



PHOENIX

ENVIRONMENTAL SCIENCES

Black cockatoo breeding activity census 2018-19 for Muchea North

Great Northern Highway, Muchea to Wubin Upgrade Stage 2 Project

Prepared for Muchea to Wubin Integrated Project Team (Main Roads
WA, Jacobs and Arup)

October 2019

Final report



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Great Northern Highway, Muchea to Wubin Upgrade Stage 2 Project.

Prepared for Muchea to Wubin Integrated Project Team (Main Roads WA, Jacobs and Arup)

Draft Report

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1 INTRODUCTION

Phoenix Environmental Sciences Pty Ltd (Phoenix) was commissioned by the Muchea to Wubin Integrated Project Team (Main Roads WA, Jacobs and Arup) to undertake a Carnaby's Cockatoo breeding activity census over the 2018-19 breeding season within and surrounding the disturbance footprint for the Muchea North project area (Figure 1). This report presents the results of the census.

1.1 BACKGROUND

Muchea North is part of the Great Northern Highway (GNH) Muchea to Wubin Upgrade Stage 2 Project and entails proposed upgrade works to the GNH between Old Gingin Road and Chittering Roadhouse, approximately 63 km north of Perth. The proponent for Muchea North is Main Roads Western Australia ('Main Roads') who, together with industry partners Arup and Jacobs, have formed the Integrated Project Team (IPT).

Detailed black cockatoo habitat assessments conducted as part of the baseline assessments for the Muchea North Project (Phoenix 2015, 2017) recorded all potential breeding trees of species known to support black cockatoo breeding and identified suitable nesting hollows and hollows with evidence of use.

The Commonwealth Department of Environment and Energy (DoEE) deemed Muchea North a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (EPBC ref: 2016/7656), with a contributing factor being proposed impacts to Carnaby's Cockatoo (*Calyptorhynchus latirostris*) habitat, including suitable nesting hollows. The species is listed as a matter of national environmental significance (NES) under the EPBC Act, with the conservation status of 'Endangered'. It is also listed as Endangered under the *WA Biodiversity Conservation Act 2016*.

The Muchea North proposal was approved by the Commonwealth Minister for the Environment on 10 August 2018. Conditions of approval in relation to Carnaby's Cockatoo included:

Condition 4: To mitigate and offset the loss of known nesting trees and suitable nesting hollows the approval holder must:

- a. install at least three artificial nesting hollows for each known nesting hollow and suitable hollow cleared*
- b. install at least ten of the artificial nesting hollows required by Condition 4a prior to clearing of any known nesting hollow or suitable nesting hollow with all remaining hollows to be installed prior to the beginning of the next breeding season following the commencement of the action*
- c. maintain the pre-impact breeding density of the Carnaby's Black Cockatoo within the project area by undertaking adaptive management of the artificial nesting hollows to maximise the likelihood that the installed artificial nesting hollows are used by the Carnaby's Black Cockatoo*
- d. adaptive management may cease when at least one artificial nesting hollow for each known nesting hollow cleared has shown evidence of use by the Carnaby's Black Cockatoo, as verified by the suitable qualified person, for three consecutive years, the artificial nesting hollow in use for three consecutive years need not be the same artificial nesting hollow each year.*
- e. n/a*
- f. each artificial nesting hollow installed must*

- i. *be inspected at least twice a year by a suitably qualified person during the peak breeding season to record any evidence of use by the Carnaby's Black Cockatoo and to identify maintenance requirements.*
- j. *be monitored and maintained in accordance with relevant artificial hollow guidance for the life of the approval, with maintenance actions, if required, undertaken outside of the breeding season and before the commencement of the next breeding season.*

A native vegetation clearing permit (NVCP) for Muchea North (Permit no. 7563/2) has been approved by the WA Department of Water and Environmental Regulation (DWER) under the *Environmental Protection Act 1986* (EP Act). Permit conditions include the following in relation to artificial black cockatoo nest hollows:

"9. Fauna management – black cockatoo nesting trees

- (a) *Prior to undertaking any clearing of black cockatoo nesting trees outside of the period 1 March to 31 May, the Permit holder shall engage a fauna specialist to conduct a fauna survey of those trees to identify any that are being utilised by *Calyptorhynchus latirostris* (Carnaby's black cockatoo) or *Calyptorhynchus banksii naso* (forest red-tailed black cockatoo)*
- (b) *Where a black cockatoo nesting tree(s) being utilised by Carnaby's cockatoo or forest red-tailed black cockatoo is identified, the Permit Holder shall monitor the black cockatoo nesting tree(s) to determine when the chick(s) has fledged; and*
- (c) *The Permit Holder shall not clear a black cockatoo nesting tree identified as being utilised by Carnaby's cockatoo or forest red-tailed black cockatoo until the chick(s) had fledged.*

