



Transport  
**Roads & Maritime  
Services**

# Warrell Creek to Nambucca Heads

Interim Underpass Monitoring Report – year two  
operational phase 2019-2020

Transport for New South Wales | March 2020





## Document Review

Date	Version	Status	Sent to	Represent	Delivered Format	Dispatched By
6/3/2020	A	Internal draft	D. Rohweder	SES	MSW	L. Andrews
10/3/2020	B	Internal draft	D. Rohweder	SES	MSW	L. Andrews
11/3/2020	1	Draft	S. Hardiman	RMS	MSW	D. Rohweder

## Document Distribution

Date	Version	Status	Sent to	Represent	Delivered Format	Dispatched By
30/3/2020	2	Final	S. Hardiman	RMS	MSW	D. Rohweder

### Project team:

David Rohweder (Project management, field survey, review)  
Luke Andrews (Field survey, reporting)  
Nirvarna Makings (Field survey)  
Nick Priest (Field survey)  
Oska Taylor (Field assistant)  
Sam Rohweder (Field assistant)

### Report prepared for:

Transport for NSW

© Sandpiper Ecological Surveys 2020  
ABN: 82 084 096 828  
  
PO Box 401  
ALSTONVILLE NSW 2477  
P 02 6628 3559 | E david@sandpipereco.com.au

### Disclaimer:

This report has been prepared in accordance with the scope of services described in the contract or agreement between Sandpiper Ecological Surveys (ABN 82 084 096 828) and Transport for New South Wales. The report relies upon data, surveys and measurement obtained at the times and locations specified herein. The report has been prepared solely for Transport for New South Wales and Sandpiper Ecological Surveys accepts no responsibility for its use by other parties. Sandpiper Ecological Surveys accepts no responsibility or liability for changes in context, meaning, conclusions or omissions caused by cutting, pasting or editing the report.

# Table of contents

<b>1.</b>	<b>Introduction</b>	<b>1</b>
1.1	Background	1
1.2	Study area	2
<b>2.</b>	<b>Methods</b>	<b>2</b>
2.1	Timing and weather conditions	2
2.2	Underpasses	4
2.2.1	Sand pads	4
2.2.2	Scat and track searches	5
2.2.3	Cameras	5
2.3	Adjacent habitat	7
2.3.1	Survey design	7
2.3.2	Trapping	7
2.3.3	Diurnal active search	8
2.3.4	Nocturnal active search	8
2.3.5	Opportunistic records	9
<b>3.</b>	<b>Results</b>	<b>9</b>
3.1	Underpasses	9
3.1.1	Sand pads	9
3.1.2	Scat and track searches	12
3.1.3	Cameras	12
3.2	Adjacent habitat	18
3.3	Species recorded in underpasses and adjacent habitat	20
<b>4.</b>	<b>Discussion</b>	<b>21</b>
4.1	Low rates of use of fauna underpasses and adjacent habitats by feral predators	21
4.2	High levels of fauna underpass use by a variety of native species	21
4.3	No change to densities, distribution, habitat use and movement patterns compared to baseline population data of target species	22
4.4	Evidence of use by dispersing individuals and different age cohorts	22
4.5	Use by cover-dependent species with low mobility	22
4.7	Underpass survey effort	22
<b>5.</b>	<b>Recommendations</b>	<b>23</b>
<b>6.</b>	<b>References</b>	<b>23</b>
	<b>Appendix A – Species list</b>	<b>25</b>
	<b>Appendix B – Weather and climatic conditions</b>	<b>27</b>
	<b>Appendix C – Field data</b>	<b>31</b>

# List of tables

Table 1: Underpasses sampled during operational phase monitoring of the WC2NH upgrade. SQ = spotted-tailed quoll; K = koala; GBF = giant barred frog; * sites consists of dual cell 3x3m box culverts with one cell providing wet passage for aquatic fauna; P/A = presence/absence. ....	1
Table 2: Summary of weather conditions recorded at Coffs Harbour Airport (station 059151) and Bellwood weather station (059150) between 22 September and 28 February 2020. .	2
Table 3: Camera survey effort during year one operational phase monitoring.....	6
Table 4: Survey effort for sampling adjacent habitat on the WC2NH upgrade in spring/summer 2019. ....	9
Table 5: Species and groups of fauna recorded making complete and incomplete crossings during sand pad monitoring at 12 underpasses on the WC2NH upgrade in spring/summer of year two monitoring. C =complete crossing, I = Incomplete crossing. * = Threatened species. ....	11
Table 6: Species and fauna groups recorded during track and scat surveys of 12 underpasses on the WC2NH upgrade. I = introduced species, * = Threatened species SS = Spring/Summer, W = Winter (data to be collected). ....	12
Table 7: Number of complete crossings per week recorded for each species and fauna group at 12 underpasses on the WC2NH upgrade in spring/summer of year two operational phase. I = introduced species SS = Spring/Summer; W = Winter. * = Threatened species. ....	13
Table 8: Number of complete crossings/week made by each species/group at each of 12 underpasses monitored on the WC2NH upgrade in spr/sum 2019. Sites 1 and 5 did not contain fauna furniture. FI = Floor, FF = fauna furniture. I = introduced species. * = Threatened species.....	17
Table 9: Species of vertebrate recorded during surveys of adjacent habitat in spr/sum 2019. SS = Spring/Summer, W = Winter. * = Threatened species. E= Endangered species. * denotes threatened species; I = Introduced species. ....	18
Table 10: Species and fauna groups recorded using underpasses by all methods and those recorded in adjacent habitat. * denotes threatened species. E= Endangered species. I = Introduced species. ....	20

# List of figures

<b>Figure 1:</b> Location of underpass sample sites in relation to the WC2NH alignment. ....	3
<b>Figure 2:</b> Number of complete crossings by native and introduced species at each underpass during year one monitoring. ....	14
<b>Figure 3:</b> Average number of complete crossings/week recorded in spring/summer and winter at each site. n = 12 for each site. ....	14
<b>Figure 4:</b> Complete crossings/week in spring/summer and winter by all species on underpass floor and fauna furniture during year one operational phase monitoring. Sites 1 and 5 do not have fauna furniture installed. ....	16

# List of plates

Plate 1: Sand pad being installed in a fauna underpass on the WC2NH upgrade. ....	5
Plate 2: Example of a pitfall trap line installed during adjacent habitat surveys (L). Setting up traps in adjacent habitat at site 1 (R). ....	8
Plate 3: Koala tracks (L) recorded on sand pads at Site 4 and Brushtail possum tracks (R) during spring/summer monitoring. ....	10
Plate 4: Single cat responsible for the majority of complete crossings at Site 3. ....	15
Plate 5: Swamp wallaby recorded at site 5 during spring/summer monitoring. ....	15
Plate 6: Koala recorded moving east through site 9 (L) and 10 (R) on 9 September during spring/summer monitoring. ....	16
Plate 7: <i>Calypotis ruficauda</i> captured in a pitfall trap (L) and a sugar glider (L) captured in an arboreal Elliott during spring/summer. ....	19
Plate 8: A short-eared brushtail possum captured in a cage trap (L) and a fawn-footed melomys captured in a ground Elliot during spring/summer adjacent habitat trapping. ....	19

# 1. Introduction

In 2015, Transport for NSW (TfNSW), in conjunction with Acciona Ferrovia Joint Venture (AFJV), commenced the upgrade of the Pacific Highway between Warrell Creek and Nambucca Heads (WC2NH). The WC2NH project was opened to traffic in two stages:

- Stage 2a - 13.5km section from Lower Warrell Creek Bridge to Nambucca Heads opened on 18 December 2017; and
- Stage 2b - 6.25km section from the southern end of the project to the Lower Warrell Creek bridge opened on 29 June 2018.

Approvals for the WC2NH upgrade required monitoring of several species and mitigation measures during the operational phase. Species and mitigation measures targeted include koala, spotted-tailed quoll, grey-headed flying-fox, yellow-bellied glider, giant barred frog, green-thighed frog ponds, fauna underpasses, vegetated median, road-kill, exclusion fencing, and threatened flora. Sandpiper Ecological Surveys (Sandpiper) was contracted by TfNSW to deliver the WC2NH operational ecological and water quality monitoring program.

The objective of fauna underpass monitoring is “to assess use of underpasses by threatened and common fauna and to assess the effect of exclusion fencing on movement of small mammals, reptiles and frogs” (RMS 2018). Inspection of the exclusion fence occurs annually in winter and is reported in the annual report. Effectiveness of exclusion fence is also assessed in the annual road-kill report (see Sandpiper Ecological 2018, 2019)

The following interim report presents methods and results of the year two operational phase spring/summer (SS) underpass and adjacent habitat surveys. As the report is of an interim nature it includes a basic summary of results, and the discussion is limited to key points that should be considered prior to the next (winter) sampling event. Recommendations are also limited to actions that will benefit the next sampling event. A list of species names for fauna referred to in text and Tables is provided in Appendix A.

## 1.1 Background

The WC2NH upgrade features 23 fauna underpasses, including 13 box culverts, three pipe culverts and seven bridges. Underpasses targeted for monitoring were specified in the WC2NH Ecological Monitoring Program (EMP; Table 1) and include eleven box culverts and one bridge. Site five includes a dual cell box culvert with one cell designated as a wet passage (for aquatic fauna) and the other as dry passage. The dry cell includes a concrete ledge that provides dry passage for terrestrial fauna. Fauna underpasses were designed to target spotted-tailed quoll (*Dasyurus maculatus*), koala (*Phascolarctos cinereus*) and giant barred frog (*Mixophyes iteratus*). Giant barred frog is known to occur at site 1 (Upper Warrell Creek) only, whilst quoll and koala could occur at sites 2-12. Sites 9/10, and 11/12 consist of corresponding culverts on either side of a vegetated median.

**Table 1:** Underpasses sampled during operational phase monitoring of the WC2NH upgrade. SQ = spotted-tailed quoll; K = koala; GBF = giant barred frog; \* sites consists of dual cell 3x3m box culverts with one cell providing wet passage for aquatic fauna; P/A = presence/absence.

Site	Chainage	Type	Structure	Dimensions	Fauna Furniture (P/A)	Substrate	SQ	K	GBF
1	42500	Combined	Bridge		A	Soil			x
2	55120	Dedicated	Box Culvert	1 x 3000 x 3000	P	Concrete	x	x	
3	56410	Combined	Box Culvert	1 x 2400 x 2400	P	Concrete	x	x	
4	57770	Dedicated	Box Culvert	1 x 3000 x 3000	P	Mulch	x	x	

Site	Chainage	Type	Structure	Dimensions	Fauna Furniture (P/A)	Substrate	SQ	K	GBF
5	58510	Combined	Box Culvert	2 x 3000 x 3000*	A	Concrete	x	x	
6	58560	Dedicated	Box Culvert	1 x 3000 x 3000	P	Mulch	x	x	
7	59090	Dedicated	Box Culvert	1 x 3000 x 3000	P	Mulch	x	x	
8	59550	Dedicated	Box Culvert	1 x 3000 x 3000	P	Mulch	x	x	
9	59750 NB	Dedicated	Box Culvert	1 x 2400 x 2400	P	Mulch	x	x	
10	59760 SB	Dedicated	Box Culvert	1 x 2400 x 2400	P	Mulch	x	x	
11	60600 NB	Dedicated	Box Culvert	1 x 2400 x 2400	P	Mulch	x	x	
12	60610 SB	Dedicated	Box Culvert	1 x 2400 x 2400	P	Mulch	x	x	

## 1.2 Study area

The WC2NH project covers a total length of 19.75km and extends from Warrell Creek in the south to Nambucca Heads in the north (Figure 1). The alignment bypasses the town of Macksville and the northern section traverses Nambucca State Forest. Eleven underpasses are situated north of the Nambucca River and one (Site 1) is situated at Upper Warrell Creek near the southern extent of the project. Sites four to twelve adjoin Nambucca State Forest and sites two and three adjoin remnant vegetation on private land.

## 2. Methods

### 2.1 Timing and weather conditions

Spring/summer underpass monitoring was conducted between 22 September 2019 and 28 February 2020. The spring/summer sample period was characterised by warm humid conditions (Table 2). Dry warm conditions occurred from September through to January with a total of 194 mm of rainfall being recorded at the Bureau of Meteorology Bellwood weather station (059150) (Appendix B, Table B1). Warm and wet conditions occurred during February with the Bellwood station receiving 427 mm (Table 2, Appendix B, Table B1). Due to limitations in access and data availability air temperature, wind and relative humidity were collected from Coffs Harbour Airport (station 059151) (Appendix B, Table B1).

**Table 2:** Summary of weather conditions recorded at Coffs Harbour Airport (station 059151) and Bellwood weather station (059150) between 22 September 2019 and 28 February 2020.

Monitoring period	Total rainfall (mm)	No. rain days	Max wind gusts (kph)	Relative Humidity (%)	Max temp range (°C)	Min temp range (°C)
Spring/Summer	665	37	22-81kph	>60% on 90% of days	18.5-35.5	6.7-25



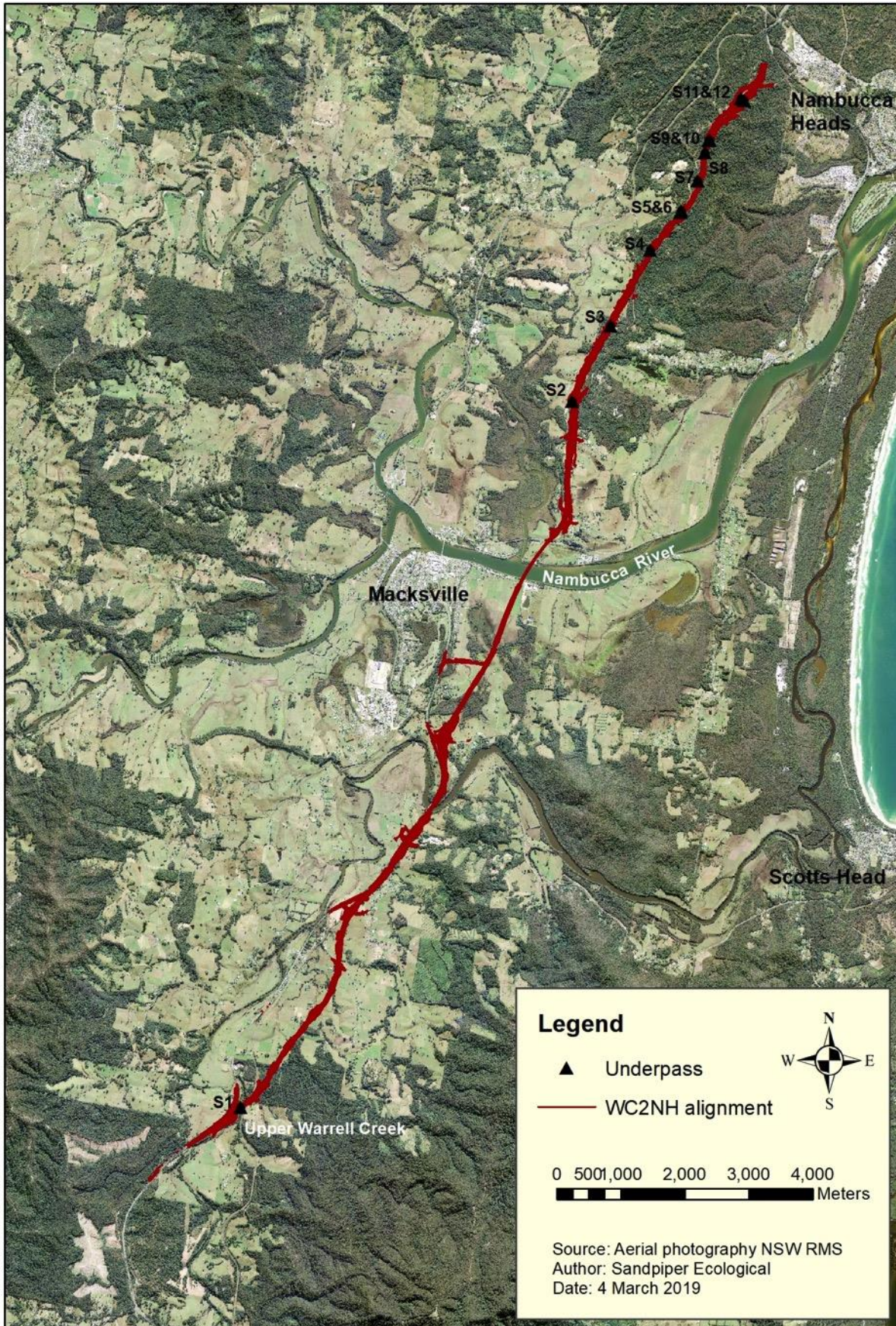


Figure 1: Location of underpass sample sites in relation to the WC2NH alignment.



## 2.2 Underpasses

### 2.2.1 Sand pads

During the spring/summer sample period, sand pads were installed on 15 October 2019. A 50:50 mix of brickies sand and washed beach sand was used for all sand pads. Two sand pads were installed at each site. In culverts, pads were installed 3-5m from each end, whilst at the bridge (site 1) one pad was installed on each side of Warrell Creek. Each pad was approximately 50mm deep by 1m wide and extended for the entire culvert width, or for 3m at site 1. At sites with a concrete ledge the pad covered both the floor and ledge (Plate 1). The exception was site 5 where the pad covered the ledge only due to standing water over the culvert floor.

Sand pads were inspected on eight consecutive days, 16 October to 23 October at all sites during the spring/summer sampling period. Inspections were conducted by an ecologist and included a systematic scan of each pad searching for fauna tracks. A small torch was used to illuminate the pad, if required. Information recorded included species or fauna group, number of traverses, direction of traverse and pad condition (good, moderate, poor). A complete crossing was recorded when the direction and number of traverses from a species or fauna group was consistent across both pads (east and west) at each site. Incomplete crossings were recorded when the traverse direction and number of track sequences was not consistent across both sand pads. Small fauna exhibit erratic movement making it difficult to accurately determine complete and incomplete crossings. Tracks were identified with reference to Triggs (2004) and advice from senior ecologists. Tracks that could not be identified insitu were photographed and referred to a senior ecologists for identification.



**Plate 2:** Sand pad being installed in a fauna underpass on the WC2NH upgrade.

## 2.2.2 Scat and track searches

Each underpass was searched by a senior ecologist and/or ecologist for scats and tracks on two occasions during the spring/summer sample period. The search involved a slow systematic traverse of each culvert using a hand-held spotlight (Led Lenser P14). Fauna furniture, the culvert floor, and joints were targeted. Areas of accumulated fine sediment were targeted for tracks. Tracks and scats were identified in-situ, with reference to Triggs (2004) and the ecologists experience, or photographed and sent to colleagues for identification.

## 2.2.3 Cameras

Two motion-activated infra-red cameras (Swift 3C or Swift Enduro) were installed centrally in each culvert, with the exception of site five where one camera was mounted centrally in each cell. At site 1, Reconyx HC500 cameras were initially attached to steel posts, and following theft, were housed in security boxes attached to large boulders. A single camera was installed at approximately 200mm above ground near the waters edge on each side of Upper Warrell Creek (site 1). In total, 24 cameras were installed. In underpasses, both cameras were installed centrally, one on the fauna furniture, and one approximately 300mm above the culvert floor. Cameras were oriented to the east except for site 1 which were oriented perpendicular to the creek on the north and south banks. Cameras at site 9 were re-oriented to the west following a high incidence of false triggers cause by traffic on the southbound carriageway. Swift cameras were set to take 10 seconds of video with no delay between activation. Reconyx cameras were set on time-lapse mode to take a picture at 1-minute intervals between 8 pm and 6 am each day throughout the spring/summer sample period. Time-lapse mode is better suited to targeting frogs and was used

successfully to monitor frog pipes on the Sapphire to Woolgoolga Pacific Highway Upgrade (Sandpiper Ecological 2017a, 2018a). Cameras at site 1 were inundated by floodwater on several occasions in February 2020.

During the spring/summer sample period, cameras at sites 2-12 were installed on 8 October, with cameras at site 1 installed on 9 October. Cameras at sites 1-12 were checked on 22 October and 18 November to download images and replace batteries if capacity was below 50%. Between 22 October and 18 November, all cameras at sites 1, 2, 3 and 6 (8 cameras) were stolen. Replacement cameras were reinstalled on 28 November at sites 2, 3, 6 and 22 January at site 1. Cameras from sites 2-12 were retrieved on 18 December 2019 following a total sample period of 70-71 days. Cameras at site 1 were retrieved on 28 February following a sample period of 49 days.

The total number of sample days in spring/summer was 1310 across all sites (Table 3). During which nine of the 24 cameras were active for less than the 60-day minimum sample period, with eight a result of theft and one (site 11 furniture) due to battery failure. Sampling days were further reduced at site 6 (14 days) and site 1 south (14 days) due to camera malfunction and flooding. The remaining 15 cameras were active for 70-71 days.

**Table 3:** Camera survey effort during year one operational phase monitoring.

Location	Cam location	Days active (Yr 2)		
		Spr/Sum	Winter	Total
1	North	34		34
	South	14		14
2	Furniture	20		20
	Floor	34		34
3	Furniture	34		34
	Floor	34		34
4	Furniture	71		71
	Floor	71		71
5	North	71		71
	South	71		71
6	Furniture	14		14
	Floor	14		14
7	Furniture	71		71
	Floor	71		71
8	Furniture	71		71
	Floor	71		71
9	Furniture	70		70
	Floor	71		71
10	Furniture	71		71
	Floor	71		71
11	Furniture	48		48
	Floor	71		71
12	Furniture	71		71
	Floor	71		71
Totals		1310		1310

## **Image review**

Images were uploaded to a computer and viewed using Windows Photo Viewer ©. A senior ecologist or ecologist reviewed all images, with reference to standard field guides (i.e. Menkhorst & Knight 2004; Pizzey & Knight 2007; Van Dyck *et al.* undated). Input from multiple ecologists was sought to identify some images.

Fauna were scored making a complete or incomplete crossing. A complete crossing was scored when an animal showed directional movement when detected by the centrally mounted camera. An incomplete crossing was scored when an animal showed no directional movement (i.e. remained stationary in front of camera) or passed the camera but returned within 10 minutes. Crossing definitions are consistent with those used at other Pacific Highway monitoring sites (e.g. Sandpiper Ecological 2017b, 2018b, 2019) and crossing structure research programs (e.g. Soanes *et al.* 2015). Further, it represents a conservative approach to identification of complete crossings.

Data recorded for each active image included: site, date, time, species, accuracy (definite 90%+ certainty, probable 75-90% certainty, and possible 60-75% certainty), movement direction (east, west, no directional movement (animal stationary, returned), number of images and image numbers. A hierarchical approach was adopted to species identification that included: species, genus or group. If a species could not be identified or assigned to a group, it was labelled as “unidentified species”. Microbats were recorded as presence only due to their transient nature and none reliance on underpasses for thoroughfare.

