



mainroads
WESTERN AUSTRALIA

Action Management Plan

*We're working for
Western Australia.*

Tonkin Highway Extension

March 2021

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Report Compilation & Review	Name and Position	Document Revision	Date
Author:	Environment Officer	Draft v1	15/02/2021
Reviewer:	Elizabeth Johnston (Senior Environment Officer)	Draft v1	17/02/2021
Reviewer:	Freea Itzstein-Davey (Senior Environment Officer)	Rev 0	25/02/2021

1 DECLARATION OF ACCURACY

I declare that to the best of my knowledge, all the information contained in, or accompanying this document is complete, current and correct. I am duly authorised to sign this declaration on behalf of the proponent/approval holder. I am aware that:

- a. giving false or misleading information is a serious offence under section 137.1 of the Criminal Code Act 1995 (Cth)
- b. section 137.2 of the Criminal Code Act 1995 (Cth) makes it an offence for a person to produce a document to another person in compliance or purported compliance with a law of the Commonwealth where the person knows that the document is false or misleading;
- c. section 490 of the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) makes it an offence for an approval holder to provide information in response to an approval condition where the person is reckless as to whether the information is false or misleading; and
- d. section 491 of the EPBC Act makes it an offence for a person to provide information or documents to specified persons who are known by the person to be performing a duty or carrying out a function under the EPBC Act or the Environment Protection and Biodiversity Conservation Regulations 2000 (Cth) (EPBC Regulations) where the person knows the information or document is false or misleading.

Signed: _____ **Date:** _____

Full name: Laura Zimmermann, Environment Officer

Organisation: Main Roads Western Australia

EPBC Referral Number: EPBC 2019/8608

Action Management Plan Title: Tonkin Highway Extension, Action Management Plan

2 INTRODUCTION

2.1 Proposed Action background

Main Roads Western Australia (Main Roads) is proposing to extend Tonkin Highway from Thomas Road in Oakford to South Western Highway in Mundijong (the Proposed Action). The Proposed Action area encompasses approximately 315 ha of road reserve, with a disturbance footprint of 230 ha.

The south-east corridor is an important and fast-growing area faced with increased congestion, higher travel times for freight vehicles and reduced safety outcomes on the existing road network. Population projections show that by 2031, sustained growth in the south-east sub-region will result in a population increase of approximately 35 per cent (from the 2008 base level). This additional population will put significant pressure on the existing road network with volumes exceeding recommended capacity.

As the Proposed Action may have a significant impact on Matters of National Environmental Significance (MNES), Main Roads was required to prepare Preliminary Documentation to inform the assessment of the relevant impacts of the Proposed Action. The Preliminary Documentation was prepared in response to a request by the Department of Agriculture, Water, and Environment (DAWE) in April 2020 for additional information to support assessment of impacts for the Proposed Action (EPBC 2019/8608) under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

2.2 Proposed Action description and location

The Proposed Action is located within the Shire of Serpentine-Jarrahdale on the Swan Coastal Plain in Western Australia. The Project is approximately 30 km south-west of the Perth Central Business District and approximately 3.5 km west of Byford. The Project spans approximately 14 km in length.

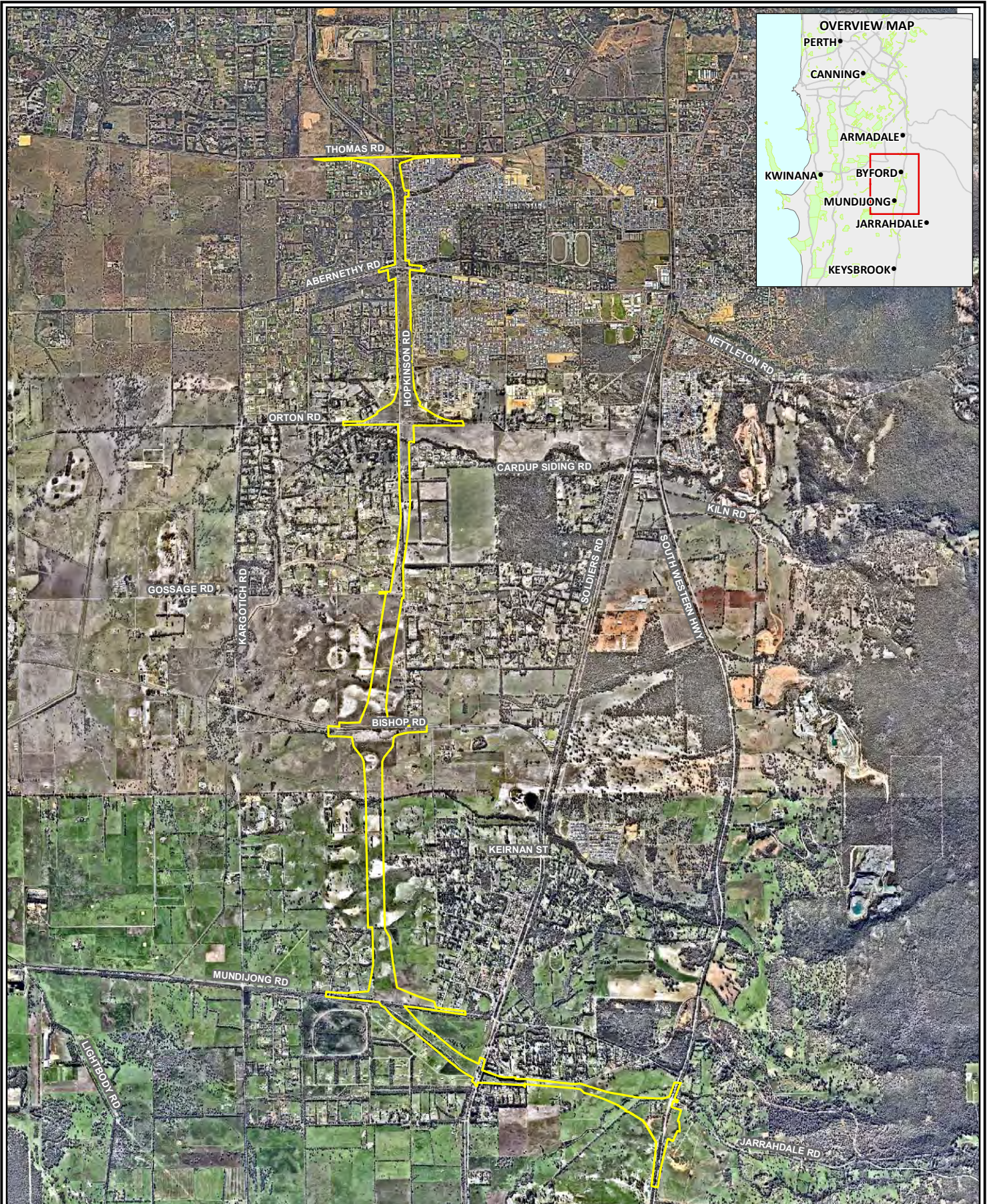
Key components of the Proposed Action include:


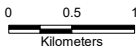


- Approximately 14 km of four lane dual carriageway road from Thomas Road to South Western Highway;
- Construction/upgrades of intersections at Thomas Road, Orton Road, Mundijong Road and South Western Highway;
- A grade separated interchange at Bishop Road catering for the Perth to Bunbury rail line and freight line;
- A principal shared path along the corridor; and
- Installation of associated road infrastructure, such as lighting, noise and retaining walls, safety barriers, stopping bays and traffic monitoring devices

2.3 Purpose of this management plan

This Action Management Plan (AMP) has been prepared as part of Preliminary Documentation to support assessment of the Tonkin Highway Extension (EPBC 2019/8608, the Proposed Action) under the EPBC Act.

The structure and content of this AMP has been prepared in accordance with Attachment C of DAWE's request for additional information.



Legend  Proposed Action	Scale 1:60,000 at A4 	Tonkin Highway Extension WA
	Coord. Sys. GDA 1994 MGA Zone 50 	PROJECT AREA
	Job No: 58910	FIGURE 1 
	Client: Main Roads Western Australia	
	Version: A	
	Date: 18-Feb-2021	
Drawn By: hsullivan	Checked By: DN	

2.4 Schedule of Action phases

2.4.1 Pre-construction

On-ground pre-construction activities will include investigations to inform the design of the Proposed Action. Investigations are likely to include survey pick up and geotechnical investigations that do not impact on native vegetation or MNES.

Design of the Proposed Action will continue to be refined during the pre-construction phase in order to reduce the environmental impacts and improve safety and usability. Consequently the disturbance from the Proposed Action is expected to be less than is currently being assessed.

2.4.2 Construction

Construction of the Proposed Action is planned to commence in first quarter of 2022 with construction expected to be completed in 2024. Commencement of the Proposed Action is subject to approvals and refinement of the preferred design option.

Construction of the road will be undertaken using conventional earth-moving and paving equipment and construction techniques. The majority of the length of the road will be primarily in fill. This material will be imported to the site. Bridges are likely to consist of pre-cast concrete or steel, supported on piled foundations or spread footings with mechanically stabilised earth (MSE) walls at the abutments.

Laydown areas for road building material will be established by the Construction Contractor in consultation with Main Roads and Local Government Authorities.

Temporary groundwater dewatering may be required for construction of bridge piers, abutment footings, noise walls, retaining walls and drainage structures. Construction water may be abstracted by bores in the superficial aquifer within the Proposed Action area.

2.4.3 Operation

Traffic modelling of the Tonkin Highway intersections was used to inform the road and bridge design, with forecast volumes based on the Main Roads ultimate network planning which extends to 2041.

Tonkin Highway will operate as a controlled access highway with access to the highway restricted to the grade separated interchange locations. Traffic will generally be free flowing on the four-lane dual carriageway (two lanes each direction). Daily volumes along the alignment are likely to ultimately range from 30,000 to 70,000 vehicles. Traffic volumes are expected to be the highest between Thomas Road and Orton Road.

Tonkin Highway will be subject to normal routine, recurrent and periodic maintenance during operation. The maintenance operations will be confined to the road corridor and the road itself, typically including vegetation, drainage, lighting, road markings, signs and resurfacing the road pavement.

2.5 Protected Matters

2.6 Information on MNES

The Proposed Action area comprises and lies adjacent to land that supports the following MNES:

- Threatened Ecological Communities (TECs)
 - Clay Pans of the Swan Coastal Plain TEC – Critically Endangered
 - *Corymbia calophylla* – *Kingia australis* woodlands on heavy soils, Swan Coastal Plain TEC (referred to as *Corymbia-Kingia* TEC (SCP 3a)) – Endangered
 - *Corymbia calophylla* - *Xanthorrhoea preissii* woodlands and shrublands of the Swan Coastal Plain (referred to as *Corymbia-Xanthorrhoea* TEC (SCP 3c)) – Endangered
- Threatened Flora
 - *Synaphea* sp. Serpentine – Critically Endangered
 - *Tetralia australiensis* – Vulnerable
- Black Cockatoos
 - Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) – Endangered
 - Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) (FRTBC)– Vulnerable
 - Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) – Endangered

TECs

The Clay Pans of the Swan Coastal Plain TEC occurs where clay soils form an impermeable layer close to the landscape surface, forming wetlands solely reliant on rainfall to fill, which then dry to impervious pans in summer. The ecology is entirely dependent on the hydrological functioning of the clay pan; with no connection to the local groundwater. Key threats include clearing, hydrological changes, weed invasion, grazing, altered fire regimes, disease, disturbance from recreational activities and drying climate.

Corymbia-Kingia TEC (SCP 3a) occurs on heavy soils on the eastern side of the Swan Coastal Plain IBRA extending approximately 200 km from Guildford (near Perth, north) to Ruabon (near Busselton, south). This TEC occurs on wetter soils which contain an impervious clay layer that act as a barrier to drainage of water through the soil, with occurrences inundated by rainfall and surface water during wetter months (Department of the Environment and Energy (DEE) 2017a). Key threats include clearing, hydrological changes, weed invasion, salinisation, grazing, altered fire regimes, and disease (English, V. and J. Blyth 2000a).

Corymbia-Xanthorrhoea TEC (SCP 3c) occurs on heavy soils on the eastern side Swan Coastal Plain extending approximately 200 km from Bullsbrook (north of Perth) to Capel (south, towards Bunbury). This TEC occurs on drier soils of all the eastern Swan Coastal Plain *Corymbia* communities but is also characterised by soils that contain a clay layer that is quite impervious, resulting in occurrences frequently becoming inundated in the wetter months due to rainfall and surface flows (DEE 2017b). Key threats include clearing, hydrological changes, weed invasion, salinization and inundation, grazing, altered fire regimes, disease and erosion by wind and water (English, V. and J. Blyth 2000b).

Threatened flora

Synaphea sp. Serpentine is an erect clumped shrub growing up to 0.6 m high occurring in seasonally wet areas (WA Herbarium 1998-). This species is listed as Critically Endangered under

both the *Biodiversity Conservation Act 2016* (BC Act) and EPBC Act. It is endemic to Western Australia (Threatened Species Scientific Committee 2018), occurring over a narrow geographic range from west of Byford to south of Serpentine, growing predominantly in grey-brown sandy-loam or clay (DPaW 2017). Key threats include weeds, road, rail, track and firebreak maintenance, fragmentation of habitat, clearing, inappropriate fire regimes, insecure land tenure, poor recruitment, limited seed production, recreational activities, infrastructure maintenance, insect infestation, rabbits and dieback disease.

Tetraria australiensis is a rhizomatous tufted perennial herb growing to 1 m high occurring on sand over clay flats (WA Herbarium 1998-). This taxon is listed as Vulnerable under both the BC Act and EPBC Act. It is endemic to Western Australia (Department of the Environment, Water, Heritage and the Arts 2008), occurring over a range of approximately 197 km from Ferndale (Perth) in the north to near Busselton in the south (DBCA 2007-). Key threats include habitat clearing for urban development, impacts from road construction and maintenance activities, recreational activities (e.g. horse riding and track maintenance and the introduction of weeds and dieback).

Black Cockatoos

Carnaby's Cockatoo is a large Black Cockatoo with white markings. The species nests in hollows in live or dead trees including Jarrah, Flooded Gum and Marri (DSEWPaC 2012). Breeding occurs mainly from July to mid-December. The species feeds in the canopy and understorey of forests and woodlands and in heath vegetation including *Banksia* species, Marri, Jarrah and non-native Pine (DSEWPaC 2012). Key threats include loss of habitat due to clearing or degradation, competition for nests, and death due to vehicle strike (DPaW 2013).

FRTBC is a large Black Cockatoo with red markings. The species displays erratic breeding activity in the summer and winter, peaking from April to June and August to October. Breeding is primarily in hollows of large, mature Marri trees and to a lesser extent Jarrah, Blackbutt Bullich and Wandoo (Johnstone, Kirkby and Sarti 2013). The species is a canopy feeder, with a diet primarily consisting of seeds of Marri and Jarrah and, in recent times, the seeds of Cape Lilac (Johnstone, Kirkby and Sarti 2017). Key threats include forest habitat loss, nest shortage and competition for nest hollows.

Baudin's Cockatoo is a large Black Cockatoo with white markings, with a more slender beak than Carnaby's Cockatoo. The species nest in hollows of live or dead trees including Marri and Tuart. Breeding occurs from August to March in the eucalypt forests of the south west (DSEWPaC 2012). The species forages in Jarrah, Marri and proteaceous woodland and heath (DSEWPaC 2012). Key threats include forest habitat loss, nest shortage and competition for nest hollows.

2.6.1 Location and condition

2.6.1.1 Biological surveys

The MNES within the Proposed Action area have been determined through biological surveys as follows:

- Woodman Environmental Consulting (Woodman) (2020) Flora and Vegetation Survey over a 362.3 ha Survey Area comprising the Proposed Action area and surrounding land
- Black Cockatoo Breeding Habitat Surveys (Kirkby 2019 and 2020)
- Black Cockatoo Consolidated Report (Strategen JBS&G 2021)
- Dieback Assessment (Glevan 2020)

2.6.1.2 TECs

Figure 2, Figure 3 and Figure 4 present the extent and condition of patches of the three TECs within and adjacent to the Proposed Action area.

2.6.1.2.1 Clay Pans of the Swan Coastal Plain TEC

The Proposed Action will not directly impact the Clay Pans TEC.

The Proposed Action may have indirect impacts on the Clay Pans TEC that remains immediately adjacent to the Proposed Action area (Figure 2) including from the introduction or spread of weeds, increased incidence of fire, hydrological change and other edge impacts.

2.6.1.2.2 *Corymbia-Kingia* TEC (SCP 3a)

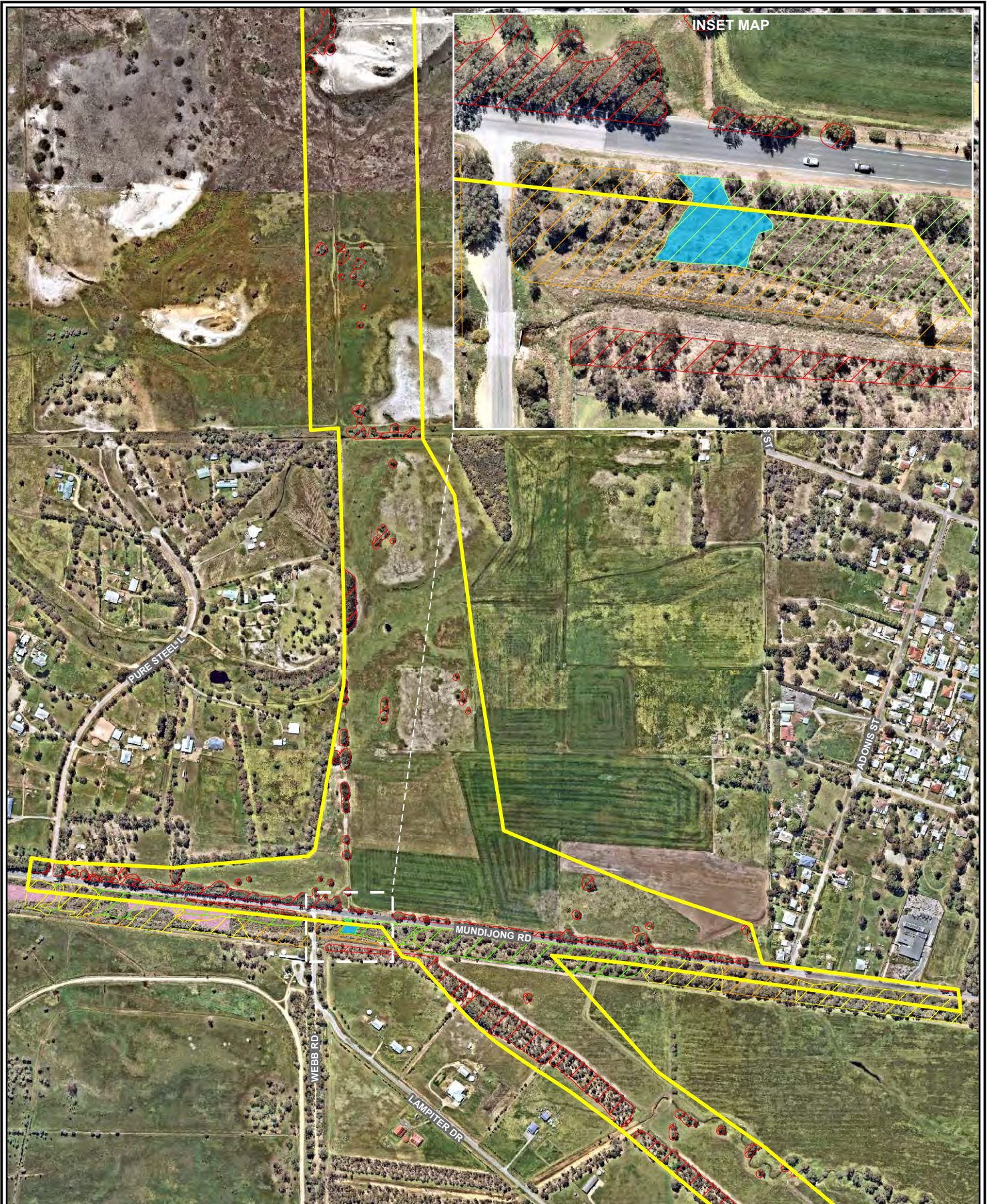
The biological surveys by Woodman (2020) mapped a total of 2.09 ha of the *Corymbia-Kingia* TEC at one occurrence within the broader Survey Area. Woodman (2020) defined vegetation occurring within vegetation unit VT2 and VT3, to represent the *Corymbia-Kingia* TEC based on statistical similarity to SCP3a. The Proposed Action will impact a maximum of 0.13 ha of the mapped *Corymbia-Kingia* TEC area.

The *Corymbia-Kingia* TEC comprises two vegetation types, with the condition ranging from 'Very Good' (1.33 ha) to 'Degraded' (0.75 ha). Of the 0.13 ha of *Corymbia-Kingia* TEC that will be impacted for the Proposed Action, 0.10 ha is in 'Very Good' condition and the remaining 0.02 ha is in 'Degraded' condition.

2.6.1.2.3 *Corymbia-Xanthorrhoea* TEC (SCP 3c)

A total of 9.75 ha of *Corymbia-Xanthorrhoea* TEC was mapped within the broader Survey Area, across nine occurrences. Vegetation consistent with the *Corymbia-Xanthorrhoea* TEC were identified as VT4, VT5 and VT6 given their statistical similarity to the TEC. All occurrences of the TEC within the survey area were previously known as per DBCA mapping. There is up to 2.09 ha of *Corymbia-Xanthorrhoea* TEC within one patch to be impacted within the Proposed Action area, of which 1.35 ha is in Very Good condition, 0.29 ha in Good condition and 0.46 ha is in Degraded condition.

The *Corymbia-Xanthorrhoea* TEC comprises three vegetation types within the broader Survey Area, with more than half of the total recorded area for the ecological community being in 'Degraded' to 'Completely Degraded' condition. On the advice of DBCA, where 'Degraded' and 'Completely Degraded' patches are small and isolated, they have been excluded from being assessed as *Corymbia-Xanthorrhoea* TEC. However, where larger patches comprise a portion of the mapped area as 'Degraded' to 'Completely Degraded', these areas have been included as part of the mapped occurrence as they are considered viable and potentially important to maintain the integrity of the patch.

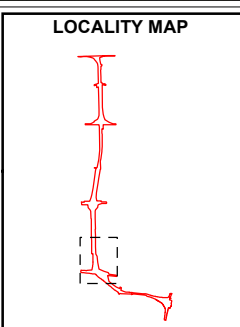


Legend

- Proposed Action
- Clay Pans TEC (EPBC-CE) – Survey area (Woodman 2020)
- Clay Pans TEC (EPBC-CE) – Regional distribution (DBCAs, 2019)

Vegetation condition

- Very good
- Good
- Degraded
- Completely degraded
- Local and regional roads

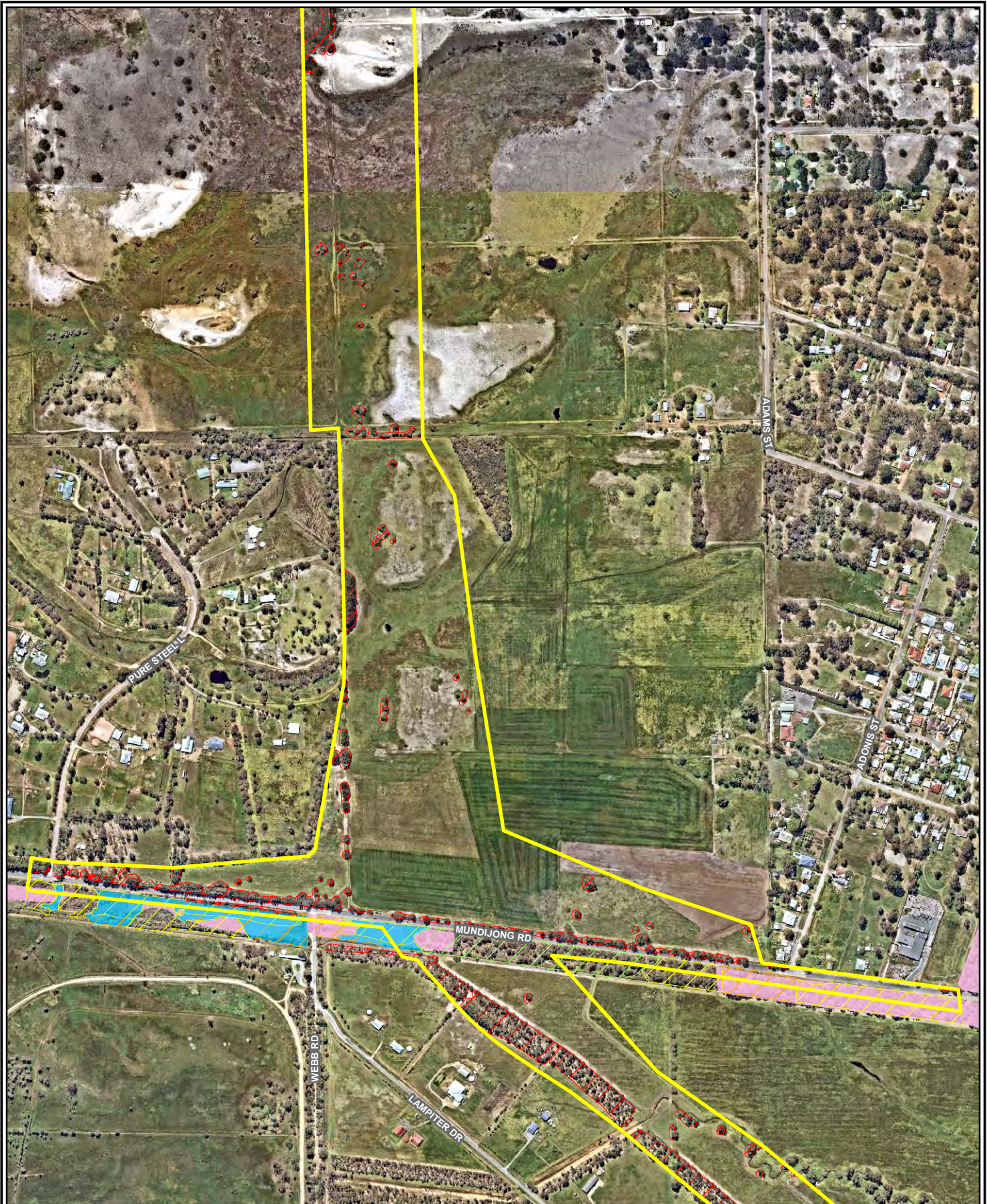


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Coord. Sys. GDA 1994 MGA Zone 50		
Job No: 58910		
Client: Main Roads Western Australia		
Version: A	Date: 18-Feb-2021	
Drawn By: hsullivan	Checked By: DN	

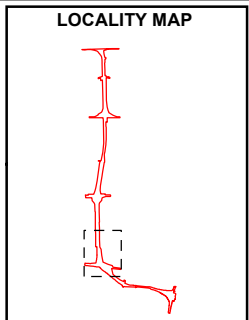
Tonkin Highway Extension WA

CLAY PANS TEC ADJACENT TO THE PROPOSED ACTION AREA

FIGURE 2



- Legend**
- Proposed Action
 - Corymbia-Kingia* TEC (EPBC-E) – Survey area (Woodman 2020)
 - Corymbia-Kingia* TEC (EPBC-E) – Regional distribution (DBCA, 2019)
- Vegetation condition
- Very good
 - Good
 - Degraded
 - Completely degraded



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Job No: 58910		
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CORYMBIA-KINGIA TEC WITHIN THE PROPOSED ACTION AREA

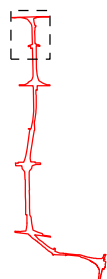
FIGURE 3



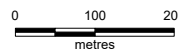
Legend

- Proposed Action
 - Corymbia-Xanthorrhoea* TEC (EPBC-E) – Survey area (Woodman 2020)
 - Corymbia-Xanthorrhoea* TEC (EPBC-E) – Regional distribution (DBCA, 2019)
- Vegetation condition
- Very good
 - Good
 - Degraded
 - Completely degraded

