO A3

0 10 20 30 40

Metres

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

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Bunbury Outer Ring Road Southern Section

Threatened and priority ecological community extents within the Proposal Area

Project No. **61-37041**
Revision No. **3**
Date **4/08/2021**

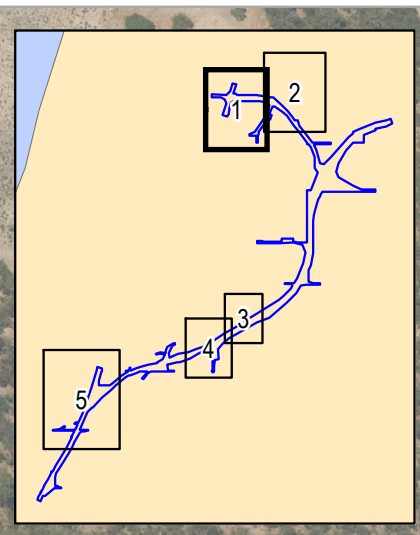
FIGURE 2

G:\61\37041\19_0_GIS\Maps\Working\BORR South Referral Update\Offset Strategy Update\6137041_002_TECPEC_Rev3.mxd
Print date: 04 Aug 2021 - 15:50

Data source: BORR team: North environmental survey area - 20191025, North referral boundary - 20191016, TEC/PEC - 20200630; Landgate: Roads - 201805, Localities - 20180319, Imagery - WA Now accessed 20210804. Created by: slei

LEGEND

- Major road
- BORR Southern Section Referral Boundary
- Banksia Woodland TEC/PEC
- Tuart Woodland TEC / PEC and Tuart-Peppermint Woodland PEC
- Tuart-Peppermint Woodland PEC



USHER

COLLEGE GROVE

BTW-S-I-1

BTW-S-I-2

BTW-S-I-2

BTW-S-I-3

TW-S-I-3

TW-S-I-4

Centenary Rd

Bussell Hwy

Neslite Rd

DALYELLUP

Ashberg Link

Starlite Bend

Rutile Lane

Ferndale Av

Ferndale Av

Logan Lane

Epidote Loop

Crystal Bend

Paragon Loop

Meadow View Rd

Maynard Pde

Sleaford Dr

Holly Hill Av

GELORUP

Duffield Pl

Jules Rd

Dunmow Rise

SLIP POWERED BY LANDGATE

Paper Size ISO A3

0 30 60 90 120

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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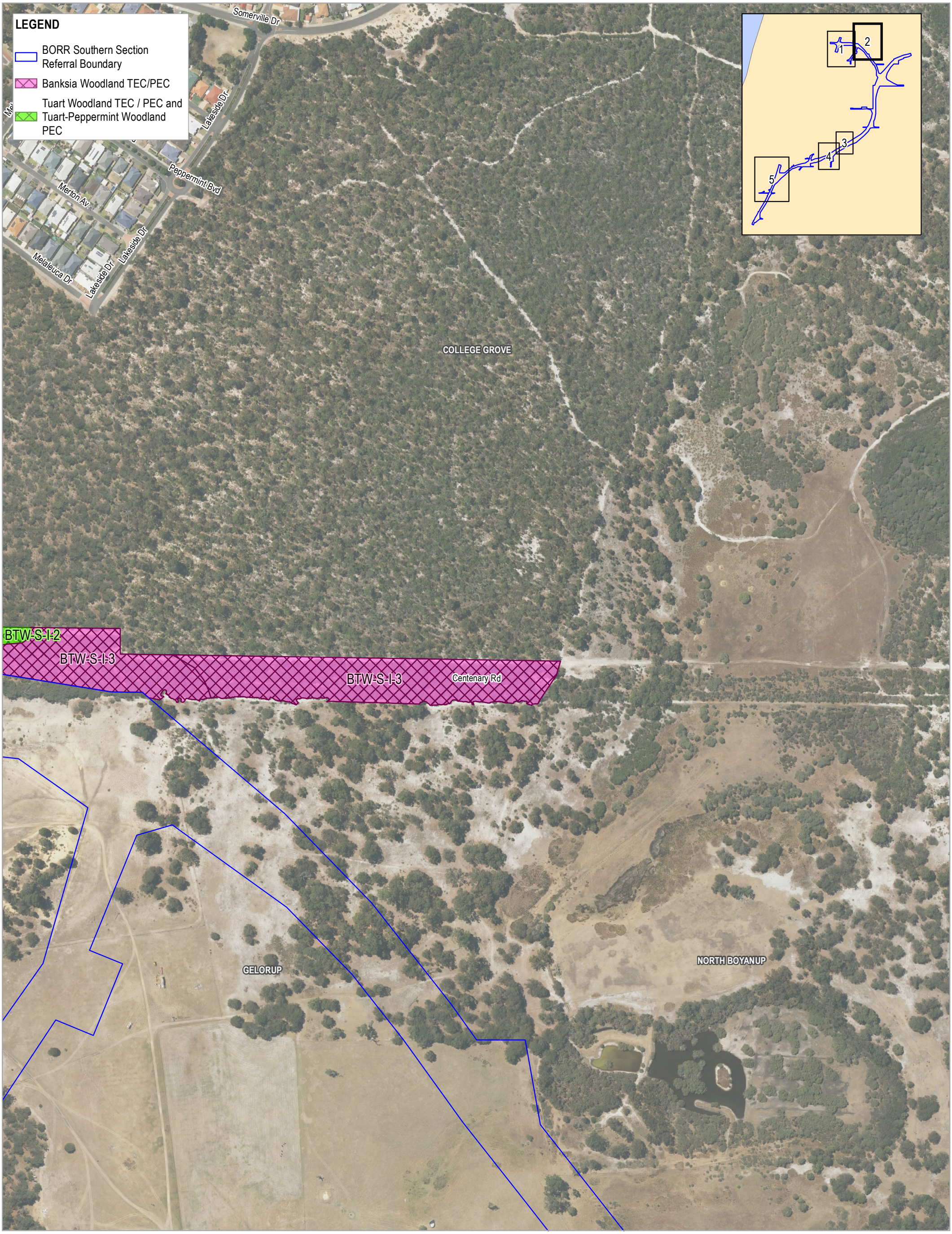
Threatened and priority ecological community extents abutting the Proposal Area

Project No. **61-37041**
Revision No. **4**
Date **4/08/2021**

FIGURE 3

G:\61\37041\19_0_GIS\Maps\Working\BORR South Referral Update\Offset Strategy Update\6137041_003_TECPECAdjacent_Rev4.mxd
Print date: 04 Aug 2021 - 16:08

Data source: BORR team: South referral boundary - 20191212, TEC/PEC - 20200701, Reference sites - 20200327; Landgate: Roads - 201805, Localities - 20180319, Imagery - WA Now accessed 20210804; EcoEdge: Reference sites - 20200325. Created by: slei



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Paper Size ISO A3

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

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Main Roads Western Australia
Bunbury Outer Ring Road Southern Section

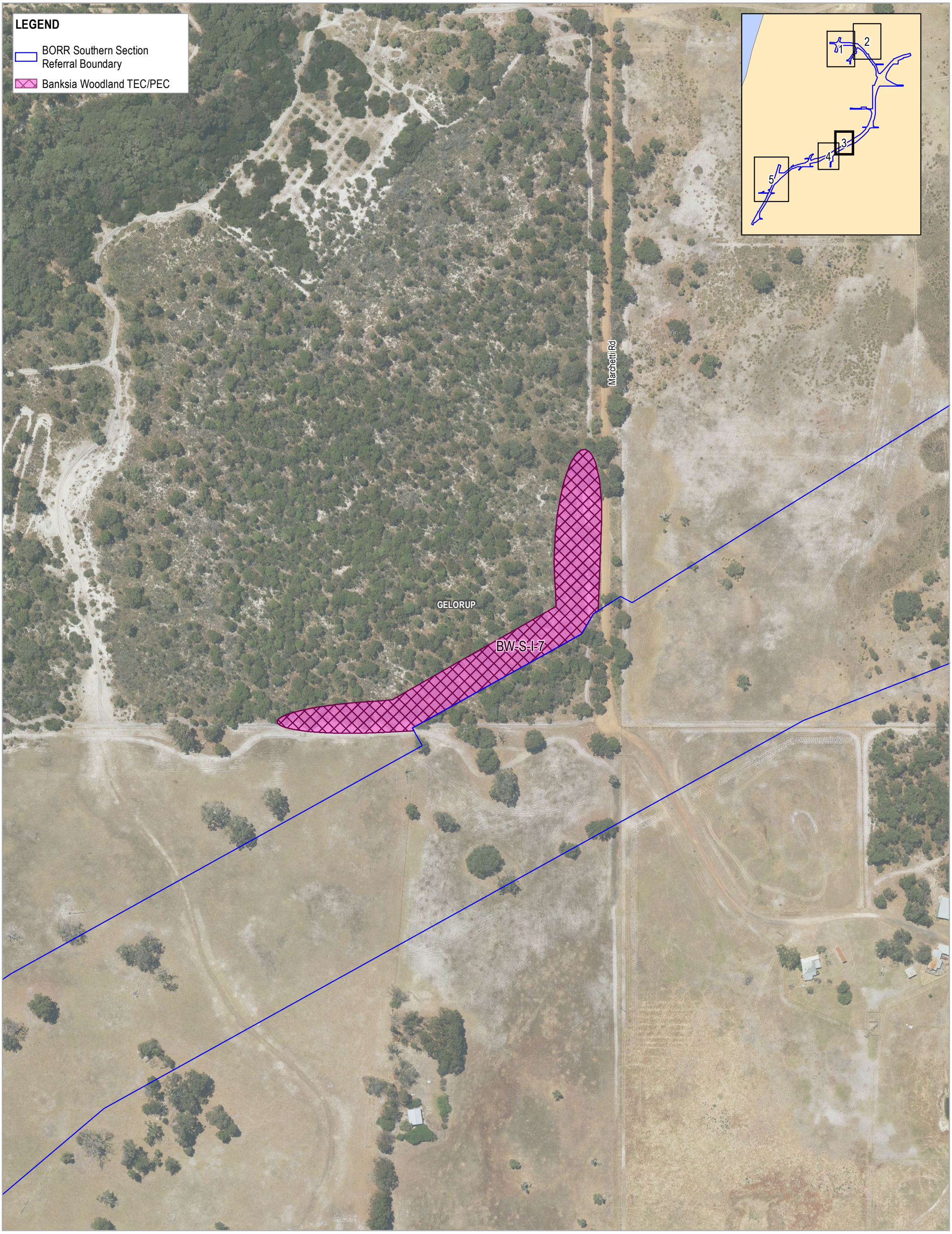
Threatened and priority ecological community extents abutting the Proposal Area

