Forshaw Pastoral Company Pty Ltd

Nita Downs Station Irrigated Fodder Production

# Greater Bilby and Spectacled Hare-wallaby assessment

July 2017

Broome Bird Observatory

BirdLife Australia Ltd

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| Document Status | | | | |
|---|---|---|---|---|
| **Revision** | **Author** | **Approved by** | **Distributed to** | **Date** |
| Rev 0 | E. Lai, N. Jackett | N. Jackett | D. & K. Forshaw | 19/07/2017 |

## Tables



## Figures

# 1. Introduction

## Project Description

Forshaw Pastoral Company Pty Ltd has applied for a Purpose Permit to clear up to 800 hectares of native vegetation on Nita Downs Station for the purpose of irrigated fodder production. The Department of Environmental Regulation (DER) identified the application area may contain significant habitat for the Greater Bilby (*Macrotis lagotis*), listed as vulnerable under the EPBC Act and WC Act, and for the Spectacled Hare-wallaby (*Lagorchestes conspicillatus leichardti*), listed as Priority 3.

In order to determine the potential impacts to the Greater Bilby and Spectacled Hare-wallaby, a targeted fauna survey was required within the application area. Forshaw Pastoral Company Pty Ltd commissioned Broome Bird Observatory to undertake a targeted survey for the Greater Bilby and Spectacled Hare-wallaby within the application area.

## Study Area

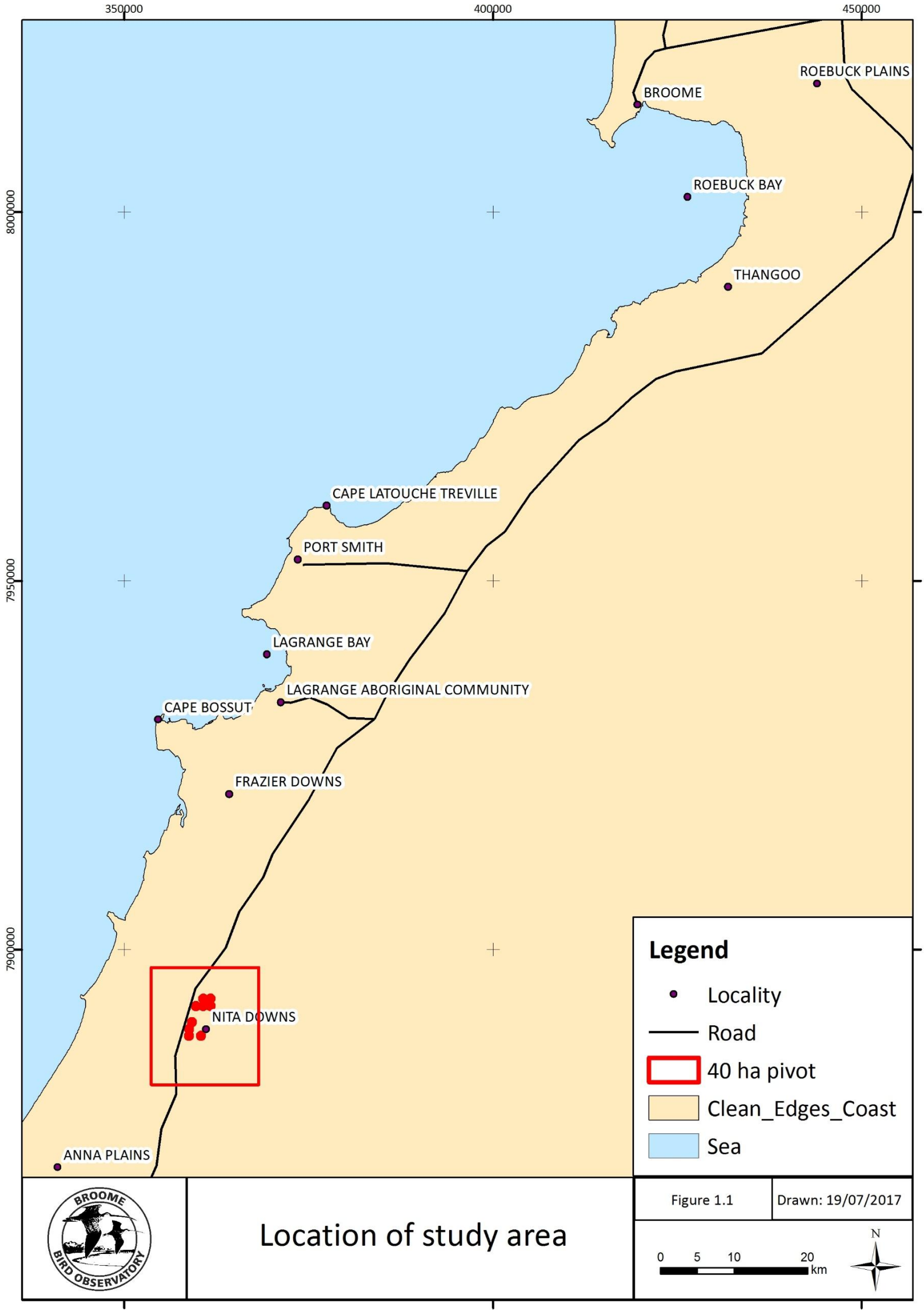
The application area is located within Lot 39 on Deposited Plan 238417 and Lot 41 on Deposited Plan 238418, on Nita Down Station. Nita Downs Station is located approximately 200 km south of Broome, adjacent to the Great Northern Highway (Figure 1.1).

## Previous Surveys

A list of previous assessments considering the Greater Bilby and/or Spectacled Hare-wallaby are presented in Table 1.1.

