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Roy Hill Night Parrot Survey

Final Report

FINAL

Prepared for
Roy Hill Holdings Pty Ltd
by Strategen

July 2018

Roy Hill Night Parrot Survey

Final Report

FINAL

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July 2018

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Client: Client name

Report Version	Revision No.	Purpose	Strategen author/reviewer	Submitted to Client	
				Form	Date
Draft Report	A	Client review	L Stevens/R Firth	Electronic (email)	16/07/18
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Executive Summary

A Night Parrot (*Pezoporus occidentalis*) survey was conducted in various locations in mining, exploration and miscellaneous tenements for Roy Hill Iron Ore Pty Ltd (Roy Hill) from 24/4 to 3/5/18 using Song Meter 4 (SM4) acoustic units. To determine what survey effort (the number of SM4 units, number of different locations and the number of nights each recorded was out for [duration]) Dr Steve Murphy (Steve - recognised Night Parrot expert) and Nick Leseberg (Nick – PhD candidate examining Night Parrot ecology) were consulted. These experts produced an interim recommendations document that outlined what survey effort would be adequate (Appendix 3). Based on these recommendations, ten SM4 units at 20 locations for 4 nights at each location was deemed to be an adequate survey effort.

Given the limited information on the ecology of the Night Parrot – site selection for the most part was based on information from Queensland that indicates that the Night Parrot prefers to nest in large Spinifex hummocks. At each survey site, a very broad habitat assessment was undertaken.

The acoustic recordings from the SM4s were analysed using a new call recogniser system that has been recently developed by Steve Murphy and Nick Leseberg (Adaptive NRM) in collaboration with Conservation Metrics. This new system has superior resolving power, lower error rates and can detect more calls. This system exceeds that recommended in the Western Australian Department of Parks and Wildlife's (DPaW) interim guideline for preliminary surveys of Night Parrot (*Pezoporus occidentalis*) in Western Australia (DPaW are now known as the Department of Biodiversity, Conservation and Attractions [DBCA]).

The 10 SM4s deployed recorded 1088.65 hours of acoustic data across a survey effort of 89 nights at 20 different locations, did not record any Night Parrot calls. Given the very large size of the Survey Area and the number of locations where acoustic data has been recorded, we cannot unequivocally say that there are no Night Parrots present in the Survey Area, however, the likelihood of their occurrence in the Survey Area is considered Low.

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1. Introduction

In August 2017, a level 1 targeted vertebrate fauna assessment was undertaken in various Roy Hill Iron Ore Pty Ltd (Roy Hill) mining tenements (Biologic 2017). This assessment included a preliminary Night Parrot (*Pezoporus occidentalis*) survey at seven locations for a total survey effort of 21 nights. During this survey, the Song Meter 2 units (SM2s) were used to obtain acoustic recordings. No calls of the Night Parrot were detected. Given the size of the area to be assessed, a relatively close record from 2005 near the Fortescue Marshes (Davis & Metcalf 2008) and the species status as Endangered under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), it was determined that a targeted Night Parrot survey should be conducted.

In addition, the Western Australian Department of Parks and Wildlife's (DPAW) interim guideline for preliminary surveys of Night Parrot (*Pezoporus occidentalis*) in Western Australia (DPAW are now known as the Department of Biodiversity, Conservation and Attractions [DBCA]) recommends that Night Parrot surveys should be undertaken if there is suitable Night Parrot habitat present in an area proposed to be disturbed. The Roy Hill tenements (Survey Area) fall into a location that the DBCA considers a high priority area for the species (Appendix 1).

Strategen was engaged by Roy Hill to undertake a substantial field component to at a minimum meet the DBCA interim guideline for preliminary surveys of the Night Parrot (Figure 1).

1.1 Night Parrot Background Information

The Night Parrot is listed as Endangered under the EPBC Act and Schedule 1 under the WC Act. It is an enigmatic species thought possibly to be extinct until the recent recoveries of two dead specimens from Queensland (and new locations more recently). The type specimen and many early sightings, however, came from WA (Johnstone et al. 2013). Night Parrots are cryptic, nocturnal and endemic to Australia's arid interior. Until the late 19th century, they were widespread and relatively easily found at least at some locations. For instance, 14 of the 25 museum specimens in existence came from the Gawler Ranges in South Australia between 1871 and 1881 (Murphy et al. 2017). The last Night Parrot collected intentionally was in Western Australia in 1912 (Wilson 1937). Then followed 78 years of unconfirmed reports spanning all mainland states and the Northern Territory, until in 1990 a desiccated bird was found by a roadside in western Queensland (Boles et al. 1994, Murphy et al. 2017). In 2006, another dead bird was discovered by a Ranger 200 km to the south-east of the 1990 specimen (McDougall et al. 2009, Murphy et al. 2017). In 2013, the first photographs of a living night parrot were captured close to the site of the 2006 specimen (Dooley 2013, Murphy et al. 2017). A more recent sighting of the Night Parrot in WA comes from the Pilbara (12 April 2005) at a well near the Fortescue Marshes near samphire (*Tecticornia spp.*) (Davis & Metcalf 2008). There was also a sighting near Matuwa (Lorna Glen), north-east of Wiluna, in 2009 (Hamilton et al. 2017). There was also a recently confirmed sighting (2017) in WA from 240 km NW of Lake Mackay (Murphy et al. 2017).

Their cryptic nature, remote distribution and apparently rapid decline mean that there is scant ecological information about Night Parrots. Based on limited data Night Parrots seem to prefer to nest in large Spinifex hummocks (Murphy et al. 2017), which is a common and widespread habitat type throughout much of WA. There is also some data that indicates that birds may also nest and forage in or at least near samphire habitat, with a recently confirmed 2017 WA record coming from a spinifex plain adjacent to an open chenopod shrubland dotted with a chain of ephemeral pools fringed by samphire (Murphy et al. 2017).

Currently, the most effective survey technique to detect Night Parrots is to use passive acoustic recorders (i.e. record the calls of the Night Parrot). These passive acoustic recording units with microphones can be placed out in potential Night Parrot roosting or nesting habitat and left in the field to record the birds calls as they are autonomous. Night Parrots typical call at their roost sites prior to leaving (after sunset) and then on their return to the roost (prior to sunrise) (Murphy et al. 2017). Therefore, the acoustic recording units are set to record throughout the night.



Figure 1: Site location map

Scale 1:224,528 at A3

0 1 2 3 4 5 Kilometers

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 13/07/2018
Author: JCrute
Source: Aerial: Landgate 2018; Roads: Main Roads 2018; Tenure: RHH 07/2018.



Legend

- Roads
- Tenement boundaries



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2. Methods

To detect for the presence or absence of Night Parrots, the current best practice technique is to use acoustic recording devices to record their calls (Appendix 1, Murphy et al. 2017). During this survey (24/4 to 3/5/18) Song Meter 4 (SM4) acoustic units were placed out in various locations based on habitat, to record the calls of the Night Parrot.

2.1 Site Selection

Given the limited information on the ecology of the Night Parrot, site selection for the most part was based on information from Queensland that indicates that the Night Parrot prefers to nest in large Spinifex hummocks. Therefore, preliminary survey sites were chosen in the first instance from Google Earth i.e. sites that appeared to have a cover of Spinifex. Once in the field some preliminary survey sites chosen were not considered suitable (they were either burnt or did not have much cover of Spinifex) and therefore were replaced with other more suitable sites. At each survey site, a very broad habitat assessment was undertaken (Appendix 2). Please note that the Survey Area is very large and that there were some access constraints due to the limited number of tracks that could be driven by vehicle.

2.2 Survey Effort

Dr Steve Murphy (recognised Night Parrot expert [Adaptive NRM]) and Nick Leseberg (PhD candidate examining the ecology of the Night Parrot [Adaptive NRM]) were consulted about the Night Parrot survey and provided advice. These experts produced an interim recommendations document that outlined (with background information and sampling for Night Parrots) what survey effort would be adequate (see Appendix 3). In summary, 10 SM4 units at 20 locations for 4 nights at each location was deemed to be an adequate survey effort to meet DPaW guidelines for survey of the Night Parrot.

