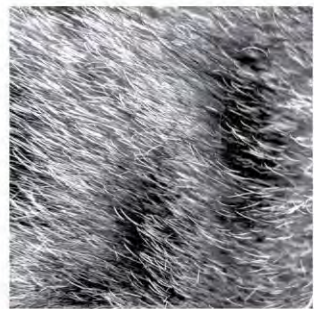
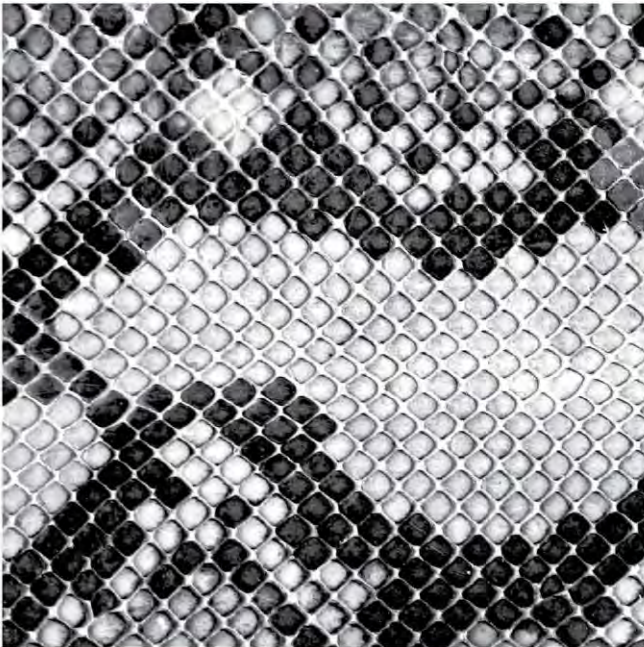




2019 Mt Holland Malleefowl Monitoring



Covalent Lithium

ecoscape



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| VERSION | AUTHOR | QA REVIEWER | APPROVED | DATE |
|---------|--------------|--|---|-----------|
| final | Bruce Turner |  Andrew Fry Senior Environmental Scientist |  Andrew Fry Senior Environmental Scientist | 7/01/2020 |

Direct all inquiries to:
Ecoscape (Australia) Pty Ltd
9 Stirling Highway • PO Box 50 NORTH FREMANTLE WA 6159
Ph: (08) 9430 8955 Fax: (08) 9430 8977

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Ecoscope would like to acknowledge the assistance and support we received from both the Covalent head office staff and the staff on-site who made us welcome and provided logistical support where needed. Acknowledgement is also made to Carl Danzi from the National Malleefowl Recovery Team (NMRT) for his training efforts and kind assistance. We look forward to returning for the next years monitoring.

SUMMARY

Ecoscape was engaged in August 2019 to provide the following services for the project:

- undertake NMRT Malleefowl mound monitoring training
- monitoring of known Malleefowl mounds
- ground truthing of LiDAR results for potential Malleefowl mounds.

The results of the Malleefowl mound monitoring and review of the recorded images of Malleefowl at mounds has provided baseline data that can be used to compare future monitoring results for the Covalent Lithium Mt Holland Project site.

There is one active mound and 30 inactive mounds within the development envelope that were identified as requiring annual monitoring as a result of the surveys. There are 14 mounds within the development envelope that were determined to be either not mounds or long unused mounds that were assigned as Do Not Monitor using NMRT monitoring methods.

A temporal analysis determined two active mounds at MM23 and MM17 were active consecutively, so it is feasible to estimate that there are two breeding pairs within the local area. The individual seen visiting MM53 and MM56 could potentially be one of the two pairs but is unlikely that a paired bird would be investigating inactive mounds.

Trail cameras identified four different Malleefowl mounds were visited by Feral Cat. This included both active Malleefowl mounds.

To provide Malleefowl population health and abundance data the following aspects are recommended to be monitored annually:

- Trail camera monitoring during the egg incubation season (September to January) of all Malleefowl mounds that have been identified as annual, within and adjacent to the development envelope. Each active mound (i.e. a mound that has Malleefowl images recorded) indicates one breeding pair.
- Implement agreed buffer zone around active mounds and update Covalent GIS data.
- Maintain database of Malleefowl sightings within a fauna register and report annually on number and location of active mounds.
- Collate image data and report on status of all monitored mounds.
- Collate and report on records of sightings of feral predators and images captured on cameras at the monitored mounds.
- Complete ground truthing of LiDAR data within the development envelope.
- Commence development of a procedure for removal of mounds.

1 INTRODUCTION

1.1 PROJECT PURPOSE

Covalent Lithium is developing the Mt Holland Lithium Project which will include the construction and operation of a fully integrated mine, concentrator and refinery in Western Australia. The Mount Holland Lithium Project (the project) is an integrated project consisting of a mine, concentrator and refinery to produce battery quality lithium hydroxide (LiOH) for the international market. The project is centred on the Earl Grey hard-rock lithium deposit 105 km south of Southern Cross in Western Australia and approximately 500 km east of Perth (**Figure 1**). It is owned by a 50-50 joint venture (JV) between subsidiaries of Wesfarmers Pty Ltd (WES:ASX) and Sociedad Química y Minera de Chile S.A. (SQM: NYSE). Covalent is the manager for the JV and is responsible for the development and operation of the project.

The survey area intersects with habitat of two conservation significant fauna species, the Malleefowl (*Leipoa ocellata*) and the Chuditch (*Dasyurus geoffroii*). Both species are listed as vulnerable (VU) under both the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and the Western Australian *Biodiversity Conservation Act 2016* and are considered as Matters of National Environmental Significance (MNES).

1.1.1 PROJECT SCOPE

The project scope was to conduct a desktop assessment and fauna survey, as well as describing other environmental aspects, of the survey area as outlined by Covalent Lithium. Field personnel are to undertake and complete Malleefowl mound monitoring training by National Malleefowl Recovery Team personnel (NMRT).

Ecoscope was engaged in August 2019 to provide the following services for the project:

- undertake and complete NMRT Malleefowl mound monitoring training
- monitoring of known Malleefowl mounds
- ground truthing of LiDAR results for potential Malleefowl mounds.

The requirements of the desktop assessment were as follows:

- be conducted prior to the field survey to identify biological features and constraints that may be within or near the project area
- include a review of relevant environmental reports (provided by Covalent Lithium) and other documents relevant to the project area and/or ecological values associated with the locality.

The requirements of the field survey were as follows:

- be conducted in accordance with current statutory and technical requirements and guidance, as outlined below
- be conducted by personnel complying with regulatory expectations in relation to years of experience to ground truth the desktop findings through a comprehensive and targeted survey
- record track logs of survey effort to illustrate time and effort expended during the survey
- identify, map and measure Malleefowl mounds to NMRT standards
- install and deploy trail cameras on mounds considered for annual and five year monitoring.

The report (this document) includes:

- maps of monitored and visited Malleefowl mounds produced using GIS mapping software
- assessment of Matters of National Significance (MNES) and identifying if such matters are likely to require referral of the project to DotEE
- detailing the findings of desktop assessment and biological field survey, including any required reporting to DBCA (conservation significant flora, fauna and ecological communities).

1.2 SURVEY AREA

1.2.1 REGIONAL LOCATION

The survey area is located in the Shire of Yilgarn in the Goldfields region of Western Australia, about 100km south of Southern Cross. The development envelope (DE) is within the Great Western Woodlands (GWW) and is approximately 1,984 ha in extent (**Figure 1**). The GWW is a 16 million hectare area extending from the wheatbelt to the edge of the deserts and is the largest intact area of Mediterranean Woodland on earth (DEC 2010). The GWW includes open eucalypt woodlands (63%), Mallee eucalypt woodlands, shrublands and grasslands (Fox *et al.* 2016). Less common habitats in the GWW include granite outcrops, banded ironstone formations, salt lakes and freshwater wetlands (Fox *et al.* 2016).

The DE is in the Southern Cross Subregion of the Coolgardie Bioregion of the Interim Biogeographic Regionalism for Australia (IBRA) classification system (Australian Government & Department of the Environment and Energy 2017). The dominant land-uses in this bioregion are Crown Reserves and Unallocated Crown Land (66.7%), grazing on native pastures (17%), conservation (11.5%) and dryland agriculture (2.3%) (Cowan *et al.* 2001). The greenstone hills, alluvial valleys and broad plains of calcareous earths support diverse eucalypt woodlands. The uplands support Mallee woodlands and scrub-heaths on sandplains, gravelly sandplains and lateritic breakaways, chains of salt lakes with dwarf shrublands of samphire occur in the valleys (Cowan *et al.* 2001).

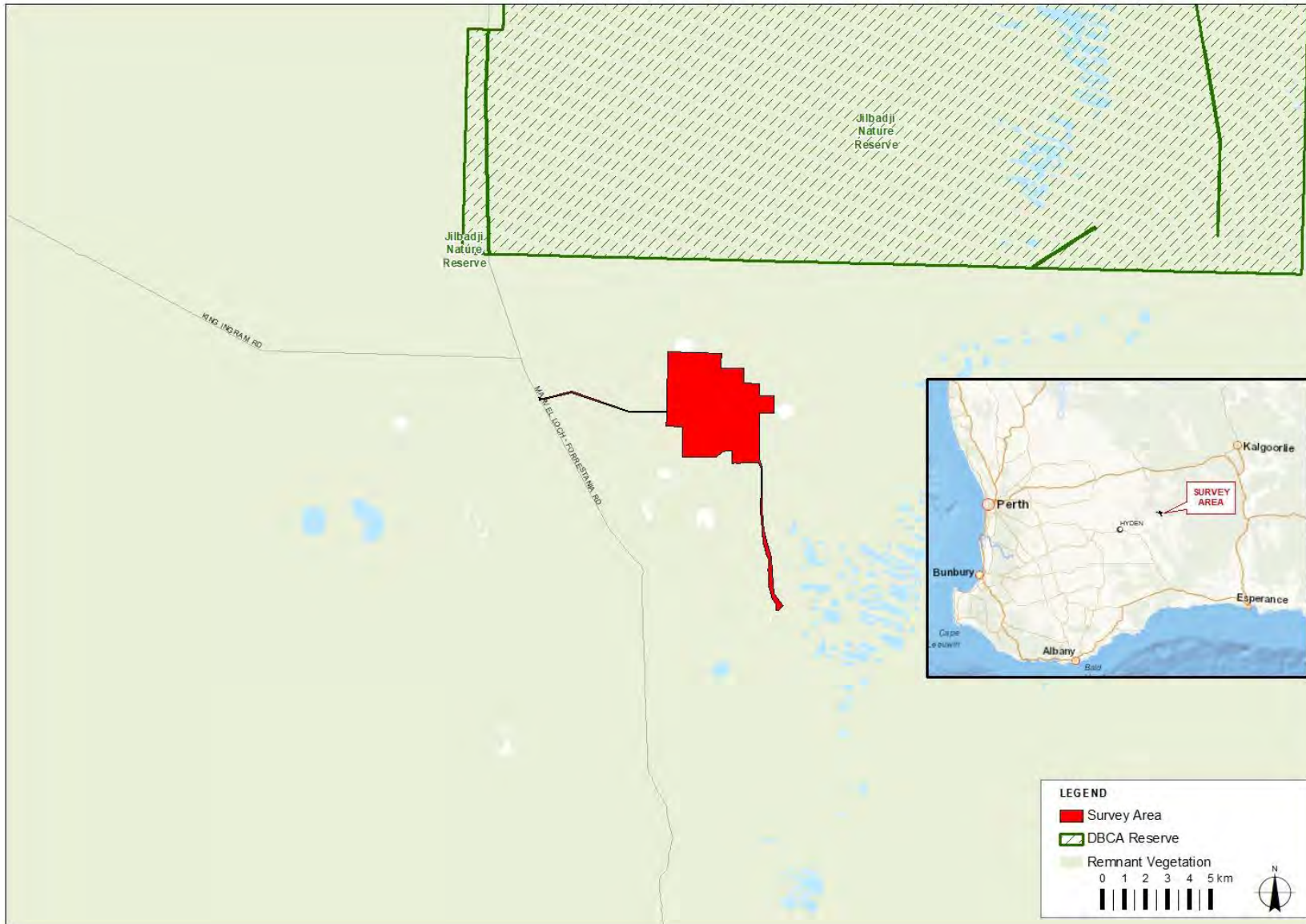


Figure 1: Project location

1.3 STATUTORY AND TECHNICAL FRAMEWORK

This environmental assessment was conducted in accordance with Commonwealth and State legislation and guidelines:

- Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)
- Western Australian Environmental Protection Act 1986 (EP Act)
- Western Australian Biodiversity Conservation Act 2016 (BC Act)
- Department of Environment Water Heritage and the Arts (DEWHA 2009) *Matters of National Environmental Significance. Significant impact guidelines 1.1 - Environment Protection and Biodiversity Conservation Act 1999.*

In addition, the Minister for the Environment has published lists of fauna species in need of special protection because they are considered rare, likely to become extinct, or are presumed extinct. The current listings were published in the Government Gazette on 11 September 2018 (Government of Western Australia 2018) and was taken into account.

