



Transport  
**Roads & Maritime  
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# **Warrell Creek to Nambucca Heads Koala Monitoring**

Annual report 2018-19

Roads and Maritime Services | September 2019





## Document Review

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# 1. Introduction

In 2015, Roads and Maritime Services (RMS) NSW, 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 in late 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, yellow-bellied glider, giant barred frog, green-thighed frog ponds, underpasses, vegetated median, roadkill, exclusion fence, and threatened flora. Sandpiper Ecological Surveys (SES) has been contracted by RMS to deliver the WC2NH operational ecological and water quality monitoring program.

The following report details the results pertaining to koala in the first year of operation. The report summarises results obtained from three monitoring tasks: koala population surveys; monitoring of underpasses and adjacent habitats and yellow-bellied glider population monitoring in Nambucca State Forest. The aim of koala monitoring is to identify changes in resident koala activity (abundance, home range and movements) in response to construction of WC2NH and the effectiveness of koala habitat connectivity mitigation measures (i.e. fauna underpasses and exclusion fencing).

## 1.1 Background

The impact of the upgrade on koala (*Phascolarctos cinereus*) was assessed in the Project Environmental Assessment (Sinclair Knight Merz [SKM] 2010a, SKM 2010b), and following the species listing on the *Environment Protection and Biodiversity Conservation Act 1999*, a supplementary assessment in accordance with the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* (Geolink 2016). The supplementary assessment found that the Proposal would have negative impacts on koalas utilising the Nambucca State Forest/Old Coast Road area, mainly through habitat removal and fragmentation.

The Project, with effective implementation of proposed mitigation measures, was found to be unlikely to result in a significant impact to the local koala population. Notwithstanding, as the Project adversely affected habitat that satisfied the SEWPaC (2012) definition of 'habitat critical to the survival of the species' (including direct removal of approximately 86.5 ha of vegetation that satisfied that criteria); the Project was considered to constitute a significant impact on the Koala as per SEWPaC (2012) and DoE (2013a) guidelines. A Koala Plan of Management (KMP) was prepared to manage impacts on koalas during the pre-construction, construction, and operational phases of the project (Geolink 2017a).

Measures implemented to minimise impacts on koalas include:

- Population monitoring to determine the effectiveness of mitigation measures and project impacts.
- Construction phase pre-clearing surveys, staged clearing, project inductions, Environmental Work Method Statements, rescue procedure, and installation of temporary barriers.

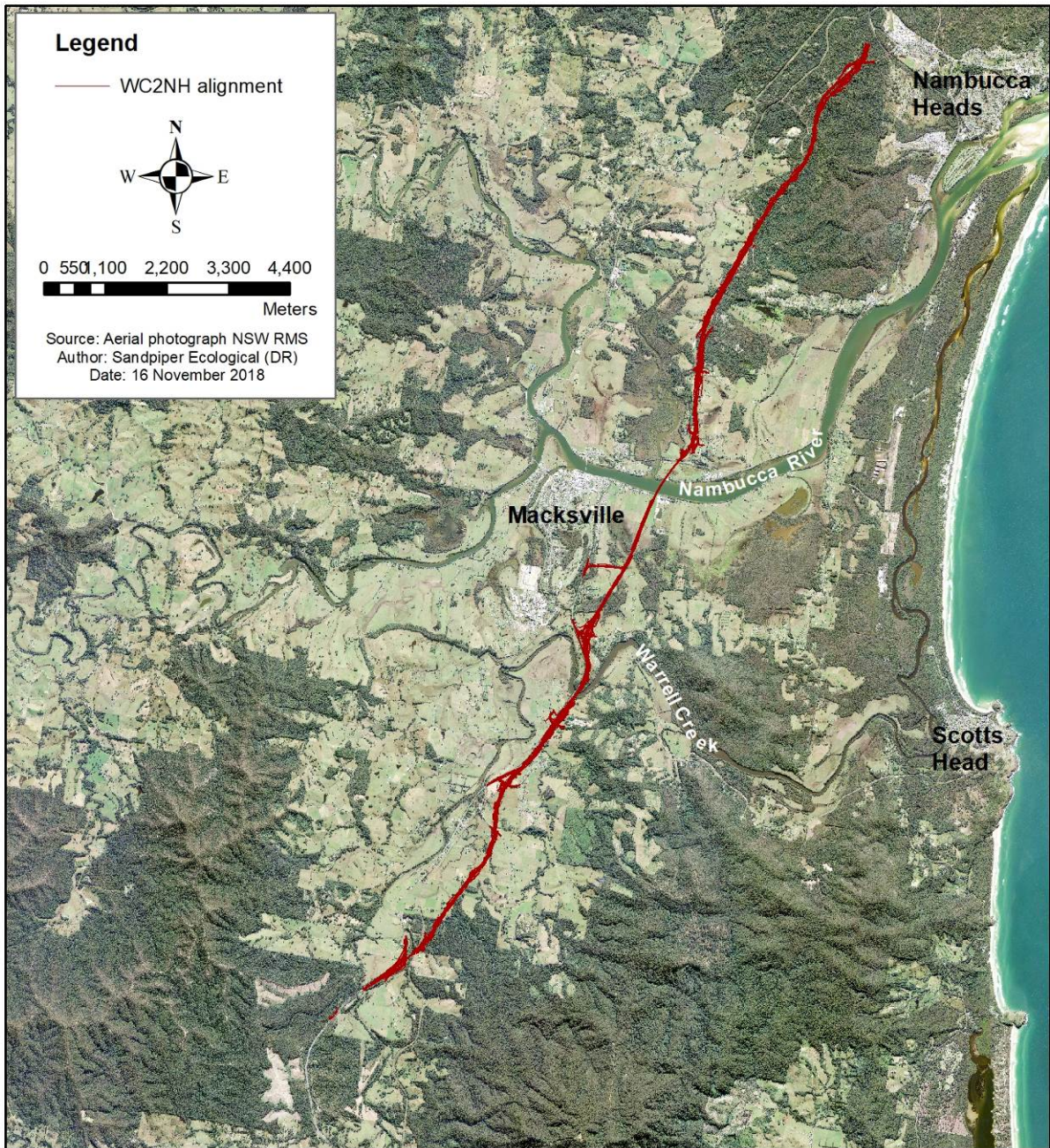
- Installation of fauna crossings, and fauna exclusion fencing to allow for safe passage of fauna (including the koala) crossing the Pacific Highway.
- Installation of 'floppy-top' fauna exclusion fencing to minimise road strike.
- Habitat offsets.