Project No. **61-37041**
Revision No. **4**
Date **4/08/2021**

FIGURE 3

G:\61\37041\19_0_GIS\Maps\Working\BORR South Referral Update\Offset Strategy Update\6137041_003_TECPECAdjacent_Rev4.mxd
Print date: 04 Aug 2021 - 16:08

Data source: BORR team: South referral boundary - 20191212, TEC/PEC - 20200701, Reference sites - 20200327; Landgate: Roads - 201805, Localities - 20180319, Imagery - WA Now accessed 20210804; EcoEdge: Reference sites - 20200325. Created by: slei



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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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Bunbury Outer Ring Road Southern Section

Threatened and priority ecological community extents abutting the Proposal Area

Project No. **61-37041**
Revision No. **4**
Date **4/08/2021**

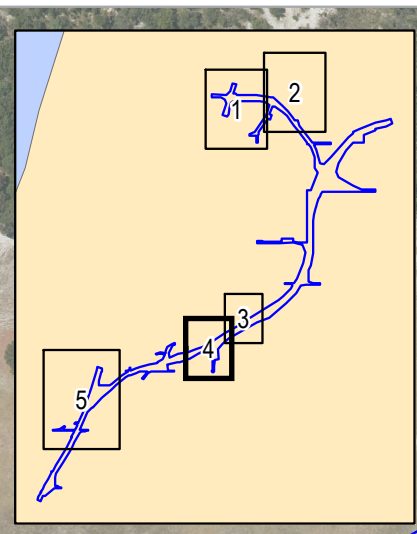
FIGURE 3

G:\61\37041\19_0_GIS\Maps\Working\BORR South Referral Update\Offset Strategy Update\6137041_003_TECPECAdjacent_Rev4.mxd
Print date: 04 Aug 2021 - 16:08

Data source: BORR team: South referral boundary - 20191212, TEC/PEC - 20200701, Reference sites - 20200327; Landgate: Roads - 201805, Localities - 20180319, Imagery - WA Now accessed 20210804; EcoEdge: Reference sites - 20200325. Created by: slei

LEGEND

- BORR Southern Section Referral Boundary
- Banksia Woodland TEC/PEC
- Retention Vegetation Areas
- Clearing Exclusion Areas



Yalinda Dr

BW-S-I-6

GELORUP

Jilley Rd

Woods Rd

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Paper Size ISO A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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Bunbury Outer Ring Road Southern Section

Threatened and priority ecological community extents abutting the Proposal Area

Project No. **61-37041**
Revision No. **4**
Date **4/08/2021**

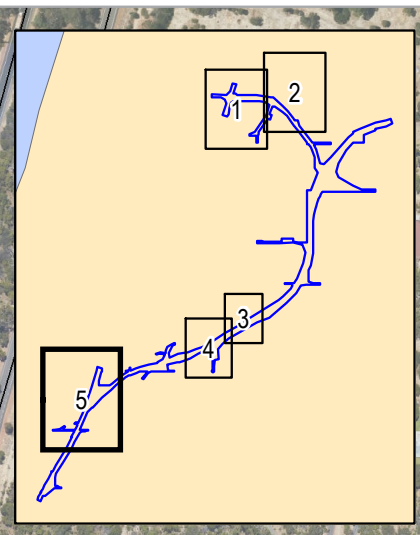
FIGURE 3

G:\61\37041\19_0_GIS\Maps\Working\BORR South Referral Update\Offset Strategy Update\6137041_003_TECPECAdjacent_Rev4.mxd
Print date: 04 Aug 2021 - 16:08

Data source: BORR team: South referral boundary - 20191212, TEC/PEC - 20200701, Reference sites - 20200327; Landgate: Roads - 201805, Localities - 20180319, Imagery - WA Now accessed 20210804; EcoEdge: Reference sites - 20200325. Created by: slei

LEGEND

- Major road
- BORR Southern Section Referral Boundary
- Banksia Woodland TEC/PEC



DALYELLUP
Woods Rd
BTW-S-I-4
STRATHAM
GELORUP
Brockway Dr
Manea Dr
BTW-S-I-4
Lakes Rd
BTW-S-I-4
Tamra Cl
Calinup Rd
STRATHAM

SLIP POWERED BY LANDGATE

Paper Size ISO A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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Main Roads Western Australia
Bunbury Outer Ring Road Southern Section

Threatened and priority ecological community extents abutting the Proposal Area

Project No. **61-37041**
Revision No. **4**
Date **4/08/2021**

FIGURE 3

G:\61\37041\19_0_GIS\Maps\Working\BORR South Referral Update\Offset Strategy Update\6137041_003_TECPECAdjacent_Rev4.mxd
Print date: 04 Aug 2021 - 16:08

Data source: BORR team: South referral boundary - 20191212, TEC/PEC - 20200701, Reference sites - 20200327; Landgate: Roads - 201805, Localities - 20180319, Imagery - WA Now accessed 20210804; EcoEdge: Reference sites - 20200325. Created by: slei

Bussell Hwy

1

2

LEGEND

- Proposal Area
- Retention Vegetation Areas
- Clearing Exclusion Areas
- *Pseudocheirus occidentalis* Habitat - Survey Area (128 ha)

Pseudocheirus occidentalis Observation

Year 2019

- August 2019
- September 2019
- October 2019
- November 2019
- December 2019

Year 2020

- February 2020
- April 2020
- June 2020
- July 2020
- August 2020

SLIP POWERED BY LANDGATE

Paper Size ISO A3

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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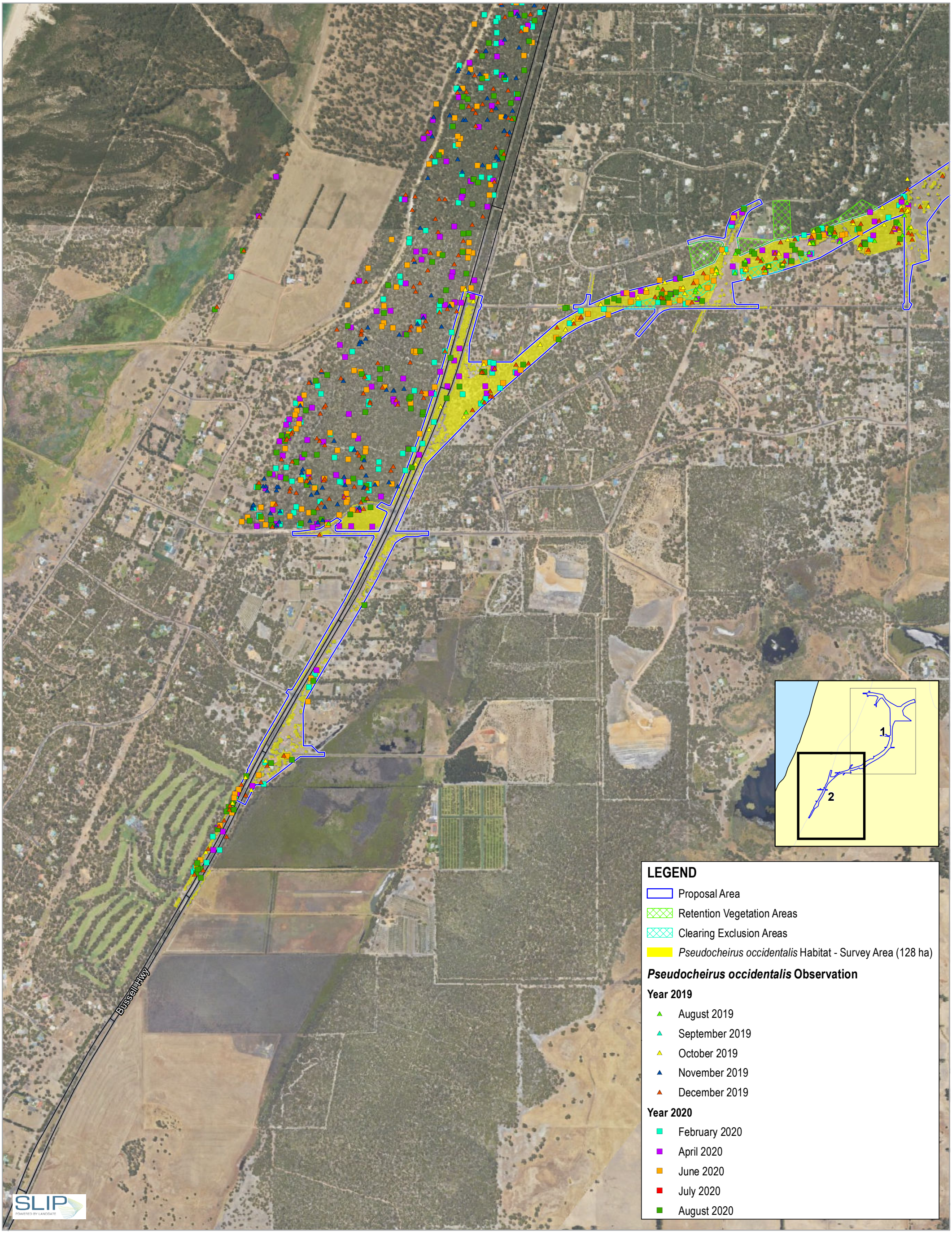
WRP habitat and observations within and adjacent to the Proposal Area

