



Winu Project Targeted Night Parrot Survey





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1.0 Executive Summary

Rio Tinto Winu Pty Limited (RTW) plans to develop a new copper-gold mine, referred to as the Winu Project ('the project'), approximately 320 km east of Port Hedland in the Pilbara region of Western Australia, within both the Nyangumarta and Martu Peoples' Native Title Determination Areas.

Night Parrot calls were detected on passive acoustic recordings collected during preliminary targeted fauna surveys in the proposed Texas borefield in March and April 2024. As a result, Biota Environmental Sciences (Biota) was commissioned to undertake a targeted Night Parrot survey to assess the species' status within the project development envelope. The survey area for this study encompassed the mine and infrastructure area (MIA), the Rimfire borefield area (Rimfire), the Texas borefield area (Texas), and surrounding areas of potentially suitable habitat. The survey was extended in September to include several contextual sites proximate to Lake Waukarlycarly located between 40km and 50km to the south of the Rimfire development envelope.

The survey methods focussed on habitat assessment and passive acoustic survey using 'autonomous recording units' (ARUs), in accordance with the latest guidelines for Night Parrot surveys (DBCA 2024).

Habitat mapping was undertaken for the survey area and surrounds in September 2024 and February 2025. Habitat mapping initially involved a desktop-based assessment of detailed satellite imagery and spatial layers (e.g. preliminary vegetation mapping, soil units, paleodrainages) followed by field-based habitat verification involving overflying the survey area and some adjacent areas of interest by helicopter to assess habitats from the air, and then undertaking ground-based assessment in areas identified as potentially suitable habitat. Two types of potential Night Parrot habitat were mapped, roosting and foraging, following DBCA (2024) guidelines.

ARUs were deployed for extended periods (27 nights to >100 nights) at 28 locations in the survey area beginning in March 2024. Most units were placed in the Texas borefield area and surrounds, which included the majority of potentially suitable Night Parrot habitat. In September, six units were also deployed around Lake Waukarlycarly on long-term deployment to provide local context for the occurrence of Night Parrots in the survey area. In addition to long-term ARU deployments, units were deployed for single nights in roosting habitat in the Texas borefield area to try to identify any current roosting locations within the survey area.

Based on DBCA (2024), a total of 2,167.8 ha of roosting habitat and 307.3 ha of foraging habitat for Night Parrots was identified within the survey area. However, the subsequent removal of the Texas borefield from the development envelope, and modification of the Rimfire borefield pipeline corridor boundary, mean that there is now no mapped potential Night Parrot habitat present in the development envelope.

Night Parrot calls were detected from eight locations within the survey area and surrounds, all within the Texas borefield and adjacent suitable habitat. These are the most north-westerly records of Night Parrot in Great Sandy Desert thus far, c. 100 km north of the nearest recent record. The majority of the detections were of the "two-note trill" call type, a known call type that has previously been detected from the Great Sandy Desert. However, the peak frequency of the Winu "two-note trill" calls is around 3.3 kHz, which is higher frequency than is typical

for this call type. The remaining confirmed calls were “one-note trill” calls that were very similar in structure and frequency to a single note of the “two-note trill” calls detected; indeed in many cases these calls were faint and thus the second trill note may have been present but not detectable at that range. The very similar call structure and frequency of these calls suggests that they are attributable to a single individual. Several “hollow whistle” type calls were also detected that may be attributable to Night Parrots, but this call type can be difficult to distinguish from a particular Pallid Cuckoo call, and so these calls should only be treated as possible detections.

The pattern of calling detected in the survey area in 2024 indicated that the Winu individual spent increasing amounts of time in the area through April and May. The temporal pattern of calling throughout the night suggested that the bird roosted frequently within the area in May, primarily in proximity to the ARU at WIB12A, as calling was frequently detected from within the 60 minutes prior to sunrise and the 45 minutes after sunset during this period. This likely coincided with the presence of high-quality foraging resources in close proximity to suitable roosting habitat following significant rainfall events in January and March. The availability of surface water in the area following this rainfall may also have been a factor, as suggested by Leseberg (2025). After the first week of June, only occasional detections were made within the survey area and surrounds, suggesting that the bird had largely moved away and was only making occasional visits to the survey area.

Night Parrots calls were also detected at two locations at Lake Waukarlycarly, representing the first confirmed records of Night Parrots from the lake, although suitable habitat has previously been identified (Biologic 2022). The range of calls detected at Lake Waukarlycarly suggests that at least four individual Night Parrots were detected in the area. This included a bird giving a similar “two-note trill” call at the same unusually high frequency as the detections from the survey area, suggesting that this may have been the same individual detected at Winu earlier in the year; however, it is not possible to conclude this with certainty. The recording of the same call type as at Winu does at least lend credence to our view that Lake Waukarlycarly is likely to be the source population for the bird recorded in the survey area, which does not appear to have a permanent Night Parrot presence.

2.0 Introduction

2.1 Project Information and Terminology

Rio Tinto Winu Pty Limited (RTW) plans to develop a copper and gold mine, referred to as the Winu Project ('the project'), approximately 320 km east of Port Hedland in the Pilbara region of Western Australia, within both the Nyangumarta and Martu Peoples' Native Title Determination Areas (Figure 2.1).

Key terminology for the project is outlined below in Table 2.1 and the project development envelope is mapped in Figure 2.2.

Table 2.1: Winu Project terminology.

Term	Description
Project	Includes the development of a new below-water table copper-gold deposit and associated infrastructure and activities required to access, process and transport ore.
Survey area	Refers to the combined areas of the mine and infrastructure area, access road and regional borefields Rimfire and Texas, and is based on an older iteration of the development envelope current at the commencement of the survey.
Habitat mapping extent	Area within the Winu locality over which Night Parrot habitat mapping was undertaken. This includes the Survey area and a number of adjacent areas of interest, combined into a larger polygon.
Development Envelope (DE)	Refers to the current development envelope, including the combined areas of the mine and infrastructure area, access road and regional borefield at Rimfire. The Texas borefield was removed from the development envelope following the detection of Night Parrot there. All mining-related activities will occur within this area.
Mine and Infrastructure Area (MIA)	Refers to the area containing the mineralised deposit and related infrastructure. This is the Winu mine site.
Road Access Corridor (RAC)	Refers to the Access Road, which encompasses the entire length of the existing Access Road from Great Northern Highway to the Winu Project Area.
Rimfire Borefield (Rimfire)	Refers to the regional borefield located at Rimfire, which is approximately 31 km from the MIA.
Texas Borefield (Texas)	Refers to the regional borefield located at Texas, approximately 22 km from the MIA. This area has been removed from the current DE as RTW no longer intends to extract water from this area, but it is included as part of the scope of this survey within the Winu survey area.

Considerable biological survey work has already been completed to support the environmental impact assessment (EIA) of the Winu Project (Biota 2020a, 2020b, 2021a, 2021b, 2022a, 2022b, 2022c, 2023a, 2023b). During these surveys, no Night Parrots had been detected on any of the autonomous recording units (ARUs) deployed for these scopes over a total of 94 nights (Biota 2025).

Night Parrots were initially detected on the two ARUs within the proposed Texas borefield during a targeted Night Parrot survey in March and April 2024. Simultaneously, no detections were obtained from four ARUs in the nearby Rimfire borefield. As a result of this discovery, Biota Environmental Sciences (Biota) was commissioned to undertake further Night Parrot surveys to assess the species' status within the project area.

2.2 Study Scope

2.2.1 Survey Area

The survey area considered for this scope includes the entirety of the initial DE (as it was proposed at the commencement of the survey), excluding the road access corridor to Great Northern Highway (Figure 2.1). This included the MIA and both Rimfire and Texas borefield areas. The survey area is shown in Figure 2.2. The habitat mapping extent represents the full extent of the Night Parrot habitat mapping for this survey, and incorporates the survey area plus additional adjacent areas that were of potential interest to RTW (Figure 2.2).

A preliminary review of the habitats of the MIA, borefield corridors and borefield areas indicated that the Texas borefield area contained the majority of potentially suitable Night Parrot habitat. This was also where calls of the Night Parrot were initially recorded, and it has become a focal point for ongoing survey and monitoring for Night Parrot at Winu.

A contextual component was added to the study scope in September to provide local context for the Winu detections, with six long-term ARUs deployed between the Texas borefield area and Lake Waukarlycarly, 40-50 km to the south, within the Lake Waukarlycarly Indigenous Protected Area (IPA) (Figure 2.1). Regionally, Lake Waukarlycarly was identified as the closest area of extensive, high quality Night Parrot habitat and the most likely source population for the Texas borefield Night Parrot.

2.2.2 Scope

The scope of this survey was to undertake a targeted Night Parrot survey within the Winu survey area and surrounding habitat, including both habitat mapping and passive acoustic surveys in accordance with updated guidelines for determining the presence of Night Parrot (DBCA 2024). This included:

- Assessment of all habitats within the habitat mapping extent to identify and map the extent of potentially important Night Parrot habitat within this area;
- Deployment of ARUs within the Winu survey area and adjacent habitat to identify the likely extent of Night Parrot occurrence, the number of birds involved, and their likely usage of the Winu survey area; and
- Deployment of ARUs at contextual sites at Lake Waukarlycarly to provide additional context for the occurrence of Night Parrot within the within survey area.

2.3 Acknowledgments

Biota gratefully acknowledge the Martu and Nyangumarta traditional owners for their assistance with biological survey work for the Winu Project. In particular, we thank the Martu traditional owners for granting access to country and assisting with the field surveys for this scope.

We would also like to acknowledge the Dr Nick Leseberg (Adaptive NRM) and Dr Allan Burbidge (DBCA) for their input into this study. We particularly thank Dr Leseberg for his review of the final draft of this report (Leseberg 2025) and have endeavoured to incorporate feedback from this review into this final version of the report.