2.3 Call Analysis

The acoustic recordings from the SM4s were analysed using a new call recogniser system that has recently been developed by Steve and Nick (Adaptive NRM) in collaboration with an American specialist company (Conservation Metrics) that develops automated alternatives for some labour-intensive aspects of wildlife surveys. This new system has superior resolving power, lower error rates and can detect more calls. This system will exceed that recommended in the DPaW interim guideline for preliminary surveys of the Night Parrot.

The acoustic data was analysed using a deep neural network (DNN) model trained to identify four distinct Night Parrot vocalizations:

1. didit
2. croak
3. four note whistle
4. hollow whistle

3. Results

During the survey 10 SM4s were placed out at 20 different locations across the Survey Area (Figure 2). No Night Parrot calls were recorded on any of the SM4s.

3.1 Survey Effort

The 10 SM4s recorded 1088.65 hours of acoustic data across a survey effort of 89 nights at 20 different locations (Table 1 and Figure 3). The number of nights each SM4 unit was recording acoustic data at each of the 20 locations is presented below in Table 2.

Table 1: Survey effort - number of nights and hours each SM4 was recording acoustic data

SM4 Identifying Number	Number of Nights	Number of Hours
1	9	151.87
2	8	75.15
3	9	101.5
4	9	101.5
5	9	101.5
6	9	100.93
7	9	101.5
8	9	151.7
9	9	101.5
10	9	101.5
Total	89	1088.65

Table 2: Number of nights each SM4 was recording acoustic data at each of the 20 locations (Figure 2)

SM4 unit location	Number of Nights	SM4 unit location	Number of Nights
1	5	1C	4
2B	4	2C	4
3B	5	3C	4
4B	5	4C	4
5	5	5C	4
6B	5	6C	4
7	5	7C	4
8B	5	8C	4
9	5	9C	4
10B	5	10C	4

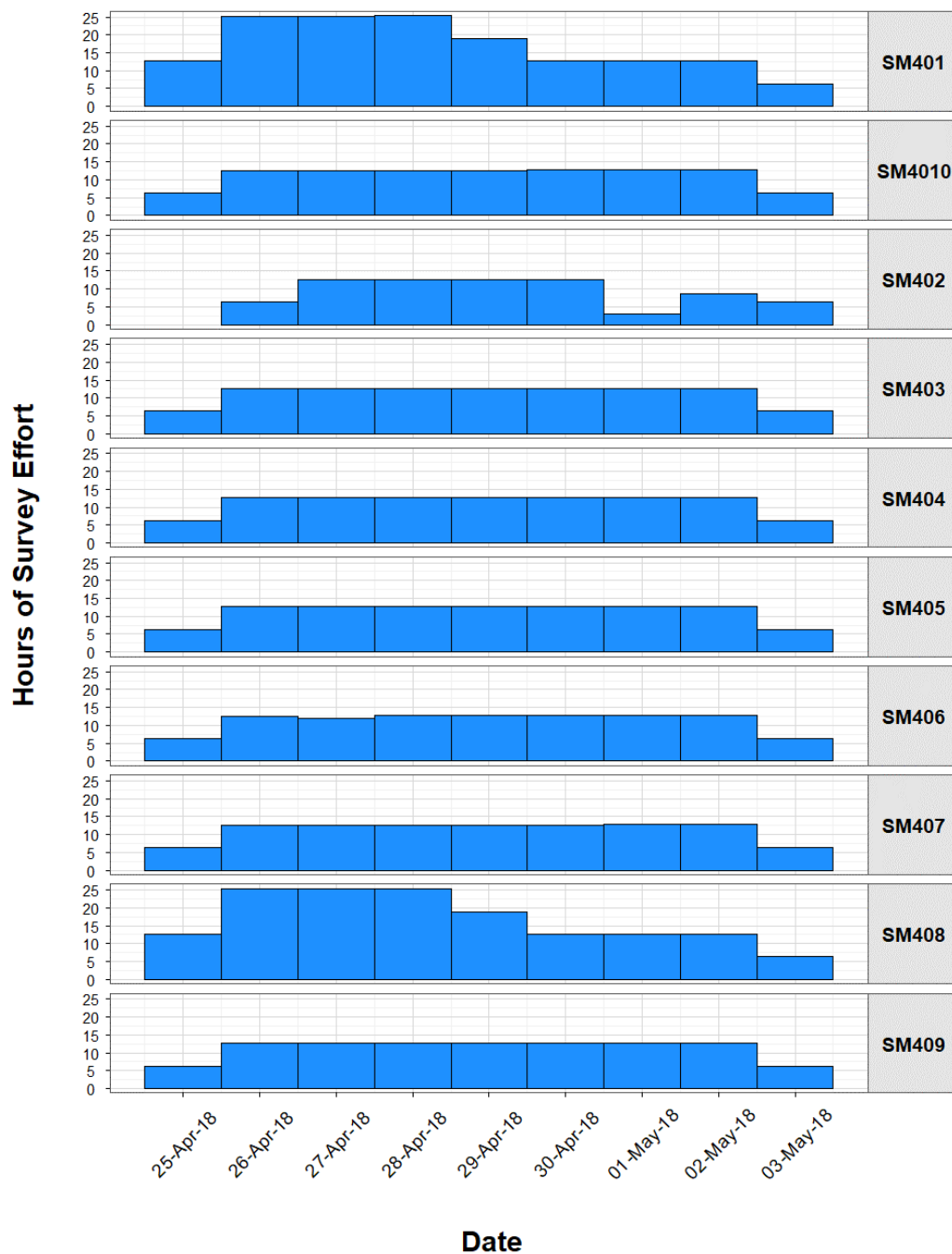


Figure 3: Survey effort in hours by date and SM4 unit number during the assessment

3.2 Call Analysis

During the survey, the recording conditions were suitable as there was no rain and little wind and no other acoustic disturbance. As mentioned above no Night Parrot calls were recorded during the survey, however, the analysis detected 57 calls in total, 55 calls resembled the Night Parrot 'hollow whistle' call. This call can be difficult to separate from a call of the Pallid Cuckoo (*Cacomantis pallidus*). Most of these calls were relatively easily dismissed as the Pallid Cuckoo or other species, while a further five of these 55 'hollow whistle' calls were more like Night Parrots. However, review of these calls by three experts (Dr Steve Murphy, Nick Leseberg, and Nigel Jackett) with field experience of Night Parrot calls determined that they were not from the Night Parrot. They lacked the tonal consistency and percussion of confirmed Night Parrot hollow whistle calls. Two additional calls were detected that were somewhat like the Night Parrot 'four note whistle', but these were later positively identified by manual review as calls of the Spiny-cheeked Honeyeater (*Acanthagenys rufogularis*). Appendix 4 shows the details of each detection call.

4. Discussion

During the survey, no calls of the Night Parrot were detected on SM4s, despite considerable survey effort of 1088.65 hours of acoustic data across 89 nights at 20 different locations. A previous survey had SM2s at seven locations for a total survey effort of 21 nights and didn't recorded any Night Parrot calls (Biologic 2017). The number of hours each unit recorded acoustic data was not presented in that report, however, there has now been a total survey effort of 110 nights at 27 different locations and no calls of the Night Parrot have been recorded.

During this survey, sites chosen for deployment of the SM4 units were based on what is currently known about the ecology of the Night Parrot in the scientific literature, which now is relatively little. The calls were analysed by the most up to date techniques and by several experts. Given the very large size of the Survey Area and the number of locations where acoustic data has been recorded, we cannot unequivocally say that there are no Night Parrots present in the Survey Area, however, the likelihood of their occurrence in the Survey Area is considered Low.

5. References

- Biologic (2017). Roy Hill level 1 targeted vertebrate fauna assessment. Unpublished report prepared for Roy Hill Iron Ore Pty Ltd.
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Appendix 1: DPaW Interim Guideline for Preliminary Surveys of the Night Parrot in WA



Interim guideline for preliminary surveys of night parrot (*Pezoporus occidentalis*) in Western Australia

Version 1 – May 2017

Background

The night parrot (*Pezoporus occidentalis*) is a small, elusive parrot that is endemic to Australia. Night parrots are highly cryptic in nature, being nocturnal, primarily ground-feeding parrots that inhabit remote arid and semi-arid areas of Australia.