Project No. **61-37041**
Revision No. **2**
Date **4/08/2021**

FIGURE 4

G:\61\37041\19_0_GIS\Maps\Working\BORR South Referral Update\Offset Strategy Update\61137041_004_BORRSouthWRP_Multipage3_Rev2.mxd
Print date: 04 Aug 2021 - 17:23

Data source: Geoscience Australia: GeoData Topo 250k Series III - 2006; DBCA: *Pseudocheirus occidentalis* Habitat - 20200220; Landgate: Roads - 20180501, Imagery - WA Now accessed 20210804; BORR: Proposal Area - 20191212, Environmental Survey Area - 20200214; Biota: Western Ringtial Possum Observations - 20200130. Created by: slei



Paper Size ISO A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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Main Roads Western Australia
Bunbury Outer Ring Road Southern Section

WRP habitat and observations within and adjacent to the Proposal Area

Project No. **61-37041**
Revision No. **2**
Date **4/08/2021**

FIGURE 4

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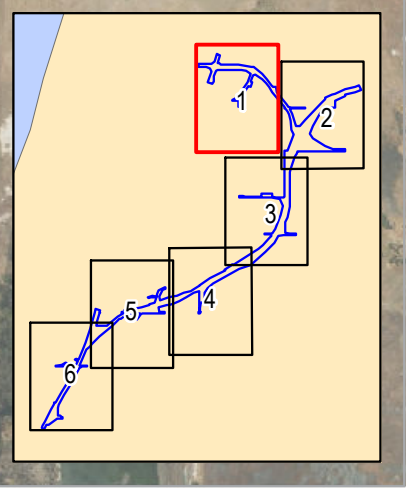
LEGEND

- BORR South design
- BORR Southern Section Referral Boundary

Current Fauna Connectivity Structures

- Fauna Rope Bridge
- Possum Exclusion Fencing (Permanent)
- Dual Use Culvert



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Paper Size ISO A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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Main Roads Western Australia
Bunbury Outer Ring Road Southern Section

Fauna Crossing Provisions and Exclusion Fencing Plan

Project No. **61-37041**
Revision No. **3**
Date **04 Aug 2021**

FIGURE 5

G:\61\37041\19_0_GIS\Maps\Working\BORR South Referral Update\Offset Strategy Update\6137041_005_PossumExclusionFencing_Rev3.mxd
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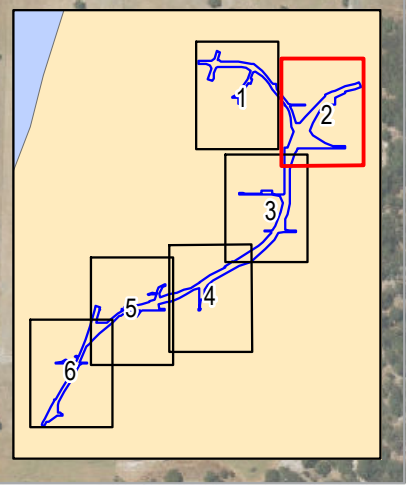
Data source: BORR team: North design - 201908, North referral boundary - 20191016, Possum Exclusion Fencing Structure - 20210222; Biota: Western Ringtail Possum Records - 20200327, Possum habitat - 201910; Landgate: Imagery - WA Now accessed 20210804. Created by: slei

LEGEND

- BORR South design
- BORR Southern Section Referral Boundary

Current Fauna Connectivity Structures

- Possum Exclusion Fencing (Permanent)
- Dual Use Culvert



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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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Main Roads Western Australia
Bunbury Outer Ring Road Southern Section

Fauna Crossing Provisions and Exclusion Fencing Plan

Project No. **61-37041**
Revision No. **3**
Date **04 Aug 2021**

FIGURE 5

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Print date: 04 Aug 2021 - 14:25

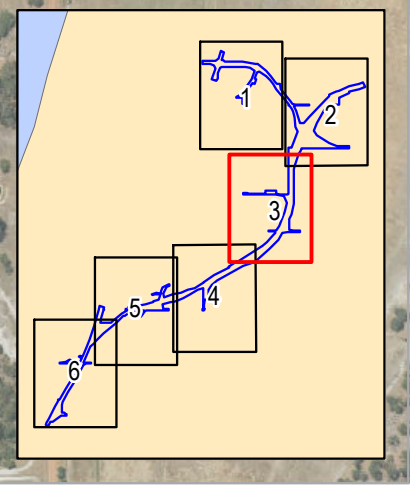
Data source: BORR team: North design - 201908, North referral boundary - 20191016, Possum Exclusion Fencing Structure - 20210222; Biota: Western Ringtail Possum Records - 20200327, Possum habitat - 201910; Landgate: Imagery - WA Now accessed 20210804. Created by: slei

LEGEND

- BORR South design
- BORR Southern Section Referral Boundary

Current Fauna Connectivity Structures

- Fauna Underpass (Box)
- Possum Exclusion Fencing (Permanent)
- Possum Exclusion Fencing (Temporary)



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Paper Size ISO A3

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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Bunbury Outer Ring Road Southern Section

Fauna Crossing Provisions and Exclusion Fencing Plan

Project No. **61-37041**
Revision No. **3**
Date **04 Aug 2021**

FIGURE 5

G:\61\37041\19_0_GIS\Maps\Working\BORR South Referral Update\Offset Strategy Update\6137041_005_PossumExclusionFencing_Rev3.mxd
Print date: 04 Aug 2021 - 14:25

Data source: BORR team: North design - 201908, North referral boundary - 20191016, Possum Exclusion Fencing Structure - 20210222; Biota: Western Ringtail Possum Records - 20200327, Possum habitat - 201910; Landgate: Imagery - WA Now accessed 20210804. Created by: slei

LEGEND

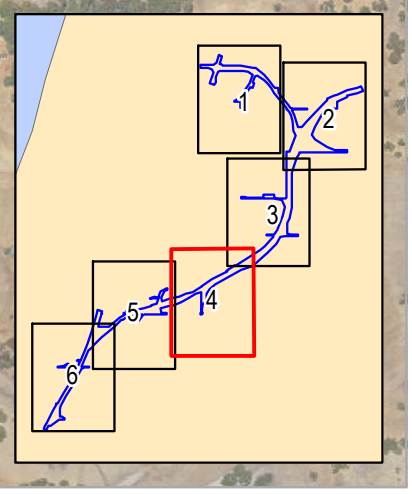
- BORR South design
- BORR Southern Section Referral Boundary
- Retention Vegetation Areas
- Clearing Exclusion Areas

Current Fauna Connectivity Structures

- Fauna Rope Bridge
- Fauna Underpass (Arch)
- Fauna Underpass (Box)
- Possum Exclusion Fencing (Permanent)
- Possum Exclusion Fencing (Temporary)
- Dual Use Culvert
- Noise Wall
- Retaining Wall
- Screen Wall

Additional Fauna Connectivity Structures

- Fauna Land Bridge



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Paper Size ISO A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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Main Roads Western Australia
Bunbury Outer Ring Road Southern Section

Fauna Crossing Provisions and Exclusion Fencing Plan

Project No. **61-37041**
Revision No. **3**
Date **04 Aug 2021**

FIGURE 5

G:\61\37041\19_0_GIS\Maps\Working\BORR South Referral Update\Offset Strategy Update\6137041_005_PossumExclusionFencing_Rev3.mxd
Print date: 04 Aug 2021 - 14:25

Data source: BORR team: North design - 201908, North referral boundary - 20191016, Possum Exclusion Fencing Structure - 20210222; Biota: Western Ringtail Possum Records - 20200327, Possum habitat - 201910; Landgate: Imagery - WA Now accessed 20210804. Created by: slei

LEGEND

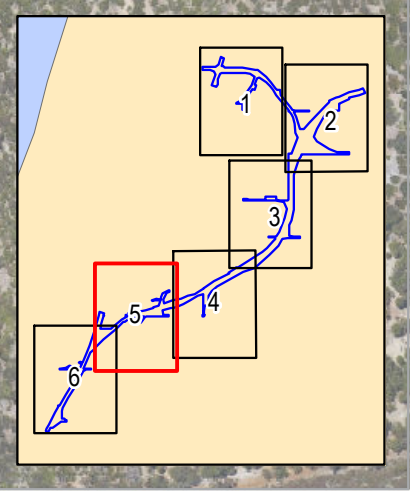
- BORR South design
- BORR Southern Section Referral Boundary
- Retention Vegetation Areas
- Clearing Exclusion Areas

Current Fauna Connectivity Structures

- Fauna Rope Bridge
- Fauna Underpass (Box)
- Possum Exclusion Fencing (Permanent)
- Possum Exclusion Fencing (Temporary)
- Noise Wall
- Retaining Wall
- Screen Wall

Additional Fauna Connectivity Structures

- Fauna Land Bridge
- Over-road Rope Bridge



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Main Roads Western Australia
Bunbury Outer Ring Road Southern Section

Fauna Crossing Provisions and Exclusion Fencing Plan

Project No. **61-37041**
Revision No. **3**
Date **04 Aug 2021**

FIGURE 5

G:\61\37041\19_0_GIS\Maps\Working\BORR South Referral Update\Offset Strategy Update\6137041_005_PossumExclusionFencing_Rev3.mxd
Print date: 04 Aug 2021 - 14:25