As well as those listed above, the assessment complied with EPA requirements for environmental survey and reporting in Western Australia, as outlined in:

- EPA (2016b) Technical Guidance - Terrestrial Fauna Surveys, known as the Fauna Technical Guidance
- EPA (2016a) Technical Guidance - Sampling Methods for Terrestrial Vertebrate Fauna.

1.3.1 COMMONWEALTH ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

At a Commonwealth level, threatened taxa (flora and fauna) are protected under the EPBC Act, which lists species that are considered Critically Endangered, Endangered, Vulnerable, Conservation Dependant, Extinct, or Extinct in the Wild (detailed in **Table 4** in **Appendix One**).

1.3.2 WESTERN AUSTRALIAN ENVIRONMENTAL PROTECTION ACT 1986

The Western Australian EP Act was created to provide for an Environmental Protection Authority (EPA) that has the responsibility for:

- prevention, control and abatement of pollution and environmental harm
- conservation, preservation, protection, enhancement and management of the environment
- matters incidental to or connected with the above.

The EPA is responsible for providing the guidance and policy under which environmental assessments are conducted. It conducts environmental impact assessments (based on the information included in environmental assessments and provided by the proponent), initiates measures to protect the environment and provides advice to the Minister responsible for environmental matters.

1.3.3 WESTERN AUSTRALIAN BIODIVERSITY CONSERVATION ACT 2016

The Western Australian BC Act provides for the conservation, protection and ecologically sustainable use of biodiversity and biodiversity components in Western Australia. It commenced on 1 January 2019.

Threatened species (both flora and fauna) and ecological communities that meet the categories listed within the BC Act are highly protected and require authorisation by the Minister to take or disturb. These are known as Threatened Flora, Threatened Fauna and Threatened Ecological Communities. The conservation categories of Critically Endangered, Endangered and Vulnerable have been aligned with those detailed in the EPBC Act and are detailed in **Table 5** in **Appendix One**.

Flora and fauna species may be listed as being of special conservation interest if they have a naturally low population, restricted natural range, are subject to or recovering from a significant population decline or reduction of range or are of special interest, and the Minister considers that taking may result in depletion of the species. Migratory species and those subject to international agreements are also listed under the Act. These are known as specially protected species in the BC Act.

The most recent flora and fauna listings were published in the Government Gazette on 11 September 2018 (Government of Western Australia 2018).

1.3.4 WESTERN AUSTRALIAN PRIORITY FAUNA

Conservation significant fauna species are listed by the DBCA as Priority Fauna where populations are geographically restricted or threatened by local processes, or where there is insufficient information to formally assign them to threatened fauna categories. Whilst Priority Fauna are not specifically listed in the BC Act, these have a greater level of significance than other native species. The categories covering Priority Fauna species are outlined in **Table 5** in **Appendix One**.

2 DESKTOP ASSESSMENT

2.1 CONSERVATION SIGNIFICANT FAUNA SPECIES

The survey focussed on the monitoring of Malleefowl mounds identified through previous surveys and completing the training of personnel in NMRT monitoring methods. The following desktop results are provide for context on the assemblage of species that are likely to occur and possibly be detected by the trail cameras deployed at the monitored Malleefowl mounds.

2.2 PREVIOUS SURVEYS

Zoologists from Western Wildlife undertook a targeted EPA Level 2 survey in 2016/17 which included targeted surveys for both Malleefowl and Chuditch (Western Wildlife 2017). The surveys were undertaken over a 12 month period between October 2016 to November 2017 using a variety of techniques designed specifically to detect both Malleefowl and Chuditch (**Table 1**).

Table 1: Surveys undertaken by Western Wildlife between 2016 to 2017 (Western Wildlife 2017)

| Survey | Level of survey | Extent of survey | Dates of fieldwork |
|--------|--|---|----------------------|
| 1 | Level 1 fauna survey with targeted Malleefowl and Chuditch (camera trap) surveys | Survey Area A (see Figure 6) | 10 – 15 Oct 2016 |
| 2 | Level 2 (single season) fauna survey with targeted Malleefowl and Chuditch (camera trap) surveys | Focus on survey Areas A and B, plus sites in the Regional Survey Area ('Prince of Wales' and 'Van Uden') Some targeted Chuditch and Malleefowl survey in Regional Survey Area – original extent (see Figure 6) | 21 Nov – 4 Dec 2016 |
| 3 | Targeted Chuditch survey (camera traps) | Regional Survey Area – original extent (see Figure 6) | 16 Jan – 25 Feb 2017 |
| 4 | Targeted Malleefowl & Chuditch (camera trap) surveys | Malleefowl survey in the Development Envelope excluding Survey Areas A and B, with targeted Chuditch survey in the Regional Survey Area – final extent (see Figure 6) | 12 – 21 Sept 2017 |
| 5 | Level 2 (single season) fauna survey with targeted Malleefowl survey | Development envelope, excluding Survey Areas A and B (see Figure 6) | 2 – 14 Oct 2017 |
| 6 | Targeted Chuditch (cage trapping) survey | Regional Survey Area – final extent, with some Malleefowl and opportunistic surveys in the Development Envelope (see Figure 6) | 25 - 30 Nov 2017 |

Malleefowl surveys were undertaken on four occasions in October 2016; November 2016; September 2017 and October 2017. Survey area A was a large area that included the DE.

The previous surveys provided the following results as extracted from the Western Wildlife report (Western Wildlife 2017). A total of 51 Malleefowl mounds were recorded during the fauna survey, four active, eight recently active and 39 old mounds, with an additional ten instances of mound attempts that were not used for nesting. Of these, two active, four recently active and 31 old mounds were within the DE, and one recently active mound (MM-61) was just outside the edge of the DE on the bore fields road. It should be noted that the distribution of mounds is influenced by the level of survey carried out in various areas. Where areas were intensively searched the inventory of mounds is likely to be near-complete. The remaining areas, including almost all of the Regional Survey Area, were only sampled opportunistically so it is likely that many mounds remain unrecorded.

Three broad fauna habitats were identified across the Earl Grey Lithium Project DE by the Western Wildlife team:

- Mallee woodland
- Salmon Gum woodland
- Shrubland.

The survey recorded five conservation significant fauna species in the DE as follows:

- Malleefowl (*Leipoa ocellata*)– VU (EPBC Act, BC Act)
- Chuditch (*Dasyurus geoffroii*) – VU (EPBC Act, BC Act)
- Peregrine Falcon (*Falco peregrinus*)– OS (BC Act)
- Inland Western Rosella (*Platycercus icterotis* subsp. *xanthogenys*) – Priority 4 (DBCA)
- Western Brush Wallaby (*Notamacropus irma*) – Priority 4 (DBCA).

Monitoring for Malleefowl used the data collected by the Western Wildlife surveys as a starting point for the 2019 Mt Holland Malleefowl monitoring. Recent LiDAR survey data was also used to detect potential mounds post the 2017 surveys however this data was not delivered to the field team until the last few days of the survey and only limited ground truthing was able to be undertaken.

3 METHOD

3.1 FIELD SURVEY

The field survey for Malleefowl monitoring was undertaken by Ecoscape zoologists Bruce Turner and Melinda Henderson under DBCA Wildlife Licensing License No. BA27000085-2. Covalent Lithium Personnel Shane McAdam and Brigitta Longbottom also attended and participated in the training for Malleefowl mound monitoring.

3.1.1 TRAINING

The purpose of this field survey was to train Ecoscape and Covalent staff in the National Malleefowl Recovery Team (NMRT) monitoring standards and procedures for Malleefowl mounds, and to collect monitoring data on all mounds within the DE. This is to enable future annual monitoring of mounds which occur within the DE and local area by NMRT-trained personnel.

Ecoscape staff Bruce Turner and Melinda Henderson, Covalent Lithium staff Shane McAdam and Brigitta Longbottom and Carl Danzi from NMRT undertook Malleefowl mound monitoring at the Mt Holland Lithium Project during 14-23 October 2019. Carl Danzi provided training services in NMRT data collection standards for the field team.

3.1.2 MALLEEFOWL MONITORING

Mounds previously identified in the targeted Level 2 survey of 2016/17 were revisited (Western Wildlife 2017). The team, with guidance from Carl Danzi, assessed each of these mounds to determine signs of current activity and the term of monitoring which each mound should receive in future events e.g. annually, five yearly monitoring or do not monitor. LiDAR results were also ground truthed however the data was delivered towards the completion of the monitoring and therefore a limited number of potential new mounds were monitored.

At each mound a series of criteria was addressed as stated in section three of the NMRT Monitoring Manual (NMRT 2019). Each mound was recorded as either active or inactive and given a mound profile. A series of measurements and observations were taken and recorded on an android device running the CyberTracker application (provided by NMRT). Mounds were marked with a numbered star picket, photographed and cross sticks were left in place for future monitoring events. A 20 m radius was searched around active mounds only for any signs of predation. At the end of each day data collected was downloaded and verified by the NMRT trainer.

3.1.3 TRAIL CAMERA MONITORING

Trail cameras were mounted at mounds which were assessed as currently active or had evidence of recent activity (**Table 7**). Cameras were mounted on brackets attached to star pickets installed close to the mound and high enough off the ground to view the interior of the mound (**Image 1**).

The cameras are operating from late October 2019 to late January 2020. Data from the cameras was downloaded after every four to five weeks of operation for review and collation of images of species captured.

Recorded images of Malleefowl are subjected to a temporal analysis to potentially determine a population abundance. This is achieved by logging the activities undertaken at each mound recorded by date, time activity began and time the activity ended. A period of consecutive activity on a mound from start to finish was classed as an event. Any break in activity (no recorded images at the mound) was used to indicate the end of an event. Each event was determined by a break in activity on a single mound of more than two hours.

Tabulated events were used by cross referencing dates and times to determine how many birds were present at any one time. Ground truthing of LiDAR results was undertaken opportunistically when potential mounds were within the vicinity of mound searches. The remaining LiDAR targets will potentially be ground truthed in 2020.



Image 1: Typical camera deployment at a monitored mound (MM24)

4 RESULTS

4.1 NMRT TRAINING

Training was undertaken and completed over the six day period of the survey; revisiting mounds recorded in 2017. Carl Danzi from NMRT supervised personnel in the correct process and procedures for collecting monitoring data for each mound. Personnel were trained in the use of data collection on a mobile device and were guided in the assessment of mound profiling and measuring the physical aspects of a mound required for NMRT standards.

Data was reviewed each day on return to the camp and validated by Carl Danzi before being uploaded to the NMRT database online. Personnel were given the opportunity to make enquiries and ask for clarification on all aspects of the data collection procedure during the mound monitoring surveys.

All personnel successfully completed the training and were subsequently endorsed to undertake future mound monitoring by the NMRT trainer Carl Danzi, certificates are presented in **Appendix Three**.

4.2 MALLEEFOWL MOUND MONITORING

A total of 62 Malleefowl mounds were monitored and measured over the course of the survey period (**Map 1**); 43 of these were within the DE (**Table 7** in **Appendix Two**) and 22 were outside the DE. Three mounds (MM14, MM15, MM20) were not visited due to access and time constraints.

One active mound was recorded (MM23) from a total of 43 mounds within the DE (**Table 6** in **Appendix Two**) and another active mound was recorded (MM17) from a total of 22 outside the DE. The remaining 42 mounds within the DE and the remaining 21 mounds outside the DE were either inactive (used within 5 years of this survey) or were mega mounds which are long unused.