The night parrot is recognised as a threatened species under State and Commonwealth legislation. Due to its threatened status, surveys for the night parrot may be required in areas of suitable habitat within the likely range of the species in WA, including for development impact assessment, land management and research into the species.

The following information is provided to assist in determining when night parrot surveys are required and to outline appropriate methods for survey. Please note that this information is provided as a guide only and this guideline is subject to change as new information about night parrots becomes available. Survey practitioners are strongly encouraged to check the [Parks and Wildlife night parrot webpage](#) regularly for the latest version of this guideline.

When and where night parrot surveys may be required

Historical collection records, and more recent observational information on the night parrot from Queensland and WA, provide evidence of the historical distribution, potential current distribution, and likely habitat of the night parrot. This information will identify the areas within WA where night parrot surveys could or should be undertaken. It is advisable to contact traditional owners, particularly in areas subject to native title, who may also have knowledge of the species and its occurrence.

Development proposals and land management activities potentially affecting suitable habitat in areas of WA where night parrots may occur may require survey for the presence of the species. Areas in WA where night parrots and their habitat should be considered in the planning and assessment of proposals prior to approval or implementation are shown in Figure 1.

The broad habitat requirements of night parrots include areas of old-growth spinifex (*Triodia*) for roosting and nesting, together with foraging habitats that are likely to include various native grasses and herbs, and may or may not contain shrubs or low trees. Night parrots have been known to fly up to 40 km or more in a night during foraging expeditions, so foraging habitat is not necessarily within or adjacent to roosting areas.

At the local (site) level, roosting and nesting sites are in clumps of dense vegetation, primarily old and large spinifex clumps (often >50 years unburnt), especially hummocks that are ring-forming. These may be in expanses or isolated patches, but sometimes associated with other vegetation types, such as dense chenopod shrubs. Spinifex hummocks that are collapsed (i.e. less than about 40-50 cm in height) are not likely to provide adequate shelter. Photographs of example roosting sites are shown on the [Night Parrot Recovery Team](#) website). Often the vegetation in these habitats will be naturally fragmented and therefore well-protected from fire.

Little is known about foraging sites, but favoured sites are likely to vary across the range of the species, and to vary with season. In Queensland, night parrots have been shown to feed in areas rich in herbs including forbs, grasses and grass-like plants, and similar areas are believed to also be important in WA. *Triodia* is likely to provide a good food resource at least in times of mass flowering and seeding. The succulent *Sclerolaena* has been shown to be a source of food and moisture; other succulent chenopods are also likely to be important. Foraging habitat is likely to be more important if it is adjacent to or within about 10 km of patches of *Triodia* deemed suitable as roosting habitat.

Survey effort should be focussed primarily on likely roosting and nesting sites as the birds can be heard calling as they leave these sites, and will return after they have foraged during the night, whereas foraging sites are likely to be dispersed, seasonally variable, and less well defined. It is not known whether they call at foraging sites.

Survey methods

Within an area identified as potentially supporting the species, any stands of large, old clumps of spinifex (*Triodia*) should be surveyed for the presence of night parrots. This is especially so if the identified area is part of a palaeo-drainage system or contains healthy stands of samphire.

The most effective survey technique for night parrots is passive acoustic surveys. A selection of reference calls is available on the [Night Parrot Recovery Team](#) website, and this resource will be expanded over time. Some calls from WA appear slightly different from those in Queensland, but such differences are currently poorly known and not quantified. Autonomous recording units (ARUs) with microphones in good condition should be deployed in prospective roosting or nesting habitat, and supplemented by listening by experienced human observers in the field at night within potential roosting habitat. A survey will need to include at least six nights of recordings that are made under good recording conditions (i.e. little or no wind, rain, or other acoustic disturbances) for each recording device (ARU) at a given position. The number of ARUs required will depend on the area to be surveyed. Note that under reasonable conditions with relatively new microphones, some ARUs may pick up night parrot calls up to a radius of about 300 m. Windy or rainy conditions, or microphones that have deteriorated as a result of lengthy field use, will reduce their effectiveness.

For non-breeding birds, peak calling periods occur in the two hours after sunset and the two hours before sunrise. However, during breeding events, calls can occur any time during the night, and peak calling may occur outside the post-sunset and pre-sunrise periods. Optimum timing for surveys would be in the few months following significant rainfall events, when breeding is more likely to be occurring and therefore detectability of the species is expected to be higher.

Programming ARUs to record throughout the night is therefore required to provide the most effective survey effort. Currently, efficient software recognisers are not available for night parrots and therefore manual scanning of recordings in spectrogram view is the recommended approach to analysis. Suitable software (e.g. Raven Lite) is available freely on the internet.

Call broadcast ('playback') may be appropriate in some circumstances, but it is not recommended when birds are suspected to be breeding, as this may disturb breeding efforts (in such situations, calling is much more frequent anyway, meaning that detection probability is relatively high without the need for call broadcast). Call broadcast is not required in situations where birds have already been heard, unless it is important to confirm an identification. It is best to listen first – if calls are heard, then call broadcast may not be necessary. If spontaneous calls are not heard within a 30 minute listening session, call broadcast could then be used for a fixed amount of time (play several calls, wait five minutes, then repeat) to try to elicit a response, followed by another short listening period. Note that if call broadcast is used near an ARU, the broadcast calls may be recorded on the ARU, thereby producing a false positive record.

If proposing to use call broadcasts, a licence to take (including disturb) fauna for scientific purposes, under regulation 17 of the Wildlife Conservation Regulations 1970, is required to be obtained from Parks and Wildlife. Parks and Wildlife will advise if the use of call broadcast is appropriate in the specific circumstances.

Camera traps have proved not to be effective in surveying roosting or feeding areas, but could be used as a supplementary technique at potential drinking sites, especially during times of high temperatures and high water stress, such as droughts.

Transect foot surveys that seek to flush out birds are not recommended as this has a very low chance of success, and may disturb nesting or roosting birds, degrade their habitat and potentially make them more prone to predation if they are unable to rapidly find new cover.

It is vital to note that at present, no available survey technique can irrefutably demonstrate that night parrots are absent from a site. Habitat assessment is therefore critically important. Where habitat is suitable, even if the species was not confirmed as being present, it might be present at another time of year or in another year. In such cases, impact assessments should indicate the likelihood of occurrence based on the quality of the habitat at the site, focus on the risk of a project to the species on the assumption that it is present, and assess any threatening processes that may occur as a result (e.g. reduction of the extent or quality of habitat, increase in numbers of feral predators, increase (or decrease) in grazing pressure, or changed fire regime).

Further information

Night Parrot Recovery Team webpage (www.nightparrot.com.au). Includes downloadable reference calls, guidance on effective, non-intrusive survey techniques and sighting reporting protocols.

EPBC SPRAT profile – Night Parrot (http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=59350)

Parks and Wildlife WA night parrot webpage (www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-animals/487-night-parrot). Includes the most up to date night parrot survey guidelines.