## **2.3 Adjacent habitat**

### **2.3.1 Survey design**

A total of 18 sites were sampled at the 12 underpasses as part of adjacent habitat surveys. Sample sites were established on each side of an underpass or underpass pair in the case of sites 5/6, 9/10 and 11/12. Adjacent habitat at sites 5 and 6 was sampled as one site as the underpass entrances were located within 50m of each other. Survey effort was reduced at site 3 due to concern about disturbing neighbours. No spotlighting or arboreal Elliott trapping occurred on the west side at site 3 and the diurnal active search was restricted to a small (100m x 30m) triangular shaped remnant of vegetation in the road reserve.

### **2.3.2 Trapping**

Trapping methods applied during the survey included: cage traps, ground Elliott traps (Type A), arboreal Elliott traps (Type B), pitfall traps, and hair funnels. Trapping occurred within a 1ha area immediately adjacent to each culvert entrance and was conducted over three nights at each site. A maximum of 10 sites were sampled concurrently and trapping was conducted between 14 and 20 November 2019 during the spring/summer sample.

Traps were set in a “X” formation with five ground and five arboreal traps set at 20m intervals on one axis and two cage traps and two hair funnels set at 50m spacing on the other axis (Plate 2). A line of three pitfall traps with drift fence was set at the intersection of both lines (Plate 2). Pitfall traps typically followed the contour and were set near fallen logs and dense ground cover. Trap effort is summarised in Table 4.





**Plate 3:** Example of a pitfall trap line installed during adjacent habitat surveys (L). Setting up traps in adjacent habitat at site 1 (R).

Arboreal traps and ground Elliott traps were baited with a peanut butter, honey and oats mixture. Arboreal traps were installed 1.8m above ground and attached to a bracket. Honey water was sprayed on the trunk above each arboreal trap, and bait was replaced as required. A plastic bag was placed over the end of each trap to provide cover, and a small amount of leaf litter was placed inside the trap. In spring/summer, arboreal traps were set on the western side of trees to provide shelter from the morning sun. Cage traps were set in a sheltered location and alternately baited with either peanut butter, honey and oats, or sardines. A tuna oil and water mix was sprayed around the entrance to cage traps baited with sardines. All traps were checked within four hours of sunrise. In spring/summer cage and Elliott traps were closed following the morning inspection and re-opened in the late afternoon. Pitfall traps were checked in the morning and again in mid-afternoon.

Captured fauna were identified to species or genus, and, where possible, sexed and aged. Fauna were identified with reference to standard field guides (Van Dyck *et al.* 2013; Menkhorst & Knight 2004; Wilson & Swan 2010). Fauna were not marked as the aim of sampling was to determine the range of species present in adjacent habitat.

### 2.3.3 Diurnal active search

Diurnal active searches were conducted by one or two ecologists and involved a meandering traverse of habitat within 100m of the underpass entrance at each sample site. Surveys involved searching leaf litter, rolling logs, observing reptile habitat (i.e. log piles, rocks, dense leaf litter) and looking for fauna signs such as scats and tracks. Each site was sampled twice during each sample period for a minimum of 30 person minutes/sample. Spring/summer diurnal active searches were conducted between 22 September and 21 October 2019. A total of 1080 person minutes were spent conducting diurnal active searches (Table 4).

### 2.3.4 Nocturnal active search

Nocturnal surveys were conducted on each side of each underpass on two non-consecutive nights during the spring/summer sample period. One or two ecologists conducted spotlight surveys for 60 person minutes per underpass side/sample period (Table 4). Surveys were conducted using hand-held Led Lenser

P14 spotlights and involved a meandering traverse of habitat within 200m of the culvert entrance. Fauna were detected by sight and call and identified to species or genus where possible. Spring/summer surveys were conducted between 3 October and 28 November 2019. A total of 1080 person minutes was spent conducting nocturnal active searches (Table 4).

### 2.3.5 Opportunistic records

Opportunistic observations of fauna near culvert entrances made whilst doing other monitoring activities such as koala, giant barred frog and yellow-bellied glider monitoring were recorded. All fauna observed whilst setting up equipment, with exception of birds, were also recorded.

**Table 4:** Survey effort for sampling adjacent habitat on the WC2NH upgrade in spring/summer 2019.

Component	Method / culvert side	No Samples	Total effort
Arboreal Elliott traps	5 x traps @ 20m spacing	3 nights/site	510 trap nights
Ground Elliott traps	5 x Type A Elliott traps @ 20m spacing	3 nights/site	540 trap nights
Cage traps	2 @ 50m spacing	3 nights/site	216 trap nights
Pitfall traps	1 x line of 3 pits with drift fence	3 nights/site	324 trap nights
Hair funnels	2 @ 50m spacing	14 nights/site	504 trap nights
Active diurnal search	30 person minute search at UP entrance	2 sample/site	1080 person minutes
Active nocturnal search	30 person minute search at UP entrance	2 samples/site	1080 person minutes

## 3. Results

### 3.1 Underpasses

#### 3.1.1 Sand pads

Ten species and ten fauna groups were recorded during sand pad monitoring (Table 5). Species diversity was found to be highest at site 7 (8 species/groups). Rodent spp. was the most commonly recorded fauna group with tracks (incomplete and complete crossings) identified in all underpasses except sites 1 and 8 (Table 5). Koala was recorded making a complete crossing on two occasions at site 4 (Table 5, Plate 3). *Trichosurus* spp. (Brushtail possum, Plate 3) and lace monitor were reported at six sites each, while wallaby spp. (including swamp and red-necked wallabies) were recorded making complete crossings at four sites (Table 5). Of the smaller fauna groups (small mammals, reptiles and amphibians), a small lizard was reported on one occasion at site 11 and *Antechinus* spp. was reported making three complete crossings at site 2 (Table 5).

Three introduced predator species cat, dog and red fox were confirmed using the underpasses (Table 5). Cat and fox recorded the highest number of complete crossings of individual species with 28 and 21 respectively (Table 5). Crossing completions by cats was highest at site 3 where 25 complete crossings were recorded (Table 5). Fox activity was highest at site 2 where 18 complete crossings were recorded (Table 5). Dog tracks were reported on one occasion at site 6 (Table 5).



**Plate 4:** Koala tracks (L) recorded on sand pads at Site 4 and Brushtail possum tracks (R) recorded during spring/summer monitoring.



**Table 5:** Species and groups of fauna recorded making complete and incomplete crossings during sand pad monitoring at 12 underpasses on the WC2NH upgrade in spring/summer of year two monitoring. C =complete crossing, I = Incomplete crossing. \* = Threatened species.

Species/group	1		2		3		4		5		6		7		8		9		10		11		12		Total sequences (C)	Total sequences (I)
	C	I	C	I	C	I	C	I	C	I	C	I	C	I	C	I	C	I	C	I	C	I	C	I		
Short-beaked echidna			1										2												3	0
<i>Antechinus</i> spp.			3																						3	0
Bandicoot spp.							3							2											5	0
Koala*							2																		2	0
<i>Trichosurus</i> spp.			1	1									2	3	1	1									7	2
Swamp wallaby													1												1	0
Red neck wallaby					1								2												3	0
Wallaby spp.			4		8								3		1										15	1
Macropod spp.	2																								2	0
Rodent spp.			1	1		1	2		14	9	1	3		1			6		2		4		1		31	15
House mouse																						1			0	1
Cat					25		1						1	1											28	0
Red fox	1		18		2					1															21	1
Dog											2														2	0
Lace monitor											1	1		2		3	1	3							10	1
<i>Lampropholis</i> spp.																					1				1	0
Medium reptile						4		1		1						2									8	0
Australian brush turkey													1												1	0
Waterbird spp.	1																								1	0
<b>Total species/group</b>	<b>3</b>	<b>0</b>	<b>5</b>	<b>2</b>	<b>4</b>	<b>1</b>	<b>4</b>	<b>0</b>	<b>2</b>	<b>2</b>	<b>4</b>	<b>1</b>	<b>8</b>	<b>1</b>	<b>4</b>	<b>2</b>	<b>4</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>144</b>	<b>21</b>

### 3.1.2 Scat and track searches

Nine species, and ten fauna groups were recorded during scat and track surveys in spring/summer of year two (Table 6). Site 8 reported the highest diversity of fauna species and groups with eight in total (Table 6). Sites 11, 12 and 1 reported three fauna groups/species or less (Table 6). Tracks or scats of rodent spp. were found in nine of the twelve culverts and was the most commonly recorded fauna across all sites (Table 6).

Native species/fauna groups were found to be using all culverts (Table 6). The most commonly recorded was wallaby spp. at sites 1 to 8, with lace monitor and bandicoot species reported at seven sites each (Table 6). Records of small fauna visitations to the underpasses included *Antechinus* spp. at sites 11 and 12, small and medium reptiles at sites 2, 3, 5 and 8, and a green-tree frog (*Litoria* spp.) scat was recorded at site 10 (Table 6, Appendix C, Table C8). Notably, koala tracks were recorded at site 4 on 28 November and at site 9/10 on 3 October (Appendix C, Table C8).

Introduced predators were recorded at 10 of the 12 underpasses, with no records at sites 8 and 11 (Table 6). Fox and cat were both reported at six sites each and dog at two sites (Table 6).

**Table 6:** Species and fauna groups recorded during track and scat surveys of 12 underpasses on the WC2NH upgrade. I = introduced species, \* = Threatened species SS = Spring/Summer, W = Winter (data to be collected).

Species/Group	Site																								
	1		2		3		4		5		6		7		8		9		10		11		12		
	SS	W	SS	W	SS	W	SS	W	SS	W	SS	W	SS	W	SS	W	SS	W	SS	W	SS	W	SS	W	
Short-beaked echidna															X										
<i>Antechinus</i> spp.			X				X				X		X						X		X			X	
Bandicoot spp.			X						X			X		X		X		X		X				X	
Koala*							X									X		X							
<i>Trichosurus</i> spp.													X												
Swamp wallaby													X												
Wallaby spp.	X		X		X		X		X		X		X		X										
Macropod spp.	X														X										
Microbat spp.							X																		
Rodent spp.			X		X		X		X		X		X		X		X		X						
Dog											X						X								
Fox <sup>I</sup>	X		X		X				X		X		X												
Cat <sup>I</sup>			X		X				X				X						X					X	
Lace monitor					X		X				X		X		X		X		X						
Medium lizard			X						X						X										
Small reptile					X				X																
<i>Litoria</i> spp.																			X						
Welcome swallow					X																				
Bird spp.																	X								
Total no. Species/groups	3		7		7		6		7		6		9		7		6		7		1		3		

### 3.1.3 Cameras

#### Species richness

Twenty species, two genera and six fauna groups were recorded during underpass camera monitoring in spring/summer of year two (Table 7) The highest fauna diversity was recorded at site 5 with ten species/groups, followed by site 7 (8 species/groups), and site 2 (7 species/groups). The lowest diversity was recorded at sites 11 and 6 with two species each. Koala was the only threatened species recorded, with individuals detected at sites 4, 9, and 10 (Table 7). Five introduced species were recorded. Cat and red fox were recorded at nine sites, house mouse at one site and black rat at seven sites (Table 7).

**Table 7:** Number of complete crossings per week recorded for each species and fauna group at 12 underpasses on the WC2NH upgrade in spring/summer of year two operational phase. I = introduced species SS = Spring/Summer; W = Winter. \* = Threatened species.

Species/ Groups	Site and Season																								Total
	1		2		3		4		5		6		7		8		9		10		11		12		
	S/S	W	S/S	W	S/S	W	S/S	W	S/S	W	S/S	W	S/S	W	S/S	W	S/S	W	S/S	W	S/S	W	S/S	W	
Short-beaked echidna			0.2										0.2												0.4
<i>Antechinus</i> spp.													0.6												0.6
Long-nosed bandicoot									0.1				0.1				0.1								0.3
Bandicoot spp.													0.1				0.3		0.8						1.2
Koala *							0.7										0.1		0.1						0.9
Short-eared brushtail possum									0.5				6.9		7.8		0.2		0.2						15.6
<i>Trichosurus</i> spp.													0.2		1				0.1						1.3
Eastern grey kangaroo					1																				1
Red-necked wallaby																	0.4								0.4
Swamp wallaby	0.2		4.5		2.9		0.1		0.7				0.1		0.6		0.2		0.2						9.5
Wallaby spp.			0.2		2.3								0.2		0.1										2.8
Macropod spp.			0.4		1.2										2										3.6
Swamp rat			0.2						0.1																0.3
Water rat									1																1
Rodent spp.									1.5																1.5
House mouse <sup>I</sup>									0.3														0.2		0.5
Black rat <sup>I</sup>						0.3		8.1		1		0.1					0.3		0.4				2.5		12.6
Bush rat								0.1																	0.1
Cat <sup>I</sup>			0.2		16.1		1						0.1		0.1		0.1		0.2		0.5		0.3		18.6
Dog <sup>I</sup>			0.4																						0.4
Fox <sup>I</sup>			5.1		1.9		0.1						0.1												7.2
Small mammal spp.	0.2								0.1																0.3
Lace monitor						2.6		0.3		1		0.6		3.1		0.4		0.9							8.8
Eastern water dragon								0.3										0.1		0.1		0.1			0.6
White-browed treecreeper																	0.1								0.1
Australian brush turkey													0.1												0.1
White faced heron	0.2																								0.2
<b>Total</b>	<b>0.6</b>		11.3		25.5		4.7		13		2		11.7		12.6		1.8		3.1		0.6		3.2		90.2

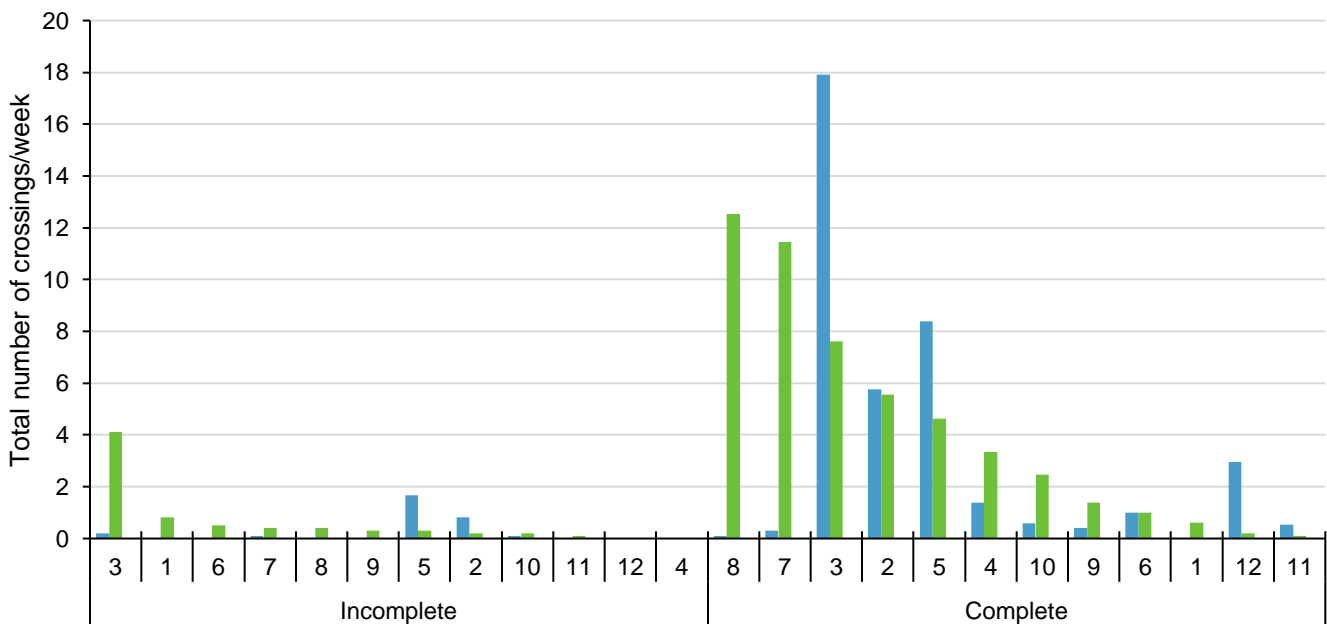
**Complete and incomplete crossings**

A total of 90.2 complete crossings (cc) were recorded across all underpass structures in spring/summer of year two (Table 7). Native fauna accounted for 56.5% (50.9cc/week) of complete crossings with introduced species accounting for 43.5% (39.3cc/week) (Table 7). Native species were recorded making more complete crossings than introduced species at Sites 1, 4, 6, 7, 8, 10 and 12 (Figure 2). Whereas, introduced species were recorded making more complete crossings than native species at sites 2, 3, 5, 9, and 11 (Figure 2). Complete crossings by native species were highest at sites 8 (12.52cc/week) and 7 (11.43cc/week) (Figure 2). While the highest number of complete crossings by introduced species was recorded at sites 3 (17.9cc/week) and 5 (8.4cc/week) (Figure 2).

Short-eared brushtail possum was the most common native species with 15.6 cc/week recorded across five sites (14.7cc/week at sites 7 and 8) (Table 2). Followed by, swamp wallaby with 9.5cc/week across nine sites (Plate 5) and lace monitor 8.8 cc/week across seven sites (Table 7). Small mammals recorded making complete crossings included water rat (1.0cc/week at site 5), *Antechinus* spp. (0.6cc/week at site 7), swamp rat (0.3cc/week between sites 2 and 5), and bush rat (0.1cc/week at site 5). Koala made 0.9cc/week with 0.7cc/week at site 4 and 0.1cc/week at sites 9 and 10 (Table 7).

Of the introduced species, two feral predators, cat and red fox made up 66% (cat = 18.6/week & fox = 7.2/week) of completed crossings (Table 7). Cat was most common at site 3 where 16.1cc/week was recorded. Most of these were attributable to one easily distinguished black and white cat (Appendix C, Table C2; Plate 4). Fox was most common at site two making 5.1cc/week (Table 7). Black rat was the second-most recorded introduced species with 8.1cc/week at site 5 and 2.5cc/week at site 12 (Table 7). Dog was also recorded at site 2 with 0.4cc/week and house mouse at site 5 and 12 with a combined 0.5cc/week (Table 7).

A total of 65 incomplete crossings were recorded over the spring/summer monitoring period (see Appendix C, Table C7). Site 3 reported the highest number of incomplete crossings/week (ic/week) for native species (4.1ic/week) with the remaining sites reporting less than 0.9 ic/week (Figure 2). Incomplete crossings were not recorded at site 4 or 12 (Figure 2).



**Figure 2:** Number of complete and incomplete crossings/week by native and introduced species at each underpass during spring/summer year two operation monitoring.



**Plate 5:** Single cat responsible for the majority of complete crossings at Site 3.



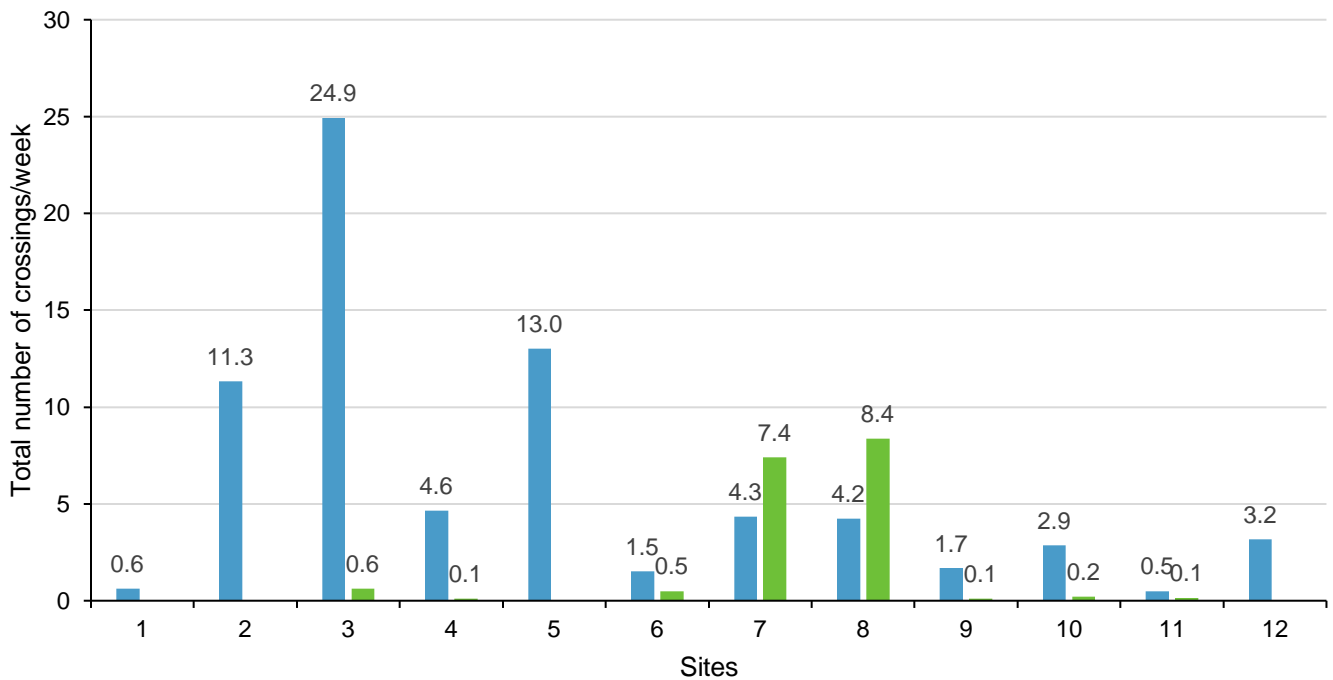
**Plate 6:** Swamp wallaby recorded at site 5 during spring/summer monitoring.



**Plate 7:** Koala recorded moving east through site 9 (L) and 10 (R) on 9 September during spring/summer monitoring.

**Use of floor and fauna furniture**

Fauna were recorded using both the underpass floor and fauna furniture. In total, 72.8 cc/week were recorded on the underpass floor compared to 17.4cc/week on fauna furniture (Table 8). No fauna were recorded using fauna furniture at sites 2 and 12, and sites 1 and 5 did not contain furniture (Figure 3). Use of the underpass floor was substantially greater than use of furniture across all sites except sites 7 and 8 where the reverse occurred (Figure 3). The result at both sites (7 and 8) was due to preferential use of furniture by short-eared brushtail possum. Other species to utilise the floor and furniture were water dragon, cat, and black rat (Table 8). Koalas were recorded using the culvert floor only, and *Antechinus* spp. were recorded on furniture only (Table 8).



