



# Spotted-tailed Quoll Monitoring 2022

**Oxley Highway to Kempsey, Pacific Highway Upgrade**

**Prepared for Transport for NSW**

**May 2023**

## Document control

Project no.:	1702
Project client:	Transport for NSW
Project office:	Port Macquarie
Document description:	Spotted-tailed Quoll Monitoring 2022 Report
Project Director:	Lawrence Smith
Project Manager:	Radika Michniewicz
Authors:	Jodie Danvers
Internal review:	Radika Michniewicz
Document status:	R0
Local Government Area:	Kempsey and Port Macquarie-Hastings

## Document revision status

Author	Revision number	Internal review	Date issued
Jodie Danvers	D1	Radika Michniewicz	2/05/2023
Jodie Danvers	R0		3/05/2023
Radika Michniewicz	R1		14/05/2023

© Niche Environment and Heritage, 2023

Copyright protects this publication. Except for purposes permitted by the Australian Copyright Act 1968, reproduction, adaptation, electronic storage, and communication to the public is prohibited without prior written permission. Enquiries should be addressed to Niche Environment and Heritage, PO Box 2443, Parramatta NSW 1750, Australia, email: [info@niche-eh.com](mailto:info@niche-eh.com).

Any third party material, including images, contained in this publication remains the property of the specified copyright owner unless otherwise indicated, and is used subject to their licensing conditions.

*Cover photograph:* Fauna captured on camera: Brown Bandicoot recorded in Fauna Underpass F22.32 within the Ballengarra State Forest Monitoring Area (left); Echidna recorded passing through combined culvert underpass C7.26 with Cairncross State Forest Monitoring Area (right).

## Niche Environment and Heritage

Excellence in your environment.  
ABN: 19 137 111 721

### Head Office

Parramatta NSW 2150  
All mail correspondence to:  
PO Box 2443  
North Parramatta NSW 1750  
Phone: **02 9630 5658**  
Email: [info@niche-eh.com](mailto:info@niche-eh.com)

### Locations

Sydney  
Bulli  
Central Coast  
Newcastle  
Port Macquarie  
Brisbane  
Cairns

## Executive summary

---

### **Context**

This report documents findings of the 2022 monitoring period, the third and last, for the Spotted-tailed Quoll (*Dasyurus maculatus*), as required for the Oxley Highway to Kempsey (OH2K) Pacific Highway upgrade project (the Project) and specified in the Oxley Highway to Kempsey (OH2K) Ecological Monitoring Program (EMP, TfNSW 2022). Transport for NSW (TfNSW) is required to manage and monitor the effectiveness of biodiversity mitigation measures implemented as part of the Project. The Spotted-tailed Quoll is one of the threatened species identified as requiring mitigation and monitoring during the operational phase of the Project.

### **Aim**

The aim of the Spotted-tailed Quoll monitoring program is to determine whether the Project is meeting the performance indicators for the species, and provide corrective actions where required.

### **Method**

Monitoring was undertaken in accordance with the EMP, in three broad areas of Cairncross State Forest, Ballengarra State Forest and Maria River State Forest. Cameras were deployed at fourteen fauna crossing locations within the three broad monitoring areas. Two motion-detecting cameras were deployed at each crossing location. Cameras were left to operate continuously from 1 June 2022 – 14 September 2022.

### **Key results**

The Spotted-tailed Quoll was not recorded during the 2022 monitoring period and has not been recorded during either of two previous survey/monitoring events undertaken to date. These results are consistent with baseline findings. There were a total of 773 photo records, including 465 (61.2%) with native fauna (including the threatened Koala), 232 with (30.0%) introduced predators (including wild dogs, cats and foxes), and 50 (0.6%) with non-predatory introduced fauna.

As part of the analogous underpass monitoring program undertaken as part of the OH2K EMP, a Spotted-tailed Quoll was previously recorded during the 2018 underpass monitoring traversing underpass C36.40 (Niche 2018b).

### **Conclusion**

The performance measure for all monitoring events has been met; monitoring was undertaken as per the EMP in Years 4, 6 and 8.

### **Management implications**

Further monitoring is not recommended for the following reasons:

- Baseline (before construction) surveys did not record the Spotted-tailed Quoll.
- The species was detected using underpass C36.40 in 2018, a positive outcome given the low density, cryptic nature and expected low detection rate for this species.
- The detection of the species using underpass C36.40 supports the installation of box culverts as a mitigation measure to facilitate movement for this species.