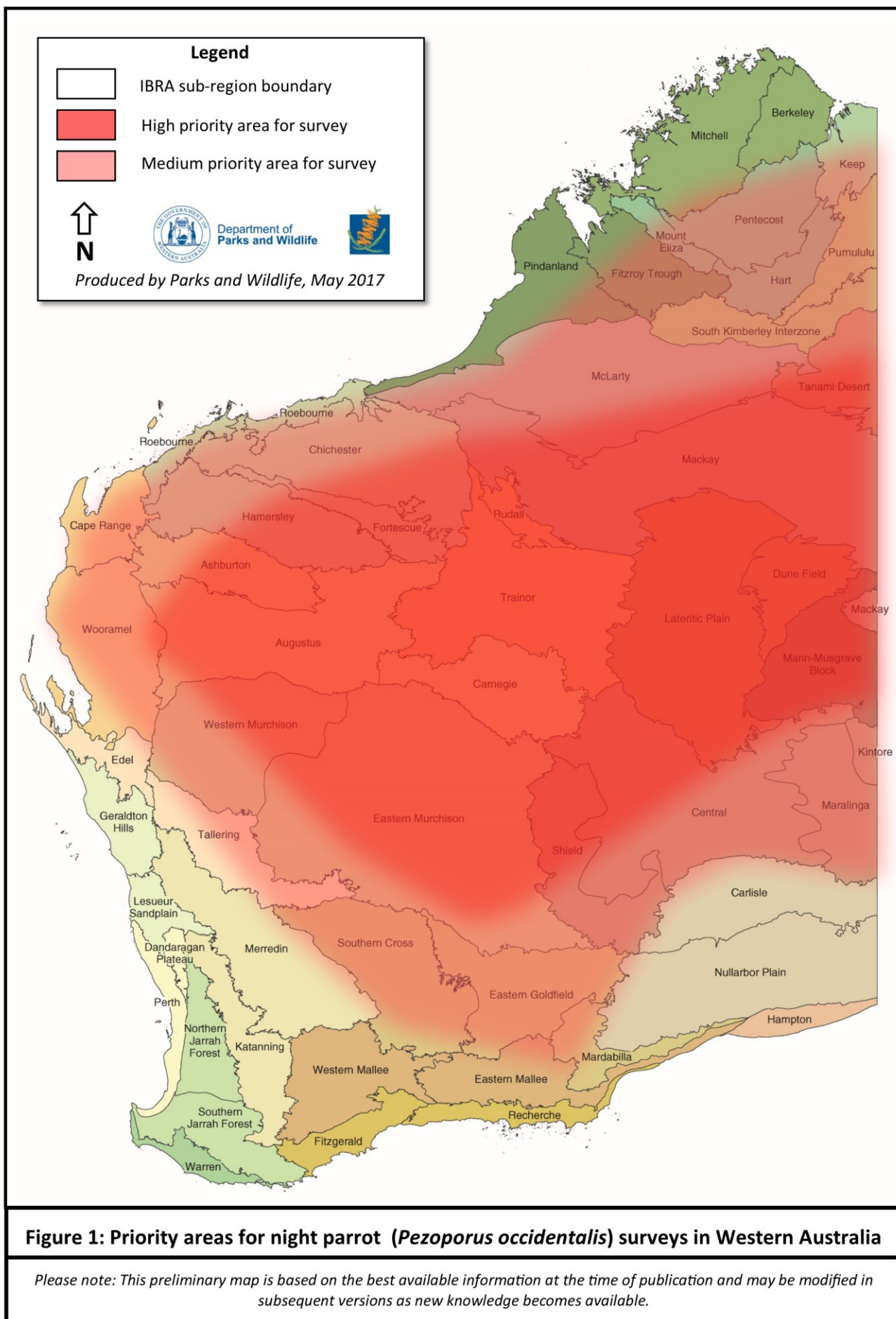




Figure 1: Priority areas for night parrot (*Pezoporus occidentalis*) surveys in Western Australia

Please note: This preliminary map is based on the best available information at the time of publication and may be modified in subsequent versions as new knowledge becomes available.

Appendix 2: Habitat Assessment Sheets



FAUNA HABITAT ASSESSMENT SHEET - STRATEGEN										
Location: Roy Hill						Site Number: #1				
Project Number: RH18197.01										
Date: 26/04/2018			Easting: 794342			Aspect	N	NE	SW	NW
Quadrat Size: 50 x 50			Northing:7473068				E	SE	W	N/A
										
Soil Texture	sand		sandy-loam		loam		cracking clay		rock	
VEGETATION										
Vegetation Description	Hummock Grassland	Other:			Average Height (m)	Cover				
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	Spinifex cover
	Riverine Woodland	Overstorey	Mulga		3	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
	Other Grassland	Midstorey				0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
	Low Woodland	Ground Cover	Triodia sp.		0.2	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	60%
CONDITION						LAST FIRE				
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr
(general)						(cattle)				
DISTURBANCE						DISTURBANCE				
	0 heavy	1 medium	2 mild	3 none		0 heavy	1 medium	2 mild	3 none	
GROUND COVER										
Bare Ground	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Hummock Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	30%
Rock	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
Leaf Litter	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Herbs	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
Logs >10cm	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other:	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
NIGHT PARROT SUITABILITY										
Night Parrot Y / N		Triodia is small and there are no large clumps or rings								


FAUNA HABITAT ASSESSMENT SHEET - STRATEGEN										
Location: Roy Hill						Site Number: #2B				
Project Number: RH18197.01										
Date: 26/04/2018			Easting: 802710			Aspect	N	NE	SW	NW
Quadrat Size: 50 x 50			Northing:7487082				E	SE	W	N/A
										
Soil Texture	sand		sandy-loam		loam		cracking clay		rock	
VEGETATION										
Vegetation Description	Hummock Grassland	Other:			Average Height (m)	Cover				
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	Spinifex cover
	Riverine Woodland	Overstorey	Mulga		3	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
	Other Grassland	Midstorey				0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
	Low Woodland	Ground Cover	Triodia sp.		0.8	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	70%
CONDITION						LAST FIRE				
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr
(general)			DISTURBANCE				(cattle)			
	0 heavy	1 medium	2 mild	3 none		0 heavy	1 medium	2 mild	3 none	
GROUND COVER										
Bare Ground	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Hummock Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	70%
Rock	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
Leaf Litter	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Herbs	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
Logs >10cm	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other:	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
NIGHT PARROT SUITABILITY										
Night Parrot Y / N		Large, unburnt Triodia hummocks / clumps								



FAUNA HABITAT ASSESSMENT SHEET - STRATEGEN											
Location: Roy Hill						Site Number: #3B					
Project Number: RH18197.01											
Date: 26/04/2018			Easting: 797748			Aspect	N	NE	SW	NW	
Quadrat Size: 50 x 50			Northing:7476569				E	SE	W	N/A	
											
Soil Texture	sand		sandy-loam		loam		cracking clay		rock		
VEGETATION											
Vegetation Description	Hummock Grassland	Other:			Average Height (m)	Cover					
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	Spinifex cover	
	Riverine Woodland	Overstorey	Mulga		5	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
	Other Grassland	Midstorey				0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
	Low Woodland	Ground Cover	Triodia sp.		0.3	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	30%	
CONDITION							LAST FIRE				
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr	
(general)		DISTURBANCE					(cattle)				
	0 heavy	1 medium	2 mild	3 none		0 heavy	1 medium	2 mild	3 none		
GROUND COVER											
Bare Ground	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Hummock Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	30%	
Rock	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
Leaf Litter	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Herbs	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
Logs >10cm	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other:	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
NIGHT PARROT SUITABILITY											
Night Parrot Y / N		Triodia is forming small hummocks / clumps, but there is moderately little ring development.									
		The adjacent area was burnt less than a year ago									


FAUNA HABITAT ASSESSMENT SHEET - STRATEGEN										
Location: Roy Hill						Site Number: #4B				
Project Number: RH18197.01										
Date: 26/04/2018			Easting: 801024			Aspect	N	NE	SW	NW
Quadrat Size: 50 x 50			Northing:7482863				E	SE	W	N/A
										
Soil Texture	sand		sandy-loam		loam		cracking clay		rock	
VEGETATION										
Vegetation Description	Hummock Grassland	Other:			Average Height (m)	Cover				
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	Spinifex cover
	Riverine Woodland	Overstorey	Mulga, Acacia sp.		2.5	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
	Other Grassland	Midstorey				0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
	Low Woodland	Ground Cover	Triodia sp.		0.4	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	60%
CONDITION						LAST FIRE				
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr
(general)			DISTURBANCE				(cattle)			
	0 heavy	1 medium	2 mild	3 none		0 heavy	1 medium	2 mild	3 none	
GROUND COVER										
Bare Ground	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Hummock Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	60%
Rock	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
Leaf Litter	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Herbs	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
Logs >10cm	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other:	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
NIGHT PARROT SUITABILITY										
Night Parrot Y / N		Triodia hummocks are large and there are well developed Triodia rings								



FAUNA HABITAT ASSESSMENT SHEET - STRATEGEN										
Location: Roy Hill						Site Number: #5				
Project Number: RH18197.01										
Date: 26/04/2018			Easting: 791316			Aspect	N	NE	SW	NW
Quadrat Size: 50 x 50			Northing:7458104				E	SE	W	N/A
										
Soil Texture	sand		sandy-loam		loam		cracking clay		rock	
VEGETATION										
Vegetation Description	Hummock Grassland	Other:			Average Height (m)	Cover				
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	Spinifex cover
	Riverine Woodland	Overstorey	Mulga, Acacia sp.		4	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
	Other Grassland	Midstorey				0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
	Low Woodland	Ground Cover	Triodia sp.		0.3	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	70%
CONDITION						LAST FIRE				
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr
(general)			DISTURBANCE				(cattle)			
	0 heavy	1 medium	2 mild	3 none		0 heavy	1 medium	2 mild	3 none	
GROUND COVER										
Bare Ground	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Hummock Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	70%
Rock	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
Leaf Litter	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Herbs	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
Logs >10cm	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other:	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
NIGHT PARROT SUITABILITY										
Night Parrot Y / N	The hummocks / clumps of triodia and rings are not well developed.									