**Figure 3:** Complete crossings/week in spring/summer by all species on underpass floor and fauna furniture during year two operational phase monitoring. Sites 1 and 5 do not have fauna furniture installed.



**Table 8:** Number of complete crossings/week made by each species/group at each of 12 underpasses monitored on the WC2NH upgrade in spring/summer 2019. Sites 1 and 5 did not contain fauna furniture. FI = Floor, FF = fauna furniture. I = introduced species. \* = Threatened species.

Species	Site and Camera location																						
	1		2		3		4		5	6		7		8		9		10		11		12	
	FI	FI	FF	FI	FF	FI	FF	FI	FI	FF	FI	FF	FI	FF	FI	FF	FI	FF	FI	FF	FI	FF	
Short-beaked Echidna		0.2										0.2											
<i>Antechinus</i> spp													0.6										
Northern brown bandicoot																		0.1				0.1	
Long-nosed bandicoot								0.1				0.1					0.1						
Bandicoot spp.												0.1					0.3		0.8				
Koala*							0.7										0.1		0.1				
Short-eared brushtail possum								0.5				0.3	6.6	0.4	7.4	0.2		0.1	0.1				
<i>Trichosurus</i> spp.												0.1	0.1		1			0.1					
Eastern grey kangaroo				1																			
Red-necked wallaby												0.4											
Swamp wallaby	0.2	4.5		2.9		0.1		0.7				0.1		0.6		0.2		0.2					
Wallaby spp.		0.2		2.3								0.2		0.1									
Macropod spp.		0.4		1.4								2											
Bush rat								0.1															
Water rat								1															
Swamp rat		0.2						0.1															
Rodent spp.								1.5															
Black Rat <sup>I</sup>						0.3		8.1	1			0.1			0.3		0.3	0.1				2.5	
House mouse <sup>I</sup>								0.3														0.2	
Cat <sup>I</sup>		0.2		15.4	0.6	1						0.1		0.1		0.1		0.2		0.4	0.1	0.3	
Fox <sup>I</sup>		5.1		1.9		0.1						0.1											
Dog <sup>I</sup>		0.4																					
Small mammal spp.	0.2							0.1															
Eastern water dragon								0.3										0.1		0.1		0.1	
Lace monitor						2.5	0.1	0.3	0.5	0.5	0.6		3.1		0.4		0.9						
Australia brush turkey											0.1												
Treecreeper spp.																0.1							
White-faced heron	0.2																						
<b>Total</b>	<b>0.6</b>	<b>11.3</b>	<b>0</b>	<b>24.9</b>	<b>0.6</b>	<b>4.6</b>	<b>0.1</b>	<b>13</b>	<b>1.5</b>	<b>0.5</b>	<b>4.3</b>	<b>7.4</b>	<b>4.2</b>	<b>8.4</b>	<b>1.7</b>	<b>0.1</b>	<b>2.9</b>	<b>0.2</b>	<b>0.5</b>	<b>0.1</b>	<b>3.2</b>	<b>0</b>	

### 3.2 Adjacent habitat

Thirty-two species and a further nine fauna groups were recorded in habitat adjoining underpasses (Table 9). The majority of species/groups (28 in total) were detected by diurnal and nocturnal active searches (Table 9). During trapping surveys, a total of 14 species were identified while hair funnels reported a total of seven fauna groups and species (Table 9). Several threatened species were recorded during spotlight surveys of adjacent habitat, including grey-headed flying fox on 17 occasions, koala on the eastern side of site 4 and giant barred frog at site 1 (Appendix C, Table C4).

A total of 66 individuals were captured during the spring/summer survey (Appendix C, Table C5). Sugar glider, fawn-footed melomys and black rat were captured in arboreal Elliott traps (Plates 8 & 9). Eight species, two mammals, five reptiles and one frog were captured in pitfall traps, and five species including brown antechinus, sugar glider, fawn-footed melomys, bush rat and black rat were captured in ground Elliott traps. During spring/summer trapping seven individuals were captured in cage traps (including four short-eared brushtail possum & three northern brown bandicoot), 22 in ground Elliott traps, 15 in pitfall traps and five in arboreal Elliott traps (Plate 8).

During spring/summer trapping, fawn-footed melomys was the most commonly captured species, with 22 individuals, followed by brown antechinus (10 individuals); black rat (four individuals) and bush rat (three individuals). Remaining species and groups reported two individuals or less.

**Table 9:** Species of vertebrate recorded during surveys of adjacent habitat in spring/summer 2019. SS = Spring/Summer, W = Winter. \* = Threatened species. E= Endangered species. † denotes threatened species; ‡ = Introduced species.

Species	Active Search		Spotlight		Ground Elliott trap		Arboreal Elliott trap		Cage trap		Pitfall trap		Hair funnel	
	SS	W	SS	W	SS	W	SS	W	SS	W	SS	WW	SS	W
<b>Mammals</b>														
Short-beaked echidna	*													
Brown antechinus					*							*		
<i>Antechinus</i> spp.														*
Northern brown bandicoot			*						*					*
Long-nosed bandicoot			*											*
Peramelidae spp. (bandicoot)	*		*											
Sugar glider			*		*		*							
Koala*			*											
Short-eared brushtail possum									*					
<i>Trichosurus</i> spp.														*
Wallaby spp.	*													
Swamp wallaby			*											*
Macropodidae spp.			*											
Grey-headed flying fox *			*											
<i>Pteropus</i> spp.			*											
Fawn-footed melomys					*		*							*
Bush rat					*									*
House mouse †												*		
Black rat †					*		*							*
Red fox †	*													
Cat †			*											
<b>Reptiles</b>														
Burton's legless lizard	*													
Eastern water dragon	*		*											
Agamid spp.	*													
<i>Calyptotis ruficauda</i>												*		
<i>Lampropholis delicata</i>												*		
<i>Lampropholis</i> spp.	*													
Yellow-faced whipsnake	*													
Dwarf Crowned Snake												*		



Species	Active Search		Spotlight		Ground Elliott trap		Arboreal Elliott trap		Cage trap		Pitfall trap		Hair funnel	
	SS	W	SS	W	SS	W	SS	W	SS	W	SS	WW	SS	W
Blackish blind snake											*			
Black-bellied swamp snake	*										*			
Bandy-bandy			*											
<b>Frogs</b>														
<i>Litoria fallax</i>			*											
<i>Litoria peronii</i>			*											
<i>Adelotus brevis</i>	*		*											
<i>Limnodynastes peronii</i>			*											
<i>Mixophyes iteratus</i> <sup>E</sup>			*											
<i>Crinia signifera</i>			*											
<i>Pseudophryne coriacea</i>			*								*			
<b>Total N° Species/groups</b>	<b>11</b>		<b>20</b>		<b>5</b>		<b>3</b>		<b>2</b>		<b>8</b>		<b>7</b>	



**Plate 8:** *Calyptotis ruficauda* captured in a pitfall trap (L) and a sugar glider (L) captured in an arboreal Elliott during spring/summer.



**Plate 9:** A short-eared brushtail possum captured in a cage trap (L) and a fawn-footed melomys captured in a ground Elliot during spring/summer adjacent habitat trapping.

### 3.3 Species recorded in underpasses and adjacent habitat

In spring/summer 2019 39 species/fauna groups were recorded in adjacent habitat and 32 in underpasses (Table 10). Excluding birds, 43% of species/groups recorded in adjacent habitat were recorded in underpasses. Red-necked wallaby, swamp rat, water rat, lace monitor, dog and green tree frog were recorded in underpasses only (Table 10). If these species are assumed to also reside in adjacent habitat the proportion of species in adjacent habitat that utilise underpasses increases to 51%. Green tree frog was the only species of amphibian reported using underpasses, while seven were reported in adjacent habitat (Table 10). Further, of the 12 reptile species/families recorded during monitoring, only two (lace monitor and eastern water dragon) were confirmed using underpasses (Table 10).

**Table 10:** Species and fauna groups recorded using underpasses by all methods and those recorded in adjacent habitat. \* denotes threatened species. E= Endangered species. I = Introduced species; SS = spring/summer; W = winter

Species	Adjacent habitat		Underpass	
	SS	W	SS	W
Mammals				
Short-beaked echidna	*		*	
Brown antechinus	*			
<i>Antechinus</i> spp.	*		*	
Northern brown bandicoot	*		*	
Long-nosed bandicoot	*		*	
Peramelidae spp. (bandicoot)	*		*	
Sugar glider	*			
Koala*	*		*	
Short-eared brushtail possum	*		*	
<i>Trichosurus</i> spp.	*		*	
Wallaby spp.	*		*	
Swamp wallaby	*		*	
Red-neck wallaby			*	
Macropodidae spp.	*		*	
Grey-headed flying fox *	*			
<i>Pteropus</i> spp.	*			
Microbat spp.			*	
Fawn-footed melomys	*			
Rodent spp.			*	
Swamp rat			*	
Water rat			*	
Bush rat	*		*	
House mouse <sup>I</sup>	*		*	
Black rat <sup>I</sup>	*		*	
Dog <sup>I</sup>			*	
Red fox <sup>I</sup>	*		*	
Cat <sup>I</sup>	*		*	
Reptiles				
Burton's legless lizard	*			
Lace monitor			*	
Eastern water dragon	*		*	
Agamid spp.	*			
Small lizard			*	
Medium Lizard			*	
<i>Calyptotis ruficauda</i>	*			
<i>Lampropholis delicata</i>	*			
<i>Lampropholis</i> spp.	*			
Yellow-faced whipsnake	*			
Dwarf Crowned Snake	*			
Blackish blind snake	*			
Black-bellied swamp snake	*			
Bandy-bandy	*			
Frogs				
<i>Litoria fallax</i>	*			

Species	Adjacent habitat		Underpass	
	SS	W	SS	W
<i>Litoria peronii</i>	*			
<i>Adelotus brevis</i>	*			
<i>Limnodynastes peronii</i>	*			
<i>Mixophyes iteratus</i> <sup>£</sup>	*			
<i>Crinia signifera</i>	*			
<i>Pseudophryne coriacea</i>	*			
Green tree frog			*	
Birds				
Australia brush turkey			*	
White faced heron			*	
Purple-swamp hen			*	
Welcome swallow			*	
Treecreeper spp.			*	
<b>Total N<sup>o</sup> Species/groups</b>	<b>39</b>		<b>32</b>	<b>0</b>

## 4. Discussion

Interim results from year 2 spring/summer operational phase monitoring are dot pointed with reference to the indicators of success specified in the Ecological Monitoring Program (RMS 2018).

### 4.1 Low rates of use of fauna underpasses and adjacent habitats by feral predators

- Evidence of feral predators using underpasses was apparent with cat, red fox and dog recorded making complete crossings at nine of the 12 sites.
- Rates of feral predator underpass usage were not consistent throughout the study area. Higher usage rates by feral predators were recorded at sites 2 and 3. Crossings by red fox peaked at site 2 with 5.1/week, and crossings by cat peaked at site 3 with 16.1cc/week. The majority of cat crossings at site 3 were by one distinctive individual.
- Higher usage by feral predators at sites 2 and 3 is not unexpected as both sites are situated in a fragmented agricultural landscape.
- Given the high use of the underpass at site 3 by one easily distinguished cat it is likely that targeted trapping could reduce cat crossings.
- Removal of two cats from the locality in winter 2019 may have reduced cat activity around some culverts.

### 4.2 High levels of fauna underpass use by a variety of native species

- Native species regularly frequented underpasses in the study area recording 50.96cc/week across all sites. This accounted for 56.5% of all complete crossings during spring/summer monitoring.
- A total of 16 native species and a further three native fauna groups (*Antechinus* spp, *Trichosurus* spp. and *Bandicoot* spp.) were recorded making complete crossings.
- The inclusion of broad groups makes it difficult to be definitive in determining how many species from adjacent habitat have used underpasses. Most of the individuals attributed to Genera, Families and Groups would be species that were confirmed during trapping surveys. For example, *Trichosurus* spp. would be either short-eared or common brushtail possum, rodent spp. would most likely be bush rat, black rat or fawn footed melomys. Methods like sand pads only allow identification to the group level for some fauna and contribute substantially to the inclusion of broad groups such as small reptile and macropod spp.

### 4.3 No change to densities, distribution, habitat use and movement patterns compared to baseline population data of target species.

- The target species for underpass monitoring, as outlined in the project brief, are spotted-tailed quoll, koala and giant barred frog. No spotted-tailed quolls were detected during spring/summer year two, consistent with baseline monitoring (GeoLink 2014). Spotted-tailed quolls occur in low densities in northern NSW and the absence of records in underpasses is not unexpected.
- Koalas occur in low densities in Nambucca State Forest and small numbers of individuals were recorded near the alignment during baseline (1 individual), construction phase (3 individuals), and year one operational phase (3 individuals) surveys (GeoLink 2014; Geolink 2017; Sandpiper Ecological 2019b).
- Koalas were recorded using underpasses at sites 4, 9 and 10 during both sand pad and camera monitoring. However, there is no substantive baseline data to confirm if changes in habitat use and movement patterns have occurred. Results to date are encouraging as they suggest that koalas continue to maintain territory on both sides of the alignment.
- Giant barred frogs were detected in adjacent habitat at site 1 but not recorded on underpass cameras. Improved habitat connectivity beneath the Warrell Creek bridge in conjunction with significant rainfall events and reduced human disturbance may increase giant barred frog movement beneath the highway. Further monitoring is required to confirm if the species can rebound to previous population levels Sandpiper Ecological 2019c.

### 4.4 Evidence of use by dispersing individuals and different age cohorts

- Accurately confirming age of individuals using underpasses is difficult using surveys methods outlined in the EMP.
- Immature short-eared brushtail possums, following adults, were regularly recorded making complete crossings at sites 7 and 8 with two records at site 5.

### 4.5 Use by cover-dependent species with low mobility

- Several cover-dependent species (typically small mammals, reptiles and frogs) were recorded in adjacent habitat including eight frog species, three native mammals (brown antechinus, fawn-footed melomys and bush rat) and eight reptile species. Comparatively, in underpasses additional small mammal species were recorded including the cover dependent swamp rat, and the water rat. Consistent with previous surveys there were limited records of reptiles and amphibians in underpasses.
- Low occurrence of frogs and reptiles may be attributed to reduced camera detection. This issue may be overcome by installing temporary cover in underpasses such as roof/floor tiles.
- While confirmed underpass use by small mammals is encouraging, records still remain relatively sparse. Use by cover dependent species, such as antechinus is likely to improve as vegetation grows and matures at culvert entrances. At present, revegetation near underpass entrances is in poor condition owing to ongoing finishing works and drought.

### 4.7 Underpass survey effort

- Underpass survey effort was compromised due to theft of all cameras at sites 1,2,3 and 6 during the spring/summer sample.

## 5. Recommendations

1. Targeted trapping for cats should be conducted in high use underpasses during the winter 2020 survey. Sites 2 and 3 should be target sites.
2. Actively manage revegetation of underpass aprons, mulch around plants to retain moisture, replace dead plants and exclude people and machinery where possible.
3. Install two roof tiles at each of the WC2NH underpasses. Tiles would be inspected during each subsequent sample event as part of the existing contract and monitor these during the winter 2020 survey.
4. Install additional signage at culverts regarding the intent of monitoring and investigate further anti-theft measures to ensure data from camera monitoring events is not lost.

## 6. References

GeoLink (2014) Warrell Creek to Nambucca Heads Pacific Highway Upgrade, Koala Management Plan. Report prepared for Roads and Maritime service NSW.

GeoLink (2014) Warrell Creek to Nambucca Heads Pacific Highway Upgrade, Spotted-tailed Quoll Management Plan. Report prepared for Roads and Maritime service NSW.

Gagnon, J. W. Dodd, N. L., Ogren, K. S. & Schweinsburg, R. E. (2011). Factors associated with use of wildlife underpasses and the importance of long-term monitoring. *Journal of Wildlife Management*: **75**, 1477-1487.

Menkhorst, P. & Knight, F. (2004). *A field guide to the mammals of Australia*. Oxford University press, Melbourne.

Pizzey, G. & Knight, F. (2007). *The field guide to the birds of Australia*. Harper Collins, Sydney.

RMS (2018). *Warrell Creek to Nambucca Heads Operational Ecological and Water Quality Monitoring Brief*. NSW Government.

Sandpiper Ecological (2017a). Pacific Highway Upgrade – Sapphire to Woolgoolga: operational phase fauna monitoring year 1 – Greys Dam Frog Pipes. Report prepared for Roads and Maritime Services.

Sandpiper Ecological (2017b). Pacific Highway Upgrade – Glenugie: operational phase fauna crossing monitoring program (years 1-3). Report prepared for NSW Roads and Maritime Services.

Sandpiper Ecological (2018a). Sapphire to Woolgoolga Pacific Highway Upgrade: operational phase fauna crossing monitoring program years 1-3. Report prepared for NSW Roads and Maritime Services.

Sandpiper Ecological (2018b). Pacific Highway Upgrade – Warrell Creek to Nambucca Heads operational phase road-kill monitoring – annual report. Report prepared for NSW Roads and Maritime Services.

Sandpiper Ecological (2019a). Pacific Highway Upgrade – Warrell Creek to Nambucca Heads operational phase road-kill monitoring – summer 2019. Report prepared for NSW Roads and Maritime Services.



Sandpiper Ecological (2019b). Pacific Highway Upgrade – Warrell Creek to Nambucca Heads operational phase koala monitoring – year one operational phase. Report prepared for NSW Roads and Maritime Services.

Sandpiper Ecological (2019c). Pacific Highway Upgrade – Warrell Creek to Nambucca Heads giant barred frog (*Mixophyes iteratus*) monitoring program – year 1 operational phase. Report prepared for NSW Roads and Maritime Services.

Sandpiper Ecological (2019d). Pacific Highway Upgrade –Nambucca Heads to Urunga underpass and vegetated median monitoring program monitoring – year 2 operational phase. Report prepared for NSW Roads and Maritime Services.

Soanes, K., Vesk, P. A. and van der Ree, R. (2015). Monitoring the use of road-crossing structures by arboreal marsupials: insights gained from motion-triggered cameras and passive integrated transponder (PIT) tags. *Wildlife Research*: 10.107.

Triggs, B. (2004). *Tracks, scats and other traces: a field guide to Australian mammals*. Oxford University Press, Melbourne.

Wilson, S. & Swan, G. (2010). *A complete guide to reptiles of Australia*. New Holland, Sydney.

Van Dyck, S., Gynther, I. & Baker, A. (2013). *Field companion to the mammals of Australia*. New Holland, Sydney.

# Appendix A – Species list

**Table A1:** Common and scientific names for all species recorded during year two monitoring at WC2NH. ^ = Threatened species.

Common Name	Scientific Name
Koala <sup>^</sup>	<i>Phascolarctos cinereus</i>
Swamp wallaby	<i>Wallabia bicolor</i>
Red-necked wallaby	<i>Macropus rufogriseus</i>
Wallaby spp.	
Eastern grey kangaroo	<i>Macropus giganteus</i>
	<i>Macropodidae spp.</i>
Short-beaked echidna	<i>Tachyglossus aculeatus</i>
Yellow-bellied glider <sup>^</sup>	<i>Petaurus australis</i>
Sugar glider	<i>Petaurus breviceps</i>
	<i>Petaurus spp.</i>
Feathertail glider	<i>Acrobates pygmaeus</i>
Short-eared brushtail possum	<i>Trichosurus caninus</i>
Common brushtail possum	<i>Trichosurus vulpecula</i>
Brushtail possum spp.	<i>Trichosurus spp.</i>
Common ringtail possum	<i>Pseudocheirus peregrinus</i>
Northern brown bandicoot	<i>Isodon macrourus</i>
Long-nosed bandicoot	<i>Perameles nasuta</i>
Bandicoot species	<i>Peramelidae spp.</i>
Fawn-footed melomys	<i>Melomys cervinnipes</i>
	<i>Melomys spp.</i>
Water rat	<i>Hydromys chrysogaster</i>
Bush rat	<i>Rattus fuscipes</i>
Murid spp.	<i>Muridae spp.</i>
Brown antechinus	<i>Antechinus stuartii</i>
	<i>Antechinus spp.</i>
Long-nosed potoroo <sup>^</sup>	<i>Potorous tridactylus</i>
Grey-headed flying fox <sup>^</sup>	<i>Pteropus poliocephalus</i>
Flying fox spp.	<i>Pteropus spp.</i>
Bent-wing spp.	<i>Miniopterus spp.</i>
Small mammal spp.	
	<i>Dasyuridae spp.</i>
Eastern crevice skink	<i>Egernia mcphieii</i>
Garden skink	<i>Lampropholis delicata</i>
Grass skink	<i>Lampropholis guichenoti</i>
	<i>Lampropholis spp.</i>
Red-tailed calyptotis	<i>Calyptotis ruficauda</i>
Eastern water-skink	<i>Eulamprus quoyii</i>
Three-toed skink	<i>Saiphos equalis</i>
Skink spp.	<i>Scincidae spp.</i>
Coastal carpet python	<i>Morelia spilota</i>
Red-bellied black snake	<i>Pseudechis porphyriacus</i>
Yellow-faced whipsnake	<i>Demansia psammophis</i>
Black-bellied swamp snake	<i>Hemiaspis signata</i>
Blackish blind snake	<i>Anilius nigrescens</i>
Bandy bandy	<i>Vermicella annulata</i>
Coastal carpet python	<i>Morelia spilota</i>
Burton's legless lizard	<i>Lialis burtonis</i>
Lace monitor	<i>Varanus varius</i>
Eastern water dragon	<i>Intellagama lesueurii</i>
	<i>Agamid spp.</i>
Freshwater turtle spp.	<i>Chelidae spp.</i>
Medium reptile spp.	
Small reptile spp.	
Small snake spp.	
Pacific black duck	<i>Anas superciliosa</i>
Pheasant coucal	<i>Centropus phasianinus</i>
Intermediate egret	<i>Ardea intermedia</i>
Tawny frogmouth	<i>Podargus strigoides</i>
Owlet-nightjar	<i>Aegotheles</i>

Common Name	Scientific Name
Little eagle^	<i>Hieraaetus morphnoides</i>
Eastern osprey^	<i>Pandion haliaetus</i>
Glossy Black Cockatoo^	<i>Calyptorhynchus lathami</i>
White-throated treecreeper	<i>Cormobates leucophaea</i>
Green catbird	<i>Ailuroedus crassirostris</i>
Eastern yellow robin	<i>Eopsaltria australis</i>
Eastern whipbird	<i>Psophodes olivaceus</i>
Water bird spp.	
Medium bird spp.	
Small bird spp.	
Eastern dwarf tree frog	<i>Litoria fallax</i>
Tyler's tree frog	<i>Litoria tyleri</i>
Red-eyed tree frog	<i>Litoria chloris</i>
Green tree frog	<i>Litoria cerulea</i>
Dusky toadlet	<i>Uperolia fusca</i>
	<i>Uperolia spp.</i>
Tusked frog	<i>Adelotus brevis</i>
Common eastern froglet	<i>Crinia signifera</i>
Great barred frog	<i>Mixophyes fasciolatus</i>
Giant barred frog^	<i>Mixophyes iteratus</i>
Striped marsh frog	<i>Limnodynastes peronii</i>
Red-backed toadlet	<i>Pseudophryne coriacea</i>
Medium frog spp.	
Frog spp.	
Cat	<i>Felis catus</i>
Red fox	<i>Vulpes vulpes</i>
Black rat	<i>Rattus rattus</i>
European hare	<i>Lepus europaeus</i>
House mouse	<i>Mus musculus</i>



## Appendix B – Weather and climatic conditions

**Table B1:** Weather during the spring/summer monitoring period. Rainfall taken from the BOM weather station at Bellwood (059150). Air temperature, wind and relative humidity collected from Coffs Harbour Airport (station 059151).

