



BHP Western Australia Iron Ore

Ministers North Fauna Survey

Level 1 Survey

February 2021

Executive summary

Introduction

BHP West Australian Iron Ore (BHP WAIO) commissioned GHD Pty Ltd (GHD) to undertake vertebrate fauna surveys at two study areas within the Minister North area. Study Area 1 comprised eight areas requiring a Level 1 (targeted) vertebrate fauna survey in accordance with the Environmental Protection Authority (EPA) Technical Guidance documents (2016a; 2016b). Study Area 2 comprised a potential groundwater dependent ecosystem (GDE) in Yandicoogina Creek, which required a detailed two season Level 2 vertebrate fauna survey and is the subject of a separate report.

This report details the results from the Level 1 vertebrate fauna survey undertaken in Study Area 1 (hereafter referred to as the survey area) in September 2019 and includes results from remote cameras deployed during this period and collected during the second season Level 2 survey in March 2020.

Survey effort

The field survey consisted of a twelve day single season Level 1 assessment undertaken from 9 to 20 September, 2019. Habitat assessment was conducted in accordance with the BHP fauna survey guidelines.

Opportunistic active searches were carried out throughout the survey area for the duration of the survey. Conservation significant species targeted throughout the Level 1 survey included the Western Pebble-mound Mouse, Rufous Grasswren, Peregrine Falcon, Grey Falcon, Ghost Bat, Northern Quoll, Pilbara Leaf-nosed Bat, Pilbara Flat-headed Blind Snake, Pilbara Olive Python and Pilbara Barking Gecko. Five locations were assessed with bird acoustic recorders and five locations were assessed with bat acoustic recorders. Each bird and bat acoustic recorder was left out for three consecutive nights before being moved to a new location to increase survey coverage. In addition, 10 remote cameras were deployed and collected after the wet season. Total trapping effort consisted of 15 nights of bat detector deployment, 15 nights of bird acoustic deployment, and 1912 remote camera trap nights.

Key results

- € Eight habitat types (excluding disturbed areas) were identified within the survey area. These comprise Hillcrest/Hillslope (1,309.01 ha), Minor Drainage Line (109.73 ha), Major Drainage Line (72.59 ha), Gorge/Gully (71.09 ha), Drainage Area/Floodplain (56.57 ha), Breakaway/Cliff (38.00 ha), Rehabilitated Area (32.44 ha), Basalt Outcrops (15.58 ha) and Cleared/Disturbed (820.34 ha). The Breakaway/Cliff, Gorge/Gully, Minor Drainage Line and Major Drainage Line habitats are considered to be of high fauna value while all other habitat types are of moderate to low value.
- € There is a high degree of fauna habitat continuity throughout and adjacent to the survey area, while extensive mining operations at Yandi, Area C and in Rio Tinto tenements north and northeast of the survey area reduce connectivity regionally.
- € The impact from mining operations in the northern portion of the survey area have resulted in Cleared/Disturbed areas of land. With this in mind, the overall quality of the remainder of habitats within the survey areas are in very good to excellent condition.
- € The fauna survey identified 67 species of vertebrate fauna within the survey area. This number comprises 40 birds, 19 mammals and eight reptiles.

- € Two conservation significant fauna species were recorded within the survey area during the field survey:
 - Ghost Bat (*Macroderma gigas*) ĩ listed as Vulnerable under the *Biodiversity Conservation Act 2016* (BC Act) and Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
 - Western Pebble-mound Mouse (*Pseudomys chapmani*) ĩ Listed as Priority 4 under Department of Biodiversity Conservation and Attractions (DBCA) fauna listings.
- € Seven additional conservation significant species are considered likely to utilise the survey area on the basis of suitable habitat and nearby records including:
 - Rufous Grasswren (*Amytornis striatus* subsp. *whitei*) - listed as Priority 4 under the BC Act (nesting and foraging habitat available in Hillcrest/Hillslope habitat)
 - Peregrine Falcon (*Falco peregrinus*) - listed as Other Special under the BC Act (nesting and foraging habitat available in Major Drainage Line and Gorge/Gully habitat)
 - Grey Falcon (*Falco hypoleucos*) - listed as Vulnerable under the BC Act (nesting and foraging habitat available in Major Drainage Line and Gorge/Gully habitat)
 - Northern Quoll (*Dasyurus hallucatus*) - listed as Endangered under the BC Act and Endangered under the EPBC Act (foraging and denning habitat available in Gorge/Gully and Breakaway/Clim habitat)
 - Pilbara Flat-headed Blind Snake (*Anilius ganei*) - listed as Priority 1 under the DBCA fauna listings (suitable habitat available within Gorge/Gully habitat)
 - Pilbara Olive Python (*Liasis olivaceus barroni*) - listed as Vulnerable under the BC Act and Vulnerable under the EPBC Act (denning and foraging habitat available in Gorge/Gully habitat)
 - Pilbara Barking Gecko (*Underwoodisaurus seorsus*) - listed as Priority 2 under the DBCA fauna listings (suitable habitat available within Gorge/Gully and Hillcrest/Hillslope habitat).

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Appendix A Ĩ Relevant legislation, background information and conservation codes
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1. Introduction

1.1 Project background

BHP Western Australian Iron Ore (BHP WAIO) commissioned GHD Pty Ltd (GHD) to undertake vertebrate fauna surveys at two study areas within the Ministers North area. Study Area 1 (hereafter referred to as the survey area) is the subject of this report and comprises eight areas requiring a Level 1 (targeted) vertebrate fauna survey. Study Area 2 comprised a potential groundwater dependent ecosystem (GDE) in Yandicoogina Creek, which required a detailed two season Level 2 vertebrate fauna survey and is the subject of a separate report.

1.2 Purpose of this report

This report details the results from the Level 1 vertebrate fauna survey undertaken between 9 and 20 September 2019. It includes data from remote cameras deployed during September 2019 and collected in March 2020 during the second phase Level 2 survey. The purpose of the survey was to identify ecological values, further add to the biodiversity knowledge within the survey area and support future approvals documentation. This report includes habitat mapping, opportunistic species list, and bird and bat acoustic data.

1.2.1 Limitations and assumptions

This report has been prepared by GHD for BHP WAIO and may only be used and relied on by BHP for the purpose agreed between GHD and the BHP WAIO as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than BHP WAIO arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. Site conditions may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. The opinions, conclusions and recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by BHP WAIO and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

1.3 Scope of works

The scope of works was to:

- Provide a comprehensive desktop assessment comprising vertebrate fauna database searches for the survey area as detailed in BHP guidance document SPR-IEN-EMS-012 v6, to determine the presence, or likely presence, of conservation significant vertebrate fauna species.
- Undertake a Level 1 vertebrate fauna survey within the survey area as detailed in guidance document SPR-IEN-EMS-012 v6 and in line with Environmental Protection Authority (EPA) Technical Guidance – *Terrestrial Fauna Surveys* (EPA 2016a) and EPA Technical Guidance – *Sampling methods for terrestrial vertebrate fauna* (EPA 2016b).
- Provide a technical report (this document) detailing the desktop assessment and the fauna survey, prepared in accordance with guidance document SPR-IEN-EMS-012 v6.
- Submit fauna survey data in accordance with BHP guidance document SPR-IEN-EMS-015 v11.

1.4 Survey location

The survey area includes multiple tenements and is located directly southeast of the BHP Yandi mining operation and approximately 81 kilometres (km) northwest of Newman. The survey area covers 2,507.69 hectares (ha) (see Figure 1).

For this report, the term database search area includes the survey area and an additional 40 km radius buffer around the survey area. The database search area defines the limits of the desktop assessment as described in section 2.3.

1.5 Environment

1.5.1 Regional biogeography

The survey area is situated in the Eremaean Botanical Province, within the Pilbara bioregion and the Hamersley sub-region as described by the Interim Biogeographic Regionalisation of Australia.

Bastin and the ACRIS Management Committee (2008) have characterised the Pilbara bioregion by vast coastal plains and inland mountain ranges with cliffs and deep gorges. Vegetation is predominantly mulga low woodlands or snappy gum over bunch and hummock grasses. Tenure comprises Aboriginal land, leasehold (for grazing cattle) and conservation reserves. The bioregion provides the majority of Western Australia (WA)'s exports in petroleum, natural gas and iron ore. Major population centres are Karratha, Port Hedland, Newman and Tom Price (Bastin and the ACRIS Management Committee 2008).

1.5.2 Geology and soils

Geology

The Australian continent is made up of four continental blocks: the Yilgarn, Pilbara and Gawler Cratons and the Wilyama Block. The survey area is located within the Fortescue Large Igneous Provinces of the Pilbara Craton. The Pilbara Craton is a geological formation formed from Archaean crust (3.6-2.7 billion years ago). The Fortescue Large Igneous Province comprises mafic to intermediate and ultramafic volcanic rocks, mafic sills, mafic-ultramafic layered intrusions and dykes, such as the Black Range Suite. The tectonic setting of the Fortescue Group has been variably interpreted as a rift-to-passive margin, to a more complex rift- and breakup-shelf subsidence model (Thorne & Trendall 2001, Pirajno & Morris 2005).

Land systems, landforms and soil

Soils within the survey area comprise the Fa13 soil type (BRS 2009). This unit is described as: *Ranges of banded jaspilite and chert along with shales, dolomites, and iron ore formations; some areas of ferruginous duricrust as well as occasional narrow winding valley plains and steeply dissected pediments. This unit is largely associated with the Hamersley and Ophthalmia Ranges. The soils are frequently stony and shallow and there are extensive areas without soil cover: chief soils are shallow stony earthy loams (Um5.51) along with some (Uc5. 11) soils on the steeper slopes. Associated are (Dr2.33 and Dr2.32) soils on the limited areas of dissected pediments, while (Um5.52) and (Uf6.71) soils occur on the valley plains* (BRS 2009).

The Pilbara region has been surveyed by the Department of Agriculture and Food, Western Australia and others for the purposes of land classification, mapping and resource evaluation. One hundred and two land systems have been described for the region, which are distinguished on the basis of topography, geology, soils and vegetation (van Vreeswyk et al. 2004). The survey area intersects five mapped land systems; details of these land systems are presented in Table 1.

Table 1 Land systems within the survey area

Land system	Description	Land type
Newman	Rugged jaspilite plateaux, ridges and mountains supporting hard spinifex grasslands	Hills and ranges with spinifex grasslands
River	Active flood plains, major rivers and banks supporting grassy eucalypt woodlands, tussock grasslands and soft spinifex	River plains with grassy woodlands and tussock grasslands
McKay	Hills, ridges, plateaux remnants and breakaways of meta sedimentary and sedimentary rocks supporting hard spinifex grasslands	Hills and ranges with spinifex grasslands
Robe	Low plateaux, mesas and buttes of limonites supporting soft spinifex (and occasionally hard spinifex) grasslands	Mesas, breakaways and stony plains with spinifex grasslands
Boolgeeda	Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands or mulga shrublands	Stony plains with spinifex grasslands

1.5.3 Hydrology

The northern-most survey area (of the eight that comprise Study Area 1) is intersected by Marillana Creek and one of its major tributaries (unnamed) and the southern-most survey area is intersected by Yandicoogina Creek. Marillana Creek is classified as a Major River while Yandicoogina Creek is classified as a Minor River. Surface water in both creeks appears to flow seasonally depending on cyclonic and monsoonal weather events. Some smaller permanent water pools may exist throughout the year. No permanent water pools were identified within the survey areas at the time of the survey. However seasonal temporary pools were located by field staff during the survey along a tributary of the Yandicoogina Creek which weaves in and out of the southern survey area. All pools were in sections of the tributary located outside the survey area but within the desktop search area. Permanent water pools were detected in the Level 2 survey area (GHD 2020 i unpublished), within 1.7 km southeast of the closest Level 1 survey area.

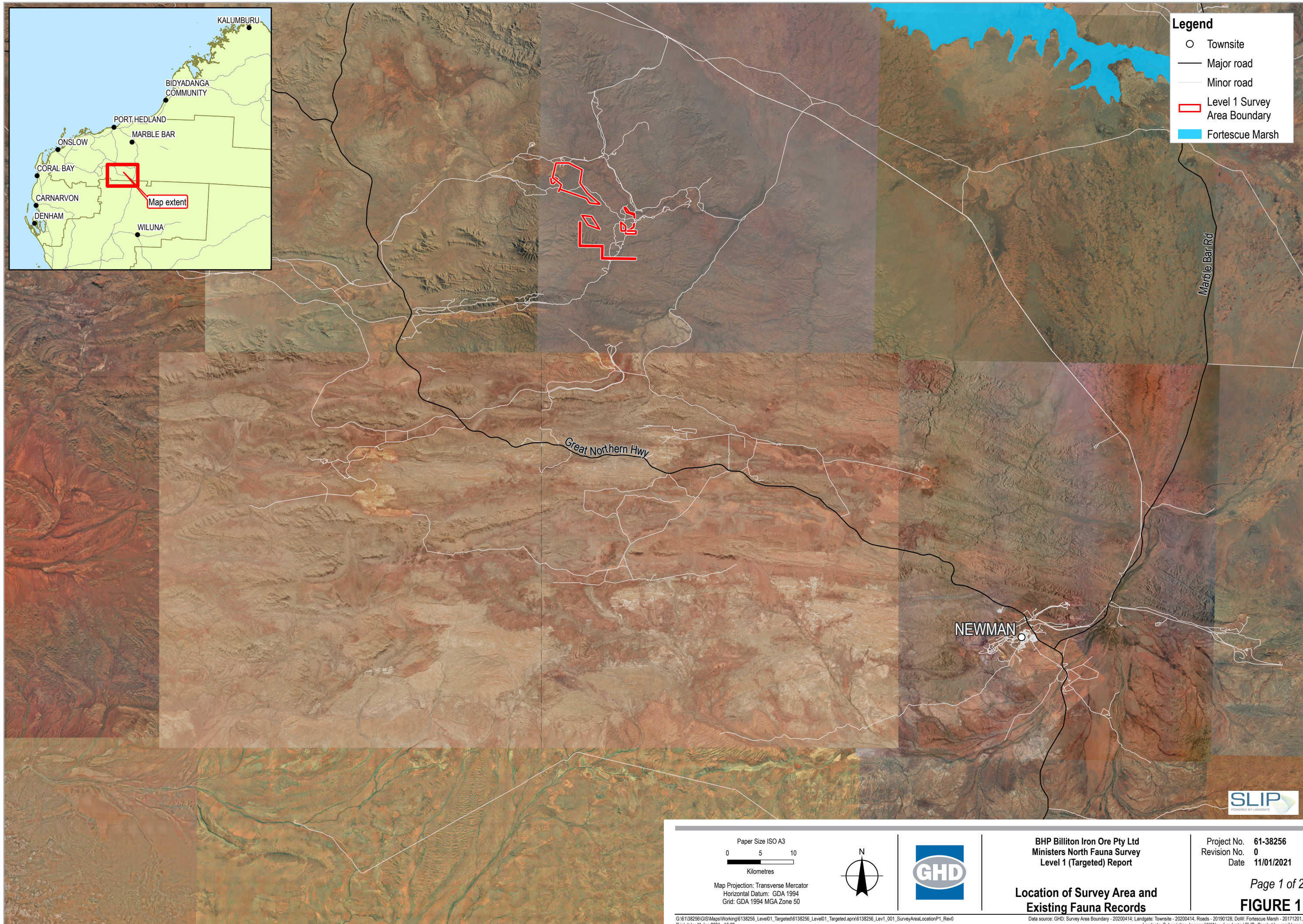
1.5.4 Land use

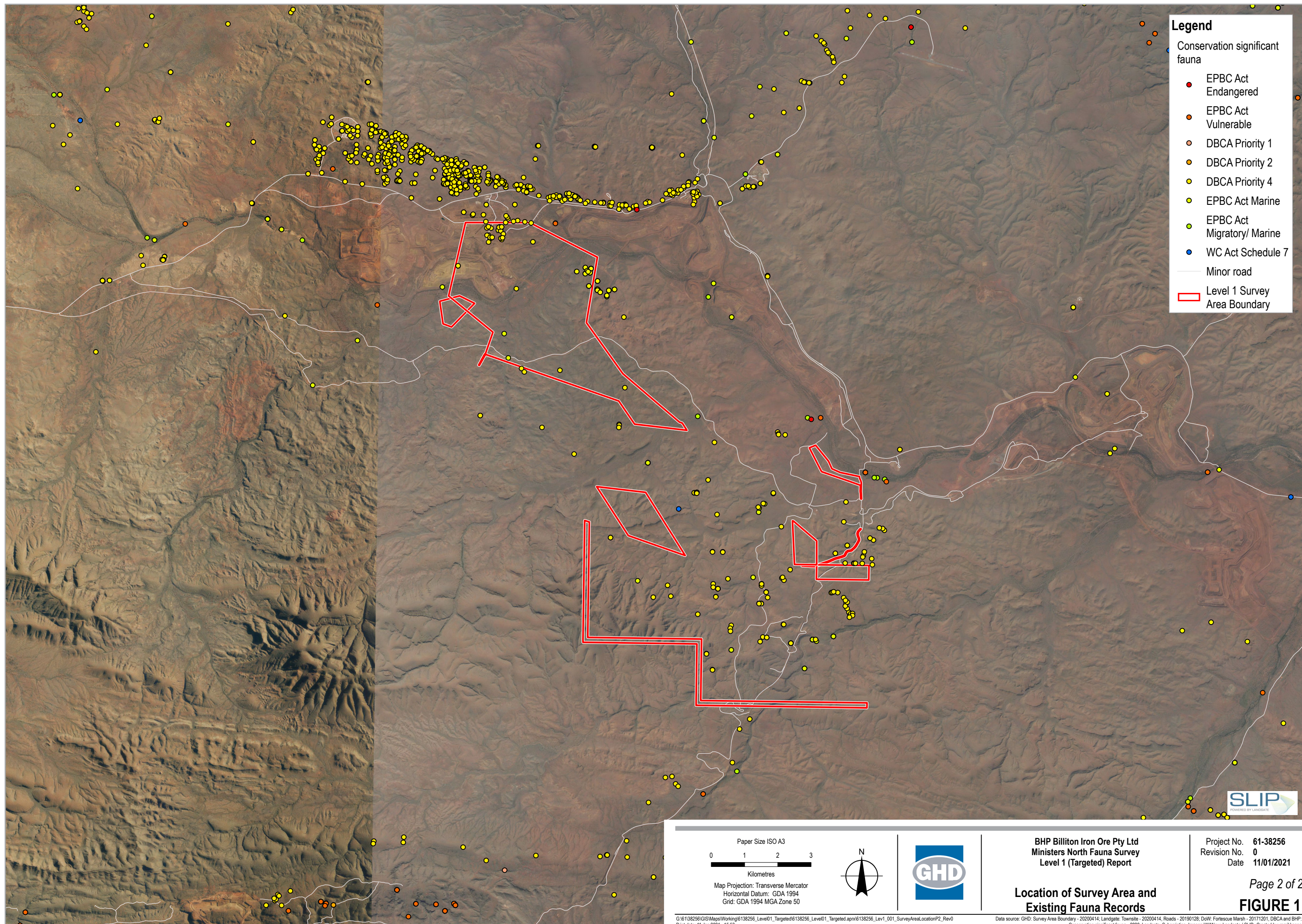
The survey area lies within BHP Billiton Minerals Pty Ltd, Hamersley Iron-Yandi Pty Ltd, BHP Iron Ore (Jimblebar) Pty Ltd mining tenements (DMIRS 2019). The northern survey areas also appears to intersect the Juna Downs Station and Marillana Station pastoral leases.

1.5.5 Vegetation

Broad scale (1:1,000,000) pre-European vegetation mapping of the Pilbara region was completed by Beard (1976) at an association level. The mapping indicated two vegetation associations present within the survey area:

- ≠ Low tree-steppe: Hummock grassland with scattered bloodwoods & snappy gum, *Triodia* spp., *Corymbia dichromophloia*, *Eucalyptus leucophloia*
- ≠ Low woodland, open low woodland or sparse woodland: Mulga, *Acacia aneura* and associated species.





2. Methodology

2.1 BHP requirements

BHP requirements applied to this survey are set out in Guidance for Vertebrate Fauna Surveys in the Pilbara (SPR-IEN-EMS-012 v6). This document outlines BHP's expectations for survey components including the level of survey, desktop assessment, survey design and intensity, timing, habitat assessment and reporting requirements. Biological survey spatial data requirements (SPR-IEN-EMS-015 v11) set out all biodiversity data requirements to a standard and consistent format. These standards enable analysis of survey data and comparison between surveys spatially and temporally.

2.2 Relevant legislation and background documents

In Western Australia all native species and communities are protected under the *Biodiversity Conservation Act 2016* (BC Act). Species of high conservation status (conservation significant species) are further protected under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). An overview of these key legislation and guidelines, conservation codes and background information relevant to this fauna survey is provided in Appendix B. In addition, regulatory authorities also provide a range of guidance and information on expected standards and protocols for environmental surveys.

2.3 Desktop assessment

Prior to the field survey a desktop assessment was undertaken to collect relevant environmental and ecological information pertaining to the survey area and wider database search area and to assist survey design. This included a review of:

- The Department of the Environment and Energy (DEE) (now Department of Agriculture, Water and the Environment) Protected Matters Search Tool (PMST) to identify communities and species listed under the EPBC Act potentially occurring within the database search area (DEE 2019) (Appendix B).
- Literature review of ten previous fauna survey reports provided by BHP that cover portions of the survey area and wider database search area
- The Department of Biodiversity Conservation and Attractions (DBCA) Threatened and Priority Fauna database for the study area.
- The DBCA *NatureMap* database for fauna species previously recorded within the database search area (DBCA 2007i) (Appendix B). This is an integrated database comprising the following databases:
 - ï Atlas of Australian birds
 - ï Pilbara Threatened Fauna
 - ï Birddata - Birdlife Australia
 - ï Fauna Survey Returns Database
 - ï Pilbara Biological Survey - Birds of the Pilbara
 - ï Biological Survey - Pilbara Biological Survey (mammals, birds, reptiles)
 - ï Waterbirds or Pilbara Threatened Fauna
 - ï WA Threatened Fauna Database
 - ï WA Museum (WAM) databases (mammals, birds, reptiles, amphibians)

- Aerial photography, geology/soils, land systems and hydrology information to provide background information on the variability of the environment and likely vegetation and habitat types present.

Likelihood of occurrence

Prior to undertaking the fieldwork a likelihood of occurrence (LOO) assessment was performed on the conservation significant fauna species detected in the desktop assessment. The LOO assigns a likelihood of the species occurring within the survey area based on the known preferences and requirements of each conservation significant species and the landscape characteristics (i.e. geographic location, vegetation type, land systems, landscape features etc.) detected during the desktop assessment. The LOO assessment is updated following the completion of the survey depending on observations made in the field. The LOO outcomes used for assessment are:

- € **Present** ĩ species recorded during the field survey or from recent, reliable records from within or close proximity to the survey area.
- € **Likely** ĩ species are likely to occur in the survey area where there is suitable habitat within the survey area and there are recent records of occurrence of the species in close proximity to the survey area OR the species known distribution overlaps with the survey area and there is suitable habitat within the survey area.
- € **Unlikely** ĩ species assessed as unlikely include those species previously recorded within 10 km of the survey area however:
 - There is limited (i.e. the type, quality and quantity of the habitat is generally poor or restricted) habitat in the survey area
 - The suitable habitat within the survey area is isolated from other areas of suitable habitat and the species has no capacity to migrate into the survey area OR
- € Those species that have a known distribution overlapping with the survey area however:
 - There is limited habitat in the survey area (i.e. the type, quality and quantity of the habitat is generally poor or restricted)
 - The suitable habitat within the survey area is isolated from other areas of suitable habitat and the species has no capacity to migrate into the survey area.
- € **Highly Unlikely** ĩ species that are considered highly unlikely to occur in the survey area include:
 - Those species that have no suitable habitat within the survey area.
 - Those species that have become locally extinct, or are not known to have ever been present in the region of the survey area.

2.4 Field survey

2.4.1 Field survey details and timing

The field survey consisted of a twelve day pre-wet season Level 1 assessment from 9 to 20 September 2019. The field survey was led by Principal Zoologist Glen Gaikhorst assisted by Senior Zoologist Robert Browne-Cooper and Ecologists Madison Roberts and Sarah Flemington. The experience of these staff members are presented in Table 2.

Table 2 Personnel experience

Name	Years of experience	Role
Glen Gaikhorst	20	Principle Zoologist and field lead
Robert Browne-Cooper	20+	Senior Zoologist
Madison Roberts	3	Ecologist
Sarah Flemington	3	Ecologist

2.4.2 Guiding documents

In addition to the BHP requirements listed in section 2.1, the survey methodology and data collection that GHD employed was consistent with:

- EPA Technical Guidance ĩ Terrestrial Fauna Surveys, Perth, Environmental Protection Authority (EPA 2016a)
- EPA Technical Guidance ĩ Sampling methods for terrestrial vertebrate fauna, Perth, Environmental Protection Authority (EPA 2016b)
- Interim guideline for preliminary surveys of Night Parrot (*Pezoporus occidentalis*) in Western Australia. (Department of Parks and Wildlife, 2017)
- Survey Guidelines for Australia's Threatened Bats (Department of the Environment, Water, Heritage and the Arts 2010a)
- Survey Guidelines for Australia's Threatened Mammals (Department of the Environment, Water, Heritage and the Arts 2010b)
- Survey Guidelines for Australia's Threatened Reptiles (Department of the Environment, Water, Heritage and the Arts 2010c).
- EPBC Act referral guideline for the endangered northern quoll *Dasyurus hallucatus* (Department of Environment 2016b)

2.4.3 Permits and ethics

A Regulation 17 Licence to Take Fauna for Scientific Purposes was obtained from DBCA prior to undertaking the fauna survey (Licence Number: BA27000036). This permit also allows vouchering a limited number of non-conservation significant specimens for lodgement with the Western Australian Museum (WAM). However in general, only specimens of particular scientific interest or taxonomic significance are collected for the WAM. The fauna survey (specifically trapping and animal handling) was undertaken in accordance with Standard Operating Procedures (SOPs) which were required to be followed under the conditions of GHD's fauna trapping permit. At the time of survey, compliance with these SOPs was accepted by DBCA as evidence of ethical treatment of animals.

2.4.4 Habitat assessment

Habitat assessment was conducted in accordance with the BHP fauna survey guidelines as outlined in section 2.1. Field data was collected via the ArcGis Online platform at significant species record sites and other locations as required to enable delineation and mapping of major fauna habitat types throughout the survey area.

Habitat value is assessed based on the landform habitat characteristics and the known habitat preferences and requirements for a given species. The terms High, Moderate, or Low are used to assign a broad value to a habitat feature or landform being assessed. Low habitat value is assigned to habitat that lack a species's preferred foraging, sheltering, denning and or breeding opportunities. Moderate habitat value is assigned to habitat that has limited or marginal foraging,

sheltering, denning and or breeding opportunities. High habitat value is assigned to habitat that has a species's preferred foraging, sheltering, denning and or breeding opportunities.

Broad habitat types within the survey area were identified, mapped and described based on the following:

- Location within survey area
- Landscape position
- Geomorphology, topography and substrate
- Photos of representative habitat types
- Values to associated fauna including significant species (e.g. refuge, foraging, shelter)
- Disturbances (weeds, fire, ground disturbance)
- Comparison between broad habitat types
- Evaluation of the likelihood of occurrence of conservation significant fauna within the environments present (based on presence of suitable habitats and species recorded).

2.4.5 Fauna Habitat Mapping

Within most of the survey area, on-ground assessment enabled accurate and relatively fine scale habitat mapping (1:1500). BHP WAIO Vertebrate fauna survey and data guidelines were used for the correct habitat terminology. In addition to habitat mapping, various fauna habitat assessment points were included in areas where habitat either supported significant fauna, or warranted further descriptive information as it differed slightly from surrounding habitats. All data was recorded on the tablet devices, using the BHP database. Due to active mining limiting access within the northern-most portion of the survey area, habitat mapping of this portion was completed using aerial imagery and through observations using binoculars from vantage points. The location of habitat mapping points are displayed in Table 3.

Table 3 Locations of habitat assessments

Site ID	Date assessed	Easting	Northing
HAB-01	10/09/2019	711912	7484630
HAB-02	10/09/2019	711926	7484438
HAB-03	10/09/2019	711566	7484062
HAB-04	11/09/2019	709804	7482774
HAB-05	11/09/2019	709371	7482536
HAB-06	11/09/2019	708129	7482956
HAB-07	11/09/2019	708085	7483073
HAB-08	11/09/2019	707999	7483160
HAB-09	11/09/2019	708528	7483605
HAB-10	11/09/2019	711993	7482739
HAB-11	11/09/2019	720467	7475485
HAB-12	11/09/2019	720445	7475715
HAB-13	13/09/2019	718852	7476183
HAB-14	13/09/2019	719028	7476048
HAB-15	13/09/2019	718770	7475990
HAB-16	13/09/2019	718617	7475835
HAB-17	13/09/2019	718795	7475866
HAB-18	13/09/2019	718913	7475737
HAB-19	13/09/2019	719756	7475989
HAB-20	13/09/2019	718479	7476190
HAB-21	13/09/2019	718559	7476276
HAB-22	13/09/2019	718542	7476709
HAB-23	13/09/2019	718531	7476851
HAB-24	13/09/2019	718462	7476949
HAB-25	13/09/2019	718743	7476686
HAB-26	13/09/2019	719008	7476345
HAB-27	13/09/2019	718827	7476456
HAB-28	13/09/2019	719093	7476413
HAB-29	13/09/2019	719986	7476111
HAB-30	13/09/2019	720193	7476235
HAB-31	13/09/2019	720366	7476620
HAB-32	13/09/2019	720400	7478256
HAB-33	13/09/2019	720290	7478372
HAB-34	14/09/2019	715535	7472397
HAB-35	14/09/2019	715578	7472697
HAB-36	14/09/2019	715583	7472880
HAB-37	14/09/2019	715580	7473442
HAB-38	14/09/2019	719832	7475542
HAB-39	14/09/2019	719592	7475740
HAB-40	14/09/2019	719508	7475759
HAB-41	14/09/2019	719209	7475598
HAB-42	14/09/2019	719218	7475790
HAB-43	16/09/2019	713787	7476557
HAB-44	16/09/2019	713839	7476622
HAB-45	16/09/2019	713558	7477143
HAB-46	16/09/2019	713174	7477433
HAB-47	16/09/2019	713189	7477862

Site ID	Date assessed	Easting	Northing
HAB-48	16/09/2019	713357	7477708
HAB-49	16/09/2019	718776	7476392
HAB-50	17/09/2019	720028	7478480
HAB-51	17/09/2019	719528	7478646
HAB-52	17/09/2019	719216	7478977
HAB-53	16/09/2019	713573	7476724
HAB-54	16/09/2019	713666	7477575
HAB-55	16/09/2019	713112	7477894
HAB-56	16/09/2019	713103	7477464
HAB-57	16/09/2019	713660	7477403
HAB-58	16/09/2019	714053	7477340
HAB-59	17/09/2019	712177	7475071
HAB-60	17/09/2019	712218	7476158
HAB-61	17/09/2019	712202	7476716

2.4.6 Fauna identification and nomenclature

Species Identification

Fauna were identified in the field or office (remote camera, bat call and bird acoustic analysis) using reference books, field guides and electronic guides (Table 4). Where identification was not possible, photographs of specimens were collected to be later identified (field) or species were identified to genus level (bat call and bird acoustic analysis).