The objective of the baseline koala population monitoring was to determine the pre-impact (baseline) densities, distribution and usage of habitats within proximity to the WC2NH project. Ongoing monitoring aims to identify changes in resident koala activity (abundance, home range and movements) in response to construction of WC2NH and the effectiveness of koala habitat connectivity mitigation measures (i.e. fauna underpasses and exclusion fencing).

Baseline surveys were conducted in autumn and spring 2014 (SKM 2014). Construction phase koala monitoring surveys were conducted in spring 2015 (year 1) and spring 2017 (year 3) (Geolink 2017b) and year one operational surveys were conducted in spring 2018 (Sandpiper Ecological 2018a).

## 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.



**Figure 1:** Location of the WC2NH alignment.



## 2. Methods

Methods used to sample koalas are summarised in the year one operational phase koala population monitoring report (Sandpiper 2018a), year 1 operational phase underpass monitoring report (Sandpiper 2019a), year one operational phase yellow-bellied glider population monitoring report (Sandpiper 2019b).

## 3. Results

### 3.1 Koala population surveys

#### 3.1.1 Transect surveys

One koala was recorded on transect W11 during the spring 2018 sample event (Table 1; Figure 2). An unconfirmed koala call was heard west of transect W7 on 12 November 2018 but the location of that call remains unconfirmed. Koala scats were recorded beneath three tallowwood trees (*Eucalyptus microcorys*), two on transect E10, and one on transect E19 (Table 2; Figure 2).

#### 3.1.2 Tracks and easements

Two confirmed koala records were obtained during surveys of tracks and easements, one during the day between transects E18 and E19, and one at night between transects W20 and W21 (Table 1; Figure 2). Two individuals appeared healthy (dry bottom and clear eyes) and diagnostic features could not be determined for the third individual. One individual was a female and the sex of the other two individuals could not be determined. The individual recorded on 13/11/2018 was recorded in the same tree during the day and night surveys.

#### 3.1.3 Habitat use and distribution

Koalas were recorded using both Open Blackbutt Forest on ridges and midslope, and Flooded Gum Moist Open Forest in gullies. Occupied tree species included flooded gum (*Eucalyptus grandis*), tallowwood (*Eucalyptus microcorys*), and white mahogany (*Eucalyptus* spp). Scats were recorded beneath tallowwoods only.

In 2018, koala records occurred in the southern third and centre of the study area (Figure 2). Records near transects 19, 20 and 21 were in a similar area to records in 2017 and 2014 (Figure 2). The 2018 record on transect W11 was within 150m of a record in 2015. Koala scats recorded on E10 were near a koala record from 2017. The scats recorded at the east end of E19 may be from the individual recorded adjacent to the alignment between E18 and E19 in spring 2018 (Figure 2).