Date	MINIMUM Air Temperature (°C)	MAXIMUM Air Temperature (°C)	TOTAL Rain Gauge (mm)	AVERAGE Wind Direction DESCRIPTION	MAXIMUM Wind Speed (km/h)	9am Relative Humidity (%)
22/09/2019	18	26.7	0	SE		64
23/09/2019	16	22	4	SE	26	90
24/09/2019	11.2	20.7	0	SW	30	58
25/09/2019	11.8	22	0	NE	39	61
26/09/2019	14.1	22.7	0	NE	54	89
27/09/2019	10.9	25.3	0	NNE	37	72
28/09/2019	10.4	28.3	0	SSW	57	32
29/09/2019	9.7	21.5	0	NE	35	62
30/09/2019	11.8	22	0	SE	41	73
1/10/2019	13.9	20.7	4	SSE	31	81
2/10/2019	12.1	22.3	0	NE	41	54
3/10/2019	14.2	24.1	0	NE	46	54
4/10/2019	11.7	25.5	0	NE	46	44
5/10/2019	16.7	21.7	0	SW	48	76
6/10/2019	16.6	23.5	0			73
7/10/2019	15.7	28.4	0	NE	41	63
8/10/2019	14.3	22.3	0	SSW	46	96
9/10/2019	9.1	21	0	SSE	50	43
10/10/2019	12.4	20.9	0	SW	44	54
11/10/2019	10.4	19.3	0	ESE	31	82
12/10/2019	11.5	18.5	14	SW	31	83
13/10/2019	12.7	21	6	SW	43	77
14/10/2019	10.2	22.2	7	NE	37	64
15/10/2019	14.7	25.4	0	NE	46	77
16/10/2019	15.3	26.6	0	S	69	65
17/10/2019	18.3	32.8	7	NNW	50	73
18/10/2019	12.1	23.2	0	SSW	31	32
19/10/2019	13	25	0	NNE	33	60
20/10/2019	14.7	22.6	0	SW	54	59
21/10/2019	10.9	22.1	0	SE	28	62
22/10/2019	10	22.8	0	ESE	26	59
23/10/2019	12	24.3	0	NE	44	68
24/10/2019	13.8	25.2	0	NNE	54	57
25/10/2019	14.1	26.3	0	NE	56	56
26/10/2019	18.4	28.7	0	NNE	63	44
27/10/2019	16.5	23.9	0	SW	37	55
28/10/2019	12.5	24.3	0	ESE	28	67

Date	MINIMUM Air Temperature (°C)	MAXIMUM Air Temperature (°C)	TOTAL Rain Gauge (mm)	AVERAGE Wind Direction DESCRIPTION	MAXIMUM Wind Speed (km/h)	9am Relative Humidity (%)
29/10/2019	12.7	24.4	0	NE	44	60
30/10/2019	17.4	26	0	NNE	54	63
31/10/2019	15.9	25	0	NNE	52	61
1/11/2019	17.1	24.9	0	NE	48	58
2/11/2019	17.4	25.4	0	NNE	54	62
3/11/2019	18.9	27.8	0	NNE	72	60
4/11/2019	19.1	28.8	2	N	33	59
5/11/2019	13.9	22	0	S	65	71
6/11/2019	12.4	24.4	3	N	35	48
7/11/2019	10.9	30.2	0	NE	48	34
8/11/2019	12	34.3	0	WSW	44	19
9/11/2019	17.3	22.4	0	S	63	52
10/11/2019	6.7	24.9	0	ENE	33	31
11/11/2019	10.6	23.8	0	NE	41	66
12/11/2019	16.1	30.3	0	NE	54	55
13/11/2019	13.4	23.1	0	S	57	66
14/11/2019	13.3	24.1	0	SE	22	68
15/11/2019	14.7	26.3	0	NNE	48	69
16/11/2019	11.2	24.8	0	SW	41	57
17/11/2019	15.1	24.4	0	WSW	54	73
18/11/2019	14.5	24.4	0	NE	44	69
19/11/2019	16.7	26.5	0	N	39	54
20/11/2019	16.2	25.7	0	SSW	37	57
21/11/2019	17.7	27.6	0	NNE	70	68
22/11/2019	20.6	32	0	NNE	70	42
23/11/2019	20.5	26.1	0	NNE	61	65
24/11/2019	17.7	25.8	0	NNE	37	75
25/11/2019	20.7	27.3	0	NNE	67	67
26/11/2019	17.7	31.2	0	NNE	61	59
27/11/2019	18.2	24.2	1	S	48	43
28/11/2019	14.6	25.6	0	NE	50	65
29/11/2019	21	27.7	0	NE	61	81
30/11/2019	21.4	30.3	0	SW	72	74
1/12/2019	19.9	27.5	16	NE	35	78
2/12/2019	18.7	31.2	6	WSW	65	56
3/12/2019	12.6	25.8	0	NNE	54	27
4/12/2019	10.5	27.4	0	NNE	43	31
5/12/2019	11.8	30	0	NE	30	44
6/12/2019	11.8	34.1	0	NNE	43	26
7/12/2019	14.3	26.2	0	S	41	55
8/12/2019	13.8	26.8	0	ESE	28	67

Date	MINIMUM Air Temperature (°C)	MAXIMUM Air Temperature (°C)	TOTAL Rain Gauge (mm)	AVERAGE Wind Direction DESCRIPTION	MAXIMUM Wind Speed (km/h)	9am Relative Humidity (%)
9/12/2019	16.4	27.7	0	NE	50	67
10/12/2019	23.3	29.5	0	NNE	57	66
11/12/2019	21.8	24	0	N	54	86
12/12/2019	21	25.8	0	SSW	35	79
13/12/2019	19.3	24	7	SSE	35	95
14/12/2019	19.3	27.2	0	WSW	30	77
15/12/2019	19.2	28.4	0	NNE	37	74
16/12/2019	17.6	28.6	0	S	61	50
17/12/2019	18.3	25.6	0	SW	37	60
18/12/2019	16	25.7	0	ENE	35	56
19/12/2019	19.1	28.7	0	NNE	63	54
20/12/2019	18.8	27.2	0	WSW	35	72
21/12/2019	17.9	27.6	0	NNE	56	67
22/12/2019	21.9	25.5	0	S	57	85
23/12/2019	19.5	27.3	0	WSW	39	65
24/12/2019	21.7	27.4	1	NE	48	79
25/12/2019	20.7	25.9	8	ESE	33	81
26/12/2019	16.9	26.4	4	E	28	93
27/12/2019	16.9	27.4	0	E	31	58
28/12/2019	15	27.8	0	NE	43	53
29/12/2019	18.3	29.3	0	NE	54	55
30/12/2019	20.9	28.8	0	NNE	59	58
31/12/2019	21.6	30	0	NNE	69	55
1/01/2020	22	28.3	0	NNE	67	64
2/01/2020	20.9	28.3	0	NE	46	67
3/01/2020	21.9	28	0	NNE	54	65
4/01/2020	21.5	29.2	0	NNE	63	57
5/01/2020	21.5	28	0	SSW	57	68
6/01/2020	21.5	28.1	0	SSW	35	69
7/01/2020	22.6	29.4	0	NE	44	71
8/01/2020	22.7	30.7	0	NE	56	59
9/01/2020	20.5	30	0	ENE	37	61
10/01/2020	20.1	30.1	0	NNE	67	63
11/01/2020	25	34.5	0	SSE	54	61
12/01/2020	19.2	26.2	3	SSE	41	92
13/01/2020	18.2	27.3	0	S	31	66
14/01/2020	19.2	26.4	0	SW	28	74
15/01/2020	20.5	28.5	0	ENE	26	83
16/01/2020	23.6	30.5	0	NE	54	67
17/01/2020	20.7	24.9	4	NNE	35	83
18/01/2020	20.7	24.4	12	WSW	26	91

Date	MINIMUM Air Temperature (°C)	MAXIMUM Air Temperature (°C)	TOTAL Rain Gauge (mm)	AVERAGE Wind Direction DESCRIPTION	MAXIMUM Wind Speed (km/h)	9am Relative Humidity (%)
19/01/2020	20.5	28.9	85	NNE	41	87
20/01/2020	22.9	33	0	NW	61	66
21/01/2020	22.6	30.7	0	NE	48	62
22/01/2020	21.5	29.7	0	NNE	41	71
23/01/2020	23.6	33.6	0	NNE	63	69
24/01/2020	23.5	31.2	0	NNE	48	80
25/01/2020	21	30.4	0	N	39	77
26/01/2020	23.6	29	0	NNE	59	70
27/01/2020	24.2	29.3	0	NNE	48	65
28/01/2020	23.6	29.6	0	NNE	57	65
29/01/2020	21.3	28.7	0	S	37	76
30/01/2020	23.6	28.8	0	NNE	31	76
31/01/2020	24.6	30	0	NNE	54	63
1/02/2020	23.6	30.8	0	NNE	63	63
2/02/2020	24.1	33.3	0	NE	59	65
3/02/2020	21.5	35.3	10	S	81	73
4/02/2020	20.2	21.8	3	SSW	61	74
5/02/2020	18.9	24.2	0	WSW	26	72
6/02/2020	19.1	25.4	2	E	48	92
7/02/2020	19.3	28.1	69	ENE	43	85
8/02/2020	21.1	25.9	6	SSE	30	92
9/02/2020	21.1	24.3	95	ENE	52	95
10/02/2020	21	28.7	59	NNE	50	88
11/02/2020	20.5	27.1	35	ENE	41	92
12/02/2020	20.6	25.4	32	NE	41	93
13/02/2020	21.5	26.6	42	ESE	35	94
14/02/2020	21	27.2	6	SSW	39	93
15/02/2020	18.6	29	0	NE	28	71
16/02/2020	22.2	26.5	1	S	33	89
17/02/2020	22.4	29.5	0	SW	63	93
18/02/2020	19.1	31.4	13	NE	50	70
19/02/2020	24.4	35.5	0	SSW	39	73
20/02/2020	21	27.8	3	SSE	31	58
21/02/2020	19.9	26.7	0	ESE	28	71
22/02/2020	19.6	25.5	3	WSW	28	92
23/02/2020	18.4	24.6	13	S	22	88
24/02/2020	19.2	24.5	58	SSW	22	95
25/02/2020	19.8	27.7	20	ENE	30	81
26/02/2020	19.7	30.3	0	NNE	44	69
27/02/2020	18.7	28.7	1	SSW	41	76
28/02/2020	19.2	28.6	0	SSW	43	78

# Appendix C – Field data

**Table C1:** Underpass camera survey effort for spring/summer monitoring.

Location	Cam Location	Easting	Northing	Cam type	Cam No	Date installed	Date checked	Battery status	Days active	Date checked	Battery status	Days active	Reinstall	Date checked	Battery status	Pics	Days active	Total Days Active
12 median west	Furniture	497115	6610068	Enduro	SES152	8/10/19	21/10/2019	Active	13	18/11/19	Active	28	-	18/12/2019	Active	87	30	71
	Ground	497115	6610068	3c	S101	8/10/19	21/10/2019	Active	13	18/11/19	Active	28	-	18/12/2019	Active	78	30	71
11 median east	Furniture	497168	6610040	Enduro	SES181	8/10/19	21/10/2019	Active	13	18/11/19	Flat	28	-	18/12/2019	Flat (20/11/19)	49	7	48
	Ground	497168	6610040	3c	SES91	8/10/19	21/10/2019	Active	13	18/11/19	Active	28	-	18/12/2019	Active	283	30	71
10 median west	Furniture	496622	6609409	Enduro	No no.	8/10/19	21/10/2019	Active	13	18/11/19	Active	28	-	18/12/2019	Active	224	30	71
	Ground	496622	6609409	Enduro	SES172	8/10/19	21/10/2019	Active	13	18/11/19	Active	28	-	18/12/2019	Active	198	30	71
9 median east	Furniture	496622	6609409	Enduro		8/10/19	21/10/2019	Active	13	18/11/19	Active	28	-	17/12/2019	Flat (18/12/19)	327	29	70
	Ground	496622	6609409	3c	S103	8/10/19	22/10/2019	Active	14	18/11/19	Active	27	-	18/12/2019	Active	155	30	71
8 full length	Furniture	496506	6609219	Enduro	SES157	8/10/19	22/10/2019	Active	14	18/11/19	Active	27	-	18/12/2019	Active	121	30	71
	Ground	496506	6609219	3c	S93	8/10/19	22/10/2019	Active	14	18/11/19	Active	27	-	18/12/2019	Active	220	30	71
7 full length	Furniture	496438	6608780	Enduro		8/10/19	22/10/2019	Active	14	18/11/19	Active	27	-	18/12/2019	Active	90	30	71
	Ground	496438	6608780	3c	S100	8/10/19	22/10/2019	Active	14	18/11/19	Active	27	-	18/12/2019	Active	160	30	71
6 full length	Furniture	496188	6608319	Enduro	S173	8/10/19	22/10/2019	Active	14	18/11/19	Stolen	NA	28/11/19	18/12/2019	Malfunction	9		14
	Ground	496188	6608319	3c	S96	8/10/19	22/10/2019	Active	14	18/11/19	Stolen	NA	28/11/19	18/12/2019	Malfunction	0		14
5	North	496171	6608286	Enduro	No no.	8/10/19	22/10/2019	Active	14	18/11/19	Active	27	-	18/12/2019	Active	413	30	71
	South	496168	6608282	3c	S110	8/10/19	22/10/2019	Active	14	18/11/19	Active	27	-	18/12/2019	Active	489	30	71
4	Furniture	495702	6607693	Enduro	S124	8/10/19	22/10/2019	Active	14	18/11/19	Active	27	-	17/12/2019	Active	51	30	71
	Ground	495702	6607693	3c	SES188	8/10/19	22/10/2019	Active	14	18/11/19	Active	27	-	18/12/2019	Active	135	30	71
3	Furniture	495082	6606515	Enduro	SES167	8/10/19	22/10/2019	Active	14	18/11/19	Stolen	NA	28/11/19	18/12/2019	Active	109	20	34
	Ground	495082	6606515	3c	SES187	8/10/19	22/10/2019	Active	14	18/11/19	Stolen	NA	28/11/19	18/12/2019	Active	215	20	34
2	Furniture	494477	6605329	Enduro	SES169	8/10/19	22/10/2019	Malfunction	0	18/11/19	Stolen	NA	28/11/19	18/12/2019	Active	91	20	20
	Ground	494477	6605329	3c	S92	8/10/19	22/10/2019	Active	14	18/11/19	Stolen	NA	28/11/19	18/12/2019	Active	909	20	34
1	North	489300	6594286	Reconyx	SES82	9/10/19	22/10/2019	Active	14	18/11/19	Stolen	NA	22/1/20	28/02/2020	Active	16953	34	34
	South	489262	6594252	Reconyx	SES28	9/10/19	22/10/2019	Active	14	18/11/19	Stolen	NA	22/1/20	28/02/2020	Malfunction	0	0	0

**Table C2:** All species detected in fauna underpasses by infrared camera during spring/summer monitoring., D = Definite, Pr = Probable, Po = Possible, NDM = no directional movement, EXM = exploratory movement, E then W = east then west; EW = eastern water; SEBtP = Short-eared brushtail possum

Site	Side	Date	Time	Species	Accuracy	Movement	Pic/vid No.	Complete or incomplete	Comments
12	Furniture			Nil					
		20/11/2019		Nil					
	Ground	10/10/2019	0139	Black Rat	Pr	E	17	Complete	
		10/10/2019	0438	Cat	D	W	19-20	Complete	black cat
		12/10/2019	2217	House mouse	Pr	E	28	Complete	
		13/10/2019	2153	Cat	D	E	29-30	Complete	tabby
		15/10/2019	0201	Black Rat	Pr	E	42	Complete	
		15/10/2019	2006	Black Rat	D	W	86	Complete	
		18/10/2019	0306	House mouse	Pr	E	111	Complete	
		18/10/2019	2332	Black Rat	D	E	152-153	Complete	
		20/10/2019	1946	Black Rat	D	W	165	Complete	
		22/10/2019	2327	Black Rat	D	E	13	Complete	
		5/11/2019	2350	Black Rat	D	E	23	Complete	
		6/11/2019	1948	Black Rat	D	W	28	Complete	
		7/11/2019	0047	Cat	D	E	29	Complete	
		7/11/2019	0447	Black Rat	D	E	30	Complete	
		7/11/2019	1946	Black Rat	D	W	35	Complete	
		11/11/2019	2140	Black Rat	Pr	W	52	Complete	
		12/11/2019	1006	EW dragon	D	W	53	Complete	
		12/11/2019	1956	Black Rat	D	W	55	Complete	
		13/11/2019	0022	Black Rat	D	E	56	Complete	
		17/11/2019	0103	Black Rat	Pr	E	63	Complete	
		17/11/2019	2200	Black Rat	D	W	64	Complete	
		17/11/2019	2259	Black Rat	D	E	65	Complete	
		18/11/2019	2010	Black Rat	D	W	66	Complete	
		19/11/2019	0148	Black Rat	D	E	67	Complete	
		26/11/2019	2308	Black Rat	D	E	9	Complete	
		2/12/2019	0015	Black Rat	D	E	20	Complete	
		2/12/2019	2049	Black Rat	D	E	24	Complete	
		6/12/2019	0144	Black Rat	D	E	34	Complete	
		7/12/2019	0123	Black Rat	D	E	37-38	Complete	
		14/12/2019	0158	Black Rat	D	E	45	Complete	
14/12/2019	2252	Northern brown bandicoot	Pr	E	46-47	Complete			
17/12/2019	0041	Black Rat	D	E	61	Complete			
11	Furniture	nil							
		nil							
		26/10/19	0433	Cat	D	E	69	Complete	tabby
		20/11/2019	nil						
	Ground	10/10/2019	0435	Cat	D	W	29	Complete	black cat
		13/10/2019	2155	Cat	D	E	32	Complete	tabby
		26/10/2019	0430	Cat	D	W	37	Complete	
		7/11/2019	0049	Cat	D	E	84-85	Complete	
		8/11/2019	1545	EW Dragon	Pr	E	105	Complete	
		6/12/2019	1251	Lace Monitor	Pr	EXM	195-196	Incomplete	
10	Furniture			Microbat spp	present				
		nil							
		26/10/2019	2219	SEBtP	Pr	E-W	41,43-44	Incomplete	
		27/10/2019	2055	Black Rat	D	W	45	Complete	
		7/11/2019	0109	SEBtP	Pr	W	75	Complete	
		25/11/2019	2220	Black Rat	D	EXM	11-14, 16	Incomplete	
	Ground	13/10/2019	2219	Cat	D	E	19	Complete	tabby
		21/10/2019	1314	EW Dragon	Pr	E	142	Complete	
		21/10/2019	1457	Lace Monitor	D	E	11	Complete	
		22/10/2019	1321	Lace Monitor	D	W	24	Complete	
		24/10/2019	2233	Bandicoot spp.	D	W-E	31-32	Incomplete	

Site	Side	Date	Time	Species	Accuracy	Movement	Pic/vid No.	Complete or incomplete	Comments
		25/10/2019	1443	Lace Monitor	D	E	40	Complete	
		28/10/2019	0220	Bandicoot spp	D	W	42	Complete	
		31/10/2019	0446	Black Rat	D	E	46	Complete	
		31/10/2019	1254	Lace Monitor	D	E	47	Complete	
		1/11/2019	2329	Trichosurus spp	D	W	49	Complete	
		7/11/2019	0255	Northern brown bandicoot	Pr	W	55	Complete	
		8/11/2019	0159	Bandicoot spp	D	W	58	Complete	
		9/11/2019	0404	Cat	D	W	61	Complete	tabby
		9/11/2019	2242	Koala	D	W	63	Complete	
		12/11/2019	0311	Bandicoot spp	D	W	67	Complete	
		13/11/2019	0139	Bandicoot spp	D	W	77	Complete	
		16/11/2019	0106	Bandicoot spp	D	W	80	Complete	
		18/11/2019	1158	Lace Monitor	D	W	93	Complete	
		19/11/2019	0210	Bandicoot spp	D	W	94	Complete	
		22/11/2019	0149	Bandicoot spp.	D	W	15	Complete	
		22/11/2019	0216	Black Rat	D	W	16	Complete	
		22/11/2019	1559	Lace Monitor	D	E	19	Complete	
		23/11/2019	0003	Bandicoot spp.	Pr	W	20	Complete	
		25/11/2019	2252	Black Rat	D	EXM	31	Complete	
		28/11/2019	1403	Lace Monitor	D	E	46	Complete	
		4/12/2019	0055	Swamp wallaby	D	E	110	Complete	
		4/12/2019	0539	Swamp wallaby	Pr	W	111	Complete	
		4/12/2019	2350	SEBtP	D	W	112	Complete	
		6/12/2019	1535	Lace Monitor	D	E	118	Complete	
		17/12/2019	1049	Lace Monitor	D	W	187	Complete	
9	Furniture	4/12/2019	0653	Treecreeper spp.	Pr	E	176	Complete	
		17/12/2019	0659	Australian brush turkey	D	NDM	318	Incomplete	
	Ground	13/10/2019	0447	Black Rat	Pr	W	8	Complete	
		14/10/2019	2049	Black Rat	Pr	E	24	Complete	
		21/10/2019	1459	Lace Monitor	D	E	128	Complete	
		22/10/2019	1159	Lace Monitor	D	W	4-5	Complete	
		22/10/2019	1315	Lace Monitor	D	W	6	Complete	
		23/10/2019	2306	SEBtP	Pr	E	9	Complete	
		24/10/2019	2229	Long-nosed bandicoot	Pr	W	10	Complete	
		24/10/2019	2336	Bandicoot spp	D	E	11	Complete	
		25/10/2019	0157	SEBtP	D	E	13-16	Complete	
		29/10/2019	0229	SEBtP	Pr	W-E	19-23	Incomplete	
		1/11/2019	2101	Bandicoot spp	D	E	26	Complete	
		9/11/2019	2239	Koala	D	W	43	Complete	
		21/11/2019	2150	Bandicoot spp.	D	E	4	Complete	
		22/11/2019	0019	SEBtP	D	EXM	5	Incomplete	
		2/12/2019	0116	Black Rat	D	E	40	Complete	
		4/12/2019	0054	Swamp wallaby	Pr	E	67	Complete	
		4/12/2019	0535	Swamp wallaby	D	W	68	Complete	
		6/12/2019	1536	Lace Monitor	D	E	97	Complete	MB present
		9/12/2019	0331	cat	D	E	115	Complete	Tabby
8	Furniture	9/10/2019	0407	SEBtP	Pr	E	3	Complete	
		9/10/2019	1955	SEBtP	D	W	14	Complete	
		10/10/2019	0317	2 x SEBtP	Pr	E	15	Complete	2 individuals
		10/10/2019	0349	SEBtP	D	W	16	Complete	
		12/10/2019	0445	SEBtP	Pr	E	28	Complete	
		12/10/2019	2149	SEBtP	D	W	29	Complete	
		13/10/2019	0235	2 x SEBtP	D	E	30	Complete	2 individuals
		13/10/2019	0401	SEBtP	D	E	31	Complete	
		13/10/2019	2018	SEBtP	Pr	E	33	Complete	
		14/10/2019	0027	SEBtP	D	W	34	Complete	
		14/10/2019	0514	SEBtP	Pr	E	36	Complete	
		14/10/2019	2022	SEBtP	D	W	44	Complete	

