LYNWOOD QUARRY, NSW

Ecological Monitoring of Nest Boxes Winter 2021

Prepared for:

Holcim Australia Pty Ltd
PO Box 5697
WEST CHATSWOOD NSW 1515

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PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
10 Kings Road
New Lambton NSW 2305 Australia
(PO Box 447 New Lambton NSW 2305)
T: +61 2 4037 3200
E: newcastleau@slrconsulting.com www.slrconsulting.com

BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Holcim Australia Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
630.30045.00100-R01-v1.0	30 August 2021	Jarrid Beeton	Fiona Iolini	Jeremy Pepper

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DOCUMENT REFERENCES

TABLES

FIGURES

APPENDICES

1 INTRODUCTION

1.1 Background

SLR Consulting Australia Pty Ltd (SLR) was commissioned by Holcim (Australia) Pty Ltd ('Holcim') to undertake ecological monitoring at the Lynwood Quarry, a hard rock quarry approximately two kilometres west of Marulan, in the Southern Highland IBRA Region and Bungonia Sub-region of New South Wales (NSW) (see Figure 1).

Initial planning consent for the Lynwood Quarry was granted to Cemex (now Holcim) on 21 December 2005 for an approved five million tonnes per annum (mta) output. Since the original development approval, five modifications have been approved, with quarrying operations approved until 01 January 2038. Ecological monitoring is a requirement of the project approval and associated ecology reports and management plans.

1.2 Previous Ecological Reports

Various documents were prepared during the approval phase of the quarry (Umwelt 2005, 2013, 2018) and these have been relied upon for background information in relation to the ecology and management of the site. A summary of previous ecological reports is provided below.

1.2.1 Ecological Assessment

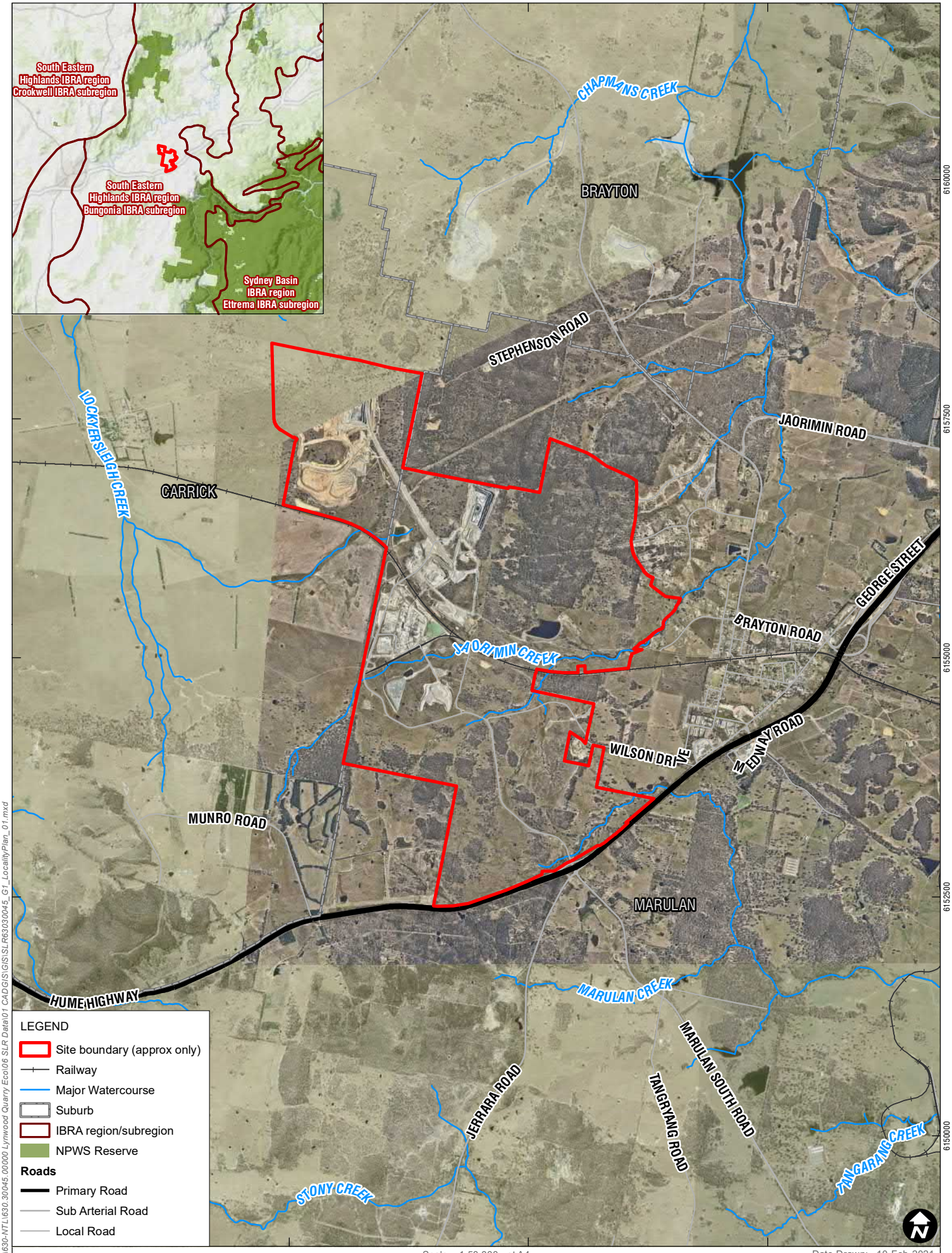
Key findings of the Ecological Assessment (EA) (Umwelt 2005) with respect to nest box monitoring are as follows:

