Main Roads Western Australia

Mitchell Freeway Extension (Hester Avenue to Romeo Road)
EPBC 2019/8367
Offset Strategy

December 2019

GHD scope and limitations

Main Roads Western Australia (Main Roads) commissioned GHD Pty Ltd (GHD) to prepare an offset strategy to support Preliminary Documentation for EPBC 2018/8367 Mitchell Freeway Extension (Hester Avenue to Romeo Road) for submission to Department of the Environment and Energy.

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Executive summary

Main Roads Western Australia (Main Roads) proposes to extend Mitchell Freeway north from Hester Avenue to Romeo Road, including an upgrade to Wanneroo Road from Dunstan Road to Trian Road (the Proposal).

The Proposal will extend the Mitchell Freeway a further 5.6 km north from Hester Avenue to Romeo Road, as well as upgrading Wanneroo Road to a dual carriageway for 5.5 km from Dunstan Road to Trian Road. The Proposal will improve accessibility, travel times and road safety as well as sustaining jobs and enabling regional development in Perth's northern suburbs.

The Proposal is a controlled action (EPBC 2018/8367) requiring assessment, via Preliminary Documentation, and approval under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Preliminary Documentation (GHD 2019a) indicates the Proposal will result in significant residual impacts to Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community (BWSCP TEC), Carnaby's Cockatoo (*Calyptorhynchus latirostris*) and Forest Red-tailed Black Cockatoo (FRTBC, *Calyptorhynchus banksii naso*). These include:

- Clearing of up to 50.07 ha of BWSCP TEC
- Clearing of up to 328 potential breeding trees for Carnaby's Cockatoo
- Clearing of up to eight trees, each containing between one and four potentially suitable hollows for Carnaby's Cockatoo nesting (totalling 22 potentially suitable hollows)
- Clearing of up to 95.61 ha of high quality foraging habitat, 8.56 ha of medium quality foraging habitat and 27.90 ha of low quality foraging habitat for Carnaby's Cockatoo
- Clearing of up to 6.29 ha of high quality foraging habitat, 70.06 ha of medium quality foraging habitat and 27.90 ha of low quality foraging habitat for FRTBC.

This draft Offset Strategy has been prepared to support the Preliminary Documentation, to demonstrate Main Roads' commitment to offset the Proposal's significant residual impacts to BWSCP TEC, Carnaby's Cockatoo and FRTBC.

The draft Offset Strategy comprises the following offset package under consideration, with Main Roads pursuing a number of options to counterbalance the potential significant impacts of the Proposal. Details of Offset 3 (including locality) remains commercial in confidence at this time and will be provided upon the outcome of commercial negotiations.

Overview of offset package under consideration

No.	Offset type	Offset summary	Property location	Existing tenure
1	Direct	240 ha land transfer to DBCA 219 ha Carnaby's Cockatoo habitat	Lot 1 on Plan 62729, Bannovich Road, Hill River WA	Freehold owned by Main Roads
2	Direct	110 ha land transfer to DBCA 109 ha Carnaby's Cockatoo habitat 63 ha FRTBC habitat 44 ha BWSCP TEC	Lots 1921 and 2342, Ashworth Road, Gingin WA	Crown Reserve 24560 C Class – Gravel
3	Direct	190 ha land transfer to DBCA Carnaby's Cockatoo and FRTBC habitat	Confidential pending survey and commercial negotiations	Freehold owned by third party

4	Direct	Funding contribution to WA Offsets Fund Provisional sum $492,800 based on a 140 ha unimproved rural freehold property in Shire of Gingin, providing BWSCP TEC
5	Indirect	Funding contribution to Murdoch University Research Proposal: Conservation Management for the long-term survivorship of Black Cockatoos endemic to the south-west of Western Australia: the application of telemetry to determine spatial ecology on the Perth-Peel Coastal Plain, south-west forest region and key breeding sites in response to a changing environment.

The table below provides a summary of the potential for the offset package to counterbalance the potential significant residual impacts to BWSCP TEC, Carnaby's Cockatoo and FRTBC.

Summary of preliminary offset calculations

No.	Offset	Carnaby's Cockatoo residual impact: 132 ha x quality 9 = 118.66 ha total		FRTBC residual impact: 105 ha x quality 6 = 63.00 ha total		BWSCP TEC residual impact: 50.1 ha x quality 6 = 30.06 ha total	
		Offset area (ha)	% of impact offset	Offset area (ha)	% of impact offset	Offset area (ha)	% of impact offset
1	Banovich Road, Hill River	219	26%	Site not suitable		Site not suitable	
2	Ashworth Road, Gingin	109	43%	63	45%	44	48%
3	Confidential	190	21%	190	46%	Site not suitable	
4	WA offset fund contribution	Purchased land likely to contain species habitat but is not accounted for in the offset		Purchased land may contain species habitat but is not accounted for in the offset.		140	52%
5	Research offset	n/a	10%	n/a	10%	n/a	n/a
	Total potential offset		**100%**		**101%**		**100%**

The draft Offset Strategy will be refined subject to the findings of surveys currently underway, commercial negotiations with property owners, and consultation with the WA Department of Biodiversity, Conservation and Attractions (DBCA). Once the strategy is agreed with DBCA, Main Roads will develop a detailed Offset Proposal for submission and approval under the EPBC Act.

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1. Introduction

1.1 Proposal background

Main Roads Western Australia (Main Roads) proposes to extend Mitchell Freeway north from Hester Avenue to Romeo Road, including an upgrade to Wanneroo Road from Dunstan Road to Trian Road (the Proposal). Figure 1 presents the Proposal location and Development Envelope (DE). The DE comprises an area of approximately 249 ha.

The Proposal will extend the Mitchell Freeway a further 5.6 km from Hester Avenue to Romeo Road, as well as upgrading Wanneroo Road to a dual carriageway for 5.5 km from Dunstan Road to Trian Road. The Proposal will improve accessibility, travel times and road safety as well as sustaining jobs and enabling regional development in Perth's northern suburbs.

1.2 Proposal description

The Mitchell Freeway extension works include:

- Constructing a new 5.6 km four lane freeway (two lanes in each direction)
- Completion of northbound on ramp and southbound off ramp at Hester Avenue interchange
- Grade separated interchange at Lukin Drive
- Rail tunnel for the existing rail to exit the freeway median to Butler train station
- Terminate freeway at Romeo Road with a grade separated interchange
- Principal Shared Path on the western side of the freeway
- Romeo Road constructed as dual carriageway with 2 lanes east to Wanneroo Road
- Footpaths/shared paths proposed for Romeo Road
- New/upgraded at-grade intersections at Romeo Road/Wanneroo Road.

The Wanneroo Road upgrade works include:

- Constructing a 5.5 km dual carriageway from Dunstan Road to Trian Road. Existing carriageway to be used where possible
- Intersection improvement to Wanneroo Road and Nowergup Road
- Improvements to the old Wanneroo Road alignment currently acting as a service road
- Modifications to formalise the service road providing safe access and egress to adjoining properties.

1.3 Purpose of this strategy

The Proposal is a controlled action (EPBC 2018/8367) requiring assessment and approval under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). Main Roads engaged GHD to prepare Preliminary Documentation for the assessment of the Proposal under the EPBC Act.

The Preliminary Documentation (GHD 2019a) indicates the Proposal will result in significant residual impacts to Banksia Woodlands of the Swan Coastal Plain Threatened Ecological

Community (BWSCP TEC), Carnaby's Cockatoo (*Calyptorhynchus latirostris*) and Forest Red-tailed Black Cockatoo (FRTBC, *Calyptorhynchus banksii naso*).

This draft Offset Strategy has been prepared to support the Preliminary Documentation for the Proposal, to demonstrate Main Roads' commitment to offset the Proposal's significant residual impacts to BWSCP TEC, Carnaby's Cockatoo and FRTBC.

The draft Offset Strategy will be refined subject to the findings of surveys currently underway, commercial negotiations with property owners, and consultation with the WA Department of Biodiversity, Conservation and Attractions (DBCA). Once the strategy is agreed with DBCA, Main Roads will develop a detailed Offset Proposal for submission and approval under the EPBC Act.