Table 1.1. Previous regional assessments considering Greater Bilby and Spectacled Hare-wallaby

| Assessment | Survey type |
|---|---|
| Sheffield Resources Thunderbird Project Targeted Greater Bilby Assessment (*ecologia* 2016) | Targeted Greater Bilby assessment |
| Assessment of the Bilby Macrotis lagotis on Wallal Downs Station; Homestead and Chirup project areas (Bamford Consulting Ecologists 2016) | Targeted Greater Bilby assessment |
| Main Roads Cape Leveque Road Upgrade Targeted Greater Bilby Assessment (GHD 2013) | Targeted Greater Bilby assessment |
| Targeted Greater Bilby assessment of the Landcorp WA industrial development near Crab Creek Road, Broome (Envisage Environmental Services 2015) | Targeted Greater Bilby assessment |
| Fauna assessment of the Pardoo Direct Shipping Ore Project (Bamford Consulting Ecologists 2007) | Level 1 fauna assessment |
| Browse Bilby Review (SKM 2012) | Desktop assessment |
| Peer review of Browse Bilby Review (Envisage Environmental Services 2012) | Desktop assessment |


350000
400000
450000
8000000
7950000
7900000
ROEBUCK PLAINS
BROOME
ROEBUCK BAY
THANGOO
CAPE LATOUCHE TREVILLE
PORT SMITH
LAGRANGE BAY
LAGRANGE ABORIGINAL COMMUNITY
CAPE BOSSUT
FRAZIER DOWNS
NITA DOWNS
ANNA PLAINS
Legend
Locality
Road
40 ha pivot
Clean_Edges_Coast
Sea
BROOME BIRD OBSERVATORY
Location of study area
Figure 1.1
Drawn: 19/07/2017
0 5 10 20
km
N

## Greater Bilby (*Macrotis lagotis*)

The Greater Bilby is an iconic nocturnal marsupial of arid Australia, with a fragmented distribution from south-west Queensland, through the Tanami Desert in the Northern Territory, to the Gibson, Little Sandy, and Great Sandy Deserts, as well as the Pilbara and south-western Kimberley.

The Greater Bilby inhabits areas with soft substrate, where it constructs burrows, and digs for a range of food, including invertebrates, seeds, bulbs and fungi.

The decline of the Greater Bilby since European settlement has been attributed to predation by introduced predators (e.g. foxes and cats), habitat loss through land clearing, extensive and frequent fires that remove vegetation and increase predator presence, and compaction of substrate and degradation of vegetation from introduced herbivores.

The Greater Bilby is listed as Vulnerable under the Environment Protection and Biodiversity Act 1999 and Vulnerable under the Wildlife Conservation Act 1950.

## Spectacled Hare-wallaby (*Lagorchestes conspicillatus leichardti*)

The Spectacled Hare-wallaby (subspecies *leichardti*) is a scarce, secretive, small wallaby with a scattered distributed from northern Western Australia across to Queensland, where it occurs in open woodlands, shrublands and hummock grasslands.

The Spectacled Hare-wallaby shelters during the day in dense tussocks, and forages at night on shrubs, grasses and herbs, usually within close proximity to shelter sites.

Threats to the Spectacled Hare-wallaby include extensive and frequent fires which modify vegetation, introduced predators (e.g. cats) and impacts to habitat from grazing and land clearing.

The Spectacled Hare-wallaby is listed as Priority 3 under the Wildlife Conservation Act 1950.

# 2. Methodology

## Adhering guidelines

This survey was undertaken as part of the Environmental Impact Assessment process in WA and is required to address the following government legislation and guidelines:

• EPA Guidance Statement No. 56: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia (EPA 2002a);

• EPA Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002b);

• Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA and DEC 2010);

• Greater Bilby specific survey guidelines within Survey guidelines for Australia's Threatened Mammals (DSEWPaC 2011).

## Survey Timing

The targeted Greater Bilby and Spectacled Hare-wallaby assessment was conducted in the early dry season over four days (Table *2.1*).

Table 2.1 Timing of Greater Bilby and Spectacled Hare-wallaby field survey

| **Dates** | **Pivot areas assessed** |
|---|---|
| 1-3 June 2017 (two zoologists) | A1, A2, A3, A4, PW1, PW2, PW3, PW4 |
| 19 June 2017 (one zoologist) | PW5 |

## Study Team

The survey was undertaken by two qualified zoologists (Table 2.2), and led by Nigel Jackett, who has extensive experience conducting formal fauna surveys within Western Australia, including targeted surveys for the Greater Bilby in the West Kimberley and Pilbara.

Table 2.2 Project staff

| **Name** | **Qualification** | **Project role** |
|---|---|---|
| Nigel Jackett | B. Env. Sc. (Hons) | Project management, survey design, field survey, reporting |
| Emilia Lai | M. Sc. | Field survey, reporting |

## Sampling Methods

Prior to conducting the field survey, proposed sampling methods required endorsement from the Department of Parks and Wildlife (DPaW). Broome Bird Observatory submitted the proposed sampling methods to DPAW in June 2017, which were deemed adequate in meeting the requirements of the assessment.

The following sampling techniques were used to survey both the Greater Bilby and Spectacled Hare-wallaby during the field survey:

1. Transect searches for sign

Each 40ha pivot area was traversed at 100m intervals (east-west orientation) in search of sign. For the Greater Bilby, this included searching for old or active burrows, scat, diggings and tracks, while for the Spectacled Hare-wallaby, this included searching for vegetated denning sites (in grass tussocks), scats and tracks.

Where sign was located, further searches took place in the immediate surrounds to try locate additional evidence of either species' presence.

GPS coordinates and photos were taken at all sites where sign was detected.

2. Two-hectare plot searches for sign.

Two 2ha plot searches were conducted within each of the nine pivot areas (totalling 18 plots within pivots). A further seven 2ha plots were conducted outside of the pivot areas (but within 500m of a pivot area), to provide contextual information relating to the habitats present, and the distribution of either the Greater Bilby or Spectacled Hare-wallaby outside of the pivot areas.