## Table of Contents

<b>Executive summary .....</b>	<b>ii</b>
<b>1. Introduction .....</b>	<b>1</b>
1.1 Context .....	1
1.2 Performance Measures .....	2
1.3 Monitoring Timing .....	2
1.4 Reporting .....	2
<b>2. Methodology.....</b>	<b>3</b>
2.1 Monitoring Sites .....	3
2.2 Survey Method .....	3
2.3 Analysis.....	3
<b>3. Results .....</b>	<b>5</b>
3.1 2022 Monitoring Results .....	5
<b>4. Discussion and Recommendations .....</b>	<b>7</b>
4.1 Performance Measures .....	7
4.2 Recommendations.....	7
<b>References.....</b>	<b>8</b>
<b>Annex 1. Field Data – 2022 results .....</b>	<b>9</b>

## List of Figures

Figure 1: Monitoring sites.....	4
---------------------------------	---

## List of Tables

Table 1: Monitoring sites.....	3
Table 2: Camera details .....	5
Table 3: Summary of records.....	6
Table 4: Summary of performance measures for the 2022 monitoring period.....	7

## 1. Introduction

---

### 1.1 Context

The Oxley Highway to Kempsey (OH2K) section of the Pacific Highway Upgrade Project (the Project) was approved in 2012 subject to various Ministers Conditions of Approval (MCoA) and a Statement of Commitments (SoC). A subsequent approval with additional conditions of consent (CoA) was granted in 2014 by the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW, previously Department of Environment (DoE)) for Matters of National Environmental Significance (MNES) listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1995* (EPBC Act). The Ecological Monitoring Program (hereafter referred to as the EMP) (TfNSW 2022) combines these approval conditions and defines the mitigation and offsetting requirements for threatened species and ecological communities impacted by the Project. The Spotted-tailed Quoll (*Dasyurus maculatus*) was one threatened species identified as requiring monitoring following the completion of the Project's construction, during the operational phase.

#### 1.1.1 Legal status

The Spotted-tailed Quoll is listed as vulnerable under the New South Wales *Biodiversity Conservation Act 2016* (BC Act) and endangered under the Commonwealth EPBC Act. Monitoring of the species is required under the Project's approval.

#### 1.1.2 Monitoring framework

The survey design, methodology and performance indicators that define the Spotted-tailed Quoll monitoring program are specified in the EMP. The EMP requires monitoring of the Spotted-tailed Quoll on three occasions in total: in autumn or winter (preferably between March and Mid-July) in Year 4, 6 and 8 (operational phase of the Project).

After the Year 4 and 6 monitoring events (Niche 2018a, Niche 2020) the monitoring method was reviewed in consultation with the NSW Environment Protection Authority (EPA) and a revised method was approved by the EPA and DCCEEW in accordance with the recommendations provided in Niche (2020).

The result of these recommendations are as follows:

- The previous monitoring program was discontinued.
- Camera monitoring resources were redirected to mitigation structures.
- Performance measures were updated.
- The EMP was updated to reflect the change in methods and performance measures.

As such, the current and final 2022 monitoring event has been undertaken in accordance with the updated EMP (TfNSW 2022).

#### 1.1.3 Baseline data

No Spotted-tailed Quoll were recorded during baseline surveys conducted by Lewis Ecological in August 2013 (Lewis 2014).

One Spotted-tailed Quoll was previously recorded during the 2018 underpass monitoring traversing underpass C36.40 (combined culvert C36.40) in a westerly direction (Niche 2018b).

#### **1.1.4 Purpose of this report**

This report details the findings obtained from the third and final monitoring event for the Spotted-tailed Quoll.

The aims of this report are to summarise the methods and results of the 2022 monitoring and determine if performance measures are being met, as per the EMP.

### **1.2 Performance Measures**

The EMP specifies the following performance measures for the Spotted-tailed Quoll:

- *Monitoring is undertaken in Year 4, 6 and 8 or until monitoring can demonstrate that mitigation measures are effective.*

### **1.3 Monitoring Timing**

Monitoring is to be undertaken during autumn or winter, but preferably March – mid-July.

### **1.4 Reporting**

As per the EMP, annual reporting of monitoring results will include:

- Detailed description of monitoring methodology employed.
- Results of the monitoring period.
- Discussion of results, including how the results compare against performance measures, if any modifications to timing or frequency of monitoring periods or monitoring methodology are required and any other recommendations.
- If contingency measures should be implemented.

All reports prepared under the EMP will be submitted to DCCEEW, the NSW Department of Planning and Environment (DPE) and the EPA.