"10. Fauna management – artificial black cockatoo nest hollows

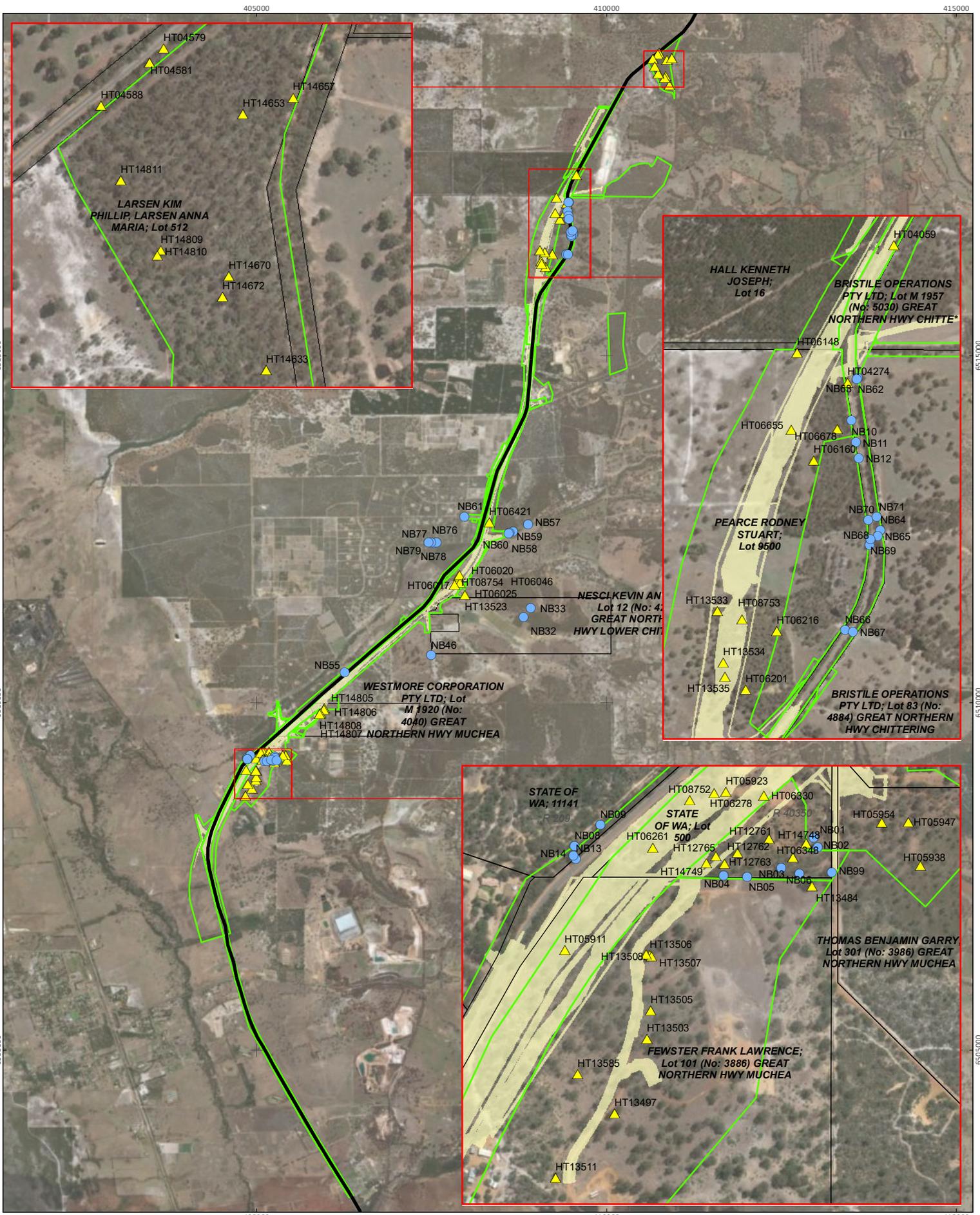
- (c) *The Permit Holder must monitor and maintain the installed artificial black cockatoo nest hollows for a period of at least ten years.*
- (d) *Monitoring and maintenance must be undertaken in accordance with the guidelines provided in Schedule 2."*

To support Condition 4c of EPBC 2016/7656, Main Roads commissioned Phoenix to undertake baseline monitoring of confirmed and suitable nesting hollows recorded within the Muchea North EPBC Act Approval Boundary and wider baseline survey (Phoenix 2015, 2017) study area (the study area; Figure 1). The initial baseline monitoring program was conducted in the 2017-18 breeding season (August 2017 – February 2018) and assessed hollow usage of suitable nesting hollows and hollows with evidence of use within the study area (Phoenix 2018).

Phoenix was subsequently commissioned to undertake a second year of monitoring for hollow usage within the study area in the 2018-19 breeding season. This report incorporates the results of the second monitoring season into the nesting hollow usage dataset for Muchea North.

In addition, artificial nesting hollows were installed for Muchea North in accordance with Condition 4a and 4b of EPBC 2016/7656 at the start of the 2018-19 breeding season. These nest boxes were also monitored for activity during the program, where possible¹, to support Condition 4f of EPBC 2016/7656 and Condition 9c of clearing permit 7563/2.

¹ Not part of original scope, this activity was added in during the program. Artificial nest boxes were only monitored if time permitted, and where accessible.



Jacobs: Great Northern Highway Muecha to Wubin Upgrade
 Stage 2: Carnaby's black cockatoo breeding activity census
 (2018-2019 breeding season)

Project No	1220
Date	18-Jun-19
Drawn by	AL
Map author	AL

0 1 2
Kilometers

1:70,000 (at A4) GDA 1994 MGA Zone 50

- Study area
- Disturbance footprint
- Road
- Monitored hollows**
- Artificial nesting hollow
- ▲ Natural nesting hollow

Figure 1
Study area and sampling sites



1.2 SCOPE OF WORK

The scope of work was as follows:

1. Conduct a census of all known nesting trees and trees with suitable breeding hollows for Black Cockatoo within the study area – visit each tree monthly between August and February and inspect for evidence of breeding activity of these hollows
2. Time permitting, inspect artificial nesting hollows installed for Muchea North for evidence of breeding activity
3. Prepare a brief memo report documenting the results and providing an estimated utilisation rate considering the 2017-18 and 2018-19 census data.

2 CENSUS METHODOLOGY

Black cockatoos are known to “prospect” for breeding hollows to find the most suitable hollow to lay their eggs. This involves going in and out of the hollow and chewing off around the entrance to the hollow. Chewing around the hollow is often in preparation for egg-laying, as the base of the hollow is lined with these woodchips. Each year the same breeding pair may return to the same hollow, or a different hollow to breed. For Carnaby’s Cockatoo, from egg-laying to fledging of the chick takes approximately 14-16 weeks (DoEE 2019). Recent chewings are generally detectable by fresh marks which are usually a brighter red/orange colour than old chewings and un-chewed wood.

In the most recent breeding season, site visits were undertaken to the study area roughly monthly between August 2018 and February 2019: 21 August, 21 September, 19 October, 28 November, 3 January 2018 and 5 February.

Each hollow was inspected for evidence of nesting activity such as prospecting (adults investigating the hollow), fresh chewing around the hollow entrance or females perched at the entrance to the hollow. Trees with evidence of nesting activity were investigated using a pole camera to determine if eggs or chicks were in the nest when adults were not around (i.e. out foraging; this was to avoid disturbance).