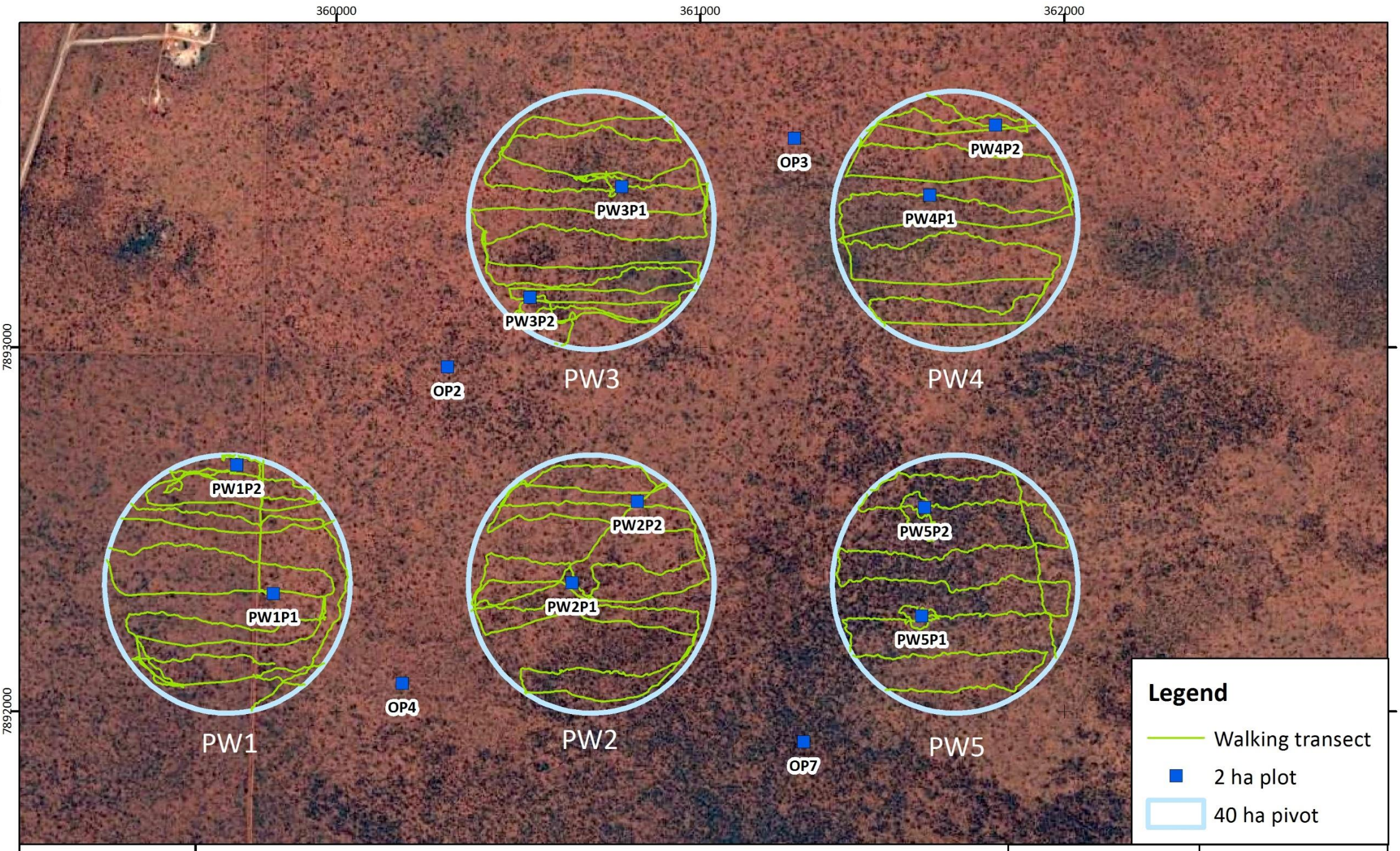
Each 2ha plot (both within and outside a pivot area) involved searching an area (200m x 100m) for sign (burrows, diggings, scats, tracks and vegetated denning sites) for a minimum of 20 minutes. A 2ha plot survey datasheet was obtained from DPaW (Broome office) for use during the field survey, to ensure consistency with other surveys within the region. Selected data recorded during the 2 ha plot surveys are shown in Appendix 1.

## Survey Effort

The total search time expended within each pivot area, and outside of the pivot areas is shown in Table 2.3. The walking transects and 2 ha plots conducted within each pivot area are displayed in Figure 2.1and Figure 2.2.

Table 2.3. Search effort expended within each pivot area

| Pivot | Transect search effort (person hours) | 2ha plots completed | 2ha plot search effort (person hours) | Total search effort (person hours) |
|---|---|---|---|---|
| A1 | 2:10 | 2 | 1:14 | 3:24 |
| A2 | 2:52 | 2 | 0:40 | 3:32 |
| A3 | 3:28 | 2 | 1:20 | 4:48 |
| A4 | 5:32 | 2 | 1:20 | 6:52 |
| PW1 | 3:38 | 2 | 1:00 | 4:38 |
| PW2 | 2:16 | 2 | 1:00 | 3:16 |
| PW3 | 4:00 | 2 | 1:20 | 5:20 |
| PW4 | 1:42 | 2 | 1:20 | 3:02 |
| PW5 | 1:20 | 2 | 0:40 | 2:00 |
| **Pivot total** | **26:58** | **18** | **9:54** | **36:52** |
| Outside | - | 7 | 4:26 | 4:26 |
| **Overall total** | **26:58** | **25** | **14:20** | **41:18** |