The classification of the 43 mounds monitored within the DE are listed in **Table 2** and are summarised as follows:

- one mound recorded as active and included in mounds for annual monitoring
- 16 mounds recorded as annual monitoring
- 13 mounds recorded as inactive and selected for five-year monitoring
- 14 mounds recorded as long unused and marked as Do Not Monitor (DNM).

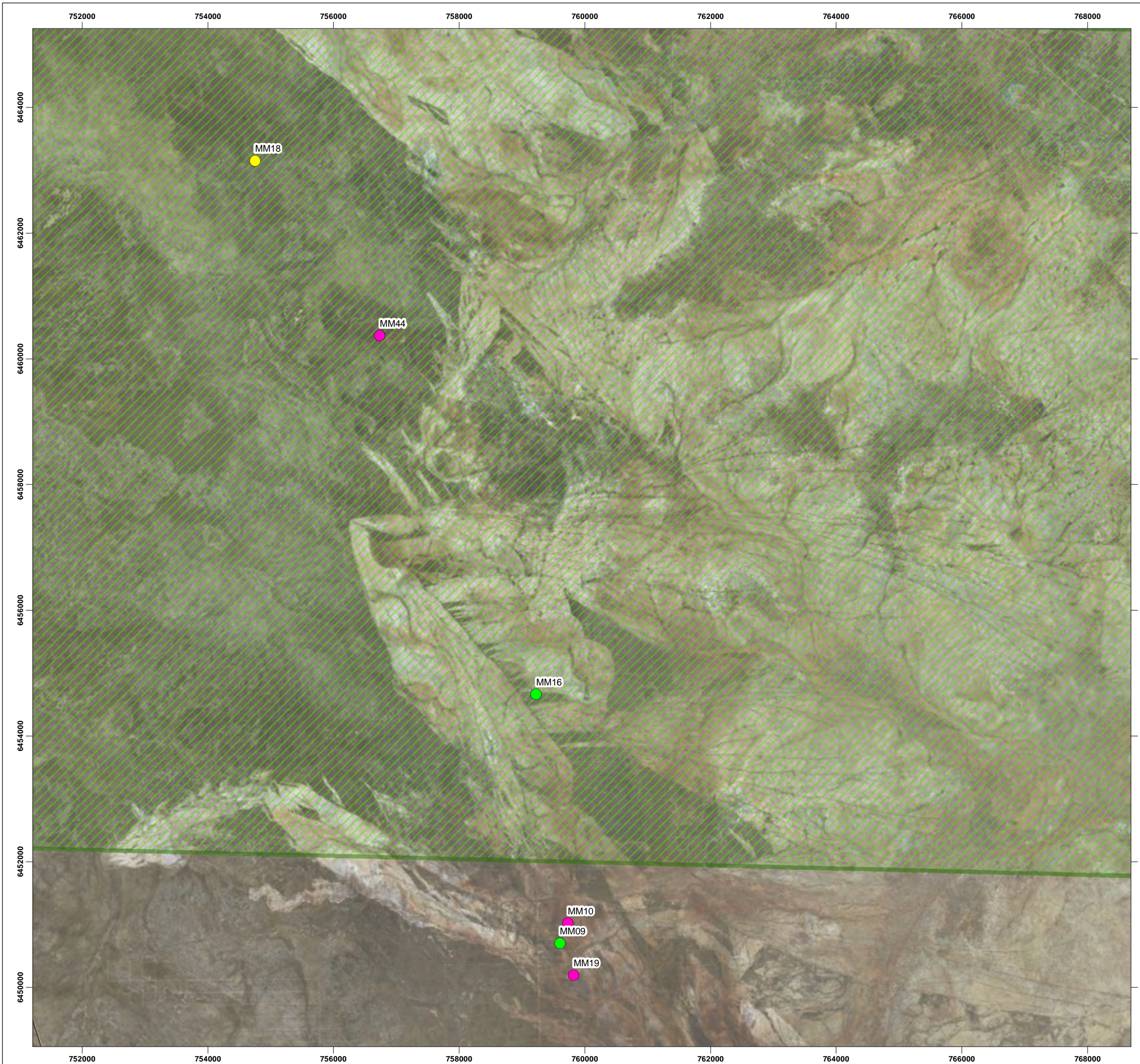
Table 2: Malleefowl mounds monitored and associated future monitoring classifications

| Monitoring Frequency | Mound Location | |
|----------------------|----------------|------------|
| | Inside DE | Outside DE |
| Annual | 16 | 12 |
| 5 year | 13 | 3 |
| Do Not Monitor | 14 | 7* |
| Total | 43 | 22 |

* includes 3 mounds not visited.

Two opportunistic records were made; a series of fresh tracks and scratching's from an adult bird was recorded on the mine entry road close to the airstrip entry, and one adult Malleefowl was sighted on the haul road close to the camp location and mound MM48 (**Map 2**).

An additional two new mounds were encountered through ground truthing of preliminary LiDAR data (MM64, MM65). Mound MM63 was found opportunistically during the survey. All three new mounds are outside of the development envelope.



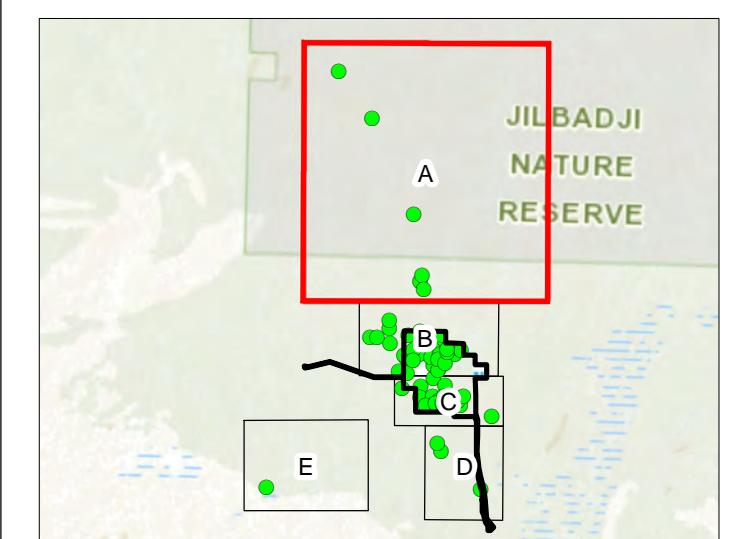
LEGEND

- Covalent Development Envelope
- DBCA Legislated Lands and Waters

Monitoring Classification

Action

- 5 YR
- ANNUAL
- DNM



**MALLEEFOWL MOUND SURVEY
MONITORED MOUNDS**

COVALENT FAUNA MONITORING

COVALENT



DATASOURCES:
SOURCE DATA: TRAP SITES (ECOSCAPE, 2019)
BASEMAP: GEOSCIENCE AUSTRALIA
SERVICE LAYERS: SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR, GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

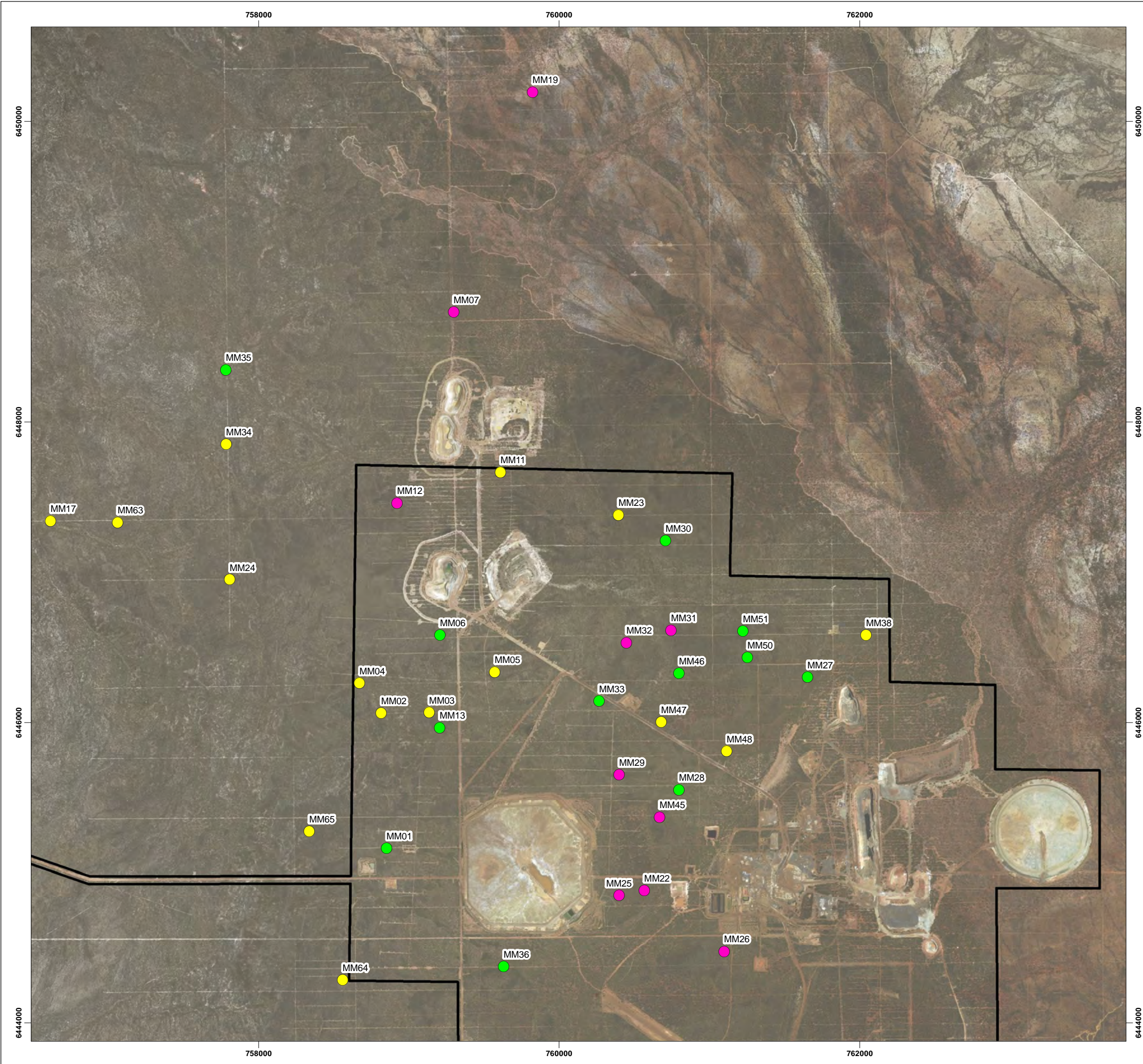
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PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1994
UNITS: METER



PROJECT NO: 4484-19

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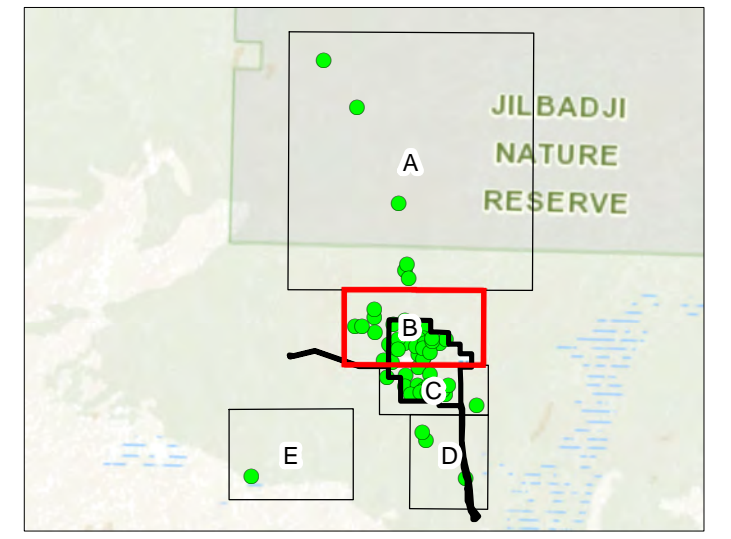
LEGEND