Baseline surveys for Muchea North identified a total of 57 trees in the study area containing suitable nesting hollows for black cockatoos, of which 25 had evidence of nesting activity (Table 1). In the 2017-18 breeding season, 37 of these were monitored as the remaining 20 were unable to be assessed due to access constraints.

In the 2018-19 season, 47 natural nesting hollows and 36 artificial nesting hollows were monitored (Table 1). This included two new natural hollows added to the census in the current season and 14 trees that were not accessible in the 2017-18 season. Twelve further natural nesting hollows were not monitored; five of these were not able to be accessed, three were not relocated and four hollows were removed from monitoring in the 2017-18 season due to collapse, cracks forming or tree death.

In this report:

- *confirmed breeding event* – means eggs were seen in hollow and/or other clear evidence observed that chick was present (i.e. female seen at hollow entrance when brooding eggs and/or parents seen preparing to feed chick in the hollow)
- *evidence of nesting activity* – means chewing around the hollow entrance and/or bird seen prospecting hollows. It does not necessarily mean that a breeding event took place that year; however, it is evidence that the hollow is suitable and was considered and may have been used in previous years.

Table 1 Monitored hollows

HT ID*	Baseline records (pre 2017-18)	Species	Monitored 2017-18	Monitored 2018-19
HT04059	Evidence of nesting activity, artificial hollow	<i>Eucalyptus wandoo</i>	Yes	Yes
HT04274	Suitable, no evidence of breeding	<i>Eucalyptus wandoo</i>	Yes	Yes
HT04579	Suitable, artificial hollow, no evidence of breeding	<i>Eucalyptus wandoo</i>	Yes	Yes
HT04581	Suitable, artificial hollow, no evidence of breeding	<i>Eucalyptus wandoo</i>	Yes	Yes
HT04588	Suitable, artificial hollow, no evidence of breeding	<i>Eucalyptus accedens</i>	Yes	Yes
HT05911	Suitable, no evidence of breeding	<i>Eucalyptus marginata</i>	No access	No
HT05923	Suitable, no evidence of breeding	<i>Eucalyptus wandoo</i>	Yes	Yes
HT05938	Suitable, no evidence of breeding	<i>Eucalyptus wandoo</i>	Yes	No
HT05947	Suitable, no evidence of breeding	<i>Eucalyptus wandoo</i>	Yes	No
HT05954	Evidence of nesting activity	<i>Eucalyptus wandoo</i>	Yes	Yes
HT06017	Evidence of nesting activity	<i>Eucalyptus wandoo</i>	No access	Yes
HT06020	Suitable, no evidence of breeding	<i>Corymbia calophylla</i>	No access	Yes
HT06025	Suitable, no evidence of breeding	<i>Eucalyptus wandoo</i>	No access	Yes
HT06046	Suitable, no evidence of breeding	<i>Eucalyptus wandoo</i>	No access	Yes
HT06148	Suitable, no evidence of breeding	<i>Corymbia calophylla</i>	Yes	No
HT06160	Suitable, no evidence of breeding	<i>Eucalyptus wandoo</i>	Yes	Yes
HT06201	Suitable, no evidence of breeding	<i>Eucalyptus wandoo</i>	Yes	Yes
HT06216	Suitable, no evidence of breeding	<i>Eucalyptus marginata</i>	Yes	Yes
HT06261	Suitable, no evidence of breeding	<i>Eucalyptus wandoo</i>	Yes	Yes
HT06278	Evidence of nesting activity	<i>Eucalyptus wandoo</i>	Yes	Yes
HT06330	Not suitable	<i>Eucalyptus wandoo</i>	No	Yes
HT06348	Evidence of nesting activity	<i>Eucalyptus wandoo</i>	Yes	Yes
HT06421	Evidence of nesting activity	<i>Corymbia calophylla</i>	No access	No access
HT06655	Suitable, no evidence of breeding	<i>Corymbia calophylla</i>	Yes	No
HT06678	Suitable, no evidence of breeding	<i>Eucalyptus wandoo</i>	Yes	Yes
HT08752	Evidence of nesting activity	<i>Eucalyptus wandoo</i>	Yes	Yes
HT08753	Evidence of nesting activity	<i>Eucalyptus wandoo</i>	Yes	Yes
HT08754	Evidence of nesting activity	<i>Eucalyptus wandoo</i>	No access	Yes
HT12761	Evidence of nesting activity	<i>Eucalyptus wandoo</i>	No	No
HT12762	Evidence of nesting activity	<i>Eucalyptus wandoo</i>	Yes	Yes
HT12763	Evidence of nesting activity (FRTBC)	<i>Eucalyptus wandoo</i>	Yes	Yes
HT12765	Evidence of nesting activity	<i>Eucalyptus wandoo</i>	Yes	Yes
HT13484	Suitable, no evidence of breeding	<i>Eucalyptus wandoo</i>	No access	Yes
HT13497	Suitable, no evidence of breeding	<i>Eucalyptus marginata</i>	No access	Yes
HT13503	Suitable, no evidence of breeding	<i>Eucalyptus marginata</i>	No access	Yes

Black cockatoo breeding activity census 2018-19 for Muchea North

Prepared for Muchea to Wubin Integrated Project Team (Main Roads WA, Jacobs and Arup)