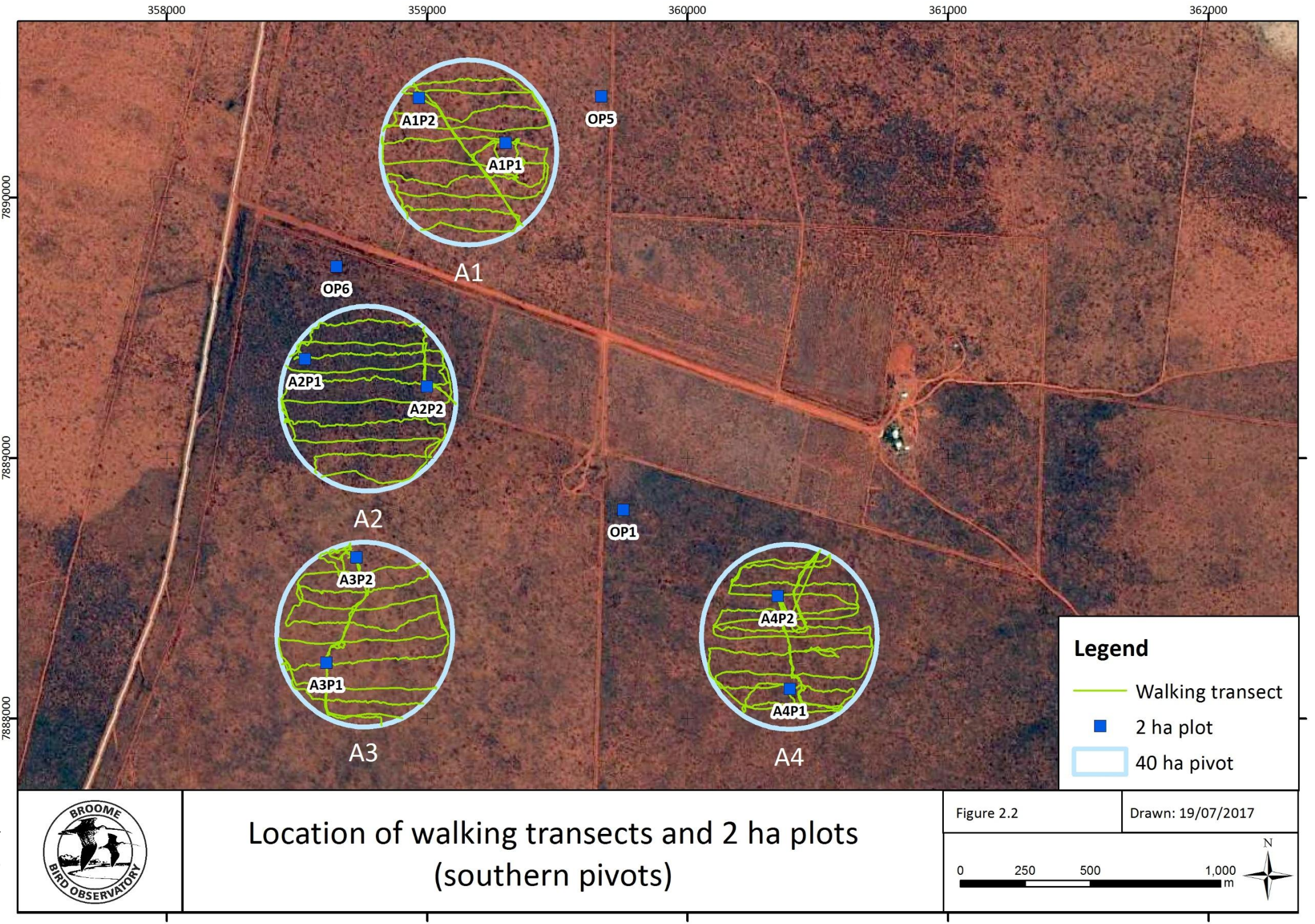

# Location of walking transects and 2 ha plots (northern pivots)

Figure 2.1

Drawn: 19/07/2017

0 125 250 500 m

N


358000
359000
360000
361000
362000
7890000
7889000
7888000
A1P2
A1P1
OP5
A1
OP6
A2P1
A2P2
A2
OP1
A3P2
A3P1
A3
A4P2
A4P1
A4
Legend
Walking transect
2 ha plot
40 ha pivot
BROOME BIRD OBSERVATORY
Location of walking transects and 2 ha plots (southern pivots)
Figure 2.2
Drawn: 19/07/2017
0
250
500
1,000
m
N

# 3. Results

Secondary evidence of the Greater Bilby occurring was recorded within one pivot area during the field survey (Table 3.1). No evidence of the Spectacled Hare-wallaby occurring within the pivot areas was recorded (Table 3.1).

Table 3.1. Summary of sign detected within each pivot area

| Pivot | Occurrence of sign within pivot area | |
|---|---|---|
| | Greater Bilby | Spectacled Hare-wallaby |
| A1 | Detected (burrow, scat) | Not detected |
| A2 | Not detected | Not detected |
| A3 | Not detected | Not detected |
| A4 | Not detected | Not detected |
| PW1 | Not detected | Not detected |
| PW2 | Not detected | Not detected |
| PW3 | Not detected | Not detected |
| PW4 | Not detected | Not detected |
| PW5 | Not detected | Not detected |

## Greater Bilby (*Macrotis lagotis*)

Secondary evidence (inactive burrow and scat) of the Greater Bilby was recorded at a single location within pivot A1. The burrow was located within a dense stand of *Acacia monticola*, and was estimated to have been used by a Greater Bilby since the end of the wet season (~April). However, the scat found at the burrow entrance was still relatively fresh, suggesting a Greater Bilby may have been present within several weeks of the field survey.

Numerous diggings were found outside the south-western boundary of pivot PW1, and scat was also detected alongside them. The diggings were all made at the base of *Senna notabilis*, where extractions of larvae were evident based on the chewed roots.

Table 3.2. Location of secondary evidence detected

| Pivot | Sign type | UTM Easting | UTM Northing |
|---|---|---|---|
| A1 | Burrow (inactive) | 359350 | 7890225 |
| A1 | Scat | 359350 | 7890225 |
| Outside | Scat | 359476 | 7891987 |
| Outside | Digging | 359496 | 7892035 |
| Outside | Digging | 359497 | 7892036 |
| Outside | Digging | 359495 | 7892055 |
| Outside | Digging | 359496 | 7892056 |
| Outside | Digging | 359497 | 7892053 |

| Pivot | Sign type | UTM Easting | UTM Northing |
|---|---|---|---|
| Outside | Digging | 359499 | 7892053 |
| Outside | Digging | 359432 | 7892058 |
| Outside | Digging | 359439 | 7892041 |
| Outside | Digging | 359427 | 7892027 |
| Outside | Digging | 359423 | 7892027 |
| Outside | Digging | 359422 | 7892026 |
| Outside | Digging | 359422 | 7892026 |
| Outside | Digging | 359415 | 7892031 |
| Outside | Digging | 359414 | 7892031 |
| Outside | Digging | 359416 | 7892025 |
| Outside | Digging | 359421 | 7892021 |
| Outside | Digging | 359427 | 7892015 |
| Outside | Digging | 359432 | 7892024 |
| Outside | Digging | 359439 | 7892014 |
| Outside | Digging | 359443 | 7892009 |
| Outside | Digging | 359445 | 7892005 |
| Outside | Digging | 359442 | 7892005 |
| Outside | Digging | 359461 | 7891986 |
| Outside | Digging | 359468 | 7891984 |
| Outside | Digging | 359474 | 7891987 |
| Outside | Digging | 359476 | 7891987 |
| Outside | Digging | 359488 | 7891985 |
| Outside | Digging | 359490 | 7892007 |
| Outside | Digging | 359489 | 7892011 |
| Outside | Digging | 359477 | 7892030 |
| Outside | Digging | 359470 | 7892025 |

Zone 51K.