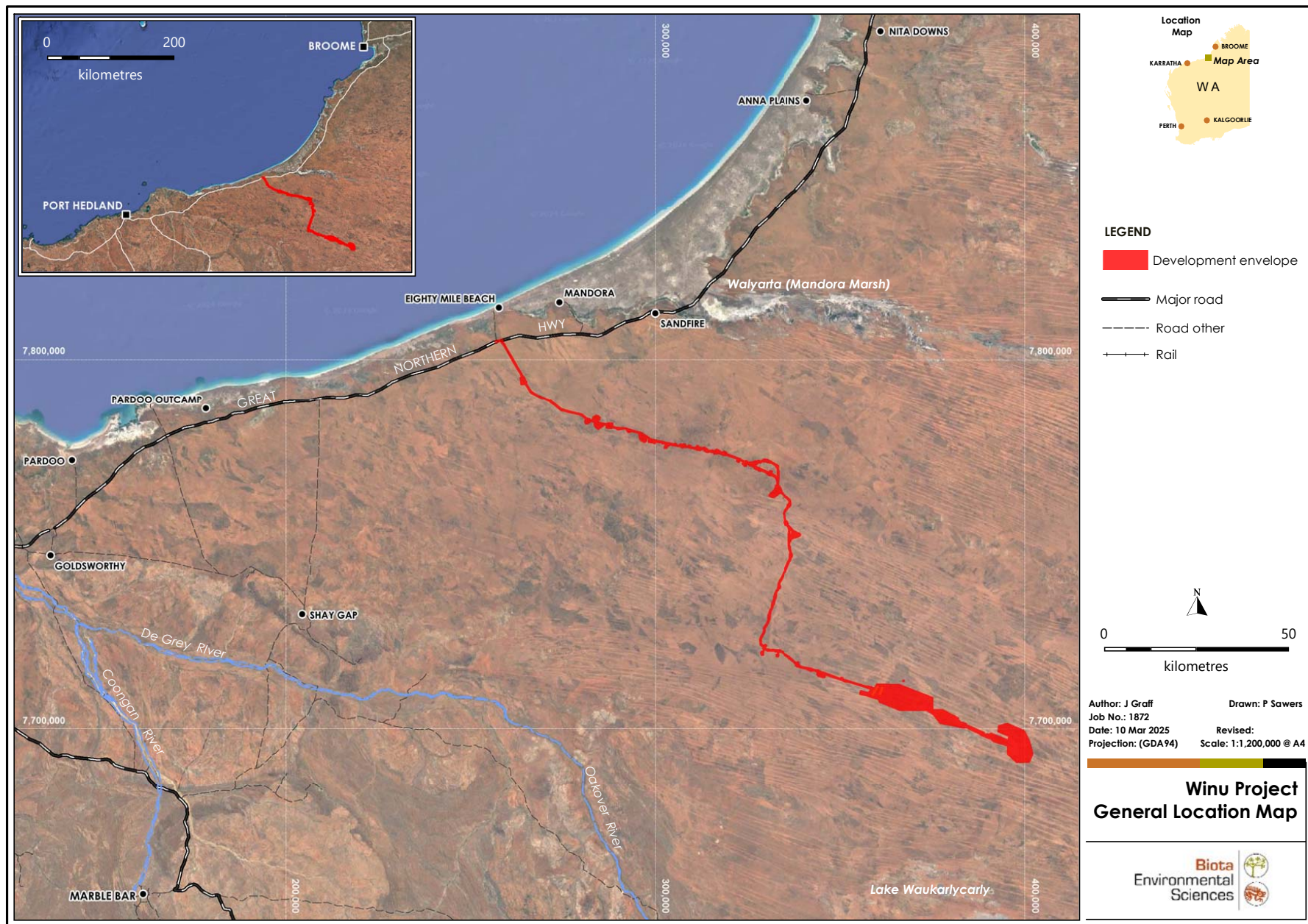


Figure 2.1: Location of Winu Project and Lake Waukarlycarly.

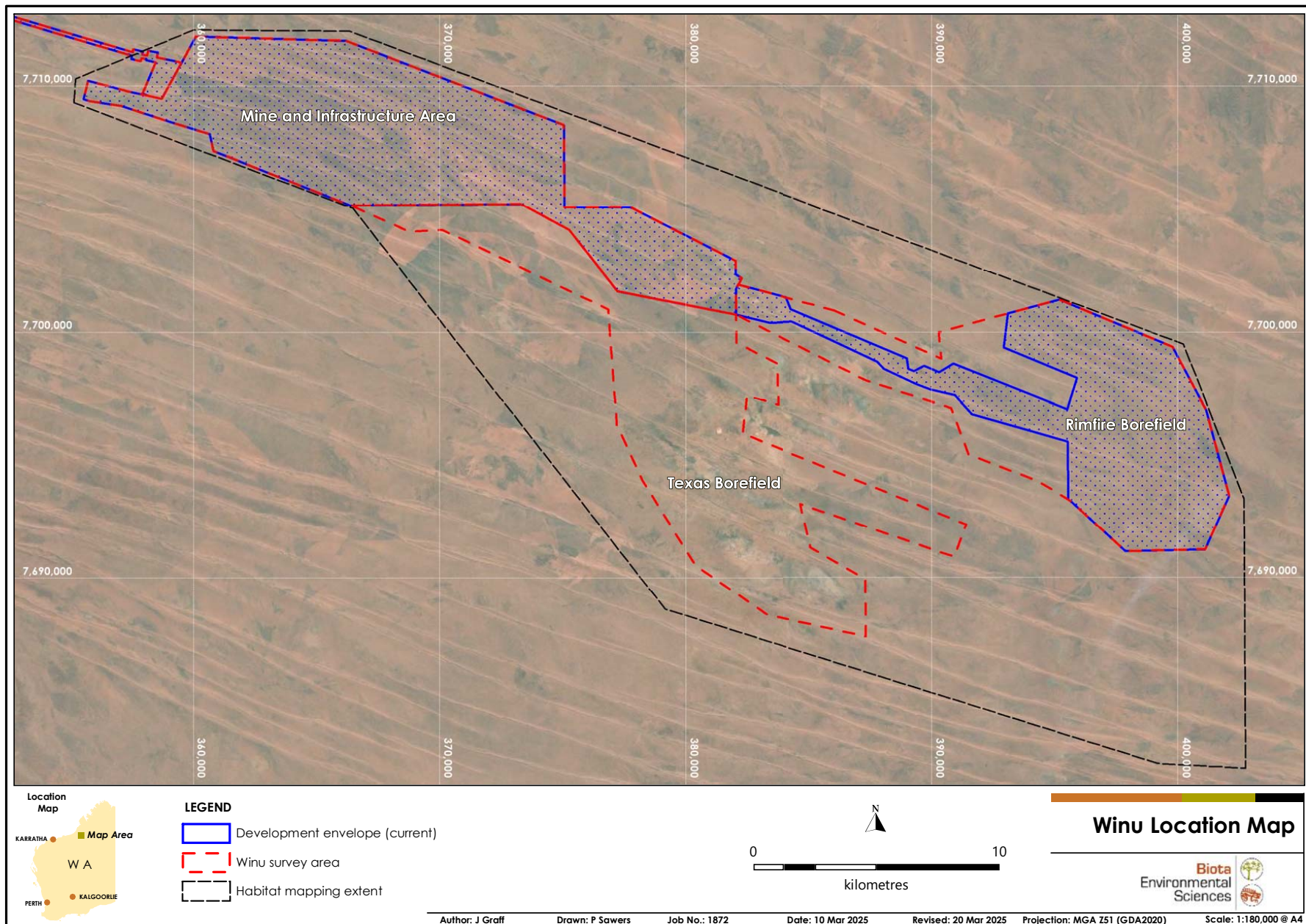


Figure 2.2: Winu Project development envelope, survey area and habitat mapping extent.

3.0 Night Parrot

3.1 Distribution

The Night Parrot occurs in semi-arid and arid areas of inland Australia, with historical records indicating that it was widespread and relatively common in these areas up until the late 19th century (Murphy et al. 2017b, Leseberg et al. 2021). The species appears to have undergone significant declines in abundance and extent of occurrence during the 19th and 20th centuries, and is now known from the Murchison, eastern Pilbara and north-eastern desert regions in Western Australia, as well as a small area in western Queensland (Leseberg et al. 2021, Lindsay et al. 2024).

3.2 Habitat

Night Parrot presence requires two different habitat types, one for roosting and nesting, and one for foraging (DBCA 2024). Roosting and nesting habitat typically comprises patches of long-unburnt spinifex (*Triodia* spp.), particularly ring-forming species such as *T. longiceps*, in open areas with very few (if any) trees and shrubs (Jackett et al. 2017, Murphy et al. 2017a, DBCA 2024, Ngururrpa Rangers et al. 2024). The total extent of spinifex within a patch does not appear to be an important determinant of Night Parrot occupancy, but structural complexity of the spinifex, including a mix of hummock sizes with at least some large, long-unburnt hummocks, does appear to be important (DBCA 2024). In addition, although the extent of a particular patch of spinifex does not appear to be important, widespread suitable roosting habitat on a landscape scale does appear to be required for Night Parrots to persist in an area (DBCA 2024).

Foraging habitat is generally characterised by floristically diverse run-on areas that provide a broad array of grasses and forbs, ranging from small depressions and gilgai formations to large floodplains (Murphy et al. 2017a). Night Parrots are known to travel up to 10 km from their roosting sites to visit foraging areas (Murphy et al. 2017a), so foraging habitat is likely to be more important if it is located within 10 km of patches of suitable roosting habitat (DBCA 2024). The proximity of suitable foraging areas to suitable roosting habitat is likely to be important in determining whether a landscape can support Night Parrots (Leseberg 2024).

4.0 Methods

Night Parrot survey methods were based on relevant Western Australian guidelines for determining the likely presence of Night Parrots (DBCA 2024), namely habitat mapping and passive acoustic survey.

4.1 Habitat Mapping

4.1.1 External consultation

The survey area is located within the Great Sandy Desert bioregion, which falls within the High Priority Survey Bioregion as defined in the DBCA guidelines (2024), where the occurrence of Night Parrot must be considered in the planning and assessment of proposals. Identifying Night Parrot habitat was therefore a key component of the scope for the project environmental assessment, with an initial habitat survey occurring in September 2024 and a follow up in February 2025.

Preliminary formal advice on the approach was sought from the Department of Biodiversity, Conservation and Attractions (DBCA) in October 2024 and Dr Nick Leseberg, an authority on the Night Parrot and one of the authors of the DBCA guidelines, with the outcome that habitat would be classified as either roosting/breeding or foraging habitat, in line with the habitat characteristics outlined in said guidelines (DBCA 2024).

4.1.2 Desktop assessment

The desktop assessment primarily followed the approach and guidance detailed in the DBCA (2024) Night Parrot guidelines. Local landforms, substrate and vegetation types potentially preferred by Night Parrots as described in the DBCA guidelines (2024) were identified from detailed satellite imagery and available spatial layers such as soils, fire history, paleodrainage channels and preliminary vegetation mapping (Western Botanical 2025). A uniform mapping effort at 1:2000 scale was applied across the Habitat Mapping Extent, which encompassed the mining impact area (MIA), former Texas borefield, Rimfire borefield, prospective new bore locations, and intervening areas to identify all potentially suitable Night Parrot habitat (see Figure 2.2). The desktop assessment also specifically considered the potential occurrence of chenopod-dominated habitats (e.g. samphire, *Sclerolaena* spp.) as possible roosting and foraging habitat, consistent with DBCA (2024) guidance on historical chenopod records, although no such habitats were present within the Habitat Mapping Extent.

4.1.3 Field survey

Following the desktop assessment, aerial surveys from helicopter were conducted across the Habitat Mapping Extent to assess areas earmarked as potential habitat during the desktop exercise, as well as areas considered not to represent Night Parrot habitat. In some locations, aerial survey was insufficient to determine suitability for Night Parrots and here on-ground surveys and vegetation complexity assessments were conducted to determine suitability. For both roosting and foraging habitat types, field observations assessed whether areas were flat to gently sloping and very open, with no or very few trees or shrubs; the open, practically treeless topography that is a primary diagnostic criterion for Night Parrot habitat in DBCA (2024). Areas with moderate to dense tree or shrub cover were excluded from mapped habitat on this basis.

Field verification of roosting habitat focused on assessing the structural characteristics of *Triodia* spp. required to support Night Parrots, including hummock height (greater than 40–50 cm), the presence of ring-forming species, the degree of structural complexity (with a focus on a mix of hummock sizes), the extent of long-unburnt vegetation and protection from fire, consistent with the specific habitat criteria outlined in the DBCA guidelines (2024).

For foraging habitat, field verification criteria included the presence of native grasses and forbs characteristic of productive run-on or low-lying drainage areas. Claypans and low-lying depressions were mapped as foraging habitat only where they exhibited a native grass layer indicative of productive run-on hydrology, and were excluded where they were dominated by bare, scalded, or sparsely vegetated surfaces, or by halophytic or salt-tolerant species without an associated grass/forb assemblage.

Areas outside of these mapped habitats were considered to be of low suitability for Night Parrot on the basis that they lacked one or more of the key habitat attributes required by the species.

Note that roosting/breeding habitat was considered to also represent seasonal foraging habitat, as spinifex seeding events provide an additional food resource. While the DBCA guidelines distinguish between the two habitat types, this dual function is supported by contemporary research (e.g. Murphy et al. 2017, Ngurrpa Rangers et al. 2024). Smaller ‘satellite’ areas of potential roosting habitat were also included in the mapping, given that patch size has been shown to be unimportant for breeding or roosting, consistent with DBCA guidance that there is no known minimum *Triodia* patch size necessary to support Night Parrot occupancy.

The resulting habitat mapping is presented in Section 5.1.