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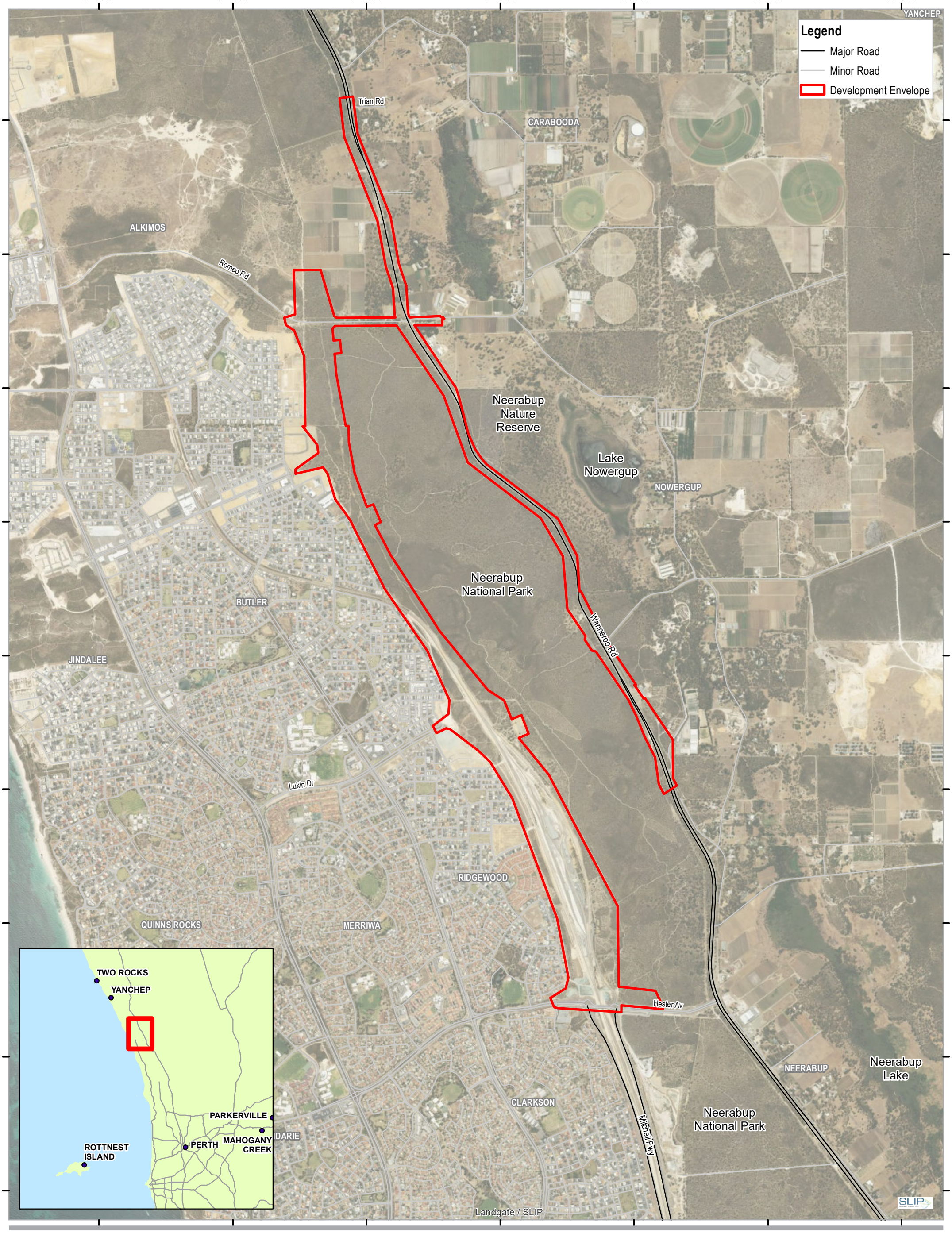

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Kilometres

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

GHD

Main Roads Western Australia
SR155 Mitchell Fwy Extension EPBC PD

Proposal location and Development Envelope

Project No.	**61-38302**
Revision No.	**0**
Date	**10/09/2019**

FIGURE 1

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Print date: 10 Sep 2019 - 13:03

Data source: GHD: EPBC Development Envelope - 20190531; ABS: Local Government Areas - 20190220; MRWA: Road network - 20190114; LGATE: Imagery - August 2018; Geoscience Australia: Geodata topo series 3. Created by: afeeney

2. Predicted impacts of Proposal

2.1 Controlling provisions

The Proposal has been determined a controlled action under the EPBC Act due to the likelihood of significant impacts on listed threatened species and communities (Sections 18 and 18A of the Act), including:

- Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community (BWSCP TEC) – Endangered
- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) – Endangered
- Forest Red-tailed Black Cockatoo (FRTBC, *Calyptorhynchus banksii naso*) – Vulnerable.

The Preliminary Documentation (GHD 2019a) provides details of the predicted impacts of the Proposal to the above Matters on National Environmental Significance (MNES). This information is summarised below.

2.2 Existing environment

2.2.1 Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community

Main Roads commissioned GHD (2019b) to complete a biological survey during spring 2018 over the DE and its vicinity. GHD (2019b) concluded the BWSCP TEC covers approximately 349 ha over 13 patches within and in the vicinity of the DE. The largest patch accounts for approximately 82% (285 ha) of the mapped Banksia Woodland TEC, which is primarily within Neerabup National Park and outside the DE. The large patch within the Neerabup National Park includes a large area of Excellent condition vegetation, which occurs outside the DE.

GHD (2019b) concluded the DE covers 50.07 ha of BWSCP TEC over seven patches. Table 1 presents the condition of the TEC in the survey area and in the DE, which indicates the TEC within the DE is relatively degraded compared to that of surrounding vegetation, particularly in the Neerabup National Park.

Table 1 Banksia Woodlands of the Swan Coastal Plain TEC

Vegetation condition	Area within total survey area (ha)	Area within DE (ha)
Excellent	50.22	0
Excellent-Very Good	110.51	4.41
Very Good	114.51	16.74
Very Good-Good	28.85	5.61
Good	27.61	13.73
Good-Degraded	12.62	6.52
Degraded	4.79	2.53
Degraded-Completed Degraded	0.53	0.53
Total	**349.64**	**50.07**

2.2.2 Black Cockatoo habitat

Black Cockatoo habitat

GHD (2019b) identified a total of 328 potential breeding trees within the DE, as presented in Table 2. Of these trees, eight had hollows suitable for Black Cockatoo breeding. These trees

had between one to four potentially suitable hollows present for a total of 22 suitable hollows. The 22 suitable hollows were monitored in August, November and January/February 2018/2019, during which no Black Cockatoo use was evident or recorded (GHD 2019b).

Table 2 Potential Black Cockatoo breeding tress within the DE

Tree species	Number of potential breeding trees	Number of trees with suitable hollows (large or signs of use)	Number of suitable hollows (large/medium or signs of use)*
Tuart	256	8	22
Jarrah	58	-	-
Marri	11	-	-
Flooded Gum	2	-	-
Other eucalypt species	1	-	-
Total	328	8	22

GHD (2019b) surveyed 29 tree plots in the extended survey area, recording an average of approximately 20.8 potential breeding trees per ha (GHD 2019b). This density of trees was comparable to the density recorded in the DE. The tree plot data suggests the survey area outside the DE may support in the order of 2800 potential breeding trees, within the Tuart forest and Jarrah woodland mapped in the survey area outside the DE. Potential breeding trees may also be present in other areas including Banksia woodlands and cleared/disturbed areas.

GHD (2019b) mapped approximately 132 ha of foraging habitat for Carnaby's Cockatoo and approximately 104 ha of foraging habitat for Forest Red-tailed Black Cockatoo within the DE, as presented in Table 3

Table 3 Black Cockatoo foraging habitat

Habitat type	Carnaby's Cockatoo foraging habitat – by condition (ha)			Forest Red-tailed Black Cockatoo foraging habitat – by condition (ha)		
	High	Medium	Low	High	Medium	Low
Banksia woodland	61.50	-	-	-	61.50	-
Tuart forest	-	8.56	-	-	8.56	-
Jarrah woodland	6.29	-	-	6.29	-	-
Mixed Heathland	27.82	-	-	-	-	-
Scattered natives over weeds, Cleared/highly disturbed	-	-	20.59	-	-	20.59
Revegetation	-	-	7.31	-	-	7.31
Total foraging habitat	**95.61**	**8.56**	**27.90**	**6.29**	**70.06**	**27.90**

GHD (2019b) recorded potential roosting trees within the buffer zone but outside of the DE, close to the intersection of Wanneroo Road and Romeo Road. No roosting was recording during the biological survey, however the Tuart forest and Jarrah woodland vegetation within the DE has potential to support roosting habitat (GHD 2019a).

The DE and adjacent vegetation is considered to represent breeding habitat for Carnaby's Cockatoo, due to the availability of potential breeding trees and quality foraging resources (GHD 2019a). The DE and adjacent vegetation is not considered to breeding habitat for Forest Red-tailed Black Cockatoo, lying well away from recorded breeding areas and being devoid of large Marri trees with suitable hollows (GHD 2019a).

Other threatened ecological communities and threatened species

The biological survey (GHD 2019b) did not record any other EPBC Act listed threatened ecological communities or threatened flora or fauna species within the survey area.