LOCALITY MAP



Scale 1:9,500 at A4



Coord. Sys. GDA 1994 MGA Zone 50



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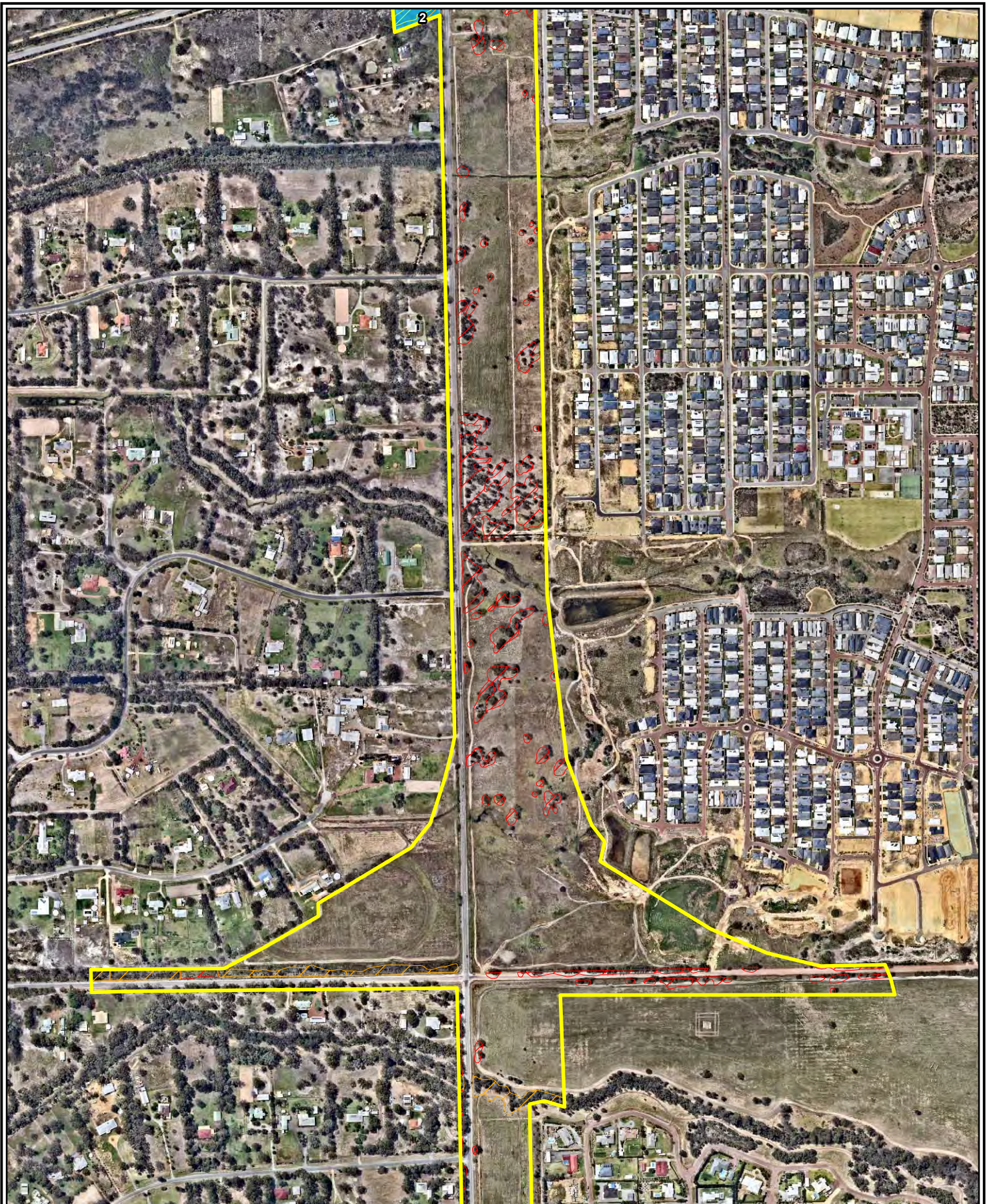
**Tonkin Highway Extension
WA**

***CORYMBIA-XANTHORRHOEA* TEC
WITHIN THE PROPOSED ACTION AREA**

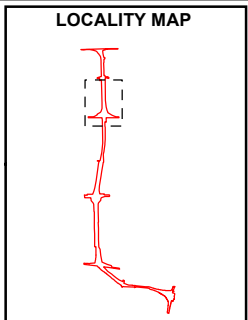
FIGURE 4

PAGE 1 of 8





- Legend**
- Proposed Action
 - Corymbia-Xanthorrhoea* TEC (EPBC-E) – Survey area (Woodman 2020)
 - Corymbia-Xanthorrhoea* TEC (EPBC-E) – Regional distribution (DBCA, 2019)
- Vegetation condition
- Very good
 - Good
 - Degraded
 - Completely degraded

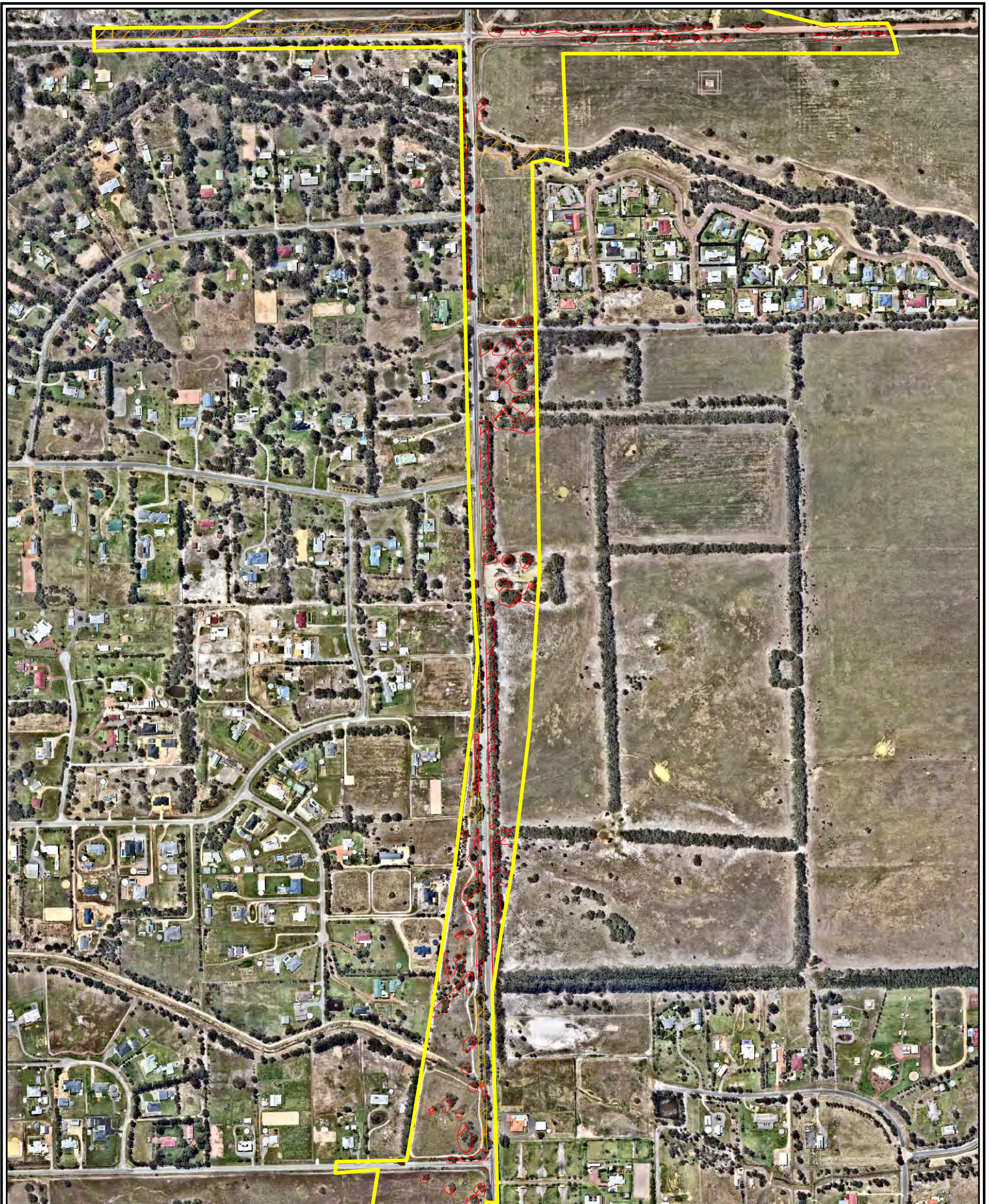


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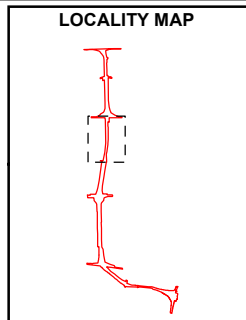
**Tonkin Highway Extension
WA**

***CORYMBIA-XANTHORRHOEA* TEC
WITHIN THE PROPOSED ACTION AREA**

FIGURE 4 **PAGE 2 of 8**



- Legend**
- Proposed Action
 - Corymbia-Xanthorrhoea* TEC (EPBC-E) – Survey area (Woodman 2020)
 - Corymbia-Xanthorrhoea* TEC (EPBC-E) – Regional distribution (DBCA, 2019)
- Vegetation condition
- Very good
 - Good
 - Degraded
 - Completely degraded

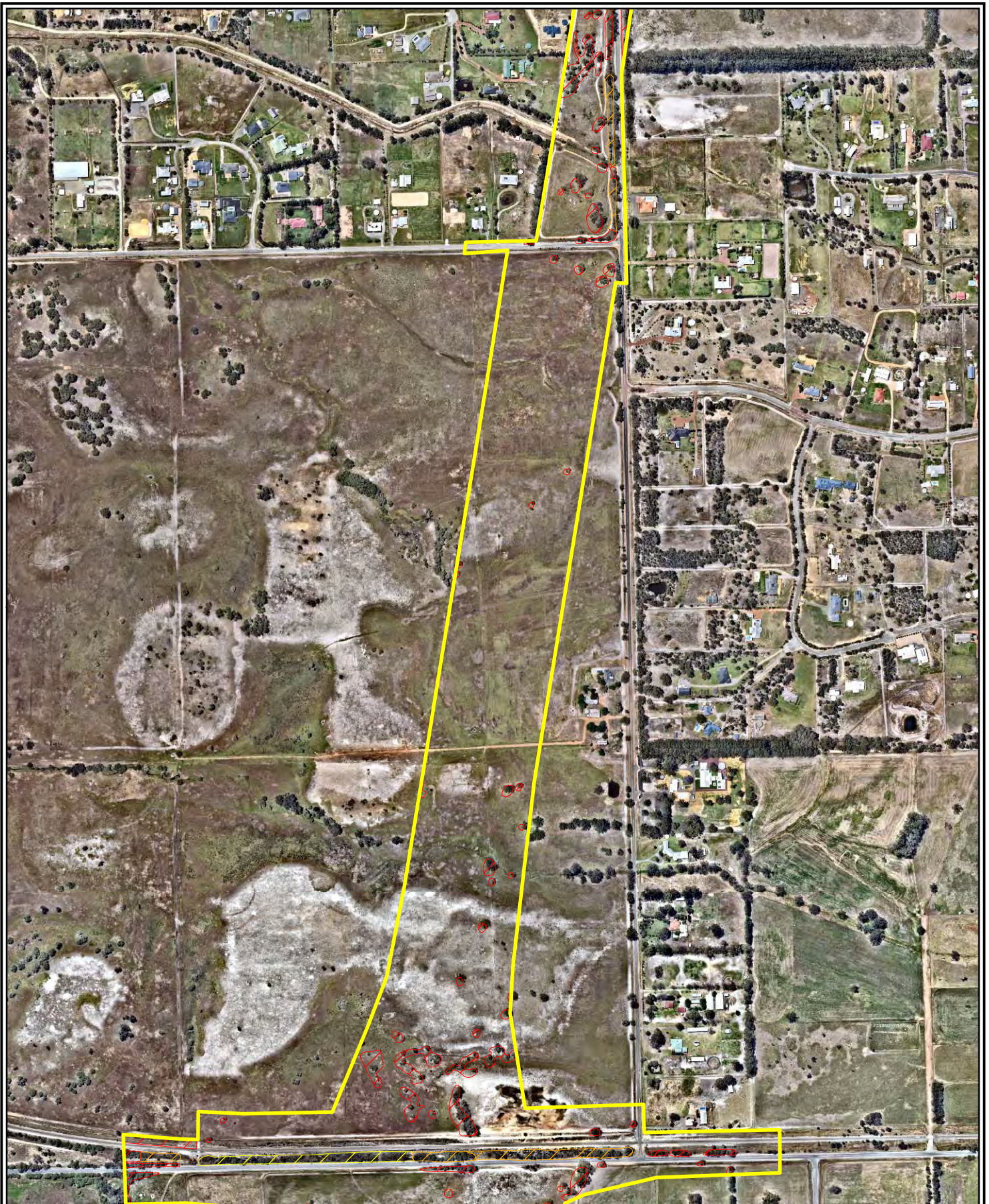


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Client: Main Roads Western Australia		
Version: A	Date: 18-Feb-2021	
Drawn By: hsullivan	Checked By: DN	

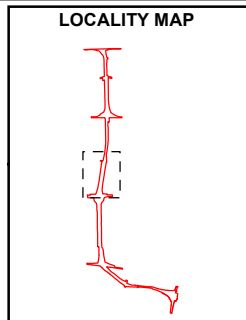
Tonkin Highway Extension WA

CORYMBIA-XANTHORRHOEA TEC WITHIN THE PROPOSED ACTION AREA

FIGURE 4 **PAGE 3 of 8**



- Legend**
- Proposed Action
 - Corymbia-Xanthorrhoea* TEC (EPBC-E) – Survey area (Woodman 2020)
 - Corymbia-Xanthorrhoea* TEC (EPBC-E) – Regional distribution (DBCA, 2019)
- Vegetation condition
- Very good
 - Good
 - Degraded
 - Completely degraded

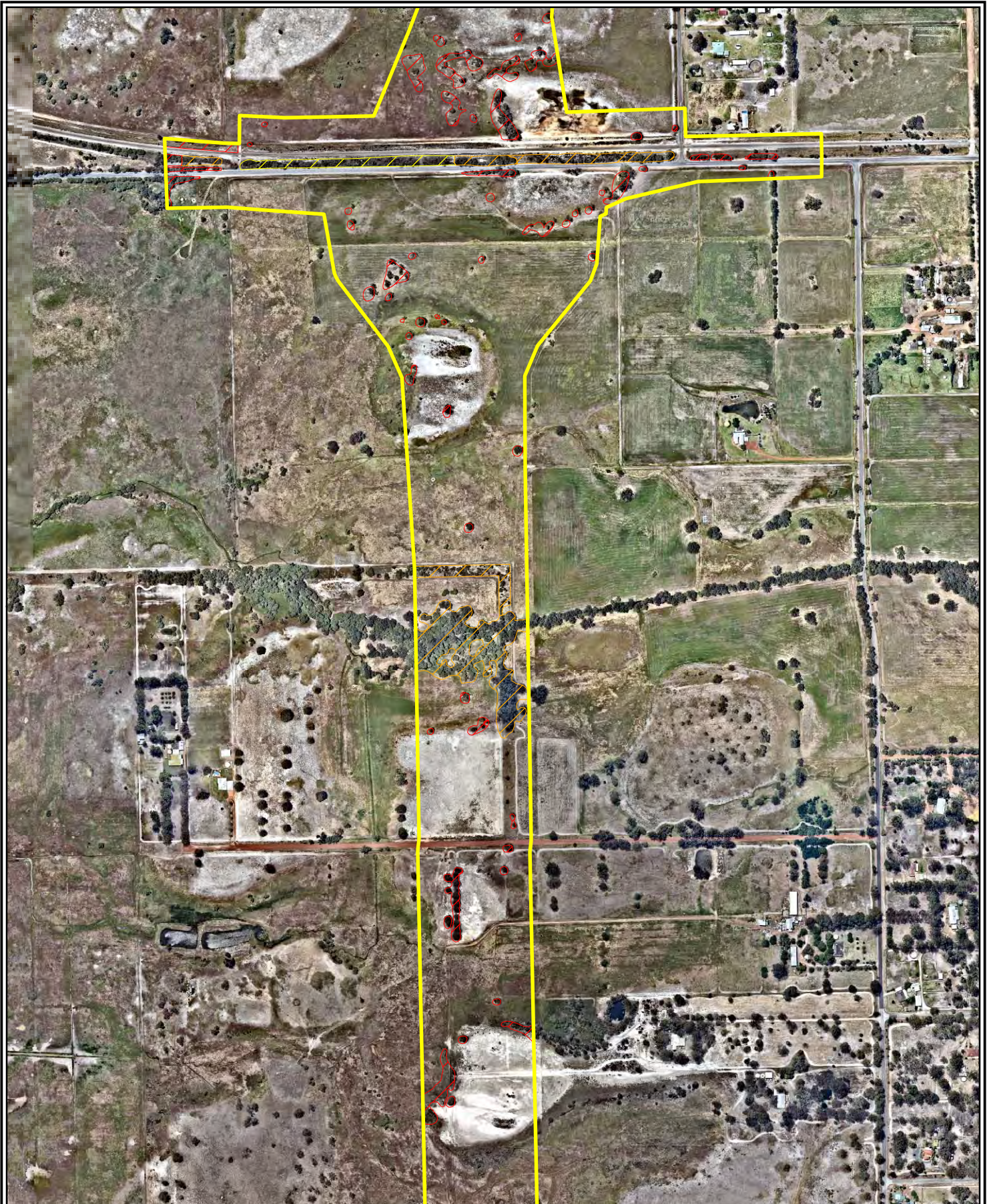


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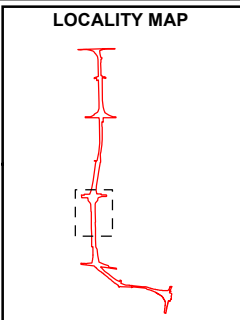
Tonkin Highway Extension WA

CORYMBIA-XANTHORRHOEA TEC WITHIN THE PROPOSED ACTION AREA

FIGURE 4 PAGE 4 of 8



- Legend**
- Proposed Action
 - Corymbia-Xanthorrhoea* TEC (EPBC-E) – Survey area (Woodman 2020)
 - Corymbia-Xanthorrhoea* TEC (EPBC-E) – Regional distribution (DBCA, 2019)
- Vegetation condition
- Very good
 - Good
 - Degraded
 - Completely degraded

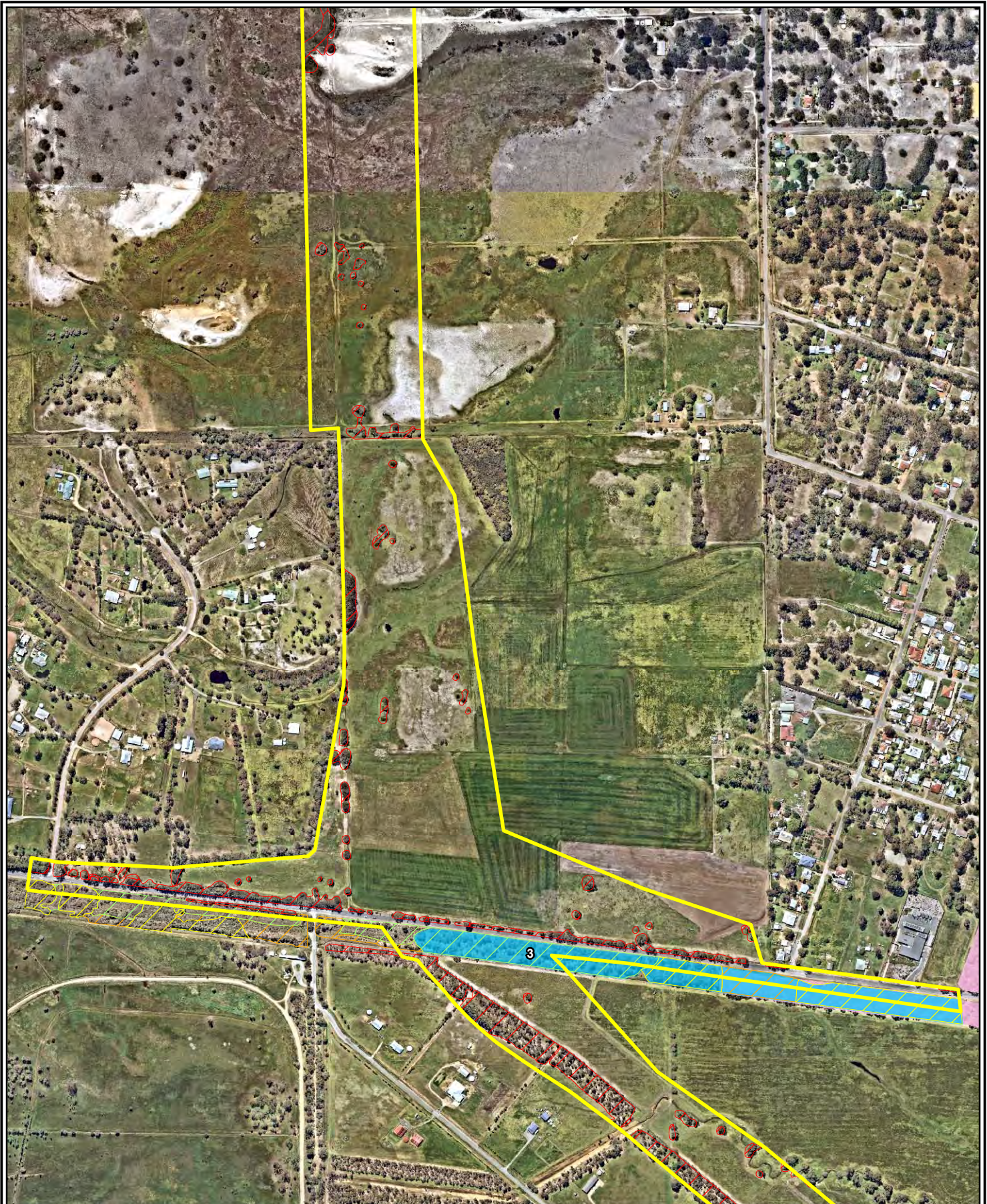


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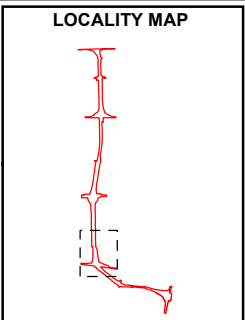
Tonkin Highway Extension WA

CORYMBIA-XANTHORRHOEA TEC WITHIN THE PROPOSED ACTION AREA

FIGURE 4 PAGE 5 of 8



- Legend**
- Proposed Action
 - Corymbia-Xanthorrhoea* TEC (EPBC-E) – Survey area (Woodman 2020)
 - Corymbia-Xanthorrhoea* TEC (EPBC-E) – Regional distribution (DBCA, 2019)
- Vegetation condition**
- Very good
 - Good
 - Degraded
 - Completely degraded

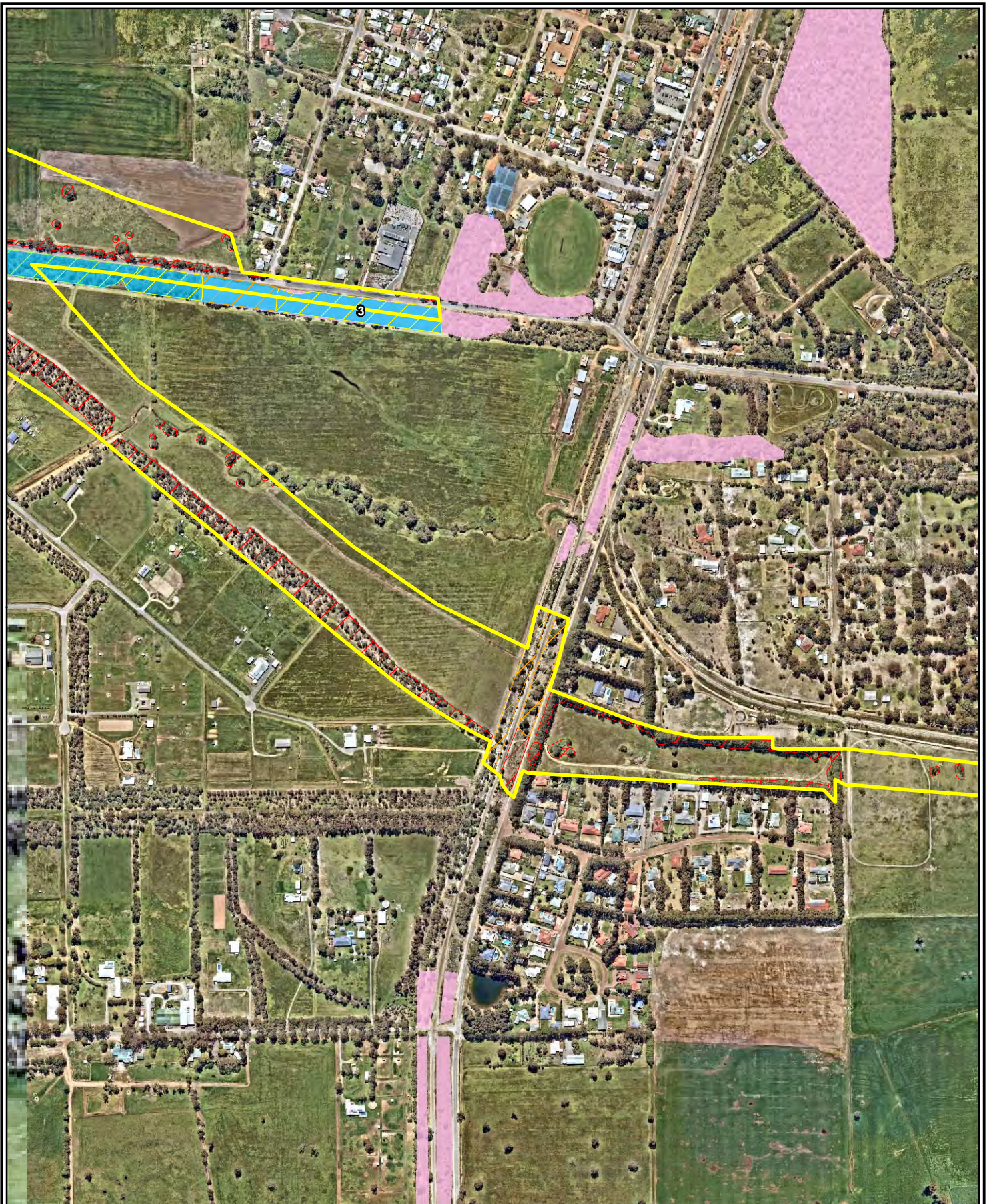


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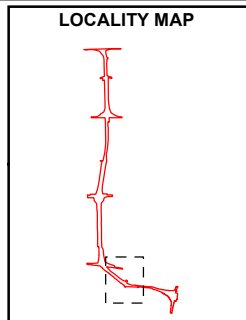
Tonkin Highway Extension WA

CORYMBIA-XANTHORRHOEA TEC WITHIN THE PROPOSED ACTION AREA

FIGURE 4 PAGE 6 of 8



- Legend**
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 - Corymbia-Xanthorrhoea* TEC (EPBC-E) – Regional distribution (DBCA, 2019)
- Vegetation condition**
- Very good
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 - Degraded
 - Completely degraded