4.2 Autonomous Recording Units (ARUs)

Passive acoustic surveys are widely regarded as the most effective field survey technique for Night Parrots as research has shown that Night Parrots call reliably year-round around dusk and dawn from roost sites (Murphy et al. 2017b).

4.2.1 Long-term ARUs

Long-term ARUs were deployed in potentially suitable areas of habitat within the survey area and its immediate surrounds (Table 4.1; Figure 4.1). The majority of potentially suitable habitat was located within the Texas borefield area and surrounds so the majority of ARU survey effort was concentrated in these areas (Table 4.1). Six ARUs are still deployed long-term in these areas at the time of writing, with an additional three in the Rimfire borefield. Night Parrots were targeted previously in the MIA and adjacent areas for a total of 94 nights, with no Night Parrot detections, during detailed fauna surveys prior to this one (Biota 2025); these prior surveys are not included in Table 4.1. Since this study was finalised an additional six ARUs (not shown in the table) have been deployed in the Rimfire borefield as part of ongoing monitoring, with more planned for deployment.

Table 4.1: Long-term ARUs deployed in the survey area.

Site name	Location		Deployment date	Collection date	Effort (nights)
	Latitude	Longitude			
Texas Borefield and surrounds					
WIF03A			09/04/2024	10/05/2024	31
WIF04A			10/04/2024	10/05/2024	30
WIB09A			10/05/2024	21/08/2024	103
WIB10A			10/05/2024	21/08/2024	103
WIB11A			10/05/2024	21/08/2024	103
WIB12A			10/05/2024	21/08/2024	103
WPC01A			11/07/2024	21/08/2024	41
WPC02A			11/07/2024	21/08/2024	41
WNM01A			09/09/2024	(27/11/2024) ¹	(79)
WNM02A			09/09/2024	(27/11/2024) ¹	(79)
WNM03A			09/09/2024	(27/11/2024) ¹	(79)
WNM04A			09/09/2024	(07/11/2024) ¹	(59)
WNM05A			09/09/2024	(27/11/2024) ¹	(79)
WNM06A			09/09/2024	(27/11/2024) ¹	(79)
WNM07A			10/09/2024	08/10/2024	28
WNM10A			10/09/2024	08/10/2024	28
Rimfire Borefield and surrounds					
WIF01A			01/03/2024	07/05/2024	67
WIF02A			09/04/2024	07/05/2024	28
WIF05A			10/04/2024	07/05/2024	27
WIF06A			10/04/2024	07/05/2024	27
WIF07A			07/05/2024	08/07/2024	62
WIF08A			07/05/2024	08/07/2024	62
WNM12A			09/10/2024	28/11/2024 ²	36 ²
WNM13A			09/10/2024	28/11/2024 ²	36 ²
WNM14A			09/10/2024	28/11/2024 ²	30 ²
Mine and Infrastructure Area					
WNM11A			10/09/2024	08/10/2024	28
Rimfire Pipeline Corridor					
WNM08A			10/09/2024	08/10/2024	28
WNM09A			10/09/2024	08/10/2024	28
				Total	1,530

¹ Units still deployed, “collection date” in these cases refers to date of latest data collection

² Collected 28th November, effort reflects end date of recordings.

In order to better understand the movements and presence of Night Parrot within the study area, additional survey effort was undertaken in the broader region. Lake Waukarlycarly was identified as the closest area of Night Parrot habitat to the habitat in the Winu survey area based on examination of aerial imagery. While the habitat here was not formally mapped as a part of this scope, satellite imagery suggested it had much more extensive roosting and foraging habitat than was present in the study area. A preliminary reconnaissance of 20 potential locations around Lake Waukarlycarly identified from satellite imagery in September 2024 confirmed this, and six target sites were selected from a candidate set of potential locations for Night Parrot. Long-term ARUs were deployed at these locations (Table 4.2). In addition to its greater extent, potential roosting habitat on the lakeshores supported large

hummocks of hard spinifex (*Triodia angusta*) as well as chenopod shrublands, both of which were absent from the study area. Because of the habitat quality of the Lake Waukarlycarly system it was considered to be the most likely source for birds visiting the survey area. However, prior to this study, no confirmed Night Parrot records existed for Lake Waukarlycarly.

Table 4.2: Long-term ARUs deployed around Lake Waukarlycarly.

Site name	Location		Deployment date	Collection date	Effort (nights)
	Latitude	Longitude			
WRN01A			08/09/2024	(30/11/2024) ²	(83)
WRN02A			08/09/2024	(01/12/2024) ²	(84)
WRN03A			08/09/2024	(01/12/2024) ²	(84)
WRN04A			08/09/2024	(01/12/2024) ²	(84)
WRN05A			08/09/2024	(01/12/2024) ²	(84)
WRN06A ¹			08/09/2024	10/09/2024	2
WRN06A			10/09/2024	(30/11/2024) ²	(81)
				Total	502

¹ The unit at WRN06A was moved to nearby better foraging habitat after two nights.

² Units still deployed, “collection date” in these cases refers to date of latest data collection.

4.2.2 Short-term ARUs

ARUs were deployed for single nights in an overlapping pattern within suitable habitat in the Texas borefield and surrounds during the field survey in September 2024. The purpose of this exercise was to try to determine whether a Night Parrot was actively roosting within the survey area, as the results from a prior data collection indicated that a Night Parrot had been roosting in the Texas borefield, but had since moved.

Table 4.3: Short-term ARUs deployed in the survey area.

Site name	Location		Deployment date	Collection date	Effort (nights)
	Latitude	Longitude			
WNR01A			03/09/2024	04/09/2024	1
WNR02A			03/09/2024	04/09/2024	1
WNR03A			03/09/2024	04/09/2024	1
WNR04A			03/09/2024	04/09/2024	1
WNR05A			03/09/2024	04/09/2024	1
WNR06A			03/09/2024	04/09/2024	1
WNR07A			03/09/2024	04/09/2024	1
WNR08A			03/09/2024	04/09/2024	1
WNR09A			03/09/2024	04/09/2024	1
WNR10A			03/09/2024	04/09/2024	1
WNR11A			04/09/2024	05/09/2024	1
WNR12A			04/09/2024	05/09/2024	1
WNR13A			04/09/2024	05/09/2024	1
WNR14A			04/09/2024	05/09/2024	1
WNR15A			04/09/2024	05/09/2024	1
WNR16A			04/09/2024	05/09/2024	1
WNR17A			04/09/2024	05/09/2024	1
WNR18A			04/09/2024	05/09/2024	1
WNR19A			04/09/2024	05/09/2024	1
WNR20A			04/09/2024	05/09/2024	1

Site name	Location		Deployment date	Collection date	Effort (nights)
	Latitude	Longitude			
WNR21A			05/09/2024	06/09/2024	1
WNR22A			05/09/2024	06/09/2024	1
WNR23A			05/09/2024	06/09/2024	1
WNR24A			05/09/2024	06/09/2024	1
WNR25A			05/09/2024	06/09/2024	1
WNR26A			05/09/2024	06/09/2024	1
WNR27A			05/09/2024	06/09/2024	1
WNR28A			05/09/2024	06/09/2024	1
WNR29A			05/09/2024	06/09/2024	1
WNR30A			05/09/2024	06/09/2024	1
				Total	30

4.2.3 Night Parrot call analysis

John Graff (Senior Zoologist at Biota) initially detected a number of unusually high frequency Night Parrot calls, which were verified by Night Parrot experts including Dr Nick Leseberg.

Most analysis of ARU data was undertaken by John Graff, who has demonstrated expertise in detecting Night Parrot recordings. Dr Stewart Ford (Principal Zoologist at Biota), and Dr Nick Leseberg (Adaptive NRM) also analysed one batch of data independently with near identical results. Recordings were scanned using Kaleidoscope Pro software (Wildlife Acoustics), targeting a frequency range of 1500 – 3500 kHz and using parameters based on the full range of available Night Parrot calls (Leseberg et al. 2019).

Potential matches from the Kaleidoscope output were then manually reviewed to identify potential Night Parrot calls, based on comparison to known call types.

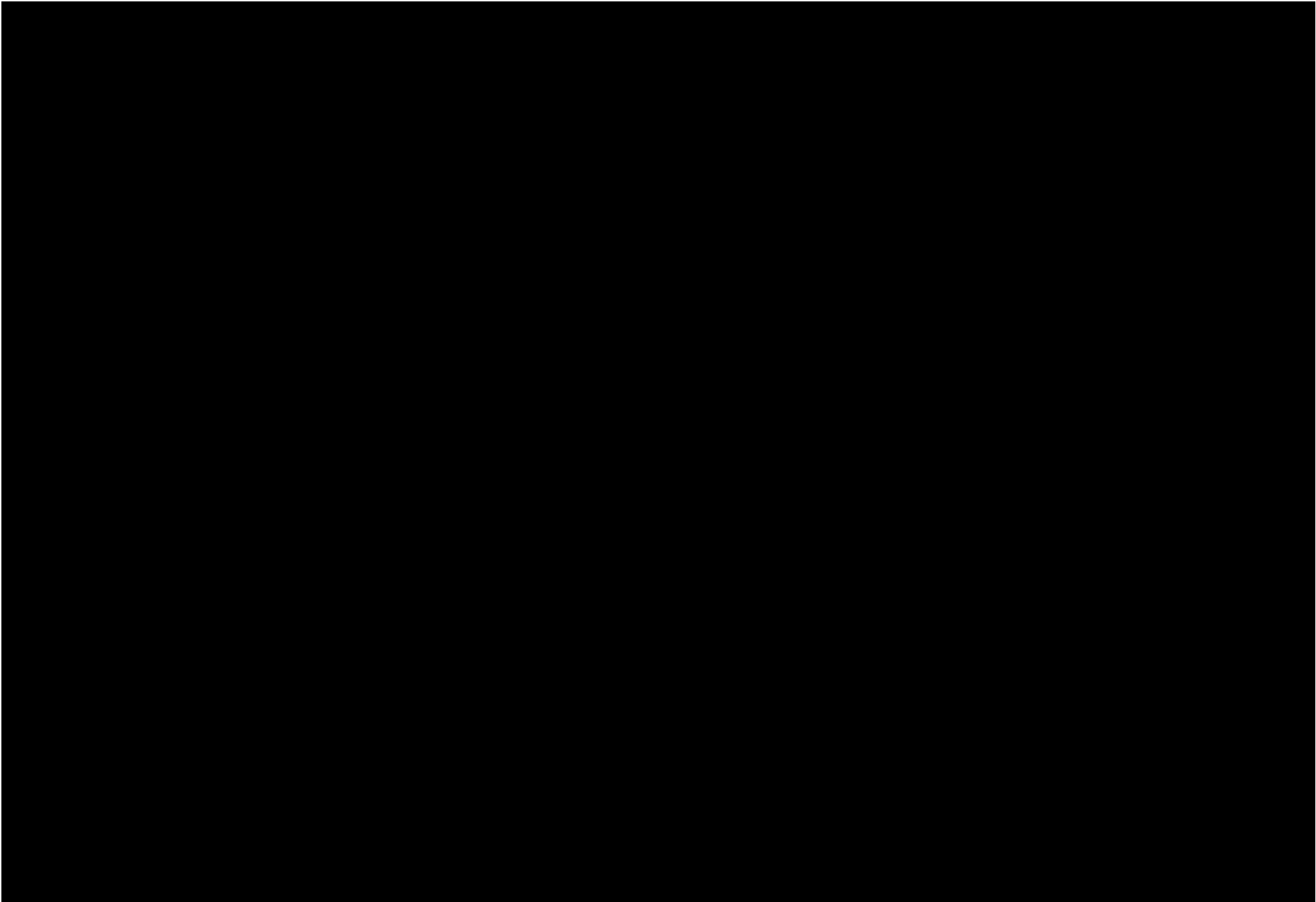


Figure 4.1: Location of long-term ARUs deployed in the survey area.