HT ID*	Baseline records (pre 2017-18)	Species	Monitored 2017-18	Monitored 2018-19
HT13505	Suitable, no evidence of breeding	<i>Eucalyptus sp.</i>	No access	Yes
HT13506	Suitable, no evidence of breeding	<i>Eucalyptus wandoo</i>	No access	Yes
HT13507	Suitable, no evidence of breeding	<i>Eucalyptus wandoo</i>	No access	Yes
HT13508	Suitable, no evidence of breeding	<i>Eucalyptus wandoo</i>	No access	Yes
HT13511	Suitable, no evidence of breeding	<i>Corymbia calophylla</i>	No access	Yes
HT13523	Suitable, no evidence of breeding	<i>Eucalyptus wandoo</i>	No access	Yes
HT13533	Suitable, no evidence of breeding	<i>Eucalyptus wandoo</i>	Yes	Yes
HT13534	Suitable, no evidence of breeding	<i>Eucalyptus wandoo</i>	Yes	Yes
HT13535	Suitable, no evidence of breeding	<i>Eucalyptus wandoo</i>	Yes	Yes
HT13585	Not suitable	<i>Corymbia calophylla</i>	No	Yes
HT14633	Suitable, no evidence of breeding	<i>Eucalyptus wandoo</i>	Yes	Yes
HT14653	Evidence of nesting activity	<i>Eucalyptus wandoo</i>	Yes	Yes
HT14657	Evidence of nesting activity	<i>Eucalyptus wandoo</i>	Yes	Yes
HT14670	Evidence of nesting activity	<i>Eucalyptus wandoo</i>	Yes	No
HT14672	Evidence of nesting activity	<i>Eucalyptus wandoo</i>	Yes	Yes
HT14748	Evidence of nesting activity	<i>Eucalyptus wandoo</i>	Yes	Yes
HT14749	Evidence of nesting activity	<i>Eucalyptus wandoo</i>	Yes	Yes
HT14805	Evidence of nesting activity	<i>Eucalyptus wandoo</i>	No access	No access
HT14806	Evidence of nesting activity	<i>Eucalyptus wandoo</i>	No access	No access
HT14807	Suitable, no evidence of breeding	<i>Eucalyptus wandoo</i>	No access	No access
HT14808	Suitable, no evidence of breeding	<i>Eucalyptus wandoo</i>	No access	No access
HT14809	Evidence of nesting activity	<i>Eucalyptus wandoo</i>	Yes	Yes
HT14810	Evidence of nesting activity	<i>Eucalyptus wandoo</i>	Yes	Yes
HT14811	Evidence of nesting activity	<i>Eucalyptus wandoo</i>	Yes	Yes
NB01	n/a		n/a	Yes
NB02	n/a		n/a	Yes
NB03	n/a		n/a	Yes
NB04	n/a		n/a	Yes
NB05	n/a		n/a	Yes
NB06	n/a		n/a	Yes
NB08	n/a		n/a	Yes
NB09	n/a		n/a	Yes
NB10	n/a		n/a	Yes
NB11	n/a		n/a	Yes
NB12	n/a		n/a	Yes
NB13	n/a		n/a	Yes
NB14	n/a		n/a	Yes
NB32	n/a		n/a	Yes

Black cockatoo breeding activity census 2018-19 for Muchea North
Prepared for Muchea to Wubin Integrated Project Team (Main Roads WA, Jacobs and Arup)

HT ID*	Baseline records (pre 2017-18)	Species	Monitored 2017-18	Monitored 2018-19
NB33	n/a		n/a	Yes
NB46	n/a		n/a	Yes
NB55	n/a		n/a	Yes
NB57	n/a		n/a	Yes
NB58	n/a		n/a	Yes
NB59	n/a		n/a	Yes
NB60	n/a		n/a	Yes
NB61	n/a		n/a	Yes
NB62	n/a		n/a	Yes
NB63	n/a		n/a	Yes
NB64	n/a		n/a	Yes
NB65	n/a		n/a	Yes
NB66	n/a		n/a	Yes
NB67	n/a		n/a	Yes
NB68	n/a		n/a	Yes
NB69	n/a		n/a	Yes
NB70	n/a		n/a	No
NB71	n/a		n/a	Yes
NB76	n/a		n/a	Yes
NB77	n/a		n/a	Yes
NB78	n/a		n/a	Yes
NB79	n/a		n/a	Yes
NB99	n/a		n/a	Yes

* HT = habitat tree (natural); NB = nest box (artificial)

3 RESULTS

3.1 CENSUS RESULTS 2018-19 BREEDING SEASON

Eight of the trees in the monitoring program were felled during the 2018-19 breeding season for the Muchea North Project, including three with hollows that recorded evidence of nesting activity in 2017-18 (Appendix 1). On this basis, the 2018-19 breeding season does not represent a true baseline, and therefore the results for the new artificial nesting hollows – erected to offset the cleared natural hollows – have been included in the 2018-19 census.

Confirmed breeding events were recorded in three hollows by Phoenix, two natural nesting hollows and one artificial nesting hollow (Table 2; Figure 2). Evidence of nesting activity was observed in a further three natural nesting hollows and two artificial nesting hollows (Table 2; Figure 2).