2.2.3 Predicted impacts

The Proposal will result in significant residual direct impacts to BWSCP TEC, Carnaby's Cockatoo and FRTBC, through the following direct impacts:

- Clearing of up to 50.07 ha of BWSCP TEC
- Clearing of up to 328 potential breeding trees for Carnaby's Cockatoo
- Clearing of up to eight trees containing between one and four potentially suitable hollows for Black Cockatoo nesting (up to 22 potentially suitable hollows total)
- Clearing of up to 95.61 ha of high quality foraging habitat, 8.56 ha of medium quality foraging habitat and 27.90 ha of low quality foraging habitat for Carnaby's Cockatoo
- Clearing of up to 6.29 ha of high quality foraging habitat, 70.06 ha of medium quality foraging habitat and 27.90 ha of low quality foraging habitat for FRBTC.

The Proposal will not result in impacts to known nesting hollows of Carnaby's Cockatoo. The Proposal is not expected to result in impacts to FRTBC breeding habitat.

The above estimates are conservative, representing the full extent of MNES values within the 249 ha DE which represents the preliminary impact footprint. The actual clearing footprint is expected to be less and will be refined through the detailed design and construction planning process.

Based on the current concept design, Main Roads estimates approximately 60 ha of native vegetation within the DE will either be retained or landscaped/revegetated with a mix of local, native species suitable as Carnaby's Cockatoo and FRTBC foraging habitat.

The Proposal is not expected to result in significant indirect impacts to BWSCP TEC, Carnaby's Cockatoo or FRTBC. The Proposal will not fragment TEC or Black Cockatoo habitat, with clearing being limited to the edges of existing disturbed corridors and the Butler urban residential area.

3. Proposed environmental offsets

3.1 Overview of offset package

Main Roads have pursued a number of options in developing a package of offsets to counterbalance the significant residual impacts of the Proposal to BWSCP TEC, Carnaby's Cockatoo and FRTBC. The options investigated have comprised acquisition of land and provision of funding. Table 4 provides an overview of the offset package under consideration, with offset property locations presented in Figure 2. Details of Offset 3 (including locality) remains commercial in confidence at this time and will be provided upon the outcome of commercial negotiations.

The direct offsets involve acquisition of land by the Crown and land transfer to the conservation estate, which will enable land management by DBCA as the lead agency in WA responsible for conservation management. DBCA will be responsible for vesting the land with the Conservation and Parks Commission of WA, which will provide a conservation mechanism to maintain the offset ecological values in perpetuity.

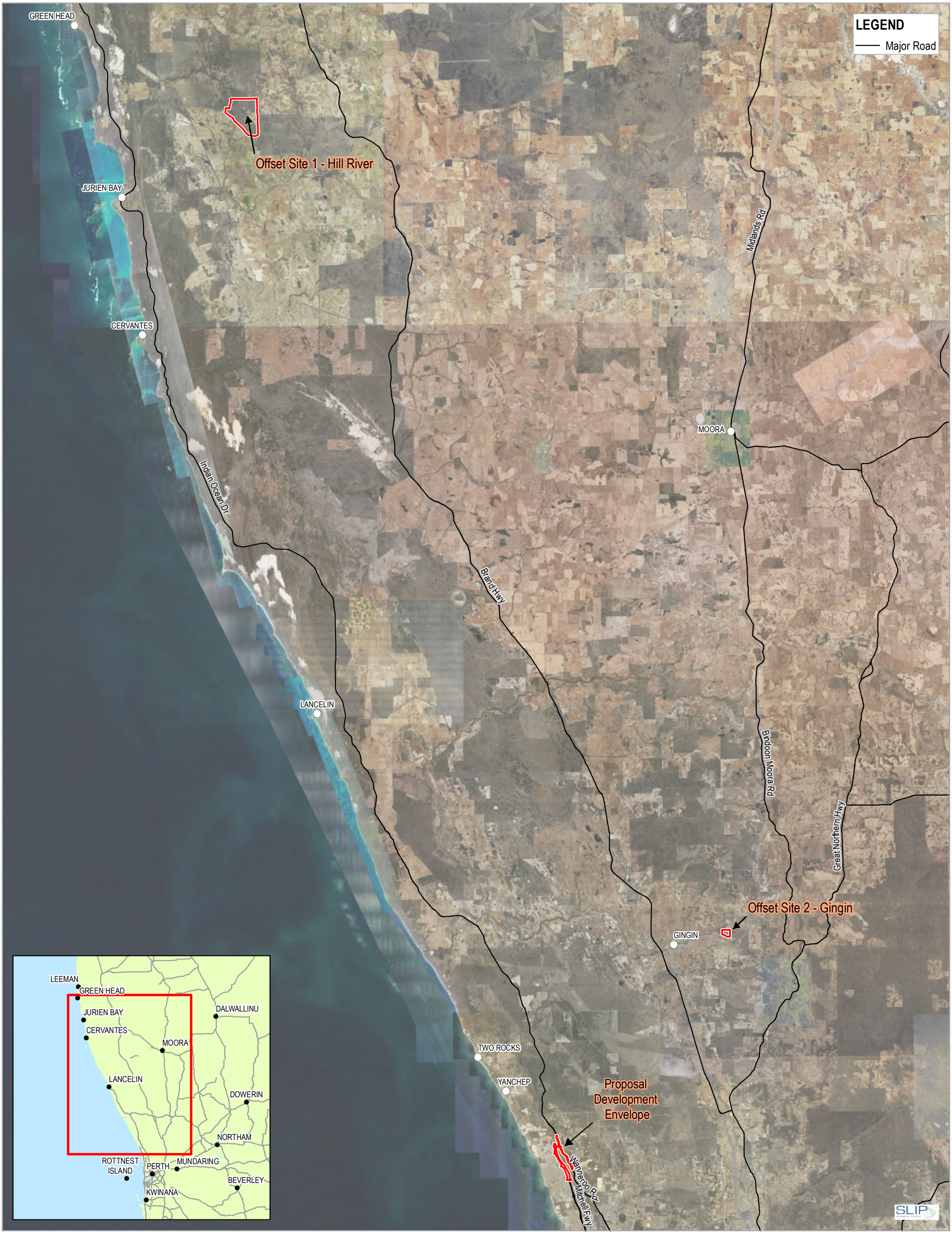
Main Roads is liaising with DBCA regarding acquisition of suitable land in order to meet offset requirements and intends to have all required offsets in place within 12 months of commencement of construction.

Table 4 Overview of offset package under consideration

No.	Offset type	Offset summary	Property location	Existing tenure
1	Direct	Land transfer to DBCA	Lot 1 on Plan 62729, Bannovich Road, Hill River WA	Freehold owned by Main Roads
2	Direct	Land transfer to DBCA	Lots 1921 and 2342, Ashworth Road, Gingin WA	Crown Reserve 24560 C Class – Gravel
3	Direct	Land transfer to DBCA	Confidential pending survey and commercial negotiations	Freehold owned by third party
4	Direct	Funding contribution to WA Offsets Fund Provisional sum $492,800 based on a 140 ha unimproved rural freehold property in Shire of Gingin, providing BWSCP TEC		
5	Indirect	Funding contribution to Murdoch University Research Proposal: Conservation Management for the long-term survivorship of Black Cockatoos endemic to the south-west of Western Australia: the application of telemetry to determine spatial ecology on the Perth-Peel Coastal Plain, south-west forest region and key breeding sites in response to a changing environment.		

3.2 Description of offsets

The components of the offset package are described below. Offset 1 has been subject to survey, whereas the values of offsets 2 and 3 are inferred through publicly available mapping, site inspection and aerial imagery. Main Roads are confirming the values of offsets 2 and 3 through survey and consultation with DBCA.



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Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

Main Roads Western Australia
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Location Map

Project No. **61-38302**
Revision No. **0**
Date **6/09/2019**

FIGURE 2

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Data source: GHD: Proposal Development Envelope - 20190815; MRWA: Road network - 20190114; LGATE: Imagery - August 2018; Geoscience Australia: Geodata topo series 3. Created by: afeeney

3.2.1 Offset 1 – Banovich Road, Hill River

Offset 1 comprises a 200 ha portion of a 1933 ha property located at Hill River, near Jurien Bay. Main Roads has previously acquired the property with the intention of utilising the property as an offset for multiple projects. Several portions of the property have been used to date as an offset, with 988 ha remaining unallocated. The property has been extensively surveyed and its ecological attributes are well documented.

Main Roads engaged GHD (2019c) to review the biological attributes of the unallocated portions of the Hill River property, as presented in Appendix A. GHD (2019c) concluded the property retains a total of 523.88 ha of breeding habitat and 765.18 ha of foraging habitat for Carnaby's Black Cockatoo, as presented in Figure 3 and summarised below:

Breeding and foraging habitat:

- 215.08 ha Wandoo woodland (VT04 & VT10)
- 308.80 ha Marri woodland (VT09).

Foraging habitat:

- 128.37 ha Xanthorrhoea and Kingia heathland (VT06)[1]
- 6.00 ha *Banksia attenuata* open heathland (VT11)
- 74.50 ha *Eucalyptus todtiana, Banksia attenuata/ menziesii* low open woodland (VT05)
- 21.10 ha scattered trees of Wandoo and Marri in Paddock (VT14)[2].