Table 4 Fauna references

Fauna group	Field guide
Mammals	Menkhorst & Knight (2004), Van Dyck & Strahan (2008), Pizzey & Knight (2012)
Bats	Churchill (2008), Menkhorst & Knight (2011), Pizzey & Knight (2012), Van Dyck et al. (2013), Armstrong (2011), Armstrong & Coles (2007), Bullen & McKenzie (2011), Duffy et al. (2000), Hourigan (2011), McKenzie & Bullen (2009; 2012), Mills et al. (1996), Reardon et al. (2014)
Birds	Morcombe (2004), Jakkett et al. (2017); Murphy et al. (2017); Leseberg et al. (2019)
Reptiles	Wilson & Swan (2017), Storr et al. (1999), Storr et. al. (2002)
Amphibians	Tyler & Doughty (2009)

Nomenclature

Nomenclature used in this report follows that used by WAM as reported on *NatureMap*. This nomenclature is deemed the most up-to-date species information for WA fauna.

2.4.7 Non-systematic fauna survey

Non-systematic methods detect fauna by opportunistic observation and selectively searching particular habitat types and landform features in consideration of target species's habitat preferences, optimal seasonal and diurnal timing to record active fauna or opportunistic secondary evidence. Non-systematic methods described below, particularly opportunistic observations, generally account for a high proportion of the total fauna inventory including significant fauna recorded during surveys. Non-systematic survey method locations are shown in Figure 2.

Opportunistic observations

Opportunistic observations involve the recording of fauna taxa (physical presence and/or signs of presence) spatially throughout the survey area. Opportunistic observations include physical observations (sighting or hearing fauna), and indirect evidence (scats, tracks, diggings, nests, feathers, skeletal remains, pellets) which indicate the current or recent activity of a species. Wherever possible, numbers of individuals, microhabitat use and other relevant information was recorded.

Cave searches

Caves identified as potentially suitable for Pilbara Leaf-Nosed Bat or Ghost Bat were first observed opportunistically while driving or traversing through the survey areas, and then further investigated by foot where accessible. Outcrops not accessible by vehicle but considered to potentially contain caves were accessed by foot and searched thereafter. Assessment of suitability for Pilbara Leaf-Nosed Bat and Ghost Bat included cave dimensions, the presence of guano and evidence of feeding. If possible, Song Meters and/or cameras were set at the mouths of caves to collect further evidence of cave use.

2.4.8 Remote Fauna recording devices

Remote fauna recording devices were used in conjunction with non-systematic survey methods to increase survey effort and target more cryptic species/groups not often encountered using non-systematic methods. Remote fauna recording devices used in the Level 1 survey are described below.

Remote Cameras

Remote sensor cameras (Reconyx-Hyperfire and Scoutguard) were deployed during the September 2019 survey and collected in March 2020. Cameras were used to target significant fauna species such as Northern Quoll and add to the general species inventory. Cameras generally target medium to large mammals, birds and reptiles. Cameras can opportunistically detect Pilbara Olive Python (POP) however the preferred method for detecting POP is via searching water bodies and rocky habitat for individuals or signs of use (e.g. scat, sluffs). Cameras were set in areas where significant species are more likely to be recorded e.g. rocky potential forage or den sites, or along potential fauna movement corridors. Cameras were baited with sardines and/or universal animal bait (peanut butter, oats and sardines) to attract fauna species within the survey area. For each camera location the time and date deployed and recovered, and the GPS coordinates were recorded (Table 5).

Data from the cameras were manually analysed for the presence of fauna following collection in March 2020.

Bat acoustic recorders

Bat Detectors (SM4 and SM2 SongMeters) were deployed targeting a range of micro bats, but focussing on Ghost Bat and Pilbara Leaf-nosed Bat. Detectors were set for three nights before being moved to new locations. Bat detectors were positioned in areas where bats were likely to be present i.e. water bodies, fly-ways such as rocky gullies and clearings, and set at potential roost caves. Bat detectors were programmed to record from 25 minutes pre-dusk to 25 minutes post-dawn. For each detector the time and date deployed and recovered, and the GPS coordinates were recorded Table 6.

Data from the bat detectors were downloaded to a computer and analysed for the presence of bats following the field survey. Data from the detectors was analysed by GHD Zoologist Craig Grabham to determine species, using Kaleidoscope bat analysis software and a series of graphical reference comparison calls.

Bird acoustic recorders

Bird acoustic recorders were set primarily for detecting the Night Parrot in line with DPaW (2017). Acoustic detectors (SM4 Songmeter & Acoustic recorders) were deployed in areas where Night Parrot might be recorded such as potential roosting or feeding habitat i.e. utilising water bodies or *Triodia* and grassland plain. The detectors were set for a maximum of three nights and programmed to record from 25 minutes pre-dusk to 25 minutes post-dawn. Following three nights of deployment, the detectors were moved to a different area to increase coverage. For each detector the time and date deployed and recovered, and the GPS coordinates were recorded (Table 7). Data from the recorders was analysed by Nigel Jakkett, an Ecologist with three years' experience in analysis and identification of Night Parrot acoustic data.

2.5 Survey effort and sampling locations

Opportunistic active searches were carried out over the survey area throughout the duration of the survey. In addition, 10 remote cameras were deployed and collected after the wet season, five locations were assessed with bird acoustic recorders and five locations were assessed with bat acoustic recorders. Each bird and bat acoustic recorder was left out for 3 consecutive nights before being moved to a new location to increase survey coverage.

The effort and location of sampling (excluding opportunistic active search) can be found in the following tables; Table 5, Table 6 and Table 7. Figure 2 shows the location of cameras and acoustic recorders over the survey area.

Table 5 Camera trap locations

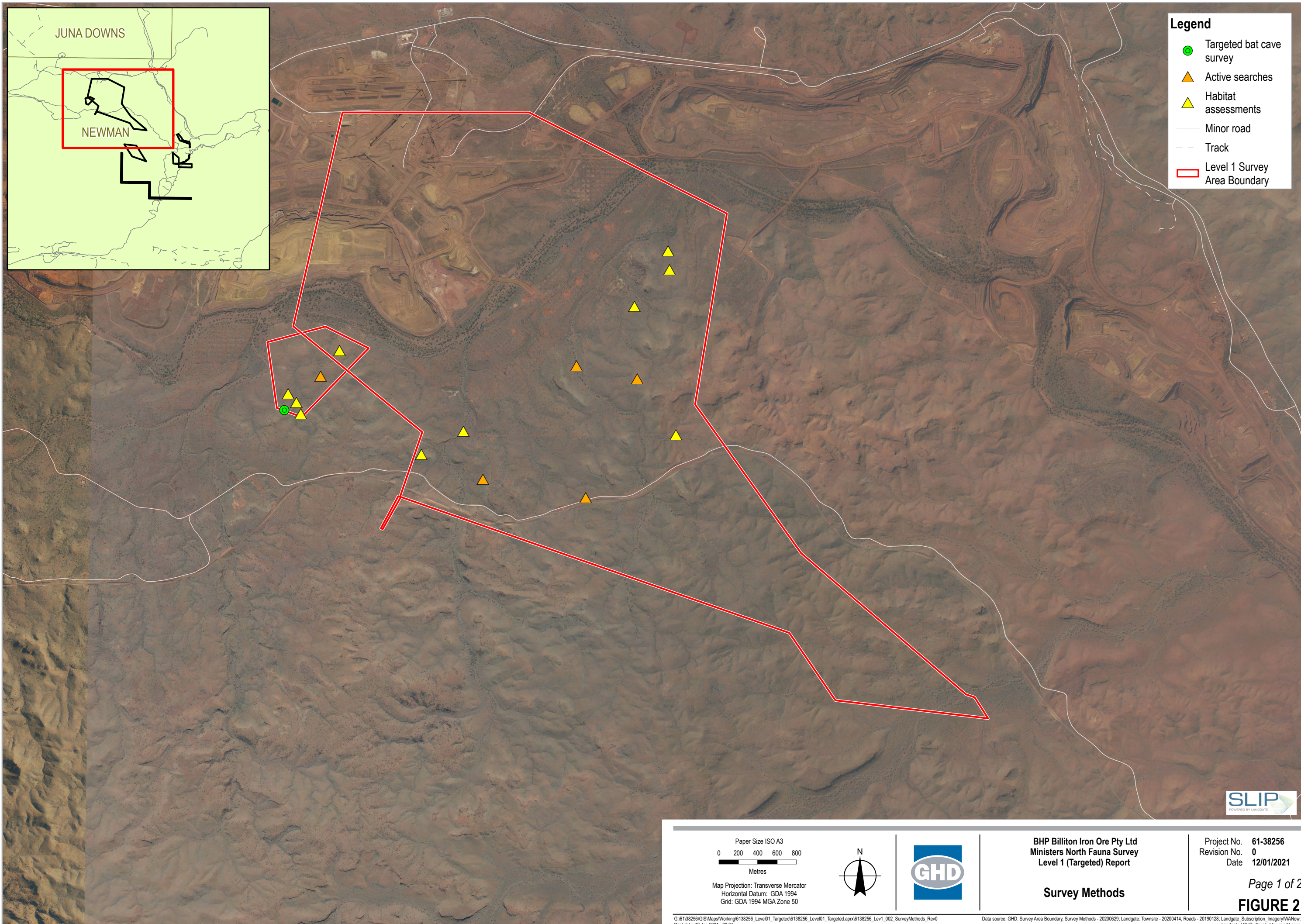
Camera number (Site-ID)	Habitat type	Micro Habitat	Location		Date deployed	Date recovered	Total nights deployed
			Easting	Northing			
MC77 (Cam-01)	Breakaway/ Cliff	Breakaway	720581.249	7475630.65	11/09/2019	23/03/2020	194
MC13 (Cam-02)	Breakaway/ Cliff	Breakaway	719983.95	7475533.89	11/09/2019	23/03/2020	194
R41 (Cam-03)	Breakaway/ Cliff	Breakaway	720099.80	7475607.46	11/09/2019	23/03/2020	194
4SG (Cam-04)	Hillcrest/ Hillslope	Breakaway	718835.48	7476035.14	13/09/2019	21/03/2020	190
MC45 (Cam-05)	Hillcrest/ Hillslope	Cliff	718710.32	7476455.92	13/09/2019	21/03/2020	190
MC14 (Cam-06)	Gorge/ Gully	Gorge	716261.83	7471637.87	13/09/2019	21/03/2020	190
SG1 (Cam-07)	Gorge/ Gully	Gorge	715894.03	7471611.143	13/09/2019	21/03/2020	190
MC25 (Cam-08)	Gorge/ Gully	Gorge	716131.03	7471632.77	13/09/2019	21/03/2020	190
MC4 (Cam-9)	Gorge/ Gully	Gully	713817.74	7477091.23	16/09/2019	24/03/2020	190
MC10 (Cam-10)	Gorge/ Gully	Gully	713847.72	7476959.50	16/09/2019	24/03/2020	190
Total nights							1912 nights

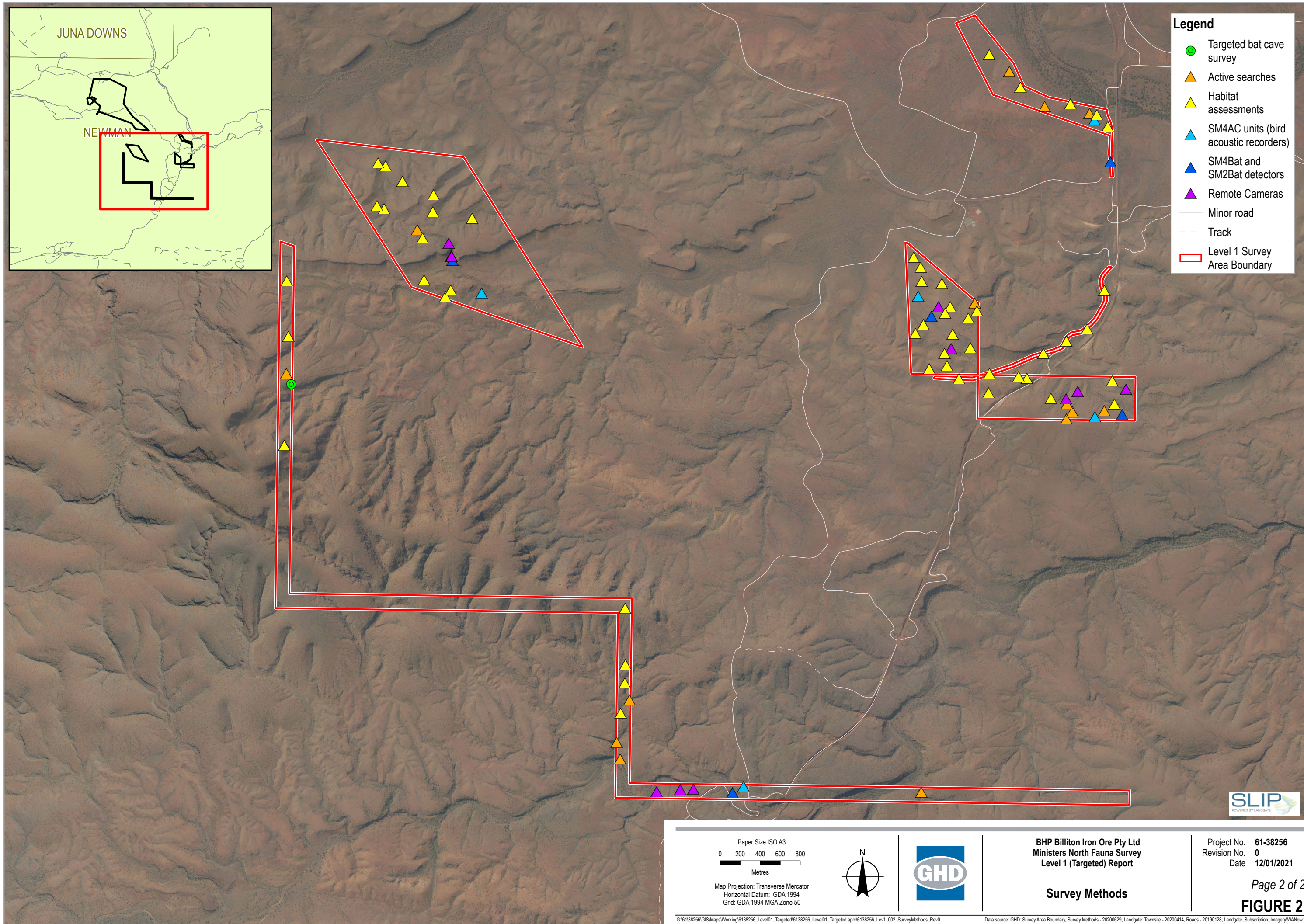
Table 6 Bat Detector locations

Bat detector sites (Site-ID)	Detector	Habitat type	Location		Nights deployed
			Easting	Northing	
Site 1 (Bat-05)	SM4-1	Other (artificial water body)	720427.63	7477902.32	3
Site 2 (Bat-01)	SM4-1	Hillcrest/ Hillslope	718638.29	7476359.68	3
Site 3 (Bat-02)	SM4-6	Gorge/ Gully	716652.32	7471600.27	3
Site 4 (Bat-03)	SM4-1	Hillcrest/ Hillslope	713856.17	7476918.07	3
Site 5 (Bat-04)	SM4-6	Gorge/ Gully	720544.12	7475376.83	3
Total					15 nights

Table 7 Night Parrot Detector locations

Night Parrot detector number (Site-ID)	Habitat type	Location		Nights deployed
		Easting	Northing	
Site 1 (BAR-01)	Drainage Area/ Floodplain	720267.02	7478320.38	3
Site 2 (BAR-02)	Hillcrest/Hillslope	718506.65	7476559.86	3
Site 3 (BAR-03)	Hillcrest/ Hillslope	716761.73	7471665.18	3
Site 4 (BAR-04)	Minor Drainage Line	714147.26	7476589.95	3
Site 5 (BAR-05)	Hillcrest/ Hillslope	720271.18	7475357.50	3
Total				15 nights





2.6 Seasonal conditions

The survey area is located within the Pilbara region of WA. The climate of this region is arid to tropical with very hot summers and mild winters. Rainfall in the Pilbara is spatially and temporally variable. Rainfall in the eastern Pilbara (containing the site) is most influenced by tropical and monsoonal drivers which are predominantly active in the summer and autumn months (December to May) while rainfall in the western Pilbara is also influenced by southern mid-latitude drivers such as frontal systems during autumn and winter (March-Aug) (Sudmeyer 2016).

During summer and early autumn (December to March), average daily temperatures exceed 30°C across the region, with average daily maxima exceeding 35°C from October to March. During the winter months (June to August), average temperatures are around 20°C across the region.

The closest current weather station to the site is in Newman (Station ID: 007176) located approximately 81 km southeast of the southern survey area boundary. Climate data from this station indicate:

- Mean maximum temperature ranges from 23.0 °C in June and July to 39.2 °C in December
- Mean minimum temperature ranges from 6.4 °C in July to 25.1 °C in January
- Mean annual rainfall is 329.5 mm with an average of 29.9 rain days per year (BoM 2019).

Rainfall for the 6 months prior to the survey is presented in Table 8 (based on Newman data), with the total rainfall for this period being 83.6 mm. This is approximately a quarter of the year's total for this region; however, is well below the long term average for these months (190.4 mm).

The weather over the survey period is presented in Table 9.

Table 8 Rainfall 6 months prior to the survey month.

Date	Rainfall (mm)
February 2019	46.2
March 2019	12.2
April 2019	3.8
May 2019	0.0
June 2019	17.8
July 2019	0.0
August 2019	3.6
Total	83.6

Table 9 Weather during survey period (sourced BoM 2019)

Date	Temperature (°C)		Rainfall (mm)
	Minimum	Maximum	
09/09/2019	13.6	34.7	0
10/09/2019	18.6	35.5	0
11/09/2019	14.6	33.6	0
12/09/2019	11.8	33.7	0
13/09/2019	8.6	33.4	0
14/09/2019	7.4	33.2	0
15/09/2019	9.8	34.5	0
16/09/2019	10.5	34.7	0
17/09/2019	13.7	36.1	0
18/09/2019	14.3	35.3	0
19/09/2019	14.9	30.4	0
20/09/2019	12.0	23.2	0

3. Desktop assessment

3.1 Fauna diversity

The *NatureMap* database identified 387 vertebrate fauna taxa previously recorded within the database search area (DBCA 2007i). This total includes seven amphibians, 185 birds, 55 mammals, four fish and 141 reptiles. The EPBC Act PMST indicated the potential presence of 13 additional fauna taxa within the database search area (DEE 2018). The DBCA Threatened and Priority fauna database did not detect any additional vertebrate fauna. The full database search can be seen in Appendix B.

3.2 Conservation significant fauna

From the above species diversity, 26 conservation significant fauna were identified to be present/potentially present within the database search area. Available point location records are presented in Figure 1. The desktop search recorded:

- € Three Critically Endangered taxa (EPBC Act) (one also listed as Endangered under BC Act)
- € Two Endangered taxa (BC Act) (one also listed as Critically Endangered under EPBC Act)
- € Seven Vulnerable taxa (BC Act and/or EPBC Act)
- € One Other Specially protected taxa (BC Act)
- € One Priority 1 taxa (DBCA listed)
- € Two Priority 2 taxa (DBCA listed)
- € One Priority 3 taxa (DBCA listed)
- € Four Priority 4 taxa (DBCA listed)
- € Six Migratory taxa (one also Listed as Critically Endangered (EPBC Act & BC Act))

These species are listed in Appendix C. A likelihood of occurrence assessment was then performed on the 26 conservation significant fauna and of those, 10 were considered known or likely to occur within the survey area following desktop assessment and field survey results. The final likelihood of occurrence assessment is presented in section 4.3.

3.3 Literature review

As part of the desktop assessment fauna survey reports of spatial relevance to the survey area were provided by BHP. Following a review of the reports the findings were collated and are summarised in Table 10.

Table 10 Literature review

Name of survey	Ministers North Biological Survey 2006	Munjina and Ministers North (Yandi Hub) Fauna Assessment 2009	Ministers North Level 2 Vertebrate Fauna Survey 2017	Ministers North to Yandi Single Phase Level 2 Fauna and Detailed Flora/Vegetation Survey Corridor 2017	East Packsaddle Level 1 Vertebrate Fauna Study 2010
Consultant	Ecologia Environment	ENV Australia	Biologic	Biologic	Biologic
Level of experience of consultant	All members of the survey team have had appropriate training, experience and mentoring in fauna identification and fauna assemblage surveys. Positions unknown.	One Senior Zoologist/Ornithologist , four Zoologists and one Taxonomist	One Principle Zoologist and three Senior Zoologists	One experienced zoologist.	One Principal Zoologist, two Senior Zoologist and one Herpetologist
Location of survey in relation to this survey	Intersects GHD 2020 survey area	Intersects GHD 2020	Intersects GHD 2020 survey area	Intersects GHD 2020 survey area	Intersects GHD 2020 survey area
Dates of survey	10-14 May 2006	21 Nov-2 Dec 2007	15-26 October 2016 and 3-13 April 2017	9-13 October 2017	5-18 October 2009 and 20-1 April 2010
Seasonal conditions during and in the six months prior to the survey	The report indicates that rainfall has been high in the previous 4 months. During survey moderate day temperatures and cool night temperatures were experienced.	The area received 2.8 mm of rain in the three months preceding the survey. The day temperatures were in the low 40s, with night temperatures in the high 20s.	The weather conditions during the first season dry survey were typical of that time of year, averaging around the long-term average for October of 35.2°C. No rainfall recorded in the month before or during the first season survey. However, heavy rainfall was experienced in the summer months between the two	Not specified	Not presented.

Name of survey	Ministers North Biological Survey 2006	Munjina and Ministers North (Yandi Hub) Fauna Assessment 2009	Ministers North Level 2 Vertebrate Fauna Survey 2017	Ministers North to Yandi Single Phase Level 2 Fauna and Detailed Flora/Vegetation Survey Corridor 2017	East Packsaddle Level 1 Vertebrate Fauna Study 2010
			surveys which was well above average for Newman (152.4 mm of rain falling during March 2017, compared to the long-term average of 41.5 mm).		
Summary of survey techniques and survey effort	Level 1 survey: 17.16 hrs diurnal search, 2 hrs nocturnal search, 16.6 hrs bird survey, 4 nights of bat recordings (Anabat II)	Single phase Level 2 survey: Five trapping sites, between 5 and 8 trap nights per site. Total trapping effort is equal to 2170 trap nights including 310 cage trap, Elliot trap and Bucket trap nights, and 620 Funnel and Pot trap nights. Non-systematic survey effort included 14.75 hours diurnal searches, 13.5 hours of nocturnal searches, 30 hours of bird census, 10 nights of bat recordings (52 hours) (Anabat II).	Level 2 survey: A total of 10 trapping sites with 7 monitored per season. Each trapping site comprised 10 pit traps, 20 funnel traps, 20 medium Elliot traps, and 2 cage traps. Targeted and nocturnal searches were conducted along along 8 transects; SM2BAT+ recorders were placed at 28 locations, motion cameras at 26 locations, and opportunistic sightings throughout survey area. Habitat assessments were conducted at every trapping site/ motion camera/ bat recorder/ nocturnal transect location, as well at standalone habitat	Single phase Level 2 survey: Survey included; 23 motion cameras, SongMeter2 (SM2) for bat call detection at 5 locations, SongMeter4 (SM4) acoustic recorders for bird call detection at two locations, 37 habitat assessments, three targeted search locations, and opportunistic recordings throughout the survey.	Level 1 fauna survey: 4 trap sites were established and open for six nights per phase, only two sites were open during the second phase. Birds were recorded throughout the day during transects of the project area. Bat echolocation calls were recorded using an ANABAT receiver coupled with a ZCAIM unit. Overnight bat recordings using ANABAT systems were performed at 7 locations. Motion sensitive cameras were set up at 6 locations. Opportunistic surveys

Name of survey	Ministers North Biological Survey 2006	Munjina and Ministers North (Yandi Hub) Fauna Assessment 2009	Ministers North Level 2 Vertebrate Fauna Survey 2017	Ministers North to Yandi Single Phase Level 2 Fauna and Detailed Flora/Vegetation Survey Corridor 2017	East Packsaddle Level 1 Vertebrate Fauna Study 2010
			assessment locations (for a total of 73 habitat assessments)		were conducted at trapping sites and at 20 opportunistic survey sites. Targeted searches for conservation significant fauna were undertaken via transects. Habitat types were assessed throughout the survey area.
Species richness within survey area (species recorded)	71 vertebrate fauna species comprising 18 reptiles, 42 birds, 10 mammals and one amphibian.	134 vertebrate fauna species comprising 22 mammals, 45 reptiles, 66 birds and one amphibian.	116 vertebrate fauna comprising 17 mammal species, 54 bird species, 43 reptile species, and two amphibians	59 vertebrate fauna comprising; 35 birds, 14 mammals and 10 reptiles.	110 vertebrate fauna comprising 19 mammals, 48 birds, 39 reptiles and four amphibians.
Conservation significant species recorded	<i>Pseudomys chapmani</i> Western Pebble-mound Mouse (P4)	<i>Pseudomys chapmani</i> Western Pebble-mound Mouse (P4)	<i>Pseudomys chapmani</i> Western Pebble Mouse- (P4) (One locally significant species was recorded during the survey, the Chocolate Wattled Bat (<i>Chalinolobus morio</i>))	<i>Pseudomys chapmani</i> Western Pebble-mound Mouse (P4)	<i>Pseudomys chapmani</i> Western Pebble-mound Mouse (P4) <i>Macroderma gigas</i> Ghost Bat (Vu)
Taxonomic changes for conservation significant species	None	None	None	None	None

Name of survey	Ministers North Biological Survey 2006	Munjina and Ministers North (Yandi Hub) Fauna Assessment 2009	Ministers North Level 2 Vertebrate Fauna Survey 2017	Ministers North to Yandi Single Phase Level 2 Fauna and Detailed Flora/Vegetation Survey Corridor 2017	East Packsaddle Level 1 Vertebrate Fauna Study 2010
Survey limitations	Unlikely for all vertebrate fauna species to have been detected as a result of the single survey using non-systematic sampling methodology; ecologia also indicated that seasonal conditions (cool nights, moderate day temps) may have reduced herpetofauna detection.	Hot, dry weather conditions experienced during the survey may have limited activity of certain fauna groups such as amphibians. The survey area was recently burnt.	Heavy rainfall during March 2017 delayed the second season survey and caused access restrictions to three of the trapping sites, resulting in three new trapping sites being established. Due to identical characteristics in the calls of some bat species within a genus, it was not possible to differentiate all species using calls The survey area was recently burnt. Site placement was restricted in some cases due to the presence of heritage sites.	The survey was conducted during a single season only (dry season) that reduced the ability to detect some fauna.	Not specified.

Continued

Name of survey	Marillana Creek (Yandi) Iron Ore Mine Modification Level 2 Fauna Survey 2008	Yandi Life of Mine Flora and Fauna 2003	Packsaddle West, Vegetation and Flora Survey and Fauna Assessment 2010	Packsaddle Range Biological Survey 2004	RGP5 Fauna Survey, Kurrajura Siding to Yandi Wye , including Yandi Repeater 1 2008
Consultant	Ecologia Environment	Maunsell Australia	Astron Environmental Services	Biologic	Ecologia Environmental
Level of experience of consultant	Four Senior Zoologists	Two ecologists from Bamford Consulting in conjunction with staff from Maunsell Australia	One Principal Zoologist	Two Senior Zoologists, One Herpetologist, One Research assistant	Two Senior Zoologists (one specializing in ornithology)
Location of survey in relation to this survey	Intersects GHD 2020 survey area.	Intersects GHD 2020 survey area.	Located approximately 30 km southwest of GHD 2020 survey area.	Located approximately 30 km west of the GHD 2020 survey area.	Located approximately 33 km southwest of GHD 2020 survey area.
Dates of survey	19-30 March 2008	23 ÷ 28 September 2003	10-19 April 2010	5-10 May 2004	9-13 May 2008
Seasonal conditions during and in the six months prior to the survey	In months preceding the study, Newman received most rain in February with 124.6 mm however, anecdotal evidence suggests that little rainfall was received during February at Yandi with most rain prior to the survey haven fallen in January and no rain falling in February. During the survey weather conditions were excellent for all vertebrate forms. Hot, humid days and nights	Not specified	Approximately 170 mm of rain was recorded in the 12 months preceding the survey at Wittenoom weather station and at the Area C weather station, which is below the long-term average of 460 mm. Four months prior to the survey a rain bearing depression brought 69 mm to Wittenoom, and 31 mm to Area C.	Biologic indicate that the timing of the survey was optimal, following several months of heavy rainfall. Not discussed specifically for the lead up to survey.	Climatic conditions experienced during the survey were generally warm during the day and cool at night with no rainfall recorded

Name of survey	Marillana Creek (Yandi) Iron Ore Mine Modification Level 2 Fauna Survey 2008	Yandi Life of Mine Flora and Fauna 2003	Packsaddle West, Vegetation and Flora Survey and Fauna Assessment 2010	Packsaddle Range Biological Survey 2004	RGP5 Fauna Survey, Kurrajura Siding to Yandi Wye , including Yandi Repeater 1 2008
	were experienced in the initial half of the survey accompanied by thunderstorms and rainfall. Cooler, wet conditions were experienced during the latter half of the survey.				
Summary of survey techniques and survey effort	Level 2 fauna survey: Trapping occurred at 6 locations. Total systematic trapping effort consists of 2976 trap nights (pit traps, funnels, Elliot traps and cage traps. Non-systematic trapping effort comprised 1620 minutes of bird census, 3660 minutes of opportunistic diurnal searching, 240 minutes of bat recordings and 1825 minutes of nocturnal searching.	Level 1 fauna survey: Survey area was traversed on foot looking for evidence of pebble mounds, Bilby burrows and Spectacled Hare-Wallaby coupled with opportunistic observations, nocturnal searches on four evenings (10 man hours), and recordings and analysis of bat calls using ANABAT II.	Level 1 fauna survey: Opportunistic survey sites were established in all fauna habitats present within the survey area. At each opportunistic survey site, a bird census, and targeted searches for mammals, reptiles, frogs and conservation significant species was undertaken. Motion-sensitive cameras were established at two locations. Habitat mapping was performed over the area.	Level 1 fauna Opportunistic searches, nocturnal searches and targeted fauna survey techniques were used in combination with Anabat system for bat call analysis. A total of 8 hours and 30 minutes of bird census, 35 hours and 5 minutes of reptile searching and 5 hours and 15 minutes of bat recordings were undertaken.	Level 1 Fauna survey: The survey comprised a total of 51.7 man hours of opportunistic searching (both diurnal and nocturnal) across a total of 32 localities between the Kurrajura siding and Yandi. Repeater 1 was surveyed for a total of 5 hours, including a walked transect of both sides of the access road.