- Covalent Development Envelope
- DBCA Legislated Lands and Waters

Monitoring Classification

Action

- 5 YR
- ANNUAL
- DNM



MALLEEFOWL MOUND SURVEY MONITORED MOUNDS

COVALENT FAUNA MONITORING

COVALENT



DATASOURCES:
SOURCE DATA: TRAP SITES (ECOSCAPE, 2019)
BASEMAP: GEOSCIENCE AUSTRALIA
SERVICE LAYERS: SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR, GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRIID, IGN, AND THE GIS USER COMMUNITY

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DATUM: GDA 1984
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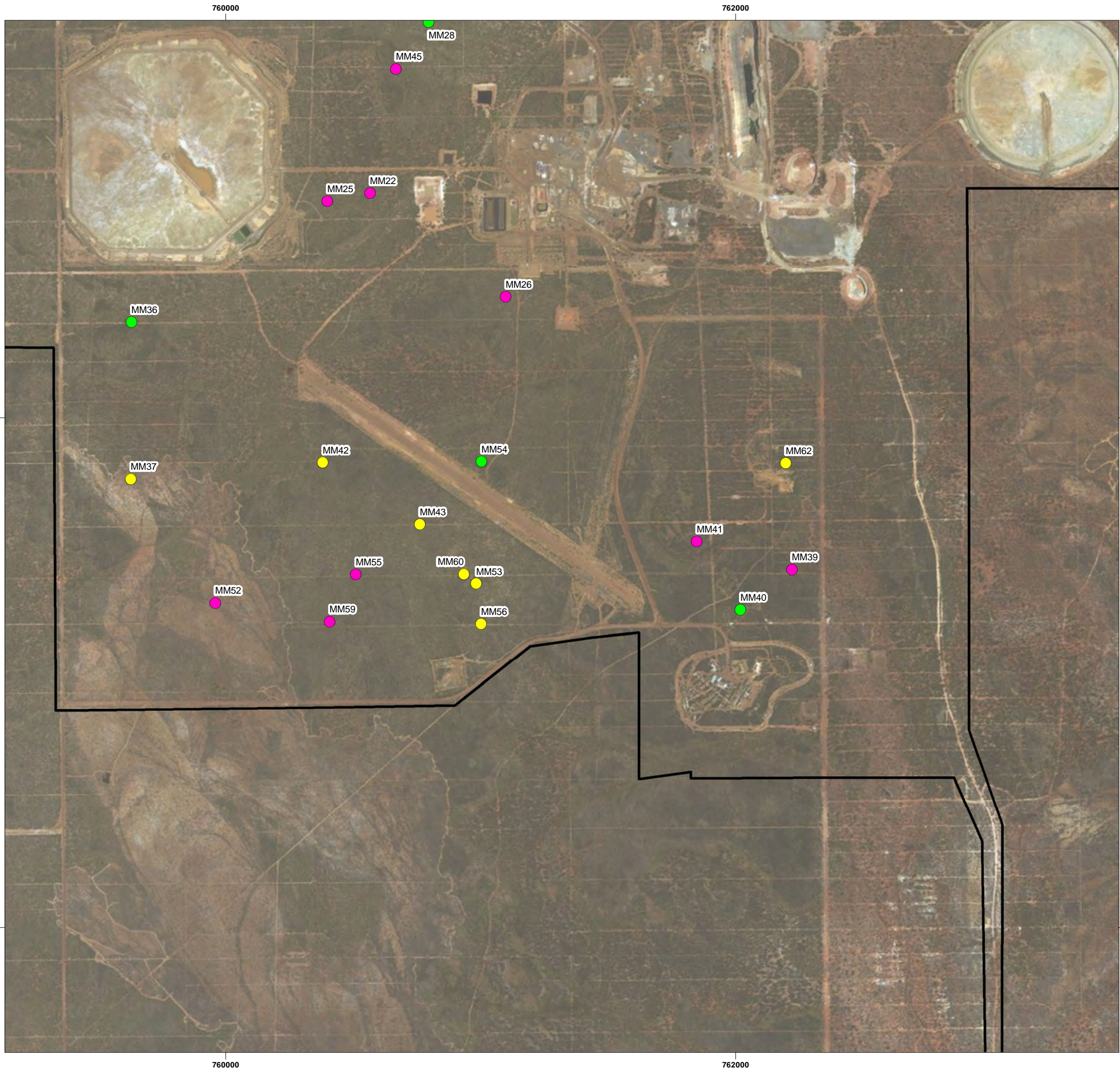


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PROJECT NO: 4484-19

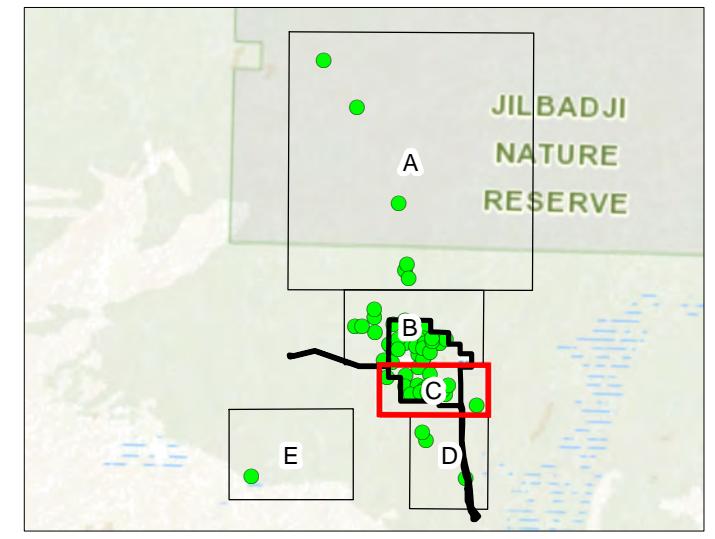
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| 01 | DR | SB | 18/12/2019 |

01-B



LEGEND

- Covalent Development Envelope
- DBCA Legislated Lands and Waters
- Monitoring Classification**
- Action**
- 5 YR
- ANNUAL
- DNM



**MALLEEFOWL MOUND SURVEY
MONITORED MOUNDS**

COVALENT FAUNA MONITORING

COVALENT



DATASOURCES:
SOURCE DATA: TRAP SITES (ECOSCAPE, 2019)
BASEMAP: GEOSCIENCE AUSTRALIA
SERVICE LAYERS: SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR, GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

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MAP

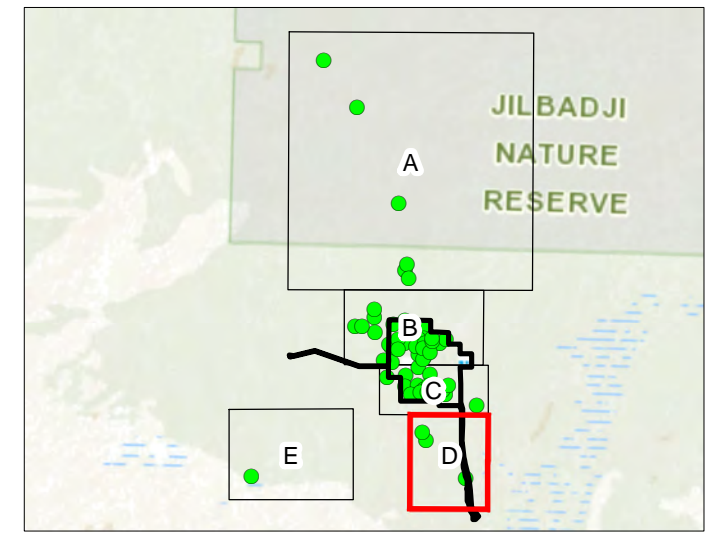
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01-C



- LEGEND**
- Covalent Development Envelope
 - DBCA Legislated Lands and Waters
- Monitoring Classification**
- Action**
- 5 YR
 - ANNUAL
 - DNM



**MALLEEFOWL MOUND SURVEY
MONITORED MOUNDS**

COVALENT FAUNA MONITORING

COVALENT



DATASOURCES:
SOURCE DATA: TRAP SITES (ECOSCAPE, 2019)
BASEMAP: GEOSCIENCE AUSTRALIA
SERVICE LAYERS: SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR, GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRIID, IGN, AND THE GIS USER COMMUNITY

COORDINATE SYSTEM: GDA 1984 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1984
UNITS: METER



PROJECT NO: 4484-19

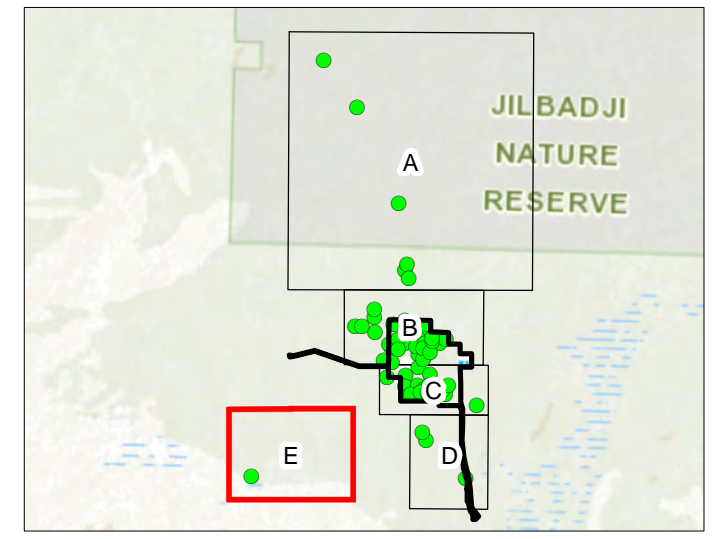
| REV | AUTHOR | APPROVED | DATE |
|-----|--------|----------|------------|
| 00 | SB | BT | 07/11/2019 |
| 01 | DR | SB | 18/12/2019 |

MAP

01-D



- LEGEND**
- Covalent Development Envelope
 - DBCA Legislated Lands and Waters
- Monitoring Classification**
- Action**
- 5 YR
 - ANNUAL
 - DNM



MALLEEFOWL MOUND SURVEY MONITORED MOUNDS

COVALENT FAUNA MONITORING

COVALENT



DATASOURCES:
SOURCE DATA: TRAP SITES (ECOSCAPE, 2019)
BASEMAP: GEOSCIENCE AUSTRALIA
SERVICE LAYERS: SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR, GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

