



mainroads  
WESTERN AUSTRALIA

# Clearing Impact Assessment and Vegetation Management Plan

*We're working for  
Western Australia.*

Mitchell Freeway Southbound –  
Hepburn Avenue on-ramp (H590)

April 2020

1969

Printed copies are uncontrolled unless marked  
otherwise. Refer to iRoads for current version.

D20#289851

# Contents

<b>1</b>	<b>SUMMARY</b> .....	<b>4</b>
1.1	Project Information .....	4
<b>2</b>	<b>ASSESSMENT SCOPE</b> .....	<b>5</b>
<b>3</b>	<b>PROJECT DESCRIPTION</b> .....	<b>6</b>
3.1	Project Location .....	6
<b>4</b>	<b>METHODOLOGY</b> .....	<b>9</b>
4.1	Preliminary Desktop Study.....	9
4.2	Detailed Clearing Impact Assessment .....	9
<b>5</b>	<b>CLEARING OF NATIVE VEGETATION</b> .....	<b>10</b>
5.1	Measures to Avoid, Minimise, Mitigate and Manage Project Clearing Impacts .....	10
5.2	Vegetation Details.....	13
5.2.1	Project Site Vegetation Description.....	13
5.2.2	Vegetation Complexes and Representation.....	14
5.3	Assessment against the Ten Clearing Principles .....	15
<b>6</b>	<b>SUMMARY OF BIOLOGICAL SURVEYS</b> .....	<b>22</b>
<b>7</b>	<b>ADDITIONAL ACTIONS REQUIRED</b> .....	<b>24</b>
<b>8</b>	<b>STATEMENT ADDRESSING STAKEHOLDER SUBMISSIONS</b> .....	<b>25</b>
<b>9</b>	<b>VEGETATION MANAGEMENT</b> .....	<b>26</b>
<b>10</b>	<b>REFERENCES</b> .....	<b>27</b>
<b>11</b>	<b>APPENDICES</b> .....	<b>28</b>
	Appendix A: Biological Survey Report.....	29
	Appendix B: Vegetation Management Plan.....	<b>Error! Bookmark not defined.</b>
	Appendix B1 – Principal Environmental Management Requirements (PEMR's).....	<b>Error! Bookmark not defined.</b>
	Appendix C: Constraints Mapping.....	30

# Amendments

Report Compilation & Review	Name and Position	Document Revision	Date
Author:	Associate, Strategen- JBS&G	Rev A	30 March 2020
Reviewer:	Principal Environmental Officer	Rev A	
Author:	Associate, Strategen- JBS&G	Rev B	13 April 2020
Reviewer:	Principal Environmental Officer	Rev B	
Author:	Associate, Strategen- JBS&G	Rev 0	26 April 2020
Reviewer:	Senior Environment Officer	Rev 0	22 May 2020

# 1 SUMMARY

## 1.1 Project Information

**Project Name:** Mitchell Freeway Southbound - Hepburn Avenue on-ramp

**Project Location(s):** The project area is located on the Hepburn Avenue on-ramp (H590) SLK 0.045 to SLK 0.629 and Mitchell Freeway (H016) between SLK 17.75 to SLK 17.18 within the local government authority boundary of the City of Joondalup (Figure 1).

**Project Purpose / Components:** Main Roads Western Australia (Main Roads) proposed to upgrade the Mitchell Freeway southbound on-ramp at Hepburn Avenue.

Note that this assessment is ONLY for the clearing of native vegetation for above project activities.

**Area Proposed to be Cleared:** The project will require clearing of up to 0.52 hectares (ha) of remnant vegetation

**Temporary Clearing Required:** None

A detailed Clearing Impact Assessment (CIA) of the project clearing activities was undertaken. The CIA outlined the key activities associated with the project, the existing environment and an assessment of native vegetation clearing. This assessment provided an evaluation of the vegetation clearing impacts associated with the project using the ten clearing principles and strategies used to manage vegetation clearing. Key items associated with the clearing impact assessment are listed below.

- Flora and Vegetation
  - Clearing of 0.52 ha of remnant native vegetation, of which 0.41 ha is in a 'Completely Degraded' condition and 0.11 ha in 'Good' condition.
  - Clearing of 0.52 ha of 'Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain' Priority Ecological Community (Priority 3iii).
- Terrestrial Fauna
  - The project has the potential to impact Black Cockatoo species, specifically Carnaby's and Forest Red-tailed Black Cockatoo through the removal of up to 13 suitable diameter at breast height (DBH) trees, none containing suitable hollows, and up 0.52 ha of foraging habitat.
- The project is not likely to be at variance with any of the ten clearing principles.

Main Roads Statewide Purpose Clearing Permit CPS 818 will be used to undertake native vegetation clearing for the project. Project clearing will be undertaken in accordance with the conditions of CPS 818 and detailed records of native vegetation clearing will be maintained as required under the permit.

## 2 ASSESSMENT SCOPE

This clearing impact assessment involved a desktop analysis of environmental aspects and impacts, a site investigation, and an assessment of native vegetation clearing impacts. The study area is confined to a local area of a 10 km radius. This assessment determined the need to develop and obtain approvals from the Department of Water and Environmental Regulation (DWER) for a Revegetation Plan, a Vegetation Management Plan (VMP), a Dieback Management Plan or an Offset Proposal.

### 3 PROJECT DESCRIPTION

Table 1 describes the project in detail, including the full extent of the proposed work and all the components of the proposal.

**Table 1. Project Description**

Project Components	Clearing Required (Y/N)	Estimated Clearing Area (ha) <i>TBC if unknown</i>
Road Widening(H590) SLK 0.045 to SLK 0.629 and (H016) between SLK 17.75 to SLK 17.18	Y	0.52 ha
Pre-construction works/service Relocations	Y	Within the 0.52 ha

#### 3.1 Project Location

The project area is located on the Hepburn Avenue on-ramp (H590) SLK 0.045 to SLK 0.629 and Mitchell Freeway (H016) between SLK 17.75 to SLK 17.18 within the local government authority boundary of the City of Joondalup (Figure 1).

*Start*

Latitude: -31.817464°

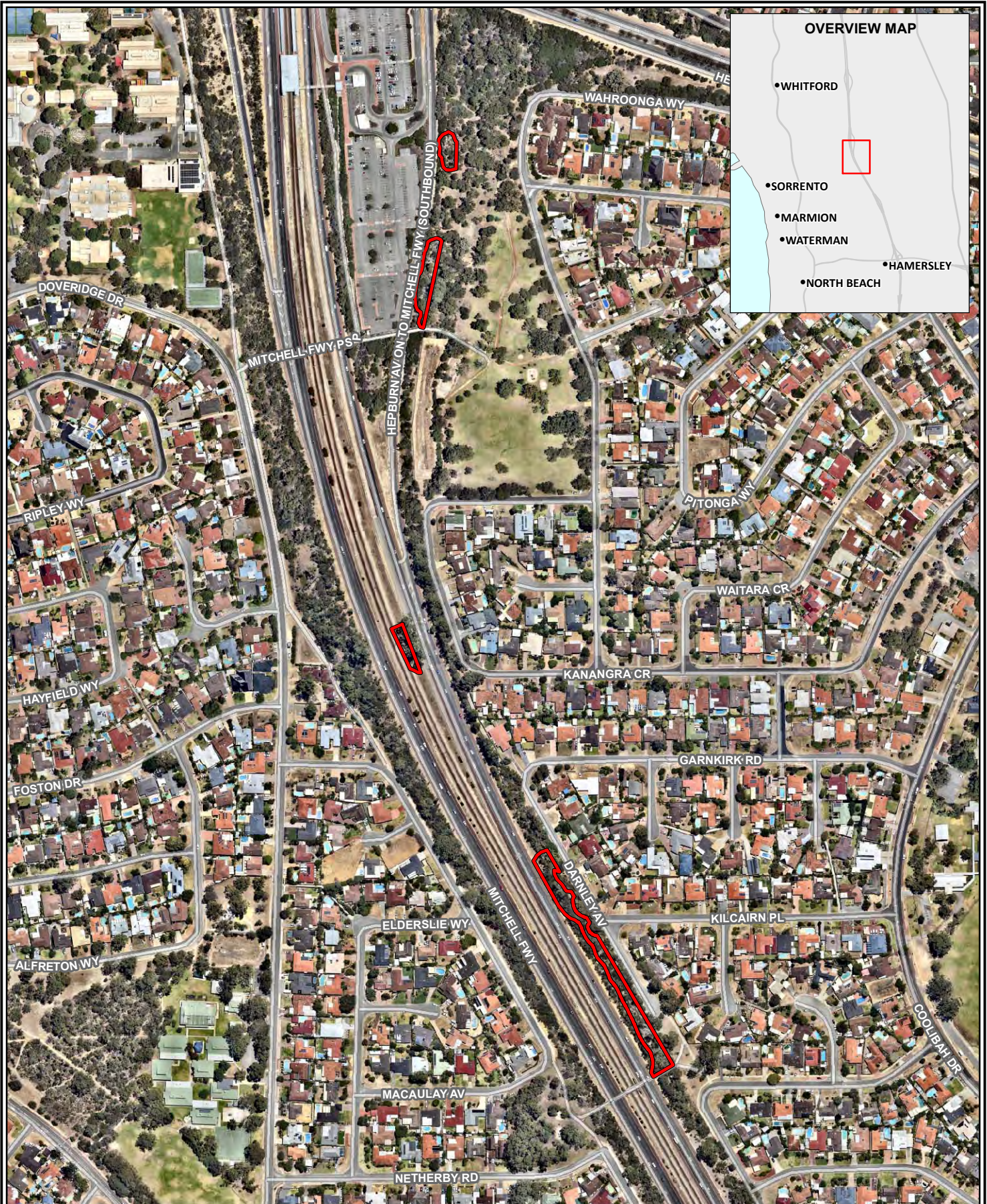
Longitude: 115.782694°

*End*

Latitude: -31.856397°

Longitude: 115.800251°

The location and boundaries of the study area (10 km radius) for the project are shown in Figure 2.



**Legend:**  
 Project area  
 Roads (MRWA)

Scale 1:5,000 at A4

**Mitchell Freeway  
Perth, WA**

Coord. Sys. GDA 1994 MGA Zone 50

**PROJECT AREA**

Job No: 58540

Client: Main Roads

**FIGURE 1**

Version: A

Date: 17-Apr-2020

Drawn By: hsullivan

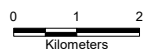
Checked By: WS





- Legend:**
-  Project area
  -  10km buffer
  -  Roads (MRWA)

Scale 1:120,000 at A4



Coord. Sys. GDA 1994 MGA Zone 50



Job No: 58540

Client: Main Roads

Version: A

Date: 08-Apr-2020

Drawn By: hsullivan

Checked By: WS

**Mitchell Freeway  
Perth, WA**

**PROJECT AREA AND STUDY AREA**

**FIGURE 2**



## **3.2 Methodology**

### **3.3 Preliminary Desktop Study**

A preliminary desktop study was undertaken as part of the PCIA, to assess the proposed native vegetation clearing and potential constraints associated with the project. The desktop assessment included viewing GIS shapefiles, reviewing government agency managed databases (where necessary) and consulting with relevant stakeholders. The outcome of the desktop study identified that native vegetation clearing was not at variance with any of the ten clearing principles.

The methodology used when completing an assessment of the clearing principles is provided in Section 5.3. Mapping was completed using ArcMap or Main Roads Integrated Mapping System (IMS).

### **3.4 Detailed Clearing Impact Assessment**

Further environmental assessment of the impacts of native vegetation clearing was undertaken and a CIA report completed. The CIA included a site visit to verify desktop information and a biological survey to delineate key environmental elements of the project area. A summary of the outcome of the survey is provided in Section 6.

The methodology used for the biological survey is provided in the *Mitchell Freeway Widening Southbound and PSP Mitchell Freeway Gaps Hodges Drive to Reid Highway Biological Survey September/October 2019*, Astron (2020) report in Appendix A.

## **4 Clearing of Native Vegetation**

Native vegetation describes all indigenous aquatic and terrestrial vegetation (living or dead). The term does not include vegetation that was intentionally sown, planted or propagated unless it was required under a statutory condition.

Apart from activities that are exempt under the clearing regulation (Section 5 – Prescribed Clearing), all native vegetation clearing completed by Main Roads will be undertaken using a permit.

### **4.1 Measures to Avoid, Minimise, Mitigate and Manage Project Clearing Impacts**

The design and management measures implemented to avoid and minimise the project clearing impacts are provided in Table 2.

**Table 2. Justification of Avoiding, Minimising, Mitigating and Managing Project Clearing Impacts**

<b>Design or Management Measure</b>	<b>Applied to Current Design</b>	<b>Discussion and Justification</b>
<b>Steepen batter slopes</b>	Yes	Batters will be steepened beyond standard practice to ensure that clearing doesn't extend outside the proposed footprint.
<b>Installation of safety barriers</b>	Yes	Installation of safety barriers is required in order to comply with road safety requirements.
<b>Alignment to one side of existing road</b>	Yes	All widening is to the verge, which has already been heavily disturbed
<b>Alternative alignment to follow existing road (or) to preferentially locate within pasture or a degraded area</b>	No	Widening of the on-ramp must go into the verge and disturb native and planted vegetation.
<b>Installation of kerbing</b>	No	Freeway surfacing with Open Graded Asphalt may prevent kerbing from being effective.
<b>Simplification of design to reduce number of lanes and/or complexity of intersections</b>	No	Road design must allow for ramp metering and sufficient capacity on the ramp to allow for the metering. This is unfortunately complicated and is being simplified as far as possible.
<b>Preferential use of existing cleared areas for access tracks, construction storage and stockpiling</b>	Yes	No vegetation to be cleared for temporary works.
<b>Drainage modification</b>	No	No, the project will utilise the existing drainage in place for this section of Hepburn Avenue and Mitchell Freeway.
<b>Other design treatment</b>	No	No other design treatment is appropriate for the required work. The project involves the widening and upgrade of an existing major road alignment. No design alternatives exist to achieve the same outcome while reducing clearing requirements.

In addition to the elements discussed in Table 1, the following avoidance and minimisation action have been applied to this project:

- The clearing area will be demarcated prior to the commencement of native vegetation clearing.
- The project design was refined to avoid clearing as many potential cockatoo habitat trees as practicable.
- Where possible vegetation will be pruned as opposed to removed.
- Further project clearing will be avoided as the site office, materials storage areas, construction vehicles/machinery and access tracks will be located on previously disturbed or cleared areas.