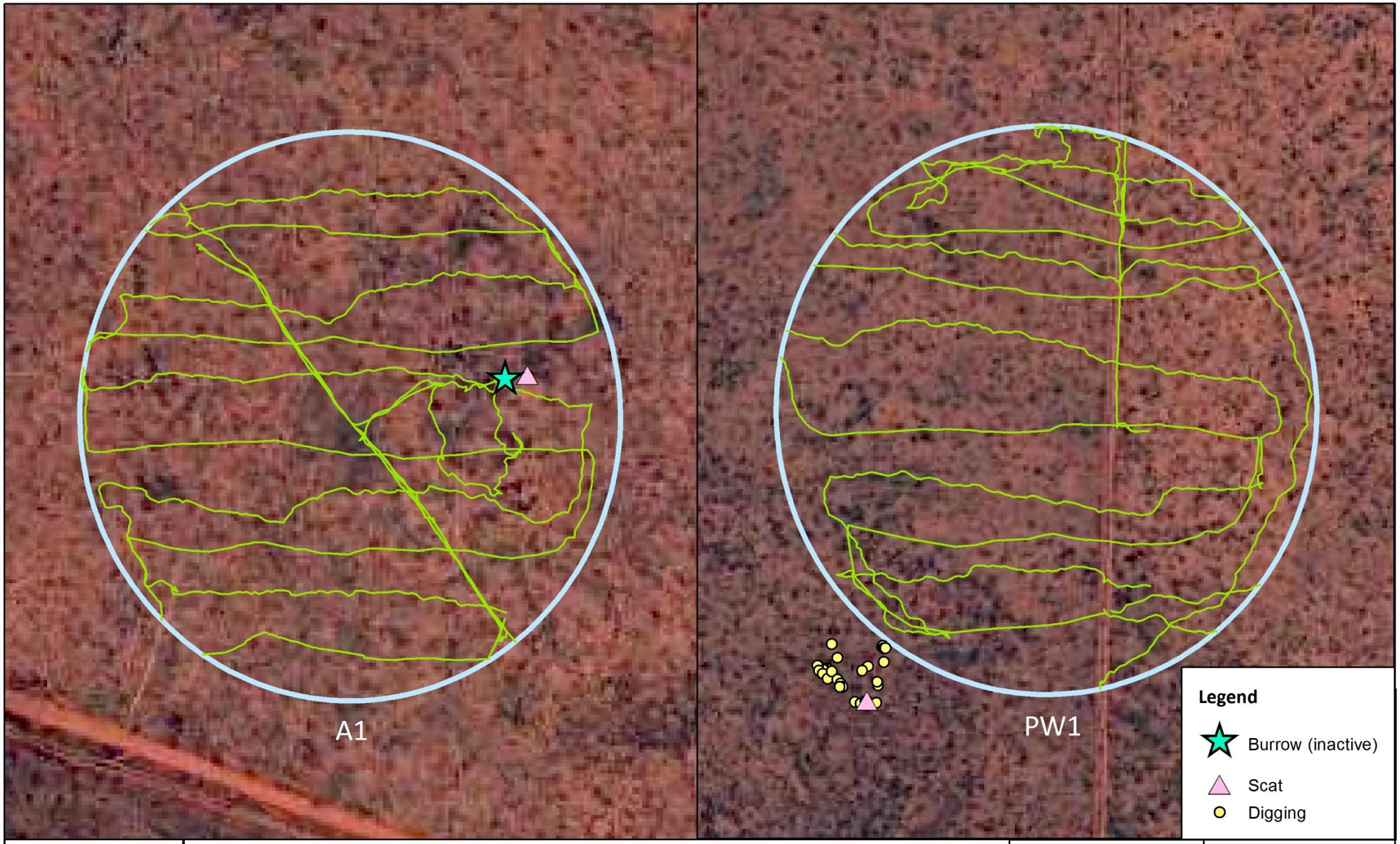
## Habitat Association

The habitat in which the Greater Bilby burrow was detected within pivot area A1, was described as *Bauhinia cunninghamii* and *Corymbia greeniana* open woodland, containing dense stands of *Acacia monticola*, with little grass ground cover, but extensive leaf litter around shrub bases (Figure *3.1*).

Figure 3.1 Acacia monticola shrubland where Greater Bilby burrow and scat were detected

The burrow entrance (Figure *3.2*) had filled with leaves and spider web, and was not deemed to be active. However, based on the apparent freshness of the scat, the burrow was likely to have been used since the 2016/17 wet season, and likely within two months prior to the field survey. The location of the burrow is shown in Figure 3.3.

Figure 3.2. Inactive burrow and scat on mound located during the field assessment.




BROOME BIRD OBSERVATORY

# Locations of Greater Bilby secondary evidence

Figure 3.3

Drawn: 19/07/2017

0 75 150 300 m

N

Numerous Greater Bilby diggings were found in an open *Senna notabilis* shrubland, where the majority of individual plants has been excavated at their bases. In most cases, an area had been chewed in the root where it is assumed larvae were extracted (Figure 3.4). The *Senna* shrubland was found adjacent to pivot PW1 (Figure 3.3), but ended close to the boundary of the pivot. As such, no diggings were found within PW1 itself, but it is likely Greater Bilbies traverse through the pivot.