Site	Side	Date	Time	Species	Accuracy	Movement	Pic/vid No.	Complete or incomplete	Comments
		15/10/2019	2107	SEBtP	D	E	57	Complete	
		17/10/2019	0419	SEBtP	D	E	62	Complete	
		18/10/2019	2055	SEBtP	D	E	73	Complete	
		19/10/2019	0119	2 x SEBtP	D	E	74	Complete	2 individuals
		21/10/2019	0046	SEBtP	D	E	92	Complete	
		21/10/2019	0329	2 x SEBtP	D	E	93	Complete	2 individuals
		21/10/2019	1927	SEBtP	Pr	E	101	Complete	
		22/10/2019	2345	SEBtP	D	W	3	Complete	
		24/10/2019	0133	SEBtP	Pr	W	6	Complete	
		24/10/2019	0243	SEBtP	Pr	W	7	Complete	
		24/10/2019	1933	SEBtP	Pr	E	9	Complete	
		24/10/2019	2232	SEBtP	D	E	12	Complete	
		25/10/2019	0129	SEBtP	D	W	13	Complete	
		25/10/2019	0249	2 x SEBtP	D	E	14	Complete	2 individuals
		27/10/2019	2306	SEBtP	Pr	E-W	21-22	Incomplete	
		28/10/2019	0118	SEBtP	D	W	24	Complete	
		30/10/2019	0141	2 x SEBtP	D	E	30	Complete	2 individuals (mother and young)
		31/10/2019	2348	SEBtP	D	E	32	Complete	
		1/11/2019	0215	2 x SEBtP	Pr	E	33	Complete	2 individuals (mother and young)
		1/11/2019	2141	SEBtP	Pr	W	35	Complete	
		2/11/2019	0004	SEBtP	D	W	37	Complete	
		4/11/2019	0333	2 x SEBtP	Pr	E	40	Complete	2 individuals (mother and young)
		6/11/2019	0126	SEBtP	D	W	43	Complete	
		6/11/2019	0231	2 x SEBtP	D	E	44	Complete	2 individuals (mother and young)
		10/11/2019	0144	SEBtP	D	E	51	Complete	
		11/11/2019	0146	2 x SEBtP	D	E	55	Complete	2 individuals (mother and young)
		14/11/2019	0244	2 x SEBtP	D	E	61	Complete	3 individuals (mother and young)
		15/11/2019	0127	SEBtP	Pr	E	62	Complete	
		15/11/2019	2053	SEBtP	D	W	66	Complete	
		18/11/2019	0214	2 x SEBtP	D	E	70	Complete	2 individuals (mother and young)
		19/11/2019	2229	SEBtP	D	E	76	Complete	
		22/11/2019	0126	2 x SEBtP	D	E	2	Complete	2 individuals (mother and young)
		22/11/2019	2230	2 x SEBtP	D	W	5	Complete	2 individuals (mother and young)
		25/11/2019	0335	2 x SEBtP	D	E	9	Complete	2 individuals (mother and young)
		27/11/2019	0111	SEBtP	D	E	12	Complete	
		27/11/2019	2218	SEBtP	D	E	18	Complete	
		28/11/2019	0204	2 x SEBtP	D	E	19	Complete	2 individuals (mother and young)
		28/11/2019	2244	BtPoss spp	D	W	24	Complete	
		30/11/2019	0339	2 x SEBtP	D	E	25	Complete	2 individuals (mother and young)
		30/11/2019	2140	BtPoss spp	D	W	27	Complete	
		1/12/2019	2311	BtPoss spp	D	W	30	Complete	
		2/12/2019	0208	SEBtP	D	E	31-33	Complete	
		4/12/2019	0021	SEBtP	D	E	52	Complete	
		4/12/2019	0124	BtPoss spp	D	W	53	Complete	
		5/12/2019	1106	Small bird	Pr	NDM	66	Incomplete	



Site	Side	Date	Time	Species	Accuracy	Movement	Pic/vid No.	Complete or incomplete	Comments
		6/12/2019	2155	SEBtP	Pr	E	73	Complete	
		7/12/2019	0151	SEBtP	D	E	74	Complete	
		9/12/2019	0250	BtPoss spp	D	W	84	Complete	
		10/12/2019	0204	BtPoss spp	D	W	89	Complete	
		10/12/2019	2318	BtPoss spp	Pr	W	95	Complete	
		11/12/2019	0025	SEBtP	D	E	96	Complete	
		12/12/2019	2333	SEBtP	D	E	100	Complete	
		13/12/2019	0218	Trichosurus spp	D	W	101	Complete	
		14/12/2019	2354	SEBtP	D	W-E	102-104	Incomplete	
		15/12/2019	2337	BtPoss spp	Pr	W	106	Complete	
		16/12/2019	2329	SEBtP	D	E	110	Complete	
		17/12/2019	0244	BtPoss spp	Pr	W	111	Complete	
		17/12/2019	2355	SEBtP	Pr	E	116	Complete	
		18/12/2019	0039	SEBtP	D	E	118	Complete	MB present
	Ground	9/10/2019	1336	Lace Monitor	D	E	11	Complete	
		10/10/2019	2356	SEBtP	Pr	W	45	Complete	
		17/10/2019	2038	SEBtP	D	E	93	Complete	
		19/10/2019	0038	SEBtP	D	W	101	Complete	
		19/10/2019	1224	Lace Monitor	D	W	108	Complete	
		20/10/2019	2245	Cat	D	E	115	Complete	tabby
		21/10/2019	0045	SEBtP	Pr	E	116	Complete	
		22/10/2019	0437	Swamp wallaby	D	E	126	Complete	
		23/10/2019	1037	Lace Monitor	D	W	7	Complete	
		23/10/2019	1452	Lace Monitor	D	E	8	Complete	
		27/10/2019	1324	Lace Monitor	D	W	28	Complete	
		27/10/2019	1524	Lace Monitor	D	E	30	Complete	
		27/10/2019	1612	Lace Monitor	D	E	31	Complete	
		28/10/2019	1128	Lace Monitor	D	W	40	Complete	
		28/10/2019	1504	Lace Monitor	D	W	41	Complete	
		29/10/2019	1002	Lace Monitor	D	W	48	Complete	
		1/11/2019	1010	Lace Monitor	D	W	58	Complete	
1/11/2019	1450	Lace Monitor	D	E	60	Complete			
		4/11/2019	1425	Lace Monitor	D	W	69	Complete	
		6/11/2019	0956	Lace Monitor	D	W	75	Complete	
		6/11/2019	1317	Lace Monitor	D	E-W	77-78	Incomplete	
		6/11/2019	1413	Lace Monitor	D	E	79	Complete	
		7/11/2019	1531	Lace Monitor	D	E	87	Complete	
		12/11/2019	1936	Wallaby spp.	D	E	130	Complete	
		13/11/2019	1328	Lace Monitor	D	W	134	Complete	
		15/11/2019	1125	Lace Monitor	D	W	150	Complete	
		15/11/2019	1523	Lace Monitor	D	E	152	Complete	
		17/11/2019	1052	Lace Monitor	D	E	167-169	Complete	
		18/11/2019	1214	Lace Monitor	Pr	W	182	Complete	
		25/11/2019	0606	Swamp wallaby	D	W	23-24	Complete	
		28/11/2019	1148	Lace Monitor	D	E	41	Complete	
		30/11/2019	1014	Lace Monitor	D	W	56	Complete	
		2/12/2019	1155	Lace Monitor	D	W	62	Complete	
		3/12/2019	1450	Lace Monitor	D	W	72	Complete	
				4/12/2019	1148	Lace Monitor	D	W	82
7/12/2019	1316			Lace Monitor	D	W	152	Complete	
8/12/2019	1115			Lace Monitor	D	W	159	Complete	
8/12/2019	1439			Lace Monitor	Pr	E	160	Complete	
9/12/2019	0645			Swamp wallaby	Pr	E	167	Complete	
9/12/2019	0750			Swamp wallaby	D	W	173	Complete	
12/12/2019	1445			Lace Monitor	D	W	181	Complete	
15/12/2019	1141			Lace Monitor	Pr	E	185	Complete	
17/12/2019	0609			Swamp wallaby	D	E	208	Complete	
17/12/2019	1644	Swamp wallaby	D	W	212-213	Complete			
7	Furniture	9/10/2019	2056	SEBtP	D	W-E	35-39	Incomplete	

Site	Side	Date	Time	Species	Accuracy	Movement	Pic/vid No.	Complete or incomplete	Comments
		9/10/2019	2217	SEBtP	D	W	40-43	Complete	
		9/10/2019	2316	SEBtP	D	W	44-45	Complete	
		10/10/2019	0116	SEBtP	D	E	46-47	Complete	
		12/10/2019	2122	2 x SEBtP	D	W	60	Complete	2 individuals (mother and joey)
		13/10/2019	0305	SEBtP	D	E-W	61-64	Incomplete	
		20/10/2019	0154	SEBtP	D	E-W	109-108	Incomplete	
		20/10/2019	0814	SEBtP	D	E	110	Complete	
		20/10/2019	1942	SEBtP	D	E-W	117-118	Incomplete	
		20/10/2019	2358	2 x SEBtP	D	W	119	Complete	2 individuals (mother and joey)
		21/10/2019	0121	SEBtP	D	W	121	Complete	
		22/10/2019	0133	SEBtP	D	W	130	Complete	
		22/10/2019	2104	SEBtP	D	E	2	Complete	
		22/10/2019	2247	SEBtP	D	W	3	Complete	
		23/10/2019	0021	2 x SEBtP	D	E	5	Complete	2 individuals (mother and joey)
		23/10/2019	0249	SEBtP	D	E	7	Complete	
		23/10/2019	1959	SEBtP	D	E	10	Complete	
		23/10/2019	2126	SEBtP	D	E	11	Complete	
		24/10/2019	0419	SEBtP	D	W	12	Complete	
		24/10/2019	2204	SEBtP	D	E	13	Complete	
		24/10/2019	2240	SEBtP	D	W	14	Complete	
		25/10/2019	2253	SEBtP	D	E	15	Complete	
		27/10/2019	0031	SEBtP	D	E	16	Complete	
		27/10/2019	0219	2 x SEBtP	D	E	17	Complete	2 individuals (mother and joey)
		27/10/2019	2047	SEBtP	D	E	18	Complete	
		27/10/2019	2303	SEBtP	D	E	19	Complete	
		29/10/2019	2135	SEBtP	D	E	22	Complete	
		30/10/2019	2109	Antechinus spp	D	E	25	Complete	
		30/10/2019	2317	2 x SEBtP	D	W	27	Complete	2 individuals (mother and joey)
		31/10/2019	0107	Antechinus spp	D	E	28	Complete	
		1/11/2019	0442	Antechinus spp	D	E	31	Complete	
		2/11/2019	0051	Antechinus spp	D	E	38	Complete	
		3/11/2019	0035	Antechinus spp	D	E	42-44	Complete	
		4/11/2019	0208	Black Rat	D	E	52-53	Complete	
		5/11/2019	0036	2 x SEBtP	D	W	54	Complete	2 individuals (mother and joey)
		5/11/2019	2102	SEBtP	D	E	56	Complete	
		6/11/2019	2238	2 x SEBtP	D	W	58	Complete	2 individuals (mother and joey)
		7/11/2019	0331	Antechinus spp	D	E	59	Complete	
		8/11/2019	0227	SEBtP	D	W	64	Complete	
		11/11/2019	2140	SEBtP	D	E	69	Complete	
		12/11/2019	0055	2 x SEBtP	D	W	70	Complete	2 individuals (mother and joey)
		13/11/2019	2253	SEBtP	D	E	77	Complete	
		18/11/2019	2320	2 x SEBtP	D	W	82	Complete	2 individuals (mother and joey)
		20/11/2019	0111	SEBtP	D	E	88	Complete	
		20/11/2019	0230	SEBtP	D	W	89	Complete	
		25/11/2019	2323	2 x SEBtP	D	W	5	Complete	2 individuals (mother and joey)
		27/11/2019	0339	SEBtP	D	E	6-7	Complete	
		27/11/2019	2111	SEBtP	D	W	8	Complete	

Site	Side	Date	Time	Species	Accuracy	Movement	Pic/vid No.	Complete or incomplete	Comments
		28/11/2019	0124	SEBtP	D	W	9	Complete	
		28/11/2019	2034	SEBtP	D	E	20	Complete	
		28/11/2019	2034	SEBtP	D	E	21	Complete	
		28/11/2019	2154	SEBtP	D	W	24-25	Complete	
		28/11/2019	2309	SEBtP	D	W	27-28	Complete	
		1/12/2019	2107	SEBtP	D	E	29	Complete	
		6/12/2019	0156	SEBtP	D	E	47	Complete	
		6/12/2019	2223	SEBtP	D	W	51	Complete	
		9/12/2019	0338	SEBtP	D	E	58-59	Complete	
		9/12/2019	2140	SEBtP	D	W	60	Complete	
		9/12/2019	2231	SEBtP	D	E	61-62	Complete	
		10/12/2019	0438	SEBtP	D	E	63	Complete	
		10/12/2019	2303	SEBtP	D	W	69	Complete	
		11/12/2019	0332	SEBtP	D	E	70	Complete	
		11/12/2019	2046	SEBtP	Pr	W	72	Complete	
		13/12/2019	0423	SEBtP	D	E	76	Complete	
	Ground	13/12/2019	2354	Trichosurus spp	D	W	77	Complete	
		14/12/2019	0429	SEBtP	D	W	78	Complete	
		14/12/2019	2139	SEBtP	D	W	80	Complete	
		15/12/2019	0431	SEBtP	D	E	82	Complete	
		15/12/2019	2132	SEBtP	D	W	85	Complete	
		9/10/2019	1046	Lace Monitor	Pr	W	12	Complete	
		9/10/2019	2053	SEBtP	D	E	23	Complete	
		10/10/2019	0702	Macropod spp	D	E	25	Complete	
		10/10/2019	2233	Wallaby spp	D	W	31	Complete	
		14/10/2019	0618	Macropod spp	D	E	34	Complete	
		17/10/19	0616	Macropod spp	D	E	35	Complete	
		17/10/2019	1147	Brush turkey	Pr	E	55	Complete	
		18/10/2019	0017	Red-necked wallaby	Pr	W	63	Complete	
		19/10/2019	2237	Red-necked wallaby	Pr	W	79	Complete	
		20/10/2019	1947	SEBtP	Pr	E	90	Complete	
		21/10/2019	0015	Fox	Pr	E	91	Complete	
		22/10/2019	0333	Macropod spp	Pr	E	97	Complete	
		22/10/19	0423	Macropod spp	D	E	98	Complete	
		22/10/2019	1821	Short-beaked echidna	D	W	5	Complete	
		22/10/2019	2139	Macropod spp	D	W	6	Complete	
		29/10/2019	0513	Macropod spp	Pr	E	24	Complete	
		30/10/2019	0025	Red-necked wallaby	D	W	25-27	Complete	
		1/11/2019	2037	Trichosurus spp	D	E	28	Complete	
		3/11/2019	0956	Macropod spp	D	E	29	Complete	
		6/11/2019	0719	Macropod spp	D	E	32	Complete	
		6/11/2019	1201	Lace Monitor	Pr	W	33	Complete	
		7/11/2019	2038	Red-necked wallaby	D	W	36	Complete	
		8/11/2019	2031	Macropod spp	D	E	46	Complete	
		10/11/2019	0521	Macropod spp	D	E	48	Complete	
		13/11/2019	0431	Macropod spp	D	E	56	Complete	
	15/11/2019	0508	Macropod spp	D	E	61	Complete		
	18/11/2019	0328	Macropod spp	D	E	72	Complete		
	21/11/2019	0557	Wallaby spp.	D	E	7	Complete		
	22/11/2019	2248	Black Rat	D	EXM	10-13	Incomplete		
	23/11/2019	0131	Short-beaked echidna	D	W	14	Complete		
	23/11/2019	0525	Macropod spp	D	E	15	Complete		
	26/11/2019	0002	Bandicoot spp.	D	W	19	Complete		
	26/11/2019	0855	Macropod spp	D	E	20	Complete		
	27/11/2019	0624	Macropod spp	D	E	22	Complete		
	27/11/2019	1126	Lace Monitor	D	W	26	Complete		
	28/11/2019	0820	Macropod spp	D	E	29	Complete		
	29/11/2019	1414	Lace Monitor	D	W	36	Complete		
	2/12/2019	0503	Macropod spp	Pr	E	40	Complete		

WC2NH operational phase underpass monitoring – year two interim report

Site	Side	Date	Time	Species	Accuracy	Movement	Pic/vid No.	Complete or incomplete	Comments		
6	Furniture	3/12/2019	0044	Long-nosed bandicoot	D	E	52	Complete			
		4/12/2019	0921	Lace Monitor	D	E	62	Complete			
		8/12/2019	0528	Macropod spp	D	E	101	Complete			
		8/12/2019	0955	Lace Monitor	D	E	103	Complete			
		15/12/2019	2213	Swamp wallaby	D	W	128	Complete			
		17/12/2019	0015	Cat	Pr	E	139	Complete	tabby		
		17/12/2019	0218	SEBtP	D	W	140	Complete			
	Ground	19/10/2019	1233	Lace Monitor		E	136-139	Complete			
		20/10/2019		Nil	Pr						
		14/10/2019	0421	Swamp wallaby	D	E-W	47	Incomplete			
		19/10/2019	1115	Lace Monitor	D	EXM	106-167	Complete			
		19/10/2019	2146	Black Rat	Pr	E	173	Complete			
		21/10/2019	2317	Black Rat		W	180	Complete			
		20/10/2019		Nil	D						
5	North	9/10/2019	2033	Black Rat	Pr	E	22	Complete			
		17/10/2019	1956	House mouse	D	E	48	Complete			
		21/10/2019	2112	Black Rat	D	NDM	60	Incomplete			
		22/10/2019	2035	Rodent spp	Pr	E	4	Complete			
		23/10/2019	2102	Black Rat	D	E	11	Complete			
		23/10/2019	2158	Rodent spp	Pr	E	14	Complete			
		23/10/2019	2224	Black Rat	D	E	16	Complete			
		24/10/2019	0302	Rodent spp	Pr	E	18	Complete			
		24/10/2019	2122	Black Rat	Pr	E	21	Complete			
		24/10/2019	2159	Black Rat	Pr	E-W	22	Incomplete			
		25/10/2019	1503	EW dragon	D	W	26	Complete			
		25/10/2019	2130	Black Rat	Pr	NDM	29	Incomplete			
		25/10/2019	2148	Black Rat	D	E	32	Complete			
		26/10/2019	2037	Black Rat	D	EXM	37,39	Incomplete			
		26/10/2019	2119	Black Rat	D	W	40	Complete			
		29/10/2019	2312	Black Rat	Pr	E	67	Complete			
		1/11/2019	2019	Black Rat	D	E	73	Complete			
		1/11/2019	2043	Black Rat	D	E	75	Complete			
		1/11/2019	2249	Black Rat	Pr	W-E	79-81	Complete			
		2/11/2019	2004	Black Rat	Pr	E	83	Complete			
		4/11/2019	0254	Black Rat	D	E	88	Complete			
		4/11/2019	0414	Black Rat	D	W	89	Complete			
		4/11/2019	0441	Black Rat	D	E	90	Complete			
		12/11/2019	1327	Swamp wallaby	D	NDM	137	Incomplete			
		13/11/2019	0241	Swamp wallaby	Pr	E	138	Complete			
		14/11/2019	2137	Black Rat	D	NDM	149	Incomplete			
				16/11/2019	2035	Black Rat	D	E	175-176	Complete	
				18/11/2019	2045	Black Rat	D	E	227-228	Complete	
22/11/2019	0303			Black Rat	D	E	36	Complete			
23/11/2019	0026			Long-nosed bandicoot	D	W	48	Complete			
23/11/2019	2058			Black Rat	Pr	E	62	Complete			
26/11/2019	2354			Black Rat	D	E	79	Complete			
15/12/2019	2307			Black Rat	D	E	336	Complete			
15/12/2019	2327			Black Rat	D	W	338	Complete			
16/12/2019	0044			Black Rat	D	E	339	Complete			
16/12/2019	0240			Black Rat	Pr	E	341	Complete			
	South			16/12/2019	0503	Black Rat	D	E	343	Complete	
				16/12/2019	0518	House mouse	Pr	E	345	Complete	
				16/12/2019	2116	Black Rat	D	E	364	Complete	
				16/12/2019	2310	House mouse	D	E	366	Complete	
		17/12/2019	2149	Black Rat	D	E	391	Complete			
		18/12/2019	0125	Black Rat	D	W	393	Complete			
		8/10/2019	2055	Black Rat	D	E	16	Complete			
		8/10/2019	2236	Black Rat	Pr	W	17	Complete			
8/10/2019	2326	Black Rat	Pr	E	18	Complete					