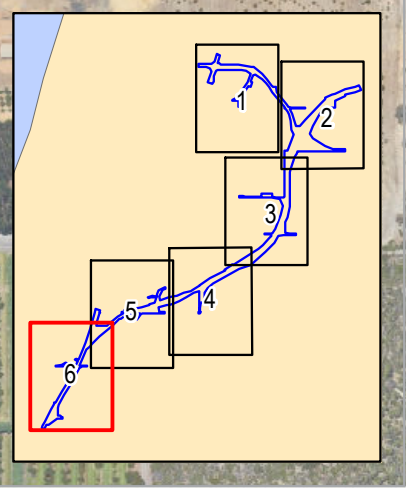
Data source: BORR team: North design - 201908, North referral boundary - 20191016, Possum Exclusion Fencing Structure - 20210222; Biota: Western Ringtail Possum Records - 20200327, Possum habitat - 201910; Landgate: Imagery - WANow accessed 20210804. Created by: slei

LEGEND

- BORR South design
- BORR Southern Section Referral Boundary

Current Fauna Connectivity Structures

- Fauna Rope Bridge
- Fauna Underpass (Box)
- Possum Exclusion Fencing (Permanent)
- Noise Wall
- Retaining Wall
- Screen Wall



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Paper Size ISO A3

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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Main Roads Western Australia
Bunbury Outer Ring Road Southern Section

Fauna Crossing Provisions and Exclusion Fencing Plan

Project No. **61-37041**
Revision No. **3**
Date **04 Aug 2021**

FIGURE 5

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Print date: 04 Aug 2021 - 14:25

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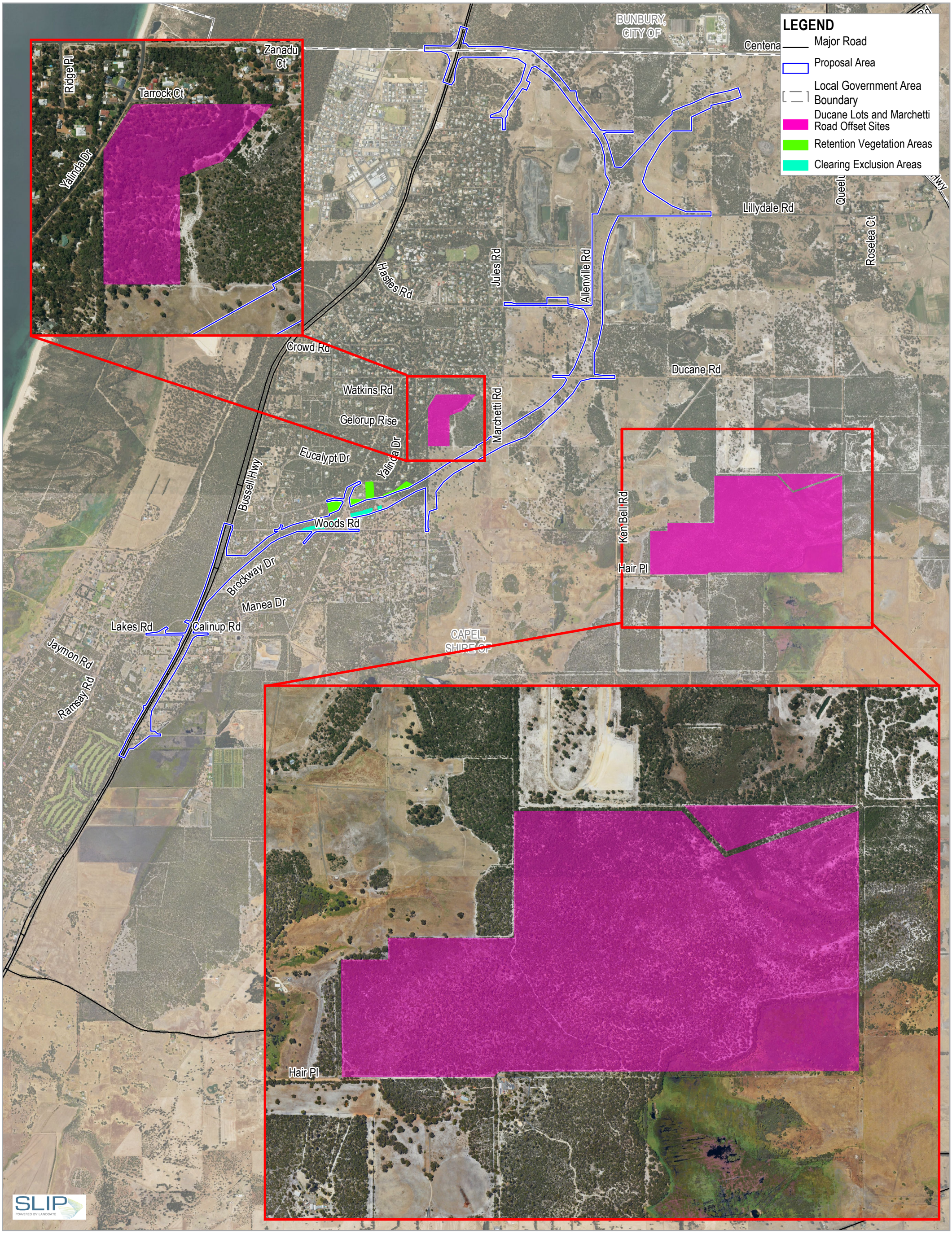

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

Main Roads Western Australia
Bunbury Outer Ring Road Southern Section

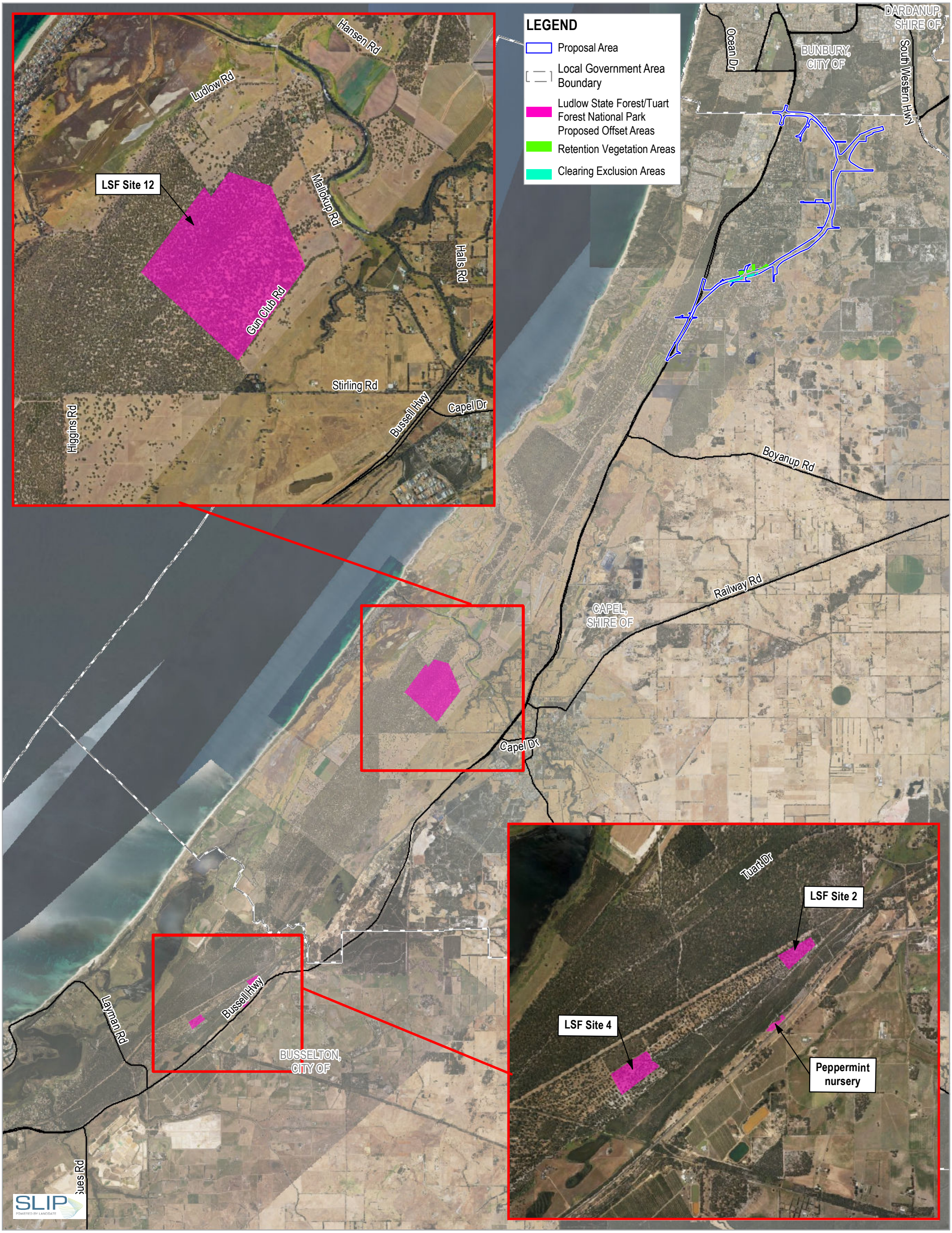
Lots 153, 267 and 268 Ducane Road and Lot 156 Marchetti Road Offset Sites

Project No.	**61-37041**
Revision No.	**1**
Date	**4/08/2021**

FIGURE 6

G:\61\37041\19_0_GIS\Maps\Working\BORR South Referral Update\Offset Strategy Update\6137041_006_OffsetPropertiesDucane_Rev1.mxd
Print date: 04 Aug 2021 - 16:28

Data source: Geoscience Australia: GeoData Topo 250k Series III - 2006; Landgate: Roads, LGA Boundaries - 20180501, Imagery - WA Now accessed 20210804; BORR: Proposal Area - 201912, Excluded area - 20200720; MRWA: Offset properties - 20200721. Created by: slei



Paper Size ISO A3

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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
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Main Roads Western Australia
Bunbury Outer Ring Road Southern Section

