




KING OF THE HILLS

NATIVE VEGETATION CLEARING PERMIT

Native Vegetation Clearing Permit Supporting Document

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1. Introduction

1.1 Background

APA Operations Pty Ltd (APA) has been commissioned by Red 5 Limited (Red 5) to design, build and operate the King of the Hills Gas Pipeline (KOTHGP) located in the Eastern Murchison Region of Western Australia (WA). The King of the Hills (KOTH) Mine is located approximately 26km northwest of the town of Leonora in the northern Goldfields of Western Australia.

The KOTHGP will lie within Pipeline License PL127 (application currently under assessment by Department of Mines, Industry Regulation and Safety) and will connect to the Goldfields Gas Pipeline (GGP) at approximately Kilometre Point (KP) 1131, and will run below ground for approximately 13 km, ending at the proposed Tarmoola delivery station on miscellaneous licence L37/248. The KOTHGP will include other associated infrastructure such as extra workspace areas for construction, turning bays, laydown areas and a pipeline service road for operations.

The project is owned by Greenstone Resources (WA) Pty Ltd, and consists of the KOTH underground mine, Tarmoola open pit mine along with the Galahad, Rainbow and Puzzle satellite deposits. The mine site lies within the Shire of Leonora, on the Tarmoola pastoral lease, and is currently accessed via the Goldfields Highway.

The project will consist of the construction of a DN100 natural gas, high pressure pipeline and facilities, including the buried hot-tap offtake at GGP KP 1131 and Tarmoola delivery station consisting of isolation, filtration, metering, heating and pressure control to control and measure gas delivery suitable for the requirements of the adjacent power station and processing plant at the KOTH mine.

The intention of the project is to supply gas to the power station and mine site at a nominal flowrate of 6.0 TJ/day.

This Native Vegetation Clearing Permit (NVCP) application is being submitted for the proposed clearing required for the construction and ongoing maintenance of the KOTHGP.

Proposed clearing under this NVCP will primarily occur in the narrower proposed Construction Right of Way (CROW) which is nominally designated a width of up to 25 m, but in some areas will be as wide as 200 m. Minor clearing activities may occur outside the CROW, and the final clearing footprint may deviate from the CROW in order to avoid areas of hard-digging. Clearing activities will result in a maximum total of 80 ha of actual land disturbance (NVCP Application Area). The extent of the NVCP Application Area is shown in **Figure 1**, however the proposed pipeline alignment within PL127 has not yet been finalised.

1.2 Purpose and Scope

The purpose of this document is to support the application for a NVCP purpose permit under the *Environmental Protection Act 1986* (EP Act) to allow for the clearing of native vegetation necessary for the completion of the works outlined above.

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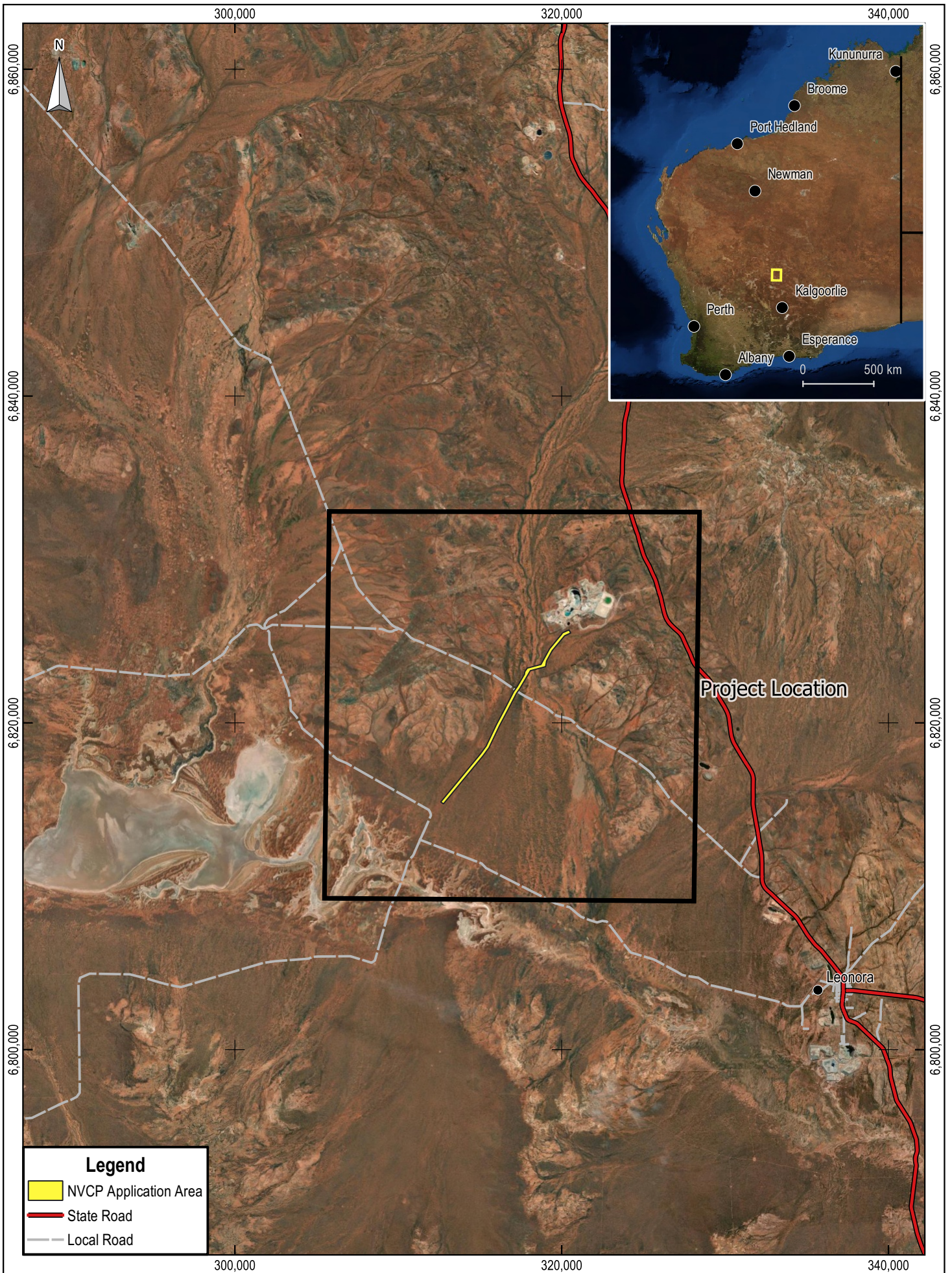
This report provides an assessment against the ten Land Clearing Principles described within Schedule 5 of the EP Act to support the application for a NVCP purpose permit for the KOTHGP Project.

This report presents information about the existing environment and documents environmental impacts management measures to prevent or minimise adverse impacts associated with the proposed clearing.

1.3 Responsible Person

All compliance and regulatory requirements regarding this assessment document should be forwarded by email, post or courier to the following address:

Name: Snyman Van Straaten
Title: Manager Access and Approvals: West
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Phone: (08) 6189 4386
Email: snyman.vanstraaten@apa.com.au



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 Image: Copernicus Sentinel Data 2020
 Grid: GDA94 / MGA zone 51

0 5 10 km

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Figure 1
Project Location and NVCP Application Area

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2. Site Description

2.1 Location

The KOTH Project is a gold deposit located approximately 26 km northwest of Leonora in the northeastern Goldfields and consists of KOTH underground mine, Tarmoola open pit mine along with the Galahad, Rainbow and Puzzle satellite deposits (Figure 1). The site lies within the Shire of Leonora, on the Tarmoola pastoral lease, and is currently accessed via the Goldfields Highway.

A summary of the tenements applicable to this Clearing Permit is provided in **Table 1** and displayed in **Figure 2**.

Table 1: Tenements Intersecting the Project Area

Lease	Tenement Holder	Status	Grant Date	Expiry Date	Area (Hectare)
L37/248	Greenstone Resources (WA) Pty Ltd	Live	21/04/2021	20/04/2042	272.96

2.2 Land Tenure

The NVCP Application Area applies to 272.96 ha, comprising 80 ha of clearing for the CROW on tenement L37/248. The tenement is held by Greenstone Resources (WA) Pty Ltd, a wholly owned subsidiary of Red5 Limited. This tenure is designated for the express purpose of isolating the proposed gas pipeline licence PL127 into separate tenure which will be transferred to the pipeline operator (APA Operations Pty Ltd) in the near future. This NVCP application relates to the PL127 licence area (L37/248) and is a standalone application for a Purpose Permit over the PL127 licence area.

L37/248 overlies Tarmoola pastoral lease in the northern section, while the southern section overlies Sturt Meadows pastoral lease. The pipeline route is bisected by the Peak Hill Stock Route (Reserve 9699) (**Figure 2**).

There are no Environmentally Sensitive Areas (ESAs), national parks, conservation reserves or Department of Biodiversity, Conservation and Attractions (DBCA) Managed Lands within or adjacent to the KOTHGP project area. The nearest DBCA Managed Land is an unnamed nature reserve, located approximately 84 km south of the project (DBCA 2020).

Evidence of ownership is provided in **Appendix 1**.

2.3 Existing Operations

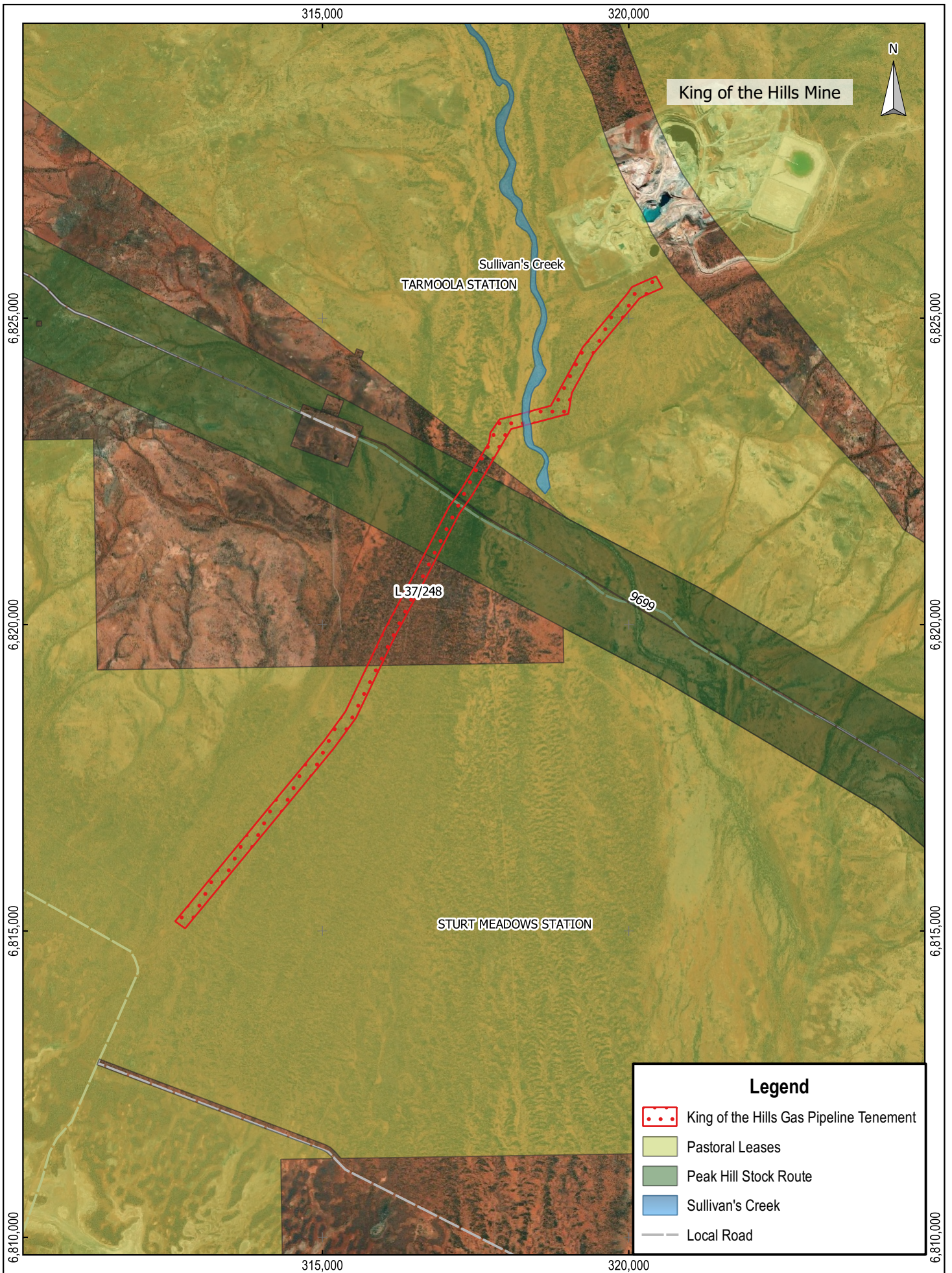
Mining at the KOTH project has been undertaken since 1989, with the site going into care and maintenance from 2004 to 2015. The existing KOTH project comprises two open pits, Tarmoola and Galahad, as well as the KOTH underground operation. The site contains five associated mine waste dumps, a deconstructed Processing Plant,

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four tailings storage facilities (including the early stages of TSF5 construction), and associated workshops and offices. Other infrastructure includes an access road and haul roads, Reverse Osmosis (RO) plant, and borefields. A crushing and screening plant is also located on site and is operated by a third party. Two small satellite sites are located just south of Tarmoola, the shallow oxide Rainbow pit and minor workings at the Puzzle deposit.



Scale: 1: 80,000
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0 1 2 km

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Figure 2
**Project Tenements and
 Surrounding Land Use**

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3. Regional Background

3.1 Climate

Climate in the KOTHGP project region is characterised as arid. Mean annual rainfall is approximately 236.4 mm, with annual rainfall recorded at the closest meteorological station (Leonora) ranging from 57.8 mm to 552.2 mm (**Chart 1** ; BOM 2021). Rainfall is influenced by decaying tropical cyclones which originate off the northwest coast in summer, and anticyclonic systems in winter. Evaporation greatly exceeds rainfall with annual average pan evaporation rate for the Leonora region at 2.8 m. The hottest month is January with an average maximum temperature of 37°C; however, temperatures above 40.0°C occur frequently when the hot and dry, north to north easterly winds prevail. Winters tend to be cool, and July is the coldest month with average maximum and minimum temperatures of 18.4°C and 6.1°C, respectively (BOM 2021).

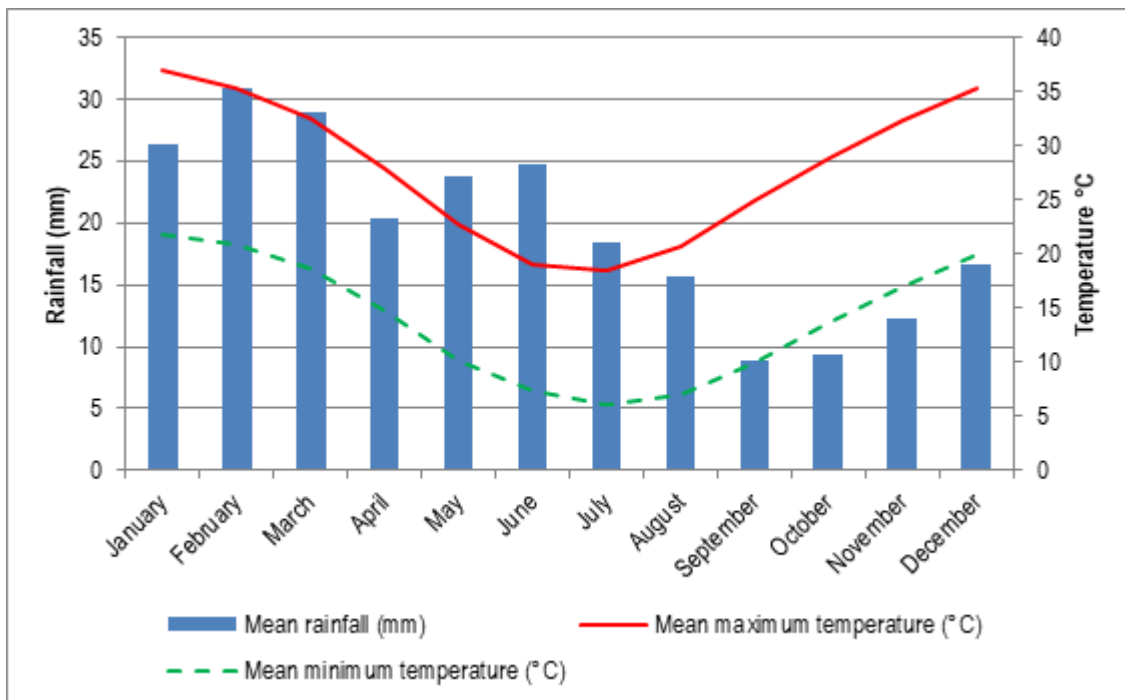


Chart 1 Climate Data for Leonora Station #12046 (BOM 2021)

3.2 Geology, Soils and Land Systems

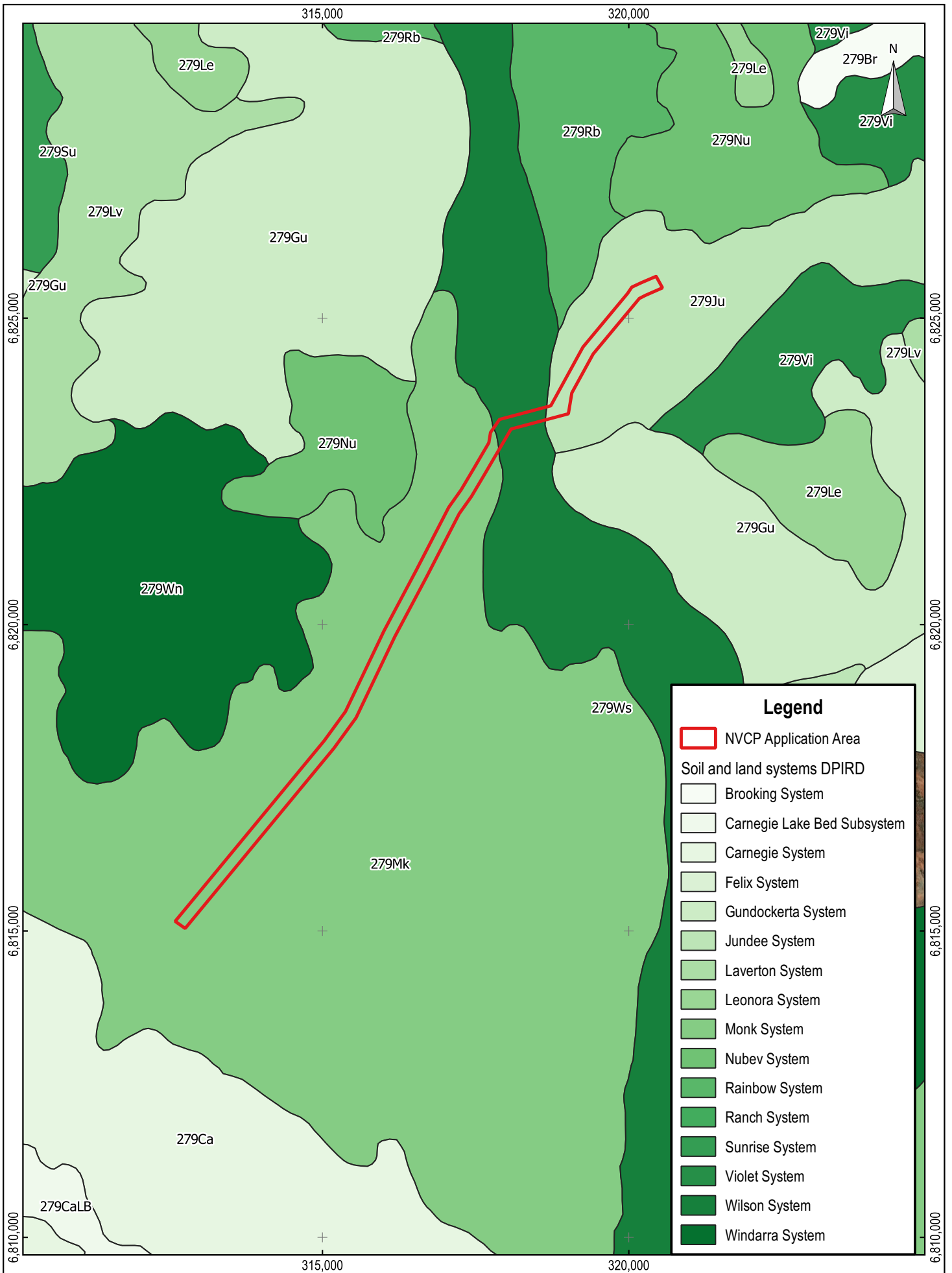
The KOTHGP Project is located within the Salinaland Plains Zone of the Murchison Province (DPIRD 2019a). The project occurs across a number of different landscape systems, as listed in **Table 2** and displayed in **Figure 3**.

Landforms associated with the Salinaland Plains Zone include plains (with hardpan wash plains and some mesas, stony plains and salt lakes) on granitic and minor greenstone rocks of the Yilgarn Craton. The area within 40 km of the KOTHGP Project has topography with elevations in the range 380 to 500 mAHD, with low hills of bedrock occurring to the east and west of the mine (BDH 2019).

Soils of the project area include red sandy earths, red deep sands, red shallow loams and red loamy earths with some red-brown hardpan shallow loams, salt lake soils and red shallow sandy duplexes. Characterisation of soils to the north and south of the existing operation was completed during 2006 by the Centre for Land Rehabilitation, University of Western Australia (UWA 2006). Soils are typical of the Goldfields region; topsoils (upper 0 to 50 cm of the soil profile) are non-saline, with deeper subsoils below 1 m typically characterised by higher salinity and sodicity.

Table 2 Soil Landscape Systems within the KOTHGP Project Area

Soil & Land Systems	Description
Jundee System	Hardpan plains with variable gravelly mantles and minor sandy banks supporting weakly groved mulga shrublands.
Monk System	Hardpan plains with occasional sandy banks supporting mulga tall shrublands and wanderrie grasses.
Wilson System	Large creeks with extensive distributary fans, supporting mulga and chenopod shrublands.



Scale: 1: 80,000
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 Grid: GDA94 / MGA zone 51

0 1 2 km

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Figure 3

Soil and Land Systems

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3.3 Topography & Hydrology

The KOTHGP Project Area is located within the Raeside-Ponton Catchment of the Western Plateau Basin. The local surface topography is dominated by the 1,400 km² catchment of Sullivan's Creek, which flows through a 30 km channel from north to south through the centre of the project to discharge into the Lake Raeside drainage approximately 15 km south of the KOTHGP Project Area (**Figure 4**).

Sullivan's Creek has formed an alluvial plain ranging from 2 to 3 km in width and broadening downstream, and flows infrequently after periods of heavy rainfall, usually arising from summer cyclonic storms (Big Dog Hydrology 2019). Sullivan's Creek is of significance to the local Traditional Owners and is a registered heritage site. An unnamed minor creek also occurs north of the Sullivan's Creek. Both features will be traversed by the KOTHGP, with Sullivan's Creek being crossed via Horizontal Directional Drilling (HDD) detailed in **Section 3.4.3**.

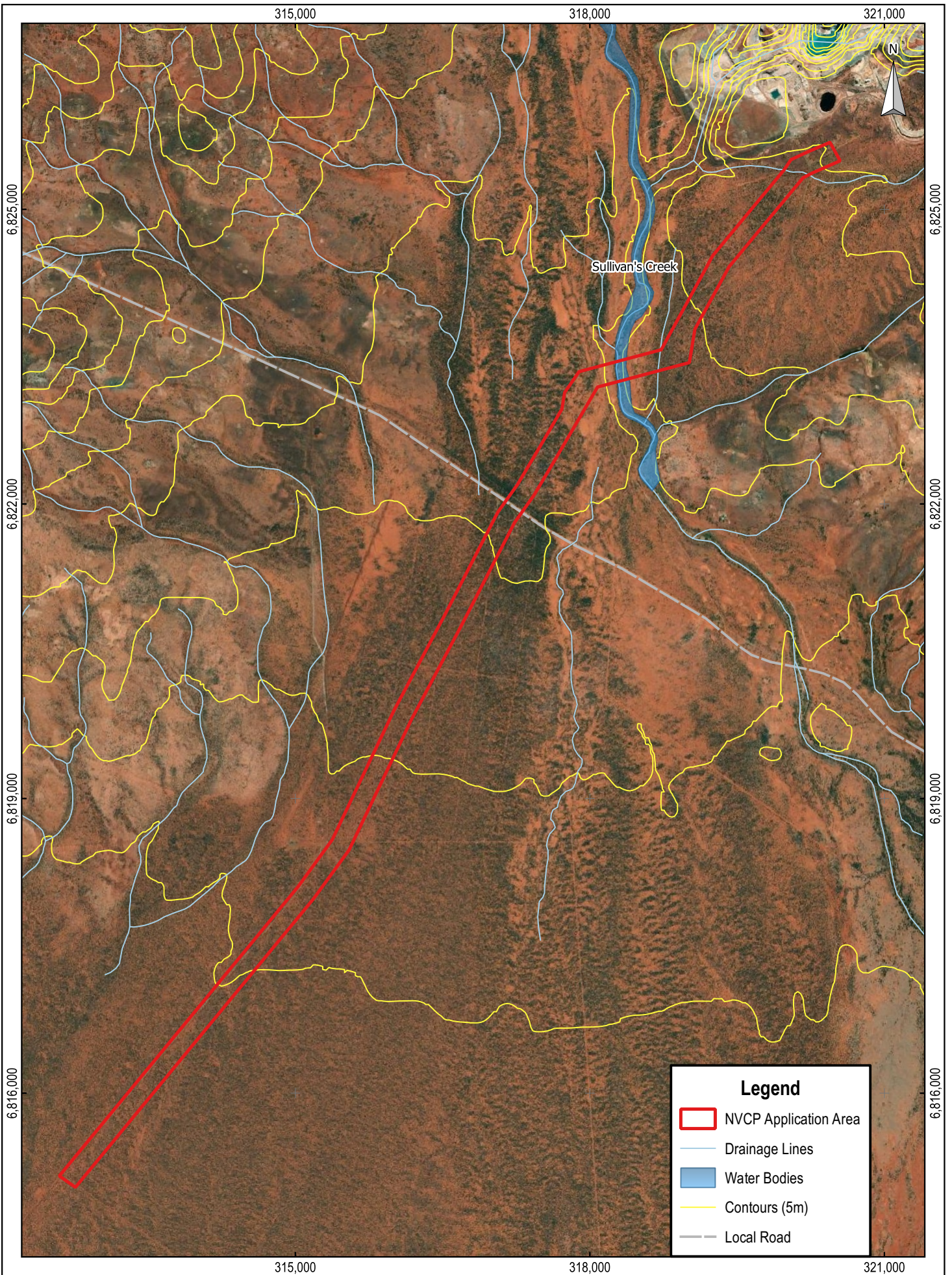
No wetlands occur within the project area or surrounds. Two nationally important wetlands as listed under the Directory of Important Wetlands in Australia occur to the southwest of the project, these being the Lake Ballard and the Lake Barlee System, which are located approximately 80 km south and 115 km southwest of the project respectively.

The Project Area does not occur within a proclaimed surface water area under the *Rights in Water and Irrigation Act 1991* (RIWI Act).

The KOTHGP Project is situated in the Goldfields Groundwater Proclamation Area under Section 26B (1) of the RIWI Act. Three existing groundwater licences are valid for the KOTH Mine Project (GWL6377, GWL204011 and GWL204012).

The Leonora Water Reserve occurs immediately to the south of the Purpose Permit Area, as proclaimed under the *Country Areas Water Supply Act 1947*. It is a Priority 1 (P1) public drinking water source area (PDWSA), which has a water quality objective of risk avoidance (DoW 2010). The reserve supplies water for the Leonora township from the Station Creek wellfield (DoW 2010). The wellfield draws water from the Station Creek aquifer, which is a shallow, unconfined, fractured rock aquifer that forms part of the Lake Raeside palaeodrainage system (DoW 2010). Groundwater is abstracted from both shallow sedimentary rocks and fractured bedrock from depths of 6 to 11 m (DoW 2010).

Groundwater quality in the area is generally fresh to brackish, however, bores near the existing Tarmoola Pit have previously intercepted saline to hypersaline groundwater. Groundwater quality ranges from potable in recharge areas to hypersaline in discharge areas (DoW 2010).



Legend

- NVCP Application Area
- Drainage Lines
- Water Bodies
- Contours (5m)
- Local Road

Scale: 1: 50,000
 Original Size: A4
 Grid: GDA94 / MGA zone 51

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Figure 4
**Topography and Surface
 Water**

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3.4 Flora and Vegetation

The KOTHGP lies within the East Murchison (MUR-1) subregion of the Murchison bioregion under the Interim Biogeographical Regionalisation for Australia (IBRA). Vegetation within this subregion is described as 'dominated by Mulga Woodlands often rich in ephemerals; hummock grasslands, saltbush shrublands and Tecticornia shrublands'.

Several studies have been completed on flora and vegetation for the greater KOTH Mine Project, those relevant to the KOTHGP are attached as appendices:

- Mine Site Rehabilitation Services (1997) Tarmoola Gold Mine Flora and Fauna Survey. Report for Mt Edon Gold Mines, February 1997.
- Matisse Consulting Ltd (1999) Flora and Vegetation of Sullivan Creek. Report for Tarmoola Operations Pty Ltd, July 1999.
- Mine Site Rehabilitation Services (2000) Flora Survey of the Area North of the Present Tarmoola Mining Operation. Report for Tarmoola Operations Pty Ltd, December 2000.
- Matisse Consulting Ltd (2003) Flora and Vegetation Survey Prospects South of Tarmoola. Report for Sons of Gwalia Pty Ltd, July 2003.
- Law (2004) Tarmoola Minesite TSF 5 – Flora Survey. Report for Sons of Gwalia Ltd, January 2004.
- Matisse Consulting Ltd (2006) Flora and Vegetation Survey of St Barbara, Tarmoola Mine Site. Report for St Barbara Limited, June 2006.
- Matisse Consulting Pty Ltd (2019) Assessment of Potential Flora and Vegetation Values – King of the Hills Mine Expansion. Desktop Flora and Vegetation Report for Red 5 Limited, November 2019 (**Appendix 2**).
- Matisse Consulting Pty Ltd (2019) Assessment of Flora and Vegetation Values – King of the Hills Mine Expansion. Level 2 Flora and Vegetation Survey. Report for Red 5 Limited, November 2019 (**Appendix 2**).
- Matisse Consulting Pty Ltd (2020) Flora and Vegetation Values on Proposed Expansion Areas at Tarmoola. Level 1 Flora and Vegetation Survey. Memorandum for Red 5 Limited, April 2020 (**Appendix 2**).
- Matisse Consulting Pty Ltd (2020) Assessment of Flora and Vegetation Values – King of the Hills Mine Expansion. Level 2 Flora and Vegetation Survey. Report for Red 5 Limited, May 2020 (**Appendix 2**).

3.4.1 Significant Flora

No Threatened flora species as listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or the WA *Biodiversity Conservation Act 2016* (BC Act) are likely to occur in the KOTHGP Project area (Matisse 2020).

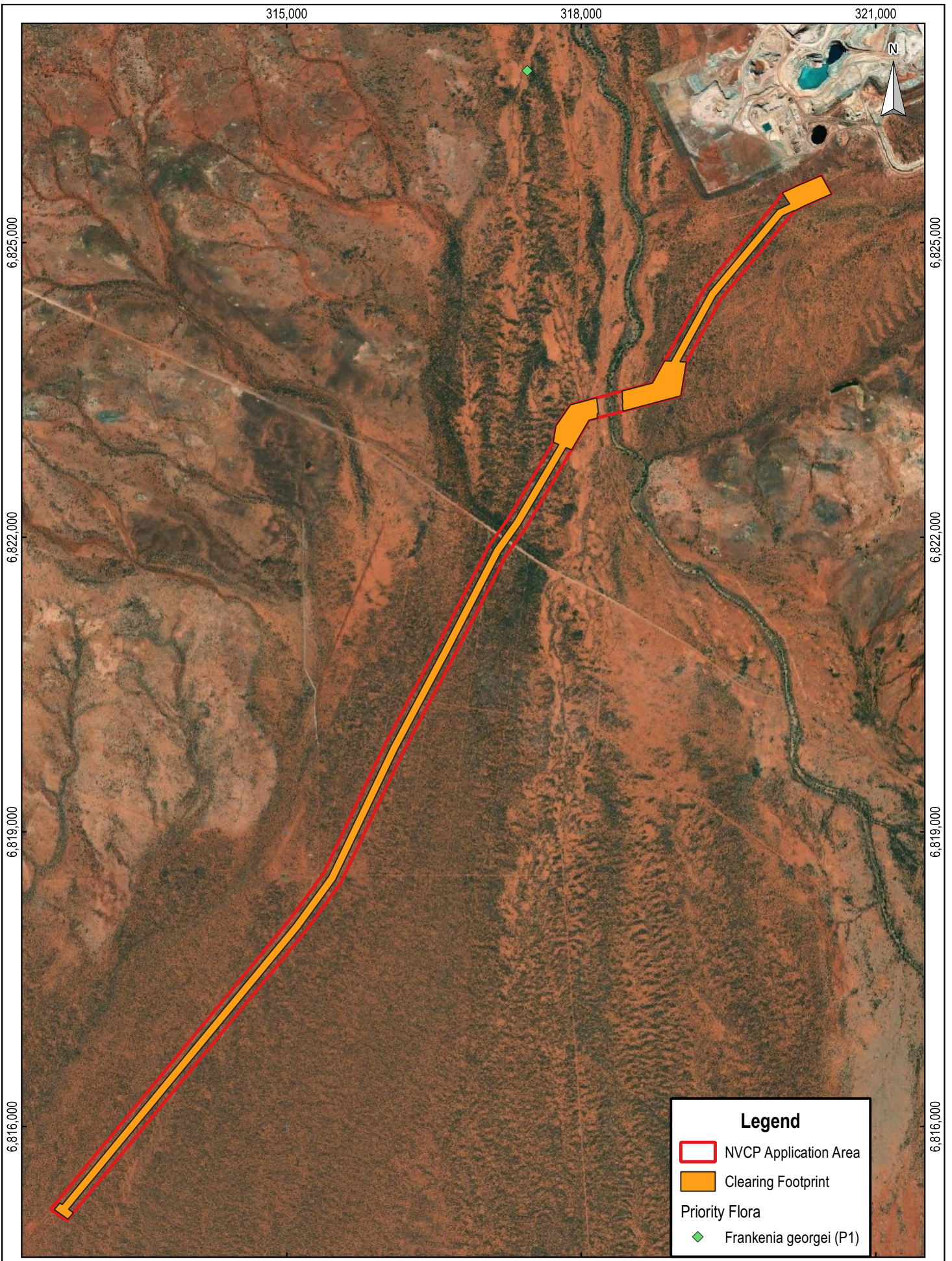
Three Priority species were identified during the Matisse (2020) survey of the broader KOTH site, these species being:

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- *Frankenia georgei* (P1).
- *Stenanthemum patens* (P1).
- *Grevillea inconspicua* (P4).

A population of *Frankenia georgei* was identified to the west of the existing Mine footprint. The population was identified as having over 1,000 individuals (Mattiske 2020). The KOTHGP Project Area will not interface with priority species and no disturbance is anticipated (**Figure 5**).



Legend

- NVCP Application Area
- Clearing Footprint

Priority Flora

- ◆ Frankenia georgei (P1)

Scale: 1: 50,000
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Figure 5
 Priority Flora Locations

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Legend

Fauna Habitats

- Open Mulga Woodland
- Sullivan's Creek System
- NVCP Application Area

Scale: 1: 50,000
 Original Size: A4
 Grid: GDA94 / MGA zone 51

0 1 2 km

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Figure 7
**Fauna Habitats of the King
 of the Hills Gas Pipeline
 Project Area**

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3.4.2 Remnant Vegetation Communities

A search of the pre-European vegetation community dataset (DPIRD 2020b) indicated three vegetation associations of the Laverton System occur within the wider KOTH project area, of which two occur within the KOTHGP corridor itself, as summarised in **Table 3** and shown on **Figure 6**. All vegetation associations identified retain greater than 97.5% of their pre-European extent (DBCA, 2019) and the small amount of disturbance proposed for the project will not significantly impact upon them.

Table 3: Pre-European Vegetation Communities and Extent

Pre-European Vegetation ID	Vegetation Description	Current Extent in WA (ha)	Pre-European Extent Remaining %
Laverton18 ¹	Mulga (<i>Acacia aneura</i>) and associated species.	2,342,961.36	99.55
Laverton 28 ¹	Mulga (<i>Acacia aneura</i>) and associated species.	131,531.31	98.35
Laverton 39	Wattle, teatree & other species <i>Acacia</i> spp. <i>Melaleuca</i> spp.	151,580.18	97.53

¹ Vegetation community occurs within KOTHGP disturbance area

3.4.3 Significant Vegetation Communities

Fifteen vegetation communities have been mapped and described for the greater KOTH Mine Project, with the majority of communities represented as *Acacia* open woodlands that are commonly represented in the region (Mattiske 2020). Of those, seven (7) exist within the KOTHGP proposed disturbance footprint and are described in **Table 4** and **Figure 6**.

Based on the Keighery vegetation condition rating scale, vegetation condition within the survey area ranged from 'good' to 'excellent' and was on average 'very good' (Mattiske 2019) and associations were considered to be well represented in the region.

There are no Threatened Ecological Communities (TECs), or Priority Ecological Communities (PECs) listed at Commonwealth or State level within the KOTHGP Project Area or surrounds.

Table 4: Vegetation Communities within the KOTHGP Project Area

Vegetation Community Code	Vegetation Community Description
A1	Low Open Forest of <i>Acacia</i> spp. over <i>Eremophila youngii</i> subsp. <i>youngii</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Rhagodia drummondii</i> , <i>Ptilotus obovatus</i> , <i>Solanum lasiophyllum</i> over <i>Aristida contorta</i> , <i>Enneapogon caerulescens</i> , annual herbs and grasses on sandy loams on flats and flowlines.
A2	Low Open Woodland of <i>Acacia</i> spp. over <i>Hakea preisii</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Spartothamnella teucriflora</i> , <i>Ptilotus calostachyus</i> , <i>Ptilotus obovatus</i> , <i>Solanum lasiophyllum</i> over <i>Maireana suaedifolia</i> , <i>Aristida contorta</i> , <i>Enneapogon caerulescens</i> , annual herbs and grasses on sandy-loams on flats and lower slopes.
A7	Low Open Woodland of <i>Acacia</i> spp. over <i>Ptilotus obovatus</i> , <i>Solanum lasiophyllum</i> , <i>Eremophila galeata</i> over mixed Chenopods, annual herbs and grasses on flats and lower slopes with calcrete soils.
C1	Open Chenopod Shrubland with <i>Atriplex nummularia</i> , <i>Maireana pyramidata</i> and mixed <i>Sclerolaena</i> species with occasional emergent <i>Hakea preisii</i> and patches of <i>Acacia aneura</i> on calcrete soils.
E1	Open Woodland of <i>Eucalyptus camaldulensis</i> subsp. <i>Obtusa</i> with pockets of <i>Casuarina</i> and <i>Acacia citrinoviridis</i> over <i>Bossiaea walkeri</i> over mixed grasses and annual herbs on sandy soils in creeklines.
D	Disturbed Sites. These sites include tracks old coal load out areas near Leonora and very disturbed sites.
CL	Cleared Sites. These sites include all the mining areas and the previously cleared areas near Leonora.

3.4.4 Introduced Flora and Weeds

A Level 2 flora and vegetation survey undertaken by Mattiske (2019) identified no introduced flora species or Declared Pest species pursuant to Section 22 of the *Biosecurity and Agriculture Management Act 2007* (BAM Act).

Desktop surveys identified potential for five introduced plant taxa listed as both Weeds of National Significance (DAWE 2020d) and Declared Pest organisms according to Section 22 of the BAM Act and have a Prohibited Organism Control category of 'C3 – Restricted' (Mattiske 2020). Of these five introduced taxa, four have all been recorded at Tarmoola Station homestead which is located on mining tenement M 37/449 approximately 3 km south of the Application Area. The other taxon, *Opuntia stricta* is of a lower probability of occurrence with the closest known location 25 kms to the south (Mattiske 2020).

3.5 Fauna and Habitat

3.5.1 Fauna Habitat

A Level 2 vertebrate fauna survey was undertaken in Spring 2019 for the KOTH Mine project area (**Appendix 3**). Based on the assessment, it was determined that two broad fauna habitats exist within the KOTHGP Project Area (Terrestrial Ecosystems 2020):

- Open Mulga Woodland over Mixed Shrubs and Scattered Grasses or Bare Ground.
- Woodland of large Eucalypts over mixed shrubs and scattered grasses located along the ephemeral creekline that runs north-south through the project area.

The assessment concluded that much of the KOTHGP Project Area is disturbed as cattle and goats have foraged on both stations for many years and much of the grasses and lower-level vegetation have either been lost, depleted or altered. The consequence is that the vertebrate fauna assemblage will differ significantly from what existed prior to it becoming pastoral lease.

3.5.2 Significant Fauna

A desktop assessment of the DBCA NatureMap database did not identify any Threatened or Priority fauna species records in or surrounding the KOTH Mine or KOTHGP Project Area (DBCA 2020). A database search of the Department of Agriculture, Water and Environment (DAWE) Protected Matters Search Tool (PMST) identified three Threatened fauna species as listed under the EPBC Act as potentially occurring in the project area, these being:

- Malleefowl (*Leipoa ocellata*) – Vulnerable under both the EPBC Act and BC Act.
- Chuditch (*Dasyurus geoffroii*) – Vulnerable under both the EPBC Act and BC Act.
- Princess Parrot (*Polytelis alexandrae*) – Vulnerable under the EPBC Act and Priority 4 as listed by DBCA.

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No Threatened or significant species as defined by the EPBC Act or BC Act were recorded during the Level 2 fauna survey (**Appendix 3**), including the three species identified by database searches as potentially being present. When the data from all sites were combined, 40 species of reptiles and small mammals were observed in the project area. Species accumulation curves were calculated for the two habitat types and this modelling predicted that 23 species would be present in the ephemeral creekline, with 22 species actually observed. For the Mulga Woodland, 33 species were caught, and it is modelled that there are about 35 species in this habitat type (Terrestrial Ecosystems 2020).

3.5.3 Subterranean Fauna

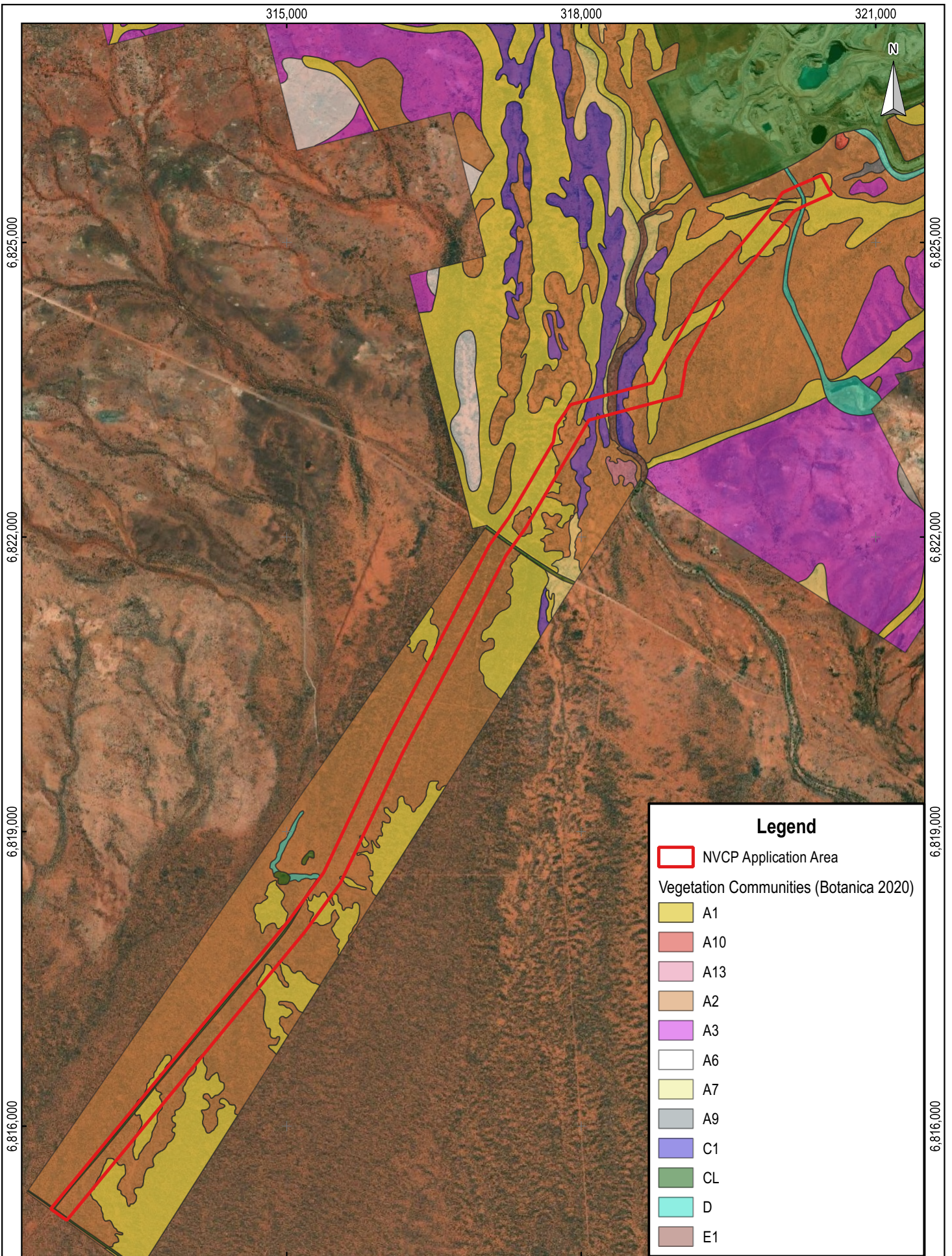
Subterranean fauna surveys undertaken in the project area identified a low diversity of stygofauna present in the vicinity of the Project (Tang 2006). Two stygofauna species were recorded outside the KOTH and KOTHGP Project tenements during the investigation, comprising copepod species *Mesocyclops brooksi* and *Australocamptus similis*. Both species are considered common across the region, and water extraction from within and surrounding the project area would not likely lead to the extinction of either copepod species (Tang 2006). No subterranean fauna species were found in any bores currently within or adjacent to the project area.

Other arthropod members, such as insects, collembolans and arachnids, were collected in a few bore samples during this investigation, however, their presence is regarded as accidental as they did not possess stygomorphic features (Tang 2006).

3.5.4 Introduced Fauna

A desktop database search of the EPBC Act PMST identified ten introduced species as potentially occurring within the project area and surrounds (DAWE 2020):

- Domestic dog (*Canis lupus familiaris*).
- Cat (*Felis catus*).
- House Mouse (*Mus musculus*).
- Goat (*Capra hircus*).
- Camel (*Camelus dromedarius*).
- Donkey (*Equus asinus*).
- Rabbit (*Oryctolagus cuniculus*).
- Red fox (*Vulpes vulpes*).
- Rock pigeon (*Columba livia*).
- Laughing turtle-dove (*Streptopelia senegalensis*).



Scale: 1: 50,000
 Original Size: A4
 Grid: GDA94 / MGA zone 51

APA
 King of the Hills Gas Pipeline
 NVCP

Figure 6
 Vegetation Communities

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4. Proposed Clearing

4.1 Schedule

APA intends that, subject to final design, approvals, and commercial, access, and other agreements, construction will be over a twelve -week period (November 2021 to January 2022). APA intends substantial completion (except for minor works and final commissioning) by late January 2022. APA expects the KOTHGP will be constructed progressively, working from the GGP tie-in point towards the KOTH Mine with a single mainline construction workfront.

Table 5: Construction Schedule

Project Activity	Target Completion Date
Mobilisation	November 2021
Earthworks/Civil Works	November 2021
Pipeline Construction	November 2021
Commissioning	January/February 2022
Demobilisation	February 2022
Site Clean-up	February 2022
Operations	February 2022

4.2 Clearing area

APA is seeking permission to clear land within the NVCP Application Area for establishment of a gas pipeline from the GGP to the KOTH Mine. This NVCP application is a request to clear up to 80 ha of native vegetation within the 272.96 ha application area.

The proposed application area covered by each tenement is outlined in **Table 6** and comprises of:

- Clearing for pipeline construction right of way (CROW) - a temporary, cleared construction zone along the pipeline alignment intended to accommodate equipment, vehicle movements, and temporary storage of trench spoil and topsoil.

The width of the CROW provides enough room for construction works to proceed with low risk of collisions or other incidents. In general, the CROW will be 25 m in width within a License Area of about 200 m width. In some areas the CROW will cover the full width of the License Area in order to accommodate

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special activities such as HDD and the construction of a Turkeys Nest. In areas of higher environmental or social value it will be reduced to consider heritage constraints. Access to the CROW will be via designated access tracks.

- Delivery station (100 m x 100 m).

Establishment of temporary work areas and infrastructure will include:

- Site offices
- Ablutions
- Turkey's nests
- Pipe delivery and laydown areas; and
- Vehicle turn around bays (50 m x 50 m) to allow large trucks to turn around when travelling the CROW, to be installed approximately every 2.0 km.
- Burying of the pipeline so as not cause physical obstructions post-works. The CROW, with the exclusion of a permanent vehicle access track, will be rehabilitated within weeks of pipeline construction being completed.
- Clearing as required in perpetuity for pipeline operations and maintenance purposes in accordance with the requirements of the *Petroleum Pipelines Act 1967* (PP Act).

A shapefile is provided for the NVCP Application Area. There may be minor variations made to the precise location and area of infrastructure. To allow for potential minor changes to areas of disturbance, APA has applied to clear 80 ha and maintain vegetation to a low height for approximately 5.2ha within the Application Area of 272.96 ha.

Table 6: NVCP Application Area within Project Tenement

Tenement	Area (Ha)
L37/248	272.96
TOTAL	272.96

4.3 Access

Access to the NVCP Application Area will be from existing roads and tracks, including mine access roads and tracks.

4.4 Clearing Method

A Sample Native Vegetation Clearing Procedure is attached in **Appendix 4**.

This form is required to be completed for all activities that will, or have the potential to, impact upon native vegetation in the KOTHGP Project Area.

For pipeline construction, vegetation will be cleared and pushed into separate piles at the side of the CROW and ancillary areas using bulldozers. Topsoil will be stripped to a minimum depth of approximately 100 mm (depending on the soil profile) using

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graders and pushed into windrows at the side of the cleared areas (adjacent to, but separate from, the stockpiled vegetation), where it will not be disturbed by construction works. Bed and banks of Sullivan's Creek will be isolated by flagging during construction to ensure the preservation of riparian vegetation and heritage values.

Clearing management measures will be implemented in accordance with the APA Native Vegetation Management Procedure.

During operation of the pipeline, woody vegetation overlying the pipeline may need to be pruned to maintain line of sight between pipeline markers as required under the PP Act. The frequency and severity of pruning will be dependent on regrowth characteristics.

4.4.1 HDD description

Due to the intersection of the KOTHGP with Sullivan's Creek at approximately KP10, horizontal directional drilling (HDD) will be required. HDD will involve excavating entry and exit pits (typically up to 3 m by 3 m by 3 m) at either side of the creek, drilling a borehole under the crossing from entry to exit, then pulling a prefabricated section of pipe back through the borehole from exit to entry. **Figure 8** illustrates the typical arrangement of an HDD site.

HDD works will be carried out by specialist contractors using special equipment, in accordance with project-specific HDD procedures that will be approved by APA. The contractor procedures will incorporate environmental management measures.

HDD excavations are generally only open for the duration of HDD works (usually three to four days). Excavations would be ramped and fenced and inspected for fauna at the start of each workday.

Bentonite (a non-hazardous clay) would be used as a drilling fluid, and is recirculated through transportable tanks, and/or captured in the entry and exit pits. Drilling fluids would be monitored during drilling to assure that there is little or no loss onto or into the ground.

HDD works would be suspended immediately if any substantial loss of drilling fluid is apparent. The expected volume of drilling fluid is no more than 10 m³ and used drilling fluid would be disposed of at a facility licensed for the class of waste.

Entry and exit pits would be backfilled as soon as practicable after HDD is complete, and all disturbances associated with HDD crossings reinstated shortly after construction, as part of mainline reinstatement.

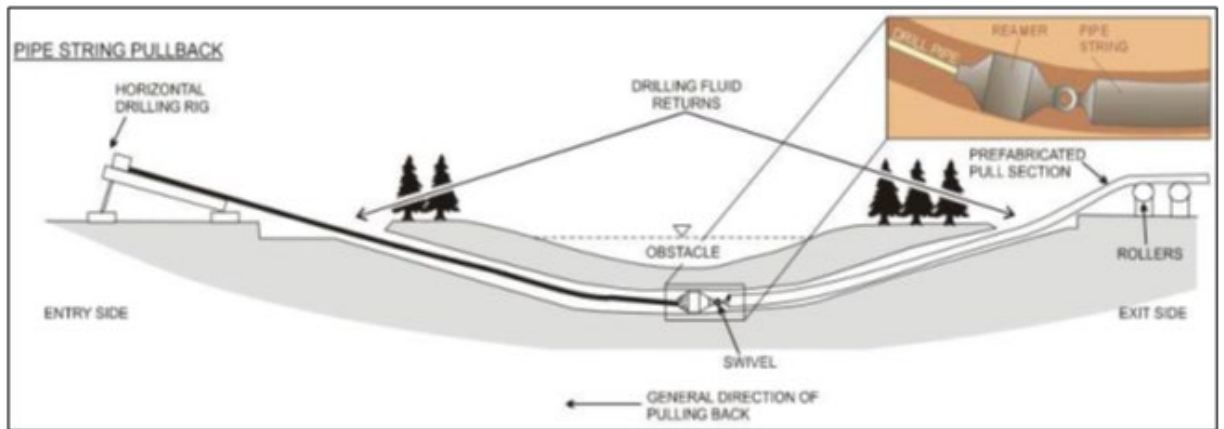


Figure 8: Typical Arrangement of HDD Site

4.5 Rehabilitation

All cleared areas along the CROW will be rehabilitated following completion of pipeline installation, except for the above-ground connecting facilities and an access track adjacent to the pipeline corridor (approximately 4m in width).

The Delivery Station footprint will be fenced and remain cleared, with a 10 m firebreak cleared around the fence line.

APA's rehabilitation approach aligns with DMIRS' philosophy outlined in the EP Guidelines, which state that rehabilitation should be undertaken progressively after the completion of an activity for cleared or disturbed areas that are no longer required.

Reinstatement of the CROW and other areas disturbed for construction within PL127 license area will aim to:

- Reinstatement of contours, to minimise the potential for erosion and any impact on drainage patterns;
- Support regrowth of representative native vegetation and habitat, similar to the pre-existing ecosystem, and minimise weed establishment; and
- Minimise the long-term visual impact of the pipeline installation.

Upon completion of works, all waste and surplus materials will be removed from site and disposed of at the appropriate class landfill facility. Those areas required for construction only (including the CROW, laydown areas, site offices, and ablutions) will be rehabilitated.

The overall objective of rehabilitation is for vegetation re-establishment and soil stabilisation. Specific works to be undertaken include:

- Scarification of compacted areas to a depth of approximately 100 mm to facilitate seed and water trapping and vegetation re-establishment.

KING OF THE HILLS GAS PIPELINE



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- Replacement of stockpiled topsoils over disturbed areas, with distribution to be roughly even to a maximum depth of approximately 100 mm; and
- Redistribution of stockpiled vegetation (removed during initial vegetation clearing) over scarified areas.

The above approach is typical of gas pipelines and has been successful at previous APA pipeline construction sites.

Extra inspections will be carried out within the 12-month contractor defects liability period after construction, to identify any remediation required. Practical completion checklists will be used to verify conformance of reinstatement works to requirements.

APA expects that the KOTHGP will remain operational for at least 40 years. The remaining cleared land to be used for operations will be rehabilitated upon asset decommissioning.

5. Assessment of the Clearing Principles

Clearing applications are assessed against 10 principles outlined in Schedule 5 of the EP Act (**Table 7**). The principles aim to ensure that potential impacts resulting from the removal of native vegetation can be assessed in an integrated way and apply to all lands throughout WA. The principles address the four main environmental areas of biodiversity significance, land degradation, conservation estate and ground and surface water quality.

Information regarding the potential impact of clearing for pipeline construction on each of these principles for the project area is provided below.

Table 7: Clearing Principles and Outcome Summary

Principle	Clearing Principle	Outcome
A.	Native vegetation should not be cleared if it comprises a high level of biological diversity.	Unlikely to be at variance
B.	Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a significant habitat for fauna indigenous to Western Australia.	Not at variance
C.	Native vegetation should not be cleared if it includes, or is necessary for the continued existence of rare flora.	Unlikely to be at variance
D.	Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a Threatened Ecological Community (TEC).	Not at variance
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.	Not at variance
F.	Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.	Not at variance
G.	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	Not at variance
H.	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.	Not at variance
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.	Unlikely to be at variance
J.	Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.	Not at variance

Information regarding the potential impact of clearing for pipeline construction on each of these principles for the Application Area is provided in the sections below.