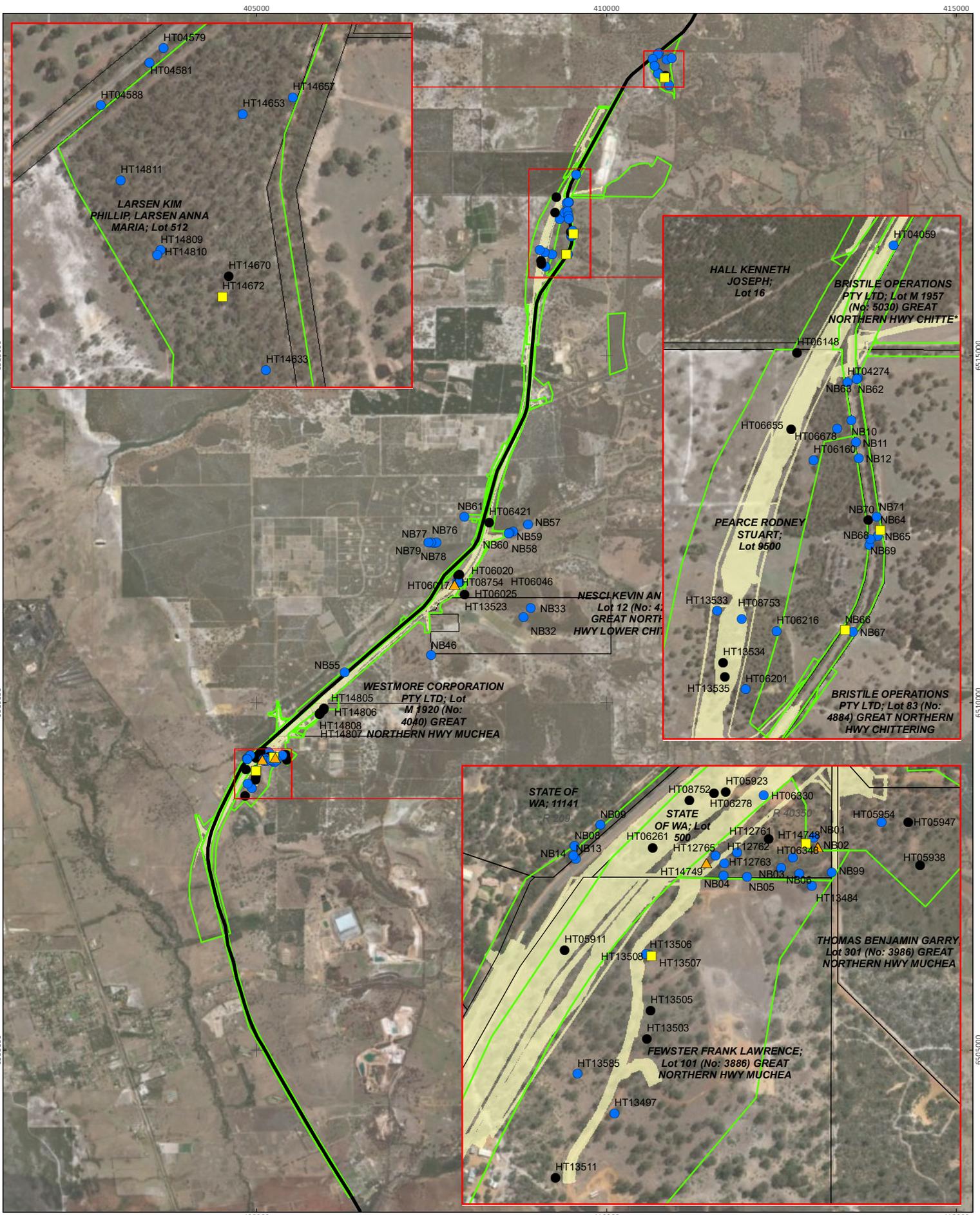
Of the confirmed breeding events:

- HT08754 – is presumed to have resulted in successful fledgling of chick. Chick photographed.
- HT14749 – is presumed to have resulted in successful fledgling of chick. The hollow is too high to inspect with a camera but activity observed suggests chick present.
- NB02 – laying of eggs is suspected but unknown if chick hatched or fledged.

No evidence of nesting was observed in 30 of the natural nesting hollows (Appendix 1). Four natural nesting hollows that were not accessible in the 2017-18 season were considered no longer suitable for use by black cockatoos and no longer require monitoring (Appendix 1).

Table 2 Evidence of breeding records by Phoenix during the 2018-19 census

HT ID	Inspection date						Result_2018-19	Photo
	21/08/2018	21/09/2018	19/10/2018	28/11/2018	3/01/2019	5/02/2019		
HT08754	No access	No flush	No flush	No flush	No flush	CBC chick photog. prev. week	Confirmed breeding event. Assumed successful.	
HT14749	No flush	Carnaby's: pair prospecting + other female in hollow with 2 entrances, female squabbling calls.	No flush (could be present with chick)	Carnaby's M+F flushed, +F inside ?feeding young	No flush	No flush, no activity all morning	Confirmed breeding event. Assumed successful.	
NB02	n/a	n/a	No flush	CBC Pair flew off and returned, F entered box. ?laying (by sound). Too high for camera.	No flush	No flush	Confirmed breeding event. Unknown if successful.	
NB66	n/a	n/a	CBC F on box, flushed	CBC 1F on nest	No flush. Camera check, empty. CBC calls to W	No flush	Evidence of nesting activity	Plate 1
HT13507	No flush	No flush	No flush	No flush. Fresh chewing	No flush	No flush	Evidence of nesting activity	
HT14672	No flush	No flush	No flush. Redtail foraging traces	No flush	No flush	No flush	Evidence of nesting activity	
HT14748	No flush	No flush	Flushed CBC female	No flush. Camera check: empty	No flush	No flush	Evidence of nesting activity	Plate 2
NB64	n/a	n/a	No flush; CBC pair in upper branches, M feeding F	No flush	No flush	No flush	Evidence of nesting activity	



Jacobs: Great Northern Highway Muchea to Wubin Upgrade
 Stage 2: Carnaby's black cockatoo breeding activity census
 (2018-2019 breeding season)

Project No	1220
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Drawn by	AL
Map author	AL

0 1 2
Kilometers

1:70,000 (at A4) GDA 1994 MGA Zone 50

- Study area
- Disturbance footprint
- Road
- Results**
- ▲ Confirmed breeding event
- Evidence of nesting activity
- No evidence of breeding
- Not surveyed (no access, no longer suitable, not located, tree felled)

Figure 2

Monitoring result for 2018-19 breeding season

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Plate 1 NB66 19 October 2018



Plate 2 HT14748 19 October 2018

3.2 COMPARISON BETWEEN 2017-18 SEASON AND 2018-19 SEASON

Abundance of confirmed nesting events and evidence of nesting activity was lower in the 2018-19 breeding season compared with the 2017-18 season (Table 3).

The average number of confirmed breeding events over the two seasons is five. The average number of hollows observed with evidence of nesting activity, but no confirmed breeding event is 10.