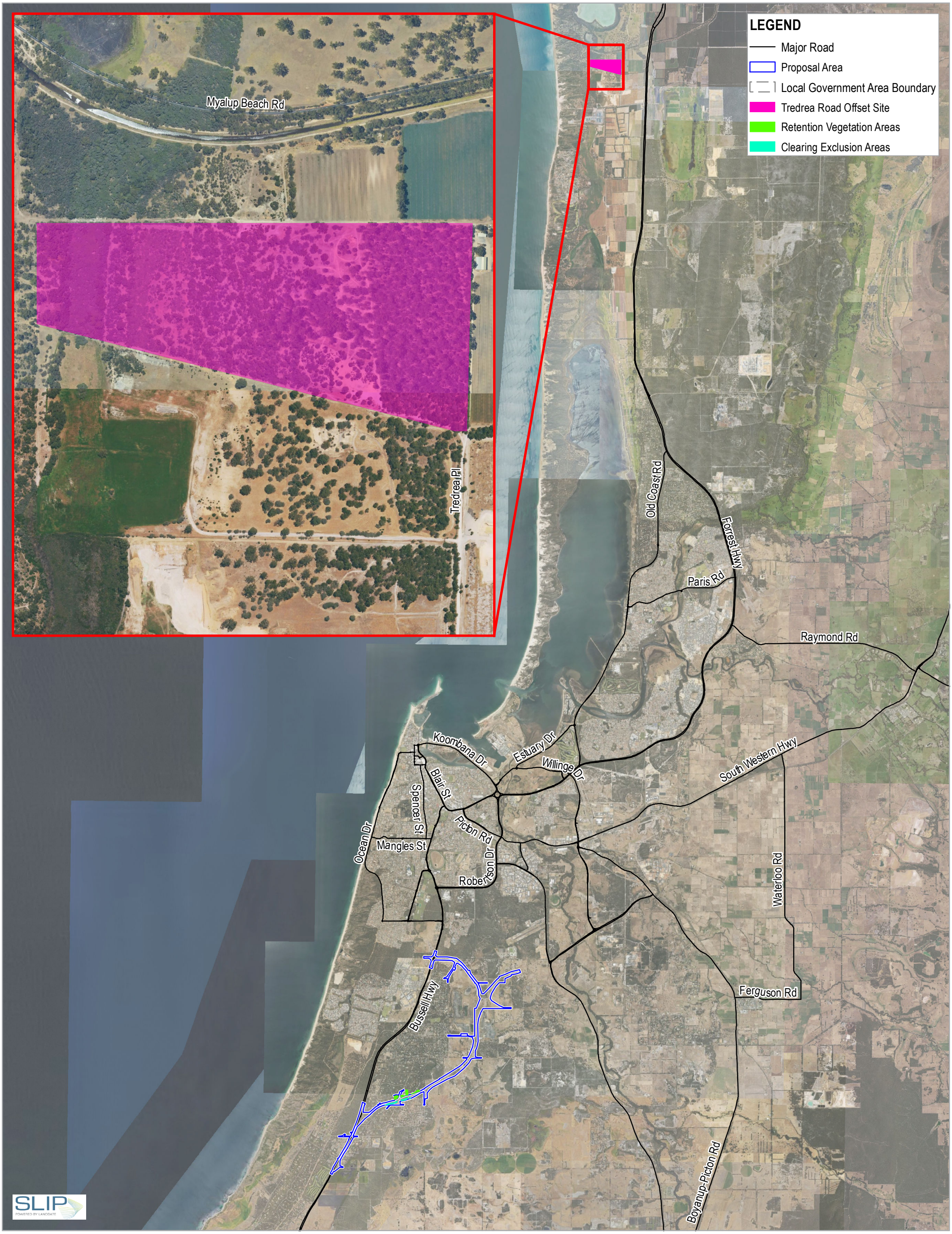
Ludlow State Forest/Tuart Forest National Park Proposed Offset Areas

Project No. **61-37041**
Revision No. **2**
Date **4/08/2021**

FIGURE 7

G:\61\37041\19_0_GIS\Maps\Working\BORR South Referral Update\Offset Strategy Update\6137041_007_OffsetPropertiesStateForest2_Rev2.mxd
Print date: 04 Aug 2021 - 19:21

Data source: Geoscience Australia: GeoData Topo 250k Series III - 2006; Landgate: Roads, LGA Boundaries - 20180501, Imagery - WA Now accessed 20210804; BORR: Proposal Area - 201912, Offset properties - 20200130, Excluded area - 20200720. Created by: slei



Paper Size ISO A3

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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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Main Roads Western Australia
Bunbury Outer Ring Road Southern Section

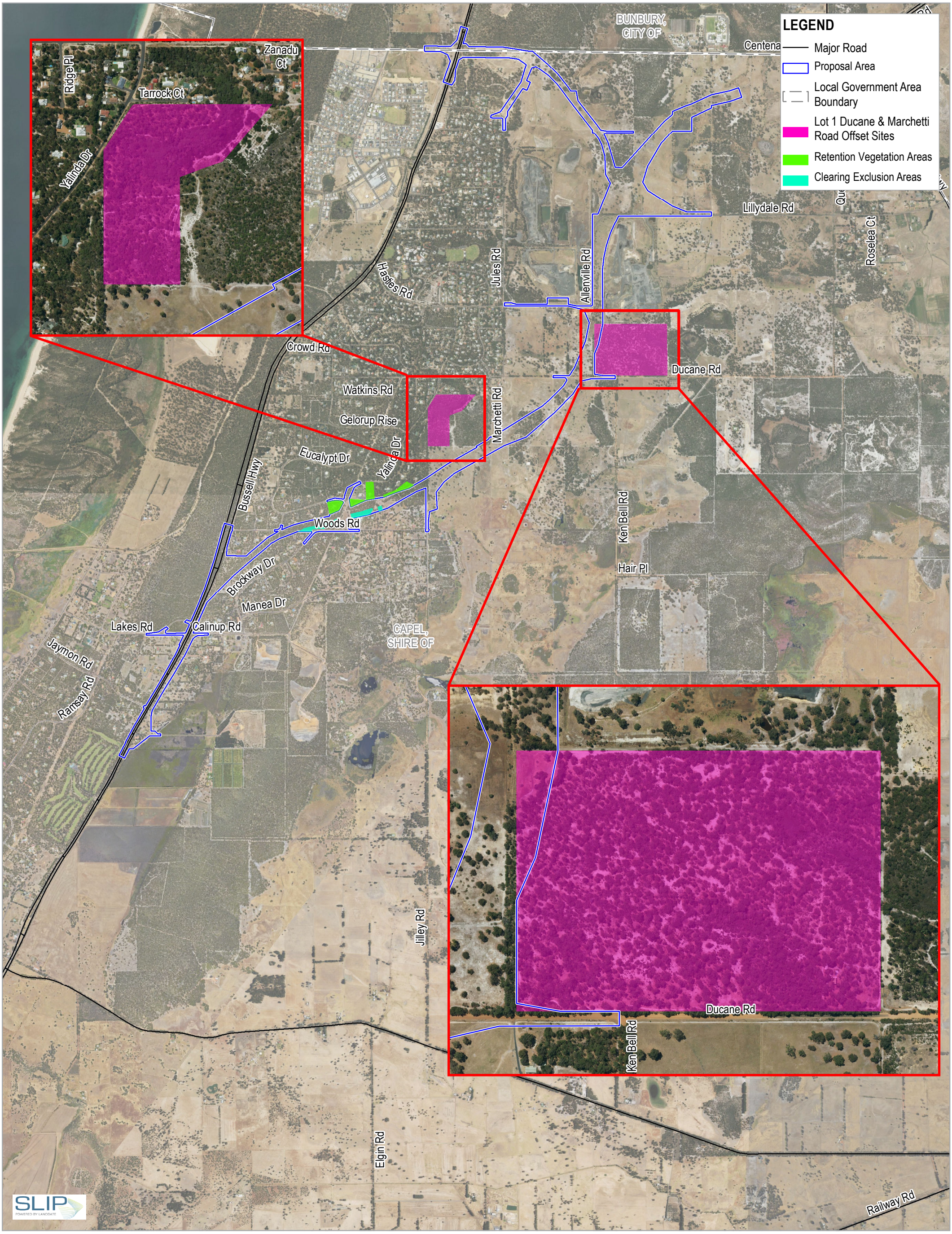
Tredrea Road Offset Site

Project No. **61-37041**
Revision No. **1**
Date **4/08/2021**

FIGURE 8

G:\61\37041\19_0_GIS\Maps\Working\BORR South Referral Update\Offset Strategy Update\6137041_008_OffsetPropertiesTredrea_Rev1.mxd
Print date: 04 Aug 2021 - 16:23

Data source: Geoscience Australia: GeoData Topo 250k Series III - 2006; Landgate: Roads, LGA Boundaries - 20180501, Imagery - WA Now accessed 20210804; BORR: Proposal Area - 201912, Excluded area - 20200720; MRWA: Offset properties - 20200721. Created by: slei



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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

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BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