5.1 Biodiversity

Clearing Principle A: Native vegetation should not be cleared if it comprises a high level of biological diversity.

Impacts to the biological diversity of native vegetation associated with clearing for the KOTHGP are limited to localised flora/habitat loss from clearing in the NVCP Application Area as well as the potential spread of existing weed species and the introduction of new weed species into the area.

Flora assessments of the KOTHGP project area identified no Threatened flora, TECs or PECs within or surrounding the NVCP Application Area.

Potential impacts to the vegetation communities mapped within the NVCP Application Area are detailed in **Table 8**. From this it can be concluded:

- The proposed disturbance to any mapped vegetation community does not exceed 8.5% of the surveyed extent.
- The vegetation communities to be disturbed within the NVCP Application Area are all well represented at a local and regional scale.

Table 8: Potential Impact on Vegetation Communities

Vegetation Community Code	Vegetation Aspect	Mapped Extent (ha)	Mapped Extent within NVCP Application Area (ha)	Potential Impact (%)
A1	Low Open Forest of <i>Acacia</i> spp. over <i>Eremophila youngii</i> subsp. <i>youngii</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Rhagodia drummondii</i> , <i>Ptilotus obovatus</i> , <i>Solanum lasiophyllum</i> over <i>Aristida contorta</i> , <i>Enneapogon caerulescens</i> , annual herbs and grasses on sandy loams on flats and flowlines.	2719.06	59.19	2.18%
A2	Low Open Woodland of <i>Acacia</i> spp. over <i>Hakea preisii</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Spartothamnella teucriflora</i> , <i>Ptilotus calostachyus</i> , <i>Ptilotus obovatus</i> , <i>Solanum lasiophyllum</i> over <i>Maireana suaedifolia</i> , <i>Aristida contorta</i> , <i>Enneapogon caerulescens</i> , annual herbs and grasses on sandy-loams on flats and lower slopes.	4521.54	194.94	4.31%
A7	Low Open Woodland of <i>Acacia</i> spp. over <i>Ptilotus obovatus</i> , <i>Solanum lasiophyllum</i> , <i>Eremophila galeata</i> over mixed Chenopods, annual herbs and grasses on flats and lower slopes with calcrete soils.	295.37	0.93	0.32%
C1	Open Chenopod Shrubland with <i>Atriplex nummularia</i> , <i>Maireana pyramidata</i> and mixed <i>Sclerolaena</i> species with occasional emergent <i>Hakea preisii</i> and patches of <i>Acacia aneura</i> on calcrete soils.	516.37	5.7	1.10%
E1	Open Woodland of <i>Eucalyptus camaldulensis</i> subsp. <i>obtusata</i> with pockets of <i>Casuarina</i> and <i>Acacia citrinoviridis</i> over <i>Bossiaea walkeri</i> over mixed grasses and annual herbs on sandy soils in creeklines.	22.09	1.83	8.28%
D	Disturbed Sites. These sites include tracks old coal load out areas near Leonora and very disturbed sites.	109.75	0.86	0.78%
CL	Cleared Sites. These sites include all the mining areas and the previously cleared areas near Leonora.	1010.15	9.54	0.94%
Total		14391.69	272.96	

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Management measures to reduce impacts on biodiversity comprise:

- Clearing and vegetation will be kept to the minimum required for the KOTHGP.
- Managing clearing via the Project Land Clearing Procedure (refer sample at Appendix 4).
- Green tagging will be conducted as part of the CROW alignment setup. The CROW alignment will be designed to avoid populations of priority flora species and potential fauna habitats, where practicable.
- Clear delineation of the clearing area with survey pegs and flagging tape to ensure no inadvertent clearing occurs.
- Stockpiling vegetation with access to topsoil stockpiles restricted, for use in rehabilitation activities.
- Rehabilitation of disturbed areas on completion of construction activities.
- Weed hygiene practices will be implemented. Site weed control will be conducted as required.
- Utilisation of dust control measures.
- Clearing undertaken will be recorded and reported in the Annual Environmental Report (AER).

It is not expected that the KOTHGP will significantly impact on biodiversity and subsequently the proposed clearing is unlikely to be at variance with Clearing Principle A.

5.2 Significant Fauna Habitat

Clearing Principle B: Native vegetation should not be cleared if it comprises the whole or part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

The Level 2 fauna survey of the project did not identify any Threatened or Priority fauna species occurring within the project area (Terrestrial Ecosystems 2020). A desktop database search identified three species as potentially occurring, however they were not recorded during the fauna survey.

The main risk to fauna habitat is loss or fragmentation through clearing activities. To minimise risk to fauna and fauna habitats, the following management measures will be implemented:

- Clearing and vegetation will be kept to the minimum required for the KOTHGP.
- Managing clearing via the Project Land Clearing Procedure (refer sample at **Appendix 4**).
- Green tagging will be conducted as part of the CROW alignment setup. The CROW alignment will be designed to retain/avoid trees (especially those with hollows) for bird, bat and reptile habitat where practicable.
- Clear delineation of the clearing area with survey pegs and flagging tape to ensure no inadvertent clearing occurs.

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- Night construction works will be avoided where practicable.
- Vehicle movements will be confined to defined tracks and construction areas.
- Speed limits will be applied to vehicle and equipment movements on the CROW.
- Stockpiling vegetation and respreading where possible to provide habitat for fauna and to assist revegetation by providing a local seed source.
- Removing rubbish to an approved landfill area.
- Rehabilitating disturbed areas on completion of construction activities.
- Weed hygiene practices will be implemented. Site weed control will be conducted as required.
- Utilisation of dust control measures.
- Clearing undertaken will be recorded and reported in the AER.

Considering the absence of significant fauna in the proposed Purpose Permit area and the planned mitigation measures, the proposed clearing is considered unlikely to impact significant habitat for Threatened or Priority fauna and is therefore not at variance to Clearing Principle B

5.3 Significant Flora

Clearing Principle C: Native vegetation should not be cleared if it includes, or is necessary for the continued existence of rare (Threatened) flora.

No Threatened flora species as listed under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or the *WA Biodiversity Conservation Act 2016* (BC Act) are likely to occur in the KOTH Project area (Mattiske 2020).

Three Priority flora species *Frankenia georgei*, *Stenanthemum patens* and *Grevillea inconspicua* were identified during the Mattiske (2020) survey of the broader KOTH site. Neither have been recorded within the Application Area. A population of *Frankenia georgei* was identified to the west of the existing Mine footprint. The population was identified as having over 1,000 individuals (Mattiske 2020). The KOTHGP project area will not interface with priority species and no disturbance is anticipated.

Management and mitigation strategies to reduce impacts on significant flora comprise:

- Clearing and vegetation will be kept to the minimum required for the KOTHGP.
- Managing clearing via the Project Land Clearing Procedure (refer sample at **Appendix 4.**)
- Green tagging will be conducted as part of the CROW alignment setup. The CROW alignment will be designed to avoid disturbance to as many individuals of both Priority species as possible.
- Clear delineation of the clearing area with survey pegs and flagging tape to ensure no inadvertent clearing occurs.
- Weed hygiene practices will be implemented. Site weed control will be conducted as required.
- Clearing undertaken will be recorded and reported in the AER.

Given the three priority species are known from a number of locations in the broader KOTH site and outside of the NVCP Application Area, proposed clearing would have only a minimal loss of individual plants and is not considered likely to adversely impact their conservation status. Therefore, proposed clearing is unlikely to be at variance with Clearing Principle C.

5.4 Threatened Ecological Communities

Clearing principle D: Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community.

There are no TECs or PECs listed under either the EPBC Act or the BC Act within the NVCP Application Area or surrounds of the KOTHGP Project area. Therefore, the proposed clearing will have no impact on TECs and is not at variance to Principle D.

5.5 Remnant Vegetation

Clearing Principle 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.

The NVCP Application Area intersects two Pre-European vegetation associations mapped in the region as outlined in **Table 3**.

The Environmental Protection Authority (EPA) uses a standard level of native vegetation retention of at least 30% of the pre-clearing extent of an ecological community as a benchmark. The levels of native vegetation retention have most recently been recognised in the National Objectives and Targets for Biodiversity Conservation 2001-2005, which recognised that the retention of 30%, or more, of the pre-clearing extent of an ecological community is necessary if Australia's biological diversity is to be protected (DoEH 2001).

A large percentage of Pre-European vegetation in the State remains (>99%) after the proposed clearing. As the extent of actual clearing is likely to be lower than the Application Area, the actual impact will be lower. Clearing for the KOTHGP will not result in loss of a significant remnant of native vegetation (**Table 3**). The proposal will not be at variance with Clearing Principle E.

5.6 Watercourse or Wetland Environments

Clearing Principle F: Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

There are no permanent water bodies or wetlands within the NVCP Application Area. There are no significant perennial drainage lines intersecting the project application area, however, there are some minor ephemeral drainage lines that intersect the NVCP Application Area. Drainage lines are expected to be re-activated by periods of high rainfall.

Pipeline construction has been scheduled outside of the peak rainfall periods when surface flows would be greatest. The proposed clearing is not expected to adversely impact ephemeral drainage lines.

Where the ephemeral drainage lines intercept the NVCP Application Area, appropriate measures will be implemented to manage the crossing. This includes:

- KOTHGP alignment will be designed to avoid and/or minimise disturbance to ephemeral drainages as much as possible.

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- Culverts or floodways will be installed where necessary to prevent blockage of ephemeral drainages.
- HDD crossing of Sullivan's Creek eliminates disturbance of bed, banks and surrounding vegetation.

As the proposed clearing will not impact on wetlands and will have negligible impacts on drainage lines, the proposal will not be at variance with Clearing Principle F.

5.7 Land Degradation

Clearing Principle G: Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

Vegetation condition within the NVCP Application Area was assessed (Mattiske 2020) to range from 'Completely Degraded' to 'Excellent' as shown in **Table 9**.

Table 9: Vegetation Condition

Vegetation Condition Rating	Occurrence within NVCP Application Area (ha)
Completely Degraded	9.55
Good	48.09
Very Good	205.83
Excellent	1.83
Area excluded from survey	7.67
TOTAL	272.96

Cleared and degraded areas pre-development constitute 10.40 ha of the land in NVCP Application Area. This includes minor regional access (unsealed) roads.

Land degradation of vegetation that was apparent during the ecological surveys is mostly attributed to the grazing impacts of cattle and feral herbivores such as donkeys and rabbits (Bamford 2019).

Potential sources of land degradation from construction of the KOTHGP include:

- Wind erosion during vegetation and topsoil stripping activities.
- Wind and water erosion of topsoil stockpiles and cleared areas.
- Wind and water erosion of rehabilitated surfaces.
- Water erosion due to changes in surface water flow.
- Soil compaction.
- Soil contamination.

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- Introduction and/or spread of weeds.

Minimisation of land degradation will be achieved by undertaking rehabilitation of temporary work areas and infrastructure upon completion of construction, with only the KOTHGP maintenance track remaining open. Management and mitigation strategies to achieve this include:

- Managing clearing via the Project Land Clearing Procedure (refer sample at Appendix 4).
- Minimising the area requiring vegetation removal.
- Confining vehicle movements to defined roads and tracks.
- Conducting topsoil-stripping activities during periods of low winds.
- Stockpiling topsoil and vegetation for use in rehabilitation.
- Storing hydrocarbons and refuelling in bunded areas.
- Scarifying or deep ripping (as appropriate) compacted construction work areas.
- Using raised blade or other pruning techniques during pipeline corridor vegetation maintenance to minimise soil disturbance.

In the context of the low erodibility of the land system, intact vegetation on a regional scale and existing level of localised land degradation, the scale and short-term nature of disturbance from the proposed clearing is not anticipated to increase land degradation. As such, the proposed clearing will not be at variance with Clearing Principle G.

5.8 Conservation Estate

Clearing Principle H: 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.

There are no national parks, conservation reserves or DBCA Managed Lands within or adjacent to NVCP Application Area.

No ESA as declared in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005* occur within or surrounding the NVCP Application Area. Therefore, the proposed clearing is not considered at variance with Clearing Principle H.

5.9 Surface and Groundwater Quality

Clearing Principle 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.

There are no wetlands within the NVCP Application Area.

The KOTH Project is located within the Raeside-Ponton Catchment of the Western Plateau Basin. The local surface topography is dominated by the 1,400 km² catchment of Sullivan's Creek, which flows through a 30 km channel from north to

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south through the centre of the project to discharge into the Lake Raeside drainage approximately 15 km south of KoTH.

Sullivan's Creek has formed an alluvial plain ranging from 2 to 3 km in width and broadening downstream, and flows infrequently after periods of heavy rainfall, usually arising from summer cyclonic storms (Big Dog Hydrology 2019). An unnamed minor creek also occurs north of the Sullivan's Creek. Both features will be traversed by the KOTHGP, with Sullivan's Creek being crossed via HDD (refer Section 4.4.1).

HDD will involve excavating entry and exit pits (typically up to 3 m by 3 m by 3 m) at either side of the creek, drilling a borehole under the crossing from entry to exit, then pulling a prefabricated section of pipe back through the borehole from exit to entry, therefore it is anticipated there will be minimal disturbance to the bed and banks of Sullivan's Creek, with no native riparian vegetation cleared.

The project area does not occur within a proclaimed surface water area, and there are no water management areas in the surrounding area, other than the proclaimed Goldfields Groundwater Area, which covers a large proportion of WA.

The proposed clearing is not anticipated to cause long-term impacts upon the quality of groundwater or surface water. Pipeline construction is typically to the depth of 750 mm and excavations will not intersect the groundwater table. Quality of groundwater in the KOTHGP project area ranges from fresh to brackish. It is predicted that there will be no impact associated with vegetation removal on groundwater levels and quality. No adverse impacts are thus considered likely to occur.

Management measures to prevent contamination of surface and groundwater quality include:

- Hydrocarbons and chemicals will not be stored within the CROW.
- Fuel storage will be in bunded areas.
- KOTHGP alignment will be designed to avoid and/or minimise disturbance to ephemeral drainages as much as possible.
- Where necessary, temporary drainage will be installed during construction and re-instated at completion.
- The CROW, with the exclusion of a permanent vehicle access track, will be rehabilitated within weeks of pipeline construction being completed.
- Burying of the pipeline so as not cause physical obstructions post-works.
- Using raised blade or other pruning techniques during pipeline corridor vegetation maintenance to minimise soil disturbance.

Overall, the proposed clearing is considered unlikely to be at variance with Clearing Principle I.

5.10 Flooding Potential

Clearing Principal J: Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.

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The proposed clearing is within an area of semi-arid climate where annual rainfall is low and the region loses more water via evapotranspiration than it receives as rain, generally a result of hot, sunny weather without significant cloud.

The mean annual rainfall is 236.4 mm (**Chart 1**), with the majority falling in summer (December to April) from thunderstorms or cyclone events. Removal of vegetation generally increases flooding whereby uptake, infiltration, moisture retention and physical barriers to reduce flow velocities provided by vegetation are removed. However, the NVCP Application Area is predominantly comprised of sandy plains which generally sheets surface water flows. Removal of vegetation alone would increase water flow, although the mechanical process of clearing and disruption of flat, hard surfaces of a watershed area are likely to increase infiltration of water into the soil profile, encouraging pooling in shallow excavations and reducing downgradient volumes.

Management strategies to prevent flooding include:

- KOTHGP alignment will be designed to avoid and/or minimise disturbance to ephemeral drainages and flood levels as much as possible.
- Existing flow paths will be maintained where possible.
- Diversions will be constructed where necessary to direct surface water away from the KOTHGP and flow into local drainage lines at rates similar to natural flows.
- Culverts or floodways will be installed where the roads cross ephemeral drainages.

Overall, the proposed clearing will have no detectable increased impact on flooding potential for NVCP Application Area or the area surrounding the KOTHGP. Therefore, the proposed clearing will not be at variance with Clearing Principle J.



6. Reporting and Auditing

Annual clearing amounts will be reported to DMIRS via the EARS2 online system as part of the AER and NVCP processes.

Upon approval of this Clearing Permit, subsequent environmental approvals will be sought to construct and develop the KOTHGP. These approvals will include additional conditions and commitments relating to environmental monitoring and reporting.

7. Conclusion

The proposed clearing involves the development of a CROW (nominal 25 m width) within the 200 m wide NVCP Application Area to allow for construction of the KOTHGP.

The proposed clearing supports vegetation ranging from 'Completely Degraded' to 'Excellent' (Mattiske 2006) condition. The vegetation and habitats present within the NVCP Application Area are well represented on a regional scale of what would be expected from similar landforms in the Eastern Murchison Subregion. Impacts of the KOTHGP construction and ongoing maintenance are considered unlikely to influence the conservation status of the flora and fauna species present within the project area, with impacts to vegetation expected to be minor, short term and at a local scale.

No significant water courses intersect the NVCP Application Area, and land degradation as a result of the clearing is not expected. The vegetation represents limited value as fauna habitat, with all habitats broadly represented outside of the NVCP Application Area.

The proposed clearing will not impact significantly upon the ten clearing principles and a range of environmental management measures are in place to ensure clearing will be managed to minimise any potential adverse impacts.

Rehabilitation of construction areas will be undertaken at completion of pipeline construction to minimise exposed areas and the long-term loss of vegetation cover. Ongoing maintenance clearing of the pipeline footprint for operational safety reasons will be managed to minimise soil disturbance.

8. References

Big Dog Hydrogeology (BDH). 2019. Hydrogeological Assessment of Open Pit Mining King of the Hills Mine, Leonora. Report prepared for Red 5.

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KING OF THE HILLS GAS PIPELINE

Native Vegetation Clearing Permit Supporting Document



APPENDIX 1 EVIDENCE OF OWNERSHIP



MINING TENEMENT SUMMARY REPORT

MISCELLANEOUS LICENCE 37/248

Status: Live

TENEMENT SUMMARY

Area: 272.95677 HA **Death Reason :**
Mark Out : N/A **Death Date :**
Received : 21/09/2020 14:17:42 **Commence :** 21/04/2021
Term Granted : 21 Years

CURRENT HOLDER DETAILS

Name and Address

GREENSTONE RESOURCES (WA) PTY LTD
AUSTWIDE MINING TITLE MANAGEMENT PTY LTD, C/- AUSTWIDE MINING TITLE MANAGEMENT PTY LTD,
PO BOX 1434, WANGARA, WA, 6947, xxxxxxxx@austwidemining.com.au, xxxxxxx400

DESCRIPTION

Locality: Sturt Meadows - Tarmoola
Datum: Datum situated at Zone 51 GDA coordinates 312595.67E
6815157.88N
Boundary: Thence to 312614.97E 6815181.37N 315027.65E
6818103.80N 315375.33E 6818581.24N 316002.39E
6819893.66N 316004.32E 6819897.50N 316525.28E
6820877.12N 317058.08E 6821909.12N 317059.56E
6821911.88N 317062.35E 6821916.59N 317065.40E
6821921.15N 317263.04E 6822199.42N 317459.49E
6822530.43N 317715.67E 6822968.30N 317743.03E
6823135.59N 317890.44E 6823349.05N 317987.09E
6823374.76N 318048.47E 6823391.08N 318726.73E
6823571.50N 319247.59E 6824521.85N 319247.91E
6824522.44N 319252.49E 6824529.87N 319257.69E
6824536.88N 319258.40E 6824537.74N 319978.56E
6825403.43N 320049.04E 6825507.80N 320206.84E
6825581.47N 320442.31E 6825682.31N 320445.14E
6825682.60N 320447.07E 6825681.68N 320549.69E
6825496.09N 320269.74E 6825373.24N 320170.63E
6825322.34N 320165.43E 6825315.34N 320164.72E
6825314.48N 319418.33E 6824417.26N 319070.37E
6823782.37N 319013.62E 6823440.86N 318819.55E
6823389.23N 318804.44E 6823385.21N 318078.31E
6823192.07N 317631.96E 6822429.16N 317631.64E
6822428.62N 317432.95E 6822093.82N 317428.48E
6822086.95N 317232.55E 6821811.09N 316702.71E
6820784.83N 316702.14E 6820783.75N 316181.92E
6819805.49N 315551.82E 6818486.71N 315548.98E
6818481.20N 315545.86E 6818475.98N 315542.43E
6818470.95N 315187.54E 6817983.60N 315184.32E
6817979.42N 315183.82E 6817978.80N 312766.00E

6815050.19N 312759.18E 6815041.97N 312671.05E
6815104.44N 312595.67E 6815157.88N back to datum

Area :	Type	Dealing No	Start Date	Area
	Granted		21/04/2021	272.95677 HA
	Applied For		21/09/2020	272.96000 HA

SHIRE DETAILS

Shire	Shire No	Start	End	Area
LEONORA SHIRE	5040	21/09/2020		272.95705 HA

KING OF THE HILLS GAS PIPELINE

Native Vegetation Clearing Permit Supporting Document



APPENDIX 2: FLORA AND VEGETATION SURVEY REPORTS

ASSESSMENT OF FLORA AND VEGETATION VALUES

KING OF THE HILLS MINE EXPANSION LEONORA, WA

Prepared By



Mattiske Consulting Pty Ltd

Prepared For

Red 5 Limited

May 2020



DOCUMENT STATUS				
DOCUMENT REFERENCE: RED1901/57/2019				
VERSION	TYPE	AUTHOR/S	REVIEWER/S	DATE DISTRIBUTED
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V2	Draft for client	Nick Watson/Liam Rowles	E.M. Mattiske	
FINAL	Final report	Liam Rowles	E.M. Mattiske	13/05/2020



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LIST OF ABBREVIATIONS

BAM Act:	<i>Biosecurity and Agriculture Management Act 2007 (WA)</i>
BC Act:	<i>Biodiversity Conservation Act 2016 (WA)</i>
BOM:	Bureau of Meteorology
DAWE:	Department of Agriculture, Water and the Environment (2020)
DBCA:	Department of Biodiversity, Conservation and Attractions
EP Act:	<i>Environmental Protection Act 1986 (WA)</i>
EPA:	Environmental Protection Authority
EPBC Act:	<i>Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)</i>
HRP:	Haul Road Project
IBRA:	Interim Biogeographical Regionalisation for Australia
KOTH:	King of the Hills
MCPL:	Mattiske Consulting Pty Ltd
PCP:	Power Corridor Project
PEC:	Priority ecological community
TEC:	Threatened ecological community
WAH:	Western Australian Herbarium (PERTH)

EXECUTIVE SUMMARY

Mattiske Consulting Pty Ltd (MCPL) was commissioned in February 2020 by Red 5 Ltd to conduct a desktop and Field survey assessment to evaluate the flora and vegetation values of four survey areas within the King of the Hills gold mining area, Eastern Goldfields region, WA. Three of the proposed survey sites are within existing mining tenements operated by Red 5 Ltd, approximately 30 km north of Leonora, Western Australia. A third survey site extends south-west outside of the current tenements. The collation of the data in this report reflects the previously series of field studies which have now been integrated into this one summary.

Desktop

Vegetation

The King of the Hills mining area lies in the Austin Botanical Subdistrict (East Murchison IBRA subregion), which has arid climate with cool winters and hot, dry summers, and rain in both seasons. Geologically, it is situated in an Archaean-aged greenstone belt within the Yilgarn craton, which hosts the gold targeted mine. The topography is dominated by low rounded hills and rocky ridges of granitic rocks and greenstone, with hardpan wash plains and stony plains below the hills. The soils of the area can be broadly defined as red loamy earths, shallow loams and shallow sands.

The vegetation of the King of the Hills mining area is described using botanical districts, land systems, pre-European vegetation and recently mapped vegetation communities. There has been little clearing of the native vegetation within the mining area, except within the pit area and access/haul roads, and hence much of the pre-European vegetation remains. In general, the vegetation can be summarised as being dominated by low open *Acacia* spp. woodlands or tall shrublands over *Eremophila* spp. and *Senna* spp. sparse low shrublands over mixed herbs and grasses on red sandy loam on rocky hills or gentler slopes; with chenopod shrublands in low-lying salt-prone areas or *Eucalyptus camaldulensis* in drainage lines. A total of 24 vegetation communities have previously been mapped in the area.

Potential Flora and Communities

A total of 326 vascular plant taxa could potentially be found within the proposed survey areas, fourteen of which are listed as priority species at State level. No taxa are listed as threatened at Commonwealth or State level. Of the priority flora species, four had a High likelihood of occurrence in King of the Hills mining area, all of which have been recorded in, on the boundary of, or within 5 km of the proposed survey areas. A total of 26 introduced plant taxa that could possibly occur in the mining area were identified, of which five are categorised as significant weeds (both Weeds of National Significance and Declared Pests). Four of the five significant weeds have a High likelihood of occurring within the proposed survey areas. A further five species are of concern due to their High ecological impact and Rapid invasiveness. Searches identified no Threatened Ecological Communities at Commonwealth or State level that could potentially occur in the King of the Hills mining area; there are none listed for the entire Murchison-1 IBRA subregion.

Field survey

Flora

A small number of flora species (67 vascular plant taxa) were recorded within the Power Corridor survey area of the greater King of the Hills mining area in 2020. Relatively low numbers of species were recorded in the Mulga communities that dominated this area. Two taxa were annual species; most of the taxa recorded were shrubs or trees. None of the recorded taxa are listed as threatened species at Commonwealth or State level, however one Priority 1 species, *Frankenia georgei* was found during a search of the Haul road survey area. The population was identified as having over 1000 individuals. No introduced species were recorded within the survey area.

Vegetation

No Threatened Ecological Communities as listed at Commonwealth or State level or Priority Ecological Communities listed at State level were identified as occurring within the Power Corridor survey area, consistent with the desktop study. Five vegetation communities were defined and mapped, using statistical analysis and aerial imagery, three of which are *Acacia* woodlands, one a Chenopod shrubland and another a Eucalypt woodland. The two largest groupings of survey sites corresponded with the A1 (*Acacia* low woodland in drainage lines) and A2 (*Acacia* open low woodland on flats) communities previously defined by Mattiske in 2006. The vegetation condition of the Power Corridor survey area ranged from Good to Very Good and was on average Very Good. There did not appear to be signs of recent fire or heavy cattle activity at any point throughout the survey area. The survey area was substantially disturbed by vehicle tracks as there were a multitude of drill sites and thoroughfares within and intersecting the survey area.

Conclusions and Recommendations

Aside from the Priority 1 species *Frankenia georgei*, the results of the field survey of the flora and vegetation in the Power Corridor survey area demonstrated no specific botanical values associated with potential clearing for mining. An evaluation of the ecological values of the Power Corridor survey area against the Clearing Principles that apply with regard to the assessment of an application to clear native vegetation under the *Environmental Protection Act 1986* indicated that the only Principle that could be potentially be breached by clearing the vegetation in the survey area is that regarding clearing of an environment associated with a watercourse. It is recommended that unnecessary clearing of the vegetation where *Frankenia georgei* is mapped and any adjacent to any watercourses be avoided in order to reduce impacts. Adequate time to apply for and receive a clearing permit for any exploration and ongoing mining activities should be allowed for in future planning.

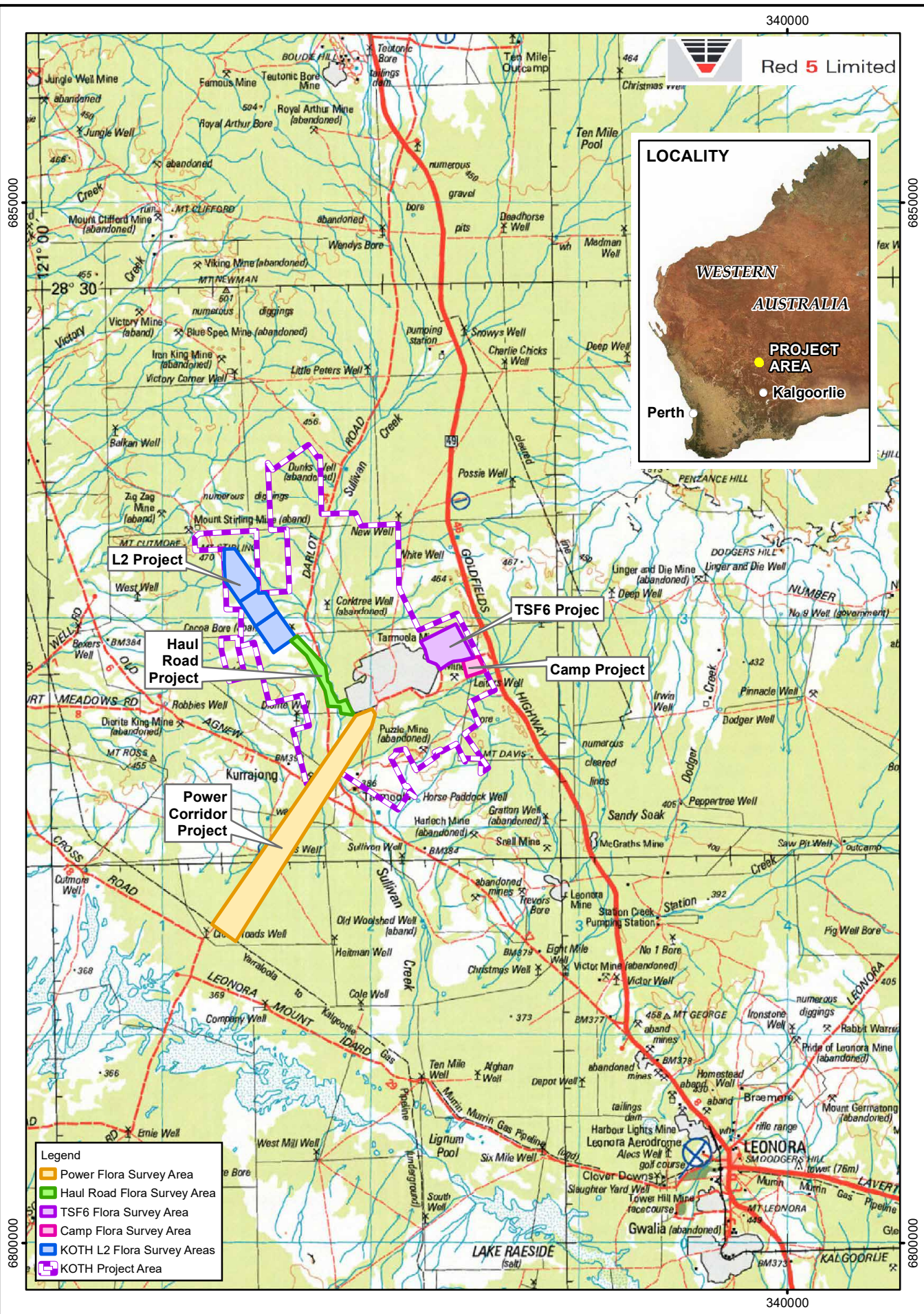
1. INTRODUCTION

MCPL was commissioned in February 2020 by Red 5 Ltd to conduct a desktop and in field assessment to evaluate the flora and vegetation values within the at the King of the Hills (KOTH) gold mining area, located within the Eastern Goldfields region, 30 km north of Leonora, WA (Figure 1). Red 5 Ltd wishes to infill and extend the mineral resource (Red 5 Ltd 2019).

1.1. Location and Scope of Project

Gold from the KOTH mining area has been produced since 1985. Ore currently comes primarily from both the KOTH and Rainbow open pits, with smaller contributions from the underground operation at KOTH and satellite open pits. After acquiring the mine in 2017, Red 5 Ltd now wishes to take initial steps to expand it through a regional surface drilling program (Red 5 Limited 2019). Four parts of the mining area are currently required to be surveyed; a proposed haul road to the level 2 site previously surveyed in 2019, west of the mining area for a proposed storage facility, a smaller area south of the storage facility for a camp and a power corridor running towards the south west. The Goldfields Highway runs from Leinster in the north to Leonora in the south, with the eastern edge of the active mining area approximately 2.5 km west of the highway. Old Agnew Road runs down the western side of the tenements. Darlot Road runs north-south through the centre of the mining area, immediately to the west of Sullivan Creek. This report describes the potential and already recorded flora and vegetation values of the proposed survey sites and places them within a local and regional context. Recommendations are made as to the survey effort that may be required prior to further exploration and development activities occurring in the project area.

A Level 2 flora and vegetation survey was required over three survey areas. Three of the proposed survey sites, the Haul Road Project (HRP) area the Camp and the TSF6 Project areas are within existing mining tenements operated by Red 5 Ltd, approximately 30 km north of Leonora, Western Australia. The sites are located within the following tenements; M 37/457, L 37/129, M 37/222, M 37/330, M 37/394, M 37/571, M 37/572, E 37/1385, L 37/129, L 37/150, L 37/155, L 37/161, L 37/197, L 37/203, M 37/222, M 37/330, M 37/407, M 37/449, M 37/508, M 37/547, M 37/90, P 37/9157, P 37/9283, P 37/9284, P 37/9285, P 37/9286, P 37/9288, P 37/9289, P 37/9290, L 37/211, M 37/410, M 37/457 and M 37/548. These areas had been previously mapped by Mattiske Consulting (2019), and surveys in March 2020 were to focus specifically on the presence of any threatened or priority flora in the areas. A third survey site, the Power Corridor Project (PCP) area extends south-west outside of the current tenements (1146.86 ha). This site is situated in existing tenements (E 37/1385, L 37/129, L 37/150, L 37/155, L 37/161, L 37/197, L 37/203, M 37/222, M 37/330, M 37/407, M 37/449, M 37/508, M 37/547, M 37/90, P 37/9157, P 37/9283, P 37/9284, P 37/9285, P 37/9286, P 37/9288, P 37/9289, P 37/9290) and extends south-west into pending tenements. A portion of this site has had a Level 1 survey undertaken however the area outside of the existing tenements has not been surveyed previously by MCPL. A Level 2 flora and vegetation survey is required for the Power Corridor Project (PCP) site inclusive of vegetation mapping and targeted threatened and priority species searches. .



Source: Image: Landgate

N
 0 4.25 km
 Scale: 1:250,000
 MGA94 (Zone 51)
 CAD Ref: a2725_f08_01
 Date: February 2020 Rev: A | A4

Matiske Consulting Pty Ltd
 28 Central Road, Kalamunda WA 6076 ~ Tel: 9257 1625 ~ Fax: 9257 1640
 Author: E M Matiske MCPL Ref:
 Drawn: CAD Resources ~ www.cadresources.com.au
 Tel: (08) 9246 3242 ~ Fax (08) 9246 3202

King Of The Hill Project Locality

Figure: **1**

1.2. Environmental Legislation and Guidelines

The following key Commonwealth (federal) legislation relevant to this survey is the:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The following key Western Australian (state) legislation relevant to this survey includes the:

- *Biodiversity Conservation Act 2016* (BC Act);
- *Biosecurity and Agriculture Management Act 2007* (BAM Act) and *Regulations 2013*;
- *Environmental Protection Act 1986* (EP Act); and
- *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*

Furthermore, key Western Australian guidelines relevant to this survey are the:

- Environmental Factor Guideline: Flora and Vegetation (Environmental Protection Authority [EPA] 2016a); and
- Technical Guidance – Flora and vegetation surveys for environmental impact assessment (EPA 2016b).

Definitions of flora and vegetation terminology commonly used throughout this report are provided in Appendix A.

1.3. Objectives

The objective of this survey was to undertake a detailed flora and vegetation assessment of the four survey area located within the broader KOTH mining area, including:

- Perform a desktop survey of the greater KOTH mining area to identify potential environmental values of the project area;
- Undertake a detailed survey of the proposed survey areas, and collect and identify the vascular plant species present;
- Undertake targeted searches for threatened and priority flora;
- Review the conservation status of the vascular plant species recorded by reference to current literature and listings by the Department of Biodiversity, Conservation and Attractions (DBCA) and plant collections held at the Western Australian State Herbarium (WAH), and listed by the Department of Agriculture, Water and the Environment (DAWE) (formerly the Department of the Environment and Energy, DotEE) under the EPBC Act;
- Identify and record the location of any threatened and priority flora located within each survey area;
- Identify and record the locations of any Declared Pest organisms within each survey area;
- Define and map the vegetation communities within the PCP survey area;
- Define and prepare a vegetation map of the vegetation communities within the PCP survey area;
- Provide descriptions of the vegetation communities present within survey areas and evaluate their regional significance; and
- Prepare a report summarising the findings.

2. METHODS

2.1. Desktop Assessment

The NatureMap (Department of Parks and Wildlife 2007-) and *EPBC Act* Protected Matters Search Tool (Department of Agriculture, Water and the Environment (DAWE)(2020a)) databases were used to identify the possible occurrence of flora (including threatened and priority taxa) and threatened and priority ecological communities within the proposed survey areas.

Searches within NatureMap were centred on the point 28° 41' 48" S, 121° 09' 30" E. A 20 km radius was deemed to be suitable as it would allow for vegetation from a greater variety of habitats potentially present in the proposed survey areas to be included. The search parameters used for the *EPBC Act* Protected Matters Search Tool search were the same as those for the NatureMap search. The TPFL database of threatened and priority flora and ecological communities and the Western Australian Herbarium (WAH) database (Department of Biodiversity, Conservation and Attractions (DBCA) 2019a) were searched by CAD Resources (Carine, WA). In addition, any flora recorded by Matiske Consulting Pty Ltd (1999, 2003, 2006 and 2019) in their study areas were included.

In addition, historical documentation and vegetation mapping of the region that provide resource material for the floristics and vegetation of the KOTH mining area was reviewed, for example: Beard's map (1974) and accompanying documentation (1976) of the vegetation of the Murchison region; Beard's (1990) overview of the Austin Botanical District; Pringle et al.'s (1994) description of the rangelands of the northeastern Goldfields; Cowan's (2001) description and overview of biodiversity values for the Murchison-1 IBRA subregion; Tille's (2006) soil-landscape mapping for the Western Australian rangelands and interior; and MCPL (1999, 2003, 2006 and 2019) reports on their flora and vegetation surveys in the KOTH mining area. Nomenclature of flora species was checked against and is consistent with Florabase (WAH 1998-).

2.2. Previous Surveys

MCPL conducted a flora and vegetation survey of 1600 ha likely to be disturbed by long-term pumping of groundwater beneath Sullivan Creek in July 1999 (MCPL 1999) for the owners at the time, Tarmoola Operations Pty Ltd. The area mapped was an approximately 8 km long by 1.5 km wide strip along Sullivan Creek, stretching from 6 km north of the currently active mining area to 1.5 km south. Seven relevé sites were surveyed in detail along with multiple vehicle and foot traverses of the survey area.

In June 2003, MCPL completed a flora and vegetation survey over prospects south of the Tarmoola pit and associated proposed haul roads for the lease holders at the time, Sons of Gwalia Ltd (MCPL 2003). The survey area included the Rainbow, Puzzle and Severn prospects, which are located south of the main Tarmoola pit (Red 5 Ltd 2019). The survey area was centred approximately 1 km south of the current haul road out to the Goldfields Highway from the southern side of the currently active mining area.

MCPL also carried out a flora and vegetation survey of proposed pipeline areas and fringes of the Tarmoola mine site for the then owners, St. Barbara Ltd, in April 2006 (MCPL 2006). The main part of the survey area was centred on main Tarmoola pit with a 1 km wide swath extending southwest for approximately 7 km. A total of 87 quadrats were surveyed, including 9 quadrats at the Gwalia mine approximately 25 km to the south of the KOTH mining area. Additional areas were assessed outside the current lease areas and this data has been utilized in this desktop report for regional context.

In 2019, MCPL completed a level 2 flora survey over the Cerebus-Eclipse and Centauri targets (approximately 627 hectares). The survey area was located to the north-west of the main Tarmoola pit. A total of 16 quadrats were sampled.

2.3. Field Survey

A detailed field assessment of the flora and vegetation of the four survey areas was undertaken by two botanists, from Mattiske, with extensive experience in the Goldfields region. The survey was completed over the 24th - 28th of March 2020. The survey work was carried out in accordance with methods outlined in *Technical Guidance – Flora and vegetation surveys for environmental impact assessment* (EPA 2016b). All botanists held valid collection licences to collect flora for scientific purposes, issued under the BC Act.

Aerial photographic maps of each survey area were prepared and supplied by CAD Resources. Survey quadrats were selected and search areas identified using aerial photographic maps and other field observations to provide adequate coverage and replication.

A total of 28 survey quadrats (Figure 6), measuring 20 m x 20 m, were selected to sample all vegetation types, with replication, within the PCP survey area. GPS locations of all survey quadrats are provided in Appendix B. The survey quadrats were not pegged. The northwest corner of the quadrat was marked on a GPS unit and a photograph taken looking southeast.

Flora and vegetation were described and sampled systematically at each survey quadrat, and additional opportunistic collections were undertaken wherever previously unrecorded plants were observed. At each quadrat the following floristic and environmental parameters were recorded:

- GPS location (GDA94 datum, zone 51J);
- Local topography;
- Soil type and colour;
- Outcropping rocks and their type;
- Percentage and type of litter cover and percentage bare ground;
- Approximate time since fire;
- Brief description of the vegetation;
- Vegetation condition (based on Trudgen 1988); and
- For each vascular plant species, the average height and the percentage cover (of both alive and dead material) over the survey quadrat.

In addition to vegetation mapping undertaken in the Power Corridor Project area, all survey areas were searched for threatened and priority flora via foot traverse. As well as areas traversed whilst enroute to survey quadrats, pockets of favoured habitat and known records were also targeted during the search to ensure adequate coverage of the survey areas (see Figure 6 for track logs).

All plant specimens collected during the field surveys were dried and processed in accordance with the requirements of the WAH. The plant species were identified based on taxonomic literature and through comparison with pressed specimens. Where appropriate, plant taxonomists with specialist skills were consulted. Nomenclature of the species recorded is in accordance with the WAH (1998-).

2.4. Survey Timing

According to the *Technical guidance – Flora and vegetation surveys for environmental impact assessment* (EPA 2016b), surveys in the Eremaean region should be undertaken in the optimal time for the area, approximately 6 – 8 weeks post wet season (March – June). This survey was performed in March, within the optimal time range, which minimised constraints in terms of species observation and identification.

To assess survey adequacy a species accumulation curve, based on accumulated species versus quadrats surveyed was prepared (*EstimateS* – Colwell 2013). As the number of survey quadrats increases, and correspondingly the size of the area surveyed increases, there should be a diminishing number of new species recorded. At a point, the number of new species recorded becomes essentially asymptotic. The asymptotic value was determined using Michaelis-Menten modelling based on combined data from all five survey areas, and provided an incidence-based coverage estimator of species richness (Chao 2004). When the number of new species being recorded for survey effort expended approaches this asymptotic value, the survey effort can be considered to be adequate.

2.5. Analysis of Quadrat Data

Plymouth Routines in Multivariate Ecological Research v7 (PRIMER) statistical analysis software was used to analyse species-by-quadrat data and discriminate survey quadrats on the basis of their species composition (Clarke and Gorley 2015). To down-weight the relative contributions of quantitatively dominant species, a square root transformation was applied to the data set. Computation of similarity matrices was based on the Bray-Curtis similarity measure. Data were analysed using a series of multivariate analysis routines including Hierarchical Clustering, Similarity Profile and Similarity Percentages. Results were used to inform and support interpretation of aerial photography and delineation of individual plant communities.

2.6. Vegetation Descriptions

Previous mapping within the project area by Mattiske used vegetation community descriptions based on the structural forms of Australian vegetation as outlined in Beard (1990). More recent vegetation community descriptions are based on the National Vegetation Information System (NVIS; Executive Steering Committee for Australian Vegetation Information 2003; Appendix A5). Vegetation communities identified in this report were described at the association level of the NVIS classification framework, consistent with the *Technical guidance – Flora and vegetation surveys for environmental impact assessment* (EPA 2016b). Vegetation communities were described and mapped using a combination of aerial imaging, previous vegetation mapping, statistical analysis and field observations.

In 2012 a taxonomic revision of Mulga species (*Acacia aneura* and its close relatives) in Western Australia was carried out (Maslin & Reid 2012). Several new species, which previously were classified under *A. aneura*, were recognised. These include *A. caesaneura* and *A. incurvaneura*, which were recorded in this survey. When comparison is made here with vegetation communities defined prior to 2012, *Acacia aneura*, as listed in previous surveys, is treated as equivalent to *Acacia ?caesaneura* and *Acacia ?incurvaneura* in this survey.

2.7. Survey Limitations

A general assessment was made of the current survey against a range of factors that may have limited the outcomes and conclusions of this report (Table 1).

Table 1: Potential limitations affecting survey conclusions

Potential survey limitation	Impact on current survey
Availability of contextual information at a regional and local scale	Not a limitation. Previous surveys have been performed in the immediate area surrounding the KOTH mine site by Mattiske (1999, 2003, 2006, 2019). Adequate background information at a broader scale was obtained from sources such as regional biodiversity summaries (Cowan 2001), rangeland land system surveys (Pringle et al. 1994), vegetation mapping (Beard 1974, 1976, 1990) and online flora and vegetation databases. These sources have all provided detailed contextual information for the current project (see desktop report).
Competency/experience of team carrying out survey; experience in the bioregion surveyed	Not a limitation. Botanists had extensive experience working within the Murchison region, WA.
Survey effort and extent of survey	Not a limitation. Generally the survey area was thoroughly covered. Survey quadrats were initially selected from high resolution aerial maps, with additional quadrats selected in situ based on in field observations. Lack of replication within some vegetation communities was unavoidable given their low occurrence within the survey area.
Access restrictions within survey area	Not a limitation. Survey areas had vehicle tracks through the general area, providing adequate access to undertake surveys.
Survey timing, rainfall, season of survey	Potential limitation. Survey timing was considered optimal as it was performed during the recommended months of March-June (EPA 2016b) and rainfall in the months prior to the surveys was above average (BOM 2020). While identification to species level was problematic for some flora the dominant structural components were largely definable and discernible between communities. Of the fourteen priority species potentially found in the area, only three were in flowering season during the survey period, this however did not unduly compromise identification as many of the target species can be recognised in the field by foliage alone.
Disturbances (fire/flood/clearing)	Not a limitation. Field observations suggest the last fire in the area was more than 20 years ago. Evidence of the presence cattle was observed at several sites; however, there did not appear to be any signs of substantial grazing or trampling of vegetation associated with cattle over the survey area. The survey area was considerably disturbed by vehicle tracks, as there were a multitude of drill sites and thoroughfares within and intersecting the survey area. This disturbance is likely to assist the spread of invasive plant species.
Accuracy of data and suitability of statistical analysis	Not a limitation. Measures were taken to improve the robustness of data and analysis (See Methods section); however, the relatively small number of survey sites does result in increased levels of uncertainty.

3. RESULTS

The climate, geology, soils and landforms all influence the vegetation of the area and are described in this section. Flora, including threatened, priority and introduced species are described, along with possible vegetation communities, and placed within a local and regional context.

3.1. Climate

The Austin Botanical District is characterised by an arid climate with cool winters and hot, dry summers. Rain falls in both the warm and cool seasons (Beard 1990).

The nearest Bureau of Meteorology (BOM) weather stations with the most complete long-term and the latest climate data are Leonora Station (ID 12046) and Leonora Aero Station (ID 12241), respectively, both of which are located approximately 25 km southeast of the project area (BOM 2019). Rainfall and air temperature data for the twelve months to January 2020 and averaged over the long-term (1961-1990) are shown in Figure 2. Total rainfall for the 12 months to February 2020 was 134 mm, lower than the long-term average annual rainfall of 244.2 mm. However, over that time period, over half of the total rainfall (73 mm) fell in summer (December - February 2020), just before the survey was undertaken. High rainfall is optimum for growth of annual species and for flowering and fruiting of perennial species, aiding in identification to species level. Winter rainfall promotes the growth of annual species and summer cyclonic rainfall tends to aid the growth of woody plants. However, the effectiveness of rainfall for overall plant growth is higher in winter when evaporative demand is lower due to the lower temperatures. Soil water is therefore available to plants for growth for longer periods of time (Gilligan 1994).

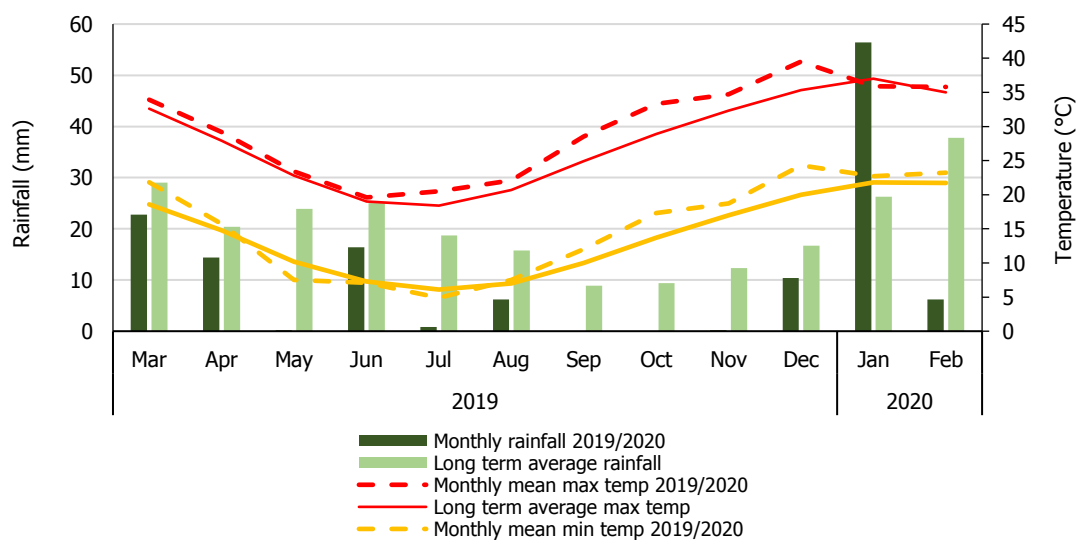


Figure 2: Climatic data for Leonora, WA (BOM 2019-2020)

Long term average rainfall and temperature from the Leonora weather station (ID 12046, years 1961-1990) and monthly rainfall and temperature from the Leonora Aero weather station (ID 12241, Mar 2019 – Feb 2020)

3.2. Desktop

3.2.1. Geology, Soils and Topography

The Eastern Goldfields region is underlain by rocks of the Yilgarn Craton which are mostly Archaean granitic rocks, often intruded by quartz veins and dolerite dykes. Areas of Archaean migmatite and gneiss are associated with Archaean greenstone belts, which contain a mix of metamorphosed mafic-ultramafic and felsic volcanics and metasediments. The Archaean bedrock has been extensively weathered and is often covered by Tertiary and Quaternary alluvial, colluvial and Aeolian deposits (Beard 1990; Tille 2006).

The KOTH gold deposit is situated within the Tarmoola Archaean-aged greenstone belt, which is related to the northwest trending Sons of Gwalia shear zone. The Tarmoola structure is dominated by a granitoid pluton that intrudes a sequence of supracrustal rocks (greenstone). The major ore bodies are related to the contact between the pluton and the greenstone, and the Ursus and Tarmoola Fault Zones, where pervasive hydrothermal alteration has resulted in the deposition of gold (PorterGeo n.d.; Red 5 Ltd 2019).

The northern part of the Eastern Goldfields region is characterised by its internal drainage, with the most obvious features being salt lake systems (associated with a deeper paleodrainage system) and extensive areas of elevated red desert sandplains (Cowan 2001). However, within the greenstone belts, such as at the KOTH mining area, low rounded hills and rocky ridges dominate the topography, along with occasional laterite breakaways and broad stony slopes. Hardpan wash plains and stony plains are often found below the hills, but not the extensive sandplains found elsewhere in the region (Tille 2006). Topography and drainage of the KOTH mining area are shown in Figure 4.

The soils of the area generally comprise: red loamy earths and red-brown hardpan shallow loams with some red shallow loams on the wash plains; red shallow loams with red shallow sandy duplexes on stony plains; red shallow sands on gritty plains over granite; and red shallow loams, stony soils and red shallow sands in the hilly areas (Beard 1976, Tille 2006). Further soil description is given in section 3.3.2.

Soil-landscape zones of Western Australia's rangelands and arid interior were defined by Tille (2006) and describe an area using various physical and biological aspects. The KOTH mining area and surrounds are situated in Tille's (2006) Salinaland Plains Zone within the Murchison Province. The Salinaland Plains Zone soil-landscape zone is described as "sandplains (with hardpan wash plains and some mesas, stony plains and salt lakes) on granitic rocks (and some greenstone) of the Yilgarn Craton. Red sandy earths, red deep sands, red shallow loams and red loamy earths with some red-brown hardpan shallow loams, salt lake soils and red shallow sandy duplexes. Mulga shrublands with spinifex grasslands (and some halophytic shrublands and eucalypt woodlands)" (Tille 2006).

3.2.2. Regional Vegetation

The King of the Hills Project lies within the Austin Botanical District of the Eremaean Botanical Province (Beard 1990). More recently, the vegetation of Western Australia has been assigned to bioregions and subregions under the Interim Biogeographical Regionalisation for Australia (IBRA, v7) (DAWE 2020b), with the project area being situated within the *MURI – East Murchison* subregion of the Murchison Bioregion. Vegetation within this subregion is described as being 'dominated by Mulga Woodlands often rich in ephemerals; hummock grasslands, saltbush shrublands and *Tecticornia* shrublands'. There are no Threatened Ecological Communities in the East Murchison subregion (Cowan 2001).

Several studies describe the vegetation of the KOTH mining area (e.g., Beard 1974, Beard 1976, Beard 1990, Pringle et al. 1994, Tille 2006); some of these are summarised below.

3.2.3. Botanical Districts

The Austin Botanical District, in which the survey area is located, is the largest of the Eremaean regions and is predominately Mulga (*Acacia aneura* and its close relatives) low woodlands on red loams over siliceous hardpans on the plains reducing to scrub on the rises and hills (Pringle et al. 1994). This botanical district is also comprised of tree steppe of *Eucalyptus* spp. and *Triodia basedowii* on sand plains (Beard 1990), Mulga and *Eremophila* shrublands which dominate on stony plains, and chenopod communities are more often associated with duplex soils (Pringle et al. 1994).

Acacia aneura grows in the form of a tree with a single erect trunk on the more favourable soils, i.e. red loam soil overlying siliceous hardpan, forming low woodland. On other soils both further up slope or down slope towards the rivers, it takes the form of a shrub. It tends to be absent or sparingly present on sandplains and on heavy alkaline and saline soils. On stony plains and stony pediments in many parts of the region nearly all the mulga is dead, under which conditions the understorey species of *Senna* and *Eremophila* become larger and numerous, as well as some secondary *Acacia* species (Beard 1990).

The structure and component species of mulga low woodland consist of:

- an open low tree or tall shrub layer of more than 3 m, including *Acacia aneura* (most abundant), localised populations of *A. coriacea*, *A. ligulata*, *A. ramulosa*, *A. tetragonophylla*, *Hakea lorea*, and scattered *Eucalyptus kingsmillii*, *E. lucasii*;
- a sparse low shrub layer of 1-2 m including *Senna* spp., *Eremophila* spp. and *Ptilotus* spp.; and
- a ground layer of ephemeral herbs which may be a closed one in a favourable season, including *Cephalopterum drummondii*, *Ptilotus* spp., *Rhodanthe* spp., *Swainsona* spp. This layer may not be present in an unfavourable season. There are also sparse perennial and annual grasses including *Aristida* spp., *Eragrostis* spp. and *Eriachne* spp. (Beard 1990).

The KOTH mining area is situated within the Laverton sub-region of the Austin Botanical District. In particular, it is located within the chain of hills running through Leonora. The rockier hills are vegetated with scrubland of *Acacia aneura* and *A. quadrimarginea* over *Eremophila leucophylla* [now *E. forrestii*], *Ptilotus obovatus* and annual herbs. On the gentler slopes *Acacia aneura* of medium height dominates, over *Cassia nemophila* [now *Senna artemisioides* subsp. x *coriacea*], *Eremophila compacta*, *E. dielsiana* [now *E. platycalyx*], *E. granitica*, *Stipa variabilis* [now *Austrostipa variabilis*] and annual herbs. Open salty patches on the slopes are vegetated with *Hakea preissii* and *Maireana pyramidata* (Beard 1990).

3.2.4. Land systems

Land system mapping of the north-eastern Goldfields, including the survey area, has been prepared by the Western Australia Department of Agriculture (now the Agriculture and Food division of the Department of Primary Industries and Regional Development) (Pringle et al. 1994). This mapping sought to define the topographic characteristics of the north-eastern Goldfields. Land systems are grouped into land types according to a combination of landforms, soils, vegetation and drainage patterns. Pringle et al. (1994) noted that boundaries between plant communities are often sharp and mostly associated with boundaries between landforms and their soils along the slope of the land. Greater diversity in plant communities is often found higher in the landscape where differential weathering and erosion occurs. Across slope, changes are usually more subtle.

A total of eight land systems are intersected by the survey areas (Table 2; Figure 3). A description of each land system, summarised from Pringle et al. (1994) is presented after Table 2.

Table 2: Extent of land systems intersecting the survey areas at the KOTH mine
Data from Tille (2006).