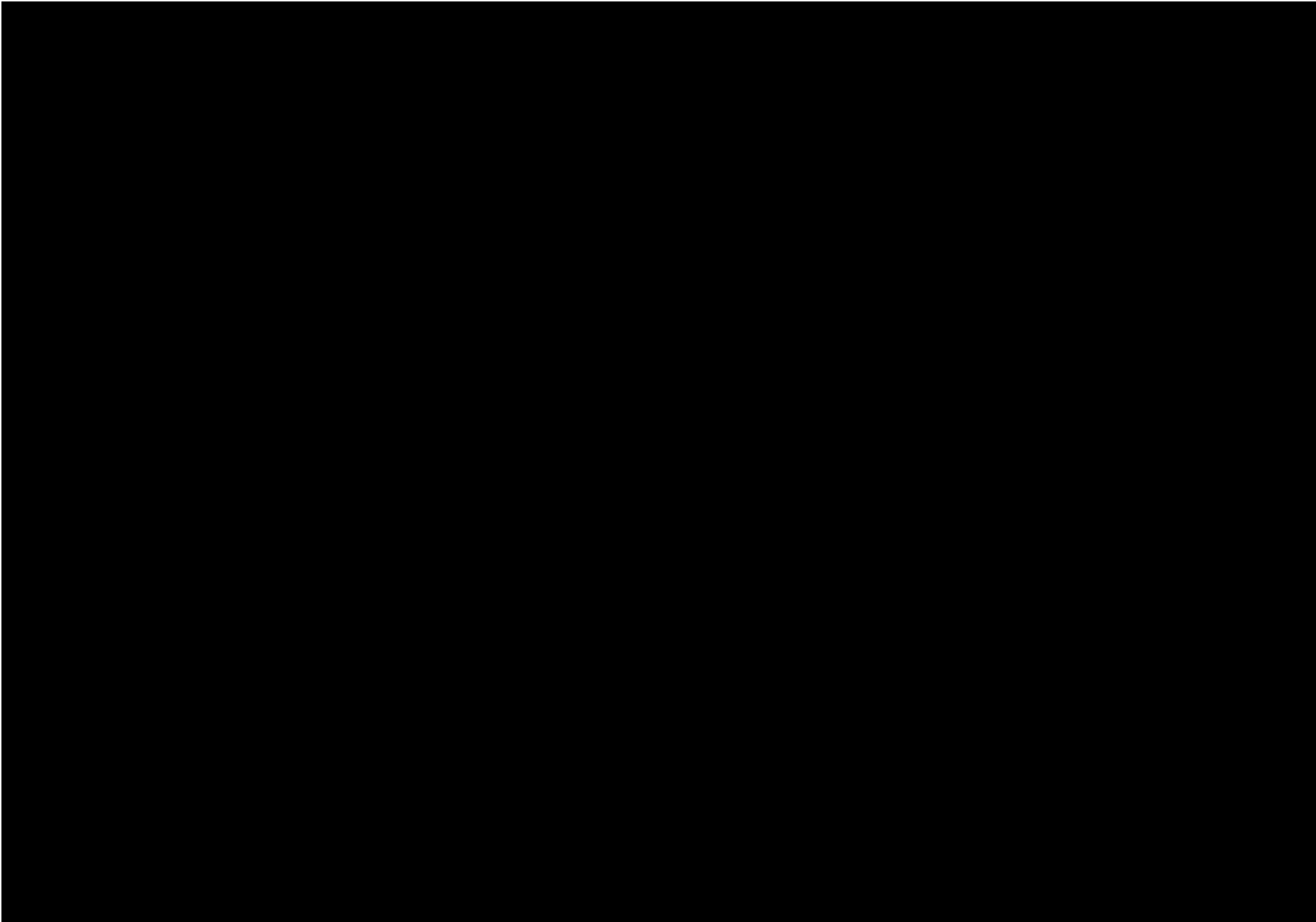


Figure 4.2: Location of short-term roost site search ARUs deployed in the survey area.

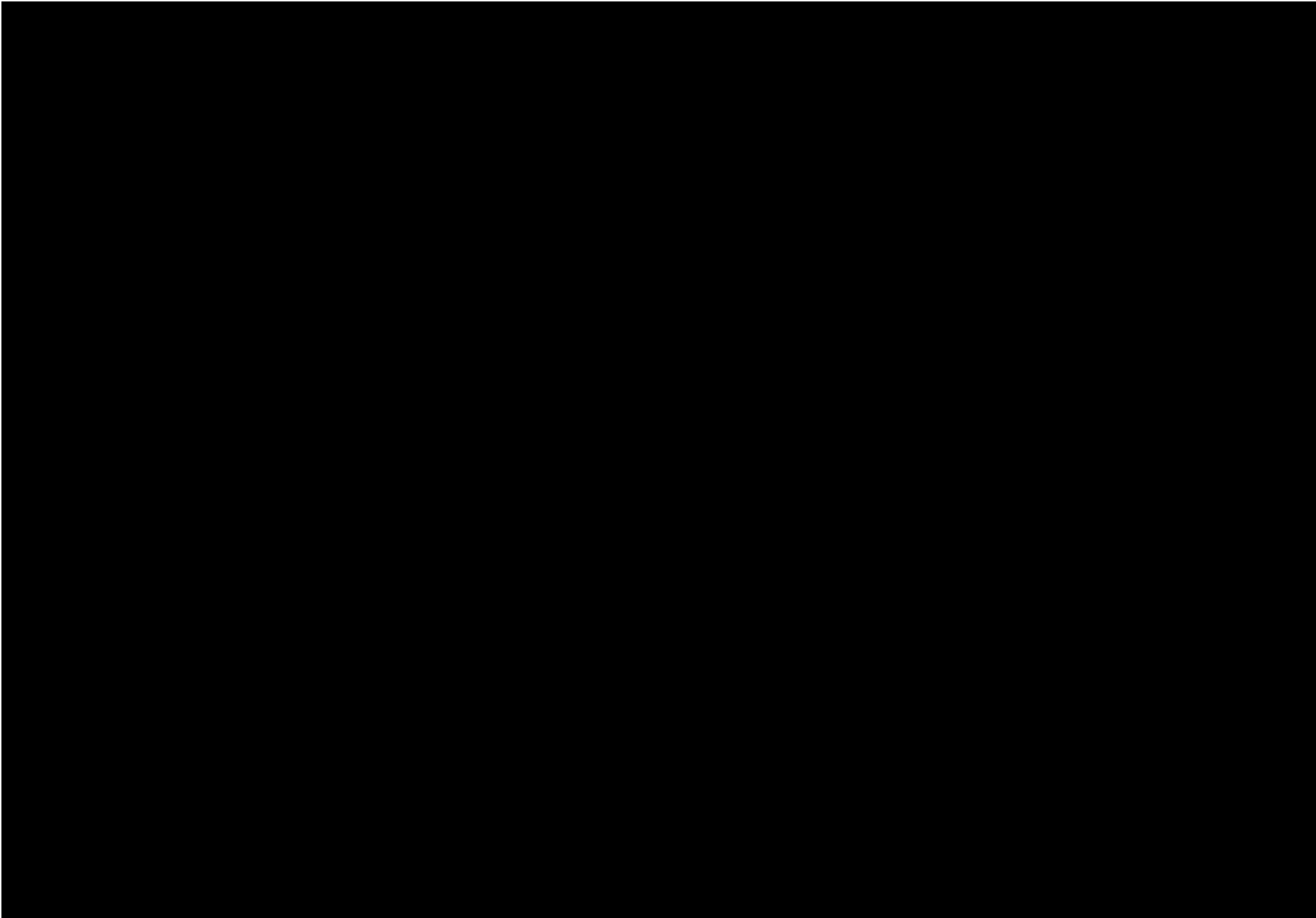


Figure 4.3: Location of long-term ARUs deployed in the Lake Waukarlycarly IPA.

4.3 Field Survey Timing

ARUs were deployed initially in March and April 2024 as part of a basic and targeted fauna survey of the Texas and Rimfire borefield areas (Table 4.4). The majority of ARU deployment and maintenance was undertaken during field trips with broader scopes for efficiency, and the dates shown here show the full duration of these trips.

Habitat mapping was undertaken during the September 2024 targeted Night Parrot survey and refined during the February 2025 field survey. Targeted roost site searches (using short-term deployments of ARUs) were undertaken during the September 2024 field survey.

Table 4.4: Field survey timing and activities.

Dates	Night Parrot survey activities
26 th February to 4 th March 2024	One ARU deployed in Rimfire
8 th to 11 th April 2024	Five ARUs deployed in Texas and Rimfire
6 th to 16 th May 2024	Six ARUs collected and redeployed in new locations around Texas and Rimfire
8 th to 12 th July 2024	Four units serviced and two units collected and redeployed in Texas pipeline corridor
20 th to 27 th August 2024	Six units collected.
2 nd to 11 th September 2024	Night Parrot habitat mapping ARU-based roost searching in Texas borefield and surrounds Eight ARUs deployed within the Winu survey area Six ARUs deployed regionally at Lake Waukarlycarly
8 th to 10 th October 2024	14 ARUs within the Winu survey area and surrounds and at Lake Waukarlycarly serviced
25 th November to 2 nd December 2024	12 ARUs within the Winu survey area and surrounds and at Lake Waukarlycarly serviced Two ARUs collected from Winu survey area
16 th to 21 st February 2025	Night Parrot habitat mapping 12 ARUs within the Winu survey area and surrounds and at Lake Waukarlycarly serviced ¹ Six additional long-term ARUs deployed in and around the Rimfire borefield

¹ Analysis of ARU data from this trip is in progress and is not included in this report.

Survey work was undertaken under the following licenses and authorities:

- Regulation 27 Fauna Taking (Biological Assessment) License No. BA27000992-b issued to Nicola Watson;
- Regulation 27 Fauna Taking (Biological Assessment) License No. BA27001142 issued to Stewart Ford;
- Section 40 Authorisation To Take Or Disturb Threatened Species No. TFA-2425-0086 issued to Stewart Ford;
- DPIRD Licence To Use Animals For Scientific Purposes No. U280/2022-2024; and
- Wildlife Animal Ethics Committee Permit No. WAEC 23-03-15.

4.4 Seasonal Conditions

The northern Great Sandy Desert has an arid tropical climate, with rainfall unpredictable but typically highest over the tropical wet season from December to March (DCCEEW 2008). Spatially-averaged median annual rainfall is 223 mm (DCCEEW 2008), though the mean rainfall tends to be somewhat higher; e.g. mean annual rainfall at Telfer is 366 mm (Bureau of Meteorology 2025). Rainfall for the year 2024 recorded at Winu was close to the annual mean Telfer rainfall, with the majority of rain falling in January and March (Figure 4.4).