Name of survey	Marillana Creek (Yandi) Iron Ore Mine Modification Level 2 Fauna Survey 2008	Yandi Life of Mine Flora and Fauna 2003	Packsaddle West, Vegetation and Flora Survey and Fauna Assessment 2010	Packsaddle Range Biological Survey 2004	RGP5 Fauna Survey, Kurrajura Siding to Yandi Wye , including Yandi Repeater 1 2008
Species richness within survey area (species recorded)	119 vertebrate species comprising 19 mammals, 60 birds, 37 reptile and 3 amphibians.	82 vertebrate species comprising 4 mammals, 68 birds, 8 reptiles and 2 amphibians.	87 vertebrate species comprising 60 birds, 14 reptiles and 13 mammals.	88 vertebrate species 11 mammals, 56 birds, and 22 reptiles.	77 vertebrate species comprising, 14 mammals, 52 birds, 9 reptiles and two amphibians.
Conservation significant species recorded	<i>Pseudomys chapmani</i> Western Pebble-mound Mouse (P4)	<i>Pseudomys chapmani</i> Western Pebble-Mouse (P4) (mounds), <i>Liasis olivaceus barroni</i> Pilbara Olive Python, (VU) <i>Tringa hypoleucos</i> Common Sandpiper (MI) <i>Amytornis striatus striatus</i> Striated Grasswren (P4)	<i>Macroderma gigas</i> Ghost Bat (VU) <i>Pseudomys chapmani</i> Western Pebble-mound Mouse (P4);	<i>Pseudomys chapmani</i> Western Pebble-mound Mouse (P4) <i>Macroderma gigas</i> Ghost Bat (VU)	<i>Rhinonictis aurantia</i> Pilbara leaf nosed bat (VU) <i>Macroderma gigas</i> Ghost Bat (VU) <i>Pseudomys chapmani</i> Western Pebble- Mouse (P4)
Taxonomic changes for conservation significant species	<i>Merops ornatus</i> Rainbow Bee-eater detected during survey and has since been delisted	<i>Merops ornatus</i> Rainbow Bee-eater detected during survey and has since been delisted <i>Stipiturus ruficeps</i> Rufous-crowned Emu-wren now delisted	None	None	<i>Merops ornatus</i> Rainbow Bee-eater detected during survey and has since been delisted
Survey limitations	The survey area was recently burnt in some parts. Site placement was restricted in some cases due to the presence of heritage sites. Wet weather	Limited literature for literature review, otherwise not discussed.	Cryptic species were unlikely to be recorded due to the survey methodology. Not all areas were searched for conservation significant species. Cool	Some areas within the survey area were inaccessible by road. However, the habitats that needed to be sampled to adequately	In a number of locations along the corridor, access was limited to only one side of the railway. Where possible searches for

Name of survey	Marillana Creek (Yandi) Iron Ore Mine Modification Level 2 Fauna Survey 2008	Yandi Life of Mine Flora and Fauna 2003	Packsaddle West, Vegetation and Flora Survey and Fauna Assessment 2010	Packsaddle Range Biological Survey 2004	RGP5 Fauna Survey, Kurrajura Siding to Yandi Wye , including Yandi Repeater 1 2008
	precluded deployment of the ANABAT detectors at all sites (considered partly limiting). Proportion of fauna detected was lower than previous site studies.		temperatures during the day potentially reduced activity levels for many species making them less likely to be recorded. Not all significant areas were visited. This includes caves which are likely to be numerous within the survey area.	represent the project area were accessible.	animals using binoculars was conducted. A number of Aboriginal Heritage areas occur within the survey area, these areas were not available for survey. Mammals tend to be poorly represented in any opportunistic survey.

4. Results

4.1 Fauna habitats

4.1.1 Habitat type

Eight habitat types (not including Cleared/Disturbed land) were identified within the survey area. These comprise:

- | | |
|-----------------------|----------------------------|
| € Hillcrest/Hillslope | € Drainage Area/Floodplain |
| € Minor Drainage Line | € Breakaway/Cliff |
| € Major Drainage Line | € Rehabilitated Area |
| € Gorge/Gully | € Basalt Outcrops |

A description of each habitat type along with the representative area (ha) located within the survey area is presented in Table 11 and mapped in Figure 3.

The survey area is predominantly made up of Hillcrest/Hillslope habitat which is separated by Minor and Major Drainage Lines. Drainage Area/Floodplain habitat is located in the lower part of the landscape as overflow areas off the drainage lines. The Breakaway/Cliff habitat lies at the edges of the Hillcrest/Hillslope habitat and is associated with the identified caves (described in section 4.3). The northern-most portion of the survey area contains the Rehabilitated Area and Cleared/Disturbed land as a result of mining activities.

4.1.2 Habitat linkages

There is a high degree of fauna habitat continuity throughout and adjacent to the survey area. Extensive mining operations at Yandi, Area C and in Rio Tinto tenements north and northeast of the survey area reduce connectivity regionally. Iron ore rail infrastructure between the smaller survey areas reduces local habitat connectivity. Riparian habitat associated with Yandcoogina Creek is continuous downstream for 6 km where it intersects with mine infrastructure, with seasonal stream flow maintained via culverts. Current disturbances to the survey area are high in the northern-most portion with clearing and an open pit present. There is limited to low level cattle disturbance and associated weeds within Drainage Area/ Floodplain and Minor and Major Drainage Lines.

4.1.3 Quality of habitat

The quality of the fauna habitats are currently affected by the impacts described above in section 4.1.2. Whilst the vegetation is mostly intact the impact by mining operations particularly in the northern portion of the survey area have resulted in Cleared/Disturbed areas of land. The quality of the remainder habitats within the survey areas are in very good to excellent condition.

The survey results (i.e. species recorded) suggest that the habitat features and micro habitats within Hillcrest/Hillslope, Gorge/Gully, Drainage Lines and Breakaway/Cliff play a significant part in influencing species occurrence. The Breakaway/Cliff and Gorge/Gully habitat contains caves suitable for bats to occur however the majority of the habitat within the survey area is non-cave forming. The Hilltop/Hillcrest areas are covered in pebbles and small scattered rocks which are used by Pebble Mound Mouse (*Pseudomys chapmani*) to construct burrows. The soil underneath is very hard and shallow which reduces the opportunity for many burrowing species to hide or create refuge. This habitat mainly provides support for lizards, snakes, ground dwelling birds and some rodents.

Where small areas of micro-habitat (outcropping, breakaway or exposed rock) are present they provide high quality resources for a diverse suite of fauna particularly reptiles and small mammals. This micro-habitat supports numerous saxicoline species such as Wooley's False Antechinus, Pilbara Rock Monitor, Hamersley Range Dtella and Rock Ctenotus. Several reptiles endemic to the region are rock habitat specialists (thigmotactic). These environments provide refuge, breeding, feeding and dispersal for species. However, the highest quality habitat for these species lies within the Gorge/Gully habitat which is only a minor habitat type within the scale of the survey area and is mainly located within the southern and eastern extents. The majority of the survey area is Hilltop/Hillcrest which provides relatively few microhabitats and does not support a large array of species.

Table 11 Major habitat types within the survey area

Description	Extent in the Survey area	Representative Images
Hillcrest/Hillslope Low sparse shrubland of <i>Acacia</i> sp. <i>Senna</i> sp. and <i>Solanum lasiophyllum</i> over tussock grassland of <i>Triodia</i> sp. The majority of the survey area comprise Hillcrest/Hillslopes. The Hillcrest/hillslope habitat comprises undulating low hills, hill slopes, hill crests, breakaways, cliffs, basalt outcrops and drainage area/floodplains. This habitat comprises varying small to gravel sized ironstone rocks. Soil was scarce with some areas containing few small patches of silty clay loam or heavy clay. This habitat supports limited vegetation (likely due to limited soil availability). Vegetation within this habitat includes scattered mixed shrubs of <i>Acacia</i>, <i>Senna</i> sp., <i>Eremophila</i> sp., <i>Solanum</i> and <i>Grevillea</i> sp. over <i>Triodia</i>. Few microhabitats were available (i.e. limited litter, logs or debris). Some areas showed evidence of a recent fire but most areas did not appear to have had a fire for at least six or more years. The hillcrest/ hillslopes in this survey area are predominantly flat or have a low slope and there was minor banded iron formation (BIF) outcropping. Due to the lack of cover and limited soils (difficulty for species to dig and hide) relatively few species were observed in this environment. This is a locally and regionally extensive habitat type occurring throughout the Hamersley subregion. Conservation significant fauna 39 active, eight inactive and three recently inactive Pebble-mound Mouse (<i>Pseudomys chapmani</i>) mounds were recorded over the extent of the survey area. Other mounds are expected to be scattered through the habitat as conditions are well suited to support the Pebble-mound Mouse (i.e. denning). Ghost Bat (<i>Macroderma gigas</i>), Peregrine Falcon (<i>Falco peregrinus</i>) and Grey Falcon (<i>Falco hypoleucos</i>) may also utilise these areas for foraging. Northern Quoll may use this habitat opportunistically and for dispersing purposes however it is not considered core foraging or denning habitat. Night Parrot may use some of the habitat with larger, old growth spinifex for nesting. Night Parrot are known to be nomadic and resource dependent therefore depending on environmental conditions could potentially use unburnt areas within this habitat. Night Parrot	1,309.01 ha (51.8%)	

Description	Extent in the Survey area	Representative Images
audio recorders were deployed in this habitat and returned no hits for Night Parrot during the survey. Pilbara Barking Gecko may also utilise this habitat for shelter and foraging. Moderate value		
Gorge/Gully Eucalyptus woodland over mixed shrubland of <i>Acacia</i> sp., <i>Senna</i> sp., <i>Hakea</i> sp., <i>Eremophila</i>, <i>Ptilotus</i> sp. and <i>Solanum</i> sp. over tussock grassland of <i>Triodia</i> sp. Gorge/Gully habitat is predominantly located in the southernmost survey area with some smaller features interspersed within the central survey areas. This habitat is characterised by deep gorges with cliffs, breakaways, rocky outcropping, scree slopes, caves and overhangs. Some Gorge/Gully habitat have major drainage lines running through them. The Gorge/Gully habitat has an array of micro habitats including moderate litter, logs and debris and many small to medium rocks. No water features were discovered within the Gorge/Gully habitat type within the Level 1 survey area. Most of this environment showed no signs of fire with some small areas showing signs of fire from the past three to five years. This habitat type contains a variety of microhabitats and habitat features suitable to support a variety of species including caves, hollows, rock crevices, sand and leaf litter. Conservation significant fauna This habitat is suitable for Pilbara Olive Python (shelter and foraging) and Ghost Bat (roosting and foraging). Pilbara Olive Python scat was found at one of the water holes within the Level 2 survey area (GHD 2020) within 1.5 km from the Level 1 survey area and the general terrain is considered excellent Pilbara Olive Python habitat. Where the hill crest and hill slopes have out cropping rocks or gullies the Pilbara Flat-headed Blind Snake may likely persist. Peregrine Falcon and Grey Falcon may also utilise these areas for foraging. The Gorge/Gully habitat is also suitable to support the Northern Quoll (denning and foraging). Pilbara Barking Gecko may also utilise this habitat for shelter and foraging. High value	71.05 ha (2.8%)	

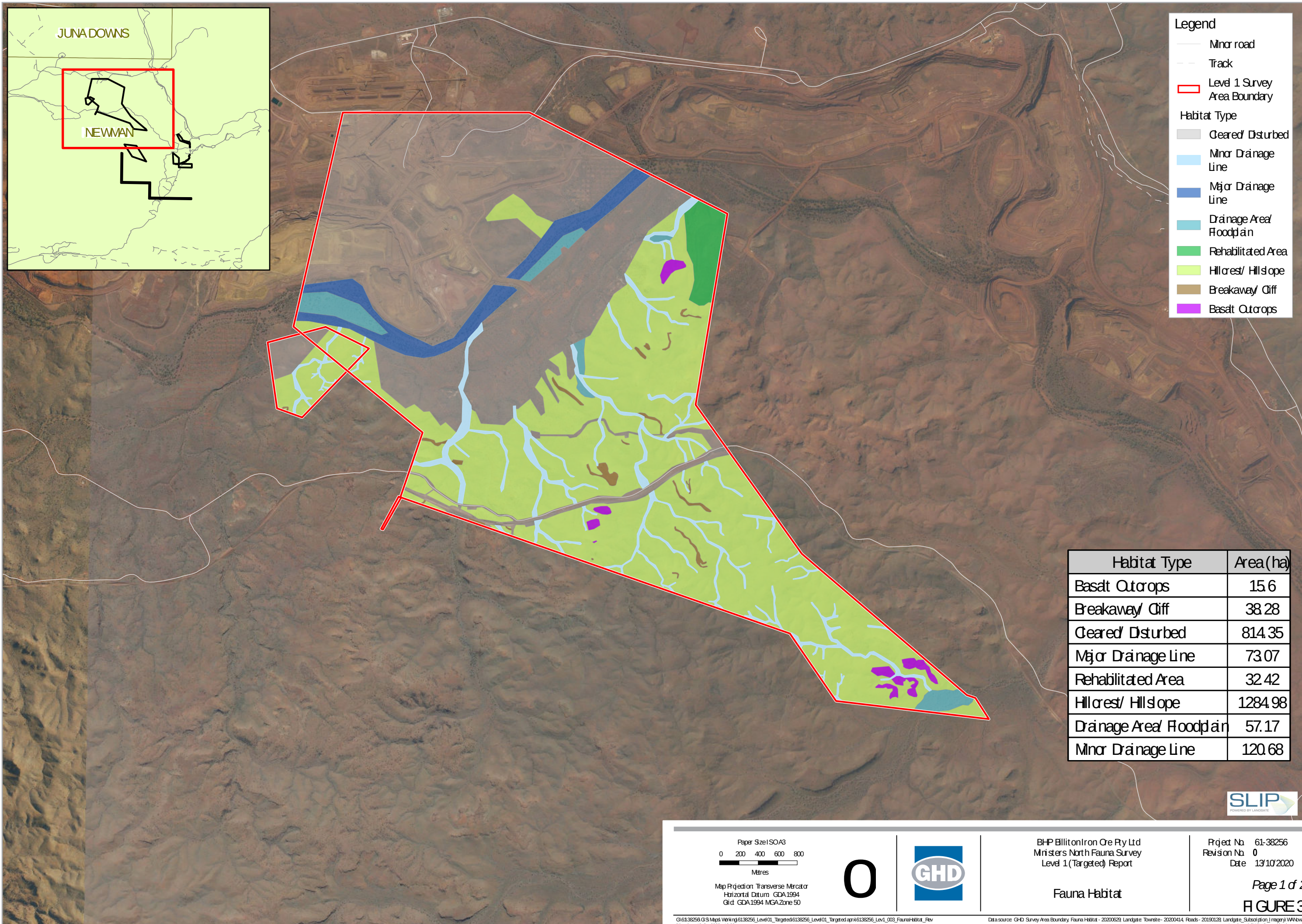
Description	Extent in the Survey area	Representative Images
		
Drainage area/Floodplain Shrublands of mixed <i>Acacia</i> over <i>Triodia</i> and native grasses on silty/clay/loam soils Drainage areas/ Floodplain habitat comprise a relatively small portion of the survey area. The vegetation primarily comprises <i>Acacia</i> shrubs over native and introduced grasses. The habitat appears to be either long unburnt or moderately long unburnt. Disturbances include two active mine pits and vehicle tracks. Litter is evenly spread and very light. Soils comprise silty clay loam and heavy clay with pebbles to large rocks. The soil is considered too hard and rocky to be suitable for most burrowing species and no signs of burrowing were detected during the survey. However, smaller patches of sand were observed at irregular intervals which may provide some use to burrowing fauna. Conservation significant fauna Seasonally numerous species (opportunistic migratory species) may utilise this habitat particularly if water is maintained for prolonged periods, however this would be very rare. The Peregrine and Grey Falcon would utilise the well vegetated corridors for hunting/foraging. Night Parrot may use some of the habitat with larger, old growth spinifex for nesting. Night Parrot are known to be nomadic and resource dependent therefore depending on environmental conditions could	56.57 ha (2.2%)	

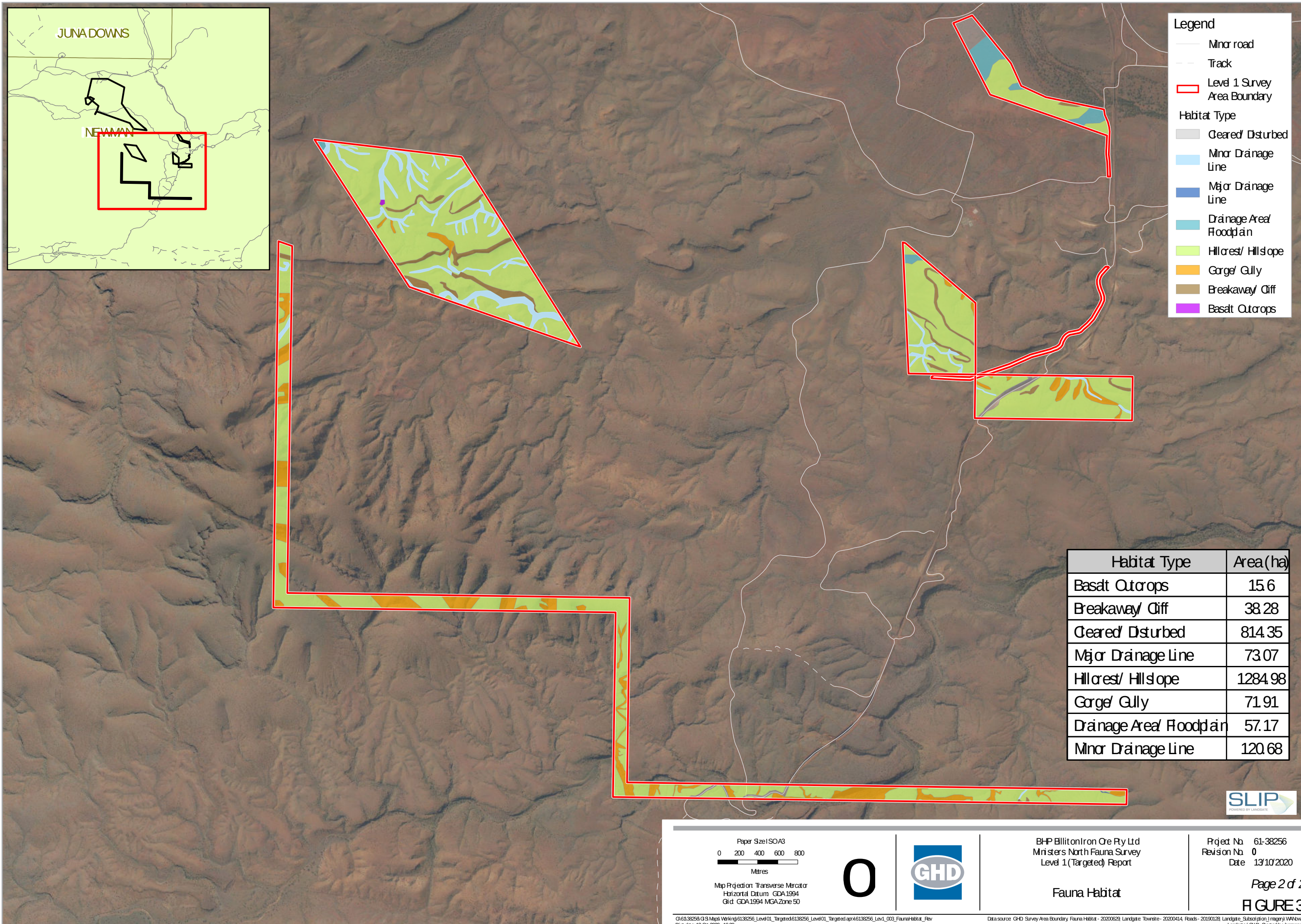
Description	Extent in the Survey area	Representative Images
potentially use unburnt areas within this habitat. Night Parrot audio recorders were deployed in this habitat and returned no hits for Night Parrot during the survey. Moderate Value		
Minor Drainage Line Scattered Eucalypts over shrublands of mixed <i>Acacia</i> over <i>Triodia</i> and native grassland on heavy loam/clay soils Numerous minor drainage lines run through the survey area. The vegetation along these drainage lines is dominated by <i>Acacia</i> species with scattered mixed shrubs including <i>Cymbopogon</i>, <i>Grevillea</i>, <i>Hakea</i> with <i>Triodia</i> and <i>Poaceae sp.</i> grassland. The minor drainage lines mainly represent the transition from Hillcrest/Hillslope into the Gorge/Gully habitat types. The drainage lines have a mosaic of substrates with a complex and variable mix of rocky, stony and sandy profiles. Leaf litter is light to moderate depending on the area. The substrates would vary and erode in response to rainfall and flooding. Some recent fire activity was present in the northern survey area but the majority of the survey area was moderate to long unburnt. These linear patches of habitat provide a corridor for the movement of fauna through the local landscape. Small birds (such as the Variegated Fairy-wren (<i>Malurus lamberti</i>) and White-winged Fairy-wren (<i>Malurus leucopterus</i>) that rarely move though open habitats would utilise this denser vegetation for foraging, movement and nesting. Eucalypts scattered throughout the habitat provide hollows which may be used by small mammals (including bats), reptiles and birds for shelter. The Eucalypts also provide ambush structures for bats such as the Ghost Bat. Conservation significant fauna Ghost Bat, Peregrine and Grey Falcon may utilise these well vegetated corridors for hunting/foraging. Night Parrot may also utilise this habitat for nesting where patches of spinifex are long unburnt and depending on resource availability. Moderate Value	109.73 ha (4.3%)	

Description	Extent in the Survey area	Representative Images
Major Drainage Line Low open woodland of <i>Eucalyptus camaldulensis</i> over <i>Melaleuca</i> sp. and <i>Acacia</i> sp. over grassland of <i>Poaceae</i> sp. One major drainage line runs through the northern most survey area, Marillana Creek. The drainage line appeared dry during the survey however pools of water may be present outside of the survey area. The vegetation along this drainage line was dominated by <i>Acacia</i> species with scattered mixed trees including <i>Eucalyptus camaldulensis</i>, with herbs and grassland. In areas this environment was densely vegetated particularly where associated with sandy soils. Yandicoogina Creek bisects the southern portion of the survey area and had water bodies present during both site visits. The drainage lines have a mosaic of substrates with a complex and variable mix of rocky, stony and sandy profiles. The substrates would vary and erode in response to rainfall and flooding. There was no evidence of fire in this habitat type. The drainage line provides a corridor for the movement of fauna through the local landscape. Small birds would utilise this denser vegetation for foraging, movement and nesting. Frogs may also use this habitat, predominantly seasonally. Conservation significant fauna Ghost Bat, Peregrine Falcon and Grey Falcon are likely to utilise these well vegetated corridors for hunting/foraging. Northern Quoll may utilise the habitat for opportunistic foraging and for dispersal. Night Parrot may also utilise this habitat for nesting where patches of spinifex are long unburnt and depending on resource availability. High value	72.59 ha (2.9%)	
Basalt Outcrops A few small areas of basalt outcropping were observed within the northern-most survey area. This area could not be physically accessed during the time of survey due to access constraints; however the habitat type has been identified through aerial imagery and was confirmed in the field with binoculars where possible. Low value	15.58 ha (0.6%)	None available.

Description	Extent in the Survey area	Representative Images
Breakaway/Cliff <i>Triodia</i> grassland with scattered <i>Eucalypt</i> and <i>Acacia</i> sp. While the Gorge/Gully habitat type contained some breakaway, other areas were identified outside the Gorge/Gully system. Breakaway/Cliff areas were predominantly found at the edges of Hillcrest/Hillslope or around drainage areas. Breakaway/Cliff areas may contain suitable rock type for the creation of cave systems. The habitat comprises major or extensive BIF or conglomerate outcropping and rocks from pebble to large in size. Vegetation is generally scarce or with few small evenly spread patches. Fire frequency ranged from moderate to old with other disturbances listed as access tracks and mining exploration. Conservation significant fauna One potential Ghost Bat cave was found in the northern survey area which contained evidence suggestive of Ghost Bat feeding (piles of feathers from avian prey). Other caves suitable for Ghost Bat feeding or roosting may be present within the Breakaway/ Cliff habitat type throughout the survey area. This habitat may also be used for denning and foraging by Northern Quoll. High value	38.00 ha (1.5%)	
Cleared/Disturbed There are a number of Cleared/Disturbed areas within the survey area. These predominantly include mining exploration/pits and access tracks/roads. These areas do not contained suitable habitat to support conservation significant species. Low value	820.34 ha (32%)	

Description	Extent in the Survey area	Representative Images
Rehabilitated Area Scattered <i>Acacia</i> sp. over <i>Solanum</i> sp. over <i>Triodia</i> and <i>Poaceae</i> grassland. An area of rehabilitated land exists within the northern-most portion of the survey area. This area is in the process of rehabilitation from past clearing during exploration and mining activity. The <i>Triodia</i> in this habitat is still relatively small as are the scattered trees. The groundcover is predominantly pebbles and small rocks with light, evenly spread leaf litter and little woody debris. Conservation significant fauna Multiple signs of the Pebble-mound Mouse have previously been recorded within this area. Peregrine Falcon and Grey Falcon may opportunistically use this area to forage. Low value	32.44 ha (1.3%)	





4.2 Fauna diversity

The survey identified 67 species of vertebrate fauna within the survey area. This number comprises 19 mammals, 40 birds and eight reptiles. A breakdown of the fauna assemblages is provided below.

4.2.1 Mammals

The survey recorded 19 mammal species within the survey area, including two introduced and 17 native species. A breakdown of mammal families recorded during the surveys is provided in Table 12. The composition of species includes one native rodent, two macropod, Echidna, Dingo, feral cat, sheath-tailed bat, free-tailed bat and evening bat.

Only presence or absence information was collected, with species abundance not assessed.

Table 12 Mammal families recorded during the field surveys

Mammal Family	No. of species
Canidae (Dog)	2
Dasyuridae (Marsupial mammals)	1
Emballonuridae (Sheath-tailed bats)	3
Felidae (Cat)	1
Macropodidae (Kangaroos)	2
Molossidae (Free-tailed bats)	3
Muridae (Rodents)	2
Tachyglossidae (Echidna)	1
Vespertilionidae (Evening bats)	4
Total	19

Chocolate Wattle Bat

The Chocolate Wattle Bat (*Chalinolobus morio*) was detected on an SM4 Song Meter E at one location (Site 2, Table 6) with a definite detection on 13 September 2019 and a probable detection on the 14 September 2019. Probable calls are those defined as a call most likely to represent a particular species, with a low probability of confusion with species of similar call type or where the call lacks sufficient detail. The Chocolate Wattle Bat calls were detected in Hillcrest/Hillslope habitat and likely represents the species foraging outside of their typical roosting habit of hollows in woodlands (habitat restricted to valleys, gorges and gullies in this region). No other detections of this species were recorded.

4.2.2 Birds

The survey identified 40 bird species from 22 families. The most speciose families were the Meliphagidae (five species), Accipitridae (four species) and Columbidae (four species). A breakdown of bird families recorded during the survey is provided in Table 13.

The Night Parrot (*Pezoporus occidentalis*) was specifically targeted for assessment in potential habitat areas (Drainage Lines, Drainage Area/Floodplain, Hillcrest/Hillslope). These areas were targeted due to portions having good coverage of Spinifex present and/or water present representing potential foraging or roosting habitat (Department of Parks and Wildlife 2017).

The results of the targeted Night Parrot survey are based on five locations where Bird Acoustic Recorder SM4 E units were deployed for a combined total of 15 nights of bioacoustic recordings. A total of 48,893 acoustic detections were analysed for Night Parrot. No calls of Night Parrots were detected. Calls that were detected were identified from 24 common non-target bird species including Australian Owlet-nightjar and White-plumed Honeyeater. The call frequency range of

these non-target species overlaps with Night Parrot calls, therefore it is highly likely the detectors would have recorded Night Parrot calls if vocalisation had occurred within reasonable distance of a unit (~300 m during clear conditions as per DPaW (2017)).

Table 13 Bird families recorded during the field surveys

Bird Family	No. of species
Acanthizidae	1
Accipitridae	4
Artamidae	2
Cacatuidae	1
Campephagidae	2
Columbidae	4
Corvidae	1
Cracticidae	2
Dicaeidae	1
Dicruridae	1
Estrildidae	2
Falconidae	2
Maluridae	2
Meliphagidae	5
Meropidae	1
Monarchidae	1
Motacillidae	1
Pachycephalidae	2
Pardalotidae	1
Pomatostomidae	1
Psittaculidae	2
Rhipiduridae	1
Total	40

4.2.3 Reptiles

A total of eight reptile species were recorded during the field surveys from four families. The most speciose families were Scincidae (three species) and Varanus (three species). A breakdown of reptile families recorded during the survey is provided in Table 14.

Table 14 Reptile families recorded during the field surveys

Reptile Family	No. of species
Agamidae (Dragons)	1
Elapidae (Snakes)	1
Scincidae (Skinks)	3
Varanus (Monitors)	3
Total	8

4.2.4 Introduced species

Mammals comprised the only group in which introduced fauna were recorded, with the two species observed being:

- Cat (*Felis catus*)
- Dog (*Canis familiaris*).

4.3 Conservation significant fauna

Two conservation significant fauna species were recorded within the survey area during the field survey:

- Western Pebble-mound Mouse (*Pseudomys chapmani*) – Listed as Priority 4 under the BC Act, found in Hillcrest/ Hillslope habitat
- Ghost Bat (*Macroderma gigas*) – listed as Vulnerable under the BC Act and Vulnerable under the EPBC Act, found in Gorge/ Gully habitat.

The locations of all conservation significant fauna recorded during the survey are presented in Figure 4.