LAND SYSTEM	MAP UNIT	Hectares (Ha) inside survey areas				CURRENT EXTENT (ha)	Percentage (%) impact inside survey areas			
		POWER CORRIDOR	HAUL ROAD	TSF6	CAMP		POWER CORRIDOR	HAUL ROAD	TSF6	CAMP
Brooking	Br	-	-	108.12	-	96709.19	0.001	0.000	0.000	0.000
Gundockerta	Gu	-	63.39	-	-	340558.66	0.000	0.000	0.000	0.000
Jundee	Ju	202.07	-	--	18.23	664962.80	0.000	0.000	0.000	0.000
Monk	Mk	1084.16	-	-	-	998274.96	0.001	0.000	0.000	0.000
Nubev	Nu	-	-	34.42	-	153742.23	0.000	0.000	0.000	0.000
Rainbow	Rb	-	21.75	-	-	258665.87	0.000	0.000	0.000	0.000
Violet	Vi	-	-	166.78	47.90	548625.39	0.000	0.000	0.000	0.000
Wilson	Ws	-	102.29	-	-	48416.18	0.000	0.000	0.000	0.000

Brooking System

Prominent ridges of banded iron formation supporting mulga shrublands and occasional minor halophytic communities.

Gundockerta System

Extensive, gently undulating, calcareous, stony plains, supporting bluebush shrublands.

Jundee System

Hardpan plains with variable gravelly mantles and minor sandy banks supporting weakly groved mulga shrublands.

Monk System

Hardpan plains with occasional sandy banks supporting mulga tall shrublands and wanderrie grasses.

Nubev System

Gently undulating stony plains, minor limonitic low rises and drainage floors supporting mulga and halophytic shrublands.

Rainbow System

Hardpan plains supporting mulga shrublands.

Violet System

Gently undulating gravelly plains on greenstone, laterite and hardpan, with low stony rises and minor saline plains; supporting groved mulga and bowgada shrublands and occasionally chenopod shrublands.

Wilson System

Large creeks with extensive tributary fans, supporting mulga and chenopod shrublands.

3.2.5. Pre-European Vegetation

Pre-European vegetation (DBCA 2019b, Shepherd et al. 2002) within the King of the Hills mining area (Figure 7) is described in Table 2a. The entire area is covered by *Acacia* spp. low woodland (units 18.16 and 28) and shrubland (unit 39.3).

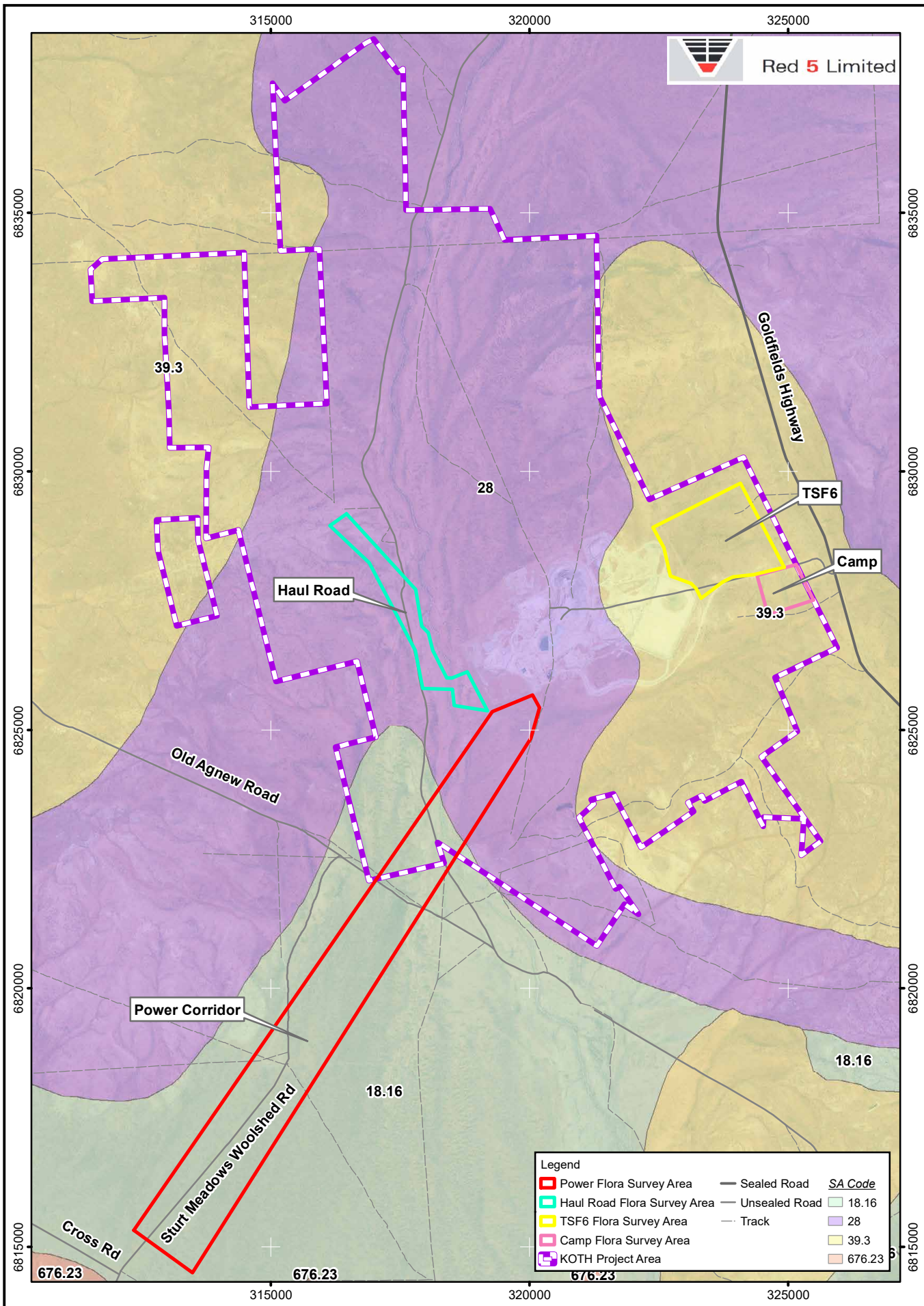
Table 3a: Pre-European vegetation of the KOTH mining area

NUMBER	DESCRIPTION	% REMAINING IN EASTERN MURCHISON IBRA SUBREGION
18.16	Low woodland, open low woodland or sparse woodland of Mulga (<i>Acacia aneura</i>) over <i>Eremophila</i> sparse shrubland over <i>Eragrostis</i> mixed sparse tussock grassland.	99.4
28	Low woodland, open low woodland or sparse woodland of Mulga (<i>Acacia aneura</i>) and associated species.	97.4
39.3	Scrub, open scrub or sparse scrub of <i>Acacia</i> species over <i>Ptilotus</i> sparse forbland.	97.5

The Pre-European vegetation units within each of the survey areas are shown in Table 3b.

Table 3b: Pre-European vegetation units in each survey area

VEGETATION UNIT	HECTARES (HA) INSIDE SURVEY AREAS				CURRENT EXTENT (HA)	PERCENTAGE (%) IMPACT INSIDE SURVEY AREAS			
	POWER CORRIDOR	HAUL ROAD	TSF6	CAMP		POWER CORRIDOR	HAUL ROAD	TSF6	CAMP
18.16	1203.83	-	-	-	2539173.83	0.047	-	-	-
28.00	243.03	187.43	-	-	379144.35	0.064	0.049	-	-
39.30	-	-	309.32	66.13	155400.67	-	-	0.199	-



Legend		SA Code
	Power Flora Survey Area	18.16
	Haul Road Flora Survey Area	28
	TSF6 Flora Survey Area	39.3
	Camp Flora Survey Area	676.23
	KOTH Project Area	
	Sealed Road	
	Unsealed Road	
	Track	

Source: Image: Landgate, Tracks: MRD, Pre European Veg: DPIRD

N
0 1.75 km
Scale: 1:100,000
MGA94 (Zone 51)
CAD Ref: a2725_f09_06
Date: April 2020

 **Mattiske** Consulting Pty Ltd
28 Central Road, Kalamunda WA 6076 ~ Tel: 9257 1625 ~ Fax: 9257 1640
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King Of The Hill Project Pre European Vegetation

3.2.6. Vegetation Communities

Beard (1974, 1976) mapped the vegetation of the Murchison region at 1:1,000,000 scale. His vegetation units in the vicinity of the KOTH mining area include: Mulga (*Acacia aneura*) shrubland, Mulga open low woodland on denuded greenstone hills and Mulga low woodland (Beard 1974).

In previous vegetation mapping in and around the KOTH mining area, MCPL (1999, 2003, 2006 and 2019) defined 24 vegetation communities (Figure 5).

In the MCPL (1999) survey, four vegetation communities were mapped as occurring within the survey area; two communities of Acacia shrublands, one of Eucalypt woodlands and one of Chenopod shrublands. No Threatened ecological communities were recorded in the survey area. It was noted that the communities identified were well represented regionally within the conservation estate.

The MCPL (2003) survey, on the southern side of the currently active mining area, mapped five vegetation communities over the survey area; these included four Mulga (*Acacia aneura*) communities (on plains, quartz plains, floodplains and creeklines) and one Grassland community. No Threatened ecological communities were recorded in the survey area. None of the vegetation communities mapped were considered to be of local or regional significance as they were well represented throughout the Botanical District.

Twelve vegetation communities were defined in the survey areas over the currently active mining area by MCPL (2006); ten Low Open Forest or Low Open Woodland communities dominated by *Acacia aneura* varieties; one Open Chenopod Shrubland community; and one Open Woodland of *Eucalyptus camaldulensis* var. *obtusa*. It was noted that the complexity of the communities reflected the inherent complexity of the landform and soils. Three of the mapped vegetation communities (A8, A10 and A11) were considered to be of local significance due to their restricted distribution associated with the local topography; four communities (A3, A7, A8 and C1) were thought to be of interest as they supported the two known priority species. No Threatened ecological communities were recorded in the survey area. Vegetation condition was found to vary from degraded near the mine site to excellent in the less disturbed areas further away from the mine.

In the MCPL (2019) survey, six communities were identified. Three of those communities (A1, A2 and A3) were found to be similar to communities found in past surveys (2003 and 2006). The remaining three communities (A12, A13 and Er1) were unique to the 2019 survey. The newly discovered Acacia communities differed from those previously documented due to understorey species composition. The Er1 community was unique due to the dominance of *Eremophila scoparia* and was a statistical outlier, being observed at a single site. No Threatened ecological communities were recorded in the survey area.

315000

320000

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6835000

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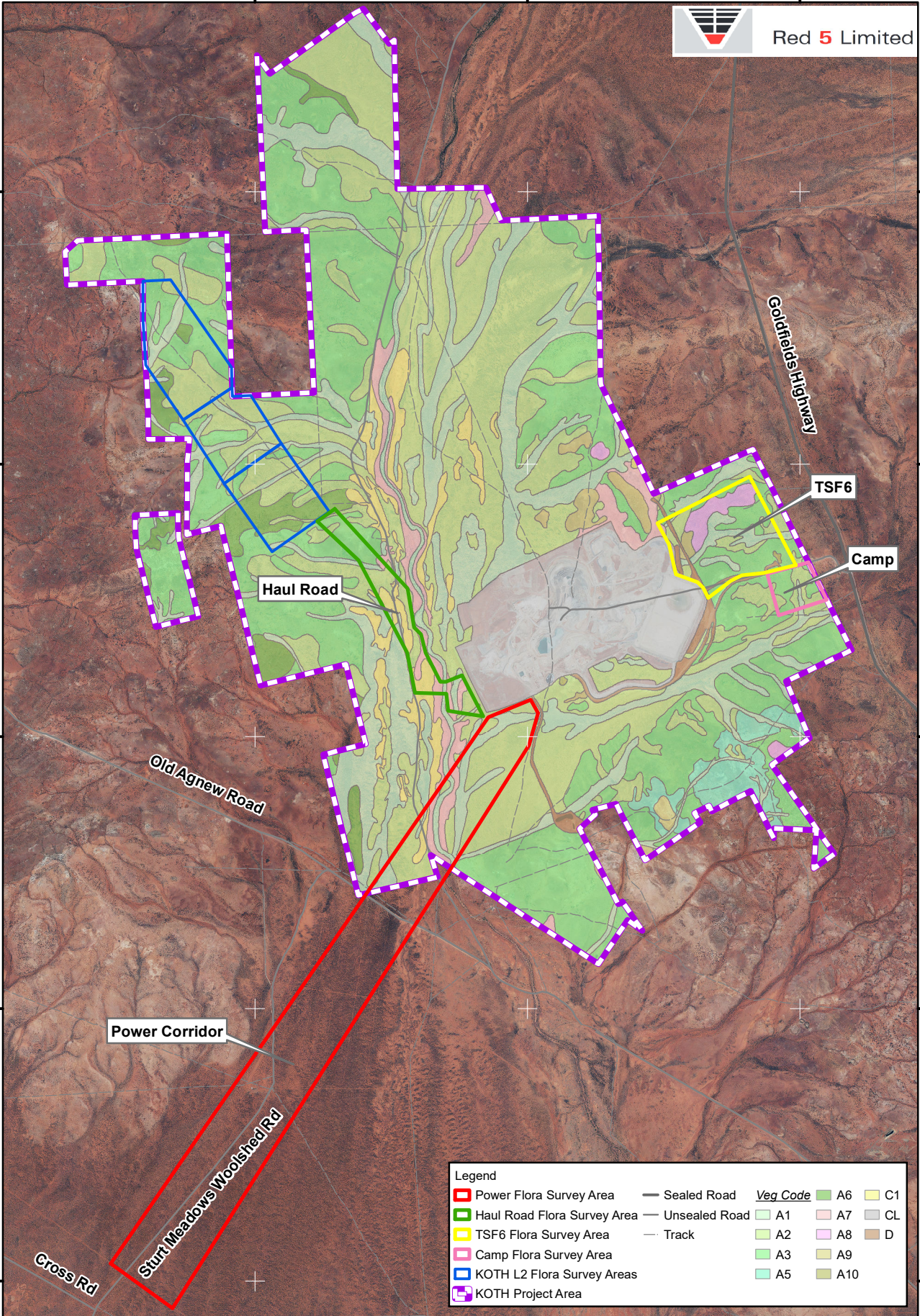
6825000

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6815000

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Source: Image: Landgate, Tracks: MRD, Historical Vegetation Mapping: MCPL

N
0 1.75 km
Scale: 1:100,000
MGA94 (Zone 51)
CAD Ref: a2725_f09_07
Date: April 2020

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King Of The Hill Project Historical Vegetation Mapping

Figure:
5

3.2.7. Potential Flora

A total of 326 vascular plant taxa, representative of 133 genera and 51 families (Appendix C), had the potential to occur within the PCP, HRP, Camp and TSF6 survey areas (see section 2.1 for methodology). The most commonly represented families are Fabaceae (47 taxa), Chenopodiaceae (46 taxa) and Poaceae (41 taxa). The most commonly represented genera are *Eremophila* (29 taxa), *Acacia* (28 taxa) and *Maireana* (15 taxa).

In comparison, Mattiske Consulting Pty Ltd in 1999 recorded 77 vascular plant taxa, comprising 44 genera and 23 families, with 4 introduced taxa and no threatened or priority flora recorded. The MCPL (2003) survey, on the southern side of the currently active main mining area, found 67 vascular plant taxa, representative of 46 genera and 30 families, of which 5 were introduced species. Species diversity was lower than expected, due to extensive grazing and also the after-effects of a hailstorm. No threatened flora and no priority flora were recorded. In the 2006 MCPL survey over the currently active mining area, a total of 186 flora taxa, representative of 90 genera and 43 families, were recorded. Ten of these taxa were introduced species. No threatened flora species were found, but two priority flora species were recorded: *Stenanthemum patens* (Priority 1) and *Frankenia georgei* (Priority 3 in 2006; now ranked Priority 1). The MCPL 2019 survey found a total of 45 vascular plant taxa, representative of 19 genera and 14 families. No threatened or priority species were recorded.

3.2.8. Potential Threatened and Priority Flora

No threatened flora species, pursuant to section 179 of the *EPBC Act* and as listed by DAWE (2020c) or pursuant to Part 2, Division 1 and Subdivision 2 of the *BC Act* and as listed by DBCA (2018a) are likely to occur in the KOTH survey areas.

A total of fourteen priority flora species as listed by DBCA (2018b) have the potential to occur within the survey areas (Appendix D). These taxa are:

- Priority 1: *Calandrinia quartzica*, *Frankenia georgei*, *Korthalsella leucothrix*, *Micromyrtus chrysodema* and *Stenanthemum patens*
- Priority 3: *Acacia* sp. Marshall Pool (G. Cockerton 3024), *Calytrix praecipua*, *Eremophila simulans* subsp. *megacalyx*, *Micromyrtus serrulata*, *Phyllanthus baeckeoides*, *Sauropus* sp. Woolgorong (M. Officer s.n. 10/8/94) and *Thryptomene* sp. Leinster (B.J. Lepschi & L.A. Craven 4362)
- Priority 4: *Grevillea inconspicua* and *Hemigenia exilis*

Three of these taxa were observed by MCPL (2006) within the KOTH mining area: *Frankenia georgei* (P1), *Stenanthemum patens* (P1) and *Sauropus* sp. Woolgorong (M. Officer s.n. 10/8/94) (P3). Of these, both *F. georgei* and *S. patens* were identified by the NatureMap (Department of Parks and Wildlife 2007-) search, along with *Calandrinia quartzica* (P1) and *Grevillea inconspicua* (P4). Searches of the DBCA databases (DBCA 2020a) resulted in thirteen priority taxa (all of those listed above except *Sauropus* sp. Woolgorong (M. Officer s.n. 10/8/94) (P3)).

Frankenia georgei (P1) was recorded in two sites in the MCPL 2006 survey within the boundary of the KOTH mining area, in vegetation communities A7 and A8. *Stenanthemum patens* (P1) was recorded in two sites in the MCPL 2006 survey within the boundary of the KOTH mining area, in vegetation communities A3 and A8. *Sauropus* sp. Woolgorong (M. Officer s.n. 10/8/94) (P3) was recorded in the MCPL (2006) survey in one location, just inside the eastern boundary of the Level 2 survey in the vegetation community A8 (see Appendix B for description). This species was originally recorded as *Sauropus ramosissimus*, which is currently housed under *Sauropus* sp. Woolgorong (M. Officer s.n. 10/8/94) (Barrett & Telford 2015). Additionally, *Grevillea inconspicua* (P4) was recorded in a cluster of locations in 1992 (DBCA 2020a) just outside the northwestern boundary of the KOTH survey area, approximately 6km from the proposed HRP site (Figure 9). No other species have been recorded within 10 km of the KOTH mining area, according to the performed searches (MCPL 1999, 2003, 2006, 2019; Department of Parks and Wildlife 2007-; DBCA 2020a).

The likelihood that these species would occur within the survey areas was determined using the following criteria:

- Known records within a 40 km radius of the centre of the survey area (as described above). More recent, proximal and numerous records were ranked higher.
- Potential presence of suitable habitat and landforms for the species within the survey area (e.g. soil type, bedrock type, topography, drainage lines, vegetation).

The likelihood was ranked Low, Medium or High.

Four species, *Frankenia georgei* (P1), *Stenanthemum patens* (P1), *Sauropus* sp. Woolgorong (M. Officer s.n. 10/8/94) (P3) and *Grevillea inconspicua* (P4) were ranked as having a High likelihood of occurrence in the survey area; all of these taxa have been recorded in or on the boundary of the proposed survey areas and have compatible habitats. Additionally, seven species were assessed as having a Medium likelihood and three species have a Low likelihood of occurrence (Appendix G).

All potential threatened and priority flora are listed in Appendix D, along with their State Conservation Codes (see Appendix A for definitions), a description and an assessment of the likelihood of their occurrence in the Western and Northern survey areas.

3.2.9. Potential Introduced (Weed) Species and Declared Pest (Plant) Organisms

A total of 26 introduced taxa from 13 families and 21 genera may potentially exist in the proposed survey areas, based on NatureMap (Department of Parks and Wildlife 2007-), the *EPBC Act* Protected Matters Search Tool (DAWE 2020a) search results (section 2.1 and Appendix C) and records from MCPL (1999, 2003, 2006, 2019) surveys.

Five of the potential introduced taxa are listed as both Weeds of National Significance (DAWE 2020d) and Declared Pest organisms pursuant to section 22 of the *BAM Act* (Department of Primary Industries and Regional Development 2020a) and have a Prohibited Organism Control category of 'C3 – Restricted' (see Appendix A for definitions). Four (all except the generic *Cylindropuntia* sp.) are also Goldfields Region Priority Alert Weeds (Appendix E). These taxa are all opuntoid cacti in the Cactaceae family:

- *Cylindropuntia fulgida* var. *mamillata*
- *Cylindropuntia imbricata*
- *Cylindropuntia* sp. (in the Murchison IBRA bioregion this includes the above two listed *Cylindropuntia* species and *C. pallida*)
- *Opuntia elata*
- *Opuntia stricta*

The remaining 22 potential introduced taxa are listed as Permitted Organisms pursuant to section 11 of the *BAM Act* (Department of Primary Industries and Regional Development 2020a)(see Appendix A for definitions).

During the MCPL (1999) survey, four introduced flora species were recorded, in the (2003) survey five introduced flora species were recorded, ten species (including two recorded in 2003) were recorded in the later (MCPL 2006) survey, and four introduced species were recorded in 2019 (including two recorded in 2006).

An assessment of the likelihood that the five potential conservation significant introduced taxa would occur within the survey areas (Appendix E) was determined using the following criteria:

- Known records within a 40 km radius of the centre of the survey area (as described above). More recent, proximal and numerous records were ranked higher.
- Potential presence of suitable habitat and landforms for the species within the survey area (e.g. soil type, bedrock type, topography, drainage lines, vegetation).

The likelihood was ranked Low, Medium or High.

Of the five potential conservation significant introduced taxa, four are ranked as having a High likelihood of occurrence in the proposed survey area; these taxa have all been recorded on the southwestern boundary of the proposed survey area (at Tarmoola Station homestead in 2007). The other taxon, *Opuntia stricta*, is ranked as having a Medium likelihood of occurrence in the survey area; its nearest known location is 25 km to the south in the Gwalia mine area (Appendix E).

Five other of the introduced taxa with the potential to occur in the KOTH mining area have been ranked as having both High Ecological Impact and Rapid Invasiveness by the DBCA's weed prioritisation process (Department of Parks and Wildlife 2014): **Carrichtera annua*, **Cenchrus ciliaris*, **Cenchrus setiger*, **Centaurea melitensis* and **Cynodon dactylon*.

3.2.10. Potential Threatened and Priority Ecological Communities

There are no threatened ecological communities (TECs) listed at Commonwealth level pursuant to sections 181 and 182 of the *EPBC Act* and listed by the DAWE (2020e) or at State level pursuant to Part 2 of the *BC Act* and as listed by DBCA (2018c) and no priority ecological communities (PECs) as listed at State level by DBCA (2020c) that could potentially occur within the KOTH mining area.

There are no TECs listed at either Commonwealth DAWE (2020e) or State DBCA (2018c) level for the for the Murchison-1 IBRA subregion. There are, however, a number of PECs that occur within the subregion. These mostly relate to vegetation complexes on banded iron formation ranges or invertebrate assemblages inhabiting groundwater within calcrete aquifers in paleodrainage associated with salt lakes. The nearest PEC to the proposed survey areas is the 'Mt Forrest-Mt Richardson (Bulga Downs) vegetation complex (banded ironstone formation)' located on the ex-Bulga Downs pastoral lease 90 km to the west of the KOTH mining area. There are several other vegetation complexes associated with banded ironstone formations that are listed as PECs to the west of the KOTH mining area, and at least one to the east ('Mount Linden banded ironstone formation vegetation complex' (P3)). There are also several calcrete groundwater invertebrate assemblage related PECs in the area (DBCA 2020c).

3.2.11. Other Areas of Conservation Significance

There are no DBCA managed lands within the KOTH mining area. Lake Ballard, a nationally important wetland (DAWE 2020f), is located approximately 90 km to the southwest. Approximately 90 km to the west of the KOTH mining area a portion of the Bulga Downs pastoral lease is in the process of being gazetted as part of the National Reserve System (DAWE 2016). Goongarrie National Park is around 140 km to the south. A major watercourse, Sullivan Creek, flows north-south through the middle of the KOTH mining area (Figure 1). The drainage from the western half of the KOTH mining area (including the proposed survey areas) is predominantly to the east into Sullivan Creek, although at the western edge of the Western survey area the drainage is to the west away from the tenements. Sullivan Creek drains into the Lake Raeside system of salt lakes approximately 15 km south of the KOTH mining area and 15 km west of Leonora.

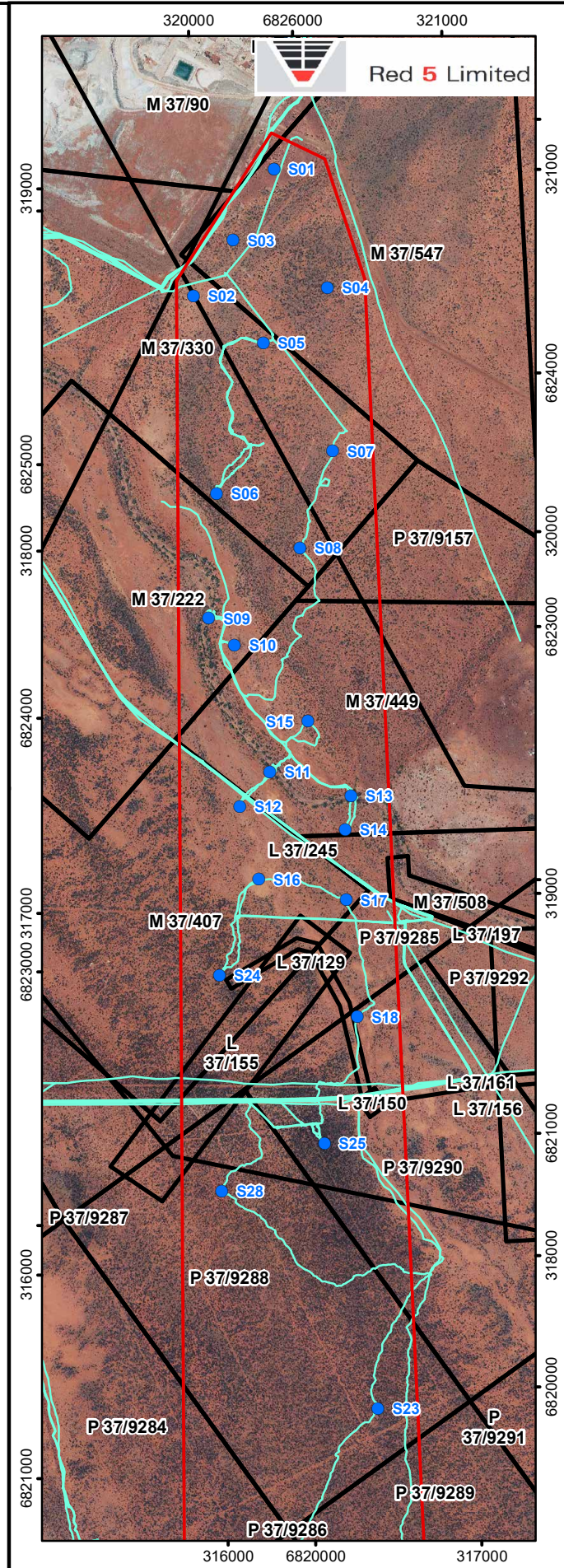
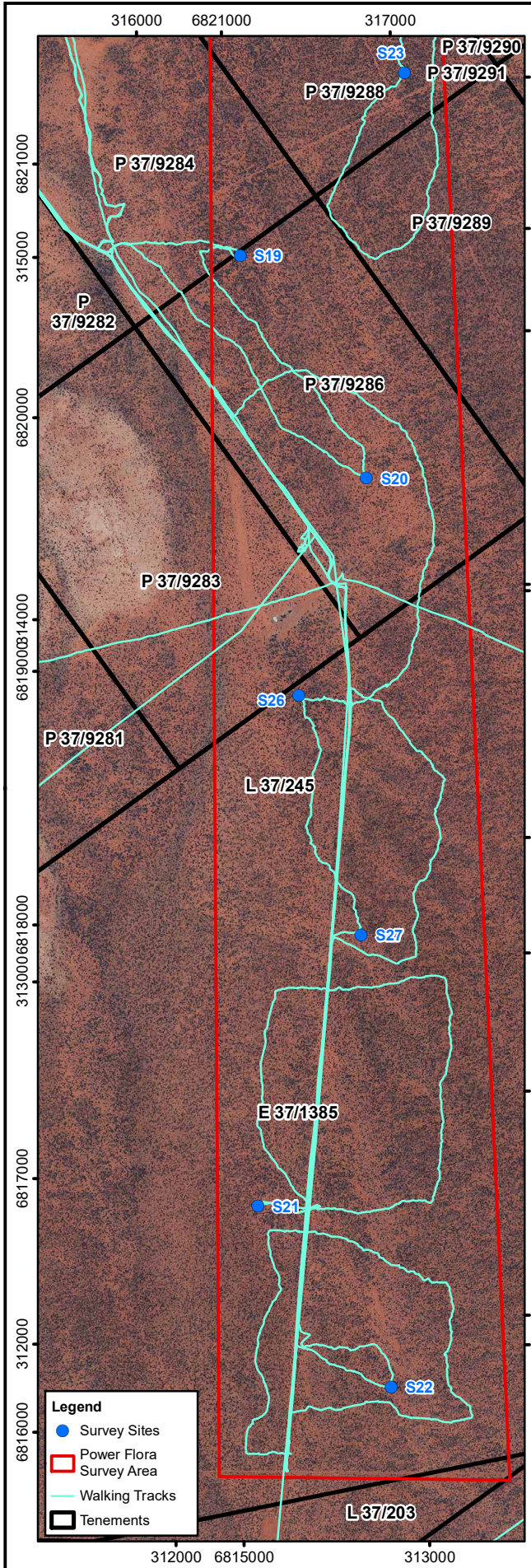
3.2.12. Aboriginal Heritage and Native Title

There are two registered Aboriginal Heritage Sites inside the proposed survey areas covered in this desktop survey. Lake Raeside/Sullivan Creek itself, which runs through the centre of the PCP and HRP areas and one smaller, more specific site within Sullivan Creek inside the PCP area. One other site (15266) is inside the previous KOTH level 1 survey area but outside the proposed PCP area. Three more sites nearby outside the KOTH mining area. None of these sites are protected areas and none are subject to gender restrictions (Department of Planning, Lands and Heritage 2019). These sites are listed in Appendix F (Table F1).


The KOTH mining area is in the centre of the Native Title application *DARLOT WC2018/005* (filed 04/10/2018) which is 47,207 km² in area and also includes the town of Leonora.

3.2.13. Other Heritage Places

At least 22 other heritage places are located in the vicinity of the updated mining areas not surveyed last year (Appendix F; Table F2). Of these, 14 are on the boundary of, or inside, the mining area. These comprise natural features, water sources, mythological and ceremonial sites, camps, man-made structures, artefacts/scatter, an old mining settlement and a hunting place. None of these sites are protected areas (Department of Planning, Lands and Heritage 2019).



Source: Image: Landgate (Nov 2014)



 0 500 m

 Scale: 1:30,000

 MGA94 (Zone 51)


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King Of The Hill Project
Power Corridor
MCPL Sites and Tracks

Figure: **6**

3.3. Field Survey

3.3.1. Flora

A total of 67 vascular plant taxa, representative of 43 genera and 24 families (Appendix H) were recorded within the Power Corridor survey area. The most commonly represented families were Poaceae (13 taxa), Fabaceae (12 taxa) and Scrophulariaceae (7 taxa). The most commonly represented genera were Eremophila (7 taxa), Senna (6 taxa) and Acacia (5 taxa). Plant species as recorded at each site are listed in Appendix I.

Species richness averaged 12.14 species per 20 m x 20 m quadrat, with a range from 4 to 32 species. Eight taxa were annual species. Over 58 % of the taxa recorded were shrubs or trees. Additionally, 12 taxa were identified to genus level and two to family level only, due to the lack of fertile material available on the plants which enables identification to a species level. Eighteen taxa were singletons, i.e. recorded at one site only.

A species accumulation curve (Colwell 2013) was used to evaluate the sampling adequacy and is presented in Figure 7. The incidence-based coverage estimator of species richness was 83. Based on this value and the total of 67 taxa recorded in this survey, approximately 80.68% of the flora species potentially present within the survey area were recorded.

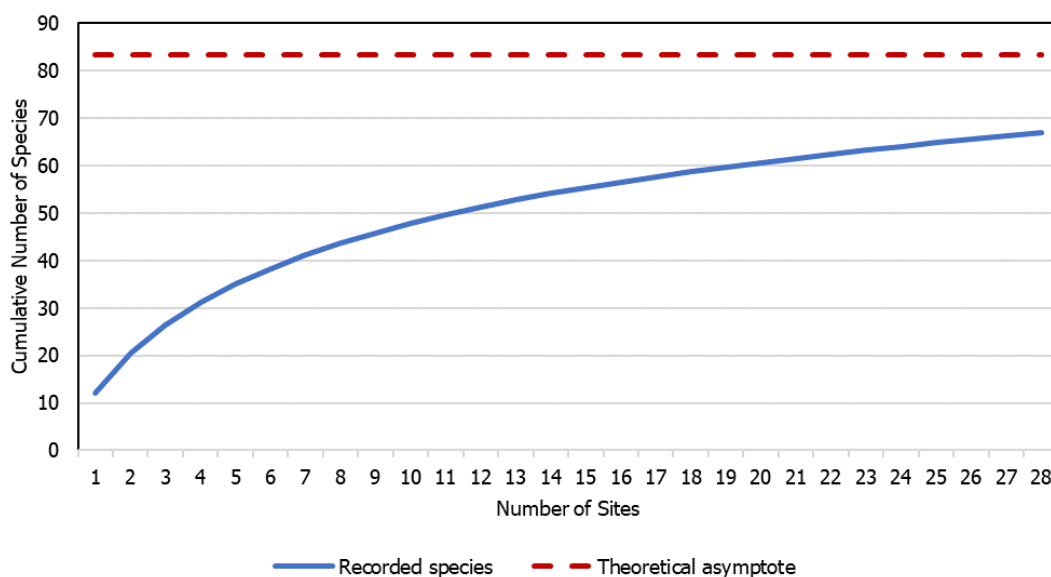


Figure 7: Species Accumulation Curve for the King of the Hills Power Corridor survey area, March 2020

3.3.2. Threatened and Priority Flora

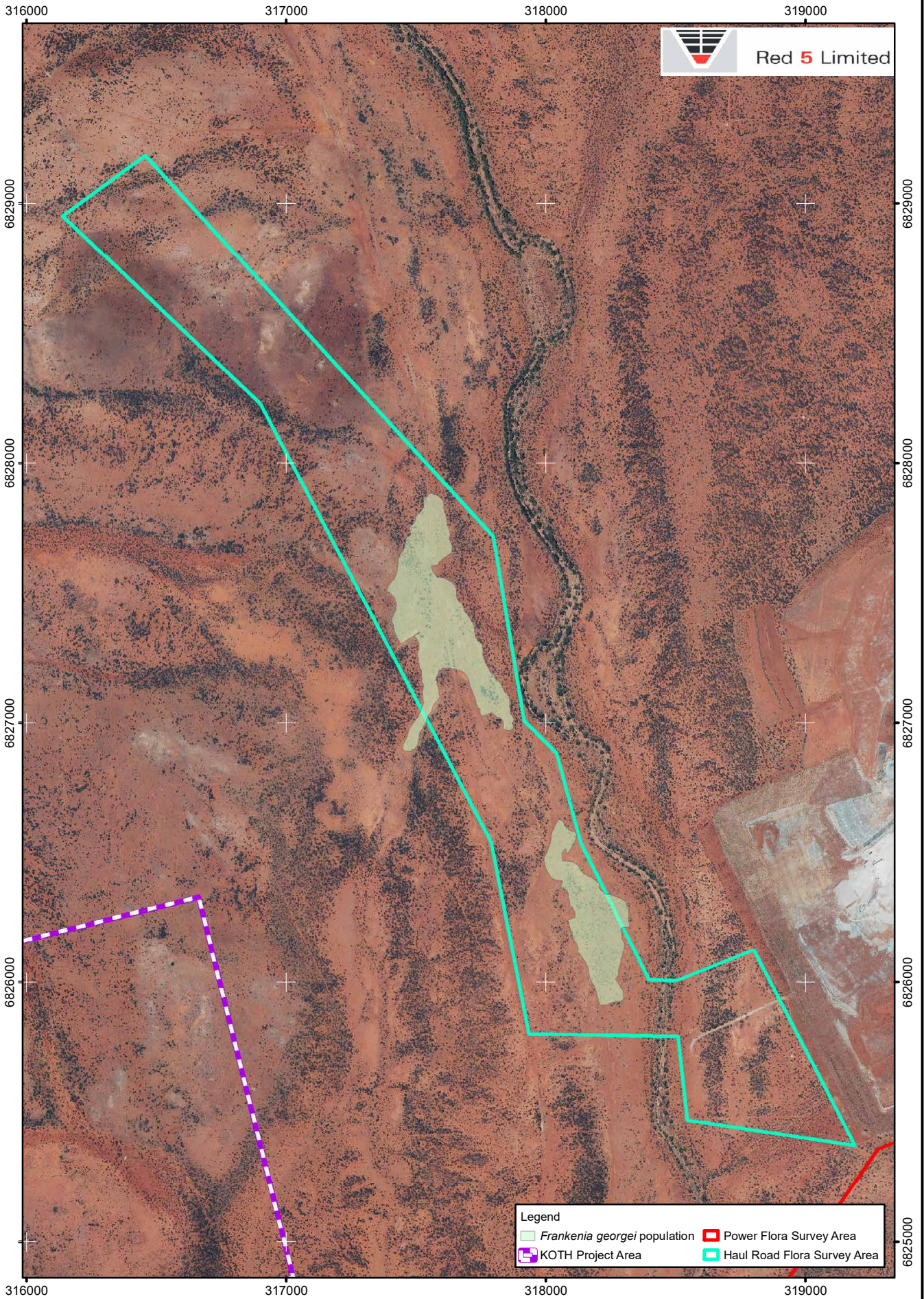
No threatened flora species, pursuant to section 179 of the *EPBC Act* and as listed by DAWE (2020a) were found in the survey areas. One priority flora species pursuant to Part 2, Division 1 and Subdivision 2 of the *BC Act* and as listed by DBCA (2018a, 2018b) was recorded in the Haul road survey area. *Frankenia georgei* (P1) had been previously recorded by Mattiske in 2006, during the 2020 survey the extent of the population was mapped and was found to overlap with part of the middle section of the HRP area (Figure 8). The population stretched across most of the width of the proposed corridor and covered a total area of approximately 0.29 sq. km (Figure 8). The estimated population size was >2000 individual plants. The general vegetation type of the area occupied by the population could be characterised as a low heath-land dominated by *F. georgei* (P1) with occasional small shrubs and no overstorey. The majority of the population of *F. georgei* (P1) was sterile, however a small number of individual plants were in flower.

3.3.3. Introduced (Weed) Species and Declared Pest (Plant) Organisms


No Introduced species or Declared Pest species pursuant to section 22 of the BAM Act 2007 according to the DPIRD (2019) were recorded within the Power Corridor survey area.

3.3.4. Threatened and Priority Ecological Communities

No Threatened Ecological Communities as listed at Commonwealth (DAWE 2020e) or State level (DBCA 2018c) or Priority Ecological Communities listed at State level (DBCA 2019a) were recorded within the Power Corridor survey area.



Source: Image: Landgate, Tracks: MRD, Flora and TEC/PEC: DBCA (07-0819FL)


 0 0.325 km
 Scale: 1:20,000
 MGA94 (Zone 51)


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King Of The Hill Project
Threatened & Priority Species
Frankenia georgei Population

Figure: **8**

3.3.5. Vegetation Communities

Statistical analysis (see section 2.3 for methodology) along with comparison with previously defined vegetation communities and examination of aerial photographs resulted in the definition of three associated groups of sites ($P_i = 2.33$; $p = 0.2$) (Figure 9). In order to define sites within the *Acacia aneura* groups, the dominant acacias were combined into a super group allowing the differences in understorey to determine similar groupings.

The largest grouping of sites (22 sites) corresponded with vegetation communities A1 and A2 of Matiske (2006) and generally comprises *Acacia ?caesaneura* and *Acacia quadrimarginea* shrubs over *Eremophila margarethae* and *Maireana planifolia* on flats. These two communities were defined as very similar with the exception that A1 community vegetation is traditionally denser and more associated with drainage lines while A2 presents as more broadly spread over flats. These sites were then separated into the two communities based on landforms observed in the field and aerial photography, resulting in 15 sites categorised as A2 and 7 sites categorised as A1.

The next largest grouping (4 sites) was defined as statistically similar however one site was separated based on the absence of *Eucalyptus camaldulensis* var. *obtusata* and drainage features and classified as A13. This site consists floristically of *Acacia caesaneura* shrubs over *A. craspedocarpa* over *Maireana planifolia* *Ptilotus obovatus*. The other three sites consisted of *Eucalyptus camaldulensis* var. *obtusata* and *Casuarina obesa* associated drainage lines corresponding with the previously mapped community E1 (Matiske 2006).

The remaining two sites were delineated as statistically different from all other sites, consisting primarily of Chenopod species such as *Atriplex* spp. and *Maireana* spp. They were also visually distinct on aerial imagery due to the more yellow as opposed to red soil colour and the sparsity of vegetation.

A summary of the vegetation communities defined in this survey is given in Table 2, and further details, with photographs are given in Appendix J.

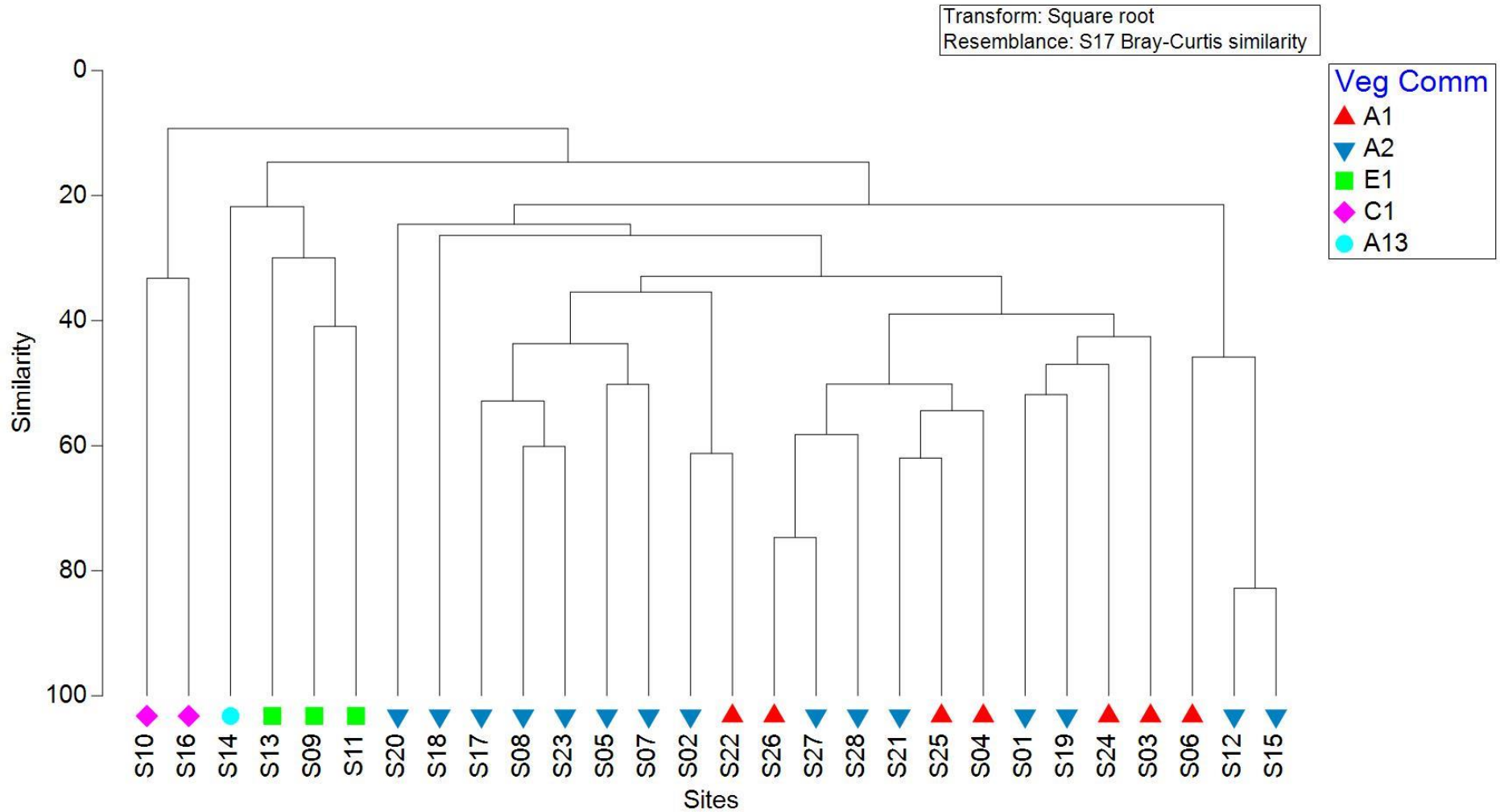


Figure 9: Dendrogram showing results of statistical analysis for vegetation communities in the King of the Hills Power Corridor survey area, March 2020

Table 4: Vegetation communities defined in the King of the Hills Power Corridor survey area, March 2020

Vegetation descriptions for communities A1, A2 and A7 are taken from Mattiske (2006).

Vegetation description for community A13 is taken from Mattiske (2019).

For other communities see Appendix B of the desktop report.

VEGETATION CODE	VEGETATION DESCRIPTION	AREA (ha)	COVER (%)
A1	Low woodland of <i>Acacia caesaneura</i> over mid open shrubland of <i>Acacia quadrimarginea</i> , <i>Acacia craspedocarpa</i> and <i>Eremophila margarethae</i> over low isolated clumps of <i>Ptilotus obovatus</i> , <i>Maireana</i> shrubs and other mixed shrubs on red/orange clay in drainage lines.	397.60	27.50
A2	Low Open Woodland of <i>Acacia caesaneura</i> , <i>Acacia craspedocarpa</i> - <i>Acacia tetragonophylla</i> over <i>Hakea preissii</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Teucrium teucriiflorum</i> , <i>Ptilotus obovatus</i> , <i>Solanum lasiophyllum</i> over <i>Aristida contorta</i> , <i>Enneapogon caerulescens</i> , annual herbs and grasses on sandy-loams on flats and lower slopes.	941.17	65.05
A7	Low Open Woodland of <i>Acacia aneura</i> and other <i>Acacia</i> spp. over mixed shrubs over mixed chenopods, annual herbs and grasses on flats and lower slopes with calcrete soils.	16.98	1.17
A13	Low woodland of <i>Acacia burkittii</i> over shrubland of <i>Eremophila margarethae</i> , <i>Scaevola spinescens</i> , <i>Senna artemisioides</i> subsp. <i>x helmsii</i> , and <i>Psyrdrax</i> spp. mid sparse shrubland on hard red clay flats.	6.00	0.41
C1	Open Chenopod Shrubland with <i>Atriplex</i> sp., <i>Maireana planifolia</i> and mixed <i>Sclerolaena</i> species with occasional emergent <i>Hakea preissii</i> and patches of <i>Acacia aneura</i> on calcrete soils.	47.30	3.27
E1	Open Woodland of <i>Eucalyptus camaldulensis</i> var. <i>obtusa</i> with pockets of <i>Casuarina</i> and <i>Acacia caesaneura</i> over <i>Grevillea ?nematophylla</i> <i>Bossiaea walkeri</i> over mixed grasses and annual herbs on sandy soils in creeklines.	13.73	0.95
D	Severely disturbed	5.12	0.35
CL	Completely cleared	13.73	1.31

The vegetation mapping for this survey was integrated where possible to previous mapping (Mattiske 2006 and 2019). Mapping for this survey and previous mapping is shown in Figure 10.

3.3.6. Vegetation Condition

The average condition of the vegetation in the survey area is Very Good, with one site rated as Excellent, 27 as Very Good and 7 as Good on the Trudgen (1988) scale (scale categories are Excellent, Very Good, Good, Poor, Degraded or Completely Degraded). Sites were qualified in terms of disturbance by the presence of animal and vehicle tracks and the density of weed species. Field observations suggest that the last fire in the area was more than 20 years ago. Heavy grazing and trampling by cattle were not evident within the survey area; however, there were some signs of their presence. The survey area was substantially disturbed by vehicle tracks as there were a multitude of drill sites and thoroughfares within and intersecting the survey area. This disturbance is likely to assist the spread of invasive plant species. Average vegetation condition based on vegetation community type is displayed in Figure 11.

315000

320000

325000



6815000
6820000
6825000
6830000
6835000

6815000
6820000
6825000
6830000
6835000



Legend		
Veg_Code		
E1	A5	A10
A1	A6	A13
A2	A7	C1
A3	A8	CL
	A9	D

Source: Image: Landgate, Tracks: MRD, Historical Vegetation Mapping: MCPL

N
0 1.75 km
Scale: 1:100,000
MGA94 (Zone 51)

CAD Ref: a2725_f11_07
Date: May 2020

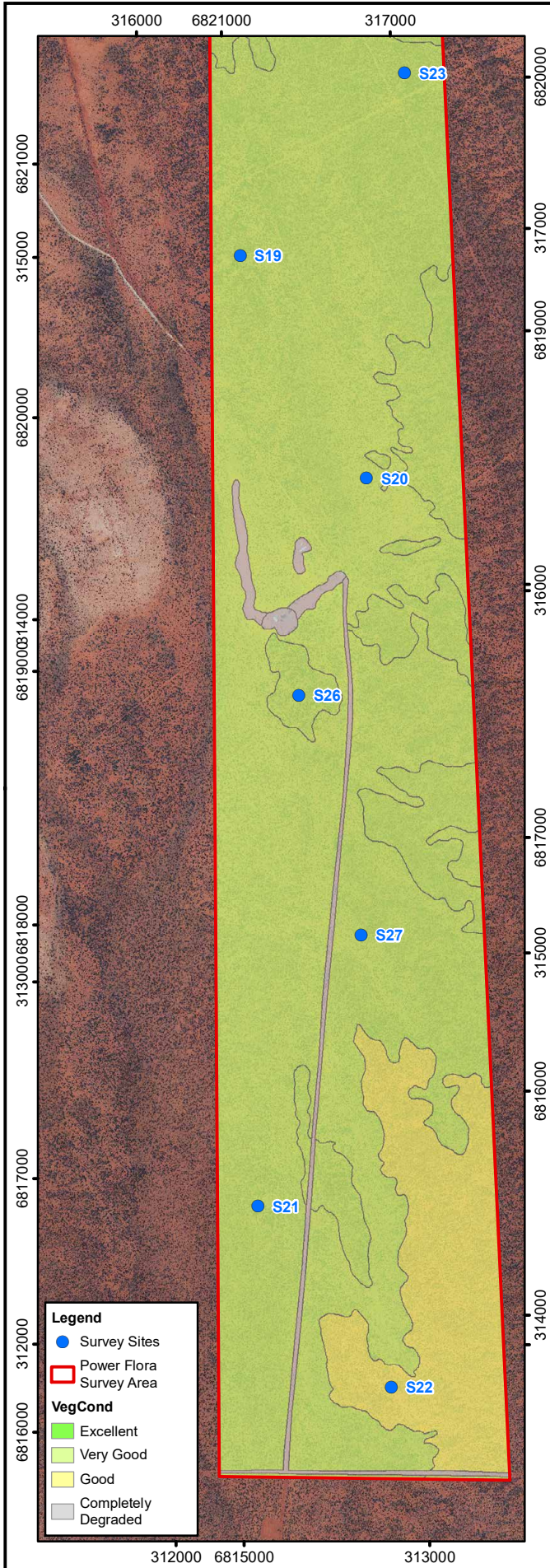
Rev: A | A4

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King Of The Hill Project Vegetation Mapping

Figure:
10

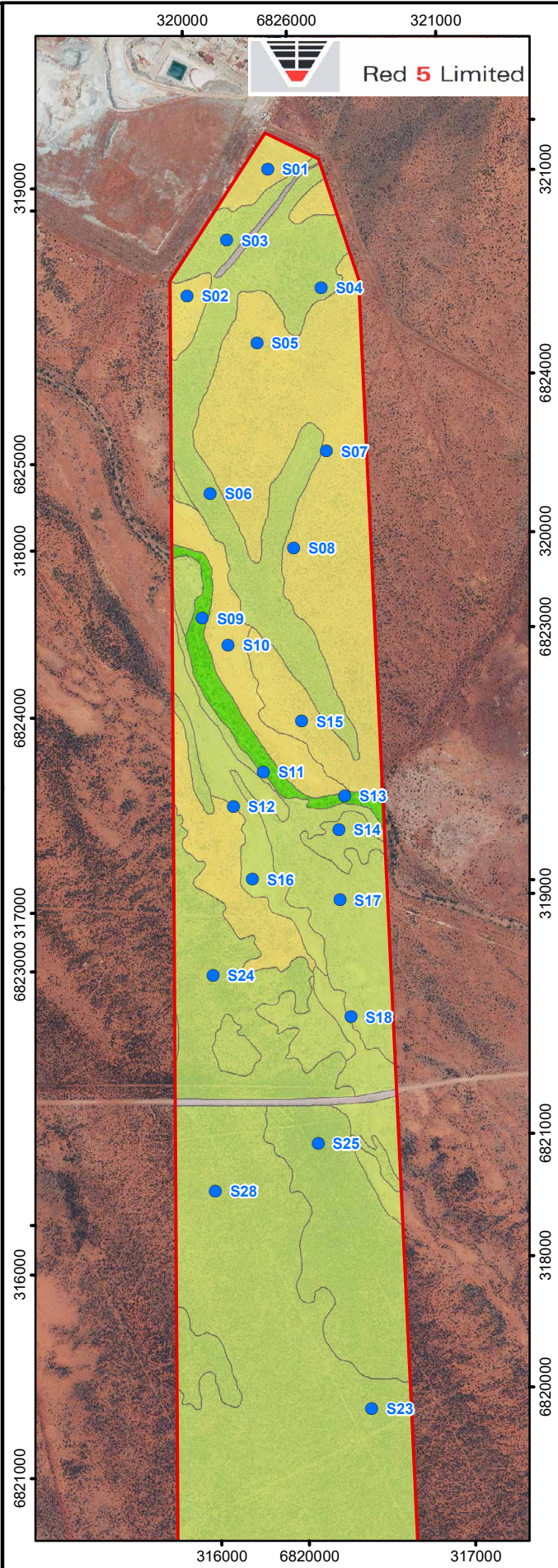


Legend

- Survey Sites
- ▭ Power Flora Survey Area

VegCond

- Excellent
- Very Good
- Good
- Completely Degraded



Source: Image: Landgate (Nov 2014)

0 500 m
Scale: 1:30,000
MGA94 (Zone 51)

CAD Ref: a2725_f11_06
Date: May 2020

Rev: A A4

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**King Of The Hill Project
Power Corridor
Vegetation Condition**

4. DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

4.1. Desktop

4.1.1. Flora

A large number of flora species (326 vascular plant taxa) had been recorded or could potentially be found within the proposed survey areas (Appendix C). None of these taxa are listed threatened species at federal or state level, but fourteen are listed as priority species at state level. Four of the priority taxa have a High likelihood of occurring in the two proposed survey areas. These are: *Frankenia georgei* (P1), *Stenanthemum patens* (P1), *Sauropus* sp. Woolgorong (M. Officer s.n. 10/8/94) (P3) and *Grevillea inconspicua* (P4), all of which have been recorded in, on the boundary of, or within 5 km of the proposed survey areas.

4.1.2. Introduced (Weed) Species and Declared Pest (Plant) Organisms

Searches identified 26 introduced plant taxa that could possibly occur in the project area. Five of these, all opuntoid cactus species, are categorised as significant - Weeds of National Significance and Declared Pests, with a Prohibited Organism Control category of 'C3 – Restricted' (Department of Primary Industries and Regional Development, 2020b). Four of these taxa were recorded on the southwestern boundary of the proposed Level 1 survey area, and one 25 km to the south in similar terrain and vegetation. These species were considered likely to be encountered in the proposed survey areas, although any weed control targeting cacti that has occurred in the last 12 years may have reduced this likelihood. Another five of the potential introduced taxa have both High ecological impact and Rapid invasiveness rankings. Given the number of significant and potentially significant weed species that could occur in the proposed survey areas, protocols to ensure weeds are not spread throughout the native vegetation of the area should be developed and followed when carrying out any activities in the KOTH mining area.

4.1.3. Vegetation Communities

The vegetation in and around the KOTH mining area has been described by several authors with slightly different perspectives, including botanical subdistricts, soil-landscape zones, land systems and vegetation communities. In general, the vegetation can be summarised as being dominated by low open *Acacia* spp. woodlands or tall shrublands over *Eremophila* spp. and *Senna* spp. sparse low shrublands over mixed herbs and grasses on red sandy loam on rocky hills or gentler slopes, with chenopod shrublands in low-lying salt-prone areas or *Eucalyptus camaldulensis* in drainage lines. Almost all (>97%) of the pre-European vegetation is still present in the East Murchison IBRA subregion; very little clearing of native vegetation has occurred in the KOTH mining area, except in the active pit area and immediate surrounds and any access or haul roads. 24 vegetation communities have been previously mapped by Mattiske Consulting Pty Ltd (1999, 2003, 2006, 2019; Appendix B; Figures 7.1-7.6) and can be used in any follow up work.