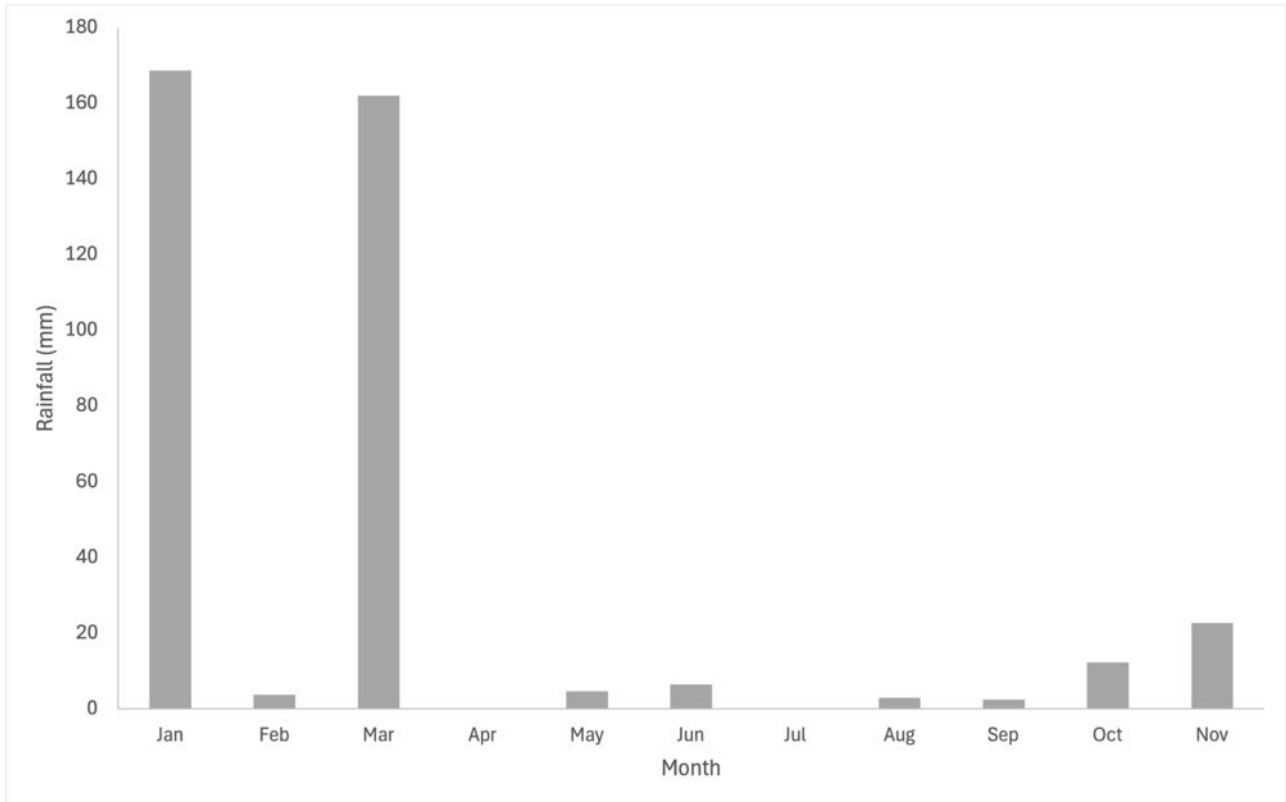


Figure 4.4: Monthly rainfall for Winu from January to November 2024.

5.0 Results

5.1 Habitat Mapping

The majority of potential roosting and foraging habitat was located in the Texas borefield area and the area immediately to the north, with smaller patches extending into the surrounding locality (Figure 5.1).

Both types of habitat were typically flat, very open and with few trees or shrubs. Potential roosting habitat was identified where spinifex (*Triodia* spp.) grasses were dominant, particularly in longer unburned areas with ring-forming spinifex hummocks of differing sizes and complexity. The primary areas of this habitat were large, and featured extensive and complex bare clay or stony patches (Plate 5.1, Plate 5.3), a topology that affords a measure of fire resistance and thus allows spinifex to mature.

Open areas, floodplains and low-lying depressions supporting a diverse assemblage of native grasses and forbs were identified as potential foraging habitat for Night Parrot (Plate 5.2, Plate 5.4). Areas of potential foraging habitat were typically associated with larger areas of potential roosting habitat. Chenopod shrublands, a potentially important food and water source for Night Parrot (DBCA 2024) were absent from the survey area.



Plate 5.1: Aerial photograph of roosting habitat.

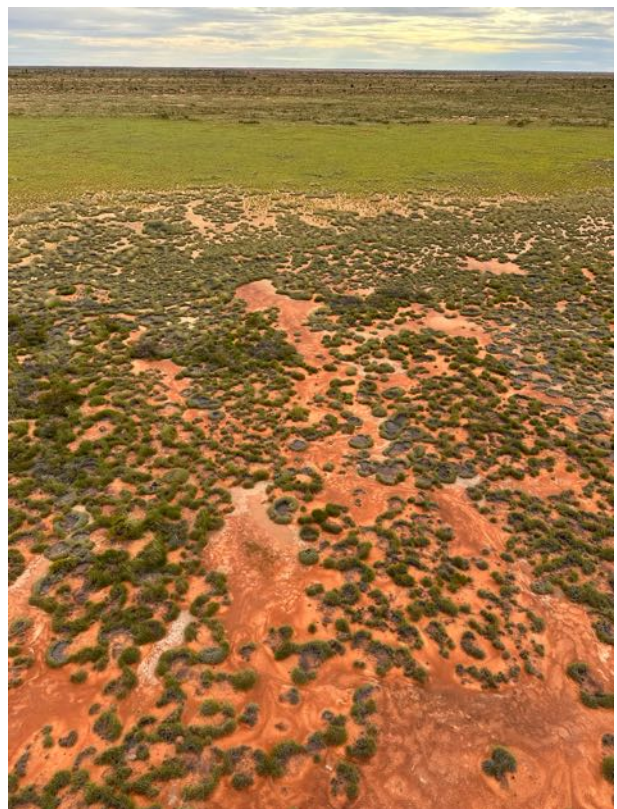


Plate 5.2: Foraging habitat above roosting habitat.



Plate 5.3: Roosting/breeding habitat.

A large expanse of longer-unburned mixed *Triodia brizoides* / *T. epactia* hummock grassland with complex bare areas. Spinifex hummocks have structural complexity in size and shape. A roosting Night Parrot was detected near this location (WIB12A).



Plate 5.4: Foraging habitat.

Dense mixed native grasses in a drainage depression adjacent to roosting habitat. Night parrot calls were detected at this location (WIF03A).

The total amount of potential Night Parrot habitat in the Habitat Mapping Extent was 2,475.1 ha. Roosting habitat accounted for most of that total at 2,167.8 ha, with foraging habitat comprising the rest at 307.3 ha. With amendment of the DE following the discovery of Night Parrots in the Texas borefield area, there is now no Night Parrot habitat mapped in either the MIA or Rimfire borefield.

Detailed mapping of Night Parrot habitat at Lake Waukarlycarly was not undertaken in the current study, but previous desktop-based habitat mapping indicates extensive foraging and roosting habitat is present (Biologic 2022). Examination of satellite imagery of the Lake Waukarlycarly area also indicated that there are extensive areas of mature *Triodia* spp. fringing the salt lake areas of the system and covering a considerably greater extent than within the Winu survey area. The Lake Waukarlycarly system supports extensive smaller salt lakes with mixed succulent shrublands, mature spinifex and drainage depressions supporting mixed native grasses.

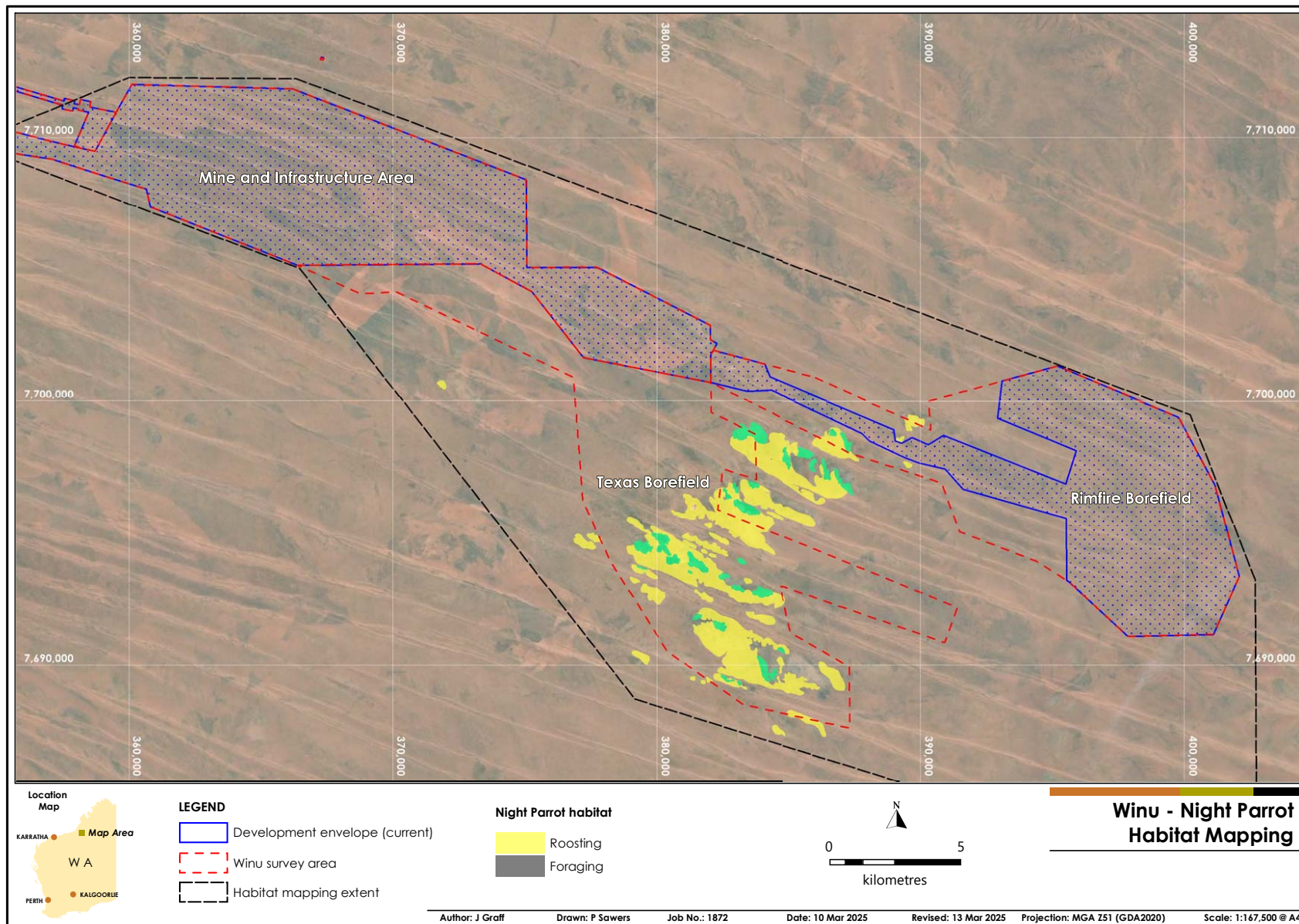


Figure 5.1: Potential roosting and foraging habitat in the survey area and surrounds, showing the Habitat Mapping Extent.

5.2 Acoustic Results

The results presented here include detections up to the 2nd December 2024.

Night Parrot calls have been detected at eight locations within the survey area (Table 5.1; Figure 5.4). To date, there have been no detections of Night Parrots on any ARUs located outside of roosting or foraging habitats, with all recordings located within larger areas of mapped roosting habitat and adjacent foraging areas. Where ARUs were deployed simultaneously in mapped Night Parrot habitat and nearby unsuitable habitat concurrently, only ARUs in mapped Night Parrot habitat had detections (Figure 5.4).

The majority of these detections involve a “two-note trill” call type (Plate 5.5). The peak frequency of the “two-note trill” calls recorded at Winu is relatively high, around 3.3 kHz. The remaining confirmed detections appeared to be “one-note trill” calls, although in many cases these calls were faint and thus the second trill note may have been present but not detectable at that range. A few “hollow whistle” type calls were also detected that may be attributable to Night Parrots (Table 5.1; Figure 5.4), however, this call type is very difficult to distinguish from a particular type of Pallid Cuckoo vocalisation, and therefore these are currently considered possible detections.