Likelihood of occurrence assessment

A likelihood assessment of conservation significant species occurring in the survey area was undertaken in addition to the field survey. The assessment takes into consideration the species's biology, habitat requirements, and the quality and availability of suitable habitat as determined during the field survey as well as previous records of the species in the survey area and the general region. Species-specific searches of the DBCA *NatureMap* database for the database search area were conducted in order to gather information about the broader regional occurrence of species to further inform the likelihood of occurrence assessment.

In addition to the two known conservation significant species recorded (section 4.3), seven conservation significant species are considered likely to occur in the survey area (Table 15). A brief description of these species and their associated habitat types within the survey area are described below. The parameters of determination and the full likelihood of occurrence assessment for the species identified through the desktop assessment are provided in Appendix C.

Table 15 Summary of likelihood of occurrence assessment

Species	EPBC Act	BC Act/ DBCA	Assessment outcome
Birds			
Rufous Grasswren (<i>Amytornis striatus subsp. whitei</i>)		P4	Likely. The Hillcrest/ Hillslope habitat comprises <i>Triodia</i> which may be large enough to nest in although the surrounding areas have larger patches of spinifex which may be favoured by this species. The closest known record is located 9.7 km southeast of the survey area.
Peregrine Falcon (<i>Falco peregrinus</i>)	-	OS	Likely. Suitable habitat is present for the species within the survey area and surrounds (Major Drainage Line, Gorge/Gully) and the species is known from the region. The closest record is located approximately 500 m east of the survey area.
Grey Falcon (<i>Falco hypoleucos</i>)		Vu	Likely. Suitable habitat is present for the species within the survey area and surrounds (Major Drainage Lines, Gorge/Gully) and the species is known from the region. The closest record is located approximately 14 km north of the survey area.
Mammals			

Species	EPBC Act	BC Act/ DBCA	Assessment outcome
Ghost Bat (<i>Macroderma gigas</i>)	Vu	Vu	Known. The species was recorded via feeding evidence (feathers from consumed prey) within one cave in the survey area. Daytime roosting caves may be located within close proximity of the survey area based on available habitat (particularly Gorge/Gully and Breakaway/Cliff habitat located outside of the survey area). The closest known record of the species is located approximately 1.5 km south of the survey area, within Study Area 2 (GHD 2020) which is within the known foraging range of this species. No Ghost Bat calls were recorded on detectors.
Western Pebble-mound Mouse (<i>Pseudomys chapmani</i>)		P4	Known. The species was recorded in the Hillcrest/Hillslope habitat via their pebble mound structures. Mounds were assessed as active, inactive and recently non-active.
Northern Quoll (<i>Dasyurus hallucatus</i>)	En	En	Likely. The Gorge/ Gully and Breakaway/Cliff habitat types presents suitable habitat to support this species (foraging and denning), while the Major Drainage Line habitat may be used opportunistically and for dispersal. The closest record of this species is approximately 800 m north of the survey area. Northern Quoll were not detected on remote cameras during the survey.
Reptiles			
Pilbara Flat-headed Blind Snake (<i>Anilius ganei</i>)		P1	Likely. Habitat is present for this species particularly in the rocky features within the Gorge/ Gully. This species was recorded in the Level 2 survey area within Gorge/Gully habitat (GHD 2020).
Pilbara Olive Python (<i>Liasis olivaceus barroni</i>)	Vu	Vu	Likely. A Pilbara Olive Python scat was found within a nearby Gorge/ Gully in Study Area 2 at the time of the survey (GHD 2020) and the closest known record is located within 200 m northeast of the survey area. Suitable habitat is present throughout the Gorge/Gully habitat type. Pilbara Olive Python was not detected on the remote cameras during the survey.
Pilbara Barking Gecko (<i>Underwoodisaurus seorsus</i>)		P2	Likely. The survey area contains suitable habitat to support this species (Gorge/Gully and Hillcrest/Hillslope habitat). The closest known record is located approximately 7.5 km south of the survey area.

Key ĩ (SP) = Other Special Protection under BC Act, (Vu) = Vulnerable under the EPBC Act and/ or BC Act, P1 = Priority 1 under DBCA, P4 = Priority 4 under DBCA. For breakdown of code meaning see Appendix B.

Fauna species recorded in the survey area

Western Pebble-mound Mouse (*Pseudomys chapmani*)

The Western Pebble-mound Mouse is listed as Priority 4 under the DBCA's Priority fauna listing.

The Western Pebble-mound Mouse is restricted to the Pilbara region where it is recognised as an endemic species. Habitat for the species can be found on stony hills or hillsides with hummock grasslands. It constructs large mounds of pebbles on stony hills which cover an area of 0.5 to 9 m². Active mounds are characterized by volcano-like cones capped by craters that mark occluded entrances to subterranean burrow systems where the mice live, often gregariously (Van Dyck and Strahan, 2008). Additionally an active mound has pebbles that do not or are not settled, meaning the mound is being worked and pebbles continuously manipulated.

In total 39 active, three recently inactive and eight inactive mounds were recorded on the Hillcrest/Hillslope habitat (as shown below in Table 16 and in Figure 4).

NatureMap records (DPaW 2007) indicate this species is widespread in the eastern Pilbara region. However this species is known to be sensitive to external impacts and populations are known to decline in areas where disturbance has occurred.

Table 16 Western Pebble-mound Mouse mounds recorded in the survey area

Easting	Northing	Date observed	Habitat	Active/ in active
711583.10	7483394.53	11/09/2019	Hillcrest/ Hillslope	Mound (active)
711331.90	7483693.83	11/09/2019	Hillcrest/ Hillslope	Mound (active)
711275.96	7483727.61	11/09/2019	Hillcrest/ Hillslope	Mound (active)
711199.86	7483726.68	11/09/2019	Hillcrest/ Hillslope	Mound (inactive)
709666.03	7482200.90	11/09/2019	Hillcrest/ Hillslope	Mound (active)
720378.42	7475397.29	11/09/2019	Hillcrest/ Hillslope	Mound (active)
720589.29	7475550.31	11/09/2019	Hillcrest/ Hillslope	Mound (active)
720336.55	7475680.52	11/09/2019	Hillcrest/ Hillslope	Mound (inactive)
720315.59	7475663.66	11/09/2019	Hillcrest/ Hillslope	Mound (inactive)
718649.66	7476020.63	13/09/2019	Hillcrest/ Hillslope	Mound (inactive)
718563.49	7475951.92	13/09/2019	Hillcrest/ Hillslope	Mound (active)
718424.46	7476133.38	13/09/2019	Hillcrest/ Hillslope	Mound (active)
718423.00	7476151.93	13/09/2019	Hillcrest/ Hillslope	Mound (active)
718469.65	7476455.70	13/09/2019	Hillcrest/ Hillslope	Mound (active)
719025.03	7476434.43	13/09/2019	Hillcrest/ Hillslope	Mound (active)
718999.35	7476424.62	13/09/2019	Hillcrest/ Hillslope	Mound (active)
719022.49	7476372.56	13/09/2019	Hillcrest/ Hillslope	Mound (active)
719987.66	7475333.94	12/09/2019	Hillcrest/ Hillslope	Mound (active)
720046.13	7475409.45	12/09/2019	Hillcrest/ Hillslope	Mound (active)
719764.79	7475403.72	14/09/2019	Hillcrest/ Hillslope	Mound (active)
719789.71	7475498.90	14/09/2019	Hillcrest/ Hillslope	Mound (active)
719612.59	7475453.07	14/09/2019	Hillcrest/ Hillslope	Mound (active)
719531.97	7475466.75	14/09/2019	Hillcrest/ Hillslope	Mound (active)
719359.25	7475663.73	14/09/2019	Hillcrest/ Hillslope	Mound (active)
713417.43	7477218.80	16/09/2019	Hillcrest/ Hillslope	Mound (active)
713163.55	7477189.53	16/09/2019	Hillcrest/ Hillslope	Mound (active)
713494.45	7477183.38	16/09/2019	Hillcrest/ Hillslope	Mound (active)
713462.73	7476965.48	16/09/2019	Hillcrest/ Hillslope	Mound (active)
720195.16	7475334.65	16/09/2019	Hillcrest/ Hillslope	Mound (active)
720273.78	7475347.79	16/09/2019	Hillcrest/ Hillslope	Mound (recently inactive)

Easting	Northing	Date observed	Habitat	Active/ in active
720326.55	7475349.66	16/09/2019	Hillcrest/ Hillslope	Mound (recently inactive)
720324.89	7475355.14	16/09/2019	Hillcrest/ Hillslope	Mound (active)
720355.44	7475345.86	16/09/2019	Hillcrest/ Hillslope	Mound (active)
720054.52	7478390.43	17/09/2019	Hillcrest/ Hillslope	Mound (inactive)
719734.29	7478432.66	17/09/2019	Hillcrest/ Hillslope	Mound (active)
719661.96	7478452.06	17/09/2019	Hillcrest/ Hillslope	Mound (inactive)
719598.61	7478520.78	17/09/2019	Hillcrest/ Hillslope	Mound (recently inactive)
719892.24	7478400.11	17/09/2019	Hillcrest/ Hillslope	Mound (active)
713551.09	7477105.61	16/09/2019	Hillcrest/ Hillslope	Mound (inactive)
713474.48	7477137.78	16/09/2019	Hillcrest/ Hillslope	Mound (active)
713485.47	7477225.85	16/09/2019	Hillcrest/ Hillslope	Mound (active)
713567.51	7477334.23	16/09/2019	Hillcrest/ Hillslope	Mound (active)
713593.32	7477335.99	16/09/2019	Hillcrest/ Hillslope	Mound (active)
713573.30	7477404.71	16/09/2019	Hillcrest/ Hillslope	Mound (active)
713368.79	7477419.95	16/09/2019	Hillcrest/ Hillslope	Mound (inactive)
713639.71	7477500.78	16/09/2019	Hillcrest/ Hillslope	Mound (active)
713641.61	7477322.38	16/09/2019	Hillcrest/ Hillslope	Mound (active)
713639.51	7477240.88	16/09/2019	Hillcrest/ Hillslope	Mound (active)
713673.53	7477210.32	16/09/2019	Hillcrest/ Hillslope	Mound (active)
720227.16	7475344.15	18/09/2019	Hillcrest/ Hillslope	Mound (active)

Ghost Bat (*Macroderma gigas*)

The Ghost Bat (*Macroderma gigas*) is listed as Vulnerable under the EPBC Act and under the BC Act.

The Ghost Bat occurs in a wide range of habitats (foraging), and requires an undisturbed cave, deep fissure or disused mine shaft in which to roost (roosting and breeding). It is patchily distributed across northern Australia with an isolated population persisting in the Pilbara region, and is sensitive to disturbance (Van Dyck and Strahan 2008).

The Gorge/Gully habitat type comprises cave systems which may support the Ghost Bat for foraging and/or as a potential day roosts. The Hilltop/Hillcrest habitat, the major drainage line within the Gorge/Gully and minor drainage lines supporting trees and tall shrubs within the survey area may provide potential foraging habitat for the Ghost Bat.

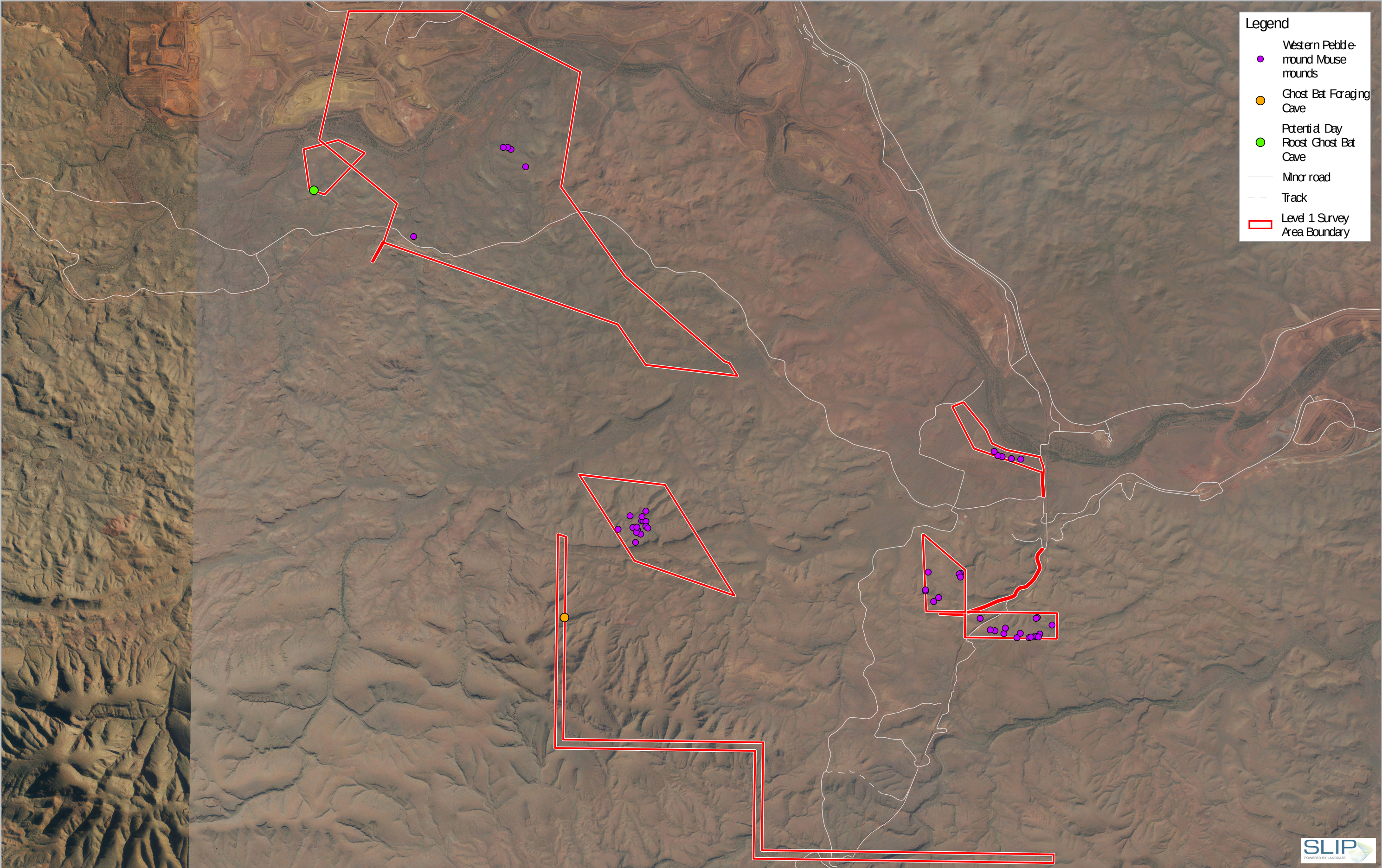
Two caves were identified within the Breakaway/ Cliff and Gorge/Gully habitats. Cave 1 (Table 17) was recorded in Breakaway/ Cliff habitat and contained Ghost Bat foraging evidence in the form of feathers however this cave did not have the appropriate structure to support Ghost Bat roosting and is considered to be a foraging location only. The remaining cave (Cave 2) was recorded within Gorge/Gully habitat. The entrance of this cave was too small for ecologists to enter and undertake a scat analysis within although it had suitable dimensions to qualify as a potential Ghost Bat day roost (Table 17). The five bat detectors deployed over the survey area at the time of the survey (one at a water body, two in Gorge/Gully habitat and two in Hillcrest/Hillslope habitat) did not detect Ghost Bat calls during deployment. This does not indicate Ghost Bat absence from the survey area as calls can be difficult to capture. Further details of Ghost Bat evidence and potential habitat locations is presented in Table 17. Locations of the Ghost Bat caves are displayed on Figure 4.

Studies undertaken on Ghost Bat foraging found the species will travel on average 1.9 km from day roosts utilising large trees as vantage points to hunt (Tidemann et al. 1985). The survey area

contains a number of large Eucalypts along the drainage lines and within the gorge/gully systems which may be used as ambush structures. Based on the current evidence it is likely Ghost Bats will move into this environment to forage and utilise the located caves for feeding. This is most likely to occur during warm wet conditions, which are seasonally suitable for wide dispersal. During these favourable dispersal conditions, and based on home range, it is likely a more permanent day roost or maternal cave is present within 2 km of the feeding locations (Churchill 1998). A targeted Ghost Bat cave assessment would be required to potentially identify this area.

Table 17 Ministers North Level 1 survey Ghost Bat evidence

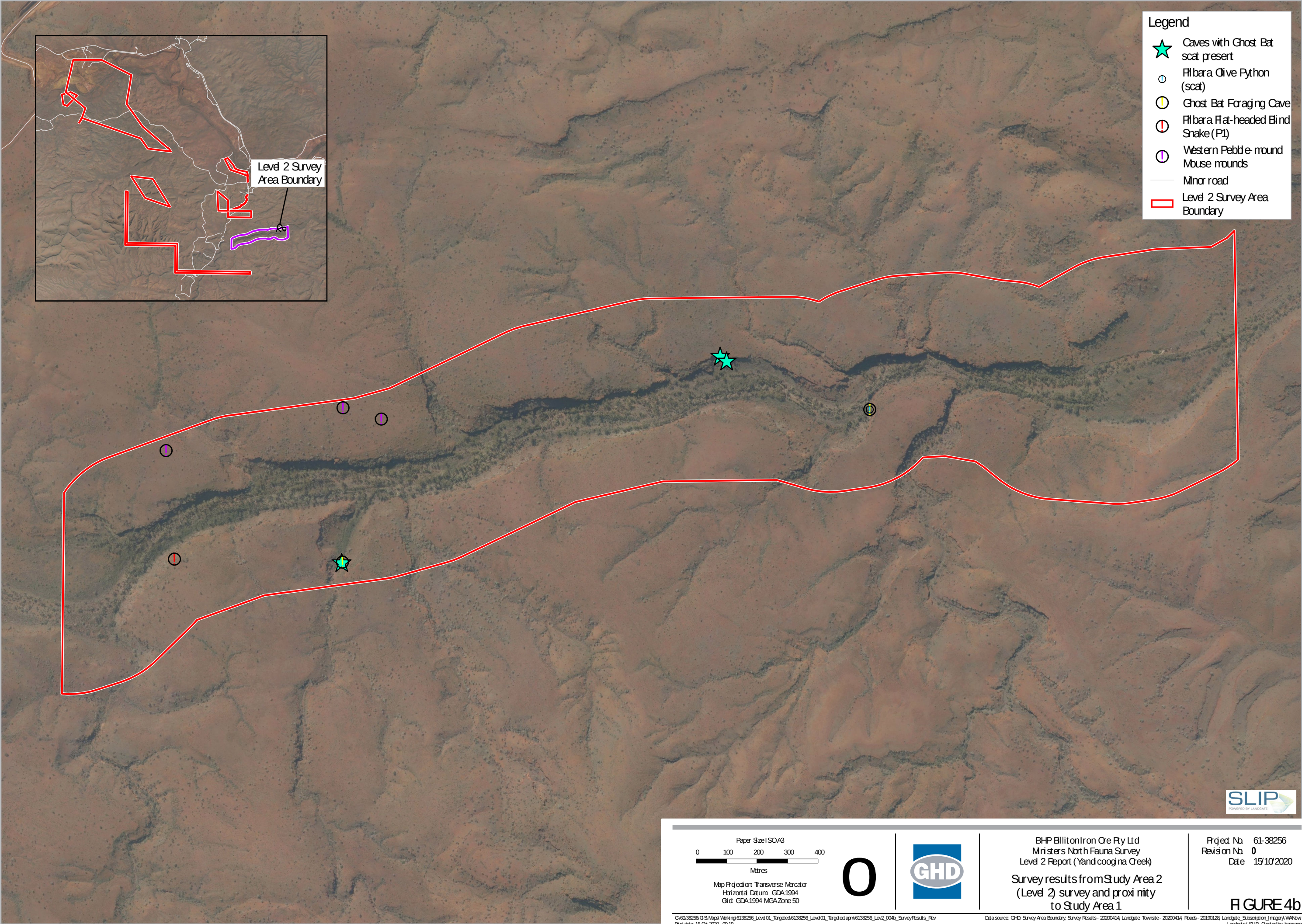
Cave and location (Cave-ID)	Easting	Northing	Cave description	Ghost Bats present/ other evidence	Cave Type and comments	Image
Cave 1 (CAV-01)	712246.99	7475678.85	Mid-slope, sheltered cavern with round/oval entrance. Entrance dimensions: 3 m x 3 m Single chamber	Foraging evidence in the form of feathers located	Foraging cave (occasional usage) for Ghost Bat with one medium sized chamber. Comments: Suitable for foraging but not suitable for roosting.	
Cave 2 (Cav-02)	707960.04	7482991.69	Mid-slope, semi-exposed overhang with horizontal entrance. Entrance dimensions: 2 m x 0.6 m Single chamber, 4 m high, 10 m deep	Cave is suitable dimensions for Ghost Bat but could not be closely assessed due to entrance size	Potential day roost for Ghost Bat. Opens up into 4 m high, 10 m wide single chamber. Comments: Could not access to look for scat. Considered potential day roost.	



Paper Size: SOA3 0 0.5 1 1.5 2 Kilometres Map Projection: Transverse Mercator Horizontal Datum: GDA1994 Grid: GDA1994 MGA Zone 50		BHP Billiton Iron Ore Pty Ltd Ministers North Fauna Survey Level 1 (Targeted) Report Survey Results	Project No: 61-38256 Revision No: 0 Date: 15/10/2020 FIGURE 4a
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G:\61-38256 GIS Maps\Working\61-38256_Level01_Targeted.aprx\61-38256_Level1_004a_SurveyResults_Rev
 Print date: 15 Oct 2020 - 09:09

Data source: GHD Survey Area Boundary; Survey Results - 20200629; Landgate: Townsite - 20200414; Roads - 20190129; Landgate: Subscription; Imagery: WANA
 Landgate/SLIP. Created by: bmcginn



4.4 Fauna survey limitations

EPA Technical Guidance i Terrestrial Fauna Surveys (EPA 2016a) states fauna and faunal assemblage survey reports for environmental impact assessment in Western Australia should contain a section describing the limitations of the survey methods used. The limitations and constraints associated with the fauna component of this field survey are discussed in Table 18.

Table 18 Fauna survey limitations

Limitations	Constraints	Impact on Survey outcomes
Scope (what faunal groups were sampled? Were some sampling methods not able to be employed because of constraints such as weather conditions?)	Minimal	All faunal groups were able to be sampled except amphibians, however access issues limited extent of survey as discussed below. Four ecologists covered the survey area over a 12 day period. Bird acoustic monitors were set at five locations as were bat acoustic detectors. Ten remote cameras were deployed over the survey area to increase survey effort and build a larger inventory of birds, mammals and medium-large reptiles in particular.
Seasonal environmental conditions	Minimal	The Pilbara and this survey area in the summer period leading up to this survey had below average rainfall. The Newman long term average rainfall is 190.4 mm over the 6 month period prior to survey. Whereas in 2019, Newman only received 82.6 mm over this period. Although the area received below average rainfall, pools of water were still present in Study Area 2 which suggests surface water may be close to the survey area, although no surface water was present at the time of survey in Study Area 1. Recommended survey timing for birds and amphibians are immediately after rain events. While August received 3.6 mm of rainfall no major rain events were recorded prior to the survey. The survey was undertaken during recommended survey timing for reptiles (Sept-April) while there is no preferred time to survey mammals. Additional remote camera deployment was undertaken to combat any potential reductions in expected survey outcome.
Proportion of fauna identified, recorded and/or collected	Nil	All fauna was identified on site.
Proportion of the task achieved and further work which might be needed.	Moderate	While most of the survey area was suitably surveyed, parts of the area were not accessible at the time of survey due to access constraints. This area was adequately assessed and mapped using existing local habitat data, aerial imagery and viewing areas from proximal vantage points. Where appropriate, bat acoustic recorders were placed in major drainage lines in apparent flyways or near artificial water sources to capture any bats that may come out to forage or drink.
Remoteness and/or access problems	Moderate	Parts of the northern survey area were not accessible due to current works in the area and mining lease/rail corridor overlap. This area was adequately assessed and mapped for habitat using existing local habitat, aerial imagery and viewing areas from proximal vantage points.

Limitations	Constraints	Impact on Survey outcomes
Accordance to EPA guidelines	Minor	The commissioning of this study, dual season surveys and revisions A and B of this report were performed during the implementation of the <i>Technical Guidance: Sampling methods for terrestrial vertebrate fauna</i> (EPA 2016a) and <i>Technical Guidance: Terrestrial Fauna Surveys</i> (EPA 2016b) and prior to the implementation of the newer <i>Technical Guidance i Terrestrial vertebrate fauna surveys for environmental impact assessment</i> (EPA 2020) guideline which supersedes the 2016 versions. This document has not been updated to comply with 2020 guidelines.

5. Conclusion

In total eight broad fauna habitat types (not including disturbed areas) were recorded in the survey area during the field survey. These different habitat types are closely aligned with the different vegetation types and landforms within the survey area. The habitat types include Hillcrest/Hillslope, Gorge/Gully, Drainage Area/Floodplain, Major Drainage lines, Minor Drainage lines, Breakaway/Cliff, Basalt Outcrops, Rehabilitated Area and Cleared/Disturbed.

The habitats within the survey area are wide spread over the region and are not considered unique to the survey area. Habitat quality was moderate to high over the survey area, with the exception of the basalt outcrops, cleared/disturbed and rehabilitated areas. The Breakaway/Cliff, Drainage Line and Gorge/Gully habitat provided the highest quality habitat in the survey area due to available micro habitat and foraging/roosting/denning habitat for fauna, particularly conservation significant fauna, however in comparison to the whole survey area represents a relatively small portion. The majority of the habitat (although in excellent condition) is considered only of moderate value to fauna due to the shallow soil profile which prevents use by soil dwelling/burrowing fauna and lack of habitat features (caves, boulders, dense vegetation, water pools etc.) that provides refuges to fauna species.

The fauna survey recorded 67 vertebrate fauna species utilising the survey area, including 19 mammals, 40 birds, and eight reptiles. Of these, two species were introduced including the Feral Cat and Feral Dog. Remote cameras detected an additional 13 fauna species that were not otherwise detected during the survey.

Two species of conservation significance were recorded during the survey and which are the Ghost Bat and the Western Pebble-mound Mouse. In addition to the two known species recorded, eight conservation significant species are considered likely to occur in the survey area.

Ghost Bat foraging evidence was identified at one cave within the survey area while a second cave was assessed as being a potential day roost. The survey area provides foraging and potential day roost habitat, however much of the landform characteristics are not conducive to the formation of suitable maternity caves for Ghost Bat. Gorge/Gully and Breakaway/Cliff habitats are the only habitat types considered to potentially support Ghost Bat roosting and these represent a relatively small portion of the survey area. The Drainage Lines, Hillcrest/Hillslope, Drainage area/Floodplain and Gorge/Gully habitats all provide suitable foraging habitat. While no maternity cave is suspected to lie within the survey area (based on lack of records and suitable caves), a larger day roost or maternity cave may be present in the surrounding area. This is based on the known foraging distance from caves both day roost and maternal.

The Western Pebble-mound Mouse was recorded via active and inactive pebble mounds on Hillcrest/Hillslope habitat in the survey area. This species has been recorded in the survey area previously and is patchily distributed through the rocky substrate habitats (often on the hill crest or slope areas). The Western Pebble-mound Mouse is highly susceptible to disturbance and is known to disappear from areas impacted.

Rufous Grasswren, Peregrine Falcon, Grey Falcon, Northern Quoll, Pilbara Leaf-nosed Bat, Pilbara Olive Python, Pilbara Flat-headed Blind Snake and Pilbara Barking Gecko were all identified as likely to be present within the habitat of the survey area. All species identified have previously been recorded in the region and suitable habitat is present within the survey area. At the same time as assessing the Level 1 area GHD also undertook a Level 2 assessment of a portion of Yandicoogina Creek thought to be a GDE. During this assessment a large Pilbara Olive Python scat was recorded at one of the permanent pools. This pool is approximately 1.7 km southeast of the closest Study Area 1 survey boundary. Yandicoogina Creek flows into the most southern portion of the Level 1 survey area therefore likely supporting Pilbara Olive Python. The

remainder of the survey area would be considered non-core habitat for this species. The Pilbara Flat-headed Blind Snake and Pilbara Barking Gecko are small reptiles typically associated to gorges/gullies or ridgelines restricted to the Pilbara. Both species have a patchy distribution and are cryptic in the environment. These species are likely present but may require additional survey effort to detect. The Pilbara Flat-headed Blind Snake was detected in the potential GDE during the Level 2 survey and is likely to exist in the southern portion of the Level 1 area containing Yandicoogina Creek. The remaining birds, Rufous Grasswren, Peregrine Falcon and Grey Falcon are all known from the region and are opportunistic, utilising areas as resources become available. Breeding habitat is present for the Peregrine Falcon along some of the high cliffs and breakaways in the survey area.

The Northern Quoll was not detected within the survey area or Study Area 2 but is considered likely to occur in the survey area. The closest known record is approximately 800 m north of the survey area and the Gorge/Gully and Breakaway/Cliff habitat types present suitable foraging and denning habitat for this species, while Major Drainage Lines within the survey area may assist dispersal. Five remote cameras were set in Gorges to target this species however returned no hits. This does not suggest Northern Quoll absence from the survey area as the species may persist at low densities.

Pilbara Leaf-nosed Bat was also not detected through cave assessment or via bat detectors within the survey area. Some foraging habitat is present for the species within Gorge/Gully, Major and Minor Drainage Lines, and Hillcrest/ Hillslope habitat while on route to permanent water features along Yandicoogina Creek. No suitable roosting habitat was detected during the survey and the closest known records of the species are approximately 8 km west of the survey area. One bat detector was set at a water body with hopes to detect the species as it seeks water, two bat detectors were set in the Gorge/Gully habitat and two within Hillcrest/Hillslope habitat with aims to detect the species while foraging. The bat detectors returned no calls for the species however they may be persisting in low numbers or opportunistically using the survey area as resource availability fluctuates.

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Appendices

Appendix A – Relevant legislation, background information and conservation codes

Relevant legislation to Fauna

Federal *Environment Protection and Biodiversity Conservation Act 1999*

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Federal Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as Matters of National Environmental Significance (MNES).

The biological aspects listed as MNES include:

- Nationally threatened flora and fauna species and ecological communities
- Migratory species

A person must not undertake an action that has, will have, or is likely to have a significant impact (direct or indirect) on MNES, without approval from the Federal Minister for the Environment.

The EPBC Act is administered by the Department of the Environment and Energy (DEE).

State *Environmental Protection Act 1986*

The *Environmental Protection Act 1986* (EP Act) is the primary legislative Act dealing with the protection of the environment in Western Australia. The Act allows the Environmental Protection Authority (EPA), to prevent, control and abate pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the foregoing. Part IV of the EP Act is administered by the EPA and makes provisions for the EPA to undertake environmental impact assessment of significant proposals, strategic proposals and land use planning schemes.