There are no TECs listed at Commonwealth or State level, nor PECs listed at State level, anywhere near the KOTH mining area. The nearest flora-focussed PECs are really restricted vegetation complexes on ranges of banded ironstone formation. Given the geology of the proposed survey area, and its location between known PECs on banded iron formation ranges, it is possible that previously unknown and range-restricted flora species and ecological communities associated with banded iron formations could occur.

Clearing of native vegetation requires a permit under the *EP Act*, unless an exemption applies, as prescribed in either Schedule 6 of the *EP Act* or *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. Several principles apply with regard to the assessment of an application to clear native vegetation by the Department of Water and Environmental Regulation (2019; Appendix A5). Adequate time to apply for and receive a clearing permit for any exploration and ongoing mining activities should be allowed for when planning.

Flora and vegetation surveys should ideally be carried out in the 6-8 weeks after the wet season (i.e. approximately March-June), as this is the primary survey timing recommended for the Eremaean Botanical Province in *Technical guidance – Flora and vegetation surveys for environmental impact assessment* (EPA 2016b). However, eleven of the fourteen potential priority flora species flower between June and December, making identification more difficult. *Technical guidance – Flora and vegetation surveys for environmental impact assessment* (EPA 2016b) does state that supplementary surveys can be conducted in this region after winter rainfall. It should be noted that the low rainfall in the month preceding the proposed survey, with the exception of the January prior, may pose some limitations for the survey, likely reducing the number of annual taxa present and making identification to species level difficult.

4.2. Field survey

4.2.1. Flora

A small number of flora species (67 vascular plant taxa) were recorded within the 38 sites of the 1446.86 ha Power Corridor survey area within the greater KOTH mining area. This was relatively low as a result of the lack of diversity in the dominant Mulga communities. Eight taxa were annual species; while most of the taxa recorded were shrubs or trees.

4.2.2. Threatened and Priority Flora

None of the recorded taxa are listed as threatened species at Commonwealth or State level. One priority flora species pursuant to Part 2, Division 1 and Subdivision 2 of the *BC Act* and as listed by DBCA (2018a, 2018b) was recorded in the Haul road survey area. *Frankenia georgei* (P1) was found during the 2020 survey, the extent of the population was mapped and was found to overlap with part of the middle section of the HRP area. The population stretched across most of the width of the proposed corridor and covered a total area of approximately 0.29 sq. km. The estimated population size was >2000 individual plants. No other threatened or priority flora were found throughout the Power corridor survey area, likely due to the lack of appropriate habitat as many of the potential conservation significant flora are found on salt lakes or rocky slopes of which none were found in the survey area.

4.2.3. Introduced (Weed) Species and Declared Pest (Plant) Organisms

No introduced species were recorded within the survey area; this is probably due to the low rainfall in the nine months leading up to the field survey, given that most of the introduced taxa assessed as having potential to occur in the area in the desktop study were annual species. In the four previous surveys by Mattiske (1999, 2003, 2006, 2019), 16 introduced flora species were recorded, of which 13 are annual herbs and the remainder comprise a short-lived climber, a perennial grass and a perennial herb. If the previous observations can be considered to be representative of the area as a whole, then the climatic conditions preceding this survey (which were not favourable for growth of annual species) could explain why no introduced taxa were recorded in this survey.

4.2.4. Threatened and Priority Ecological Communities

No Threatened Ecological Communities as listed at Commonwealth or State level or Priority Ecological Communities listed at State level were identified as occurring within the Power Corridor survey area. This was consistent with the desktop study, as there were no Threatened or Priority Ecological Communities identified as having the potential to occur within the survey area.

4.2.5. Vegetation Communities

The vegetation in the Power Corridor survey area can be described mostly as *Acacia caesaneura* and/or *Acacia craspedocarpa* low woodlands over *Acacia* spp. and *Eremophila* spp. mid shrublands over *Ptilotus* spp. and *Maireana* spp. low shrublands. The topography was generally flat with occasional drainage lines. Soils comprised red-orange clays, often with quartz pebbles on the surface. These descriptions are largely consistent with the vegetation of the rest of the KOTH mining area and the larger region, as described in the desktop study. However, they tend to correspond best with the Jundee (hardpan plains with variable gravelly mantles and minor sandy banks supporting weakly groved mulga shrublands) or Rainbow (hardpan plains supporting mulga shrublands) Land Systems, rather than the Gundockerta Land System (extensive, gently undulating, calcareous, stony plains, supporting bluebush shrublands) as is currently mapped over the survey area by Tille (2006; desktop report).

In this survey, five vegetation communities were defined and mapped, three of which are *Acacia* woodlands, one a Chenopod shrubland and another a Eucalypt woodland. The two largest groupings of survey sites corresponded with the A2 (*Acacia* low woodland on flats) and A1 (*Acacia* low woodland in drainage lines) communities. Three sites correspond with the previously defined community E1 (Eucalypt woodland in drainage lines). The previously defined community A13 (*Acacia* low woodland on flats) was restricted and had only one site. Community C1 (Chenopod shrubland) was present, following parallel with the watercourse.

4.2.6. Vegetation Condition

The vegetation condition of the Power Corridor Survey area ranged from Good to Very Good and was on average Very Good. They indicated evidence of disturbance and were therefore not considered to be in 'Pristine' or 'Excellent' condition. There did not appear to be signs of recent fire at any point throughout the survey area. Signs of the presence of cattle were observed at several sites; however, evidence of heavy grazing and trampling was not apparent. The survey area was substantially disturbed by vehicle tracks as there were a multitude of drill sites and thoroughfares within and intersecting the survey area.

4.3. Conclusions and Recommendations

Aside from the presence of Priority 1 species *Frankenia georgei*, the results of the field survey of the flora and vegetation in the four survey areas demonstrated no specific botanical values associated with potential clearing for mining. An evaluation of the ecological values of the Power Corridor survey area against the Clearing Principles (Department of Water and Environmental Regulation 2019; Appendix A6) that apply with regard to the assessment of an application to clear native vegetation under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* indicated that the only Principle that could be potentially be breached by clearing the vegetation in the survey area is Principle F (regarding clearing of an environment associated with a watercourse). It is recommended that unnecessary clearing of the vegetation where *Frankenia georgei* is mapped and any adjacent to any watercourses be avoided in order to reduce impacts. Adequate time to apply for and receive a clearing permit for any exploration and ongoing mining activities should be allowed for in future planning.

5. ACKNOWLEDGEMENTS

The authors would like to thank Steve Petty from Red 5 Ltd and Mike Hislop at the Western Australian Herbarium for their assistance with this project.

6. PERSONNEL

The following Mattiske Consulting Pty Ltd personnel were involved in this project:

NAME	POSITION	PROJECT INVOLVEMENT	FLORA COLLECTION PERMITS
Dr EM Mattiske	Managing Director & Principal Ecologist	Planning, managing, reporting	N/A
L Rowles	Experienced Botanist	Planning, Field work, Plant identification, Data analysis, Reporting	FB62000020-2
K Lambert	Experienced Botanist	Field work, Plant identification, Reporting	FB62000023-2
N Watson	Botanist	Data collation, Reporting	N/A

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APPENDIX A1: THREATENED AND PRIORITY FLORA DEFINITIONS

Under section 179 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), **threatened flora** are categorised as extinct, extinct in the wild, critically endangered, endangered, vulnerable and conservation dependent (Table A1.1).

Table A1.1 Federal definition of threatened flora species

Note: Adapted from section 179 of the EPBC Act.

CODE	CATEGORY	DEFINITION
Ex	Extinct	Species which at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
ExW	Extinct in the Wild	Species which is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
CE	Critically Endangered	Species which at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
E	Endangered	Species which is not critically endangered and it is facing a very high risk of extinction in the wild in the immediate or near future, as determined in accordance with the prescribed criteria.
V	Vulnerable	Species which is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
CD	Conservation Dependent	Species which at a particular time if, at that time, the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

The *Biodiversity Conservation Act 2016* (BC Act) provides for (amongst other things) the protection of flora that is facing an extremely high risk of extinction in the wild in the immediate, near or medium-term future in Western Australia under Part 10 (Division 2).

Threatened flora are listed in the *Wildlife Conservation (Rare Flora) Notice 2018* (under Part 2, Division 1, Subdivision 2 of the BC Act; Department of Biodiversity, Conservation and Attractions (DBCA) 2018a) and are categorised under Schedules 1-3. A flora species is defined as **threatened** if it is facing an extremely high risk of extinction in the wild in the immediate, near or medium-term future, pursuant to sections 20, 21 and 22 of the BC Act (DBCA 2019c). Threatened species are categorised as critically endangered, endangered, and vulnerable (Table A1.2).

Table A1.2 State definition of threatened flora species

Note: Adapted from DBCA (2019c).

CODE	CATEGORY	DEFINITION
CR	Critically endangered	Species considered to be facing an extremely high risk of becoming extinct in the wild (listed under Schedule 1 of the <i>Wildlife Conservation (Rare Flora) Notice 2018</i>).
EN	Endangered	Species considered to be facing a very high risk of becoming extinct in the wild (listed under Schedule 2 of the <i>Wildlife Conservation (Rare Flora) Notice 2018</i>).
VU	Vulnerable	Species considered to be facing a high risk of becoming extinct in the wild (listed under Schedule 3 of the <i>Wildlife Conservation (Rare Flora) Notice 2018</i>).

Priority flora species are defined as “possibly threatened species that do not meet the survey criteria, or are otherwise data deficient” or species that are “adequately known, are rare but not threatened, meet criteria for near threatened or have recently been removed from the threatened species list” for other than taxonomic reasons” (DBCA 2019c). Priority species are not afforded the same level of protection under state or federal legislation as the listed Threatened species, however are considered significant under the Environmental Protection Authority’s *Environmental Factor Guideline: Flora and Vegetation* (Environmental Protection Authority 2016a). The Department of Biodiversity, Conservation and Attractions categorises priority flora into four categories: Priority 1; Priority 2, Priority 3 and Priority 4 (Table A1.3).

Table A1.3: State definition of priority flora species

Note: Adapted from DBCA (2019c).

CODE	CATEGORY	DEFINITION
P1	Priority 1: Poorly-known species	Known from one or a few locations (< 5) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation; or are otherwise under threat of habitat destruction or degradation. In urgent need of further survey.
P2	Priority 2: Poorly-known species	Known from one or a few locations (< 5). Some occurrences are on lands managed primarily for nature conservation. In urgent need of further survey.
P3	Priority 3: Poorly-known species	Known from several locations and the species does not appear to be under imminent threat; or from few but widespread locations with either a large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. 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 do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. c) Other - Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

APPENDIX A2: THREATENED AND PRIORITY ECOLOGICAL COMMUNITY DEFINITIONS

Under section 181 of the *EPBC Act*, **threatened ecological communities** are categorised as critically endangered, endangered and vulnerable (Table A2.1).

Table A2.1 Federal definition of threatened ecological communities

Note: Adapted from section 181 and section 182 of the *EPBC Act*.

CATEGORY	DEFINITION
Critically Endangered	If, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future.
Endangered	If, at that time, it is not critically endangered and is facing a very high risk of extinction in the wild in the near future.
Vulnerable	If, at that time, it is not critically endangered or endangered, and is facing a high risk of extinction in the wild in the medium-term future.

Threatened ecological communities are listed in the *List of Threatened Ecological Communities endorsed by the Western Australian Minister for Environment (28 June 2018)* (under Part 2, Division 2, Subdivision 1 of the BC Act; DBCA 2018c). An ecological community is defined as **threatened** if it is facing an extremely high risk of collapse in the immediate, near or medium-term future, pursuant to sections 28, 29 and 30 of the BC Act. Threatened ecological communities are categorised as critically endangered, endangered, and vulnerable (Table A2.2).

Currently there is no Western Australian legislation covering the conservation of state listed **threatened ecological communities** (TECs), however, a non-statutory process is in place, whereby the DBCA (and former equivalent departments) have been identifying and informally listing TECs since 1994. Some of these threatened ecological communities are also endorsed by the Federal Minister as threatened, and some of these are also listed under the *EPBC Act* and therefore afforded legislative protection at the Commonwealth level.

Table A2.2 State definition of threatened ecological communities

Note: Adapted from Department of Environment and Conservation (2013).

CODE	CATEGORY	DEFINITION
CR	Critically Endangered	<p>An ecological community will be listed as CR when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future, meeting any one or more of the following criteria:</p> <ol style="list-style-type: none"> 1. The estimated geographic range and distribution has been reduced by at least 90% and is either continuing to decline with total destruction imminent, or is unlikely to be substantially rehabilitated in the immediate future due to modification; 2. The current distribution is limited i.e. highly restricted, having very few small or isolated occurrences, or covering a small area; or 3. The ecological community is highly modified with potential of being rehabilitated in the immediate future.
EN	Endangered	<p>An ecological community will be listed as EN when it has been adequately surveyed and is not CR, but is facing a very high risk of total destruction in the near future. The ecological community must meet any one or more of the following criteria:</p> <ol style="list-style-type: none"> 1. The estimated geographic range and distribution has been reduced by at least 70% and is either continuing to decline with total destruction imminent in the short term future, or is unlikely to be substantially rehabilitated in the short term future due to modification; 2. The current distribution is limited i.e. highly restricted, having very few small or isolated occurrences, or covering a small area; or 3. The ecological community is highly modified with potential of being rehabilitated in the short term future.
VU	Vulnerable	<p>An ecological community will be listed as VU when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing high risk of total destruction in the medium to long term future. The ecological community must meet any one or more of the following criteria:</p> <ol style="list-style-type: none"> 1. The ecological community exists largely as modified occurrences that are likely to be able to be substantially restored or rehabilitated; 2. The ecological community may already be modified and would be vulnerable to threatening process, and restricted in range or distribution; or 3. The ecological community may be widespread but has potential to move to a higher threat category due to existing or impending threatening processes.

Priority ecological communities are defined as possible threatened ecological communities that do not meet the stringent survey criteria for the assessment of threatened ecological communities, and are listed by the DBCA (2019a) in the *Priority Ecological Communities for Western Australia – Version 28 (17 January 2019)*. Similarly to priority flora, priority ecological communities are not afforded legislative protection, however are considered significant under the Environmental Protection Authority's (2016a) *Environmental Factor Guideline: Flora and Vegetation*. The Department of Biodiversity, Conservation and Attractions categorises priority ecological communities into five categories: Priority 1; Priority 2, Priority 3, Priority 4 and Priority 5 (Table A2.3).

Table A2.3 State definition of priority ecological communities

Note: Adapted from Department of Environment and Conservation (2013).

CODE	CATEGORY	DEFINITION
P1	Priority 1 (Poorly known ecological communities)	Ecological communities that are known from very few, restricted occurrences (generally ≤ 5 occurrences or a total area of ≤ 100 ha). Most of these occurrences are not actively managed for conservation (e.g. located within agricultural or pastoral lands, urban areas, or active mineral leases) and for which immediate threats exist.
P2	Priority 2 (Poorly known ecological communities)	Communities that are known from few small occurrences (generally ≤ 10 occurrences or a total area of ≤ 200 ha). At least some occurrences are not believed to be under immediate threat of destruction or degradation.
P3	Priority 3 (Poorly known ecological communities)	<ol style="list-style-type: none"> Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation; Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat; or Communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing and inappropriate fire regimes.
P4	Priority 4 (Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring)	<ol style="list-style-type: none"> Rare – Communities known from few occurrences that are considered to have been adequately surveyed, sufficient knowledge is available, and are considered not to be currently threatened. Near Threatened – Communities considered to have been adequately surveyed and do not qualify for Conservation Dependent, but are close to qualifying for Vulnerable. Communities that have been removed from the list of threatened communities during the past five years.
P5	Priority 5 (Conservation Dependent ecological communities)	Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

APPENDIX A3: CATEGORIES AND CONTROL MEASURES OF DECLARED PEST (PLANT) ORGANISMS IN WESTERN AUSTRALIA

Section 22 of Western Australia's *Biosecurity and Agriculture Management Act 2007* (BAM Act) makes provision for a plant taxon to be listed as a declared pest organism in respect to parts of, or the entire State. According to the BAM Act, a declared pest is defined as a prohibited organism (section 12), or an organism for which a declaration under section 22 (2) of the Act is in force.

Under the *Biosecurity and Agriculture Management Regulations 2013* (WA), declared pest plants are placed in one of three control categories, C1 (exclusion), C2 (eradication) or C3 (management), which determines the measures of control which apply to the declared pest (Table A4.1). The current listing of declared pest organisms and their control category is through the Western Australian Organism List (Department of Primary Industries and Regional Development 2019).

Table A3.1 Categories and control measures of declared pest (plant) organisms

Note: Adapted from *Biosecurity and Agriculture Management Regulations 2013*.

CONTROL CATEGORY	CONTROL MEASURES
<p style="text-align: center;">C1 (Exclusion)</p> <p>'(a) Category 1 (C1) — Exclusion: if in the opinion of the Minister introduction of the declared pest into an area or part of an area for which it is declared should be prevented.'</p> <p>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.</p>	<p>In relation to a category 1 declared pest, the owner or occupier of land in an area for which an organism is a declared pest or a person who is conducting an activity on the land must take such of the control measures specified in subregulation (1) as are reasonable and necessary to destroy, prevent or eradicate the declared pest.</p>
<p style="text-align: center;">C2 (Eradication)</p> <p>'(b) Category 2 (C2) — Eradication: if in the opinion of the Minister eradication of the declared pest from an area or part of an area for which it is declared is feasible.'</p> <p>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.</p>	<p>In relation to a category 2 declared pest, the owner or occupier of land in an area for which an organism is a declared pest or a person who is conducting an activity on the land must take such of the control measures specified in subregulation (1) as are reasonable and necessary to destroy, prevent or eradicate the declared pest.</p>
<p style="text-align: center;">C3 (Management)</p> <p>'(c) Category 3 (C3) — Management: if in the opinion of the Minister eradication of the declared pest from an area or part of an area for which it is declared is not feasible but that it is necessary to:</p> <p>(i) alleviate the harmful impact of the declared pest in the area; or</p> <p>(ii) reduce the number or distribution of the declared pest in the area; or</p> <p>(iii) prevent or contain the spread of the declared pest in the area.'</p> <p>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.</p>	<p>In relation to a category 3 declared pest, the owner or occupier of land in an area for which an organism is a declared pest or a person who is conducting an activity on the land must take such of the control measures specified in subregulation (1) as are reasonable and necessary to:</p> <p>(a) alleviate the harmful impact of the declared pest in the area for which it is declared; or</p> <p>(b) reduce the number or distribution of the declared pest in the area for which it is declared; or</p> <p>(c) prevent or contain the spread of the declared pest in the area for which it is declared.</p>

APPENDIX A4: OTHER DEFINITIONS

Environmentally sensitive areas

Environmentally sensitive areas are declared by the State Minister under section 51B of the *Environmental Protection Act 1986* (EP Act) and are listed in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*, gazetted 8 April 2005. Specific environmentally sensitive areas relevant to this report include: a defined wetland and the area within 50 metres of the wetland; the area covered by vegetation within 50 metres of rare flora; the area covered by a threatened ecological community; a Bush Forever site – further areas and information are described in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*.

Conservation significant flora

Under the *Environmental Factor Guideline: Flora and Vegetation* (Environmental Protection Authority 2016a), flora may be considered significant for a range of reasons, including, but not limited to the following:

- being identified as threatened or priority species;
- locally endemic or associated with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems);
- new species or anomalous features that indicate a potential new species;
- representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);
- unusual species, including restricted subspecies, varieties or naturally occurring hybrids; or
- relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.

Conservation significant vegetation

Under the *Environmental Factor Guideline: Flora and Vegetation* (Environmental Protection Authority 2016a), vegetation may be considered significant for a range of reasons, including, but not limited to the following:

- being identified as threatened or priority ecological communities;
- restricted distribution;
- degree of historical impact from threatening processes;
- a role as a refuge; or
- providing an important function required to maintain ecological integrity of a significant ecosystem.

APPENDIX A5: NVIS STRUCTURAL FORMATION TERMINOLOGY

Note: Adapted from Environmental Steering Committee for Australian Vegetation Information (2003).

COVER CHARACTERISTICS							
Foliage cover*	70-100	30-70	10-30	<10	≈0	0-5	unknown
Crown cover**	>80	50-80	20-50	0.25-20	<0.25	0-5	unknown
% cover***	>80	50-80	20-50	0.25-20	<0.25	0-5	unknown
Cover code	d	c	i	r	bi	bc	unknown

GROWTH FORM	HEIGHT RANGES (m)	STRUCTURAL FORMATION CLASSES						
		closed forest	open forest	woodland	open woodland	isolated trees	isolated clumps of trees	trees
tree, palm	<10, 10-30, >30	closed forest	open forest	woodland	open woodland	isolated trees	isolated clumps of trees	trees
tree mallee	<3, <10, 10-30	closed mallee forest	open mallee forest	mallee woodland	open mallee woodland	isolated mallee trees	isolated clumps of mallee trees	mallee trees
shrub, cycad, grass-tree, tree-fern	<1, 1-2, >2	closed shrubland	shrubland	open shrubland	sparse shrubland	isolated shrubs	isolated clumps of shrubs	shrubs
mallee shrub	<3, <10, 10-30	closed mallee shrubland	mallee shrubland	open mallee shrubland	sparse mallee shrubland	isolated mallee shrubs	isolated clumps of mallee shrubs	mallee shrubs
heath shrub	<1, 1-2, >2	closed heathland	heathland	open heathland	sparse heathland	isolated heath shrubs	isolated clumps of heath shrubs	heath shrubs
chenopod shrub	<1, 1-2, >2	closed chenopod shrubland	chenopod shrubland	open chenopod shrubland	sparse chenopod shrubland	isolated chenopod shrubs	isolated clumps of chenopod shrubs	chenopod shrubs
samphire shrub	<0.5, >0.5	closed samphire shrubland	samphire shrubland	open samphire shrubland	sparse samphire shrubland	isolated samphire shrubs	isolated clumps of samphire shrubs	samphire shrubs
hummock grass	<2, >2	closed hummock grassland	hummock grassland	open hummock grassland	sparse hummock grassland	isolated hummock grasses	isolated clumps of hummock grasses	hummock grasses
tussock grass	<0.5, >0.5	closed tussock grassland	tussock grassland	open tussock grassland	sparse tussock grassland	isolated tussock grassland	isolated clumps of tussock grasses	tussock grasses
other grass	<0.5, >0.5	closed grassland	grassland	open grassland	sparse grassland	isolated grasses	isolated clumps of grasses	other grasses
sedge	<0.5, >0.5	closed sedgeland	sedgeland	open sedgeland	sparse sedgeland	isolated sedges	isolated clumps of sedges	sedges
rush	<0.5, >0.5	closed rushland	rushland	open rushland	sparse rushland	isolated rushes	isolated clumps of rushes	rushes
forb	<0.5, >0.5	closed forbland	forbland	open forbland	sparse forbland	isolated forbs	isolated clumps of forbs	forbs
fern	<1, 1-2, >2	closed fernland	fernland	open fernland	sparse fernland	isolated ferns	isolated clumps of ferns	ferns
bryophyte	<0.5	closed bryophyteland	bryophyteland	open bryophyteland	sparse bryophyteland	isolated bryophytes	isolated clumps of bryophytes	bryophytes
lichen	<0.5	closed lichenland	lichenland	open lichenland	sparse lichenland	isolated lichens	isolated clumps of lichens	lichens
vine	<10, 10-30, >30	closed vineland	vineland	open vineland	sparse vineland	isolated vines	isolated clumps of vines	vines
aquatic	0-0.5, <1	closed aquatic bed	aquatic bed	open aquatic bed	sparse aquatics	isolated aquatics	isolated clumps of aquatics	aquatics
seagrass	0-0.5, <1	closed seagrass bed	seagrass bed	open seagrass bed	sparse seagrasses	isolated seagrasses	isolated clumps of seagrasses	seagrasses

APPENDIX A6: CLEARING PRINCIPLES

Note: Adapted from Schedule 5 of the EP Act (Department of Water and Regulation 2019).

PRINCIPLE	ASSESSMENT
A	<i>Native vegetation should not be cleared if it comprises a high level of biological diversity.</i>
B	<i>Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.</i>
C	<i>Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, threatened flora.</i>
D	<i>Native vegetation should not be cleared if it comprises the whole or part of, or is necessary for the maintenance of a threatened ecological community.</i>
E	<i>Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.</i>
F	<i>Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.</i>
G	<i>Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.</i>
H	<i>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.</i>
I	<i>Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface and underground water.</i>
J	<i>Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.</i>

**APPENDIX B: LOCATION OF SURVEY QUADRATS IN THE KING OF THE HILLS POWER
CORRIDOR SURVEY AREA, MARCH 2020**

Datum GDA94, UTM Zone 51J

SITE NAME	EASTING (m)	NORTHING (m)
S01	319970	6825528
S02	319303	6825252
S03	319613	6825360
S04	319854	6824912
S05	319448	6824871
S06	318848	6824406
S07	319424	6824253
S08	319025	6823960
S09	318473	6823936
S10	318501	6823758
S11	318290	6823161
S12	318075	6823108
S13	318544	6822844
S14	318428	6822724
S15	318579	6823255
S16	317949	6822767
S17	318236	6822445
S18	317957	6821953
S19	315805	6820083
S20	315687	6818856
S21	313249	6816284
S22	313276	6815202
S23	316957	6820350
S24	317529	6822498
S25	317479	6821545
S26	314822	6818185
S27	314404	6817068
S28	316943	6821640

APPENDIX C: VASCULAR PLANT SPECIES WITH THE POTENTIAL TO OCCUR IN THE KING OF THE HILLS MINING AREA

* denotes introduced species (WAH 1998-); SCC is State Conservation Code (see Appendix A for definitions); MCPL (1999, 2002, NatureMap (Department of Parks and Wildlife 2007-), DBCA (TPFL and WAH databases)(2020a) and EPBC (DAWE 2020a) are

FAMILY	SPECIES	SCC	EPBC	DBCA	Nature Map	MCPL 1999	MCPL 2003	MCPL 2006	MCPL 2019
ASTERACEAE	<i>Senecio</i> sp.					X			X
(continued)	* <i>Sonchus oleraceus</i>				X	X		X	X
	<i>Trichanthodium skirrophorum</i>				X				
	<i>Triptilodiscus pygmaeus</i>				X				
	<i>Vittadinia sulcata</i>				X			X	
	<i>Vittadinia</i> sp.					X			X
	Asteraceae sp.					X		X	X
BORAGINACEAE	<i>Heliotropium inexplicitum</i>							X	
BRASSICACEAE	* <i>Carrichtera annua</i>		X					X	
	<i>Lepidium oxytrichum</i>				X				
CACTACEAE	* <i>Cylindropuntia fulgida</i> var. <i>mamillata</i>		X		X				
	* <i>Cylindropuntia imbricata</i>		X		X				
	* <i>Opuntia elata</i>		X		X				
	* <i>Opuntia stricta</i>		X					X	
CAMPANULACEAE	<i>Isotoma petraea</i>							X	
	<i>Wahlenbergia</i> sp.				X				
CASUARINACEAE	<i>Casuarina obesa</i>				X				
	<i>Casuarina pauper</i>					X		X	X
CELASTRACEAE	<i>Stackhousia</i> sp.						X		
CHENOPODIACEAE	<i>Atriplex acutibractea</i> subsp. <i>karoniensis</i>					X			X
	<i>Atriplex amnicola</i>							X	
	<i>Atriplex bunburyana</i>				X			X	
	<i>Atriplex lindleyi</i> subsp. <i>inflata</i>					X			X
	<i>Atriplex nummularia</i>							X	
	<i>Atriplex nummularia</i> subsp. <i>spathulata</i>				X				
	<i>Atriplex semilunaris</i>				X			X	
	<i>Atriplex vesicaria</i>							X	
	* <i>Chenopodium murale</i>				X		X		
	<i>Dissocarpus paradoxus</i>							X	
	<i>Dysphania kalpari</i>				X			X	
	<i>Dysphania melanocarpa</i>							X	
	<i>Dysphania rhadinostachya</i>							X	
	<i>Enchylaena tomentosa</i>				X				
	<i>Enchylaena tomentosa</i> var. <i>tomentosa</i>				X		X	X	
	<i>Maireana appressa</i>							X	
	<i>Maireana carnosia</i>							X	
	<i>Maireana convexa</i>							X	
	<i>Maireana georgei</i>				X	X		X	X
	<i>Maireana glomerifolia</i>							X	
	<i>Maireana lobiflora</i>					X			X
	<i>Maireana planifolia</i>					X		X	X
	<i>Maireana pyramidata</i>				X	X		X	X

APPENDIX C: VASCULAR PLANT SPECIES WITH THE POTENTIAL TO OCCUR IN THE KING OF THE HILLS MINING AREA

* denotes introduced species (WAH 1998-); SCC is State Conservation Code (see Appendix A for definitions); MCPL (1999, 2002 NatureMap (Department of Parks and Wildlife 2007-), DBCA (TPFL and WAH databases)(2020a) and EPBC (DAWE 2020a) are

FAMILY	SPECIES	SCC	EPBC	DBCA	Nature Map	MCPL 1999	MCPL 2003	MCPL 2006	MCPL 2019
HALORAGACEAE	<i>Haloragis odontocarpa</i> forma <i>rugosa</i>					x			x
HEMEROCALLIDACEAE	<i>Dianella revoluta</i> var. <i>divaricata</i> <i>Prostanthera albiflora</i>					x	x	x	x
LAMIACEAE	<i>Lachnostachys eriobotrya</i> <i>Prostanthera althoferi</i> subsp. <i>althoferi</i> <i>Teucrium teucriiflorum</i>				x x x		x	x	
LORANTHACEAE	<i>Amyema fitzgeraldii</i> <i>Amyema preissii</i> <i>Lysiana casuarinae</i> <i>Lysiana murrayi</i>				x x	x		x	x
MALVACEAE	<i>Abutilon</i> aff. <i>fraseri</i> <i>Abutilon cryptopetalum</i> <i>Abutilon oxycarpum</i> <i>Brachychiton gregorii</i> <i>Hibiscus burtonii</i> <i>Hibiscus coatesii</i> <i>Hibiscus</i> sp. Gardneri (A.L. Payne PRP 1435) <i>Lawrenzia squamata</i> <i>Seringia velutina</i> <i>Sida calyxhymenia</i> <i>Sida excedentifolia</i> <i>Sida</i> sp. dark green fruits (S. van Leeuwen 2260) <i>Sida</i> sp.				x x	x	x	x	x
MONTIACEAE	<i>Calandrinia pleiopetala</i> <i>Calandrinia quartzitica</i> <i>Calandrinia</i> sp.		P1		x x		x	x	
MYRTACEAE	<i>Calytrix birdii</i> <i>Eucalyptus camaldulensis</i> <i>Eucalyptus camaldulensis</i> subsp. <i>arida</i> <i>Eucalyptus camaldulensis</i> subsp. <i>obtusa</i> <i>Eucalyptus lucasii</i> <i>Melaleuca interioris</i>				x x x x	x		x	x
NYCTAGINACEAE	<i>Boerhavia coccinea</i>							x	
OXALIDACEAE	<i>Oxalis perennans</i>							x	
PHYLLANTHACEAE	<i>Sauropus</i> sp. Woolgorong (M. Officer s.n. 10)		P3					x	
PITTOSPORACEAE	<i>Pittosporum angustifolium</i>					x	x	x	x
PLANTAGINACEAE	<i>Plantago debilis</i>						x		

APPENDIX C: VASCULAR PLANT SPECIES WITH THE POTENTIAL TO OCCUR IN THE KING OF THE HILLS MINING AREA

* denotes introduced species (WAH 1998-); SCC is State Conservation Code (see Appendix A for definitions); MCPL (1999, 2002 NatureMap (Department of Parks and Wildlife 2007-), DBCA (TPFL and WAH databases)(2020a) and EPBC (DAWE 2020a) are

FAMILY	SPECIES	SCC	EPBC	DBCA	Nature Map	MCPL 1999	MCPL 2003	MCPL 2006	MCPL 2019	
POACEAE	<i>Aristida contorta</i>				x	x	x	x	x	
	<i>Aristida holathera</i> var. <i>holathera</i>							x		
	<i>Austrostipa elegantissima</i>						x			
	<i>Austrostipa nitida</i>					x		x	x	
	<i>Austrostipa scabra</i>				x	x			x	
	<i>Austrostipa</i> sp.					x			x	
	* <i>Cenchrus ciliaris</i>		x		x			x		
	* <i>Cenchrus setiger</i>							x		
	<i>Cymbopogon ambiguus</i>					x		x	x	
	<i>Cymbopogon obtectus</i>				x		x	x		
	* <i>Cynodon dactylon</i>							x		
	<i>Dactyloctenium radulans</i>							x		
	<i>Dichanthium sericeum</i> subsp. <i>humilius</i>							x		
	<i>Digitaria ammophila</i>					x				
	<i>Enneapogon caerulescens</i>					x	x	x	x	
	<i>Enneapogon cylindricus</i>					x				
	<i>Enneapogon polyphyllus</i>					x		x		
	<i>Eragrostis cumingii</i>							x		
	<i>Eragrostis dielsii</i>						x		x	
	<i>Eragrostis eriopoda</i>							x	x	
	<i>Eragrostis falcata</i>					x				
	<i>Eragrostis kennedyae</i>						x		x	
	<i>Eragrostis lanipes</i>					x				
	<i>Eragrostis leptocarpa</i>								x	
	<i>Eragrostis setifolia</i>					x				
	<i>Eragrostis</i> sp.							x		
	<i>Eriachne flaccida</i>					x			x	
	<i>Eriachne helmsii</i>								x	
	<i>Eriachne pulchella</i>								x	
	<i>Eriachne pulchella</i> subsp. <i>dominii</i>								x	
	<i>Eriachne pulchella</i> subsp. <i>pulchella</i>					x				
	<i>Iseilema eremaeum</i>								x	
	<i>Iseilema fragile</i>								x	
	<i>Monachather paradoxus</i>					x			x	
	<i>Paspalidium basicladum</i>					x			x	
	* <i>Polypogon monspeliensis</i>					x				
	* <i>Rostraria cristata</i>					x				
	<i>Rytidosperma caespitosum</i>					x				
	<i>Themeda triandra</i>								x	
	<i>Tragus australianus</i>					x				
	<i>Tripogonella loliiformis</i>					x				
	POLYGONACEAE	<i>Duma florulenta</i>				x				
		* <i>Rumex vesicarius</i>					x	x	x	x
	PORTULACACEAE	<i>Portulaca oleracea</i>							x	
PRIMULACEAE	* <i>Lysimachia arvensis</i>					x		x	x	
	<i>Samolus repens</i>				x					

APPENDIX C: VASCULAR PLANT SPECIES WITH THE POTENTIAL TO OCCUR IN THE KING OF THE HILLS MINING AREA

* denotes introduced species (WAH 1998-); SCC is State Conservation Code (see Appendix A for definitions); MCPL (1999, 2002 NatureMap (Department of Parks and Wildlife 2007-), DBCA (TPFL and WAH databases)(2020a) and EPBC (DAWE 2020a) are

FAMILY	SPECIES	SCC	EPBC	DBCA	Nature Map	MCPL 1999	MCPL 2003	MCPL 2006	MCPL 2019	
PROTEACEAE	<i>Grevillea acuaria</i>	P4			x					
	<i>Grevillea berryana</i>					x		x	x	
	<i>Grevillea extorris</i>					x				
	<i>Grevillea inconspicua</i>					x				
	<i>Grevillea nematophylla</i> subsp. <i>supraplana</i>					x			x	
	<i>Grevillea sarissa</i>					x			x	
	<i>Grevillea sarissa</i> subsp. <i>sarissa</i>					x				
	<i>Hakea lorea</i> subsp. <i>lorea</i>					x	x			x
	<i>Hakea preissii</i>						x	x	x	x
	<i>Hakea recurva</i> subsp. <i>recurva</i>						x		x	x
PTERIDACEAE	<i>Cheilanthes austrotenuifolia</i>							x		
	<i>Cheilanthes lasiophylla</i>				x					
	<i>Cheilanthes sieberi</i>							x		
	<i>Cheilanthes</i> sp.						x			
RHAMNACEAE	<i>Stenanthemum patens</i>	P1			x			x		
RUBIACEAE	<i>Psychdrax latifolia</i>									
	<i>Psychdrax rigidula</i>				x					
	<i>Psychdrax suaveolens</i>						x	x		
RUTACEAE	<i>Boronia purdieana</i> subsp. <i>purdieana</i>				x					
SANTALACEAE	<i>Anthobolus leptomerioides</i>				x					
	<i>Exocarpos aphyllus</i>				x	x	x	x	x	
	<i>Santalum lanceolatum</i>					x		x	x	
	<i>Santalum spicatum</i>						x	x		
SAPINDACEAE	<i>Dodonaea lobulata</i>							x		
	<i>Dodonaea rigida</i>						x	x		
	<i>Dodonaea viscosa</i> subsp. <i>mucronata</i>							x		
SCROPHULARIACEAE	<i>Eremophila alternifolia</i>				x			x		
	<i>Eremophila clarkei</i>				x					
	<i>Eremophila eriocalyx</i>				x					
	<i>Eremophila foliosissima</i>				x			x		
	<i>Eremophila forrestii</i> subsp. <i>forrestii</i>							x		
	<i>Eremophila galeata</i>				x			x		
	<i>Eremophila georgei</i>				x			x		
	<i>Eremophila gilesii</i>					x			x	
	<i>Eremophila gilesii</i> subsp. <i>variabilis</i>				x			x		
	<i>Eremophila glabra</i>							x		
	<i>Eremophila glandulifera</i>				x					
	<i>Eremophila granitica</i>				x	x	x	x	x	
	<i>Eremophila homoplastica</i>				x					
	<i>Eremophila hygrophana</i>				x					
	<i>Eremophila latrobei</i>					x		x	x	
<i>Eremophila latrobei</i> subsp. <i>latrobei</i>					x		x			

APPENDIX D: CONSERVATION SIGNIFICANT PLANT SPECIES POTENTIALLY OCCURRING WITHIN THE KING OF THE HILLS MINING AREA

Note: SCC denotes State Conservation Code and FCC denotes Federal Conservation Code (*EPBC Act*) (refer to Appendix A for definitions). IBRA Distribution: COO– Coolgardie; GAS – Gascoyne; GID – Gibson desert; GVD – Great Victoria Desert; LSD – Little Sandy Desert; MUR – Murchison; YAL - Yalgoo. Ranking of Likelihood of occurrence in survey area is on a Low, Medium or High scale (see Section 3.4.1 for ranking criteria). Information from Florabase (WAH 1998-) , DBCA TPFL and WAH databases (DBCA 2020a), Atlas of Living Australia (National Collaborative Research Infrastructure Strategy 2019).

Species	Family	SCC	FCC	Description and Habitat	Likelihood of Occurrence
<i>Calandrinia quartzitica</i>	Montiaceae	P1	x	Description: Semi-erect to erect perennial herb, to 0.5 m Habit: Edge of salt lakes Flower colour: White to mid-pink Flowering period: Mid Sep to mid Oct, likely longer Soils: Clayey sand, silty sand or loam strewn with quartzite pieces IBRA Distribution: MUR Florabase records: 9	Medium: Little potentially suitable habitat (no salt lakes in the proposed survey area). Nearest location is ~4km SW of the PCP area on the edge of a salt lake in low chenopod shrublands.
<i>Frankenia georgei</i>	Frankeniaceae	P1	x	Description: Small shrub Habit: Rocky slopes Flower colour: Pink Flowering period: December Soils: Clay-loam IBRA Distribution: MUR, COO Florabase records: 6	High: Survey area contains suitable habitat (rocky hillslopes). Recorded at 2 locations in KOTH by MCPL (2006). Recorded in HRP area.
<i>Korthalsella leucothrix</i>	Santalaceae	P1	x	Description: Aerial, parasitic shrub Habit: Parasite on <i>Acacia</i> shrubs and trees Flower colour: White Flowering period: August Soils: Exclusively hosted by <i>Acacia</i> spp. IBRA Distribution: GID, MUR, YAL Florabase records: 14	Medium: Survey area contains suitable habitat (<i>Acacia</i> woodland/shrubland). Nearest population is ~75 km NW of the survey area (1993) in <i>Acacia</i> woodland.
<i>Micromyrtus chrysodema</i>	Myrtaceae	P1	x	Description: Densely branched shrub Habit: Red sands/ Sandplains Flower colour: White Flowering period: March to April Soils: Red loamy sand, red sands IBRA Distribution: MUR Florabase records: 1	Low: Little potentially suitable habitat (hardpan wash plains but few sandplains). Only one Florabase population, which is ~60 km N of the survey area in <i>Acacia</i> scrubland (2004).
<i>Stenanthemum patens</i>	Rhamnaceae	P1	x	Description: Shrub Habit: Rocky hillside Flower colour: White Flowering period: April to October Soils: Dry red sand/loam IBRA Distribution: MUR Florabase records: 10	High: Survey area contains suitable habitat (rocky hillslopes). One recorded under 2km NW from TSF6 site.

APPENDIX D: CONSERVATION SIGNIFICANT PLANT SPECIES POTENTIALLY OCCURRING WITHIN THE KING OF THE HILLS MINING AREA

Note: SCC denotes State Conservation Code and FCC denotes Federal Conservation Code (*EPBC Act*) (refer to Appendix A for definitions). IBRA Distribution: COO– Coolgardie; GAS – Gascoyne; GID – Gibson desert; GVD – Great Victoria Desert; LSD – Little Sandy Desert; MUR – Murchison; YAL - Yalgoo. Ranking of Likelihood of occurrence in survey area is on a Low, Medium or High scale (see Section 3.4.1 for ranking criteria). Information from Florabase (WAH 1998-) , DBCA TPFL and WAH databases (DBCA 2020a), Atlas of Living Australia (National Collaborative Research Infrastructure Strategy 2019).

Species	Family	SCC	FCC	Description and Habitat	Likelihood of Occurrence
<i>Acacia</i> sp. Marshall Pool (G. Cockerton 3024)	Fabaceae	P3	x	Description: Large shrub to 1-3 m Habit: Rocky hills and ridges Flower colour: Yellow Flowering period: May Soils: Dry brown clayey sand IBRA Distribution: MUR Florabase records: 10	Medium: Survey area contains suitable habitat (rocky hills and ridges). Nearest locations are ~20 km SE of the survey area on a serpentinite hill (1970) and ~40 km SE of the survey area on a low rocky hill in <i>Acacia</i> shrubland (2016).
<i>Calytrix praecipua</i>	Myrtaceae	P3	x	Description: Shrub to 0.7 m Habit: Breakaways, outcrops. Flower colour: Pink-white Flowering period: Jun to Jul or Sep to Nov Soils: Skeletal sandy soils over granite or laterite IBRA Distribution: GAS, GVD, LSD, MUR Florabase records: 28	Medium: Survey area contains suitable habitat (rocky breakaways, outcrops). Nearest locations are ~50 km SE of the survey area on a breakaway platform (1988) and ~60 km N of the survey area on a breakaway plateau (1989).
<i>Eremophila simulans</i> subsp. <i>megacalyx</i>	Scrophulariaceae	P3	x	Description: Shrub to 2 m Habit: Rocky surface, sandy slope Flower colour: Violet Flowering period: August to September Soils: Sandy soils IBRA Distribution: MUR Florabase records: 11	Low: Survey area contains suitable habitat. Nearest location is ~15 km E of the survey area but is very old (1961). All other records ~400 km to W.
<i>Micromyrtus serrulata</i>	Myrtaceae	P3	x	Description: Erect or spreading shrub to 1.5 m Habit: Granite outcrops, slopes and flats over granite. Flower colour: White Flowering period: June to November Soils: Brownish sandy and clayey soils over granite IBRA Distribution: COO, MUR Florabase records: 19	Medium: Survey area contains suitable habitat (granite bedrock, slopes and flats). Nearest location is ~50 km SW of the survey area on an exposed breakaway platform (1988).
<i>Phyllanthus baeckeoides</i>	Phyllanthaceae	P3	x	Description: Shrub to 1.5 m Habit: Granite outcrops. Flower colour: white-yellow/green-yellow Flowering period: July to September Soils: Red lateritic & sandy clay soils IBRA Distribution: MUR, GVD Florabase records: 31	Low: Survey area contains suitable habitat (granite bedrock). Nearest locations are all >100 km from the survey area.

APPENDIX D: CONSERVATION SIGNIFICANT PLANT SPECIES POTENTIALLY OCCURRING WITHIN THE KING OF THE HILLS MINING AREA

Note: SCC denotes State Conservation Code and FCC denotes Federal Conservation Code (*EPBC Act*) (refer to Appendix A for definitions). IBRA Distribution: COO– Coolgardie; GAS – Gascoyne; GID – Gibson desert; GVD – Great Victoria Desert; LSD – Little Sandy Desert; MUR – Murchison; YAL - Yalgoo. Ranking of Likelihood of occurrence in survey area is on a Low, Medium or High scale (see Section 3.4.1 for ranking criteria). Information from Florabase (WAH 1998-) , DBCA TPFL and WAH databases (DBCA 2020a), Atlas of Living Australia (National Collaborative Research Infrastructure Strategy 2019).

Species	Family	SCC	FCC	Description and Habitat	Likelihood of Occurrence
<i>Sauropus</i> sp. Woolgorong (M. Officer s.n. 10/8/94)	Phyllanthaceae	P3	x	Description: Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records: Shrub to 1 m Plains or rocky slopes/outcrops Yellow June to October Red sandy loam/loamy sand over ironstone GAS, MUR, YAL 23	High: Survey area contains suitable habitat (rocky slopes with ironstone). Recorded in MCPL (2006) as <i>Sauropus ramosissimus</i> in one location, just inside eastern boundary of Level 1 survey.
<i>Thryptomene</i> sp. Leinster (B.J. Lepschi & L.A. Craven 4362)	Myrtaceae	P3	x	Description: Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records: Shrub to 2 m Breakaways, rocky hillsides Pink September to October Red sand/loam over ironstone GAS, MUR 24	Medium: Survey area contains suitable habitat (rocky breakaways and slopes). Nearest location is ~60 km N of the survey area on a rocky plateau (2004).
<i>Grevillea inconspicua</i>	Proteaceae	P4	x	Description: Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records: Intricately branched, spreading shrub Along drainage lines on rocky outcrops, creeklines Pink/white-pink June to August Loam, gravel MUR 61	High: Survey area contains suitable habitat (drainage lines amongst rocky outcrops). Cluster of records (TPFL database) found ~6km NW of HRP area.
<i>Hemigenia exilis</i>	Lamiaceae	P4	x	Description: Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records: Erect, multi-stemmed shrub Breakaways, slopes blue-purple/white April or September to November Laterite MUR 42	Medium: Survey area contains suitable habitat (rocky breakaways and slopes). Nearest location is ~25 km N of the survey area in Acacia shrubland on a plain.

APPENDIX E: INTRODUCED PLANT SPECIES POTENTIALLY OCCURRING WITHIN THE KING OF THE HILLS MINING AREA

Note: FCS denotes Federal Conservation Status (DAWE 2019d); WoNS is Weed of National Significance. SCS denotes State Conservation Status (Department of Primary Industries and Regional Development 2019a) (refer to Appendix A for definitions). IBRA Distribution: AVW – Avon Wheatbelt; CAR – Carnarvon; COO– Coolgardie; DAL – Dampierland; GAS – Gascoyne; GES – Geraldton Sandplains; GID – Gibson desert; MAL – Mallee; MUR – Murchison; PIL – Pilbara; SWA – Swan Coastal Plain; YAL - Yalgoo. Ranking of Likelihood of occurrence in survey area is on a Low, Medium or High scale (see Section 3.4.2 for ranking criteria). Ecological Impact and Invasiveness rankings from Department of Parks and Wildlife 2014. Description and habitat from Florabase (WAH 1998-), Department of Primary Industries and Regional Development (2020a, 2020b), DAWE (2020d,g).

Species	Common Name	Family	FCS/SCS	Ecological Impact	Invasiveness	Description and Habitat	Likelihood of Occurrence
<i>Cylindropuntia fulgida</i> var. <i>mamillata</i>	Coral cactus	Cactaceae	WoNS/ Declared Pest (C3 Restricted)	H	R	Description: Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records: Erect shrub to 0.8 m Flats, drainage lines Deep red Rarely flowers Loose surface gravel, alkaline sands, limestone, clay/loam. CAR, COO, DAL, GAS, MUR, PIL 13	High: Survey area contains suitable habitat (Chenopod and <i>Acacia</i> shrubland on flats and drainage lines). Three records (2007) from Tarmoola Station; all at the homestead, on the SW boundary of the Level 1 survey area in the creek floodplain.
<i>Cylindropuntia imbricata</i>	Devil's rope	Cactaceae	WoNS/ Declared Pest (C3 Restricted), Goldfields Region Priority Alert Weed	-	-	Description: Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records: Spreading or erect shrub to 3 m Drainage lines, disturbed areas Red, purple September to April Sandy clay-loam AVW, COO, MUR, PIL 9	High: Survey area contains suitable habitat (Chenopod and <i>Acacia</i> shrubland in drainage lines and disturbed areas). Two records (2007) from Tarmoola Station; both at the homestead, on the SW boundary of the Level 1 survey area in the creek floodplain.
<i>Cylindropuntia</i> sp.	Prickly pears	Cactaceae	WoNS/ Declared Pest (C3 Restricted), Goldfields Region Priority Alert Weed	-	-	Description: Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records: Shrub Disturbed areas, flats, drainage lines Pink/purple/red Rare/year round Red sandy clay/loam or disturbed soils AVW, CAR, COO, DAL, GAS, MUR, PIL 25 <i>N.B: based on the three Cylindropuntia spp. known to occur in the Murchison IBRA bioregion: Cylindropuntia fulgida</i> var. <i>mamillata</i> , <i>C. imbricata</i> , <i>C. pallida</i> (WAH 1998-).	High: Survey area contains suitable habitat (see above). Several records from edge of proposed Level 1 survey area (see above).

APPENDIX E: INTRODUCED PLANT SPECIES POTENTIALLY OCCURRING WITHIN THE KING OF THE HILLS MINING AREA

Note: FCS denotes Federal Conservation Status (DAWE 2019d); WoNS is Weed of National Significance. SCS denotes State Conservation Status (Department of Primary Industries and Regional Development 2019a) (refer to Appendix A for definitions). IBRA Distribution: AVW – Avon Wheatbelt; CAR – Carnarvon; COO– Coolgardie; DAL – Dampierland; GAS – Gascoyne; GES – Geraldton Sandplains; GID – Gibson desert; MAL – Mallee; MUR – Murchison; PIL – Pilbara; SWA – Swan Coastal Plain; YAL - Yalgoo. Ranking of Likelihood of occurrence in survey area is on a Low, Medium or High scale (see Section 3.4.2 for ranking criteria). Ecological Impact and Invasiveness rankings from Department of Parks and Wildlife 2014. Description and habitat from Florabase (WAH 1998-), Department of Primary Industries and Regional Development (2020a, 2020b), DAWE (2020d,g).

Species	Common Name	Family	FCS/SCS	Ecological Impact	Invasiveness	Description and Habitat	Likelihood of Occurrence
<i>Opuntia elata</i>	Riverina pear	Cactaceae	WoNS/ Declared Pest (C3 Restricted), Goldfields Region Priority Alert Weed	-	-	Description: Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records: Shrub with erect branches to 2 m Disturbed ground, riverbeds Orange October to February Sandy clay/loam AVW, COO, MUR, PIL 8	High: Survey area contains suitable habitat (Chenopod and <i>Acacia</i> shrubland in drainage lines and disturbed areas). One record (2007) from Tarmoola Station at the homestead, on the SW boundary of the Level 1 survey area in the creek floodplain.
<i>Opuntia stricta</i>	Common prickly pear	Cactaceae	WoNS/ Declared Pest (C3 Restricted), Goldfields Region Priority Alert Weed	-	-	Description: Habit: Flower colour: Flowering period: Soils: IBRA Distribution: Florabase records: Spreading to erect shrub to 2 m Disturbed areas, flats, drainage lines Yellow September to April Brown sandy loam COO, GES, MAL, MUR, PIL, SWA 18	Medium: Survey area contains suitable habitat (Eucalypt woodland over Chenopod and <i>Acacia</i> shrubland in drainage lines and disturbed areas). MCPL (2006) recorded this in 3 locations near the Gwalia mine ~25 km south of the proposed Level 1 survey area.

APPENDIX F: ABORIGINAL HERITAGE SITES AND OTHER HERITAGE PLACES WITHIN THE VICINITY OF THE KING OF THE HILLS MINING AREA

Table F1: Aboriginal Heritage Sites in the vicinity of the KOTH mining area (Department of Planning, Lands and Heritage 2020). Note: PCP = Power Corridor Project, HRP = Haul Road Project.

SITE ID	SITE NAME	LOCATION (* indicates inside KOTH mining area)	SITE TYPE
1741	Lake Raeside/Sullivan Creek	*Sullivan Creek – inside proposed PCP and HRP areas.	Mythological
2708	Lake Reyside (Raeside)	1km S of proposed PCP area.	Mythological
15266	Sullivan Creek 01	*Sullivan Creek – N of proposed PCP area. (318491 mE/6825031 mN)	Artefacts/Scatter
15779	Sullivan Creek 02	*Sullivan Creek – inside proposed PCP area. (318508 mE/6823846 mN)	Artefacts/Scatter
2563	Leonora-Leinster 02	Between active area and Goldfields Highway (325337 mE/6825458 mN), 3km S of TSF6.	Artefacts/Scatter, Quarry
15628	Carolina Quarry, White Well	Immediately west of western boundary of M37/570, N of TSF6 (324652 mE/ 6832000 mN)	Artefacts/Scatter, Quarry

APPENDIX F: ABORIGINAL HERITAGE SITES AND OTHER HERITAGE PLACES WITHIN THE VICINITY OF THE KING OF THE HILLS MINING AREA

Table 2: Other Heritage Places in the vicinity of the KOTH mining area (Department of Planning, Lands and Heritage 2020). Note: PCP = Power Corridor Project, HRP = Haul Road Project.

SITE ID	SITE NAME	LOCATION (* indicates inside KOTH mining area)	SITE TYPE
2500	Leonora-Leinster 25	*1.5 km NW of TSF6. (321437 mE/ 6830458 mN)	Artefacts/Scatter
2564	Leonora-Leinster 03	W of TSF6 on Goldfields Hwy. (325237 mE/ 6829708 mN)	Artefacts/Scatter
2606	Kents Bore West	SE of TSF6 on Goldfields Hwy. (326132 mE/ 6827527 mN)	Artefacts/Scatter
15780	Sullivan Creek 03	*Immediately bordering PCP and HRP areas. (318702 mE/ 6825198 mN)	Artefacts/Scatter
20684	Kurrajong	1.5 NW of PCP area. (315017 mE/ 6823459 mN)	Historical, Other: Early mining settlement
20685	Diorite Range	3.5km NW of PCP area. (309615 mE/ 6823091 mN)	Artefact/Scatter, Mythological, Natural Feature
20808	Claypan (SOL07)	3km S of PCP area. (314936 mE/ 6811157 mN)	Mythological, Natural Feature
21828	Tarmoola Hills	*0.5km W of TSF6 (321412 mE/ 6829263 mN)	Mythological
22412	Leighters White Quartz Hill	*1km SE of PCP area. (319836 mE/ 6822663 mN)	Camp, Natural Feature
22413	Leighters Drilling Area	*1km SE of PCP area. (320615 mE/ 6823314 mN)	Natural Feature
22420	Wanangari Pool	*0.5km E of PCP area. (321756 mE/ 6825470 mN)	Camp, Hunting Place, Natural Feature, Water Source
22427	Mt Davis Range	2.5km SE of TSF6. (327176 mE/ 6824477 mN)	Natural Feature
22437	Wonder North Laterite Hill	*Inside HRP area. (316902 mE/ 6828355 mN)	Natural Feature
22438	Wonder North Swamp 1	*0.5km E of HRP area. (317067 mE/ 6828971 mN)	Natural Feature, Water Source
22439	Wonder North Mottled Rock	*2km N of HRP area. (316879 mE/ 6830769 mN)	Natural Feature
22443	Cork Tree Well	*2km NE of HRP area. (317938 mE/ 6830332 mN)	Man-Made Structure, Camp
22444	Wonder North Swamp 2	*1.5km W of TSF6. (320900 mE/ 6828986 mN)	Natural Feature, Water Source
22695	Tarmoola Artefact Scatter 2	*2km NW of TSF6. (320824 mE/ 6830728 mN)	Artefacts/Scatter
24099	Sullivan Creek 3	2.5km SE of PCP area. (319982 mE/ 6821044 mN)	Artefacts/Scatter
24100	Sullivan Creek 4	*Immediately bordering NW of PCP area. (318315 mE/ 6824060 mN)	Artefacts/Scatter
24101	Sullivan Creek 5	*1km N of HRP area. (317264 mE/ 6829806 mN)	Artefacts/Scatter
24390	Sullivan Gnamma	1km NW of PCP area. (313558 mE/ 6819177 mN)	Man-Made Structure, Water Source

APPENDIX G: VEGETATION COMMUNITIES PREVIOUSLY MAPPED IN THE KING OF THE HILLS SURVEY AREAS

Previous mapping from MCPL (1999, 2003, 2006, 2019). Species names have been updated to reflect the current names (WAH 1998-).