WC2NH operational phase underpass monitoring – year two interim report

Site	Side	Date	Time	Species	Accuracy	Movement	Pic/vid No.	Complete or incomplete	Comments
		9/10/2019	2021	Black Rat	D	E	63, 65	Complete	
		10/10/2019	2131	Black Rat	Pr	E	76	Complete	
		12/10/2019	0008	Water rat	Pr	E	88	Complete	
		12/10/2019	2257	Water rat	D	E	93	Complete	
		14/10/2019	2208	Water rat	D	W	105	Complete	
		14/10/2019	2307	Water rat	D	E	106	Complete	
		15/10/2019	0150	Water rat	D	E	107	Complete	
		16/10/2019	2333	Water rat	Pr	E	117	Complete	
		20/10/2019	0009	Black Rat	D	E	138	Complete	
		20/10/2019	0243	Fox	D	E-W	139-140	Incomplete	
		21/10/2019	2118	Black Rat	D	E-W	177-178	Incomplete	
		21/10/2019	2135	Black Rat	D	W	179	Complete	
		21/10/2019	2138	Black Rat	D	EXM	180-183	Incomplete	
		21/10/2019	2153	Black Rat	D	E	184	Complete	
		22/10/2019	2025	Black Rat	Pr	E-W	9-10	Incomplete	
		23/10/2019	0211	Black Rat	Pr	E	11	Complete	
		24/10/2019	0116	Black Rat	Pr	E	17	Complete	
		24/10/2019	1958	Black Rat	D	E	18	Complete	
		25/10/2019	0034	Black Rat	Pr	E	20	Complete	
		25/10/2019	2036	Black Rat	D	E	26	Complete	
		25/10/2019	2154	Rodent spp	D	E	27	Complete	
		25/10/2019	2314	Rodent spp	Pr	E	29	Complete	
		26/10/2019	0128	Black Rat	Pr	E	30	Complete	
		26/10/2019	0204	Black Rat	Pr	E-W	31-32	Incomplete	
		26/10/2019	2105	Black Rat	Pr	E	35	Complete	
		26/10/2019	2242	Black Rat	D	NDM	36	Incomplete	
		26/10/2019	2359	Water rat	Pr	E	39	Complete	
		27/10/2019	0458	Black Rat	Pr	E	40	Complete	
		27/10/2019	2012	Black Rat	D	E	46	Complete	
		27/10/2019	2051	Rodent spp	Pr	E	48	Complete	
		27/10/2019	2158	Black Rat	Pr	E	49	Complete	
		28/10/2019	0507	Black Rat	Pr	NDM	50	Incomplete	
		28/10/2019	1936	Black Rat	Pr	E	60	Complete	
		28/10/2019	2341	Water rat	D	W	62	Complete	
		29/10/2019	0141	Black Rat	Pr	W	63-64	Complete	
		29/10/2019	2109	Black Rat	D	E	81	Complete	
		29/10/2019	2250	Black Rat	D	W	82	Complete	
		30/10/2019	0039	Rodent spp	Pr	E	84	Complete	
		30/10/2019	0149	Black Rat	Pr	E	86	Complete	
		30/10/2019	2027	Black Rat	Pr	E	96	Complete	
		30/10/2019	2134	Black Rat	Pr	E	97	Complete	
		31/10/2019	2158	Black Rat	D	E	116	Complete	
		1/11/2019	0308	Black Rat	Pr	W	117	Complete	
		1/11/2019	2143	Black Rat	D	E	126	Complete	
		1/11/2019	2301	Black Rat	D	W	128	Complete	
		2/11/2019	0354	Rodent spp	D	E	129	Complete	
		3/11/2019	0244	Rodent spp	D	E	137	Complete	
		3/11/2019	2233	Water rat	D	W	139	Complete	
		4/11/2019	0346	Rodent spp	D	E	140	Complete	
		4/11/2019	1445	EW dragon	Pr	NDM	147	Incomplete	
		4/11/2019	2322	Black Rat	D	E	148	Complete	
		4/11/2019	2342	Black Rat	D	W	149	Complete	
		6/11/2019	0025	Rodent spp	Pr	E	157	Complete	
		6/11/2019	2045	SEBitP x 2	Pr	E	165	Complete	Mother and joey
		6/11/2019	2112	SEBitP x 3	D	W	166	Complete	Mother and joey
		6/11/2019	2250	Black Rat	D	W	167	Complete	
		6/11/2019	2314	Black Rat	D	E	168	Complete	
		7/11/2019	0242	Rodent spp	D	E	169	Complete	

WC2NH operational phase underpass monitoring – year two interim report

Site	Side	Date	Time	Species	Accuracy	Movement	Pic/vid No.	Complete or incomplete	Comments
		8/11/2019	0025	Black Rat	D	E	182	Complete	
		8/11/2019	0445	Black Rat	D	W	183	Complete	
		8/11/2019	2052	Black Rat	Pr	W	197	Complete	
		9/11/2019	0054	Black Rat	D	E	199	Complete	
		9/11/2019	0133	Black Rat	Pr	W-E	200,202	Incomplete	
		9/11/2019	0433	Black Rat	D	W	203	Complete	
		10/11/2019	0124	Rodent spp	Pr	E	209-210	Complete	
		11/11/2019	0248	Black Rat	Pr	W	230	Complete	
		11/11/2019	0440	Black Rat	D	W	231	Complete	
		12/11/2019	0427	Rodent spp	Pr	E	232	Complete	
		12/11/2019	0801	Swamp wallaby	D	E	234	Complete	
		12/11/2019	1239	Lace Monitor	D	W	237	Complete	
		12/11/2019	1748	Swamp wallaby	D	E	239-242	Complete	
		14/11/2019	1506	Swamp wallaby	D	W	261-262	Complete	
		15/11/2019	1401	Lace Monitor	Pr	E	277	Complete	
		15/11/2019	1705	Swamp wallaby	D	E-W	278-279	Incomplete	
		15/11/2019	2047	Rodent spp	D	E	280	Complete	
		15/11/2019	2201	Black Rat	D	W	281	Complete	
		15/11/2019	2319	Black Rat	D	W	282	Complete	
		17/11/2019	2109	Small mammal	Pr	E	306	Complete	
		17/11/2019	2342	Black Rat	Pr	E	307	Complete	
		18/11/2019	0532	Swamp wallaby	D	E	310	Complete	
		19/11/2019	1142	Lace Monitor	Pr	W	368	Complete	
		19/11/2019	1945	Black Rat	Pr	E	369	Complete	
		20/11/2019	0028	Black Rat	Pr	E	371	Complete	
		20/11/2019	1951	Black Rat	D	E	8	Complete	
		21/11/2019	1131	EW dragon	D	W	29	Complete	
		21/11/2019	2327	Black Rat	D	W	30	Complete	
		22/11/2019	0414	Black Rat	D	W	31	Complete	
		22/11/2019	2121	Black Rat	D	E	71	Complete	
		22/11/2019	2211	Black Rat	D	EXM	72-75	Incomplete	
		24/11/2019	0153	Black Rat	Po	W	90	Incomplete	
		24/11/2019	2306	Swamp rat	Pr	E	109	Complete	
		25/11/2019	2246	Black Rat	D	E	120	Complete	
		26/11/2019	2318	Black Rat	D	W	147	Complete	
		27/11/2019	0001	Black Rat	D	E	148	Complete	
		27/11/2019	0204	Black Rat	D	W	149-150	Complete	
		2/12/2019	0052	Black Rat	D	E-W	231-233	Incomplete	
		3/12/2019	1427	EW dragon	D	E	280	Complete	
		9/12/2019	0039	Bush rat	Pr	W	394	Complete	
		9/12/2019	0523	Swamp wallaby	Pr	E	395	Complete	
		9/12/2019	0728	Swamp wallaby	Po	E	407	Complete	
		11/12/2019	0422	Water rat	D	E	422	Complete	
		16/12/2019	0120	House mouse	D	EXM	443-444	Incomplete	
		17/12/2019	2217	Black Rat	D	W	473	Complete	
		18/12/2019	0437	Black Rat	D	W	474-475	Complete	
<b>4</b>	<b>Furniture</b>	11/12/2019	1028	Lace Monitor	D	E	39	Complete	MB present
	<b>Ground</b>	14/10/2019	0145	Cat	D	E	33	Complete	Tabby
		14/10/2019	0200	Fox	D	E	34	Complete	
		16/10/2019	2253	Black Rat	D	E	48	Complete	
		19/10/2019	0234	Koala	D	E	68	Complete	
		20/10/2019	1242	Lace Monitor	D	W	90	Complete	
		21/10/2019	2227	Koala	D	W	95	Complete	
		22/10/2019	2055	Cat	D	W	4	Complete	tabby
		23/10/2019	1217	Lace Monitor	D	E	6	Complete	
		25/10/2019	1113	Lace Monitor	D	E	12	Complete	
		28/10/2019	1203	Lace Monitor	D	W	17	Complete	
		29/10/2019	1156	Lace Monitor	D	E	18	Complete	
		29/10/2019	2227	Black Rat	D	E	19	Complete	



Site	Side	Date	Time	Species	Accuracy	Movement	Pic/vid No.	Complete or incomplete	Comments		
		30/10/2019	1227	Lace Monitor	D	W	20	Complete			
		1/11/2019	0956	Lace Monitor	D	E	21	Complete			
		1/11/2019	1521	Lace Monitor	D	W	23	Complete			
		3/11/2019	1007	Lace Monitor	D	E	27	Complete			
		3/11/2019	1354	Lace Monitor	D	W	30	Complete			
		9/11/2019	0959	Lace Monitor	D	E	47	Complete			
		9/11/2019	1505	Lace Monitor	D	W	48	Complete			
		13/11/2019	0825	Cat	D	E	65	Complete			
		13/11/2019	1944	Cat	D	W	66	Complete			
		15/11/2019	0104	Koala	D	E	67	Complete			
		15/11/2019	1255	Lace Monitor	D	E	73-74	Complete			
		16/11/2019	1402	Lace Monitor	D	E	77	Complete			
		18/11/2019	1223	Lace Monitor	Pr	W	85	Complete			
		19/11/2019	0431	Swamp wallaby	D	W	86-87	Complete			
		19/11/2019	1052	Lace Monitor	D	E	89	Complete			
		20/11/2019	0502	Cat		E	91	Complete			
		20/11/2019 to 18/12/2019 period (Camera date record malfunction)									
				6/01/2015	1925	cat	D	E	5	Complete	Tabby
				6/01/2015	2152	Koala	D	E	6	Complete	
				7/01/2015	1121	Lace Monitor	D	W	10	Complete	
				10/01/2015	2017	Koala	D	W	12	Complete	
				10/01/2015	2052	cat	Pr	E	13	Complete	
				11/01/2015	1853	Black Rat	D	E	16	Complete	
				12/01/2015	1854	Koala	D	E	20	Complete	
				14/01/2015	1003	Lace Monitor	D	W	37	Complete	
				18/01/2015	0616	Lace Monitor	D	W	45	Complete	
		20/01/2015	0514	Lace Monitor	D	E	53	Complete			
		20/01/2015	0624	Lace Monitor	Pr	W	54	Complete			
		23/01/2015	0936	Lace Monitor	D	W	88	Complete			
		26/01/2015	1056	Lace Monitor	D	W	93	Complete			
		27/01/2015	1014	Lace Monitor	D	W	99	Complete			
		29/01/2015	1945	Cat	D	E	106	Complete	Tabby		
		30/01/2015	2130	Koala	D	W	107	Complete			
		31/01/2015	0414	cat	D	E	108	Complete	Tabby		
		31/01/2015	0918	Lace Monitor	D	W	118	Complete			
		31/01/2015	1617	cat	D	W	119	Complete	Tabby		
<b>3</b>	<b>Furniture</b>	9/10/2019	1013	Welcome swallow	Pr	EXM	8-10	Incomplete	2 individuals		
		9/10/2019	1147	Welcome swallow	D	EXM	13	Incomplete			
		14/10/2019	0417	Cat	Pr	W	22	Complete	Black, white paws		
		14/10/2019	1002	Welcome swallow	D	EXM	24-26	Incomplete			
		15/10/2019	1059	Welcome swallow	Pr	EXM	32-33	Incomplete	2 individuals		
		16/10/2019	0952	Welcome swallow	Pr	EXM	49-50	Incomplete			
		16/10/2019	1052	Welcome swallow	Pr	EXM	51-52	Incomplete			
		17/10/2019	0817	Welcome swallow	Pr	EXM	70	Incomplete	2 individuals		
		17/10/2019	1026	Welcome swallow	Pr	EXM	81	Incomplete			
		17/10/2019	1251	Welcome swallow	Pr	EXM	91	Incomplete			
		17/10/2019	1426	Welcome swallow	Pr	EXM	95, 97	Incomplete			
		17/10/2019	1527	Welcome swallow	Pr	EXM	103	Incomplete			
		17/10/2019	1705	Welcome swallow	Pr	EXM	108	Incomplete			
		18/10/2019	1604	Welcome swallow	Pr	EXM	133	Incomplete			
		18/10/2019	1350	Welcome swallow	Pr	EXM	144	Incomplete			
		19/10/2019	1408	Welcome swallow	Pr	EXM	146	Incomplete			
		21/10/2019	1020	Welcome swallow	Pr	EXM	157-159	Incomplete	2 individuals		
		29/11/2019	1048	Welcome swallow	D	EXM	10-11	Incomplete			
		1/12/2019	1453	cat	Pr	E	18	Complete	Black, white paws		
		1/12/2019	1826	Welcome swallow	D	EXM	20	Incomplete			
		5/12/2019	0705	cat	D	E	52	Complete	Black, white paws		

WC2NH operational phase underpass monitoring – year two interim report

Site	Side	Date	Time	Species	Accuracy	Movement	Pic/vid No.	Complete or incomplete	Comments
Ground		9/10/2019	0529	Cat	D	E	55	Complete	Black, white paws
		10/10/2019	0146	Cat	D	W	65-69	Complete	Black, white paws
		10/10/2019	0542	Cat	D	W	71	Complete	Black, white paws
		10/10/2019	0722	Cat	Pr	E	72	Complete	Black, white paws
		10/10/2019	2037	Fox	Pr	E	76	Complete	
		11/10/2019	0547	Wallaby spp.	Pr	E	77	Complete	
		11/10/2019	0623	Wallaby spp.	D	E	78	Complete	
		11/10/2019	0834	Wallaby spp.	D	W	80	Complete	
		11/10/2019	1331	Cat	D	W	81	Complete	Black, white paws
		11/10/2019	1401	Cat	D	E	82	Complete	Black, white paws (With killed rodent spp.)
		12/10/2019	0412	Cat	D	W	83	Complete	Black, white paws
		12/10/2019	0442	Cat	D	E	84	Complete	Black, white paws
	12/10/2019	0545	Cat	D	W	85	Complete	Black, white paws	
	12/10/2019	0629	Cat	D	E	86	Complete	Black, white paws	
	12/10/2019	1351	Cat	D	W	87	Complete	Black, white paws	
	12/10/2019	1438	Cat	D	W	88	Complete	Black, white paws	
	12/10/2019	1542	Cat	D	E	89	Complete	Black, white paws	
	12/10/2019	1545	Cat	D	E	90	Complete	Black, white paws	
	13/10/2019	0410	Cat	D	W	91	Complete	Black, white paws	
	13/10/2019	0607	Cat	Po	E	92	Complete	Black, white paws	
	13/10/2019	0930	Macropod	D	W	93	Complete		
	13/10/2019	2232	Fox	D	E	94	Complete		
	13/10/2019	2322	Cat	D	W	95	Complete	Black, white paws	
	14/10/2019	0542	Cat	D	W	97	Complete	Black, white paws	
	14/10/2019	0633	Cat	D	E	102	Complete	Black, white paws (With killed rodent spp.)	
	14/10/2019	0658	Cat	D	E	103	Complete	Black, white paws	
	14/10/2019	1828	EG kangaroo	D	W	104-106	Complete		
	14/10/2019	2035	Cat	D	W	107	Complete	Black, white paws	
	14/10/2019	2227	Cat	D	E	108	Complete	Black, white paws	
	15/10/2019	0103	Cat	D	W	109	Complete	Black, white paws	
	15/10/2019	0143	Cat	D	E	110	Complete	Black, white paws	
	15/10/2019	0228	Cat	D	W	111-115	Complete	Black, white paws, and throat	
	15/10/2019	0320	Cat	D	E	116	Complete	Black, white paws	
	15/10/2019	0436	Fox	Pr	W	118-120	Complete		
	15/10/2019	0453	EG kangaroo	D	E	121	Complete		
	15/10/2019	0553	Cat	D	W	122	Complete		
	15/10/2019	0605	Fox	Pr	E	123	Complete		
	15/10/2019	0625	EG kangaroo	D	E	124-125	Complete		
	15/10/2019	0629	Cat	Pr	E	126	Complete	Black, white paws	
	15/10/2019	2020	Wallaby spp.	D	W	131-132	Complete		
	16/10/2019	0458	Cat	Pr	W	136	Complete	Black, white paws	
	16/10/2019	0533	EG kangaroo	Pr	E	137-138	Complete		

WC2NH operational phase underpass monitoring – year two interim report

Site	Side	Date	Time	Species	Accuracy	Movement	Pic/vid No.	Complete or incomplete	Comments
		16/10/2019	0537	EG kangaroo	D	W	139	Complete	
		17/10/2019	0207	Fox	D	W	145	Complete	
		17/10/2019	1413	Cat	D	W	156-159	Complete	Black, white paws, and throat
		17/10/2019	1454	Cat	D	E	160	Complete	
		17/10/2019	1538	Cat	D	W	161	Complete	
		17/10/2019	1542	Cat	D	E	163	Complete	
		17/10/2019	1549	Cat	D	E	164	Complete	
		18/10/2019	0522	Fox	D	E	165	Complete	
		18/10/2019	1012	Cat	Pr	NDM	177-178	Incomplete	
		18/10/2019	1138	Welcome swallow	D	EXM	187-189	Incomplete	
		18/10/2019	1209	Welcome swallow	Pr	EXM	192-193	Incomplete	
		18/10/2019	1911	Swamp wallaby	D	W	202-206	Complete	
		18/10/2019	2053	Cat	D	W	210	Complete	Black, white paws
		19/10/2019	0142	Fox	D	W	211	Complete	
		19/10/2019	0222	Fox	D	E	212	Complete	
		19/10/2019	0331	Cat	D	W	213	Complete	Black, white paws, and throat
		19/10/2019	0356	Cat	D	W	214	Complete	Black, white paws
		19/10/2019	0401	Cat	D	E	215	Complete	Black, white paws
		19/10/2019	0415	Cat	Pr	W	216	Complete	Black, white paws
		19/10/2019	0508	Swamp wallaby	D	E	217-219	Complete	
		19/10/2019	0618	Cat	Pr	E	221	Complete	Black, white paws
		19/10/2019	2001	Wallaby spp.	D	W	230	Complete	
		20/10/2019	0511	Macropod spp.	Pr	E	231	Complete	
		20/10/2019	1752	Swamp wallaby	D	W	240-241	Complete	
		20/10/2019	2202	Cat	D	W	242	Complete	Black, white paws
		21/10/2019	0514	Swamp wallaby	D	E	243-245	Complete	
		21/10/2019	0519	Cat	D	E	246	Complete	Black, white paws
		21/10/2019	0804	Cat	D	W	247	Complete	Black, white paws
		21/10/2019	0814	Cat	D	E	248	Complete	Black, white paws, (with killed rodent spp.)
		21/10/2019	1302	Cat	D	W	249	Complete	Black, white paws, and throat
		21/10/2019	1307	Cat	D	E	250	Complete	Black, white paws
		21/10/2019	1331	Cat	D	W	251	Complete	Black, white paws, and throat
		21/10/2019	1558	Cat	D	E	252	Complete	Black, white paws
		21/10/2019	2313	Cat	D	E	257	Complete	Black, white paws
		22/10/2019	0446	Cat	D	W	258	Complete	Black, white paws, and throat
		22/10/2019	0644	Cat	D	E	259	Complete	Black, white paws
		22/10/2019	0704	Macropod spp.	D	E	260	Complete	
		22/10/2019	0836	Cat	D	E	262	Complete	Black, white paws
		22/10/2019	1107	Cat	D	W	265	Complete	Black, white paws, and throat
		22/10/2019	1146	Cat	D	E	266	Complete	Black, white paws
		28/11/2019	2018	Cat	D	E	12	Complete	Black, white paws
		30/11/2019	2240	Cat	Po	EXM	22-30	Complete	Black, white paws

Site	Side	Date	Time	Species	Accuracy	Movement	Pic/vid No.	Complete or incomplete	Comments
		1/12/2019	0435	Fox	D	W	33	Complete	
		1/12/2019	0507	Wallaby spp.	Pr	E	34	Complete	
		1/12/2019	1231	Cat	Pr	W	38	Complete	
		1/12/2019	2302	Swamp wallaby	D	W	40-41	Complete	
		2/12/2019	2121	Cat	D	E	43-51	Complete	Tabby
		2/12/2019	2250	Cat	D	W	52-54	Complete	Black, white paws
		3/12/2019	0347	Cat	Pr	EXM	55-58	Complete	
		3/12/2019	0517	Wallaby spp.	D	E	61	Complete	
		3/12/2019	2041	Swamp wallaby	D	W	78	Complete	
		4/12/2019	0101	Cat	D	W	79	Complete	Black, white paws
		4/12/2019	0517	Wallaby spp.	D	E	81	Complete	
		4/12/2019	1831	Cat	D	E	94	Complete	Black, white paws
		5/12/2019	0308	Cat	D	W	95	Complete	Black, white paws, and throat
		6/12/2019	0235	Cat	D	W	103-104	Complete	Black, white paws, and throat
		6/12/2019	2237	Swamp wallaby	Po	W	135	Complete	
		7/12/2019	0227	Cat	D	W	136	Complete	Tabby
		7/12/2019	0530	Cat	Pr	E	138	Complete	Black, white paws
		8/12/2019	0450	Macropod spp.	D	E	150	Complete	
		8/12/2019	0613	Cat	Po	EXM	153-154	Complete	Black, white paws, and throat
		8/12/2019	1700	Swamp wallaby	Po	E	156	Complete	
		9/12/2019	0508	Macropod spp.	Pr	E	158	Complete	
		9/12/2019	1728	Swamp wallaby	D	E	161	Complete	
		9/12/2019	2227	Cat	D	E	162-163	Complete	
		10/12/2019	0648	Swamp wallaby	D	E	165	Complete	
		10/12/2019	0743	Swamp wallaby	D	W	166	Complete	
		10/12/2019	2224	Macropod spp.	D	E	176	Complete	
		11/12/2019	1701	Swamp wallaby	D	E	177	Complete	
		12/12/2019	0109	Cat	D	E	178	Complete	Black, white paws, and throat
		12/12/2019	2130	Cat	D	W	179-181	Complete	Black, white paws, and throat
		12/12/2019	2351	Cat	D	W	182	Complete	Black, white paws, and throat
		13/12/2019	0054	Swamp wallaby	Pr	W	183	Complete	
		13/12/2019	0622	Wallaby spp.	Pr	W	184	Complete	
		13/12/2019	0645	Wallaby spp.	Pr	E	185	Complete	
		14/12/2019	2017	Wallaby spp.	D	E	187	Complete	
		14/12/2019	2210	Cat	D	W	188	Complete	Black, white paws, and throat
		15/12/2019	0043	Cat	D	E	189	Complete	Black, white paws
		17/12/2019	2112	Swamp wallaby	Pr	W	194-195	Complete	
		18/12/2019	0228	Cat	D	W	196	Complete	
		18/12/2019	0451	Cat	D	E	197	Complete	
		18/12/2019	0458	Macropod spp.		E	198	Complete	
<b>2</b>	<b>Furniture</b>	No pics							MB present
		28/11/2019	Nil fauna		D				
	<b>Ground</b>	8/10/2019	1943	Fox	D	W	2	Complete	
		8/10/2019	2021	Cat	Pr	E	3	Complete	Black, white paws
		9/10/2019	0431	Wallaby spp.	Pr	W	4	Complete	
		10/10/2019	0102	Swamp wallaby	D	W	11	Complete	
		10/10/2019	0312	Swamp wallaby	D	E	12	Complete	
		10/10/2019	0329	Swamp wallaby	D	E	13-14	Complete	