### 3.2 Underpass monitoring

Koalas were detected using underpasses, by cameras and sandpads, in both the spring/summer and winter sample periods (Table 3). In spring/summer, cameras detected koalas making 15 complete crossings of the carriageway distributed across four sites. In winter, cameras detected a koala making a complete crossing at one site. Site 4 was the most regularly used underpass with 11 complete crossings recorded in year one of the operational phase (Figure 2). Koala tracks were detected in sandpads on 4 occasions at site 4 in spring/summer (Table 3). No koala tracks were recorded during

sandpad monitoring in winter 2019, however tracks were recorded at sites 4, 9 and 10 during the scat and track surveys. Koalas were recorded moving both east and west.

### 3.3 Opportunistic records

Opportunistic records of koalas were collected whilst conducting year one and two spotlight surveys for yellow-bellied glider and fox baiting at selected underpasses. Five koalas were recorded during these surveys, four adults, and one back young. During yellow-bellied glider surveys one individual, was recorded on 28/11/2018, close to the alignment at chainage 58,400, and three individuals, two adults and one back young, were recorded on 2 September 2019. Both of the latter records were west of the north coast rail line. One koala was recorded crossing culvert 9 / 10 on 18 September 2019 during feral pest control baiting (Plate 1).



**Plate 1:** Koala recorded at underpass 9/10 on 18 September 2019.

## 3.4 Koala distribution

Koala records obtained during year one of the operation phase show that the species continues to use habitat on both sides of the carriageway and records obtained from underpass monitoring prove that individuals are utilising dedicated underpasses to move across the carriageway. Koalas have been sighted in Nambucca State Forest within 650m of underpasses at chainages 57700, 59100, and 59740 but not near the northern underpass (Site 11 & 12) at chainage 60500. Apart from a record during the baseline population surveys koalas have not been recorded during construction or operation phase spotlight surveys near Site 4 at chainage 57700. This is despite 11 complete crossings in year one of the operation phase. Comparison between spotlight and underpass records suggests that individuals are moving distances of at least 650m between feed trees and the highway. It is likely that some of the koalas detected in underpasses are additional to those individuals detected during spotlight surveys.

## 3.5 Road kill surveys

No koalas were recorded during roadkill surveys conducted quarterly between October 2018 and August 2019 (Sandpiper 2018b, 2019c, 2019d, 2019e).

**Table 1:** Koalas recorded during the spring 2018 population monitoring surveys in Nambucca State Forest. Uk = unknown; F = female