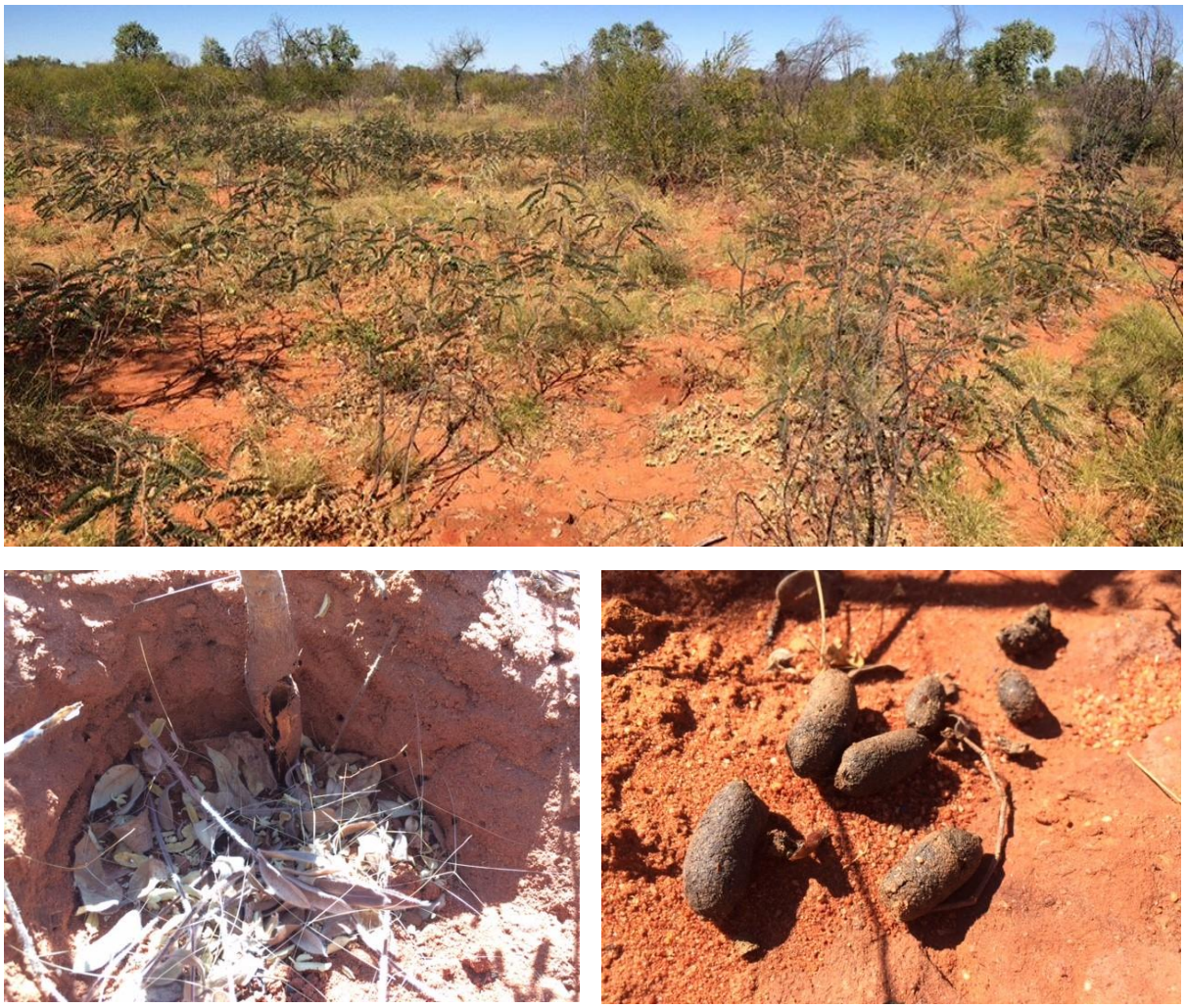


Figure 3.4. (a) *Senna notabilis* shrubland, with (b) chewed larval extraction hole in root and (c) associated scat.

## Spectacled Hare-wallaby (*Lagorchestes conspicillatus leichardti*)

No evidence of the Spectacled Hare-wallaby was detected within the pivot areas, or while traversing or conducting 2 ha plots within the surrounding area.

Generally, the fire age within the landscape was recent (1-3 years), resulting in low and small *Triodia* hummocks being present, which were deemed unsuitable for Spectacled Hare-wallaby sheltering sites. However, small patches of dense, tall *Aristida* were present within two pivot areas (Figure 3.5), which were considered suitable as sheltering sites, but searches within these patches did not detect any scat, tracks or dens of Spectacled Hare-wallaby.

Figure 3.5. Tall *Aristida* tussocks suitable for Spectacled Hare-wallaby denning sites.

# 4. Discussion

## Greater Bilby (*Macrotis lagotis*)

The Greater Bilby was detected via secondary evidence within a single pivot area during the field survey.

The habitats suitable for the Greater Bilby recorded within the pivot areas were analogous with habitats recorded outside of the pivot boundaries, and consistent with habitats where Greater Bilby have been recorded during other previous assessments in the region. Although Greater Bilby are likely to occur at times within the pivot areas, the evidence recorded during the field assessment suggests the species is in low abundance (within the pivot areas), and that very few individuals are likely to have been using the pivot areas for either burrowing or foraging within. Based on habitat assessments outside of the pivot areas, where stands of *Acacia monticola* and *Senna notabilis* were also recorded, it is expected the species will occur in similar abundances within the surrounding landscape.

## Spectacled Hare-wallaby (*Lagorchestes conspicillatus leichardti*)

The Spectacled Hare-wallaby was not detected during the field assessment. Suitable habitat for denning was found in pivots PW1 and PW4, where stands of dense, tall *Aristida* were recorded. However, the size of these patches was small enough that they could be thoroughly searched during the field assessment, and with no Spectacled Hare-wallaby sign detected, it is unlikely that any significant population, or even any individuals, occurred at the time of the assessment.

The likelihood of occurrence based on the suitability of habitat for Greater Bilby and Spectacled Hare-wallaby within each pivot area is assessed in Table 4.1.

Table 4.1. Likelihood of occurrence table for Greater Bilby and Spectacled Hare-wallaby

| Pivot | Likelihood of occurrence based on habitat | | | |
|---|---|---|---|---|
| | Greater Bilby | | Spectacled Hare-wallaby | |
| A1 | Likely | Secondary evidence recorded within pivot; stands of *Acacia monticola* near lower centre of pivot. | Unlikely | Habitat unsuitable; vegetation of young age; lacking in tussock grassland favoured by species; dense, low *Triodia* present |
| A2 | Unlikely | Understory generally open and degraded from livestock. No dense stands of *Acacia* present. | Unlikely | Habitat unsuitable; vegetation of young age; lacking in tussock grassland favoured by species; dense, low *Triodia* present |
| A3 | Unlikely | Habitat generally unsuitable; dense, low *Triodia* and lacking in *Acacia* stands. Very open habitat. | Unlikely | Habitat unsuitable; vegetation of young age; lacking in tussock grassland favoured by species; dense, low *Triodia* present |
| A4 | Unlikely | Habitat generally unsuitable; dense, low *Triodia* and lacking in *Acacia* stands. Very open habitat. | Unlikely | Habitat unsuitable; vegetation of young age; lacking in tussock grassland favoured by species; dense, low *Triodia* present |
| PW1 | Likely | Recorded adjacent to pivot foraging in *Senna notabilis*; some similar | Possible | Small area (<1 ha) of suitable tussock grassland in northern end of pivot, |

| Pivot | Likelihood of occurrence based on habitat | | | |
|---|---|---|---|---|
| | Greater Bilby | | Spectacled Hare-wallaby | |
| | | suitable foraging habitat present | | although no sign found |
| PW2 | Possible | Some suitable habitat present; *Acacia monticola* stands in southern half of pivot area. | Unlikely | Habitat unsuitable; vegetation of young age; lacking in tussock grassland favoured by species; dense, low *Triodia* present |
| PW3 | Possible | Suitable habitat present; *Acacia monticola* stands present, particularly in northern half of pivot area. | Unlikely | Habitat unsuitable; vegetation of young age; lacking in tussock grassland favoured by species; dense, low *Triodia* present |
| PW4 | Unlikely | Habitat generally unsuitable; dense *Triodia* and lacking in *Acacia* stands. | Possible | Small area (<1 ha) of suitable tussock grassland lower centre of pivot, although no sign found |
| PW5 | Unlikely | Limited habitat present; small area of *Acacia monticola* in SW corner of pivot. | Unlikely | Habitat unsuitable; vegetation of young age; lacking in tussock grassland favoured by species; dense, low *Triodia* present |

## Survey Limitations

The potential limitations of the assessment are listed in Table 4.2.