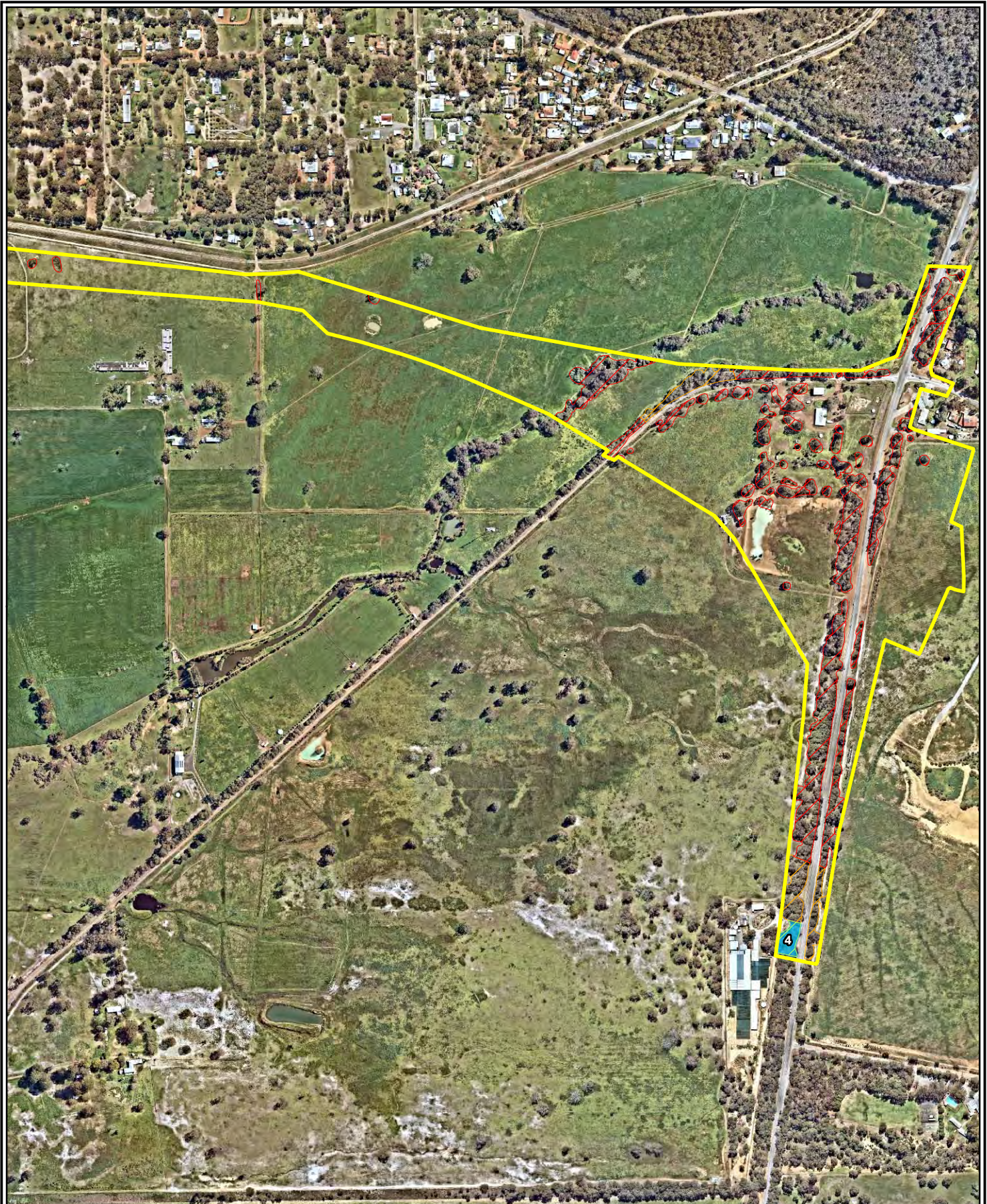


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Job No: 58910	
Client: Main Roads Western Australia	
Version: A	Date: 18-Feb-2021
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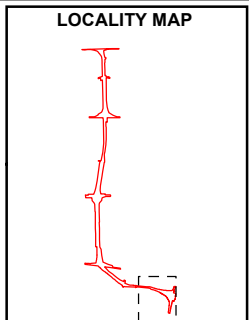
Tonkin Highway Extension WA

CORYMBIA-XANTHORRHOEA TEC WITHIN THE PROPOSED ACTION AREA

FIGURE 4 **PAGE 7 of 8**



- Legend**
- Proposed Action
 - Corymbia-Xanthorrhoea* TEC (EPBC-E) – Survey area (Woodman 2020)
 - Corymbia-Xanthorrhoea* TEC (EPBC-E) – Regional distribution (DBCA, 2019)
- Vegetation condition**
- Very good
 - Good
 - Degraded
 - Completely degraded



Scale 1:9,000 at A4		
Coord. Sys. GDA 1994 MGA Zone 50		
Job No: 58910		
Client: Main Roads Western Australia		
Version: A	Date: 18-Feb-2021	
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CORYMBIA-XANTHORRHOEA TEC WITHIN THE PROPOSED ACTION AREA

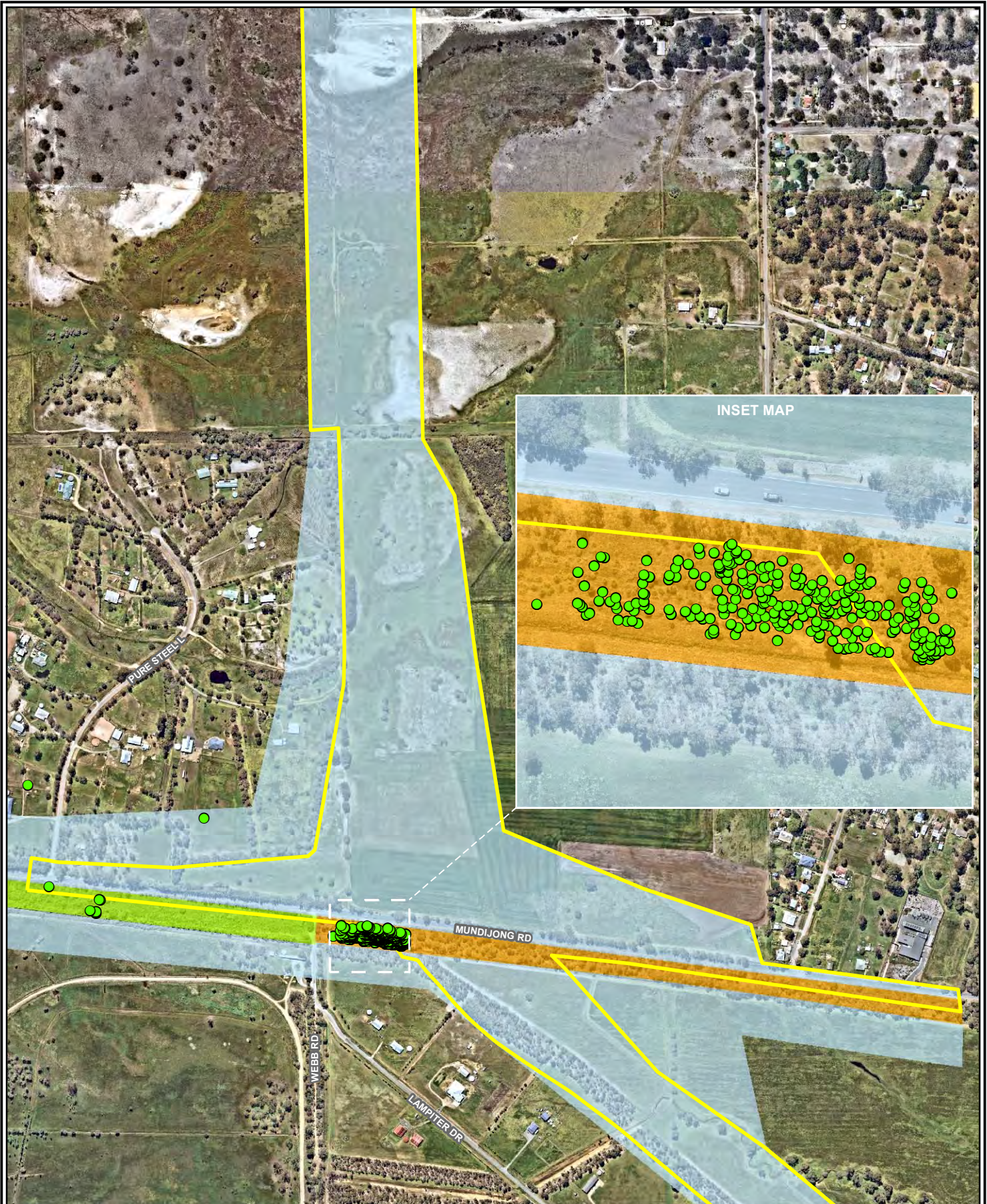
FIGURE 4 **PAGE 8 of 8**

2.6.1.3 Threatened flora

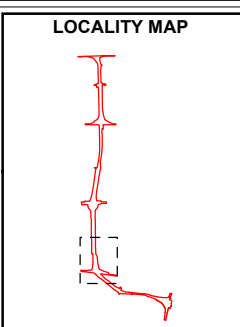
The recorded populations of the two listed threatened flora species within the Survey Area and Proposed Action area are summarised in Table 4 below.

Figure 5 presents the extent of *Synaphea* sp. Serpentine habitat and records of individuals within the Survey Area and Proposed Action area. Figure 6 presents the extent of *Tetraria australiensis* habitat and records of individuals within the Survey Area and Proposed Action area

Species	Population within Survey Area	Population within Proposed Action area
<i>Synaphea</i> sp. Serpentine	551	3
<i>Tetraria australiensis</i>	1,214	165



- Legend**
- Proposed Action
 - *Synaphea* sp. Serpentine (CE) locations
- Phytophthora* Dieback status
- Excluded
 - Infested
 - Uninterpretable unprotectable

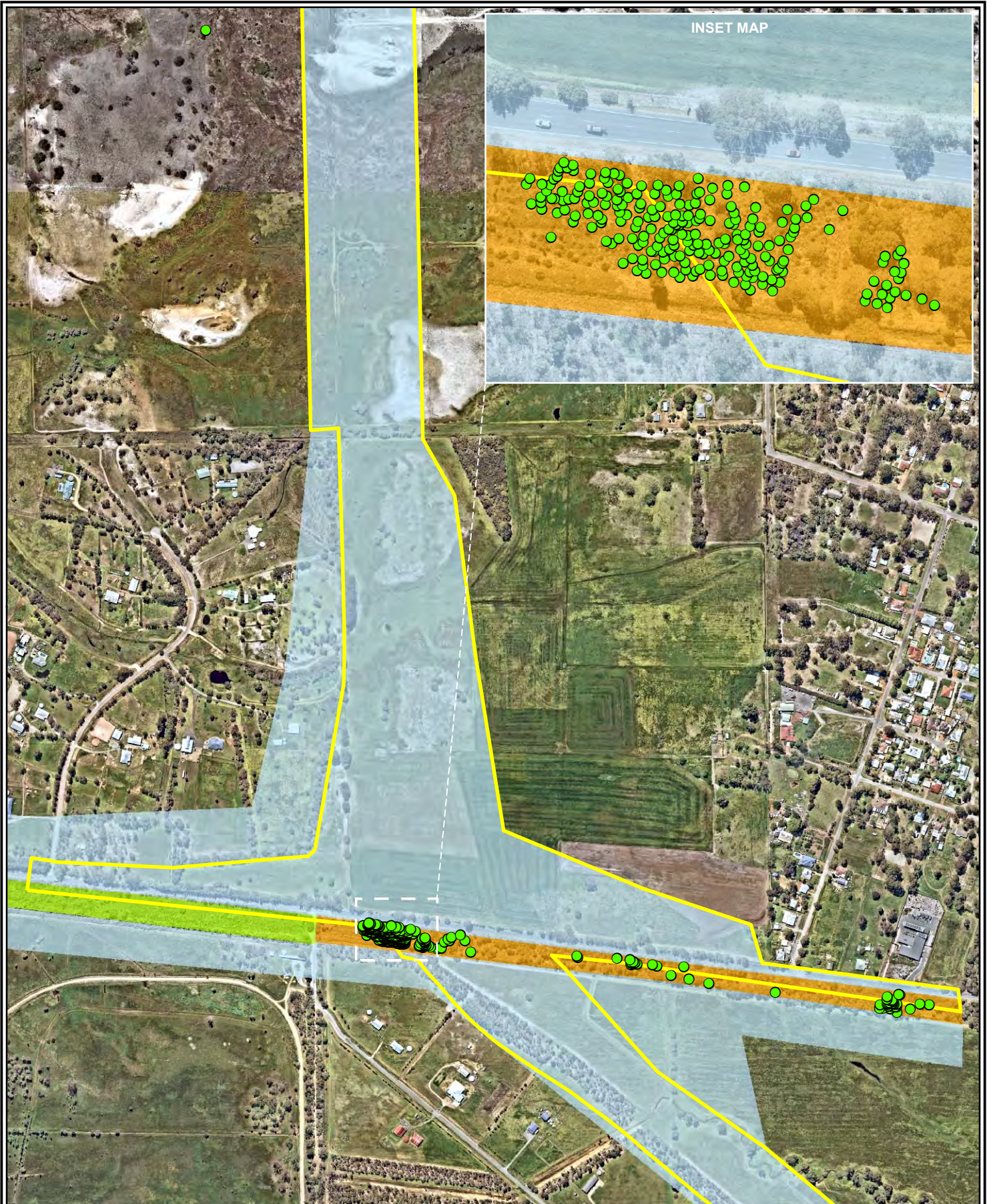


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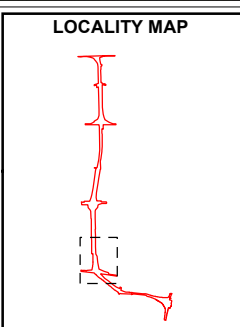
Tonkin Highway Extension WA

SYNAPHEA SP. SERPENTINE WITHIN THE PROPOSED ACTION AREA

FIGURE 5



- Legend**
- Proposed
 - *Tetraria australiensis* (V) locations
- Phytophthora* Dieback status
- Excluded
 - Infested
 - Uninterpretable



Scale 1:9,000 at A4		0 100 200 Meters	
Coord. Sys. GDA 1994 MGA Zone 50		↑	
Job No: 58910			
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TETRARIA AUSTRALIENSIS WITHIN THE PROPOSED ACTION AREA

FIGURE 6

2.6.1.4 Black Cockatoo habitat

Figure 7, Figure 8, Table 1 and Table 2 present the extent and condition of Black Cockatoo breeding and foraging habitat within the Proposed Action area. Black Cockatoo habitat is also located in native vegetation on land adjacent to the Proposed Action area.

In summary, Proposed Action will cause direct impacts to the following Black Cockatoo habitat within the Proposed Action area:

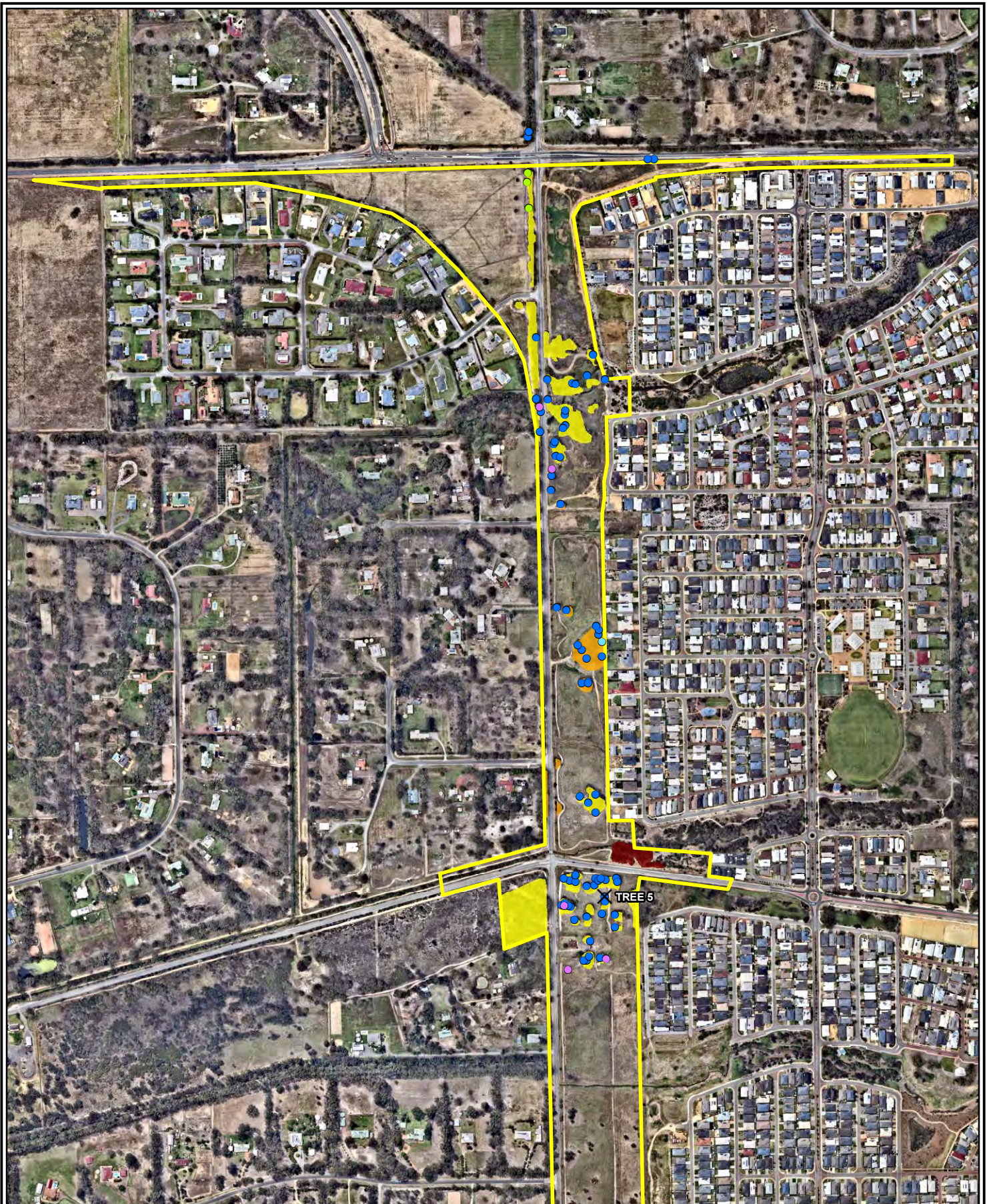
- 346 potential breeding trees (> 500 mm Diameter at Breast Height) for Black Cockatoo species, including two trees that contain hollows suitable for nesting by Black Cockatoos
- 20.93 ha of 'Low to Moderate' quality foraging habitat for Carnaby's Cockatoo
- 20.61 ha of 'Moderate to High' to 'Low to Moderate' foraging habitat for FRTBC and Baudin's Cockatoo

Table 1 Black Cockatoo potential breeding trees

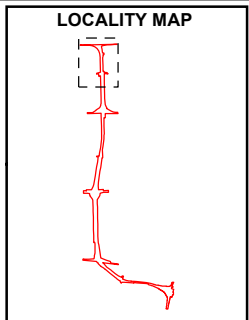
Tree species	No. of trees	No. of trees with hollows	No. of trees	No. of trees with hollows
Flooded Gum (<i>Eucalyptus rudis</i>)	85	2 (1 hollow)	69	0
Flooded Gum (<i>Eucalyptus rudis</i>) – Stag	2	1 (2 hollows)	1	0
Jarrah (<i>Eucalyptus marginata</i>)	7	1 (2 hollows)	6	1 (2 hollows ¹)
Jarrah (<i>Eucalyptus marginata</i>) - Stag	4	0	4	0
Marri (<i>Corymbia calophylla</i>)	341	1 (2 hollows) 9 (1 hollow)	254	1 (2 hollows) ² 4 (1 hollow) ²
Marri (<i>Corymbia calophylla</i>) - Stag	19	1 (2 hollows)	15	1 (2 hollows)
Wandoo (<i>Eucalyptus wandoo</i>)	1	0	2	0
Unknown Eucalypt species	1	0	0	0
Total	460	4 (2 hollows) 11 (1 hollow)	346	3 (2 hollows) 4 (1 hollow)

Table 2 Black Cockatoo Foraging Habitat Extent and Quality

Habitat quality and score	Carnaby's Cockatoo		Forest Red-tailed Black Cockatoo		Baudin's Cockatoo	
	Extent (ha)	Proportion (%)	Extent (ha)	Proportion (%)	Extent (ha)	Proportion (%)
High (6)	0	0	0.0	0.0	0.0	0.0
Moderate to High (5)	0	0	5.61	2.4	5.61	2.4
Moderate (4)	9.32	4.0	3.70	1.6	3.70	1.6
Low to Moderate (3)	11.61	5.0	11.29	4.8	11.29	4.8
Low (2)	8.69	3.7	13.56	5.8	13.56	5.8
Negligible to low (1)	4.55	2.0	0.0	0.0	0.0	0.0
No (0)	199.33	85.4	199.33	85.4	199.33	85.4
Total	233.50	100	233.50	100	233.50	100



- Legend**
- Proposed Action
 - Foraging value - CBC
 - Moderate (4)
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 - Negligible to low (1)
 - Black Cockatoo significant habitat trees
 - Flooded Gum
 - Jarrah stag
 - Marri
 - Marri stag
 - X Unsuitable breeding hollows

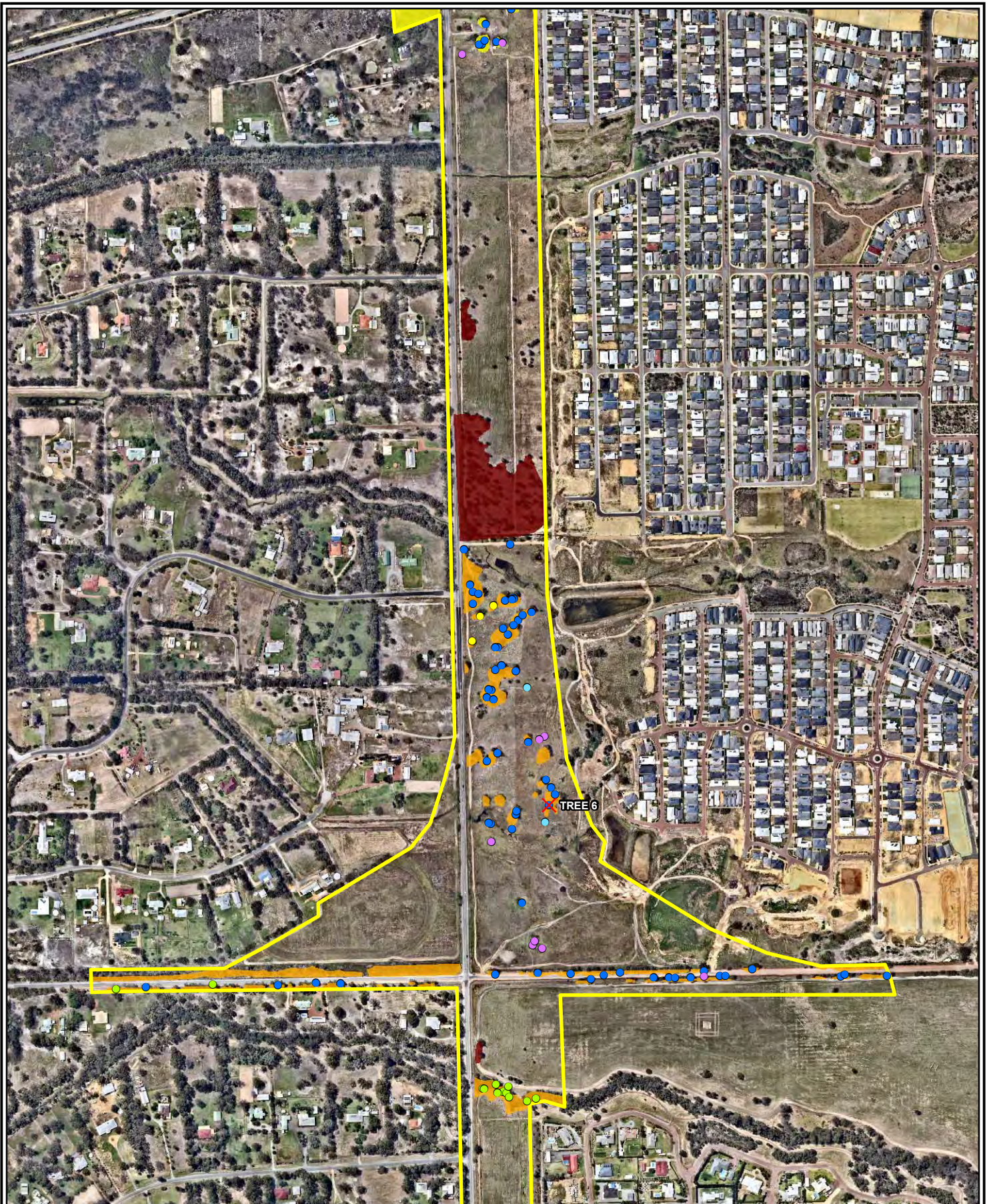


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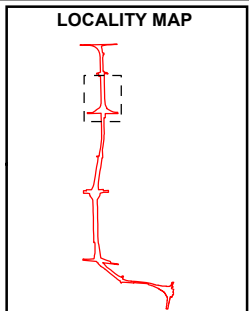
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**CARNABY'S BLACK COCKATOO
HABITAT WITHIN PROPOSED ACTION
AREA**

FIGURE 7 **PAGE 1 of 8**



- Legend**
- Proposed Action
 - Foraging value - CBC
 - Moderate (4)
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 - Jarrah
 - Jarrah stag
 - Marri
 - Marri stag
 - X Possible breeding hollows

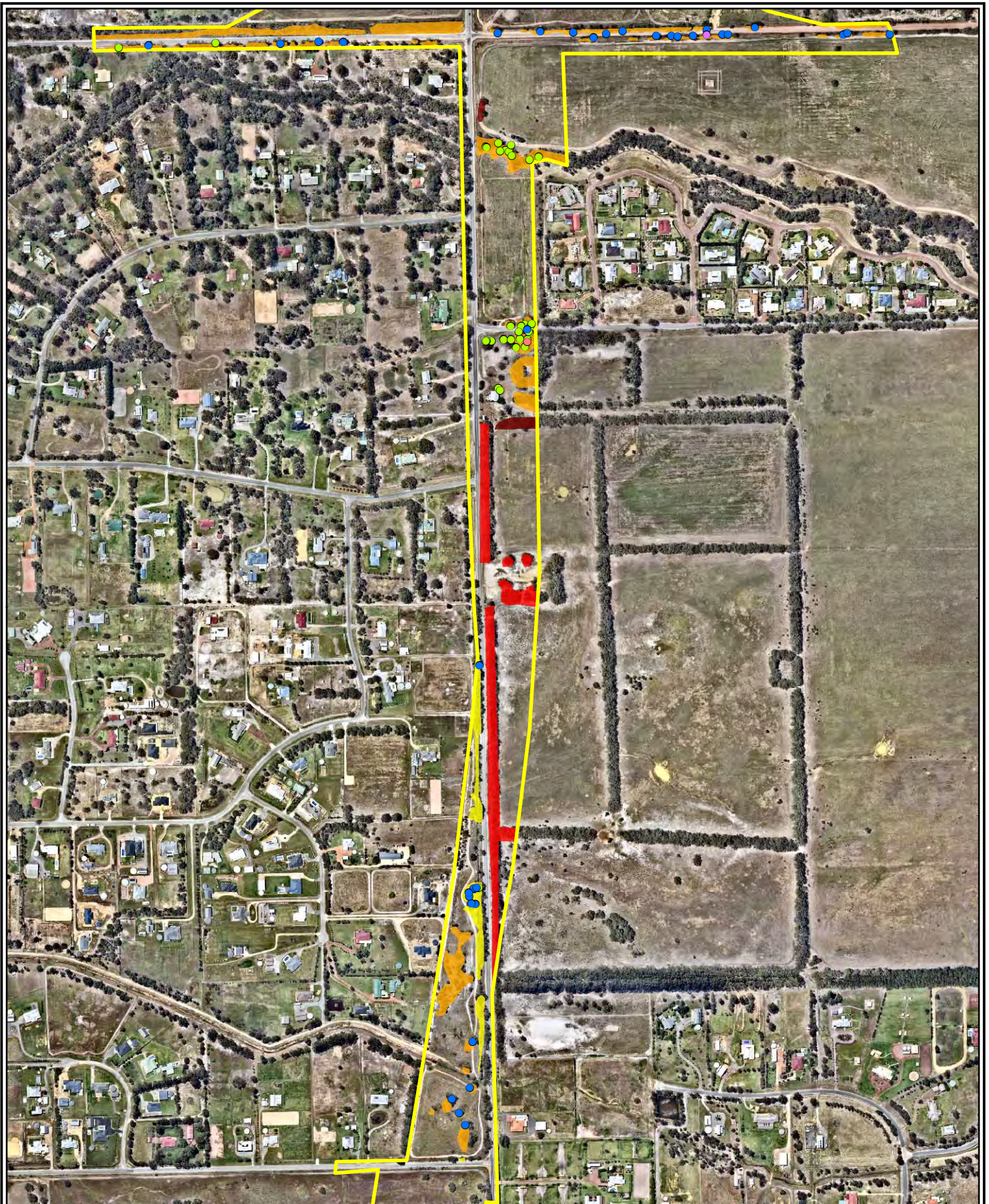


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Version: A	Date: 18-Feb-2021	
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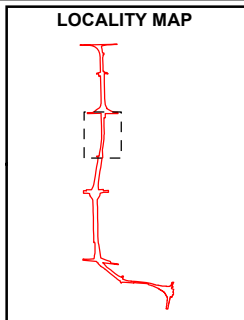
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**CARNABY'S BLACK COCKATOO
HABITAT WITHIN PROPOSED ACTION
AREA**