GHD (2019c) concluded the 523.88 ha of breeding habitat contains an estimated 11,200 Wandoo potential breeding trees (diameter at breast height, DBH > 300 mm) and 7,400 Marri potential breeding trees (DBH > 500 mm). Two actual breeding events were recorded at the site, with four additional trees present with hollows considered highly likely to support actual breeding (GHD 2019c).

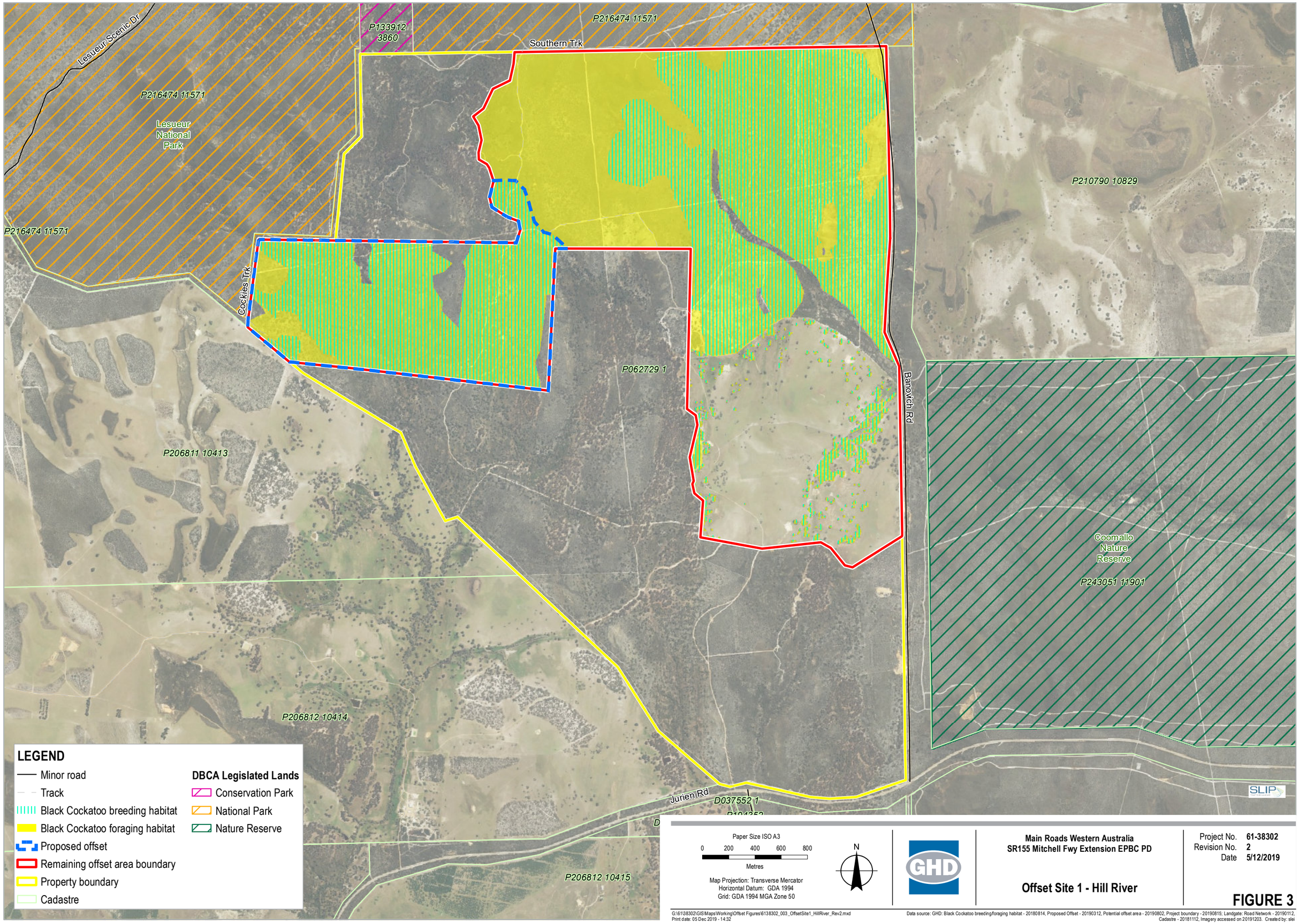
Offset 1 does not comprise vegetation representative of the BWSCP TEC, and is outside the distribution of FRTBC.

Main Roads propose that Offset 1 comprise an approximate 239 ha portion of the unallocated land at the Hill River property (Figure 3) to provide a contiguous connection with adjacent property boundaries. The 239.47 ha portion contains the following Black Cockatoo habitat:

- 91.24 ha Wandoo woodland (VT04 & VT10)
- 103.81 ha Marri woodland (VT09).
- 23.57 ha other Black Cockatoo foraging habitat (VT05, VT06, VT11)
- 20.85 ha other native vegetation (VT07, VT08, VT12).

Based on tree plot data (GHD 2016) the Wandoo woodland (VT04 & VT10) is estimated to contain approximately 52 Wandoo potential breeding trees per ha and the Marri woodland (VT09) is estimated to contain approximately 24 Wandoo potential breeding trees per ha. Accordingly, the 239 ha offset area is estimated to contain approximately 4700 Wandoo and 2500 Marri potential breeding trees.

[1] Including Xanthorrhea, Banksia and Hakea foraging species.
[2] The remaining 224.48 ha of VT14 comprises cleared paddock that does not provide foraging habitat.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Black Cockatoo breeding habitat
Black Cockatoo foraging habitat
Proposed offset
Remaining offset area boundary
Property boundary
Cadastre
DBCA Legislated Lands
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National Park
Nature Reserve
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Main Roads Western Australia
SR155 Mitchell Fwy Extension EPBC PD
Offset Site 1 - Hill River
Project No. 61-38302
Revision No. 2
Date 5/12/2019
FIGURE 3
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Print date: 05 Dec 2019 - 14:32
Data source: GHD: Black Cockatoo breeding/foraging habitat - 20180814, Proposed Offset - 20190312, Potential offset area - 20190802, Project boundary - 20190815; Landgate: Road Network - 20190112, Cadastre - 20181112, Imagery accessed on 20191203. Created by: slei

3.2.2 Offset 2 – Ashworth Road, Gingin

Offset 2 comprises Crown Reserve 24560, a 110 ha property located at Gingin. The property is a Class C Gravel Reserve vested in Main Roads. A small portion of the property (less than 0.7%) is currently used as a gravel reserve, with the remainder covered by remnant vegetation (see Figure 4).

Main Roads engaged Focused Vision Consulting to conduct ecological surveys at the property. Interim survey results (Focused Vision 2019, Appendix B) indicate that the property contains 43.53 ha of Banksia (*B. attenuata*, *B. menziesii*) woodland in predominantly Very Good-Excellent to Good condition, forming part of a broader 375.29 ha patch of Banksia woodland. Based on the species, condition and size of the patch, the Banksia woodlands within the property are considered eligible for inclusion as the BWSCP TEC (Focused Vision 2019).

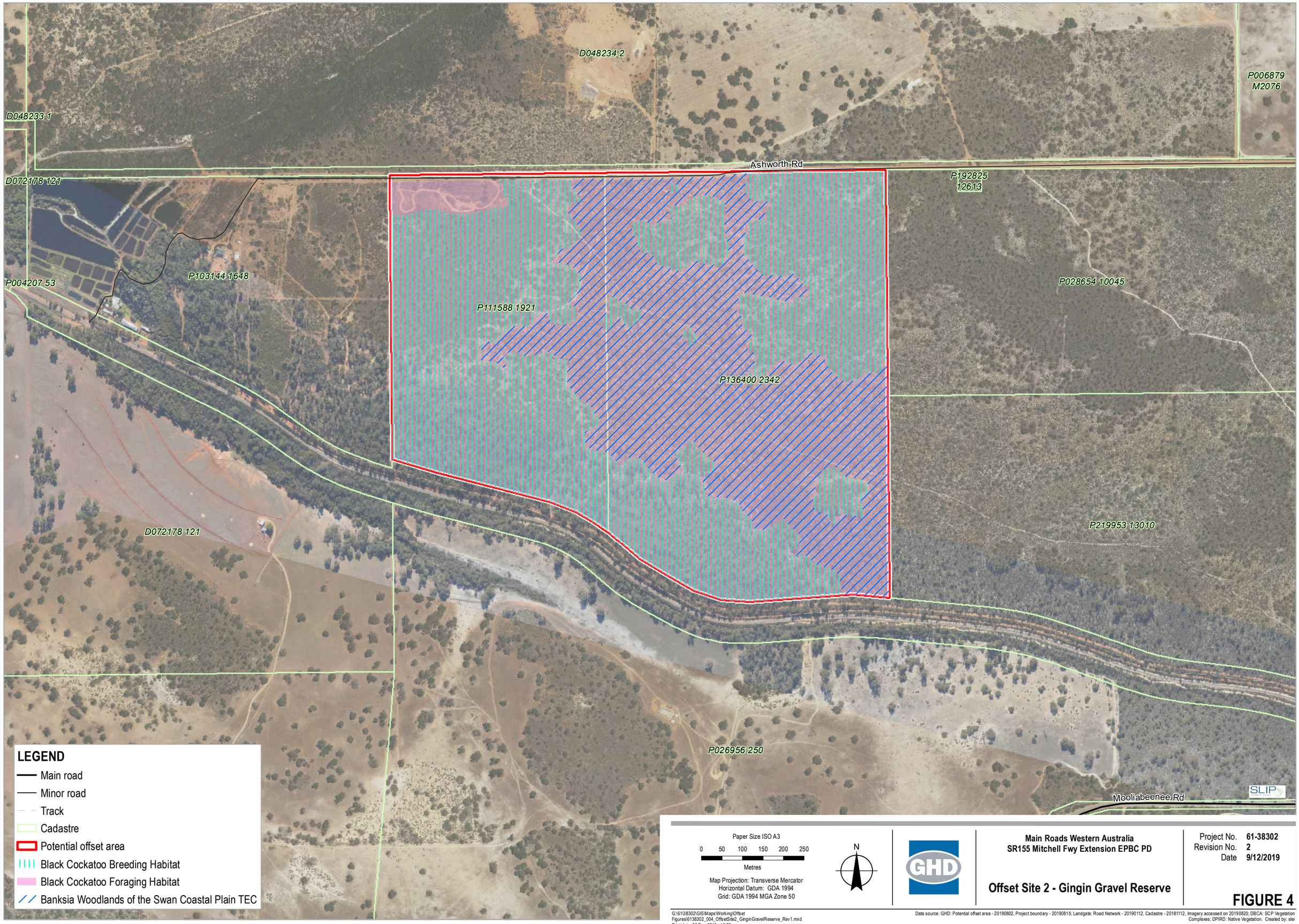
The property is well within the distribution of Carnaby's Cockatoo and the BWSCP TEC, and at the northern end of the distribution of FRTBC.