FAUNA HABITAT ASSESSMENT SHEET - STRATEGEN											
Location: Roy Hill						Site Number: #6B					
Project Number: RH18197.01											
Date: 26/04/2018			Easting: 798958			Aspect	N	NE	SW	NW	
Quadrat Size: 50 x 50			Northing:7460853				E	SE	W	N/A	
											
Soil Texture		sand		sandy-loam		loam		cracking clay		rock	
VEGETATION											
Vegetation Description	Hummock Grassland	Other:			Average Height (m)	Cover					
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	Spinifex cover	
	Riverine Woodland	Overstorey	Mulga, Acacia sp.		5	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
	Other Grassland	Midstorey				0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
	Low Woodland	Ground Cover	Triodia sp.		0.4	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	70%	
CONDITION						LAST FIRE					
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr	
(general)			DISTURBANCE			(cattle)					
	0 heavy	1 medium	2 mild	3 none		0 heavy	1 medium	2 mild	3 none		
GROUND COVER											
Bare Ground	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Hummock Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	70%	
Rock	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
Leaf Litter	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Herbs	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
Logs >10cm	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other:	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
NIGHT PARROT SUITABILITY											
Night Parrot Y / N		Triodia hummocks and rings are reasonably well developed									



FAUNA HABITAT ASSESSMENT SHEET - STRATEGEN											
Location: Roy Hill						Site Number: #7					
Project Number: RH18197.01											
Date: 26/04/2018			Easting: 790660			Aspect	N	NE	SW	NW	
Quadrat Size: 50 x 50			Northing:7462610				E	SE	W	N/A	
											
Soil Texture	sand		sandy-loam		loam		cracking clay		rock		
VEGETATION											
Vegetation Description	Hummock Grassland	Other:			Average Height (m)	Cover					
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	Spinifex cover	
	Riverine Woodland	Overstorey	Acacia sp.		3	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
	Other Grassland	Midstorey				0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
	Low Woodland	Ground Cover	Triodia sp.		0.5	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	70%	
CONDITION						LAST FIRE					
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr	
(general)			DISTURBANCE			(cattle)					
	0 heavy	1 medium	2 mild	3 none		0 heavy	1 medium	2 mild	3 none		
GROUND COVER											
Bare Ground	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Hummock Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	70%	
Rock	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
Leaf Litter	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Herbs	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
Logs >10cm	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other:	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
NIGHT PARROT SUITABILITY											
Night Parrot Y / N		Triodia rings are medium in size, but there are not many. Triodia clumps / hummocks are of a reasonable size.									



FAUNA HABITAT ASSESSMENT SHEET - STRATEGEN											
Location: Roy Hill						Site Number: #8B					
Project Number: RH18197.01											
Date: 26/04/2018			Easting: 794706			Aspect	N	NE	SW	NW	
Quadrat Size: 50 x 50			Northing:7470405				E	SE	W	N/A	
<div></div>											
Soil Texture	sand		sandy-loam		loam		cracking clay		rock		
VEGETATION											
Vegetation Description	Hummock Grassland	Other:			Average Height (m)	Cover					
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	Spinifex cover	
	Riverine Woodland	Overstorey	Mulga, Acacia sp.		5	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
	Other Grassland	Midstorey				0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
	Low Woodland	Ground Cover	Triodia sp.		0.4	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	80%	
CONDITION							LAST FIRE				
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr	
(general)		DISTURBANCE					(cattle)				
	0 heavy	1 medium	2 mild	3 none		0 heavy	1 medium	2 mild	3 none		
GROUND COVER											
Bare Ground	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Hummock Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	80%	
Rock	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
Leaf Litter	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Herbs	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
Logs >10cm	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other:	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
NIGHT PARROT SUITABILITY											
Night Parrot Y / N		Triodia is generally small and there are not many large clumps. There are a small number of large rings									



FAUNA HABITAT ASSESSMENT SHEET - STRATEGEN											
Location: Roy Hill						Site Number: #9					
Project Number: RH18197.01											
Date: 26/04/2018			Easting: 790883			Aspect	N	NE	SW	NW	
Quadrat Size: 50 x 50			Northing:7461998				E	SE	W	N/A	
											
Soil Texture	sand		sandy-loam		loam		cracking clay		rock		
VEGETATION											
Vegetation Description	Hummock Grassland	Other:			Average Height (m)	Cover					
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	Spinifex cover	
	Riverine Woodland	Overstorey	Mulga, Acacia sp.		3	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
	Other Grassland	Midstorey				0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
	Low Woodland	Ground Cover	Triodia sp.		0.4	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	80%	
CONDITION						LAST FIRE					
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr	
(general)			DISTURBANCE			(cattle)					
	0 heavy	1 medium	2 mild	3 none		0 heavy	1 medium	2 mild	3 none		
GROUND COVER											
Bare Ground	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Hummock Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	80%	
Rock	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
Leaf Litter	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Herbs	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
Logs >10cm	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other:	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
NIGHT PARROT SUITABILITY											
Night Parrot Y / N		Triodia is relatively dense and the rings are reasonably well developed with space in the middle.									



FAUNA HABITAT ASSESSMENT SHEET - STRATEGEN											
Location: Roy Hill						Site Number: #10B					
Project Number: RH18197.01											
Date: 26/04/2018			Easting: 799881			Aspect	N	NE	SW	NW	
Quadrat Size: 50 x 50			Northing:7481025				E	SE	W	N/A	
											
Soil Texture	sand		sandy-loam		loam		cracking clay		rock		
VEGETATION											
Vegetation Description	Hummock Grassland	Other:			Average Height (m)	Cover					
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	Spinifex cover	
	Riverine Woodland	Overstorey	Mulga		5	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
	Other Grassland	Midstorey				0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
	Low Woodland	Ground Cover	Triodia sp.		0.4	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	50%	
CONDITION						LAST FIRE					
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr	
(general)			DISTURBANCE			(cattle)					
	0 heavy	1 medium	2 mild	3 none		0 heavy	1 medium	2 mild	3 none		
GROUND COVER											
Bare Ground	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Hummock Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	50%	
Rock	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
Leaf Litter	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Herbs	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
Logs >10cm	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other:	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
NIGHT PARROT SUITABILITY											
Night Parrot Y / N		Triodia hummocks are large and there are well developed Triodia rings									



FAUNA HABITAT ASSESSMENT SHEET - STRATEGEN										
Location: Roy Hill						Site Number: #1C				
Project Number: RH18197.01										
Date: 29/04/2018			Easting: 786509			Aspect	N	NE	SW	NW
Quadrat Size: 50 x 50			Northing:7463446				E	SE	W	N/A
										
Soil Texture	sand		sandy-loam		loam		cracking clay		rock	
VEGETATION										
Vegetation Description	Hummock Grassland	Other:			Average Height (m)	Cover				
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	Spinifex cover
	Riverine Woodland	Overstorey	Acacia sp.		4	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
	Other Grassland	Midstorey				0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
	Low Woodland	Ground Cover	Triodia sp.		0.4	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	70%
CONDITION							LAST FIRE			
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr
(general)		DISTURBANCE				(cattle)				
	0 heavy	1 medium	2 mild	3 none		0 heavy	1 medium	2 mild	3 none	
GROUND COVER										
Bare Ground	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Hummock Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	70%
Rock	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
Leaf Litter	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Herbs	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
Logs >10cm	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other:	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
NIGHT PARROT SUITABILITY										
Night Parrot Y / N		Triodia in this area has some rings that are relatively well developed and the clumps are relatively large								