COORDINATE SYSTEM: GDA 1984 MGA ZONE 50
PROJECTION: TRANSVERSE MERCATOR
DATUM: GDA 1984
UNITS: METER

SCALE: 1:24,000 @ A3

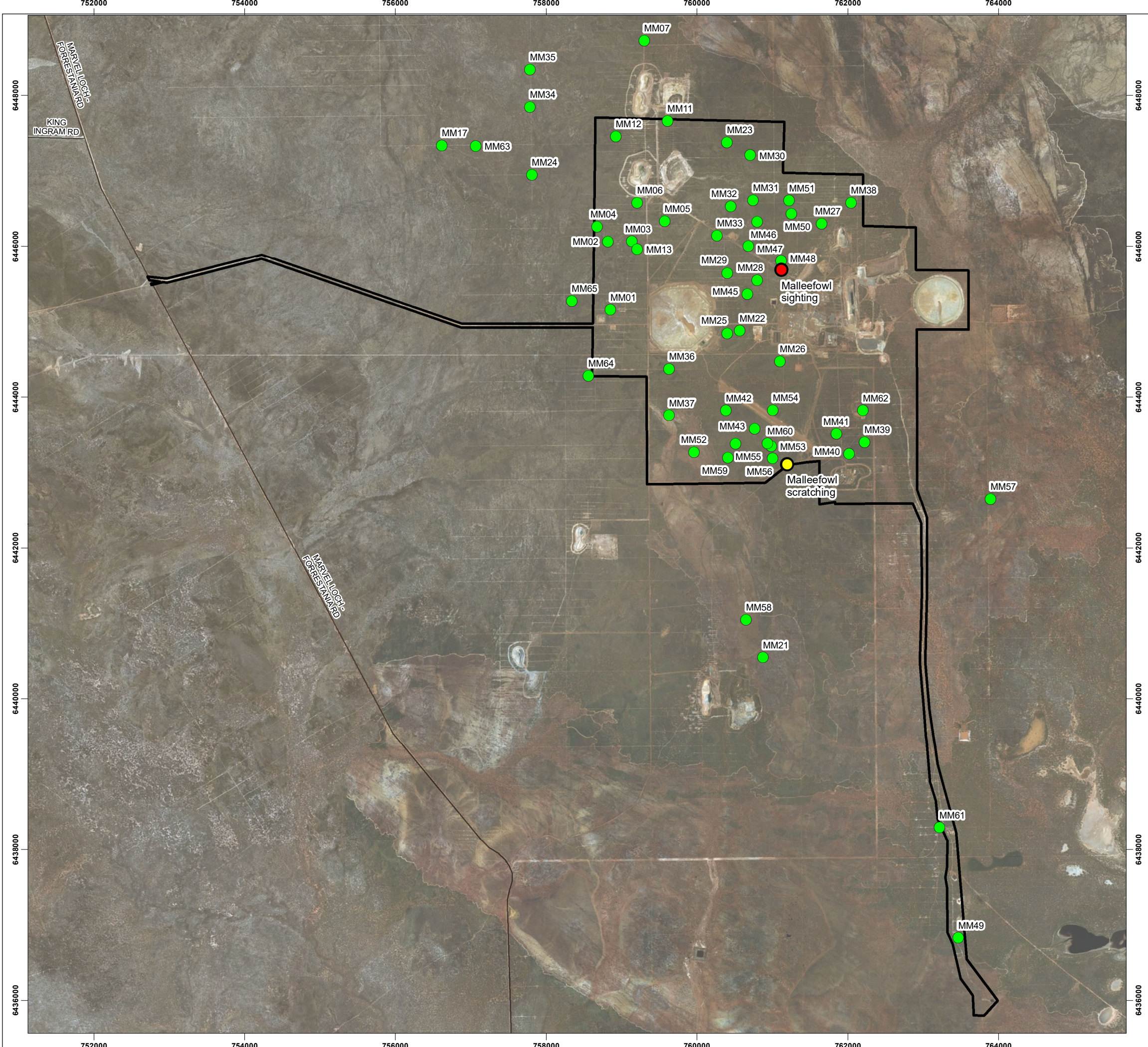


MAP

PROJECT NO: 4484-19

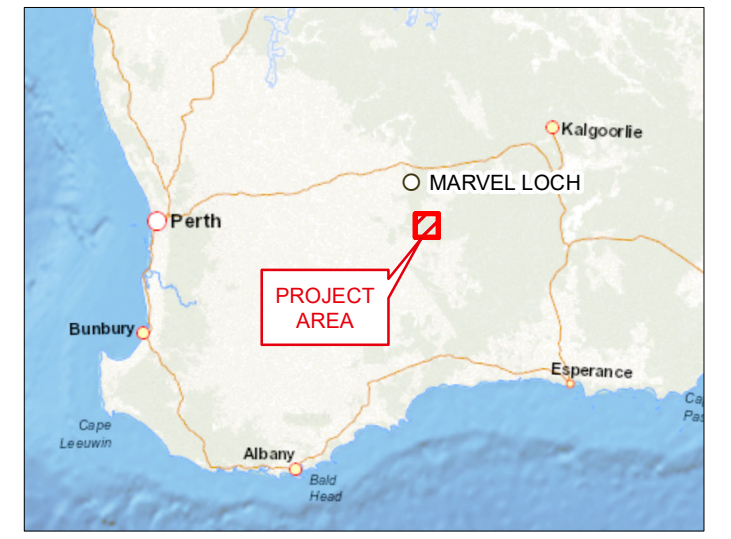
| REV | AUTHOR | APPROVED | DATE |
|-----|--------|----------|------------|
| 00 | SB | BT | 07/11/2019 |
| 01 | DR | SB | 18/12/2019 |

01-E



LEGEND

- Covalent Development Envelope
- DBCA Legislated Lands and Waters
- Type**
- Malleefowl scratching
- Malleefowl sighting
- Monitored Mounds 2019



MALLEEFOWL SIGHTINGS

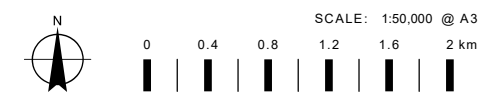
COVALENT FAUNA MONITORING

COVALENT



DATASOURCES:
 SOURCE DATA: TRAP SITES (ECOSCAPE, 2019)
 AERIAL: MOUNT HOLLAND MOSAIC (COVALENT, 2019)
 BASEMAP: GEOSCIENCE AUSTRALIA
 SERVICE LAYERS: SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR, GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRIID, IGN, AND THE GIS USER COMMUNITY

COORDINATE SYSTEM: GDA 1984 MGA ZONE 50
 PROJECTION: TRANSVERSE MERCATOR
 DATUM: GDA 1984
 UNITS: METER



PROJECT NO: 4484-19

| REV | AUTHOR | APPROVED | DATE |
|-----|--------|----------|------------|
| 00 | SB | BT | 07/11/2019 |
| 01 | DR | SB | 18/12/2019 |

MAP
02

4.3 TRAIL CAMERA IMAGE REVIEW (OCTOBER TO DECEMBER 2019)

A total of 39 cameras were placed at active mounds and mounds which had been active within the past five years, 32 of these being located within the DE and 7 located outside the DE (**Map 1**). **Table 6** and **Table 7** in **Appendix Two** give the locations for all Malleefowl mounds monitored during the survey and the mounds at which trail cameras were placed (**Map 3**).

All of the cameras were revisited in November 2019 to have batteries replaced and image data downloaded. The downloaded data was collated into folders for each monitored mound and then reviewed. The review process involved removing images with no fauna present (e.g. wind moving shrubs) and then sorting images with fauna present into species subfolders. Where images of Malleefowl were recorded these were further categorised into temporal listings to provide an understanding of the frequency that Malleefowl attend to the mounds.

Table 8 (Appendix Two) lists the full species assemblage recorded by the cameras on the monitored mounds. One Chuditch, two Varanid species and a Feral Cat were recorded on mounds indicating predators of Malleefowl eggs were active at the time of survey.

4.3.1 MALLEEFOWL

Images of Malleefowl were reviewed for behaviour e.g. scratching or egg laying and the results tabulated. Other species captured are also tabulated with the mound location, date and time. All results are discussed with respect to possible abundance based on timing of image capture.

Six camera monitored Malleefowl mounds recorded Malleefowl and were mapped to indicate their spatial relationship to each other (**Map 3**). Five of these mounds were inside the DE and remain targets for future monitoring.

Mound MM23 recorded images of a pair of Malleefowl scratching and laying and maintains its status as active (**Image 2**).



Image 2: Malleefowl recorded at mound MM23

Mound MM17 recorded images of a pair of Malleefowl scratching and laying and maintains its status as active. This mound is outside of the DE to the west of the Earl Grey pit and recorded two birds visiting and maintaining the mound (**Image 3**).



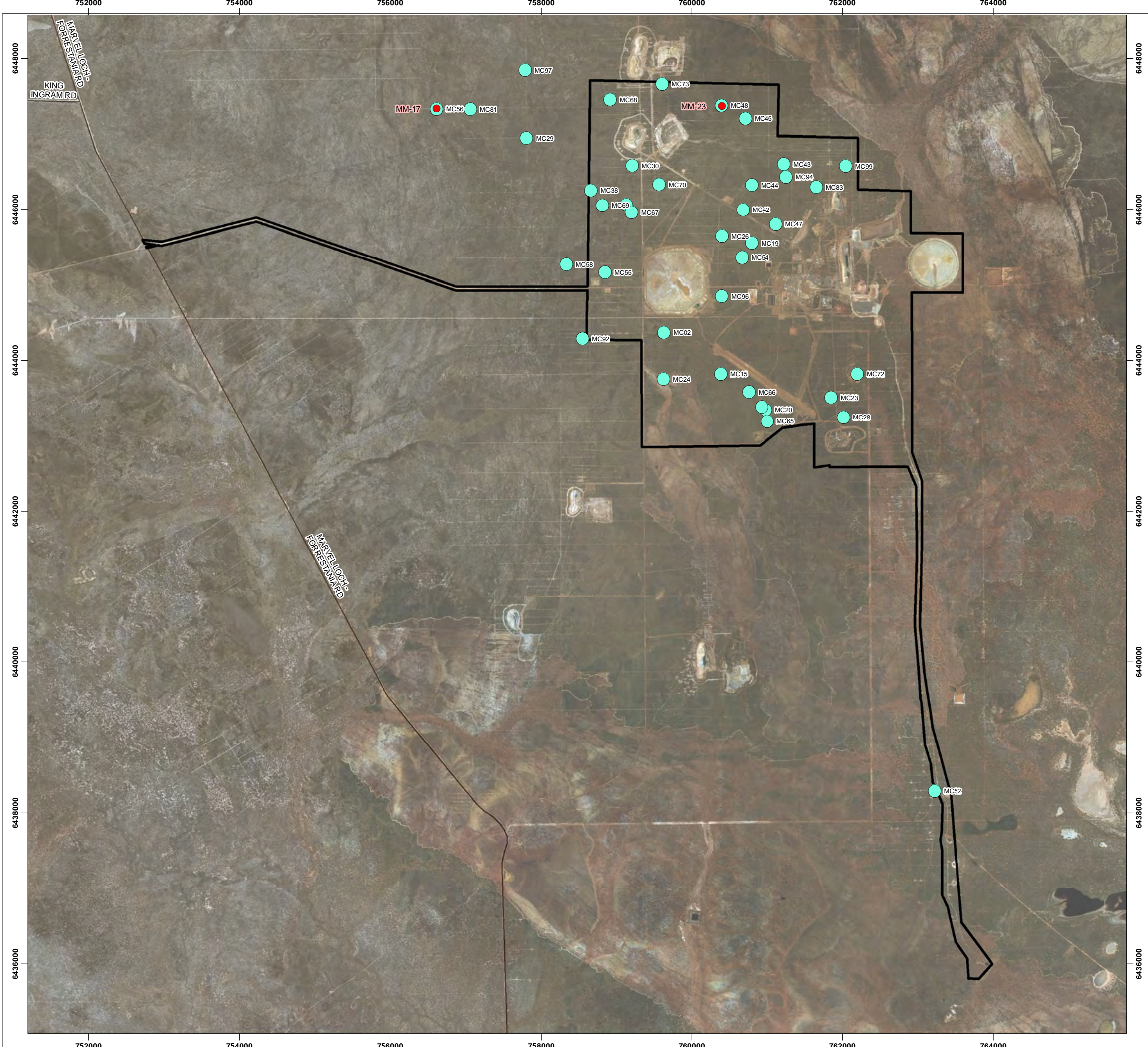
Image 3: Malleefowl at mound MM17

Mound MM56 recorded one Malleefowl on two occasions and was not changed in status as no consistent scratching behaviour or subsequent visit was recorded.

Mound MM53 recorded one Malleefowl on one occasion only and was not changed in status as no consistent scratching behaviour or subsequent visit was recorded.

Mound MM01 recorded one Malleefowl on one occasion only and was not changed in status as no consistent scratching behaviour or subsequent visit was recorded.

Mound MM62 recorded one Malleefowl on one occasion only and was not changed in status as no consistent scratching behaviour or subsequent visit was recorded.



- LEGEND**
- Covalent Development Envelope
 - DBCA Legislated Lands and Waters
 - Camera Monitored Mounds
 - Active Malleefowl Mound



**MALLEEFOWL MOUND SURVEY
CAMERA MONITORED MOUNDS**

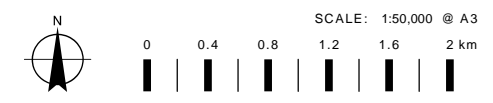
COVALENT FAUNA MONITORING

COVALENT



DATASOURCES:
 SOURCE DATA: TRAP SITES (ECOSCAPE, 2019)
 AERIAL: MOUNT HOLLAND MOSAIC (COVALENT, 2019)
 BASEMAP: GEOSCIENCE AUSTRALIA
 SERVICE LAYERS: SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRIID, IGN, AND THE GIS USER COMMUNITY

COORDINATE SYSTEM: GDA 1984 MGA ZONE 50
 PROJECTION: TRANSVERSE MERCATOR
 DATUM: GDA 1984
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PROJECT NO: 4484-19

| REV | AUTHOR | APPROVED | DATE |
|-----|--------|----------|------------|
| 00 | SB | BT | 07/11/2019 |
| 01 | DR | SB | 18/12/2019 |

**MAP
03**

4.3.2 OTHER SPECIES

Chuditch (**Image 4**); wallaby, goanna; Emu and Crested Dragon where all recorded visiting mounds together with a suite of small woodland bird species (**Appendix Two, Table 8**).