Main Roads Western Australia
Bunbury Outer Ring Road Southern Section

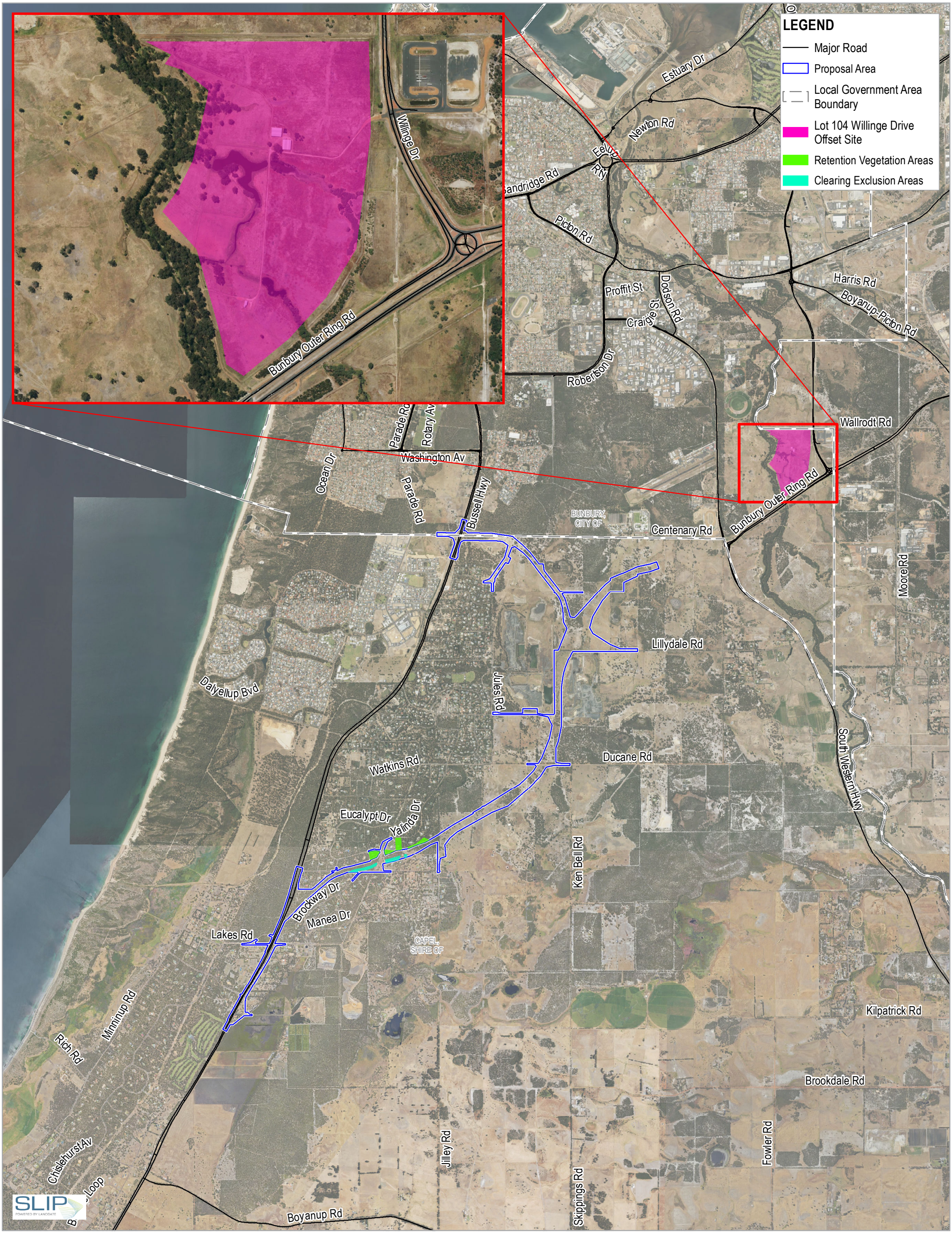
Lot 1 Ducane Rd and
Lot 156 Marchetti Road Offset Sites

Project No. **61-37041**
Revision No. **1**
Date **4/08/2021**

FIGURE 9

G:\61\37041\19_0_GIS\Maps\Working\BORR South Referral Update\Offset Strategy Update\6137041_009_OffsetPropertiesDucaneMarchetti_Rev1.mxd
Print date: 04 Aug 2021 - 16:26

Data source: Geoscience Australia: GeoData Topo 250k Series III - 2006; Landgate: Roads, LGA Boundaries - 20180501, Imagery - WA Now accessed 20210804; BORR: Proposal Area - 201912, Excluded area - 20200720; MRWA: Offset properties - 20210224. Created by: slei



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0 500 1,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 Perth Coastal Grid 1994

N

BORR Team

Australian Government

BUILDING OUR FUTURE

mainroads WESTERN AUSTRALIA

BUNBURY OUTER RING ROAD | PLANNING AND DEVELOPMENT

Main Roads Western Australia
Bunbury Outer Ring Road Southern Section

Lot 104 Willinge Drive Offset Site

Project No. **61-37041**
Revision No. **1**
Date **4/08/2021**

FIGURE 10

G:\61\37041\19_0_GIS\Maps\Working\BORR South Referral Update\Offset Strategy Update\6137041_010_OffsetPropertyLot104_Rev1.mxd
Print date: 04 Aug 2021 - 16:27

Data source: Geoscience Australia: GeoData Topo 250k Series III - 2006; Landgate: Roads, LGA Boundaries - 20180501, Imagery - WA Now accessed 20210804; BORR: Proposal Area - 201912, Excluded area - 20200720; MRWA: Offset properties - 20210224. Created by: slei

APPENDIX B

Offset calculations

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	WRP
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	**6.8%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Clearing of up to 60.9 ha of WRP habitat	**Area**	60.9	Hectares	Site assessment and the Proposal design have been used to identify impacts
			Quality	**8**	Scale 0-10	
			Total quantum of impact	48.72	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	48.72	Adjusted hectares	38.5 ha of Lot 1 Ducane Rd, Gelorup	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	38.5	**Risk of loss (%) without offset**	15%	**Risk of loss (%) with offset**	5%	3.85	80%	3.08	0.83	5.56	11.42%	No	
									Future area without offset (adjusted hectares)	32.7	**Future area with offset (adjusted hectares)**	36.6								
					Time until ecological benefit	1	**Start quality (scale of 0-10)**	**8**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**8**	2.00	80%	1.60	1.50				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	48.72	5.56	11.42%	**No**	$0.00	#DIV/0!	#DIV/0!
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	WRP
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	**6.8%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Clearing of up to 60.9 ha of WRP habitat	**Area**	60.9	Hectares	Site assessment and the Proposal design have been used to identify impacts
			Quality	**8**	Scale 0-10	
			Total quantum of impact	48.72	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	48.72	Adjusted hectares	126.0 ha of Lot 153, 267 and 268 Ducane Rd, Gelorup	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	126	**Risk of loss (%) without offset**	15%	**Risk of loss (%) with offset**	5%	12.60	80%	10.08	2.70	18.21	37.37%	No	
									Future area without offset (adjusted hectares)	107.1	**Future area with offset (adjusted hectares)**	119.7								
					Time until ecological benefit	1	**Start quality (scale of 0-10)**	**8**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**8**	2.00	80%	1.60	1.50				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	48.72	18.21	37.37%	**No**	$0.00	#DIV/0!	#DIV/0!
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