- Areas of retained vegetation across the site were found to provide habitat to a suite of local fauna species as well as the following threatened species which are listed as 'vulnerable' under the Biodiversity Conservation Act 2016 (BC Act): Speckled Warbler, Squirrel Glider, Eastern Costal Free-tailed Bat (previously Eastern Freetail-bat), Eastern False Pipistrelle and Large Bent-winged Bat (previously known as Eastern Bentwing-bat).
- To mitigate the impacts of the development the EA proposed monitoring in retained vegetation on a three-yearly basis involving four monitoring locations to be established within a Habitat Management Area (HMA), Joarimin Creek Management Area and Cultural Management Area (CMA). The proposed approach was a standard 20 m by 20 m flora quadrat to record species diversity and structural composition, as well as photo monitoring and fauna monitoring targeting threatened species. Nest boxes were also proposed to be installed and monitored on an annual basis for five years.

1.2.2 Rehabilitation and Landscape Management Plan

The relevant components of the Rehabilitation and Landscape Management Plan (Umwelt 2018) with respect to nest box monitoring can be summarised as follows:

- Maintenance and replacement of arboreal habitat is to occur through the relocation of salvaged tree hollows or installation of nest boxes. Nest boxes are to be monitored annually for a period of five years, followed by condition inspections every four years.
- Preliminary Completion Criteria for the HMA are as follows:
  - Nest boxes are being utilised or show signs of use by native species. Each nest box installed should be in good structural condition and functioning in the landscape.



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Coordinate System: GDA 1994 MGA Zone 55

Date Drawn: 10-Feb-2021
Project Number: 630.30045.00000

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SLR

Data Source: NSW SS, 2020, Basemap supplied by ESRI and other sources
Aerial imagery supplied by Nearmap (January, 2021) and © Department of Customer Service 2020

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SITE LOCATION

FIGURE 1

1.3 Objectives

The purpose of the Lynwood ecological monitoring program is to monitor ecological values within areas of retained vegetation within the site and demonstrate the achievement of objectives in accordance with the Ecological Assessment (Umwelt 2005), Box Gum Woodland Management Plan (Umwelt 2013) and Rehabilitation and Landscape Management Plan (Umwelt 2018).

The objectives of the 2021 ecological monitoring with respect to nest boxes are to:

- Determine whether nest boxes are being utilised by native fauna and determine whether any nest box maintenance actions are required.

Additional rehabilitation monitoring will be undertaken in December 2021 following rehabilitation of the Amenity Bund.

2 METHODS

2.1 Staff Roles and Qualifications

The roles and qualifications of all staff responsible for preparation of this report are listed in Table 1.