The interim survey results indicates that all mapped vegetation units (108.67 ha) are likely to be foraging habitat for Carnaby's Cockatoo and 63.01 :eight trees with suitable hollows and evidence of use (e.g. chew marks)

- 147 trees with potentially suitable hollows and no evidence of use)
- 446 potential breeding trees with no visible hollows.

The 62.01 ha of EmXp vegetation is expected to provide foraging habitat for FRTBC.

Main Roads propose that Offset 2 comprise the full 110 ha portion of Crown Reserve 24560, providing up to 109 ha of habitat for Carnaby's Cockatoo, up to 63 ha of habitat for FRTBC, and up to 44 ha of BWSCP TEC.



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

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GHD

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Offset Site 2 - Gingin Gravel Reserve

Project No. **61-38302**
Revision No. **2**
Date **9/12/2019**

FIGURE 4

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Print date: 09 Dec 2019 - 15:28

Data source: GHD: Potential offset area - 20190802, Project boundary - 20190815; Landgate: Road Network - 20190112, Cadastre - 20181112, Imagery accessed on 20190820; DBCA: SCP Vegetation Complexes; DPIRD: Native Vegetation. Created by: slei

3.2.3 Offset 3 – Confidential property acquisition

Offset 3 comprises properties currently under investigation by DBCA, and have yet to be negotiated with land owners or subject to surveys. Based on their location and a review of aerial imagery the properties are expected to comprise at least 500 ha of habitat for Black Cockatoos. The properties lie off the Swan Coastal Plain and are not expected to contain BWSCP TEC.

Main Roads are consulting with DBCA to confirm the availability and commercial terms to acquire the property. Should the property be suitable for acquisition, Main Roads will arrange for surveys to confirm the ecological values present, including the habitat and usage by Black Cockatoos.

Main Roads propose that Offset 3 comprise a portion of the properties, providing up to 190 ha of habitat for Carnaby's Cockatoo and FRTBC.

3.2.4 Offset 4 – Contribution to WA Offsets Fund

Offset 4 comprises a provisional sum of $492,800 to the WA Offsets Fund. The provisional sum is in acknowledgement that Offset 2 provides an estimated 48% direct offset for significant residual impacts to BWSCP TEC (see Section 5 and Table 15), with no property yet identified for the remaining 52% offset.

Main Roads are working with DBCA to identify suitable properties for the remaining 52% offset. In the interim, the offset strategy includes a provisional sum for acquisition of a suitable property for transfer to the conservation estate.

To offset the remaining 52% of impacts, the suitable property is estimated to require 140 ha of BWSCP TEC in very good to excellent condition. For the purposes of financial provision, it is assumed that a 140 ha rural freehold property is acquired on the northern Swan Coastal Plain. The value of un-improved (vegetated) rural land in the Shire of Gingin is estimated by the Valuer-General at $3,520/hectare, which for 140 ha equates to a sum of $492,800.

The acquisition of an additional property for BWSCP TEC is likely to provide an additional offset for Carnaby's Cockatoo and potentially for FRTBC. Such additional offsets are not accounted for in the offset package in order to provide maximum flexibility for securing a suitable offset for the BWSCP TEC.

3.2.5 Offset 5 – Murdoch University Research Proposal

Offset 5 comprises an indirect offset through funding contribution for a Murdoch University Research Proposal. Appendix C provides details of the Research Proposal, which is titled:

Murdoch University Research Proposal - Conservation Management for the long-term survivorship of black cockatoos endemic to the south-west of Western Australia: the application of telemetry to determine spatial ecology on the Perth-Peel Coastal Plain, south-west forest region and key breeding sites in response to a changing environment.

The Research Proposal is proposed to commence in 2019 and generate data to identify key habitats and areas for conservation/revegetation, determining threatening processes for Black Cockatoo species across their range, and information decision making in relation to conservation and land management planning at both State and Commonwealth government levels. The Research proposal addresses major priority actions in the Carnaby's Cockatoo and FRTBC recovery plans and is fully supported by the chairs of the Carnaby's Cockatoo and FRBC recovery teams.

Main Roads propose to contribute a total of $406,970 in funding for the Research Proposal, a portion of which provides a 10% indirect offset for the Proposal's significant residual impacts to Carnaby's Cockatoo and FRTBC.

Appendix C includes an assessment of the Research Proposal against the criteria for research programs specified in Appendix A of the EPBC Act Environmental Offsets Policy (DSEWPaC 2012). As presented in Appendix C, the Research Proposal is consistent with the relevant criteria under the EPBC Act Environmental Offsets Policy.

4. Offset guide inputs and justification

4.1 Assumptions

The preliminary offset calculations undertaken for Offsets 1-4 have been based on the available information for the properties. Offsets 1 and 2 have been subject to field survey, whereas Offset 3 has been characterised based on publicly available mapping and aerial imagery.

The suitability of each Offset site for Carnaby's Cockatoo, FRTBC and BWSCP TEC is detailed in Section 3.2 and summarised in Table 15. Offsets 1-3 are all suitable for Carnaby's Cockatoo, Offsets 2-3 are suitable for FRTBC, and Offset 2 is suitable for BWSCP TEC. The suitability of Offsets 2 and 3 will be confirmed through survey and/or consultation with DBCA.

4.2 Carnaby's Black Cockatoo

Table 5 to Table 8 provide the inputs used in the EPBC Offset Assessment Guide in relation to Carnaby's Cockatoo.

Table 5 Impact Calculator, Carnaby's Cockatoo

Attribute	Value	Justification
Area of impact	132 ha	Approximately 95.6 ha of high quality habitat, 8.6 ha of medium quality foraging habitat and 27.9 ha of low quality foraging habitat, as assessed by GHD (2019b).
Quality	8	Average score against three criteria: • Site condition • Site context • Stocking rate. The score for each criteria is discussed below.
Site condition	9	A moderate to strong score is provided considering an area-weighted scoring for foraging habitat quality across the Development Envelope, as follows: • High quality – score 10 x 72% of habitat area • Quality – score 7 x 7% of habitat area • Low quality – score 5 x 21% of habitat area. The area-weighted score is 8.75. The strong score reflects the diversity of foraging habitat resources provided by the Banksia woodlands and mixed heath in predominantly Very Good to Good condition, with a lower diversity of resources in disturbed areas. The score reflects a portion of habitat (35 ha or 26%) comprising Tuart forest, Jarrah woodland and disturbed roadside areas that may provide potential breeding habitat (noting that the disturbed roadside areas are low quality foraging habitat). Within these areas the DE contains 328 potential breeding trees including eight trees with suitable hollows for breeding (22 hollows total). No evidence of breeding was recorded at the suitable hollows during monitoring in the 2018/2019 breeding season. The closest breeding record is approximately 14 km to the south. The score reflects a small portion of habitat (14 ha or 11%) comprising Tuart forest and Jarrah woodland that may provide roosting habitat for the species. No water sources lie within the DE, however water sources are present at Nowergup and Carabooda Lakes, approximately 500 m east of the DE.
Site context	6	A moderate score is provided as the DE lies at the interface of existing disturbed areas along Wanneroo Road, Romeo Road, Perth-Butler Railway and the Butler urban residential area. The