## 4.2 Vegetation Details

### 4.2.1 Project Site Vegetation Description

The project area is predominately in a degraded condition with one native vegetation unit present, described by Astron (2020) as:

- **Tuart Forest 2:** *Eucalyptus gomphocephala* mid open to closed forest over *Eucalyptus marginata* (+/- *Banksia attenuata*, *Allocasuarina fraseriana*, *Corymbia calophylla*) mid to low woodland to open woodland over *Xanthorrhoea preissii* (+/- *Acacia rostellifera*, *Jacksonia sternbergiana*, *Allocasuarina humilis*) mid shrubland to isolated shrubs over *Mesomelaena pseudostygia* and *Lepidosperma calcicola* sparse sedgeland over an introduced tussock grassland.

Tables 3 and 4 provide details of the Pre-European Vegetation Associations within the project area and the remaining extents of these associations.

For a full description of the existing vegetation, refer to the Biological Assessment Report (Astron, 2020) in Appendix A.

**Table 3. Summary of Project Area's Mapped Pre-European Vegetation Associations**

Pre-European Vegetation Association(s)	Clearing Description	Vegetation Condition	Comments
Vegetation Association 6 described as a Medium woodland: Tuart and jarrah (Government of Western Australia, 2019).	Clearing of up to 0.52 ha for road widening, Hepburn Avenue on-ramp.	Degraded (0.41 ha) to good condition (0.11 ha) (Astron, 2020)	Vegetation description and condition determined from biological survey (Astron, 2020)

**Table 4. Pre-European Vegetation Representation**

Pre-European Vegetation Association	Scale	Pre-European (ha)	Current Extent (ha)	% Remaining	% Remaining in DBCA reserves
<b>Veg Assoc No. 6</b>	<b>Statewide</b>	56,343	13,362.25	23.72	9.45
	<b>IBRA Bioregion</b> Swan Coastal Plain	56,343	13,362.25	23.72	9.45
	<b>IBRA Sub-region</b> Perth	56,343	13,362.25	23.72	9.45
	<b>Local Government Authority</b> City of Joondalup	2,294.47	326.68	14.24	1.32

## 4.2.2 Vegetation Complexes and Representation

Vegetation Complexes within the project area have been defined by Heddle et al. (1980) and are based on vegetation in association with landforms and underlying geology. Native vegetation complexes as described by Heddle et al. (1980) within the Project area comprise:

- **Karrakatta Complex** – Central and South: Predominately open forest of *Eucalyptus gomphocephala* (Tuart), *E. marginata* (Jarrah), *Corymbia calophylla* (Marri) and woodland of *E. marginata* and *Banksia* species.
- **Cottesloe Complex** – Central and South: mosaic of woodland of *Eucalyptus gomphocephala* (Tuart) and open forest of *Eucalyptus gomphocephala* (Tuart) - *Eucalyptus marginata* (Jarrah) - *Corymbia calophylla* (Marri); closed heath on the Limestone outcrops.

These complexes are above the minimum threshold of 10% target for the retention of vegetation complexes in constrained areas on the Swan Coastal Plain (EPA, 2000). The current remaining extent of these vegetation complexes (Government of WA, 2019) are detailed in Table 5.

**Table 5. Vegetation Complexes (Heddle/Mattiske) within the Project Area**

Heddle/Mattiske Veg Complex	Pre-European Extent (ha)	2019 Vegetation Extent	% Remaining
Karrakatta Complex - Central and South	53,081.0	12,467.2	23.5
Cottesloe Complex – Central and South	45,299.6	14,567.9	32.2

### 4.3 Assessment against the Ten Clearing Principles

In assessing whether the project’s proposed clearing is likely to have a significant impact on the environment, the project was assessed against the ten clearing principles (EP Act 1986, Schedule 5).

Each principle has been assessed in accordance with DWER’s ‘A Guide to the Assessment of Applications to Clear Native Vegetation’.

The proposed clearing is considered not likely to be at variance to clearing principles (a), (b), (d) and (i) and not at variance to clearing principles (c), (e), (f), (g), (h) and (j).

**(a) Native vegetation should not be cleared if it comprises a high level of biological diversity.**

Comments	Proposed clearing is not likely to be at variance to this Principle
	<p>This project involves the clearing of up to 0.52 ha of native vegetation (Appendix C: Figure 3). The vegetation unit within the project area has been assessed as:</p> <ul style="list-style-type: none"> <li>• <b>Tuart Forest 2:</b> <i>Eucalyptus gomphocephala</i> mid open to closed forest over <i>Eucalyptus marginata</i> (<i>Banksia attenuata</i>, <i>Allocasuarina fraseriana</i>, <i>Corymbia calophylla</i>) mid to low woodland to open woodland over <i>Xanthorrhoea preissii</i> (<i>Acacia rostellifera</i>, <i>Jacksonia sternbergiana</i>, <i>Allocasuarina humilis</i>) mid shrubland to isolated shrubs over <i>Mesomelaena pseudostygia</i> and <i>Lepidosperma calcicola</i> sparse sedgeland over an introduced tussock grassland.</li> </ul> <p>The vegetation is in ‘Completely Degraded’ to ‘Good’ condition with the majority (0.41 ha) of the vegetation in ‘Completely Degraded’ condition (Appendix C: Figure 4). One vegetation unit was mapped during the detailed field survey, as shown above in section 4.2.1 (Astron 2020).</p> <p>No State or Federally listed Threatened flora species were recorded within the Project area. One state listed Priority flora species was recorded within the project area, <i>Grevillia olivacea</i> (P4). However, Astron (2020) consider this to have been planted within the road reserve due to being well outside of its home range and it will not be considered further.</p> <p>Within the project area, no federally listed Threatened or Priority Ecological Communities are considered to occur. Vegetation consists mainly of planted vegetation and completely degraded patches of Tuart Woodland. There is a small section (0.1 ha) of Tuart Woodland vegetation that has been assessed as ‘Good’ condition (Figure 4).</p> <p>Astron (2020) determined that vegetation within the project area does not meet the criteria for classification as the Tuart Woodlands and Forests of the Swan Coastal Plain Threatened Ecological Community.</p> <p>The project will impact on approximately 0.52 ha of the State listed Tuart (<i>Eucalyptus gomphocephala</i>) woodlands of the Swan Coastal Plain’ Priority Ecological Community (P3). Within the project area, the majority of vegetation been assessed as a ‘Degraded’ to ‘Completely Degraded’ (0.42 ha) condition. This is unlikely to result in a significant impact to the PEC as clearing represents approximately 0.3% of vegetation considered to represent the PEC within 5 km of the Project area. Noting this, it is considered that the vegetation within the project area is not representative of a diverse native vegetation remnant that comprises the whole, or a part of, a significant occurrence of an ecological community; or native vegetation that has a higher diversity than other examples of an ecological community in the region.</p>

	<p>The project area is within the known distribution range of the Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo, but outside of the known breeding range of Carnaby's Cockatoo and considered unlikely to support breeding for the Forest Red-tailed Black Cockatoo due to the absence of intact woodland or forest habitat.</p> <p>Within the project area, approximately 0.52 ha of potentially suitable foraging habitat was recorded (Appendix C: Figure 5). The black cockatoo assessment undertaken by Astron (2020) determined that no quality foraging habitat as defined referral guidelines (Department of Sustainability Environment Water Population and Communities 2012) is present, due to the altered state of vegetation and the sporadic and isolated distribution of known foraging flora species.</p> <p>The survey identified a total of 13 potential black cockatoo breeding trees (those of a suitable species with greater than the 500 mm DBH) within the project area. No suitable hollows were observed during the survey and no evidence of breeding was recorded at the time of the survey.</p> <p>Based on the mostly Completely Degraded condition of the clearing area, its small size and the occurrence similar remnant vegetation in similar of better condition in the local area, it is considered that the vegetation to be cleared does not comprise a high level of biological diversity.</p> <p><b>Assessed Outcome:</b>  <b>Noting the above, clearing for this project is not likely to be at variance to this principle.</b></p>
<b>Methodology</b>	<p>MRWA Shapefiles                  DBCA shapefiles                  DSEWPaC (2012)                  NatureMap (February, 2020)                  EPA (2016)                  Biological Survey (October, 2019)</p>

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

<b>Comments</b>	<b>Proposed clearing is not likely to be at variance to this Principle</b>
	<p>Within the survey area there are known records of 61 protected fauna species. The biological survey identified that there were three conservation species present within the wider survey area. These are:</p> <ul style="list-style-type: none"> <li>• <i>Calyptorhynchus latirostris</i> (Carnaby's Cockatoo) -Threatened</li> <li>• <i>Calyptorhynchus banksii naso</i> (Forest Red-tailed Black Cockatoo) -Threatened</li> <li>• <i>Isodoon obesulus subsp. fusciventer</i> (Southern Brown Bandicoot) - Priority 4</li> </ul> <p>Within the project area, Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo are considered to potentially be present. No evidence of Quenda presence within the project area was recorded (Astron, 2020).</p> <p><b><u>Black Cockatoo</u></b></p>

	<p>The project area is within the known distribution range of the Carnaby’s Cockatoo, but outside of the known breeding range of Carnaby’s Cockatoo and is outside of the modelled distribution of the Forest Red-tailed Black Cockatoo (Department of Sustainability, Environment, Water, Population and Communities 2012). Given the small area of potential habitat and its poor condition, it is considered unlikely to be significant habitat for foraging or breeding for Carnaby’s Cockatoo and Forest Red-tailed Black Cockatoo.</p> <p>Within the project area, approximately 0.52 ha of potentially suitable foraging habitat was recorded (Appendix C: Figure 5). The black cockatoo assessment undertaken by Astron (2020) determined that no quality foraging habitat as defined referral guidelines (Department of Sustainability Environment Water Population and Communities 2012) is present, due to the altered state of vegetation and the sporadic and isolated distribution of known foraging flora species.</p> <p>The survey identified a total of 13 potential black cockatoo breeding trees (those greater than the 500 mm DBH) within the project area. No suitable hollows were observed during the survey and no evidence of breeding was recorded at the time of the survey.</p> <p>No evidence of current or historic use of the project area for roosting was observed (Astron 2020). The closest confirmed roost site is located 2.3 km north-east to the project area.</p> <p>Within 4 km of the project area there is approximately 290 ha of suitable habitat within Local or State Government reserves which would provide significantly higher quality habitat for black cockatoos (Appendix C: Figure 6). These reserves consist of:</p> <ul style="list-style-type: none"> <li>• Hepburn Heights Conservation area (20 ha);</li> <li>• Shepherds Bushland Reserve (20 ha);</li> <li>• Craigie Open Space (Bushland) (215 ha); and</li> <li>• Woodvale Nature Reserve (35 ha).</li> </ul> <p>Clearing as a result of the project represents 0.17% of potentially available habitat within 4 km of the project area.</p> <p><b><u>Other Conservation Significant Species</u></b></p> <p>The Southern Brown Bandicoot (Quenda) occurs in wet or dry sclerophyll forest through to open woodland and scrubby, dense vegetation on sandy soils. This species was identified within the survey area in close proximity to the Woodvale Nature Reserve, approximately 3.5 km north of the project area.</p> <p>It is considered unlikely that the small area of vegetation to be cleared as a result of the project constitutes significant habitat for the species, which is more likely to be in larger pockets of native vegetation associated with the reserves listed above.</p> <p><b>Assessed Outcome:</b></p> <p><b>Noting the above, clearing for this project is not likely to be at variance to this principle.</b></p>
<p><b>Methodology</b></p>	<p>DBCA Shapefiles                  DBCA website                  DSEWPaC (2012)                  EPA (2016)                  Biological Survey (October, 2019)                  Aerial Photography</p>

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

<b>Comments</b>	<b>Proposed clearing is not at variance to this Principle</b>
	<p>A total of 207 vascular flora species, from 47 families and 127 genera, were recorded in the wider survey area, between Hodges Drive and Reid Highway (Astron 2020). No State or Federally listed threatened flora species were recorded within the project area.</p> <p><b>Assessed Outcome:</b></p> <p><b>Noting the above, clearing for this project is not at variance to this principle.</b></p>
<b>Methodology</b>	<p>DBCA shapefiles                  Florabase (February, 2020)                  Biological Survey (October, 2019)</p>

**(d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.**

<b>Comments</b>	<b>Proposed clearing is not likely to be at variance to this Principle</b>
	<p>Astron (2020) did not record any State listed Threatened Ecological Communities in the Project area.</p> <p><b>Assessed Outcome:</b></p> <p><b>Noting the above, clearing for this project is not likely to be at variance to this principle.</b></p>
<b>Methodology</b>	<p>DBCA shapefiles                  Biological Survey (October, 2019)</p>

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

<b>Comments</b>	<b>Proposed clearing is not at variance to this Principle</b>																															
	<p>The project area is mapped as Vegetation Association 6 described as a Medium woodland: tuart and jarrah. The project proposes to clear up to 0.52 ha of native vegetation, of this, 0.41 ha (78%) has been assessed as ‘Completely Degraded’ and the remainder in good condition (Astron, 2020).</p> <p><b>Table 5.1. Pre-European Vegetation Representation</b></p> <table border="1"> <thead> <tr> <th>Pre-European Vegetation Association</th> <th>Scale</th> <th>Pre-European (ha)</th> <th>Current Extent (ha)</th> <th>% Remaining</th> <th>% Remaining in DBCA reserves</th> </tr> </thead> <tbody> <tr> <td rowspan="4"><b>Veg Assoc No. 6</b></td> <td><b>Statewide</b></td> <td>56,343</td> <td>13,362.25</td> <td>23.72</td> <td>9.45</td> </tr> <tr> <td><b>IBRA Bioregion</b> Swan Coastal Plain</td> <td>56,343</td> <td>13,362.25</td> <td>23.72</td> <td>9.45</td> </tr> <tr> <td><b>IBRA Sub-region</b> Perth</td> <td>56,343</td> <td>13,362.25</td> <td>23.72</td> <td>9.45</td> </tr> <tr> <td><b>Local Government Authority</b></td> <td>2,294.47</td> <td>326.68</td> <td>14.24</td> <td>1.32</td> </tr> </tbody> </table>					Pre-European Vegetation Association	Scale	Pre-European (ha)	Current Extent (ha)	% Remaining	% Remaining in DBCA reserves	<b>Veg Assoc No. 6</b>	<b>Statewide</b>	56,343	13,362.25	23.72	9.45	<b>IBRA Bioregion</b> Swan Coastal Plain	56,343	13,362.25	23.72	9.45	<b>IBRA Sub-region</b> Perth	56,343	13,362.25	23.72	9.45	<b>Local Government Authority</b>	2,294.47	326.68	14.24	1.32
Pre-European Vegetation Association	Scale	Pre-European (ha)	Current Extent (ha)	% Remaining	% Remaining in DBCA reserves																											
<b>Veg Assoc No. 6</b>	<b>Statewide</b>	56,343	13,362.25	23.72	9.45																											
	<b>IBRA Bioregion</b> Swan Coastal Plain	56,343	13,362.25	23.72	9.45																											
	<b>IBRA Sub-region</b> Perth	56,343	13,362.25	23.72	9.45																											
	<b>Local Government Authority</b>	2,294.47	326.68	14.24	1.32																											