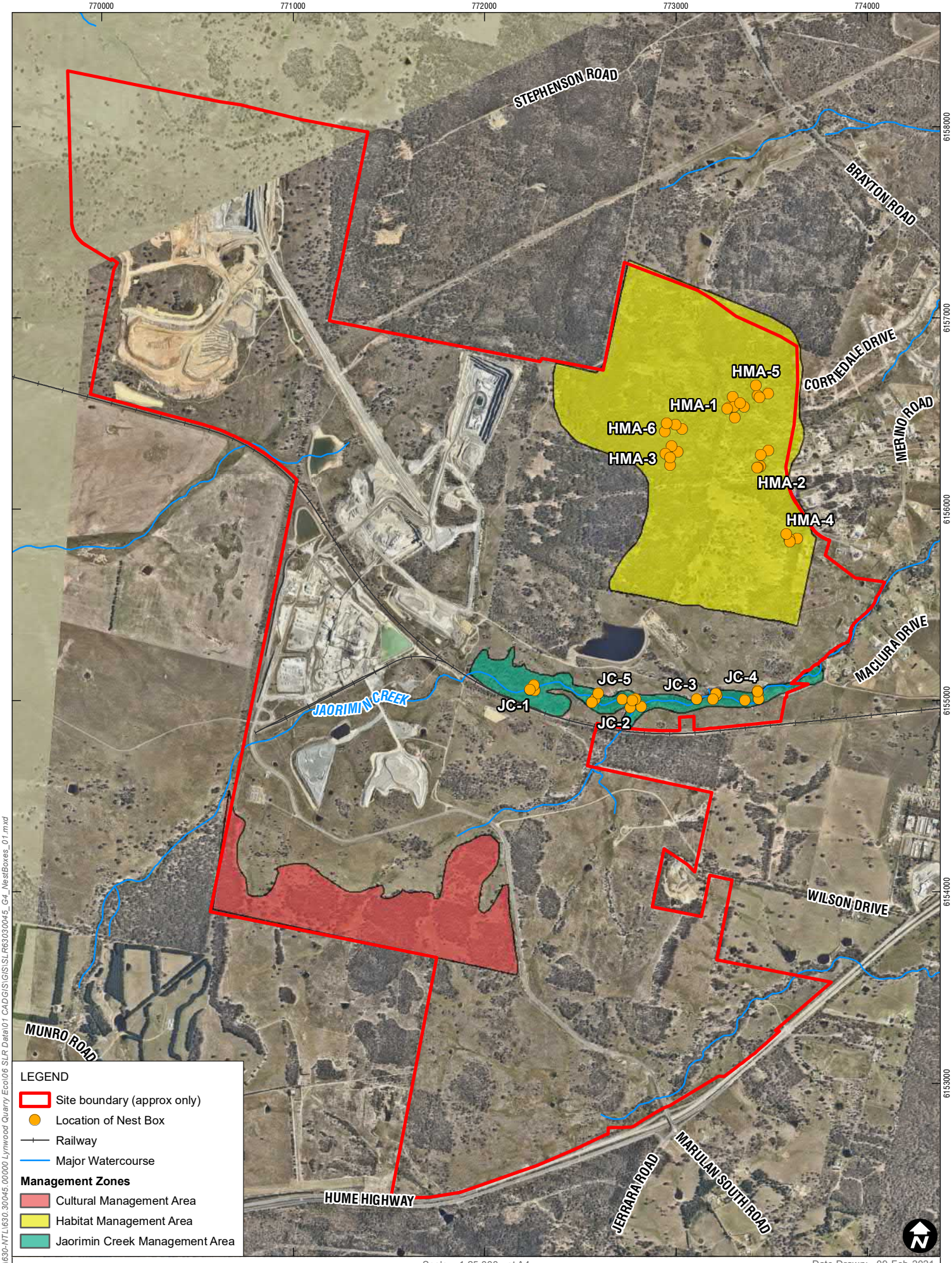
Table 1 Staff Roles and Qualifications

Staff Name & Title	Qualifications and Training	Role
Jeremy Pepper Principal Ecologist	Bachelor of Science (Hons Class 1) University of NSW 1996 Cert II Bushland Regeneration, TAFE NSW Cert III Horticulture (Arboriculture), TAFE NSW BAM accredited assessor (#BAAS17104)	Project Director, report technical review
Fiona Iolini Associate Ecologist	Bachelor of Environmental Science and Management, University of Newcastle 2007 Certificate of Native Plant Identification, Sydney University 2008 Cert III Conservation and Land Management, TAFE NSW 2015 BAM accredited assessor (#BAAS19042)	Project Manager, Spring field survey, report preparation
Bo Davidson Associate Ecologist	M Env, Macquarie University B Env Sc, Macquarie University Accredited Biodiversity Assessment Method (BAM) BAAS19079	Winter field survey
Jarrid Beeton Project Ecologist	Bachelor of Environmental Science and Management, University of Newcastle 2018 Dip. Conservation and Land Management, TAFE NSW Cert III Horticulture, TAFE NSW	Winter field survey, report preparation, Spring field survey

2.2 Nest-box Monitoring Methods

A total of 50 nest boxes were inspected as part of the winter monitoring event. The locations of nest boxes are shown in Figure 2. This was completed by two qualified SLR ecologists, using a non-invasive remote camera inspection method to record the following details:

- Native fauna occupancy
- Presence of nests, eggs, or young
- Indirect signs of usage (eg scats, fur, feathers, egg fragments)
- Evidence of pest species (eg bees, exotic birds, such as Indian Miners)
- Nest box condition and maintenance requirements


770000
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STEPHENSON ROAD
BRAYTON ROAD
CORRIEDALE DRIVE
MERINO ROAD
MACLURA DRIVE
WILSON DRIVE
MUNRO ROAD
HUME HIGHWAY
JERRARA ROAD
MARULAN SOUTH ROAD
JAORIMIN CREEK
HMA-1
HMA-2
HMA-3
HMA-4
HMA-5
HMA-6
JC-1
JC-2
JC-3
JC-4
JC-5
LEGEND
Site boundary (approx only)
Location of Nest Box
Railway
Major Watercourse
Management Zones
Cultural Management Area
Habitat Management Area
Jaorimin Creek Management Area
0
0.5
1
km
Scale: 1:25,000 at A4
Coordinate System: GDA 1994 MGA Zone 55
Date Drawn: 09-Feb-2021
Project Number: 630.30045.00000
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Data Source: NSW SS, 2020, Basemap supplied by ESRI and other sources