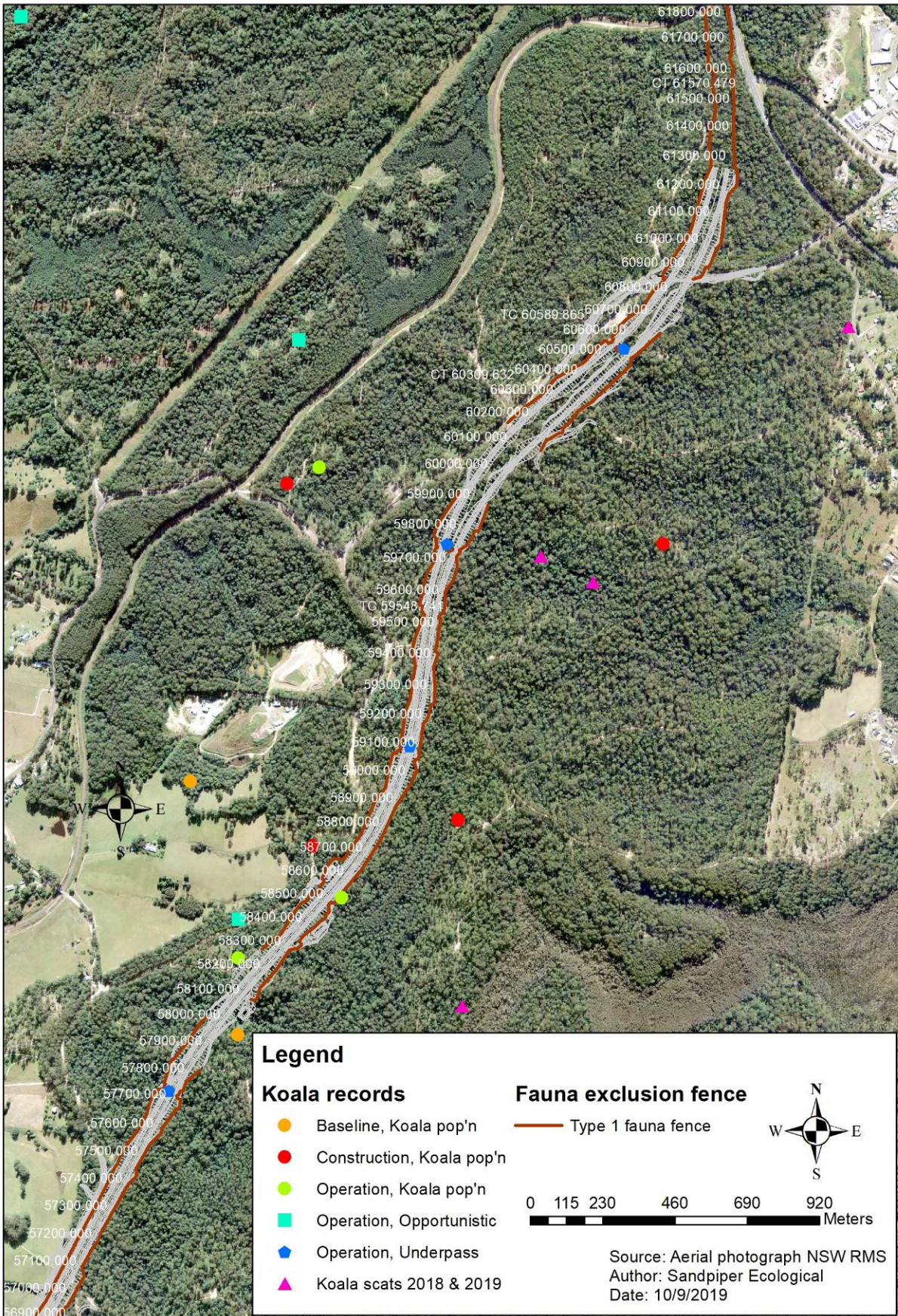
Date	Easting	Northing	Time of observation	Closest transect & distance (m)	Survey type	Occupied tree	Habitat type	Tree height (m)	Tree diameter (mm)	Sex	Behaviour	Disease status	Reproductive status	Side of carriageway
12/11/2018	496198	6609663	Night	W11; 26	Transect	Flooded gum	Flooded Gum Moist Forest	35	340	Uk	Resting on lateral branch	Healthy	Uk	West
13/11/2018	496270	6608294	Day	E18; 59	Track & easement	Tallowwood	Open Blackbutt Forest	18	440	Uk	Resting – curled in tight ball; recorded during following night survey	Uk	Uk	East
20/11/2018	495941	6608102	Night	W21; 59	Track & easement	White mahogany	Open Blackbutt Forest	8	150	F	Resting on branch	Healthy	Uk	West

**Table 2:** Location of koala scats recorded during spring 2018 koala population monitoring surveys in Nambucca State Forest. Datum – GDA 94.

Transect	Evidence	Distance from alignment (m)	Easting	Northing	Date
E10	Old scats beneath tallowwood	241	496903	6609380	14/11/2018
E10	Old scats beneath tallowwood	424	497068	6609298	14/11/2018
E19	Very old scats beneath tallowwood	540	496652	6607950	13/11/2018

**Table 3:** Koalas recorded during underpass monitoring in year one operational phase monitoring for the WC2Nh upgrade. P = present.

Site	Complete crossings (cameras)		Sand pad detections	
	Spring/Summer 2018	Winter 2019	Spring/Summer 2018	Winter 2019
C4	10	1	4	P
C7	2			
C9 & 10	1			P
C11 & 12	2			
Total	15	1		



**Figure 2:** Location of koala records obtained between 2014 and 2019 during surveys for the WC2NH Pacific Highway Upgrade.

## 4. Discussion

### 4.1 Koala population

The same number of koalas (3 individuals) was recorded during the spring 2018 and spring 2017 population surveys. This was substantially more than the single individual recorded during baseline surveys and year one of the construction phase (Table 4). Possible variation in methods between surveys, particularly effort expended on tracks and easements where most koalas are recorded, makes it impossible to draw conclusions on whether koala abundance has increased or decreased due to the WC2NH upgrade.

**Table 4:** Comparison of koala records during the baseline, construction, and operational phases of the WC2NH upgrade. \* individual recorded on four occasions.