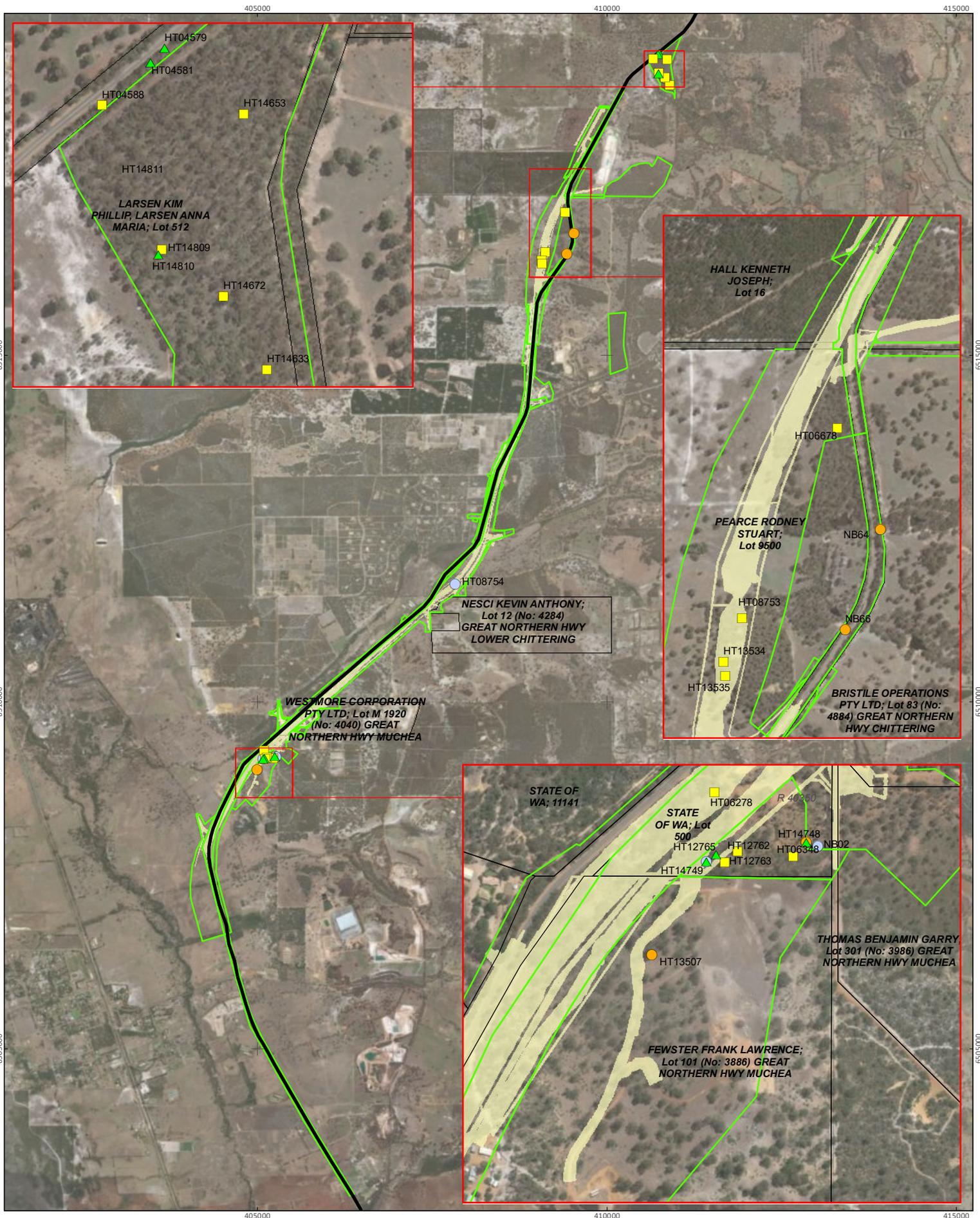
Breeding events and evidence of nesting activity in 2018-19 were identified in the same general areas as in the 2017-18 season, including the two areas that were identified as having a higher rate of breeding activity, Reserve 40350 and Lot 512 (Figure 3). The 2018-19 results indicate however that breeding activity is also occurring elsewhere in the study area and is not limited to these two lots.

Three hollows, HT14749, HT14672 and HT14748, recorded breeding activity over both seasons (Appendix 1). The remaining hollows with breeding activity in 2018-19 were either not accessible in the 2017-18 season or were new artificial hollows (Appendix 1). Four hollows with confirmed breeding events in 2017-18 and 12 hollows with evidence of nesting activity in 2017-2018 were not recorded with any activity in 2018-19.

Table 3 Summary of results for 2017-18 and 2018-19 breeding seasons

Result type	Baseline records pre 2017-18 ¹ Natural hollows and existing artificial hollows	2017-18 breeding season Natural hollows and existing artificial hollows	2018-19 breeding season All hollows {natural&existing artificial hollows/new artificial hollows}	Average across 2017-18 and 2018-19 All hollows
Confirmed breeding event	n/a	6	3 {2/1}	5
Evidence of nesting activity	24	14	5 {3/2}	10
No evidence of breeding	35	13	63 {30/33}	38
No longer suitable, not accessible, not sampled, felled	n/a	26	25 {24/1}	26

¹ Evidence of nesting activity recorded at some point. Not annual census data and cannot be compared with annual census results.



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Kilometers

1:70,000 (at A4) GDA 1994 MGA Zone 50

- Study area
- Disturbance footprint
- Road

- 2018-2019 breeding season**
- Confirmed breeding event
 - Evidence of nesting activity
- 2017-2018 breeding season**
- ▲ Confirmed breeding event
 - Evidence of nesting activity

Figure 3
 Confirmed breeding events and
 Evidence of nesting activity across
 the 2017-2018 and 2018-2019
 breeding seasons



4 CONCLUSION

Three confirmed breeding events were observed in the 2018-19 season and evidence of nesting was observed in a further five hollows, with both natural and artificial nesting hollows showing activity.

The difference in nesting activity recorded between the 2017-18 and 2018-19 seasons is not unexpected as the sample size for this monitoring program is small and breeding activity can be highly variable between years.

The 2018-19 census results indicate that breeding activity is occurring throughout the Muchea North area. Due to the historic large-scale clearing of trees and continuing decline of suitable trees with hollows in the area, all remaining suitable nesting hollows in the study area should be considered of high value to Carnaby's Cockatoo.

Considering the artificial nesting hollows were installed during the current season, the observations of a breeding event and/or evidence of nesting activity in three of these indicate the readiness of Carnaby's Cockatoo to prospect new hollows.

For the purposes of future monitoring, the pre-impact breeding density is defined as:

- the average number of confirmed breeding events over two seasons = five
- the average number of hollows observed with evidence of nesting activity over two seasons = 10.

For future monitoring of the nesting hollows, consistent methodology should be employed to that used in the 2017-18 and 2018-19 breeding census. Where possible, pole cameras should be used to inspect suspected breeding events.