Aerial imagery supplied by Nearmap (January, 2021) and © Department of Customer Service 2020
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SLR
NEST BOX LOCATIONS
FIGURE 4

2.3 Survey Details

The current 2021 winter ecological monitoring involved surveys as detailed in Table 2.

Table 2 Details of Ecological Monitoring of Nest Boxes Winter 2021

Date (2021)	Survey Technique	Weather Conditions*
26 July	Nest box inspections	26th - Temp 4°C (min) 9°C (max). Rain 0.0mm. Wind WNW 43km/hr 10:00 (max). Moon phase: Full moon to third quarter moon. Sunrise 6:52am. Sunset 5:11pm.
27 July	Nest box inspections	27th Temp 7ºC (min) 14ºC (max) Rain 0.0mm. Wind NW 33km/hr 13:00 (max). Moon phase: Full moon to third quarter moon. Sunrise 6:51am. Sunset 5:12pm.

* Weather data sourced from BOM (2021) weather station Goulburn Airport (20km SW of site) and www.timeanddate.com (Sydney 2021).

2.4 SLR Permits and Licenses

The SLR ecology team operates under a Scientific Licence (licence number SL100176, issued under the BC Act), which authorises field staff to trap, capture, harm, hold and release plants and animals protected under the BC Act and National Parks and Wildlife Act 1974, as well as an Animal Research Authority (issued by the Secretary of the NSW Animal Care and Ethics Committee of DPIE), which allows trapping of animals in NSW for the purposes of animal research.

3 RESULTS and DISCUSSION

3.1 Nest Box Monitoring Results

A total of 50 nest boxes were inspected during the winter monitoring event (See Appendix A for complete nest box inventory). Key results are summarised as follows:

- Eight nest boxes were occupied by native fauna, including: 6 boxes occupied by either Sugar or Squirrel Gliders Petaurus spp. (two boxes had young) and two boxes occupied by Brushtail Possum Trichosurus vulpecula (one box had young).
- 41 of the 50 nest boxes contained nesting material, identified as being a mix of glider nests (leaf material), wood duck nest (bark and leaves with fragments of eggs) and bird nests (sticks and feathers).
- Two nest boxes were recorded as having pests (inactive wasp nest and inactive beehive).
- Five nest boxes require maintenance including:
  - Two requiring the removal of an inactive wasp nest/beehive.
  - Two boxes require straightening up or repositioning on the tree.
  - One box needs to be reinstalled on to a new tree because of a snapped tree trunk.