FAUNA HABITAT ASSESSMENT SHEET - STRATEGEN										
Location: Roy Hill						Site Number: #2C				
Project Number: RH18197.01										
Date: 29/04/2018			Easting: 786644			Aspect	N	NE	SW	NW
Quadrat Size: 50 x 50			Northing:7464221				E	SE	W	N/A
										
Soil Texture	sand		sandy-loam		loam		cracking clay		rock	
VEGETATION										
Vegetation Description	Hummock Grassland	Other:			Average Height (m)	Cover				
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	Spinifex cover
	Riverine Woodland	Overstorey	Acacia sp.		5	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
	Other Grassland	Midstorey				0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
	Low Woodland	Ground Cover	Triodia sp.		0.5	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	40%
CONDITION						LAST FIRE				
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr
(general)						(cattle)				
DISTURBANCE						DISTURBANCE				
	0 heavy	1 medium	2 mild	3 none		0 heavy	1 medium	2 mild	3 none	
GROUND COVER										
Bare Ground	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Hummock Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	40%
Rock	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
Leaf Litter	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Herbs	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
Logs >10cm	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other:	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
NIGHT PARROT SUITABILITY										
Night Parrot Y / N		Triodia in this area has some rings that are relatively well developed and the clumps are moderately sized (approximately 3 m diameter)								

FAUNA HABITAT ASSESSMENT SHEET - STRATEGEN											
Location: Roy Hill						Site Number: #3C					
Project Number: RH18197.01											
Date: 29/04/2018			Easting: 786641			Aspect	N	NE	SW	NW	
Quadrat Size: 50 x 50			Northing:7465723				E	SE	W	N/A	
											
Soil Texture	sand			sandy-loam		loam		cracking clay		rock	
VEGETATION											
Vegetation Description	Hummock Grassland	Other:			Average Height (m)	Cover					
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	Spinifex cover	
	Riverine Woodland	Overstorey	Acacia sp.		6	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
	Other Grassland	Midstorey				0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
	Low Woodland	Ground Cover	Triodia sp.		0.5	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	40%	
CONDITION						LAST FIRE					
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr	
(general)			DISTURBANCE			(cattle)					
	0 heavy	1 medium	2 mild	3 none		0 heavy	1 medium	2 mild	3 none		
GROUND COVER											
Bare Ground	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Hummock Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	40%	
Rock	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
Leaf Litter	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Herbs	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
Logs >10cm	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other:	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
NIGHT PARROT SUITABILITY											
Night Parrot Y / N		Triodia rings are well developed and there are a few clumps									

FAUNA HABITAT ASSESSMENT SHEET - STRATEGEN										
Location: Roy Hill						Site Number: #4C				
Project Number: RH18197.01										
Date: 29/04/2018			Easting: 797959			Aspect	N	NE	SW	NW
Quadrat Size: 50 x 50			Northing:7485329				E	SE	W	N/A
										
Soil Texture	sand		sandy-loam		loam		cracking clay		rock	
VEGETATION										
Vegetation Description	Hummock Grassland	Other:			Average Height (m)	Cover				
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	Spinifex cover
	Riverine Woodland	Overstorey	Acacia sp.		2	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
	Other Grassland	Midstorey				0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
	Low Woodland	Ground Cover	Triodia sp.		0.7	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	30%
CONDITION						LAST FIRE				
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr
(general)			DISTURBANCE				(cattle)			
	0 heavy	1 medium	2 mild	3 none		0 heavy	1 medium	2 mild	3 none	
GROUND COVER										
Bare Ground	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Hummock Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	30%
Rock	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
Leaf Litter	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Herbs	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
Logs >10cm	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other:	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
NIGHT PARROT SUITABILITY										
Night Parrot Y / N		Large hummcks of Triodia but no well developed rings. Adjacent area has been burn, probably within the last year.								



FAUNA HABITAT ASSESSMENT SHEET - STRATEGEN											
Location: Roy Hill						Site Number: #5C					
Project Number: RH18197.01											
Date: 29/04/2018			Easting: 794957			Aspect	N	NE	SW	NW	
Quadrat Size: 50 x 50			Northing:7483205				E	SE	W	N/A	
											
Soil Texture	sand		sandy-loam		loam		cracking clay		rock		
VEGETATION											
Vegetation Description	Hummock Grassland	Other:			Average Height (m)	Cover					
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	Spinifex cover	
	Riverine Woodland	Overstorey	Acacia sp.		3	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
	Other Grassland	Midstorey				0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
	Low Woodland	Ground Cover	Triodia sp.		0.3	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	40%	
	CONDITION						LAST FIRE				
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr	
(general)			DISTURBANCE				(cattle)				
	0 heavy	1 medium	2 mild	3 none		0 heavy	1 medium	2 mild	3 none		
GROUND COVER											
Bare Ground	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Hummock Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	40%	
Rock	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
Leaf Litter	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Herbs	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
Logs >10cm	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other:	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
NIGHT PARROT SUITABILITY											
Night Parrot Y / N		The clumps of triodia have some ring development. The hummocks / clumps are not large.									
		Parts of the site have probably be burnt in the last 1-2 years, and other areas not burnt for more than 5 years									

FAUNA HABITAT ASSESSMENT SHEET - STRATEGEN											
Location: Roy Hill						Site Number: #6C					
Project Number: RH18197.01											
Date: 29/04/2018			Easting: 796183			Aspect	N	NE	SW	NW	
Quadrat Size: 50 x 50			Northing:7485372				E	SE	W	N/A	
											
Soil Texture	sand		sandy-loam		loam		cracking clay		rock		
VEGETATION											
Vegetation Description	Hummock Grassland	Other:			Average Height (m)	Cover					
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	Spinifex cover	
	Riverine Woodland	Overstorey	Acacia sp.		3	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
	Other Grassland	Midstorey				0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
	Low Woodland	Ground Cover	Triodia sp.		0.5	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	60%	
CONDITION						LAST FIRE					
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr	
(general)			DISTURBANCE			(cattle)					
	0 heavy	1 medium	2 mild	3 none		0 heavy	1 medium	2 mild	3 none		
GROUND COVER											
Bare Ground	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Hummock Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	60%	
Rock	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
Leaf Litter	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Herbs	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
Logs >10cm	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other:	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
NIGHT PARROT SUITABILITY											
Night Parrot Y / N		Triodia is forming large hummocks / clumps, but there is relatively little ring development.									

FAUNA HABITAT ASSESSMENT SHEET - STRATEGEN											
Location: Roy Hill						Site Number: #7C					
Project Number: RH18197.01											
Date: 29/04/2018			Easting: 802020			Aspect	N	NE	SW	NW	
Quadrat Size: 50 x 50			Northing:7486392				E	SE	W	N/A	
											
Soil Texture	sand		sandy-loam		loam		cracking clay		rock		
VEGETATION											
Vegetation Description	Hummock Grassland	Other:			Average Height (m)	Cover					
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	Spinifex cover	
	Riverine Woodland	Overstorey	Acacia sp.		1.5	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
	Other Grassland	Midstorey				0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
	Low Woodland	Ground Cover	Triodia sp.		0.8	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	60%	
CONDITION						LAST FIRE					
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr	
(general)			DISTURBANCE			(cattle)					
	0 heavy	1 medium	2 mild	3 none		0 heavy	1 medium	2 mild	3 none		
GROUND COVER											
Bare Ground	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Hummock Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	60%	
Rock	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
Leaf Litter	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Herbs	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
Logs >10cm	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other:	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
NIGHT PARROT SUITABILITY											
Night Parrot Y / N		Triodia hummocks are well developed and there are also well developed rings of Triodi up to 6-7 m diameter									