		DE is predominantly (95%) outside the Neerabup National Park and Neerabup Nature Reserve, which provide core habitat for the species. The DE is subject to threatening processes to habitat associated with informal access and weed invasion along the interface with the disturbed areas. The DE is anticipated to be relatively resistant to Dieback spread and expression due to the presence of well drained, calcareous soils. The DE represents approximately 2.2% of approximately 6047 ha of Carnaby's Cockatoo habitat remaining within 5 km of the DE, of which 3060 ha (51%) is protected in Bush Forever sites and/or DBCA managed lands. The DE lies well within the range of the species distribution within the northern Perth metropolitan region. The extensive, well reserved areas in the vicinity are expected to provide suitable foraging, roosting and potential breeding resources for the highly mobile species, including in the order of 100,000 potential breeding trees.
Species stocking rate	6	A moderate score is provided as the DE is known to support foraging and occupation by the species, but has an absence of breeding and roosting evidence. The DE is expected to play a minor role in sustaining the overall species population viability as the species forages and migrates across the Swan Coastal Plain each year. The DE is known to support foraging and occupation by the species, with observations at approximately ten locations and recorded groups of up 17 birds. The score reflects the presence of 104.17 ha of quality foraging habitat, as well as 35.44 ha of potential breeding habitat and potential roosting habitat in Tuart forest, Jarrah woodland and disturbed roadside vegetation. The score reflects the absence of breeding evidence in suitable hollows within the DE during the 2018/19 breeding period, and that the closest breeding record is 14 km to the south. The score reflects the absence of roost trees identified in the DE. The score reflects limited roosting recorded at nearby monitoring sites at Lakes Carabooda, Nowergup and Neerabup during the Great Cocky Count over the past five years.

Table 6 Offset Calculator, Carnaby's Cockatoo – Offset 1 Hill River

Attribute	Value	Justification
Offset area	219 ha	A 240 ha portion of the property will be allocated to the offset, comprising 195 ha foraging and breeding habitat and 24 ha foraging habitat for Carnaby's Cockatoo.
Start quality	9	Site condition: Survey indicates vegetation predominantly in Pristine or Excellent condition with suitable understorey for foraging. High biological diversity, with ten vegetation types identified which provide habitat. Stocking rate: Known populations of Black Cockatoos recorded during survey. Estimated potential breeding trees at 4,700 Wandoo trees (DBH > 300 mm) and 2,500 Marri trees (DBH > 500 mm) within the 195 ha of breeding habitat. Site context: Site is part of a large vegetated band that provides continuous habitat for Black Cockatoo species. Site is less prone to threatening processes such as weed invasion. Site has high value as future habitat.
Future quality without offset	8	Vegetation may deteriorate without management and site will benefit from transfer to the conservation estate.

Future quality with offset	9	No rehabilitation proposed. Land will be managed for conservation of existing values.
Time over which loss is averted	20 years	Land will be transferred to conservation estate so long term protection is afforded. Twenty years is the maximum value that can be input.
Time until ecological benefit	1 year	Property is freehold owned by Main Roads and will be immediately transferred to conservation estate.
Risk of loss without offset	15%	Low risk as property is freehold owned by Main Roads, zoned Rural under Shire of Dandaragan Local Planning Scheme No. 7. No approval for development.
Risk of loss with offset	5%	Very low risk through protection of conservation estate.
Confidence in result	90%	High degree of confidence. Habitat values have been confirmed through survey and property is freehold owned by Main Roads.

Table 7 Offset Calculator, Carnaby's Cockatoo – Offset 2 Gingin

Attribute	Value	Justification
Offset area	109 ha	An approximate 110 ha portion of the property will be allocated to the offset and based on the survey results (Focused Vision 2019) contains 63 ha foraging and breeding habitat and 46 ha foraging habitat for Carnaby's Cockatoo.
Start quality	9	Site condition: Survey indicates Banksia woodland is predominantly in Very Good-Excellent to Good condition with only a small area of Degraded-Good condition. Property contains 601 potential breeding trees, including 147 with hollows suitable for use and 8 with suitable hollows showing evidence of use. Stocking rate: Site lies well within the species range, including 601 potential breeding trees with 8 potential breeding trees having suitable hollows showing evidence of use. Site context: Site is bordered by native vegetation on three sides and part of a large vegetated band that provides more extensive habitat for Black Cockatoo species. Site is less prone to threatening processes such as weed invasion. Site has high value as future habitat.
Future quality without offset	5	Site reserved for gravel extraction, zoned for Public Use (Service and Infrastructure) under Shire of Gingin Local Planning Scheme No. 9. Expect future gravel extraction is likely to occur over a portion of the site if not transferred to conservation estate, impacting site context and condition as well as stocking rate.
Future quality with offset	9	No rehabilitation proposed. Land will be managed for conservation of existing values.
Time over which loss is averted	20 years	Land will be transferred to conservation estate so long term protection is afforded. Twenty years is the maximum value that can be input.
Time until ecological benefit	1 year	Property is a reserve vested in Main Roads. Administrative arrangements to transfer to the conservation estate will commence immediately.
Risk of loss without offset	50%	High risk of loss with future gravel extraction under current land tenure and zoning.
Risk of loss with offset	5%	Very low risk through protection of conservation estate.
Confidence in result	90%	High degree of confidence. Property will be surveyed to confirm values and is a reserve vested in Main Road

Table 8 Offset Calculator, Carnaby's Cockatoo – Offset 3 Confidential

Attribute	Value	Justification
Offset area	~ 190 ha	Based on their location and a review of aerial imagery the properties are expected to comprise at least 500 ha of habitat for Carnaby's Cockatoo. A 190 ha portion of the property will be allocated to the offset, primarily to counterbalance impacts to FRTBC but also to provide offset for Carnaby's Cockatoo.
Start quality	8	Excellent habitat quality based on the large, contiguous size of the parcel of land. Aerial imagery indicates minimal previous clearing within the property. Large area likely to provide resistance against edge effects from adjacent cleared lands. Site lies well within the range of Carnaby's Cockatoo. Large areas of remnant vegetation, expected to comprise species habitat, lie within a few km of the site. Quality assumes survey evidence for use by FRTBC.
Future quality without offset	7	Vegetation may deteriorate without management and site will benefit from transfer to the conservation estate.
Future quality with offset	8	No rehabilitation proposed. Land will be managed for conservation of existing values.
Time over which loss is averted	20 years	Land will be transferred to conservation estate so long term protection is afforded. Twenty years is the maximum value that can be input.
Time until ecological benefit	1 year	Property will be acquired and immediately transferred to conservation estate.
Risk of loss without offset	15%	Low risk as property is zoned rural and unlikely to be developed in the near future.
Risk of loss with offset	5%	Very low risk through protection of conservation estate.
Confidence in result	90%	High degree of confidence, property will be surveyed to confirm habitat values and then purchased for transfer to the conservation estate.

4.3 Forest Red-tailed Black Cockatoo

Table 9 to Table 11 provide the inputs used in the EPBC Offset Assessment Guide in relation to FRTBC.

Table 9 Impact Calculator, FRTBC

Attribute	Value	Justification
Area of impact	104 ha	6.3 ha of high quality habitat, 70.1 ha of medium quality foraging habitat and 27.9 ha of low quality foraging habitat, as assessed by GHD (2019b).
Quality	6	Average score against three criteria: • Site condition • Site context • Stocking rate. The score for each criteria is discussed below.
Site condition	7	A moderate score is provided considering an area-weighted scoring for foraging habitat quality across the Development Envelope, as follows: • High quality – score 10 x 6% of habitat area • Quality – score 7 x 67% of habitat area • Low quality – score 5 x 27% of habitat area.