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Matter of National Environmental Significance	
Name	WRP
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	**6.8%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Clearing of up to 60.9 ha of WRP habitat	**Area**	60.9	Hectares	Site assessment and the Proposal design have been used to identify impacts
			Quality	**8**	Scale 0-10	
			Total quantum of impact	48.72	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	48.72	Adjusted hectares	14.2 ha of WRP habitat at 156 Marchetti Road	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	14.2	**Risk of loss (%) without offset**	15%	**Risk of loss (%) with offset**	5%	1.42	80%	1.14	0.30	2.05	4.21%	No	
									Future area without offset (adjusted hectares)	12.1	**Future area with offset (adjusted hectares)**	13.5								
					Time until ecological benefit	1	**Start quality (scale of 0-10)**	**8**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**8**	2.00	80%	1.60	1.50				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	48.72	2.05	4.21%	**No**	$0.00	#DIV/0!	#DIV/0!
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	WRP
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	**6.8%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Clearing of up to 60.9 ha of WRP habitat	**Area**	60.9	Hectares	WRP impact assessed through site surveys and assessment of the concept design
			Quality	**8**	Scale 0-10	
			Total quantum of impact	48.72	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset** **Future area without offset (adjusted hectares)**	0.0	**Risk of loss (%) with offset** **Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	48.72	Adjusted hectares	Revegetation of 185 ha of State Forest No.2 to create WRP habitat	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	185	**Risk of loss (%) without offset** **Future area without offset (adjusted hectares)**	30% 129.5	**Risk of loss (%) with offset** **Future area with offset (adjusted hectares)**	5% 175.8	46.25	80%	37.00	9.93	32.79	67.29%	No	
					Time until ecological benefit	10	**Start quality (scale of 0-10)**	**1**	**Future quality without offset (scale of 0-10)**	**1**	**Future quality with offset (scale of 0-10)**	**6**	5.00	80%	4.00	2.07				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	48.72	32.79	67.29%	**No**	$0.00	#DIV/0!	#DIV/0!
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	WRP
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	**6.8%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Clearing of up to 60.9 ha of WRP habitat	**Area**	60.9	Hectares	Site assessment and the Proposal design have been used to identify impacts
			Quality	**8**	Scale 0-10	
			Total quantum of impact	48.72	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset** **Future area without offset (adjusted hectares)**	0.0	**Risk of loss (%) with offset** **Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	48.72	Adjusted hectares	Lot 104 - 35 ha of revegetation to create WRP habitat	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	35	**Risk of loss (%) without offset** **Future area without offset (adjusted hectares)**	40% 21.0	**Risk of loss (%) with offset** **Future area with offset (adjusted hectares)**	5% 33.3	12.25	80%	9.80	2.63	6.80	13.95%	No	
					Time until ecological benefit	10	**Start quality (scale of 0-10)**	**0**	**Future quality without offset (scale of 0-10)**	**0**	**Future quality with offset (scale of 0-10)**	**6**	6.00	80%	4.80	2.49				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	48.72	6.80	13.95%	**No**	$0.00	#DIV/0!	#DIV/0!
Area of community	0				$0.00		$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Black Cockatoo species
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes		**Area**		Hectares	
			Quality		Scale 0-10	
			Total quantum of impact	0.00	Adjusted hectares	
Threatened species habitat						
Area of habitat	Yes	65.4 ha of Black Cockatoo foraging, and potential nesting and roosting habitat	**Area**	60.9	Hectares	Impact determined through field survey and assessment of concept design
			Quality	**8**	Scale 0-10	
			Total quantum of impact	48.72	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	Yes		Adjusted hectares		**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**		0.00		0.00	0.00	0.00	#DIV/0!	#DIV/0!	
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**		0.00		0.00	0.00				
Threatened species habitat																				
Area of habitat	Yes	48.72	Adjusted hectares	37.7 ha of BC habitat on Lot 1 Ducane Rd, Gelorup Jarrah Banksia woodland.	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	37.7	**Risk of loss (%) without offset**	15%	**Risk of loss (%) with offset**	5%	3.77	80%	3.02	2.38	14.30%	No		
									Future area without offset (adjusted hectares)	32.0	**Future area with offset (adjusted hectares)**	35.8								
					Time until ecological benefit	1	**Start quality (scale of 0-10)**	**8**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**8**	2.00	80%	1.60	1.58				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	48.72	6.97	14.30%	**No**	$0.00	#DIV/0!	#DIV/0!
Area of community	0	0.00	#DIV/0!	**#DIV/0!**	$0.00	#DIV/0!	#DIV/0!
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Black Cockatoo species
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes		**Area**		Hectares	
			Quality		Scale 0-10	
			Total quantum of impact	0.00	Adjusted hectares	
Threatened species habitat						
Area of habitat	Yes	65.4 ha of Black Cockatoo foraging, and potential nesting and roosting habitat	**Area**	60.9	Hectares	Impact determined through field survey and assessment of concept design
			Quality	**8**	Scale 0-10	
			Total quantum of impact	48.72	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	Yes		Adjusted hectares		**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**		0.00		0.00	0.00	0.00	#DIV/0!	#DIV/0!	
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**		0.00		0.00	0.00				
Threatened species habitat																				
Area of habitat	Yes	48.72	Adjusted hectares	124.1 ha of cockatoo habitat (Banksia Woodland) on Lots 153, 267 and 268 Ducane Road Gelorup Jarrah Banksia woodland.	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	124.1	**Risk of loss (%) without offset**	15%	**Risk of loss (%) with offset**	5%	12.41	80%	9.93	7.82	47.07%	No		
									Future area without offset (adjusted hectares)	105.5	**Future area with offset (adjusted hectares)**	117.9								
					Time until ecological benefit	1	**Start quality (scale of 0-10)**	**8**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**8**	2.00	80%	1.60	1.58				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	48.72	22.93	47.07%	**No**	$0.00	#DIV/0!	#DIV/0!
Area of community	0	0.00	#DIV/0!	**#DIV/0!**	$0.00	#DIV/0!	#DIV/0!
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Black Cockatoo species
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes		**Area**		Hectares	
			Quality		Scale 0-10	
			Total quantum of impact	0.00	Adjusted hectares	
Threatened species habitat						
Area of habitat	Yes	65.4 ha of Black Cockatoo foraging, and potential nesting and roosting habitat	**Area**	60.9	Hectares	Impact determined through field survey and assessment of concept design
			Quality	**8**	Scale 0-10	
			Total quantum of impact	48.72	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	Yes		Adjusted hectares		**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**		0.00		0.00	0.00		0.00	#DIV/0!	#DIV/0!		
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**		0.00		0.00	0.00					
Threatened species habitat																					
Area of habitat	Yes	48.72	Adjusted hectares	9.7 ha of Lot 156 Marchetti Rd, Gelorup	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	9.7	**Risk of loss (%) without offset**	15%	**Risk of loss (%) with offset**	5%	0.97	80%	0.78	0.61		1.79	3.68%	No		
									Future area without offset (adjusted hectares)	8.2	**Future area with offset (adjusted hectares)**	9.2									
					Time until ecological benefit	1	**Start quality (scale of 0-10)**	**8**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**8**	2.00	80%	1.60	1.58					
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	48.72	1.79	3.68%	**No**	$0.00	#DIV/0!	#DIV/0!
Area of community	0	0.00	#DIV/0!	**#DIV/0!**	$0.00	#DIV/0!	#DIV/0!
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Black Cockatoo species
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes		**Area**		Hectares	
			Quality		Scale 0-10	
			Total quantum of impact	0.00	Adjusted hectares	
Threatened species habitat						
Area of habitat	Yes	65.4 ha of Black Cockatoo foraging, and potential nesting and roosting habitat	**Area**	60.9	Hectares	Impact determined through field survey and assessment of concept design
			Quality	**8**	Scale 0-10	
			Total quantum of impact	48.72	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	Yes		Adjusted hectares		**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**		0.00		0.00	0.00	0.00	#DIV/0!	#DIV/0!	
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**		0.00		0.00	0.00				
Threatened species habitat																				
Area of habitat	Yes	48.72	Adjusted hectares	Revegetation of 50 ha area within State Forest to create Black Cockatoo habitat	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	50	**Risk of loss (%) without offset**	30%	**Risk of loss (%) with offset**	5%	12.50	80%	10.00	7.88	17.15	35.21%	No	
									Future area without offset (adjusted hectares)	35.0	**Future area with offset (adjusted hectares)**	47.5								
					Time until ecological benefit	10	**Start quality (scale of 0-10)**	**1**	**Future quality without offset (scale of 0-10)**	**1**	**Future quality with offset (scale of 0-10)**	**6**	5.00	80%	4.00	3.55				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	48.72	17.15	35.21%	**No**	$0.00	#DIV/0!	#DIV/0!
Area of community	0	0.00	#DIV/0!	**#DIV/0!**	$0.00	#DIV/0!	#DIV/0!
					$0.00	**#DIV/0!**	**#DIV/0!**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Banksia Woodlands of the
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes	Clearing of up to 23.4 ha of Bansia woodland TEC/PEC	**Area**	23.4	Hectares	Site assessment and proposal design have used to identify residual impact
			Quality	**7**	Scale 0-10	
			Total quantum of impact	16.38	Adjusted hectares	
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	Yes	16.38	Adjusted hectares	92 ha of Banksia woodland TEC within Lot 153, 267 and 268 Ducane Rd	**Risk-related time horizon (max. 20 years)**	20	**Start area (hectares)**	92	**Risk of loss (%) without offset**	15%	**Risk of loss (%) with offset**	5%	9.20	80%	7.36	5.80	16.42	100.26%	Yes		
									Future area without offset (adjusted hectares)	78.2	**Future area with offset (adjusted hectares)**	87.4								
					Time until ecological benefit	1	**Start quality (scale of 0-10)**	**7**	**Future quality without offset (scale of 0-10)**	**5**	**Future quality with offset (scale of 0-10)**	**7**	2.00	80%	1.60	1.58				
Threatened species habitat																				
Area of habitat	No				**Time over which loss is averted (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	16.38	16.42	100.26%	**Yes**	$0.00	N/A	$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Tuart Woodland TEC/PEC
EPBC Act status	Critically Endangered
Annual probability of extinction Based on IUCN category definitions	**6.8%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes	Clearing of up to 4.5 ha of Tuart TEC/PEC	**Area**	4.5	Hectares	Assessed through site surveys and concept design
			Quality	**6**	Scale 0-10	
			Total quantum of impact	2.70	Adjusted hectares	
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality	**6**		
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	Yes	2.70	Adjusted hectares	19 ha of Tuart TEC/PEC within Lot 27 Tredrea Rd, Myalup	**Risk-related time horizon (max. 20 years)**	20	**Start area (hectares)**	19	**Risk of loss (%) without offset**	15%	**Risk of loss (%) with offset**	5%	1.90	80%	1.52	0.41	2.70	100.18%	Yes		
									Future area without offset (adjusted hectares)	16.2	**Future area with offset (adjusted hectares)**	18.1									
					Time until ecological benefit	1	**Start quality (scale of 0-10)**	**7**	**Future quality without offset (scale of 0-10)**	**5**	**Future quality with offset (scale of 0-10)**	**7**	2.00	80%	1.60	1.50					
Threatened species habitat																					
Area of habitat	Yes		Adjusted hectares		**Time over which loss is averted (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**		0.00		0.00	0.00	0.00	#DIV/0!	#DIV/0!		
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**	**7**	**Future quality without offset (scale of 0-10)**	**5**	**Future quality with offset (scale of 0-10)**	**7**	2.00		0.00	0.00					
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0	0.00	#DIV/0!	**#DIV/0!**	$0.00	#DIV/0!	#DIV/0!
Area of community	2.7	2.70	100.18%	**Yes**	$0.00	N/A	$0.00
					$0.00	**#DIV/0!**	**#DIV/0!**