Image 4: Chuditch recorded at mound MM56

4.3.3 INTRODUCED PREDATORS

Introduced predator images of Feral cat were recorded by the cameras set on Malleefowl mounds (**Image 5**). Feral cat was recorded at both active Malleefowl mounds (mounds MM17 and MM23) and was also recorded at mounds MM04 and MM63. This is of concern for the persistence of Malleefowl and Chuditch in the local region.



Image 5: Feral Cat recorded at mound MM63

4.3.4 TEMPORAL ANALYSIS

An analysis was performed using the recorded images of Malleefowl to determine an estimate of population abundance (**Table 3**). Images were reviewed for Malleefowl occurrences and then compared to the time of recording to determine an estimate of abundance. Abundance was estimated by applying a criteria to the timings in that one event of Malleefowl occurrence was counted where multiple images were separated by more than 30 minutes in time. Using this criteria 24 events of Malleefowl were recorded at six different mounds with three of these events recording two Malleefowl in the one event at the same mound (**Table 3**). The analysis determined that there is possibly seven individual Malleefowl within the area of the monitored mounds.

Table 3: Malleefowl mound temporal analysis

| Mound ID | Camera ID | Location | Malleefowl abundance | Date | Event start | Event finish |
|----------|-----------|------------|----------------------|------------|-------------|--------------|
| MM53 | MC020 | Inside DE | 1 | 4/11/2019 | 7:05 | 7:06 |
| MM01 | MC055 | Inside DE | 1 | 13/11/2019 | 15:24 | 15:24 |
| MM56 | MC065 | Inside DE | 1 | 4/11/2019 | 6:51 | 6:51 |
| MM62 | MC072 | Inside DE | 1 | 30/10/2019 | 6:10 | 6:10 |
| MM62 | MC072 | Inside DE | 1 | 7/11/2019 | 7:58 | 8:05 |
| MM23 | MC048 | Inside DE | 1 | 20/10/2019 | 9:59 | 10:31 |
| MM23 | MC048 | Inside DE | 1 | 26/10/2019 | 10:53 | 12:06 |
| MM17 | MC056 | Outside DE | 1 | 22/10/2019 | 8:21 | 14:12 |
| MM17 | MC056 | Outside DE | 1 | 22/10/2019 | 17:27 | 17:27 |
| MM17 | MC056 | Outside DE | 1 | 23/10/2019 | 6:41 | 7:07 |
| MM17 | MC056 | Outside DE | 1 | 24/10/2019 | 6:36 | 10:05 |
| MM17 | MC056 | Outside DE | 1 | 24/10/2019 | 12:47 | 12:50 |
| MM17 | MC056 | Outside DE | 2 | 28/10/2019 | 5:44 | 9:09 |
| MM17 | MC056 | Outside DE | 1 | 30/10/2019 | 16:05 | 17:36 |
| MM17 | MC056 | Outside DE | 2 | 2/11/2019 | 7:54 | 14:44 |
| MM17 | MC056 | Outside DE | 2 | 2/11/2019 | 17:00 | 17:02 |
| MM17 | MC056 | Outside DE | 1 | 3/11/2019 | 7:47 | 12:58 |
| MM17 | MC056 | Outside DE | 1 | 3/11/2019 | 15:40 | 16:21 |
| MM17 | MC056 | Outside DE | 1 | 5/11/2019 | 6:54 | 13:25 |
| MM17 | MC056 | Outside DE | 1 | 5/11/2019 | 17:19 | 17:28 |
| MM17 | MC056 | Outside DE | 1 | 7/11/2019 | 10:55 | 10:57 |
| MM17 | MC056 | Outside DE | 1 | 7/11/2019 | 18:24 | 18:37 |
| MM17 | MC056 | Outside DE | 1 | 10/11/2019 | 6:37 | 7:42 |
| MM17 | MC056 | Outside DE | 1 | 10/11/2019 | 16:37 | 17:19 |

Six Malleefowl mounds recorded visitation events. Mound MM17 had the greatest activity with 17 separate events recorded over 19 days, with events recorded in the morning and again in the afternoon. Active mound MM23 recorded two separate events six days apart. Mound MM62 also recorded two visitation events but no time was invested digging or scratching by the individual (**Image 6**).



Image 6; Mound MM62 Malleefowl record

Mound MM62 and MM17 recorded data on 30 October. Due to the spatial separation of the mounds and time difference (morning and evening) these records are expected to be separate individuals.

An individual Malleefowl was observed on the morning of 4 November visiting mound MM53 and 14 minutes later at mound MM56. These mounds are approximately 163 m apart, so it is feasible for a single bird to have visited both mounds within the time frame. No other mounds recorded activity on the same date.

It is estimated that that in addition to the two breeding pairs at mounds MM23 and MM17 there is also three individual adult birds within the local population.

Active mounds were not maintained daily with up to three consecutive days of no maintenance at mound MM17 and up to six consecutive days of no maintenance at mound MM23. Activity at mound MM23 ceased after the 26 November for no apparent reason. Both mounds were visited by a Feral cat which did not appear to impact on the birds return or activity on the mound.

5 DISCUSSION AND RECOMMENDATIONS

5.1 MALLEEFOWL POPULATION

5.1.1 MALLEEFOWL MOUND MONITORING

The results of the Malleefowl mound monitoring and the review of the recorded images of Malleefowl at mounds has provided baseline data that can be used to compare future monitoring results for the Covalent Lithium Mt Holland Project site.

There is one active mound and 30 inactive mounds within the DE that require annual monitoring as a result of the monitoring. There are 14 mounds within the DE that were determined to be either not mounds or long unused mounds that were assigned as Do Not Monitor using NMRT monitoring methods.

Table 8 (Appendix Two) lists all the mounds that will be monitored in the future monitoring program.

5.1.2 TEMPORAL ANALYSIS

A temporal analysis of Malleefowl images determined a Malleefowl population estimate of two breeding pairs, and another three individuals currently inhabiting the DE and the immediate surrounding landscape (**Table 3**).

The two active mounds at MM23 and MM17 were active consecutively so it is feasible to estimate that there are two breeding pairs within the local area. The individual Malleefowl seen visiting MM53 and MM56 could potentially be one of the two pairs or a separate individual. It is difficult to give a definitive number as images cannot distinguish between individuals and therefore the estimate of seven individuals is most likely optimistic and erring on a precautionary aspect.

It is unknown why activity at mound MM23 was so sporadic (6 days with no maintenance) and the reason for cessation of activity on the 26 November.

5.1.3 INTRODUCED PREDATORS

Over the period of camera monitoring four different mounds were visited by a Feral Cat. This included both active Malleefowl mounds. These mounds are all located within the northern part of the study area and the images recorded show distinguishing stripe patterns suitable to confirm that the cat seen on all cameras is the same individual.

5.2 RECOMMENDATIONS

These recommendations are made without knowledge of the possible conditions of approval and pertain to monitoring of the likely Malleefowl population within the overall project area and are aligned with the guidelines of the NMRT Monitoring Manual (2019).

Monitoring of mounds both within and outside of the DE may provide insight on the number of birds breeding and foraging that may be impacted by potential clearing activity.

To provide Malleefowl population health and abundance data the following aspects are recommended to be monitored annually:

- Trail camera monitoring during the egg incubation season (September to January) of all Malleefowl mounds that have been identified as annual, within and adjacent to the DE. Each active mound (i.e. a mound that has Malleefowl images recorded) indicates one breeding pair.
- Implement agreed buffer zone around active mounds and update Covalent GIS data.
- Maintain database of Malleefowl sightings within a fauna register and report annually on number and location of active mounds.
- Collate image data and report on status of all monitored mounds.
- Collate and report on records of sightings of feral predators and images captured on cameras at the monitored mounds.
- Complete ground truthing of LiDAR data within the DE.
- Commence development of a procedure for removal of mounds.

The recommendation for development of a mound removal procedure is dependent on approval from relevant regulators and is likely to be restricted to February to August once active mounds are no longer producing hatchlings. Ecoscape is hopeful that inactive and long unused mounds could be approved for removal at any time of the year. It should be noted that Malleefowl have been recorded as using inactive and long unused mounds to commence new mounds and is the reason that NMRT stipulate that all mounds should be monitored without exception.

Mitigation measures that could be implemented for mound removal could be achieved by the following;

- spoil from removed mounds could be used to create potential mounds in areas outside of the DE and should be monitored accordingly. A number of recorded mounds showed evidence that spoil piles from previous drill line clearing had been utilised by Malleefowl to build mounds. An example is mound MM08 outside of the DE area that showed the mound had been built over drilling sample bags (**Image 7**).
- implement an annual fox and cat baiting program around the DE to control feral predators
- commit to future monitoring of mounds adjacent to the DE to provide evidence of continued presence of Malleefowl.

One factor that may influence the removal of mounds is that as it is now known where and how many mounds are active within the DE for the 2019 incubation season, this being one mound (MM23), and therefore one pair of birds. This could lead to the assumption that the impact is a known factor and the removal of all inactive and long unused mounds may not be considered a significant impact on one pair of Malleefowl within the local region that consists of vast areas of suitable habitat outside of the DE.

The preliminary LiDAR data indicated 17 potential mounds within four km of MM23 which are north of the DE. These potential mounds are yet to be ground truthed, but they are considered highly likely to be mounds according to the LiDAR algorithm. Given the historical evidence that Malleefowl use old mounds (and anecdotal evidence of favouring drill track spoil heaps), it is likely that the Malleefowl pair currently using MM23 will have many alternative sites to build a new mound.



Image 7: Mound MM08 showing sample bags under mound spoil to the right

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APPENDIX ONE

DEFINITIONS AND CRITERIA

Table 4: EPBC Act categories for flora and fauna

| <i>EPBC ACT 1999 category</i> | Definition |
|-----------------------------------|---|
| Extinct | A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died. |
| Extinct in the wild | A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time: <ul style="list-style-type: none"> (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form. |
| Critically Endangered (CE) | A native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria. |
| Endangered (EN) | A native species is eligible to be included in the endangered category at a particular time if, at that time: <ul style="list-style-type: none"> (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria. |
| Vulnerable (VU) | A native species is eligible to be included in the vulnerable category at a particular time if, at that time: <ul style="list-style-type: none"> (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria. |
| Conservation Dependent | A native species is eligible to be included in the conservation dependent category at a particular time if, at that time: <ul style="list-style-type: none"> (a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or (b) the following subparagraphs are satisfied: <ul style="list-style-type: none"> (i) the species is a species of fish; (ii) the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species. |