The Department of Water and Environment Regulation (DWER) is responsible for administering the clearing provisions of the EP Act (Part V). Clearing of native vegetation in Western Australia requires a permit from the DWER, unless exemptions apply. Applications for clearing permits are assessed by the Department and decisions are made to grant or refuse the application in accordance with the Act. When making a decision the assessment considers clearing against the ten clearing principles as specified in Schedule 5 of the EP Act:

- a) Native vegetation should not be cleared if it comprises a high level of biodiversity.
- b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a significance habitat for fauna indigenous to Western Australia.
- c) Native vegetation should not be cleared if it includes, or is necessary, for the continued existence of rare flora.
- d) Native vegetation should not be cleared if it comprises the whole or part of native vegetation in an area that has been extensively cleared.
- e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.
- f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.
- g) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.
- h) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

- i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.
- j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.

Exemptions for clearing include clearing that is a requirement of a written law or authorised under certain statutory processes (listed in Schedule 6 of the EP Act) and exemptions for prescribed low impact day-to-day activities (prescribed in the Environmental Protection (Clearing of Native Vegetation) Regulations 2004); these exemptions do not apply in environmentally sensitive areas (ESAs).

State *Biodiversity and Conservation Act 2016*

The *Biodiversity Conservation Act 2016* (BC Act) provides for the conservation and protection of biodiversity and biodiversity components, as well as the promotion of the ecologically sustainable use of biodiversity components in Western Australia. The BC Act replaces both the repealed *Wildlife Conservation Act 1950* (WC Act) and the *Sandalwood Act 1929* (Sandalwood Act), as well as their associated regulations. To attain the objectives of the BC Act, principles of ecological sustainable development have been established:

- ⌘ Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations
- ⌘ If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation
- ⌘ The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations
- ⌘ The conservation of biodiversity and ecological integrity should be a fundamental consideration in decision-making
- ⌘ Improved valuation, pricing and incentive mechanisms should be promoted.

The BC Act is administered by the Department of Biodiversity Conservation and Attractions (DBCA).

State *Biosecurity and Agriculture Management Act 2007*

The *Biosecurity and Agriculture Management Act 2007* (BAM Act) and associated regulations are administered by the Department of Primary Industries and Regional Development (DPIRD) and replace the repealed *Agriculture and Related Resources Protection Act 1976*. The main purposes of the BAM Act and its regulations are to:

- ⌘ Prevent new animal and plant pests (vermin and weeds) and diseases from entering WA
- ⌘ Manage the impact and spread of those pests already present in the state
- ⌘ Safely manage the use of agricultural and veterinary chemicals
- ⌘ Increased control over the sale of agricultural products that contain violative chemical residues.

The Western Australian Organism List (WAOL) provides the status of organisms which have been categorised under the BAM Act. A Declared Pest is a prohibited organism or an organism for which a declaration under Section 22(2) of the Act is in force. Declared Pests may be assigned a control category including: C1 (exclusion), C2 (eradication) and C3 (management). The category may apply to the whole of the State, LGAs, districts, individual properties or even paddocks, and all landholders are obliged to comply with the specific category of control. Categories of control are defined below.

DPIRD Categories for Declared Pests under the BAM Act

Control class code	Description
C1 (Exclusion)	Pests will be assigned to this category if they are not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
C2 (Eradication)	Pests will be assigned to this category if they are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3 (Management)	Pests will be assigned to this category if they are established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

Fauna Conservation codes

Conservation significant fauna

The Federal conservation level of fauna species and their significance status is assessed under the EPBC Act. The significance levels for fauna used in the EPBC Act align with the International Union for Conservation of Nature (IUCN) Red List criteria, which are internationally recognised as providing best practice for assigning the conservation status of species. The EPBC Act also protects land and migratory species that are listed under International Agreements. The list of migratory species established under section 209 of the EPBC Act comprises:

- ≠ Migratory species which are native to Australia and are included in the appendices to the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals Appendices I and II)
- ≠ Migratory species included in annexes established under the Japan-Australia Migratory Bird Agreement (JAMBA) and the China-Australia Migratory Bird Agreement (CAMBA)
- ≠ Native, migratory species identified in a list established under, or an instrument made under, an international agreement approved by the Minister, such as the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)

The State conservation level of fauna species and their significance status also follows the IUCN Red List criteria. Under the BC Act fauna can be listed as Threatened, Extinct and as Specially Protected species.

Threatened species are those species which have been adequately searched for and are deemed to be, in the wild, either rare, under identifiable threat of extinction, or otherwise in need of special protection, and have been gazetted as such. The assessment of the conservation status of Threatened species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria. Specially protected species meet 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 or Extinct species under the BC Act cannot also be listed as Specially Protected species.

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna List 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 flora or fauna.

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.

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.

For the purposes of this assessment, all species listed under the EPBC Act, BC Act and DBCA Priority species are considered conservation significant.

Conservation categories and definitions for EPBC Act and BC Act listed fauna species

Conservation category	Definition
Threatened species	
Critically Endangered (CR)	Threatened species considered to be 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 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.
Endangered (EN)	Threatened species considered to be 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 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
Vulnerable (VU)	Threatened species considered to be 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 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.
Extinct species	
Extinct (EX)	Species where there is no reasonable doubt that the last member of the species has died and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).
Extinct in the Wild (EW)	Species that 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 and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).
Specially protected species	

Conservation category	Definition
Migratory (MI)	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). 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 Convention on the Conservation of Migratory Species of Wild Animals (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
Species of special conservation interest (conservation dependent fauna) (CD)	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened.
Other specially protected fauna (OS)	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).

Conservation codes for DBCA listed Priority fauna

Priority category	Definition
Priority 1	Poorly-known taxa 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. 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.
Priority 2	Poorly-known taxa 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.
Priority 3	Poorly-known taxa 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.

Priority category	Definition
Priority 4	Rare, Near Threatened and other taxa in need of monitoring A. Rare: Taxa 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 taxa are usually represented on conservation lands. B. Near Threatened. Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. C. Taxa that have been removed from the list of threatened taxa during the past five years for reasons other than taxonomy.

Other significant fauna

Fauna species may be significant for a range of reasons other than those protected by international agreement or treaty, Specially Protected or Priority Fauna. Significant fauna may include short-range endemic species, species that have declining populations or declining distributions, species at the extremes of their range, or isolated outlying populations, or species which may be undescribed (EPA 2010).

References

- ANZECC 2000, *Core Environmental Indicators for Reporting on the State of Environment*, ANZECC State of the Environment Reporting Task Force.
- Commonwealth of Australia 2001, *National Targets and Objectives for Biodiversity Conservation 2001-2005*, Canberra, AGPS.
- EPA 2010, *Technical Guide to Terrestrial Fauna Surveys*, EPA, Perth, WA.

Appendix B - Desktop Searches

NatureMap Species Report

Created By Guest user on 03/04/2020

Kingdom Animalia
Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 119° 09' 53" E, 22° 49' 35" S
Buffer 40km
Group By Species Group

Species Group	Species	Records
Amphibian	7	705
Bird	185	15986
Fish	4	391
Invertebrate	365	2438
Mammal	55	6054
Reptile	141	8719
TOTAL	757	34293

Name	ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Amphibian					
1.	25375	<i>Cyclorana maini</i> (Sheep Frog)			
2.	25376	<i>Cyclorana platycephala</i> (Water-holding Frog)			
3.	25392	<i>Litoria rubella</i> (Little Red Tree Frog)			
4.	25427	<i>Neobatrachus sutor</i> (Shoemaker Frog)			
5.	25432	<i>Pseudophryne douglasi</i> (Gorge Toadlet)			
6.	25445	<i>Uperoleia russelli</i> (Northwest Toadlet)			
7.	41428	<i>Uperoleia saxatilis</i> (Pilbara Toadlet)			
Bird					
8.	24559	<i>Acanthagenys rufogularis</i> (Spiny-cheeked Honeyeater)			
9.	24260	<i>Acanthiza apicalis</i> (Broad-tailed Thornbill, Inland Thornbill)			
10.	24261	<i>Acanthiza chrysorrhoa</i> (Yellow-rumped Thornbill)			
11.	24264	<i>Acanthiza robustirostris</i> (Slaty-backed Thornbill)			
12.		<i>Acanthiza</i> sp.			
13.	24265	<i>Acanthiza uropygialis</i> (Chestnut-rumped Thornbill)			
14.	25535	<i>Accipiter cirrocephalus</i> (Collared Sparrowhawk)			
15.	24281	<i>Accipiter cirrocephalus</i> subsp. <i>cirrocephalus</i> (Collared Sparrowhawk)			
16.	25536	<i>Accipiter fasciatus</i> (Brown Goshawk)			
17.	24283	<i>Accipiter fasciatus</i> subsp. <i>didimus</i> (Brown Goshawk)			
18.	25755	<i>Acrocephalus australis</i> (Australian Reed Warbler)			
19.	25544	<i>Aegotheles cristatus</i> (Australian Owlet-nightjar)			
20.	25647	<i>Amytornis striatus</i> (Striated Grasswren)			
21.	24540	<i>Amytornis striatus</i> subsp. <i>whitei</i> (Rufous Grasswren)			
22.	24316	<i>Anas superciliosa</i> (Pacific Black Duck)			
23.	47414	<i>Anhinga novaehollandiae</i> (Australasian Darter)			
24.	25670	<i>Anthus australis</i> (Australian Pipit)			
25.	24599	<i>Anthus australis</i> subsp. <i>australis</i> (Australian Pipit)			
26.	25528	<i>Aphelocephala leucopsis</i> (Southern Whiteface)			
27.	25554	<i>Apus pacificus</i> (Fork-tailed Swift, Pacific Swift)		IA	
28.	24285	<i>Aquila audax</i> (Wedge-tailed Eagle)			
29.	41324	<i>Ardea modesta</i> (great egret, white egret)			
30.	24340	<i>Ardea novaehollandiae</i> (White-faced Heron)			
31.	24341	<i>Ardea pacifica</i> (White-necked Heron)			
32.	24610	<i>Ardeotis australis</i> (Australian Bustard)			
33.	25566	<i>Artamus cinereus</i> (Black-faced Woodswallow)			
34.	24352	<i>Artamus cinereus</i> subsp. <i>melanops</i> (Black-faced Woodswallow)			
35.	24353	<i>Artamus cyanopterus</i> (Dusky Woodswallow)			
36.	24355	<i>Artamus minor</i> (Little Woodswallow)			
37.	24356	<i>Artamus personatus</i> (Masked Woodswallow)			
38.		<i>Barnardius zonarius</i>			
39.	24359	<i>Burhinus grallarius</i> (Bush Stone-curlew)			

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
40.	25715	<i>Cacatua roseicapilla</i> (Galah)			
41.	24725	<i>Cacatua roseicapilla</i> subsp. <i>assimilis</i> (Galah)			
42.	24726	<i>Cacatua roseicapilla</i> subsp. <i>roseicapilla</i> (Galah)			
43.	25716	<i>Cacatua sanguinea</i> (Little Corella)			
44.	24728	<i>Cacatua sanguinea</i> subsp. <i>sanguinea</i> (Little Corella)			
45.	24727	<i>Cacatua sanguinea</i> subsp. <i>westralensis</i> (Little Corella)			
46.	42307	<i>Cacomantis pallidus</i> (Pallid Cuckoo)			
47.	25600	<i>Centropus phasianinus</i> (Pheasant Coucal)			
48.	24564	<i>Certhionyx variegatus</i> (Pied Honeyeater)			
49.	24431	<i>Chrysococcyx basalis</i> (Horsfield's Bronze Cuckoo)			
50.	24434	<i>Chrysococcyx osculans</i> (Black-eared Cuckoo)			
51.	25580	<i>Cinclosoma castaneothorax</i> (Chestnut-breasted Quail-thrush)			
52.	24288	<i>Circus approximans</i> (Swamp Harrier)			
53.	24289	<i>Circus assimilis</i> (Spotted Harrier)			
54.	25675	<i>Colluricincla harmonica</i> (Grey Shrike-thrush)			
55.	24613	<i>Colluricincla harmonica</i> subsp. <i>rufiventris</i> (Grey Shrike-thrush)			
56.	24361	<i>Coracina maxima</i> (Ground Cuckoo-shrike)			
57.	25568	<i>Coracina novaehollandiae</i> (Black-faced Cuckoo-shrike)			
58.	24362	<i>Coracina novaehollandiae</i> subsp. <i>novaehollandiae</i> (Black-faced Cuckoo-shrike)			
59.	24363	<i>Coracina novaehollandiae</i> subsp. <i>subpallida</i> (Black-faced Cuckoo-shrike)			
60.	24416	<i>Corvus bennetti</i> (Little Crow)			
61.	25592	<i>Corvus coronoides</i> (Australian Raven)			
62.	25593	<i>Corvus orru</i> (Torresian Crow)			
63.	24418	<i>Corvus orru</i> subsp. <i>ceciliae</i> (Western Crow)			
64.	24419	<i>Corvus splendens</i> (House Crow)			
65.	25701	<i>Coturnix ypsilophora</i> (Brown Quail)			
66.	24420	<i>Cracticus nigrogularis</i> (Pied Butcherbird)			
67.	25595	<i>Cracticus tibicen</i> (Australian Magpie)			
68.	24422	<i>Cracticus tibicen</i> subsp. <i>dorsalis</i> (White-backed Magpie)			
69.	24423	<i>Cracticus tibicen</i> subsp. <i>tibicen</i> (Black-backed Magpie)			
70.	25596	<i>Cracticus torquatus</i> (Grey Butcherbird)			
71.	25547	<i>Dacelo leachii</i> (Blue-winged Kookaburra)			
72.	24304	<i>Dacelo leachii</i> subsp. <i>leachii</i> (Blue-winged Kookaburra)			
73.	24325	<i>Dendrocygna eytoni</i> (Plumed Whistling Duck)			
74.	25607	<i>Dicaeum hirundinaceum</i> (Mistletoebird)			
75.	24470	<i>Dromaius novaehollandiae</i> (Emu)			
76.		<i>Egretta novaehollandiae</i>			
77.		<i>Elanus axillaris</i>			
78.	25540	<i>Elanus caeruleus</i> (Black-shouldered Kite)			
79.	24290	<i>Elanus caeruleus</i> subsp. <i>axillaris</i> (Australian Black-shouldered Kite)			
80.	24291	<i>Elanus scriptus</i> (Letter-winged Kite)		P4	
81.	47937	<i>Elseyornis melanops</i> (Black-fronted Dotterel)			
82.	24631	<i>Emblema pictum</i> (Painted Finch)			
83.		<i>Eolophus roseicapillus</i>			
84.	24570	<i>Epthianura tricolor</i> (Crimson Chat)			
85.	24837	<i>Eremiornis carteri</i> (Spinifex-bird)			
86.	24379	<i>Erythronyx cinctus</i> (Red-kneed Dotterel)			
87.	24368	<i>Eurostopodus argus</i> (Spotted Nightjar)			
88.	25621	<i>Falco berigora</i> (Brown Falcon)			
89.	24471	<i>Falco berigora</i> subsp. <i>berigora</i> (Brown Falcon)			
90.	25622	<i>Falco cenchroides</i> (Australian Kestrel, Nankeen Kestrel)			
91.	24472	<i>Falco cenchroides</i> subsp. <i>cenchrus</i> (Australian Kestrel, Nankeen Kestrel)			
92.	24473	<i>Falco hypoleucos</i> (Grey Falcon)		T	
93.	25623	<i>Falco longipennis</i> (Australian Hobby)			
94.	24474	<i>Falco longipennis</i> subsp. <i>longipennis</i> (Australian Hobby)			
95.	25624	<i>Falco peregrinus</i> (Peregrine Falcon)		S	
96.	25730	<i>Gallirallus philippensis</i> (Buff-banded Rail)			
97.	42314	<i>Gavialis virens</i> (Singing Honeyeater)			
98.	24401	<i>Geopelia cuneata</i> (Diamond Dove)			
99.	25585	<i>Geopelia striata</i> (Zebra Dove)			
100.	24403	<i>Geopelia striata</i> subsp. <i>placida</i> (Peaceful Dove)			
101.	24404	<i>Geophaps plumifera</i> (Spinifex Pigeon)			
102.	25530	<i>Gerygone fusca</i> (Western Gerygone)			
103.	24271	<i>Gerygone fusca</i> subsp. <i>fusca</i> (Western Gerygone)			
104.	47959	<i>Gerygone fusca</i> subsp. <i>mungii</i> (Desert Gerygone)			
105.	24443	<i>Grallina cyanoleuca</i> (Magpie-lark)			
106.	24571	<i>Grantiella picta</i> (Painted Honeyeater)			
107.	24295	<i>Haliastur sphenurus</i> (Whistling Kite)			
108.	24296	<i>Hamirostra isura</i> (Square-tailed Kite)			
109.	24297	<i>Hamirostra melanosternon</i> (Black-breasted Buzzard)			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
110.	47965 <i>Hieraaetus morphnoides</i> (Little Eagle)			
111.	25734 <i>Himantopus himantopus</i> (Black-winged Stilt)			
112.	24572 <i>Lacustroica whitei</i> (Grey Honeyeater)			
113.	24367 <i>Lalage tricolor</i> (White-winged Triller)			
114.	25661 <i>Lichmera indistincta</i> (Brown Honeyeater)			
115.	24582 <i>Lichmera indistincta</i> subsp. <i>indistincta</i> (Brown Honeyeater)			
116.	24690 <i>Macronectes giganteus</i> (Southern Giant Petrel)		IA	
117.	25651 <i>Malurus lamberti</i> (Variegated Fairy-wren)			
118.	24544 <i>Malurus lamberti</i> subsp. <i>assimilis</i> (Variegated Fairy-wren)			
119.	25652 <i>Malurus leucopterus</i> (White-winged Fairy-wren)			
120.	24549 <i>Malurus leucopterus</i> subsp. <i>leuconotus</i> (White-winged Fairy-wren)			
121.	24548 <i>Malurus leucopterus</i> subsp. <i>leucopterus</i> (Dirk Hartog black and white fairy-wren)		T	
122.	25654 <i>Malurus splendens</i> (Splendid Fairy-wren)			
123.	24583 <i>Manorina flavigula</i> (Yellow-throated Miner)			
124.	47997 <i>Melanodryas cucullata</i> (Hooded Robin)			
125.	25665 <i>Melithreptus gularis</i> (Black-chinned Honeyeater)			
126.	24589 <i>Melithreptus gularis</i> subsp. <i>laetior</i> (Black-chinned Honeyeater)			
127.	24736 <i>Melopsittacus undulatus</i> (Budgerigar)			
128.	24598 <i>Merops ornatus</i> (Rainbow Bee-eater)			
129.	25542 <i>Milvus migrans</i> (Black Kite)			
130.	24298 <i>Milvus migrans</i> subsp. <i>affinis</i> (Black Kite)			
131.	25545 <i>Mirafra javanica</i> (Horsfield's Bushlark, Singing Bushlark)			
132.	24302 <i>Mirafra javanica</i> subsp. <i>horsfieldii</i> (Horsfield's Bushlark, Singing Bushlark)			
133.	25685 <i>Neochmia ruficauda</i> (Star Finch)			
134.	24639 <i>Neochmia ruficauda</i> subsp. <i>clarescens</i> (Star Finch)			
135.	24737 <i>Neophema bourkii</i> (Bourke's Parrot)			
136.	<i>Neopsephotus bourkii</i>			
137.	25747 <i>Ninox connivens</i> (Barking Owl)			
138.	24819 <i>Ninox connivens</i> subsp. <i>connivens</i> (Barking owl (southwest subpop.))		P3	
139.	25564 <i>Nycticorax caledonicus</i> (Rufous Night Heron)			
140.	24742 <i>Nymphicus hollandicus</i> (Cockatiel)			
141.	24407 <i>Ocyphaps lophotes</i> (Crested Pigeon)			
142.	24618 <i>Oreoica gutturalis</i> (Crested Bellbird)			
143.	34012 <i>Oreoica gutturalis</i> subsp. <i>pallascens</i> (Crested Bellbird, central)			
144.	25680 <i>Pachycephala rufiventris</i> (Rufous Whistler)			
145.	24624 <i>Pachycephala rufiventris</i> subsp. <i>rufiventris</i> (Rufous Whistler)			
146.	24627 <i>Pardalotus rubricatus</i> (Red-browed Pardalote)			
147.	25682 <i>Pardalotus striatus</i> (Striated Pardalote)			
148.	24628 <i>Pardalotus striatus</i> subsp. <i>murchisoni</i> (Striated Pardalote)			
149.	24629 <i>Pardalotus striatus</i> subsp. <i>uropygialis</i> (Striated Pardalote)			
150.	24630 <i>Pardalotus striatus</i> subsp. <i>westraliensis</i> (Striated Pardalote)			
151.	24648 <i>Pelecanus conspicillatus</i> (Australian Pelican)			
152.	48060 <i>Petrochelidon ariel</i> (Fairy Martin)			
153.	48061 <i>Petrochelidon nigricans</i> (Tree Martin)			
154.	24659 <i>Petroica goodenovii</i> (Red-capped Robin)			
155.	24667 <i>Phalacrocorax sulcirostris</i> (Little Black Cormorant)			
156.	25699 <i>Phalacrocorax varius</i> (Pied Cormorant)			
157.	24409 <i>Phaps chalcoptera</i> (Common Bronzewing)			
158.	24748 <i>Platycercus varius</i> (Mulga Parrot)			
159.	25721 <i>Platycercus zonarius</i> (Australian Ringneck, Ring-necked Parrot)			
160.	24751 <i>Platycercus zonarius</i> subsp. <i>zonarius</i> (Port Lincoln Parrot)			
161.	25703 <i>Podargus strigoides</i> (Tawny Frogmouth)			
162.	24683 <i>Pomatostomus superciliosus</i> (White-browed Babbler)			
163.	25706 <i>Pomatostomus temporalis</i> (Grey-crowned Babbler)			
164.	24684 <i>Pomatostomus temporalis</i> subsp. <i>rubeculus</i> (Grey-crowned Babbler)			
165.	25731 <i>Porphyrio porphyrio</i> (Purple Swamphen)			
166.	24771 <i>Porzana tabuensis</i> (Spotless Crane)			
167.	24390 <i>Psophodes occidentalis</i> (Western Wedgebill, Chiming Wedgebill)			
168.	<i>Ptilonorhynchus guttatus</i>			
169.	25724 <i>Ptilonorhynchus maculatus</i> (Spotted Bowerbird)			
170.	24757 <i>Ptilonorhynchus maculatus</i> subsp. <i>guttatus</i> (Western Bowerbird)			
171.	24758 <i>Ptilonorhynchus nuchalis</i> subsp. <i>nuchalis</i> (Great Bowerbird)			
172.	42323 <i>Ptilotula keartlandi</i> (Grey-headed Honeyeater)			
173.	48088 <i>Ptilotula penicillata</i> (White-plumed Honeyeater)			
174.	42344 <i>Purnella albifrons</i> (White-fronted Honeyeater)			
175.	24278 <i>Pyrrholaemus brunneus</i> (Redthroat)			
176.	<i>Rhipidura albicauda</i>			
177.	48096 <i>Rhipidura albiscapa</i> (Grey Fantail)			
178.	25614 <i>Rhipidura leucophrys</i> (Willie Wagtail)			
179.	24454 <i>Rhipidura leucophrys</i> subsp. <i>leucophrys</i> (Willie Wagtail)			

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
180.	30948	<i>Smicrornis brevirostris</i> (Weebill)			
181.	25656	<i>Stipiturus ruficeps</i> (Rufous-crowned Emu-wren)			
182.	24556	<i>Stipiturus ruficeps</i> subsp. <i>ruficeps</i> (Rufous-crowned Emu-wren)			
183.	30870	<i>Taeniopygia guttata</i> (Zebra Finch)			
184.	30871	<i>Taeniopygia guttata</i> subsp. <i>castanotis</i> (Zebra Finch)			
185.	24845	<i>Threskiornis spinicollis</i> (Straw-necked Ibis)			
186.	42351	<i>Todiramphus pyrrhopygius</i> (Red-backed Kingfisher)			
187.	25549	<i>Todiramphus sanctus</i> (Sacred Kingfisher)			
188.	24309	<i>Todiramphus sanctus</i> subsp. <i>sanctus</i> (Sacred Kingfisher)			
189.	24808	<i>Tringa nebularia</i> (Common Greenshank, greenshank)		IA	
190.	24851	<i>Turnix velox</i> (Little Button-quail)			
191.	25762	<i>Tyto alba</i> (Barn Owl)			
192.	24852	<i>Tyto alba</i> subsp. <i>delicatula</i> (Barn Owl)			

Fish

193.		<i>Amniataba percooides</i>			
194.		<i>Leiopotherapon unicolor</i>			
195.		<i>Melanotaenia australis</i>			
196.		<i>Neosilurus hyrtlii</i>			

Invertebrate

197.		'Bryocyclops' sp. 1 (PSS)			
198.		<i>Acariformes</i> sp.			
199.		<i>Aeolosoma</i> sp. 1 (PSS)			
200.		<i>Aeolosoma</i> sp. 3 (PSS)			
201.		<i>Aeshnidae</i> sp.			
202.		<i>Ainudrilus</i> sp. WA26 (PSS)			Y
203.		<i>Allonais paraguayensis</i>			
204.		<i>Allonais pectinata</i>			
205.		<i>Alluaudomyia</i> sp.			
206.		<i>Alona</i> cf. <i>verrucosa</i>			
207.		<i>Ameiridae</i> sp.			
208.		<i>Amphipoda</i> sp.			
209.		<i>Amphora coffeaeformis</i> (Ag.) Kütz.			
210.		<i>Aname mellosa</i>			
211.		<i>Anomoeoneis styriaca</i> (Grun.) Hust.			
212.		<i>Anopheles annulipes</i> s.l.			
213.		<i>Antichiropus</i> sp.			
214.		<i>Arcella</i> sp.			
215.		<i>Argiocnemis rubescens</i>			
216.		<i>Argiope protensa</i>			
217.		<i>Armatalona macrocopa</i>			
218.		<i>Arrenurus</i> sp. nov. 1 (PSS)			Y
219.		<i>Arthrorhabdus paucispinus</i>			
220.		<i>Asadipus yundamindra</i>			
221.		<i>Aspidiobates pilbara</i>			
222.		<i>Atopobathynella</i> sp.			
223.		<i>Australiobates</i> n. sp. (PSS)			
224.		<i>Australiobates queenslandensis</i>			
225.		<i>Australoeucyclops karaytugi</i> (ex <i>Paracyclops</i> sp. 7)			
226.		<i>Austraturus</i> sp. P1 (PSW)			
227.		<i>Austroagrimon pindrina</i> /Ischnura heterosticta			
228.		<i>Austrodytes insularis</i>			
229.		<i>Austroepigomphus</i> (<i>Xerogomphus</i>) <i>gordonii</i>			
230.		<i>Austrolimnius</i> WA sp. 2 (= adult sp WA 2) (PSW)			
231.		<i>Austropeplea lessoni</i>			
232.		<i>Austrostrophus stictopygus</i>			
233.		<i>Axonopsella</i> nr <i>truza</i> (PSW)			
234.		<i>Baetidae</i> sp.			
235.		<i>Bathynella</i> sp.			
236.		<i>Bdelloidea</i> sp. 2:2			
237.		<i>Belostomatidae</i> sp.			
238.		<i>Berosus pulchellus</i>			
239.		<i>Berosus</i> sp.			
240.		<i>Bezzia</i> sp. 1 (SAP)			
241.		<i>Bezzia</i> sp. 2 (SAP)			
242.		<i>Bigenditia zuytdorp</i>			
243.		<i>Bolboleas truncatus</i>			
244.		<i>Boongurrus occidentalis</i>			
245.		<i>Boongurrus</i> sp.			Y
246.		<i>Buddelundia</i> sp.			

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247.	<i>Caenidae</i> sp.			
248.	<i>Candoninae</i> ' (pss)			
249.	<i>Candonocypris fitzroyi</i>			
250.	<i>Candonopsis cf. tenuis</i> (PSS)			
251.	<i>Candonopsis williami</i> (PSS)			Y
252.	<i>Carenum pulchrum</i>			
253.	<i>Carenum subplanatum</i>			
254.	<i>Carenum venustum</i>			
255.	<i>Cavisternum clavatum</i>			
256.	<i>Cephalodella gibba</i>			
257.	<i>Ceratopogonidae</i> sp.			
258.	<i>Cheumatopsyche wellsae</i>			
259.	<i>Chimarra</i> sp AV17 (PSW)			
260.	<i>Chironominae</i> sp.			
261.	<i>Chironomus aff. alternans</i> (V24) (CB)			
262.	<i>Chydaekata</i> sp.			
263.	<i>Clinohalea</i> sp.			
264.	<i>Cloeon</i> sp.			
265.	<i>Cnephia nr aurantiacum</i>			
266.	<i>Cocconeis placentula</i> var. <i>euglypta</i> ehr.			
267.	<i>Coenagrionidae</i> sp.			
268.	<i>Conopterum leai</i>			
269.	<i>Conopterum pyripenne</i>			
270.	<i>Corduliidae</i> sp.			
271.	<i>Corixidae</i> sp.			
272.	<i>Cormocephalus strigosus</i>			
273.	<i>Cormocephalus turneri</i>			
274.	<i>Corynoneura</i> sp. P2 (PSW)			
275.	<i>Cryptochironomus griseidorsum</i>			
276.	<i>Culex crinicauda</i>			
277.	<i>Culicidae</i> sp.			
278.	<i>Culicoides?</i> sp P4 (PSW)			
279.	<i>Cymbella affinis</i> Kütz.			
280.	<i>Cymbella cymbiformis</i> Ag.			
281.	<i>Cymbella delicatula</i> Kütz.			
282.	<i>Cymbella falaisensis</i> (Grun.) Krammer & Lange-Bertalot			
283.	<i>Cymbella pusilla</i> Grun.			
284.	<i>Cypretta baylyi</i>			
285.	<i>Cypretta seurati</i>			
286.	<i>Cypretta</i> sp. BOS080			
287.	<i>Dasyheleinae</i> sp. P1 (PSW)			
288.	<i>Dasyheleinae</i> sp. P2 (PSW)			
289.	<i>Deminutiocandona 'stomachosa'</i> (PSS)			
290.	<i>Deminutiocandona mica</i>			Y
291.	<i>Deminutiocandona</i> sp. 1' (PSS)			
292.	<i>Diacyclops cockingi</i>			
293.	<i>Diacyclops humphreysi humphreysi</i>			
294.	<i>Diacyclops scanloni</i>			
295.	<i>Diacyclops sobeprolatus</i>			
296.	<i>Diacyclops</i> sp.			
297.	<i>Dicrotendipes</i> sp P4 (PSW)			
298.	<i>Diffugia</i> sp. P1			
299.	<i>Diplacodes haematodes</i>			
300.	<i>Diplonychus eques</i>			
301.	<i>Diplopoda</i> sp.			
302.	<i>Dissotrocha n. sp.</i> (Pilbara stygo)			
303.	<i>Djalmabatista</i> sp.			
304.	<i>Dolichopodidae</i> sp.			
305.	<i>Dytiscidae</i> sp.			
306.	<i>Ecnomidae</i> sp.			
307.	<i>Ecnomus pilbarensis</i>			
308.	<i>Ecnomus</i> sp.			
309.	<i>Ectocyclops phaleratus</i>			
310.	<i>Elaphoidella</i> sp. 2 (PSS)			
311.	<i>Elaphoidella</i> sp. 3 (PSS)			
312.	<i>Empididae</i> sp.			
313.	<i>Enchytraeidae</i> sp.			
314.	<i>Enchytraeus Pilbara</i> sp. 2 (PSS)			
315.	<i>Eolimna minima</i> (Grun.) Lange-Bertalot			
316.	<i>Ephemeroporus barroisi</i> s.l.			