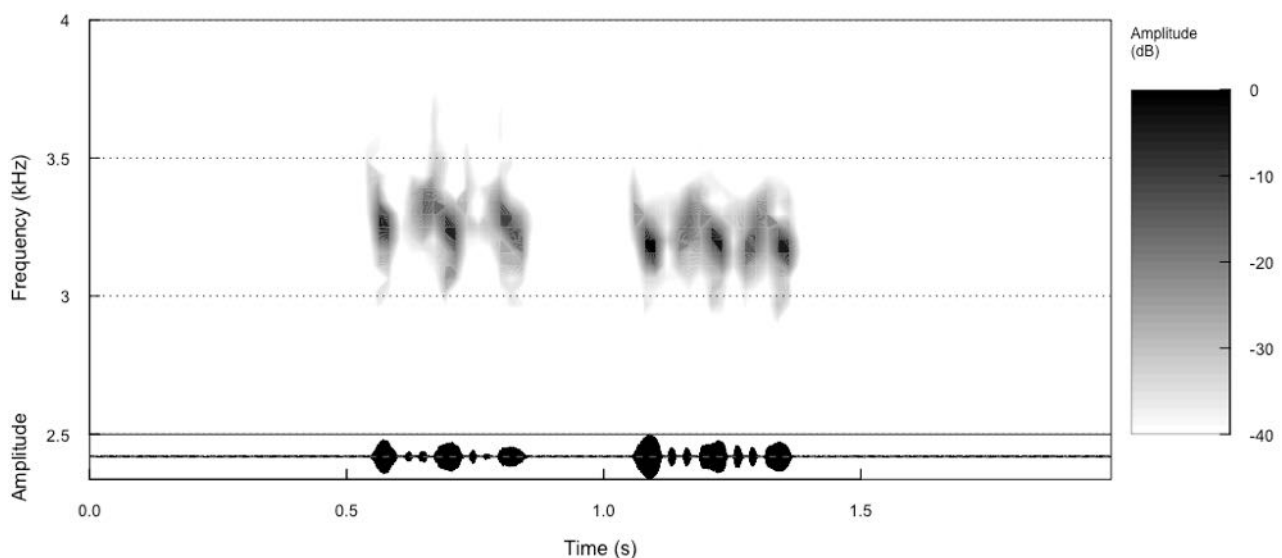
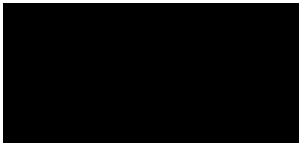
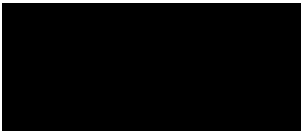
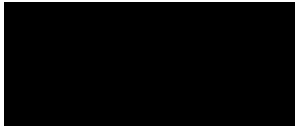
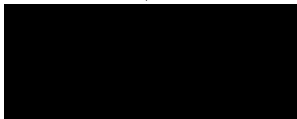
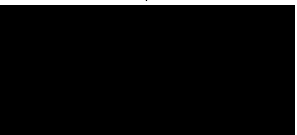
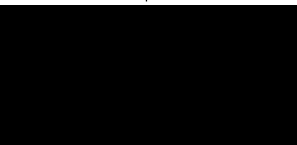


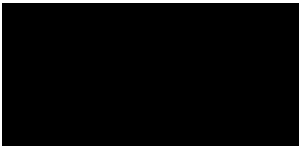
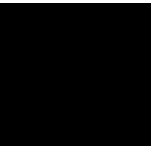
Plate 5.5: Typical example of the two-note trill call detected from the Winu survey area.

Table 5.1: Night Parrot detections and possible detections from the survey area.

Site name	Mapped habitat type	Image	Location		Detection details (all dates in 2024)
			Latitude	Longitude	
Confirmed detections					
WIF03A	Foraging				43 detections across six nights, with first detection date 10 th April and last detection date 6 th May. One faint detection on 10 th May relatively early at 8:40 pm, remainder between 11 pm and 1 am.
WIF04A	Roosting				281 detections across 13 nights, with first detection date 13 th April and last detection date 9 th May. Calls recorded at a range of times throughout the night but earliest calls at 7:27 pm and latest calls at 5.05 am.

Site name	Mapped habitat type	Image	Location		Detection details (all dates in 2024)
			Latitude	Longitude	
Confirmed detections (cont.)					
WIB09A	Roosting				A single call detected on the 11 th May at 9:28 pm.
WIB10A	Roosting				106 detections across 16 nights (102 across 13 nights in May), with last detection very early on 28 th June. Earliest call at 5:57 pm, with frequent calls in the 6:00-6:10 pm on several nights. Latest call at 5:28 am. On one day (21 st May), two calls were detected within 50 minutes prior to sunrise, which suggests roosting in the area.
WIB11A	Roosting				Seven detections across two nights, on the 12 th and 17 th May, both just after 11 pm.

Site name	Mapped habitat type	Image	Location		Detection details (all dates in 2024)
			Latitude	Longitude	
Confirmed detections (cont.)					
WIB12A	Roosting				1,371 detections across 23 nights (1,365 across 18 nights in May), with the last detection on 25 th July. Earliest call at 5:45 pm, latest call at 5:54 am. On seven days (11th to 16th May, and again on 29th May), calling was detected within the 60 minutes prior to sunrise and subsequently within 45 minutes post sunset on the same day, strongly suggesting roosting. On 10 further days between 10 th May and 1 st June, and on 3 rd July, calling was detected within 60 minutes prior to sunrise or within 45 minutes post sunset (but not both), suggesting roosting in the area.
WNM05A	Foraging				Single detection on 17 th October at 3:43 am.
WNM06A	Roosting				Single detection on 17 th October at 12:42 am. A single possible “one-note hollow whistle” call detected on 14 th October at 4:09am.

Site name	Mapped habitat type	Image	Location		Detection details (all dates in 2024)
			Latitude	Longitude	
Possible detections					
WNM01A	Roosting				Possible detections on 19 th November at 4:25am and 24 th November at 12:59am, both of “one-note hollow whistle” call types.
WNM03A	Roosting				A series of three possible detections on the 24 th November, from 2:21 to 2:23am, including both “one-note whistle” and “two-note hollow whistle” or call-response “one-note hollow whistle” call types.

Calls were initially detected in early April, with calling activity increasing to a peak in early May and then dropping off again from the start of June (Figure 5.2). Only occasional calls were detected from the Winu survey area and surrounds after the first week of June. At most sites, the majority of calls were detected between 8 pm and midnight, with the exception of site WIB12A, where calls were frequently detected between midnight and dawn (Figure 5.3).

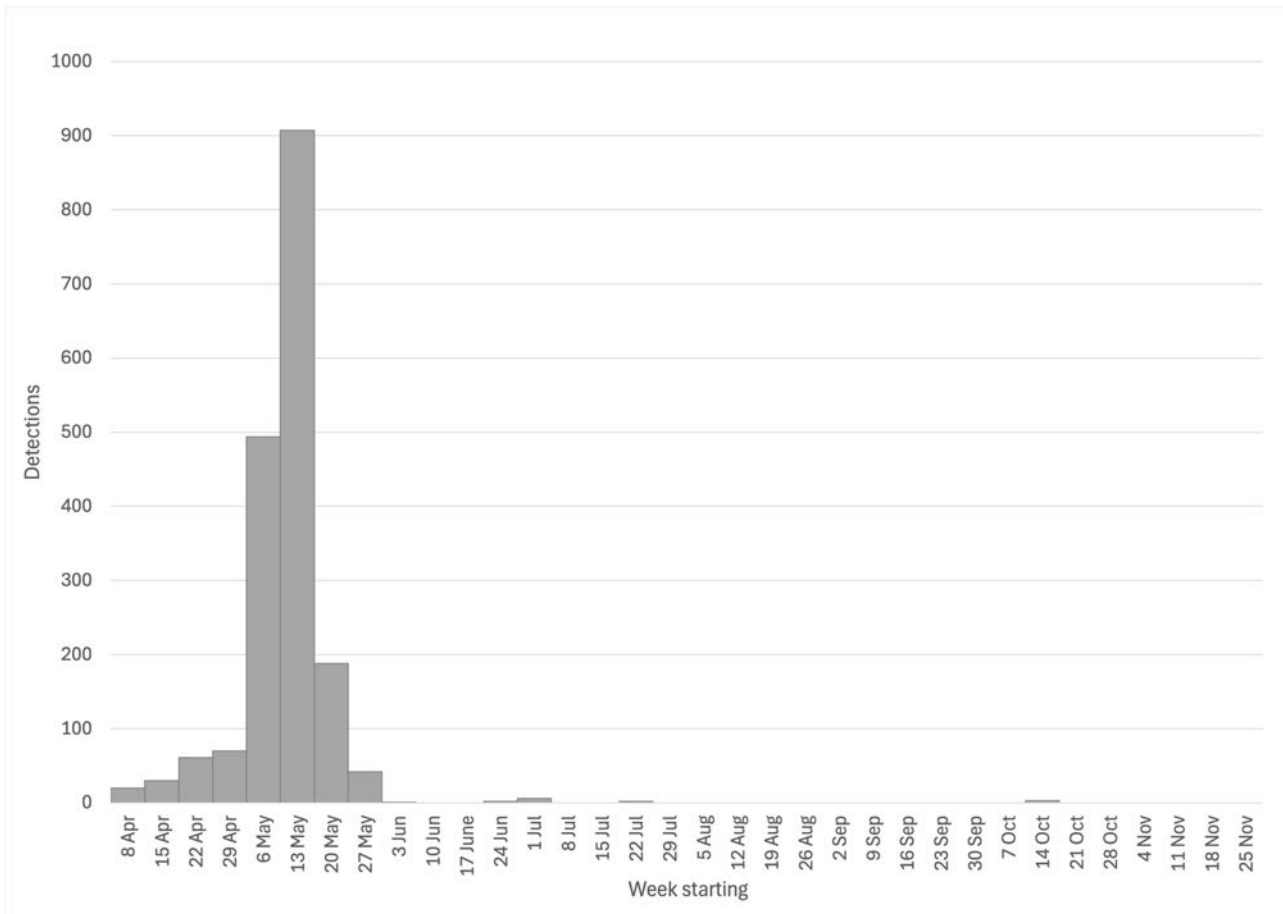


Figure 5.2: Number of Night Parrot calls detected per week within the survey area in 2024.

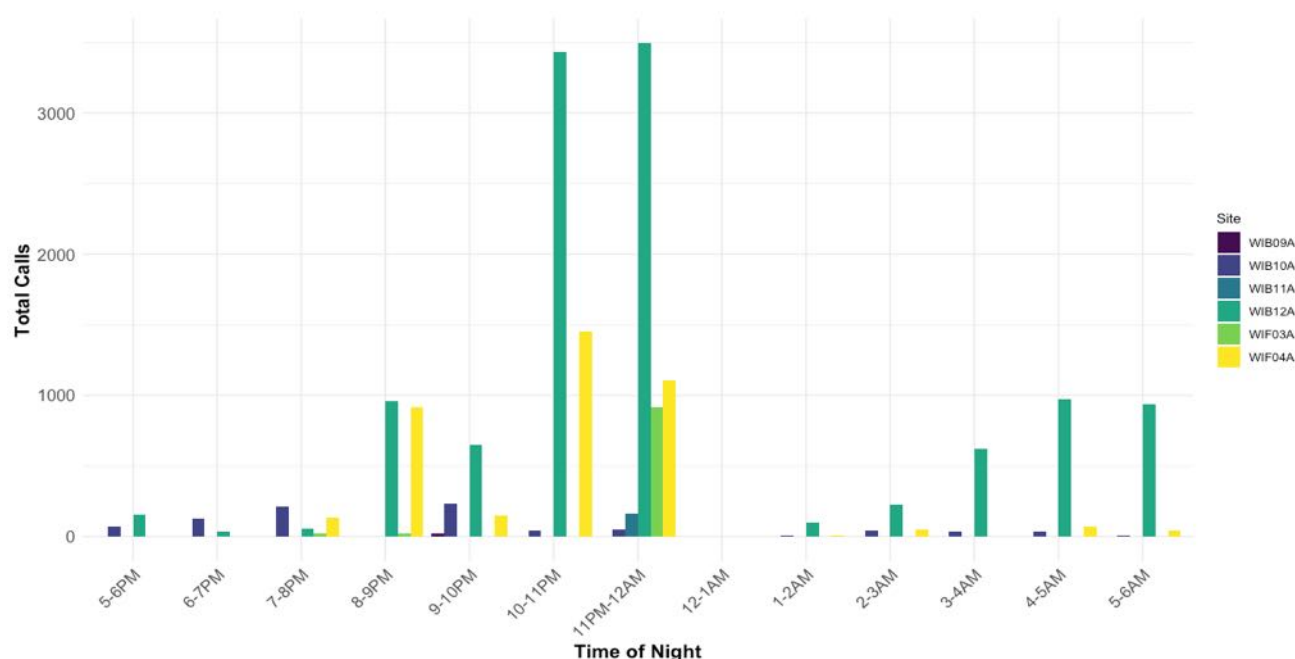


Figure 5.3: Nightly timing of Night Parrot calls detected within the survey area in 2024.