NAME	YEAR	DESCRIPTION	UPPER STRATUM	MIDDLE STRATUM	LOWER STRATUM	
Aa-Aa	1999	Shrubland of <i>Acacia aneura</i> and <i>Acacia ayersiana</i> over dense herbs of <i>Rhodanthe charsleyae</i> and grass, <i>Aristida contorta</i> in sandy loam with scattered quartz rocks on the surface.	<i>Acacia aneura</i> <i>Acacia ayersiana</i>	<i>Acacia craspedocarpa</i> <i>Senna artemisioides</i> subsp. <i>filifolia</i> <i>Senna artemisioides</i> subsp. x <i>sturtii</i> <i>Hakea recurva</i>	<i>Sclerolaena eurotioides</i> <i>Sclerolaena fusiformis</i> <i>Maireana lobiflora</i> <i>Rhodanthe charsleyae</i>	
Ab-Aa		Open Shrubland of <i>Acacia burkittii</i> and <i>Acacia aneura</i> over mixed low shrubs on outcropping rock above Sullivan Creek.	<i>Acacia burkittii</i> <i>Acacia aneura</i>	<i>Bossiaea walkeri</i> <i>Scaevola spinescens</i> <i>Acacia tetragonophylla</i>	<i>Ptilotus obovatus</i> <i>Cymbopogon ambiguus</i> <i>Enneapogon caerulescens</i>	
Ec-Cp		Woodland to Open Woodland of <i>Eucalyptus camaldulensis</i> and <i>Casuarina pauper</i> along the sandy banks of Sullivan Creek.	<i>Eucalyptus camaldulensis</i> <i>Casuarina pauper</i>	<i>Eremophila longifolia</i> <i>Pittosporum angustifolium</i> <i>Pimelea microcephala</i>	<i>Senecio glossanthus</i> <i>Austrostipa</i> sp. <i>Indigofera georgei</i>	
Mg-Mt-Mp		Shrubland of mixed Chenopods including <i>Maireana georgei</i> , <i>Maireana triptera</i> and <i>Maireana pyramidata</i> , with emergent <i>Acacia aneura</i> and <i>Acacia burkittii</i> on silty flats.	<i>Acacia aneura</i> <i>Acacia burkittii</i>	<i>Maireana georgei</i> <i>Maireana triptera</i> <i>Maireana pyramidata</i>	<i>Sclerolaena eurotioides</i> <i>Ptilotus obovatus</i> <i>Atriplex lindleyi</i> subsp. <i>inflata</i>	
A1	2003	Low Open Woodland of <i>Acacia aneura</i> over mixed shrubs and scattered annual species on sandy-loam soils with patchy laterised pebbles and/or quartz on the surface.	<i>Acacia aneura</i> <i>Acacia ramulosa</i> var. <i>ramulosa</i> <i>Acacia tetragonophylla</i> <i>Eremophila ? platycalyx</i>	<i>Acacia craspedocarpa</i> <i>Eremophila ramiflora</i>	<i>Eragrostis eriopoda</i> <i>Eremophila ? margarethae</i> <i>Ptilotus obovatus</i> <i>Rhodanthe battii</i>	
A2		Low Woodland to Low Open Woodland of <i>Acacia aneura</i> over mixed shrubs and scattered annual species on sandy-loam soils with sparse laterised pebbles and/or quartz on the surface.	<i>Acacia aneura</i> var. <i>aneura</i> <i>Acacia ramulosa</i> var. <i>ramulosa</i> <i>Acacia tetragonophylla</i> <i>Eremophila ? platycalyx</i>	<i>Eremophila granitica</i> <i>Eremophila serrulata</i>	<i>Aristida contorta</i> <i>Calandrinia</i> sp. <i>Ptilotus obovatus</i> <i>Rhodanthe battii</i>	
A3		Scrub of <i>Acacia aneura</i> over mixed shrubs and scattered annual species on loamy sands to sandy-loam soils with sparse laterised pebbles and/or quartz on the surface associated with creek-lines.	<i>Acacia aneura</i> <i>Acacia craspedocarpa</i> <i>Acacia tetragonophylla</i> <i>Eremophila oldfieldii</i> subsp. <i>angustifolia</i> <i>Santalum spicatum</i>	<i>Eremophila granitica</i> <i>Senna artemisioides</i> subsp. <i>filifolia</i>	<i>Abutilon ? oxycarpum</i> <i>Ptilotus aervoides</i> <i>Rhodanthe battii</i> <i>Scaevola spinescens</i> <i>Solanum lasiophyllum</i>	
A4		Open Scrub <i>Acacia aneura</i> over mixed shrubs and scattered annual species on sandy-loam soils with sparse quartz pebbles and occasional outcropping on the surface.	<i>Acacia aneura</i> <i>Acacia tetragonophylla</i> <i>Eremophila oldfieldii</i> subsp. <i>angustifolia</i>	<i>Acacia craspedocarpa</i> <i>Eremophila granitica</i> <i>Eremophila ? platycalyx</i>	<i>Enchylaena tomentosa</i> var. <i>tomentosa</i> <i>Enneapogon caerulescens</i> <i>Ptilotus obovatus</i> <i>Solanum lasiophyllum</i>	
G1		Low Open Grassland of <i>Aristida contorta</i> with scattered shrubs on sandy-loam soils with sparse laterised pebbles on the surface.	<i>Hakea preissii</i> <i>Rhagodia ? drummondii</i>	-	<i>Aristida contorta</i> <i>Enneapogon caerulescens</i> <i>Eragrostis eriopoda</i>	
A1		2006	Low Open Forest of <i>Acacia aneura</i> and other <i>Acacia</i> spp. over <i>Eremophila</i> spp. and mixed shrubs over	<i>Acacia aneura</i> <i>Acacia fuscaneura</i> <i>Acacia craspedocarpa</i>	<i>Eremophila youngii</i> subsp. <i>youngii</i> <i>Eremophila forrestii</i> subsp. <i>forrestii</i>	<i>Aristida contorta</i> <i>Enneapogon caerulescens</i>

APPENDIX G: VEGETATION COMMUNITIES PREVIOUSLY MAPPED IN THE KING OF THE HILLS SURVEY AREAS

Previous mapping from MCPL (1999, 2003, 2006, 2019). Species names have been updated to reflect the current names (WAH 1998-).

NAME	YEAR	DESCRIPTION	UPPER STRATUM	MIDDLE STRATUM	LOWER STRATUM
		annual herbs and grasses on sandy-loams on flats and flowlines.	<i>Acacia tetragonophylla</i>	<i>Rhagodia drummondii</i> <i>Ptilotus obovatus</i> <i>Solanum lasiophyllum</i>	
A2		Low Open Woodland of <i>Acacia aneura</i> and other <i>Acacia</i> spp. over mixed shrubs over low chenopod shrubs, annual herbs and grasses on sandy-loams on flats and lower slopes.	<i>Acacia aneura</i> <i>Acacia fuscaneura</i> <i>Acacia craspedocarpa</i> <i>Acacia tetragonophylla</i>	<i>Hakea preissii</i> <i>Eremophila forrestii</i> subsp. <i>forrestii</i> <i>Teucrium teucriiflorum</i> <i>Ptilotus calostachyus</i> <i>Ptilotus obovatus</i> <i>Solanum lasiophyllum</i>	<i>Maireana suaedifolia</i> <i>Aristida contorta</i> <i>Enneapogon caerulescens</i>
A3		Low Open Woodland of <i>Acacia aneura</i> and other <i>Acacia</i> spp. over mixed shrubs over mixed chenopods, annual herbs and grasses on flats and lower slopes with pebbles and quartz on surface.	<i>Acacia aneura</i> <i>Acacia ayersiana</i> <i>Acacia tetragonophylla</i>	<i>Hakea preissii</i> <i>Eremophila galeata</i> <i>Ptilotus obovatus</i> <i>Solanum lasiophyllum</i>	-
A5		Low Open Woodland of <i>Acacia aneura</i> and other <i>Acacia</i> spp. and patches of <i>Casuarina pauper</i> over Senna and chenopod species over annual herbs and grasses on ridges and slopes, with sandy-loams with mixed volcanic rocks on surface.	<i>Acacia aneura</i> <i>Acacia fuscaneura</i> <i>Acacia ramulosa</i> var. <i>ramulosa</i> <i>Acacia nigripilosa</i> subsp. <i>nigripilosa</i> <i>Casuarina pauper</i>	-	-
A6		Low Open Woodland of <i>Acacia fuscaneura</i> and <i>A. aneura</i> over mixed shrubs over mixed chenopods, annual herbs and grasses on lower slopes with calcrete soils and quartz on surface.	<i>Acacia fuscaneura</i> <i>Acacia aneura</i>	<i>Ptilotus obovatus</i> <i>Solanum lasiophyllum</i> <i>Eremophila galeata</i> <i>Brachychiton gregorii</i>	-
A7		Low Open Woodland of <i>Acacia aneura</i> and other <i>Acacia</i> spp. over mixed shrubs over mixed chenopods, annual herbs and grasses on flats and lower slopes with calcrete soils.	<i>Acacia aneura</i> <i>Acacia ayersiana</i> <i>Acacia tetragonophylla</i>	<i>Ptilotus obovatus</i> <i>Solanum lasiophyllum</i> <i>Eremophila galeata</i>	-
A8		Low Open Woodland of <i>Acacia aneura</i> and other <i>Acacia</i> spp. over mixed shrubs on rockier volcanic hills and slopes or on erosional slopes.	<i>Acacia aneura</i> <i>Acacia quadrimarginea</i> <i>Acacia rhodophloia</i> <i>Acacia ramulosa</i> var. <i>ramulosa</i> <i>Acacia nigripilosa</i> subsp. <i>nigripilosa</i>	<i>Eremophila</i> spp. <i>Dodonaea lobulata</i> <i>Prostanthera albiflora</i>	-
A9		Low Open Woodland of <i>Acacia aneura</i> and <i>Hakea preissii</i> over mixed chenopods and <i>Eremophila</i> spp. on sandy-loam soils with pebbles and quartz.	<i>Acacia aneura</i> <i>Hakea preissii</i>	<i>Eremophila</i> spp.	
A10		Low Open Woodland of <i>Acacia aneura</i> and <i>Acacia ramulosa</i> var. <i>ramulosa</i> over <i>Eremophila youngii</i>	<i>Acacia aneura</i> <i>Acacia ramulosa</i> var. <i>ramulosa</i>	<i>Eremophila youngii</i> subsp. <i>youngii</i>	<i>Cheilanthes austrotenuifolia</i>

APPENDIX G: VEGETATION COMMUNITIES PREVIOUSLY MAPPED IN THE KING OF THE HILLS SURVEY AREAS

Previous mapping from MCPL (1999, 2003, 2006, 2019). Species names have been updated to reflect the current names (WAH 1998-).

NAME	YEAR	DESCRIPTION	UPPER STRATUM	MIDDLE STRATUM	LOWER STRATUM
A11		subsp. <i>youngii</i> over <i>Cheilanthes austrotenuifolia</i> , annual herbs and grasses on quartz ridge.			
C1		Low Open Woodland of <i>Acacia aneura</i> and <i>Acacia tetragonophylla</i> over <i>Dodonaea rigida</i> and <i>Scaevola spinescens</i> over annual herbs and grasses on ironstone outcropping ridge.	<i>Acacia aneura</i> <i>Acacia tetragonophylla</i>	<i>Dodonaea rigida</i> <i>Scaevola spinescens</i>	-
E1		Open chenopod Shrubland with <i>Atriplex nummularia</i> , <i>Maireana pyramidata</i> and mixed <i>Sclerolaena</i> spp. with occasional emergent <i>Hakea preissii</i> and patches of <i>Acacia aneura</i> on calcrete soils.	<i>Hakea preissii</i> <i>Acacia aneura</i>	<i>Atriplex nummularia</i> <i>Maireana pyramidata</i> <i>Sclerolaena</i> spp.	-
A1		Open Woodland of <i>Eucalyptus camaldulensis</i> subsp. <i>obtusata</i> with pockets of <i>Casuarina</i> and <i>Acacia citrinoviridis</i> over <i>Bossiaea walkeri</i> over mixed grasses and annual herbs on sandy soils in creeklines.	<i>Eucalyptus camaldulensis</i> subsp. <i>obtusata</i> <i>Casuarina</i> spp. <i>Acacia citrinoviridis</i>	<i>Bossiaea walkeri</i>	-
A2	2019	Low Open Woodland of <i>Acacia aneura</i> over mixed shrubs and scattered annual species on sandy-loam soils with patchy laterised pebbles and/or quartz on the surface.	<i>Acacia aneura</i> <i>Acacia ramulosa</i> var. <i>ramulosa</i> <i>Acacia tetragonophylla</i> <i>Eremophila</i> ? <i>platycalyx</i>	<i>Acacia craspedocarpa</i> <i>Eremophila ramiflora</i>	<i>Eragrostis eriopoda</i> <i>Eremophila</i> ? <i>margarethae</i> <i>Ptilotus obovatus</i> <i>Rhodanthe battii</i>
A3		Low Open Woodland of <i>Acacia aneura</i> and other <i>Acacia</i> spp. over mixed shrubs over low chenopod shrubs, annual herbs and grasses on sandy-loams on flats and lower slopes.	<i>Acacia aneura</i> <i>Acacia fusca</i> <i>Acacia craspedocarpa</i> <i>Acacia tetragonophylla</i>	<i>Hakea preissii</i> <i>Eremophila forrestii</i> subsp. <i>forrestii</i> <i>Teucrium teucriiflorum</i> <i>Ptilotus calostachyus</i> <i>Ptilotus obovatus</i> <i>Solanum lasiophyllum</i>	<i>Maireana suaedifolia</i> <i>Aristida contorta</i> <i>Enneapogon caerulescens</i>
A12		Scrub of <i>Acacia aneura</i> over mixed shrubs and scattered annual species on loamy sands to sandy-loam soils with sparse laterised pebbles and/or quartz on the surface associated with creek-lines.	<i>Acacia aneura</i> <i>Acacia craspedocarpa</i> <i>Acacia tetragonophylla</i> <i>Eremophila oldfieldii</i> subsp. <i>angustifolia</i> <i>Santalum spicatum</i>	<i>Eremophila granitica</i> <i>Senna artemisioides</i> subsp. <i>filifolia</i>	<i>Abutilon</i> ? <i>oxycarpum</i> <i>Ptilotus aervoides</i> <i>Rhodanthe battii</i> <i>Scaevola spinescens</i> <i>Solanum lasiophyllum</i>
A12		Low open woodland of <i>Acacia</i> ? <i>incurvaneura</i> over <i>Eremophila</i> ? <i>platycalyx</i> , <i>E. latrobei</i> ?subsp. <i>glabra</i> and <i>Acacia</i> spp. mid sparse shrubland over <i>Maireana convexa</i> , <i>Ptilotus</i> spp. and mixed low isolated shrubs on orange clay with quartz pebbles on flats.	<i>Acacia</i> ? <i>incurvaneura</i>	<i>Eremophila</i> ? <i>platycalyx</i> <i>Eremophila latrobei</i> ?subsp. <i>glabra</i> <i>Acacia</i> spp.	<i>Maireana convexa</i> <i>Ptilotus</i> spp.

APPENDIX G: VEGETATION COMMUNITIES PREVIOUSLY MAPPED IN THE KING OF THE HILLS SURVEY AREAS

Previous mapping from MCPL (1999, 2003, 2006, 2019). Species names have been updated to reflect the current names (WAH 1998-).

NAME	YEAR	DESCRIPTION	UPPER STRATUM	MIDDLE STRATUM	LOWER STRATUM
A13		Low woodland of <i>Acacia ?incurvaneura</i> over <i>Acacia</i> spp. tall open shrubland over <i>Eremophila ?platycalyx</i> , <i>Scaevola spinescens</i> , <i>Senna artemisioides</i> subsp. x <i>artemisioides</i> , <i>Eremophila latrobei</i> subsp. <i>glabra</i> and <i>Psydrax</i> spp. mid sparse shrubland on hard red clay flats.	<i>Acacia ?incurvaneura</i>	<i>Eremophila ?platycalyx</i> <i>Scaevola spinescens</i> <i>Senna artemisioides</i> subsp. x <i>artemisioides</i> <i>Eremophila latrobei</i> subsp. <i>glabra</i>	-
Er1		Mid sparse shrubland of <i>Eremophila scoparia</i> , <i>Hakea preissii</i> , <i>Acacia oswaldii</i> and <i>Senna artemisioides</i> subsp. x <i>sturtii</i> over <i>Maireana</i> spp. and <i>Ptilotus</i> spp. low isolated shrubs on gentle slopes with rock outcropping and angular black pebbles over hard red clay.	-	<i>Eremophila scoparia</i> <i>Hakea preissii</i> <i>Acacia oswaldii</i> <i>Senna artemisioides</i> subsp. x <i>sturtii</i>	<i>Maireana</i> spp. <i>Ptilotus</i> spp.

**APPENDIX H: SUMMARY OF VASCULAR PLANT SPECIES RECORDED IN THE KING OF THE HILLS
POWER CORRIDOR, MARCH 2020**

* denotes introduced species (WAH 1998-); SCC is State Conservation Code (see Appendix A for definitions); 1999, 2003, 2006, 2019 are records from previous Mattiske Consulting Pty Ltd surveys in the vicinity.

FAMILY	SPECIES	SCC	1999	2003	2006	2019	2020
AMARANTHACEAE	<i>Amaranthus mitchellii</i>				x		
	<i>Ptilotus aervoides</i>			x			
	<i>Ptilotus calostachyus</i>				x		
	<i>Ptilotus exaltatus</i>		x	x	x	x	x
	<i>Ptilotus gaudichaudii</i>			x	x		
	<i>Ptilotus helipteroides</i>			x	x		
	<i>Ptilotus obovatus</i>		x	x	x	x	x
	<i>Ptilotus polystachyus</i>				x		
	<i>Ptilotus roei</i>				x		
	<i>Ptilotus schwartzii</i>				x	x	
	<i>Ptilotus</i> sp.						x
ANACARDIACEAE	* <i>Schinus molle</i>				x		
APOCYNACEAE	<i>Marsdenia australis</i>		x	x	x		x
	Apocynaceae sp.					x	
ASTERACEAE	* <i>Centaurea melitensis</i>			x			
	* <i>Flaveria trinervia</i>				x		
	* <i>Hypochaeris glabra</i>		x				
	* <i>Hypochaeris radicata</i>				x		
	* <i>Sonchus oleraceus</i>		x		x		
	<i>Brachyscome ciliaris</i>				x		
	<i>Brachyscome</i> sp.		x				
	<i>Chrysocephalum puteale</i>				x		
	<i>Cratystylis subspinescens</i>		x				
	<i>Gnephosis arachnoidea</i>				x		
	<i>Helipterum craspedioides</i>				x		
	<i>Leiocarpa semicalva</i>						x
	<i>Olearia stuartii</i>				x		
	<i>Pluchea dentex</i>				x		x
	<i>Podolepis capillaris</i>			x	x		
	<i>Podolepis kendallii</i>				x		
	<i>Podolepis lessonii</i>				x		
	<i>Rhodanthe battii</i>				x		
	<i>Rhodanthe charsleyae</i>		x				
	<i>Rhodanthe</i> sp.		x				
	<i>Schoenia cassiniana</i>		x				
	<i>Senecio glossanthus</i>		x				
	<i>Senecio magnificus</i>				x		
<i>Senecio</i> sp.			x				
<i>Vittadinia sulcata</i>				x			
<i>Vittadinia</i> sp.			x				
Asteraceae sp.			x		x		
BORAGINACEAE	<i>Heliotropium inexplicitum</i>				x		
BRASSICACEAE	* <i>Carrichtera annua</i>				x		
CACTACEAE	* <i>Opuntia stricta</i>				x		
CAMPANULACEAE	<i>Isotoma petraea</i>				x		
CASUARINACEAE	<i>Casuarina obesa</i>						x
	<i>Casuarina pauper</i>		x		x		
CELASTRACEAE	<i>Stackhousia</i> sp.			x			

**APPENDIX H: SUMMARY OF VASCULAR PLANT SPECIES RECORDED IN THE KING OF THE HILLS
POWER CORRIDOR, MARCH 2020**

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FAMILY	SPECIES	SCC	1999	2003	2006	2019	2020
CHENOPODIACEAE	* <i>Chenopodium murale</i>			x			
	<i>Atriplex acutibractea</i> subsp. <i>karoniensis</i>		x				
	<i>Atriplex amnicola</i>				x		
	<i>Atriplex bunburyana</i>				x		
	<i>Atriplex lindleyi</i> subsp. <i>inflata</i>		x				
	<i>Atriplex nummularia</i>				x		
	<i>Atriplex semilunaris</i>				x		
	<i>Atriplex vesicaria</i>				x		
	<i>Atriplex</i> sp.						x
	<i>Dissocarpus paradoxus</i>					x	
	<i>Dysphania kalpari</i>					x	
	<i>Dysphania melanocarpum</i>					x	
	<i>Dysphania rhadinostachya</i>					x	
	<i>Enchylaena tomentosa</i> var. <i>tomentosa</i>				x	x	
	<i>Maireana appressa</i>					x	
	<i>Maireana carnosae</i>					x	x
	<i>Maireana convexa</i>					x	x
	<i>Maireana georgei</i>			x		x	
	<i>Maireana glomerifolia</i>					x	
	<i>Maireana lobiflora</i>			x			
	<i>Maireana planifolia</i>			x		x	
	<i>Maireana pyramidata</i>			x		x	x
	<i>Maireana radiata</i>					x	
	<i>Maireana sedifolia</i>					x	
	<i>Maireana suaedifolia</i>					x	
	<i>Maireana thesioides</i>						x
	<i>Maireana tomentosa</i> subsp. <i>tomentosa</i>			x			
	<i>Maireana triptera</i>			x		x	x
	<i>Maireana villosa</i>					x	
	<i>Maireana</i> sp.						x
	<i>Rhagodia drummondii</i>				x	x	
	<i>Rhagodia ?drummondii</i>						x
	<i>Rhagodia eremaea</i>					x	
	<i>Salsola australis</i>			x	x	x	
	<i>Sclerolaena cuneata</i>			x		x	x
	<i>Sclerolaena diacantha</i>					x	
	<i>Sclerolaena ?diacantha</i>						x
	<i>Sclerolaena drummondii</i>				x		
	<i>Sclerolaena eriacantha</i>					x	x
	<i>Sclerolaena eurotoides</i>			x			
	<i>Sclerolaena fusiformis</i>			x			
	<i>Sclerolaena lanicuspis</i>					x	
	<i>Sclerolaena patenticuspis</i>					x	
	<i>Sclerolaena</i> sp.						x
<i>Tecticornia calypttrata</i>					x		
<i>Tecticornia indica</i> subsp. <i>bidens</i>					x		
CONVOLVULACEAE	* <i>Cuscuta epithymum</i>				x		
	<i>Convolvulus remotus</i>				x		
	<i>Duperreya sericea</i>		x	x	x		
	<i>Duperreya commixta</i>						x
CUCURBITACEAE	* <i>Citrillus amarus</i>			x			
	* <i>Cucumis myriocarpus</i>			x	x		
CYPERACEAE	<i>Bulbostylis barbata</i>				x		
	<i>Bulbostylis turbinata</i>				x		
	<i>Fimbristylis depauperata</i>				x		

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POWER CORRIDOR, MARCH 2020**

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FAMILY	SPECIES	SCC	1999	2003	2006	2019	2020
EUPHORBIACEAE	<i>Euphorbia australis</i>				x		
	<i>Euphorbia boophthona</i>				x		
FABACEAE	<i>Acacia aneura</i>		x	x	x		
	<i>Acacia ayersiana</i>		x		x		
	<i>Acacia burkittii</i>		x	x			x
	<i>Acacia caesaneura</i>						x
	<i>Acacia ?caesaneura</i>					x	
	<i>Acacia citrinoviridis</i>				x		
	<i>Acacia craspedocarpa</i>		x	x	x	x	x
	<i>Acacia effusifolia</i>						x
	<i>Acacia fuscaneura</i>				x		
	<i>Acacia incurvaneura</i>				x		
	<i>Acacia ?incurvaneura</i>					x	
	<i>Acacia kalgoorliensis</i>			x			
	<i>Acacia nigripilosa</i> subsp. <i>nigripilosa</i>				x		
	<i>Acacia oswaldii</i>				x	x	
	<i>Acacia paraneura</i>				x		
	<i>Acacia pteraneura</i>				x		x
	<i>Acacia quadrimarginea</i>				x		x
	<i>Acacia ramulosa</i>			x			
	<i>Acacia ramulosa</i> var. <i>linophylla</i>					x	
	<i>Acacia ramulosa</i> var. <i>ramulosa</i>				x	x	
	<i>Acacia resinimarginea</i>			x			
	<i>Acacia rhodophloia</i>				x		
	<i>Acacia ?salicina</i>				x		
	<i>Acacia sibirica</i>				x		
	<i>Acacia tetragonophylla</i>			x	x	x	x
	<i>Acacia xiphophylla</i>					x	
	<i>Acacia</i> sp.						x
	<i>Bossiaea walkeri</i>			x		x	x
	<i>Glycine canescens</i>					x	
	<i>Indigofera georgei</i>			x		x	
	<i>Senna artemisioides</i> subsp. <i>filifolia</i>			x	x	x	
	<i>Senna artemisioides</i> subsp. <i>helmsii</i>				x	x	x
	<i>Senna artemisioides</i> subsp. x <i>artemisioides</i>			x		x	x
	<i>Senna artemisioides</i> subsp. x <i>sturtii</i>			x		x	
	<i>Senna ?artemisioides</i> subsp. x <i>sturtii</i>						x
	<i>Senna cardiosperma</i>					x	
	<i>Senna charlesiana</i>					x	
	<i>Senna glaucifolia</i>					x	
	<i>Senna glutinosa</i> subsp. <i>chatelainiana</i>				x	x	
	<i>Senna glutinosa</i> subsp. x <i>luerssenii</i>					x	
<i>Senna manicula</i>					x		
<i>Senna pleurocarpa</i> var. <i>angustifolia</i>			x				
<i>Senna</i> sp.						x	
<i>Swainsona kingii</i>					x		
<i>Swainsona</i> sp.				x			
FRANKENIACEAE	<i>Frankenia georgei</i>	P1			x		
	<i>Frankenia laxiflora</i>		x				
	<i>Frankenia pauciflora</i> var. <i>pauciflora</i>				x		
GERANIACEAE	* <i>Erodium aureum</i>				x		

APPENDIX H: SUMMARY OF VASCULAR PLANT SPECIES RECORDED IN THE KING OF THE HILLS POWER CORRIDOR, MARCH 2020

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FAMILY	SPECIES	SCC	1999	2003	2006	2019	2020
GOODENIACEAE	<i>Goodenia havilandii</i>			x	x		
	<i>Scaevola spinescens</i>		x	x	x	x	x
	<i>Velleia rosea</i>				x		
HALORAGACEAE	<i>Haloragis odontocarpa</i> forma <i>rugosa</i>		x				
HEMEROCALLIDACEAE	<i>Dianella revoluta</i> var. <i>divaricata</i>		x	x	x		x
	<i>Prostanthera albiflora</i>				x		
LAMIACEAE	<i>Hemigenia</i> ? <i>brachyphylla</i>						x
	<i>Teucrium teucriiflorum</i>			x	x	x	x
LORANTHACEAE	<i>Amyema preissii</i>		x				
	<i>Lysiana casuarinae</i>				x		
	<i>Lysiana murrayi</i>			x			
MALVACEAE	<i>Abutilon cryptopetalum</i>				x		
	<i>Abutilon</i> aff. <i>fraseri</i>				x		
	<i>Abutilon oxycarpum</i>		x	x	x		
	<i>Abutilon</i> sp.						x
	<i>Brachychiton gregorii</i>			x	x	x	
	<i>Hibiscus burtonii</i>				x		
	<i>Hibiscus coatesii</i>				x		
	<i>Seringia velutina</i>				x		
	<i>Sida calyxhymentia</i>		x		x		
	<i>Sida excedentifolia</i>				x		
	<i>Sida</i> sp. dark green fruits (S. van Leeuwen 2260)				x		
	<i>Sida</i> sp.			x		x	x
	Malvaceae sp.						x
MONTIACEAE	<i>Calandrinia</i> sp.			x	x		x
MYRTACEAE	<i>Calytrix birdii</i>				x		
	<i>Eucalyptus camaldulensis</i>		x		x		
	<i>Eucalyptus camaldulensis</i> subsp. <i>obtusa</i>				x		x
NYCTAGINACEAE	<i>Boerhavia coccinea</i>				x		x
OXALIDACEAE	<i>Oxalis perennans</i>				x		
	<i>Oxalis</i> sp.						x
PHYLLANTHACEAE	<i>Sauropus</i> sp. Woolgorong (M. Officer s.n. 10/8/9	P3			x		
PITTOSPORACEAE	<i>Pittosporum angustifolium</i>		x	x	x		
PLANTAGINACEAE	<i>Plantago debilis</i>			x			
POACEAE	* <i>Cenchrus ciliaris</i>				x		
	* <i>Cenchrus setiger</i>				x		
	* <i>Cynodon dactylon</i>				x		
	<i>Aristida contorta</i>		x	x	x		x
	<i>Aristida holathera</i> var. <i>holathera</i>				x		
	<i>Austrostipa elegantissima</i>			x			
	<i>Austrostipa nitida</i>		x		x		
	<i>Austrostipa scabra</i>		x				
	<i>Austrostipa</i> sp.		x				
<i>Cymbopogon ambiguus</i>		x		x		x	

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POWER CORRIDOR, MARCH 2020**

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FAMILY	SPECIES	SCC	1999	2003	2006	2019	2020
POACEAE (continued)	<i>Cymbopogon obtectus</i>			x	x		
	<i>Dactyloctenium radulans</i>				x		x
	<i>Dichanthium sericeum</i> subsp. <i>humilius</i>				x		
	<i>Enneapogon caerulescens</i>		x	x	x		x
	<i>Enneapogon polyphyllus</i>				x		x
	<i>Enteropogon ramosus</i>						x
	<i>Eragrostis cumingii</i>				x		
	<i>Eragrostis dielsii</i>		x				
	<i>Eragrostis eriopoda</i>			x	x	x	x
	<i>Eragrostis kennedyae</i>		x				
	<i>Eragrostis leptocarpa</i>				x		
	<i>Eragrostis</i> sp.				x		
	<i>Eriachne flaccida</i>				x		
	<i>Eriachne helmsii</i>				x		
	<i>Eriachne ovata</i>						x
	<i>Eriachne pulchella</i>					x	
	<i>Eriachne pulchella</i> subsp. <i>dominii</i>				x		
	<i>Eriachne pulchella</i> subsp. <i>pulchella</i>						x
	<i>Iseilema eremaeum</i>					x	
	<i>Iseilema fragile</i>					x	
	<i>Monachather paradoxus</i>					x	x
	<i>Paspalidium basicladum</i>					x	x
	<i>Themeda triandra</i>					x	x
	Poaceae sp.						x
	POLYGONACEAE	* <i>Rumex vesicarius</i>		x	x	x	
PORTULACACEAE	<i>Portulaca oleracea</i>				x		x
PRIMULACEAE	* <i>Lysimachia arvensis</i>		x		x		
PROTEACEAE	<i>Grevillea berryana</i>		x		x	x	
	<i>Grevillea nematophylla</i> subsp. <i>supraplana</i>				x		x
	<i>Grevillea sarissa</i>				x		
	<i>Hakea lorea</i> subsp. <i>lorea</i>		x				
	<i>Hakea preissii</i>		x	x	x	x	x
	<i>Hakea recurva</i> subsp. <i>recurva</i>		x		x		
PTERIDACEAE	<i>Cheilanthes austrotenuifolia</i>				x		
	<i>Cheilanthes sieberi</i>				x		x
	<i>Cheilanthes</i> sp.			x			
	<i>Stenanthemum patens</i>	P1			x		
RUBIACEAE	<i>Psydrax latifolia</i>					x	
	<i>Psydrax rigidula</i>					x	
	<i>Psydrax suaveolens</i>			x	x	x	x
SANTALACEAE	<i>Exocarpos aphyllus</i>		x	x	x		
	<i>Santalum lanceolatum</i>		x		x		x
	<i>Santalum spicatum</i>			x	x		x
	<i>Santalum</i> sp.					x	
SAPINDACEAE	<i>Dodonaea lobulata</i>				x		
	<i>Dodonaea rigida</i>			x	x	x	
	<i>Dodonaea viscosa</i> subsp. <i>mucronata</i>				x		

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FAMILY	SPECIES	SCC	1999	2003	2006	2019	2020	
SCROPHULARIACEAE	<i>Eremophila alternifolia</i>				x		x	
	<i>Eremophila ?clarkei</i>					x		
	<i>Eremophila foliosissima</i>				x			
	<i>Eremophila forrestii</i> subsp. <i>forrestii</i>				x		x	
	<i>Eremophila galeata</i>				x			
	<i>Eremophila georgei</i>				x			
	<i>Eremophila gilesii</i>		x					
	<i>Eremophila gilesii</i> subsp. <i>variabilis</i>				x			
	<i>Eremophila glabra</i>				x			
	<i>Eremophila granitica</i>		x	x	x			
	<i>Eremophila latrobei</i>		x		x		x	
	<i>Eremophila latrobei</i> ?subsp. <i>glabra</i>					x		
	<i>Eremophila latrobei</i> subsp. <i>latrobei</i>				x			
	<i>Eremophila longifolia</i>		x					
	<i>Eremophila maculata</i>				x			
	<i>Eremophila maculata</i> subsp. <i>brevifolia</i>		x					
	<i>Eremophila margarethae</i>		x	x	x		x	
	<i>Eremophila metallicorum</i>				x			
	<i>Eremophila ?metallicorum</i>					x		
	<i>Eremophila miniata</i>				x			
	<i>Eremophila oldfieldii</i> subsp. <i>angustifolia</i>				x	x	x	
	<i>Eremophila ?oldfieldii</i> subsp. <i>oldfieldii</i>						x	
	<i>Eremophila platycalyx</i>		x	x	x			
	<i>Eremophila ?platycalyx</i>					x		
	<i>Eremophila ramiflora</i>			x				
	<i>Eremophila scoparia</i>			x	x	x		
	<i>Eremophila serrulata</i>				x	x		
	<i>Eremophila youngii</i> subsp. <i>youngii</i>					x	x	
	<i>Eremophila</i> sp.						x	
	<i>Myoporum montanum</i>					x		
	SOLANACEAE	<i>Nicotiana occidentalis</i>				x		
		<i>Nicotiana occidentalis</i> subsp. <i>obliqua</i>				x		
		<i>Nicotiana rosulata</i> subsp. <i>rosulata</i>			x			
<i>Nicotiana</i> sp.							x	
<i>Solanum lasiophyllum</i>			x	x	x	x	x	
<i>Solanum nigrum</i>					x			
<i>Solanum orbiculatum</i> subsp. <i>orbiculatum</i>					x			
<i>Solanum</i> sp.				x	x			
STYLIDIACEAE	<i>Stylidium ?inaequipetalum</i>				x			
THYMELAEACEAE	<i>Pimelea microcephala</i>		x	x	x			
ZYGOPHYLLACEAE	<i>Tribulus astrocarpus</i>						x	
	* <i>Tribulus terrestris</i>				x			
	<i>Roepera ovata</i>			x				

APPENDIX J: SUMMARY OF VEGETATION COMMUNITIES DEFINED IN THE POWER CORRIDOR SURVEY AREA WITHIN THE KING OF THE HILLS MINING AREA, MARCH 2020

VEGETATION COMMUNITY DESCRIPTION

Vegetation map code: A1

Structural:

Low woodland of *Acacia caesaneura* over mid open shrubland of *Acacia quadrimarginea*, *Acacia craspedocarpa* and *Eremophila margarethae* over low isolated clumps of *Ptilotus obovatus*, *Maireana* shrubs and other mixed shrubs on red/orange clay in drainage lines.

Associated species:

Acacia ?incurvaneura, *Eremophila ?metallicorum*, *Maireana planifolia*, *Aristida contorta*, *Eriachne pulchella*

Soils and Landforms: Red-orange clay in microchannels and on flats at the edge of channels.

Outcropping: Not present.

Condition: Good to Very Good.

Area: 397.60 ha

Proportion of survey area: 27.48 %

Number of Quadrats: 7

Species richness: 13.43 ± 1.03 (s.e.)

REPRESENTATIVE PHOTOGRAPH



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APPENDIX J: SUMMARY OF VEGETATION COMMUNITIES DEFINED IN THE POWER CORRIDOR SURVEY AREA WITHIN THE KING OF THE HILLS MINING AREA, MARCH 2020

VEGETATION COMMUNITY DESCRIPTION

Vegetation map code: A2

Structural

Low Open Woodland of *Acacia caesaneura*, *Acacia craspedocarpa*, *Acacia tetragonophylla* over *Hakea preissii*, *Eremophila forrestii* subsp. *forrestii*, *Ptilotus obovatus*, *Maireana planifolia* over *Aristida contorta* and annual herbs and grasses on sandy-loams on flats and lower slopes.

Associated species

Teucrium teucriiflorum, *Maireana triptera*, *Solanum lasiophyllum*, *Enneapogon caerulescens*, *Paspalidium basicladum*

Soils and Landforms: Orange clay with quartz and other pebbles on flats.

Outcropping: Not present.

Condition: Very Good – Excellent.

Area: 941.17 ha

Proportion of survey area: 65.05 %

Number of Quadrats: 15

Species richness: 11.80 ± 1.39 (s.e.)

REPRESENTATIVE PHOTOGRAPH



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APPENDIX J: SUMMARY OF VEGETATION COMMUNITIES DEFINED IN THE POWER CORRIDOR SURVEY AREA WITHIN THE KING OF THE HILLS MINING AREA, MARCH 2020

VEGETATION COMMUNITY DESCRIPTION

Vegetation map code: A13

Structural

Low woodland of *Acacia burkittii* over shrubland of *Eremophila margarethae*, *Scaevola spinescens*, *Senna artemisioides* subsp. x *helmsii* and *Psydrax* spp. mid sparse shrubland on hard red clay flats.

Associated species

Acacia ?incurvaneura, *Acacia* sp., *Acacia tetragonophylla*, *Eremophila latrobei* ?subsp. *glabra*, *Eremophila ?platycalyx*, *Eremophila* sp., *Psydrax latifolia*, *Psydrax rigidula*, *Psydrax suaveolens*, *Senna artemisioides* subsp. x *artemisioides*, *Sida* sp.

Soils and Landforms: Orange sandy clay on flats.

Outcropping: Numerous, Lateritic

Condition: Very Good.

Area: 6.00 ha

Proportion of survey area: 0.41 %

Number of Quadrats: 1

Species richness: 15

REPRESENTATIVE PHOTOGRAPH



S14

APPENDIX J: SUMMARY OF VEGETATION COMMUNITIES DEFINED IN THE POWER CORRIDOR SURVEY AREA WITHIN THE KING OF THE HILLS MINING AREA, MARCH 2020

VEGETATION COMMUNITY DESCRIPTION

Vegetation map code: C1

Structural

Open Chenopod Shrubland with *Atriplex* sp., *Maireana planifolia* and mixed *Sclerolaena* species with occasional emergent *Hakea preissii* and patches of *Acacia aneura* on calcrete soils.

Associated species

Acacia caesaneura, *Rhagodia eremea*, *Solanum lasiophyllum*, *Enteropogon ramosus*, *Enneapogon polyphyllus*

Soils and Landforms: Red to orange clayey sand.

Outcropping: Not present.

Condition: Good to Very Good.

Area: 47.3 ha

Proportion of survey area: 3.27 %

Number of Quadrats: 2

Species richness: 11.50 ± 0.50 (s.e.)

REPRESENTATIVE PHOTOGRAPH



S16

APPENDIX J: SUMMARY OF VEGETATION COMMUNITIES DEFINED IN THE POWER CORRIDOR SURVEY AREA WITHIN THE KING OF THE HILLS MINING AREA, MARCH 2020

VEGETATION COMMUNITY DESCRIPTION

Vegetation map code: E1

Structural

Open Woodland of *Eucalyptus camaldulensis* var. *obtusa* with pockets of *Casuarina* and *Acacia caesaneura* over *Grevillea ?nematophylla* *Bossiaea walkeri* over mixed grasses and annual herbs on sandy soils in creek lines.

Associated species

Acacia pteraneura, *Acacia quadrimarginea*, *Acacia burkittii*, *Senna artemisioides* subsp. *artemisioides*, *Scaevola spinescens*, *Enneapogon caerulescens*

Soils and Landforms: Red to orange sandy clay with gravel, in creek lines

Outcropping: Not present

Condition: Very good to Excellent.

Area: 13.73 ha

Proportion of survey area: 0.95 %

Number of Quadrats: 3

Species richness: 12.33 ± 0.88 (s.e.)

REPRESENTATIVE PHOTOGRAPH



S11

KING OF THE HILLS GAS PIPELINE

Native Vegetation Clearing Permit Supporting Document



APPENDIX 3: FAUNA SURVEY REPORTS

Level 2 Vertebrate Fauna Assessment

King of the Hills Project

Prepared for: Red 5

Version 1. May, 2020



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EXECUTIVE SUMMARY

Red 5 is proposing further mining operations on its tenements at the King of the Hills mine site, which is approximately 30km north, northwest of Leonora, Western Australia. Access to the King of the Hills operations is via the Goldfields Highway. This is a large project area (15,450ha) and the expansion program is likely to have multiple mining proposals prepared and submitted over a number of years. This vertebrate fauna assessment will be used to support future mining proposals and native vegetation clearing permits.

There are two broad fauna habitats in the project area:

- open mulga woodland over mixed shrubs and scattered grasses or bare ground; and
- woodland of large eucalypts over mixed shrubs and scattered grasses along the ephemeral creekline that runs north-south through the project area.

The quality of fauna habitat varies from highly degraded to good; the more degraded areas include the active mining area, historical and recent exploration and areas with higher intensity cattle grazing. There are numerous access tracks in the project area, but most are narrow and only wheel tracks on a sand-clay substrate. There is widespread evidence of feral fauna (i.e. wild dogs, cats and goats) in the project area.

There are no conservation significant vertebrate fauna in the project area that would be significantly impacted by vegetation clearing, development and additional mining activity, so there are no recommendations for a referral under the *Environment Protection and Biodiversity Conservation Act 1999*.

There are approximately 23 small trappable vertebrate species in the ephemeral creekline and 35 in the mulga woodland habitat. Avifauna species richness and abundance will vary seasonally and from year-to-year, and for the combined two survey periods, 72 species were recorded in the project area and this included 8 waterbirds in a disused mining pit. In addition to the small terrestrial reptiles, mammals and amphibians, there were two species of macropods [i.e. *Osphranter rufus* (Red Kangaroo) and *Osphranter robustus* (Euro)] which were recorded in the camera trap survey and while moving around site. *Canis lupus* (wild dogs / dingo) and *Felis catus* (feral cat) were relatively abundant across the project area, with a high number of dogs nearer the mining operations. There is at least one herd of *Capra hircus* (goats) that were mostly seen around the mining operations.

Species richness, abundance and diversity of the small trappable vertebrate fauna, particularly in the mulga woodland habitat, was lower than at other surveyed sites in the Goldfields, possibly due to the previous drought conditions and the abundance of feral predators, with the consequence that the project area has low ecological functional value and biodiversity value. The north-south ephemeral creekline (Sullivan Creek) in the project area provides a movement pathway for some avifauna and over a period of many years, small terrestrial mammals, reptiles and amphibians. Excluding Sullivan Creek, fauna habitats present in the project area are abundant in adjacent areas, so it is highly probable that the fauna assemblage in the project area is similar to the many square kilometres of similar habitat in adjacent areas and the bioregion.

Potential impacts on vertebrate fauna in the project area include death/injury of fauna during vegetation clearing, development and mining operations, habitat fragmentation, cumulative loss of habitat, introduction of weeds and feral and pest fauna, impacts with vehicles, and anthropogenic activity such as noise, vibrations and artificial light negatively impacting of native fauna in adjacent areas. Overall, the potential impact of vegetation clearing, development and mining operations will be low. The abundance of wild dogs, feral cats and goats in the project area and surrounds is probably having a greater impact on the native vertebrate fauna and habitat than the proposed vegetation clearing, development and future mining operations. A significant reduction in these feral and pest species is likely to offset much of the potential impacts associated with development.

The following recommendations are provided to mitigate potential impacts:

- (1) An induction program that includes a component on managing vertebrate fauna is mandatory for staff and contractors working in the project area;
- (2) The impact of dust on adjacent vegetation and fauna habitat is managed against appropriate KPIs and in accordance with the clients' Construction Environmental Management Plan;
- (3) Management of the mine sites' waste management facility is reviewed and altered so that putrescible waste is not available to feral and pest animals and birds;
- (4) A feral predator (i.e. feral cat and wild dog) reduction program is implemented, their numbers regularly monitored (e.g. biannually) and the population periodically reduced;
- (5) The goats in the project area are removed;
- (6) Where practical, vegetation clearing, and mining activity should avoid impacting on the ephemeral creekline habitat that runs north-south through the central portions of the project area and the linkages within this habitat type are maintained; and
- (7) A Vertebrate Fauna Management is prepared and implemented.

1. INTRODUCTION

1.1 BACKGROUND

Red 5 is proposing further mining operations on its tenements at the King of the Hills mine site and has requested a vertebrate fauna risk assessment to support the preparation of environmental approval applications. This is a large project area that is likely to have multiple mining proposals and native vegetation clearing permit applications submitted over a number of years. The total assessed area is an odd shaped polygon of approximately 15,450ha, however, the anticipated disturbance footprint(s) will be considerably smaller.

1.2 PROJECT OBJECTIVES AND SCOPE OF WORKS

Terrestrial Ecosystems was commissioned by Red 5 to undertake a Level 2 vertebrate fauna risk assessment for its tenements at the King of the Hills operations which is approximately 30km north northwest of Leonora, Western Australia with the access road running off the Goldfields Highway (Figure 1). The purpose of this vertebrate fauna risk assessment was to provide information to the proponent and eventually the environmental regulators on the potential impacts on the vertebrate fauna assemblage in the project area to enable a series of proposed developments and vegetation clearing permits to be adequately assessed. The methodology broadly follows that described in the Environmental Protection Authority (2016b) Technical Guidance Terrestrial Fauna Surveys.

This Level 2 fauna risk assessment involved a desktop review and site survey. The objectives were to:

- provide an indication of the vertebrate fauna assemblage (reptiles, amphibians, mammals and birds) on and near the project area, so that potential impacts on the fauna and fauna assemblage might be adequately assessed;
- identify the presence and/or potential risk of impacts on species of conservation significance that are present or likely to be present in the project area;
- assess the impact and environmental risks associated with the proposed development on the vertebrate fauna assemblage;
- determine if any additional surveys are required to assess the potential impact on the vertebrate fauna assemblage including impacts on species of conservation significance; and
- make recommendations that avoid, mitigate or minimise potential impacts on resident vertebrate fauna.

To achieve these objectives, Terrestrial Ecosystems:

- reviewed Terrestrial Ecosystems' database [includes Atlas of Living Australia and Department of Biodiversity, Conservation and Attractions (DBCA) records in NatureMap] to identify potential vertebrate fauna within the area;
- searched the DBCA's NatureMap for Threatened and Priority Species;
- searched the Commonwealth Governments database of fauna of national environmental significance to identify species potentially occurring within the area that are protected under the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* or international migratory bird agreements (JAMBA/CAMBA);
- undertook multiple site surveys and assessments;
- reviewed previous fauna surveys conducted in and near the project area;
- undertook an assessment of the potential risks to the fauna associated with clearing additional areas of native vegetation;
- discussed the likelihood of *EPBC Act 1999* and *Biodiversity Conservation (BC) Act 2016* listed species being present in the project area; and

- provided management recommendations to avoid, mitigate and minimise potential impacts on the fauna in the project area.

2. EXISTING ENVIRONMENT

2.1 LOCATION OF PROJECT AREA

The project area is in the Murchison 1 (MUR1 - East Murchison subregion) IBRA bioregion (Figure 1). Cowan (2003) described the subregion as mostly dominated by mulga woodlands that are often rich in ephemerals; hummock grasslands, salt bush shrub lands and halosarcia shrub lands. Cowan (2003) recorded no threatened ecological communities in the vicinity of the project area. Threatening processes for conservation significant fauna were listed by Cowan (2003) as foxes and feral cats.

2.2 LAND USE HISTORY

The dominant land uses for the bioregion are native pasture to support grazing and crown land reserves, and to a lesser extent mining and exploration. The region surrounding the project area has been disturbed for minerals exploration and there are many operational and non-operational mining projects in the region.

The project area has an existing operational mine and is spread across two pastoral leases - Tarmoola and Sturt Meadows stations. There are multiple station and exploration tracks in the project area.

2.3 CLIMATE

The project area is characterised as semi-arid. Leonora, 30km to the south, southeast, has an annual rainfall of approximately 235mm, although this varies considerably from year-to-year. The highest mean maximum and minimum temperatures in Leonora are in January with an average of 37°C and 21.8°C, respectively (Bureau of Meteorology, 2020). The lowest mean daily maximum and minimum temperatures occur in July (Chart 1). Average monthly rainfall is heaviest in January - March.

Summer rain is unpredictable and often results from thunderstorms coming from the north and the west or decaying cyclonic activity as low-pressure cells move from the Pilbara through the Goldfields.

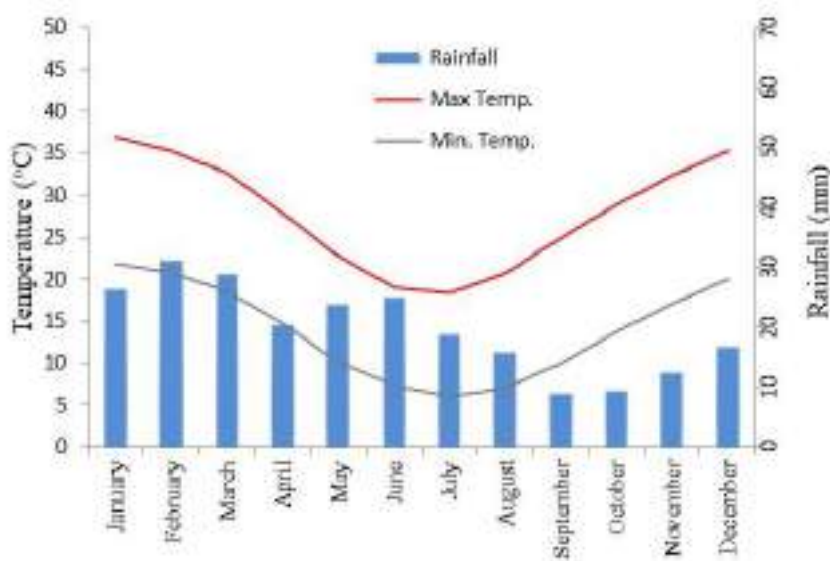


Chart 1. Climatic averages for Leonora

2.4 REGIONAL BIOLOGICAL FAUNA CONTEXT OF PROJECT AREA

The frogs, reptiles, mammals and birds in the vicinity of the project area have been surveyed for other environmental assessments and research purposes and are therefore known. Fauna surveys and assessments undertaken in the vicinity of the project area that have been reviewed for this assessment include:

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- Terrestrial Ecosystems (2016d) *Level 1 Fauna Risk Assessment for the Petra Project Area*. Unpublished report for Regis Resources Ltd, Perth.
- Terrestrial Ecosystems (2016e) *Level 1 Fauna Risk Assessment for the Tooheys Project Area*. Unpublished report for Regis Resources Ltd, Perth.
- Terrestrial Ecosystems (2017a) *Level 1 Fauna Risk Assessment for the proposal Haul Road to the Baneygo Project Area*. Unpublished report for Regis Resources Ltd, Perth.
- Terrestrial Ecosystems (2017b) *Level 1 Fauna Risk Assessment for the proposal Haul Road to the proposed Petra Mining area*. Unpublished report for Regis Resources Ltd, Perth.
- Terrestrial Ecosystems (2018a) *Level 1 Fauna Risk Assessment for the proposal Haul Road to the proposed Petra Mining area*. Unpublished report for Regis Resources Ltd, Perth.
- Terrestrial Ecosystems (2018c) *Vertebrate Fauna Risk Assessment for the Petra Mining Project*, Perth.
- Terrestrial Ecosystems (2018b) *Vertebrate Fauna Risk Assessment for the Granny Smith Solar Power Farm Project*, Unpublished report for Granny Smith Mining Company Pty Ltd, Perth.
- Volschenk, E. S. (2011) *Granny Deeps Scorpion Identification Report*. Perth.
- Whisson, C. and Slack-Smith, S. (2011) *Land Snails from the area of Laverton, Western Australia (Granny Deeps Project)*, Perth.

In addition, there are individual records for fauna contained in the Atlas of Living Australia, Western Australian Museum collection and in NatureMap's records that have also been accessed. Plate 1 provides a visual indication of the available fauna survey data for the region (blue is the project area; black dots are incidental records; and red dots are survey sites).

The most relevant and useful data are those from Coffey Environments (2008) and the two Terrestrial Ecosystems' (2010, 2011b) Level 2 surveys as they are comprehensive and incorporate habitat similar to that in the project area. These surveys were undertaken in 2007, 2010 and 2011 to the east and north-east of the project area. These surveys included pit trapping, funnel traps, echolocation bat detection surveys, avifauna surveys and short-range invertebrate surveys. Terrestrial Ecosystems has also completed multiple Level 1 fauna risk assessments in similar habitats nearby (Terrestrial Ecosystems 2012g, a, e, c, d, f, h, b, 2013, 2014, 2015a, b, 2016a, e, c, b, d, 2017b, a, 2018a, c, b).

Western Australian Museum's (WAM) regional eastern goldfields biological surveys were undertaken in the Duketon-Sir Samuel, Sandstone-Sir Samuel and Laverton areas (How et al. 1992, McKenzie *et al.* 1994). These surveys were to the north-east of the project area. HGM (1999) undertook a terrestrial fauna assessment for the Rosemont Gold Project, which is also located to the north-east of the project area. A survey was undertaken by Terrestrial Ecosystems staff for the Duketon Gold Project (Coffey Environments 2008) in the summer of 2007/08 and subsequently, Terrestrial Ecosystems (2010) surveyed the Garden Well mine; both of these surveys included habitat similar to the project area. The WAM bioregional surveys of the Edjudina – Menzies and the Kurnalpi - Kalgoorlie areas (Dell and How 1988, McKenzie and Hall 1992) and the Murrin Murrin Expansion project fauna survey (Ninox Wildlife Consulting 1998); east of the project area, surveyed similar habitat.

In addition, Terrestrial Ecosystems has reviewed the Thompson (2004) fauna survey data; which was collected after Thompson's (2004) PhD was completed. Much of this work has been published or been presented at various workshops and conferences (Thompson and Thompson 2002, Thompson *et al.* 2003a, Thompson *et al.* 2003b, Thompson *et al.* 2003c, Thompson and Thompson 2003a, Thompson and Thompson 2003b, Thompson and Thompson 2004a, Thompson and Thompson 2004b, Thompson and Thompson 2005a, Thompson and Thompson 2005c, b, Thompson *et al.* 2005a, b, Thompson and Thompson 2006a, Thompson and Thompson 2006c, b, Thompson and Thompson 2006d, Thompson and Thompson 2007a, b, c, 2008a, Thompson and Thompson 2008c). These data are to the south of the project area but contain similar habitat types.

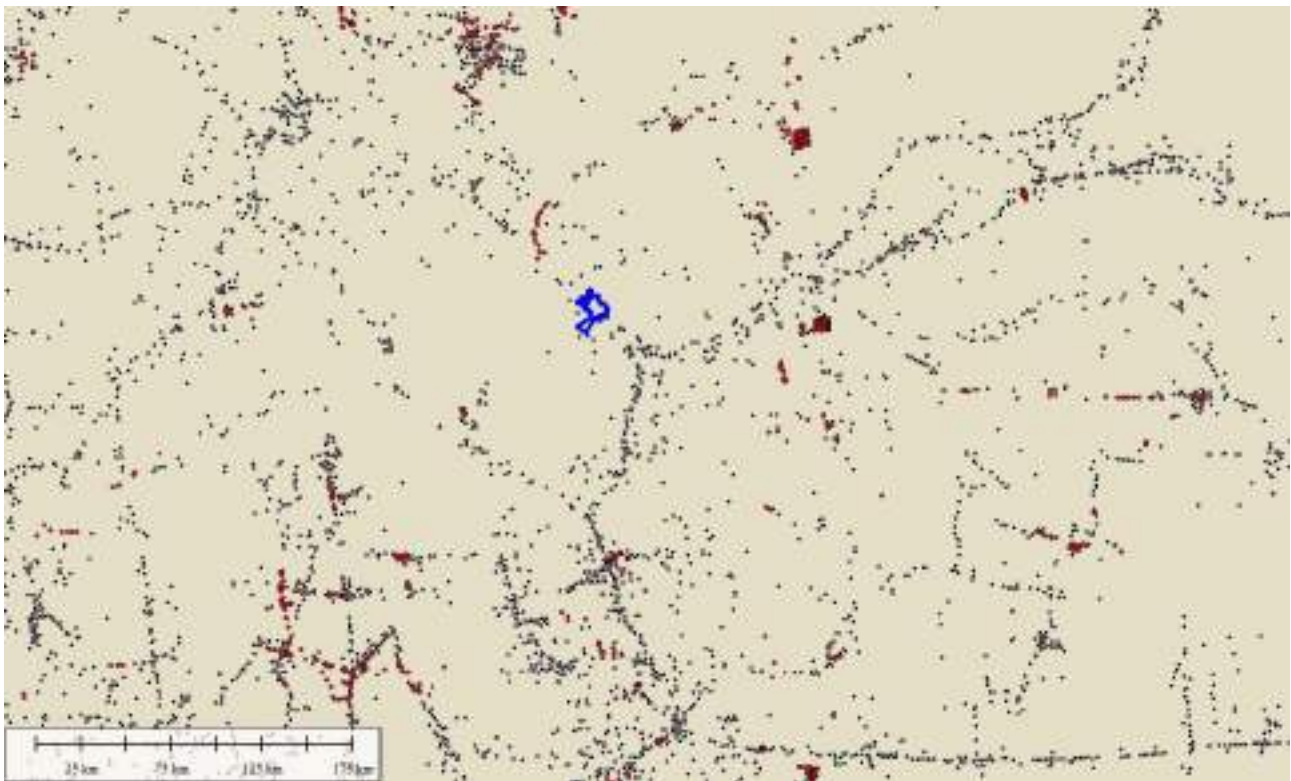


Plate 1. Regional fauna surveys

Ninox Wildlife Consulting (2006) undertook a Level 1 fauna assessment of the project area, but did not include a trapping program, and previous to this, Minesite Rehabilitation Services (1997) reported on the flora, vegetation and fauna in the project area, with the fauna data coming from the Western Australian online database.