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317.	<i>Ethmostigmus curtipes</i>			
318.	<i>Euchlanis dilatata</i>			
319.	<i>Euchlanis oropha</i>			
320.	<i>Eucyclops australiensis</i>			
321.	<i>Euglypha</i> sp.			
322.	<i>Eurysticta coolawanyah</i>			
323.	<i>Fissarena castanea</i>			
324.	<i>Fragilaria ulna</i> (Nitz.) Lange Bertalot			
325.	<i>Geoscaptus laevisissimus</i>			
326.	<i>Gerridae</i> sp.			
327.	<i>Glossiphoniidae</i> sp.			
328.	<i>Gnathaphanus melbournensis</i>			
329.	<i>Gomphidae</i> sp.			
330.	<i>Gomphodella</i> sp. 4 (PSS)			
331.	<i>Gondwanabates nr bodivus</i> (PSW)			
332.	<i>Guineaxonopsis</i> sp. P1 (PSW)			
333.	<i>Gyraulus hesperus</i>			
334.	<i>Gyrinidae</i> sp.			
335.	<i>Harpacticoida</i> sp.			
336.	<i>Hebridae</i> sp.			
337.	<i>Hellyethira litua</i>			
338.	<i>Hellyethira</i> sp.			
339.	<i>Helochares/E mastersi</i> larvae			
340.	<i>Hemicordulia intermedia</i>			
341.	<i>Hesperomomonis humphreysi</i>			
342.	<i>Heteronyx tepperi</i>			
343.	<i>Heteropoda marillana</i>			Y
344.	<i>Hoggicosa bicolor</i>			
345.	<i>Humphreyscandona woutersi</i>			
346.	<i>Hydra</i> sp.			
347.	<i>Hydraena barbipes</i>			
348.	<i>Hydraenidae</i> sp.			
349.	<i>Hydrochus eurypleuron</i>			
350.	<i>Hydrochus lateviridis</i>			
351.	<i>Hydrochus obscuraeaeus</i>			
352.	<i>Hydrochus</i> sp.			
353.	<i>Hydrodroma</i> sp.			
354.	<i>Hydroglyphus leai</i>			
355.	<i>Hydroglyphus orthogrammus</i>			
356.	<i>Hydrophilidae</i> sp.			
357.	<i>Hydropsychidae</i> sp.			
358.	<i>Hydroptilidae</i> sp.			
359.	<i>Ictinogomphus dobsoni</i>			
360.	<i>Ilyodromus</i> sp BOS25			
361.	<i>Indolpium</i> sp.			
362.	<i>Inermipes</i> sp. 1 (PSS)			
363.	<i>Ischnura aurora aurora</i>			
364.	<i>Isostictidae</i> sp.			
365.	<i>Laccobius</i> sp.			
366.	<i>Lamponata daviesae</i>			
367.	<i>Lamponina scutata</i>			
368.	<i>Larsia albiceps</i>			
369.	<i>Latrodectus hasseltii</i>			
370.	<i>Lecane aculeata</i>			
371.	<i>Lecane bulla</i>			
372.	<i>Lecane hornemanni</i>			
373.	<i>Lecane lunaris</i>			
374.	<i>Lecane obtusa</i>			
375.	<i>Lecane papuana</i>			
376.	<i>Lecane thalera</i>			
377.	<i>Lepadella</i> (H.) heterostyla			
378.	<i>Lepadella acuminata</i>			
379.	<i>Lepadella latusinus</i>			
380.	<i>Lepadella ovalis</i>			
381.	<i>Lepadella patella</i>			
382.	<i>Lepidota squamulata</i>			
383.	<i>Leptasteron platyconductor</i>			
384.	<i>Leptoceridae</i> sp.			
385.	<i>Lesquereusia spiralis</i>			
386.	<i>Libellulidae</i> sp.			

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387.	<i>Limnebius</i> sp.			
388.	<i>Limnesia</i> sp.			
389.	<i>Limnesia</i> sp. 1 (PSW)			
390.	<i>Limnesia</i> sp. 4 (PSW)			
391.	<i>Limnochares australica</i>			
392.	<i>Limnocythere dorsosicula</i>			
393.	<i>Limnogonus luctuosus</i>			
394.	<i>Loxandrus laevigatus</i>			
395.	<i>Loxandrus micantior</i>			
396.	<i>Lychas</i> sp. 1			
397.	<i>Lychas</i> sp. 2			
398.	<i>Lycidas</i> sp. 1			
399.	<i>Lymnaeidae</i> sp.			
400.	<i>Maarka weeliwoili</i>			Y
401.	<i>Macrochaetus altamirai</i>			
402.	<i>Macrogyrus darlingtoni</i>			
403.	<i>Macrothrix indistincta</i>			
404.	<i>Masasteron sampeyae</i>			
405.	<i>Masasteron tealei</i>			
406.	<i>Mastogloia elliptica</i> (Ag.) Cl.			
407.	<i>Mastogloia elliptica</i> var. <i>danseii</i> (thwaites) grun.			
408.	<i>Mastogloia smithii</i> Thwaites			
409.	<i>Meedo houstoni</i>			
410.	<i>Melitidae</i> sp.			
411.	<i>Meridiescandona</i> 'marillaneae' (PSS)			Y
412.	<i>Meridiescandona</i> cf. <i>facies</i> (PSS)			
413.	<i>Meridiescandona facies</i> (PSS)			Y
414.	<i>Meridiescandona</i> sp. 1" (PSS)			Y
415.	<i>Meridiescandona</i> sp. 3' (PSS)			
416.	<i>Mesocyclops darwini</i>			
417.	<i>Mesostigmata</i> sp.			
418.	<i>Mesovelgia vittigera</i>			
419.	<i>Mesoveliidae</i> sp.			
420.	<i>Microchironomus</i> 'K1' (PSW)			
421.	<i>Microcyclops varicans</i>			
422.	<i>Microvelia</i> (<i>Austromicrovelia</i>) <i>peramoena</i>			
423.	<i>Minasteron minusculum</i>			
424.	<i>Missulena faulderi</i>			Y
425.	<i>Missulena langlandsi</i>			Y
426.	<i>Mituliodon tarantulinus</i>			
427.	<i>Mytilina ventralis macracantha</i>			
428.	<i>Naididae</i> (ex <i>Tubificidae</i>)			
429.	<i>Navicula cryptonella</i> Lange-Bertalot			
430.	<i>Navicula leptostriata</i> Jørgensen			
431.	<i>Navicula radiosa</i> Kütz.			
432.	<i>Navicula variostrata</i> Krasske			
433.	<i>Nebela</i> sp.			
434.	<i>Necterosoma regulare</i>			
435.	<i>Nematoda</i> sp.			
436.	<i>Nematoda</i> sp. 12 (PSS)			
437.	<i>Nematoda</i> sp. 4 (PSS)			
438.	<i>Nematoda</i> sp. P2/P4 (PSW)			
439.	<i>Nematoda</i> sp. P3 (PSW)			
440.	<i>Nematoda</i> sp. P8 (PSW)			
441.	<i>Neocandona</i> sp. 1 (PSS)			Y
442.	<i>Nephila edulis</i>			
443.	<i>Nerthra luteovaria</i>			
444.	<i>Nilobezzia</i> sp.			
445.	<i>Nilotanypus</i> sp. P1 (PSW)			
446.	<i>Nitzschia angustata</i> Grun.			
447.	<i>Nitzschia palea</i> (Kütz.) W. Sm.			
448.	<i>No invertebrates</i>			
449.	<i>Nososticta</i> sp.			
450.	<i>Notacandona boultoni</i>			Y
451.	<i>Notacandona</i> cf. <i>modesta</i> (PSS)			Y
452.	<i>Notacandona modesta</i>			Y
453.	<i>Notobathynella</i> sp.			
454.	<i>Notonectidae</i> sp.			
455.	<i>Oecetis</i> sp. <i>Pilbara</i> 4 (PSW)			
456.	<i>Offadens soror</i> (ex <i>genus</i> 1 WA sp. 1)			

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457.	<i>Oligochaeta</i> sp.			
458.	<i>Onthophagus consentaneus</i>			
459.	<i>Opisthopora</i> sp.			
460.	<i>Oribatida</i> group 1 (PSS)			
461.	<i>Oribatida</i> group 5 (PSS)			
462.	<i>Orphnaeus brevilabiatus</i>			
463.	<i>Orthetrum caledonicum</i>			
464.	<i>Orthetrum pruinatum migratum</i>			
465.	<i>Orthocladinae</i> sp.			
466.	<i>Ostracoda</i> (unident.)			
467.	<i>Paracyclops chiltoni</i>			
468.	<i>Paramelitidae</i> cf. sp. 9 (PSS)			Y
469.	<i>Paramelitidae</i> sp.			
470.	<i>Paramelitidae</i> sp. 2 (PSS)			
471.	<i>Parametricnemus</i> sp P1 (PSW)			
472.	<i>Pediana horni</i>			
473.	<i>Pellenes bitaeniata</i>			
474.	<i>Pentaneurini</i> sp. P6 (PSW)			
475.	<i>Philopotamidae</i> sp.			
476.	<i>Phorticosomus gularis</i>			
477.	<i>Phreodrilid</i> with dissimilar ventral chaetae			
478.	<i>Phreodrilid</i> with similar ventral chaetae			
479.	<i>Phreodrilidae</i> sp.			
480.	<i>Phreodrilus</i> sp.			Y
481.	<i>Phrysonotus novaehollandiae</i>			
482.	<i>Pilbaracandona 'rosa'</i> (PSS)			
483.	<i>Pilbaracandona eberhardi</i>			
484.	<i>Pilbarascutigera incola</i>			
485.	<i>Pilbarus millsii</i>			
486.	<i>Planorbidae</i> sp.			
487.	<i>Platyias quadricornis</i>			
488.	<i>Platynectes decempunctatus</i> var <i>decempunctatus</i>			
489.	<i>Pleidae</i> sp.			
490.	<i>Polypedilum nubifer</i>			
491.	<i>Polypedilum watsoni</i>			
492.	<i>Prethopalpus julianneae</i>			Y
493.	<i>Prethopalpus maini</i>			
494.	<i>Prethopalpus pearsoni</i>			Y
495.	<i>Pristina longiseta</i>			
496.	<i>Pristina</i> sp.			
497.	<i>Procladius paludicola</i>			
498.	<i>Procorticacarus</i> P1 (PSW)			
499.	<i>Prodidomus woodleigh</i>			
500.	<i>Pseudagrion microcephalum</i>			
501.	<i>Psychodidae</i> sp.			
502.	<i>Pygolabis weelivollii</i>			
503.	<i>Pyrilidae</i> nr sp. 37 of JHH (now sp. 53) (ex. <i>Pilbara</i> sp. 3) (PSW)			
504.	<i>Pyrilidae</i> sp.			
505.	<i>Pyrilidae</i> sp. 3 of JHH (PSW) (= <i>Margarosticha ?repetitalis</i>)			
506.	<i>Ranatra diminuta</i>			
507.	<i>Recifella</i> sp.			
508.	<i>Regimbartia attenuata</i>			
509.	<i>Rheocricotopus</i> sp. P1 (PSW)			
510.	<i>Rheotanytarsus trivittatus</i>			
511.	<i>Rhodothermis lieftincki</i>			
512.	<i>Sciomyzidae</i> sp.			
513.	<i>Scirtidae</i> sp.			
514.	<i>Scirtidae</i> sp. 1 (PSW)			
515.	<i>Scolopendra laeta</i>			
516.	<i>Scolopendra morsitans</i>			
517.	<i>Sellephora pupula</i> (Kütz) Mereschowsky			
518.	<i>Simuliidae</i> sp.			
519.	<i>Simulium clathrinum</i>			
520.	<i>Spinasteron barlee</i>			
521.	<i>Spinasteron cavasteroides</i>			
522.	<i>Spinasteron waldockae</i>			
523.	<i>Sternolophus marginicollis</i>			
524.	<i>Stilobezzia</i> sp P1 (PSW)			
525.	<i>Stratiomyidae</i> sp.			
526.	<i>Stygonitocrella bispinosa</i>			

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527.	<i>Stygorgidgewayia trispinosa</i>			
528.	<i>Supunna funerea</i>			
529.	<i>Synsphyronus gracilis</i>			
530.	<i>Synsphyronus heptatrichus</i>			
531.	<i>Tabanidae</i> sp.			
532.	<i>Tamopsis fickerti</i>			
533.	<i>Tanypodinae</i> sp.			
534.	<i>Tanytarsus</i> sp. D (SAP)			
535.	<i>Tanytarsus</i> sp. P2 (PSW)			
536.	<i>Tasmanocoenis arcuata</i>			
537.	<i>Testudinella amphora</i>			
538.	<i>Thienemanniella</i> sp. P1 (PSW)			
539.	<i>Tiporus</i> sp.			
540.	<i>Tiporus tambreyi</i>			
541.	<i>Tipulidae</i> sp.			
542.	<i>Tipulidae</i> type P1 (PSW)			
543.	<i>Trachyspina mundaring</i>			
544.	<i>Triaenodes</i> sp. P1=P2 (PSW)			
545.	<i>Trichocerca pusilla</i>			
546.	<i>Trichocyclus aranda</i>			
547.	<i>Tropocyclops confinis</i> (ex <i>Paracyclops</i> sp. 6)			
548.	<i>Tubificidae</i> WA28 (SAP))			
549.	<i>Tubificidae</i> stygo type 1 (imm <i>Ainudrilus</i> WA25/26?) (PSS)			
550.	<i>Turbellaria</i> sp.			
551.	<i>Tyrannochthonius aridus</i>			
552.	<i>Unixenus attemsi</i>			
553.	<i>Urodacus butleri</i>			
554.	<i>Veliidae</i> sp.			
555.	<i>Vestalenula marmonieri</i>			
556.	<i>Wandesia</i> sp. P1(nr <i>glareosa</i>)(PSW)			
557.	<i>Wyndura barrow</i>			
558.	<i>Wyndura kennedy</i>			
559.	<i>Zenodorus orbiculatus</i>			
560.	<i>Zygomma elgneri</i>			
561.	nr <i>Encoptarthria</i> sp. B01			Y

Mammal

562.	47713	<i>Austronomus australis</i> (White-striped Free-tailed Bat)		
563.	24251	<i>Bos taurus</i> (European Cattle)	Y	
564.	24252	<i>Bubalus bubalis</i> (Water Buffalo)	Y	
565.	24254	<i>Camelus dromedarius</i> (Dromedary, Camel)	Y	
566.	24181	<i>Chaerephon jobensis</i> (Greater Northern Freetail-bat, Northern Mastiff Bat)		
567.	24186	<i>Chalinolobus gouldii</i> (Gould's Wattled Bat)		
568.	24187	<i>Chalinolobus morio</i> (Chocolate Wattled Bat)		
569.	30903	<i>Dasycercus blythi</i> (Brush-tailed Mulgara, Ampurta)		P4
570.	48395	<i>Dasycercus</i> sp. (mulgara)		P4
571.	24091	<i>Dasykaluta rosamondae</i> (Little Red Kaluta)		
572.	24092	<i>Dasyurus geoffroii</i> (Chuditch, Western Quoll)		T
573.	24093	<i>Dasyurus hallucatus</i> (Northern Quoll)		T
574.	24257	<i>Equus asinus</i> (Donkey)	Y	
575.	24258	<i>Equus caballus</i> (Horse)	Y	
576.	24041	<i>Felis catus</i> (Cat)	Y	
577.	24180	<i>Macroderma gigas</i> (Ghost Bat)		T
578.	25489	<i>Macropus robustus</i> (Euro, Biggada)		
579.	24135	<i>Macropus robustus</i> subsp. <i>erubescens</i> (Euro, Biggada)		
580.	24136	<i>Macropus rufus</i> (Red Kangaroo, Marlu)		
581.	24168	<i>Macrotis lagotis</i> (Bilby, Dalgyte, Ninu)		T
582.	24183	<i>Mormopterus loriae</i> (Little Northern Freetail-bat)		
583.	24223	<i>Mus musculus</i> (House Mouse)	Y	
584.	24094	<i>Ningai ridei</i> (Wongai Ningai)		
585.	24095	<i>Ningai timealeyi</i> (Pilbara Ningai)		
586.	24224	<i>Notomys alexis</i> (Spinifex Hopping-mouse)		
587.	42365	<i>Nyctophilus daedalus</i> (Northwestern Long-eared Bat, Pallid Long-eared Bat)		
588.	24194	<i>Nyctophilus geoffroyi</i> (Lesser Long-eared Bat)		
589.	24085	<i>Oryctolagus cuniculus</i> (Rabbit)	Y	
590.	48034	<i>Osphranter robustus</i> (Euro, Biggada)		
591.	24144	<i>Petrogale rothschildi</i> (Rothschild's Rock-wallaby)		
592.	48401	<i>Petrogale</i> sp. (rock wallaby)		T
593.	24101	<i>Planigale ingrami</i> (Long-tailed Planigale)		
594.	24102	<i>Planigale maculata</i> (Common Planigale)		
595.	24106	<i>Pseudantechinus woolleyae</i> (Woolley's <i>Pseudantechinus</i>)		

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
596.	24233	<i>Pseudomys chapmani</i> (Western Pebble-mound Mouse, Ngadji)		P4	
597.	24235	<i>Pseudomys desertor</i> (Desert Mouse)			
598.	24237	<i>Pseudomys hermannsburgensis</i> (Sandy Inland Mouse)			
599.	24239	<i>Pseudomys nanus</i> (Western Chestnut Mouse)			
600.	43368	<i>Rhinonicteris aurantia</i> (Orange Leaf-nosed bat)		P4	
601.	48095	<i>Rhinonicteris aurantia</i> (Pilbara) (Pilbara leaf-nosed bat)		T	
602.	24174	<i>Saccolaimus flaviventris</i> (Yellow-bellied Sheath-tailed Bat)			
603.	24200	<i>Scotorepens greyii</i> (Little Broad-nosed Bat)			
604.	24109	<i>Sminthopsis dolichura</i> (Little long-tailed Dunnart)			
605.	24114	<i>Sminthopsis hirtipes</i> (Hairy-footed Dunnart)			
606.	24116	<i>Sminthopsis macroura</i> (Stripe-faced Dunnart)			
607.	24117	<i>Sminthopsis ooldea</i> (Ooldea Dunnart)			
608.	24120	<i>Sminthopsis youngsoni</i> (Lesser Hairy-footed Dunnart)			
609.	24207	<i>Tachyglossus aculeatus</i> (Short-beaked Echidna)			
610.	24175	<i>Taphozous georgianus</i> (Common Sheath-tailed Bat)			
611.	24176	<i>Taphozous hilli</i> (Hill's Sheath-tail-bat)			
612.	24205	<i>Vespadelus finlaysoni</i> (Finlayson's Cave Bat)			
613.	24248	<i>Zyzomys argurus</i> (Common Rock-rat)			
614.	24249	<i>Zyzomys pedunculatus</i> (Central Rock-rat, Antina)		T	
615.		<i>Zyzomys</i> sp.			Y
616.	24250	<i>Zyzomys woodwardi</i> (Kimberley Rock-rat)			

Reptile

617.	25332	<i>Acanthophis wellsi</i> (Pilbara Death Adder)			
618.	30833	<i>Amphibolurus longirostris</i> (Long-nosed Dragon)			
619.	44634	<i>Anilius ganei</i> (Gane's blind snake (Pilbara))		P1	
620.	44635	<i>Anilius grypus</i>			
621.	25318	<i>Antaresia perthensis</i> (Pygmy Python)			
622.	25448	<i>Antaresia stimsoni</i> (Stimson's Python)			
623.	25319	<i>Antaresia stimsoni</i> subsp. <i>orientalis</i> (Stimson's Python)			
624.	25241	<i>Antaresia stimsoni</i> subsp. <i>stimsoni</i> (Stimson's Python)			
625.	25320	<i>Aspidites melanocephalus</i> (Black-headed Python)			
626.	25331	<i>Brachyuropsis approximans</i> (North-western Shovel-nosed Snake)			
627.	25015	<i>Carlia munda</i> (Shaded-litter Rainbow Skink)			
628.	25017	<i>Carlia triacantha</i> (Desert Rainbow Skink)			
629.	25456	<i>Crenadactylus ocellatus</i> (Clawless Gecko)			
630.	24919	<i>Crenadactylus ocellatus</i> subsp. <i>horni</i> (Clawless Gecko)			
631.	24921	<i>Crenadactylus ocellatus</i> subsp. <i>rostralis</i> (Clawless Gecko)			
632.	30893	<i>Cryptoblepharus buehneri</i>			
633.	25020	<i>Cryptoblepharus plagiocephalus</i>			
634.	30892	<i>Cryptoblepharus ustulatus</i>			
635.	25458	<i>Ctenophorus caudicinctus</i> (Ring-tailed Dragon)			
636.	24865	<i>Ctenophorus caudicinctus</i> subsp. <i>caudicinctus</i> (Ring-tailed Dragon)			
637.	25459	<i>Ctenophorus isolepis</i> (Crested Dragon, Military Dragon)			
638.	24874	<i>Ctenophorus isolepis</i> subsp. <i>citrinus</i> (Yellow Military Dragon)			
639.	24875	<i>Ctenophorus isolepis</i> subsp. <i>gularis</i> (Central Military Dragon)			
640.	24876	<i>Ctenophorus isolepis</i> subsp. <i>isolepis</i> (Crested Dragon, Military Dragon)			
641.	24882	<i>Ctenophorus nuchalis</i> (Central Netted Dragon)			
642.	24886	<i>Ctenophorus reticulatus</i> (Western Netted Dragon)			
643.	25025	<i>Ctenotus ariadnae</i>			
644.	25036	<i>Ctenotus duricola</i>			
645.	25462	<i>Ctenotus grandis</i>			
646.	25041	<i>Ctenotus grandis</i> subsp. <i>grandis</i>			
647.	25043	<i>Ctenotus grandis</i> subsp. <i>titan</i>			
648.	25044	<i>Ctenotus hanloni</i>			
649.	25045	<i>Ctenotus helenae</i>			
650.	25048	<i>Ctenotus inornatus</i>			
651.	25052	<i>Ctenotus leonhardi</i>			
652.	25463	<i>Ctenotus pantherinus</i> (Leopard Ctenotus)			
653.	25060	<i>Ctenotus pantherinus</i> subsp. <i>acripes</i> (Leopard Ctenotus)			
654.	25064	<i>Ctenotus pantherinus</i> subsp. <i>ocellifer</i> (Leopard Ctenotus)			
655.	25065	<i>Ctenotus pantherinus</i> subsp. <i>pantherinus</i> (Leopard Ctenotus)			
656.	25066	<i>Ctenotus quattuordecimlineatus</i>			
657.	25072	<i>Ctenotus rubicundus</i>			
658.	25071	<i>Ctenotus rutilans</i>			
659.	25073	<i>Ctenotus saxatilis</i> (Rock Ctenotus)			
660.	25074	<i>Ctenotus schomburgkii</i>			
661.	25077	<i>Ctenotus serventyi</i>			
662.	25465	<i>Ctenotus uber</i> (Spotted Ctenotus)			
663.	25081	<i>Ctenotus uber</i> subsp. <i>johnstonei</i> (Spotted Ctenotus (northeast), Spotted Skink (Balgo, NE WA))		P2	

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
664.	25466	<i>Cyclodomorphus melanops</i> (Slender Blue-tongue)			
665.	25089	<i>Cyclodomorphus melanops</i> subsp. <i>elongatus</i> (Slender Blue-tongue)			
666.	25090	<i>Cyclodomorphus melanops</i> subsp. <i>melanops</i> (Slender Blue-tongue)			
667.	24997	<i>Delma butleri</i>			
668.	24998	<i>Delma elegans</i>			
669.	25000	<i>Delma haroldi</i>			
670.	25001	<i>Delma nasuta</i>			
671.	25002	<i>Delma pax</i>			
672.	25004	<i>Delma tincta</i>			
673.	25468	<i>Demansia psammophis</i> (Yellow-faced Whipsnake)			
674.	25295	<i>Demansia psammophis</i> subsp. <i>cupreiceps</i> (Yellow-faced Whipsnake)			
675.	25296	<i>Demansia psammophis</i> subsp. <i>reticulata</i> (Yellow-faced Whipsnake)			
676.	25297	<i>Demansia rufescens</i> (Rufous Whipsnake)			
677.	24926	<i>Diplodactylus conspicillatus</i> (Fat-tailed Gecko)			
678.	24940	<i>Diplodactylus pulcher</i>			
679.	24944	<i>Diplodactylus savagei</i> (Southern Pilbara Beak-faced Gecko)			
680.	24899	<i>Diporiphora valens</i> (Southern Pilbara Tree Dragon)			
681.	41406	<i>Egernia cygnitos</i> (Western Pilbara Spiny-tailed Skink)			
682.	25092	<i>Egernia depressa</i> (Southern Pygmy Spiny-tailed Skink)			
683.	25094	<i>Egernia formosa</i>			
684.	42404	<i>Eremiascincus isolepis</i>			
685.	43381	<i>Eremiascincus pallidus</i> (Western Narrow-banded Skink, Narrow-banded Sand Swimmer)			
686.	25109	<i>Eremiascincus richardsonii</i> (Broad-banded Sand Swimmer)			
687.	25301	<i>Furina ornata</i> (Moon Snake)			
688.	24953	<i>Gehyra montium</i>			
689.	24956	<i>Gehyra pilbara</i>			
690.	24958	<i>Gehyra punctata</i>			
691.	24957	<i>Gehyra purpurascens</i>			
692.	24959	<i>Gehyra variegata</i>			
693.	24961	<i>Heteronotia binoei</i> (Bynoe's Gecko)			
694.		<i>Heteronotia</i> sp.			
695.	24962	<i>Heteronotia spelea</i> (Desert Cave Gecko, Pilbara Cave Gecko)			
696.	30926	<i>Lerista amicum</i>			
697.	25125	<i>Lerista bipes</i>			
698.	30929	<i>Lerista jacksoni</i>			
699.	25146	<i>Lerista labialis</i>			
700.	25482	<i>Lerista macropisthopus</i>			
701.	25151	<i>Lerista macropisthopus</i> subsp. <i>fusciceps</i>			
702.	25155	<i>Lerista muelleri</i>			
703.	25156	<i>Lerista neander</i>			
704.	42411	<i>Lerista timida</i>			
705.	30925	<i>Lerista verhmens</i>			
706.	25183	<i>Lerista zietzi</i>			
707.	25005	<i>Lialis burtonis</i>			
708.	25238	<i>Liasis olivaceus</i> subsp. <i>barroni</i> (Pilbara Olive Python)		T	
709.	30933	<i>Lucasium stenodactylum</i>			
710.	30934	<i>Lucasium wombeyi</i>			
711.	25184	<i>Menetia greyii</i>			
712.	25491	<i>Menetia surda</i>			
713.	25187	<i>Menetia surda</i> subsp. <i>surda</i>			
714.	25495	<i>Morethia ruficauda</i>			
715.	25193	<i>Morethia ruficauda</i> subsp. <i>exquisita</i>			
716.	25498	<i>Nephurus wheeleri</i>			
717.	24972	<i>Nephurus wheeleri</i> subsp. <i>cinctus</i>			
718.	24973	<i>Nephurus wheeleri</i> subsp. <i>wheeleri</i>			
719.	25499	<i>Notoscincus ornatus</i>			
720.	25197	<i>Notoscincus ornatus</i> subsp. <i>ornatus</i>			
721.		<i>Oedura fimbria</i>			
722.	24976	<i>Oedura marmorata</i> (Marbled Velvet Gecko)			
723.	25254	<i>Parasuta monachus</i>			
724.	25510	<i>Pogona minor</i> (Dwarf Bearded Dragon)			
725.	24907	<i>Pogona minor</i> subsp. <i>minor</i> (Dwarf Bearded Dragon)			
726.	24908	<i>Pogona minor</i> subsp. <i>mittelli</i> (Dwarf Bearded Dragon)			
727.	25199	<i>Proablepharus reginae</i>			
728.	25261	<i>Pseudechis australis</i> (Mulga Snake)			
729.	42416	<i>Pseudonaja mengdeni</i> (Western Brown Snake)			
730.	25263	<i>Pseudonaja modesta</i> (Ringed Brown Snake)			
731.	25264	<i>Pseudonaja nuchalis</i> (Gwardar, Northern Brown Snake)			
732.	25009	<i>Pygopus nigriceps</i>			

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
733.	24982	<i>Rhynchoedura ornata</i> (Western Beaked Gecko)			
734.	24927	<i>Strophurus elderi</i>			
735.	24932	<i>Strophurus jeanae</i>			
736.	24949	<i>Strophurus wellingtonae</i>			
737.	25269	<i>Suta fasciata</i> (Rosen's Snake)			
738.	25307	<i>Suta punctata</i> (Spotted Snake)			
739.	25202	<i>Tiliqua multifasciata</i> (Central Blue-tongue)			
740.	30814	<i>Tympanocryptis cephalus</i> (Pebble Dragon)			
741.	41426	<i>Underwoodisaurus seorsus</i> (Pilbara Barking Gecko)		P2	
742.	25209	<i>Varanus acanthurus</i> (Spiny-tailed Monitor)			
743.	25210	<i>Varanus brevicauda</i> (Short-tailed Pygmy Monitor)			
744.	30825	<i>Varanus bushi</i> (Pilbara Mulga Monitor)			
745.	25211	<i>Varanus caudolineatus</i>			
746.	25212	<i>Varanus eremius</i> (Pygmy Desert Monitor)			
747.	25216	<i>Varanus giganteus</i> (Perentie)			
748.	25218	<i>Varanus gouldii</i> (Bungarra or Sand Monitor)			
749.	48154	<i>Varanus hamersleyensis</i> (Southern Pilbara Rock Goanna)			
750.	25524	<i>Varanus panoptes</i> (Yellow-spotted Monitor)			
751.	25222	<i>Varanus panoptes</i> subsp. <i>panoptes</i>			
752.	25223	<i>Varanus panoptes</i> subsp. <i>rubidus</i>			
753.	25224	<i>Varanus pilbarensis</i> (Pilbara Rock Monitor, Northern Pilbara Rock Goanna)			
754.		<i>Varanus</i> sp.			
755.	25526	<i>Varanus tristis</i> (Racehorse Monitor)			
756.	25227	<i>Varanus tristis</i> subsp. <i>tristis</i> (Racehorse Monitor)			
757.	25311	<i>Vermicella snelli</i>			

Conservation Codes

T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholly contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 20/04/20 15:26:38

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)

No Image
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[Coordinates](#)

Buffer: 40.0Km

No Image
Available

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	8
Listed Migratory Species:	9

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	14
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	9
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Mammals		
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Macrotis lagotis Greater Bilby [282]	Vulnerable	Species or species habitat likely to occur within area
Rhinonictoris aurantia (Pilbara form) Pilbara Leaf-nosed Bat [82790]	Vulnerable	Roosting known to occur within area
Reptiles		
Liasis olivaceus barroni Olive Python (Pilbara subspecies) [66699]	Vulnerable	Species or species habitat known to occur within area
Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species

Name	Threatened	Type of Presence
Motacilla flava Yellow Wagtail [644]		habitat may occur within area Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species	[Resource Information]	
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species

Name	Threatened	Type of Presence
Hirundo rustica Barn Swallow [662]		habitat known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]		Species or species habitat may occur within area

Extra Information

Invasive Species	[Resource Information]
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Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Mammals		
Camelus dromedarius Dromedary, Camel [7]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Equus asinus Donkey, Ass [4]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-22.82663 119.16437

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [Office of Environment and Heritage, New South Wales](#)
- [Department of Environment and Primary Industries, Victoria](#)
- [Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [Department of Environment, Water and Natural Resources, South Australia](#)
- [Department of Land and Resource Management, Northern Territory](#)
- [Department of Environmental and Heritage Protection, Queensland](#)
- [Department of Parks and Wildlife, Western Australia](#)
- [Environment and Planning Directorate, ACT](#)
- [Birdlife Australia](#)
- [Australian Bird and Bat Banding Scheme](#)
- [Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [Museum Victoria](#)
- [Australian Museum](#)
- [South Australian Museum](#)
- [Queensland Museum](#)
- [Online Zoological Collections of Australian Museums](#)
- [Queensland Herbarium](#)
- [National Herbarium of NSW](#)
- [Royal Botanic Gardens and National Herbarium of Victoria](#)
- [Tasmanian Herbarium](#)
- [State Herbarium of South Australia](#)
- [Northern Territory Herbarium](#)
- [Western Australian Herbarium](#)
- [Australian National Herbarium, Canberra](#)
- [University of New England](#)
- [Ocean Biogeographic Information System](#)
- [Australian Government, Department of Defence](#)
- [Forestry Corporation, NSW](#)
- [Geoscience Australia](#)
- [CSIRO](#)
- [Australian Tropical Herbarium, Cairns](#)
- [eBird Australia](#)
- [Australian Government – Australian Antarctic Data Centre](#)
- [Museum and Art Gallery of the Northern Territory](#)
- [Australian Government National Environmental Science Program](#)
- [Australian Institute of Marine Science](#)
- [Reef Life Survey Australia](#)
- [American Museum of Natural History](#)
- [Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

Appendix C ĩ Fauna species data

[Fauna species list](#)

[Fauna likelihood of occurrence assessment guideline and definitions](#)

[Fauna likelihood of occurrence assessment](#)

Species recorded from studies and database searches

The table presents all vertebrate fauna species recorded in database searches within a 40 kilometre radius of the survey area, as well as the results from the 2019 field survey and remote cameras.