FIGURE 7 **PAGE 2 of 8**



- Legend**
- Proposed Action
 - Foraging value - CBC
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 - Flooded Gum
 - Flooded Gum stag
 - Marri
 - Marri stag

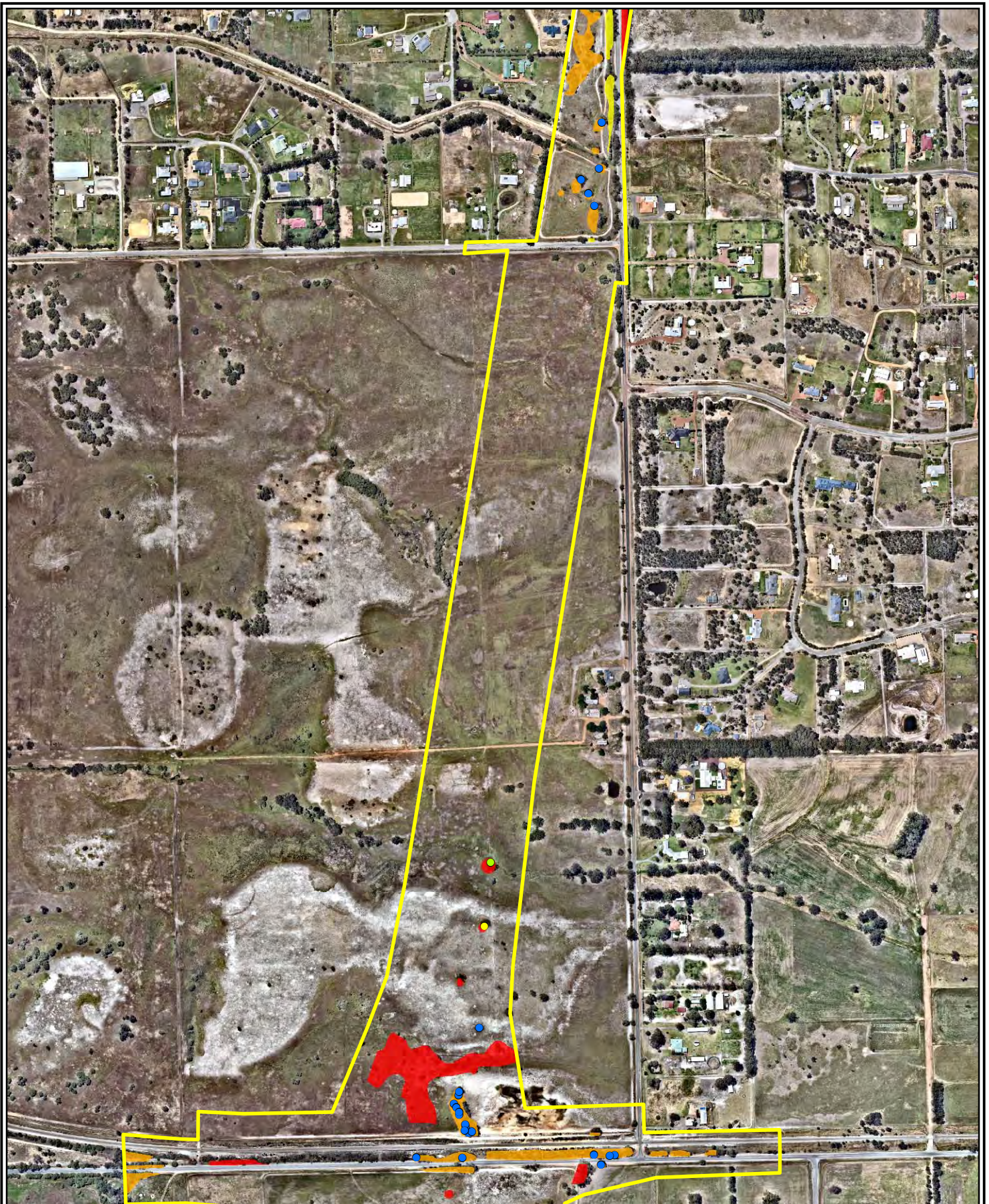


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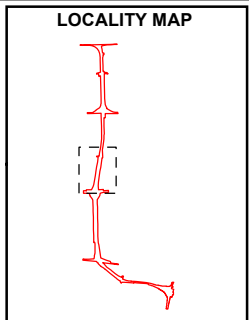
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CARNABY'S BLACK COCKATOO HABITAT WITHIN PROPOSED ACTION AREA

FIGURE 7 **PAGE 3 of 8**



- Legend**
- Proposed Action
 - Foraging value - CBC
 - Moderate (4)
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 - Marri

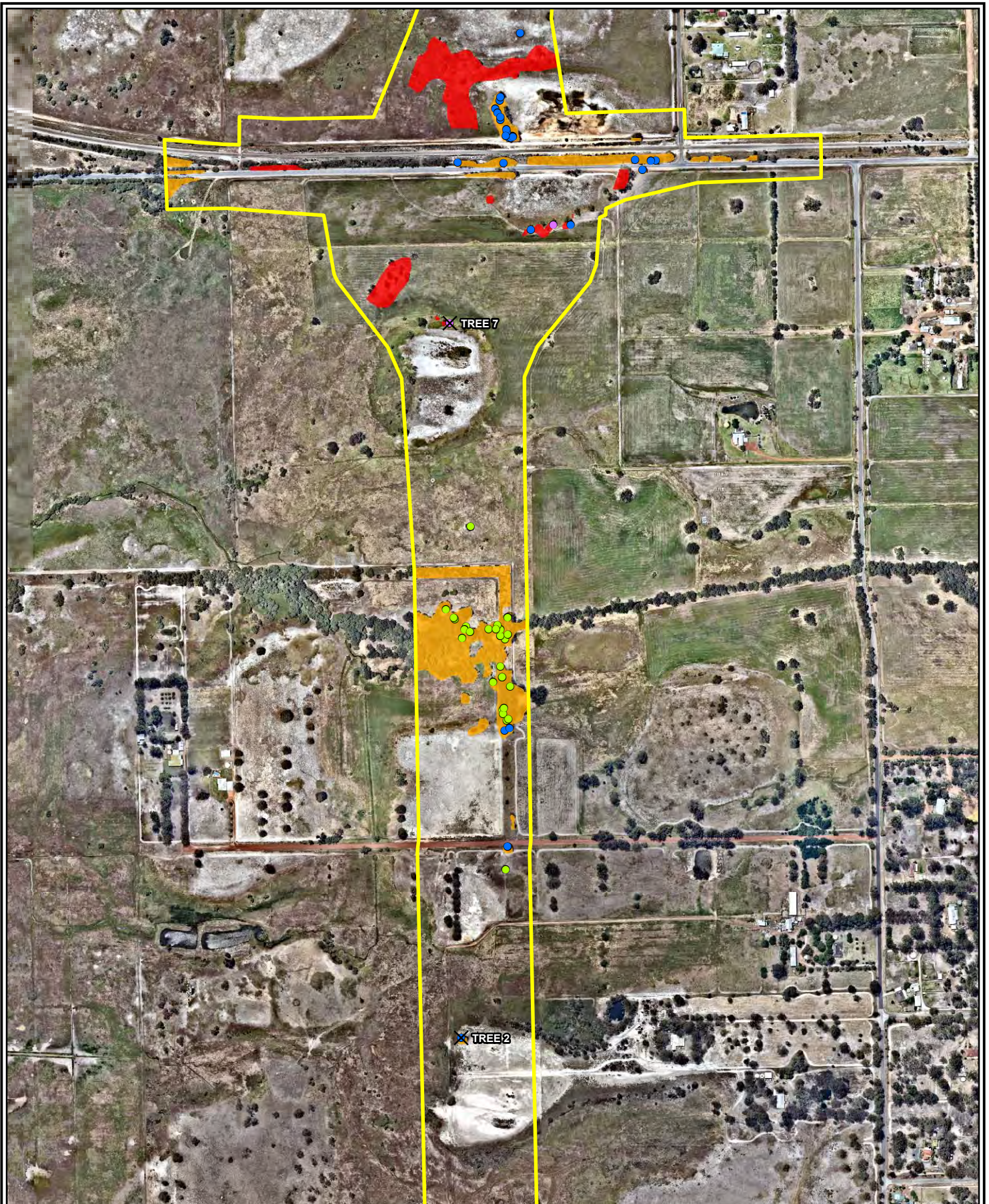


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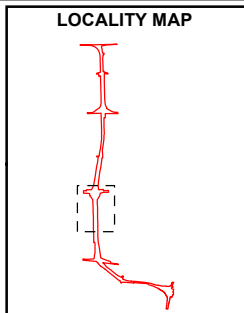
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**CARNABY'S BLACK COCKATOO
HABITAT WITHIN PROPOSED ACTION
AREA**

FIGURE 7 **PAGE 4 of 8**



- Legend**
- Proposed Action
 - Foraging value - CBC
 - Low to moderate (3)
 - Low (2)
 - Black Cockatoo significant habitat trees
 - Flooded Gum
 - Marri
 - Marri stag
 - X Unsuitable breeding hollows

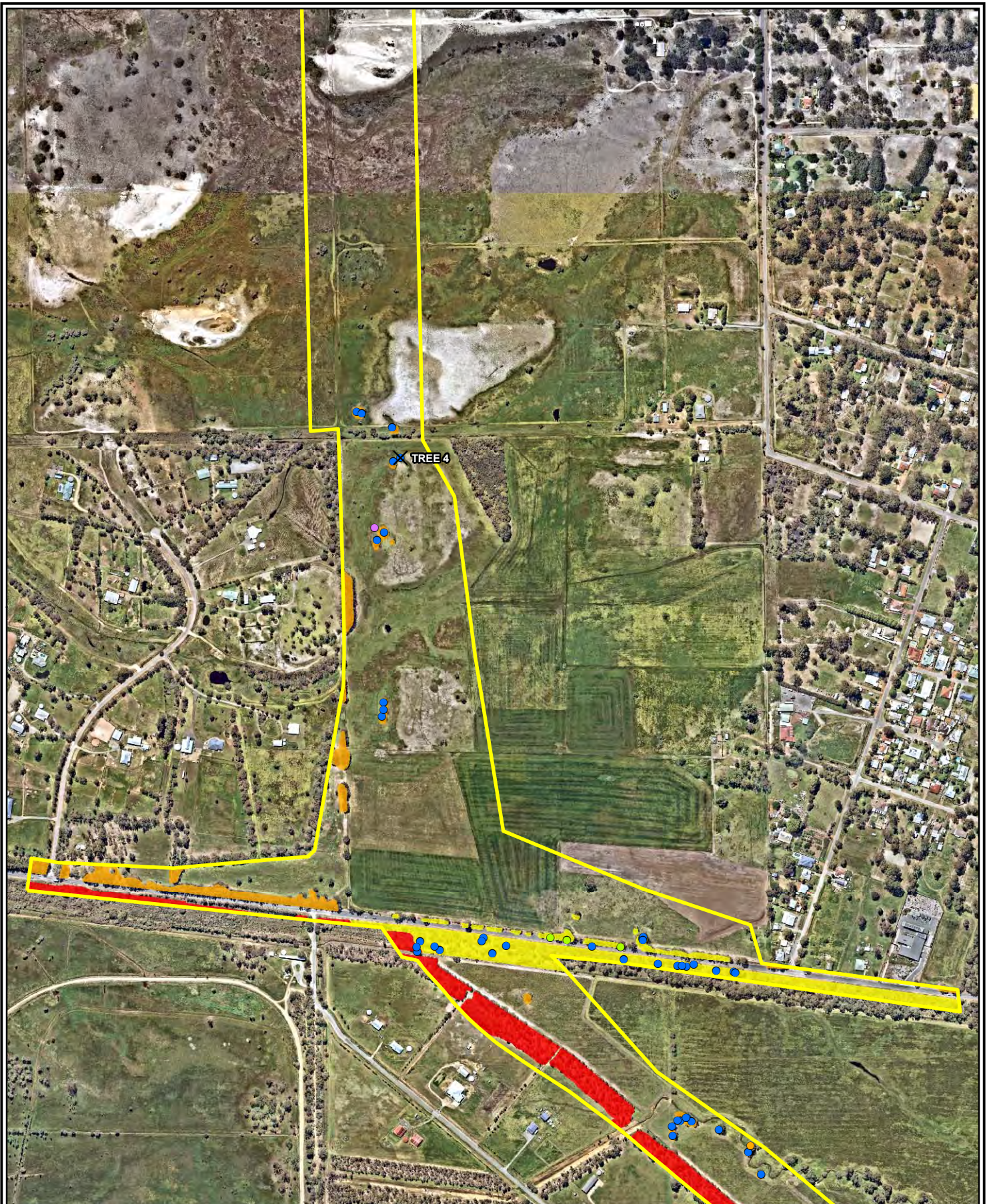


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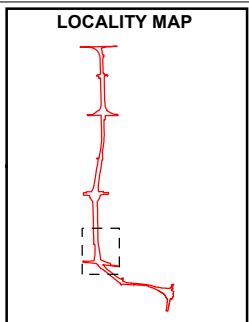
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**CARNABY'S BLACK COCKATOO
HABITAT WITHIN PROPOSED ACTION
AREA**

FIGURE 7 **PAGE 5 of 8**



- Legend**
- Proposed Action
 - Foraging value - CBC
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 - Marri stag
 - Wandoo
 - X Unsuitable breeding hollows

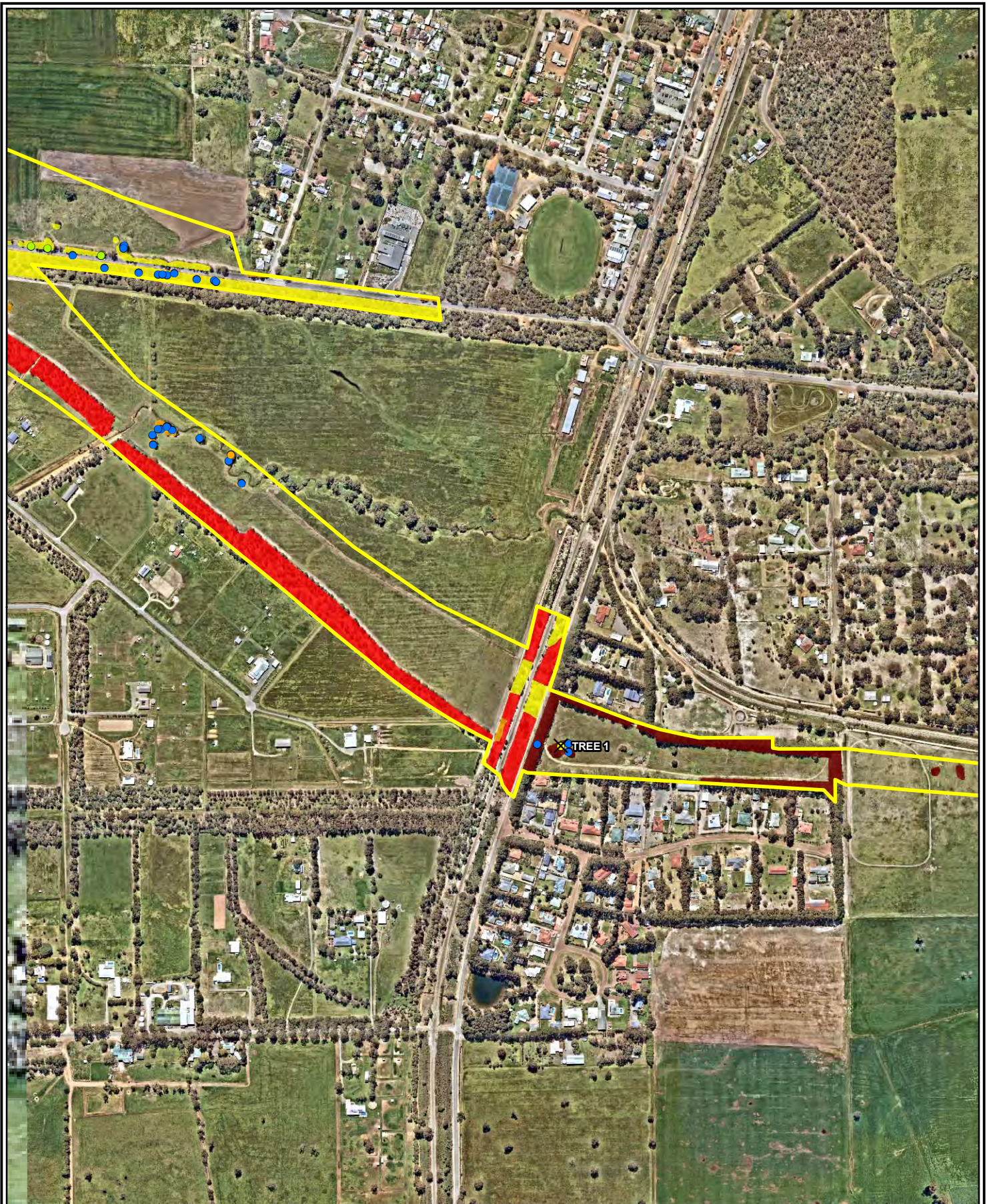


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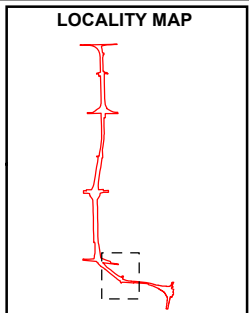
Tonkin Highway Extension WA

CARNABY'S BLACK COCKATOO HABITAT WITHIN PROPOSED ACTION AREA

FIGURE 7 **PAGE 6 of 8**



- Legend**
- Proposed Action
 - Foraging value - CBC
 - Moderate (4)
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 - Negligible to low (1)
 - Black Cockatoo significant habitat trees
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 - Marri
 - Wandoo
 - X Unsuitable breeding hollows

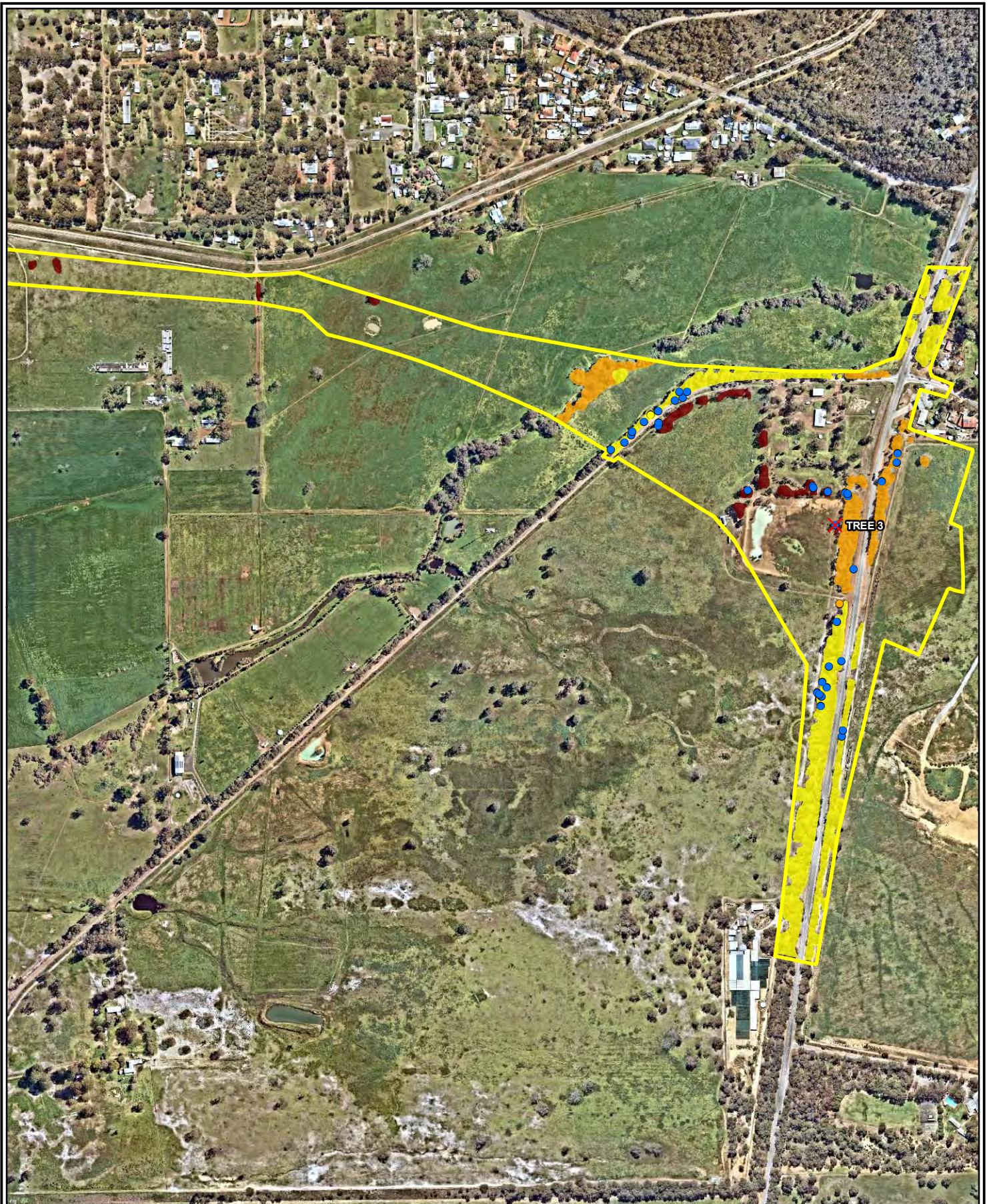


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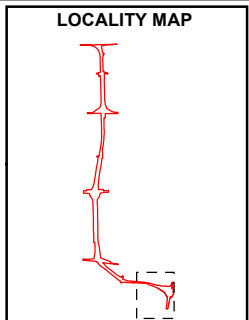
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**CARNABY'S BLACK COCKATOO
HABITAT WITHIN PROPOSED ACTION
AREA**

FIGURE 7 **PAGE 7 of 8**



- Legend**
- Proposed Action
 - Foraging value - CBC
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 - Black Cockatoo significant habitat trees
 - Jarrah
 - Marri
 - Wandoo
 - ✕ Possible breeding hollows

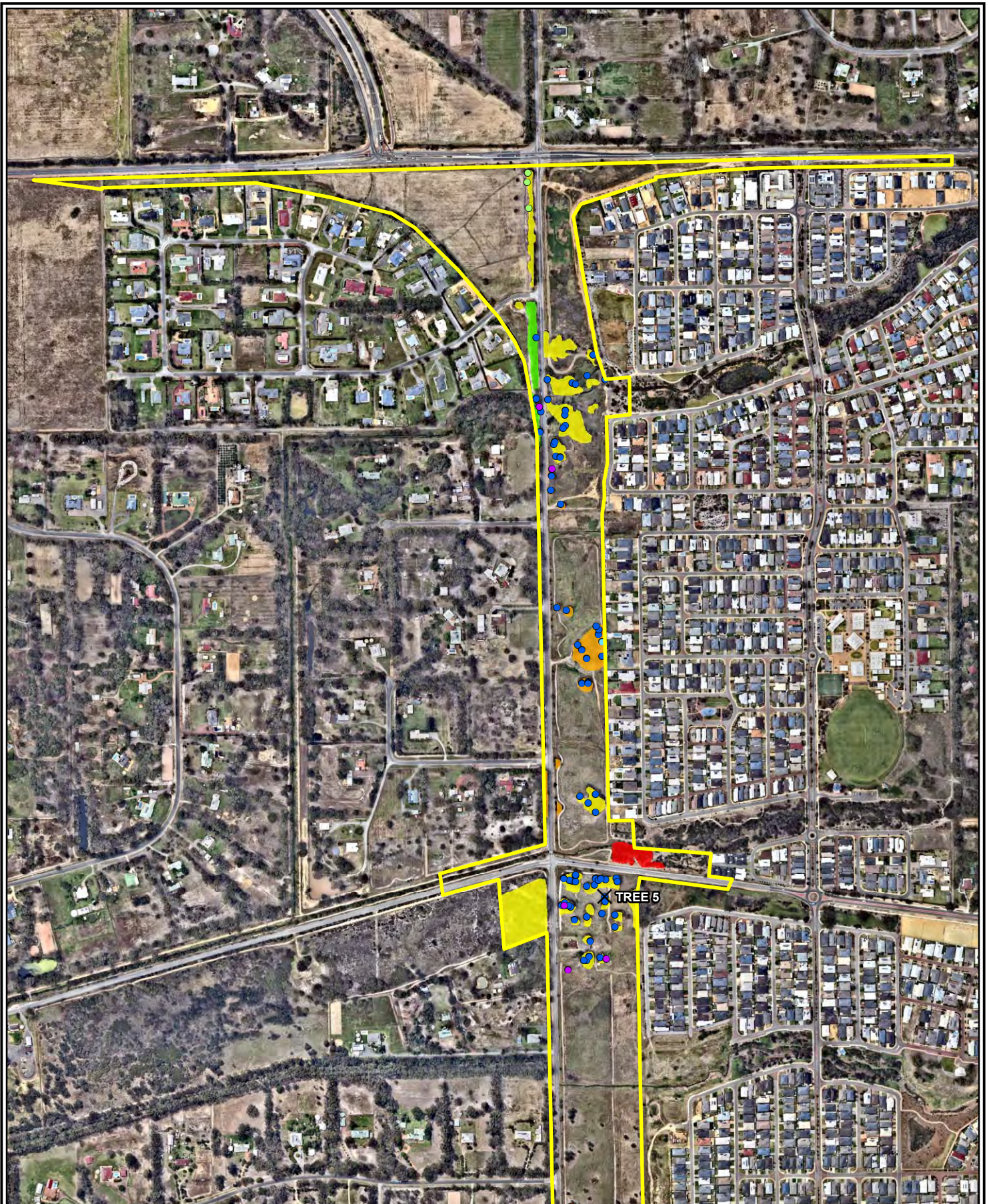


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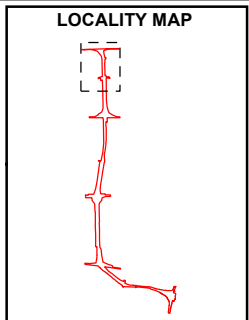
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**CARNABY'S BLACK COCKATOO
HABITAT WITHIN PROPOSED ACTION
AREA**

FIGURE 7 **PAGE 8 of 8**



- Legend**
- Proposed Action
 - Foraging value - BBC & FRTBC
 - Moderate to high (5)
 - Moderate (4)
 - Low to moderate (3)
 - Low (2)
 - Black Cockatoo significant habitat trees
 - Flooded Gum
 - Jarrah stag
 - Marri
 - Marri stag
 - X Unsuitable breeding hollows