## 2. Methodology

### 2.1 Monitoring Sites

Monitoring was undertaken in the three broad areas identified in the EMP and included Cairncross State Forest, Ballengarra State Forest and Maria River State Forest.

Cameras were deployed at fourteen fauna crossing locations (Table 1, Figure 1) within the three broad monitoring areas. Monitoring locations were determined based on their proximity to monitoring areas, connectivity between vegetated areas on either side of the highway, and position relative to existing creek lines.

**Table 1: Monitoring sites**

Area	Monitoring sites
Cairncross State Forest (dry sclerophyll forest with some swamp forest associations)	Combined culvert underpass C7.26 Fauna underpass F9.70 Combined culvert underpass C11.14/11.08 Fauna underpass F11.67
Ballengarra State Forest (dry sclerophyll forest with some moist forest and swamp forest associations)	Fauna underpass F20.54 Fauna underpass F21.24 Fauna underpass F22.32 Barry's Creek Bridge Fauna underpass F26.40
Maria River State Forest (dry sclerophyll forest with some moist forest and swamp forest associations)	Fauna underpass F33.40 Fauna underpass F34.72 Combined culvert underpass C36.40 Maria River Bridge Stumpy Creek Bridge

### 2.2 Survey Method

Two motion-detecting cameras were deployed at each crossing location. Cameras were installed to provide the best field of view of traversing fauna. Cameras were left to operate continuously for a period of not less than three months during the period from May to August. Battery change and functionality checks were completed at the one and two-month stages.

Data was collated and also added to the underpass monitoring data.

### 2.3 Analysis

Monitoring results were analysed in accordance with the performance measures specified within the EMP. In the case of the Spotted-tailed Quoll, performance measures are based on survey completion only; they do not specifically relate to the detection of this species and statistical analysis of data is not required.





Drawn by: Neil Berry File: T:\spatial\projects\1700\1702\_OH2K\_Ecology\Maps\PI\_5\_Ecology\_OH2K\PI\_52\_Quoll\2022 Reporting\1702\_P152\_Quoll\_Fig1\_Overview.mxd Last updated: 9/14/2022 12:01:40 PM



## 3. Results

### 3.1 2022 Monitoring Results

#### 3.1.1 Monitoring details

Cameras were deployed at all 14 underpasses on 1 June 2022 and were operational for three months, until they were retrieved on 12-14 September 2022 (Table 2).

Results of the 2022 monitoring are provided in Annex 1 and a summary is provided in Table 3.

There were a total of 773 photo records, including 465 (61.2%) with native fauna, 232 (30.0%) with introduced predators (including wild dogs, cats and foxes) and 50 (6.5%) with non-predatory introduced fauna.

**Table 2: Camera details**

Area	Site	Deploy Date	Retrieve Date	Cam 1 #	Location/ direction	No. Photos	No. fauna photos	Cam 2 #	Location/ direction	No. Photos	No. fauna photos
Cairncross State Forest	C7.26	1/06/2022	14/09/2022	127	Mid/E	39	10	870	Mid/W	219	68
	F9.70	1/06/2022	14/09/2022	167	Mid/W	390	66	426	E /W	250	92
	C11.14/ 11.08	1/06/2022	12/09/2022	428	E	54	33	430	W	156	52
	F11.67	1/06/2022	14/09/2022	369	E	78	27	85	Mid/E	93	38
Ballengarra State Forest	F20.54	1/06/2022	14/09/2022	174	W	170	83	447	E/ W	92	53
	F21.24	1/06/2022	14/09/2022	125	Mid/E	79	33	178	Mid/W	118	26
	F22.32	1/06/2022	14/09/2022	393	E	115	61	433	W	494	154
	Barry's Creek Bridge	1/06/2022	14/09/2022	162	NE /W	678	17	141	SE/ W	90	10
	F26.4	1/06/2022	14/09/2022	382	E	503	286	374	W	506	319
Maria River State Forest	F33.40	1/06/2022	13/09/2022	397	W	132	67	424	E /W	309	123
	F34.72	1/06/2022	13/09/2022	134	E	237	79	446	East / W	307	104
	C36.4	1/06/2022	13/09/2022	65	Mid/E	39	2	378	Mid/W	46	4
	Maria River Bridge	1/06/2022	14/09/2022	155	NE /E	111	0	80	SW /E	129	52
	Stumpy Creek Bridge	1/06/2022	14/09/2022	373	NW / E NW	46	15	422	SW /E	508	21

### 3.1.2 Spotted-tailed Quoll

No Spotted-tailed Quoll were recorded at any of the monitoring sites during the 2022 monitoring.