Genus	Species	Common Name	Conservation status		Database searches				September 2019 survey	Remote cameras (September 2019-March 2020)
			BC Act	EPBC Act	NatureMap	DOEE PMST	DBCA threatened fauna	BHP previous fauna records		
Birds										
ACANTHIZIDAE										
<i>Acanthiza</i>	<i>apicalis</i>	Inland Thornbill			X			X		
<i>Acanthiza</i>	<i>chrysorrhoa</i>	Yellow-rumped Thornbill			X			X		
<i>Acanthiza</i>	<i>uropygialis</i>	Chestnut-rumped Thornbill			X			X		
<i>Gerygone</i>	<i>fusca subsp. fusca</i>	Western Gerygone			X			X		
<i>Gerygone</i>	<i>fusca subsp. mungii</i>	Desert Gerygone			X			X		
<i>Pyrrholaemus</i>	<i>brunneus</i>	Redthroat			X			X		
<i>Smicromis</i>	<i>brevirostris</i>	Weebill			X			X	X	
ACCIPITRIDAE										
<i>Accipiter</i>	<i>cirrocephalus</i>	Collared Sparrowhawk			X			X		
<i>Accipiter</i>	<i>fasciatus</i>	Brown Goshawk			X			X		
<i>Aquila</i>	<i>audax</i>	Wedge-tailed Eagle			X			X	X	
<i>Circus</i>	<i>assimilis</i>	Spotted Harrier			X			X		
<i>Elanus</i>	<i>caeruleus</i>	Black-shouldered Kite			X			X		
<i>Haliastur</i>	<i>sphenurus</i>	Whistling Kite			X			X	X	
<i>Lophoictinia</i>	<i>isura</i>	Square-tailed Kite			X			X		
<i>Hamirostra</i>	<i>melanosternon</i>	Black-breasted Buzzard			X			X	X	
<i>Hieraaetus</i>	<i>morphnoides</i>	Little Eagle			X					
<i>Milvus</i>	<i>migrans</i>	Black Kite			X			X	X	
AEGOTHELIDAE										
<i>Aegotheles</i>	<i>cristatus</i>	Owlet-nightjar			X			X		
ALAUDIDAE										
<i>Mirafra</i>	<i>javanica</i>	Singing Bushlark			X			X		

Genus	Species	Common Name	Conservation status		Database searches				September 2019 survey	Remote cameras (September 2019-March 2020)
			BC Act	EPBC Act	NatureMap	DOEE PMST	DBCA threatened fauna	BHP previous fauna records		
ALCEDINIDAE										
<i>Dacelo</i>	<i>leachii</i>	Blue-winged Kookaburra			X			X		
<i>Todiramphus</i>	<i>pyrrhopygius</i>	Red-backed Kingfisher			X			X		
<i>Todiramphus</i>	<i>sanctus</i>	Sacred Kingfisher			X			X		
ANATIDAE										
<i>Anus</i>	<i>superciliosa</i>	Pacific Black Duck			X			X		
APODIDAE										
<i>Apus</i>	<i>pacificus</i>	Fork-tailed Swift	IA	Mi	X	X	X	X		
ARDEIDAE										
<i>Ardea</i>	<i>pacifica</i>	White-necked Heron			X			X		
<i>Ardeaa</i>	<i>alba</i>	Great Egret			X					
<i>Egretta</i>	<i>novaehollandiae</i>	White-faced Heron			X			X		
ARTAMIDAE										
<i>Artamus</i>	<i>cinereus</i>	Black-faced Woodswallow			X			X	X	
<i>Artamus</i>	<i>cyanopterus</i>	Dusty Woodswallow			X					
<i>Artamus</i>	<i>minor</i>	Little Woodswallow			X			X	X	
<i>Artamus</i>	<i>personatus</i>	Masked Woodswallow			X			X		
BURHINIDAE										
<i>Burhinus</i>	<i>grallarius</i>	Bush Stone Curlew			X					
CACATUIDAE										
<i>Eolophus</i>	<i>roseicapilla</i>	Galah			X			X	X	
CAMPEPHAGIDAE										
<i>Lalage</i>	<i>tricolor</i>	White-winged Triller			X			X	X	
<i>Coracina</i>	<i>maxima</i>	Ground Cuckoo-shrike			X			X		
<i>Coracina</i>	<i>novaehollandiae</i>	Black-faced Cuckoo-shrike			X			X	X	
CAPRIMULGIDAE										
<i>Eurostopodus</i>	<i>argus</i>	Spotted Nightjar			X			X		
CASUARIIDAE										

Genus	Species	Common Name	Conservation status		Database searches				September 2019 survey	Remote cameras (September 2019-March 2020)
			BC Act	EPBC Act	NatureMap	DOEE PMST	DBCA threatened fauna	BHP previous fauna records		
<i>Dromaius</i>	<i>novaehollandiae</i>	Emu			X			X		
CENTROPODIDAE										
<i>Centropus</i>	<i>phasianinus</i>	Pheasant Coucal			X			X		
CHARADRIIDAE										
<i>Elseyornis</i>	<i>melanops</i>	Black-fronted Dotterel			X			X		
<i>Charadrius</i>	<i>cinctus</i>	Red-kneed Dotterel			X					
CISOMATIDAE										
<i>Psophodes</i>	<i>occidentalis</i>	Western Wedgebill			X					
COLUMBIDAE										
<i>Geopelia</i>	<i>cuneata</i>	Diamond Dove			X			X		X
<i>Geopelia</i>	<i>placida</i>	Zebra Dove			X					
<i>Geopelia</i>	<i>Striata placida</i>	Peaceful Dove			X			X		
<i>Geophaps</i>	<i>plumifera</i>	Spinifex Pigeon			X			X	X	X
<i>Ocyphaps</i>	<i>lophotes</i>	Crested Pigeon			X			X	X	
<i>Phaps</i>	<i>chalcoptera</i>	Common Bronzewing			X			X		X
CORVIDAE										
<i>Corvus</i>	<i>bennetti</i>	Little Crow			X			X		
<i>Corvus</i>	<i>Orru subsp. ceciliae</i>	Torresian Crow			X			X	X	X
<i>Corvus</i>	<i>coronoides</i>	Australian Raven			X					
<i>Corvus</i>	<i>orru subsp. ceciliae</i>	Western Crow			X					
CRATICIDAE										
<i>Cracticus</i>	<i>nigrogularis</i>	Pied Butcherbird			X			X	X	X
<i>Cracticus</i>	<i>tibicen</i>	Australian Magpie			X			X		X
<i>Cracticus</i>	<i>tibicen subsp. dorsalis</i>	White-backed Magpie			X					
<i>Cracticus</i>	<i>torquatus</i>	Grey Butcherbird			X			X		
CUCULIDAE										
<i>Cacomantis</i>	<i>pallidus</i>	Pallid Cuckoo			X			X		
<i>Chrysococcyx</i>	<i>basalis</i>	Horsefield's Bronze Cuckoo			X					

Genus	Species	Common Name	Conservation status		Database searches				September 2019 survey	Remote cameras (September 2019-March 2020)
			BC Act	EPBC Act	NatureMap	DOEE PMST	DBCA threatened fauna	BHP previous fauna records		
DICAEIDAE										
<i>Dicaeum</i>	<i>hirundinaceum</i>	Mistletoe bird			X			X	X	
DICRURIDAE										
<i>Rhipidura</i>	<i>albiscapa</i>	Grey Fantail			X			X		
<i>Rhipidura</i>	<i>leucophrys</i>	Willie Wagtail			X			X	X	X
ESTRILDIDAE										
<i>Emblema</i>	<i>pictum</i>	Painted Finch			X			X		X
<i>Taeniopygia</i>	<i>guttata</i>	Zebra Finch			X			X	X	
<i>Neochmia</i>	<i>ruficauda</i>	Star Finch			X			X		
FALCONIDAE										
<i>Falco</i>	<i>berigora</i>	Brown Falcon			X			X	X	
<i>Falco</i>	<i>hypoleucos</i>	Grey Falcon	Vu		X		X			
<i>Falco</i>	<i>cenchroides</i>	Nankeen Kestrel			X			X	X	
<i>Falco</i>	<i>longipennis</i>	Australian Hobby			X			X		
<i>Falco</i>	<i>peregrinus</i>	Peregrine Falcon	OS		X		X	X		
HIRUNDINIDAE										
<i>Petrochelidon</i>	<i>nigricans</i>	Tree Martin			X			X		
<i>Hirundo</i>	<i>rustica</i>	Barn Swallow	IA	MI		X				
LARIDAE										
<i>Gelochelidon</i>	<i>nilotica</i>	Gull-billed tern				X	X			
MALURIDAE										
<i>Malurus</i>	<i>lamberti</i>	Variegated Fairy-wren			X			X	X	X
<i>Malurus</i>	<i>leucopterus</i>	White-winged Fairy-wren			X			X		
<i>Stipiturus</i>	<i>ruficeps</i>	Rufous-crowned Emu-wren			X			X		
<i>Amytornis</i>	<i>striatus</i>	Striated Grasswren			X			X		X
<i>Amytornis</i>	<i>striatus</i> subsp. <i>whitei</i>	Rufous Grasswren	P4		X					
MELIPHAGIDAE										
<i>Acanthagenys</i>	<i>rufogularis</i>	Spiny-cheeked Honeyeater			X			X		

Genus	Species	Common Name	Conservation status		Database searches				September 2019 survey	Remote cameras (September 2019-March 2020)
			BC Act	EPBC Act	NatureMap	DOEE PMST	DBCA threatened fauna	BHP previous fauna records		
<i>Epthianura</i>	<i>tricolor</i>	Crimson Chat			X			X		
<i>Eremiornis</i>	<i>carteri</i>	Spinifex-bird			X			X	X	
<i>Gavicalis</i>	<i>virescens</i>	Singing Honeyeater			X			X		
<i>Lacustroica</i>	<i>whitei</i>	Grey Honeyeater			X			X		
<i>Lichmera</i>	<i>indistincta</i>	Brown Honeyeater			X			X	X	
<i>Manorina</i>	<i>flavigula</i>	Yellow-throated Miner			X			X	X	X
<i>Melithreptus</i>	<i>gularis</i>	Black-chinned Honeyeater			X			X		
<i>Ptilotula</i>	<i>keartlandi</i>	Grey-headed Honeyeater			X			X	X	X
<i>Ptilotula</i>	<i>penicillata</i>	White-plumed Honey Eater			X			X	X	
<i>Purnella</i>	<i>albifrons</i>	White-fronted Honeyeater			X			X		
MEROPIDAE										
<i>Merops</i>	<i>ornatus</i>	Rainbow Bee-eater			X			X	X	
MONARCHIDAE										
<i>Grallina</i>	<i>cyanoleuca</i>	Magpie lark			X			X	X	X
MOTACILLIDAE										
<i>Anthus</i>	<i>novaeseelandiae</i>	Australasian Pipit			X			X	X	
<i>Motacillidae</i>	<i>cinerea</i>	Grey Wagtail	MI	IA		X				
OTIDIDAE										
<i>Ardeotis</i>	<i>australis</i>	Australian Bustard			X					
PACHYCEPHALIDAE										
<i>Oreoica</i>	<i>gutturalis</i>	Crested Bellbird			X			X		
<i>Pachycephala</i>	<i>rufiventris</i>	Rufous Whistler			X			X	X	
<i>Colluricincla</i>	<i>harmonica</i>	Grey Shrike-thrush			X			X	X	X
PANDIONIDAE										
<i>Pandion</i>	<i>cristatus</i>	Eastern osprey	MI	MI			X	X		
PARDALOTIDAE										
<i>Pardalotus</i>	<i>striatus</i>	Striated Pardalote			X			X	X	
<i>Pardalotus</i>	<i>rubicatus</i>	Red-browed Pardalote			X			X		

Genus	Species	Common Name	Conservation status		Database searches				September 2019 survey	Remote cameras (September 2019-March 2020)
			BC Act	EPBC Act	NatureMap	DOEE PMST	DBCA threatened fauna	BHP previous fauna records		
PELECANIDAE										
<i>Pelecanus</i>	<i>conspicillatus</i>	Australian Pelican			X			X		
PETROICIDAE										
<i>Melanodryas</i>	<i>cucullata</i>	Hooded Robin			X					
<i>Petroica</i>	<i>goodenovii</i>	Red-capped Robin			X			X		
PHAETHONTIDAE										
<i>Phalacrocorax</i>	<i>sulcirostris</i>	Little Black Cormorant			X			X		
PHASIANTIDAE										
<i>Coturnix</i>	<i>ypsilophora</i>	Brown Quail			X			X		
PODARGIDAE										
<i>Podargus</i>	<i>strigoides</i>	Tawny Frogmouth			X			X		
POMATOSTOMIDAE										
<i>Pomatostomus</i>	<i>temporalis</i>	Grey-crowned Babbler			X			X	X	
<i>Pomatostomus</i>	<i>superciliosus</i>	White-browed Babbler			X			X		
PROCELLARIIDAE										
<i>Macronectes</i>	<i>giganteus</i>	Southern Giant Petrel			X		X			
PSITTACIDAE										
<i>Pezoporus</i>	<i>occidentalis</i>	Night Parrot	Cr	En		X				
<i>Platycercus</i>	<i>varius</i>	Mulga Parrot			X			X		
<i>Melopsittacus</i>	<i>undulatus</i>	Budgerigar			X			X	X	
<i>Platycercus</i>	<i>zonarius subsp. zonarius</i>	Port Lincoln Parrot			X					
PTILINORHYNCHIDAE										
<i>Ptilonorhynchus</i>	<i>guttatus</i>	Western Bowerbird			X			X		X
<i>Ptilonorhynchus</i>	<i>maculatus</i>	Spotted Bowerbird			X					
RALLIDAE										
<i>Gallirallus</i>	<i>philippensis</i>	Buff-banded Rail			X			X		
<i>Porphyrio</i>	<i>porphyrio</i>	Purple Swamphen			X					

Genus	Species	Common Name	Conservation status		Database searches				September 2019 survey	Remote cameras (September 2019-March 2020)
			BC Act	EPBC Act	NatureMap	DOEE PMST	DBCA threatened fauna	BHP previous fauna records		
<i>Porzana</i>	<i>tabuensis</i>	Spotless Crane			X					
ROSTRATULIDAE										
<i>Rostratula</i>	<i>australis</i>	Australian Painted-snipe	EN	EN		X				
SCOLOPACIDAE										
<i>Calidris</i>	<i>ferruginea</i>	Curlew Sandpiper	Cr	Cr, Mi		X				
<i>Tringa</i>	<i>nebularia</i>	Common Greenshank	MI	IA			X	X		
STRIGIDAE										
<i>Ninox</i>	<i>connivens nonnivens</i>	Barking Owl	P3		X		X	X		
SYLVIIDAE										
<i>Acrocephalus</i>	<i>australis</i>	Australian Reed Warbler			X			X		
THRESKIORNITHIDAE										
<i>Threskiornis</i>	<i>spinipectus</i>	Straw-necked Ibis			X					
TURNICIDAE										
<i>Turnix</i>	<i>velox</i>	Little Button-quail			X			X		
TYTONIDAE										
<i>Tyto</i>	<i>alba</i>	Barn Owl			X					
Reptiles										
AGAMIDAE										
<i>Ctenophorus</i>	<i>caudicinctus</i>	Ring-tailed Dragon			X			X	X	
<i>Ctenophorus</i>	<i>isolepis subsp. gularis</i>	Central Military Dragon			X					
<i>Ctenophorus</i>	<i>isolepis subsp. isolepis</i>	Northern Military Dragon			X			X		
<i>Ctenophorus</i>	<i>isolepis subsp. citrinus</i>	Yellowy Military Dragon			X					
<i>Ctenophorus</i>	<i>nuchalis</i>	Central Netted Dragon			X			X		
<i>Ctenophorus</i>	<i>reticulatus</i>	Western Netted Dragon			X					
<i>Diporiphora</i>	<i>valens</i>	Pilbara Tree Dragon			X			X		
<i>Gowidon</i>	<i>longirostris</i>	Long-nosed Dragon			X			X		
<i>Pogona</i>	<i>Minor subsp. minor</i>	Dwarf Bearded Dragon			X					

Genus	Species	Common Name	Conservation status		Database searches				September 2019 survey	Remote cameras (September 2019-March 2020)
			BC Act	EPBC Act	NatureMap	DOEE PMST	DBCA threatened fauna	BHP previous fauna records		
<i>Pogona</i>	<i>minor subsp. mitchelli</i>	Dwarf Bearded Dragon			X					
<i>Tympanocryptis</i>	<i>cephalus</i>	Pebble Dragon			X					
CARPHOACTYLIDAE										
<i>Nephurus</i>	<i>wheeleri cinctus</i>	Banded Knob-tailed Gecko			X			X		
<i>Nephurus</i>	<i>wheeleri subsp. wheeler</i>	Banded Knob-tailed Gecko			X					
DIPOLOACTYLIDAE										
<i>Crenadactylus</i>	<i>ocellatus subsp. horni</i>	Clawless Gecko			X					
<i>Crenadactylus</i>	<i>ocellatus subsp. rostralis</i>	Clawless Gecko			X					
<i>Diplodactylus</i>	<i>Conspicillatus ?laevis</i>	Fat-tailed Gecko			X			X		
<i>Diplodactylus</i>	<i>pulcher</i>	Pretty Gecko			X					
<i>Diplodactylus</i>	<i>savagei</i>	Pilbara Beak-faced Gecko			X			X		
<i>Lucasium</i>	<i>stenodactylum</i>	Box-patterned Ground Gecko			X			X		
<i>Lucasium</i>	<i>wombeyi</i>	Pilbara Ground Gecko			X			X		
<i>Oedura</i>	<i>fimbria (marmorata)</i>	Marbled Velvet Gecko			X			X		
<i>Rhynchoedura</i>	<i>ornata</i>	Western Beaked Gecko			X			X		
<i>Strophurus</i>	<i>elderi</i>	Jewelled Gecko			X			X		
<i>Strophurus</i>	<i>jeanae</i>	Phasmid Gecko			X			X		
<i>Strophurus</i>	<i>wellingtonae</i>	Betty's Gecko			X			X		
ELAPIDAE										
<i>Acanthophis</i>	<i>wellsi</i>	Pilbara Death Adder			X			X		
<i>Brachyurophis</i>	<i>approximans</i>	Shovel-nosed Snake			X			X		
<i>Demansia</i>	<i>psammophis cupriceps</i>	Yellow-faced Whip Snake			X			X		
<i>Demansia</i>	<i>psammophis subsp. reticulata</i>	Yellow-faced Whip Snake			X					
<i>Demansia</i>	<i>rufescens</i>	Rufous Whipsnake			X			X		
<i>Furina</i>	<i>ornatus</i>	Orange-napped Snake			X			X		
<i>Parasuta</i>	<i>monachus</i>	Monk Snake			X			X		
<i>Pseudechis</i>	<i>australis</i>	Mulga Snake			X			X	X	

Genus	Species	Common Name	Conservation status		Database searches				September 2019 survey	Remote cameras (September 2019-March 2020)
			BC Act	EPBC Act	NatureMap	DOEE PMST	DBCA threatened fauna	BHP previous fauna records		
<i>Pseudonaja</i>	<i>modesta</i>	Ringed Brown Snake			X			X		
<i>Pseudonaja</i>	<i>mengdeni</i>	Western brown Snake, Gwardar			X			X		
<i>Pseudonaja</i>	<i>nuchalis</i>	Northern Brown Snake, Gwardar			X			X		
<i>Suta</i>	<i>fasciata</i>	Rosen's Snake			X			X		
<i>Suta</i>	<i>punctata</i>	Little Spotted Snake			X					
<i>Vermicella</i>	<i>snelli</i>	Pilbara Bandy Bandy			X			X		
GEKKONIDAE										
<i>Gehyra</i>	<i>montium</i>	Centralian Dtella			X			X		
<i>Gehyra</i>	<i>punctata</i>	Spotted Rock Dtella			X			X		
<i>Gehyra</i>	<i>pilbara</i>	Pilbara Dtella			X			X		
<i>Gehyra</i>	<i>purpurascens</i>	Purple Arid Dtella			X			X		
<i>Gehyra</i>	<i>variegata</i>	Tree Dtella			X			X		
<i>Heteronotia</i>	<i>binoei</i>	Bynoe's Gecko			X			X		
<i>Heteronotia</i>	<i>spelea</i>	Desert Cave Gecko			X			X		
<i>Underwoodisaurus</i>	<i>seorsus</i>	Pilbara Barking Gecko		P2	X		X	X		
PYGOPODIDAE										
<i>Delma</i>	<i>butleri</i>	Butler's Delma			X			X		
<i>Delma</i>	<i>elegans</i>	Elegant Delma			X			X		
<i>Delma</i>	<i>haroldi</i>	Neck-barred Delma			X			X		
<i>Delma</i>	<i>nasuta</i>	Sharp-snout Delma			X			X		
<i>Delma</i>	<i>pax</i>	Peace Delma			X			X		
<i>Delma</i>	<i>tincta</i>	Black-necked Delma			X			X		
<i>Lialis</i>	<i>burtonis</i>	Burton's Legless Lizard			X			X		
<i>Pygopus</i>	<i>nigriceps</i>	Hooded Scaly-foot			X			X		
PYTHONIDAE										
<i>Antaresia</i>	<i>perthensis</i>	Pygmy Python			X			X		
<i>Antaresia</i>	<i>stimsoni subsp. stimsoni</i>	Stimson's Python			X			X		
<i>Aspidites</i>	<i>melanocephalus</i>	Black-headed Python			X			X		

Genus	Species	Common Name	Conservation status		Database searches				September 2019 survey	Remote cameras (September 2019-March 2020)
			BC Act	EPBC Act	NatureMap	DOEE PMST	DBCAs threatened fauna	BHP previous fauna records		
<i>Liasis</i>	<i>olivaceus subsp. barroni</i>	Pilbara Olive Python	Vu	Vu	X	X	X	X		
SCINCIDAE										
<i>Carlia</i>	<i>munda</i>	Shaded-litter Rainbow Skink			X			X		
<i>Carlia</i>	<i>triacantha</i>	Desert Rainbow Skink			X			X		
<i>Cryptoblepharus</i>	<i>buchananii</i>	Buchanan's Skink			X			X		
<i>Cryptoblepharus</i>	<i>plagiocephalus</i>	Peron's Snake-eyed Skink			X			X		
<i>Cryptoblepharus</i>	<i>ustulatus</i>	Russet Snake-eyed Skink			X			X	X	
<i>Ctenotus</i>	<i>ariadnae</i>	Arid Ctenotus			X			X		
<i>Ctenotus</i>	<i>duricola</i>	Pilbara Striped Ctenotus			X			X		
<i>Ctenotus</i>	<i>grandis subsp. grandis</i>	Grand Ctenotus			X					
<i>Ctenotus</i>	<i>grandis titan</i>	Giant Desert Ctenotus			X			X		
<i>Ctenotus</i>	<i>hanloni</i>	Hanlon's Skink			X			X		
<i>Ctenotus</i>	<i>helenae</i>	Helen's Skink			X			X		
<i>Ctenotus</i>	<i>inornatus</i>	Bar-shouldered Ctenotus			X			X		
<i>Ctenotus</i>	<i>leonhardii</i>	Leonhard's Ctenotus			X			X		
<i>Ctenotus</i>	<i>pantherinus subsp. acripes</i>	Leopard Skink			X					
<i>Ctenotus</i>	<i>pantherinus subsp. ocellifer</i>	Leopard Skink			X			X		
<i>Ctenotus</i>	<i>pantherinus subsp. pantherinus</i>	Leopard Skink			X					
<i>Ctenotus</i>	<i>quattuordecimlineatus</i>	Fourteen-lined Skink			X			X		
<i>Ctenotus</i>	<i>rubicundus</i>	Ruddy Ctenotus			X			X		
<i>Ctenotus</i>	<i>rutilans</i>	Rusty-shouldered Ctenotus			X			X		
<i>Ctenotus</i>	<i>saxatilis</i>	Rock Ctenotus			X			X	X	
<i>Ctenotus</i>	<i>schomburgkii</i>	Wedge-snout Ctenotus			X			X		
<i>Ctenotus</i>	<i>serventyi</i>	North-western Sandy-loam Ctenotus			X			X		
<i>Ctenotus</i>	<i>uber johnstonei</i>	Spotted Ctenotus	P2		X			X		

Genus	Species	Common Name	Conservation status		Database searches				September 2019 survey	Remote cameras (September 2019-March 2020)
			BC Act	EPBC Act	NatureMap	DOEE PMST	DBCA threatened fauna	BHP previous fauna records		
<i>Cyclodomorphus</i>	<i>melanops subsp. elongatus</i>	Slender Blue-tongue			X					
<i>Cyclodomorphus</i>	<i>melanops subsp. melanops</i>	Slender Blue-tongue			X			X		
<i>Egernia</i>	<i>cygnitos</i>	Western Pilbara Spiny-tail			X			X		
<i>Egernia</i>	<i>depressa</i>	Southern Pygmy Spiny-tail			X			X		
<i>Egernia</i>	<i>formosa</i>	Goldfields Crevice Skink			X			X		X
<i>Eremiascincus</i>	<i>isolepis</i>	Northern Bar-lipped Skink			X			X		
<i>Eremiascincus</i>	<i>pallidus</i>	Western Narrow-banded Skink			X			X		
<i>Eremiascincus</i>	<i>richardsonii</i>	Broad-banded Sand-swimmer			X			X		
<i>Lerista</i>	<i>amicorum</i>	Friendly Slider			X					
<i>Lerista</i>	<i>bipes</i>	Western Two-toed Slider			X			X		
<i>Lerista</i>	<i>jacksoni</i>	Jackson's Slider			X			X		
<i>Lerista</i>	<i>labialis</i>	Southern Sandslider			X			X		
<i>Lerista</i>	<i>macropisthopus subsp. fusciceps</i>	Unpatterned Robust Slider			X		X			
<i>Lerista</i>	<i>muelleri</i>	Mueller's Three-toed Slider			X			X		
<i>Lerista</i>	<i>neander</i>	Robust Pilbara Slider			X			X		
<i>Lerista</i>	<i>timida</i>	Dwarf Three-toed Slider			X			X		
<i>Lerista</i>	<i>verhmsens</i>	Powerful Three-toed Slider			X					
<i>Lerista</i>	<i>zietzi</i>	Pilbara Blue-tailed Slider			X			X		
<i>Menetia</i>	<i>greyii</i>	Common Dwarf Skink			X			X		
<i>Menetia</i>	<i>surda subsp. surda</i>	Western Dwarf Skink			X			X		
<i>Morethia</i>	<i>ruficauda exquisita</i>	Fire-tail Skink			X			X		
<i>Proablepharus</i>	<i>reginae</i>	Western Soil-crevice Skink			X			X		
<i>Tiliqua</i>	<i>multifasciata</i>	Central Blue-tongue			X			X		
TYPHLOPIDAE										
<i>Anilius</i>	<i>ammodytes</i>	Sand-diving blind snake			X			X		
<i>Anilius</i>	<i>ganei</i>	Pilbara Flat-headed Blind Snake	P2		X		X	X		