	City of Joondalup																
<b>Table 5.2. Vegetation Complexes (Heddle/Mattiske) within the Project Area</b>																	
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #2e7d32; color: white;">Heddle/Mattiske Veg Complex</th> <th style="background-color: #2e7d32; color: white;">Pre-European Extent (ha)</th> <th style="background-color: #2e7d32; color: white;">2019 Vegetation Extent</th> <th style="background-color: #2e7d32; color: white;">% Remaining</th> </tr> </thead> <tbody> <tr> <td>Karrakatta Complex - Central and South</td> <td>53,081.0</td> <td>12,467.2</td> <td>23.5</td> </tr> <tr> <td>Cottesloe Complex – Central and South</td> <td>45,299.6</td> <td>14,567.9</td> <td>32.2</td> </tr> </tbody> </table>						Heddle/Mattiske Veg Complex	Pre-European Extent (ha)	2019 Vegetation Extent	% Remaining	Karrakatta Complex - Central and South	53,081.0	12,467.2	23.5	Cottesloe Complex – Central and South	45,299.6	14,567.9	32.2
Heddle/Mattiske Veg Complex	Pre-European Extent (ha)	2019 Vegetation Extent	% Remaining														
Karrakatta Complex - Central and South	53,081.0	12,467.2	23.5														
Cottesloe Complex – Central and South	45,299.6	14,567.9	32.2														
<p>The national objectives and targets for biodiversity conservation in Australia has a target to prevent clearance of ecological communities with an extent below 30 per cent of that present pre-1750, below which species loss appears to accelerate exponentially at an ecosystem level (Commonwealth of Australia, 2001). The project area is within a constrained area of the Swan Coastal Plain and as such retention objectives of at least 10 per cent apply (EPA, 2016).</p> <p>As shown in Table 5.1 and 5.2, vegetation association 6 and the vegetation complexes Karrakatta and Cottesloe (Central and South) are above the 10 per cent threshold in a constrained area (Government of Western Australia, 2019).</p> <p>Furthermore, given the condition of the vegetation, it is not considered to be representative of native vegetation that is significant as a remnant in an area that has been extensively cleared.</p> <p><b>Assessed Outcome:</b>  <b>Noting the above, clearing for this project is not at variance to this principle.</b></p>																	
<b>Methodology</b>	EPA (2016) Biological Survey (October, 2019) Government of Western Australia (2019) Perth Biodiversity Project (2013) Shepherd (2009) Aerial photography																

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

<b>Comments</b>	<p><b>Proposed clearing is not at variance to this Principle</b></p>
	<p>Interrogation of DBCA and DWER hydrological and wetland datasets determined that no wetlands or watercourses are mapped within the project area. The nearest mapped wetland is Lake Goollelal, located approximately 2.85 km from the project area.</p> <p>In addition, the Astron (2020) biological survey concluded that no remnant vegetation considered to represent riparian vegetation was recorded from the project area.</p> <p><b>Assessed Outcome:</b>  <b>Noting the above, clearing for this project is not at variance to this principle.</b></p>
<b>Methodology</b>	DWER and DBCA shapefiles Biological Survey (October, 2019)

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

Comments	Proposed clearing is not at variance to this Principle												
	<p>The Department of Primary Industries and Regional Development (DPIRD), provides a series of soil degradation risk mapping at the sub-system level. The project area is located within the Karrakatta Sand Yellow Phase subsystem of the Spearwood Dunes soil system. It is described as low hilly to gently undulating terrain. Yellow sand over limestone at 1-2 m. Banksia spp. woodland with scattered emergent <i>E. gomphocephala</i> and <i>E. marginata</i> and a dense shrub layer. (DPIRD, 2018).</p> <p>The table below summaries the soil degradation risk within the project area,</p> <table border="1" data-bbox="368 618 1445 936"> <thead> <tr> <th data-bbox="368 618 644 674">Aspect</th> <th data-bbox="644 618 1445 674">Degradation risk</th> </tr> </thead> <tbody> <tr> <td data-bbox="368 674 644 725">Wind Erosion</td> <td data-bbox="644 674 1445 725">98%</td> </tr> <tr> <td data-bbox="368 725 644 777">Waterlogging</td> <td data-bbox="644 725 1445 777">0%</td> </tr> <tr> <td data-bbox="368 777 644 828">Water Erosion</td> <td data-bbox="644 777 1445 828">0%</td> </tr> <tr> <td data-bbox="368 828 644 880">Salinity</td> <td data-bbox="644 828 1445 880">0%</td> </tr> <tr> <td data-bbox="368 880 644 936">Flood Risk</td> <td data-bbox="644 880 1445 936">0%</td> </tr> </tbody> </table> <p>Wind erosion is the only potential soil degradation aspect relevant to the project area, due to the deep yellow sands associated with the area. It is unlikely that the project will cause appreciable land degradation given the relatively small amount of clearing and the implementation of appropriate measures to mitigate and manage potential wind driven erosion during construction.</p> <p><b>Assessed Outcome:</b>  <b>Noting the above, clearing for this project is not at variance to this principle.</b></p>	Aspect	Degradation risk	Wind Erosion	98%	Waterlogging	0%	Water Erosion	0%	Salinity	0%	Flood Risk	0%
Aspect	Degradation risk												
Wind Erosion	98%												
Waterlogging	0%												
Water Erosion	0%												
Salinity	0%												
Flood Risk	0%												
<b>Methodology</b>	<p>GIS shapefiles                      Biological Survey (October, 2019)                      Natural Resource Management SLIP Soil Systems (Accessed April 2020)</p>												

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

Comments	Proposed clearing is not at variance to this Principle
	<p>Within 4 km of the project area there are 4 conservation areas/reserves are present:</p> <ul style="list-style-type: none"> <li>• Hepburn Heights Conservation area (20 ha);</li> <li>• Shepherds Bushland Reserve (20 ha);</li> <li>• Woodvale Nature Reserve (35 ha).</li> <li>• Craigie Bushland (215 ha)</li> </ul> <p>In addition to these areas, a number of small local government reserves are present. The nearest conservation area to the project area is the Craigie bushland area (Bush forever Site 303) which occurs approximately 450 m to the west of the project area, on the other side of the freeway and has no direct links to the project area.</p> <p>It is not considered that the project area contains vegetation which represents a significant ecological linkage for fauna to move between conservation reserves.</p> <p>Noting the above and that the project area is contained to the road reserve, the proposed clearing is will not result in impacts to an adjacent or nearby conservation area.</p>

	<p><b>Assessed Outcome:</b></p> <p><b>Noting the above, clearing for this project is not at variance to this principle.</b></p>
<b>Methodology</b>	<p>DBCA shapefiles EPA (2016)</p>

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

<b>Comments</b>	<p><b>Proposed clearing is not likely to be at variance to this Principle</b></p>
	<p>There are no major or minor watercourses mapped within the project area.</p> <p>The project will not change the hydrology of the area. Given the small scale of clearing and that no dewatering or drainage modifications are required; it is considered that there will be very little to no deterioration of underground water quality.</p> <p><b>Assessed Outcome:</b></p> <p><b>Noting the above, clearing for this project is not likely to be at variance to this principle.</b></p>
<b>Methodology</b>	<p>DWER and DBCA shapefiles Biological Survey (October, 2019)</p>

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

<b>Comments</b>	<p><b>Proposed clearing is not at variance to this Principle</b></p>
	<p>This project proposes to clear up to 0.52 ha of vegetation over an approximately 6km stretch of road. The removal of such a small area of vegetation makes it unlikely that the incidence or intensity of flooding will increase. NRM SLIP identifies that the area has 0% risk of flooding, largely attributed to presence of sandy soil and fast infiltration rates.</p> <p>Given the small amount of clearing, that vegetation will remain in the surrounding area and that the project area will be sealed, it is unlikely that this project will cause or exacerbate the incidence or intensity of flooding.</p> <p><b>Assessed Outcome:</b></p> <p><b>Noting the above, clearing for this project is not at variance to this principle.</b></p>
<b>Methodology</b>	<p>Natural Resource Management SLIP Soil Systems (Accessed June 2020)</p>

## 5 SUMMARY OF BIOLOGICAL SURVEYS

A Detailed biological survey of the area (survey area wider than the current project area) was undertaken in 2019 (Astron, 2020). A summary of the findings from the survey are presented below.

### Vegetation:

- Five remnant native vegetation types were defined and included:
  - One *Banksia* Woodland;
  - Two *Eucalyptus marginata* (jarrah) woodlands; and
  - two *Eucalyptus gomphocephala* (tuart) forests.
- Remnant vegetation types were mapped across 6.4 ha (19 %) of the survey area. The remaining 27.6 ha of the survey area was either cleared (3.0 ha, 9 %) or planted vegetation (24.6 ha, 72 %).
- Remnant vegetation in the survey area was in Good to Completely Degraded condition, with the majority considered Completely Degraded as it consisted of scattered remnant species only. It is expected that quality of these remnants has been declining over time due to significant edge effects.
- Vegetation inferred to represent the EPBC Act listed 'Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain' TEC was recorded within the survey area, but not within the project area.
- Vegetation inferred to represent the EPBC Act listed 'Banksia Woodlands of the Swan Coastal Plain' TEC was recorded within the survey area, across 1.4 ha near Hodges Drive and adjacent to the Woodvale Nature Reserve, but not within the project area.
- Vegetation considered to represent the State listed PECs 'Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain' and 'Banksia dominated woodlands of the Swan Coastal Plain IBRA Region' PEC were recorded within the survey area across 4.7 ha and 1.3 ha respectively. Within the project area 0.52 ha exists.

### Flora:

- A total of 207 vascular flora species, from 47 families and 127 genera, were recorded in the survey area. No EPBC Act or State listed threatened flora were recorded, one priority flora species of significance was recorded: *Jacksonia sericea* P4.
- The survey area has considerable disturbance and limited floristic diversity which further limits the potential for any threatened or priority flora species to occur.
- Sixty-three weed species were recorded within the survey area, accounting for 30% of the species recorded. Three are listed as WoNS (Australian Weeds Committee 2012) (*\*Asparagus asparagoides*, *\*Lantana camara* and *\*Genista linifolia*) and three are declared pest plants in Western Australia under the BAM Act (Department of Agriculture and Food Western Australia 2016).

### Fauna:

- 24 conservation significant vertebrate species were identified in the desktop assessment, and three species (quenda, Carnaby's cockatoo and forest red-tailed black cockatoo) were recorded within the survey area, one species were considered to have a 'moderate' likelihood and 20 species were considered to have a 'low' likelihood of occurrence.
- Based upon the current distributions for the three threatened species of black cockatoo, only the Carnaby's cockatoo (*Calyptrorhynchus latirostris*) and forest red-tailed black cockatoo (*Calyptrorhynchus banksii naso*) are likely to occur within the vicinity of the survey area.

- Three hundred and twenty-nine black cockatoo potential breeding trees (259 Tuarts, 42 jarrah, 16 dead stags and 12 marri) with a diameter at breast height of over 50 cm were recorded within the survey area including 15 trees (nine Tuarts and six dead stags) considered to have suitable hollows for Carnaby's cockatoos to breed in.
- Twenty-seven known foraging resource species for the Carnaby's cockatoo and three known foraging resource species for the forest red-tailed black cockatoo were recorded within the survey area; however, only the marri, jarrah and Banksia species are considered key species for foraging Carnaby's cockatoos. Two individual Carnaby's cockatoos were observed foraging on *Banksia prionotes* and jarrah within the survey area.

One individual quenda roadkill and multiple diggings in the same area were recorded within the survey area. The sighting was recorded 228 m south of the Woodvale Open Space, and it is likely that this individual was from of a larger quenda population within Woodvale Open Space.

## 6 ADDITIONAL ACTIONS REQUIRED

Table 6 summarises what further pre-clearing impact assessment and vegetation management is required in accordance with CPS 818.

**Table 6. Summary of Additional Management Actions Required by CPS 818**

Impact of Clearing	Yes/No or NA	Further Action Required
<p><b>1.</b> The PCIA indicates that the clearing is 'Seriously at Variance', 'At Variance' or 'May be at Variance' with one or more of the clearing principles.</p>	<p><b>No</b></p>	<p>No further action required</p>
<p><b>2.</b> The PCIA indicates that the clearing is at variance or may be at variance with clearing principle (g) land degradation, (i) surface or underground water quality or (j) the incidence of flooding.</p>	<p><b>No</b></p>	<p>No further action required</p>
<p><b>3.</b> The project involves clearing for temporary works (as defined by the permit under Condition 11 of CPS 818).</p>	<p><b>No</b></p>	<p>No further action required</p>
<p><b>4a.</b> The project is in part of a region that has annual rainfall greater than 400mm and is south of the 26<sup>th</sup> parallel of latitude.</p> <p><b>4b.</b> The project will require movement of soil in conditions other than dry conditions.</p>	<p><b>Yes</b></p> <p><b>No</b></p>	<p><b>4a.</b> No further action required</p> <p><b>4b.</b> No further action required.</p>
<p><b>5.</b> Main Roads has been notified by DWER or an environmental specialist that the area to be cleared is susceptible to a pathogen other than dieback</p>	<p><b>No</b></p>	<p>No further action required.</p>
<p><b>6.</b> The proposal requires referral to either the WA EPA or the Commonwealth DAWE.</p>	<p><b>No</b></p>	<p>No further action required.</p>
<p><b>7a.</b> The vegetation within the area to be cleared and/or the surrounding vegetation in a good or better condition</p> <p><b>7b.</b> Are weeds likely to spread to and result in environmental harm to adjacent areas of native vegetation that are in good or better condition</p>	<p><b>No</b></p>	<p><b>7a.</b> Yes. 0.11 ha within project area in good condition.</p> <p><b>7b.</b> No. Weed management will be addressed in the VMP/CEMP to avoid weed spread.</p>

## **7 STATEMENT ADDRESSING STAKEHOLDER SUBMISSIONS**

Condition 7 of CPS 818/14 requires Main Roads WA to invite submissions from a number of parties when the proposed clearing is considered likely to be seriously at variance, at variance or may be at variance with one or more of the clearing principles.

As the assessment has determined that the proposed clearing is not at variance with any of the clearing principles, no stakeholder submission is required.

## **8 VEGETATION MANAGEMENT**

Main Roads will avoid clearing native vegetation where possible. Where clearing cannot be avoided then this clearing is kept to a minimum.

## 9 REFERENCES

Astron (2020). Mitchell Freeway Widening Biological Survey [DRAFT]. Unpublished report by Astron Environmental Pty Ltd for Main Roads Western Australia

Department of Biodiversity, Conservation and Attractions (DBCA). NatureMap. Department of Parks and Wildlife and WA Museum. Accessed April 2020. Available from: <https://naturemap.dpaw.wa.gov.au/>.