Site	Side	Date	Time	Species	Accuracy	Movement	Pic/vid No.	Complete or incomplete	Comments
		10/10/2019	0343	Swamp wallaby	D	E	15-16	Complete	
		13/10/2019	0154	Fox	D	E	27	Complete	
		13/10/2019	2244	Fox	D	E-W	29-31	Incomplete	
		14/10/2019	0358	Fox	D	E	33	Complete	
		14/10/2019	1937	Fox	D	W	34	Complete	
		15/10/2019	0002	Fox	D	W	35	Complete	
		15/10/2019	0102	Fox	Po	E	36	Complete	
		15/10/2019	1936	Swamp rat	D	E	41	Complete	
		16/10/2019	2246	Fox	D	W-E	45-47	Incomplete	
		17/10/2019	0342	Fox	D	E	48	Complete	
		17/10/2019	2040	Fox	D	W	52	Complete	
		18/10/2019	2353	Fox	D	E	60	Complete	
		19/10/2019	0245	Fox	D	E	63	Complete	
		19/10/2019	0456	Fox	D	E	64	Complete	
		19/10/2019	2016	Fox	D	E-W	73	Complete	
		19/10/2019	2028	Fox	D	W	74	Complete	
		19/10/2019	2102	Fox	D	W	75	Complete	
		20/10/2019	0322	Fox	D	E	76	Complete	
		20/10/2019	2118	Fox	D	W-E	84-86	Incomplete	
		21/10/2019	0330	Fox	D	W	87	Complete	
		21/10/2019	0517	Fox	D	E	89	Complete	
		21/10/2019	1927	Swamp wallaby	D	W	94	Complete	
		21/10/2019	2014	Fox	D	W	96	Complete	
		21/10/2019	2101	Fox	D	W	97	Complete	
		22/10/2019	0417	Fox	D	E	99	Complete	
		22/10/2019	0450	Swamp wallaby	Pr	E	100	Complete	
		22/10/2019	0521	Fox	D	E	101	Complete	
		22/10/2019	0544	Swamp wallaby	D	E	102	Complete	
		30/11/2019	0422	Macropod spp.	D	E	84	Complete	
		1/12/2019	0249	Fox	D	E	90	Complete	
		1/12/2019	0800	Macropod spp.	D	E	91	Complete	
		2/12/2019	2353	Fox	Pr	E	138	Complete	
		4/12/2019	2021	Swamp wallaby	D	E	236	Complete	
		4/12/2019	2032	Swamp wallaby	D	W	237	Complete	
		5/12/2019	0508	Swamp wallaby	D	E	238	Complete	
		6/12/2019	0407	Swamp wallaby	D	E	313	Complete	
		7/12/2019	0326	Swamp wallaby	D	E	416	Complete	
		7/12/2019	2130	Swamp wallaby	D	E	441	Complete	
		8/12/2019	0009	Fox	D	E	442	Complete	
		8/12/2019	1624	Dog	D	E	465	Complete	No collar visible, relatively skinny
		8/12/2019	2005	Macropod spp.	Pr	W-E	467	Incomplete	
		9/12/2019	0409	Swamp wallaby	Pr	E	468	Complete	
		10/12/2019	2028	Swamp wallaby	D	E	589	Complete	
		11/12/2019	0453	Echidna	Po	E	591	Complete	
		12/12/2019	0050	Swamp wallaby	D	E	674	Complete	
		12/12/2019	0233	Swamp wallaby	D	E	676	Complete	
		12/12/2019	2139	Swamp wallaby	D	E	733	Complete	
		13/12/2019	0346	Swamp wallaby	Pr	E	735-737, 739	Complete	
		14/12/2019	2021	Swamp wallaby	D	E	765	Complete	
		15/12/2019	0035	Dog	D	E	769	Complete	
		15/12/2019	0159	Swamp wallaby	D	E	770	Complete	
		15/12/2019	0407	Swamp wallaby	D	W	771-772	Complete	
		16/12/2019	2315	Fox	D	E	850	Complete	
		18/12/2019	0112	Cat	D	W-E	922-923	Incomplete	Tabby
<b>1</b>	<b>North</b>	23/06/2019	0210	swamp wallaby	Po	NDM	3431	Incomplete	
		30/06/2019	1230	Medium frog	Pr	W	8371-8390	Complete	
		30/06/2019	1803	Medium frog	Pr	E	8704-8918	Complete	

WC2NH operational phase underpass monitoring – year two interim report

Site	Side	Date	Time	Species	Accuracy	Movement	Pic/vid No.	Complete or incomplete	Comments
		3/07/2019	2020	Medium frog	D	E	1002-1005	Complete	
		22/07/2019	0255	Swamp wallaby	D	NDM	2181-2184	Incomplete	
		23/07/2019	0517	Swamp wallaby	D	W	3109-3114	Complete	
		27/02/2020	0611	Swamp Wallaby	D	W	2740-2778	Complete	
		8/02/2020	0555	White faced Heron	D	E	9337-9339	Complete	
		8/02/2020	0916	Purple Swamp-hen	D	W-E	9340-9348	Incomplete	
		17/02/2020	0759	Purple Swamp-hen x 3		E-W	4228-4252	Incomplete	1 complete in background
		22/10/2019	Nil fauna		D				Camera stolen replaced in Jan 20
	<b>South</b>	30/07/2019	0558	Swamp wallaby	D	W	8631-8647	Complete	
		4/08/2019	0234	Swamp wallaby	D	NDM	2361-2372	Incomplete	
		30/07/2019	1741	Swamp wallaby	Po	W	8697-8704	Complete	
		17/08/2019	0257	Medium macropod	D	NDM	1397-1403	Incomplete	
		21/06/2019	1949	swamp wallaby	D	NDM	2510	Incomplete	
		12/08/2019	1709	Fox	D	W	8731	Complete	
		12/08/2019	1823	cat		E	8805	Complete	
		22/10/2019	Nil fauna						Camera stolen replaced in Jan 20



**Table C3:** Results from spring/summer diurnal active searches. OBS = Observed, prob = probable; MSB = moves small branches; RL = rustles leaves

Site	Date	Side	Day/Night (survey	Observers	Start	Finish	Wind	Rain	Visibility	Air	Humidity	Species (no. of individuals / behaviour)	Signs (scats/tracks
11&12	22/9/19	W	D1	NM	845	915	MSB	Nil	Good	19	82	Lampropholis spp.	OBS
	22/9/19	E	D1	NM/NP	915	930	MSB	Nil	Good	19	82	Lampropholis spp., A. brevis, Wallaby scat, bandicoot diggings	Obs
	1/10/19	W	D2	NP	1445	1515	Nil	Nil	Good	21	79	Wallaby scat	
	1/10/19	E	D2	NP	1515	1545	Nil	Nil	Good	21	79	Lampropholis spp., Wallaby scat	
9&10	3/10/19	W	D1	NP	11:00	11:30	RL	Nil	Good	21.5	68	Lampropholis spp., small mammal nest (melomys?), Bandicoot	
	3/10/19	E	D1	NP	11:30	12:00	RL	Nil	Good	21.5	68	Echidna diggings	
	15/10/19	W	D2	Nm/La	9:30	9:45	Nil	Nil	Good	22.1	75	Lampropholis spp	
	15/10/19	E	D2	Nm/La	9:50	10:05	Nil	Nil	Good	22.1	75	Bandicoot diggings, Lampropholis spp, Wallaby scat	
8	3/10/19	W	D1	NP	12:05	1235	RL	Nil	Good	23	65	Lampropholis spp, Echidna diggings, Wallaby scat	
	3/10/19	E	D1	NP	1235	1305	RL	Nil	Good	23	65	Lampropholis spp.	
	Incidental											Swamp snake	
	15/10/19	W	D2	NM/LA	1010	1025	Nil	Nil	Good	22.7	75	Lampropholis spp, bearded dragon	
	15/10/19	E	D2	NM/LA	1030	1045	Nil	Nil	Good	22.7	75	Lampropholis spp, Wallaby scat	
	16/10/19	W	D3	LA	10:10	10:40	MSB	Nil	Good	25.8	67	Yellow faced whipsnake, lace Monitor, Lampropholis spp,	
16/10/19	E	D3	LA	10:45	10:15	MSB	Nil	Good	25.8	67	Wallaby scat		
7	4/10/19	W	D1	NP	945	1015	RL	Nil	Good	23	61	Wallaby scat, bandicoot diggings	
	4/10/19	E	D1	NP	1015	1045	RL	Nil	Good	23	61	Echidna diggings, Wallaby scat	
	16/10/19	W	D2	LA	1245	1300	MSB	Nil	Good	24.9	69	Lampropholis spp multiple	
	16/10/19	E	D2	LA	1315	1330	MSB	Nil	Good	24.9	69	Lampropholis spp multiple, bandicoot diggings, Wallaby scat	
5&6	Incidental											Burtons legless lizard	
	16/10/19	W	D1	NP/NM	1025	1040	Nil	Nil	Good	29	49	Lampropholis spp, Wallaby scat, bandicoot digging	
	16/10/19	E	D1	NP/NM	1040	1055	Nil	Nil	Good	29	49	Lampropholis spp., Wallaby scat, bandicoot & echidna diggings	
	18/10/19	W	D2	NM	1200	1230	MSB	Nil	Good	22	27	Lampropholis spp multiple, bandicoot diggings	
	18/10/19	E	D2	NM	1235	1305	MSB	Nil	Good	22	27	Wallaby scat, Lampropholis spp multiple	
4	16/10/19	W	D1	NM	1105	1135	Nil	Nil	Good	25.5	66	Lampropholis spp., Wallaby scat, bandicoot & echidna diggings	
	16/10/19	E	D1	NP	1105	1135	Nil	Nil	Good	25.5	66	Lampropholis spp., Wallaby scat, bandicoot & echidna diggings	
	18/10/19	W	D2	NM	1305	1335	MSB	Nil	Good	25.7	16	Med lizard, Wallaby scat	
	21/10/19	E	D2	NM	1035	1105	Nil	Nil	Good	21.8	62	Bandicoot diggings, Wallaby scat, Lampropholis spp	
3	16/10/19	W	D1	NM	1145	1215	Nil	Nil	Good	25.4	67	Wallaby scat, bandicoot diggings	
	16/10/19	E	D1	NP	1145	1215	Nil	Nil	Good	25.4	67	Lampropholis spp., Bandicoot scat, water dragon scat, echidna	
	18/10/19	W	D2	NP/NM	1000	1015	Nil	Nil	Good	22.3	31	Wallaby scat, bandicoot diggings	
	18/10/19	E	D2	NP/NM	1015	1030	Nil	Nil	Good	22.3	31	Lampropholis spp., Bandicoot scat, water dragon scat, echidna	
2	16/10/19	W	D1	LA	15:00	15:30	Nil	Nil	Good	25.5	66	Echidna & bandicoot diggings, Wallaby scat, Lampropholis spp	
	15/10/19	E	D1	LA	15:35	16:05	Nil	Nil	Good	25.5	66		
	21/10/19	W	D2	NM	1110	1140	Nil	Nil	Good	25.5	22	Lampropholis spp, Wallaby scat	
	21/10/19	E	D2	NM	1145	1215	Nil	Nil	Good	25.5	22	Wallaby scat, lace Monitor scat, Lampropholis spp	
1	16/10/19	W	D1	LA	1055	1125	RL	Nil	Good	25	65	EW dragon x2, Lampropholis spp x 1	
	16/10/19	E	D1	LA	1130	1200	RL	Nil	Good	25	65	EW dragon x3, Lampropholis spp x2, Fox scat	
	21/10/19	W	D2	NM	1307	1337	Nil	Nil	Good	28	17	EW dragon x 2, wallaby scat, Fox scat, bandicoot diggings	
	21/10/19	E	D2	NM	1235	1305	Nil	Nil	Good	26.6	16	Lampropholis spp	

**Table C4:** Results from nocturnal active searches for spring/summer. *P. coriacea* = *Pseudophryne coriacea*, *A. brevis* = *Adelotus Brevis*, M. = Mixophyes, Lim. = Limnodynastes, Lit = Litoria. GHFF= Grey-headed flying fox. FF = Flying fox. SuG, Sugar glider. *C. signifera* = *Crinia signifera*; hc = heard call

Location	Side	Date	Obs. No.	Observers	Start Time	Finish Time	Species	Wind	Rain	Visibility	Air Temp	Humidity	Comment
11&12	E	3/10/19	1	NM/BT	2210	2225	GHFF, <i>P. coriacea</i>	Nil	Nil	Good	14.9	84	
	W	3/10/19	1	NM/BT	2152	2207	GHFF	Nil	Nil	Good	14.9	84	
	E	27/11/19	2	LA	2120	2150	GHFF, <i>A. brevis</i>						
	W	27/11/19	2	DR	2120	2150	GHFF, SuG,						
9&10	E	3/10/19	1	NM/BT	2110	2125	GHFF, <i>P. coriacea</i> , <i>A. brevis</i>	Nil	Nil	Good	16.1	79	
	W	3/10/19	1	NM/BT	2128	2143	<i>P. coriacea</i> , GHFF	Nil	Nil	Good	16.1	79	
	E	27/11/19	2	LA	2200	2230	Swamp wallaby, GHFF						
	W	27/11/19	2	DR	2200	2230	GHFF						
8	E	21/10/19	1	NM/LA	2142	2157	GHFF	Nil	Nil	Good	14.2	83	
	W	21/10/19	1	NM/LA	2125	2140	GHFF	Nil	Nil	Good	14.2	83	
	E	28/11/19	2	LA	2000	2030	GHFF						
	W	28/11/19	2	DR	2000	2030	GHFF						
7	E	21/10/19	1	NM/LA	2045	2100	<i>A. brevis</i> , <i>C. signifera</i> , Lim. peronii, GHFF	Nil	Nil	Good	14.2	83	
	W	21/10/19	1	NM/LA	2102	2117	<i>A. brevis</i> , SuG SE, prob bandicoot HM, GHFF	Nil	Nil	Good	14.2	83	
	E	28/11/19	2	LA	2040	2110	Bandy bandy, GHFF, <i>A. brevis</i>	Nil					
	W	28/11/19	2	DR	2040	2110	GHFF	Nil					
5&6	E	18/10/19	1	NP/NM	2025	2040	GHFF, Lit. peronii, Lit. fallax, <i>A. brevis</i>	Nil	Nil	Good	16.2	65	
	W	18/10/19	1	NP/NM	2040	2055	Lit. tyleri, <i>P. Coriacea</i>	Nil	Nil	Good	16.2	65	
	E	28/11/19	2	LA	2120	2150	Lit. fallax, Lit. peroni, Lim. peroni, GHFF	Nil	V. Light	Good	22	77	
	W	28/11/19	2	DR	2120	2150	GHFF, Sw. Wallaby, Lit. peroni	Nil					
4	E	21/10/19	1	NM/LA	2005	2020	GHFF, Lim. peronii	Nil	Nil	Good	16.4	71	
	W	21/10/19	1	NM/LA	2021	2036	GHFF, SuG (hc)	Nil	Nil	Good	16.4	71	
	E	28/11/19	2	LA	2200	2230	GHFF, koala (sub-adult)	Nil	V. Light	Mod	22	78	
	W	28/11/19	2	DR	2200	2230	GHFF						
3 (E only)	E	18/10/19	1	NP/NM	2005	2020	Cat, LN Bandicoot, Macropod spp.	Nil	Nil	Good	16.5	60	
	E	21/10/19	2	NM/LA	1935	1950	GHFF, Frog spp, cat, Wallaby spp	Nil	Nil	Good	16.4	71	
	E	28/11/19	3	DR/LA	1050	1105	Nil	Nil	Light	Mod	22	78	
2	E	18/10/19	1	NP/NM	1930	1945	<i>C. signifera</i>	Nil	Nil	Good	16.7	56	
	W	18/10/19	1	NP/NM	1945	2000	Nil	Nil	Nil	Good	16.7	56	
	E	28/11/19	2	LA	2315	2345	Nil	Nil	Light	Mod	22	80	
	W	28/11/19	2	DR	2315	2345	GHFF						
1	E	16/10/19	1	NP/NM	2015	2030	Lit fallax						
	W	16/10/19	1	NP/NM	2000	2015	<i>M. iteratus</i> , water dragon, small mammal spp., ad brevis						
	E	27/11/19	2	LA	2018	2048	Lit fallax, FF sp						
	W	27/11/19	2	DR	2018	2048	<i>A. brevis</i> , Lit. fallax, northern brown, FF sp, swamp wallaby						

**Table C5:** Adjacent habitat trapping data for spring/summer. FF melomys = Fawn-footed melomys. SeBtP = Short-eared brushtail possum.

Site	Date	Trap type	Species	Sex	Weight	Comments
5/6 west	15/10/19	Pit	Calyptotis ruficauda	UK	NA	
5/6 west	15/10/19	Small Elliot	Bush Rat	UK	UK	Escaped before processing
5/6 west	15/10/19	Small Elliot	Brown Antechinus	F	26g	Parous, 6 pouch young.
5/6 east	15/10/19	Pit	Calyptotis ruficauda	UK	NA	
5/6 east	15/10/19	Small Elliot	FF Melomys	M	56g?	Weight may not be accurate
5/6 east	15/10/19	Small Elliot	Brown Antechinus	F	27g	Parous, 5 pouch young.
8 east	15/10/19	Small Elliot	FF Melomys	M	74g	
9/10 west	15/10/19	Small Elliot	FF Melomys	M	54g	
9/10 west	15/10/19	Small Elliot	FF Melomys	M	77g	
9/10 west	15/10/19	Cage	SEBtP	F	NA	Young adult
11/12 east	15/10/19	Small elliot	FF melomys	M	80	
11/12 west	15/10/19	Large elliot	Sugar Glider	F	100	
11/12 west	15/10/19	Pitfall	Lampropholis delicata x 4	UK	UK	
5/6 west	16/10/19	Pit	Blackish blind snake	NA	Na	
5/6 west	16/10/19	Pit	Dwarf Crowned Snake	NA	NA	
5/6 west	16/10/19	Pit	Brown Antechinus	F		Parous
5/6 east	16/10/19	Small Elliot	FF Melomys		70g	
8 west	16/10/19	Small Elliot	FF Melomys	M	96g	
9/10 east	16/10/19	Cage	SEBtP	M	NA	
9/10 west	16/10/19	Small elliot	Black Rat	F	90g	
11/12 east	16/10/19	Pitfall	P. Coriacea	UK	UK	
5/6 west	17/10/19	Small Elliot	Brown Antechinus	F	26g	Parous, 7 pouch young
5/6 east	17/10/19	Small Elliot	Black Rat	M	NA	Euthanised
5/6 east	17/10/19	Small Elliot	FF Melomys	M	77g	
8 east	17/10/19	Small Elliot	FF Melomys	M	82g	
8 east	17/10/19	Large Elliot	FF Melomys	M	64g	
8 west	17/10/19	Small Elliot	Brown Antechinus	F	33	Parous
8 west	17/10/19	Small Elliot	FF Melomys	F	64g	
1 west	18/10/19	Large Elliot	Black Rat	M	NA	Euthanised
2 west	18/10/19	Pit	Swamp snake	NA	NA	
2 east	18/10/19	Small Elliot	FF Melomys			
2 east	18/10/19	Small Elliot	FF Melomys			
2 east	18/10/19	Small Elliot	Brown Antechinus	F		
2 west	18/10/19	Pit	L delicata x 5			
3 west	18/10/19	Pit	P. coriacea	NA	NA	
7 west	18/10/19	Small Elliot	Sugar Glider	M	120	
7 west	18/10/19	Pitfall	House mouse	F	30	
7West	18/10/19	Small Elliot	Brown Antechinus	F	30	With 7 young
7West	18/10/19	Small Elliot	FF melomys	M	80	

Site	Date	Trap type	Species	Sex	Weight	Comments
4 west	18/10/19	Small Elliot	FF melomys	F	65	
4 west	18/10/19	Large Elliot	FF melomys	M	85	
4 east	18/10/19	Small Elliot	FF melomys	M	65	
2 east	18/10/19	Small Elliot	Brown Antechinus			
3 east	18/10/19	Pit	Swamp snake			
1 west	19/10/19	Small Elliot	Yellow-throated scrubwren			
2 west	19/10/19	Small Elliot	Bush Rat	M	149	
2 east	19/10/19	Small Elliot	Brown Antechinus	F	20	Parous with 2 young
2 east	19/10/19	Small Elliot	FF Melomys	M	49	
3 east	19/10/19	Pit	Red-backed toadlet			
7 west	19/10/19	Small Elliot	FF melomys	M	85	
4West	19/10/19	Small Elliot	Black Rat	F	95	
4 west	19/10/19	Small Elliot	Black Rat			Escaped
4East	19/10/19	Cage	Northern brown bandicoot	Na	Na	Minor injuries
3West	19/10/19	Pitfall	Lampropholis delicata			
3West	19/10/19	Cage	Northern brown bandicoot			Escaped
1 east	20/10/19	Small Elliot	Brown Antechinus	F	31g	Parous with 8 pouch young
1 west	20/10/19	Cage	SEBtP x 2	F		Mother and back young
2 east	20/10/19	Small Elliot	Brown Antechinus	F		Parous with 7 young
2 east	20/10/19	Small Elliot	Bush Rat		146g	
2 east	20/10/19	Cage	Northern brown bandicoot			
2 east	20/10/19	Pit	C. ruficauda			Check ID
7 west	21/10/19	Cage	SEBtPoss	M		
7 west	21/10/19	Small Elliot	Brown Antechinus	F		With young
7 west	21/10/19	Small elliot	FF melomys	NA	85	
4 west	21/10/19	Large Elliot	FF melomys	NA		
4 east	21/10/19	Small Elliot	FF melomys	NA		