FAUNA HABITAT ASSESSMENT SHEET - STRATEGEN										
Location: Roy Hill						Site Number: #8C				
Project Number: RH18197.01										
Date: 29/04/2018			Easting: 800180			Aspect	N	NE	SW	NW
Quadrat Size: 50 x 50			Northing:7486369				E	SE	W	N/A
<div></div>										
Soil Texture	sand		sandy-loam		loam		cracking clay		rock	
VEGETATION										
Vegetation Description	Hummock Grassland	Other:			Average Height (m)	Cover				
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	Spinifex cover
	Riverine Woodland	Overstorey	Acacia sp. Hakea sp.		2	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
	Other Grassland	Midstorey				0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
	Low Woodland	Ground Cover	Triodia sp.		0.8	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	70%
CONDITION							LAST FIRE			
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr
(general) DISTURBANCE (cattle)										
	0 heavy	1 medium	2 mild	3 none		0 heavy	1 medium	2 mild	3 none	
GROUND COVER										
Bare Ground	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Hummock Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	70%
Rock	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
Leaf Litter	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Herbs	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
Logs >10cm	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other:	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	
NIGHT PARROT SUITABILITY										
Night Parrot Y / N		Triodia is forming large hummocks / clumps, but there is moderately little ring development								

FAUNA HABITAT ASSESSMENT SHEET - STRATEGEN											
Location: Roy Hill						Site Number: #9C					
Project Number: RH18197.01											
Date: 29/04/2018			Easting: 800639			Aspect	N	NE	SW	NW	
Quadrat Size: 50 x 50			Northing:7491194				E	SE	W	N/A	
<div></div>											
Soil Texture	sand		sandy-loam		loam		cracking clay		rock		
VEGETATION											
Vegetation Description	Hummock Grassland	Other:			Average Height (m)	Cover					
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	Spinifex cover	
	Riverine Woodland	Overstorey	Mulga, Acacia sp.		2	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
	Other Grassland	Midstorey				0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
	Low Woodland	Ground Cover	Triodia sp.		0.8	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	70%	
CONDITION											
Scale:	5 Pristine	4 Excellent	3 Very Good	2 Good	1 Degraded	0 Completely Degraded	0 <1 year	1 1-3 Yr	2 4-5 Yr	3 >5 Yr	
(general) DISTURBANCE (cattle)											
	0 heavy	1 medium	2 mild	3 none		0 heavy	1 medium	2 mild	3 none		
GROUND COVER											
Bare Ground	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Hummock Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	70%	
Rock	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other Grass	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
Leaf Litter	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Herbs	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
Logs >10cm	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%	Other:	0 <5% COVER	1 <20% COVER	2 20-60%	3 60-100%		
NIGHT PARROT SUITABILITY											
Night Parrot Y / N		Triodia hummocks are large and there are well developed Triodia rings									

FAUNA HABITAT ASSESSMENT SHEET - STRATEGEN											
Location: Roy Hill						Site Number: #10C					
Project Number: RH18197.01											
Date: 29/04/2018			Easting: 798784			Aspect	N	NE	SW	NW	
Quadrat Size: 50 x 50			Northing:7491211				E	SE	W	N/A	
											
Soil Texture	sand		sandy-loam		loam		cracking clay		rock		
VEGETATION											
Vegetation Description	Hummock Grassland	Other:			Average Height (m)	Cover					
	Acacia Shrubland	Stratum				Scattered Plants	Sparse	Moderate	Thick	Spinifex cover	
	Riverine Woodland	Overstorey	Mulga, Acacia sp.		4	0<5% COVER	1<20% COVER	220-60%	360-100%		
	Other Grassland	Midstorey				0<5% COVER	1<20% COVER	220-60%	360-100%		
	Low Woodland	Ground Cover	Triodia sp.		0.6	0<5% COVER	1<20% COVER	220-60%	360-100%	80%	
CONDITION							LAST FIRE				
Scale:	5Pristine	4Excellent	3Very Good	2Good	1Degraded	0Completely Degraded	0<1 year	11-3 Yr	24-5 Yr	3>5 Yr	
(general)			DISTURBANCE				(cattle)				
	0heavy	1medium	2mild	3none		0heavy	1medium	2mild	3none		
GROUND COVER											
Bare Ground	0<5% COVER	1<20% COVER	220-60%	360-100%	Hummock Grass	0<5% COVER	1<20% COVER	220-60%	360-100%	80%	
Rock	0<5% COVER	1<20% COVER	220-60%	360-100%	Other Grass	0<5% COVER	1<20% COVER	220-60%	360-100%		
Leaf Litter	0<5% COVER	1<20% COVER	220-60%	360-100%	Herbs	0<5% COVER	1<20% COVER	220-60%	360-100%		
Logs >10cm	0<5% COVER	1<20% COVER	220-60%	360-100%	Other:	0<5% COVER	1<20% COVER	220-60%	360-100%		
NIGHT PARROT SUITABILITY											
Night Parrot Y / N		Triodia hummocks / clumps are well developed, but rings are sparse									

Appendix 3: Interim recommendations about sample effort for Night Parrots

Interim recommendations about sample effort for Night Parrots

Stephen Murphy¹ and Nick Leseberg^{1,2}

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Fundamental to survey design for rare and cryptic species is sample effort per site. Until a more thorough quantitative analysis of our long-term acoustic dataset is completed, we are confident in the following series of statements in relation to what constitutes adequate and optimal sampling for Night Parrots:

1. Our recommendation is for each specific site (defined here as a discrete area of suitable roosting habitat³) to be sampled over 4 consecutive nights from sunset to sunrise. This equals 8 sample periods when birds are most likely to call from their roosts: 4 post-sunset and 4 pre-sunrise.
2. Preliminary analyses of detection distances suggests that acoustic recorders can reliably detect calling Night Parrots (i.e. >80% chance of detection) at distances up to 300m in suitable conditions. Thus, large individual sites may need to be sampled using multiple recorder installations.
3. Since 2013, there have been four sites on Pullen-Pullen Reserve (QLD) that have been occupied by Night Parrots for extended periods, from several months to years. Depending on the definition of “site”, Night Parrots have been detected at another 10-12 sites, although only for much shorter periods; single nights or a small number of nights, as opposed to continuously for weeks or months. Detections at these other sites were made exclusively following periods of significant precedent rainfall, each > 1 standard deviation from the long-term mean. This suggests that within the broader landscape where Night Parrots occur, only a small subset of apparently suitable *Triodia* roosting patches are chosen as long-term stable roosts. We suggest that detections at temporarily occupied sites may actually be the same birds that occupy the long-term, stable roosting areas.
4. Although we have not yet completed analyses that will describe the factors influencing calling, and therefore nightly probability of detection (this should be completed by July 2018), our preliminary results indicate that the probability of not detecting a calling Night Parrot for 4 consecutive nights at a long-term stable roost is very low.
5. Acoustic surveys within a landscape where there is no knowledge of occupancy involve a trade-off between longer duration sampling over relatively few sites, and shorter duration sampling over relatively more sites. Given that long-term stable occupied roosts are a small subset of all suitable *Triodia* patches, we strongly recommend that shorter duration (i.e. 4 night) sampling of relatively more sites is much more likely to result in positive detections of Night Parrot roosts compared to longer-term sampling of fewer sites.

³ Murphy, S.A., Austin, J.J., Murphy, R.K., Silcock, J., Joseph, L., Garnett, S.T., Leseberg, N.P., Watson, J.E.M., and Burbidge, A.H. (2017). Observations on breeding Night Parrots (*Pezoporus occidentalis*) in western Queensland. *Emu - Austral Ornithology* **117**, 107-113.

Murphy, S.A., Silcock, J., Murphy, R., Reid, J., and Austin, J.J. (2017). Movements and habitat use of the night parrot *Pezoporus occidentalis* in south-western Queensland. *Austral Ecology* **42**, 858-868.

6. We understand that the proposed survey involves 10 acoustic recorders and 9 survey nights. Given these constraints, the number of sites that can be sampled for a given sampling period can be calculated. At one extreme, 90 sites could be sampled for 1 night each, and at the other 10 sites could be sampled for 9 nights each. Different sampling periods will permit various permutations of deployments within the 9 survey night window, noting that any sampling period greater than 4 nights will not permit two complete deployment cycles within that 9 night survey period. For example, a sampling period of 6 nights (per DBCA guidelines) will permit each recorder to be placed for 6 nights at one site, but only 3 nights at a second site. Table 1 outlines the number of sites that can be fully covered with 10 recorders given a specified sampling period per site.

TABLE 1. PERMUTATIONS OF NO. SITES ABLE TO BE FULLY COVERED FOR DEFINED SAMPLING PERIOD PER SITE, WITHIN A 9 SURVEY NIGHT PERIOD.