These fauna surveys and assessments, when considered together, provide a near complete list of the vertebrate species likely to be found in the project area. The composition of vertebrate fauna assemblages varies from habitat-to-habitat and site-to-site within the bioregion, so the survey data contained in the attached appendices provide a near complete list of the vertebrate fauna species that are likely to be found in the region and project area. These data therefore provide a good regional context and indicate the extent of fauna assemblage variation that might be anticipated from site-to-site and temporally.

2.5 FAUNA SPECIES AT RISK

Cowan (2003) reported the fauna species at risk in the East Murchison subregion as Bilby (*Macrotis lagotis*), Marsupial Mole (*Notoryctes typhlops*), Mulgara (*Dasyercus cristicauda / blythi*), Malleefowl (*Leipoa ocellata*), Princess Parrot (*Polytelis alexandrae*), Slender-billed Thornbill (*Acanthiza iredalei iredalei*), Giant Desert Skink (*Liopholis kintorei*) and Peregrine Falcon (*Falco peregrinus*). This report assesses the potential for these species to be found in the project area and the potential impact that a proposed development might have on these species, and other conservation significant fauna. The Cowan (2003) report is now very dated, but the DBCA has not updated the biodiversity audit for Western Australia since that report.

3. METHODOLOGY

3.1 DETERMINATION OF SURVEY SAMPLING DESIGN AND INTENSITY

Prior to the development of the survey methodology, a review was undertaken of the factors likely to influence the survey design, and a summary of the issues considered is provided in Table 1.

Table 1. Factors likely to influence the survey design

Factor	Relevance	Comment
Bioregion – level of existing survey knowledge of the region and associated ability to predict accurately.	The study area is located in the Eastern Murchison (MUR1) subregion of the Murchison biogeographic region. Numerous fauna surveys and similar Level 2 fauna assessments have been undertaken in the region.	There are numerous fauna surveys in similar habitat that provide data on fauna assemblages in mulga woodland habitats.
Landform special characteristics/specific fauna/specific context of the landform characteristics and their distribution and rarity in the region.	Fauna habitat in the project area is not dissimilar to that in the many square kilometres of surrounding area, being a relative flat plain mostly vegetated with sparse mulga with more dense groves along ephemeral drainage lines.	Survey sites have sampled all the major fauna habitats present.
Life forms, life cycles, types of assemblages and seasonality (e.g. migration) of species likely to be present.	Two surveys were undertaken, one in summer and the second in early autumn. The site is not used by a large number of migratory avifauna species.	The project area supports variations of Goldfields mulga habitat, which are best sampled in the warmer months to record the reptiles and mammals and after heavy rains to maximise the inventory of birds and amphibians.
Level of existing knowledge and results of previous regional sampling (e.g. species accumulation curves, species/area curves).	Vertebrate fauna habitats present in the project area and surrounds have been well surveyed by numerous researchers and environmental consultants across the region.	Survey data in the vicinity of the project area provides a comprehensive list of vertebrate fauna likely to be recorded in the project area.
Number of different habitats or degree of similarity between habitats within a survey area.	The project area was dominated by two fauna habitat types. There were no salt lakes or wetlands present in the project area, although there is an ephemeral creekline running north-south through the project area.	Most of the proposed disturbance will occur in the mulga woodland on the plain. This was the focus area for the trapping program.
Climatic constraints (e.g. temperature or rainfall that preclude certain sampling methods).	The Murchison bioregion experiences hot summers with rainfall peaks that result from decaying cyclones and summer and winter thunderstorms. Summer rainfall is unpredictable.	The survey was conducted in summer and early autumn at a time suitable to catch/observe a representative sample of most vertebrate fauna except amphibians. Very few plants were flowering so the avifauna data will underrepresent the avifauna potentially in the project during periods after heavy rain when multiple plants are flowering.
Sensitivity of the environment to the proposed activities.	Habitat in the project area is well represented in the surrounding area.	There were no environmentally sensitive areas present in the project area. The project area was both

Factor	Relevance	Comment
	There are no environmentally sensitive environments in the project area.	systematically and opportunistically sampled.
Size, shape and location of the proposed activities.	The project area is an irregular shape (Figure 2) and is approximately 23km by 15km, with the access road into the existing mining area approximately 27km north of Leonora on the Goldfields Highway.	The proposed disturbance area is unknown, however, the assessed project area is 15,450ha. EPA's (2016b) Guidance Statement suggests a Level 2, two season survey is required for an area of this size in this location.
Scale and impact of the proposal.	The scale of the project is unknown, but early indications are that it warrants a Level 2 survey, in accordance with EPA guidelines.	A large-scale mining project located in the Goldfields requires a Level 2 survey unless there are adequate data to describe the fauna assemblage in the intended impact areas.

3.2 DATABASE SEARCHES

Several databases were consulted in the preparation of the potential list of vertebrate species that could be found in the project area. A search of Terrestrial Ecosystems' fauna survey database was undertaken to develop a list of birds, reptiles, mammals, amphibians and fish that have been recorded in previous surveys in the region. A search of the Department of Biodiversity, Conservation and Attractions' (DBCAs) NatureMap was undertaken to identify potential threatened or priority species in the region and a search of the Department of Agriculture, Water and the Environment's *EPBC Act 1999* online database was also undertaken to identify species of conservation interest to the Commonwealth Government potentially in the project area. The search area for this database search had a centre point of 28.66596°S, 121.14082°E and a buffer zone of a radius of 50km (Appendix A).

Other more general texts were also used to provide supplementary information including Tyler *et al.* (2000) for frogs; Storr *et al.* (1983, 1990, 1999, 2002, Thompson and Thompson 2006e) for reptiles; Johnstone and Storr (1998, 2004) for birds, and van Dyck and Strahan (2008) for mammals. In addition, the list of published and unpublished reports on fauna surveys identified in Section 2.4 have been used to provide a regional context for the small vertebrate assemblages sampled in the project area.

Collectively, these sources of information were used to create lists of species expected to utilise the project area and the broader region. It should be noted that these lists will include species that have been recorded in the general region but are vagrants and they will not generally be found in the project area due to a lack of suitable habitat (e.g. shore birds). Vagrants can be recorded almost anywhere. Many of the bird, mammal, reptile and amphibian species have specific habitat requirements that may be present in the general area but not in the specific survey area. As the ecology of many of these species is often not well understood it can sometimes be difficult to indicate those species whose specific habitat requirements are not present in the survey area. As a consequence, many species will be included in the lists produced from database searches but will not be present in the actual project area.

There are errors in most databases, including NatureMap and the WAM collection. These errors occur because of a misidentification of individuals, taxonomic name changes and incorrect coordinates being entered into the database. Terrestrial Ecosystems was unable to verify the primary records, so it has used the information provided. Readers should therefore appreciate that species lists, and fauna surveys reported in the tables and appendices may include these errors.

3.3 FAUNA HABITAT ASSESSMENT

A fauna habitat assessment was undertaken for the entire project area (see Figure 2 and Figure 6 for assessment coverage). This field assessment had three foci:

- assessing fauna habitat types and their condition;
- recording evidence of conservation significant fauna; and
- assessing the possible presence of Malleefowl, Mulgara and Bilbies within the project area, so that mitigation and management strategies might be implemented to reduce potential impacts.

Fauna assessors stopped at multiple locations within the project area (Figure 6) and recorded a suite of data about the fauna habitat and its condition (Appendix B). This information included a description of the habitat structure, habitat condition, landform, soils and vegetation and time since last fire. Appendix O shows the data that were recorded at each location as part of the habitat assessment.

3.4 TRAPPING

The survey methodology adopted for the vertebrate fauna trapping program was aligned with the Terrestrial Ecosystems' interpretation of EPA's Guidance Statement (Environmental Protection Authority 2016b), and the Technical Guide on terrestrial fauna assessments (Environmental Protection Authority 2016a).

Published literature based on goldfields survey data (Thompson and Thompson 2005c) indicate that spring and summer are the optimum time periods for vertebrate fauna surveys in the arid and semi-regions of Western Australia.

Survey sites were established between 29 October and 7 November 2019. All traps were opened between 19- 26 November 2019, and again between 11- 18 March 2020. Fauna survey sites were selected so that they sampled a representative set of the fauna habitats in the project area.

Fifteen survey sites were established (Figure 3). Each site consisted of four trapping lines. Each trap line consisted of three 20L buckets, three PVC pipes (500mm deep, 150mm wide) and six funnel traps (3 pair) spread along a 30m, 250mm high fly-wire drift fence (Plate 2 and Plate 3).



Plate 2. Trap line

There are no trappable fauna anticipated to be in the region which will be specifically caught in aluminium box traps or wire cage traps. Both of these trap types are unlikely to provide any additional useful information if an adequate number of pit-traps and funnel traps are used (Thompson et al. 2005b, Thompson and Thompson 2007d). The risks of compromising animal welfare due to heat and ants are also higher in aluminium box traps and wire cages in arid environments so we didn't use these strategies.

All 20L buckets contained pieces of white polystyrene in the bottom to help reduce trap deaths due to heat stress. During thunderstorms or significant rainfall events when the traps were open, the polystyrene floated and provided caught animals a raft if the pit-traps filled with water. Polystyrene was not necessary in the PVC pipes as the sun is only directly overhead for a small time and water drains freely through the fly-wire bottom. All funnel traps were covered with two shade cloth covers to minimise heat stress.

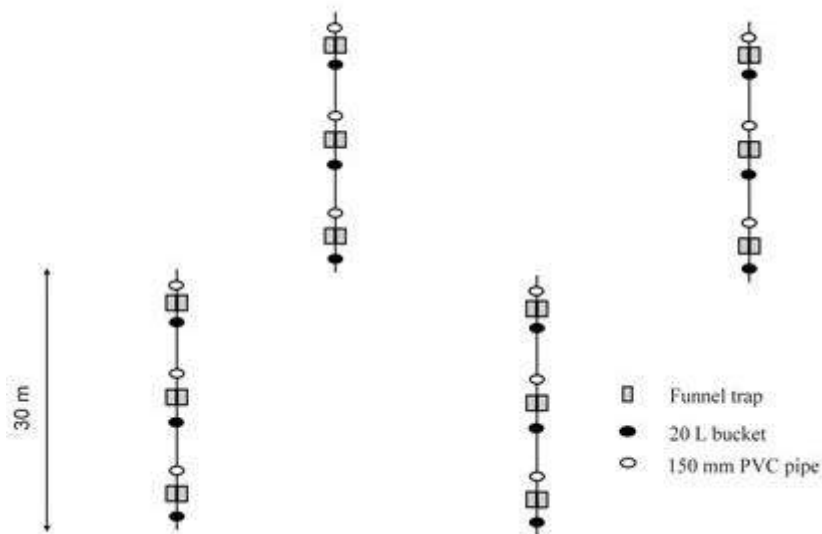


Plate 3. Layout of a single trapping site

A total of 5,040 pit-trap nights and 5,040 funnel trap-nights were used to sample the small vertebrate fauna. All traps were cleared within 4 hours of sunrise each day. The coordinates for trapping sites are shown in Appendix C.

3.4.1 Spotlighting surveys

Searches at night using spotlights were undertaken on three occasions in November 2019 and two occasions in March 2020 for a total of 40 person hours. This was mostly done in a vehicle travelling at about 5-10km per hour along the various tracks in the project area. Call playback was also undertaken during these assessments to assess the presence of nocturnal avifauna.

3.4.2 Avian surveys

Systematic avifauna surveys were carried out on most days that traps were open during both trapping periods. Areas searched for birds are shown in Appendix D and Figure 2. Twenty minutes was spent searching for birds in 2ha using a wandering transect method (Thompson and Thompson 2010). Where the habitat did not allow for a wandering approach around a central point (i.e. Sullivan Creek) a linear 2ha search (400m*50m) was adopted.

3.4.3 Camera traps

Fifty Reconyx 600 camera traps were deployed on 4 November and retrieved on 20, 21 or 22 November 2019 and 25 Reconyx HC600 camera traps were deployed on 13, 14 or 15 March and retrieved on 6 April 2020. All camera traps (Plate 4) had a non-reward bait lure (Plate 5) which consisted of peanut butter, sardines, oats and soaked in fish/whale oil. The location and deployment of camera traps is shown in Appendix E and Figure 4.



Plate 4. Camera trap



Plate 5. Non-reward camera trap lure

3.4.4 Song meters

Five SM2 Audio Song Meters were deployed at various sites each for a single night around the project area in both November 2019 and March 2020. A total of ten nights were surveyed providing a total of 50 survey sites (Appendix F and Figure 3).

3.5 DATA ANALYSIS

The first aspect of the data analysis was to characterise the vertebrate fauna assemblage in the project area and to indicate similarities and differences among sites.

3.5.1 Defining fauna habitats

Fauna habitats can be determined in multiple ways. Prior to deploying traps in the ground and undertaking avian surveys, it is necessary to assess potential habitat types in the entire project area. This was done by Dr Scott Thompson with a visual inspection of the project area on 10-11 September 2019. Based on the visual assessment, it was determined that there were two major fauna habitat types: a) mulga woodland with varying densities of mulga with sparse mid and understorey of shrubs and grasses, and b) the ephemeral creekline that runs north-south through the project area (Figure 2). Based on this visual assessment it was decided that 10 of the 15 trapping sites would be in the mulga woodland and five would be placed in the vegetated areas along the ephemeral creekline. Avian and bat echolocation surveys would ensure broad scale coverage of the entire project area, including the vegetated ephemeral creekline.

To confirm visually identified fauna habitats, a Principal Component Analysis (PCA) was calculated based on the vertebrate fauna trapping data. This would test the assumption of two broad fauna habitats, as the vertebrate fauna assemblage should cluster into two groups representing the two preselected habitat types.

A PCA was also calculated on the avian data, however, it was not expected that these data would display habitat groups, as very few birds (i.e. species and individuals) were recorded in each of the 20 minute-2ha searches, so there was unlikely to be sufficient data for each survey site to provide a meaningful result in the PCA.

The PCA was performed in StatistixL (www.statistixl.com) using the correlation matrix and plotting the Eigenvalues for PC1 and PC2 as these two principal components accounted for the highest percentage of variance.

3.5.2 Analysing data based on fauna habitats

Fauna data are best analysed based on habitat types, which is what has been done here for the trapping data.

The diversity for the trapped fauna assemblage can be measured in numerous ways (Hayek and Buzas 1997, Magurran 2004). The four most common attributes are species richness, evenness, a single diversity score and relative abundance. These metrics are interrelated and there are a diverse number of analytical tools available to quantify these metrics and similarity among the trapped assemblages for each site.

3.5.2.1 Species richness and relative abundance

The actual number of species caught at each trapping site is one measure of species richness and is directly related to the trapping effort and number of individuals caught. Had the trapping effort been extended and more individuals caught, then it is likely the number of species caught at each site would increase (Colwell and Coddington 1994, Magurran 2004).

3.5.2.2 Evenness

Smith and Wilson (1996), supported by Magurran (2004), reported their measure of evenness (Evar) to be the most satisfactory overall. Evar was calculated for each of the survey sites using Species, Diversity and Richness software (Pisces Conservation Ltd 2010, V4.1).

3.5.2.3 Diversity

Log series diversity (also known as Fisher's alpha) was used to measure diversity because of its good discriminating ability and low sensitivity to sample size (Kempton and Taylor 1974, Magurran 1988, Hayek and Buzas 1997). Log series diversity was calculated using Species, Diversity and Richness software (Pisces Conservation Ltd 2010, V4.1). Shannon-Wiener and Simpson's indices are also provided for each trapping site for comparison with other reports.

3.5.2.4 Similarity

Having established that there were significant differences among the trapped assemblages at each site, Terrestrial Ecosystems wished to indicate the extent to which the sites were similar. The Morisita-Horn similarity index was used to compare similarity between combinations of fauna assemblages at each site. The quantitative Morisita-Horn similarity index was selected because it is not strongly influenced by either species richness or sample size (Wolda 1981) and it was recommended by Magurran (2004). Readers should, however, be aware that it is heavily influenced by the abundance of the most abundant species.

3.5.2.5 Species accumulation curves

Species accumulation curves, or collectors' curves, plot the cumulative number of species discovered in a defined sampling area with increasing levels of survey effort (Thompson *et al.* 2007). Species accumulation curves provide a measure of species inventory efficacy and completeness, and can be used to compare surveys based upon standardized sampling protocols (Moreno and Halffter 2000). Soberón and Llorente (1993) suggested that species accumulation curves lend rigour to fauna inventories.

Species accumulation curves were prepared to demonstrate the adequacy of the survey effort. Input data was the number of individuals by species for each of 14 days (i.e. data for the two survey periods combined). For the trapping data, captures were randomly allocated across the 14-day trapping period and 10,000 iterations were used to average the curve. For the bird data, site survey results were used instead of days, and again

10,000 iterations were used to average the curve. Non-linear regression curves were then calculated using the Beta-P model (Thompson *et al.* 2003c) in NLREG software (Sherrod 2001) for the combined trapping and avian data. Species accumulation curves were plotted with the ordinate axis as species richness and the abscissa the number of individuals caught or seen for birds.

3.6 FIELD WORK AND REPORTING STAFF

Dr Scott Thompson was the team leader and coordinated the overall field assessment. Dr Scott Thompson and Ray Turnbull with support from Georgia Ford, Dr Cara Sambell and John-Michael Stuart undertook the fauna habitat assessment using an ATV or 4WD to move around the project area. Dr Scott Thompson, Dr Cara Sambell, Ray Turnbull, Georgia Ford, John-Michael Stuart undertook the trapping program and Ray Turnbull undertook the avian survey. Additional staff were used to assist with the set up of trapping sites prior to the surveys. Tim Clarke (Red 5) provided logistical and field assistance during the set up and trapping programs. Dr Kyle Armstrong, of Specialised Zoological, undertook the analysis of bat echolocation data. The data analysis was undertaken by Dr G Thompson and the report prepared by Drs G. and S. Thompson.

Senior scientists have appropriate relevant post-graduate qualifications, extensive experience in conducting fauna assessments in the Goldfields, have published research articles on biodiversity, fauna assemblages, conservation significant species, trapping techniques and temporal variations in trapped fauna assemblages based on Goldfields surveys and are therefore appropriately trained and experienced to undertake the survey and prepare the assessment. The qualifications and experience of the survey personnel are shown in Table 2.

Table 2. Project personnel and their qualifications

Name	Qualifications	Experience	Role
Dr Scott Thompson	BSc. (Env. Sc.), MSc. (Env. Mngt.), PhD (Env. Sc./Mngt).	> 15 years	Survey coordinator and principal zoologist
Dr Graham Thompson	Post Grad. Dip. (Zool.), PhD (Zoology)	> 20 years	Principal zoologist
Ray Turnbull	BNat Sc., GDip Ornithology	> 8 years	Senior Zoologist
Dr Cara Sambell	BA (Outdoor Env Ed), PhD (Cons Biol)		Zoologist
Georgia Ford	BSc., MSc.	> 4 years	Zoologist
Dr Kyle Armstrong	BSc. (Hons), PhD (Zoology)	> 15 years	Chiropterologist
John-Michael Stuart	BSc. (Hons),	> 5 years	Zoologist

All fauna trapping was conducted under a DBCA Regulation 27 licence #BA27000160 issued to Dr Scott Thompson.

3.7 ANIMAL ETHICS

Environmental consultants in WA are currently not required to obtain approval from an established animal ethics committee to undertake terrestrial vertebrate fauna surveys.

To minimise fauna deaths due to heat stress, all funnel traps had shade covers and all buckets contained two pieces of polystyrene. Polystyrene sheets insulate against heat and float, providing a raft for small individuals when pit-traps filled with water (Thompson and Thompson 2009). Traps were cleared daily commencing at first light with the last traps cleared within 4 hours of sunrise. Ant powder was placed around and in pit and funnel traps where ants were an obvious problem.

3.8 TAXONOMY AND NOMENCLATURE

Taxonomy and nomenclature for fauna species used in this report are generally based on the WA Museum species list except for bats, which follow Churchill (2008) and birds which follow Christidis and Boles (2008) and updated from ebird (www.ebird.org). Terrestrial Ecosystems has presumed that the identifications referred to in the appendices and in the reports used to provide regional comparative data are correct and we have only corrected obvious records where the nomenclature was known to be incorrect.

3.9 LIMITATIONS

This Level 2 fauna risk assessment uses information contained in the Commonwealth Government Matters of National Environmental Significance (MNES) online database and other published and unpublished fauna survey data for the bioregion and site surveys.

The EPA (2016b) *Technical Guidance Terrestrial Fauna Surveys* suggested that fauna surveys may be limited by many variables. Limitations associated with each of these variables are assessed in Table 3.

Table 3. Fauna survey limitations and constraints

Possible limitations	Constraint (yes/no); significant, moderate or negligible	Comment
Competency and experience of the consultant carrying out this assessment	No	The senior environmental scientists that undertook the field survey and assessment, drafted and reviewed this report are familiar with the vertebrate fauna of this bioregion.
Scope	No	All aspects of the scope of works have been addressed.
Proportion of fauna identified, recorded and/or collected	Yes, negligible	As discussed below.
Accuracy of previous survey work	Yes, negligible	Terrestrial Ecosystems has reported fauna survey data recorded by various authors but is not able to vouch for the accuracy of this information (other than its own work). It is acknowledged that the taxonomy of Western Australian vertebrates is continually being revised and the nomenclature of some of the species listed in the appendices may have changed since publication by the authors.
Sources of information	Yes, negligible	Vertebrate fauna information was available from on-line databases and unpublished and published reports of surveys conducted in the bioregion in a variety of habitat types. Many of these surveys employed a low level of trapping effort which significantly impacts on the capacity of these data to represent the fauna assemblages in the areas surveyed.
Proportion of the task achieved	No	All tasks completed.
Timing/weather/season/cycle	N/A	Weather was appropriate during the site surveys.
Disturbances which affected results of the survey	No	Disturbance in the project area have been factored into this assessment.
Intensity of survey effort	N/A	The survey effort applied here generally far exceeds that undertaken for other vertebrate fauna assessments in the Goldfields and the Pilbara (Fraser <i>et al.</i> 2003, Thompson and Thompson 2010, Thompson and Thompson in press).
Completeness	No	All aspects of this assessment have been completed.
Resources	No	Adequate resources were available.
Remoteness and/or access problems	No	All parts of the project area, other than the active mining area, were accessed.
Availability of contextual information on the region	No	Fauna survey data are available for the general area and specifically fauna habitats accessed in the project area.

4. RESULTS

4.1 FAUNA HABITAT

4.1.1 Fauna habitat type

There are two broad fauna habitats in the project area:

- open mulga woodland over mixed shrubs and scattered grasses or bare ground (Plate 6, Plate 7, Plate 8, Plate 9); and
- woodland of large eucalypts over mixed shrubs and scattered grasses along the ephemeral creekline that runs north-south through the project area (Plate 10 and Plate 11).



Plate 6. Open mulga woodland over mixed shrubs and scattered grasses or bare ground



Plate 7. Open mulga woodland over mixed shrubs and scattered grasses or bare ground



Plate 8. Open mulga woodland over mixed shrubs and scattered grasses or bare ground



Plate 9. Open mulga woodland over mixed shrubs and scattered grasses or bare ground



Plate 10. Woodland of large eucalypts over mixed scattered grasses and shrubs along the ephemeral creekline



Plate 11. Woodland of large eucalypts over mixed scattered grasses and shrubs along the ephemeral creekline



Plate 12. Woodland of large eucalypts over mixed scattered grasses and shrubs along the ephemeral creekline



Plate 13. Woodland of large eucalypts over mixed scattered grasses and shrubs along the ephemeral creekline

The results of the rapid habitat assessment are shown in Appendix O and the location of each of these assessment sites is provided in Figure 6. The density of trees and shrubs in both habitat types varied across the project area but was mostly sparse in the open mulga woodland.

4.1.2 Fauna habitat condition

Tarmoola and Sturt Meadows stations run cattle on their respective stations, and these cattle graze over the entire project area, excluding the active mining area. The quality of fauna habitat varies from highly degraded to good. The more degraded areas include the active mining area, historical and recent exploration areas and where cattle grazing is occurring. There are numerous access tracks in the project area (Figure 3), but these are generally narrow and mostly only wheel tracks on a sand-clay substrate. There is extensive evidence of feral fauna (i.e. wild dogs and cats) in the project area.

There is an isolated old mining pit (Rainbow Pit) that contains permanent freshwater water and attracts waterbirds and is a drinking point for avifauna in the dry periods.

4.2 FAUNA ASSEMBLAGE

4.2.1 Trapped terrestrial vertebrate fauna

The terrestrial vertebrate fauna were trapped at 15 sites using buckets and pipes as pit-traps and funnel traps along fly-wire drift fences. The results of the trapping program are provided by survey period and site and trap type in Appendix G. Buckets, followed by funnel traps were the most successful method of catching terrestrial fauna.

Less than five individuals were recorded for multiple species during each survey period, with five species caught once and three species caught twice. Small mammals were relatively scarce, as were large snakes and dragon lizards. The most abundant species caught were small geckos and skinks. There was a marked difference in the fauna species caught into two habitat types.

4.2.2 Spotlighting

Surveyors observed rabbits (*Oryctolagus cuniculus*), Euros (*Macropus robustus*), Red Kangaroos (*Macropus rufus*), a Stimson's Python (*Antaresia stimsoni* – dead on the haul road) and a Rosen's Snake (*Suta fasciata*) during nocturnal spotlighting surveys. The scarcity of small vertebrate fauna in the project area was evident in the spotlighting surveys.

4.2.3 Avifauna

Avifauna records are provided by site in Appendix H. Of the 53 species recorded at the 87 avifauna survey sites, 10 were recorded once, eight recorded twice and 36 species recorded on less than 10 occasions, indicating the scarcity of numerous species in the project area. Eight waterbird species were recorded in the Rainbow Pit, which was not unexpected as there is permanent freshwater in the bottom of this mine pit.

4.2.4 Camera trapping

Camera trap results are provided in a matrix in Appendix I. Cattle were the most commonly recorded species on camera traps (i.e. 43 of the 75 camera traps). Wild dogs and feral cats were each recorded on 19 camera traps, and Red Kangaroos on 24. Feral predators (e.g. cats and wild dogs) appear to be relatively abundant in the project area.



Plate 14. Feral cat



Plate 15. Wild dogs



Plate 16. Red Kangaroo



Plate 17. Cow



Plate 18. Wild dog/dingo



Plate 19. Rabbit

4.2.5 Bats

Specialised Zoological (2020) analysed the data from the SM2 Audio Acoustic Meters and a summary of the results is provided in Appendix J. The methodology is provided in the report (Appendix N).

Bats from two families (i.e. Vestertilionidae and Molossidae) were recorded at multiple survey sites using their echolocation calls. The six named species (appendix J) are widespread and abundant in the Goldfields and elsewhere in Western Australia's semi-arid regions.

4.3 FAUNA ASSEMBLAGE STRUCTURE

4.3.1 Trap type

Three trap types were deployed in this survey. Different trap types sample the small vertebrate assemblages differently (Thompson *et al.* 2005b, Thompson and Thompson 2007d). Small mammals were only caught in pit traps, with buckets and pipes catching equally well when seasonal survey data were combined (16 in buckets and 15 in pipes); however, buckets were more successful in November (6 in buckets and 2 in pipes) compared to pipes in March (10 in buckets and 13 in pipes). Buckets followed by funnel traps were the most effective in catching reptiles for both November and March (Appendix G). These trapping results differ with the conclusions of Thompson and Thompson (2007d) who reported funnel traps being important for capturing reptiles, but is similar to Thompson *et al.* (2005b) who reported buckets and pipes as having a trapping bias and capturing a different component of the fauna assemblage. If different trap types were not used, then the results may misrepresent the faunal assemblage that actually occurred on site.

4.3.2 Fauna assemblages determining fauna habitats

PCA calculated for the trapping data indicated two distinct fauna habitats (Chart 2). Trapping sites 4, 7, 8 9 and 10 are in the ephemeral creekline, whereas, all other sites are mulga woodland with variable densities of vegetation. This clear separation of fauna habitats based on the trapped fauna assemblage confirms the visual observation and the initial determination of placing five sites in the ephemeral creekline and the remaining 10 sites in the mulga woodland as they represented different fauna habitats. PCA1 recorded 45.4% of total variance and PCA2 27.9% of total variance, indicating that these two components removed 73.4% of the available variance (Chart 2).

Species accumulation curves for the trapping data should therefore be calculated based on the fauna assemblages in each of these two fauna habitat types.

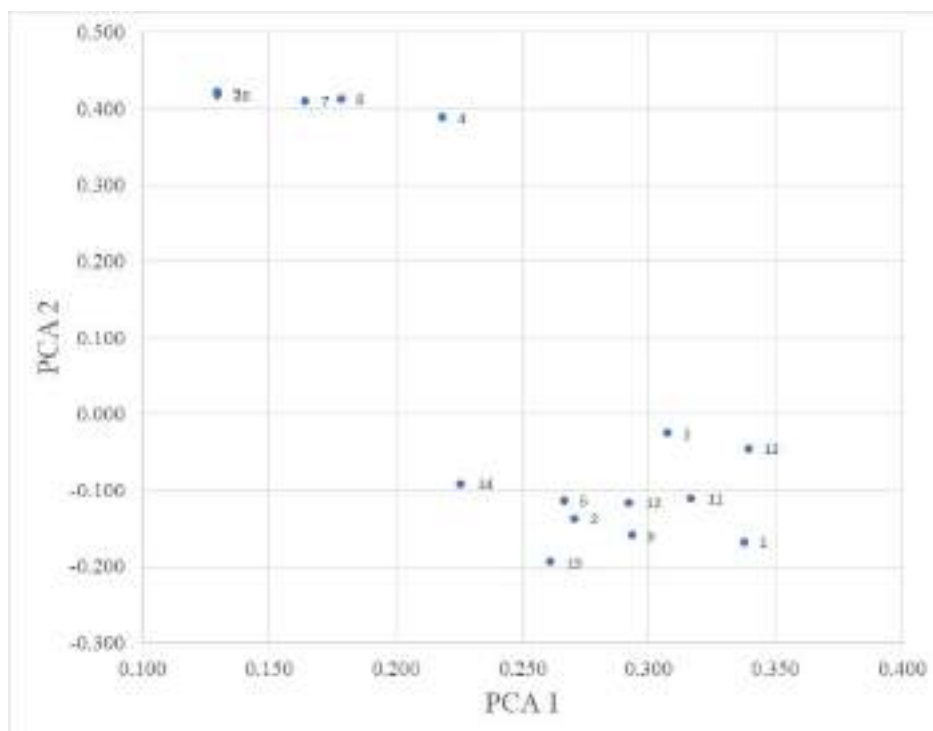


Chart 2. PCA with Eigenvectors 1 and 2

4.3.3 Species accumulation curves

Species accumulation curves plot the cumulative number of species recorded in a defined sampling area with increasing levels of survey effort (Thompson *et al.* 2003c, Thompson and Thompson 2007e). They can provide a measure of species inventory efficacy and completeness, can be used to compare surveys based upon standardized sampling protocols (Moreno and Halffter 2000) and can provide information about the assemblage structure (Thompson and Withers 2003).

When the data from all sites were combined, 40 species of reptiles and small mammals were trapped in the project area. Species accumulation curves were calculated for the two habitat types and this modelling predicted that 28 species would be caught in the ephemeral creekline and 23 species would have been caught if 1,000 individuals had been caught (Chart 3). Our survey caught 22 species in this habitat type. For the mulga woodland, it was predicted that there were 127 species, and if 1,000 individuals had been caught, then it would have recorded 35 species (Chart 4). One hundred and twenty-seven species is clearly incorrect and occurred because of the large number of singletons and doubletons recorded in the trapping survey. We

caught 33 species which is comparable to the estimate of 35 if 1000 individuals were recorded. For trappable vertebrate fauna, reasonable estimates of species richness are 23 for the ephemeral creekline and 35 for the mulga woodland.

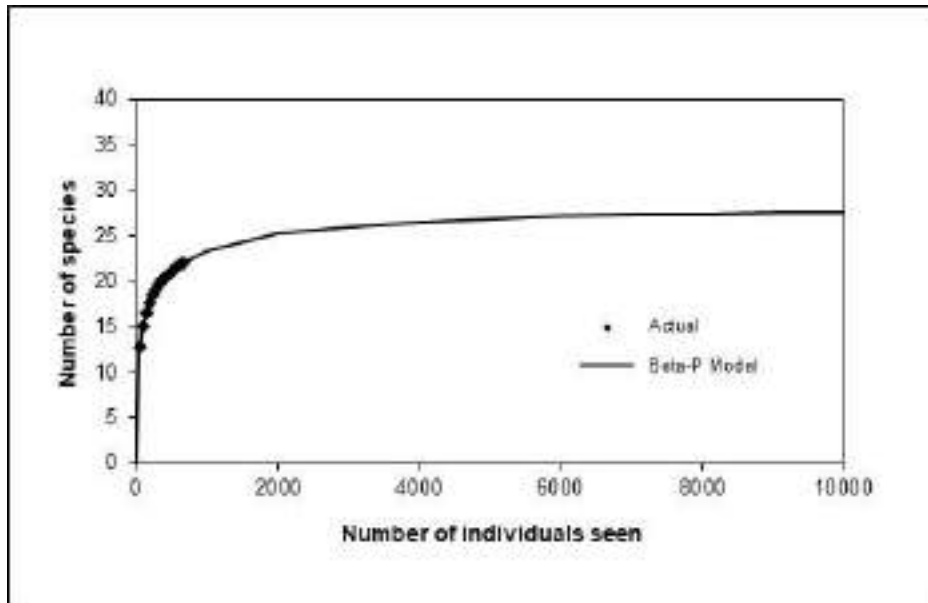


Chart 3. Species accumulation curve for the ephemeral creekline habitat

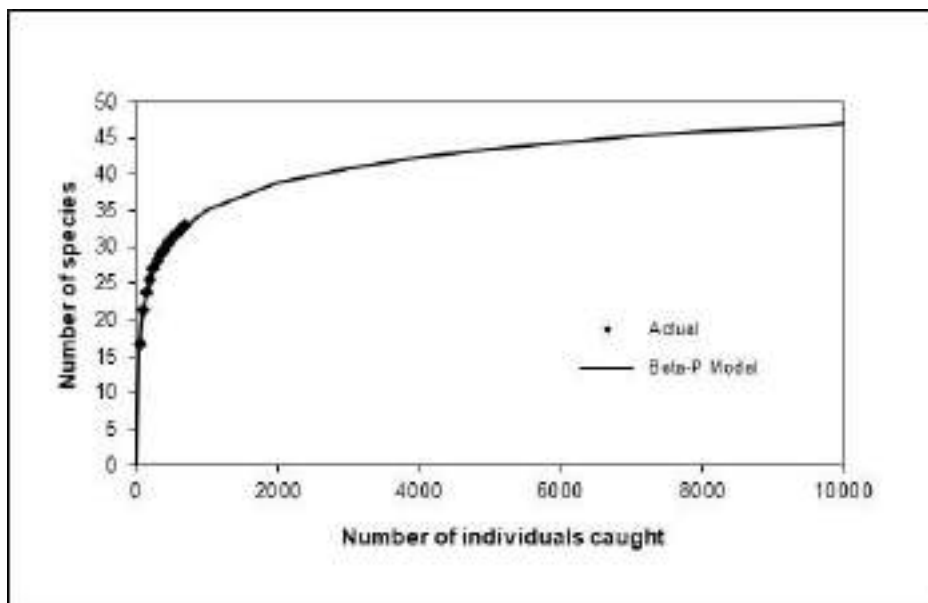


Chart 4. Species accumulation curve for the mulga woodland habitat

The species accumulation curve for avifauna based on birds recorded at the 87 surveys sites is shown in Chart 5. The projected species richness was 91 species; and had 1,000 birds been recorded then the estimated number of species recorded would have been 56. When all species were included, including incidental observations, the recorded avifauna species richness was 72. However, this included the species recorded in Rainbow Pit (Appendix D) during two visits (11 and 17 March 2020). Rainbow Pit is an old, long-used mining pit that contains permanent freshwater and supported numerous waterbirds, that were not recorded elsewhere in the project area due to a lack of suitable habitat.

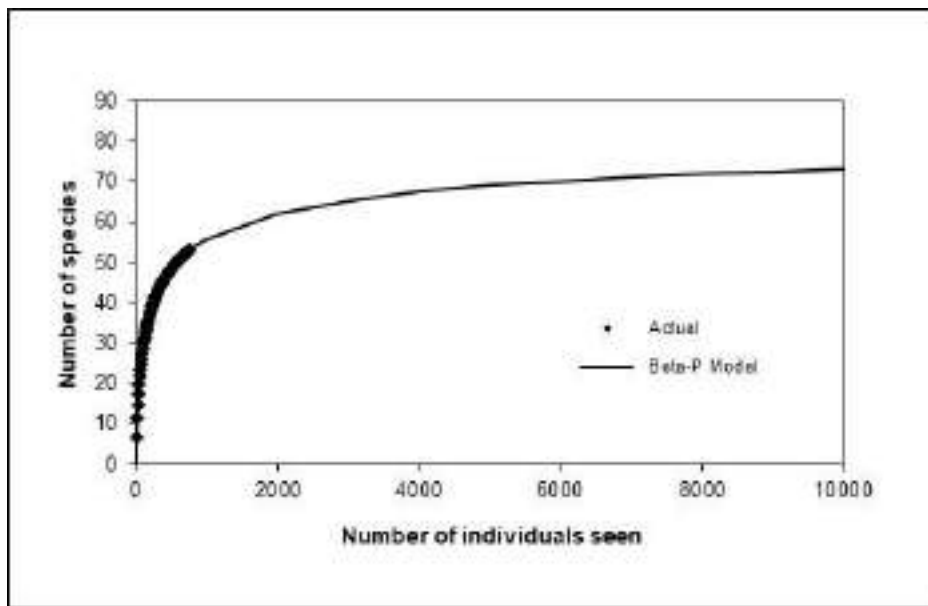


Chart 5. Species accumulation curve for all bird observations at the 87 site sites

4.3.4 Diversity and evenness

Diversity scores indicated that vertebrate diversity varied appreciably among trapping sites (Table 4). Sites 2, 9, 10, 11 and 14 had species richness of 17 or higher, and all sites had a species richness higher than 13 with the overall species richness of 40.

The most diverse sites were 11, 12 and 14, all with Fisher’s Alpha scores above 7, whereas, Shannon-Weiner Index is highest for site 11, with sites 6, 9, 10, 12 and 14 having scores higher than 2.4. Simpson’s Index more closely reflects the Fisher’s Alpha values recording site 11 as the highest, and sites 6 and 12 being above 10 (Table 4).

All sites scored above 6.4 except site 15 on evenness, with sites 6 and 11 scoring the higher values (Table 4).

Table 4. Diversity and evenness indices and species richness for vertebrate fauna captures for trapping sites

Trapping site	Fisher’s Alpha	Shannon-Weiner Index (H)	Simpson’s Index	Evenness	Species richness
1	5.449	2.229	7.524	0.716	15
2	5.770	2.253	6.516	0.643	17
3	6.747	2.167	6.842	0.684	14
4	3.506	2.185	7.704	0.778	13
5	5.633	2.273	8.674	0.774	14
6	6.598	2.448	10.600	0.804	16
7	4.355	2.197	7.418	0.737	14
8	3.258	2.114	7.258	0.778	12
9	6.258	2.426	9.426	0.740	19
10	4.611	2.422	9.235	0.769	17

Trapping site	Fisher's Alpha	Shannon-Weiner Index (H)	Simpson's Index	Evenness	Species richness
11	7.638	2.600	12.760	0.829	18
12	8.704	2.444	10.780	0.788	16
13	5.559	2.189	7.700	0.723	15
14	7.344	2.413	8.570	0.721	17
15	4.665	1.869	4.101	0.534	13
Overall	7.726	2.914	13.880	0.711	40

4.3.5 Similarity

A similarity score of 1.0 (range 0.0–1.0) indicates that the two sites being compared have identical fauna assemblages, whereas a low score indicates that the fauna assemblages differ appreciably. Based on the PCA, it would be expected that sites in each of the fauna habitats might have a similar fauna assemblage and would score higher than those between habitat types. This is true for the sites in the ephemeral creekline (Table 5; coloured mustard) but there is high variability in the mulga woodland sites, as might be expected due to the variable densities of vegetation.

Table 5. Similarity in the trapped fauna assemblage among each of the survey sites

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
2	0.779													
3	0.844	0.864												
4	0.352	0.308	0.501											
5	0.800	0.527	0.605	0.367										
6	0.801	0.447	0.568	0.377	0.746									
7	0.235	0.210	0.401	0.935	0.213	0.255								
8	0.257	0.296	0.454	0.932	0.192	0.238	0.944							
9	0.203	0.152	0.324	0.888	0.210	0.276	0.818	0.868						
10	0.242	0.131	0.354	0.862	0.225	0.344	0.825	0.862	0.906					
11	0.751	0.745	0.660	0.439	0.675	0.578	0.358	0.393	0.278	0.272				
12	0.806	0.447	0.541	0.399	0.797	0.793	0.327	0.272	0.292	0.273	0.691			
13	0.783	0.569	0.630	0.570	0.834	0.704	0.437	0.439	0.374	0.331	0.818	0.817		
14	0.578	0.878	0.680	0.334	0.501	0.292	0.280	0.360	0.197	0.154	0.757	0.356	0.518	
15	0.736	0.462	0.426	0.144	0.640	0.613	0.076	0.130	0.109	0.105	0.609	0.676	0.692	0.382

4.4 BIOREGIONAL VERTEBRATE FAUNA ASSEMBLAGE

Appendix K provides a summary of the fauna survey data that are available near the project area. There are appreciable differences in the recorded fauna assemblages within and among fauna surveys shown in Appendix K. These differences are partially due to the low survey effort deployed by some of the surveys and they also reflect variations in soils and vegetation as well as temporal variations in the fauna assemblages.

Appendix L provides a list of vertebrate species potentially found near the project area that have been compiled based on the fauna survey report results shown in Appendix K.

The Goldfields support multiple and differing fauna habitats, with the five most noticeable being open mulga woodland, spinifex on sandplains, eucalypt woodlands, chenopod shrublands and salt lakes. Each of these habitat types supports a unique fauna assemblage, and there are shared species that are widespread and ubiquitous. It was therefore expected that many of the species in the lists provided in Appendix L would not be found in the project area. Similarly, there are some species that are very tolerant of disturbance and persist in highly disturbed environments (e.g. *Heteronotia binoei*, *Underwoodisauris milii*) and might therefore be expected to be present in relatively high abundance in the project area.

There are multiple species that were expected in the project area, but were not recorded (e.g. *Ctenophorus cristatus*, *Ctenophorus nuchalis*, *Tympanocryptis cephalo*, *Cercartetus concinnus* and *Antechinomys laniger*). The lack of these species is probably due to the altered fauna habitats due to cattle and goat grazing and predation by wild dogs and feral cats, with the dry conditions in the months prior to the survey also having an influence.

The avifauna list in Appendix L contains a lot of wetland bird species. Wetland bird abundance in the Goldfields is determined by rainfall and the presence of freshwater water or salt lakes. Salt lakes are scattered throughout the Goldfields and water levels change based on major rainfall events. Permanent freshwater is probably more common now than historically because the water has filled the bottom of many abandoned mining pits. There are very few freshwater lakes in the Goldfields and water in many of the mining pits is saline, and many of the paleochannels are saline or hypersaline.

4.5 CONSERVATION SIGNIFICANT FAUNA

Conservation significant fauna are protected by the Commonwealth *EPBC Act 1999*, and this list includes species covered by international treaties such as the Japan-Australia Migratory Bird Agreement (JAMBA) and China-Australia Migratory Bird Agreement (CAMBA) and the *BC Act 2016*. The *BC Act 2016* provides for the publishing of the *Wildlife Conservation (Specially Protected Fauna) Notice* that lists species under multiple categories. In addition, the DBCA maintains a list of fauna that require monitoring under four priorities based on the current knowledge of their distribution, abundance and threatening processes. The *EPBC Act 1999* and *BC Act 2016* imply legislative requirements for the management of anthropogenic impacts to minimise the effects of disturbances on species and their habitats. Priority species have no statutory protection, other than the DBCA wishes to monitor potential impacts on these species. Environmental consultants and proponents of developments are encouraged to avoid and minimise impacts on these species. Definitions of the significant fauna under the *BC Act 2016* are provided in Appendix M.

Wetland and wetland migratory bird species have been excluded from the following list and assessments, as there is no suitable habitat for these species in the project area. One threatened species of fauna and one migratory/marine species of birds identified under the *EPBC Act 1999* potentially occur in the project area. There are three Schedule species listed under the *BC Act 2016* and one species listed on the DBCA's Priority Fauna List that potentially occur in the project area. The following is an assessment of the likelihood of each of the species listed in Table 6 being found in the project area.

Table 6. Assessment of the potential presence and impact on a species of conservation significance

Species	DBCAs Schedule / Priority	Status under Commonwealth EPBC Act 1999	Comment on the potential presence of a species and potential impact from development
Night Parrot <i>Pezoporus occidentalis</i>	Critically Endangered	Endangered	Highly unlikely to be in the project area, due to a lack of suitable habitat. The potential for impacting on this species is therefore very low.
Arid Bronze Azure Butterfly <i>Ogyris subterrestris petrina</i>	Critically Endangered	Critically Endangered	Highly unlikely to be in the project area, due to a lack of suitable habitat and lack of nearby records. The potential for impacting on this species is therefore very low.
Malleefowl <i>Leipoa ocellata</i>	Vulnerable	Vulnerable	Highly unlikely to be in the project area due to a lack of suitable habitat and high density of feral fauna. The potential for impacting on this species is therefore very low.
Chuditch <i>Dasyurus geoffroyi</i>	Vulnerable	Vulnerable	Highly unlikely to occur in the project area. The potential for impacting on this species is therefore very low.
Princess Parrot <i>Polytelis alexandrae</i>	Priority 4	Vulnerable	May infrequently be seen in the region, however, clearing vegetation or development is unlikely to impact on this species.
Mulgara <i>Dasyercus blythi</i>	Priority 4		Highly unlikely to be in the project area due to a lack of suitable habitat. The potential for impacting on this species is therefore very low.
Fork-tailed Swift <i>Apus pacificus</i>	IA	Migratory	May very infrequently be seen in the region area, however, clearing vegetation is unlikely to impact on this aerial species.
Grey Wagtail <i>Motacilla cinerea</i>	IA	Migratory	Highly unlikely to be present in the project area. The potential for impacting on this species is therefore low.
Yellow Wagtail <i>Motacilla flava</i>	IA	Migratory	Highly unlikely to be present in the project area. The potential for impacting on this species is therefore low.
Peregrine Falcon <i>Falco peregrinus</i>	OS		May infrequently be seen in the region, however, clearing vegetation is unlikely to impact on this species.
<i>Branchinella apophysata</i>	Priority 1		Unlikely to be in the project area, so the potential for impact on this species is low.
Long-tailed Dunnart <i>Sminthopsis longicaudata</i>	Priority 4		Unlikely to be in the project area due to a lack of typical habitat and high density of feral fauna. The potential for impacting on this species is therefore low.

IA – Migratory birds protected under international agreements;

OS – Other Specially protected fauna

Night Parrot (*Pezoporus occidentalis*) - Critically Endangered under the *BC Act 2016* and Endangered under the *EPBC Act 1999*

The Night Parrot is a small, arid-adapted, nocturnal, ground-feeding parrot (Johnstone and Storr 1998, Threatened Species Scientific Committee 2016). Its length is 22-25cm with a body mass of approximately 104g (Threatened Species Scientific Committee 2016), although it was suggested that they were semi-nomadic, the Night Parrots in south-western Queensland appear to be sedentary (Murphy 2015).

The Night Parrot was probably originally distributed over much of semi-arid and arid Australia (Garnett *et al.* 1993, Threatened Species Scientific Committee 2016). Records in north-west and western Queensland in the early 1990-2000s were in a broad cross section of the habitats available (Garnett *et al.* 1993, Cupitt and Cupitt 2008, Boles *et al.* 2016). There have been recent sightings in the Pilbara in 1980, 2005 and 2017, central WA in 1979, north-eastern South Australia in 1979, western Queensland (including Pullen-Pullen-Mt Windsor-Diamantina population) in 1980, 1990, 1993, 2006 and 2013-17 (Davis and Metcalf 2008, Garnett *et al.* 2011, Charalambous 2016, Pickrell 2016, AG staff 2017, Palaszczuk and Miles 2017, Rykers 2017, AG staff 2018), Pilbara in 2017 (Jones 2017) and the northern Goldfields (Jackett *et al.* 2017). Garnett *et al.* (2011) suggested that there were between 50-250 mature individuals in less than 5% of its previous range.

Wilson's (1937) summary of observations provided information on the early records of Night Parrots' preferred habitat and breeding sites. Recent information indicates its preferred habitat appears to be in *Triodia* grasslands, chenopod shrublands, shrubby samphire and floristically diverse habitats dominated by large-seeded species (Threatened Species Scientific Committee 2016, McCarthy 2017, Murphy *et al.* 2017b). At Pullen Pullen Reserve it nests in large, more or less ring-shaped *Triodia*, and the nest consists of a tunnel (25-30cm and 0cm to the ground; 20-33cm long) through an apron of dead spinifex leaves that leads to a chamber under a live hummock, with a shallow depression (3-4cm) excavated into the gravelly/sandy soil (Murphy *et al.* 2017a). In the northern Goldfields the nest was again in a spinifex hummock, it was circular, with an excavated depression (~1.5-2.0cm) in sandy substrate (Hamilton *et al.* 2017, Jackett *et al.* 2017). The entrance tunnel was 62cm long, and was downward sloping (27°) with the entrance 28cm above the ground (Hamilton *et al.* 2017). It has clutches of two to four sub-elliptical, white eggs with a lustrous appearance (Murphy *et al.* 2017a). Breeding followed significant rains in March for the observations in Pullen-Pullen Reserve and in April in the northern Goldfields (Hamilton *et al.* 2017, Murphy *et al.* 2017a), but it is thought that breeding generally occurs between April and October (Murphy *et al.* 2017a).

Murphy *et al.* (2017b) placed a GPS tag on Night Parrots and reported that the two birds called at dusk from their diurnal roosts among spinifex hummocks and then flew to more floristically diverse habitats dominated by large-seeded, prolifically seeding species to feed.

There are no mature spinifex hummocks in the project area and numerous feral fauna. As the preferred roosting and nesting sites for Night Parrots are not present and there is a significant threatening process for the species in the area (i.e. feral cats), it is Terrestrial Ecosystems' assessment that Night Parrots are not present in the project area and will therefore not be impacted by any proposed development.

Arid Bronze Azure Butterfly (*Ogyris subterrestris petrina*) – Critically Endangered under the *BC Act 2016* and *EPBC Act 1999*

Arid Bronze Azure Butterfly is associated with colonies of the ant *Camponotus terebrans* in mallee vegetation on sandy soil, often near flood plains, and the ant typically digs its nest at the base of eucalypts (Threatened Species Scientific Committee 2014). Butterfly larvae hatching from eggs laid near an ant nest entrance (often near the bases of various mallee eucalypts) are carried, by the ants, into their nest. Details of *C. terebrans* biology and of any form of herbivory by the larvae are unknown; however, it is likely that the larvae are myrmecophilous. These butterflies fly close to the ground and have been observed flying over agricultural lands near presumed breeding colonies (Williams and Williams 2008). The goldfields population was originally known from Lake Douglas, about 12kms south-west of Kalgoorlie (Field 1999), however, this population is reported to have become extinct (Williams *et al.* 2008, Williams *et al.* 2018) and also in the Barbalin Nature

Reserve (~11km west of Mukinbudin) in the Avon Wheatbelt which is now the only known extant population (Threatened Species Scientific Committee 2014).

Camponotus terebrans is typically only found in areas with smooth bark Eucalypts including gimlet (*Eucalyptus salubris*) and Lake Grace gum (*Eucalyptus loxophleba* ssp. *gratae*), but also wheatbelt wandoo (*E. capillosa capillosa*) and salmon gum (*E. salmonophloia*). At Lake Douglas, the host tree was *Eucalyptus concinna* (Field 1999, Threatened Species Scientific Committee 2014).

Williams and Williams (2008) commented that 'Over 30 surveys have been conducted in the region by DEC staff and experienced volunteers between 1992 and 2008...and include extensive surveys between Payne's Find and Kalgoorlie, including most of the major conservation reserves. The surveys have covered extensive parts of the region in which *O. s. petrina* might occur, but have not detected any individuals or additional populations of the butterfly... The fact that further populations have not been located, despite the species being conspicuous, demonstrates the rarity of this butterfly and the significance of the Barbalin site.'

Due to a lack of suitable smooth bark Eucalypts in the project area and lack of records in the region Terrestrial Ecosystems' assessment is that the Arid Bronze Azure Butterfly is highly unlikely to be present.

Malleefowl (*Leipoa ocellata*) - Vulnerable under the *BC Act 2016* and *EPBC Act 1999*

Malleefowl are large, ground-dwelling birds that rarely fly unless alarmed or are perching for the night. Historically, Malleefowl have been found in mallee regions of southern Australia from approximately the 26th parallel of latitude southwards. Prior to vegetation clearing for agriculture, Malleefowl were abundant in the WA Wheatbelt. Vegetation clearing for agriculture also opened adjacent bushland to predators, and in the south-west of WA, Malleefowl often only persist in isolated remnant patches of native vegetation. Sheep and other herbivores (e.g. goats, kangaroos) grazing in remnant vegetation removes or thins the undergrowth, and they also compete with Malleefowl for herbaceous foods and can cause changes to the structure and floristic diversity of foraging habitats (Benshemesh 2007).

Malleefowl and their eggs are vulnerable to predation by foxes, and newly hatched chicks are vulnerable to foxes, cats and raptors (Priddel and Wheeler 1990, Benshemesh and Burton 1999, Benshemesh 2007, Lewis and Hines 2014). Their abundance in the Goldfields is low and they are sparsely distributed, favouring those areas that are more densely vegetated. Malleefowl build distinctive nests that comprise a large mound of soil/rock covering a central core of leaf litter. These nest mounds range in diameter but can span more than five metres and may be up to one metre high. Malleefowl are generally monogamous and once breeding commences, and they typically pair for life. The presence of nest mounds provides an indication of the presence of Malleefowl in the area.

Malleefowl have been observed in the bioregion, however, there are no recent records of active breeding mounds in the vicinity of the project area. Open fauna habitat and the presence of feral and pest species significantly reduce the probability of Malleefowl utilising the project area. As a consequence, Terrestrial Ecosystems' assessment is that vegetation clearing or development in the project area is unlikely to have any significant impact on this species.

Chuditch (*Dasyurus geoffroii*) – Vulnerable under the *BC Act 2016* and *EPBC Act 1999*

The Chuditch is the largest extant carnivorous marsupial in WA. It is usually active from dusk to dawn. Formally known from over 70% of Australia, the Chuditch now has a patchy distribution throughout the Jarrah forest and mixed Karri/Marri/Jarrah forest of south-west WA and other isolated areas. Chuditch are solitary animals for most of their life and den in hollow logs, burrows, culverts, etc. and have also been recorded in tree hollows and rock cavities. Chuditch are opportunistic feeders, and forage primarily on the ground at night. Their diet can include other mammals, birds, lizards, bird and reptile eggs but the majority is a mixture of large invertebrates (e.g. spiders, scorpions and crickets).

How *et al.* (1988) reported Chuditch being found near the Norseman-Lake King Road and near Mount Holland. DBCA records show that one specimen was recorded in 1974 in Kambalda East. There are multiple records south of Southern Cross and Marvel Loch and there have been other reported sightings east of Kambalda and near Norseman, but Terrestrial Ecosystems can find none north of Kalgoorlie. It is therefore highly unlikely that the Chuditch will be found as far north at Leonora and in atypical habitat.