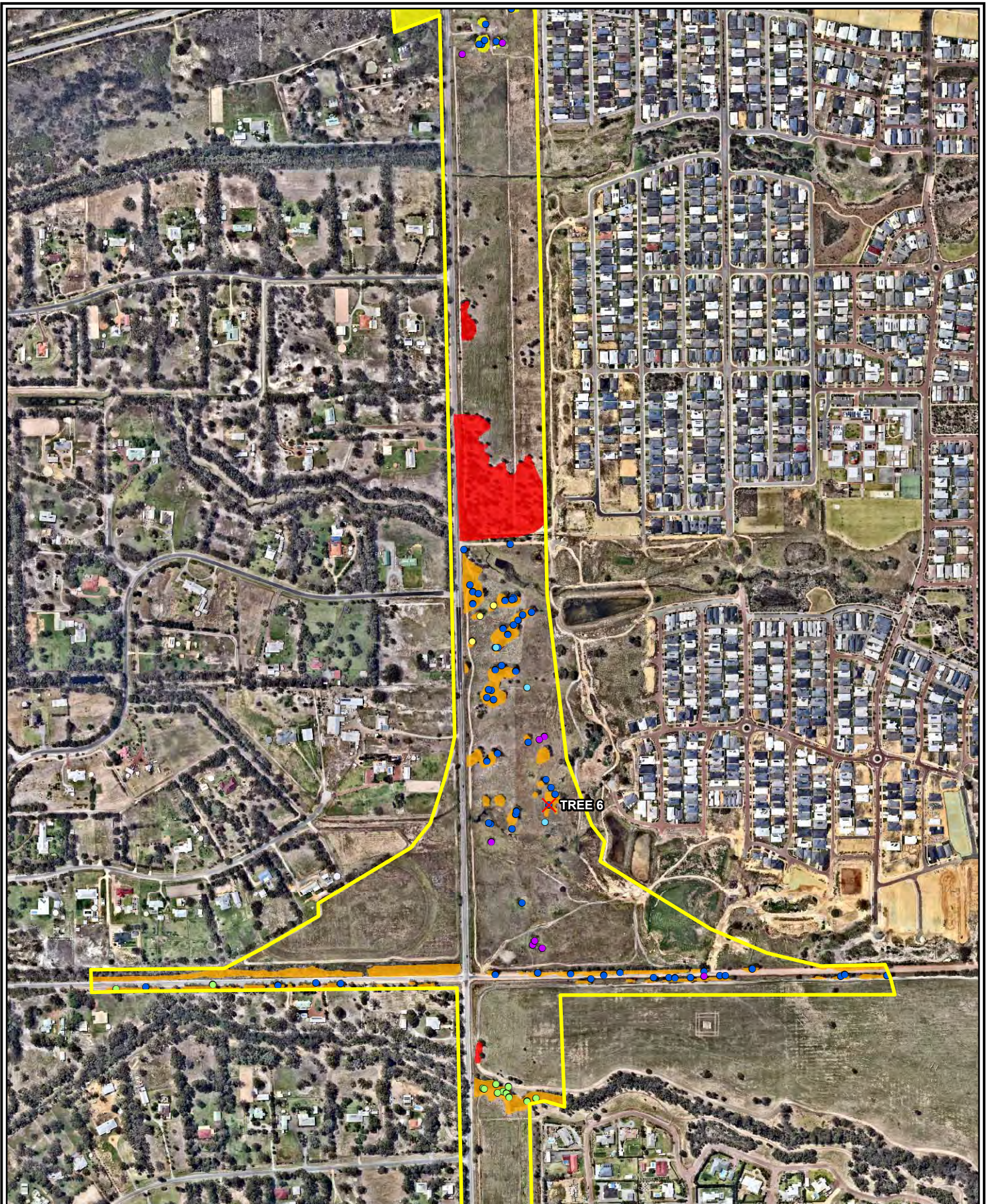


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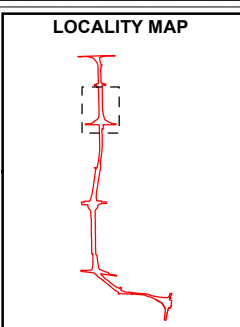
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**BAUDIN'S AND FOREST RED-TAILED
BLACK COCKATOO HABITAT WITHIN
PROPOSED ACTION AREA**

FIGURE 8 **PAGE 1 of 8**



- Legend**
- Proposed Action
 - Foraging value - BBC & FRTBC
 - Moderate (4)
 - Low to moderate (3)
 - Low (2)
 - Black Cockatoo significant habitat trees
 - Flooded Gum
 - Jarrah
 - Jarrah stag
 - Marri
 - Marri stag
 - Possible breeding hollows

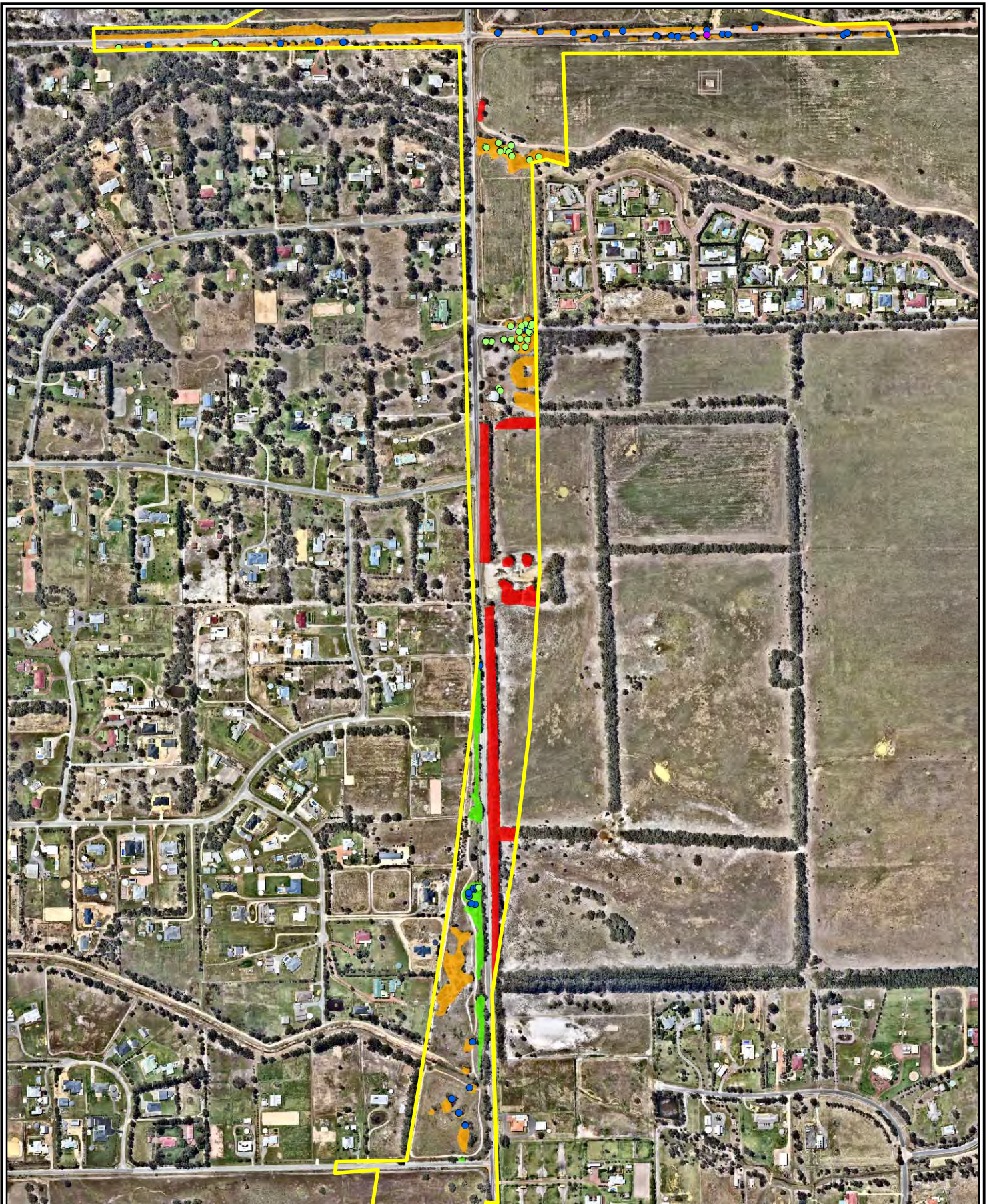


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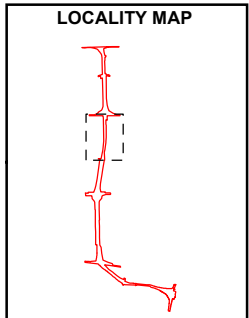
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BAUDIN'S AND FOREST RED-TAILED BLACK COCKATOO HABITAT WITHIN PROPOSED ACTION AREA

FIGURE 8 **PAGE 2 of 8**



- Legend**
- █ Proposed Action
 - Foraging value - BBC & FRTBC
 - █ Moderate to high (5)
 - █ Low to moderate (3)
 - █ Low (2)
 - Black Cockatoo significant habitat trees
 - Flooded Gum
 - Flooded Gum stag
 - Marri
 - Marri stag

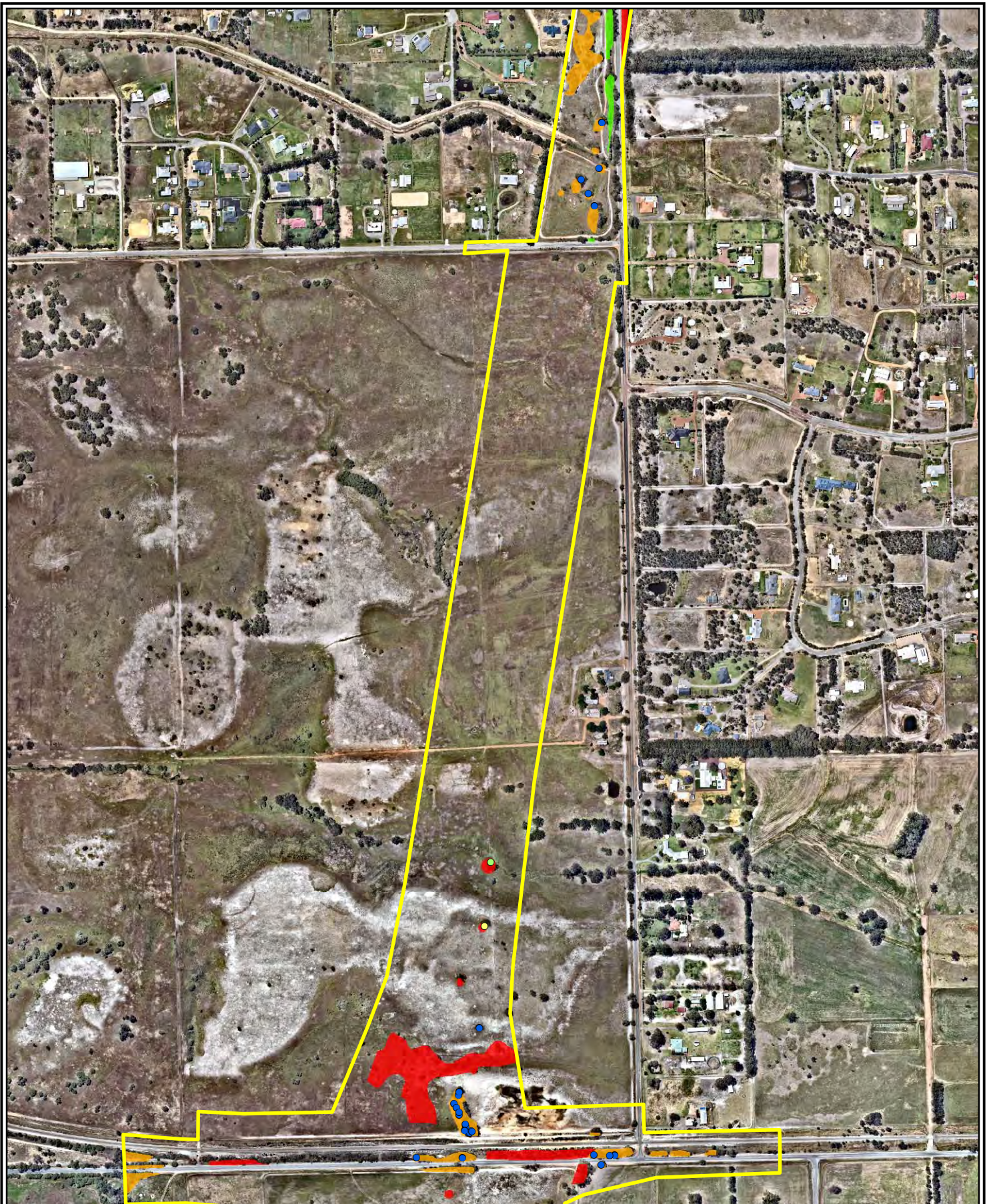


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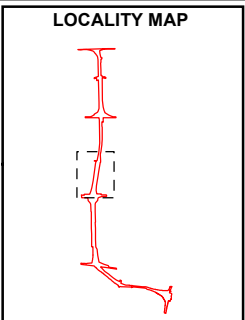
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BAUDIN'S AND FOREST RED-TAILED BLACK COCKATOO HABITAT WITHIN PROPOSED ACTION AREA

FIGURE 8 **PAGE 3 of 8**



- Legend**
- Proposed Action
 - Foraging value - BBC & FRTBC
 - Moderate to high (5)
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 - Low (2)
 - Black Cockatoo significant habitat trees
 - Flooded Gum
 - Jarrah
 - Marri

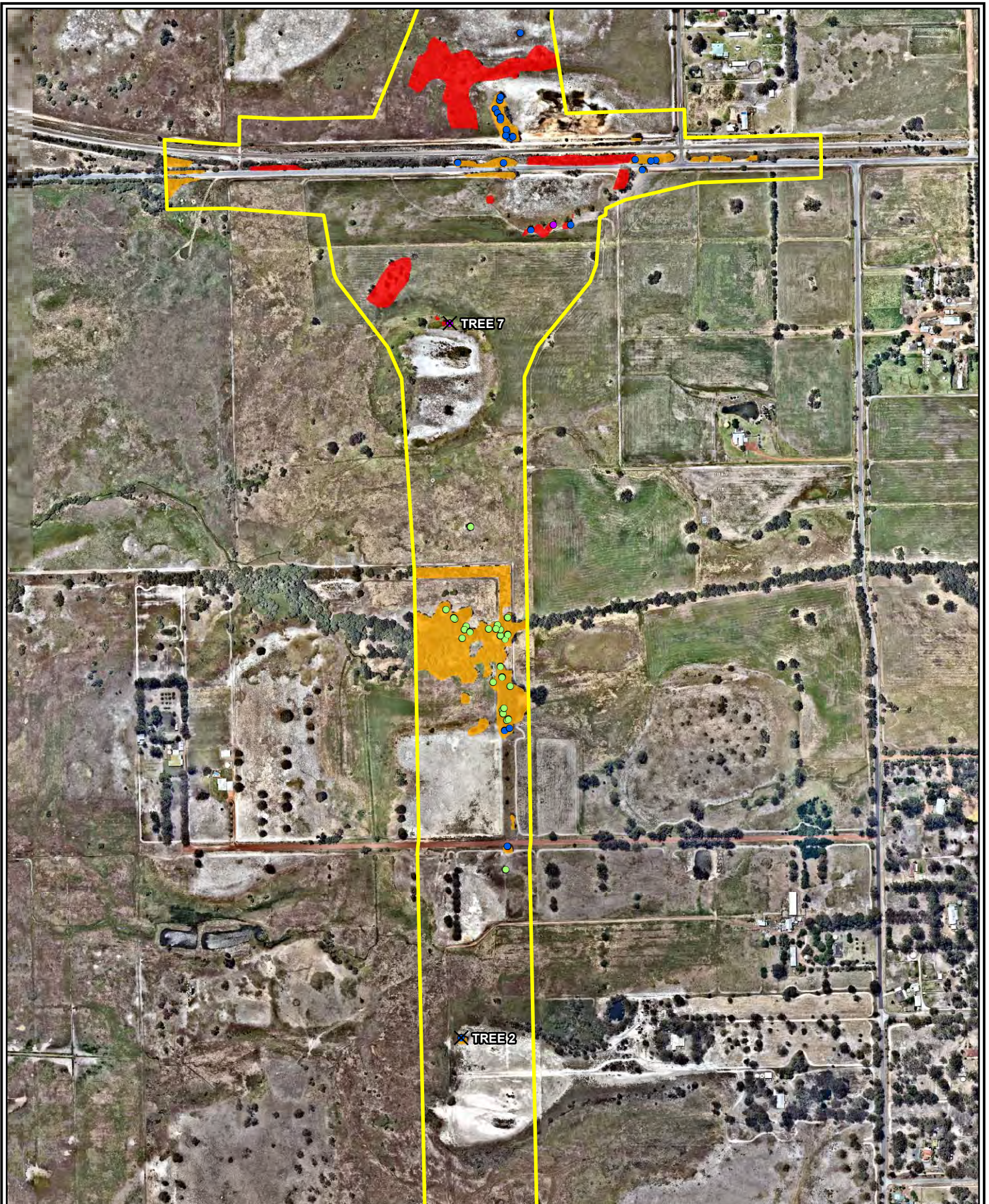


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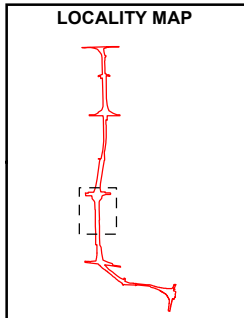
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**BAUDIN'S AND FOREST RED-TAILED
BLACK COCKATOO HABITAT WITHIN
PROPOSED ACTION AREA**

FIGURE 8 **PAGE 4 of 8**



- Legend**
- █ Proposed Action
 - Foraging value - BBC & FRTBC
 - █ Low to moderate (3)
 - █ Low (2)
 - Black Cockatoo significant habitat trees
 - Flooded Gum
 - Marri
 - Marri stag
 - ✕ Unsuitable breeding hollows

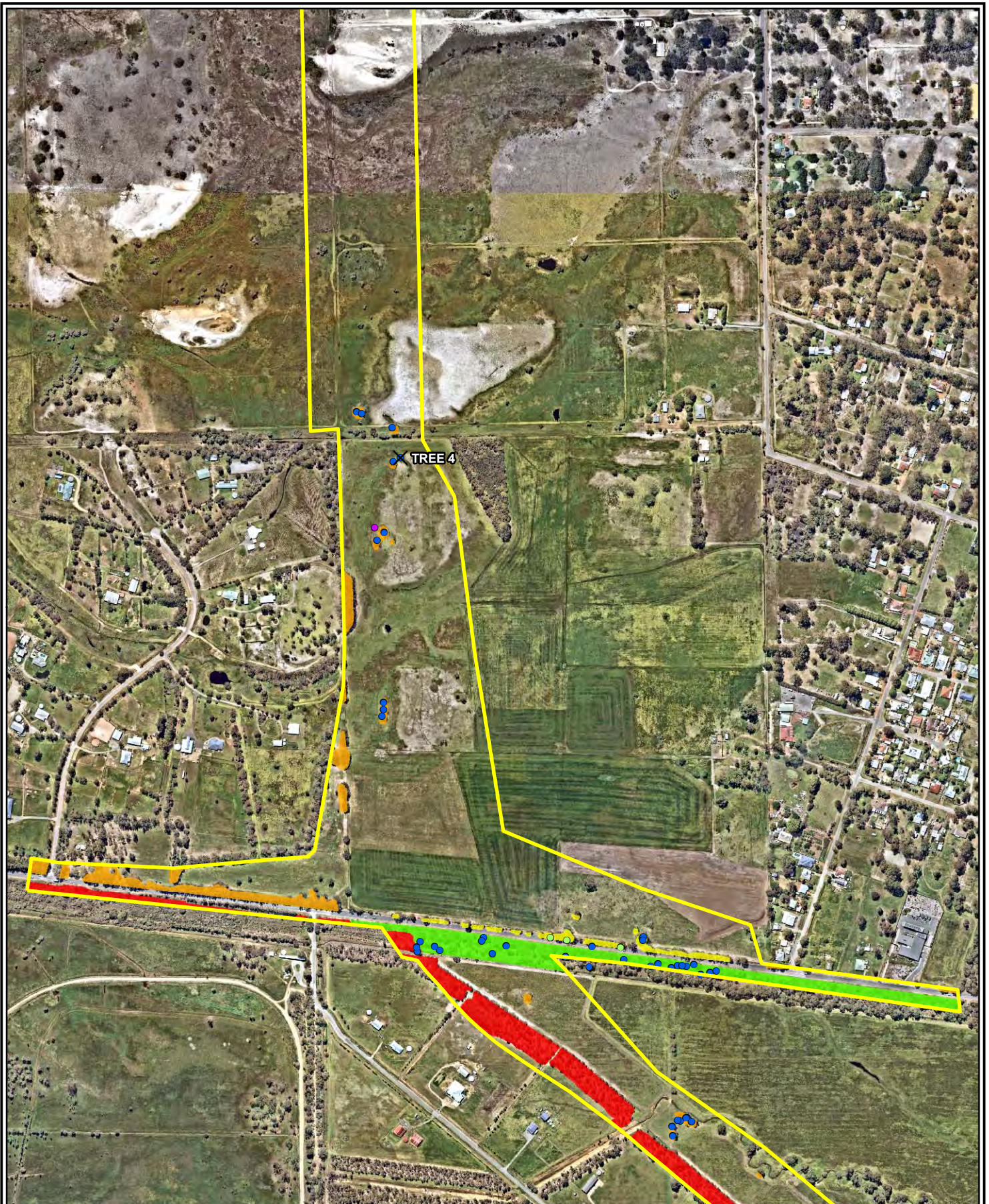


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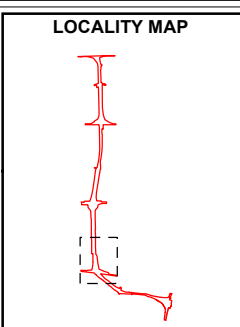
BAUDIN'S AND FOREST RED-TAILED BLACK COCKATOO HABITAT WITHIN PROPOSED ACTION AREA

FIGURE 8 **PAGE 5 of 8**



Legend

- █ Proposed Action
- Foraging value - BBC & FRTBC
 - █ Moderate to high (5)
 - █ Moderate (4)
 - █ Low to moderate (3)
 - █ Low (2)
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 - Flooded Gum
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 - Marri stag
 - ✕ Unsuitable breeding hollows

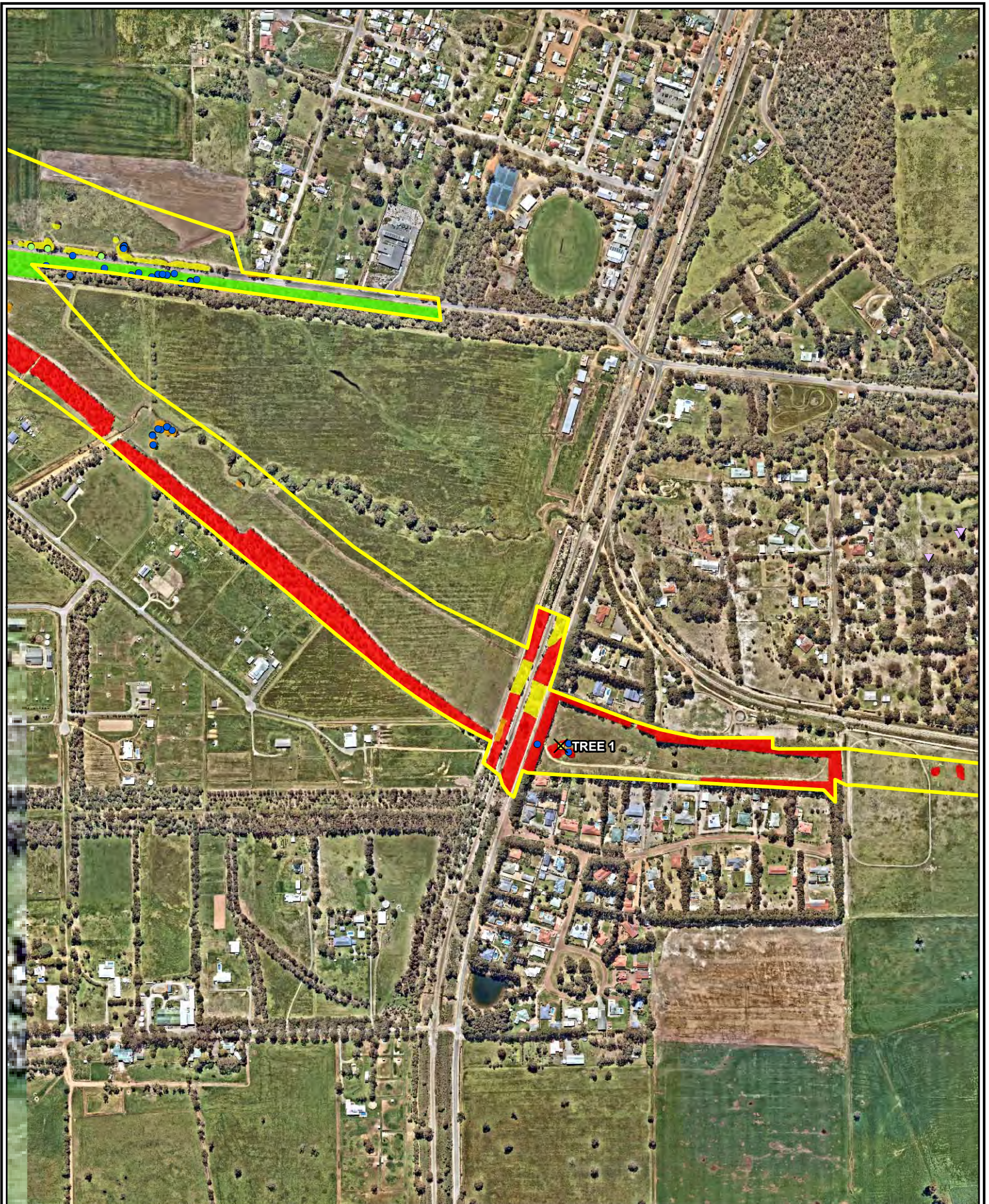


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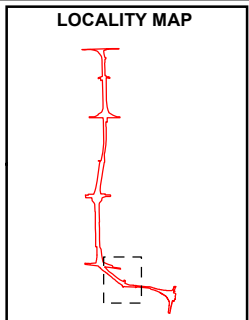
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BAUDIN'S AND FOREST RED-TAILED BLACK COCKATOO HABITAT WITHIN PROPOSED ACTION AREA

FIGURE 8 **PAGE 6 of 8**



- Legend**
- Proposed Action
 - Foraging value - BBC & FRTBC
 - Moderate to high (5)
 - Moderate (4)
 - Low to moderate (3)
 - Low (2)
 - Baudin's Black Cockatoo locations (Murdoch 2015)
 - Black Cockatoo significant habitat trees
 - Flooded Gum
 - Jarrah
 - Marri
 - Unsuitable breeding hollows