		The area-weighted score is 6.65. The moderate score reflects the predominance of Banksia woodlands and Tuart forest within the DE and moderate presence of Marri, Jarrah and Sheok which comprise the main foraging species for FRTBC. The score reflects the lack of breeding habitat for FRTBC, given the lack of mature Marri or Jarrah trees with suitable hollows and the 30 km distance to the closest recorded breeding areas to the east. FRTBC range extension on the Swan Coastal Plain, including the northern Perth metropolitan area, is predominantly for foraging and not for breeding. The score reflects a small portion of habitat (15 ha or 11%) comprising Tuart forest and Jarrah woodland that may provide roosting habitat for the species. No water sources lie within the DE, however water sources are present at Nowergup and Carabooda Lakes, approximately 500 m east of the DE. These have recorded limited roosting for FRTBC during the Great Cocky Count.
Site context	6	A moderate score is provided as the DE lies at the interface of existing disturbed areas along Wanneroo Road, Romeo Road, Perth-Butler Railway and the Butler urban residential area. The DE is predominantly (95%) outside the Neerabup National Park and Neerabup Nature Reserve. The DE is subject to threatening processes to habitat associated with informal access and weed invasion along the interface with the disturbed areas. The DE is anticipated to be relatively resistant to Dieback spread and expression due to the presence of well drained, calcareous soils. The DE represents approximately 1.9% of approximately 5353 ha of FRTBC habitat remaining within 5 km of the DE, of which 2847 ha (51%) is protected in Bush Forever sites and/or DBCA managed lands. The DE lies on the northern edge of the species distribution, associated with a recent expansion of foraging activity onto the Swan Coastal Plain. The Swan Coastal Plain does not comprise important breeding habitat for the species, which lies within the Darling Scarp/Plateau.
Species stocking rate	6	A moderate score is provided as the DE is known to support foraging and occupation by the species, with observations in Jarrah woodland and disturbed roadside vegetation in the DE. Survey recorded groups of up to seven birds within the DE. The score reflects the presence of 76 ha of medium to high quality foraging habitat, as well as 15 ha of potential roosting habitat in Tuart forest and Jarrah woodland. The score reflects the lack of breeding habitat within the DE and lack of breeding habitat in the Swan Coastal Plain.

Table 10 Offset Calculator, FRTBC – Offset 2 Gingin

Attribute	Value	Justification
Offset area	50 ha	An approximate 110 ha portion of the property will be allocated to the offset and based on survey (Focused Vision 2019) approximately 63 ha is expected to comprise habitat for FRTBC.
Start quality	8	Site condition: Survey indicates presence of foraging habitat in Jarrah and Marri woodland. Majority of site is in good condition with degraded limited to a small gravel extraction area and tracks. Property contains 601 potential breeding trees, including 147 with hollows suitable for use and 8 with suitable hollows showing evidence of use. Stocking rate: Site lies at the northern end of the species range.

		Site context: Site is bordered by native vegetation on three sides and part of a large vegetated band that provides more extensive habitat for Black Cockatoo species. Site is less prone to threatening processes such as weed invasion. Site has high value as future habitat.
Future quality without offset	5	Site reserved for gravel extraction, zoned for Public Use (Service and Infrastructure) under Shire of Gingin Local Planning Scheme No. 9. Expect future gravel extraction is likely to occur over a portion of the site if not transferred to conservation estate, impacting site context and condition as well as stocking rate.
Future quality with offset	8	No rehabilitation proposed. Land will be managed for conservation of existing values.
Time over which loss is averted	20 years	Land will be transferred to conservation estate so long term protection is afforded. Twenty years is the maximum value that can be input.
Time until ecological benefit	1 year	Property is a reserve vested in Main Roads. Administrative arrangements to transfer to the conservation estate will commence immediately.
.07Risk of loss without offset	50%	High risk of loss with future gravel extraction under current land tenure and zoning.
Risk of loss with offset	5%	Very low risk through protection of conservation estate.
Confidence in result	90%	High degree of confidence. Property will be surveyed to confirm values and is a reserve vested in Main Road

Table 11 Offset Calculator, FRTBC – Offset 3 Confidential

Attribute	Value	Justification
Offset area	~ 190 ha	Based on their location and a review of aerial imagery the properties are expected to comprise at least 500 ha of habitat for FRTBC. A 190 ha portion of the property will be allocated to the offset, primarily to counterbalance impacts to FRTBC but also to provide offset for Carnaby's Cockatoo.
Start quality	8	Excellent habitat quality based on the large, contiguous size of the parcel of land. Aerial imagery indicates minimal previous clearing within the property. Large area likely to provide resistance against edge effects from adjacent cleared lands. Large areas of remnant vegetation, expected to comprise Black Cockatoo habitat, lie within a few km of the site. Quality assumes survey evidence for use by FRTBC.
Future quality without offset	7	Vegetation may deteriorate without management and site will benefit from transfer to the conservation estate.
Future quality with offset	8	No rehabilitation proposed. Land will be managed for conservation of existing values.
Time over which loss is averted	20 years	Land will be transferred to conservation estate so long term protection is afforded. Twenty years is the maximum value that can be input.
Time until ecological benefit	1 year	Property will be acquired and immediately transferred to conservation estate.
Risk of loss without offset	15%	Low risk as property is zoned rural and unlikely to be developed in the near future.
Risk of loss with offset	5%	Very low risk through protection of conservation estate.
Confidence in result	90%	High degree of confidence, property will be surveyed to confirm habitat values and then purchased for transfer to the conservation estate.

4.1 Banksia Woodland of the Swan Coastal Plain TEC

Table 12 to Table 14 provide the inputs used in the EPBC Offset Assessment Guide in relation to BWSCP TEC.

Table 12 Impact Calculator, BWSCP TEC

Attribute	Value	Justification
Area of impact	50 ha	50 ha of BWSCP TEC was identified within the DE, as assessed by GHD (2019b).
Quality	6	Average score against three criteria: • Site condition • Site context • Stocking rate. The score for each criteria is discussed below.
Site condition	6	A moderate score is provided based on an area-weighted scoring of TEC condition across the Development Envelope, as follows: • Pristine – score 10 x 0% of TEC area • Excellent – score 9 x 0% of TEC area • Excellent – Very Good – score 8 x 9% of TEC area • Very Good – score 7 x 34% of TEC area • Very Good – Good – score 6 x 11% of TEC area • Good – score 5 x 28% of TEC area • Good – Degraded – score 4 x 13% of TEC area • Degraded – score 3 x 5% of TEC area • Degraded – Completely Degraded – score 2 x 0% of TEC area • Completely Degraded – score 1 x 0% of TEC area. The area-weighted score is 5.82. The moderate score reflects the relatively degraded condition of vegetation within the DE compared to the adjacent Neerabup National Park and Neerabup Nature Reserve. The moderate score reflects the adequate species presence (*B. attenuata* and *B. menziesii,* emergent Sheok and Eucalypts, sclerophyllous understorey) and habitat features (deep Spearwood sands, 535-900 mm/year rainfall).
Site context	6	A moderate score is provided as the DE lies at the interface of existing disturbed areas along Wanneroo Road, Romeo Road, Perth-Butler Railway and the Butler urban residential area. The DE is predominantly (95%) outside the Neerabup National Park, which provides a core area of the TEC. The DE is subject to threatening processes associated with informal access and weed invasion along the interface with the disturbed areas. The DE is anticipated to be relatively resistant to Dieback spread and expression due to the presence of well drained, calcareous soils. The DE lies within the Cottesloe Vegetation Complex – Central and South which has a minor association with the TEC as per the Conservation Advice (TSSC 2016). Vegetation with stronger associations to the TEC lie to the north (Cottesloe Complex – North) and east (Karrakata Complex – Central and South). The TEC may be present within an estimated 5075 ha of native vegetation remaining within 5 km of the DE, of which 3047 ha (60%) is located in Bush Forever sites and DBCA managed lands. The DE lies well within the range of the TEC's distribution within the northern Perth metropolitan region.

Species stocking rate	6	A moderate score is provided as the DE represents a more common sub-community of the TEC and a small portion of an expected well reserved population of the TEC including large, contiguous patches in the northern Perth metropolitan region. The TEC provides moderate habitat for threatened species. The TEC within the DE comprises FCT 28 *Spearwood Banksia attenuata or Banksia attenuata – Eucalyptus woodlands*, which is a more common sub-community of the TEC (G). The DE represents approximately 2.4% of an estimated 5075 ha of native vegetation remaining within 5 km of the DE that may contain the TEC. Of this vegetation, approximately 3047 ha (60%) is protected in Bush Forever sites and/or DBCA managed lands. No conservation significant flora were recorded within the TEC or a 50 m buffer. The TEC provides quality foraging habitat for Carnaby's Cockatoo. A small portion (6%) of the TEC comprises Tuart forest which provides potential breeding and roosting habitat for Carnaby's Cockatoo. The majority of the TEC does not provide potential breeding or roosting habitat for the species. No other threatened fauna were recorded within the TEC. FRTBC were recorded foraging within the DE but outside the TEC, in vegetation such as Jarrah woodland and degraded roadside areas.

Table 13 Offset Calculator, BWSCP TEC – Offset 2 Gingin

Attribute	Value	Justification
Offset area	50 ha	An approximate 110 ha portion of the property will be allocated to the offset and based on the results of survey (Focussed Vision 2019) a 44 ha portion is expected to comprise BWSCP TEC.
Start quality	8	A start quality of 8 is utilised, based on an area weighted scoring of TEC condition and considering the significance of the wider TEC patch. An area-weighted scoring of TEC condition across the Development Envelope is as follows: • Pristine – score 10 x 0% of TEC area • Excellent – score 9 x 0% of TEC area • Excellent – Very Good – score 8 x 40% of TEC area • Very Good – score 7 x 19% of TEC area • Very Good – Good – score 6 x 20% of TEC area • Good – score 5 x 19% of TEC area • Good – Degraded – score 4 x 2% of TEC area • Degraded – score 3 x 0% of TEC area • Degraded – Completely Degraded – score 2 x 0% of TEC area • Completely Degraded – score 1 x 0% of TEC area. The area-weighted score is 6.77. The TEC forms part of a 375.29 ha patch is some of the eastern-most Banksia woodland in the region (Focussed Vision 2019). The score reflects the patch's extent and significance in the region and adequate species presence (*B. attenuata* and *B. menziesii*, sclerophyllous understorey).