As the project area is a long way north-east of the known distribution it is unlikely that the Chuditch would be found in the project area. As a consequence, Terrestrial Ecosystems' assessment is that any development is highly unlikely to have a significant impact on this species.

Princess Parrot (*Polytelis alexandrae*) - Vulnerable under the *EPBC Act 1999* and a Priority 4 species with DBCA

The Princess Parrot is found mostly in the inland arid areas of Australia, and in Western Australia in the Gibson, Little Sandy and Great Victoria Deserts (Johnstone and Storr 1998, Pavey *et al.* 2014). They are also occasionally found in lightly wooded areas adjacent to the sandy deserts (Moriarty 1972).

Very little is known about the Princess Parrot; even the exact extent of its geographical distribution. It is thought to be nomadic within the central desert regions of Australia, occupying arid shrub lands, particularly those dominated by Mulga, Desert Oak and spinifex. Due to the paucity of information on the species, accurate estimates of its conservation significance are difficult to make, however, this species is probably threatened by habitat loss to agricultural practices and changes in fire regimes.

Dr S. Thompson sighted this parrot in a survey near the Wanjarri Nature Reserve in 2006 and Moriarty (1972) also reported it in the same area, so it may occasionally be seen in the region. If it was present any proposed development is unlikely to significantly impact on this species as it will move away to other areas if it is disturbed.

Brush-tailed Mulgara (*Dasyercus blythi*) - Priority 4 with the DBCA

Woolley (2005) recognises two species of 'Mulgara'; *Dasyercus blythi* and *D. cristicauda*. *Dasyercus blythi* has a non-crested tail, two upper premolars and six nipples; *D. cristicauda* has a crested tail, three upper premolars and eight nipples. Both species potentially have overlapping distributions in arid Australia, but it is thought that *D. cristicauda* does not currently exist in Western Australia, although there are old records indicating its presence. Woolley (2005) suggested the common names for these two species be Brush-tailed Mulgara for *D. blythi* and Crest-tailed Mulgara for *D. cristicauda*. These two species can be sympatric in places, but probably utilise different parts of the habitat on a local scale when they are recorded in the same area. Currently, there are insufficient data to separate the spatial ecology, burrows and reproductive biology of these two species. Information that follows is based on what is known for 'Mulgara' without distinguishing between the species.

The reported distribution of Mulgara includes much of the inland spinifex covered sandy desert and spinifex vegetated areas in the Pilbara and northern goldfields. Within these areas their distribution is patchy and it is most frequently confined to mature spinifex dominated habitat (Gibson and Cole 1992, Masters 1998, Masters *et al.* 2003, Thompson and Thompson 2008a). In some areas, their relative abundance is positively associated

with rainfall in the previous 12 to 24 months (Gibson and Cole 1992, Masters 1998, Dickman *et al.* 2001, Letnic and Dickman 2005) and recent burning of the spinifex does not seem to be sufficient to shift Mulgara out of an area (Thompson and Thompson 2007b). Mulgara are generally sedentary in contrast with some other small dasyurids and have high site fidelity and a low propensity for dispersal once a home range has been established (Masters 1998, Dickman *et al.* 2001).

Fauna habitat in the project area is not suitable for Mulgara. It is therefore Terrestrial Ecosystems' assessment that they are unlikely to be found in the project area.

Fork-tailed Swift (*Apus pacificus*) - Migratory species under the *EPBC Act 1999* and *BC Act 2016*

This species breeds in the northeast and mid-east Asia and winters in Australia and southern New Guinea. It is a visitor to most parts of Western Australia, beginning to arrive in the Kimberley in late September, in the Pilbara in November and in the southwest land division in mid-December, and leaving by late April. The Fork-tailed swift is an almost exclusively an aerial species, foraging and sleeping on the wing. It rarely comes to earth, usually only for breeding. It is common in the Kimberley, uncommon to moderately common near northwest, west and southeast coasts and rare to scarce elsewhere. It is rarely seen in the Goldfields.

Terrestrial Ecosystems' assessment is that the Fork-tailed Swift may infrequently be seen in the region. However, any proposed vegetation clearing, or development is unlikely to significantly impact on this species as it is an aerial species and will move away to other areas if it is disturbed.

Grey Wagtail (*Motacilla cinerea*) - Migratory under the *EPBC Act 1999* and *BC Act 2016*

The Grey Wagtail is a small yellow breasted bird with a grey back and head. Johnstone and Storr (2004) reported this migratory species as breeding in Palearctic from western Europe and north-west Africa to eastern Asia and wintering in Africa, south-east Asia, Indonesia, the Philippines, New Guinea and Australia. Its preferred habitat in Australia is banks and rocks in fast-running fresh water including rivers, streams and creeks where it feeds on insects.

The Atlas of Living Australia records two sightings on the south-coast of Western Australia and none around the project area. It is highly unlikely to be seen in the project area due to a lack of records and suitable habitat.

Yellow Wagtail (*Motacilla flava*) - Migratory under the *EPBC Act 1999* and *BC Act 2016*

The Yellow Wagtail is found in the millions in the northern hemisphere and the Atlas of Living Australia records multiple records of this bird in Australia in the coastal areas. There are no records for this species in inland Western Australia near the project area, therefore it is highly unlikely to be impacted by the proposed development.

Peregrine Falcon (Falco peregrinus) - Otherwise specially protected under the *BC Act 2016*

The Peregrine Falcon is uncommon, although widespread throughout much of Australia excluding the extremely dry areas and has a wide and patchy distribution. It shows habitat preference for areas near cliffs along coastlines, rivers and ranges and within woodlands along watercourses and around lakes. Nesting sites include ledges along cliffs, granite outcrops and quarries, hollow trees near wetlands and old nests of other large bird species. There is no evidence to suggest any change in status in the last 50 years. The Peregrine Falcon has been seen in the Wanjarri Nature Reserve (Moriarty 1972, Ninnox Wildlife Consulting 1994), at Honeymoon Well (Ninnox Wildlife Consulting 1994) and Mileura (Tingay and Tingay 1977), so they could infrequently be seen in the general area.

Terrestrial Ecosystems' assessment is that the Peregrine Falcon may infrequently be seen in the project area, however, development is unlikely to have a significant impact on this species as it will readily move away from disturbance and there are abundant areas of similar habitat in the region.

Branchinella apophysata - Priority 1 species with DBCA

Notes from DBCA indicate that this fairy shrimp is known from a single location near Mt Margaret, but nothing is known of its habits or ecological requirements. As there are no salt lakes near the project area, it is Terrestrial Ecosystems' assessment that *B. apophysata* is unlikely to be impacted by the proposed development.

Long-tailed Dunnart (Sminthopsis longicaudata) - Priority 4 species with DBCA.

Burbidge *et al.* (2008) summarised the Long-tailed Dunnart geographic distribution as widely scattered in arid zone where it inhabits rugged rocky areas. They went on to suggest that its striated footpads, long tail and behaviour in captivity indicated that it was an active and capable climber. Specimens have been recorded in several rocky ranges in the Gibson Desert, West MacDonnell National Park, Murchison, Carnarvon Basin and the Pilbara. All previous capture sites for Long-tailed Dunnarts are within rugged rocky landscapes that support a low open woodland or shrubland of Acacias (especially mulga) with an understorey of spinifex hummocks, and (occasionally) also perennial grasses and cassias.

Three adult Long-tailed Dunnarts were caught in the Granny Smith Level 2 fauna survey (Terrestrial Ecosystems 2011b) and a single individual was caught in the follow up targeted survey (Terrestrial Ecosystems 2011c). Subsequently, Long-tailed Dunnarts have been caught at Mt Ida and Bottle Creek, which area west of Leonora. This dunnart is unlikely to be recorded in the project area due to a lack of suitable habitat and high density of feral cats.

5. DISCUSSION

5.1 ADEQUACY OF THE FAUNA SURVEY DATA FOR FAUNA HABITATS REPRESENTED IN THE PROJECT AREA

The EPA's (2016b) Technical Guidance on Terrestrial Fauna indicated that a Level 2 fauna assessment is required for a disturbance area of in excess of 75ha in this bioregion. The project area is 15,450ha, so it exceeds one of the criterion to require a Level 2 survey in the Murchison 1 IBRA bioregion.

The majority of the project area is disturbed as cattle and probably goats have foraged on both stations for many years and much of the grasses and lower level vegetation has either been lost, depleted or altered. The consequence is that the vertebrate fauna assemblage will differ significantly from what existed prior to it becoming pastoral lease.

5.2 VERTEBRATE FAUNA ASSEMBLAGE

The project area is large and straddles two pastoral leases - Tarmoola and Sturt Meadows stations, both of which run cattle, and have done so for many years with the consequence the fauna habitat is degraded. There is an existing large mining pit, tailing storage facility and waste dumps around the mining pits toward the centre of the project area. All current mining operations are underground.

There is an old abandoned mining pit – Rainbow pit – south of the administration building and mining operations. It appears as if the water in this pit is permanent and relatively fresh, so it provides a permanent water point for seed eating birds, water birds, cattle and native or feral fauna.

Visual observations of fauna habitats were confirmed by a PCA on the trapped fauna data, displaying two distinct fauna assemblages that correspond to two distinct fauna habitats.

Particularly in the mulga woodland habitat, small vertebrate fauna are generally in very low densities. The consequence of this low density is:

- very few small vertebrates were seen during nocturnal spotlighting;
- hand searches found almost no individuals;
- of the forty species recorded in the 15 site-trapping program, five were singletons, three were doubletons;
- when only the 10 mulga woodland habitat trapping sites were considered, 16 of the 33 trapped species recorded less than 10 individuals in 14 days trapping;
- when only the 5 ephemeral creekline habitat trapping sites were considered, 10 of the 22 species recorded six or less captures over 14 days;
- although 695 and 672 individual animals were caught in the mulga woodland and ephemeral creekline sites respectively, the high proportion of singletons and doubletons meant that the predicted number of species based on species accumulation curve analyses was less likely to be accurate. So, although the trapping effort met the requirements (Thompson *et al.* 2007) to record 90% of the species in both of those habitat types, the low abundance of many species has altered the shape of the species accumulation curves (Thompson and Withers 2003, Thompson *et al.* 2003c, Coffey Environments 2008, Terrestrial Ecosystems 2010).

Species richness, abundance and diversity, particularly in the mulga woodland habitat, is lower than at other surveyed sites in the Goldfields (Thompson 2004, Thompson and Thompson 2005c, Thompson and Thompson 2008b) indicating that the project area has low ecological and biodiversity value compared with other locations in the Goldfields.

Very few of the shrubs and trees were flowering, so birds that depend on nectar or the invertebrates that depend on nectar are likely to be absent or in low abundance. Given the small number of species and number of individuals recorded during most of the 20 minute - 2 ha searches for avifauna, the species accumulation curve for birds is likely to be an overestimate of the actual species present in the project area.

Although there was rain immediately prior to the March 2020 survey, none had been recorded in the region for many months, so these 'dry' conditions would have significantly suppressed breeding of small vertebrates and probably avifauna (Spiller and Schoener 1995, Southgate and Masters 1996, Dickman *et al.* 1999, Dickman *et al.* 2001, Craig and Chapman 2003, Letnic *et al.* 2004, Kelly *et al.* 2013) contributing to the scarcity of small vertebrate fauna. Of note, no House Mice (*Mus musculus*) were recorded which is an indication of how dry the area is.

Diversity scores were in the mid-range of what might be expected and similarity scores among trapping sites in the ephemeral creekline habitat were generally higher than the more variable scores among mulga woodland habitat trapping sites, as might be expected. The habitat in the ephemeral creekline was more uniform and consistent than the highly variable density of vegetation in the mulga woodland habitat.

Small mammal abundance was very low and likely to be a consequence of the dry conditions in months prior to the surveys. No small mammals were recorded in the ephemeral creekline, which was a surprise as the leaf litter under the trees appeared to provide better foraging opportunities than many of the more sparsely vegetated mulga woodland habitat. This result is atypical of surveys in the goldfields (Thompson 2004, Thompson and Thompson 2005c, Thompson and Thompson 2008b).

Reptile species that were caught in high numbers in the ephemeral creekline habitat were typically those that utilise softer substrate to support a fossorial existence or live in the leaf litter (e.g. *Lerista desertorum*, *Heteronotia binoei* (Plate 20), *Ctenotus severus*, *Underwoodisaurus milii* (Plate 21), *Simoselaps bertholdi* and *Brachyurophis semifasciata*, etc).



Plate 20. *Heteronotia binoei*



Plate 21. *Underwoodisaurus milii*

Three amphibian species were recorded during the March 2020 survey with *Neobatrachus sutor* (Plate 22) being a cocoon forming burrowing species that comes to the surface after rain and *Pseudophryne occidentalis* and *Litoria rubella* (Plate 23) finding retreat sites where they do not become decimated during the dry conditions and becoming surface active when conditions are favourable. More species and more individuals are likely to have been caught if the trapping program occurred during or immediately after a heavy rainfall event.



Plate 22. *Neobatrachus sutor*



Plate 23. *Litoria rubella*

A single *Antaresia stimsoni* (Stimson’s python - Plate 24) was caught and one was found dead on the road. These observations are toward the southern geographical boundary for this species. A single blind snake was caught (i.e. *Anilius hamatus*), which is not unusual given the sparse ground cover and dry conditions.

Of the 53 species recorded at avifauna survey sites, 10 species were recorded once, a further eight species twice and 36 species were recorded on less than 10 occasions. If incidentals observations are included, then a total of 72 avian species were recorded. The most abundant species were the small species that utilise shrubby habitats [i.e. *Acanthiza uropygialis* (Chestnut-rumped Thornbill), *Gavicalis virescens* (Singing Honeyeater), *Malurus splendens* (Splendid Wren), *Petroica goodenovii* (Red-capped Robin) and *Acanthagenys rufogularis* (Spiny-cheeked Honeyeater)]; all of these species are common in the semi-arid Goldfields.

The presence of permanent potable water at Rainbow Pit (Plate 25) meant there were waterbirds present in this habitat (see Appendix H) that were not found at other locations in the project area, This is a very typical pattern of avifauna abundance in the Goldfields (Donato Environmental Services 2005b).



Plate 24. Stimson’s python



Plate 25. Rainbow pit

Based on the species accumulation curves, and taking into account the relatively high proportion of singletons and doubletons in the data set for both fauna habitat types, it is likely that 23 species in the ephemeral creekline and 35 species in the mulga woodland habitat would represent 90% of the small trappable terrestrial species present. For the avifauna, it is probable that approximately 65 species represent 90% of the bird species present

excluding the waterbirds utilising Rainbow Pit. After heavy rain and flowering by many of the plants, species richness and relative abundance of avifauna in the project area would increase (Craig and Chapman 2003).

There are many terrestrial species that have been recorded in the adjacent areas (see Appendices K and L) in similar habitat that were not recorded and are unlikely to be present in the project area. In addition to the small terrestrial reptiles, mammals and amphibians, there were two species of macropods [i.e. *Osphranter rufus* (Red Kangaroo; 24 of 75 camera traps) and *O. robustus* (Euro; 2 of 75 camera traps)] that were recorded in the camera trap survey. *Canis lupus* (wild dogs / dingo; 19 of 75 camera traps) and feral *Felis catus* (cat; 19 of 75 camera traps) were relatively abundant across the project area, with a high number of dogs nearer the mining operations. There was a herd *Capra hircus* (goats [Plate 28]; 2 of 75 camera traps) that were mostly seen around the mining operations. The two feral predators (i.e. *C. lupus* and *F. catus*) will be predated of small native reptiles, mammals and amphibians. The most obvious impact on the fauna habitat were *Bos taurus* (cattle) and they were recorded in all habitats.



Plate 26. Wild dog/dingo



Plate 27. Caption



Plate 28. Goat



Plate 29. Echidna



Plate 30. *Varanus panoptes*



Plate 31. Red kangaroo

5.2.1 Amphibians

Frogs are normally only detected immediately after rainfall or around semi-permanent pools. There were pools of water in the drainage channels (Plate 33) during the March 2020 field assessment, but there had been many months without rain prior to the November survey. *Neobatrachus sutor*, *P. occidentalis*, *C. occidentalis* (Plate 32) and *L. rubella* were recorded during the March survey. It is likely that *Neobatrachus kunapalari*, *Neobatrachus wilsmorei*, *Cyclorana maini* and *Platyplectrum spenceri* could also be found in the general area based on the regional data provided in Appendix K, as these species are widespread and abundant in the Goldfields. Development of the project area is likely to result in a loss of individuals within the disturbed area, however, vegetation clearing, and mining operations are unlikely to have a significant impact on these species when assessed in a bioregional context.



Plate 32. *Cyclorana occidentalis*



Plate 33. Inundated mulga woodland

5.2.2 Reptiles

Typically, approximately 35-40 species of reptiles are caught in open mulga woodland (Coffey Environments 2008, Terrestrial Ecosystems 2010, 2011b, 2020). If there had been more rain in the months before the two surveys, and cattle had not been grazing on both pastoral leases, then there would have been a higher abundance and possibly more reptile species recorded in the project area. The regional reptile data provided in Appendix K provides an indication of the diversity of herpetofauna in the Goldfields, however, these lists include species that are found in semi-arid sandplains vegetated with spinifex, which is not present in the project area, but has a high abundance of reptiles (Pianka 1986, 1989, 1992).

Terrestrial Ecosystems' view is that the development of the project area is unlikely to significantly impact on the reptile fauna of the bioregion.

5.2.3 Birds

The number of birds and bird species in the northern Goldfields fluctuates based on seasons and recent rainfall (Craig and Chapman 2003). Semi-arid and arid areas of inland Australia support a diverse range of transient and nomadic species that move through large areas in search of available resources. Heavy rain that is followed by flowering and seeding of many plant species is often sufficient to draw a large number of these nomadic species to the general area. These species move on to other areas once the resource is depleted or better resources are available in adjacent areas.

The project area is likely to support a similar avifauna assemblage to that present in the adjacent areas. There are no bird species of conservation significance likely to reside in the project area, however, some may infrequently be observed in the region (i.e. Peregrine Falcon and Princess Parrot). The Princess Parrot is nomadic and moves around the arid interior often in search of water and resources and the Peregrine Falcon will normally have a very large home range. Development of a portion of the project area, particularly when similar habitat exists in the adjacent areas, is unlikely to significantly impact on any conservation significant species of bird. All birds will readily shift to other areas when there is a disturbance.

Terrestrial Ecosystems’ view is that the proposed development is unlikely to significantly impact on the avian fauna of the bioregion.

5.2.4 Non-volant Mammals

The abundance of small terrestrial mammals caught in the project area was low due to the sparsely vegetated and degraded habitat, presence of feral and pest fauna and the dry conditions in the many months prior to the surveys.

Terrestrial Ecosystems’ view is that the development of the project area is unlikely to significantly impact on the mammal fauna of the bioregion.



Plate 34. Strip-faced Dunnart

5.2.5 Bats

Bats recorded in the project area are shown in Table 7. All of these bats are common throughout the Goldfields and many other parts of semi-arid Western Australia and none are of conservation significance. Clearing of vegetation, development activities and mining operations will not significantly impact on the bat fauna when considered in a bioregional context.

Table 7. Bats recorded in the project area

Vestertilionidae	
Gould’s Wattle Bat	<i>Chalinolobus gouldii</i>
Inland Broad-nosed Bat	<i>Scotorepens balstoni</i>
Inland Forest Bat	<i>Vespadelus baverstocki</i>
Finlayson’s Cave Bat	<i>Vespadelus finlaysoni</i>
Unidentified long-eared bat	<i>Nyctophilus sp.</i>
Molossidae	
Western Free-tailed Bat	<i>Ozimops kitcheneri</i>
Inland Free-tailed Bat	<i>Ozimops petersi</i>

5.3 BIODIVERSITY VALUE

An ecological assessment of a site should consider its biodiversity value at the genetic, species and ecosystem levels, and its ecological functional value at the ecosystem level. There are inadequate data to assess the ecological value at the genetic level.

The two fauna habitat types represented in the project area are abundant and in similar condition in adjacent areas. Therefore, the fauna assemblage that is present in the project area will also be present and abundant in the adjacent areas. The available fauna survey data (Appendix K) provides a good indication of the vertebrate fauna that are potentially in the project area, but the vertebrate fauna found on sandplains vegetated with spinifex habitats should be excluded from these lists.

5.3.1 Ecological functional value at the ecosystem level

Cattle and possibly goats grazing over many years has significantly negatively impacted on the fauna habitat, in particular, it has depleted, reduced and modified the grasses and shrubs that would have vegetated the areas prior to the introduction of cattle. In addition, there is an existing mine toward the centre of the project area that commenced as an open pit but is now an underground operation. The existing pits are surrounded by waste dumps and tailing storage facility. These developments have depleted the vertebrate fauna assemblage from these areas.

Rainbow Pit (Plate 25) provides a source of permeant freshwater that attracts waterbirds. This source of permanent freshwater is a recent addition to the landscape and has altered the avifauna assemblage as a consequence. These waterbirds should be excluded from the assessment as the lake is man-made and if it were to dry-out or be re-mined then the waterbirds would move to another location.

The second most significant impact on vertebrate fauna in the project area and surrounds will have been feral cats and wild dogs. Historically, goats would have heavily grazed parts of the region which would have impacted the vertebrate fauna assemblages, but the recent increase in the wild dog population has reduced the abundance of feral goats. It is unknown whether the two pastoral leases supported large goat populations in the recent past.

The more densely vegetated ephemeral creekline carries water after heavy rain. Aerial photography indicates that this creekline has a wide catchment area to the north and flows south, then south-east to discharge into a lake with no external outlet. The creek would flow infrequently. Large mature trees in this creekline would provide nesting hollows for birds that utilise tree hollows (e.g. parrots; Plate 35). There are many other similar sites within the northern Goldfields and these nesting avian species will readily find other locations should some of these trees be removed. This ephemeral creekline provides the highest area of ecological value in the project area.

The project area doesn't support conservation significant fauna or a conservation significant ecosystem.



Plate 35. Large mature tree with potential nesting hollows

5.3.2 Maintenance of threatened ecological communities

No threatened ecological fauna communities were identified in the project area.

5.3.3 Condition of fauna habitat

Much of the project area has been negatively impacted by many years of cattle grazing and some of the project area has been denuded of native terrestrial vertebrate fauna by mining activity. The uncleared fauna habitat present in the project area is similar to many square kilometres of adjacent habitat. Therefore, any proposed development is unlikely to have a significant impact on the vertebrate fauna when considered in a bioregional context.

5.3.4 Ecological linkages

The north-south ephemeral creekline would provide a movement pathway for some avifauna and over a period of many years, for small terrestrial mammals, reptiles and amphibians.

Maintaining native vegetation and the relatively undisturbed north-south corridor through the central portion of the project area would enable this ecological linkage to remain intact.

5.3.5 Size and scale of the proposed disturbance

The project area is large; however, it represents a small proportion of similar fauna habitat found in the adjacent area and region. Similar habitat is abundant in the many adjacent square kilometres.

5.3.6 Abundance and distribution of similar habitat in the adjacent areas

Fauna habitats present in the project area are abundant in adjacent areas. It is therefore likely that the fauna assemblage in the project area is similar to the many square kilometres of similar habitat in adjacent areas and the bioregion.

5.3.7 Potential impacts on ecosystem function

Clearing native vegetation is likely to result in the loss of small vertebrate fauna on-site that are unable to move away during the clearing process. The few larger animals, such as kangaroos and large goannas, and most of the birds will move into adjacent areas once clearing commences. Shifting animals into adjacent areas will increase the pressure on resources in those areas and it is likely that there will be some disruption to the ecosystems in these areas for a short period until a balance is restored.

Impacts associated with clearing vegetation and development in the project area in a landscape or bioregional context on the vertebrate fauna are likely to be low as the proposed disturbance area is small relative to the quantity of similar habitat in the bioregion and there will be no impact on conservation significant fauna.

The impact of feral and pest fauna which are present in the project area will be doing more environmental damage than the combined impacts of proposed development and vegetation clearing in the project area.

6. POTENTIAL ENVIRONMENTAL IMPACTS

It is not intended that the entire project area is cleared. This report will be used as a source of information and data to support multiple small mining proposals, and native vegetation clearing permit applications.

Development of the project area will potentially affect vertebrate fauna in numerous ways, including death/injury of fauna during vegetation clearing, impacts with vehicles and the loss of habitat.

Although there are anticipated short term impacts on fauna, they are not likely to result in significant impacts on fauna habitat and fauna assemblages in the long term. The overall impact on fauna species and species of conservation significance will be minimal provided the recommended management procedures are implemented and adhered to.

6.1 DIRECT IMPACTS

6.1.1 Animal deaths during the clearing process and displacement of fauna

Clearing vegetation and activities associated with development will result in the loss of some small fauna that retreat to burrows, such as reptiles and mammals. Nocturnal species are unlikely to be active when most of the land clearing and construction work is taking place which may result in these individuals being adversely impacted when they attempt to escape. This loss of vegetation is unlikely to have a significant impact when considered in a bioregional context. Larger terrestrial animals and avian species will most often move to adjacent areas. These species will be required to establish new activity areas and home ranges, and this could result in the temporary displacement of resident species.

Clearing large areas increases fauna habitat edges. Small mammals can respond both positively and negatively to edges depending on their ecological traits (Laurance 1991, 1994, Goosem and Marsh 1997, Goosem 2000). Edge and disturbance effects can lead to altered and most often higher levels of predation, restricting or increasing fauna movements and altering assemblage structure (Oxley *et al.* 1974, Paton 1994, Baker *et al.* 1998, Temple 1998, Luck *et al.* 1999, Goosem *et al.* 2001). Goldingay and Whelan (1997) and Clarke and Oldland (2007) reported that edge effects can extend up to 150-200m from the edge for some species, meaning the impact area on vertebrate fauna is likely to be larger than the cleared footprint.

Edge effects can lead to the disruption of ecological processes such as predation and dispersal, animal movements and can change assemblage structure. The consequence is that the impact area will always be much larger than the cleared area.

6.1.2 Reduction or loss of activity areas and closure of burrows

Clearing vegetation and associated development activities are likely to destroy reptile and mammal burrows or foraging habitat that are currently in use or could be used again. Clearing vegetation that forms part of the activity area of individuals has the potential to force these animals into adjacent areas. These areas may offer fewer resources placing individuals under survival pressure. It could also cause individuals to move into the territories of other individuals increasing competition for resources. Forced relocations could increase the possibility of predation.

Although vegetation clearing seldom results in the death of adult avian species, clearing of vegetation reduces and alters their foraging areas. The loss of foraging areas shifts individuals into adjacent areas and increases competition for resources, with the inevitable result that some of the migrants and some of the residents fail to thrive in the altered environment and some could be lost.

6.1.3 Habitat fragmentation

In addition to direct impacts of vegetation clearing, infrastructure including tracks, has the potential to fragment habitat. Clearing vegetation isolates sections of established communities and may alter long and medium-term patterns of movement around established home ranges particularly for small mammals and reptiles. A reduction in the population because of this development would be difficult to detect given our current knowledge of the spatial ecology for most of the small mammals known to be in the area. The project area contains sparse vegetation, multiple exploration tracks and existing pastoral and mining vehicle tracks.

6.1.4 Introduced fauna and weeds

Increased habitat fragmentation and human activity often results in an increase in the abundance of introduced species such as the house mouse (*Mus musculus*), feral cat (*Felis catus*) and wild dogs (*Canis lupus*). This increase may be due to a decline in habitat health, increased road kills, poor disposal of waste, easier access to areas via tracks and an increased abundance of an exotic species such as the goat.

Cats and wild dogs are known to be established in the region and based on camera trap images there are multiple cats and a relatively high density of wild dogs in the project area. In many situations, both these species have become a 'naturalised' species in the Australian bush. Increases in dog or cat numbers can have a detrimental impact on native fauna because they predate on and compete with native species, severely disrupting the natural balance. The feral cat is a particularly damaging predator on native fauna and any increase in their numbers could have a detrimental effect on local native fauna (Kinneer 1993, Bamford 1995, Woinarski *et al.* 2017, Woinarski *et al.* 2018, Murphy *et al.* 2019); hence it is important to ensure that populations of the feral predators, such as cats under control.

There are reliable reports that the population of wild dogs has significantly increased in response to the abundance of feral goats that were present in the region. The goat population has now been significantly reduced, so the wild dogs will turn their attention to predating of station cattle (i.e. most newly born calves), native animals and anthropogenic waste (i.e. rubbish tips and putrescible waste).

Infrastructure known to support feral species, such as poorly managed waste disposal sites and bins and permanent water, should be managed to minimise increases in these populations. A wild dog reduction program has been recommended for the project area.

Introduced plant species can successfully and rapidly invade areas of cleared native vegetation or otherwise disturbed by humans. Introduced plant species may replace native species that provide shelter or foraging areas for native fauna. Bringing new cattle to the stations and vehicle movement can introduce weeds to the project area. Major changes to the structure of vegetation will alter the fauna habitat and consequently may influence fauna species composition. Preparing and implementing a weed management plan will largely reduce their threat to native fauna species.

6.1.5 Road fauna deaths

An increase in road fauna deaths is likely to occur where new roads / tracks are constructed or upgraded, in particular, affecting kangaroos, nocturnal birds and ground dwelling large carnivorous predators. Species such as goannas and raptors are attracted to carrion on road verges and therefore, there is an increased propensity for these species to be killed by vehicles. Given the size of the project area, sparseness of the vegetation and the small vertebrate fauna, the impacts of road fauna deaths are likely to be low.

6.1.6 Fire

Increased human activity is often associated with an altered fire regime which lead to a degradation of natural ecosystems. Fire has been identified as one of the threatening processes for some conservation significant species as numerous small mammal and bird species rely on long unburnt vegetation, however, many Australian small mammal and reptile species are adapted to landscape scale wild fires (Pianka and Goodyear 2012, Letnic *et al.* 2013, Swan *et al.* 2016).

Large and widespread fires are unlikely to be a significant threat to native fauna species in and adjacent to the project area due to the sparseness of the vegetation.

6.1.7 Anthropogenic activity

Unnatural noises, vibrations, artificial light sources, and vehicle and human movement in an area may be sufficient to force individuals or fauna species to move from adjacent areas or alter their activity periods. This form of disturbance is likely to occur during the vegetation clearing and on-going mining operations. The overall impact is likely to be confined to small areas adjacent to mining operations and infrastructure.

6.1.8 Dust

Dust generated from shifting topsoil and increased vehicle traffic can potentially degrade surrounding vegetation, reducing its ability to absorb sunlight and influencing photosynthetic rates. Degradation of these areas may potentially render habitat unsuitable for fauna. Dust suppression and management programs are an essential component of minimising impacts on fauna in areas adjacent to the mine. An effective dust management and monitoring program is required.

6.1.9 Risk assessment

Fauna surveys to support Environmental Impact Assessments (EIA) are part of the environmental risk assessment undertaken to consider what potential impacts a development might have on the biodiversity on a particular area and region. Potential impacts on fauna from the proposed development are identified and briefly described above. Table 8, Table 9 and Table 10 provide a summary of the risk assessment associated with this project.

Any risk assessment is a product of the likelihood of an impact occurring and the consequences of that impact. Likelihood and consequences are categorised and described below. The assessed risk level (likelihood x consequences) is then calculated as the overall risk for the development. This is followed by an assessment of the acceptability of the risk associated with each of the impacts. Disturbances and vegetation clearing have an impact on the fauna at multiple scales – site, local, landscape and regional. Each of these is considered in the risk assessment. This assessment should be considered in the context of the summary in Table 8.

Table 8. Fauna impact risk assessment descriptors

Likelihood		
Level	Description	Criteria
A	Rare	The environmental event may occur, or one or more conservation significant species may be present in exceptional circumstances.
B	Unlikely	The environmental event could occur, or one or more conservation significant species could be present at some time.
C	Moderate	The environmental event should occur, or one or more conservation significant species should be present at some time.
D	Likely	The environmental event will probably occur, or one or more conservation significant species will be present in most circumstances.
E	Almost certain	The environmental event is expected to occur, or one or more conservation significant species is expected to be present in most circumstances.
Consequences		
Level	Description	Criteria
1	Insignificant	Insignificant impact on fauna of conservation significance or regional biodiversity, and the loss of individuals will be insignificant in the context of the availability of similar fauna or fauna assemblages in the area.
2	Minor	Impact on fauna localised and no significant impact on species of conservation significance in the project area. Loss of species at the local scale.
3	Moderate	An appreciable loss of fauna in a regional context or a limited impact on species of conservation significance in the project area.
4	Major	Significant impact on conservation significant fauna or their habitat in the project area and/or regional biodiversity and/or a significant loss in the biodiversity at the landscape scale.
5	Catastrophic	Loss of species at the regional scale and/or a significant loss of species categorised as 'vulnerable' or 'endangered' under the EPBC Act (1999) at a regional scale.
Acceptability of Risk		
Level of risk	Management Action Required	
Low	No action required.	
Moderate	Avoid if possible, routine management with internal audit and review of monitoring results annually.	
High	Externally approved management plan to reduce risks, monitor major risks annually with external audit and review of management plan outcomes annually. May a referral to the Commonwealth under the EPBC Act 1999.	
Extreme	Unacceptable, project should be redesigned or not proceed.	

Table 9. Levels of acceptable risk

		Likelihood				
		Rare or very low (A)	Unlikely or low (B)	Moderate (C)	Likely (D)	Almost certain (E)
Consequence	Insignificant (1)	Low	Low	Low	Low	Low
	Minor (2)	Low	Low	Low	Moderate	Moderate
	Moderate (3)	Low	Moderate	Moderate	High	High
	Major (4)	Moderate	Moderate	High	High	Extreme
	Catastrophic (5)	Moderate	High	High	Extreme	Extreme

Table 10. A risk assessment of the impact of ground disturbance activity on fauna

			Before management			With management			
Potential impacts			Inherent risk			Residual risk			
Factor			Likelihood	Consequence	Significance		Likelihood	Consequence	Significance
Fauna survey data	Inadequate survey data to adequately assess the risks	Unknown loss of fauna, fauna of conservation significance, and fauna assemblages, and an incomplete fauna assessment.	A	1	Low				
	Inadequacy of comparative data	Limits on the availability of comparative data reduced the capacity to assess the uniqueness of the fauna assemblages in the project area.	A	1	Low				
Clearing vegetation	Loss of fauna habitat – local scale	Loss of terrestrial fauna in the project area.	E	2	Mod.				
	Loss of fauna habitat – landscape scale	Loss of some fauna during vegetation clearing.	B	1	Low				
	Loss of fauna habitat – regional scale	Small loss of some fauna from the region.	B	1	Low				
	Loss of a threatened ecological fauna community	Loss of an undetected threatened ecological fauna community.	A	3	Low				
	Habitat fragmentation	Fauna movement restricted resulting in the death of fauna and a loss of biodiversity.	A	2	Low				
Death or loss of conservation significant fauna	Loss of a unique terrestrial fauna ecosystem	Loss of an ecosystem containing fauna with high species richness, high abundance and numerous top of the food chain predators.	A	2	Low				
	Night Parrot	Death or reduced viability of this species.	A	2	Low				
	Arid Bronze Azure Butterfly	Death or reduced viability of this species.	A	2	Low				
	Malleefowl	Death or reduced viability of this species.	A	2	Low				
	Chuditch	Death or reduced viability of this species.	A	2	Low				

			Before management			With management			
	Princess Parrot	Death or reduced viability of this species.	A	2	Low				
	Mulgara	Death or reduced viability of this species.	A	2	Low				
	Oriental Plover	Death or reduced viability of this species.	A	2	Low				
	Fork-tailed Swift	Death or reduced viability of this species.	A	2	Low				
	Grey Wagtail	Death or reduced viability of this species.	A	2	Low				
	Yellow Wagtail	Death or reduced viability of this species.	A	2	Low				
	Peregrine Falcon	Death or reduced viability of this species.	A	2	Low				
	Branchinella anophysata	Death or reduced viability of this species.	A	2	Low				
	Long-tailed Dunnart	Death or reduced viability of this species.	A	2	Low				
Human impacts	Increase or spread of weeds	Changed vegetation and a resulting loss of fauna habitat.	E	2	Mod.	Implementation of a weed management plan.	D	2	Low
	Road kills	Animals being killed by vehicles as they cross roads	E	1	Low	Limiting speeds	E	1	Low
	Increase in feral pests, specifically wild dogs and feral cats	Increased predation on the native fauna	C	3	Mod.	Active feral and pest management programs	C	2	Low

6.2 NATIVE VEGETATION CLEARING PRINCIPLES AS THEY PERTAIN TO VERTEBRATE FAUNA

The *Environmental Protection Act 1986* outlines 10 principles that are to be used in the assessment of native vegetation clearing permit applications which are also applicable for other assessments and approvals (Table 11). Where possible, native vegetation should not be cleared if any of the following principles are comprised.

Table 11. Assessment of impact using the native vegetation clearing principles

Principle	Response
It comprises a high level of biological diversity.	Clearing vegetation will not comprise a high level of biodiversity.
It comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.	Clearing the vegetation will not result in the loss of significant habitat for indigenous fauna. Where possible, the ephemeral creek habitat should not be impacted.
It includes, or is necessary for the continued existence or, rare flora.	N/A
It comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community.	The area does not contain a threatened ecological fauna community.
It is significant as a remnant of native vegetation in an area that has been extensively cleared.	The area is not a remnant.
It is growing in, or in association with, an environment associated with a watercourses or wetland.	The area does not contain a natural wetland. There is a disused mining pit that contains near-permanent freshwater water. There is an ephemeral creekline running north-south through the project area that supports a terrestrial and avifauna assemblage that differs from the adjacent mulga woodland, but the creekline runs further north and south outside of the project area.
The clearing of the vegetation is likely to cause appreciable land degradation.	N/A
The clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	Clearing of vegetation is unlikely to impact on conservation areas in the region.
The clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	N/A
The clearing of the vegetation is likely to cause, or exacerbate the incidence of flooding.	N/A

6.3 REFERRAL UNDER THE EPBC ACT

The proposed project is unlikely to significantly impact on a conservation significant vertebrate fauna species, so a referral under the *EPBC Act 1999* is not required.

7. SUMMARY

The total assessed area is 15,450ha but any proposed development areas are likely to be substantially less. There are two broad fauna habitats in the project area:

- open mulga woodland over mixed shrubs and scattered grasses or bare ground; and
- woodland of large eucalypts over mixed shrubs and scattered grasses along the ephemeral creekline that runs north-south through the project area.

The density of trees and shrubs varied across the project area but was mostly sparse in the mulga woodland habitat type. The fauna habitat has been degraded by many years of cattle grazing and to a lesser extent mining and feral predators (i.e. feral cat and wild dogs). There are numerous pastoral and exploration tracks in the project area, but these are generally narrow and mostly only wheel tracks on a red-clay substrate. Camera traps indicated the presence of wild dogs and feral cats in the project area.

When the data from all sites were combined, 40 species of reptiles and small mammals were trapped in the project area. Species accumulation curves were calculated for the two habitat types and this modelling predicted that 23 species would be present in the ephemeral creekline, with 22 species actually caught. For the mulga woodland, 33 species were caught, and it is modelled that there are about 35 species in this habitat type.

For the avifauna, it is probable that 65 species represent about 90% of the bird species present excluding the waterbirds utilising Rainbow Pit. Of the 53 species recorded at avifauna survey sites, 10 species were recorded once, a further eight species twice and 36 species on less than 10 occasions. Avifauna species richness and abundance would be expected to increase after a major rainfall event as many of the plant species would flower and seed.

The ephemeral creekline habitat that runs north-south through the central portions of the project area (i.e. Sullivan Creek) would provide a linkage for small terrestrial and avian fauna from areas to the north and south and is of the highest ecological value.

Clearing native vegetation in the project area is likely to result in the loss of small vertebrate fauna on-site that are unable to move away during the clearing process, however, this loss is not likely to be significant when viewed in a bioregional context. The few larger animals, such as kangaroos, large goannas and snakes, and most of the birds will move into adjacent areas once vegetation clearing commences, so potential impacts will be low. There may be an on-going loss of small native fauna to vehicle strikes on access tracks, but overall, this impact will be very low. Forced fauna migrants as a result of vegetation clearing will increase competition for resources in the short term, which may result in the subsequent loss of migrants or local individuals. Individuals shifted out of their established activity areas are also vulnerable to predation until they have become established in their new areas.

There was evidence of a population of feral cats, wild dogs and goats on-site. Other than cattle grazing, it is probable that these feral predators are having a greater impact on the native fauna than the proposed vegetation clearing and mining operations.

Impacts on vertebrate fauna associated with clearing vegetation in the project area in a landscape or bioregional context are likely to be low as there are vast tracts of similar habitat in adjacent areas.

The proposed project is unlikely to significantly impact on a conservation significant species, so a referral under the *EPBC Act 1999* is not required.

8. MANAGEMENT STRATEGIES

The purpose of this section is to identify generic management and mitigation strategies to address the potential impacts of development in the project area. Specific management and mitigation strategies to address potential impacts should be addressed in the recommended Vertebrate Fauna Management Plan and Construction Environmental Management Plan.

8.1 INDUCTION AND AWARENESS

All contractors and staff involved in vegetation clearing, development and ongoing operations in the project area should be made aware of the possible presence and issues associated with terrestrial fauna in the area through the induction process.

Recommendation 1: An induction program that includes a component on managing vertebrate fauna is mandatory for staff working in the project area.

8.2 DUST

Dust generated from the vegetation clearing and mining operations could potentially degrade surrounding vegetation, reducing its ability to absorb sunlight and influencing photosynthetic rates. Degradation of these areas will potentially render habitat unsuitable for fauna. Dust suppression and management programs are an essential component of minimising mining impacts on fauna during the construction program.

Recommendation 2: The impact of dust on adjacent vegetation and fauna habitat is managed against appropriate KPIs and in accordance with the clients' Construction Environmental Management Plan.

8.3 MINIMISING SECONDARY IMPACTS TO FAUNA AND FAUNA HABITAT

Pets and feral animals have the potential to impact on native fauna. Pets should not be permitted on site and feral and pest fauna numbers regularly monitored and controlled. To be effective, management of feral and pest species needs to be undertaken in collaboration with the pastoralist and neighbouring tenement holders.

Putrescible waste likely to attract feral animals should be suitably contained and disposed of so as not to encourage the feeding of fauna around the site. The existing putrescible waste management systems is enabling wild dogs and feral cats to access a food source, and this needs to be addressed.

Reducing the impacts of feral cats and wild dogs will reduce the stress on native fauna and fauna assemblages in the project area and surrounds. The herd of goats seen regularly around the administration and mining area should be removed. Goats are destructive and negatively impact on the native vegetation and provide an easy food source for wild dogs.

Dead animals on the road also have the propensity to attract raptors, goannas and even cattle, which are then likely to be killed.

Management of secondary impacts to habitat and fauna should be addressed in a Vertebrate Fauna Management Plan. The plan should include:

- Control and reduction methods for feral and pest fauna;
- Management of pets on site;
- Habitat fragmentation and barriers to fauna movement (e.g. fencing and access tracks);
- Vehicle impacts on vertebrate fauna (short and long term);
- Vehicle speed limits on site; and
- Anthropogenic activity.

Recommendation 3: Management of the mine sites' waste management facility is reviewed and altered so that putrescible waste is not available to pest animals and birds.

Recommendation 4: A feral predator (i.e. feral cat and wild dog) reduction program is implemented, their numbers regularly monitored (e.g. biannually) and the population periodically reduced.

Recommendation 5: The goats in the project area are removed. They can either be penned and removed or shot.

Recommendation 6: A Vertebrate Fauna Management is prepared and implemented.

The ephemeral creekline that runs north-south though the central part of the project area (i.e. Sullivan Creek) provides habitat for the most diverse vertebrate fauna assemblage in the project area, so, where practical this area should be avoided.

Recommendation 7: Where practical, vegetation clearing, and mining activity should avoid impacting on the ephemeral creekline habitat that runs north-south through the central portions of the project area and the linkages within this habitat type are maintained.

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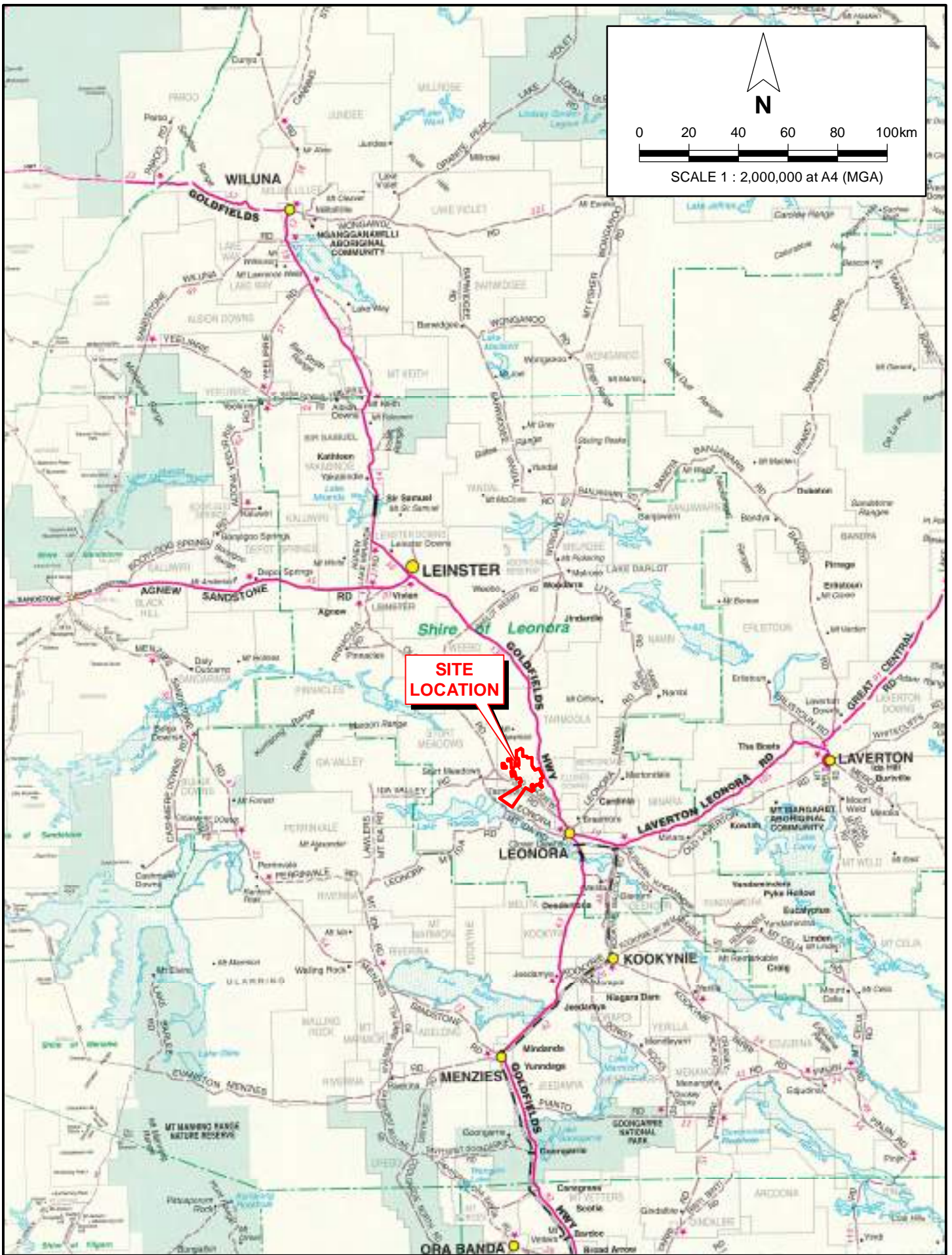
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Figures

Level 2 Vertebrate Fauna Assessment
King of the Hills Project





SITE LOCATION

PINPOINT CARTOGRAPHICS (08) 9562 7136 2019-0084-f01.mxd



TERRESTRIAL ECOSYSTEMS

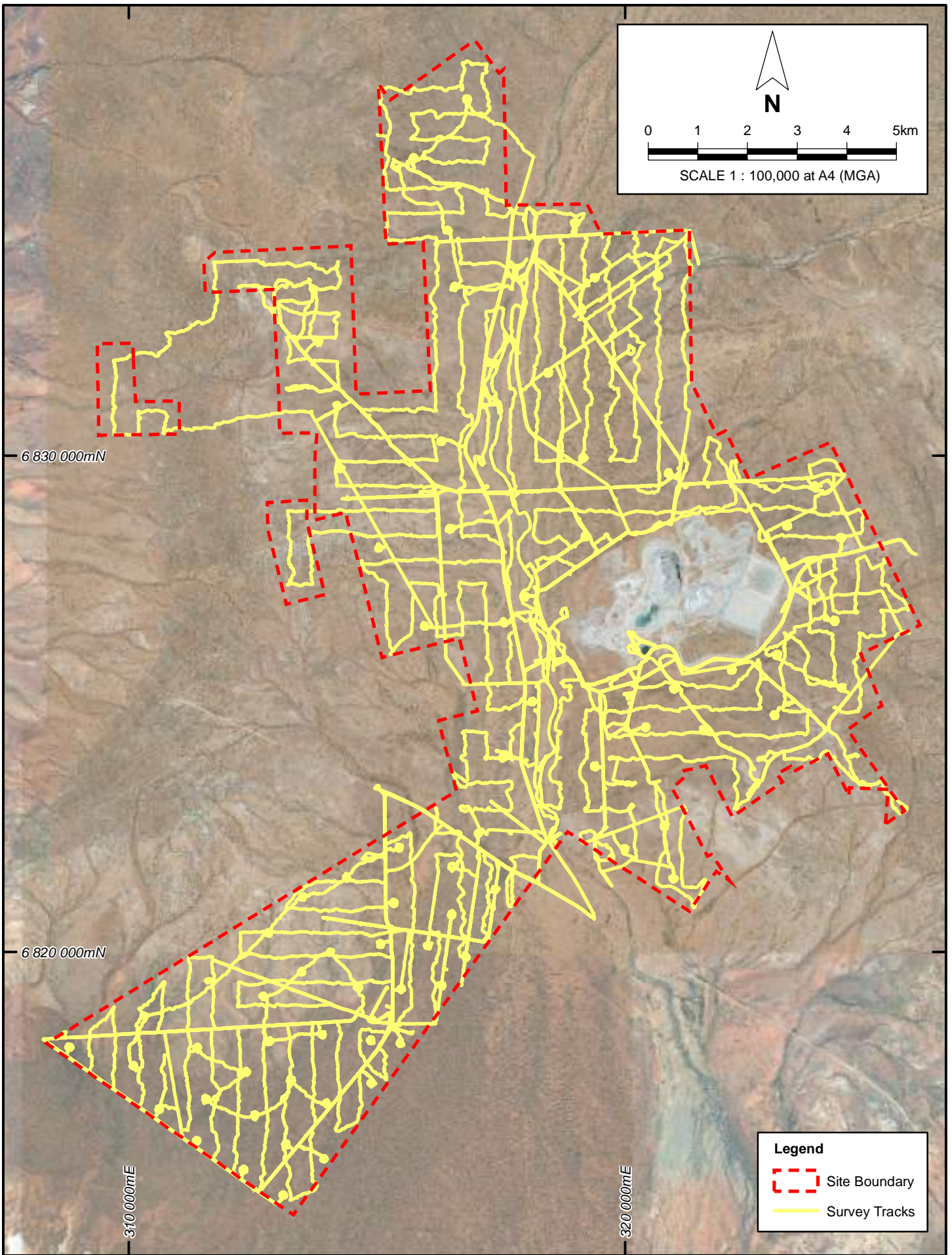
Drawn: S. Thompson Date: 18 May 2020

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 LEVEL 2 VERTEBRATE FAUNA ASSESSMENT
 KING OF THE HILLS PROJECT

REGIONAL LOCATION

Figure 1

Job: 2019-0084



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TERRESTRIAL ECOSYSTEMS

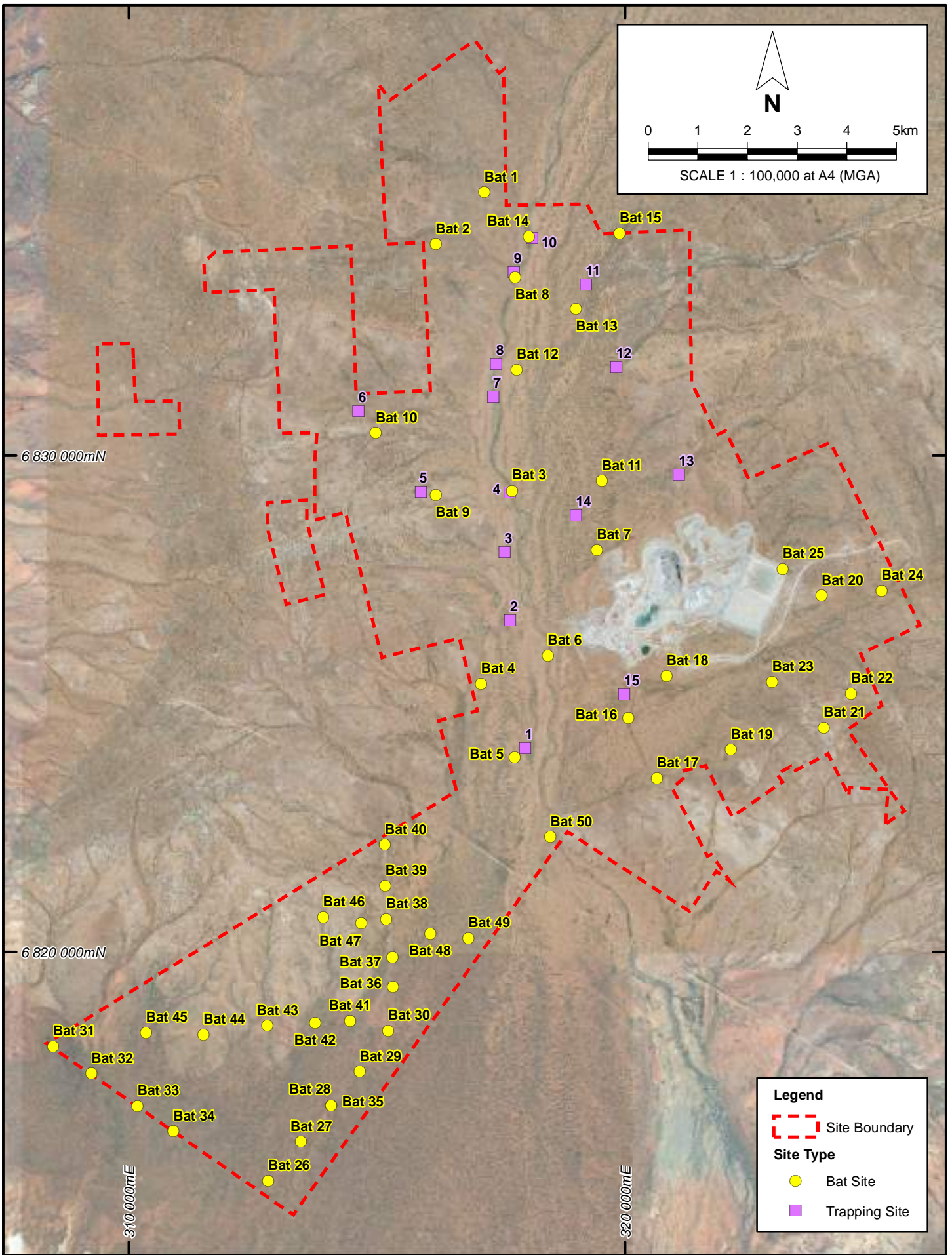
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 LEVEL 2 VERTEBRATE FAUNA ASSESSMENT
 KING OF THE HILLS PROJECT