Night Parrots were also detected from two locations in the vicinity of Lake Waukarlycarly, to the south of the survey area (Table 5.2). Calls were detected throughout the period of deployment of ARUs at Lake Waukarlycarly, and a wider range of call types were detected than from the survey area. Call types detected from Lake Waukarlycarly sites included “two-note whistle” (Plate 5.5), “three-note whistle”, “one-note hollow whistle”, “two-note trill”, “one-note didit”, “one-note dink” and “croak” calls.

The “two-note trill” calls detected at Lake Waukarlycarly were also given at a similarly high frequency to the Winu “two-note trill calls”.

Table 5.2: Night Parrot detections and possible detections from Lake Waukarlycarly and surrounds.

Site name	Location		Notes
	Latitude	Longitude	
Confirmed detections			
WRN01A			128 calls across 17 nights, with earliest calls at 7:48 pm and latest calls 4:51 am (inc. data from Leseberg 2024). Calls on most nights “three-note whistle” calls or “two-note trill” calls, with occasional “two note whistle” calls, and on 8 th October, “one-note dink”, “one-note didit” and “croak” calls also detected (inc. data from Leseberg 2024).
WRN02A			700 calls across 12 nights, comprising 685 “two-note trill” calls over 10 nights and 15 “one-note hollow whistle” calls detected on a single night in October (4 th October) from 3:52 am to 4:01 am (inc. data from Leseberg 2024). Earliest calls 6:23 pm, but vast majority of calls from after midnight, with latest calls 4:36 am.
Possible detections			
WRN01A			Two series of “one-note hollow whistle” type calls from 2:16-2:18 am and 4:12-4:15 am on 13 th October, and series of “one-note trill” type calls from 7:35-7:42 pm amongst confirmed Night Parrot calls (“three-note whistle” type) on 18 th October.
WRN04A			Single “one-note hollow whistle” type call detected on 17 th November at 3:50 am.

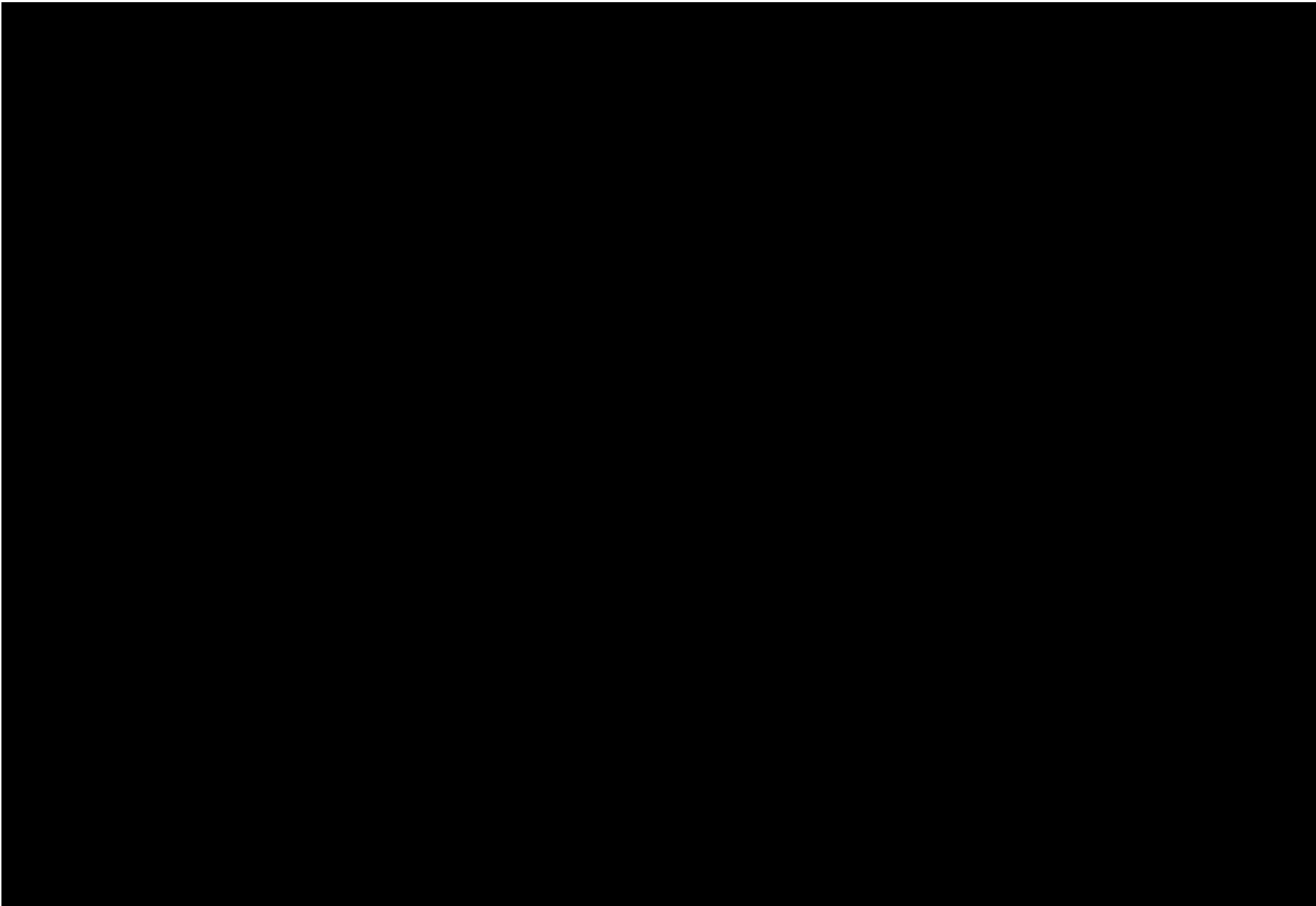


Figure 5.4: Night Parrot detections from the survey area and surrounds.

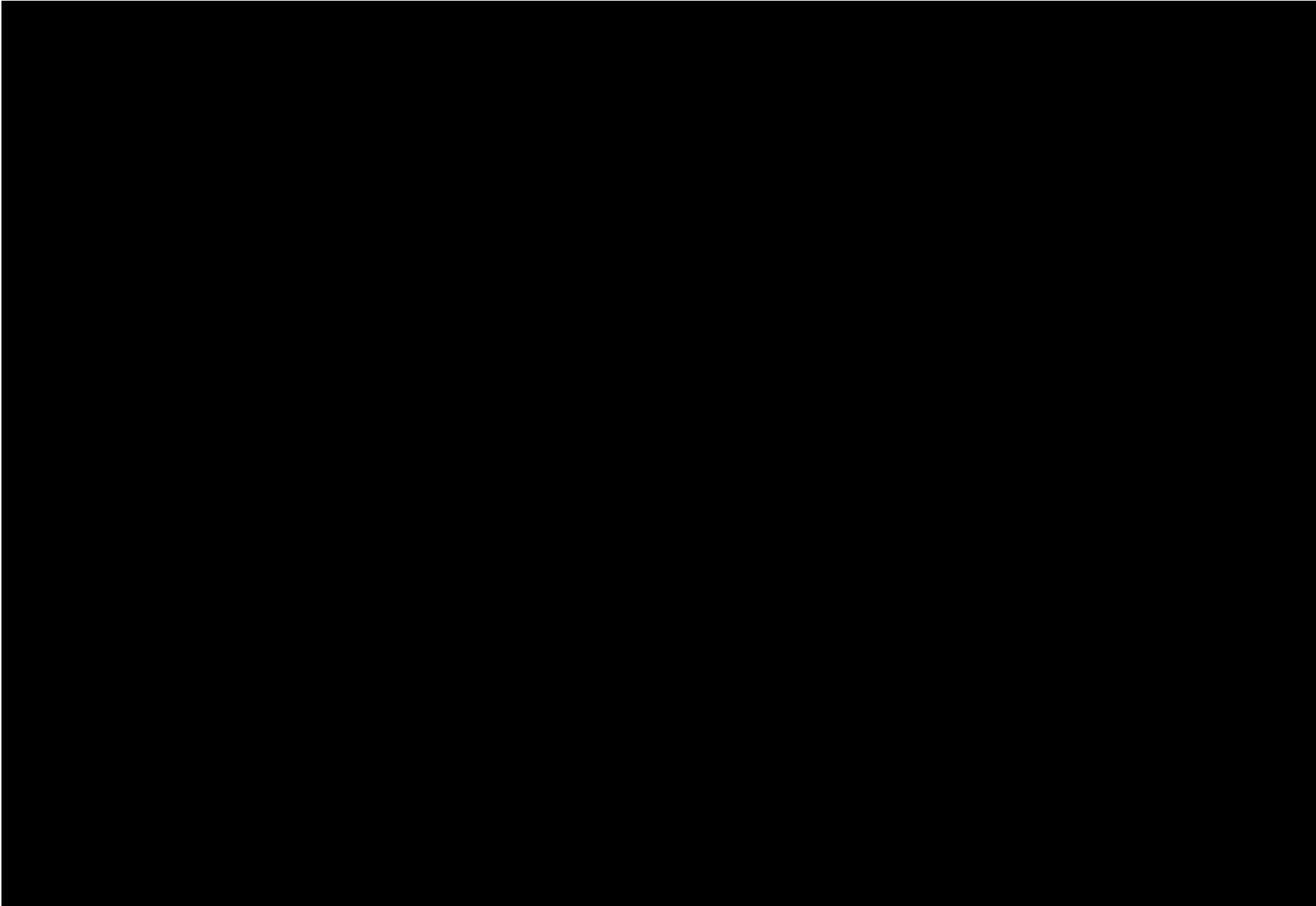


Figure 5.5: Night Parrot detections from the Lake Waukarlycarly area.

6.0 Discussion

Night Parrots were known to occur within the broader Great Sandy Desert region (e.g. Harewood 2018, Michelmores and Birch 2020, Leseberg et al. 2021), with the closest known contemporary record from the vicinity of the project at Telfer (Biologic 2021), approximately 120 km to the southeast. However, Night Parrots had not previously been detected from either study area or the region in which the survey area is situated, although it is worth noting that a targeted survey of the Texas borefield, from which this survey followed, was the first to intersect potentially suitable habitat. Night Parrots were detected there and in response, further ARU deployments and habitat mapping were undertaken. Habitat mapping initially sought to delineate areas of better quality habitat, such as those in the Texas borefield, from those that were smaller, more distant or otherwise of lower quality. This preliminary mapping was presented to DBCA, and feedback from the department and Dr Nick Leseberg resulted in the habitat mapping being altered to present foraging/breeding and roosting habitats in the survey area, based on the habitat characteristics listed in DBCA (2024).

This report has presented the results of this habitat mapping, as well as monitoring up to November 2024 within the study area. Monitoring is ongoing, but it is worth noting that to date, Night Parrot calls have only been detected from habitat mapped as either roosting or foraging habitat, including during simultaneous monitoring inside and outside of mapped Night Parrot habitat.