Table 4.2. Survey limitations

| Limitation | Comment |
|---|---|
| Competency/experience of the consultant carrying out the survey | The consultant has extensive experience conducting targeted fauna surveys throughout Western Australia, including the Pindanland IBRA sub-region, where the consultant has conducted surveys for both mammal species previously. |
| Scope (what faunal groups were sampled and were some sampling methods not able to be employed because of constraints such as weather conditions) | The survey targeted two medium-sized mammals, both of which could be detected through through walking transects and 2 ha plot surveys, searching for distinctive secondary evidence (e.g. burrows, scats, tracks etc). |
| Proportion of fauna identified, recorded and/or collected | All diggings, scats and tracks relevant to the survey could be identified in the field. |
| Sources of information e.g. previously available information (whether historic or recent) as distinct from new data | Targeted surveys for the Greater Bilby have been conducted within the Pindanland IBRA subregion, providing useful information on habitats within this area. Limited information is available for Spectacled Hare-wallaby within the Pindanland IBRA subregion, however, sufficient information is known on its biology to permit targeted surveys for this species. |
| Proportion of the task achieved and further work which might be needed | All proposed pivot areas were surveyed for Greater Bilby and Spectacled Hare-wallaby, providing sufficient information to determine the likelihood of either species occurring. |
| Timing/weather/season/cycle; | The field survey was conducted following the wet season, during a period of good vegetative growth. The conditions were therefore suitable for foraging for both mammal species, increasing the likelihood of detection. |
| Disturbances (e.g. fire, flood, accidental human intervention etc.) which affected results of survey. | There were no recent disturbances that may have impacted upon the results of the survey. |
| Intensity (in retrospect, was the intensity adequate) | The 100 m walking transects were deemed suitable in comprehensively surveying each pivot area for both species. The 2 ha plots within each pivot further increased the likelihood of detecting either species. |
| Completeness (e.g. was relevant area fully surveyed) | All pivot areas were surveyed in their entirety. |
| Resources (e.g. degree of expertise available in animal identification to taxon level) | Sufficient information is known to allow easy identification of both mammal species, based on their tracks, burrows, denning sites and scats. |
| Remoteness and/or access problems | There were no access problems encountered during the field survey. |
| Availability of contextual (e.g. biogeographic) information on the region | There have been an increasing number of fauna surveys conducted within the Pindanland IBRA sub-region, so sufficient contextual information is available. |

# 5. Conclusion

The main conclusions from the Greater Bilby and Spectacled Hare-wallaby assessment were:

- The Greater Bilby was recorded during the field assessment via secondary evidence (burrow and scat). Secondary evidence (diggings and scat) was also recorded outside of the pivot areas. No evidence of the Spectacled Hare-wallaby occurring was detected during the field assessment;
- The Greater Bilby was associated with stands of dense *Acacia monticola* shrublands, as well as *Senna notabilis* shrublands (outside of the pivot areas). These associated flora species are widespread in the region.
- The Greater Bilby burrow recorded within pivot area A1 was not determined to have been active during the field assessment. No other burrows were detected within any other pivot area, and it was therefore expected that the Greater Bilby occurred in low abundance within the study area.
- The amount of habitat suitable for denning sites for Spectacled Hare-wallaby was very limited within the pivot areas. As such, these patches could be searched thoroughly, and no sign was detected.
- There were no limitations constraining the field assessment, with access to all pivot areas being unrestricted, and survey conditions being suitable.

# 6. References


Bamford Consulting Ecologists (2007) Fauna assessment of the Pardoo Direct Shipping Ore Project. Report prepared for Atlas Iron Limited.

Bamford Consulting Ecologists (2016) Assessment of the Bilby *Macrotis lagotis* on Wallal Downs Station; Homestead and Chirup project areas. Report prepared for the Warrawagine Cattle Company.

DSEWPaC (2011) Survey guidelines for Australia's Threatened Mammals. Department of Sustainability, Environment, Water, Population and Communities.

*ecologia* Environment (2016) Thunderbird Project Targeted Greater Bilby Assessment. Report prepared for Sheffield Resources Ltd.

GHD (2013) Cape Leveque Road Upgrade Targeted Greater Bilby Assessment. Report prepared for Main Roads Western Australia.

SKM (2012) Browse Bilby Review. Consolidated information relating to the occurrence of the Bilby (*Macrotis lagotis*) in the vicinity of the Browse LNG precinct and the more broadly on the Dampier Peninsula. Report prepared for Woodside Energy Limited.

EPA (2002a) Terrestrial Biological Surveys as an Element of Biodiversity Protection in Environmental Protection Authority, ed, Perth.

EPA (2002b) Terrestrial Biological Surveys as an Element of Biodiversity Protection. Position Statement No. 3. Environmental Protection Authority, Western Australia.

EPA and DEC (2010) *Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment*. Perth, Western Australia.

Envisage Environmental Services (2012) Peer review of the Browse Bilby Review, a report detailing the consolidated information relating to the occurrence of the Bilby *Macrotis lagotis* near the proposed Browse LNG Precinct (close to James Price Point) and more broadly on the Dampier Peninsula. Report prepared for Woodside Energy Ltd

Envisage Environmental Services (2015) Targeted Greater Bilby assessment of the Landcorp WA industrial development site near Crab Creek Road, Broome.

## Appendix 1. Secondary evidence recorded during 2 ha plot surveys

| Location | Easting | Northing | Greater Bilby | Large macropod sp. | varanid sp. | Australian Bustard | Cow | Cat |
|---|---|---|---|---|---|---|---|---|
| A1P1 | 359302 | 7890211 | T,S,B | T | | | T | |
| A1P2 | 358969 | 7890383 | | | | | T | |
| A2P1 | 358531 | 7889380 | | | | | T | |
| A2P2 | 358999 | 7889275 | | | | | T | |
| A3P1 | 358613 | 7888215 | | | D | | | |
| A3P2 | 358729 | 7888619 | | | | | T,S | |
| A4P1 | 360393 | 7888114 | | | T | | T | |
| A4P2 | 360346 | 7888470 | | | | T | | |
| PW1P1 | 359827 | 7892324 | | S | | | | |
| PW1P2 | 359726 | 7892677 | | | | | T | |
| PW2P1 | 360648 | 7892353 | | | | | T | |
| PW2P2 | 360827 | 7892577 | | S | | | T | |
| PW3P1 | 360784 | 7893442 | | | | | T | |
| PW3P2 | 360532 | 7893138 | | | D | | T | |
| PW4P1 | 361631 | 7893419 | | | | | T | |
| PW4P2 | 361811 | 7893611 | | | | | T | |
| PW5P1 | 361609 | 7892262 | | | | | T | |
| PW5P2 | 361616 | 7892560 | | T,S | | | T | T |
| OP1 | 359753 | 7888802 | | | T | | T | |
| OP2 | 360305 | 7892946 | | | | | | |
| OP3 | 361259 | 7893575 | | | | | T | |
| OP4 | 360181 | 7892077 | | | | | T | |
| OP5 | 359668 | 7890389 | | | | | T | |
| OP6 | 358653 | 7889736 | | | | | T | |