Department of Sustainability, Environment, Water, Populations and Communities DSEWPaC (2012). EPBC Act referral guidelines for three black cockatoo species, Carnaby's cockatoo (*Calyptorhynchus latirostris*), Baudin's cockatoo (*Calyptorhynchus baudinii*) and the forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*). Available from <https://www.environment.gov.au/system/files/resources/895d4094-af63-4dd3-8dff-ad2b9b943312/files/referral-guidelines-wa-black-cockatoo.pdf>. Accessed March 2020.

Environmental Protection Authority (2016). *Technical Guide – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment* (eds. K Freeman, G Stack, S Thomas and N Woolfrey). Perth, Western Australia.

Government of Western Australia (2019). 2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report). Current as of March 2019. WA Department of Biodiversity, Conservation and Attractions, Perth, <https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics>

Hedde, E. M., Loneragan, O. W., and Havel, J. J (1980). Atlas of Natural Resources Darling System, Western Australia. Department of Conservation and Environment.

SLIP portal, Soil-Landscape Mapping. Available online from: <https://maps.agric.wa.gov.au/nrm-info/>. Accessed June 2020.

Perth Biodiversity Project (2013) Local Biodiversity Program 2013 Native vegetation by vegetation complex dataset for the South West of Western Australia. WALGA, viewed: <http://pbp.walga.asn.au/Publications.aspx> Accessed April 2020

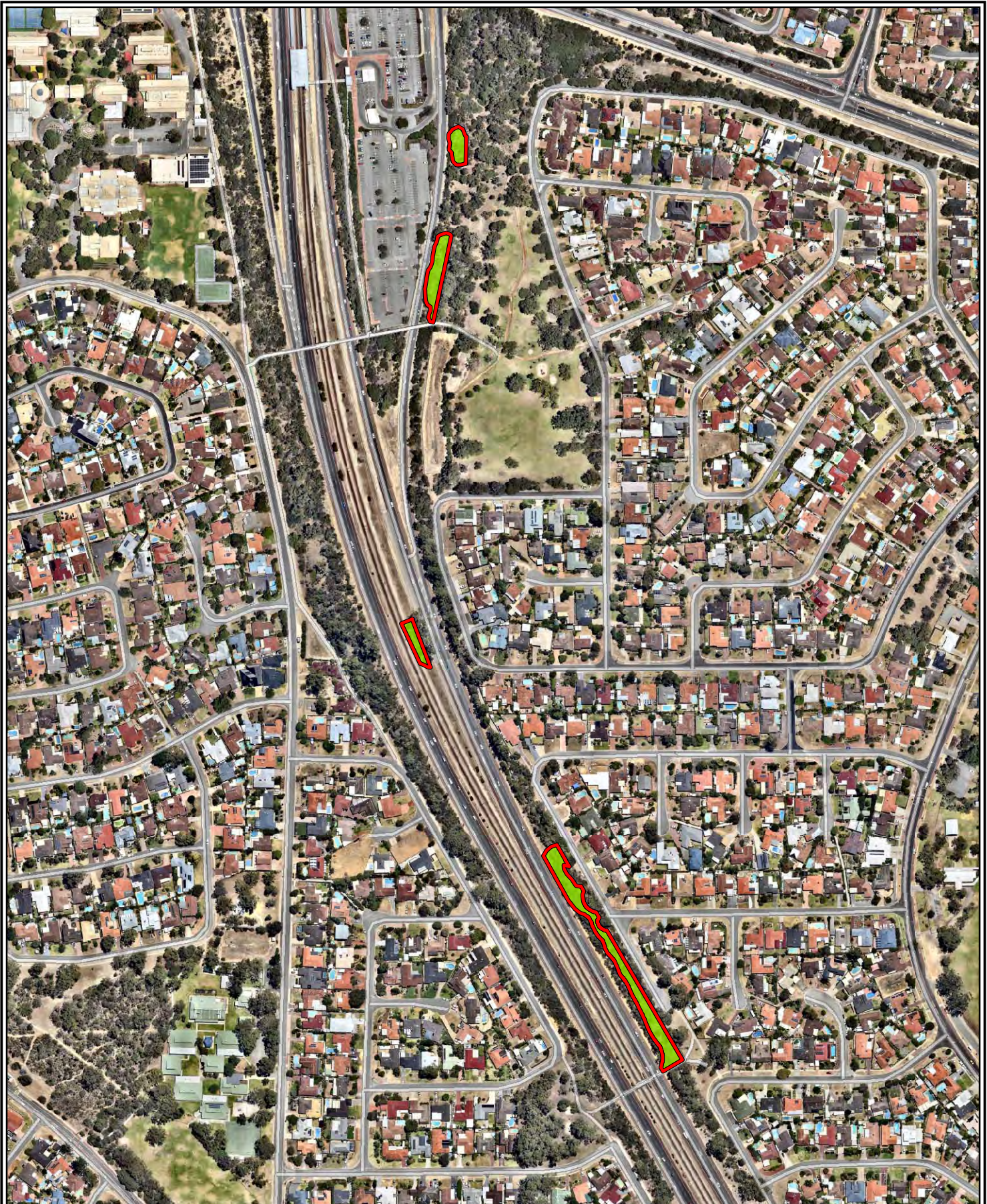
Western Australian Herbarium (1998-). *FloraBase - The Western Australian Flora*. Department of Biodiversity, Conservation and Attractions. Available online from: <https://florabase.dpaw.wa.gov.au/> Accessed April 2020

## 10 APPENDICES

Appendix	Title
<b>Appendix A</b>	Biological Assessment
<b>Appendix B</b>	Constraints Mapping

## **Appendix A: Biological Survey Report (D20#289851)**

## **Appendix B: Constraints Mapping**



- Legend:**
- Project area
  - Vegetation association
  - Tuart Forest 2
  - Roads (MRWA)

Scale 1:5,000 at A4 0 50 100  
metres

Coord. Sys. GDA 1994 MGA Zone 50 ↑

Job No: 58540

Client: Main Roads

Version: A Date: 17-Apr-2020

Drawn By: hsullivan Checked By: CT

**Mitchell Freeway  
Perth, WA**

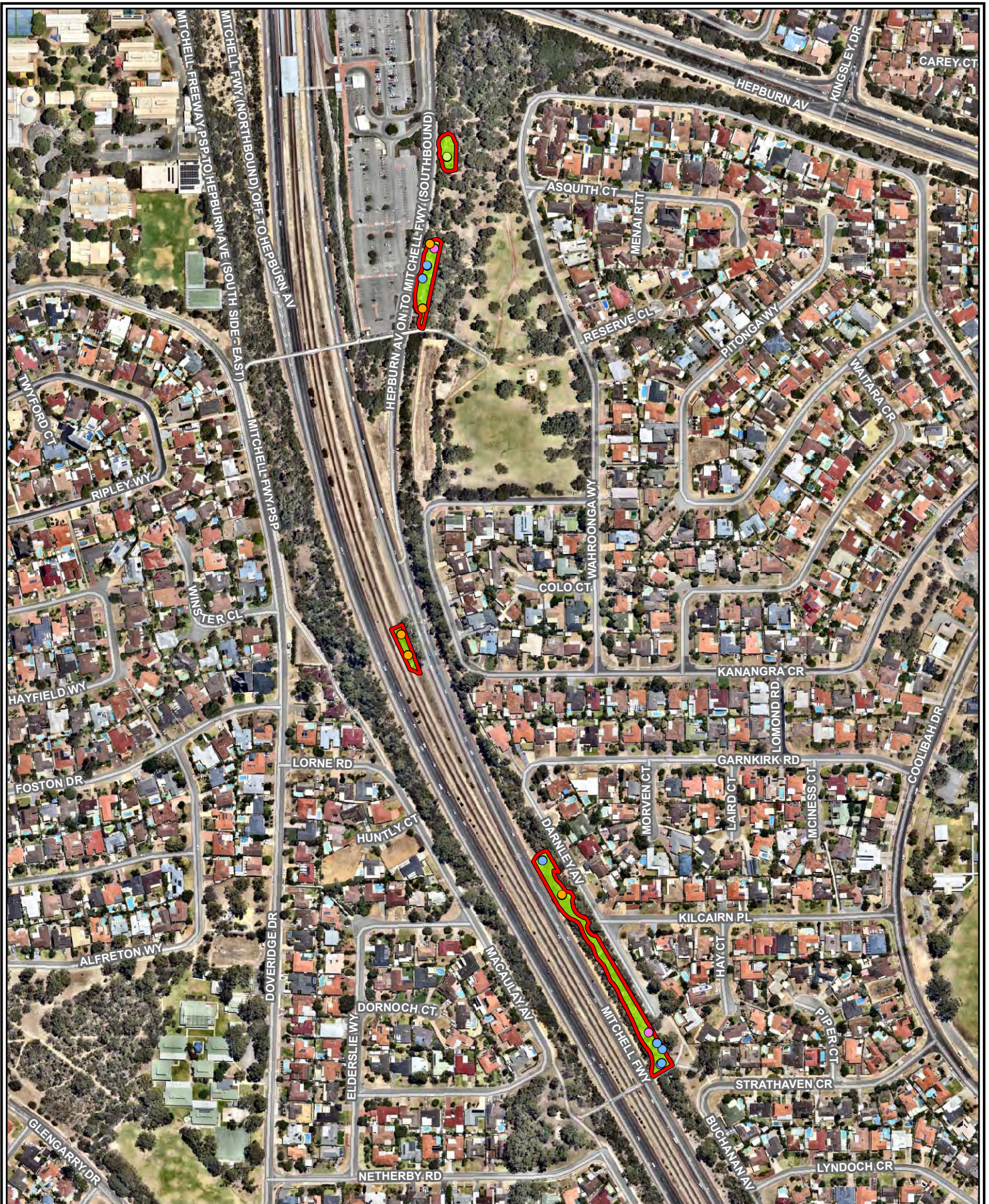
**VEGETATION ASSOCIATIONS**

**FIGURE 3**





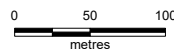
<b>Legend:</b> Project area Good Completely Degraded Roads (MRWA)	Scale 1:5,000 at A4 	<b>Mitchell Freeway Perth, WA</b>
	Coord. Sys. GDA 1994 MGA Zone 50 	<b>VEGETATION CONDITION</b>
Job No: 58540 Client: Main Roads Version: A Drawn By: esutherland	Date: 08-Jun-2020 Checked By: CT	<b>FIGURE 4</b> 



**Legend:**

- Project area
- Black Cockatoo habitat
- Black Cockatoo habitat trees
  - *Corymbia calophylla*
  - Dead Stag
  - *Eucalyptus gomphocephala*
  - *Eucalyptus marginata*
- Roads (MRWA)

Scale 1:5,000 at A4



Coord. Sys. GDA 1994 MGA Zone 50



Job No: 58540

Client: Main Roads

Version: A

Date: 17-Apr-2020

Drawn By: hsullivan

Checked By: CT

**Mitchell Freeway  
Perth, WA**

**BLACK COCKATOO HABITAT  
WITHIN THE PROJECT AREA**

**FIGURE 5**





<b>Legend:</b> Project area 4km buffer Carnaby's Black Cockatoo foraging habitat (DBCA)	Scale 1:50,000 at A4		 Kilometers		<b>Mitchell Freeway Perth,WA</b>  <b>BLACK COCKATOO HABITAT WITHIN 4KM OF PROJECT AREA</b>
	Coord. Sys. GDA 1994 MGA Zone 50				
	Job No: 58540				
	Client: Main Roads				
	Version: A		Date: 08-Apr-2020		
Drawn By: hsullivan		Checked By: CT			<b>FIGURE 6</b>  



mainroads  
WESTERN AUSTRALIA

# Clearing Assessment Report – CPS 818

*We're working for  
Western Australia.*

Mitchell Freeway Southbound –  
Construction of Noise Walls and  
Principal Shared Path (PSP) between  
Hepburn Avenue and Warwick Train  
Station

November 2022

Printed copies are uncontrolled unless marked  
otherwise. Refer to iRoads for current version.

D20#713066

# Contents

<b>1</b>	<b>PROPOSAL</b> .....	<b>3</b>
1.1	Purpose and Justification.....	3
1.1.1	Main Roads Approach to Road Safety and the Environment.....	3
1.2	Proposal Scope.....	4
1.3	Proposal Location.....	4
1.4	Clearing Details.....	4
1.5	Alternatives to Native Vegetation Clearing Considered During Proposal Development.....	8
1.6	Measures to Avoid, Minimise, Reduce and Manage Project Clearing Impacts.....	8
1.7	Approved Policies and Planning Instruments.....	10
<b>2</b>	<b>SCOPE AND METHODOLOGY OF CLEARING</b> .....	<b>11</b>
2.1	Report Terminology and Sources.....	11
2.2	Desktop Assessment.....	11
2.3	Surveys and Assessments.....	11
<b>3</b>	<b>SUMMARY OF SURVEYS</b> .....	<b>12</b>
3.1	Biological Survey.....	12
3.1.1	Biological Survey (Astron 2020).....	12
3.1.2	Black Cockatoo Habitat Assessment (Kirby 2020).....	14
3.2	Summary of Dieback Survey.....	14
<b>4</b>	<b>VEGETATION DETAILS</b> .....	<b>16</b>
4.1.1	Project Site Vegetation Description.....	16
4.1.2	Vegetation Complexes and Representation.....	17
<b>5</b>	<b>ASSESSMENT AGAINST THE TEN CLEARING PRINCIPLES</b> .....	<b>18</b>
<b>6</b>	<b>VEGETATION MANAGEMENT</b> .....	<b>27</b>
<b>7</b>	<b>STAKEHOLDER CONSULTATION</b> .....	<b>27</b>
<b>8</b>	<b>COMPLIANCE WITH CPS 818</b> .....	<b>27</b>
<b>9</b>	<b>REFERENCES</b> .....	<b>29</b>

# Amendments

Report Compilation & Review	Name and Position	Document Revision	Date
Author:	Environmental Consultant - JBS&G	Draft v1	27/10/2022
Reviewer:	Senior Environment Officer	Rev 0	16/11/2022
Author:	Environmental Consultant - JBS&G	Rev 1	24/11/2022
Reviewer:	Principal Environment Officer	Rev 1	13/12/2022

# 1 PROPOSAL

## 1.1 Purpose and Justification

The purpose of this Clearing Assessment Report (CAR) is to provide a report detailing the assessment of native vegetation clearing that is proposed to be undertaken using the Statewide Clearing Permit CPS 818 issued to Main Roads Western Australia (Main Roads).

The CAR outlines the key activities associated with the project, the existing environment and an assessment of native vegetation clearing. This assessment provides an evaluation of the vegetation clearing impacts associated with the project using the ten Clearing Principles, and the strategies used to manage vegetation clearing.