Table 5: Conservation codes for Western Australian flora and fauna (DBCA 2019)

| Conservation Codes for Western Australian Flora and Fauna | |
|--|---|
| Threatened, Extinct and Specially Protected fauna or flora ¹ are species ² which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such. | |
| The Wildlife Conservation (Specially Protected Fauna) Notice 2018 and the Wildlife Conservation (Rare Flora) Notice 2018 have been transitioned under regulations 170, 171 and 172 of the Biodiversity Conservation Regulations 2018 to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the Biodiversity Conservation Act 2016. | |
| Categories of Threatened, Extinct and Specially Protected fauna and flora are: | |
| T | <p>Threatened species</p> <p>Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the <i>Biodiversity Conservation Act 2016</i> (BC Act).</p> <p>Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i> for Threatened Fauna.</p> <p>Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> for Threatened Flora.</p> <p>The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.</p> |
| CR | <p>Critically endangered species</p> <p>Threatened species considered to be "<i>facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines</i>".</p> <p>Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i> for critically endangered fauna or the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> for critically endangered flora.</p> |
| EN | <p>Endangered species</p> <p>Threatened species considered to be "<i>facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines</i>".</p> <p>Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i> for endangered fauna or the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> for endangered flora.</p> |
| VU | <p>Vulnerable species</p> <p>Threatened species considered to be "<i>facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines</i>".</p> <p>Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i> for vulnerable fauna or the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> for vulnerable flora.</p> |
| Extinct species | |
| Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild. | |
| EX | <p>Extinct species</p> <p>Species where "<i>there is no reasonable doubt that the last member of the species has died</i>", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).</p> <p>Published as presumed extinct under schedule 4 of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i> for extinct fauna or the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> for extinct flora.</p> |
| EW | <p>Extinct in the wild species</p> <p>Species that "<i>is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form</i>", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).</p> <p>Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.</p> |
| Specially protected species | |
| Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection. | |
| Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species. | |

| Conservation Codes for Western Australian Flora and Fauna | |
|--|---|
| MI | <p>Migratory species</p> <p>Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).</p> <p>Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the <i>Convention on the Conservation of Migratory Species of Wild Animals</i> (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.</p> <p>Published as migratory birds protected under an international agreement under schedule 5 of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i>.</p> |
| CD | <p>Species of special conservation interest (conservation dependent fauna)</p> <p>Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).</p> <p>Published as conservation dependent fauna under schedule 6 of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i>.</p> |
| OS | <p>Other specially protected species</p> <p>Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).</p> <p>Published as other specially protected fauna under schedule 7 of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i>.</p> |
| P | <p>Priority species</p> <p>Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora.</p> <p>Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.</p> <p>Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.</p> |
| 1 | <p>Priority 1: Poorly-known species</p> <p>Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation.</p> <p>Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.</p> |
| 2 | <p>Priority 2: Poorly-known species</p> <p>Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.</p> |
| 3 | <p>Priority 3: Poorly-known species</p> <p>Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.</p> |
| 4 | <p>Priority 4: Rare, Near Threatened and other species in need of monitoring</p> <p>(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands.</p> <p>(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent.</p> <p>(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.</p> |
| <p>¹ The definition of flora includes algae, fungi and lichens.</p> <p>² Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).</p> | |

APPENDIX TWO

SURVEY RESULTS

Table 6: Malleefowl mounds visited and monitored during the survey

| Mound Identifier | Date | New or Revisited Mound | Easting | Northing | Action |
|------------------|-------------------|------------------------|------------------|-------------------|-----------------------|
| *MM01 | 17/10/2019 | revisited | 758850.46 | 6445161.57 | 5 YR |
| *MM02 | 17/10/2019 | revisited | 758814.45 | 6446062.10 | ANNUAL |
| *MM03 | 15/10/2019 | revisited | 759133.71 | 6446066.50 | ANNUAL |
| *MM04 | 17/10/2019 | revisited | 758671.41 | 6446261.45 | ANNUAL |
| *MM05 | 17/10/2019 | revisited | 759571.05 | 6446334.56 | ANNUAL |
| *MM06 | 17/10/2019 | revisited | 759206.90 | 6446581.35 | 5 YR |
| MM07 | 18/10/2019 | revisited | 759306.00 | 6448715.00 | DNM |
| MM08 | 20/10/2019 | revisited | 750445.19 | 6438407.38 | ANNUAL |
| MM09 | 19/10/2019 | revisited | 759604.13 | 6450699.88 | 5 YR |
| MM10 | 19/10/2019 | revisited | 759730.72 | 6451022.27 | DNM |
| *MM11 | 18/10/2019 | revisited | 759608.78 | 6447663.71 | ANNUAL |
| *MM12 | 18/10/2019 | revisited | 758920.84 | 6447458.32 | DNM |
| *MM13 | 17/10/2019 | revisited | 759204.10 | 6445963.53 | 5 YR |
| MM14 | | NOT MONITORED | | | - |
| MM15 | | NOT MONITORED | | | - |
| MM16 | 19/10/2019 | revisited | 759224.28 | 6454662.70 | 5 YR |
| MM17 | 17/10/2019 | revisited | 756616.66 | 6447339.36 | ACTIVE; ANNUAL |
| MM18 | 18/10/2019 | revisited | 754750.80 | 6463148.98 | ANNUAL |
| MM19 | 19/10/2019 | revisited | 759823.36 | 6450193.69 | DNM |
| MM20 | | NOT MONITORED | | | - |
| MM21 | 19/10/2019 | revisited | 760873.70 | 6440549.62 | ANNUAL |
| *MM22 | 17/10/2019 | revisited | 760572.00 | 6444886.00 | DNM |
| *MM23 | 15/10/2019 | revisited | 760393.67 | 6447381.41 | ACTIVE; ANNUAL |
| MM24 | 18/10/2019 | revisited | 757807.78 | 6446949.68 | ANNUAL |
| *MM25 | 16/10/2019 | revisited | 760398.02 | 6444848.90 | DNM |
| *MM26 | 17/10/2019 | revisited | 761097.59 | 6444474.57 | DNM |
| *MM27 | 15/10/2019 | revisited | 761651.63 | 6446301.61 | 5 YR |
| *MM28 | 16/10/2019 | revisited | 760796.08 | 6445552.20 | 5 YR |
| *MM29 | 16/10/2019 | revisited | 760398.40 | 6445650.18 | DNM |
| *MM30 | 15/10/2019 | revisited | 760706.64 | 6447208.88 | 5 YR |
| *MM31 | 15/10/2019 | revisited | 760743.19 | 6446612.82 | DNM |
| *MM32 | 15/10/2019 | revisited | 760446.63 | 6446530.13 | DNM |
| *MM33 | 15/10/2019 | revisited | 760265.72 | 6446143.08 | 5 YR |
| MM34 | 18/10/2019 | revisited | 757784.40 | 6447850.35 | ANNUAL |
| MM35 | 18/10/2019 | revisited | 757782.98 | 6448346.61 | 5 YR |
| *MM36 | 17/10/2019 | revisited | 759630.33 | 6444374.56 | 5 YR |
| *MM37 | 17/10/2019 | revisited | 759627.84 | 6443759.56 | ANNUAL |
| *MM38 | 15/10/2019 | revisited | 762041.07 | 6446580.55 | ANNUAL |
| *MM39 | 16/10/2019 | revisited | 762219.00 | 6443405.00 | DNM |
| *MM40 | 16/10/2019 | revisited | 762018.78 | 6443245.98 | 5 YR |
| *MM41 | 16/10/2019 | revisited | 761847.73 | 6443513.66 | DNM |
| *MM42 | 15/10/2019 | revisited | 760380.82 | 6443823.55 | ANNUAL |
| *MM43 | 15/10/2019 | revisited | 760762.25 | 6443581.31 | ANNUAL |
| MM44 | 18/10/2019 | revisited | 756735.09 | 6460365.86 | DNM |
| *MM45 | 16/10/2019 | revisited | 760667.08 | 6445368.62 | DNM |
| *MM46 | 15/10/2019 | revisited | 760796.61 | 6446325.78 | 5 YR |
| *MM47 | 15/10/2019 | revisited | 760678.55 | 6446002.24 | ANNUAL |
| *MM48 | 15/10/2019 | revisited | 761113.91 | 6445807.59 | ANNUAL |
| *MM49 | 18/10/2019 | revisited | 763460.00 | 6436828.00 | DNM |
| *MM50 | 15/10/2019 | revisited | 761250.79 | 6446432.87 | 5 YR |
| *MM51 | 15/10/2019 | revisited | 761222.70 | 6446607.56 | 5 YR |
| *MM52 | 16/10/2019 | revisited | 759958.90 | 6443272.68 | DNM |
| *MM53 | 16/10/2019 | revisited | 760983.09 | 6443348.36 | ANNUAL |
| *MM54 | 15/10/2019 | revisited | 761003.17 | 6443827.19 | 5 YR |
| *MM55 | 16/10/2019 | revisited | 760510.32 | 6443384.60 | DNM |
| *MM56 | 16/10/2019 | revisited | 761001.85 | 6443190.01 | ANNUAL |

| Mound Identifier | Date | New or Revisited Mound | Easting | Northing | Action |
|------------------|------------|------------------------|-----------|------------|--------|
| MM57 | 18/10/2019 | revisited | 763891.58 | 6442652.82 | ANNUAL |
| MM58 | 19/10/2019 | revisited | 760649.57 | 6441052.37 | ANNUAL |
| *MM59 | 16/10/2019 | revisited | 760416.00 | 6443199.00 | DNM |
| *MM60 | 16/10/2019 | revisited | 760934.21 | 6443386.15 | ANNUAL |
| MM61 | 18/10/2019 | revisited | 763216.78 | 6438292.68 | ANNUAL |
| *MM62 | 16/10/2019 | revisited | 762197.18 | 6443821.82 | ANNUAL |
| MM63 | 17/10/2019 | new | 757062.49 | 6447330.29 | ANNUAL |
| MM64 | 18/10/2019 | new | 758558.64 | 6444285.37 | ANNUAL |
| MM65 | 18/10/2019 | new | 758336.65 | 6445274.99 | ANNUAL |

*= Inside development envelope; DNM = Do Not Monitor; 5 YR = placed on 5 year monitoring list; Annual = monitored each year.

Table 7: Trail camera locations at Malleefowl mounds

| Mound Identifier | Camera Identifier | Date Set | Easting | Northing |
|------------------|-------------------|------------|-----------|------------|
| *MM01 | MC55 | 17/10/2019 | 759624.44 | 6443755.08 |
| *MM02 | MC69 | 17/10/2019 | 760680.94 | 6446001.77 |
| *MM03 | MC41 | 15/10/2019 | 756617.76 | 6447338.97 |
| *MM04 | MC38 | 17/10/2019 | 759204.53 | 6445963.16 |
| *MM05 | MC70 | 17/10/2019 | 761115.15 | 6445807.63 |
| *MM06 | MC30 | 17/10/2019 | 758921.13 | 6447459.50 |
| *MM11 | MC73 | 18/10/2019 | 760979.97 | 6443350.14 |
| *MM12 | MC68 | 18/10/2019 | 760666.71 | 6445365.37 |
| *MM13 | MC67 | 17/10/2019 | 760757.68 | 6443583.35 |
| MM17 | MC56 | 18/10/2019 | 762042.47 | 6446581.13 |
| *MM23 | MC48 | 15/10/2019 | 760399.39 | 6445649.98 |
| MM24 | MC29 | 18/10/2019 | 759607.53 | 6447666.18 |
| *MM25 | MC96 | 17/10/2019 | 757063.75 | 6447333.60 |
| *MM27 | MC83 | 15/10/2019 | 760931.24 | 6443383.36 |
| *MM28 | MC19 | 17/10/2019 | 760794.15 | 6446327.35 |
| *MM29 | MC26 | 17/10/2019 | 759568.40 | 6446336.18 |
| *MM30 | MC45 | 15/10/2019 | 761652.70 | 6446300.08 |
| MM34 | MC97 | 18/10/2019 | 758553.68 | 6444289.63 |
| *MM36 | MC02 | 17/10/2019 | 760707.85 | 6447210.13 |
| *MM37 | MC24 | 17/10/2019 | 758666.64 | 6446257.39 |
| *MM38 | MC99 | 15/10/2019 | 758336.18 | 6445275.59 |
| *MM40 | MC28 | 16/10/2019 | 759209.38 | 6446583.48 |
| *MM41 | MC23 | 16/10/2019 | 759132.69 | 6446065.31 |
| *MM42 | MC15 | 16/10/2019 | 761223.80 | 6446606.19 |
| *MM43 | MC66 | 16/10/2019 | 760382.03 | 6443821.70 |
| *MM45 | MC54 | 17/10/2019 | 759632.21 | 6444373.55 |
| *MM46 | MC44 | 15/10/2019 | 760398.09 | 6444850.68 |
| *MM47 | MC42 | 15/10/2019 | 760391.89 | 6447383.13 |
| *MM48 | MC47 | 15/10/2019 | 760796.00 | 6445555.59 |
| *MM50 | MC94 | 15/10/2019 | 762197.05 | 6443823.41 |
| *MM51 | MC43 | 15/10/2019 | 757807.10 | 6446948.92 |
| *MM53 | MC20 | 16/10/2019 | 758851.66 | 6445168.15 |
| *MM56 | MC65 | 16/10/2019 | 761849.92 | 6443511.20 |
| *MM60 | MC22 | 16/10/2019 | 758815.43 | 6446060.40 |
| MM61 | MC52 | 18/10/2019 | 757788.22 | 6447848.03 |
| *MM62 | MC72 | 16/10/2019 | 761253.38 | 6446437.30 |
| MM63 | MC81 | 18/10/2019 | 761001.11 | 6443195.12 |
| MM64 | MC92 | 18/10/2019 | 763218.60 | 6438292.66 |
| MM65 | MC58 | 18/10/2019 | 762014.24 | 6443246.73 |