As part of monitoring of mitigation measures for the Project, remotely triggered Scout Guard cameras were deployed in a number of selected combined and dedicated fauna underpasses. As mentioned, one Spotted-tailed Quoll was previously recorded during the 2018 underpass monitoring traversing underpass C36.40 (combined culvert C36.40) in a westerly direction (Niche 2018b). No Spotted-tailed Quolls were recorded during the 2022/2023 fauna underpass monitoring.

### 3.1.3 Other fauna

#### *Native fauna*

The most frequently recorded fauna from the Maria River and Ballengarra monitoring areas were medium ground-dwelling mammals, representing 34% of all records. Macropods and rodents and dasyurids were the next most frequently recorded native fauna, representing 25.9% and 8.4% of all records respectively. Of note was the detection of Koalas (vulnerable, BC Act and EPBC Act) at the Barrys Creek bridge and underpass F9.70 within the Ballengarra State Forest and Cairncross monitoring areas.

#### *Introduced predatory fauna*

Introduced predatory fauna, which may compete with the Spotted-tailed Quoll, included the European Red Fox (*Vulpes vulpes*), Cat (*Felis catus*), Wild (including Dingoes) and Domestic Dogs (*Canis familiaris*), and represented 26.4% of all records. All sites except three recorded predators on more than one occasion, with the Cairncross monitoring area representing 71% of the predator records across all sites.

**Table 3: Summary of records**

Area	Site	STQ	AM	M	MI	R&D	MGD	Bird	R	IP	Unk	Other
Cairncross	Combined culvert underpass C7.26	0		3			1		1	28		
	Fauna underpass F9.70	0	1	4			1			65		
	Combined culvert underpass C11.14/11.08	0		1			4			30		
	Fauna underpass F11.67	0		10	1					22		
Ballengarra	Fauna underpass F20.54	0		25		1	21		1			1
	Fauna underpass F21.24	0		6		1	14			2	3	
	Fauna underpass F22.32	0		9		6	46		3	11	1	
	Barry's Creek Bridge	0	3	7						3	2	
	Fauna underpass F26.4			64		44	83	2		31	2	2
Maria	Fauna underpass F33.40	0		54		1	16				2	
	Fauna underpass F34.72	0				5	71		1	5		
	Combined culvert underpass C36.4	0		8						2		
	Maria River Bridge	0	13	3		6	6					
	Stumpy Creek Bridge	0		6		1		1		5		
	total	0	17	200	1	65	263	3	6	204	10	3

STQ = Spotted-tailed Quoll; AM = arboreal mammals (Possums and Koala); M = macropods; MI = Microbat, R&D = rodents and dasyurids; MGD = medium ground dwelling mammals (Echidna, Bandicoot); R = reptile; IP = Introduced predator (Fox, Cat, Wild and Domestic Dog); Unk = Unknown/unidentified fauna; Other= non-native and non-fauna categories such as people, cars, cows, pigs, hares and horses.

## 4. Discussion and Recommendations

### 4.1 Performance Measures

A summary of the 2022 survey results in relation to the performance measures are provided in Table 4.

**Table 4: Summary of performance measures for the 2022 monitoring period.**

Performance measure	Discussion
Monitoring is undertaken in Year 4, 6 and 8 or until monitoring can demonstrate that mitigation measures are effective.	<b>This performance measure has been met for all Years.</b>

### 4.2 Recommendations

The EMP lists potential problems and contingency measures for various components of the monitoring program. There are no measures relevant to the Spotted-tailed Quoll monitoring program.

Further monitoring is not recommended for the following reasons:

- Baseline (before construction) surveys did not record the Spotted-tailed Quoll.
- The species was detected using underpass C36.40 in 2018, a positive outcome given the low density, cryptic nature and expected low detection rate for this species.
- The detection of the species using underpass C36.40 supports the installation of box culverts as a mitigation measure to facilitate movement for this species.

## References

---

Lewis (2014). Pacific Highway Upgrade: Oxley Highway to Kempsey Pre-construction Spring and Summer Baseline Monitoring. Report prepared for RPS-RMS by Lewis Ecological Surveys.

Niche (2018a). Spotted-tailed Quoll Monitoring 2018. Oxley Highway to Kempsey Pacific Highway upgrade. Prepared by Niche Environment and Heritage Pty Ltd for Roads and Maritime Services, Port Macquarie, NSW.

Niche (2018b). Fauna Underpass and Associated Fauna Fence Monitoring 2016/2017. Frederickton to Eungai Pacific Highway Upgrade. Prepared by Niche Environment and Heritage Pty Ltd for Roads and Maritime Services, Port Macquarie, NSW.