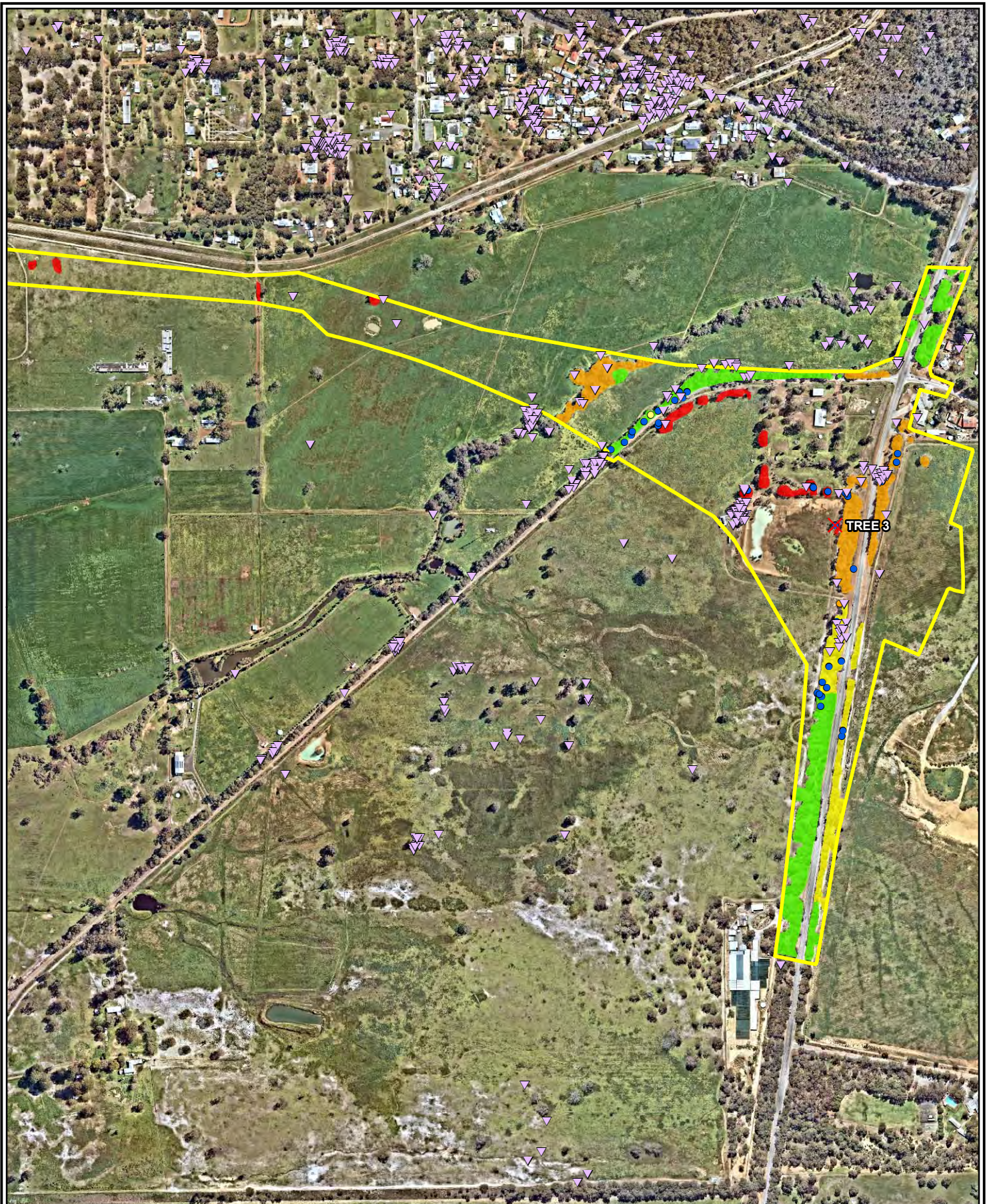


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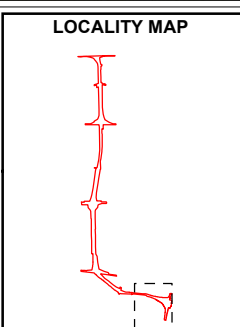
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**BAUDIN'S AND FOREST RED-TAILED
BLACK COCKATOO HABITAT WITHIN
PROPOSED ACTION AREA**

FIGURE 8 **PAGE 7 of 8**



- Legend**
- Proposed Action
 - Foraging value - BBC & FRTBC
 - Moderate to high (5)
 - Moderate (4)
 - Low to moderate (3)
 - Low (2)
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 - Jarrah
 - Marri
 - Wandoo
 - X Possible breeding hollows



Scale 1:9,000 at A4		0 100 200 Meters	
Coord. Sys. GDA 1994 MGA Zone 50		↑	
Job No: 58910			
Client: Main Roads Western Australia			
Version: A	Date: 18-Feb-2021		
Drawn By: hsullivan	Checked By: DN		

Tonkin Highway Extension WA

BAUDIN'S AND FOREST RED-TAILED BLACK COCKATOO HABITAT WITHIN PROPOSED ACTION AREA

FIGURE 8 **PAGE 8 of 8**

2.6.1.5 Significant weeds

Five flora species recorded by Woodman (2020) in the Survey Area are Declared Pests under the Biosecurity and Agriculture Management Act 2007.

One Weed of National Significance, *Asparagus asparagoides* (Bridal Creeper) was recorded within the Survey Area, but outside of the Proposed Action area.

2.6.1.6 Phytophthora dieback

Glevan Consulting (2020) undertook a dieback assessment of the Proposed Action area and surrounds. The field survey detected the presence of *P. cinnamomi* infestation at Bishop Road and Mundijong Road. The majority of the Proposed Action area was excluded due to the degraded nature of the survey area, with the majority of the proposed action area including cleared areas with parkland cleared vegetation. There was one location of uninterpretable unprotectable vegetation at Mundijong Road however this also contains populations of Threatened flora and TECs (Figure 9).

2.6.1.7 Hydrology

2.6.1.7.1 Surface Water

The Proposed Action area intersects numerous minor unnamed drainage lines and named waterways including:

- Cardup Brook
- Manjedal Brook
- Medulla Brook

These waterways are all part of the Serpentine River catchment.

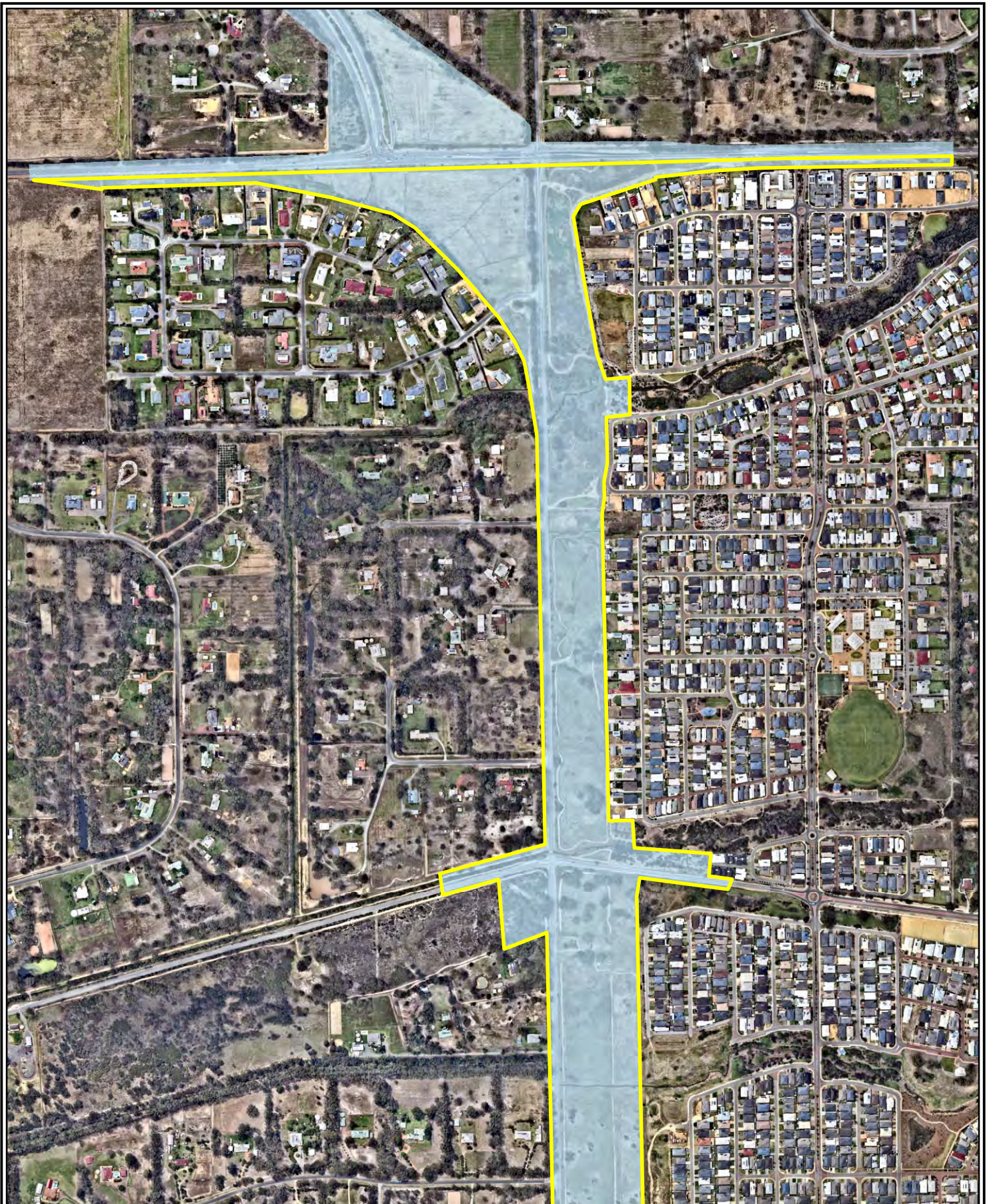
There are several small areas of Conservation category palusplains within the Proposed Action area associated with vegetated areas along Mundijong Road reserve and the freight rail line reserve. The majority of the Proposal area is mapped as Multiple Use palusplain wetland.

2.6.1.7.2 Groundwater

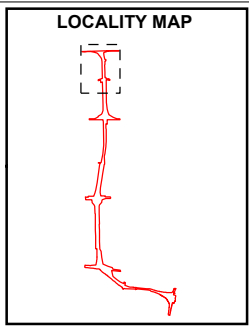
Three layers of aquifer occur beneath the Proposal area. The unconfined (or superficial) aquifer is the topmost layer and is usually accessed for groundwater abstraction. Beneath the superficial aquifer lies the semi-confined Leederville aquifer. Below the Leederville aquifer lies the confined Yarragadee North aquifer.

The superficial aquifer receives direct recharge from groundwater infiltration and surface water. There is limited interaction between the various aquifers, in terms of water exchange. Both the Yarragadee and the Leederville aquifer receive direct recharge where these formations outcrop (not within the Proposal area). Groundwater movement and recharge is very slow in these confined aquifers.

Depth to groundwater levels range from 2.0 m to 4.8 m below surface level (approximately 24 m Australian Height Datum (AHD)) across the Proposed Action area. The depth of the bottom of the superficial aquifer in the area of the Proposed Action area is approximately 15 m below ground level.



- Legend**
- Proposed Action
 - Phytophthora* Dieback status
 - Excluded

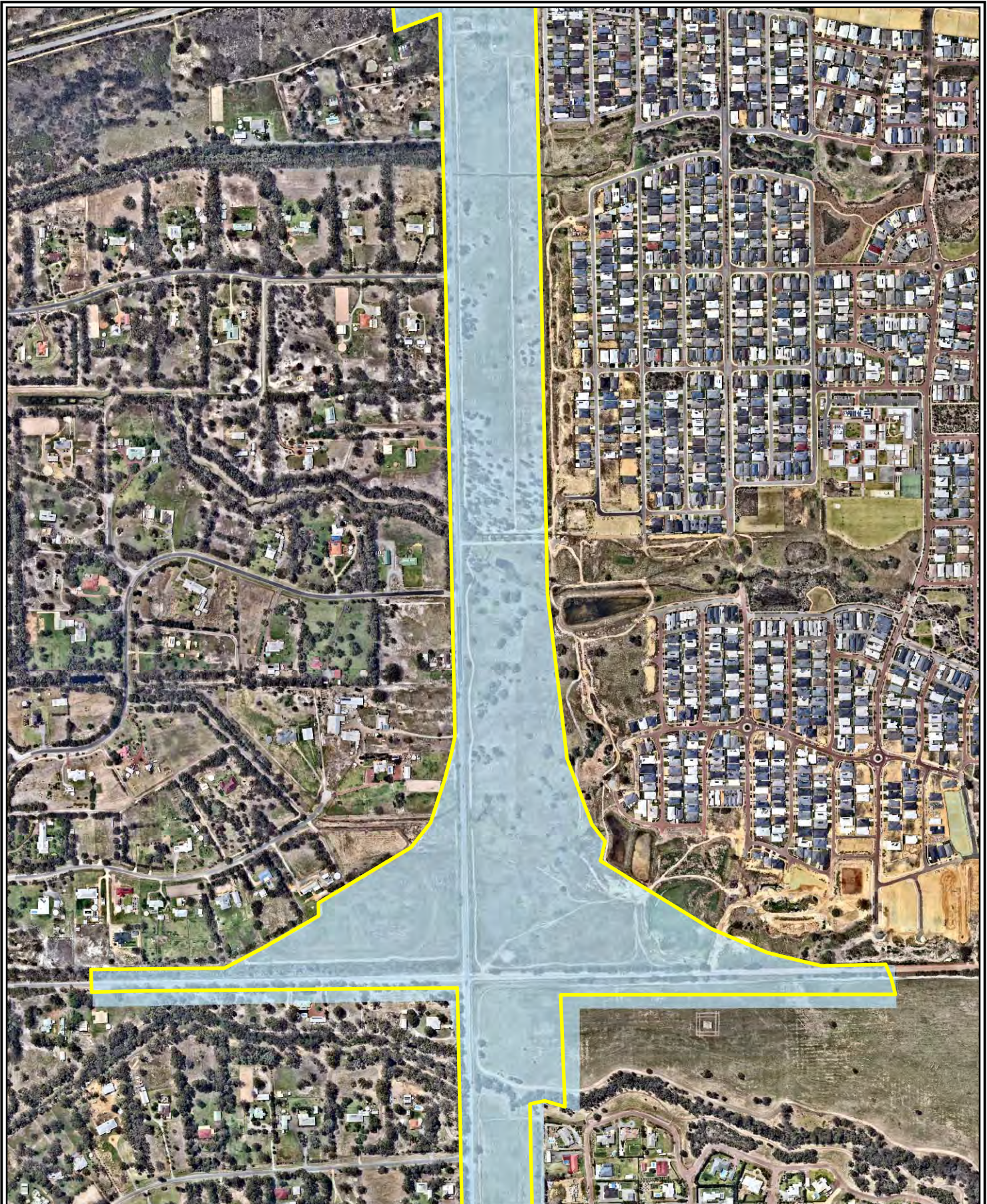




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Client: Main Roads Western Australia			
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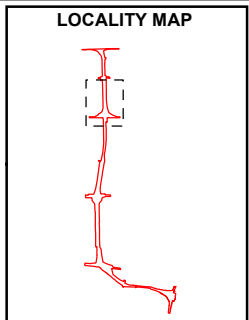
Tonkin Highway Extension WA


DIEBACK STATUS

FIGURE 9 **PAGE 1 of 8**



Legend
 Proposed Action
Phytophthora Dieback status
 Excluded



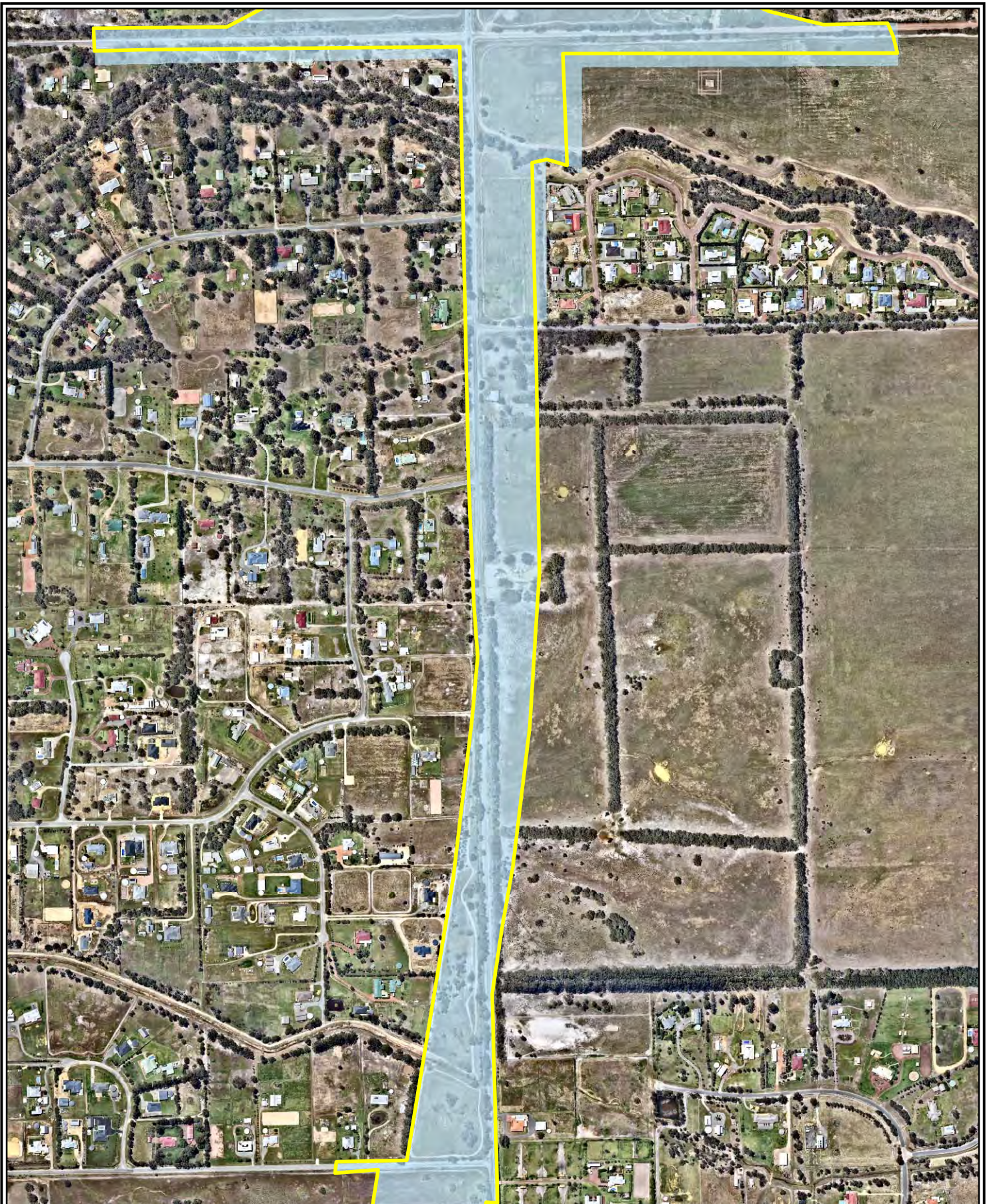
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Drawn By: hsullivan	Checked By: DN	



Tonkin Highway Extension WA

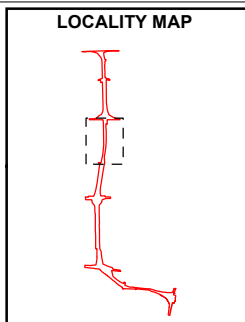
DIEBACK STATUS




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Legend
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Phytophthora Dieback status
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Coord. Sys. GDA 1994 MGA Zone 50 

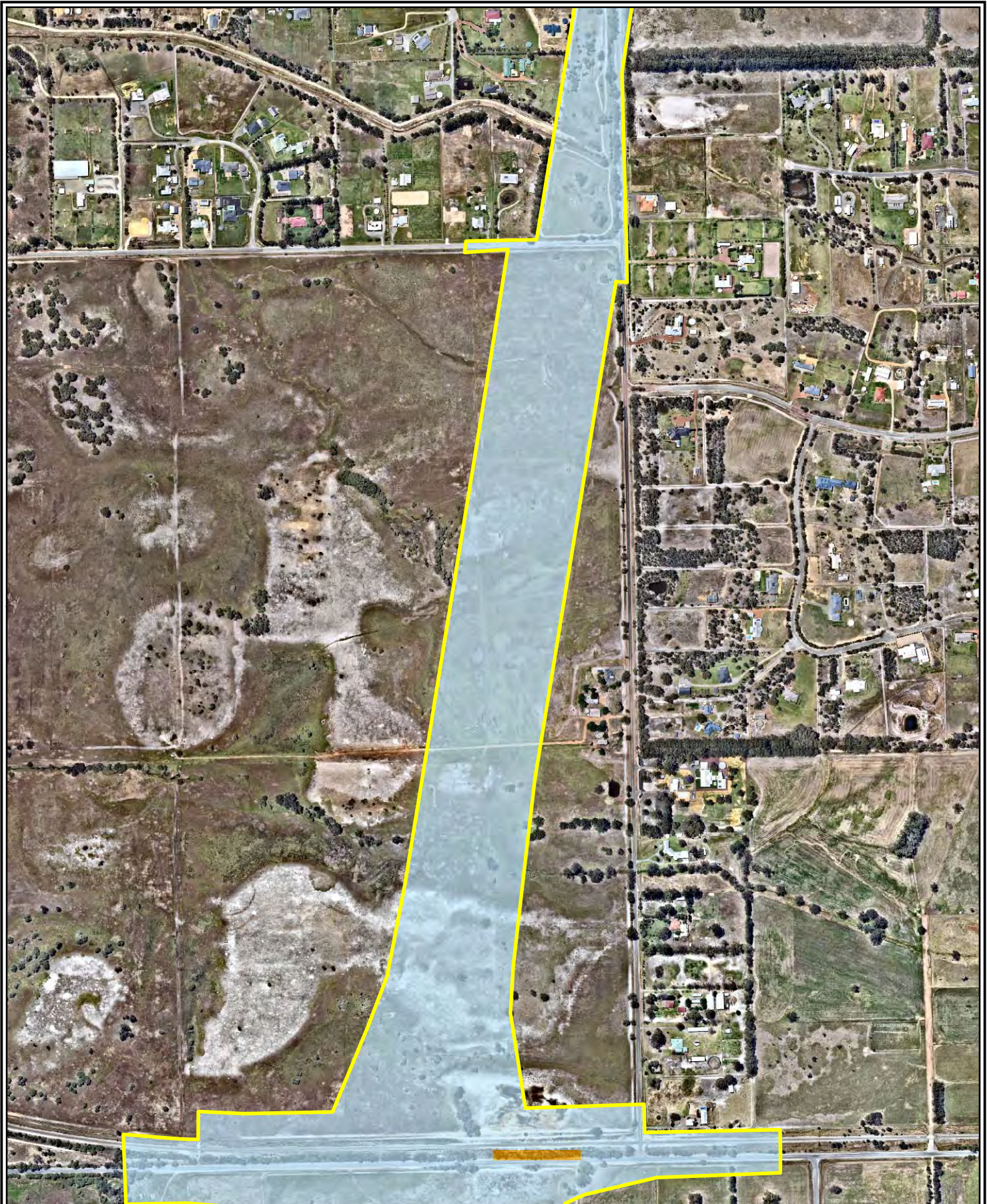
Job No: 58910
 Client: Main Roads Western Australia
 Version: A Date: 18-Feb-2021
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Tonkin Highway Extension WA

DIEBACK STATUS

FIGURE 9 **PAGE 3 of 8**

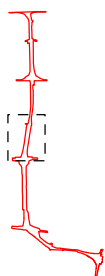




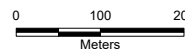
Legend

- Proposed Action
- Phytophthora* Dieback status
- Excluded
- Infested

LOCALITY MAP



Scale 1:9,000 at A4



Coord. Sys. GDA 1994 MGA Zone 50



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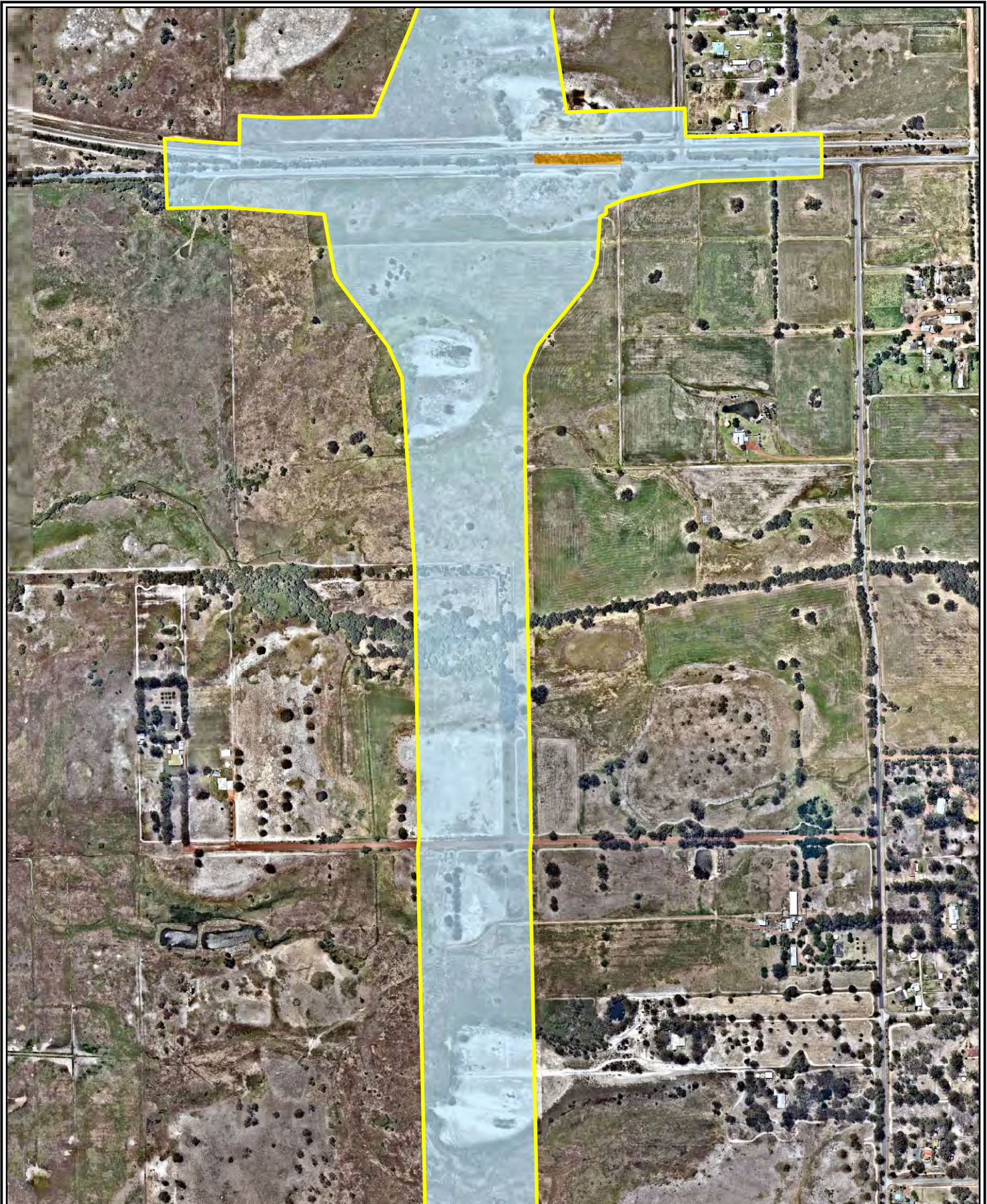
**Tonkin Highway Extension
WA**

DIEBACK STATUS

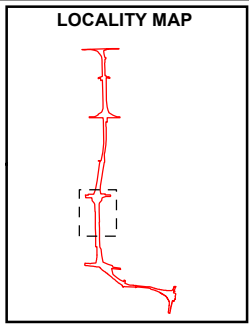
FIGURE 9

PAGE 4 of 8





- Legend**
- Proposed Action
 - Phytophthora* Dieback status
 - Excluded
 - Infested