### 1.1.1 Main Roads Approach to Road Safety and the Environment

Main Roads is committed to minimising the environmental impacts of all of its activities, and manages the State road network to achieve balanced economic, social, safety and environmental benefits for the community. Main Roads recognises that Western Australia's environment is significant from a global perspective and the unique conservation values that are contained within its road reserve. Main Roads road network often adjoins natural areas and, in some locations, the reserve itself hosts remnant vegetation with high environmental values. Although the reserves were not established for this purpose, Main Roads recognises that it has a responsibility to conserve the environmental values that occur within the State's road network and minimise the impact its proposals have on the environment. In addition to providing a safe and efficient road network for all people using the roads under its control, Main Roads is also committed to protecting and enhancing the natural environment.

In accordance with National and State Government road safety policies, Main Roads is also committed to substantially reducing road trauma on the road network through Safe System principles. The Safe System approach acknowledges that more than two thirds of all serious crashes are due to human error rather than deliberate risk taking (e.g. speeding or drink driving) and seeks to improve behaviour through education and enforcement while managing the safety of vehicles, speeds and the road and road infrastructure. It is shown that improving sub-optimal road formation will substantially reduce the likelihood and severity of road crashes. For example, according to the Road Safety Management Guideline, increasing the sealed shoulder from 0.5 m to 2 m will reduce Killed and Seriously Injured numbers by more than 50%.

As the statutory authority responsible for providing and managing a safe and efficient main road network in Western Australia, Main Roads focuses on improving road safety by thoroughly considering all environmental, economic and community benefits and impacts. It operates on a hierarchy of avoiding, minimising, reducing and then, if required, offsetting our environmental impacts. This has been achieved through changes in proposal scope and design. Main Roads regularly reduces its clearing footprint by restricting earthworks limits for proposals, steepening batters, installing barriers, establishing borrow pits in cleared paddocks and avoiding temporary clearing for storage, stockpiles and turn around bays to avoid and minimise its impacts.

Further details on measures to avoid, minimise and reduce are provided in Section 1.6.

## 1.2 Proposal Scope

**Project Name:** Mitchell Freeway Southbound Upgrade Optional Works 2.

**Project Purpose / Components:** Main Roads Western Australia (Main Roads) proposed to upgrade of the verge of Mitchell Freeway between Hepburn Avenue and Warwick Train Station which incorporates the construction of the following elements:

- A principle shared path (PSP) to connect with existing PSPs and upgrading existing PSPs to modern standards;
- The construction of a noise wall; and
- Drainage modifications

During delivery, detailed engineering design work has been conducted for the PSP and noise walls and further consultation with affected landholders has taken place. This has identified the need for minor realignments of the PSP and noise walls. Connection of ITS infrastructure has also been added to the scope of works (Additional Project). The Additional Project area is shown in Figure 1.

## 1.3 Proposal Location

The project is situated approximately 20 km north west of Perth within the Local Government Area of City of Joondalup. The Project area is located between Hepburn Avenue (H016 SLK 18.39) and Warwick Train Station (SLK 15.30) (Figure 1).

*Start*

Latitude: -31.776817°

Longitude: 115.780886°

*End*

Latitude: -31.785953°

Longitude: 115.781839°

The location and boundaries of the study area (10 km radius) for the Project are shown in [Figure 2](#).

## 1.4 Clearing Details

**The proposed clearing undertaking using CPS 818 is:** The Project area will require 2.40 ha of native vegetation in a.

**The proposed temporary clearing undertaking using CPS 818 is:** None.

A detailed CAR of the Project clearing activities was undertaken. The Clearing Assessment Report (CAR) was endorsed by Main Roads on 8 February 2021 (D21#256690). The CAR was updated to include the Additional Project in November 2022.

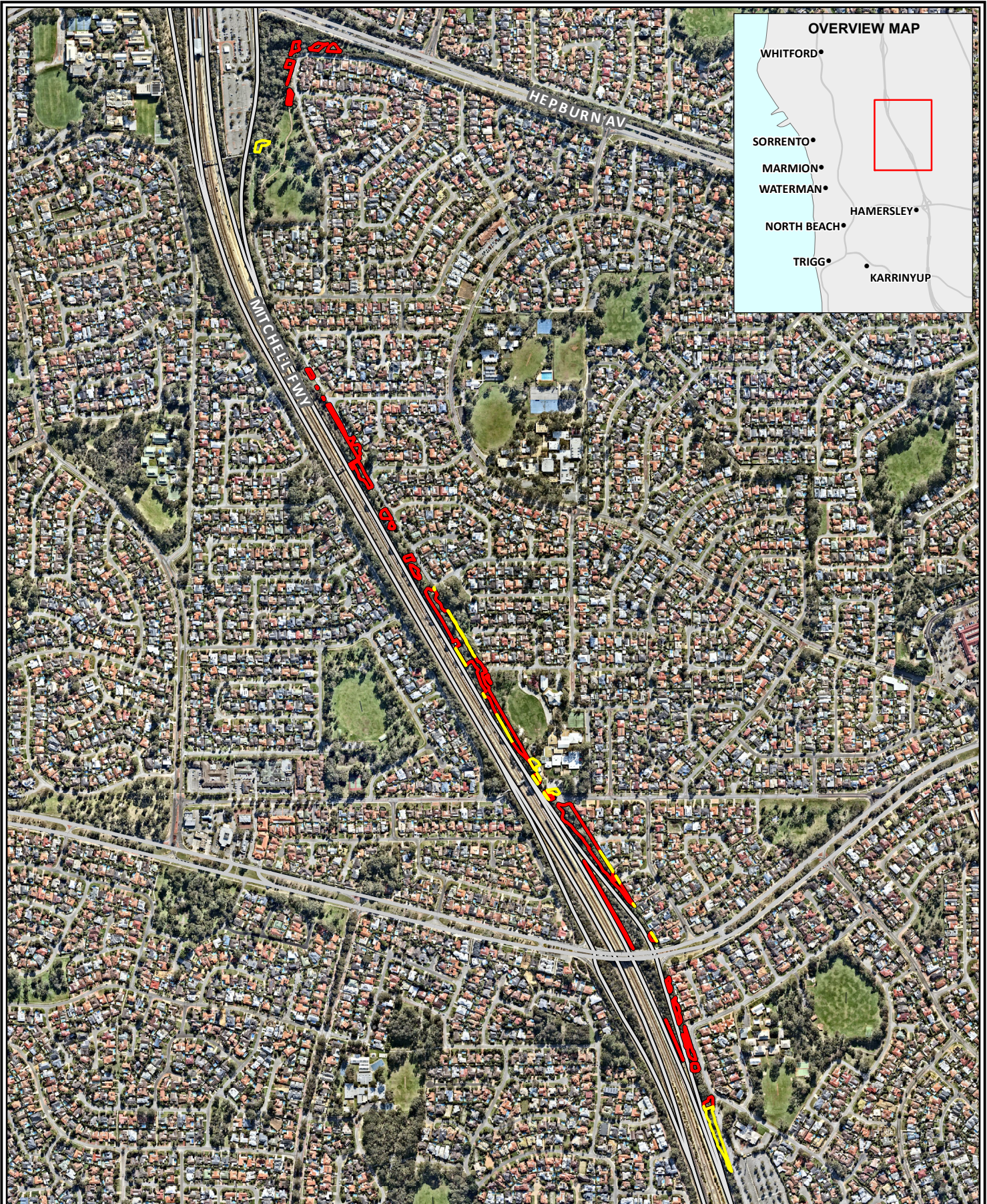
The CAR outlines the key activities associated with the entire Project, the existing environment and an assessment of native vegetation clearing. This assessment provided an evaluation of the vegetation clearing impacts associated with the Project using the ten clearing principles and strategies used to manage vegetation clearing. Key items associated with the clearing impact assessment are listed below.

- Flora and Vegetation

- Clearing of a total 2.40 ha of remnant native vegetation, of which 2.09 ha has been mapped as in a 'Degraded' to 'Completely Degraded' condition.
- Terrestrial Fauna
  - The native vegetation clearing has the potential to impact Carnaby's Black Cockatoo through the removal of up to 2.40 ha of low-quality foraging habitat and up to 57 suitable habitat trees with a diameter at breast height (DBH) greater than 500 mm (Suitable DBH Trees), none of which contain hollows suitable for Black Cockatoo use.

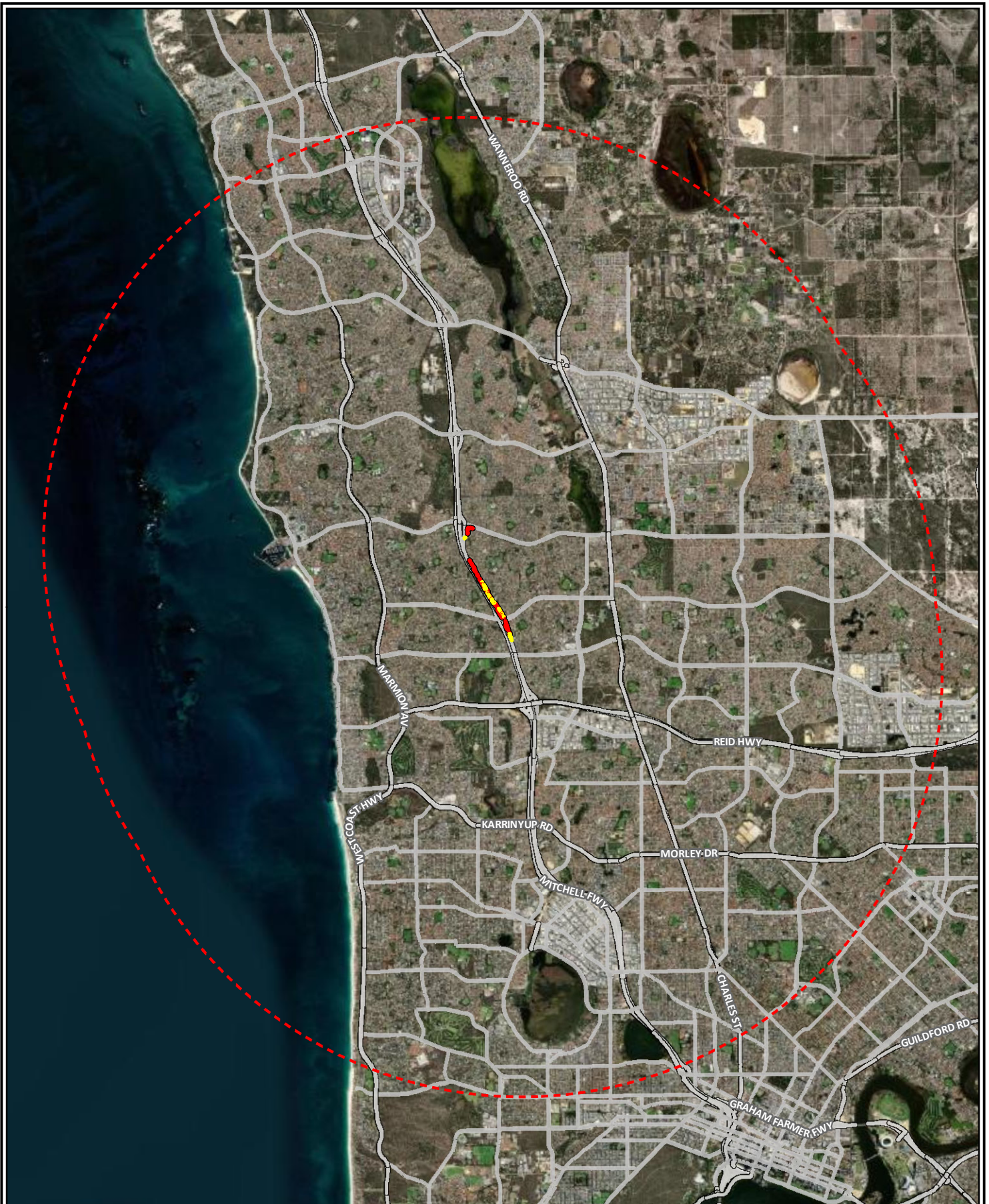
The Project is not likely to be at variance with any of the clearing principles.

Main Roads Statewide Purpose Clearing Permit CPS 818 will be used to undertake native vegetation clearing for the Project. Project clearing will be undertaken in accordance with the conditions of CPS 818 and detailed records of native vegetation clearing will be maintained as required under the permit.



<b>Legend</b> Approved project area Proposed additional project area Highways Main road	Scale 1:12,000 at A4 	<b>Optional Works 2</b> <b>Hepburn Ave - Warwick Train Station</b>
	Coord. Sys. GDA 1994 MGA Zone 50 	<b>PROJECT AREA</b>
	Job No: 63847	<b>FIGURE 1</b> 
	Client: Main Roads Western Australia	
	Version: A Date: 24-Nov-2022	
Drawn By: ianandagoda Checked By: CT		

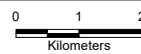
File Name: \\008PMPMR004V001.jbsg.aust\JBS Perth\Projects\1)\Open\Main Roads\63847 Mitchell Fwy Southbound updates\GIS\Maps\R01\_Hepburn\_CAR\63847\_01\_ProjectArea.mxd  
 Image Reference: www.nearmap.com© - Imagery Date: 30 August 2022.



**Legend**

- Approved project area
- Proposed additional project area
- 10km study area
- Highways
- Main road

Scale 1:120,000 at A4



Coord. Sys. GDA 1994 MGA Zone 50



Job No: 63847

Client: Main Roads Western Australia

Version: A

Date: 24-Nov-2022

Drawn By: ianandagoda

Checked By: CT

**Optional Works 2  
Hepburn Ave - Warwick Train Station**

**PROJECT AREA 10 KM STUDY AREA**

**FIGURE 2**



## **1.5 Alternatives to Native Vegetation Clearing Considered During Proposal Development**

Within the road reserve there is limited space available for development of infrastructure required for the broad Smart Freeway project, which includes widening the freeway, installing the PSP and noise walls, as well as installation of services and signage for Intelligent Transport Systems (ITS). Consequently, there were limited options available for positioning of the PSP and noise wall alignment.

Where possible the PSP and noise wall alignment has utilised previously cleared land to avoid clearing of native vegetation. This has included investigating options using previously cleared land, such as realignment through existing firebreak and parks. Alternative design approaches have also been considered such as avoiding cut options that may impact native vegetation, where practicable.

Where native vegetation clearing cannot be avoided it will be minimised. The Project area represents the maximum extent of disturbance for the proposal. Where possible, vegetation and fauna habitat will be retained during detailed design and construction. The PSP has also been positioned in its ultimate alignment where possible, to minimise potential for future clearing of native vegetation.

## **1.6 Measures to Avoid, Minimise, Reduce and Manage Project Clearing Impacts**

The design and management measures implemented to avoid and minimise the clearing impacts by the project are provided in Table 1.