3.2 Discussion

Nest box inspections found that most nest boxes showed evidence of usage (41 of 50), with eight being occupied during the survey. In regard to target species usage: the Squirrel Glider boxes were generally occupied by Sugar Gliders or their nesting materials; the Brushtail Possum boxes showed evidence of possum usage but were also being used by birds; the Ringtail Possum boxes were used by bird species; the bat boxes were unsuccessful and showed no evidence of usage; the Owlet Nightjar boxes appeared to be used by gliders; and Rosella boxes all showed evidence of bird or glider usage. In relation to maintenance two boxes require pest removal, two require repositioning, and one requires to be placed on a new tree.

Nest box monitoring indicates a high rate of usage by native fauna and general good condition of most nest boxes. Removal of pests and ongoing monitoring of the boxes, particularly along Joarimin Creek, is recommended to prevent further impacts on the native fauna using the boxes. It is also recommended that two of the boxes are repositioned and one is reinstalled.

4 REFERENCES

BOM 2021, 'Climate Data Online', Australian Government Bureau of Meteorology, Available at: http://www.bom.gov.au/climate/data/index.shtml?bookmark=200&view=map [August 2021].

Umwelt 2005, 'Ecological Assessment, Proposed Lynwood Quarry, Marulan', Umwelt (Australia) Pty Limited.

Umwelt 2013, 'Lynwood Quarry - Box Gum Woodland Management Plan', Umwelt (Australia) Pty Limited, Teralba, NSW.

Umwelt 2018, 'Lynwood Quarry Rehabilitation and Landscape Management Plan Revision 2', Umwelt (Australia) Pty Limited, Toronto, NSW.

APPENDIX A

Nest Box Inventory

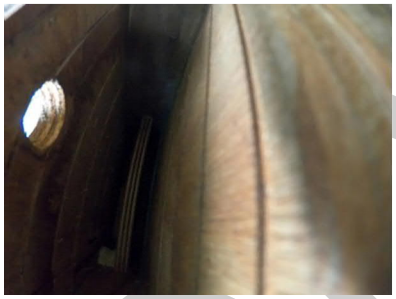
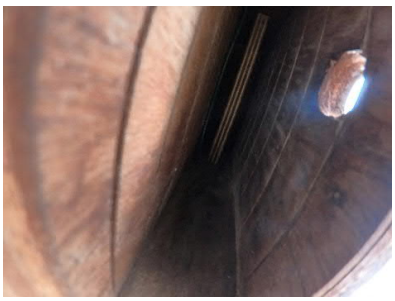
Table A1 Results of Nest Box Inspection