| Location | Easting | Northing | Greater Bilby | Large macropod sp. | varanid sp. | Australian Bustard | Cow | Cat |
|---|---|---|---|---|---|---|---|---|
| OP7 | 361284 | 7891916 | | | | | T | |

T = track, S = scat, D = digging, B = burrow; UTM Zone 51

## Appendix 2. List of bird species recorded incidentally during the field assessment

| Common Name | Scientific Name | A1 | A2 | A3 | A4 | PW1 | PW2 | PW3 | PW4 | PW5 | Opp |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Wedge-tailed Eagle | *Aquila audax* | | | | | | | | | | • |
| Collared Sparrowhawk | *Accipiter cirrocephalus* | | | | | | | | | • | |
| Black Kite | *Milvus migrans* | | | • | | | | | | | |
| Whistling Kite | *Haliastur sphenurus* | • | | | | | | | | | |
| Australian Bustard | *Ardeotis australis* | | | | | | | | | | • |
| Little Buttonquail | *Turnix velox* | | • | | • | | • | | • | | |
| Bush Stone-curlew | *Burhinus grallarius* | • | | • | • | • | • | | • | • | |
| Banded Lapwing | *Vanellus tricolor* | | | | | | | | | | • |
| Crested Pigeon | *Ocyphaps lophotes* | | | | | | | | | • | • |
| Diamond Dove | *Geopelia cuneata* | | | | | | | | | • | |
| Horsfield's Bronze Cuckoo | *Chrysococcyx basalis* | | | • | • | • | • | • | • | • | |
| Black-eared Cuckoo | *Chrysococcyx osculans* | | | | | | | | | | • |
| Pallid Cuckoo | *Cacomantis pallidus* | | | | | | | | | • | • |
| Tawny Frogmouth | *Podargus strigoides* | | | | | | | | | | • |
| Australian Owlet-nightjar | *Aegotheles cristatus* | | | | | | | • | • | | |
| Blue-winged Kookaburra | *Dacelo leachii* | | | • | | • | • | | | | |
| Red-backed Kingfisher | *Todiramphus pyrrhopygius* | | • | | | • | | | | | |
| Rainbow Bee-eater | *Merops ornatus* | | • | • | | | • | • | • | | |
| Nankeen Kestrel | *Falco cenchroides* | | • | | | | • | | | • | |
| Brown Falcon | *Falco berigora* | • | | • | • | • | • | | • | | |
| Red-tailed Black Cockatoo | *Calyptorhynchus banksii* | | | • | • | | | | | • | |
| Little Corella | *Cacatua sanguinea* | • | • | • | • | • | | • | • | • | |
| Cockatiel | *Nymphicus hollandicus* | | | | | • | | | | | |

| Common Name | Scientific Name | A1 | A2 | A3 | A4 | PW1 | PW2 | PW3 | PW4 | PW5 | Opp |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Budgerigar | *Melopsittacus undulatus* | • | • | | | | | | • | | |
| Red-winged Parrot | *Aprosmictus erythropterus* | • | | • | • | | • | • | | • | • |
| Variegated Fairywren | *Malurus lamberti* | | • | | | | | | | | |
| Red-backed Fairywren | *Malurus melanocephalus* | | | | • | | | | | | |
| Brown Honeyeater | *Lichmera indistincta* | | | | • | • | | | • | • | |
| Crimson Chat | *Epthianura tricolor* | • | • | | • | • | • | • | • | • | |
| Yellow-throated Miner | *Manorina flavigula* | | | • | • | | | • | | • | |
| Singing Honeyeater | *Gavicalis virescens* | | | • | • | | | | | | |
| Black-chinned/White-throated Honeyeater | *Melithreptus* sp. | | | | • | | | • | | | |
| Red-browed Pardalote | *Pardalotus rubricatus* | | | | | | | | | | • |
| Striated Pardalote | *Pardalotus striatus* | | | | | | | | | | • |
| White-throated Gerygone | *Gerygone olivacea* | • | | • | | | | | | | |
| Grey-crowned Babbler | *Pomatostomus temporalis* | | | | • | | • | | | | |
| Black-faced Woodswallow | *Artamus cinereus* | | | • | • | | | • | | | |
| Pied Butcherbird | *Cracticus nigrogularis* | • | • | • | | • | • | • | • | • | |
| Black-faced Cuckooshrike | *Coracina novaehollandiae* | • | • | • | • | • | • | • | • | • | |
| White-winged Triller | *Lalage tricolor* | | | • | | | | | | | |
| Varied Sittella | *Daphoenositta chrysoptera* | | | | | | | | | | • |
| Crested Bellbird | *Oreoica gutturalis* | | | • | • | • | | | | | |
| Rufous Whistler | *Pachycephala rufiventris* | | | | | | • | | | | |
| Grey Shrikethrush | *Colluricincla harmonica* | | | | | | • | | • | • | |
| Willie Wagtail | *Rhipidura leucophrys* | • | • | • | • | | • | • | • | • | |
| Magpie-lark | *Grallina cyanoleuca* | | | | | | • | | | | |
| Torresian Crow | *Corvus orru* | | | | | | | | | | • |

| Common Name | Scientific Name | A1 | A2 | A3 | A4 | PW1 | PW2 | PW3 | PW4 | PW5 | Opp |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Red-capped Robin | *Petroica goodenovii* | | | | | | • | • | | • | • |
| Tree Martin | *Petrochelidon nigricans* | • | • | • | • | • | • | • | • | | |
| Rufous Songlark | *Megalurus mathewsi* | | • | • | • | • | • | | • | • | |
| Mistletoebird | *Dicaeum hirundinaceum* | • | • | • | • | • | • | • | | • | |
| Zebra Finch | *Taeniopygia guttata* | | | | • | | • | | | | |