The Night Parrot calls detected within the survey area were almost exclusively of the “two-note trill” call type, which has previously been recorded from the Great Sandy Desert region (Leseberg et al. 2019). However, the frequency of the calls (3.2-3.3 kHz) is higher than typically recorded (N. Leseberg pers. comm. 2024). The “one-note trill” calls detected were of similarly high frequency, and in most cases were very faint and thus potentially actually “two-note trill” calls where the second note was too faint to detect. Regardless, given the similarity in call structure and frequency between the “one-note trill” calls and a single note of the “two-note trill” calls, along with their position within calling sequences of “two-note trills”, these calls are all likely to be attributable to the same individual bird.

The pattern of calling detected in the Winu survey area in 2024 indicated that this individual spent increasing amounts of time in the area through April and May. The temporal pattern of calling throughout the night suggested that the bird roosted frequently within the survey area in May, primarily near the ARU deployed at site WIB12A. Night Parrot calling periods at roost sites are predictable in timing relative to sunset and sunrise, with calling at the roost generally occurring within 30-45 minutes post sunset and within 30-60 minutes prior to sunrise (Murphy et al. 2017b, Leseberg et al. 2019). Calling was detected on seven days (11th to 16th May, and again on 29th May) both within the 60 minutes prior to sunrise and subsequently within 45 minutes post sunset on the same day at WIB12A, strongly suggesting that the bird was roosting within 200-400 m of the recorder on these dates. On 10 further days between 10th May and 1st June, as well as on 3rd July, calling was detected either within 60 minutes prior to sunrise or within 45 minutes post sunset (but not both), which also suggests the bird was roosting in the general area. In addition, calls were also detected within 50 minutes of sunrise at site WIB10A, which suggests the bird also roosted in the general locality of that ARU on one night.

The presence of a Night Parrot in the Winu area likely coincided with the presence of seasonally available foraging resources (seeding spinifex and native grasses) in close proximity to suitable roosting habitat following significant rainfall in January and March. Recent evidence from the Ngururrpa IPA, in the eastern Great Sandy Desert, also suggests that Night Parrots may leave areas where no standing water is available (Ngururrpa Rangers et al. 2024). Thus, it is also plausible that the presence of available surface water may have influenced the presence of the parrot in the Winu area, as suggested by Leseberg (2025). After the first week of June, only occasional detections were made within the survey area and surrounds, suggesting that the bird had largely moved away and was making only occasional visits to the survey area.

Our detections of Night Parrots at Lake Waukarlycarly represent another newly confirmed location for the species in Western Australia, and provide important additional contextual information for the locality around the study area. The Lake Waukarlycarly area contains areas of excellent foraging and roosting/breeding habitat for Night Parrots, with considerably larger scale, complexity and quality than the roosting and foraging habitats in the study area. Perhaps better reflecting this habitat quality, the range of calls detected at Lake Waukarlycarly suggested that at least four individual Night Parrots were detected, with at least two individuals likely detected at both WRN01A and WRN02A. Calling patterns within nights indicated that an individual giving Winu-type “two-note trill” calls roosted in close proximity to this recorder on several nights in October.

The presence of calls showing the same “two-note trill” call type and relatively high frequency as the Winu calls from two locations at Lake Waukarlycarly (WRN01A and WRN02A) in October 2024 suggests that this may have been the same individual recorded from the survey area and surrounds. This would be consistent with the bird moving into the survey area to take advantage of good foraging conditions following rainfall, and then returning to the more extensive habitat around Lake Waukarlycarly after conditions in and around the survey area became drier. However, while the similarities in call suggest this may be the same individual being recorded at both Lake Waukarlycarly and the survey area, it is not possible to conclude this with certainty. Regardless though, the presence of the same call type with a distinctive higher-than-usual frequency does suggest that Lake Waukarlycarly is a potential source of the bird recorded in the survey area.

7.0 References

- Biologic (2021). Havieron Project Infrastructure Corridor: Detailed Vertebrate and SRE Invertebrate Fauna Survey. Unpublished report prepared for Newcrest Mining Limited, Biologic Environmental Survey, Perth, WA.
- Biologic (2022). Lake Waukalicauli Preliminary Night Parrot Desktop Assessment. Unpublished report prepared for Newcrest Mining, Biologic Environmental, East Perth, Western Australia.
- Biota (2020a). Winu Project - Bilby Abundance Study. Unpublished Report Prepared for Rio Tinto Winu Pty Limited, February 2020, Biota Environmental Sciences.
- Biota (2020b). Winu Project Subterranean Fauna Desktop Study and Verification Survey. Unpublished report prepared for Rio Tinto Winu Pty Ltd, January 2020, Biota Environmental Sciences, Leederville, Western Australia.
- Biota (2021a). Winu Project Detailed Flora and Vegetation Survey. Unpublished report prepared for Rio Tinto Winu Pty Limited, May 2021, Biota Environmental Sciences, Western Australia.
- Biota (2021b). Winu Project Fauna Assessment. Unpublished report prepared for Rio Tinto Winu Pty Ltd, Biota Environmental Sciences, Leederville, Western Australia.
- Biota (2022a). Winu Production Bores Stygofauna Desktop Study. Unpublished report prepared for Rio Tinto Winu Pty Ltd, October 2022, Biota Environmental Sciences, Leederville, Western Australia.
- Biota (2022b). Winu Project Area Extension Targeted Fauna Survey. Unpublished report prepared for Rio Tinto Winu Pty Ltd, December 2022, Biota Environmental Sciences, Leederville, Western Australia.
- Biota (2022c). Winu Project Subterranean Fauna Desktop Study and Basic Survey. Unpublished report prepared for Rio Tinto Winu Pty Ltd, January 2022, Biota Environmental Sciences, Leederville, Western Australia.
- Biota (2023a). Winu Project Native Vegetation Clearing Permit Fauna Clearance Survey. Unpublished report prepared for Rio Tinto Winu Pty Ltd, August 2023, Biota Environmental Sciences, West Perth, Western Australia.
- Biota (2023b). Winu Terrestrial Fauna Interim Consolidation Report. Unpublished report for Rio Tinto Winu Pty Ltd, December 2023, Biota Environmental Sciences, West Perth, Western Australia.
- Biota (2025). Winu Project Vertebrate Fauna Consolidation Report. Unpublished Report, Biota Environmental Sciences, West Perth, Western Australia.
- Bureau of Meteorology (2025). Climate statistics for Australian Locations [WWW Document]. Retrieved from http://www.bom.gov.au/climate/averages/tables/cw_009172.shtml.

- DBCA (2024). Guidelines for determining the likely presence and habitat usage of night parrot (*Pezoporus occidentalis*) in Western Australia. Department of Biodiversity, Conservation and Attractions, Western Australia.
- DCCEEW (2008). Great Sandy Desert bioregion. Department of Climate Change, Energy, the Environment and Water. Retrieved from <https://www.dcceew.gov.au/sites/default/files/env/resources/a8015c25-4aa2-4833-ad9c-e98d09e2ab52/files/bioregion-great-sandy-desert.pdf>.
- Harewood, G. (2018). Lake Disappointment Potash Project: Night Parrot Survey Report. Unpublished report for Reward Minerals Ltd, Bunbury, WA.
- Jackett, N. A., B. R. Greatwich, G. Swann, and A. Boyle (2017). A nesting record and vocalisations of the Night Parrot *Pezoporus occidentalis* from the East Murchison, Western Australia. *Australian Field Ornithology* 34:144–150.
- Leseberg, N. P. (2024). Results of acoustic surveys conducted for Night Parrot (*Pezoporus occidentalis*): Project 1872 – Winu Sep-Oct 2024. Unpublished report for Biota Environmental Sciences, Adaptive NRM, Queensland.
- Leseberg, N. P. (2025). Peer review of Biota Environmental Sciences' Winu Project Targeted Night Parrot Survey. Unpublished report prepared for Rio Tinto Winu Pty Ltd, Adaptive NRM, Queensland.
- Leseberg, N. P., I. A. W. McAllan, S. A. Murphy, A. H. Burbidge, L. Joseph, S. A. Parker, N. A. Jackett, R. A. Fuller, and J. E. M. Watson (2021). Using anecdotal reports to clarify the distribution and status of a near mythical species: Australia's Night Parrot (*Pezoporus occidentalis*). *EMU Austral Ornithology* 121:239–249.
- Leseberg, N. P., S. A. Murphy, N. A. Jackett, B. R. Greatwich, J. Brown, N. Hamilton, L. Joseph, and J. E. M. Watson (2019). Descriptions of known vocalisations of the Night Parrot *Pezoporus occidentalis*. *Australian Field Ornithology* 36:79–88.
- Lindsay, M., R. Paltridge, N. Leseberg, N. Jackett, S. Murphy, Birriliburu Rangers, Kanyirninpa Jukurrpa (KJ) Martu Rangers, Karajarri Rangers, Kiwirrkurra Rangers, Ngurrara Rangers, Nyangumarta Rangers, Wiluna Martu Rangers, Gooniyandi Rangers, Kija Rangers, Paruku Rangers, Nharnuwangga Wajarri Ngarlawangga Warida Rangers, Ngurra Kayanta Rangers, Ngururrpa Rangers, A. Boyle, A. Watson, B. Greatwich, N. Hamaguchi, and S. Shipway (2024). Aboriginal rangers co-lead night parrot conservation: background, survey effort and success in Western Australia 2017-2023. *Wildlife Research* 51:WR24094.
- Michelmores, K., and L. Birch (2020, August 21). Night parrot located by KJ rangers on Martu country in the Pilbara. *ABC News*.
- Murphy, S. A., J. Silcock, R. Murphy, J. Reid, and J. J. Austin (2017a). Movements and habitat use of the night parrot *Pezoporus occidentalis* in south-western Queensland. *Austral Ecology* 42:858–868.
- Murphy, S., J. Austin, R. Murphy, J. Silcock, L. Joseph, S. Garnett, N. Leseberg, J. Watson, and A. Burbidge (2017b). Observations on breeding Night Parrots (*Pezoporus occidentalis*) in western Queensland. *EMU Austral Ornithology* 117:107–113.

Ngururrpa Rangers, C. Sunfly, A. Schubert, A. M. Reid, N. Leseberg, L. Parker, and R. Paltridge (2024). Potential threats and habitat of the night parrot on the Ngururrpa Indigenous Protected Area. *Wildlife Research* 51:WR24083.

This is the content of the appendix

Winu Survey Area (and surrounds)



WIF01A



WIF02A



WIF03A



WIF04A



WIF05A



WIF06A



WIF07A



WIF08A



WIB09A



WIB10A



WIB11A



WIB12A



WNM01A



WNM02A



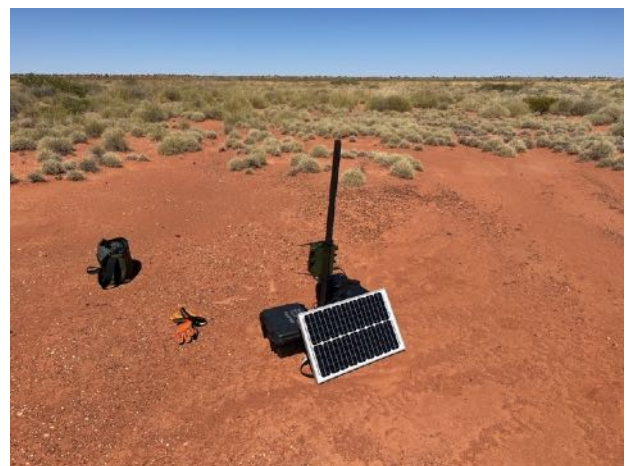
WNM03A



WNM04A



WNM05A



WNM06A



WNM07A



WNM08A



WNM09A



WNM10A



WNM11A



WNM12A



WNM13A



WNM14A



WPC01A



WPC02A

Lake Waukarlycarly and surrounds



WRN01A



WRN02A



WRN03A



WRN05A



WRN06A-2