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Black cockatoo breeding activity census 2018-19 assessment for the Muchea North
Prepared for Muchea to Wubin Integrated Project Team (Main Roads WA, Jacobs and Arup)

Appendix 1 Results for all hollows in 2017-18 and 2018-19 breeding season

HT ID	Result 2017-18	Result 2018-19	21/08/2018	21/09/2018	19/10/2018	28/11/2018	3/01/2019	5/02/2019
HT04059	No evidence of breeding	No evidence of breeding	No flush	No flush	No flush	No flush	No flush	No flush
HT04274	No evidence of breeding	No evidence of breeding	No flush	No flush. Bees in hollow	No flush	No flush. Bees in hollow	No flush	No flush
HT04579	Confirmed breeding event - failed	No evidence of breeding	No flush	No flush	No flush	No flush	No flush	No flush
HT04581	Confirmed breeding event - failed	No evidence of breeding	No flush	No flush	No flush	No flush	No flush	No flush
HT04588	Evidence of nesting activity	No evidence of breeding	No flush	No flush	No flush	No flush	No flush	No flush
HT05911	No access	Hollow not located						
HT05923	No evidence of breeding	Felled. Further monitoring not required.	No flush	Felled. Further monitoring not required.				
HT05938	No longer suitable hollow. Further monitoring not required							
HT05947	No evidence of breeding	Not located		Not located				
HT05954	No evidence of breeding	No evidence of breeding	No access	No flush. Duck down, bees in lower hollow	No flush	No flush	No flush	No flush
HT06017	No access	No evidence of breeding	No flush	No flush	No flush. Galah in smaller hollow	No flush	No flush	No flush
HT06020	No access	Felled. Further monitoring not required.	No flush	Felled. Further monitoring not required.				
HT06025	No access	No evidence of breeding	No flush. Hollow located has bees	No flush	No flush	No flush	No flush	No flush
HT06046	No access	Felled. Further monitoring not required.	No flush	Felled. Frogmouth				

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				flushed, Carnaby's pair nearby reacting to chainsaw. Further monitoring not required.				
HT06148	No longer suitable. Further monitoring not required.							
HT06160	No evidence of breeding	No evidence of breeding	No flush	No flush	No flush	No flush	No flush	No flush
HT06201	No evidence of breeding	No evidence of breeding	No flush. Marri nut carried in by FRTBC at base of tree.	No flush	No flush	No flush	No flush	No flush
HT06216	No evidence of breeding	No evidence of breeding	No flush	No flush. Carnaby's sightings & calls in vicinity	No flush	No flush	No flush	No flush
HT06261	No evidence of breeding	Felled. Further monitoring not required.	No flush	No flush	No flush	Felled. Further monitoring not required.		
HT06278	Evidence of nesting activity	Felled. Further monitoring not required.	No flush	No flush	No flush	No flush	Felled. Further monitoring not required.	
HT06330	Not sampled	No evidence of breeding. Added to breeding census in 2018-19.	No flush	No flush	No flush	No flush	No flush	No flush
HT06348	Evidence of nesting activity	No evidence of breeding	No flush	No flush	No flush	No flush	No flush	No flush
HT06421	No access. Evidence of nesting activity (from a distance)	No access	No access	No access	No access	No access	No access	
HT06655	No longer suitable. Further monitoring not required.							

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HT06678	Evidence of nesting activity (FRTBC)	No evidence of breeding	No flush	No flush	No flush	No flush	No flush	No flush
HT08752	No evidence of breeding	Felled. Further monitoring not required.	No flush	No flush.	No flush	No flush	Felled. Further monitoring not required.	
HT08753	Evidence of nesting activity	No evidence of breeding	No flush	No flush. Fresh scarring from Galahs.	No flush	No flush	No flush	No flush
HT08754	No access	Confirmed breeding event	No access	No flush.	No flush	No flush	No flush	CBC chick photog. prev. week; to be felled when fledged
HT12761	Hollow not located	Hollow not located		Not seen				
HT12762	Evidence of nesting activity	No evidence of breeding	No flush	No flush	No flush	No flush	No flush	No flush
HT12763	Evidence of nesting activity	No evidence of breeding	No flush	No flush. Duck scat around entrance	No flush	No flush	No flush	No flush
HT12765	Confirmed breeding event - successful	No evidence of breeding. May no longer be suitable	No flush	No flush	No flush	No flush	No flush	No flush. Lopped for powerline clearance
HT13484	No access	No evidence of breeding	No flush	No flush. Corella in other hollow	No flush. Corella in other hollow	No flush	No flush	No flush
HT13497	No access	No evidence of breeding	No flush	No flush	No flush	No flush	No flush	No flush
HT13503	No access	No longer suitable. Further monitoring not required.	Hollow no longer suitable					
HT13505	No access	No longer suitable. Further monitoring not required.	Hollow no longer suitable					
HT13506	No access	No evidence of breeding	Duck down at hollow entrance	No flush	No flush	No flush	No flush	No flush

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HT13507	No access	Evidence of nesting activity	No flush	No flush	No flush	No flush. Fresh chewing	No flush	No flush
HT13508	No access	No evidence of breeding	No flush	No flush	No flush	No flush	No flush	No flush
HT13511	No access	No longer suitable. Further monitoring not required.	Hollow no longer suitable					
HT13523	No access	No longer suitable. Further monitoring not required.	No flush	Hollow no longer suitable. Further monitoring not required.				
HT13533	No evidence of breeding	No evidence of breeding	No flush	No flush	No flush. Tree martins in hollows	No flush	No flush	No flush
HT13534	Evidence of nesting activity	Felled. Further monitoring not required.	No flush	Felled. Further monitoring not required.				
HT13535	Evidence of nesting activity	Felled. Further monitoring not required.	No flush	Felled. Further monitoring not required.				
HT13585	Not sampled	No evidence of breeding. Added to breeding census in 2018-19, chewing observed at hollow.		No flush		No flush	No flush	No flush
HT14633	Evidence of nesting activity	No evidence of breeding	No flush	No flush	No flush. CBC calls to south	No flush	No flush	No flush
HT14653	Evidence of nesting activity	No evidence of breeding	No flush	No flush	No flush	No flush	No flush	No flush
HT14657	No evidence of breeding	No evidence of breeding	No flush	No flush	No flush	No flush	No flush	No flush
HT14670	Collapsed, no longer suitable. Further monitoring not required.							