*= Inside development envelope

Table 8: Species recorded on camera

| Species | Common name | EPBC ranking | BC Act /DBCA ranking |
|---------------------------------|-----------------------|--------------|----------------------|
| Introduced Mammals | | | |
| Felidae | | | |
| <i>Felis catus</i> | Feral cat | | |
| Mammals | | | |
| Dasyuridae | | | |
| <i>Dasyurus geoffroii</i> | Chuditch | VU | VU |
| Macropodidae | | | |
| <i>Notamacropus irma</i> | Western Brush Wallaby | | |
| <i>Macropus fuliginosus</i> | Western grey Kangaroo | | |
| <i>Macropus robustus</i> | Euro | | |
| Birds | | | |
| Artamidae | | | |
| <i>Strepera versicolor</i> | Grey Currawong | | |
| Casuariidae | | | |
| <i>Dromaius novaehollandiae</i> | Emu | | |
| Cinclosomatidae | | | |
| <i>Cinclosoma castanotum</i> | Chestnut Quail-thrush | | |
| Columbidae | | | |
| <i>Phaps elegans</i> | Brush bronzewing | | |
| Megapodiidae | | | |
| <i>Leipoa ocellata</i> | Malleefowl | VU | VU |
| Pachycephalidae | | | |
| <i>Pachycephala inornata</i> | Gilberts Whistler | | |
| <i>Pachycephala pectoralis</i> | Golden Whistler | | |
| Reptiles | | | |
| Agamid | | | |
| <i>Ctenophorus cristatus</i> | Crested dragon | | |
| Squamata | | | |
| <i>Tiliqua occipitalis</i> | Western blue-tongue | | |
| Varanus | | | |
| <i>Varanus gouldi</i> | Gould's goanna | | |
| <i>Varanus rosenbergi</i> | Heath monitor | | |

Table 8: List of mounds requiring monitoring into the future

| Mound Identifier | Easting | Northing | Monitoring Frequency |
|------------------|-----------|------------|-------------------------|
| *MM02 | 758814.45 | 6446062.10 | ANNUAL |
| *MM03 | 759133.71 | 6446066.50 | ANNUAL |
| *MM04 | 758671.41 | 6446261.45 | ANNUAL |
| *MM05 | 759571.05 | 6446334.56 | ANNUAL |
| MM08 | 750445.19 | 6438407.38 | ANNUAL |
| *MM11 | 759608.78 | 6447663.71 | ANNUAL |
| MM17 | 756616.66 | 6447339.36 | ANNUAL (Active in 2019) |
| MM18 | 754750.80 | 6463148.98 | ANNUAL |
| MM21 | 760873.70 | 6440549.62 | ANNUAL |
| *MM23 | 760393.67 | 6447381.41 | ANNUAL (Active in 2019) |
| MM24 | 757807.78 | 6446949.68 | ANNUAL |
| MM34 | 757784.40 | 6447850.35 | ANNUAL |
| *MM37 | 759627.84 | 6443759.56 | ANNUAL |
| *MM38 | 762041.07 | 6446580.55 | ANNUAL |
| *MM42 | 760380.82 | 6443823.55 | ANNUAL |
| *MM43 | 760762.25 | 6443581.31 | ANNUAL |
| *MM47 | 760678.55 | 6446002.24 | ANNUAL |
| *MM48 | 761113.91 | 6445807.59 | ANNUAL |
| *MM53 | 760983.09 | 6443348.36 | ANNUAL |
| *MM56 | 761001.85 | 6443190.01 | ANNUAL |
| MM57 | 763891.58 | 6442652.82 | ANNUAL |
| MM58 | 760649.57 | 6441052.37 | ANNUAL |
| *MM60 | 760934.21 | 6443386.15 | ANNUAL |
| MM61 | 763216.78 | 6438292.68 | ANNUAL |
| *MM62 | 762197.18 | 6443821.82 | ANNUAL |
| MM63 | 757062.49 | 6447330.29 | ANNUAL |
| MM64 | 758558.64 | 6444285.37 | ANNUAL |
| MM65 | 758336.65 | 6445274.99 | ANNUAL |
| *MM01 | 758850.46 | 6445161.57 | 5 YR |
| *MM06 | 759206.90 | 6446581.35 | 5 YR |
| MM09 | 759604.13 | 6450699.88 | 5 YR |
| *MM13 | 759204.10 | 6445963.53 | 5 YR |
| MM16 | 759224.28 | 6454662.70 | 5 YR |
| *MM27 | 761651.63 | 6446301.61 | 5 YR |
| *MM28 | 760796.08 | 6445552.20 | 5 YR |
| *MM30 | 760706.64 | 6447208.88 | 5 YR |
| *MM33 | 760265.72 | 6446143.08 | 5 YR |
| MM35 | 757782.98 | 6448346.61 | 5 YR |
| *MM36 | 759630.33 | 6444374.56 | 5 YR |
| *MM40 | 762018.78 | 6443245.98 | 5 YR |
| *MM46 | 760796.61 | 6446325.78 | 5 YR |
| *MM50 | 761250.79 | 6446432.87 | 5 YR |
| *MM51 | 761222.70 | 6446607.56 | 5 YR |
| *MM54 | 761003.17 | 6443827.19 | 5 YR |

*= Inside development envelope

Table 9: Mound Activity Status Over Time

| Mound Identifier | Easting | Northing | Monitoring Frequency (as of 2020) | Mound Status | | |
|------------------|---------|----------|-----------------------------------|---------------|---------------|---------------|
| | | | | 2017 | 2018 | 2019 |
| *MM02 | 758814 | 6446062 | ANNUAL | Inactive | No monitoring | Inactive |
| *MM03 | 759134 | 6446067 | ANNUAL | Active | No monitoring | Inactive |
| *MM04 | 758671 | 6446261 | ANNUAL | Inactive | No monitoring | Inactive |
| *MM05 | 759571 | 6446335 | ANNUAL | Inactive | No monitoring | Inactive |
| *MM11 | 759609 | 6447664 | ANNUAL | Inactive | No monitoring | Inactive |
| *MM23 | 760394 | 6447381 | ANNUAL | Active | No monitoring | Active |
| *MM37 | 759628 | 6443760 | ANNUAL | Inactive | No monitoring | Inactive |
| *MM38 | 762041 | 6446581 | ANNUAL | Inactive | No monitoring | Inactive |
| *MM42 | 760381 | 6443824 | ANNUAL | Inactive | No monitoring | Inactive |
| *MM43 | 760762 | 6443581 | ANNUAL | Inactive | No monitoring | Inactive |
| *MM47 | 760679 | 6446002 | ANNUAL | Inactive | No monitoring | Inactive |
| *MM48 | 761114 | 6445808 | ANNUAL | Inactive | No monitoring | Inactive |
| *MM53 | 760983 | 6443348 | ANNUAL | Inactive | No monitoring | Inactive |
| *MM56 | 761002 | 6443190 | ANNUAL | Inactive | No monitoring | Inactive |
| *MM60 | 760934 | 6443386 | ANNUAL | Inactive | No monitoring | Inactive |
| *MM62 | 762197 | 6443822 | ANNUAL | Inactive | No monitoring | Inactive |
| MM08 | 750445 | 6438407 | ANNUAL | Inactive | No monitoring | Inactive |
| MM17 | 756617 | 6447339 | ANNUAL | Active | No monitoring | Active |
| MM18 | 754751 | 6463149 | ANNUAL | Inactive | No monitoring | Inactive |
| MM21 | 760874 | 6440550 | ANNUAL | Inactive | No monitoring | Inactive |
| MM24 | 757808 | 6446950 | ANNUAL | Inactive | No monitoring | Inactive |
| MM34 | 757784 | 6447850 | ANNUAL | Inactive | No monitoring | Inactive |
| MM57 | 763892 | 6442653 | ANNUAL | Inactive | No monitoring | Inactive |
| MM58 | 760650 | 6441052 | ANNUAL | Inactive | No monitoring | Inactive |
| MM61 | 763217 | 6438293 | ANNUAL | Inactive | No monitoring | Inactive |
| MM63 | 757062 | 6447330 | ANNUAL | Inactive | No monitoring | Inactive |
| MM64 | 758559 | 6444285 | ANNUAL | Inactive | No monitoring | Inactive |
| MM65 | 758337 | 6445275 | ANNUAL | Inactive | No monitoring | Inactive |
| *MM01 | 758850 | 6445162 | 5 YR | Inactive | No monitoring | Inactive |
| *MM06 | 759207 | 6446581 | 5 YR | Inactive | No monitoring | Inactive |
| *MM13 | 759204 | 6445964 | 5 YR | Inactive | No monitoring | Inactive |
| *MM27 | 761652 | 6446302 | 5 YR | Inactive | No monitoring | Inactive |
| *MM28 | 760796 | 6445552 | 5 YR | Inactive | No monitoring | Inactive |
| *MM30 | 760707 | 6447209 | 5 YR | Inactive | No monitoring | Inactive |
| *MM33 | 760266 | 6446143 | 5 YR | Inactive | No monitoring | Inactive |
| *MM36 | 759630 | 6444375 | 5 YR | Inactive | No monitoring | Inactive |
| *MM40 | 762019 | 6443246 | 5 YR | Inactive | No monitoring | Inactive |
| *MM46 | 760797 | 6446326 | 5 YR | Inactive | No monitoring | Inactive |
| *MM50 | 761251 | 6446433 | 5 YR | Inactive | No monitoring | Inactive |
| *MM51 | 761223 | 6446608 | 5 YR | Inactive | No monitoring | Inactive |
| *MM54 | 761003 | 6443827 | 5 YR | Inactive | No monitoring | Inactive |
| MM09 | 759604 | 6450700 | 5 YR | Inactive | No monitoring | Inactive |
| MM16 | 759224 | 6454663 | 5 YR | Inactive | No monitoring | Inactive |
| MM35 | 757783 | 6448347 | 5 YR | Inactive | No monitoring | Inactive |

*= Inside development envelope



Certificate of Completion

is hereby granted to

Shane McAdam

to certify that he has completed to satisfaction

**Malleefowl Monitoring Training in
accordance with the
National Malleefowl Recovery Team
standards and requirements**

Granted: 18 November, 2019

Training conducted at:
Mt Holland site (W49) over the period of 15 – 20 October 2019

Carl Danzi (NMRG Trainer, Deputy Chair - WA Malleefowl Recovery Group)



Certificate of Completion

is hereby granted to

Brigitta Longbottom

to certify that she has completed to satisfaction

**Malleefowl Monitoring Training in
accordance with the
National Malleefowl Recovery Team
standards and requirements**

Granted: 18 November, 2019

Training conducted at:
Mt Holland site (W49) over the period of 15 – 20 October 2019

Carl Danzi (NMRG Trainer, Deputy Chair - WA Malleefowl Recovery Group)



Certificate of Completion

is hereby granted to

Bruce Turner



to certify that he has completed to satisfaction

**Malleefowl Monitoring Training in
accordance with the
National Malleefowl Recovery Team
standards and requirements**

Granted: 18 November, 2019

Training conducted at:
Mt Holland site (W49) over the period of 15 – 20 October 2019

Carl Danzi (NMRG Trainer, Deputy Chair - WA Malleefowl Recovery Group)



Certificate of Completion

is hereby granted to

Melinda Henderson

to certify that she has completed to satisfaction

**Malleefowl Monitoring Training in
accordance with the
National Malleefowl Recovery Team
standards and requirements**

Granted: 18 November, 2019

Training conducted at:
Mt Holland site (W49) over the period of 15 – 20 October 2019

Carl Danzi (NMRG Trainer, Deputy Chair - WA Malleefowl Recovery Group)