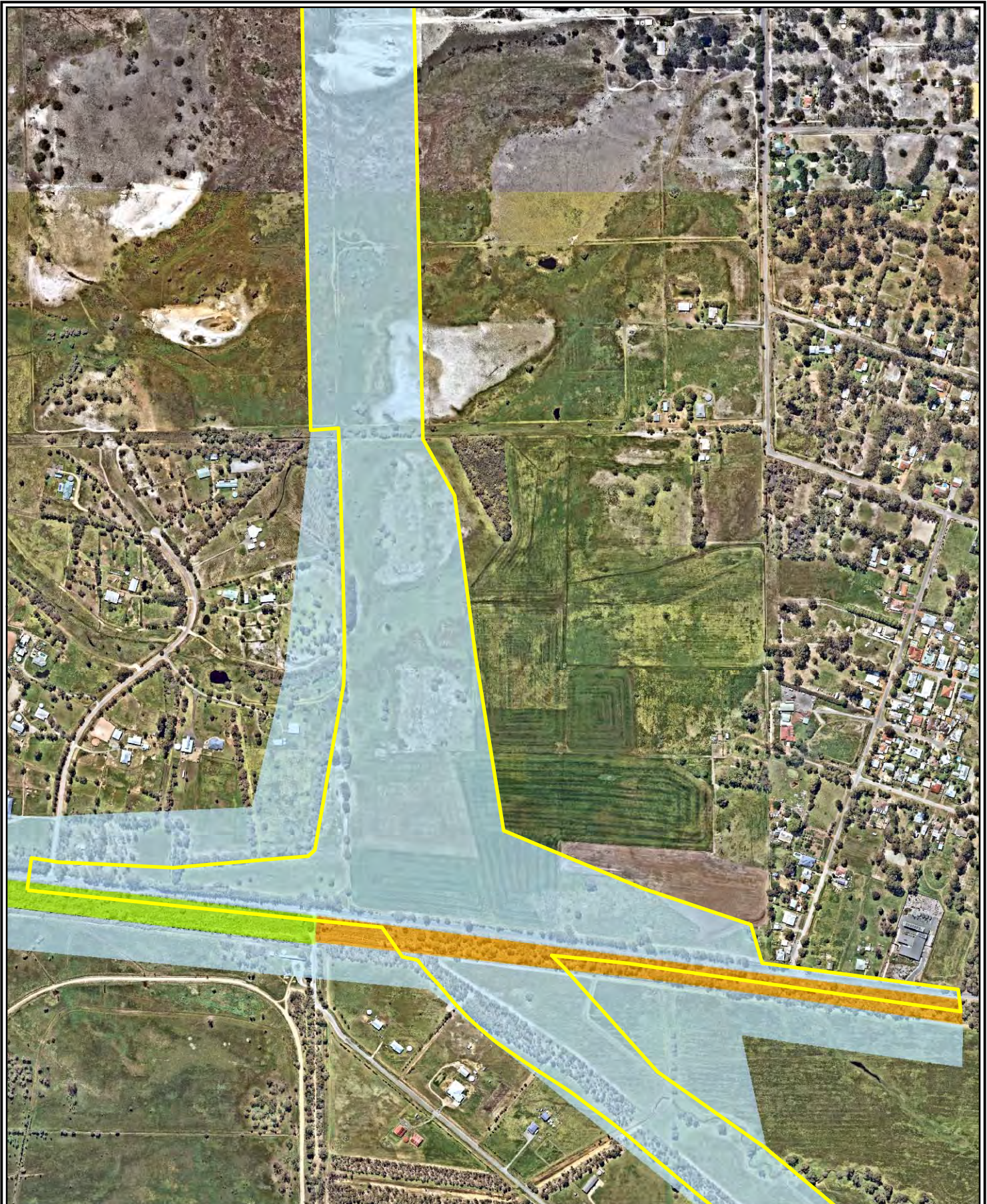


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Client: Main Roads Western Australia			
Version: A	Date: 18-Feb-2021		
Drawn By: hsullivan	Checked By: DN		

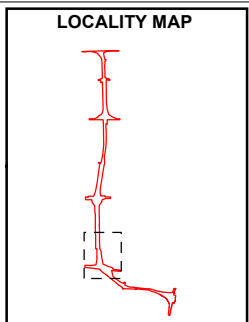
Tonkin Highway Extension WA

DIEBACK STATUS

FIGURE 9 **PAGE 5 of 8**



- Legend**
- Proposed Action
 - Phytophthora* Dieback status
 - Excluded
 - Infested
 - Uninterpretable unprotectable

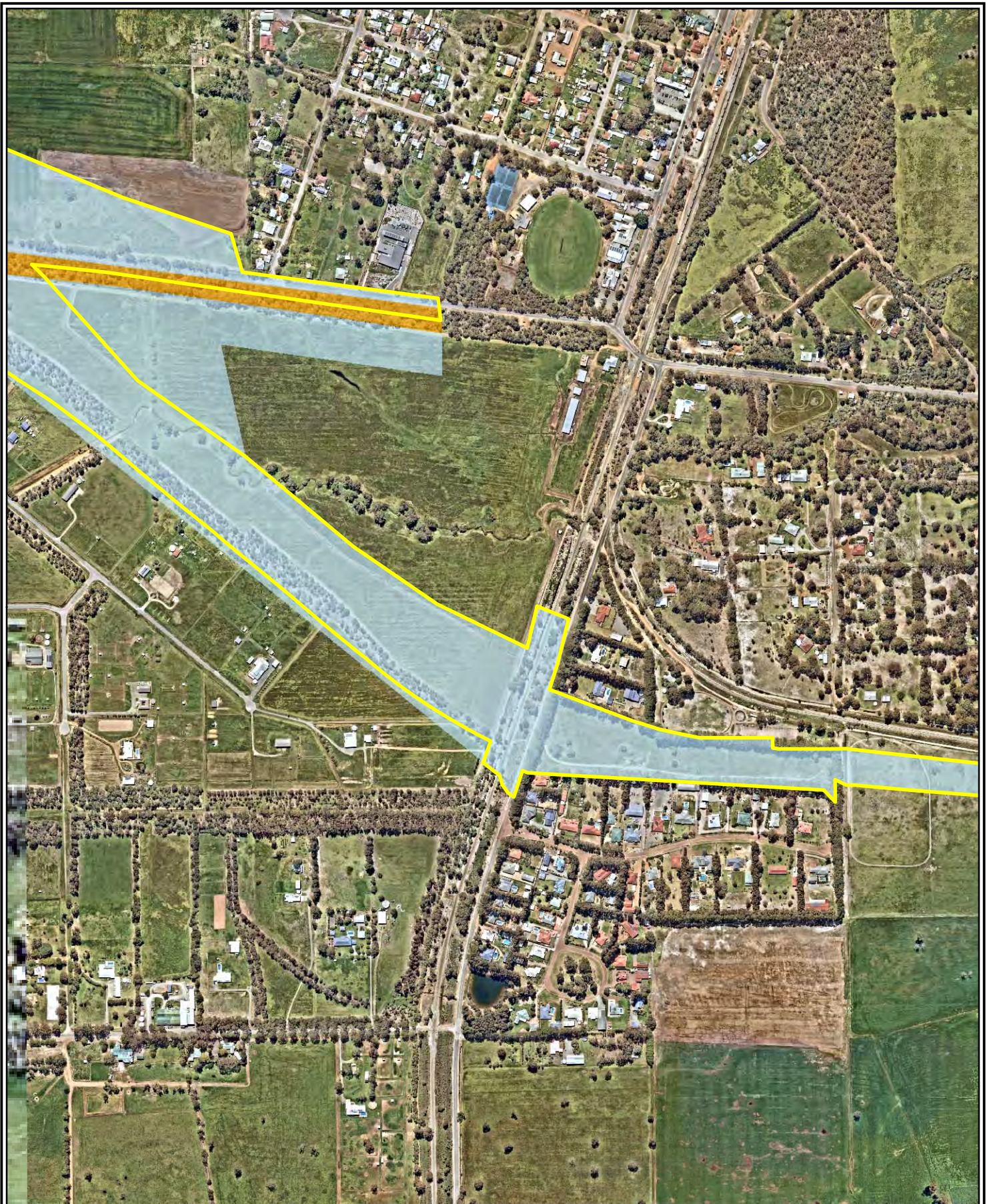


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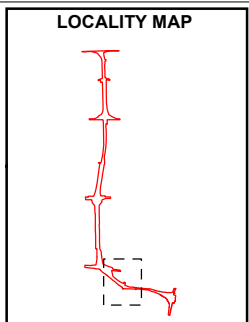
Tonkin Highway Extension WA

DIEBACK STATUS

FIGURE 9 **PAGE 6 of 8**



- Legend**
- Proposed Action
 - Phytophthora* Dieback status
 - Excluded
 - Infested

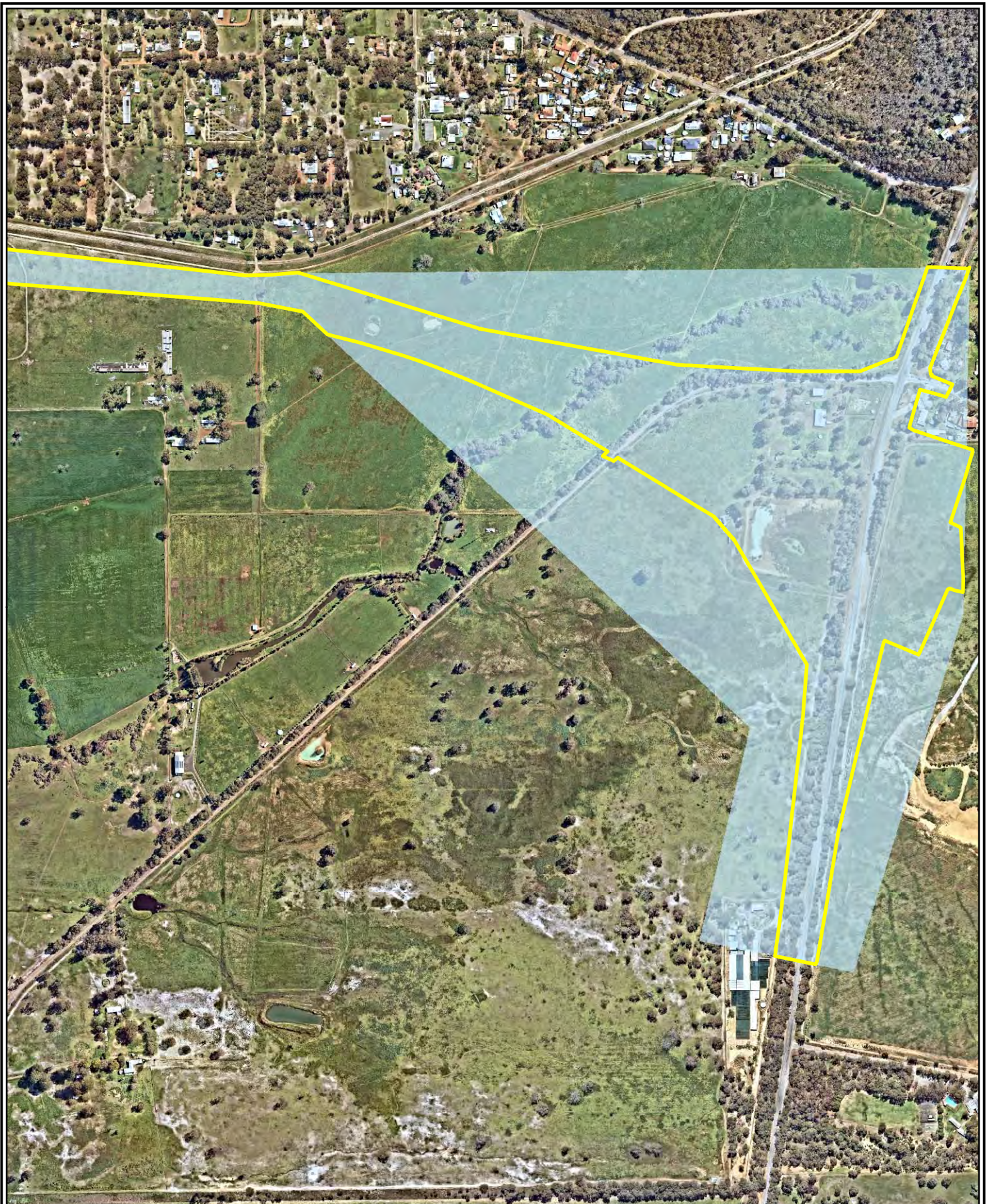


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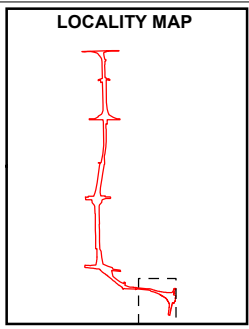
DIEBACK STATUS

FIGURE 9 **PAGE 7 of 8**



Legend

- Proposed Action
- Phytophthora* Dieback status
- Excluded



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**Tonkin Highway Extension
WA**

DIEBACK STATUS

FIGURE 9 **PAGE 8 of 8**

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2.6.2 Management objectives

This AMP has been prepared with the objective that potential direct impacts of the Proposed Action to MNES are acceptable, minimised and managed. It is a 'management-based' AMP to document management actions required during Proposed Action construction and operation. Management measures within this AMP are specific to the Proposed Action.

The following management targets have been identified:

1. Prevent unauthorised clearing of TECs, Black Cockatoo habitat and threatened flora individuals or habitat outside the Proposed Action area, including clearing no more than:
 - a) 0.13 ha of *Corymbia-Kingia* TEC (SCP 3a)
 - b) 2.09 ha *Corymbia-Xanthorrhoea* TEC (SCP 3c)
 - c) Three *Synaphea* sp. Serpentine individuals
 - d) 165 *Tetraria australiensis* individuals
 - e) 346 potential breeding trees (> 500 mm Diameter at Breast Height) for Black Cockatoo species, including two trees that contain hollows suitable for nesting by Black Cockatoos
 - f) 20.93 ha of 'Low to Moderate' quality foraging habitat for Carnaby's Cockatoo
 - g) 20.61 ha of 'Moderate to High' to 'Low to Moderate' foraging habitat for FRTBC and Baudin's Cockatoo
2. Prevent edge impacts into adjacent areas of TECs, Black Cockatoo habitat and threatened flora individuals or habitat outside the Proposed Action area.
3. Avoid injury or mortality to Black Cockatoos during construction.
4. Minimise injury or mortality to Black Cockatoos during road operation.

3 PERFORMANCE STANDARDS

3.1 SMART performance standards

The DAWE request for additional information identifies the application of 'SMART' (specific, measurable, achievable, relevant and time-bound) performance standards to be applied to AMPs.

SMART performance standards are intended to relate to measurable (numerical) values which can be applied to a Proposal (rather than qualitatively measured management/monitoring actions), and may include measurements such as 'threshold criteria', 'performance indicators', 'corrective actions' and 'completion criteria'.

Table 3 identifies the SMART performance standards related to the measurable impacts of the Proposed Action. These SMART performance standards complement the management actions and performance targets identified in Table 8, the monitoring actions identified in Table 11, and the corrective actions identified in Table 8.

The 'threshold criteria' and 'completion criteria' are considered to be achievable, with the risk potential of not achieving the proposed SMART performance standards captured by the risk assessment presented in Table 7.

As the proposed SMART performance standards for 'threshold criteria' and 'completion criteria' relate to physical measures which can be readily controlled through standard construction management processes, it is considered the proposed SMART performance standards have a low level of uncertainty, with additional margins for safety not required.

The SMART performance standards do not require detailed statistical analysis to determine if the 'threshold criteria' and 'completion criteria' have been met, nor require statistical power to detect change (for example, seasonal or climatic variability), nor control or reference sites (for comparative purposes).

Table 3 SMART performance standards

Threshold criteria	Performance indicators	Corrective actions	Completion criteria
Clearing of 0.13 ha of <i>Corymbia-Kingia</i> TEC (SCP 3a)	Area (ha) of <i>Corymbia-Kingia</i> TEC (SCP 3a) cleared	Refer to Table 8	No more than 0.13 ha of <i>Corymbia-Kingia</i> TEC (SCP 3a) cleared
Clearing of 2.09 ha <i>Corymbia-Xanthorrhoea</i> TEC (SCP 3c)	Area (ha) of <i>Corymbia-Xanthorrhoea</i> TEC (SCP 3c) cleared		No more than 2.09 ha of <i>Corymbia-Xanthorrhoea</i> TEC (SCP 3c) cleared
Clearing of 20.61 ha of foraging habitat ('Moderate to High' to 'Low to Moderate' quality) for FRTBC and Baudin's Cockatoo	Area (ha) of FRTBC and Baudin's Cockatoo foraging habitat cleared		Not more than 20.61 ha of foraging habitat ('Moderate to High' to 'Low to Moderate' quality) for FRTBC or Baudin's Cockatoo cleared
Clearing of 20.93 ha foraging habitat ('Low to Moderate' quality) Carnaby's Cockatoo	Area (ha) of Carnaby's Cockatoo foraging habitat cleared		Not more than 20.93 ha of foraging habitat ('Low to Moderate' quality) for Carnaby's Cockatoo cleared
Clearing of 346 trees with a DBH \geq 500 mm, including two trees that contain hollows suitable for nesting	Number of trees with a DBH \geq 500 mm (some of which contain a potentially suitable nesting hollow) cleared		Not more than 346 large trees (DBH 500 mm) including two trees that contain hollows suitable for nesting
Clearing of 3 individuals of <i>Synaphea</i> sp. Serpentine	Number of individuals of <i>Synaphea</i> sp. Serpentine cleared		No more than 3 individuals of <i>Synaphea</i> sp. Serpentine
Clearing of 165 individuals of <i>Tetraria australiensis</i>	Number of individuals of <i>Tetraria australiensis</i> cleared		No more than 165 individuals of <i>Tetraria australiensis</i>

4 RISK ASSESSMENT

A risk assessment of the potential impacts identified for the Proposed Action construction and operational phases has been undertaken. The risk assessment adopts likelihood and consequence criteria and a risk matrix presented in Table 4, Table 5 and Table 6, consistent with the Action Management Plan Criteria (Attachment C to DAWE request for additional information).

Table 7 presents the risk assessment results, incorporating a summary of mitigation measures to generate a residual risk outcome for each identified risk. Details of mitigation measures including monitoring and corrective actions are presented in Section 5.

Table 4 Likelihood criteria

Likelihood	Criteria
Highly likely	Is expected to occur during the construction/operation period
Likely	Will probably occur during the construction/operation period
Possible	Might occur during the construction/operation period
Unlikely	Could occur during construction/operation but considered unlikely or doubtful
Rare	May occur in exceptional circumstances

Table 5 Consequence criteria

Consequence	Criteria
Minor	Minor environmental impact that can be reversed
Moderate	Isolated but substantial environmental impact that could be reversed with intensive efforts
High	Substantial environmental impact that could be reversed with intensive efforts
Major	Major loss of environmental value and real danger of continuing
Critical	Severe widespread loss of environmental value and irrecoverable environmental damage

Table 6 Risk ranking matrix

Likelihood	Consequence				
	Minor	Moderate	High	Major	Critical
Highly likely	Medium	High	High	Severe	Severe
Likely	Low	Medium	High	High	Severe
Possible	Low	Medium	Medium	High	Severe
Unlikely	Low	Low	Medium	High	High
Rare	Low	Low	Low	Medium	High

Table 7 Risk assessment of Proposed Action to MNES

Management objective	Impact	Cause	Level of uncertainty	Summary of Mitigation	Residual risk		
					Likelihood	Consequence	Risk rating
<p>Prevent unauthorised clearing of TECs, Black Cockatoo habitat and threatened flora individuals or habitat outside the Proposed Action area.</p> <p>Achieve SMART performance standards (Section 3, Table 3)</p>	<p>Direct impact causing loss exceeding SMART performance standards:</p> <ul style="list-style-type: none"> 0.13 ha of <i>Corymbia-Kingia</i> TEC (SCP 3a) 2.09 ha <i>Corymbia-Xanthorrhoea</i> TEC (SCP 3c) Three <i>Synaphea</i> sp. Serpentine individuals 165 <i>Tetraria australiensis</i> individuals 346 potential breeding trees for Black Cockatoo species, including two trees that contain hollows suitable for nesting by Black Cockatoos 20.93 ha of 'Low to Moderate' quality foraging habitat for Carnaby's Cockatoo 20.61 ha of 'Moderate to High' to Low to Moderate' foraging habitat for FRTBC and Baudin's Cockatoo 	<p>Unauthorised clearing of native vegetation outside of Proposed Action area.</p>	<ul style="list-style-type: none"> The nature of potential impact is known and predictable based on surveys in land adjacent to the Proposed Action area, undertaken in accordance with EPA and Commonwealth guidance The scale of potential impacts is unpredictable as it relates to unauthorised clearing, however should it occur, it is only likely to be isolated and of a much smaller scale than authorised clearing. 	<ul style="list-style-type: none"> Identification and demarcation of vegetation to be retained within Proposed Action area, including MNES where practicable Pre-construction inspection of clearing areas and retention areas to confirm demarcation in place Daily inspection of clearing areas and retention areas during clearing stage Temporary construction areas will be located in existing cleared areas, areas to be cleared for permanent works, or in areas devoid of MNES Stop work and implement corrective actions in the event of exceeding SMART performance standards trigger criteria. 	Unlikely	Moderate	Low
<p>Prevent edge impacts into adjacent areas of TECs, Black Cockatoo habitat and threatened flora individuals or habitat outside the Proposed Action area.</p>	<p>Indirect impacts to condition of adjacent native vegetation including:</p> <ul style="list-style-type: none"> <i>Corymbia-Kingia</i> TEC (SCP 3a) <i>Corymbia-Xanthorrhoea</i> TEC (SCP 3c) Foraging and potential breeding habitat for Black Cockatoos Individuals of <i>Synaphea</i> sp. Serpentine Individuals of <i>Tetraria australiensis</i> 	<p>Construction plant, equipment and soil movement introducing or spreading weeds and/or dieback to uninfested vegetation.</p> <p>Unauthorised site access introducing or spreading weeds and/or dieback to uninfested vegetation.</p>	<ul style="list-style-type: none"> The nature of potential impact is known and predictable based on identified weed and dieback infested areas and vulnerable vegetation in surveys undertaken in Proposed Action area and adjacent land The scale of potential impacts is unpredictable as it relates to weeds and dieback which may progressively spread from the Proposed Action area boundary into adjacent vegetation, and some vegetation may be resistant to dieback expression as appears to be occurring in some areas in the Proposed Action area. 	<ul style="list-style-type: none"> If recorded within the Proposed Action area, Declared Plants will be treated according to WA Government advice, with the aim of eradication where possible but as a minimum prevent off site movement WoNS and environmental weeds within the Proposed Action area will be treated according to Weeds Australia guidance with the aim of controlling off-site movement Topsoil containing Declared Pests or WoNS will not be reused in landscaping or revegetation All heavy plant and machinery will be inspected prior to entry at the work site and confirmed to be clean and free of vegetation and soil material Dieback protectable areas will be identified and established within the Proposed Action area and adjacent land to guide dieback hygiene practices including restrictions on equipment and vehicle movement, soil movement, and Clean on Entry and/or Exit (CoE). 	Unlikely	High	Medium

Management objective	Impact	Cause	Level of uncertainty	Summary of Mitigation	Residual risk		
					Likelihood	Consequence	Risk rating
		Construction dewatering causing groundwater drawdown affecting groundwater dependent vegetation.	<ul style="list-style-type: none"> The nature of the impact is known as Conservation Advice (DEE 2017a, DEE 2017b) states that some components of the TECs are vulnerable to impact from groundwater lowering and hydrological changes. Other MNES present within the Proposed Action area are not known to be vulnerable to groundwater drawdown, including the threatened flora, Jarrah and Marri Subject to final design, the scale of the groundwater drawdown is expected to be temporary and localised for the construction of bridge piers, abutment footings, noise walls, retaining walls and drainage structures. The period of dewatering required (8 weeks approximately) Due to clayey soils in the area, depth and radius of drawdown is expected to be limited. 	<ul style="list-style-type: none"> Identification and demarcation of potential groundwater dependent vegetation that may be affected by dewatering Groundwater level monitoring and vegetation condition monitoring undertaken at all identified areas of potentially affected groundwater dependent vegetation, to identify any early impacts of dewatering If groundwater dependent vegetation are exhibiting signs of impact from dewatering, remedial measures (e.g. infiltration trenches, diaphragm walls) will be implemented to restore groundwater levels to pre-construction levels. 	Unlikely	Moderate	Low
		Surface water runoff and spills from temporary construction areas causing erosion, sedimentation or contamination.	<ul style="list-style-type: none"> The nature of the impact is known as construction will involve ground disturbance, generation of wastes and use of hazardous materials (e.g. diesel fuel), and will occur adjacent to the TECs, Black Cockatoo habitat and habitat for threatened flora species The scale of the impact is unpredictable as it relates to major storm or spill events, however it is expected to be localised to land in the vicinity of the Proposed Action area. 	<ul style="list-style-type: none"> Temporary erosion and sediment controls will be maintained within the Proposed Action area during construction to prevent stormwater runoff from construction areas from eroding or causing sediment deposition in adjacent native vegetation Waste and hazardous materials management measures will be implemented in construction to prevent contaminant discharges to adjacent native vegetation. No storage of waste or hazardous materials within 50 m of TECs, substantial areas of Black Cockatoo habitat or habitat for threatened flora. 	Unlikely	Moderate	Low
		Surface water runoff from road surface causing erosion, sedimentation or contamination.	<ul style="list-style-type: none"> The nature of the impact is known as the Proposed Action area will comprise upgraded carriageways and intersections that will generate stormwater runoff, and lie adjacent to TECS, Black Cockatoo habitat and habitat for threatened flora species The scale of the impact is unpredictable as it relates to major storm or spill events, however it is 	<ul style="list-style-type: none"> Surface runoff within the Proposed Action area will drain into infiltration basins and/or swales constructed within the Proposed Action area. The infiltration basins/swales will be designed to capture and infiltrate runoff for the first 16mm of rainfall. Higher rainfall events will allow for overland flow in areas of native vegetation. The infiltration basins/swales will be planted with native 	Rare	Moderate	Low

Management objective	Impact	Cause	Level of uncertainty	Summary of Mitigation	Residual risk		
					Likelihood	Consequence	Risk rating
			expected to be localised to land in the vicinity of the Proposed Action area.	vegetation to assist with nutrient stripping of stormwater during infiltration.			
Avoid injury or mortality to Black Cockatoos during construction.	Injury or mortality to Black Cockatoo individuals.	Vehicle collision with birds during construction.	<ul style="list-style-type: none"> The nature of the impact is known, as the Proposed Action area contains and lies adjacent to Black Cockatoo habitat, and Black Cockatoos have been known to be killed through vehicle strike. The scale of the impact is unpredictable as it relates to unplanned events and bird/flock behaviour. Collisions are expected to impact individuals or small numbers of birds, however the number of collisions is unpredictable. 	<ul style="list-style-type: none"> Speed limits between 40-80km/hr will be applied throughout the construction site for safety purposes which will consequently reduce the risk of fauna strikes during construction. A list of local wildlife rescue organisations and carers will be maintained on site to contact in the event of fauna injury. 	Unlikely	Moderate	Low
		Clearing of active breeding trees.	<ul style="list-style-type: none"> The nature of the impact is known, as the Proposed Action area contains and lies adjacent to two trees with hollows suitable for Black Cockatoo nesting, however neither tree have breeding records and are not expected to be utilised for breeding The scale of the impact is unpredictable as it is uncertain whether breeding will be occurring during construction, however it is considered unlikely given the lack of breeding records in the vicinity. 	<ul style="list-style-type: none"> Within 7 days prior to clearing, trees with hollows suitable for use by Black Cockatoos will be inspected by a suitably qualified person to confirm that there are no hollows being used by Black Cockatoos within the area to be cleared. 	Rare	Moderate	Low
Minimise injury or mortality to Black Cockatoos during road operation.	Injury or mortality to Black Cockatoo individuals.	Vehicle collision with birds during operations (additional impact above and beyond existing road).	<ul style="list-style-type: none"> The nature of the impact is known, as the Proposed Action area lies adjacent to Black Cockatoo habitat and Black Cockatoos have been known to be killed through vehicle strike The scale of the impact is unpredictable as it relates to unplanned events and bird/flock behaviour. Collisions are expected to impact individuals or small numbers 	<ul style="list-style-type: none"> Where trees that are known to be Black Cockatoo habitat are retained within the Proposed Action area but are located within 10 m of the edge of the road seal the risk of fauna strike will be assessed to determine if wildlife hazard signage is required Revegetation within the Proposed Action area that is within 10 m of the road seal will not be planted with Black Cockatoo foraging species. 	Unlikely	Moderate	Low

Management objective	Impact	Cause	Level of uncertainty	Summary of Mitigation	Residual risk		
					Likelihood	Consequence	Risk rating
			of birds, however the frequency of collisions is unpredictable.				