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HT ID	Result 2017-18	Result 2018-19	21/08/2018	21/09/2018	19/10/2018	28/11/2018	3/01/2019	5/02/2019
HT14672	Evidence of nesting activity	Evidence of nesting activity	No flush	No flush. Duck flushed from lower hollow	No flush. Redtail foraging traces	No flush	No flush	No flush
HT14748	Confirmed breeding event - successful	Evidence of nesting activity	No flush	No flush	Flushed CBC female	No flush. Camera check: empty	No flush	No flush
HT14749	Confirmed breeding event - successful	Confirmed breeding event	No flush	Carnaby's: pair prospecting + other female in hollow with 2 entrances, female squabbling calls.	No flush (could be present with chick)	Carnaby's M+F flushed, +F inside ?feeding young	No flush	No flush, no activity all morning
HT14805	No access	No access	No access	No access	No access	No access		
HT14806	No access	No access	No access	No access	No access	No access		
HT14807	No access	No access	No access	No access	No access	No access		
HT14808	No access	No access	No access	No access	No access	No access		
HT14809	Evidence of nesting activity	No evidence of breeding	No flush	No flush	No flush. Ringnecks x4 at tree	No flush	No flush	No flush
HT14810	Confirmed breeding event - failed	No evidence of breeding	No flush	No flush	No flush	No flush	No flush	No flush
HT14811	No evidence of breeding	No evidence of breeding	No flush	No flush. Corella pair in other hollow	No flush	No flush	No flush. CBC calls to E & W	No flush
NB01	n/a	No evidence of breeding	n/a	n/a	No flush	No flush	No flush	No flush
NB02	n/a	Confirmed breeding event	n/a	n/a	No flush	CBC Pair flew off and returned, F entered box,	No flush	No flush

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HT ID	Result 2017-18	Result 2018-19	21/08/2018	21/09/2018	19/10/2018	28/11/2018	3/01/2019	5/02/2019
						?laying (by sound). Too high for camera.		
NB03	n/a	No evidence of breeding	n/a	n/a	No flush	No flush	No flush	No flush
NB04	n/a	No evidence of breeding	n/a	n/a	No flush	No flush	No flush	No flush
NB05	n/a	No evidence of breeding	n/a	n/a	No flush	No flush	No flush	No flush
NB06	n/a	No evidence of breeding	n/a	n/a	No flush	No flush	No flush	No flush
NB08	n/a	No evidence of breeding	n/a	n/a	No flush	No flush	No flush	No flush
NB09	n/a	No evidence of breeding	n/a	n/a	Not seen	No flush	No flush	No flush
NB10	n/a	No evidence of breeding	n/a	n/a	No flush	No flush	No flush	No flush
NB11	n/a	No evidence of breeding	n/a	n/a	No flush	No flush	No flush. Marri canker	No flush
NB12	n/a	No evidence of breeding	n/a	n/a	No flush; mob of CBC ~100m S drinking at dam	Not seen	No flush	No flush
NB13	n/a	No evidence of breeding	n/a	n/a	No flush	No flush	No flush	No flush
NB14	n/a	No evidence of breeding	n/a	n/a	No flush	No flush	No flush	No flush
NB32	n/a	No evidence of breeding/no access	n/a	n/a	Not seen	No access	No access	
NB33	n/a	No evidence of breeding/no access	n/a	n/a	Not seen	No access	No access	
NB46	n/a	No evidence of breeding	n/a	n/a	No flush	No flush	No flush	No flush
NB55	n/a	No evidence of breeding	n/a	n/a	No flush	No flush	No flush	No flush
NB57	n/a	No evidence of breeding	n/a	n/a	No flush	No flush	No flush	No flush
NB58	n/a	No evidence of breeding	n/a	n/a	No flush	No flush	No flush	No flush

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NB59	n/a	No evidence of breeding	n/a	n/a	No flush	No flush	No flush	No flush
NB60	n/a	No evidence of breeding	n/a	n/a	No flush	No flush	No flush	No flush
NB61	n/a	No evidence of breeding	n/a	n/a	No flush	No flush	No flush	No flush
NB62	n/a	No evidence of breeding	n/a	n/a	No flush	No flush	No flush. CBC call to west	No flush
NB63	n/a	No evidence of breeding	n/a	n/a	No flush	No flush	No flush	No flush
NB64	n/a	Evidence of nesting activity	n/a	n/a	No flush; CBC pair in upper branches, M feeding F	No flush	No flush	No flush
NB65	n/a	No evidence of breeding	n/a	n/a	No flush; red-tails calling to E	No flush	No flush	No flush
NB66	n/a	Evidence of nesting activity	n/a	n/a	CBC F on box, flushed as vehicle passed	CBC 1F on nest	No flush. Camera check, empty. CBC calls to W	No flush
NB67	n/a	No evidence of breeding	n/a	n/a	Not seen	No flush	No flush	No flush
NB68	n/a	No evidence of breeding	n/a	n/a	No flush	No flush	No flush	No flush
NB69	n/a	No evidence of breeding	n/a	n/a	No flush	No flush	No flush	No flush
NB70	n/a	Not surveyed	n/a	n/a	Not seen	Not seen	Not seen	
NB71	n/a	No evidence of breeding	n/a	n/a	No flush	No flush	No flush	No flush
NB76	n/a	No evidence of breeding	n/a	n/a	Not seen	No flush	No flush	No flush
NB77	n/a	No evidence of breeding	n/a	n/a	Not seen	No flush	No flush	No flush
NB78	n/a	No evidence of breeding	n/a	n/a	Not seen	No flush	No flush	No flush
NB79	n/a	No evidence of breeding	n/a	n/a	Not seen	No flush	No flush	No flush

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HT ID	Result 2017-18	Result 2018-19	21/08/2018	21/09/2018	19/10/2018	28/11/2018	3/01/2019	5/02/2019
NB99	n/a	No evidence of breeding	n/a	n/a	Not seen	No flush	No flush	No flush