Number of Recorders	Sampling period (nights) per site	Complete cycles within 9 survey nights	Number of sites able to be fully covered
10	1	9	90
10	2	4	40
10	3	3	30
10	4	2	20
10	5	1	10
10	6	1	10
10	7	1	10
10	8	1	10
10	9	1	10

7. A sampling period of 4 nights (our recommendation) means that all 10 recorders could complete 2 full 4 night cycles during the 9 survey night period, covering 20 different sites. This would leave one night as a potential spare in case of poor weather, or the recorders could be deployed to new sites for one night only to complete the 9 night survey period. Alternatively, if the survey period can be extended to 12 nights, 3 full 4 night cycles could be completed, allowing complete coverage of 30 sites for 4 nights each.
8. The probability of detecting a species, $P(\text{detection})$, is a product of:
 $P(\text{species is available for detection, if present})$ and $P(\text{species will be detected if available})$
9. Extensive observations at sites in QLD and preliminary observations at sites in WA indicate that the first element of this equation is high, given how regularly the birds call at long-term stable occupied roosts sites. Our research suggests that over 4 nights (8 sample periods) and across various climatic conditions, ***$P(\text{species is available for detection, if present})$ is very close to 1***. This is based on the assumption that there are no sites that are occupied where birds do not call. Our research suggests this assumption is reasonable and reliable; even in dry conditions, at sites with few birds, they are still vocal. It also seems very unlikely that the Night Parrots at Pullen-Pullen are more vocal than Night Parrots elsewhere. There may be a density dependent effect on calling rate, and therefore $P(\text{detection})$; however, we are confident that even at sites occupied by only single birds or pairs ***$P(\text{species is available for detection, if present})$ over 4 nights is likely to be very close to 1***.
10. We also know the second element of the above equation – ***$P(\text{species will be detected if available})$*** – is high using automated acoustic recorders, set within a reasonable distance of a calling bird,

and provided recording conditions are good (wind <15km/h). The underlying assumptions of our recommendation that 4 nights is adequate – and indeed optimal given issues discussed above about maximising the number of sites sampled – are that conditions are conducive to making good recordings, the recorder is installed properly, recorder settings are appropriate and microphones are serviceable.



Data driven Natural Resource Management consultants

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Appendix 4: SM4 Call IDs

Sensor	File name	Start of Call	End of Call	Suspected Night Parrot call type	Most likely species
SM406	SM406_20180428_054208.wav	1758	1760	4 syllable whistle	Spiny-cheeked Honeyeater
SM406	SM406_20180429_053702.wav	536	538	4 syllable whistle	Spiny-cheeked Honeyeater
SM401	SM401_20180428_193702_1.wav	1676	1678	hollow whistle	Pallid Cuckoo
SM401	SM401_20180429_040702_1.wav	366	368	hollow whistle	Pallid Cuckoo
SM4010	SM4010_20180429_033703.wav	952	954	hollow whistle	Pallid Cuckoo
SM4010	SM4010_20180429_033703.wav	992	994	hollow whistle	Pallid Cuckoo
SM4010	SM4010_20180429_043702.wav	1026	1028	hollow whistle	Pallid Cuckoo
SM4010	SM4010_20180429_230704.wav	234	236	hollow whistle	Pallid Cuckoo
SM4010	SM4010_20180429_230704.wav	278	280	hollow whistle	Pallid Cuckoo
SM4010	SM4010_20180430_230604.wav	1740	1742	hollow whistle	Pallid Cuckoo
SM4010	SM4010_20180430_233604.wav	4	6	hollow whistle	Pallid Cuckoo
SM4010	SM4010_20180501_040604.wav	750	752	hollow whistle	Pallid Cuckoo
SM4010	SM4010_20180501_040604.wav	782	786	hollow whistle	Pallid Cuckoo
SM4010	SM4010_20180501_040604.wav	798	800	hollow whistle	Pallid Cuckoo
SM4010	SM4010_20180501_040604.wav	854	856	hollow whistle	Pallid Cuckoo
SM402	SM402_20180429_010702.wav	882	884	hollow whistle	Pallid Cuckoo
SM402	SM402_20180429_040702.wav	452	454	hollow whistle	Barn Owl
SM402	SM402_20180430_203602.wav	322	324	hollow whistle	Pallid Cuckoo
SM402	SM402_20180501_000602.wav	1520	1522	hollow whistle	Pallid Cuckoo
SM402	SM402_20180501_000602.wav	1552	1554	hollow whistle	Pallid Cuckoo
SM402	SM402_20180501_020602.wav	1342	1344	hollow whistle	Pallid Cuckoo
SM402	SM402_20180501_020602.wav	1356	1358	hollow whistle	Pallid Cuckoo
SM403	SM403_20180501_040602.wav	922	924	hollow whistle	Red-backed Kingfisher
SM403	SM403_20180501_040602.wav	950	952	hollow whistle	Pallid Cuckoo
SM403	SM403_20180501_040602.wav	970	972	hollow whistle	Pallid Cuckoo
SM403	SM403_20180501_040602.wav	982	984	hollow whistle	Pallid Cuckoo
SM403	SM403_20180501_040602.wav	1054	1056	hollow whistle	Pallid Cuckoo
SM403	SM403_20180501_040602.wav	1112	1114	hollow whistle	Pallid Cuckoo
SM403	SM403_20180501_040602.wav	1188	1190	hollow whistle	Pallid Cuckoo
SM403	SM403_20180501_040602.wav	1200	1202	hollow whistle	Pallid Cuckoo
SM403	SM403_20180501_040602.wav	1256	1258	hollow whistle	Pallid Cuckoo
SM403	SM403_20180501_040602.wav	1276	1278	hollow whistle	Pallid Cuckoo
SM403	SM403_20180501_040602.wav	1300	1302	hollow whistle	Pallid Cuckoo
SM403	SM403_20180501_040602.wav	1330	1332	hollow whistle	Pallid Cuckoo
SM403	SM403_20180501_040602.wav	1346	1348	hollow whistle	Pallid Cuckoo
SM404	SM404_20180503_043502.wav	1018	1020	hollow whistle	Pallid Cuckoo
SM404	SM404_20180503_043502.wav	1040	1042	hollow whistle	Pallid Cuckoo
SM405	SM405_20180427_040902.wav	882	886	hollow whistle	Pallid Cuckoo
SM405	SM405_20180427_040902.wav	930	932	hollow whistle	Pallid Cuckoo
SM406	SM406_20180430_023702.wav	1590	1592	hollow whistle	Pallid Cuckoo
SM406	SM406_20180430_023702.wav	1604	1606	hollow whistle	Pallid Cuckoo
SM407	SM407_20180429_223702.wav	1652	1656	hollow whistle	Pallid Cuckoo
SM407	SM407_20180429_223702.wav	1696	1698	hollow whistle	Pallid Cuckoo
SM408	SM408_20180429_043702_1.wav	1338	1340	hollow whistle	Pallid Cuckoo
SM408	SM408_20180429_043702_1.wav	1362	1364	hollow whistle	Pallid Cuckoo
SM408	SM408_20180429_043702_1.wav	1374	1376	hollow whistle	Pallid Cuckoo
SM408	SM408_20180429_043702_1.wav	1408	1410	hollow whistle	Pallid Cuckoo
SM409	SM409_20180501_040602.wav	832	834	hollow whistle	Pallid Cuckoo
SM409	SM409_20180501_040602.wav	892	896	hollow whistle	Pallid Cuckoo
SM409	SM409_20180501_040602.wav	908	910	hollow whistle	Pallid Cuckoo
SM409	SM409_20180501_040602.wav	942	944	hollow whistle	Pallid Cuckoo
SM406	SM406_20180430_023702.wav	1648	1650	hollow whistle	Pallid Cuckoo
SM406	SM406_20180430_023702.wav	1670	1672	hollow whistle	Pallid Cuckoo
SM407	SM407_20180430_010702.wav	950	954	hollow whistle	Pallid Cuckoo
SM409	SM409_20180429_233702.wav	1648	1650	hollow whistle	Pallid Cuckoo
SM409	SM409_20180430_233602.wav	1568	1570	hollow whistle	Pallid Cuckoo
SM409	SM409_20180501_040602.wav	1758	1762	hollow whistle	Pallid Cuckoo