5 ENVIRONMENTAL MANAGEMENT ACTIONS

In order to comply with relevant environmental legislation and manage impacts to the local environment, Main Roads has defined objectives, outcomes and management based provisions to ensure that impacts to MNES are avoided and minimised as far as practicable during the implementation of the Proposed Action (Table 8).

Table 8 Management measures to mitigate construction impacts to MNES

Management Objective / Desired Outcome	Management Measures	Performance Target/Completion Criteria	Timing	Monitoring/Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
<p>Prevent unauthorised clearing of TECS, Black Cockatoo habitat and threatened flora individuals or habitat outside the Proposed Action area.</p> <p>Achieve SMART performance standards (Section 3, Table 3)</p>	All currently identified Black Cockatoo potential breeding trees or threatened flora individuals within the construction site boundary that are not required to be cleared will be marked and identified as no-go areas, demarcated on relevant drawings and provided to the Construction Contractor Representative.	Drawings showing environmental no-go areas provided to the Construction Contractor Representative.	Contract award and prior to commencement of clearing.	Record of provision of drawings showing environmental no-go areas.	<p>Clearing more than:</p> <ul style="list-style-type: none"> 0.13 ha of <i>Corymbia-Kingia</i> TEC (SCP 3a) 2.09 ha <i>Corymbia-Xanthorrhoea</i> TEC (SCP 3c) Three <i>Synaphea</i> sp. Serpentine individuals 165 <i>Tetraria australiensis</i> individuals 346 potential breeding trees for Black Cockatoo species, including two trees that contain hollows suitable for nesting by Black Cockatoos 20.93 ha of 'Low to Moderate' quality foraging habitat for Carnaby's Cockatoo 20.61 ha of 'Moderate to High' to Low to Moderate' foraging habitat for FRTBC and Baudin's Cockatoo 	<ul style="list-style-type: none"> Clearing in the direct vicinity will cease immediately if trigger is met. Clearing will not recommence until no-go areas have been reviewed and confirmed to be in place correctly, and Main Roads Superintendent provides approval to recommence Environmental incident will be recorded and the cause investigated Incident will be reported to DAWE along with the cause identified from an investigation Unauthorised clearing of vegetation containing MNES will be assessed for potential remediation. Rehabilitation works will commence within 6-12 months of the incident. Refresher or updated training will be conducted (if appropriate). 	<ul style="list-style-type: none"> Construction Contractor Environmental Management Representative Main Roads Superintendent.
	Vegetation to be retained will be clearly marked with flagging on site.	All environmental no-go areas clearly marked with flagging on site.	Prior to commencement of clearing.	<ul style="list-style-type: none"> Incident reporting (EQSafe) Monthly site inspections Site inspection by Construction Contractor Environmental Management Representative prior to and following clearing to confirm no-go areas are appropriately flagged / fenced, and that clearing remains within limits. 			
	All clearing areas will be marked with flagging and approved by the Main Roads Superintendent prior to clearing commencing.	All vegetation to be retained will be marked with flagging on site.	All areas to be cleared will be marked with flagging on site.				
	<ul style="list-style-type: none"> Additional areas required for construction such as laydown areas, stockpile areas and vehicle turn around, will be located in areas cleared for permanent works or areas that do not contain TECS, Black Cockatoo habitat, or threatened flora habitat Clearing will be avoided for any temporary construction activities. Main Roads Superintendent is required to provide approval for clearing of native vegetation for construction laydown etc. and approval must only be given if there are no other practicable options 	Areas for ancillary services located in cleared areas or areas that do not contain TECS, Black Cockatoo habitat, or threatened flora or habitat.	During construction.	<ul style="list-style-type: none"> Construction site plan showing all ancillary areas not located on land containing or adjacent to TECS, Black Cockatoo habitat or threatened flora habitat Monthly site inspections. 	<p>Areas required for construction such as laydown areas are located within areas of native vegetation.</p> <ul style="list-style-type: none"> Clearing in the direct vicinity will cease immediately if trigger is met. Clearing will not recommence until no-go areas have been reviewed and confirmed to be in place correctly, and Main Roads Superintendent provides approval to recommence Environmental incident will be recorded and the cause investigated Incident will be reported to DAWE along with the cause identified from an investigation Unauthorised clearing of vegetation containing MNES will be assessed for potential remediation. Rehabilitation works will commence within 6-12 months of the incident. 	Main Roads Superintendent	

Management Objective / Desired Outcome	Management Measures	Performance Target/Completion Criteria	Timing	Monitoring/Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
Prevent edge impacts into adjacent areas of TECS, Black Cockatoo habitat and threatened flora individuals or habitat outside the Proposed Action area.	Declared Plants within the construction site boundary will be treated according to their Control Codes and advice from Department of Primary Industries and Regional Development (DPIRD), with the aim of eradication where possible but as a minimum prevent off site movement.	No new occurrence or spread of Declared Plants within the construction site boundary or immediately adjacent areas during construction activities.	All construction activities	<ul style="list-style-type: none"> Monthly site inspections Annual revegetation monitoring. 	New occurrence or spread of a Declared Plant identified	<ul style="list-style-type: none"> Application of weed eradication techniques for the weed species Review CoE process. 	Construction Contractor Environmental Management Representative
	WoNS and environmental weeds within the construction site boundary will be treated according to the weed control management outlined by Weeds Australia (http://weeds.ala.org.au/) with the aim of controlling off-site movement.	No new occurrence or spread of WoNS or environmental weeds through construction activities.			New occurrence or spread of a WoNS or environmental weed identified	<ul style="list-style-type: none"> Application of weed eradication techniques for the weed species Review CoE process. 	
	Topsoil containing Declared Pests or WoNS will not be reused in landscaping or revegetation.	All topsoil from Declared Pest or WoNS infested areas to be buried at a depth of at least 300 mm or disposed off-site at a landfill.	During construction	Records of topsoil segregation and burial or licensed waste facilities	Topsoil from infested areas used in landscaping or revegetation	<ul style="list-style-type: none"> Topsoil removed from landscaping/revegetation areas and replaced with clean topsoil. Infested topsoil buried at depth of at least 300 mm or disposed at a licensed waste facility. 	
	All heavy plant and machinery will be inspected by the contractor prior to entry at the work site and be confirmed to be clean and free of vegetation and soil material.	All plant and machinery will be verified clean on arrival at site.	All construction activities	Records verifying plant and machinery arriving on site is clean	Plant and machinery arriving on site without verification that it is clean of soil and vegetative matter	<ul style="list-style-type: none"> Refresher training will be conducted. Plant and machinery sent off site to be cleaned prior to re-entry to site 	
	Dieback free basic raw materials and revegetation nursery stock to be used adjacent to protectable areas (outside the Proposed Action area).	All basic raw materials and nursery stock used within or adjacent to protectable areas (outside the Proposed Action area) verified as dieback free.	During construction and revegetation.	Dieback free verification records.	Un-verified material placed in or adjacent to protectable area.	<ul style="list-style-type: none"> Environmental incident will be recorded and the cause investigated Un-verified material will be sampled for <i>Phytophthora</i> If un-verified material is found to contain <i>Phytophthora</i>, the material will be removed and placed in an infected area of a licensed waste facility Phosphite will be applied to dieback susceptible species within 30 m of placed material that tested positive for <i>Phytophthora</i>, in accordance with DBCA guidance Review material/nursery stock supplier arrangements. 	

Management Objective / Desired Outcome	Management Measures	Performance Target/Completion Criteria	Timing	Monitoring/Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
	If construction dewatering is required, groundwater modelling will be undertaken to estimate the cone of depression and identify potential groundwater dependent vegetation (GDV) that may be impacted, which will be monitored and managed to prevent impacts.	No visible signs of impact to potential GDV due to construction dewatering.	During dewatering.	<ul style="list-style-type: none"> Groundwater modelling and GDV report/mapping Groundwater level monitoring and vegetation condition monitoring undertaken at all identified areas of potentially affected GDV. 	Potential GDV are exhibiting signs of impact from dewatering.	If potential GDV are exhibiting signs of impact from dewatering, remedial measures (e.g. infiltration trenches, diaphragm walls) will be implemented to restore groundwater levels to pre-construction levels.	Construction Contractor Environmental Management Representative
	Temporary drainage structures within or adjacent to TECS, Black Cockatoo habitat or threatened flora habitat will be designed and constructed such that scouring or erosion within adjacent vegetated areas does not occur.	No evidence of erosion from construction activities within no-go areas or TECS, Black Cockatoo habitat or threatened flora habitat to be retained.	Prior to and during construction.	Monthly site inspections.	Erosion identified in TECS, Black Cockatoo habitat or threatened flora habitat be retained.	<ul style="list-style-type: none"> Review drainage to identify whether there are any failure points, and repair/address any failure points identified within 2 weeks. 	Construction Contractor Environmental Management Representative
	Topsoil within the Proposed Action area will be harvested, stockpiled and reused in accordance with Main Roads Environmental Guideline Topsoil Management.	Topsoil is managed in accordance with Main Roads Guideline.	Prior to and during construction and landscaping.	Monthly site inspections.	Topsoil is not managed in accordance with Main Roads Guideline.	<ul style="list-style-type: none"> Topsoil management amended to ensure compliance with Main Roads Guideline. 	Construction Contractor Environmental Management Representative
	Landscaping within the road reserve will use local native species in accordance with Main Roads Specification 304 (Revegetation and Landscaping) and Main Roads Environmental Guideline Revegetation Planning and Techniques.	Landscaping is compliant with Main Roads Specification 304 and Guideline.	Prior to and during landscaping.	<ul style="list-style-type: none"> Review of landscaping plans and species list Inspection of landscaping areas. 	<ul style="list-style-type: none"> Landscaping plans and species lists are not compliant Landscaping works do not comply with approved plans and species list. 	<ul style="list-style-type: none"> Landscaping plans and species list amended to ensure compliance Landscaping works are re-planted to comply with approved plans and species list. 	<ul style="list-style-type: none"> Construction Contractor Environmental Management Representative Main Roads Superintendent
Avoid injury or mortality to Black Cockatoos during construction.	Speed limits between 40-80 km p/hr will be applied throughout the construction site for safety purposes which will consequently reduce the risk of fauna strikes during construction.	No incidents of speeding within the construction site boundary.	During construction.	<ul style="list-style-type: none"> Visual monitoring by all construction personnel Incident reporting (EQSafe). 	Reported exceedance of site speed limits.	<ul style="list-style-type: none"> Refresher training will be conducted within 1 week Instances of speeding are identified and offenders will be asked to immediately reduce speed Repeat offenders (ie. Caught speeding more than 2 times) will undergo further refresher training. 	Construction Contractor Environmental Management Representative

Management Objective / Desired Outcome	Management Measures	Performance Target/Completion Criteria	Timing	Monitoring/Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
	A list of local wildlife rescue organisations and carers will be maintained on site to contact in the event of fauna injury.	A list of local wildlife rescue organisations and carers is on site at all times.		Monthly inspection.	<ul style="list-style-type: none"> A list of local wildlife rescue organizations and carers is not on site Wildlife rescue specialists not contacted immediately on discovery of an injured Black Cockatoo. 	<ul style="list-style-type: none"> A list of local wildlife rescue organizations and carers is obtained by site immediately Refresher training will be conducted within 1 week. 	
	Where any of the trees with suitable nest hollows require clearing, the hollow will be visually inspected and if not in use will be blocked to prevent birds moving in before clearing occurs and where this is not possible a pre-clearing fauna assessment will be undertaken to determine if the hollow is in use.	Preclude potential breeding within the proposed Clearing Area prior to construction	Prior to clearing events.	Detailed list of all hollows to be cleared with information and photographic evidence of 'blocked' hollows Maintain a register of nesting trees.	<p>A hollow not previously blocked is cleared, or cleared without a pre-clearing fauna assessment</p> <p>Pre-clearing fauna assessment without blocking occurs more than 7 days prior to clearing.</p>	<ul style="list-style-type: none"> Contractor to provide evidence that a suitably qualified person is engaged to conduct surveys prior to subsequent clearing events Contractor to provide evidence that hollows to be inspected and blocked prior to subsequent clearing events. Unanticipated clearing event delays will be risk assessed against survey findings Clearing in the direct vicinity will cease immediately if trigger is met Clearing will not recommence until no-go areas have been reviewed and confirmed to be in place correctly, and Main Roads Superintendent provides approval to recommence. 	Construction Contractor Environmental Management Representative

Management Objective / Desired Outcome	Management Measures	Performance Target/Completion Criteria	Timing	Monitoring/Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
	Any tree and vegetation within 10m of the tree identified as being used by Black Cockatoos for nesting must not be cleared until a suitably qualified person has verified that the tree is not in use.	<ul style="list-style-type: none"> No clearing of trees used by Black Cockatoo All trees currently being used by Black Cockatoos are marked with flagging as no-go areas with flagging with a 10 m exclusion zone All hollows being utilised by the species are detected during surveys No Black Cockatoo mortality or injury during clearing. 	Black Cockatoo breeding season and following survey of area to be cleared.	<ul style="list-style-type: none"> Surveys undertaken by suitably qualified person to confirm hollow is no longer being used by Black Cockatoo Maintain a register of nesting trees. 	<ul style="list-style-type: none"> Clearing of a tree with a hollow currently used by Black Cockatoo Suitably qualified person has not confirmed the tree is no longer being utilised by Black Cockatoos before it is cleared. 	<ul style="list-style-type: none"> Immediate inspection of felled tree (eg with hollow currently in use) to determine survivability of Black Cockatoo (if present) A list of local wildlife rescue organisations and carers will be maintained on site. This will allow efficient identification of an appropriate destination to which to transfer injured cockatoo Incorrectly cleared areas will be included in the Landscape and Revegetation Plan for the project for revegetation with Black Cockatoo foraging habitat species Clearing activities are immediately ceased in the vicinity of the unmarked trees and relevant trees are correctly flagged before clearing activities recommence If a tree currently utilised by the species is felled, clearing in the direct vicinity will cease immediately if trigger is met Clearing will not recommence until no-go areas have been reviewed and confirmed to be in place correctly, and Main Roads Superintendent provides approval to recommence. 	<ul style="list-style-type: none"> Construction Contractor Environmental Management Representative Main Roads Superintendent.
Avoid injury or mortality to Black Cockatoos during road operation.	Revegetation designs shall not include foraging or breeding plant species within 10 m of the road.	<ul style="list-style-type: none"> Landscaping designs exclude foraging or breeding plant species within 10 m of the road. 	Prior to commencement of revegetation.	<ul style="list-style-type: none"> Landscape design drawings showing location of revegetation, and summarising plant species mix. 	<ul style="list-style-type: none"> Landscape designs include foraging or breeding plant species within 10 m of the road Foraging or breeding plant species planted within 10 m of the road. 	<ul style="list-style-type: none"> Design drawings amended to exclude revegetation with foraging or breeding plant species within 10 m of the road Foraging or breeding plant species removed from within 10 of the road and replaced with non-habitat species. 	<ul style="list-style-type: none"> Construction Contractor Environmental Management Representative Main Roads Superintendent.
	Where trees that are known to be Black Cockatoo habitat are retained but are located within 10 m of the edge of the road seal the risk of fauna strike will be assessed to determine if wildlife hazard signage is required.	<ul style="list-style-type: none"> Black Cockatoo habitat retained within 10 m of the edge of the seal of the road will be risk assessed and wildlife hazard signage installed as required. 	Prior to completion of construction.	<ul style="list-style-type: none"> Risk assessment. 	<ul style="list-style-type: none"> Black Cockatoo habitat is retained within 10m of the edge of the road seal and is not risk assessed to determine whether wildlife hazard signage is required. 	<ul style="list-style-type: none"> Risk assess retained Black Cockatoo habitat within 10 m of the edge of the road seal and install wildlife hazard signage if required. 	Construction Contractor Environmental Management Representative

6 ADAPTIVE MANAGEMENT

This AMP adopts an 'adaptive management' approach which seeks to embed a cycle of monitoring, reporting and implementing change, where required. Accordingly, it is intended that this AMP may be updated (as required) over the life of the Proposed Action to reflect changes in the monitoring and management practices, subject to the results of the monitoring to identify that the environmental objectives are being achieved. The AMP may also be revised to address learnings from the implementation of corrective actions, should this occur.

In addition, auditing and review schedules are necessary to embed a formal process to identify and consider any need to update the AMP in order to achieve improved environmental performance (which may not otherwise be triggered by management or monitoring outcomes).

6.1 Environmental auditing

This AMP will be audited annually by Main Roads during construction for the Proposed Action to ensure the implementation of the management and monitoring measures, and to confirm the management measures specified are achieving the environmental outcomes.

The proposed auditing schedule for this AMP is identified in Table 9.

Table 9 Environmental audit schedule

Timing	Action	Schedule
Pre-construction	Review of construction procedures to ensure AMP management / monitoring actions are incorporated within works procedures	Prior to construction (single event)
Construction	Inspections by site environmental personnel to identify compliance with AMP	Periodic (monthly)
	Independent 'third-party' audit for assessment of compliance with AMP	Annually (once per calendar year)
Post construction	Independent 'third-party' audit for assessment of compliance with AMP	On year following construction

The results of the construction and post construction independent 'third-party' audit findings will be reported to DAWE as part of annual compliance reporting as outlined within Section 8.

6.2 Management review program

Main Roads proposes to review this AMP annually in order to consider:

- Management and monitoring actions
- Opportunities for improvement in environmental performance (for example, changes to construction methodology or timing)
- Identify a need to update this AMP to capture changes to the management and/or monitoring actions
- Identify any general need to update this AMP (for example, to capture new information on relevant MNES knowledge or management, or updates to the EPBC Act or Policy Statements).

Main Roads acknowledge that a revision to this AMP may trigger a need for additional approval by DAWE prior to implementing any changes to the specified management or monitoring actions. The proposed AMP review schedule for the Proposed Action is identified in Table 10. The proposed review will be undertaken by a suitably qualified ecologist or relevant expert.

Table 10 AMP Review schedule

Timing	Action	Schedule
Pre-construction Construction	Review of AMP management and monitoring actions Review of opportunities for an improvement in environmental performance Address learnings from corrective actions Revise AMP (if appropriate) and seek approval of DAWE for revised AMP	Annually (once per calendar year)

7 MONITORING PROGRAM AND DATA MANAGEMENT

7.1 Monitoring program

Key monitoring actions have been identified to monitor the potential impacts of the Proposed Action to MNES and habitat during and post construction. These encompass monitoring of both direct and indirect impacts of the Proposed Action. Monitoring will be undertaken by suitably qualified individuals for the methodology type specified. The proposed monitoring program for the Proposed Action is identified in Table 11.

7.2 Data management

Main Roads will maintain records on the implementation of this AMP in accordance with Main Roads' corporate standard document control procedures. The retention of records held by Main Roads will be maintained and managed in accordance with the *Western Australian State Records Act 2000 (WA)*.

7.3 Baseline data

The below figures present the baseline data of relevant MNES extent and condition, developed from on-ground surveys:

- Figure 1 Project Area
- Figure 2 Clay Plains TEC adjacent to the Proposed Action area
- Figure 3 *Corymbia-Kingia* TEC within the Proposed Action area
- Figure 4 *Corymbia-Xanthorrhoea* TEC within the Proposed Action area
- Figure 5 *Synaphea* sp. Serpentine within the Proposed Action area
- Figure 6 *Tetralia australiensis* within the Proposed Action area
- Figure 7 Carnaby's Cockatoo habitat within Proposed Action area
- Figure 8 Baudin's Cockatoo and Forest Red-tailed Black Cockatoo habitat within Proposed Action area
- Figure 9 Dieback status

Table 11 Proposed monitoring program

Management Objective / Desired Outcome	Performance Target/Completion Criteria	Monitoring/Reporting Activity	Monitoring Method	Monitoring Area	Frequency
Prevent unauthorised clearing of TECS, Black Cockatoo habitat and threatened flora individuals or habitat outside the Proposed Action area. Achieve SMART performance standards	Drawings showing environmental no-go areas provided to the Construction Contractor Representative.	Record of provision of drawings showing environmental no-go areas.	Review of written records	n/a	Prior to commencement of clearing
	All environmental no-go areas clearly marked with flagging on site.	<ul style="list-style-type: none"> • Incident reporting (EQSafe) • Monthly site inspections • Site inspection by Construction Contractor Environmental Management Representative prior to and following clearing to confirm no-go areas are appropriately flagged / fenced, and that clearing remains within limits. 	Visual inspection, pedestrian walk through Photographic record, GPS of non-conformance	Environmental no-go areas	Prior to commencement of clearing Monthly
	All vegetation to be retained will be marked with flagging on site.				
	All areas to be cleared will be marked with flagging on site.				
	Areas for ancillary services located in cleared areas or areas that do not contain TECS, Black Cockatoo habitat, or threatened flora or habitat.	<ul style="list-style-type: none"> • Construction site plan and photos showing all ancillary areas not located on land containing TECS, Black Cockatoo habitat or threatened flora habitat • Monthly site inspections. 	Written record Visual inspection, pedestrian walk through Photographic record, GPS of non-conformance	n/a Ancillary service areas	Prior to development of ancillary areas Monthly
Prevent edge impacts into adjacent areas of TECS, Black Cockatoo habitat and threatened flora individuals or habitat outside the Proposed Action area.	No new occurrence or spread of Declared Plants within the construction site boundary or immediately adjacent areas during construction activities.	<ul style="list-style-type: none"> • Monthly site inspections • Annual revegetation Representative monitoring. 	Visual inspection, pedestrian walkthrough Photographic record, GPS of non-conformance	Construction site area Construction site boundary	Monthly
	No new occurrence or spread of WoNS or environmental weeds through construction activities.				

Management Objective / Desired Outcome	Performance Target/Completion Criteria	Monitoring/Reporting Activity	Monitoring Method	Monitoring Area	Frequency
	All topsoil from Declared Pest or WoNS infested areas to be buried at a depth of at least 300 mm or disposed off-site at a landfill.	Records of topsoil segregation and burial or licensed waste facilities.	Review of written records	n/a	Monthly
	All plant and machinery will be verified clean on arrival at site.	Records verifying plant and machinery arriving on site is clean.	Written records	n/a	n/a
	Dieback free certification for basic raw materials and nurse stock used adjacent to protectable areas (outside the Proposed Action area).	Dieback free certificate records.	Review of written records	n/a	Monthly
	No visible signs of impact to potential GDV due to construction dewatering.	<ul style="list-style-type: none"> Groundwater modelling and GDV report/mapping Groundwater level monitoring and vegetation condition monitoring undertaken at all identified areas of potentially affected GDV 	Review of written record Groundwater bore upgradient at boundary of GDV Visual inspection by qualified botanist, photographic record and GPS of condition assessment	n/a Identified areas of potentially affected GDV	Prior to dewatering Weekly GWL measurement Weekly inspection of GDV
	No evidence of erosion from construction activities within no-go areas or TECS, Black Cockatoo habitat or threatened flora habitat to be retained.	Monthly site inspections.	Visual inspection, pedestrian walkthrough Photographic record, GPS of non-conformance	Environmental no-go areas	Monthly After major storm event (> 1 in 1 year Average Recurrence Internal)

Management Objective / Desired Outcome	Performance Target/Completion Criteria	Monitoring/Reporting Activity	Monitoring Method	Monitoring Area	Frequency
	Topsoil is managed in accordance with Main Roads Guideline.	Monthly site inspections.	Visual inspection, pedestrian walkthrough Photographic record, GPS of non-conformance	Topsoil stockpiles Revegetation areas	Monthly
	Landscaping is compliant with Main Roads Specification 304 and Guideline.	<ul style="list-style-type: none"> Review of landscaping plans and species list Inspection of landscaping areas. 	Review of written record Visual inspection, pedestrian walkthrough Photographic record, GPS of non-conformance	n/a Revegetation areas	Prior to commencement of landscaping After planting
Avoid injury or mortality to Black Cockatoos during construction.	No incidents of speeding within the construction site boundary.	<ul style="list-style-type: none"> Visual monitoring by all construction personnel Incident reporting (EQSafe). 	Visual inspection, pedestrian walkthrough	Construction site	Opportunistic
	A list of local wildlife rescue organisations and carers is on site at all times.	<ul style="list-style-type: none"> Monthly inspection 	Written record	n/a	n/a
	Preclude potential breeding within the proposed Clearing Area prior to construction	<ul style="list-style-type: none"> Detailed list of all hollows to be cleared with information and photographic evidence of 'blocked' hollows Maintain a register of nesting trees 	Survey undertaken by suitably qualified person, using pole camera or drone Review of written records	Individual trees with hollows suitable for nesting n/a	Hollows to be blocked prior to clearing Monthly

Management Objective / Desired Outcome	Performance Target/Completion Criteria	Monitoring/Reporting Activity	Monitoring Method	Monitoring Area	Frequency
	<ul style="list-style-type: none"> No clearing of trees used by Black Cockatoo All trees currently being used by Black Cockatoos are marked with flagging as no-go areas with flagging with a 10 m exclusion zone All hollows being utilised by the species are detected during surveys No Black Cockatoo mortality or injury during clearing. 	<ul style="list-style-type: none"> Surveys undertaken by suitably qualified person to confirm hollow is no longer being used by Black Cockatoo Maintain a register of potential breeding/nesting trees. 	<p>Survey undertaken by suitably qualified person, using pole camera or drone</p> <p>Written record</p>	Individual trees with hollows suitable for nesting	Weekly when nest is in use
Avoid injury or mortality to Black Cockatoos during road operation.	<ul style="list-style-type: none"> Revegetation designs exclude foraging or breeding plant species within 10 m of the road. 	<ul style="list-style-type: none"> Record of revegetation drawings showing species mix. 	Review of written record	n/a	Prior to revegetation commencing
	<ul style="list-style-type: none"> Black Cockatoo habitat retained within 10 m of the edge of the seal of the road will be risk assessed and wildlife hazard signage installed as required. 	<ul style="list-style-type: none"> Risk assessment. 	Review of written record	n/a	n/a

8 REPORTING

Main Roads will report to DAWE on the implementation of this AMP as part of annual compliance reporting under the conditions of approval for the Proposed Action.

Where compliance audits undertaken by Main Roads identify that the environmental management actions and/or the environmental objectives are not being achieved (i.e. non-compliance or an environmental incident), Main Roads will notify DAWE as soon as reasonably practicable.

Consistent with standard document control procedures, Main Roads will maintain copies of all reports submitted to DAWE. The reporting requirements for this AMP are identified in Table 12.

Table 12 Reporting requirements

Aspect	Report from	Report to	Reporting Frequency
Implementation of AMP	Manager Environment	DAWE	Annually (as part of annual compliance reporting)
Non-compliance with AMP or Environmental Incident impacting MNES	Manager Environment	DAWE	As soon as reasonably practicable but not more than 14 days

The format and content of annual reporting will be in accordance with the requirements of the annual reporting conditions. The format and content of reporting of a non-compliance event or an environmental incident will be subject to the nature of the non-compliance/incident and will include all requested information from DAWE. In consideration of this, specific templates for reporting these are not provided as part of this AMP.

9 ROLES AND RESPONSIBILITIES

This AMP identifies the environmental management of activities to be undertaken by Main Roads in implementation of the Proposed Action. Main Roads acknowledges that the environmental management actions contained within this AMP are legally required to be met.

The Manager Environment at Main Roads will maintain responsibility for implementation of the management actions outlined within this AMP, on behalf of Main Roads' Managing Director. Management actions may be undertaken by employees and/or contractors of Main Roads on behalf of Managing Director.

Where management actions are undertaken by employees and/or contractors of Main Roads, these will be communicated and documented to the relevant personnel through relevant environmental training.

10 REFERENCES

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