In addition, impacts to vegetation will be minimised through the implementation of the following measures:

- The clearing area will be demarcated prior to the commencement of native vegetation clearing;
- Where possible vegetation will be pruned as opposed to removed;
- Further Project clearing will be avoided as the site office, materials storage areas, construction vehicles/machinery and access tracks will be located on previously disturbed or cleared areas; and
- Development and implementation of a site-specific Construction Environmental Management Plan (CEMP) which will establish the following vegetation management actions including:
  - Clearing and access control measures (such as demarcation of clearing boundaries);
  - Weed and dieback management;
  - Landscaping of earth-worked areas;
  - Erosion and sediment control;
  - Waste and fire management;
  - Topsoil management;
  - Dust control; and
  - Tree and vegetation retention where possible.

**Table 1. Measures Undertaken to Avoid, Minimise, Reduce and Manage the Project Clearing Impacts**

<b>Design or Management Measure</b>	<b>Discussion and Justification</b>
<b>Steepen batter slopes</b>	Batters will be steepened beyond standard practice to reduce the amount of clearing required and ensure clearing doesn't extend outside the proposed footprint. Where steepening the batters is impractical and installation of retaining walls is practicable, retaining walls will be used to reduce the clearing requirement.
<b>Installation of safety barriers</b>	Installation of safety barriers is required in order to comply with road safety requirements. Where possible, safety barriers will be installed in previously cleared land within the road reserve.
<b>Alignment to one side of existing road</b>	Having the PSP on the eastern side of the freeway is a design requirement and therefore the project was constrained to stay within this verge. Design has utilised previously cleared land within the verge as much as possible and native vegetation clearing will only take place when it cannot be avoided.
<b>Alternative alignment to follow existing road (or) to preferentially locate within pasture or a degraded areas</b>	To minimise clearing required, the PSP and noise wall alignment will be positioned within existing cleared areas such as firebreaks and along batters impacted by construction of the existing freeway.
<b>Installation of kerbing</b>	Freeway surfacing with Open Graded Asphalt may prevent kerbing from being effective. Kerbing requirements are not likely to have a significant impact on the amount of native vegetation clearing required for a PSP.
<b>Simplification of design to reduce number of lanes and/or complexity of intersections</b>	Alignment has been chosen to follow existing PSP and utilise cleared areas wherever possible. Where practicable, the PSP has been positioned in its ultimate alignment to avoid future clearing of native vegetation.
<b>Preferential use of existing cleared areas for access tracks, construction storage and stockpiling</b>	Cleared areas will be used for access tracks, construction storage and stockpiling, with no vegetation to be removed for temporary works.
<b>Drainage modification</b>	The Project will modify the existing drainage for this section of Hepburn Avenue and Mitchell Freeway to increase basin capacity. Drainage alternatives have been incorporated into the design to reduce clearing requirements such as the use of levees to avoid or reduce the size of drainage basins. Where practicable existing basins will be deepened to avoid additional clearing requirements.
<b>Other design treatment</b>	To reduce the clearing requirements, cut and fill alternatives have been considered as part of the design where possible any cut options that would require additional clearing have been avoided.

## 1.7 Approved Policies and Planning Instruments

The clearing of native vegetation in Western Australia is regulated under the EP Act and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 (Clearing Regulations).

In addition to the matters considered in accordance with section 51O of the EP Act (see Section 1.3), Main Roads has also had regard to the below instruments.

### **Other Legislation of relevance for assessment of clearing and planning/other matters**

- Biodiversity Conservation Act 2016 (WA) (BC Act)
- Conservation and Land Management Act 1984 (WA) (CALM Act)
- Country Areas Water Supply Act 1947 (WA) (CAWS Act)
- Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act)
- Planning and Development Act 2005 (WA) (P&D Act)
- Soil and Land Conservation Act 1945 (WA)
- Rights in Water and Irrigation Act 1914
- Aboriginal Heritage Act 1972 (WA)
- Town Planning and Development Act 1928

### **Environmental Protection Policies**

- Environmental Protection (Peel Inlet - Harvey Estuary) Policy 1992
- Environmental Protection (Western Swamp Tortoise Habitat) Policy 2011

### **Other Relevant policies and guidance documents:**

- Environmental Offsets Policy (Government of Western Australia, 2011)
- A guide to the assessment of applications to clear native vegetation (DEC, December 2014)
- Procedure: Native vegetation clearing permits (DWER, October 2021)
- Environmental Offsets Guidelines (Government of Western Australia, August 2014)
- Technical guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016)
- Technical guidance – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA, 2020)
- Approved conservation advice under section 266B of the EPBC Act for threatened flora/fauna/vegetation communities
- Approved Recovery Plans for threatened species
- EPBC Act Referral guidelines for the three threatened black cockatoo species
- Strategic advice - EPA

## 2 SCOPE AND METHODOLOGY OF CLEARING

Native vegetation will be cleared to accommodate this Proposal. This clearing will be undertaken using the Main Roads Statewide Clearing Permit CPS 818 or a project-specific Clearing Permit.

To comply with CPS 818, Main Roads must prepare a Clearing Assessment Report (CAR).

The CAR outlines the key activities associated with the Proposal, the existing environment and an assessment of native vegetation clearing. This assessment provides an evaluation of the vegetation clearing impacts associated with the Proposal using the ten Clearing Principles listed under s51 of the *Environmental Protection Act 1986* (EP Act) and strategies used to manage vegetation clearing.

### 2.1 Report Terminology and Sources

The following terms are used in this Clearing Report:

- **Native Vegetation Clearing Area** – The maximum amount of native vegetation to be cleared for the Project that will accommodate the designed earthworks and, typically, a nominal buffer to allow for the safe movement of machinery during construction.
- **Study Area** – Area covered by the Desktop Assessment. The Study Area for the Proposal is confined to a local area of a 10km radius.
- **Survey Area** – Area covered by the Biological Survey, which is typically larger than the Development Envelope.

### 2.2 Desktop Assessment

A desktop assessment of the Development Envelope was undertaken by viewing internal datasets and other government agency managed databases, and consulting with relevant stakeholders where necessary.

GIS layer viewing and mapping is done using ArcMap and/or Main Roads corporate mapping system known as iMaps. Referencing of the GIS layers accessed is done under the relevant methodology section of each clearing principle. Government managed databases were searched to locate additional information, which are found under References in Section **Error! Reference source not found.**

### 2.3 Surveys and Assessments

The following surveys/assessments were undertaken to inform this CDR/CAR:

- Mitchell Freeway Widening Southbound and PSP Mitchell Freeway Gaps Hodges Drive to Reid Highway Biological Survey (Astron, 2020).
- Targeted Black Cockatoo habitat assessment (Tony Kirkby 2020).
- Phytophthora Dieback Assessment (Terratree, 2020)

A summary of the methodology and the results of the above surveys are provided in Section **Error! Reference source not found.**

## 3 SUMMARY OF SURVEYS

### 3.1 Biological Survey

A detailed biological survey of the area (survey area wider than the current Project area) was undertaken in 2019 (Astron, 2020). A summary of the findings from the survey are presented below.

A Black Cockatoo survey was subsequently undertaken by Tony Kirkby (2020) to provide an additional investigation into habitat trees of interest from the results of Astron (2020), between the 15<sup>th</sup> and 27<sup>th</sup> June 2020.

A summary of these surveys is provided in Sections 3.1.1 to 3.1.2 below.

#### 3.1.1 Biological Survey (Astron 2020)

Astron (Astron 2021) undertook a detailed biological survey that concluded:

##### Vegetation:

- Five remnant native vegetation types were defined and included:
  - One *Banksia* Woodland;
  - Two *Eucalyptus marginata* (jarrah) woodlands; and
  - Two *Eucalyptus gomphocephala* (tuart) forests.
- Remnant vegetation types were mapped across 6.40 ha (19 %) of the survey area. The remaining 27.60 ha of the survey area was either cleared (3.00 ha, 9 %) or planted vegetation (24.60 ha, 72 %).
- Remnant vegetation in the survey area was in Good to Completely Degraded condition, with the majority considered Completely Degraded as it consisted of scattered remnant species only. It is expected that quality of these remnants has been declining over time due to significant edge effects.
- Vegetation inferred to represent the EPBC Act listed 'Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain' TEC was recorded within the survey area, with none within the Project area.
- Vegetation considered to represent the State listed PECs 'Tuart (*Eucalyptus gomphocephala*) woodlands of the Swan Coastal Plain' and '*Banksia* dominated woodlands of the Swan Coastal Plain IBRA Region' PEC was recorded within the survey area across 4.70 ha and 1.30 ha respectively, with none within the Project area.

##### Flora:

- A total of 207 vascular flora species, from 47 families and 127 genera, were recorded in the survey area. No EPBC Act or State listed threatened flora were recorded. Three priority flora species were recorded: *Ricinocarpos tuberculatus* (P2), *Grevillea olivacea* (P4) and *Jacksonia sericea* (P4).
- The survey area has considerable disturbance and limited floristic diversity which further limits the potential for any threatened or priority flora species to occur.

- Sixty-three weed species were recorded within the survey area, accounting for 30% of the species recorded. Three are listed as WoNS (Government of Australia, 2012) (*\*Asparagus asparagoides*, *\*Lantana camara* and *\*Genista linifolia*) and three are declared pest plants in Western Australia under the BAM Act (DPIRD, 2016).

**Fauna:**

- 24 conservation significant vertebrate species were identified in the desktop assessment, and three species (Quenda, Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo) were recorded within the survey area, one species was considered to have a 'moderate' likelihood and 20 species were considered to have a 'low' likelihood of occurrence.
- Based upon the current distributions for the three threatened species of black cockatoo, only the Carnaby's Cockatoo (*Zanda latirostris*) and Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) are likely to occur within the vicinity of the survey area.
- 329 Black Cockatoo trees (259 Tuart, 42 Jarrah, 16 dead stags and 12 Marri) with a diameter at breast height of over 50 cm were recorded within the survey area including 15 trees (nine Tuarts and six dead stags) considered to have suitable hollows for Carnaby's Cockatoos to breed in.
- Twenty-seven known foraging resource species for the Carnaby's Cockatoo and three known foraging resource species for the Forest Red-tailed Black Cockatoo were recorded within the survey area; however, only the marri, jarrah and Banksia species are considered key species for foraging Carnaby's Cockatoos. Two individual Carnaby's Cockatoos were observed foraging on *Banksia prionotes* and jarrah within the survey area.
- One individual Quenda roadkill and multiple diggings in the same area were recorded within the survey area. The sighting was recorded 228 m south of the Woodvale Open Space, and it is likely that this individual was from of a larger quenda population within Woodvale Open Space.

### 3.1.2 Black Cockatoo Habitat Assessment (Kirby 2020)

Tony Kirkby (2020) undertook a specific assessment of all trees identified during the biological survey completed by Astron (2020) to provide further clarification of potentially suitable hollows. All trees with a DBH greater than 500 mm were inspected from the ground using binoculars, and further inspected using a pole camera where necessary. The findings of this assessment are summarised below.

#### **Breeding habitat:**

Of the 329 trees identified by Astron (2020), four were deemed of interest (tree numbers 103, 190, 230 and 290). These trees were all located outside of the Project area for Optional Works 2. The trees of interest were described by Kirkby (2020) as:

- Tree 103: *Eucalyptus gomphocephala* – small hollow with chewed entrance. Unlikely to be Black Cockatoo breeding hollow
- Tree 190: Dead Stag – top entry hollow with chewing at entrance. Top section of hollow in poor condition however may be sufficiently deep to provide Black Cockatoo hollow
- Tree 230: *Eucalyptus gomphocephala* dead stag – hollow with entrance large enough for Black Cockatoo however no signs of use around the rim or internally. Unlikely to be a breeding hollow, possibly too shallow
- Tree 290: *Eucalyptus gomphocephala* – hollow with suitable entrance for Black Cockatoo with chew marks at entrance. Closer inspection using pole camera not possible due to presence of feral bees in nearby hollow

None of the trees identified to have potential or suitable hollows for Black Cockatoo use were recorded within the Project area.

#### **Foraging habitat:**

Foraging habitat was found to range from poor to completely degraded within the survey area, with remaining understorey foraging species being *Banksia sessilis*, *B. nivea*, *Hakea lissocarpa*, *H. prostrata*, *H. trifurcata*, and *Xanthorrhoea pressii*. Canopy cover was considered good, with Jarrah, Marri, Tuart, *Allocasuarina fraseriana* (Sheoak) and *Banksia* spp. present. This is of note as being particularly relevant for Forest Red-tailed Black Cockatoo which rarely feeds below the canopy level. Foraging residue from Marri and *Banksia* spp. were present. No breeding sites are located within 6 km of the Project area; therefore, this foraging habitat is not significant in supporting breeding individuals.

#### **Roosting habitat:**

No roosting sites are known from the Project area, and no signs of Black Cockatoo roosting was noted within the survey area.

### 3.2 Summary of Dieback Survey

Terratree (2020) completed a Phytophthora Dieback Assessment of Mitchell Freeway on the 9<sup>th</sup> of June 2020, covering an area broader than the Project area.

Terratree (2020) concluded:

- Desktop review of Dieback Information Data Management System identified no positive sample results for *Phytophthora* species within the assessment area
- Two soil and tissue samples taken during the assessment returned negative results for any *Phytophthora* species
- 0.60 ha (1.8%) of the assessment area was mapped as 'infested'
- 0.90 ha of the assessment area was mapped as 'uninfested'
- Most of the assessment area was excluded from assessment due to the vegetation being classified as Degraded or Completely Degraded (Astron 2020)

No evidence of dieback was recorded within the Project area, with the site reported as uninfested or uninterpretable.

## 4 VEGETATION DETAILS

### 4.1.1 Project Site Vegetation Description

The Project area is predominately in 'Degraded' to 'Completely Degraded' condition with one native vegetation unit present:

- **Tuart Forest 2:** *Eucalyptus gomphocephala* mid open to closed forest over *Eucalyptus marginata* (+/- *Banksia attenuata*, *Allocasuarina fraseriana*, *Corymbia calophylla*) mid to low woodland to open woodland over *Xanthorrhoea preissii* (+/- *Acacia rostellifera*, *Jacksonia sternbergiana*, *Allocasuarina humilis*) mid shrubland to isolated shrubs over *Mesomelaena pseudostygia* and *Lepidosperma calcicola* sparse sedgeland over an introduced tussock grassland.

Table 2 and Table 3 provide details of the Pre-European Vegetation Associations within the Project area and the Additional Project area and the remaining extents of these associations.

**Table 2. Summary of Project Area’s Mapped Pre-European Vegetation Associations**

Pre-European Vegetation Association(s)	Clearing Description	Vegetation Condition	Comments
Vegetation Association 6 described as a Medium woodland: tuart and jarrah (GoWA, 2019a).	<b>Initial Project area:</b> Clearing of up to 2.06 ha for construction of noise barriers and a PSP.	Completely Degraded (0.90 ha), Degraded to Completely Degraded (0.49 ha), Degraded (0.36 ha), Degraded to Good (0.24 ha), Good (0.07 ha).	Vegetation description and condition determined from biological survey (Astron, 2020).
	<b>Additional Project area:</b> Additional clearing of up to 0.34 ha for construction of noise barriers and a PSP.	Completely Degraded (0.34 ha).	Vegetation description and condition inferred from desktop analysis of additional clearing.