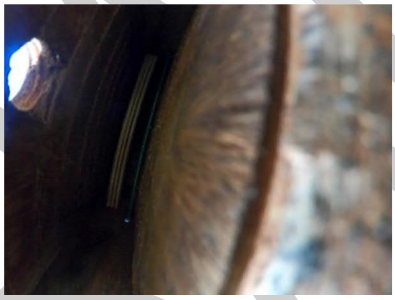
Box ID	Box Type	Native Fauna Occupancy (Y/N)				Pests (Y/N)	Repair (Y/N)	Comment (species present, signs of use, repair etc..)
		Fauna	Nest	Eggs	Young			
JC-1-1	Squirrel Glider	Y	Y	N	N	N	N	Sugar or Squirrel Glider in nest (leaf material)
JC-1-2	Squirrel Glider	N	Y	N	N	N	N	Nest (leaf material)
JC-1-3	Squirrel Glider	N	Y	N	N	N	N	Nest (leaf material)
JC-1-4	Micro-Bat	N	N	N	N	N	N	-
JC-2-1	Brushtail Possum	N	N	N	N	N	N	-
JC-2-2	Squirrel Glider	N	Y	N	N	N	N	Nest (leaf material)
JC-2-3	Squirrel Glider	N	Y	N	N	N	N	Nest (leaf material)
JC-2-4	Micro-Bat	N	N	N	N	N	Y	Broken Branch, nest box on the ground
JC-2-5	Squirrel Glider	Y	Y	N	N	N	N	Sugar or Squirrel Glider in nest (leaf material)
JC-3-1	Squirrel Glider	N	Y	N	N	N	N	Nest (leaf material)
JC-3-2	Squirrel Glider	N	Y	N	N	Y	Y	Inactive wasp nest to be removed and inactive nest (leaf material)
JC-3-3	Squirrel Glider	N	Y	N	N	N	N	Nest (leaf material)
JC-3-4	Micro-Bat	N	N	N	N	N	N	-
JC-4-1	Squirrel Glider	N	Y	N	N	Y	Y	Inactive nest (leaf material) with inactive beehive to be removed.
JC-4-2	Squirrel Glider	N	Y	N	N	N	N	Nest (leaf material)
JC-4-3	Brushtail Possum	N	Y	N	N	N	N	Inactive nest (leaf, bark material). Animal droppings and feathers present in nest box.
JC-4-4	Squirrel Glider	N	Y	N	N	N	N	Nest (leaf material)
JC-4-5	Micro-Bat	N	N	N	N	N	N	-
JC-5-1	Squirrel Glider	N	Y	N	N	N	N	Nest (leaf material)
JC-5-2	Squirrel Glider	N	Y	N	N	N	N	Nest (leaf material)
JC-5-3	Squirrel Glider	N	Y	N	N	N	N	Nest (leaf material)
HMA-1-1	Brushtail Possum	N	Y	N	N	N	N	Egg Fragments and feathers
HMA-1-2	Squirrel Glider	Y	Y	N	Y	N	N	Sugar Glider in leaf nest (family of at least 3)
HMA-1-3	Squirrel Glider	Y	Y	N	Y	N	N	Sugar Glider in leaf nest (family of at least 3)
HMA-1-4	Ringtail Possum	N	Y	Y	N	N	N	Bird nest and eggs (probable Wood Duck)
HMA-1-5	Micro-Bat	N	N	N	N	N	Y	Requires repositioning
HMA-1-6	Owlet Nightjar	N	Y	N	N	N	N	Nest (leaf material)
HMA-1-7	Owlet Nightjar	N	Y	N	N	N	N	Nest (leaf material)
HMA-2-1	Squirrel Glider	Y	Y	N	N	N	N	Glider and nest (leaf material)
HMA-2-2	Brushtail Possum	N	Y	N	N	N	N	Inactive nest (nest and egg fragments)
HMA-2-3	Rosella	N	Y	N	N	N	N	Nest (leaf material)
HMA-2-4	Owlet Nightjar	Y	Y	N	N	N	N	Glider and nest (leaf material)
HMA-2-5	Micro-Bat	N	N	N	N	N	N	-
HMA-3-1	Ringtail Possum	N	Y	N	N	N	N	Inactive nest with minimal leaf/bark

Box ID	Box Type	Native Fauna Occupancy (Y/N)				Pests (Y/N)	Repair (Y/N)	Comment (species present, signs of use, repair etc..)
		Fauna	Nest	Eggs	Young			
HMA-3-2	Brushtail Possum	N	Y	N	N	N	N	Inactive nest with minimal leaf/bark
HMA-3-3	Brushtail Possum	N	Y	N	N	N	N	Inactive nest with minimal leaf/bark
HMA-3-4	Owlet Nightjar	N	Y	N	N	N	N	Birds nest with stringybark bark and feathers
HMA-3-5	Rosella	N	Y	N	N	N	N	Nest (leaf material)
HMA-4-1	Brushtail Possum	Y	Y	N	N	N	N	Brushtail Possum
HMA-4-2	Rosella	N	Y	N	N	N	Y	Feather and bark lined nest. Box is on unstable branch, requires repositioning.
HMA-4-3	Squirrel Glider	N	Y	N	N	N	N	Glider nest (leaf material)
HMA-4-4	Micro-Bat	N	N	N	N	N	N	-
HMA-5-1	Owlet Nightjar	N	Y	N	N	N	N	Glider nest (leaf material)
HMA-5-2	Micro-Bat	N	N	N	N	N	N	-
HMA-5-3	Rosella	N	Y	N	N	N	N	Nest (leaf material). High nest box >4 m
HMA-5-4	Squirrel Glider	N	Y	N	N	N	N	Glider nest (leaf material)
HMA-6-1	Ringtail Possum	N	Y	Y	N	N	N	Well feathered nest with eggs.
HMA-6-2	Brushtail Possum	Y	Y	N	Y	N	N	Brushtail Possum and young
HMA-6-3	Ringtail Possum	N	Y	N	N	N	N	Inactive nest with leaf/bark
HMA-6-4	Brushtail Possum	N	Y	N	N	N	N	Inactive nest, with leaf/bark and egg fragments