Niche (2020). Spotted-tailed Quoll Monitoring 2020. Oxley Highway to Kempsey Pacific Highway upgrade. Prepared by Niche Environment and Heritage Pty Ltd for Roads and Maritime Services, Port Macquarie, NSW.

TfNSW (2022). Oxley Highway to Kempsey Pacific Highway Upgrade Ecological Monitoring Program. Transport for NSW Update to report prepared by SMEC Hyder Joint Venture, February 2022.



## Annex 1. Field Data – 2022 results

Monitoring Site	Cairncross State Forest				Ballengarra State Forest					Maria River State Forest				
Underpass	C7.26	F9.70	C11.14/ 11.08	F11.67	F20.54	F21.24	F22.32	Barry's Ck	F26.4	F33.40	F34.72	C36.40	Maria River	Stumpy Ck
Species/ fauna group														
Small ground-dwelling mammals														
<i>Rattus rattus</i>							Y (1)		Y (39)				Y (5)	Y (1)
Rodent/Marsupial					Y (1)		Y (3)		Y (4)	Y (1)	Y (4)			
Rodent						Y (1)	Y (2)		Y (1)		Y (1)		Y (1)	
Medium ground -dwelling mammals														
Echidna ( <i>Tachyglossus aculeatus</i> )	Y (1)		Y (4)			Y (2)	Y (4)		Y (3)	Y (1)			Y (4)	
Long-nosed Bandicoot ( <i>Perameles nasuta</i> )					Y (5)	Y (1)	Y (8)	Y (1)	Y (12)	Y (4)	Y (8)		Y (1)	
Bandicoot		Y (1)			Y (16)	Y (2)	Y (34)		Y (67)	Y (11)	Y (57)			
Northern Brown Bandicoot ( <i>Isodon macrourus</i> )						Y (9)			Y (1)		Y (6)		Y (1)	
Arboreal mammals														
Brushtail Possum													Y (3)	
Common Brushtail Possum ( <i>Trichosurus vulpecula</i> )								Y (2)					Y (10)	
Koala ( <i>Phascolarctos cinereus</i> )		Y (1)						Y (1)						
Macropods														
Eastern Grey Kangaroo ( <i>Macropus giganteus</i> )	Y (3)	Y (2)	Y (2)	Y (5)	Y (14)	Y (5)		Y (2)	Y (33)	Y (5)	Y (5)		Y (1)	
Macropod sp.			Y (1)		Y (5)	Y (1)	Y (3)		Y (11)	Y (11)				
Swamp Wallaby ( <i>Wallabia bicolor</i> )				Y (1)	Y (3)		Y (6)	Y (4)	Y (14)	Y (5)	Y (2)		Y (1)	Y (5)
Red-necked Wallaby ( <i>Macropus rufogriseus</i> )													Y (1)	
Wallaby				Y (4)	Y (3)			Y (1)	Y (6)	Y (6)	Y (1)			Y (1)

Monitoring Site	Cairncross State Forest				Ballengarra State Forest					Maria River State Forest				
Underpass	C7.26	F9.70	C11.14/ 11.08	F11.67	F20.54	F21.24	F22.32	Barry's Ck	F26.4	F33.40	F34.72	C36.40	Maria River	Stumpy Ck
Species/ fauna group														
Reptiles														
Lace Monitor ( <i>Varanus varius</i> )	Y (1)				Y (1)		Y (3)				Y (1)			
Introduced predators														
Fox ( <i>Vulpes vulpes</i> )	Y (6)	Y (53)	Y (9)	Y (15)		Y (1)	Y (11)		Y (25)	Y (26)	Y (1)	Y (2)		Y (5)
Wild Dog ( <i>Canis lupus</i> )	Y (22)	Y (13)	Y (21)	Y (7)		Y (1)		Y (3)	Y (2)					
Cat ( <i>Felis catus</i> )									Y (4)	Y (1)	Y (4)			
Other														
Unknown						Y (3)	Y (1)	Y (2)	Y (2)	Y (2)				
Microbat				Y (1)										
Rabbit ( <i>Oryctolagus cuniculus</i> )														
Bird					Y (1)				Y (2)					Y (1)
Pig									Y (2)					

---

## **Niche Environment and Heritage**

A specialist environmental and heritage consultancy.

### **Head Office**

Niche Environment and Heritage

PO Box 2443 North Parramatta NSW 1750

Email: [info@niche-eh.com](mailto:info@niche-eh.com)

All mail correspondence should be through our Head Office