**Table 3. Pre-European Vegetation Representation**

Pre-European Vegetation Association	Scale	Pre-European (ha)	Current Extent (ha)	% Remaining	% Remaining in DBCA reserves
<b>Veg Assoc No. 6</b>	<b>Statewide</b>	56,343.01	13,362.25	23.72	5,322.03 ha (9.45%)
	<b>IBRA Bioregion</b> Swan Coastal Plain	56,343.01	13,362.25	23.72	5,322.03 ha (9.45%)
	<b>IBRA Sub-region</b> Perth	56,343.01	13,362.25	23.72	5,322.03 ha (9.45%)
	<b>Local Government Authority</b> City of Joondalup	2,294.47	326.68	14.24	30.38 ha (1.32%)

#### 4.1.2 Vegetation Complexes and Representation

Vegetation Complexes within the Project area have been defined by Heddle et al. (1980) and are based on vegetation in association with landforms and underlying geology. Native vegetation complexes as described by Heddle et al. (1980) within the Project area comprise:

- **Karrakatta Complex** – Central and South: Predominately open forest of *Eucalyptus gomphocephala* (Tuart), *E. marginata* (Jarrah), *Corymbia calophylla* (Marri) and woodland of *E. marginata* and *Banksia* species.

This complex is above the minimum threshold of 10% target for the retention of vegetation complexes in constrained areas on the Swan Coastal Plain (EPA, 2015). The current extent within the local area (10 km of the Project) is more restricted, with 9.86% remaining. The current remaining extent of these vegetation complexes (GoWA, 2019b) is detailed in Table 4.

**Table 4. Vegetation Complexes (Heddle/Mattiske) within the Project Area**

Heddle/Mattiske Veg Complex	Pre-European Extent (ha)	2019 Vegetation Extent	% Remaining
Karrakatta Complex - Central and South	53,080.99	12,467.20	23.49

## 5 ASSESSMENT AGAINST THE TEN CLEARING PRINCIPLES

In assessing whether the project’s proposed clearing is likely to have a significant impact on the environment, the project was assessed against the ten Clearing Principles (Environmental Protection Act 1986, Schedule 5).

Each principle has been assessed in accordance with DWER’s ‘A Guide to the Assessment of Applications to Clear Native Vegetation’ and other relevant CPS Decision Reports prepared by DWER.

The proposed clearing is not likely to be at variance to Principles (a) and (b) and not at variance to the remaining clearing principles.

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

#### Proposed clearing is not likely to be at variance to this Principle

**Comment:**

The Project involves the clearing of up to 2.40 ha of native vegetation comprised of the following mapped vegetation unit:

- **Tuart Forest 2:** *Eucalyptus gomphocephala* mid open to closed forest over *Eucalyptus marginata* (*Banksia attenuata*, *Allocasuarina fraseriana*, *Corymbia calophylla*) mid to low woodland to open woodland over *Xanthorrhoea preissii* (*Acacia rostellifera*, *Jacksonia sternbergiana*, *Allocasuarina humilis*) mid shrubland to isolated shrubs over *Mesomelaena pseudostygia* and *Lepidosperma calcicola* sparse sedgeland over an introduced tussock grassland.

The vegetation proposed to be cleared is in ‘Completely Degraded’ to ‘Good’ condition, with the majority (2.09 ha; 87.1%) in ‘Degraded’ to ‘Completely Degraded’ condition. The Project area represents poorer quality native vegetation in comparison to that in the surrounding area. Vegetation within the Project area comprises a linear fragment, separated from surrounding patches by main roads and residential land use.

No State of Federally listed Threatened or Priority ecological communities were recorded within the Project area.

No State or Federally listed Threatened flora species were recorded within the Project area.

One population of *Grevillea olivacea* (P4), comprising of 20 individuals, was recorded immediately adjacent to the Project area. *G. olivacea* is a common horticultural species in the Perth metropolitan region and is considered to have been established via seed mix during previous revegetation work. The Project area is approximately 120 km south of the species’ natural range (Astron, 2021).

Astron (2021) observed the presence of three conservation significant fauna species within the survey area, including the Carnaby’s Black Cockatoo (foraging individuals), Forest red-tailed Black Cockatoo (foraging evidence), and Quenda (roadkill and diggings) however, no observations were reported within the Project area.

The Project area is within the known distribution range of the Carnaby’s Black Cockatoo, but outside of its known breeding range, and is outside of the modelled distribution of the Forest Red-tailed Black Cockatoo (DAWE, 2022).

Approximately 2.40 ha of potentially suitable foraging habitat was recorded by Astron (2021). The black cockatoo assessment undertaken by Astron (2021) determined that no quality foraging habitat as defined referral guidelines (DAWE, 2022) is present, due to the degraded state of vegetation and the sporadic and isolated distribution of known foraging flora species. A total of 57 trees of a suitable species for Black Cockatoo breeding with a DBH greater than 500 mm were recorded within the Project area. None of these

trees contained potentially suitable hollows (Kirby 2020). The presence of foraging habitat surrounding Suitable DBH Trees may increase the significance of that habitat.

The native vegetation to be cleared is not considered to comprise a high level of biological diversity. This is based on the vegetation being predominantly in 'Degraded' to 'Completely Degraded' condition, having a small size and high level of fragmentation, and the occurrence of similar remnant vegetation in equal or better quality in the local area.

Assessed Outcome:

- Noting the above, clearing for this Project is not likely to be at variance to this principle.

**Methodology**

MRWA Shapefiles  
 DBCA shapefiles  
 DAWE (2022)  
 NatureMap (February, 2020)  
 EPA (2016)  
 Astron (2021)

**(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna.**

**Proposed clearing is not likely to be at variance to this Principle**

**Comment:**

Native vegetation contained within the Project area is predominantly (2.09 ha; 87.1%) in 'Completely Degraded' to 'Degraded' condition, and is separated from surrounding habitat patches by roads, pathways and residential land use. The vegetation to be cleared is not considered likely to provide significant habitat for most fauna species in the local area, however does contain some Carnaby's Black Cockatoo (*Zanda latirostris*), Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) and Quenda (*Isoodon fusciventer*) foraging habitat.

Astron (2020) identified the Carnaby's Cockatoo, Forest Red-tailed Black Cockatoo and Quenda within the broader survey area. The vegetation within the Project area contains some value for Carnaby's Black Cockatoo, as discussed below.

**Black Cockatoo:**

The Project area is within the known distribution range of the Carnaby's Black Cockatoo, but outside of its known breeding range, and is outside of the modelled distribution of the Forest Red-tailed Black Cockatoo (DAWE, 2022).

Within the Project area, habitat suitable for Carnaby's Black Cockatoos comprises of 2.40 ha of potentially suitable foraging and 57 Suitable DBH Trees, none of which contain suitable hollows (Kirkby, 2020;).

Kirkby, 2020 observed foraging residue from Carnaby's Cockatoo from Marri and Banksia from within the Project area. Astron (2020) recorded 2.06 ha of potentially suitable foraging habitat. The Black Cockatoo assessment undertaken by Astron (2020) determined that no quality foraging habitat as defined by the referral guidelines (DAWE, 2022) was present, due to the degraded state of vegetation and the sporadic and isolated distribution of known foraging flora species. While Carnaby's will utilise occurrences of Marri and Banksia within the Project area, the vegetation is considered unlikely to be significant to support the local population.

Within 6 km and 12 km of the Project area, there is approximately 919.04 ha and 3,858.30 ha of potential foraging habitat (DBCA, 2020). Clearing as a result of the Project represents 0.26% and 0.06% of the foraging habitat within 6 and 12 km of the Project area, respectively.

While the Project area contains suitable foraging species and potential breeding habitat, the quality of this habitat is 'Low' (Astron 2021) and is outside of the modelled breeding range for the species. The closest known breeding site for Carnaby's Cockatoo is at the Edith Cowan University Campus, approximately 7.5 km north of the Project area.

With regards to Forest Red-tailed Black Cockatoo, Marri is the most important breeding tree throughout their range, however breeding has also been recorded in Tuarts (DAWE, 2022). Suitable breeding trees are large and mature Marris, approximately 120-150 years in age and a mean overall height of 20.24 m (Johnston, Kirkby and Sarti, 2013). The closest known Forest red-tailed Black Cockatoo breeding site is 30 km South-east in the Darling Range (Kirkby, 2020) and are not expected to utilise the Project area for breeding.

Within the Peel-Perth region, foraging and water resources within 6 km, as well as overlapping foraging within 12 km, are required to support roosting and breeding sites and maintain habitat connectivity to facilitate movement through the landscape (Groom, 2015). EPA (2019) note that the proximity of foraging and water is critical to support roosting and breeding sites.

Two roost sites are located within 1 km of the Project, and a further 20 occur within 6 km. No evidence of roosting within the Project area was recorded and is unlikely to occur due to the long linear nature of the native vegetation to be cleared.

Berry (2008) observed that Carnaby's Cockatoo prefer roosting at sites within close proximity to known food and water sources. Energy expenditure could be reduced where they are able to feed and drink close to (within a 6 km radius around a roost site) roost sites before and after nocturnal roosting (Berry 2008).

Le Roux (2017) determined that a greater area of Banksia and pine vegetation was associated with roost sites that had high Black Cockatoo counts. This highlights the importance of Banksia and pine in supporting significant roost sites, an observation that has been supported in a number of Carnaby's Cockatoo related studies (Valentine and Stock 2008, Finn et al. 2009, Johnston et al. 2016).

Within the local area, several habitat patches are likely to provide higher quality foraging habitat, consisting of greater abundance and quality of banksia species and in close proximity wetlands and waterbodies. The Project area is therefore considered of poorer habitat value in the context of the local area, and Black Cockatoo populations will continue to be supported by more locally significant habitat resources once clearing has been undertaken.

Flocks of Black Cockatoos move through the landscape by following vegetated corridors whilst actively avoiding cleared or open areas including dense urban areas. Ecological linkages are therefore required to facilitate this movement between habitat nodes. The Project area is not located within any Regional Ecological Linkages. Clearing associated with the Project is unlikely to have a significant impact on the available foraging habitat within 6 km of nearby roosting sites or impede the movement of individuals through the landscape.

Vegetation within the Project area is considered unlikely to provide significant habitat for foraging or breeding for Carnaby's Cockatoo and Forest Red-tailed Black Cockatoo due to its narrow, linear configuration poor condition, and the sporadic and isolated distribution of known foraging species.

**Other Conservation Significant Species:**

The Southern Brown Bandicoot (Quenda) occurs in wet or dry sclerophyll forest through to open woodland and scrubby, dense vegetation on sandy soils. This species was identified within the survey area near the Woodvale Nature Reserve, approximately 3.6 km north of the Project area.

It is considered unlikely that the small area of native vegetation to be cleared located in isolated pockets amongst planted vegetation, constitutes significant habitat for any species..

<p>Assessed Outcome:</p> <ul style="list-style-type: none"> <li>Noting the above, given the low quality of the habitat, its small fragmented extent and presence of larger areas of remnant vegetation in a better condition, clearing for this Project is not likely to be at variance to this principle.</li> </ul>
<p><b>Methodology</b>                  DBCA Shapefiles                  DBCA website                  DAWE 2022                  EPA (2016)                  Astron (2021)                  Aerial Photography</p>

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

<p><b>Proposed clearing is not at variance to this Principle</b></p>
<p><b>Comment:</b>                  A total of 207 vascular flora species, from 47 families and 127 genera, were recorded in the wider survey area (Astron 2020). No threatened flora species listed under the <i>Biodiversity Conservation Act 2016</i> occur within the project area.</p> <p>Assessed Outcome:</p> <ul style="list-style-type: none"> <li>Project clearing is not at variance to this Principle.</li> </ul>
<p><b>Methodology</b>                  DBCA shapefiles                  Florabase (February, 2020)                  Astron (2021)</p>

**(d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.**

<p><b>Proposed clearing is not at variance to this Principle</b></p>
<p><b>Comment:</b>                  No threatened ecological communities listed under the <i>Biodiversity Conservation Act 2016</i> were recorded within the Project area.</p> <p>Assessed Outcome:</p> <ul style="list-style-type: none"> <li>Project clearing not at variance to this Principle.</li> </ul>
<p><b>Methodology</b>                  DBCA shapefiles                  Astron (2021)</p>

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

**Proposed clearing is not likely at variance to this Principle**

**Comment:**

The Project area is mapped as Vegetation Association 6, described as a Medium Woodland: Tuart and Jarrah. The Project proposes to clear up to 2.40 ha of native vegetation. Of this, 2.09 ha (87.1%) has been assessed as 'Completely Degraded' to 'Degraded', 0.24 (10.0%) as 'Good to Degraded', and 0.07 ha (2.9%) as 'Good'. The national objectives and targets for biodiversity conservation in Australia have a target to prevent clearance of ecological communities with an extent below 30 per cent of that present pre-1750, below which species loss appears to accelerate exponentially at an ecosystem level (EPA, 2015). The Project area is within a constrained area of the Swan Coastal Plain and as such retention objectives of at least 10 per cent apply (EPA, 2016).

**Summary of Project Area's Mapped Pre-European Vegetation Associations**

Pre-European Vegetation Association(s)	Clearing Description	Vegetation Condition	Comments
Vegetation Association 6 described as a Medium woodland: tuart and jarrah (GoWA, 2019a).	Clearing of up to 2.06 ha for construction of noise barriers and a PSP.	Completely Degraded (0.90 ha), Degraded to Completely Degraded (0.49 ha), Degraded (0.36 ha), Degraded to Good (0.24 ha), Good (0.07 ha).	Vegetation description and condition determined from biological survey (Astron, 2020).
	Clearing of up to 0.34 ha for construction of noise barriers and a PSP.	Completely Degraded (0.34 ha)	Vegetation description and condition inferred from desktop analysis of additional clearing area.

**Pre-European Vegetation Representation**

Pre-European Vegetation Association	Scale	Pre-European (ha)	Current Extent (ha)	% Remaining	% Remaining in DBCA reserves
<b>Veg Assoc No. 6</b>	<b>Statewide</b>	56,343.01	13,362.25	23.72	5,322.03 ha (9.45%)
	<b>IBRA Bioregion</b> Swan Coastal Plain	56,343.01	13,362.25	23.72	5,322.03 ha (9.45%)
	<b>IBRA Sub-region</b> Perth	56,343.01	13,362.25	23.72	5,322.03 ha (9.45%)
	<b>Local Government Authority</b> City of Joondalup	2,294.47	326.68	14.24	30.38 ha (1.32%)

As shown in Tables above, Vegetation Association 6 and the Vegetation Complex Karrakatta (Central and South) are above the 10 per cent threshold in a constrained area (GoWA 2019a; GoWA, 2019b).