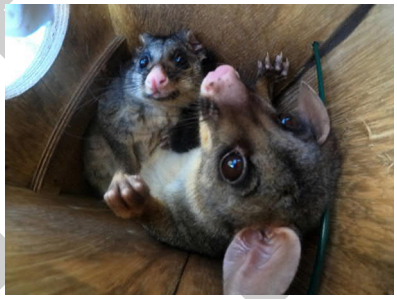
Table A2 Photograph Thumbnails of Nest Box Inspections

		
JC-1-1	JC-1-2	JC-1-3
		
JC-1-4	JC-2-1	JC-2-2

	NA – Box not operational	
JC-2-3	JC-2-4	JC-2-5
		
JC-3-1	JC-3-2	JC-3-3
		
JC-3-4	JC-4-1	JC-4-2
		
JC-4-3	JC-4-4	JC-4-5

		
JC-5-1	JC-5-2	JC-5-3
		
HMA-1-1	HMA-1-2	HMA-1-3
		
HMA-1-4	HMA-1-5	HMA-1-6
		
HMA-1-7	HMA-2-1	HMA-2-2

		
HMA-2-3	HMA-2-4	HMA-2-5
		
HMA-3-1	HMA-3-2	HMA-3-3
		
HMA-3-4	HMA-3-5	HMA-4-1
		
HMA-4-2	HMA-4-3	HMA-4-4

		
HMA-5-1	HMA-5-2	HMA-5-3
		
HMA-5-4	HMA-6-1	HMA-6-2
		
HMA-6-3	HMA-6-4	

ASIA PACIFIC OFFICES

BRISBANE
Level 2, 15 Astor Terrace
Spring Hill QLD 4000
Australia
T: +61 7 3858 4800
F: +61 7 3858 4801

CANBERRA
GPO 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
F: +61 2 9427 8200

DARWIN
Unit 5, 21 Parap Road
Parap NT 0820
Australia
T: +61 8 8998 0100
F: +61 8 9370 0101

GOLD COAST
Level 2, 194 Varsity Parade
Varsity Lakes QLD 4227
Australia
M: +61 438 763 516

MACKAY
21 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300

MELBOURNE
Level 11, 176 Wellington Parade
East Melbourne VIC 3002
Australia
T: +61 3 9249 9400
F: +61 3 9249 9499

NEWCASTLE
10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
F: +61 2 4037 3201

NEWCASTLE CBD
Suite 2B, 125 Bull Street
Newcastle West NSW 2302
Australia
T: +61 2 4940 0442

PERTH
Ground Floor, 503 Murray Street
Perth WA 6000
Australia
T: +61 8 9422 5900
F: +61 8 9422 5901

SYDNEY
Tenancy 202 Submarine School
Sub Base Platypus
120 High Street
North Sydney NSW 2060
Australia
T: +61 2 9427 8100
F: +61 2 9427 8200

TOWNSVILLE
12 Cannan Street
South Townsville QLD 4810
Australia
T: +61 7 4722 8000
F: +61 7 4722 8001

WOLLONGONG
Level 1, The Central Building
UoW Innovation Campus
North Wollongong NSW 2500
Australia
T: +61 2 4249 1000

AUCKLAND
Level 4, 12 O'Connell Street
Auckland 1010
New Zealand
T: 0800 757 695

NELSON
6/A Cambridge Street
Richmond, Nelson 7020
New Zealand
T: +64 274 898 628