**Table C6:** Results from hair funnel sampling in adjacent habitat in spring/summer.

Site	Side	Spring 2019		
		Install Date	Collect date	Fauna
1	E-1	14/11/2019	28/11/2019	<i>Trichosurus sp.</i> (Brush-tail Possum)
	E-2	14/11/2019	28/11/2019	
	W-1	14/11/2019	28/11/2019	<i>Trichosurus sp.</i> (Brush-tail Possum)
	W-2	14/11/2019	28/11/2019	
2	E-1	14/11/2019	28/11/2019	<i>Antechinus sp.</i> <i>Melomys cervinipes</i> (Fawn-footed Melomys)
	E-2	14/11/2019	28/11/2019	
	W-1	14/11/2019	28/11/2019	
	W-2	14/11/2019	28/11/2019	<i>Rattus fuscipes</i> (Southern Bush-rat)
3	E-1	14/11/2019	28/11/2019	<i>Wallabia bicolor</i> (Swamp Wallaby)
	E-2	14/11/2019	28/11/2019	
	W-1	14/11/2019	28/11/2019	
	W-2	14/11/2019	28/11/2019	<i>Perameles nasuta</i> (Long-nosed Bandicoot)
4	E-1	14/11/2019	28/11/2019	<i>Isoodon macrourus</i> (Northern Brown Bandicoot)
	E-2	14/11/2019	28/11/2019	
	W-1	14/11/2019	28/11/2019	<i>Rattus fuscipes</i> (Southern Bush-rat), (Northern Brown Bandicoot)
	W-2	14/11/2019	28/11/2019	<i>Rattus fuscipes</i> (Southern Bush-rat)
5/6	E-1	14/11/2019	28/11/2019	<i>Melomys cervinipes</i> (Fawn-footed Melomys)
	E-2	14/11/2019	28/11/2019	
	W-1	14/11/2019	28/11/2019	<i>Rattus fuscipes</i> (Southern Bush-rat)
	W-2	14/11/2019	28/11/2019	<i>Rattus fuscipes</i> (Southern Bush-rat)
7	E-1	14/11/2019	28/11/2019	<i>Melomys cervinipes</i> (Fawn-footed Melomys)
	E-2	14/11/2019	28/11/2019	
	W-1	14/11/2019	28/11/2019	
	W-2	14/11/2019	28/11/2019	<i>Perameles nasuta</i> (Long-nosed Bandicoot)
8	E-1	14/11/2019	28/11/2019	
	E-2	14/11/2019	28/11/2019	<i>Trichosurus sp.</i> (Brush-tail Possum)
	W-1	14/11/2019	28/11/2019	
	W-2	14/11/2019	28/11/2019	<i>Trichosurus sp.</i> (Brush-tail Possum)
9/10	E-1	14/11/2019	28/11/2019	
	E-2	14/11/2019	28/11/2019	<i>Trichosurus sp.</i> (Brush-tail Possum)
	W-1	14/11/2019	28/11/2019	<i>Rattus sp.</i>
	W-2	14/11/2019	28/11/2019	<i>Trichosurus sp.</i> (Brush-tail Possum) <i>Rattus rattus</i> (Black Rat)
11/12	E-1	14/11/2019	28/11/2019	<i>Melomys cervinipes</i> (Fawn-footed Melomys)
	E-2	14/11/2019	28/11/2019	
	W-1	14/11/2019	28/11/2019	<i>Rattus rattus</i> (Black Rat)
	W-2	14/11/2019	28/11/2019	

**Table C7:** Sand pad data for spring/summer monitoring in year two operational phase monitoring. D = definite, Pr = probable; Po = possible

Location	Sand pad	Date	Action	Species (direction & no passes)	Pad condition	Comments
12 median west	East	16/10/2019	Check 1	Rodent spp (1/w)	Good	
	West	16/10/2019	Check 1	Rodent spp (1/w)	Good	
	East	17/10/2019	Check 2	Nil	Fair	
	West	17/10/2019	Check 2	Nil	Fair	
	East	18/10/2019	Check 3	Nil	Fair	
	West	18/10/2019	Check 3	Nil	Fair	
	East	19/10/2019	Check 4	Nil	Fair	
	West	19/10/2019	Check 4	Nil	Fair	
	East	20/10/2019	Check 5	Nil	Fair	
	West	20/10/2019	Check 5	Nil	Fair	
	East	21/10/2019	Check 6	Nil	Fair	
	West	21/10/2019	Check 6	Nil	Fair	
	East	22/10/2019	Check 7	Nil	Fair	
	West	22/10/2019	Check 7	Nil	Fair	
	East	23/10/2019	Check 8	Nil	Fair	
	West	23/10/2019	Check 8	Nil	Fair	
11 median east	East	16/10/2019	Check 1	House mouse (1/meandering)	Good	
	West	16/10/2019	Check 1	Nil	Good	
	East	17/10/2019	Check 2	Nil	Fair	Wash out
	West	17/10/2019	Check 2	Nil	Fair	Wash out
	East	18/10/2019	Check 3	Nil	Fair	Wash out
	West	18/10/2019	Check 3	Nil	Fair	Wash out
	East	19/10/2019	Check 4	D rodent 1 e 1 w	Fair	
	West	19/10/2019	Check 4	D rodent 1e 1 w	Fair	
	East	20/10/2019	Check 5	D rodent 1 w	Fair	
	West	20/10/2019	Check 5	D rodent 1w	Fair	
	East	21/10/2019	Check 6	Nil	Fair	
	West	21/10/2019	Check 6	Nil	Fair	
	East	22/10/2019	Check 7	Nil	Poor	
	West	22/10/2019	Check 7	Nil	Poor	
	East	23/10/2019	Check 8	D rodent 1e, D small lizard 1e	Poor	
	West	23/10/2019	Check 8	D rodent 1e, D small lizard 1e	Poor	
10 median west	East	16/10/2019	Check 1	Large rodent (1/w)	Fair	
	West	16/10/2019	Check 1	Large rodent (1/w)	Fair	
	East	17/10/2019	Check 2	Nil	Fair	
	West	17/10/2019	Check2	Nil	Fair	
	East	18/10/2019	Check 3	D rodent 1 w	Fair	
	West	18/10/2019	Check 3	D rodent 1 w	Fair	
	East	19/10/2019	Check 4	Nil	Fair	



Location	Sand pad	Date	Action	Species (direction & no passes)	Pad condition	Comments
	West	19/10/2019	Check 4	Nil	Fair	
	East	20/10/2019	Check 5	Nil	Fair	
	West	20/10/2019	Check 5	Nil	Fair	
	East	21/10/2019	Check 6	D Lace Monitor 1e	Fair	
	West	21/10/2019	Check 6	D Lace Monitor 1e	Fair	
	East	22/10/2019	Check 7	Nil	Fair	
	West	22/10/2019	Check 7	Nil	Fair	
	East	23/10/2019	Check 8	D lace monitor 2w	Fair	
9 median east	West	23/10/2019	Check 8	D lace monitor 2w	Fair	
	East	16/10/2019	Check 1	Nil	Fair	
	West	16/10/2019	Check 1	Nil	Fair	
	East	17/10/2019	Check 2	Nil	Fair	
	West	17/10/2019	Check 2	Nil	Fair	
	East	18/10/2019	Check 3	D rodent 1w	Fair	
	West	18/10/2019	Check 3	D rodent 1 w	Fair	
	East	19/10/2019	Check 4	Nil	Fair	
	West	19/10/2019	Check 4	Nil	Fair	
	East	20/10/2019	Check 5	D medium reptile 1e	Fair	
	West	20/10/2019	Check 5	D medium reptile 1e	Fair	
	East	21/10/2019	Check 6	D Lace Monitor 1e, Pr rodent e,1w. D medium reptile 1w	Poor	
	West	21/10/2019	Check 6	D Lace Monitor 1e, Pr rodent e,1w. D medium reptile 1w	Poor	
	East	22/10/2019	Check 7	D rodent 1e,1w. D wallaby 1 e. D brushtail 1 w.	Poor	
	West	22/10/2019	Check 7	D rodent 1e,1w. D wallaby 1 e. D brushtail 1 w.	Poor	
East	23/10/2019	Check 8	D lace monitor 1 e 2w, D rodent 1e1w	Poor		
West	23/10/2019	Check 8	D lace monitor 1 e, D rodent 1e1w	Poor		
8 full length						
	East	16/10/2019	Check 1	Nil	Good	
	West	16/10/2019	Check 1	Nil	Good	
	East	17/10/2019	Check 2	Nil	Good	
	West	17/10/2019	Check 2	Nil	Good	
	East	18/10/2019	Check 3	D brushtail 1e	Good	
	West	18/10/2019	Check 3	D brushtail 1e	Good	
	East	19/10/2019	Check 4	D brushtail 1e 1w	Good	
	West	19/10/2019	Check 4	D brushtail 1w	Good	
	East	20/10/2019	Check 5	D lace Monitor 2w	Good	
	West	20/10/2019	Check 5	D lace Monitor 2w	Good	
	East	21/10/2019	Check 6	D brushtail 1e D cat 1e, d wallaby 1w	Good	
	West	21/10/2019	Check 6	D brushtail 1e, D cat 1e	Good	
	East	22/10/2019	Check 7	nil	Good	
	West	22/10/2019	Check 7	nil	Good	

Location	Sand pad	Date	Action	Species (direction & no passes)	Pad condition	Comments
	East	23/10/2019	Check 8	D lace monitor 1e1w, D bandicoot 1e1w	Good	
	West	23/10/2019	Check 8	D lace monitor 1e1w, D bandicoot 1e1w	Good	
7 full length	East	16/10/2019	Check 1	Nil	Good	
	West	16/10/2019	Check 1	Nil	Good	
	East	17/10/2019	Check 2	D wallaby 1e, D Brush turkey 1e	Good	
	West	17/10/2019	Check 2	D wallaby 1e, D Brush turkey 1e	Good	
	East	18/10/2019	Check 3	Nil	Good	
	West	18/10/2019	Check 3	Nil	Good	
	East	19/10/2019	Check 4	D swamp Wallaby 1 east	Good	
	West	19/10/2019	Check 4	D swamp Wallaby 1 east	Good	
	East	20/10/2019	Check 5	D wallaby 1w, D brushtail 1w	Good	
	West	20/10/2019	Check 5	D wallaby 1w, D brushtail 1w	Good	
	East	21/10/2019	Check 6	D brushtail 1e, D cat 1e, D Lace Monitor 1e	Good	
	West	21/10/2019	Check 6	D brushtail 1e, D cat 1e, D Lace Monitor 1e	Good	
	East	22/10/2019	Check 7	D wallaby 1e 1w, Pr echidna 1w, D rodent 1 e	Good	
	West	22/10/2019	Check 7	D wallaby 1e 1w, Pr echidna 1w,	Good	
	East	23/10/2019	Check 8	D wallaby 1w, Pr echidna 1e	Good	
	West	23/10/2019	Check 8	D wallaby 1w, Pr echidna 1e	Good	
6 full length	East	15/10/2019	Install		Fair	
	West	15/10/2019	Install		Fair	
	East	16/10/2019	Check 1	Nil	Fair	
	West	16/10/2019	Check 1	Nil	Fair	
	East	17/10/2019	Check 2	Medium reptile 1 e	Fair	
	West	17/10/2019	Check 2	Medium reptile 1 e	Fair	
	East	18/10/2019	Check 3	Nil	Fair	
	West	18/10/2019	Check 3	Nil	Fair	
	East	19/10/2019	Check 4	Nil	Fair	
	West	19/10/2019	Check 4	Nil	Fair	
	East	20/10/2019	Check 5	D rodent 2 e D lace Monitor 1w	Fair	
	West	20/10/2019	Check 5	D lace Monitor 1w	Fair	
	East	21/10/2019	Check 6	Nil	Fair	
	West	21/10/2019	Check 6	Nil	Fair	
	East	22/10/2019	Check 7	D rodent 1 w	Fair	
	West	22/10/2019	Check 7	D rodent 4w,3e (meandering across pad)	Fair	
East	23/10/2019	Check 8	D dog 1e1w	Fair		
West	23/10/2019	Check 8	D dog 1e1w, D rodent 1 w	Fair		
5	West	16/10/2019	1	Large rodent (1/e,1/w)	Fair	
	West water	16/10/2019	1	Large rodent (2/e, 2/w)	Fair	
	East	16/10/2019	1	Large rodent (1/e, 1/w)	Fair	
	West (water)	17/10/2019	2	Nil	Fair	
	East	17/10/2019	2	Nil	Fair	

Location	Sand pad	Date	Action	Species (direction & no passes)	Pad condition	Comments
	West	17/10/2019	2	Nil	Fair	
	West (water)	18/10/2019	3	D medium reptile 1e	Fair	
	East	18/10/2019	3	D rodent 3e, 3w	Fair	
	West	18/10/2019	3	D rodent 3e, 3w	Fair	
	West	19/10/2019	Check 4	D bounding rodent 2w,1e	Fair	
	East	19/10/2019	Check 4	D bounding rodent 1w,1e	Fair	
	West	19/10/2019	Check 4	D bounding rodent 1w,1e	Fair	
	West	20/10/2019	Check 5	Pr fox 1w, D rodent 2e 1w	Fair	
	East	20/10/2019	Check 5	D rodent 2e2w	Fair	
	West	20/10/2019	Check 5	D rodent 2e2w	Fair	
	West	21/10/2019	Check 6	D rodent 2w 1e.	Fair	
	East	21/10/2019	Check 6	D rodent 2e, 1w	Fair	
	West	21/10/2019	Check 6	D rodent 2e, 1w	Fair	
	West	22/10/2019	Check 7	D rodent 3e3w	Fair	
	East	22/10/2019	Check 7	D rodent 2e2w	Fair	
	West	23/10/2019	Check 8	D rodent 2e2w	Fair	
West	23/10/2019	Check 8	D rodent 2e2w	Fair		
4	East	16/10/2019	1	Bandicoot 1e, 1w, prob small bandicoot 1e	Good	
	West	16/10/2019	1	Bandicoot 1e, 1w, prob small bandicoot 1e	Good	
	East	17/10/2019	2	Pr rodent 1e 1w,	Good	
	West	17/10/2019	2	Pr rodent 1e 1w	Good	
	East	18/10/2019	3	Nil	Good	
	West	18/10/2019	3	Nil	Good	
	East	19/10/2019	Check 4	D koala 1 east, d Lace Monitor 1 e	Good	
	West	19/10/2019	Check 4	D koala 1 east, d Lace Monitor 1 e	Good	
	East	20/10/2019	Check 5	Nil	Good	
	West	20/10/2019	Check 5	Nil	Good	
	East	21/10/2019	Check 6	D Lace Monitor 1w	Good	
	West	21/10/2019	Check 6	D Lace Monitor 1w	Good	
	East	22/10/2019	Check 7	D koala 1 w	Good	
	West	22/10/2019	Check 7	D koala 1 w	Good	
East	23/10/2019	Check 8	D lace monitor 1e,1w. D cat 1w	Good		
West	23/10/2019	Check 8	D lace monitor 1e,1w. D cat 1w	Good		
3	East	16/10/2019	1	Wallaby 2w,1e, cat 1w	Fair/poor	
	West	16/10/2019	1	Wallaby 2w,1e, cat 1w	Fair/poor	
	East	17/10/2019	Check 2	Rodent bounding 1 w, D cat 1e1w	Fair/poor	
	West	17/10/2019	Check 2	D cat 1e, 1w.	Fair/poor	
	East	18/10/2019	Check 3	D Pr fox 1w	Fair/poor	
	West	18/10/2019	Check 3	Prfox 1w	Fair/poor	
	East	19/10/2019	Check 4	D cat 2e2w, D wallaby 1e1w, Pr fox 1e1w.	Fair/poor	
	West	19/10/2019	Check 4	D cat 2e2w, D wallaby 1e1w, Pr fox 1e1w.	Fair/poor	

Location	Sand pad	Date	Action	Species (direction & no passes)	Pad condition	Comments
	East	20/10/2019	Check 5	D Wallaby 1e1w, D cat 1e1w	Fair/poor	
	West	20/10/2019	Check 5	D Wallaby 1e1w, D cat 1e1w	Fair/poor	
	East	21/10/2019	Check 6	D cat 3e3w, D Wallaby 1 w (probably redneck)	Fair/poor	
	West	21/10/2019	Check 6	D cat 3e3w, D Wallaby 1 w (probably redneck)	Fair/poor	
	East	22/10/2019	Check 7	D cat 2e2w	Fair/poor	
	West	22/10/2019	Check 7	D cat 2e2w	Fair/poor	
	East	23/10/2019	Check 8	D cat 3e3w, D wallaby 1 west	Fair/poor	
	West	23/10/2019	Check 8	D cat 3e3w, D wallaby 1 west	Fair/poor	
2	East	16/10/2019	1	BtPoss 2e, rodent 1e1w	Fair/poor	
	West	16/10/2019	1	BtPoss 1e, rodent 1e	Fair/poor	
	East	17/10/2019	2	D fox 1e, 1w	Fair/poor	
	West	17/10/2019	2	D fox 1e, 1w	Fair/poor	
	East	18/10/2019	3	D fox 1e, 1w, Pr dasyurid 2east 1w	Fair/poor	
	West	18/10/2019	3	D fox 1e, 1w, Pr dasyurid 2east 1w	Fair/poor	
	East	19/10/2019	Check 4	D fox 2e, 1w	Fair/poor	
	West	19/10/2019	Check 4	D fox 2e, 1w	Fair/poor	
	East	20/10/2019	Check 5	D fox, 1w	Fair/poor	
	West	20/10/2019	Check 5	D fox 1w	Fair/poor	
	East	21/10/2019	Check 6	D fox 2e2w, Pr echidna 1e.	Fair/poor	
	West	21/10/2019	Check 6	D 2e2w, Pr echidna 1e	Fair/poor	
	East	22/10/2019	Check 7	D wallaby 2e2w, D fox 2w1e	Fair/poor	
	West	22/10/2019	Check 7	D wallaby 2e2w, D fox 2w1e	Fair/poor	
	East	23/10/2019	Check 8	Pr Fox, 2w1e	Fair/poor	
	West	23/10/2019	Check 8	Pr Fox, 2w1e	Fair/poor	
	East				Fair/poor	
	West				Fair/poor	
1	North	15/10/2019	Install		Fair	
	South	15/10/2019	Install		Fair	
	North	16/10/2019	Check 1	Macropod 2e	Fair	
	South	16/10/2019	Check 1	Nil	Fair	
	North	17/10/2019	Check 2	Pr fox 1W	Fair	
	South	17/10/2019	Check 2	Nil	Fair	
	North	18/10/2019	Check 3	Nil	Fair	
	South	18/10/2019	Check 3	Waterbird (1/w)	Fair	
	North	19/10/2019	Check 4	Nil	Fair	
	South	19/10/2019	Check 4	Nil	Fair	
	North	20/10/2019	Check 5	Nil	Fair	
	South	20/10/2019	Check 5	Nil	Fair	
	North	21/10/2019	Check 6	Nil	Fair	
	South	21/10/2019	Check 6	Nil	Fair	
North	22/10/2019	Check 7	Nil	Fair		

Location	Sand pad	Date	Action	Species (direction & no passes)	Pad condition	Comments
	South	22/10/2019	Check 7	Nil	Fair	
	North	23/10/2019	Check 8	Nil	Fair	
	South	23/10/2019	Check 8	Nil	Fair	

**Table C8:** Scat and Track search data for spring/summer of year two operational phase monitoring.

Site	Cell	Date	Check no.	Scats/tracks	Comments
1	NA	16/10/2019	1	Fox, macropod scats and tracks	
	NA	28/11/2019	2	Wallaby spp	
2	NA	16/10/2019	1	Small dasyurid, small rodent, Wallaby	
	NA	28/11/2019	2	Fox scat, wallaby scat, dasyurid scat. medium reptile, fox, cat, Bandicoot and rodent tracks.	
3	NA	16/10/2019	1	Small reptile, cat, rodent, swallow	Swallow nest present
	NA	28/11/2019	2	Tacks: cat, fox, lace monitor. Scats: swallows, cat and wallaby	
4	NA	21/10/2019	1	Microbat scat	
	NA	28/11/2019	2	Tracks: koala, rodent, lace monitor, wallaby. Scat: dasyurid, rodent	
5	S	16/10/2019	1	Med reptile tracks, rodent tracks, cat tracks, bandicoot tracks	
	N	16/10/2019	1	Rodent tracks & scats	
	S	28/11/2019	2	Tracks rodent wallaby cat fox medium reptile, scats rodent reptile	
	N	28/11/2019	2	Rodent and Bandicoot tracks	
6	NA	21/10/2019	1	Lace Monitor tracks (1/e)	
	NA	28/11/2019	2	Tracks: cat, dog, lace monitor, wallaby, rodent. Scat :dasyurid	
7	NA	04/10/2019	1	Small dasyurid, cat, fox, swamp Wallaby, Trichosurus spp., Bandicoot spp.	
	NA	28/11/2019	2	Tracks. Bandicoot, Wally, lace monitor, brushtail, dasyurid, rodent. Dasyurid scat	
8	NA	03/10/2019	1	Small macropod, bandicoot, lace Monitor, Short-beaked echidna, rodent tracks	
	NA	16/10/2019	2	Wallaby spp	
		02/11/2019	3	Lace monitor, medium reptile, wallaby. Wallaby scat	
10 & 9	E	03/10/2019	1	koala, rodent, lace Monitor tracks	
	W	03/10/2019	1	Bandicoot, koala, cat, rodent, lace Monitor tracks	
	E	28/11/2019	2	Tracks: canid, cat, lace monitor, Bandicoot, bird sp	
	W	28/11/2019	2	Tracks: dasyurid, rodent, lace monitor. Scats: green tree frog	Scat with scattered insects, between fox and dasyurid
12 & 11	E	01/10/2019	1	Nil	
	W	01/10/2019	1	Cat, bandicoot tracks, Antechinus scat	
	E	18/10/2019	2	Antechinus scat	
	W	18/10/2019	2	Nil	