Future quality without offset	5	Site reserved for gravel extraction, zoned for Public Use (Service and Infrastructure) under Shire of Gingin Local Planning Scheme No. 9. Expect future gravel extraction is likely to occur over a portion of the site if not transferred to conservation estate, impacting site context and condition as well as stocking rate.
Future quality with offset	8	No rehabilitation proposed. Land will be managed for conservation of existing values.
Time over which loss is averted	20 years	Land will be transferred to conservation estate so long term protection is afforded. Twenty years is the maximum value that can be input.
Time until ecological benefit	1 year	Property is a reserve vested in Main Roads. Administrative arrangements to transfer to the conservation estate will commence immediately.
Risk of loss without offset	50%	High risk of loss with future gravel extraction under current land tenure and zoning.
Risk of loss with offset	5%	Very low risk through protection of conservation estate.
Confidence in result	90%	High degree of confidence. Property will be surveyed to confirm values and is a reserve vested in Main Road

Table 14 Offset Calculator, BWSCP TEC – Offset 4 WA Offsets Fund

Attribute	Value	Justification
Offset area	140 ha	To offset the remaining 52% of impacts to BWSCP TEC, it is assumed that an un-improved (vegetated) rural freehold property is acquired on the northern Swan Coastal Plain.
Start quality	8	To meet the required offset it is assumed that the rural freehold property is un-improved contains BWSCP TEC in very good to excellent condition. Quality assumes survey evidence confirmed the presence, extent and condition of the BWSCP TEC.
Future quality without offset	7	Vegetation may deteriorate in a rural property without management and site will benefit from transfer to the conservation estate.
Future quality with offset	8	No rehabilitation proposed. Land will be managed for conservation of existing values.
Time over which loss is averted	20 years	Land will be transferred to conservation estate so long term protection is afforded. Twenty years is the maximum value that can be input.
Time until ecological benefit	1 year	Property will be acquired and immediately transferred to conservation estate.
Risk of loss without offset	15%	Low risk as property is assumed to be zoned rural and unlikely to be developed in the near future.
Risk of loss with offset	5%	Very low risk through protection of conservation estate.
Confidence in result	90%	High degree of confidence, property will be surveyed to confirm habitat values and then purchased for transfer to the conservation estate.

5. Counterbalance of significant residual impacts

Table 15 provides a summary of the offset package counterbalance of the significant residual impacts to BWSCP TEC, Carnaby's Cockatoo and FRTBC. Table 15 is based on preliminary offset calculations using the EPBC Act Offset Assessment Guide, as presented in Section 4 and Appendix D.

As presented in Table 15, the offset package is expected to provide adequate compensation for significant residual impacts to Carnaby's Cockatoo, FRTBC and BWSCP TEC, with surplus offset available for the impacts to Carnaby's Cockatoo.

Table 15 Summary of preliminary offset calculations

No.	Offset	MNES values confirmed	Carnaby's Black Cockatoo Residual impact: 132 ha x quality 9 = 118.86 ha total		Forest Red-tailed Black Cockatoo Residual impact: 105 ha x quality 6 = 63.00 ha total		Banksia Woodland TEC Residual impact: 50.1 ha x quality 6 = 30.06 ha total	
			Offset area (ha)	% of impact offset	Offset area (ha)	% of impact offset	Offset area (ha)	% of impact offset
1	Banovich Road, Hill River	Confirmed: surveyed	219	26%	Site not suitable		Site not suitable	
2	Ashworth Road, Gingin	Confirmed: surveyed	109	43%	63	45%	44	48%
3	Confidential	Inferred: survey underway	190	21%	190	46%	Site not suitable	
4	WA offset fund contribution	Provisional sum $492,800	Purchased land likely to contain Carnaby's Cockatoo habitat but is not accounted for in the offset		Purchased land may contain FRTBC habitat but is not accounted for in the offset.		140	52%
5	Research offset	n/a	n/a	10%	n/a	10%	n/a	n/a
	Total potential offset			**100%**		**101%**		**100%**

6. Application of EPBC Act environmental offsets policy

The proposed offset strategy is consistent with the principles of the EPBC Act Environmental Offsets Policy (DSEWPaC 2012) as presented in Table 16.

Table 16 Consistency with EPBC Act Environmental Offsets Policy

Policy overarching principles	Comment
Suitable offsets must deliver an overall conservation outcome that improves or maintains the viability of the protected matter	The offsets will provide a conservation outcome that maintains or improves the viability of the BWSCP TEC, Carnaby's Cockatoo and FRTBC. The offset strategy provides at least 100% offset for all three protected matters. The conservation outcome will be achieved through protecting the protected matters through transfer of BWSCP TEC and Carnaby's Cockatoo and FRTBC habitat to DBCA.
Suitable offsets must be built around direct offsets but may include other compensatory measures	The offset strategy is built around direct offsets, involving a package of suitable offset properties to provide at least 90% direct offsets for Carnaby's Cockatoo and FRTBC, and suitable offset properties and funding to provide 100% direct offsets for BWSCP TEC. The offset strategy includes up to 10% indirect offsets for Carnaby's Cockatoo and FRTBC through funding a Murdoch University Research Proposal.
Suitable offsets must be in proportion to the level of statutory protection that applies to the protected matter	All direct offsets will be transferred to DBCA. DBCA and the Conservation and Parks Commission are then responsible for the management of the land and creation of the conservation reserve, providing in perpetuity protection and management. The quantum of offsets proposed are in proportion to the level of statutory protection applied to the BWSCP TEC (Endangered), Carnaby's Cockatoo (Endangered) and FRTBC (Vulnerable), as presented in the offset assessment guide calculations.
Suitable offsets must be of a size and scale proportionate to the residual impacts on the protected matter	The offsets will be of a size and scale proportional to the residual impacts on BWSCP TEC, Carnaby's Cockatoo and FRTBC. The offset strategy provides at least 100% offset for all three protected matters. The provision of direct offsets is based on completed offset assessment guide calculations, incorporating evidence based justification for all inputs. The provisional sum for the WA Offset Fund, if required, is also based on completed offset assessment guide calculations.
Suitable offsets must effectively account for and manage the risks of the offset not succeeding	The estimation of direct offsets is based on completed offset assessment guide calculations, incorporating a conservative assessment of risk of the offset not succeeding. Main Roads has a history of offset management, including provision of land to DBCA for ongoing management and conservation. The transfer of land to DBCA is expected to have a high chance (90%) of successfully delivering the required conservation outcomes.
Suitable offsets must be additional to what is already required, determined by law or planning regulations,	The proposed offsets are additional to any other requirements.

Policy overarching principles	Comment
or agreed to under other schemes or programs	
Suitable offsets must be efficient, effective, timely, transparent, scientifically robust and reasonable	The proposed offsets identified in the offset strategy will be acquired and implemented in consultation and agreement with DBCA as the State agency with lead responsibility for conservation. Contribution to the WA Offsets Fund, if required, will support an established fund used by the State Government for the strategic acquisition of land for the conservation estate. The direct offsets will involve an efficient and timely transfer of land to DBCA. Main Roads, working with DBCA, is experienced and has the resources to fund acquisition and transfer of properties to DBCA for ongoing management and conservation. Main Roads is liaising with DBCA regarding acquisition of suitable land in order to meet offset requirements and intends to have all required offsets in place within 12 months of commencement of construction. The direct offsets will be scientifically robust, based on surveys of the Proposal DE and offset properties. Indirect offsets will involve research by established researchers in the field of Black Cockatoo conservation. The Offset Proposal will be a transparent document developed in consultation with DBCA and relevant local stakeholders.
Suitable offsets must have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced	All offset sites will be managed by DBCA through conservation tenure. The Offset Proposal will be based on a Memorandum of Understanding between Main Roads and DBCA, including requirements for land management and monitoring.

7. References

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

Focused Vision 2019, *Lots 1921 and 2342 Ashworth Road Gingin, Interim Report – Banksia Woodland Key Results*, report prepared for Main Roads Western Australia, December 2019.

GHD 2019a, *Mitchell Freeway Extension Hester Avenue to Romeo Road EPBC 2018/8367 Preliminary Documentation*, report prepared for Main Roads Western Australia, July 2019.

GHD 2019b, *Mitchell Freeway Extension Hester Avenue to Romeo Road, Biological Survey*, report prepared for Main Roads Western Australia, July 2019.

GHD 2019c, *Hill River Bannovich Offset Property*, memorandum to Main Roads Australia, August 2019.

Appendices