Genus	Species	Common Name	Conservation status		Database searches				September 2019 survey	Remote cameras (September 2019-March 2020)
			BC Act	EPBC Act	NatureMap	DOEE PMST	DBCA threatened fauna	BHP previous fauna records		
<i>Anilius</i>	<i>grypus</i>	Northern Beaked Blind Snake			X			X		
VARANIDAE										
<i>Varanus</i>	<i>acanthurus</i>	Spiny-tailed Monitor			X			X		X
<i>Varanus</i>	<i>brevicauda</i>	Short-tailed Pygmy Monitor			X			X		
<i>Varanus</i>	<i>bushi</i>	Pilbara Monitor			X			X		
<i>Varanus</i>	<i>caudolineatus</i>	Striped-tailed Monitor			X			X		
<i>Varanus</i>	<i>eremius</i>	Pygmy Desert Monitor			X			X		
<i>Varanus</i>	<i>giganteus</i>	Perentie			X			X		
<i>Varanus</i>	<i>gouldii</i>	Gould's Monitor			X			X		
<i>Varanus</i>	<i>hamersleyensis</i>	Southern Pilbara Rock Monitor			X			X		X
<i>Varanus</i>	<i>panoptes</i>	Yellow-spotted Monitor			X			X		
<i>Varanus</i>	<i>pilbarensis</i>	Pilbara Rock Monitor			X			X		
<i>Varanus</i>	<i>Tristis subsp. tristis</i>	Racehorse Goanna			X			X		X
Amphibians										
HYLIDAE										
<i>Cyclorana</i>	<i>platycephala</i>	Water-holding Frog			X					
<i>Cyclorana</i>	<i>maini</i>	Sheep Frog			X			X		
<i>Litoria</i>	<i>rubella</i>	Little Red Tree Frog			X			X		
LIMNODYNASTIDAE										
<i>Neobatrachus</i>	<i>sutor</i>	Shoemaker Frog			X					
MYOBATRACHIDAE										
<i>Pseudophryne</i>	<i>douglas</i>	Gorge Toadlet			X					
<i>Uperoleia</i>	<i>russelli</i>	Russell's Toadlet			X					
<i>Uperoleia</i>	<i>saxatilis</i>	Pilbara Toadlet			X			X		
Mammals										
BOVIDAEIDAE										
<i>Bos</i>	<i>taurus</i>	Domestic Cattle	int		X			X		
<i>Bubalus</i>	<i>bubalis</i>	Water Buffalo	int		X					

Genus	Species	Common Name	Conservation status		Database searches				September 2019 survey	Remote cameras (September 2019-March 2020)
			BC Act	EPBC Act	NatureMap	DOEE PMST	DBCA threatened fauna	BHP previous fauna records		
CAMELIDAE										
<i>Camelus</i>	<i>dromedarius</i>	Camel	int		X			X		
CANIDAE										
<i>Canis</i>	<i>lupis dingo</i>	Dingo							X	
<i>Canis</i>	<i>familiaris</i>	Dog						X		X
DASYURIDAE										
<i>Dasyurus</i>	<i>hallucatus</i>	Northern Quoll	En	En	X	X	X	X		
<i>Dasyurus</i>	<i>geoffroii</i>	Western Quoll, Chuditch	En	En	X					
<i>Dasyurus</i>	<i>blythi</i>	Brush-tailed Mulgara	P4		X		X	X		
<i>Dasykaluta</i>	<i>rosamondae</i>	Little Red Kaluta			X			X		
<i>Ningau</i>	<i>ridei</i>	Wongai Ningau			X			X		
<i>Ningau</i>	<i>timealeyi</i>	Pilbara Ningau			X			X		
<i>Planigale</i>	<i>ingrami</i>	Long-tailed Planigale			X			X		
<i>Planigale</i>	<i>maculata</i>	Common Planigale			X					
<i>Pseudantechinus</i>	<i>woolleyae</i>	Woolley's Pseudantechinus			X			X		X
<i>Sminthopsis</i>	<i>dolichura</i>	Little long-tailed Dunnart			X					
<i>Sminthopsis</i>	<i>hirtipes</i>	Hairy-footed Dunnart			X					
<i>Sminthopsis</i>	<i>macroura</i>	Stripe-faced Dunnart			X			X		
<i>Sminthopsis</i>	<i>ooldea</i>	Ooldea Dunnart			X					
<i>Sminthopsis</i>	<i>youngsoni</i>	Lesser Hairy-footed Dunnart			X			X		
EMBALLONURIDAE										
<i>Saccolaimus</i>	<i>flaviventris</i>	Yellow-belly Sheath-tail Bat			X			X	D	
<i>Taphozous</i>	<i>hilli</i>	Hilli's Sheath-tail Bat			X			X	SG	
<i>Taphozous</i>	<i>georgianus</i>	Common Sheath-tail Bat			X			X	D	
EQUIDAE										
<i>Equus</i>	<i>asinus</i>	Donkey	int		X			X		
<i>Equus</i>	<i>caballus</i>	Horse	int		X			X		
FELIDAE										

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<i>Felis</i>	<i>catus</i>	Cat	int		X			X	X	X
HIPPOSIDARIDAE										
<i>Rhinonictis</i>	<i>aurantia (Pilbara popôñ)</i>	Pilbara Leaf-nosed Bat	Vu	Vu	X	X	X	X		
LEPORIDAE										
<i>Oryctolagus</i>	<i>cuniculus</i>	European Rabbit	int		X			X		
MACROPODIDAE										
<i>Osphranter</i>	<i>robustus</i>	Euro			X			X	X	X
<i>Macropus</i>	<i>rufus</i>	Red Kangaroo			X			X		
<i>Petrogale</i>	<i>rothschildi</i>	Rothschild's Rock Wallaby			X			X	X	X
MEGADERMATIDAE										
<i>Macroderma</i>	<i>gigas</i>	Ghost Bat	Vu	Vu	X	X	X	X		
MOLOSSIDAE										
<i>Austronomus</i>	<i>australis</i>	White-striped free-tail Bat			X			X	D	
<i>Chaerephon</i>	<i>jobensis</i>	Northern Mastiff Bat			X			X	D	
<i>Ozimops</i>	<i>lumsdenae</i>	Northern Free-tailed Bat						X	D	
<i>Mormopterus</i>	<i>loriae</i>	Little Northern Free-tailed Bat			X					
MURIDAE										
<i>Mus</i>	<i>musculus</i>	House Mouse	int		X			X		
<i>Notomys</i>	<i>alexis</i>	Spinifex Hopping Mouse			X			X		
<i>Pseudomys</i>	<i>chapmani</i>	Pebble-mound Mouse	P4		X		X	X	X	
<i>Pseudomys</i>	<i>desertor</i>	Desert Mouse			X			X		
<i>Pseudomys</i>	<i>hermannsburgensis</i>	Sandy Inland Mouse			X			X		
<i>Pseudomys</i>	<i>nanus</i>	Western Chestnut Mouse			X					
<i>Zyzomys</i>	<i>argurus</i>	Common Rock Rat			X			X		X
<i>Zyzomys</i>	<i>pedunculatus</i>	Central Rock Rat			X			X		
<i>Zyzomys</i>	<i>woodwardi</i>	Kimberly Rock-rat			X					
TACHYGLOSSIDAE										
<i>Tachyglossus</i>	<i>aculeatus</i>	Short-beaked Echidna			X			X	X	X

Genus	Species	Common Name	Conservation status		Database searches				September 2019 survey	Remote cameras (September 2019-March 2020)
			BC Act	EPBC Act	NatureMap	DOEE PMST	DBCA threatened fauna	BHP previous fauna records		
THYLACOMYIDAE										
Macrotis	lagotis	Greater Bilby	Vu	Vu	X	X	X	X		
VESPERTILIOIDAE										
Chalinolobus	gouldii	Gould's Wattle Bat			X			X	D	
Chalinolobus	morio	Chocolate Wattle Bat			X			X	D	
Nyctophilus	daedalus	Northwestern Long-eared Bat			X			X		
Nyctophilus	geoffroyi?	Lesser Long-eared Bat			X			X		
Scotorepens	greyii	Little Broad-nosed Bat			X			X	D	
Vespadelus	finlaysoni	Inland Cave Bat			X			X	D	

Key; X- recorded species, int- Introduced species, Vu- Vulnerable listed under either/or both EPBC or BC Acts, En- Endangered listed under either/or both EPBC or BC Acts, Cr- Critically Endangered listed under either/or both EPBC or BC Acts, Mi - Migratory listed under EPBC Act, OS- Special Protection listed under BC Act, P1-4-Priority species listed by DBCA., D ĩ Definite recording, PR ĩ Probable recording, SG ĩ species group recorded

Fauna likelihood of occurrence assessment guidelines

Assessment outcome	Description
Present	Species recorded during the field survey or from recent, reliable records from within or close proximity to the survey area.
Likely	Species are likely to occur in the survey area where there is suitable habitat within the survey area and there are recent records of occurrence of the species in close proximity to the survey area. OR Species known distribution overlaps with the survey area and there is suitable habitat within the survey area.
Unlikely	Species assessed as unlikely include those species previously recorded within 10 km of the survey area however: ∄ There is limited (i.e. the type, quality and quantity of the habitat is generally poor or restricted) habitat in the survey area. ∄ The suitable habitat within the survey area is isolated from other areas of suitable habitat and the species has no capacity to migrate into the survey area. OR Those species that have a known distribution overlapping with the survey area however: ∄ There is limited habitat in the survey area (i.e. the type, quality and quantity of the habitat is generally poor or restricted). ∄ The suitable habitat within the survey area is isolated from other areas of suitable habitat and the species has no capacity to migrate into the survey area.
Highly unlikely	Species that are considered highly unlikely to occur in the survey area include: ∄ Those species that have no suitable habitat within the survey area. ∄ Those species that have become locally extinct, or are not known to have ever been present in the region of the survey area.

Source information - desktop searches

NM i DBCA *NatureMap* (accessed July 2019)

PMST i DEE Protected Matters Search Tool (PMST) to identify fauna listed under the EPBC Act potentially occurring within the database search area (accessed July 2019)

DBCA data for threatened and priority fauna (provided by BHP)

Definitions

Term	Description
database search area	a 40 km buffer around the survey area
survey area	the area subject to the current survey
region	the area within an approximate 40 km radius of the survey area
Cr	Critically endangered under the EPBC Act or BC Act
En	Endangered under the EPBC Act or BC Act
Vu	Vulnerable under the EPBC Act or BC Act
IA	Migratory birds protected under an international agreement
Mi, Ma	Migratory, Marine
CD	Conservation dependent fauna
OS	Other specially protected fauna under the BC Act
P1	Priority 1: Poorly known fauna. 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. 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.
P2	Priority 2: Poorly known species. 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.
P3	Priority 3: Poorly known species. 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.
P4	Priority 4: Rare, Near Threatened and other species in need of monitoring. (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. (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. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Fauna likelihood of occurrence assessment of conservation significant species identified in the desktop assessment as potentially occurring within the survey area.

Species name	Statu s		Source			Habitat requirements	Likelihood of occurrence within the survey area
	EPBC Act	BC Act	PMST	NM	DBCA threate ned fauna		
Birds							
<i>Amytornis striatus subsp. whitei</i> Rufous Grasswren		P4	X			The Rufous Grasswren occurs in spinifex, with mallee, acacias, and other inland and coastal shrubs. The species seeks big old clumps of spinifex for breeding (Pizzey & Knight 2012).	Likely , the Hillcrest/ Hillslope habitat comprises <i>Triodia</i> which may be large enough to nest in although the surrounding areas have larger patches of spinifex which may be favoured by this species. The closest known record was recorded approx. 9.7 km southeast of the survey area.
<i>Elanus scriptus</i> Letter Winged Kite		P4		X		This species is irruptive, nomadic and generally rare in Western Australia but has been reported in all states. The species roosts during the day in well-foliaged trees and along tree lined watercourses and hunts at night over grasslands and fields. It is a specialist hunter of rodents and presence of the species within an area is linked to rodent density. Birds breed almost repeatedly in colonies when rodent populations are high. Following a decline in rodent density, the Kites disperse and may be found almost anywhere in Australia except the driest of deserts (Pizzey & Knight 2012).	Unlikely , suitable habitat may be present within the survey area and surrounds however it is will only be a vagrant to the area and is not considered resident. One record of the species has been documented approximately 40 km west of the survey area.
<i>Falco hypoleucos</i> Grey Falcon		Vu			X	The Grey Falcon inhabits lightly timbered country, especially stony plains and lightly timbered acacia scrub. This species is considered scarce to rare and is usually found singularly or sometimes in pairs. (Morcombe 2004).	Likely , suitable habitat is present for the species within the survey area and surrounds (Major Drainage Lines, Gorge/Gully) and the species is known from the region. Closest record is

Species name	Statu s		Source			Habitat requirements	Likelihood of occurrence within the survey area
	EPBC Act	BC Act	PMST	NM	DBCA threate ned fauna		
							approximately 14 km north of the survey area.
<i>Falco peregrinus</i> Peregrine Falcon		OS		X	X	The Peregrine Falcon is uncommon but wide-ranging across Australia. Habitat is extremely diverse, from rainforest to arid scrub, from coastal heath to alpine, and also occurs in urban environments and city scapes. The Peregrine Falcon nests primarily on ledges of cliffs, shallow tree hollows, and ledges of building in cities (Morcombe 2004).	Likely , suitable habitat is present for the species within the survey area and surrounds (Major Drainage Line, Gorge/Gully) and the species is known from the region. Closest record is approximately 500 m east of the survey area.
<i>Malurus leucopterus subsp. leucopterus</i> Dirk Hartog black and white fairy-wren	Vu	Vu		X		The White-winged Fairy-wren (Dirk Hartog Island) is confined to Dirk Hartog Island, off the coast of Peron Peninsula, in Western Australia (Schodde & Mason 1999). It is possible that birds may occasionally disperse to the adjacent mainland: black-plumaged birds, presumably originating from Dirk Hartog Island, have occasionally been reported on the Peron Peninsula (Driskell et al. 2002; Pizzey 1980; Schodde & Mason 1999). However, due to a lack of corroborative material, these reports cannot be confirmed (Schodde & Mason 1999).	Unlikely , suitable habitat may be available to support this species however the survey area is not within their confirmed range and any species possibly visiting would be vagrant only. There are 5 records of the species occurring within the database search area, all of which are approximately 18 km northeast of the survey area.
<i>Pezoporus occidentalis</i> Night Parrot	En	Cr	X			The Night Parrot inhabits arid and semi-arid areas that are characterised by having dense, low vegetation. Based on accepted records, the habitat of the Night Parrot consists of Triodia grasslands in stony or sandy environments and of samphire and chenopod shrublands, including genera such as Atriplex, Bassia and Maireana, on floodplains and claypans, and on the margins of saltlakes, creeks or other sources of water (Parker 1980). It has also been observed to enter dense	Unlikely , some habitat is available for this species on the sand plain, however due to the paucity of sand plain there is limited habitat for this species. Sampling methods did not identify the species during the survey. Use maybe irregular and opportunistic.

Species name	Statu s		Source			Habitat requirements	Likelihood of occurrence within the survey area
	EPBC Act	BC Act	PMST	NM	DBCA threate ned fauna		
						Muehlenbecki growth when flushed from a more typical habitat (Boles et al. 1994).	
<i>Ninox Connivens connivens</i> Barking Owl (southwest subpop.)		P3		X	X	The Barking Owl is common in northern and north-western Australia, and now uncommon in south-western and eastern Australia. This species prefers open country with stands of trees, tree-lined watercourses, paperbark swamps (Morcombe 2004).	Highly unlikely , the survey area is outside the known range of this species. One DBCA record lies within 10 km of the survey area however this is likely a misidentification.
Migratory Birds							
<i>Apus pacificus</i> Fork-tailed Swift	Mi	Mi	X	X	X	A highly nomadic and very wide ranging but sparsely scattered species occurring in a wide variety of habitats throughout Australia. They are widespread in coastal and sub-coastal areas between Augusta and Carnarvon, including some on nearshore and offshore islands, venturing into inland areas following storms and cyclonic events. This species is almost exclusively aerial, flying less than 1 m to at least 300 m above ground. (DSEWPac 2013).	Unlikely , an almost exclusively aerial species that may opportunistically utilise the area during storm or cyclone events. The closest known record is within 13 km east of the eastern most survey area.
<i>Hirundo rustica</i> Barn Swallow	Mi	Mi	X			In Australia, the Barn Swallow is recorded in open country in coastal lowlands, often near water, towns and cities. Birds are often sighted perched on overhead wires, and also in or over freshwater wetlands, paperbark Melaleuca woodland, mesophyll shrub thickets and tussock grassland.	Unlikely , an almost exclusively aerial species that may opportunistically utilise the area during storm or cyclone events.
<i>Motacilla cinerea</i> Grey Wagtail	Mi	Mi	X			The Grey Wagtail is an opportunistic migrant to Australia. The species typically migrates to Indonesia occasionally landing in Australia. Most records for the species are from Northern Australia and South Australia (Morcombe 2004). The non-breeding habitat only of the Grey Wagtail has a strong association with water, particularly rocky substrates along water courses but also lakes and marshes (DotE 2019a). It can be found mainly in banks and rocks in fast-running freshwater habitats: rivers, creeks, streams,	Unlikely , some habitat is available along major drainage line habitat during times of residual pools of standing water and it may opportunistically but irregularly occur, however this species is nomadic and resource dependant.

Species name	Statu s		Source			Habitat requirements	Likelihood of occurrence within the survey area
	EPBC Act	BC Act	PMST	NM	DBCA threate ned fauna		
						and around waterfalls, both in forest and open country; but occurs almost anywhere during migration (Johnstone & Storr 2004).	
<i>Calidris ferruginea</i> Curlew Sandpiper	Cr, Mi	Cr	X			Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters (Higgins & Davies 1996). Curlew Sandpipers forage on mudflats and nearby shallow water. In non-tidal wetlands, they usually wade, mostly in water 15i 30 mm, but up to 60 mm, deep. They forage at the edges of shallow pools and drains of intertidal mudflats and sandy shores. At high tide, they forage among low sparse emergent vegetation, such as saltmarsh, and sometimes forage in flooded paddocks or inundated saltflats. Occasionally they forage on wet mats of algae or waterweed, or on banks of beach cast seagrass or seaweed.	Unlikely , some habitat is available along major drainage line habitat during times of residual pools of standing water and it may opportunistically but irregularly occur, however this species is nomadic and resource dependant.
<i>Pandion cristatus</i> Eastern Osprey	MI	MI			X	Eastern Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They require extensive areas of open fresh, brackish or saline water for foraging (Marchant & Higgins 1993). They frequent a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes. They exhibit a preference for coastal cliffs and elevated islands in some parts of their range, but may also occur on low sandy, muddy or rocky shores and over coral cays.	Unlikely , the species may infrequently visit the area when it contains water however the habitat is not primary to support this species. One record is available within a 40 km buffer of the survey area. This may have been a misidentification.

Species name	Statu s		Source			Habitat requirements	Likelihood of occurrence within the survey area
	EPBC Act	BC Act	PMST	NM	DBCA threatened fauna		
<i>Rostratula australis</i> Australian Painted-snipe	En	En	X			The Australian Painted Snipe is rarely seen as it is extremely secretive, keeping to dense vegetation of swamps, emerging only in subdued light of dawn and dusk. The preferred habitat of this species includes surrounds and shallows of wetlands that are well vegetated with dense low cover (Morcombe 2004).	Unlikely , some habitat is available within the floodplain habitat during times of residual pools of standing water and it may opportunistically but irregularly occur, however this species is nomadic and resource dependant.
<i>Tringa nebularia</i> Common Greenshank	Mi	Mi			X	The Common Greenshank is found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. Habitats include embayments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms (Morcombe 2004). The species uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats. It will also use artificial wetlands, including sewage farms and saltworks dams, inundated rice crops and bores (Morcombe 2004). The edges of the wetlands used are generally of mud or clay, occasionally of sand, and may be bare or with emergent or fringing vegetation, including short sedges and saltmarsh, mangroves, thickets of rushes, and dead or live trees.	Unlikely , some habitat is available along major drainage line habitat during times of residual pools of standing water and it may opportunistically but irregularly occur, however this species is nomadic and resource dependant.
Mammals							
<i>Dasycercus blythi</i> Brush-tail Mulgara		P4		X	X	The Brush-tailed Mulgara is primarily nocturnal, shelters in burrows and feeds on insects, other arthropods and small vertebrates. This species inhabits spinifex grasslands and, in central Australia, lives in burrows that it digs on the flats between low sand dunes (Van Dyck & Strahan 2008). The Mulgara is a solitary species exhibiting high site fidelity and a low propensity for dispersal once a home range has been established (Masters et al.	Unlikely , despite some habitat being present no expansive sand plains are present. Therefore the survey area is considered unsuitable or sub-optimal at best. The closest

Species name	Statu s		Source			Habitat requirements	Likelihood of occurrence within the survey area
	EPBC Act	BC Act	PMST	NM	DBCA threate ned fauna		
						2003). Males and females maintain home ranges of 1.4 to 14 hectares (Masters et al. 2003) which on average, overlap by less than 20% (Masters et al. 2003).	record is 17 km east of the survey area.
<i>Dasyurus hallucatus</i> Northern Quoll	En	En	X	X	X	The Northern Quoll once occurred across the majority of northern Australia but its range has significantly contracted. It occurs in the Pilbara region but in disjunct populations. The Northern Quoll inhabits a range of vegetation associations but is especially abundant on dissected rocky escarpment and eucalypt woodland within 200 km of the coast. It is known to den in rock crevices and rock piles and favours rocky areas. They are predominantly nocturnal but are occasionally active during the day, particularly during the mating season and are known to have a large home range (Van Dyck & Strahan 2008).	Likely , the Gorge/ Gully habitat type presents suitable habitat to support this species. The closest record of this species is approximately 800 m north of the survey area.
<i>Dasyurus geofroii</i> Western Quoll, Chuditch	Vu	Vu		X		The Chuditch inhabits eucalypt forest (especially Jarrah, E. marginata), dry woodland, mallee shrublands, heaths, and desert, particularly in the south coast of WA. They also occur at lower densities in drier woodland and mallee shrubland in the goldfields and wheatbelt, as well as in Kalbarri National Park (translocated). Chuditch require adequate numbers of suitable den and refuge sites (horizontal hollow logs or earth burrows) to survive (DEC 2012). In Jarrah forest, Chuditch populations occur in both moist, densely vegetated, steeply sloping forest and drier, open, gently sloping forest (Van Dyck and Strahan 2008). The species can travel large distances, and for this reason requires habitats that are of a suitable size and not excessively fragmented.	Highly Unlikely , the survey area is outside the known range for this species. <i>NatureMap</i> records within the buffered survey area are considered to be misidentification.
<i>Macrotis lagotis</i> Greater Bilby	Vu	Vu	X	X	X	The Greater Bilby distribution in Western Australia is restricted to the north, including the Pilbara, Sandy and Gibson Deserts. The Greater Bilby usually spends the daytime in burrows, often built against termite mounds, spinifex hummock or shrubs (Van Dyck & Strahan 2008). Extant population of the Greater Bilby occur in a variety of habitats, usually on landforms with level to low slope topography and light to medium soils. It occupies three major	Unlikely , despite some habitat being present no expansive sand plain are present and those patches present lack connectivity and are of insufficient size/scale to map. Therefore the survey area is

Species name	Statu s		Source			Habitat requirements	Likelihood of occurrence within the survey area
	EPBC Act	BC Act	PMST	NM	DBCA threate ned fauna		
						vegetation types; open tussock grassland on uplands and hills, mulga woodland/shrubland growing on ridges and rises, and hummock grassland in plains and alluvial areas. Laterite and rock feature substrates are an important part of Greater Bilby habitat. These habitat support shrub species, such as <i>Acacia kempeana</i>, <i>A. hilliana</i> and <i>A. rhodophylla</i>, which have root-dwelling larvae that provide a constant food source for the Greater Bilby. After dark they leave their burrows to feed and populations are known to move long distances when current habitat ranges become unsuitable. Bilbies are largely solitary, widely dispersed and found in low numbers. The current occurrence of the Greater Bilby is strongly associated with higher rainfall and temperatures, which promote areas of higher plant and food production. The Greater Bilby may also prefer these conditions as higher rainfall and temperatures are not well tolerated by foxes (Pavey 2006; Southgate et al. 2007).	considered unsuitable or sub-optimal at best. The closest record of this species is approximately 28 km northeast of the survey area.
<i>Macroderma gigas</i> Ghost Bat	Vu	Vu	X	X	X	The Ghost Bat occurs in a wide range of habitats, and requires an undisturbed cave, deep fissure or disused mine shaft in which to roost. It is patchily distributed across Australia, and is sensitive to disturbance (Van Dyck & Strahan 2008).	Known, the species was recorded via feeding evidence within one cave in the survey area but no evidence of long-term roost caves was found. Roost caves may be located within close proximity of the survey area. The closest recording of the species is approximately 1.5 km south of the survey area, within Study Area 2 (Gorge/ Gully habitat). Roosting caves may be located within close proximity of the survey area based on available habitat (particularly Gorge/Gully and

Species name	Statu s		Source			Habitat requirements	Likelihood of occurrence within the survey area
	EPBC Act	BC Act	PMST	NM	DBCA threate ned fauna		
							Breakaway/Cliff habitat located outside of the survey area). Gorge/Gully, Minor and Major Drainage Lines and Hillcrest/Hillslope are likely to support Ghost Bat foraging within the survey area.
<i>Rhinonictis aurantia</i> Pilbara leaf-nosed Bat	Vu	Vu	X	X	X	The Pilbara Leaf-nosed Bat roosts in deep caves or mines in the wet season and forages nearby. This species occurs in the Pilbara region where its populations are scattered and localised. There are a few known populations of this species in the western Pilbara, roosting in caves formed in gorges that dissect massive siliceous sedimentary geology. It is most often observed in flight over waterholes in gorges (Van Dyck & Strahan 2008). Optimal roosts are thought to occur in caves that form between ascending rock layers, where humidity is maintained from seeping groundwater (Van Dyck & Strahan 2008). Roosts are commonly located over pools of water, or areas deep within the mine or cave structure which provides elevated temperature and humidity. Foraging habitat includes: Triodia hummock grasslands covering low rolling hills and shallow gullies, with <i>Eucalyptus camaldulensis</i> along the creeks; over small watercourses throughout granite boulder terrain; over pools and low shrubs in ironstone gorges; and in and around watercourses with <i>Melaleuca leucodendron</i> .	Unlikely , some foraging habitat is present for the species (Gorge/Gully, Major and Minor Drainage Lines, and Hillcrest/ Hillslope). No calls were identified during the survey. The nearest confirmed records are approximately 8 km west of the survey area. The survey did not detect any suitable roost caves for this species during the survey therefore the survey area is unlikely to support PLNB roosting and is considered opportunistic foraging habitat only.
<i>Pseudomys chapmani</i> Western Pebble-mound Mouse		P4		X	X	The Western Pebble-mound Mouse is restricted to the Pilbara region where it is recognised as an endemic species. Habitat for the Western Pebble-mound Mouse can be found on stony hillsides with hummocky grasslands and little or no soil. It constructs large mounds of pebbles on stony slopes which cover an area of 0.5-9.0 square metres. "Active" mounds are characterized by volcano-like cones capped by 'craters' that mark	Known , the species was recorded in the survey area via active, inactive and non-active mounds. Hillcrest/ Hillslope is suitable habitat.

Species name	Statu s		Source			Habitat requirements	Likelihood of occurrence within the survey area
	EPBC Act	BC Act	PMST	NM	DBCA threate ned fauna		
						occluded entrances to subterranean burrow systems in which the mice live, often gregariously (Van Dyck & Strahan 2008).	
<i>Zyzomys pedunculatus</i> Central Rock-rat, Antina	Cr	Cr		X		The central rock-rat is restricted to the West MacDonnell Ranges of central Australia. The species has irruptive demography and is recorded in high densities following rainfall events. It occurs in a variety of rocky habitat (DotE 2019b).	Highly Unlikely , the survey area is not within the known range of this species. NatureMap shows one record within the database search area however this is considered to be misidentification.
Reptiles							
<i>Anilius ganei</i> Pilbara Flat-headed Blind Snake		P1		X	X	<i>Ramphotyphlops ganei</i> is a moderately robust blind snake known from widely separated areas between Newman and Pannawonica. A very cryptic species. Most often recorded in rocky or stony areas, and considered to be possibly associated with moist gorges and gullies (Wilson & Swan 2017).	Likely , habitat is present for this species particularly in the rocky features within the Gorge/ Gully. Recorded within Yandicoogina Creek during the Level 2 Survey (GHD, 2020).
<i>Ctenotus uber johnstonei</i> Spotted Ctenotus		P2		X		This subspecies of the Spotted Ctenotus is known from an area of chenopod shrubland at the base of a sandstone hill near Balgo in the northern interior of Western Australia. It is possible that the species also extends further west into the Pilbara region (Wilson & Swan 2010).	Unlikely , the species has not been recorded within a 40 km buffer of the survey area
<i>Liasis olivaceus barroni</i> Pilbara Olive Python	Vu	Vu	X	X	X	The Olive Python (Pilbara subspecies) is a dull olive-brown to pale fawn or rich-brown python with a white underside and pale finely dotted lips. This species reaches an average size of 2.5 m but can grow up to 4 m long. The Olive Python's range is restricted to the Pilbara region, north Western Australia, and the Dampier Archipelago. Habitat consists of rocky escarpments, gorges and waterholes within the Pilbara region. The preferred microhabitats for this species are under rock piles, on top of rocks, and under spinifex as well as in man-made features such as overburden heaps, railway embankments and sewerage treatment ponds. The	Likely , Pilbara Olive Python scat was found within a nearby Gorge/ Gully (Study Area 2) at the time of the survey and the closest known DBCA record is located within 400 m north of the survey area. Suitable habitat is present throughout the Gorge/Gully habitat type.

Species name	Statu s		Source			Habitat requirements	Likelihood of occurrence within the survey area
	EPBC Act	BC Act	PMST	NM	DBCA threate ned fauna		
						species' breeding season occurs from June to August, with males moving long distances in search of breeding females (Wilson & Swan 2017).	
<i>Underwoodisaurus seorsus</i> Pilbara Barking Gecko		P2		X		This species is found in the Hamersley Range within the Pilbara from north of Tom Price and then southeast to near Newman. It occurs in rocky areas with spinifex and low tree cover (Wilson & Swan 2017).	Likely , the survey area contains suitable habitat to support this species. The closest known record is approximately 7.5 km south of the survey area.

GHD

Level 10

999 Hay Street

T: 61 8 6222 8222 F: 61 8 9463 6012 E: permail@ghd.com

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