Phase & year	Transect Surveys (diurnal & nocturnal)		Track & Easement Surveys (nocturnal)	Total koalas recorded
	Koalas observed	Koala evidence (scats)	Koalas observed	
Baseline autumn 2014	0	0	1	1
Baseline spring 2014	0	0	1	1
Construction spring 2015	1	1	1	1*
Construction spring 2017	0	2	3	3
Operation spring 2018	1	3	2	3

The results show that koalas continue to reside in habitat immediately adjoining the highway and, based on the distribution of koala records in underpasses, it is likely that additional koalas reside near the alignment. The presence of an advanced back young in September 2019 shows that the population is breeding. The year one operational phase monitoring results support the suggestion that the study area has a low-density koala population (Geolink 2017).

Spotlight surveys sampled approximately 104ha of habitat. Three koalas within an area of 104ha is broadly consistent with published home range estimates for males in northern NSW of 22.7ha at Bonville to 37.4ha at Lismore (Lassau *et al.* 2008; Goldingay & Dobner 2014). Home range size of koalas in Nambucca State Forest is expected to be larger than at nearby Bonville due to the lower quality of habitat and forest management history.

Whilst it is impossible to confirm the impact that clearing for the upgrade had on the local koala population the continued presence of individuals around the alignment suggests that impacts have been managed and at this stage do not seem irreversible. Another positive sign is that two of the three individuals observed in spring 2018 appeared healthy, and the health status of the third individual could not be determined.

### 4.2 Habitat use and distribution

Koala sightings and scat records obtained over the course of monitoring are beginning to reveal a pattern of koala habitation. Koalas have consistently been recorded over a 1km long section of the alignment, between chainages 57900 and 58900, with fewer but consistent records between chainages 59700 and 60700. Underpass monitoring has confirmed use of four culverts with regular use in the southern cluster of records (i.e. Site 4) and occasional use in the

northern cluster. The pattern of underpass use may reflect home range extent and differences in movement patterns between male and female, or areas of varying habitat quality.

The presence of koalas in habitat immediately adjoining the highway and several confirmed crossings of underpasses in spring/summer 2018 and winter 2019 (Sandpiper Ecological 2019a) suggests that some individuals have re-established home ranges to the new forest edge and others have home ranges that encompass the highway.

### 4.3 Compliance with koala plan of management

The WC2NH upgrade has complied with goals one and two of the KMP (Table 5). Monitoring has shown that connectivity has been maintained with koalas making complete crossings at four sites over a 2.9km section of upgrade, and moving both east and west. The available data do not enable a robust temporal comparison of koala density, however, numbers recorded have been consistent between construction and operation, and greater than baseline. No koalas have been recorded during quarterly roadkill surveys and fauna exclusion fence is in good condition.

Goal 3 has been partially achieved. Plantings were undertaken around culvert entrances to improve connectivity with adjacent forest. Ongoing defect work, drought, and cattle (1 site) have had a negative impact on plants. Now that construction work has ceased it is essential that greater emphasis be placed on ensuring underpass plantings become established in the short-term (i.e. 2-3yrs).

**Table 5:** Compliance with Table 6.1 from the Koala Management Plan.

Main goal	Performance criteria	Has performance criteria been satisfied	Corrective action required
Maintain connectivity for Koalas potentially occurring either side of the upgrade.	No change to densities, distribution, habitat use and movement patterns compared to baseline Koala population data.	<b>Yes.</b> Koala abundance in year one is consistent with the construction phase and greater than the pre-construction (baseline) phase. Koalas continue to occur both sides of the highway and regular movement beneath the highway has been recorded over a 2.9km section of carriageway in Nambucca State Forest.	No corrective action required. Continue underpass and koala population monitoring.
Minimise road kill of Koala during operation of the WC2NH Project.	All fauna fencing is installed at the minimum of locations as identified in the EPBC approval prior to the operational phase of the WC2NH Upgrade.	<b>Yes.</b> No road killed koala were recorded in year one of the operation phase. Fauna exclusion fence remains in good condition.	No corrective action required. Continue road kill monitoring.
Maintain habitat rehabilitation areas.	Self-sufficient areas of rehabilitated habitat for Koalas within all nominated areas.	<b>Partial.</b> Plantings were undertaken in areas around culverts, however, a number of areas have been impacted by ongoing defect work around culverts and drought conditions. Where construction works have been completed in other fauna connectivity areas they are being planned for planting in accordance with the plan..	Yes. Dead plants need to be replaced and remaining live plants maintained. All connectivity plantings will be included in project Landscape Maintenance Plan to ensure plantings become established in the short-term (i.e. 2-3yrs).



## 5. Recommendations

1. Ensure koala habitat rehabilitation sites become established in the short-term (i.e. 2-3yrs). This could be achieved by integrating management of fauna connectivity plantings into the Landscape Maintenance Plan.
2. Continue to monitor growth and establishment of fauna connectivity plantings.

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