APPENDIX C

WA environmental offsets template

Project Name: BORR Southern Section

Existing environment/ Impact	*Mitigation*			*Significant Residual Impact*	*Offset Calculation Methodology*				
	Avoid and minimise	*Rehabilitation Type*	*Likely Rehab Success*		*Type*	*Risk*	*Likely offset success*	*Time Lag*	*Offset Quantification*
Up to 60.9 ha of suitable Western Ringtail Possum (WRP) habitat will potentially be cleared. Between 49 and 72 individual WRP home ranges may be disturbed. Based on the results of regional surveys, this is estimated to represent 0.50 % to 0.74 % of the 2019 regional WRP population.	Changes to the proposal have resulted in a reduction of a mininum of 19.1 ha of WRP habitat requiring removal for the Proposal. The areas that have been retained through these changes comprise intact habitat and known WRP movement pathways, not isolated trees or insignificant patches. Based on field survey data, in regards to the number of displaced WRP, this equates to up to 24 individuals no longer likely to have their home ranges disturbed.	Onsite rehabiliation will occur within temporary construction areas and offset sites as detailed in the Offset Strategy.	Can the environmental values be rehabilitated/Evidence? Yes, consistent with prior Main Roads projects Operator experience in undertaking rehabilitation? Main Roads has extensive experience and success in rehabilitating temporary construction areas What is the type of vegetation being rehabilitated? Revegetation would utilise locally native species Time lag? 3 years Credibility of the rehabilitation proposed (evidence of demonstrated success) Rehabilitation will comprise plant species known to be utilised by WRP in densities known to provide key WRP habitat requirements. Methodologies proven to successfully provide suitable WRP habitat will be employed.	Extent Up to 60.9 ha Quality Comprising Shedley and Williams (2014) habitat classes: o 11.5 % of Habitat Quality Class B (High) (7.0 ha) o 52 % of Habitat Quality Class C (Medium) (31.9 ha) o < 1 % of Habitat Quality Class D (Low) (0.3 ha) o 35.5 % of habitat not assessed (21.6 ha) Conservation Significance Critically Endangered Land Tenure n/a Time Scale Permanent at time of construction The clearing of Western Ringtail Possum habitat and disturbance of 0.50 % to 0.74 % of the 2019 regional population will result in a minor residual impact associated with the Proposal.	Land Acquisition and on-ground management. Values have been identified within propsed sites.	Low - Land to be ceded and managed by DBCA.	Can the values be defined and measured? Yes, the propsoed offset sites have been surveyed. Operator experience/Evidence? DBCA will manage land. What is the type of vegetation being revegetated? Fauna habitat to WRP, BTP and Black Cockatoo Is there evidence the environemntal values can be re-created (evidence of demonstrated success)? This reflects the approach for similar offset revegetation works by Main Roads in the region.	All land acquisition offsets have been secured or are in the final stages of transfer to Main Roads ownership. Ten years to allow for revegetation of 185 ha within State Forest No. 2 (Ludlow State Forest) and Tuart Forest National Park to provide suitable habitat for WRP.	The combination of proposed offsets achieves 134.3% of the offset requirement. The ratio of habitat protected compared to cleared was determined using the Commonwealth Calculator as a guide.
The Proposal may potentially result in loss of up to 60.9 ha of suitable Black Cockatoo habitat. The clearing of up to 60.9 ha of potential habitat represents a 0.8 % reduction in potential foraging and breeding habitat for the Black Cockatoo species within the local area (suitable remnant vegetation within a 12 km radius).	A high level of mitigation and management has been applied to the Proposal, with Main Roads making substantial changes to the Proposal design in order to mitigate potential impacts on terrestrial fauna including black cockatoos. The changes made have resulted in the reduction in the area of black cockatoo habitat impacted by 19.1 ha and a reduction of more than 38 % in the number of trees with a potentially suitable nest hollow(s) impacted. Connectivity of habitat will be maintained and enhanced through revegetation of additional areas within the Proposal Area.	Onsite rehabiliation will occur within temporary construction areas and offset sites as detailed in the Offset Strategy. Revegetation would include species of foraging habitat for black cockatoos, including but not limited to, Banksia spp., Hakea spp., Grevillea spp. and Eucalyptus spp. Revegetation will not occur within 10 m of the constructed road carriageway.	Can the environmental values be rehabilitated/Evidence? Yes, consistent with prior Main Roads projects Operator experience in undertaking rehabilitation? Main Roads has extensive experience and success in rehabilitating temporary construction areas What is the type of vegetation being rehabilitated? Revegetation would utilise locally native species Time lag? 3 years Credibility of the rehabilitation proposed (evidence of demonstrated success) Rehabilitation will comprise plant species known to be utilised by BC for foraging, roosting and nesting, such as Proteaceous species and Eucalypts. Methodologies proven to successfully provide suitable BC habitat will be employed.	Extent Up to 60.9 ha Quality High and Moderate quality foraging habitat. Conservation Significance Endangered and Vulnerable Land Tenure n/a Time Scale Permanent at time of construction The reduction in foraging and potential breeding habitat for Black Cockatoo species will result in minor residual impact associated with the Proposal.	Land Acquisition, on-ground management, and research. Values have been identified within propsed sites.	Low - Land to be ceded and managed by DBCA.	Can the values be defined and measured? Yes, the proposed offset sites have been surveyed Operator experience/Evidence? DBCA will manage land What is the type of vegetation being revegetated? Fauna Habitat for WRP and Black Cockatoo Is there evidence the environemntal values can be re-created (evidence of demonstrated success)? This reflects the approach for similar offset revegetation works by Main Roads in the region.	All land acquisition offsets have been secured or are in the final stages of transfer to Main Roads ownership. Ten years to allow for revegetation of 50 ha within State Forest No. 2 (Ludlow State Forest) and Tuart Forest National Park to provide suitable habitat for Black Cockatoos.	The combination of proposed offsets achieves 100.3% of the offset requirement for Black Cockatoos. The ratio of habitat protected compared to cleared was determined using the Commonwealth Calculator as a guide.
Up to 23.4 ha of Banksia Woodlands TEC / PEC vegetation within the Proposal Area will be cleared as a result of Proposal implementation.	A high level of mitigation and management has been applied to the Proposal, with Main Roads making substantial changes to the Proposal design in order to reduce potential impacts on flora and vegetation, including Banksia Woodland TEC / PEC vegetation. The changes made have resulted in the reduction in the area of Banksia Woodlands TEC / PEC impacted by 3.2 ha.	Main Roads does not anticipate to rehabilitate threatened ecological communities within temporary construction areas adjacent to the Proposal.	Can the environmental values be rehabilitated/Evidence? N/A Operator experience in undertaking rehabilitation? What is the type of vegetation being rehabilitated? Time lag? Credibility of the rehabilitation proposed (evidence of demonstrated success)	Extent Up to 23.4 ha Quality Excellent-Very Good to Completely Degraded Conservation Significance State Priority 3 PEC / Endangered TEC Land Tenure n/a Time Scale Permanent at time of construction Based on these assessments, it is unlikly that the Proposal will have a significant residual impact on the Banksia TEC / PEC. Main Roads proposes to further address the residual impacts of the Proposal on Banksia Woodlands TEC / PEC through the provision of environmental offsets.	Land Acquisition and on-ground management. Values have been identified within propsed sites.	Low - Land to be ceded and managed by DBCA.	Can the values be defined and measured? The proposed offset site (Lots 153, 267 and 268 Ducane Road, Gelorup) is 152 ha in area and comprises 132 ha of Jarrah Banksia Woodland (Biota, 2019a). Additional site assessment has been conducted and confirmed that the site vegetation conforms to Banksia Woodlands TEC / PEC. Operator experience/Evidence? DBCA will manage land. What is the type of vegetation being revegetated? n/a Is there evidence the environemntal values can be re-created (evidence of demonstrated success)? High level of certainty of habitat attributes being retained and property being managed for conservation purposes in the long term.	Main Roads has purchased the offset site and will initiate protection of the property and provide long term security through a conservation covenant or rezoning to Regional Open Space under the GBRS.	92 ha of TEC / PEC protected offsetting 100.3% of impact. The ratio of habitat protected compared to cleared was determined using the Commonwealth Calculator as a guide.

Existing environment/ Impact	*Mitigation*			*Significant Residual Impact*	*Offset Calculation Methodology*				
	Avoid and minimise	*Rehabilitation Type*	*Likely Rehab Success*		*Type*	*Risk*	*Likely offset success*	*Time Lag*	*Offset Quantification*
Up to 4.5 ha Tuart Woodlands TEC / PEC (4.4 ha) and Tuart-Peppermint Woodland PEC (0.1 ha)	A high level of mitigation and management has been applied to the Proposal, with Main Roads making changes to the Proposal design in order to reduce the potential environmental impact to Tuart Woodlands TEC / PEC and Tuart-Peppermint Woodland PEC vegetation. These have resulted in a reduction in 0.5 ha of Tuart Woodlands TEC / PEC vegetation contained within the Proposal Area.	Main Roads does not anticipate to rehabilitate threatened ecological communities within temporary construction areas adjacent to the Proposal.	Can the environmental values be rehabilitated/Evidence? N/A Operator experience in undertaking rehabilitation? What is the type of vegetation being rehabilitated? Time lag? Credibility of the rehabilitation proposed (evidence of demonstrated success)	Extent Up to 4.4 ha Quality Majority Good to Degraded with parts Very Good and Completely Degraded Conservation Significance State Priority 3 PEC/ Endangered TEC Land Tenure n/a Time Scale Permanent at time of construction Based on these assessments, it is unlikly that the Proposal will have a significant residual impact on the Tuart Woodlands TEC / PEC or Tuart-Peppermint Woodland PEC. Main Roads proposes to further address the residual impacts of the Proposal on Tuart Woodlands TEC / PEC and Tuart-Peppermint Woodland PEC through provision of environmental offsets.	Land Acquisition and on-ground management. Values have been identified within propsed sites.	Low - Land to be ceded and managed by DBCA.	Can the values be defined and measured? The proposed offset site (Lot 27 Tredrea Road, Mylup) is 40 ha in area and includes more than 20 ha of potential Tuart Woodlands TEC /PEC and potential Tuart-Peppermint Woodland PEC (GHD, 2004). Additional site assessment is proposed to identify whether the site vegetation conforms to Tuart Woodlands TEC / PEC and / or Tuart-Peppermint Woodland PEC. Should the site surveys conclude that the site vegetation is not Tuart Woodlands TEC / PEC and / or Tuart-Peppermint Woodland PEC, Main Roads will investigate an alternative offset area. Operator experience/Evidence? DBCA will manage land. What is the type of vegetation being revegetated? n/a Is there evidence the environemntal values can be re-created (evidence of demonstrated success)? High level of certainty of habitat attributes being retained and property being managed for conservation purposes in the long term.	Main Roads has purchased the offset site and will initiate protection of the property and provide long term security through a conservation covenant or rezoning to Regional Open Space under the GBRS.	4.5 ha of TEC / PEC protected offsetting 100.4% of impact. The ratio of habitat protected compared to cleared was determined using the Commonwealth Calculator as a guide.

Note: Brush-tailed Phascogale habitat is closely correlated with both WRP habitat and Black Cockatoo habitat, as such it is considered to be covered with these offsets.

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