Given the highly degraded condition of the vegetation, the vegetation within the Project area is not considered representative of native vegetation that is significant as a remnant in an area that has been extensively cleared.

Assessed Outcome:

- Project clearing not at variance to this Principle.

**Methodology**

EPA (2016)  
Aston (2021)

GoWA (2019a)  
GoWA (2019b)  
WALGA (2013)  
Aerial photography

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

<b>Proposed clearing is not at variance to this Principle</b>
<p><b>Comment:</b></p> <p>. Interrogation of DBCA and DWER hydrological and wetland datasets determined that no wetlands or watercourses are mapped within the Project area. The nearest mapped wetland is Little Carine Swamp, located approximately 600m from the Project area and will not be impacted.</p> <p>In addition, the Astron (2021) biological survey concluded that no remnant vegetation considered to represent riparian vegetation was recorded from the Project area.</p> <p>Assessed Outcome:</p> <ul style="list-style-type: none"> <li>• Project clearing not at variance to this Principle.</li> </ul>
<p><b>Methodology</b></p> <p>DWER and DBCA shapefiles Astron (2021)</p>

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

<b>Proposed clearing is not at variance to this Principle</b>												
<p><b>Comment:</b></p> <p>The Department of Primary Industries and Regional Development (DPIRD), provides a series of soil degradation risk mapping at the sub-system level. The Project area is located within the Karrakatta Sand Yellow Phase subsystem of the Spearwood Dunes soil system. It is described as low hilly to gently undulating terrain. Yellow sand over limestone at 1-2 m. <i>Banksia</i> spp. woodland with scattered emergent Tuart and Jarrah and a dense shrub layer (DPIRD, 2020).</p> <p>The table below summarises the soil degradation risk within the Project area.</p> <table border="1"> <thead> <tr> <th>Aspect</th> <th>Degradation risk</th> </tr> </thead> <tbody> <tr> <td>Wind Erosion</td> <td>98%</td> </tr> <tr> <td>Waterlogging</td> <td>0%</td> </tr> <tr> <td>Water Erosion</td> <td>0%</td> </tr> <tr> <td>Salinity</td> <td>0%</td> </tr> <tr> <td>Flood Risk</td> <td>0%</td> </tr> </tbody> </table> <p>Wind erosion is the only potential soil degradation aspect relevant to the Project area, due to the deep yellow sands associated with the area. It is unlikely that the Project will cause appreciable land degradation given the relatively small amount of clearing and the implementation of appropriate measures to mitigate and manage potential wind driven erosion during construction.</p> <p>Assessed Outcome:</p> <ul style="list-style-type: none"> <li>• Project clearing is not at variance to this principle.</li> </ul>	Aspect	Degradation risk	Wind Erosion	98%	Waterlogging	0%	Water Erosion	0%	Salinity	0%	Flood Risk	0%
Aspect	Degradation risk											
Wind Erosion	98%											
Waterlogging	0%											
Water Erosion	0%											
Salinity	0%											
Flood Risk	0%											
<p><b>Methodology</b></p> <p>GIS shapefiles Astron (2021) Natural Resource Management SLIP Soil Systems; accessed April 2020 (DPIRD, 2020)</p>												

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

<b>Proposed clearing is not likely to be at variance to this Principle</b>
<p><b>Comment:</b>                  Two Nature Reserves (Woodvale Nature Reserve and Lake Joondalup Nature Reserve) are within 6 km of the Project area, along with a number of Crown Reserves managed by DBCA.</p> <p>In addition to these areas, several small local government reserves are present. The nearest conservation area to the Project area is the Craigie bushland area (Bush forever Site 303) which occurs approximately 550 m to the north of the Project area, and Carine Open Space (Bush forever Site 203) which is approximately 500 m to the south. These sites are both on the other side of the freeway and have no direct links with the Project area.</p> <p>It is not considered that the Project area contains vegetation which represents a significant ecological linkage for fauna to move between conservation reserves, and no ecological linkages will be disrupted by the proposed clearing.</p> <p>Noting the above and that the Project area is contained to the road reserve, the proposed clearing is will not result in any significant impacts to an adjacent or nearby conservation area.</p> <p>Assessed Outcome:</p> <ul style="list-style-type: none"> <li>• Project clearing not at variance to this Principle.</li> </ul>
<p><b>Methodology</b>                  DBCA, WALGA and DOP shapefiles                  EPA (2016)</p>

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

<b>Proposed clearing is not likely to be at variance to this Principle</b>
<p><b>Comment:</b>                  There are no major or minor watercourses mapped within the Project area.</p> <p>The Project will not change the hydrology of the area. Given the small scale of clearing and that no significant dewatering or drainage modifications are required; it is considered that there will be very little to no deterioration of underground water quality.</p> <p>Assessed Outcome:</p> <ul style="list-style-type: none"> <li>• Project clearing not at variance to this Principle.</li> </ul>
<p><b>Methodology</b>                  DWER and DBCA shapefiles                  Astron (2021)</p>

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

<b>Proposed clearing is not at variance to this Principle</b>
<p><b>Comment:</b>                  The Project will clear up to 2.40 ha of native vegetation over an approximately 3 km stretch of road. The removal of such a small area of vegetation makes it unlikely that the incidence or intensity of flooding will increase. NRM SLIP identifies that the area has 0% risk of flooding in the area, largely attributed to presence of sandy soil and fast infiltration rates.</p>

Given the small amount of clearing, that vegetation will remain in the surrounding area and that the Project area will be sealed it is unlikely that this Project will cause or exacerbate the incidence or intensity of flooding.

Assessed Outcome:

- Project clearing is not at variance to this principle.

**Methodology**

Natural Resource Management SLIP Soil Systems; accessed June 2020 (DPIRD, 2020)

## 6 VEGETATION MANAGEMENT

Main Roads will avoid clearing native vegetation where possible. Where clearing cannot be avoided then this clearing is kept to a minimum.

## 7 STAKEHOLDER CONSULTATION

Condition 8 of CPS 818/15 requires Main Roads WA to invite submissions from a number of parties when the proposed clearing is considered likely to be seriously at variance, at variance or may be at variance with one or more of the clearing principles.

As the assessment has determined that the proposed clearing is not at variance with any of the clearing principles, no stakeholder submission is required. Main Roads will continue to undertake stakeholder consultation in accordance with CPS 818 Condition 8.

## 8 COMPLIANCE WITH CPS 818

Table 5 summarises what further pre-clearing impact assessment and vegetation management is required in accordance with CPS 818.

**Table 5. Summary of Additional Management Actions Required by CPS 818**

Impact of Clearing	Yes/No or NA	Further Action Required
1. The CAR indicates that the clearing is 'At Variance' or 'May be at Variance' with one or more of the Clearing Principles.	No	No further action required.
2. Clearing is at variance or may be at variance with Clearing Principle (g) land degradation, (i) surface or underground water quality or (j) the incidence of flooding.	No	No further action required.
3. Clearing is at variance with Clearing Principle (g) land degradation, (i) surface or underground water quality <b>and</b> (j) the incidence of flooding	No	No further action required.
4. The project involves clearing for temporary works (as defined by CPS 818).	No	No further action required.
5a. Project is within Region that: <ul style="list-style-type: none"> <li>- Has rainfall greater than 400mm and</li> <li>- Is South of the 26<sup>th</sup> parallel and</li> <li>- Works are in 'Other than dry conditions' and</li> <li>- Works have potential for <b>uninfested</b> areas to be impacted</li> </ul>	Yes	4a. No further action required. A dieback assessment was conducted (Terratree, 2020).
5b. Does the proposed works require clearing within or adjacent to DBCA estate in non-dry conditions?	No	4b. No further action required.
6. Main Roads has been notified by DWER or an environmental specialist that the area to be cleared is susceptible to a pathogen other than dieback	No	No further action required.
7. Weeds are likely to spread to and result in environmental harm to adjacent areas of native vegetation that are in good or better condition.	Yes	'Completely Degraded' (0.34 ha).

Impact of Clearing	Yes/No or NA	<i>Further Action Required</i>
		Weed management will be addressed in the VMP/CEMP to avoid weed spread.
8. Did an environmental specialist conduct the survey or field assessment?	<b>Yes</b>	The Environmental Specialist undertaking the biological assessments was suitably qualified and had more than three years' experience.
9. Did an environmental specialist prepare the Assessment Report and any other associated documentation including the VMP, Dieback Management Plan or Offset Proposal?	<b>Yes</b>	The Environmental Specialist preparing the Assessment Report and any other associated documentation including the VMP, Dieback Management Plan or Offset Proposal was suitably qualified and had more than three years' experience.

## 9 REFERENCES

- Astron. (2020). Mitchell Freeway Widening Southbound and PSP Mitchell Freeway Gaps Hodges Drive to Reid Highway Biological Survey. Environmental Pty Ltd prepared for Main Roads Western Australia.
- Beard, J. S. (1981). Swan, 1:1 000,000 vegetation series: explanatory notes to sheet 7: the vegetation of the Swan area. University of Western Australia Press. Nedlands, Western Australia.
- Berry, P. F. (2008). Counts of Carnaby's Cockatoo (*Calyptorhynchus latirostris*) and records of flock composition at an overnight roosting site in metropolitan Perth. *Western Australian Naturalist* 26:1.
- Department of Biodiversity, Conservation and Attractions (DBCA). (2007 – 2019). NatureMap. Department of Parks and Wildlife and WA Museum. Available from: <https://naturemap.dpaw.wa.gov.au/>. Accessed June 2020.
- Department of Biodiversity, Conservation and Attractions (DBCA). (2018). Carnaby's Cockatoo Confirmed Roost Sites (DBCA-050) shapefile. Available from: <https://catalogue.data.wa.gov.au/dataset/carnabys-cockatoo-confirmed-roost-sites>. Accessed June 2020.
- Department of Climate Change, Energy, the Environment and Water (DCCEEW). EPBC Act Referral guideline for 3 WA threatened black cockatoo species. Available from: <https://www.dcceew.gov.au/environment/epbc/publications/referral-guideline-3-wa-threatened-black-cockatoo-species-2022>
- Department of Primary Industries and Regional Development (DPIRD). (2018). Western Australian Organism List. Available from: <https://www.agric.wa.gov.au/organisms>. Accessed June 2020.
- Department of Primary Industries and Regional Development (DPIRD). (2020). NRInfo for Western Australia. Available from: <https://www.agric.wa.gov.au/resouSLIPrce-assessment/nrinfo-western-australia>. Accessed June 2020.
- Environmental Protection Authority (EPA). (2015). Perth and Peel @ 3.5 Million – Environmental impacts, risks and remedies. Perth, Western Australia. Available from: <https://www.epa.wa.gov.au/sites/default/files/Publications/Perth-Peel-s16e-interim-advice-2015-web.pdf>. Accessed August 2020.
- Environmental Protection Authority (EPA). (2016). Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment, EPA, Western Australia. Available from: [https://www.epa.wa.gov.au/sites/default/files/Policies\\_and\\_Guidance/](https://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/). Accessed June 2020.

- Environmental Protection Authority (EPA). (2019). EPA Technical Report: Carnaby's Cockatoo in Environmental Impact Assessment in the Perth and Peel Region - Advice of the Environmental Protection Authority under Section 16(j) of the Environmental Protection Act 1986, EPA, Western Australia. Available from:  
[https://www.epa.wa.gov.au/sites/default/files/Policies\\_and\\_Guidance/](https://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/). Accessed June 2020.
- Finn, H., W. Stock, and L. E. Valentine. (2009). Pines and the ecology of Carnaby's BlackCockatoos (*Calyptorhynchus latirostris*) in the Gnangara Sustainability Strategy study area.
- Government of Australia. (2012). Weeds of National Significance. Available from  
<https://www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists>. Accessed June 2020.
- Government of Western Australia. (2019a). 2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report). Current as of March 2019. Department of Biodiversity, Conservation and Attractions, Perth, Western Australia.  
<https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics>.
- Government of Western Australia. (2019b). 2018 South West Vegetation Complex Statistics. Current as of March 2019. WA Department of Biodiversity, Conservation and Attractions, Perth.  
<https://catalogue.data.wa.gov.au/dataset/dbca>.
- Groom, C. (2015). Roost site fidelity and resource use by Carnaby's Cockatoo (*Calyptorhynchus latirostris*), on the Swan Coastal Plain, Western Australia. Thesis submitted for the degree of Doctor of Philosophy, University of Western Australia, Crawley.
- Hedde, E. M., Loneragan, O. W., & Havel, J. J. (1980). Vegetation Complexes of the Darling System, Western Australia. Department of Conservation and Environment. Atlas of Natural Resources, Darling System, Western Australia.
- Johnston, T. R., Stock, W. D., & Mawson, P. R. (2016). Foraging by Carnaby's Black-Cockatoo in Banksia woodland on the Swan Coastal Plain, Western Australia. *Emu*, (116), 284-293.
- Kirby, T. (2020). Black Cockatoo Breeding, Feeding and Roosting Habitat Assessment, Mitchell Freeway. Prepared for Main Roads Western Australia.
- Le Roux, C. (2017). Nocturnal roost tree, roost site and landscape characteristics of Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) on the Swan Coastal Plain.
- Perth Biodiversity Project (2013) Local Biodiversity Program 2013 Native vegetation by vegetation complex dataset for the South West of Western Australia. WALGA, viewed:  
<http://pbp.walga.asn.au/Publications.aspx> Accessed April 2020.
- Shah, B. (2006) Conservation of Carnaby's Black-Cockatoo on the Swan Coastal Plain, Western Australia Project Report, Birds Australia Western Australia, Perth.

SLIP portal, Soil-Landscape Mapping. Available online from: <https://maps.agric.wa.gov.au/nrm-info/>. Accessed June 2020.

Terratree. (2020). Phytophthora Dieback Assessment of Mitchell Freeway, Western Australia. Unpublished report prepared for Main Roads Western Australia.

Valentine L. & Stock W. (2008) Food resources of Carnaby's cockatoo (*Calyptorhynchus latirostris*) in the Gnamptara Sustainability Strategy study area. Centre for Ecosystem Management, Edith Cowan University. Retrieved September 2020, from the Gnamptara Sustainability Study web site: <http://portal.water.wa.gov.au/portal/page/portal/gss/Reports>.

WALGA. (2013). Perth Biodiversity Project - Native vegetation by vegetation complex dataset for the South West of Western Australia. Available from <http://pbp.walga.asn.au/>. Accessed April 2020.

Western Australian Herbarium. (1998-). FloraBase - The Western Australian Flora. Department of Biodiversity, Conservation and Attractions. Available online from: <https://florabase.dpaw.wa.gov.au/>. Accessed April 2020.