SURVEY COVERAGE

Figure 2

Job: 2019-0084



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TERRESTRIAL ECOSYSTEMS

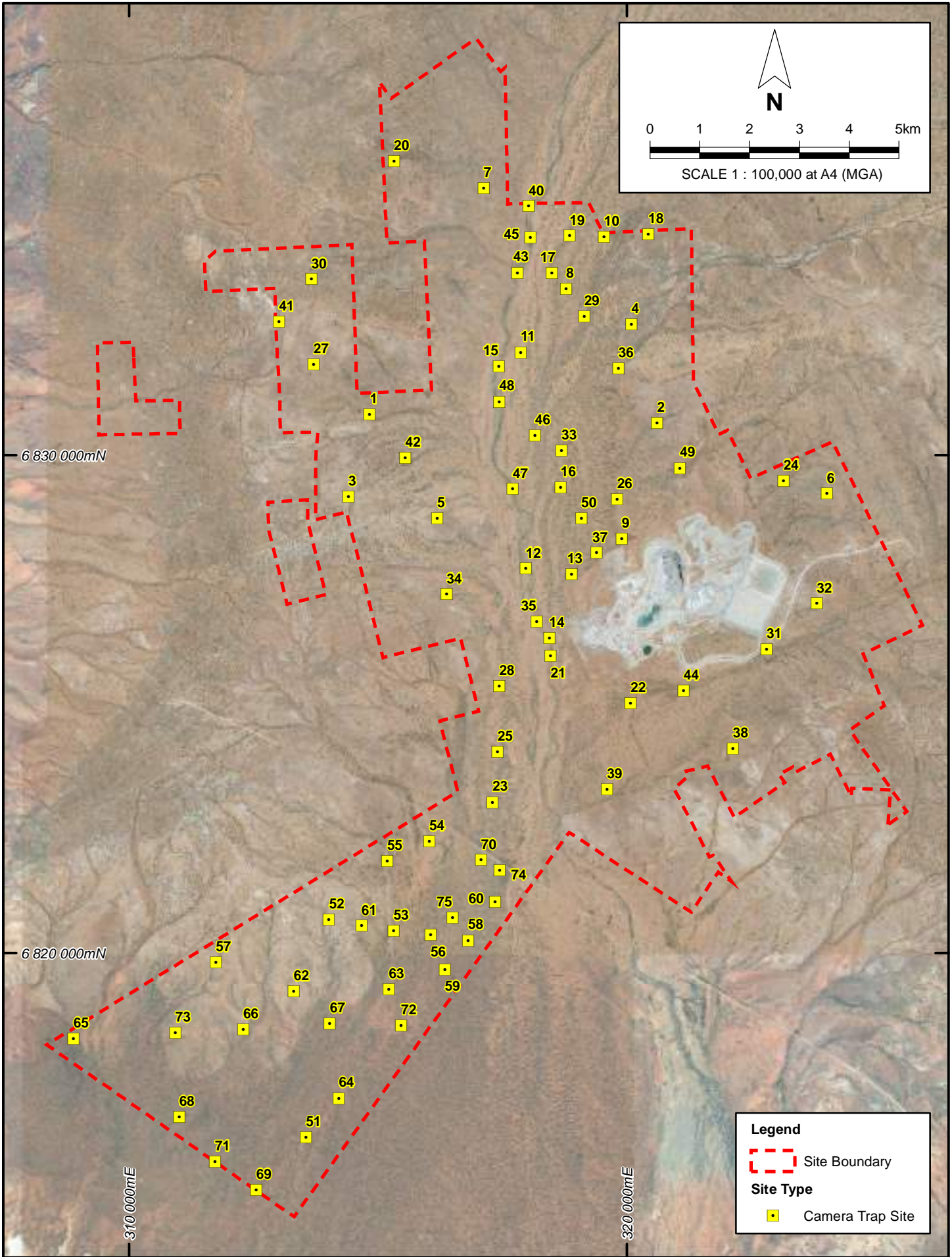
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 KING OF THE HILLS PROJECT

TRAPPING AND BAT DETECTION SITES

Figure 3

Job: 2019-0084



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TERRESTRIAL ECOSYSTEMS

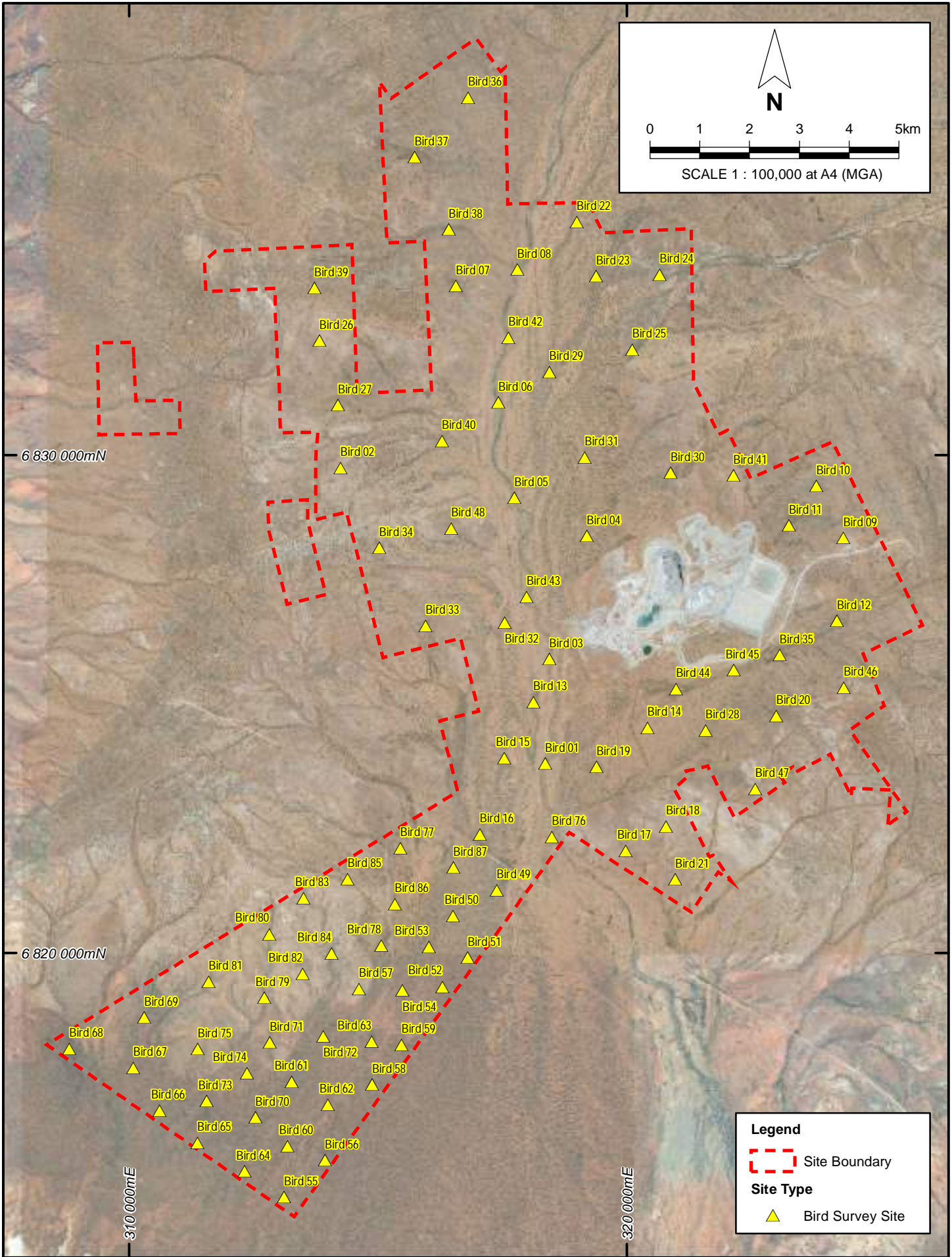
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CAMERA TRAPPING SITES

Figure 4

Job: 2019-0084



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TERRESTRIAL ECOSYSTEMS

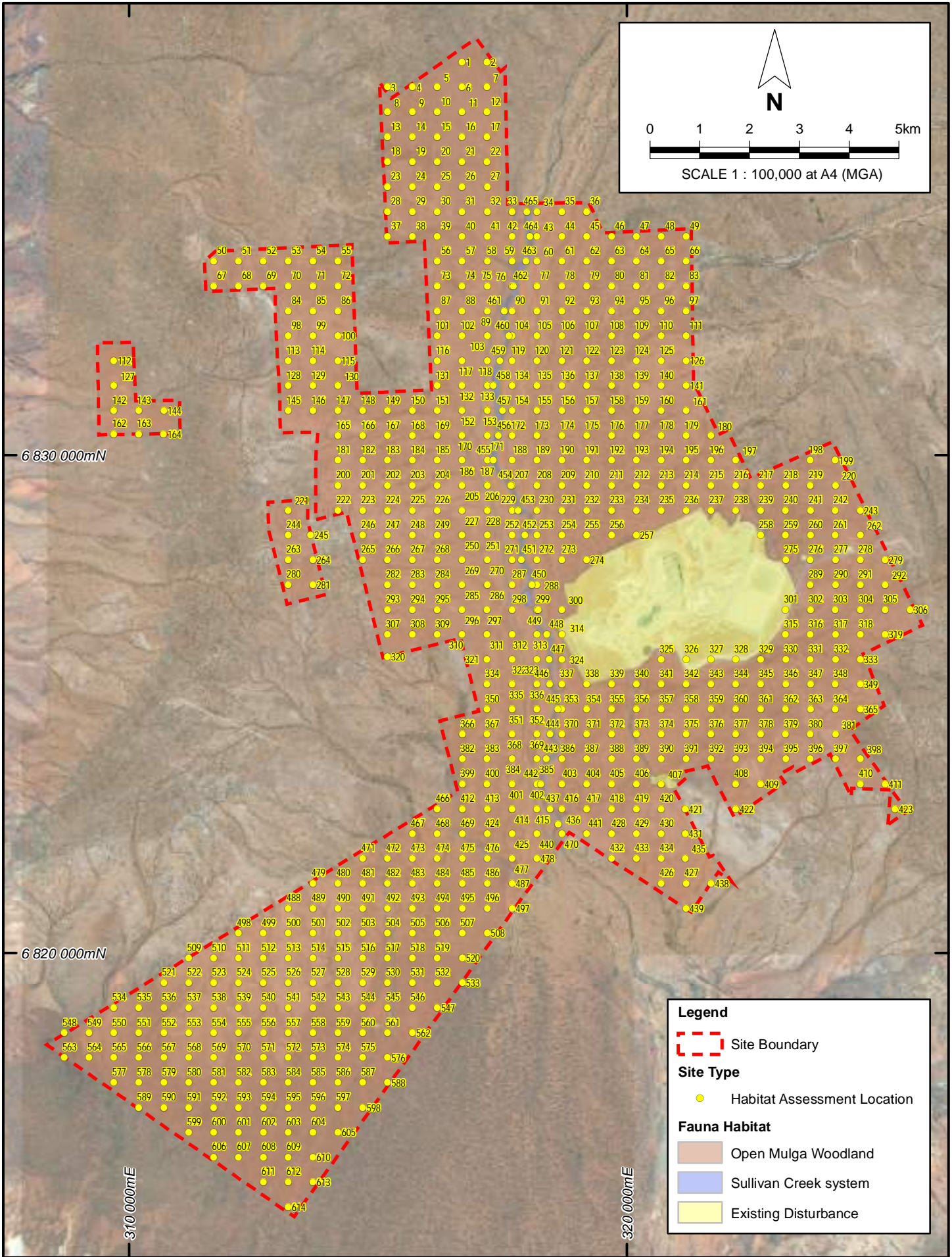
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BIRD SURVEY SITES

Figure 5

Job: 2019-0084



Legend

- Site Boundary
- Site Type**
- Habitat Assessment Location
- Fauna Habitat**
- Open Mulga Woodland
- Sullivan Creek system
- Existing Disturbance

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TERRESTRIAL ECOSYSTEMS

Drawn: S. Thompson Date: 18 May 2020

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 KING OF THE HILLS PROJECT

RAPID HABITAT ASSESSMENTS

Figure 6

Job: 2019-0084

Appendix A. Results of the EPBC Act Protected Matters Search

Level 2 Vertebrate Fauna Assessment
King of the Hills Project





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: 03/05/20 18:01:37

[Summary](#)

[Details](#)

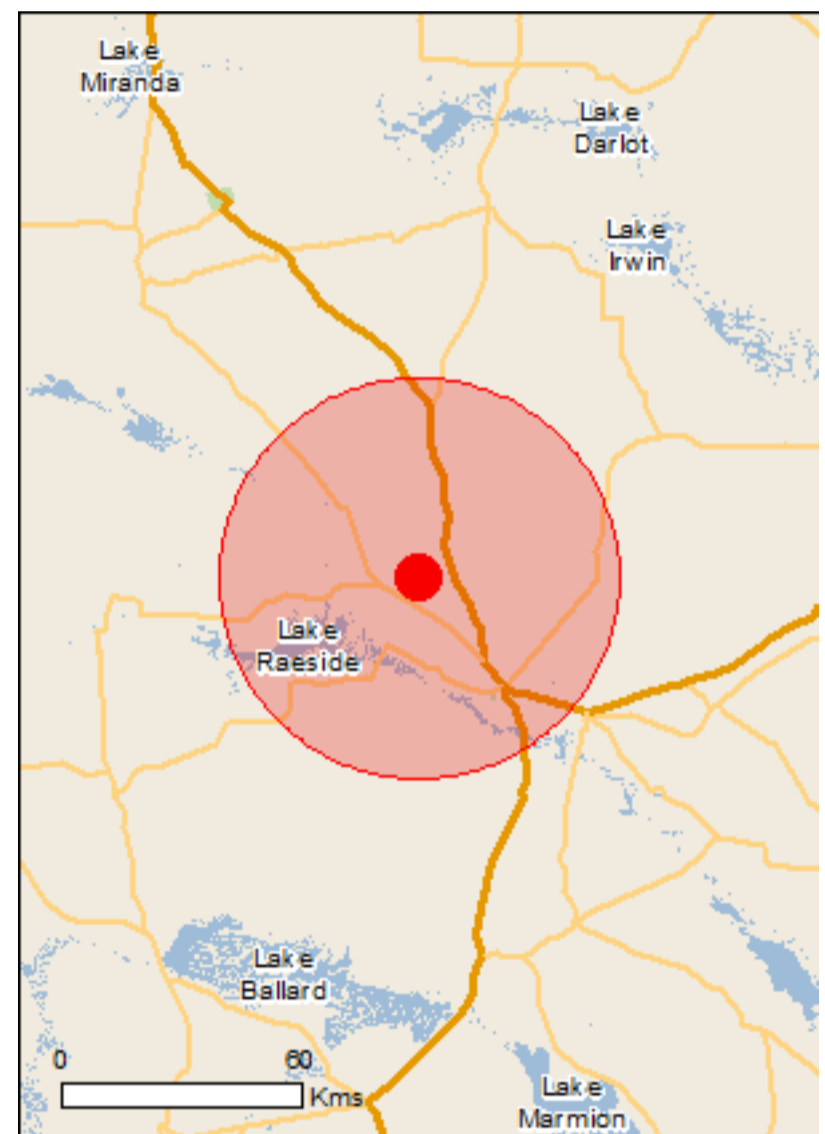
[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

[Coordinates](#)

Buffer: 50.0Km



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:	4
Listed Migratory Species:	8

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:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	12
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:	15
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		
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat known to occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Polytelis alexandrae Princess Parrot, Alexandra's Parrot [758]	Vulnerable	Species or species habitat known to occur within area

Mammals

Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat may occur within area
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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

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

Migratory Wetlands Species

Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [\[Resource Information \]](#)

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -

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 known to 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 known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		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 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

Name	Threatened	Type of Presence area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Extra Information

Invasive Species [\[Resource Information \]](#)

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 Resources Audit, 2001.

Name	Status	Type of Presence
Birds		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
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
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Equus asinus Donkey, Ass [4]		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

Name	Status	Type of Presence
Plants		
Carrichtera annua Ward's Weed [9511]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Cylindropuntia spp. Prickly Pears [85131]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

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

-28.66596 121.14082

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 B.

Rapid habitat assessment variables

Level 2 Vertebrate Fauna Assessment
King of the Hills Project



B.1 VARIABLES ASSESSED DURING THE RAPID HABITAT ASSESSMENT

Observer's Name:	
Coordinates of the location as UTM (GDA94):	
Fire history – options	
<input type="checkbox"/> > 5 years	
<input type="checkbox"/> 1-5 years	
<input type="checkbox"/> < 1 year	
Landform – options	
<input type="checkbox"/> Beach	<input type="checkbox"/> Lower slope
<input type="checkbox"/> Clay plain	<input type="checkbox"/> Mid slope
<input type="checkbox"/> Cliff	<input type="checkbox"/> Ridge
<input type="checkbox"/> Creek line	<input type="checkbox"/> River
<input type="checkbox"/> Dam	<input type="checkbox"/> Rocky outcrop / breakaway
<input type="checkbox"/> Drainage line	<input type="checkbox"/> Salt lake
<input type="checkbox"/> Dune crest	<input type="checkbox"/> Sand dune
<input type="checkbox"/> Dune slope	<input type="checkbox"/> Sand plain
<input type="checkbox"/> Dune swale	<input type="checkbox"/> Stony plain
<input type="checkbox"/> Escarpment	<input type="checkbox"/> Swamp
<input type="checkbox"/> Flat	<input type="checkbox"/> Undulating
<input type="checkbox"/> Gorge	<input type="checkbox"/> Upper slope
<input type="checkbox"/> Gully	<input type="checkbox"/> Wetland
<input type="checkbox"/> Intertidal / mangrove	<input type="checkbox"/> Water hole
<input type="checkbox"/> Lake / lake edge	
Habitat quality – options	
<input type="checkbox"/> <i>High quality fauna habitat</i> – These areas closely approximate the vegetation mix and quality that would have been in the area prior to any disturbance. The habitat has connectivity with other habitats and is likely to contain the most natural vertebrate fauna assemblage.	
<input type="checkbox"/> <i>Very good fauna habitat</i> - These areas show minimal signs of disturbance (e.g. grazing, clearing, fragmentation, weeds) and generally retain many of the characteristics of the habitat if it had not been disturbed. The habitat has connectivity with other habitats and fauna assemblages in these areas are likely to be minimally affected by disturbance.	
<input type="checkbox"/> <i>Good fauna habitat</i> – These areas showed signs of disturbance (e.g. grazing, clearing, fragmentation, weeds) but generally retain many of the characteristics of the habitat if it had not been disturbed. The habitat has connectivity with other habitats and fauna assemblages in these areas are likely to be affected by disturbance.	
<input type="checkbox"/> <i>Disturbed fauna habitat</i> – These areas showed signs of significant disturbance. Many of the trees, shrubs and undergrowth are cleared. These areas may be in the early succession and regeneration stages. Areas may show signs of significant grazing, containing weeds or have been damaged by vehicle or machinery. Habitats are fragmented or have limited connectivity with other fauna habitats. Fauna assemblages in these areas are likely to differ significantly from what might be expected in the area had the disturbance not occurred.	
<input type="checkbox"/> <i>Highly degraded fauna habitat</i> – These areas often have a significant loss of vegetation, an abundance of weeds, and a large number of vehicle tracks or are completely cleared. Limited or no fauna habitat connectivity. Fauna	

Observer's Name:	
assemblages in these areas are likely to be significantly different to what might have been in the area pre-disturbance.	
<i>Habitat structure – combined into habitat description</i>	
<i>Upper stratum</i>	
<input type="checkbox"/> Tall open woodland	<input type="checkbox"/> Scattered tall trees
<input type="checkbox"/> Tall woodland	<input type="checkbox"/> Scattered trees
<input type="checkbox"/> Open woodland	<input type="checkbox"/> Scattered low trees
<input type="checkbox"/> Woodland	<input type="checkbox"/> Low closed forest
<input type="checkbox"/> Open forest	<input type="checkbox"/> Low open forest
<input type="checkbox"/> Closed forest	<input type="checkbox"/> Low woodland
<input type="checkbox"/> Tall closed forest	<input type="checkbox"/> Low open woodland
<input type="checkbox"/> Tall open forest	
<i>Middle stratum</i>	
<input type="checkbox"/> Shrubland	<input type="checkbox"/> Open heath
<input type="checkbox"/> Tall shrubland	<input type="checkbox"/> Low closed heath
<input type="checkbox"/> Tall open shrubland	<input type="checkbox"/> Low open heath
<input type="checkbox"/> Low shrubland	<input type="checkbox"/> Tall closed scrub
<input type="checkbox"/> Scattered low shrubs	<input type="checkbox"/> Tall open scrub
<input type="checkbox"/> Low open shrubland	<input type="checkbox"/> Scattered tall shrubs
<input type="checkbox"/> Scattered tall shrubs	<input type="checkbox"/> Open shrubland
<input type="checkbox"/> Closed heath	<input type="checkbox"/> Scattered shrubs
<i>Lower stratum</i>	
<input type="checkbox"/> Closed hummock grassland	<input type="checkbox"/> Closed tussock grassland / sedgeland / herbland
<input type="checkbox"/> Mid-dense hummock grassland	<input type="checkbox"/> Tussock grass land / sedgeland / herbland
<input type="checkbox"/> Hummock grassland	<input type="checkbox"/> Open tussock grassland / sedgeland / herbland
<input type="checkbox"/> Open hummock grassland	<input type="checkbox"/> Scattered tussock / grasses / sedges / herbs
<input type="checkbox"/> Scattered hummock grassland	<input type="checkbox"/> Very open tussock grassland / herbland
Soil Type – options	
<input type="checkbox"/> Sand	<input type="checkbox"/> Silty loam
<input type="checkbox"/> Loamy sand	<input type="checkbox"/> Sand clay loam
<input type="checkbox"/> Clayey sand	<input type="checkbox"/> Clay
<input type="checkbox"/> Clay loam	<input type="checkbox"/> Peat / organic
<input type="checkbox"/> Silty clay loam	<input type="checkbox"/> Stony
<input type="checkbox"/> Sandy loam	
Soil colour - options	
<input type="checkbox"/> Black	<input type="checkbox"/> Red

Observer's Name:	
<input type="checkbox"/> Brown	<input type="checkbox"/> White
<input type="checkbox"/> Grey	<input type="checkbox"/> Yellow
<input type="checkbox"/> Orange	
Surface stones – options	
<input type="checkbox"/> None	<input type="checkbox"/> Boulders (>250mm)
<input type="checkbox"/> Pebbles (0-50mm)	<input type="checkbox"/> Rocks
<input type="checkbox"/> Cobbles (51-250)	

Appendix C.

Trapping sites

Level 2 Vertebrate Fauna Assessment
King of the Hills Project



C.1 LOCATION OF TRAPPING SITES AND OPENING AND CLOSING DATES (GDA 94, ZONE 51)

Site #	Easting	Northing	1st opening	1st closing	2nd opening	2nd closing	Days opened
1	317991	6824109	19/11/2019	26/11/2019	11/03/2020	18/03/2020	14
2	317685	6826688	19/11/2019	26/11/2019	11/03/2020	18/03/2020	14
3	317580	6828062	19/11/2019	26/11/2019	11/03/2020	18/03/2020	14
4	317676	6829265	19/11/2019	26/11/2019	11/03/2020	18/03/2020	14
5	315893	6829280	19/11/2019	26/11/2019	11/03/2020	18/03/2020	14
6	314633	6830902	19/11/2019	26/11/2019	11/03/2020	18/03/2020	14
7	317346	6831201	19/11/2019	26/11/2019	11/03/2020	18/03/2020	14
8	317404	6831848	19/11/2019	26/11/2019	11/03/2020	18/03/2020	14
9	317758	6833704	19/11/2019	26/11/2019	11/03/2020	18/03/2020	14
10	318133	6834400	19/11/2019	26/11/2019	11/03/2020	18/03/2020	14
11	319219	6833451	19/11/2019	26/11/2019	11/03/2020	18/03/2020	14
12	319829	6831795	19/11/2019	26/11/2019	11/03/2020	18/03/2020	14
13	321089	6829627	19/11/2019	26/11/2019	11/03/2020	18/03/2020	14
14	319013	6828795	19/11/2019	26/11/2019	11/03/2020	18/03/2020	14
15	319991	6825194	19/11/2019	26/11/2019	11/03/2020	18/03/2020	14

Appendix D.

Trapping site images in November 2019

Level 2 Vertebrate Fauna Assessment
King of the Hills Project



D.1 TRAPPING SITES IN NOVEMBER 2019

[Appendix Content Begins Here]



Plate 36. November 2019 Site 1 –



Plate 37. November 2019 Site 1



Plate 38. November 2019 Site 1



Plate 39. November 2019 Site 1



Plate 40. November 2019 Site 2



Plate 41. November 2019 Site 2



Plate 42. November 2019 Site 2



Plate 43. November 2019 Site 2



Plate 44. November 2019 Site 3



Plate 45. November 2019 Site 3



Plate 46. November 2019 Site 3



Plate 47. November 2019 Site 3



Plate 48. November 2019 Site 4



Plate 49. November 2019 Site 4



Plate 50. November 2019 Site 4



Plate 51. November 2019 Site 4



Plate 52. November 2019 Site 5



Plate 53. November 2019 Site 5



Plate 54. November 2019 Site 5



Plate 55. November 2019 Site 5



Plate 56. November 2019 Site 6



Plate 57. November 2019 Site 6



Plate 58. November 2019 Site 6



Plate 59. November 2019 Site 6



Plate 60. November 2019 Site 7



Plate 61. November 2019 Site 7



Plate 62. November 2019 Site 7



Plate 63. November 2019 Site 7



Plate 64. November 2019 Site 8



Plate 65. November 2019 Site 8



Plate 66. November 2019 Site 8



Plate 67. November 2019 Site 8



Plate 68. November 2019 Site 9



Plate 69. November 2019 Site 9



Plate 70. November 2019 Site 9



Plate 71. November 2019 Site 9



Plate 72. November 2019 Site 10 Plate 73. November 2019 Site 10 Plate 74. November 2019 Site 10



Plate 75. November 2019 Site 10 Plate 76. November 2019 Site 11 Plate 77. November 2019 Site 11



Plate 78. November 2019 Site 11 Plate 79. November 2019 Site 11 Plate 80. November 2019 Site 12



Plate 81. November 2019 Site 12 Plate 82. November 2019 Site 12 Plate 83. November 2019 Site 12



Plate 84. November 2019 Site 13 Plate 85. November 2019 Site 13 Plate 86. November 2019 Site 13



Plate 87. November 2019 Site 13 Plate 88. November 2019 Site 14 Plate 89. November 2019 Site 14



Plate 90. November 2019 Site 14 Plate 91. November 2019 Site 14 Plate 92. November 2019 Site 15



Plate 93. November 2019 Site 15 Plate 94. November 2019 Site 15 Plate 95. November 2019 Site 15

Appendix E.

Trapping site images in March 2020

Level 2 Vertebrate Fauna Assessment
King of the Hills Project



E.1 TRAPPING SITES IN MARCH 2020



Plate 96. March 2020 Site 1



Plate 97. March 2020 Site 1



Plate 98. March 2020 Site 1



Plate 99. March 2020 Site 1



Plate 100. March 2020 Site 2



Plate 101. March 2020 Site 2



Plate 102. March 2020 Site 2



Plate 103. March 2020 Site 2



Plate 104. March 2020 Site 3



Plate 105. March 2020 Site 3



Plate 106. March 2020 Site 3



Plate 107. March 2020 Site 3



Plate 108. March 2020 Site 4



Plate 109. March 2020 Site 4



Plate 110. March 2020 Site 4



Plate 111. March 2020 Site 4



Plate 112. March 2020 Site 5



Plate 113. March 2020 Site 5



Plate 114. March 2020 Site 5



Plate 115. March 2020 Site 5



Plate 116. March 2020 Site 6



Plate 117. March 2020 Site 6



Plate 118. March 2020 Site 6



Plate 119. March 2020 Site 6



Plate 120. March 2020 Site 7



Plate 121. March 2020 Site 7



Plate 122. March 2020 Site 7



Plate 123. March 2020 Site 7



Plate 124. March 2020 Site 8



Plate 125. March 2020 Site 8



Plate 126. March 2020 Site 8



Plate 127. March 2020 Site 8



Plate 128. March 2020 Site 9



Plate 129. March 2020 Site 9



Plate 130. March 2020 Site 9



Plate 131. March 2020 Site 9



Plate 132. March 2020 Site 10



Plate 133. March 2020 Site 10



Plate 134. March 2020 Site 10



Plate 135. March 2020 Site 10



Plate 136. March 2020 Site 11



Plate 137. March 2020 Site 11



Plate 138. March 2020 Site 11



Plate 139. March 2020 Site 11



Plate 140. March 2020 Site 12



Plate 141. March 2020 Site 12



Plate 142. March 2020 Site 12



Plate 143. March 2020 Site 12



Plate 144. March 2020 Site 13



Plate 145. March 2020 Site 13



Plate 146. March 2020 Site 13



Plate 147. March 2020 Site 13



Plate 148. March 2020 Site 14



Plate 149. March 2020 Site 14



Plate 150. March 2020 Site 14



Plate 151. March 2020 Site 14



Plate 152. March 2020 Site 15



Plate 153. March 2020 Site 15



Plate 154. March 2020 Site 15



Plate 155. March 2020 Site 15

Appendix F.

Bird survey sites

Level 2 Vertebrate Fauna Assessment
King of the Hills Project



F.1 BIRD SURVEY SITES (GDA 94, ZONE 51)

Site name	Easting	Northing	Date surveyed
KH-BS-#001	318361	6823809	21/11/2019
KH-BS-#002	314246	6829754	20/11/2019
KH-BS-#003	318444	6825907	20/11/2019
KH-BS-#004	319204	6828382	22/11/2019
KH-BS-#005	317743	6829152	22/11/2019
KH-BS-#006	317421	6831064	22/11/2019
KH-BS-#007	316571	6833406	23/11/2019
KH-BS-#008	317805	6833735	23/11/2019
KH-BS-#009	324354	6828347	24/11/2019
KH-BS-#010	323815	6829386	24/11/2019
KH-BS-#011	323263	6828592	24/11/2019
KH-BS-#012	324226	6826676	24/11/2019
KH-BS-#013	318130	6825048	21/11/2019
KH-BS-#014	320419	6824534	25/11/2019
KH-BS-#015	317544	6823919	21/11/2019
KH-BS-#016	317051	6822389	21/11/2019
KH-BS-#017	319983	6822055	21/11/2019
KH-BS-#018	320796	6822545	21/11/2019
KH-BS-#019	319392	6823741	21/11/2019
KH-BS-#020	323012	6824766	25/11/2019
KH-BS-#021	320976	6821482	21/11/2019
KH-BS-#022	318995	6834693	23/11/2019
KH-BS-#023	319391	6833599	23/11/2019
KH-BS-#024	320668	6833630	23/11/2019
KH-BS-#025	320115	6832124	22/11/2019
KH-BS-#026	313828	6832307	20/11/2019
KH-BS-#027	314202	6831011	20/11/2019
KH-BS-#028	321591	6824477	25/11/2019
KH-BS-#029	318447	6831677	22/11/2019
KH-BS-#030	320881	6829648	22/11/2019
KH-BS-#031	319156	6829967	22/11/2019

Site name	Easting	Northing	Date surveyed
KH-BS-#032	317554	6826647	20/11/2019
KH-BS-#033	315960	6826574	20/11/2019
KH-BS-#034	315027	6828145	20/11/2019
KH-BS-#035	323074	6825995	24/11/2019
KH-BS-#036	316817	6837188	23/11/2019
KH-BS-#037	315740	6835999	23/11/2019
KH-BS-#038	316427	6834541	23/11/2019
KH-BS-#039	313722	6833367	20/11/2019
KH-BS-#040	316293	6830292	22/11/2019
KH-BS-#041	322150	6829597	17/03/2020
KH-BS-#042	317626	6832364	22/11/2019
KH-BS-#043	317988	6827163	24/11/2019
KH-BS-#044	320992	6825312	25/11/2019
KH-BS-#045	322153	6825688	25/11/2019
KH-BS-#046	324365	6825330	24/11/2019
KH-BS-#047	322586	6823302	25/11/2019
KH-BS-#048	316475	6828532	25/11/2019
KH-BS-#049	317390	6821261	12/03/2020
KH-BS-#050	316510	6820750	12/03/2020
KH-BS-#051	316802	6819906	12/03/2020
KH-BS-#052	316299	6819329	12/03/2020
KH-BS-#053	316023	6820123	17/03/2020
KH-BS-#054	315491	6819256	17/03/2020
KH-BS-#055	313117	6815101	13/03/2020
KH-BS-#056	313934	6815834	13/03/2020
KH-BS-#057	314620	6819281	16/03/2020
KH-BS-#058	314888	6817361	12/03/2020
KH-BS-#059	315477	6818161	12/03/2020
KH-BS-#060	313184	6816123	13/03/2020
KH-BS-#061	313269	6817416	15/03/2020
KH-BS-#062	313994	6816954	15/03/2020

Site name	Easting	Northing	Date surveyed
KH-BS-#063	314877	6818226	12/03/2020
KH-BS-#064	312319	6815614	13/03/2020
KH-BS-#065	311369	6816195	13/03/2020
KH-BS-#066	310613	6816833	13/03/2020
KH-BS-#067	310088	6817700	14/03/2020
KH-BS-#068	308799	6818079	13/03/2020
KH-BS-#069	310303	6818708	14/03/2020
KH-BS-#070	312543	6816699	15/03/2020
KH-BS-#071	312827	6818207	16/03/2020
KH-BS-#072	313902	6818335	16/03/2020
KH-BS-#073	311561	6817029	15/03/2020
KH-BS-#074	312370	6817586	15/03/2020
KH-BS-#075	311378	6818071	15/03/2020

Site name	Easting	Northing	Date surveyed
KH-BS-#076	318501	6822342	17/03/2020
KH-BS-#077	315449	6822106	14/03/2020
KH-BS-#078	315074	6820158	17/03/2020
KH-BS-#079	312715	6819103	16/03/2020
KH-BS-#080	312819	6820386	14/03/2020
KH-BS-#081	311602	6819426	14/03/2020
KH-BS-#082	313485	6819591	16/03/2020
KH-BS-#083	313506	6821108	14/03/2020
KH-BS-#084	314073	6819996	16/03/2020
KH-BS-#085	314395	6821492	14/03/2020
KH-BS-#086	315344	6820991	17/03/2020
KH-BS-#087	316515	6821718	17/03/2020

Appendix G.

Bird survey site images

Level 2 Vertebrate Fauna Assessment
King of the Hills Project



G.1 BIRD SURVEY SITE IMAGES

[Appendix Content Begins Here]



Plate 156. Bird survey site 1



Plate 157. Bird survey site 2



Plate 158. Bird survey site 3



Plate 159. Bird survey site 4



Plate 160. Bird survey site 5



Plate 161. Bird survey site 6



Plate 162. Bird survey site 7



Plate 163. Bird survey site 8



Plate 164. Bird survey site 9



Plate 165. Bird survey site 10-



Plate 166. Bird survey site 11



Plate 167. Bird survey site 12



Plate 168. Bird survey site 13



Plate 169. Bird survey site 14



Plate 170. Bird survey site 15



Plate 171. Bird survey site 16



Plate 172. Bird survey site 17



Plate 173. Bird survey site 18



Plate 174. Bird survey site 19



Plate 175. Bird survey site 20



Plate 176. Bird survey site 21



Plate 177. Bird survey site 26



Plate 178. Bird survey site 25



Plate 179. Bird survey site 24



Plate 180. Bird survey site 25



Plate 181. Bird survey site 26



Plate 182. Bird survey site 27



Plate 183. Bird survey site 28



Plate 184. Bird survey site 29



Plate 185. Bird survey site 30



Plate 186. Bird survey site 31



Plate 187. Bird survey site 32



Plate 188. Bird survey site 33



Plate 189. Bird survey site 34



Plate 190. Bird survey site 35



Plate 191. Bird survey site 36



Plate 192. Bird survey site 37



Plate 193. Bird survey site 38



Plate 194. Bird survey site 39



Plate 195. Bird survey site 40



Plate 196. Bird survey site 41



Plate 197. Bird survey site 42



Plate 198. Bird survey site 43



Plate 199. Bird survey site 44



Plate 200. Bird survey site 45



Plate 201. Bird survey site 46



Plate 202. Bird survey site 47



Plate 203. Bird survey site 48



Plate 204. Bird survey site 49



Plate 205. Bird survey site 50



Plate 206. Bird survey site 51



Plate 207. Bird survey site 52



Plate 208. Bird survey site 53



Plate 209. Bird survey site 54



Plate 210. Bird survey site 55



Plate 211. Bird survey site 56



Plate 212. Bird survey site 57



Plate 213. Bird survey site 58



Plate 214. Bird survey site 59



Plate 215. Bird survey site 60



Plate 216. Bird survey site 61



Plate 217. Bird survey site 62



Plate 218. Bird survey site 63



Plate 219. Bird survey site 64



Plate 220. Bird survey site 65



Plate 221. Bird survey site 66



Plate 222. Bird survey site 67



Plate 223. Bird survey site 68



Plate 224. Bird survey site 69



Plate 225. Bird survey site 70



Plate 226. Bird survey site 71



Plate 227. Bird survey site 72



Plate 228. Bird survey site 73



Plate 229. Bird survey site 74



Plate 230. Bird survey site 75



Plate 231. Bird survey site 76



Plate 232. Bird survey site 77



Plate 233. Bird survey site 78



Plate 234. Bird survey site 79



Plate 235. Bird survey site 80



Plate 236. Bird survey site 81



Plate 237. Bird survey site 82



Plate 238. Bird survey site 83



Plate 239. Bird survey site 84



Plate 240. Bird survey site 85



Plate 241. Bird survey site 86



Plate 242. Bird survey site 87

Appendix H.

Camera trap locations

Level 2 Vertebrate Fauna Assessment
King of the Hills Project



H.1 CAMERA TRAP LOCATIONS AND DEPLOYMENT PERIOD

Camera trap #	Easting	Northing	Start	Finish	Days open
1	314838	6830822	4/11/2019	20/11/2019	16
2	320618	6830656	4/11/2019	22/11/2019	18
3	314407	6829173	4/11/2019	20/11/2019	16
4	320100	6832637	4/11/2019	22/11/2019	18
5	316200	6828733	4/11/2019	20/11/2019	16
6	324023	6829233	4/11/2019	24/11/2019	20
7	317131	6835371	4/11/2019	20/11/2019	16
8	318788	6833351	4/11/2019	22/11/2019	18
9	319906	6828330	4/11/2019	21/11/2019	17
10	319546	6834396	4/11/2019	22/11/2019	18
11	317868	6832074	4/11/2019	22/11/2019	18
12	317976	6827730	4/11/2019	21/11/2019	17
13	318892	6827614	4/11/2019	21/11/2019	17
14	318451	6826328	4/11/2019	21/11/2019	17
15	317428	6831795	4/11/2019	20/11/2019	16
16	318680	6829357	4/11/2019	21/11/2019	17
17	318496	6833670	4/11/2019	22/11/2019	18
18	320435	6834448	4/11/2019	22/11/2019	18
19	318856	6834416	4/11/2019	22/11/2019	18
20	315327	6835913	4/11/2019	20/11/2019	16
21	318472	6825977	4/11/2019	21/11/2019	17
22	320085	6825017	4/11/2019	23/11/2019	19
23	317301	6823036	4/11/2019	20/11/2019	16
24	323154	6829493	4/11/2019	24/11/2019	20
25	317408	6824047	4/11/2019	20/11/2019	16
26	319813	6829120	4/11/2019	22/11/2019	18
27	313704	6831836	4/11/2019	20/11/2019	16
28	317444	6825368	4/11/2019	20/11/2019	16
29	319150	6832800	4/11/2019	22/11/2019	18
30	313667	6833545	4/11/2019	20/11/2019	16
31	322814	6826107	4/11/2019	23/11/2019	19

Camera trap #	Easting	Northing	Start	Finish	Days open
32	323820	6827027	4/11/2019	23/11/2019	19
33	318694	6830095	4/11/2019	21/11/2019	17
34	316382	6827210	4/11/2019	20/11/2019	16
35	318197	6826666	4/11/2019	21/11/2019	17
36	319837	6831748	4/11/2019	19/11/2019	15
37	319395	6828042	4/11/2019	21/11/2019	17
38	322139	6824113	4/11/2019	23/11/2019	19
39	319610	6823296	4/11/2019	21/11/2019	17
40	318037	6835005	4/11/2019	21/11/2019	17
41	313014	6832690	4/11/2019	20/11/2019	16
42	315550	6829952	4/11/2019	20/11/2019	16
43	317803	6833673	4/11/2019	20/11/2019	16
44	321148	6825274	4/11/2019	23/11/2019	19
45	318066	6834371	4/11/2019	21/11/2019	17
46	318161	6830398	4/11/2019	22/11/2019	18
47	317714	6829330	4/11/2019	20/11/2019	16
48	317439	6831083	4/11/2019	20/11/2019	16
49	321072	6829746	4/11/2019	22/11/2019	18
50	319091	6828732	4/11/2019	21/11/2019	17
51	313555	6816298	13/03/2020	6/04/2020	24
52	314017	6820675	15/03/2020	6/04/2020	22
53	315317	6820446	13/03/2020	6/04/2020	24
54	316037	6822241	13/03/2020	6/04/2020	24
55	315191	6821857	13/03/2020	6/04/2020	24
56	316058	6820370	13/03/2020	6/04/2020	24
57	311741	6819816	15/03/2020	6/04/2020	22
58	316813	6820259	13/03/2020	6/04/2020	24
59	316349	6819676	13/03/2020	6/04/2020	24
60	317360	6821028	13/03/2020	6/04/2020	24
61	314676	6820550	15/03/2020	6/04/2020	22
62	313307	6819230	15/03/2020	6/04/2020	22

Camera trap #	Easting	Northing	Start	Finish	Days open
63	315219	6819276	15/03/2020	6/04/2020	22
64	314219	6817085	13/03/2020	6/04/2020	24
65	308880	6818280	14/03/2020	6/04/2020	23
66	312298	6818471	14/03/2020	6/04/2020	23
67	314034	6818583	14/03/2020	6/04/2020	23
68	311007	6816712	14/03/2020	6/04/2020	23
69	312555	6815240	13/03/2020	6/04/2020	24

Camera trap #	Easting	Northing	Start	Finish	Days open
70	317078	6821873	13/03/2020	6/04/2020	24
71	311728	6815809	13/03/2020	6/04/2020	24
72	315471	6818549	14/03/2020	6/04/2020	23
73	310936	6818398	14/03/2020	6/04/2020	23
74	317452	6821670	13/03/2020	6/04/2020	24
75	316500	6820715	13/03/2020	6/04/2020	24

Appendix I.

Camera trap site images

Level 2 Vertebrate Fauna Assessment
King of the Hills Project



1.1 CAMERA TRAP SITE IMAGES

[Appendix Content Begins Here]



Plate 243. Camera trap 1



Plate 244. Camera trap 2



Plate 245. Camera trap 3



Plate 246. Camera trap 4



Plate 247. Camera trap 5



Plate 248. Camera trap 6



Plate 249. Camera trap 7



Plate 250. Camera trap 8



Plate 251. Camera trap 9



Plate 252. Camera trap 10



Plate 253. Camera trap 11



Plate 254. Camera trap 12



Plate 255. Camera trap 13



Plate 256. Camera trap 14



Plate 257. Camera trap 15



Plate 258. Camera trap 16



Plate 259. Camera trap 17



Plate 260. Camera trap 18



Plate 261. Camera trap 19



Plate 262. Camera trap 20



Plate 263. Camera trap 21



Plate 264. Camera trap 22



Plate 265. Camera trap 23



Plate 266. Camera trap 24



Plate 267. Camera trap 25



Plate 268. Camera trap 26



Plate 269. Camera trap 27



Plate 270. Camera trap 28



Plate 271. Camera trap 29



Plate 272. Camera trap 30



Plate 273. Camera trap 31



Plate 274. Camera trap 32



Plate 275. Camera trap 33



Plate 276. Camera trap 34



Plate 277. Camera trap 35



Plate 278. Camera trap 36



Plate 279. Camera trap 37



Plate 280. Camera trap 38



Plate 281. Camera trap 39



Plate 282. Camera trap 40



Plate 283. Camera trap 41



Plate 284. Camera trap 42



Plate 285. Camera trap 43



Plate 286. Camera trap 44



Plate 287. Camera trap 45



Plate 288. Camera trap 46



Plate 289. Camera trap 47



Plate 290. Camera trap 48



Plate 291. Camera trap 49



Plate 292. Camera trap 50



Plate 293. Camera trap 51



Plate 294. Camera trap 52



Plate 295. Camera trap 53



Plate 296. Camera trap 54



Plate 297. Camera trap 55



Plate 298. Camera trap 56



Plate 299. Camera trap 57



Plate 300. Camera trap 58



Plate 301. Camera trap 59



Plate 302. Camera trap 60



Plate 303. Camera trap 61



Plate 304. Camera trap 62



Plate 305. Camera trap 63



Plate 306. Camera trap 64



Plate 307. Camera trap 65



Plate 308. Camera trap 66



Plate 309. Camera trap 67



Plate 310. Camera trap 68



Plate 311. Camera trap 69



Plate 312. Camera trap 70



Plate 313. Camera trap 71



Plate 314. Camera trap 72



Plate 315. Camera trap 73



Plate 316. Camera trap 74



Plate 317. Camera trap 75

Appendix J.

Song Meter locations

Level 2 Vertebrate Fauna Assessment
King of the Hills Project



J.1 SONG METER LOCATIONS

Bat site	Easting	Northing	Date out	Date in	Serial number
Bat 1	317167	6835313	20/11/2019	21/11/2019	7548
Bat 2	316192	6834272	20/11/2019	21/11/2019	10856
Bat 3	317726	6829298	20/11/2019	21/11/2019	10883
Bat 4	317102	6825405	20/11/2019	21/11/2019	7544
Bat 5	317782	6823925	20/11/2019	21/11/2019	7586
Bat 6	318451	6825973	21/11/2019	22/11/2019	7544
Bat 7	319437	6828098	21/11/2019	22/11/2019	7586
Bat 8	317788	6833602	21/11/2019	22/11/2019	10883
Bat 9	316184	6829209	21/11/2019	22/11/2019	10856
Bat 10	314977	6830461	21/11/2019	22/11/2019	7548
Bat 11	319536	6829495	22/11/2019	23/11/2019	7586
Bat 12	317820	6831743	22/11/2019	23/11/2019	10856
Bat 13	319018	6832966	22/11/2019	23/11/2019	7544
Bat 14	318071	6834423	22/11/2019	23/11/2019	7548
Bat 15	319897	6834487	22/11/2019	23/11/2019	10883
Bat 16	320074	6824718	23/11/2019	24/11/2019	10856
Bat 17	320651	6823502	23/11/2019	24/11/2019	10883
Bat 18	320846	6825566	23/11/2019	24/11/2019	7586
Bat 19	322139	6824080	23/11/2019	24/11/2019	7544
Bat 20	323963	6827189	23/11/2019	24/11/2019	7584
Bat 21	324007	6824523	24/11/2019	25/11/2019	7586
Bat 22	324557	6825210	24/11/2019	25/11/2019	7544
Bat 23	322971	6825441	24/11/2019	25/11/2019	10883
Bat 24	325177	6827284	24/11/2019	25/11/2019	10856
Bat 25	323182	6827724	24/11/2019	25/11/2019	7548

Bat site	Easting	Northing	Date out	Date in	Serial number
Bat 26	312811	6815391	12/03/2020	13/03/2020	7586
Bat 27	313473	6816176	12/03/2020	13/03/2020	10856
Bat 28	314081	6816917	12/03/2020	13/03/2020	7544
Bat 29	314656	6817590	12/03/2020	13/03/2020	10883
Bat 30	315234	6818414	12/03/2020	13/03/2020	7548
Bat 31	308474	6818100	13/03/2020	14/03/2020	7586
Bat 32	309252	6817550	13/03/2020	14/03/2020	10856
Bat 33	310180	6816894	13/03/2020	14/03/2020	7544
Bat 34	310899	6816385	13/03/2020	14/03/2020	10883
Bat 35	314081	6816916	13/03/2020	14/03/2020	7548
Bat 36	315323	6819303	14/03/2020	15/03/2020	10856
Bat 37	315317	6819895	14/03/2020	15/03/2020	7544
Bat 38	315188	6820666	14/03/2020	15/03/2020	7586
Bat 39	315176	9821339	14/03/2020	15/03/2020	10883
Bat 40	315167	6822158	14/03/2020	15/03/2020	7548
Bat 41	314459	6818611	15/03/2020	16/03/2020	10856
Bat 42	313755	6818571	15/03/2020	16/03/2020	7548
Bat 43	312797	6818515	15/03/2020	16/03/2020	10883
Bat 44	311507	6818336	15/03/2020	16/03/2020	7544
Bat 45	310345	6818373	15/03/2020	16/03/2020	7586
Bat 46	313921	6820702	16/03/2020	17/03/2020	10856
Bat 47	314686	6820579	16/03/2020	17/03/2020	7544
Bat 48	316075	6820376	16/03/2020	17/03/2020	10883
Bat 49	316850	6820278	16/03/2020	17/03/2020	7586
Bat 50	318498	6822321	16/03/2020	17/03/2020	7548

Appendix K. Trapping results

Level 2 Vertebrate Fauna Assessment
King of the Hills Project



K.1 NOVEMBER 2019 TRAPPING RESULTS BY TRAP TYPE

Taxa	Family	Species	Bucket	Funnel	Pipe	Total
Mammals	Dasyuridae	<i>Sminthopsis dolichura</i>	1			1
		<i>Sminthopsis macroura</i>	2		1	3
	Muridae	<i>Pseudomys hermannsburgensis</i>	3		1	4
Reptiles	Agamidae	<i>Ctenophorus reticulatus</i>	2	2	1	5
		<i>Ctenophorus scutulatus</i>		1		1
		<i>Pogona minor</i>	2			2
	Carphodactylidae	<i>Nephrurus vertebralis</i>			4	4
		<i>Underwoodisaurus milii</i>	16	10	10	36
	Diplodactylidae	<i>Diplodactylus granariensis</i>	54	8	16	78
		<i>Rhynchoedura ornata</i>	4	1	4	9
		<i>Strophurus wellingtonae</i>	5	1	1	7
	Elapidae	<i>Brachyurophis semifasciata</i>	4	1	2	7
		<i>Parasuta monachus</i>	2	1		3
		<i>Simoselaps bertholdi</i>	3	1		4
		<i>Suta punctata</i>		1		1
	Gekkonidae	<i>Diplodactylus pulcher</i>	43	6	17	66
		<i>Gehyra variegata</i>	28	9	16	53
		<i>Heteronotia binoei</i>	38	25	12	75
	Pygopodidae	<i>Pygopus nigriceps</i>	1			1
	Scincidae	<i>Cryptoblepharus buchananii</i>	4	1	3	8
		<i>Ctenotus schomburgkii</i>	5	10	2	17
		<i>Ctenotus severus</i>	3	12	2	17
		<i>Ctenotus uber</i>	18	31	6	55
		<i>Egernia depressa</i>	6	2	3	11
		<i>Eremiascincus richardsonii</i>	6	4	1	11
		<i>Lerista desertorum</i>	56	24	36	116
		<i>Lerista muelleri</i>	8	5	2	15
		<i>Menetia greyii</i>	4	1	2	7
		<i>Morethia butleri</i>	15	24	10	49
	Typhlopidae	<i>Anilius hamatus</i>	1			1

Taxa	Family	Species	Bucket	Funnel	Pipe	Total
	Varanidae	<i>Varanus caudolineatus</i>	2	5	1	8
		<i>Varanus panoptes</i>		2	1	3
		Total	336	188	154	678

K.2 NOVEMBER TRAPPING RESULTS BY SITE

Family	Species	Sites															Total
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Dasyuridae	<i>Sminthopsis dolichura</i>		1														1
	<i>Sminthopsis macroura</i>															3	3
Muridae	<i>Pseudomys hermannsburgensis</i>						4										4
Agamidae	<i>Ctenophorus reticulatus</i>	1	1	1								1				1	5
	<i>Ctenophorus scutulatus</i>											1					1
	<i>Pogona minor</i>									1	1						2
Carphodactylidae	<i>Nephrurus vertebralis</i>											4					4
	<i>Underwoodisaurus milii</i>				3			5	7	5	16						36
Diplodactylidae	<i>Diplodactylus granariensis</i>	12	10	4	7	8	9		1		5	5	5	7	1	4	78
	<i>Rhynchoedura ornata</i>					3	1								4	1	9
	<i>Strophurus wellingtonae</i>	1	2	1			1						1		1		7
Elapidae	<i>Brachyurophis semifasciata</i>	1						1		1	4						7
	<i>Parasuta monachus</i>									1			1		1		3
	<i>Simoselaps bertholdi</i>				1			2	1								4
	<i>Suta punctata</i>									1							1
Gekkonidae	<i>Diplodactylus pulcher</i>	5	4	2		6	6					10	6	7	3	17	66
	<i>Gehyra variegata</i>	2	2	1	8	4	3	4	2	2	6	2	2	11	1	3	53
	<i>Heteronotia binoei</i>				17	2		17	19	5	3	3	1	5	3		75
Pygopodidae	<i>Pygopus nigriceps</i>													1			1
Scincidae	<i>Cryptoblepharus buchananii</i>							1	1	3	3						8
	<i>Ctenotus schomburgkii</i>	1	6									4			6		17
	<i>Ctenotus severus</i>				3			2	5	1	6						17
	<i>Ctenotus uber</i>	10	15	9	1		1	3	3			3			6	4	55
	<i>Egernia depressa</i>	1	2	1		1	3					1	1	1			11
	<i>Eremiascincus richardsonii</i>					1	2	2		1	2	3					11
	<i>Lerista desertorum</i>	1	1	3	21		5	14	18	18	35						116
	<i>Lerista muelleri</i>		1		2			4	1	1	3	1	1		1		15
	<i>Menetia greyii</i>										3	2	1			1	7
	<i>Morethia butleri</i>	2		1	9		3	6	8	8	7	1	3	1			49

		Sites																
Typhlopidae	<i>Anilius hamatus</i>												1					1
Varanidae	<i>Varanus caudolineatus</i>	1	3				3							1				8
Dasyuridae	<i>Varanus panoptes</i>					2								1				3
	Total	38	48	23	72	27	41	61	66	48	94	42	24	33	28	33	678	

K.3 MARCH 2020 TRAPPING RESULTS BY TRAP TYPE

Taxa	Family	Species	Bucket	Funnel	Pipe	Total
Amphibians	Hylidae	<i>Litoria rubella</i>	1		1	2
	Limnodynastidae	<i>Neobatrachus sutor</i>	39		14	53
	Myobatrachidae	<i>Pseudophryne occidentalis</i>	3		1	4
Mammals	Dasyuridae	<i>Ningauai ridei</i>			1	1
		<i>Sminthopsis dolichura</i>	9		6	15
		<i>Sminthopsis macroura</i>	1			1
	Muridae	<i>Pseudomys hermannsburgensis</i>			6	6
Reptiles	Agamidae	<i>Ctenophorus reticulatus</i>	5	3		8
		<i>Ctenophorus scutulatus</i>		1	1	2
		<i>Diporiphora amphiboluroides</i>	1		1	2
		<i>Pogona minor</i>	1			1
	Carphodactylidae	<i>Nephrurus vertebralis</i>			1	1
		<i>Underwoodisaurus milii</i>	11	4	4	19
	Diplodactylidae	<i>Diplodactylus granariensis</i>	35	3	9	47
		<i>Rhynchoedura ornata</i>	7		4	11
		<i>Strophurus wellingtonae</i>	5	2	4	11
	Elapidae	<i>Parasuta monachus</i>	2			2
		<i>Pseudechis butleri</i>			1	1
		<i>Pseudonaja modesta</i>	1			1
	Elapidae	<i>Simoselaps bertholdi</i>	1	1		2
	Gekkonidae	<i>Diplodactylus pulcher</i>	44	1	16	61
		<i>Gehyra variegata</i>	23	18	8	49
		<i>Heteronotia binoei</i>	37	43	14	94
Pygopodidae	<i>Pygopus nigriceps</i>	2		1	3	
Pythonidae	<i>Antaresia stimsoni</i>			1	1	
Scincidae	<i>Cryptoblepharus buchananii</i>	7			7	
	<i>Ctenotus schomburgkii</i>	5	5		10	
	<i>Ctenotus severus</i>	16	24	1	41	
	<i>Ctenotus uber</i>	28	61	4	93	
	<i>Egernia depressa</i>	9	7	5	21	

Taxa	Family	Species	Bucket	Funnel	Pipe	Total
		<i>Eremiascincus richardsonii</i>	4	8	3	15
		<i>Lerista desertorum</i>	10	2	8	20
		<i>Lerista muelleri</i>	6	3	2	11
		<i>Menetia greyii</i>	8	2		10
		<i>Morethia butleri</i>	25	25	5	55
	Varanidae	<i>Varanus caudolineatus</i>	3	4	2	9
		<i>Varanus panoptes</i>		3	1	4
		Total	349	222	124	695

K.4 MARCH 2020 TRAPPING RESULTS BY SITE

Species	Sites															Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
<i>Litoria rubella</i>									1	1						2
<i>Neobatrachus sutor</i>				6			1	11	16	14					5	53
<i>Pseudophryne occidentalis</i>									4							4
<i>Ningui ridei</i>													1			1
<i>Sminthopsis dolichura</i>	2		1		2	2					3		2	2	1	15
<i>Sminthopsis macroura</i>		1														1
<i>Pseudomys hermannsburgensis</i>						5							1			6
<i>Ctenophorus reticulatus</i>		5									1	1			1	8
<i>Ctenophorus scutulatus</i>											1		1			2
<i>Diporiphora amphiboluroides</i>		1										1				2
<i>Pogona minor</i>				1												1
<i>Nephrurus vertebralis</i>											1					1
<i>Underwoodisaurus milii</i>			2	2			2	3	6	4						19
<i>Diplodactylus granariensis</i>	6	4	8	3	4	3	4	1	2	4		2	3	1	2	47
<i>Rhynchoedura ornata</i>		2			5							1		3		11
<i>Strophurus wellingtonae</i>	1	1	1		3						1	1		3		11
<i>Parasuta monachus</i>												1	1			2
<i>Pseudechis butleri</i>	1		1													2
<i>Pseudonaja modesta</i>		1														1
<i>Simoselaps bertholdi</i>			1						1							2
<i>Diplodactylus pulcher</i>	14	4	1		5	6					1	4	9	1	16	61
<i>Gehyra variegata</i>	3	3		8	7	2		3	7	3	4	1	4	2	2	49
<i>Heteronotia binoei</i>			3	15		1	10	12	15	23	4	3	7	1		94
<i>Pygopus nigriceps</i>						2									1	3
<i>Antaresia stimsoni</i>							1									1
<i>Cryptoblepharus buchananii</i>							2	1	2	2						7
<i>Ctenotus schomburgkii</i>		5									2			3		10
<i>Ctenotus severus</i>				8			14	11	3	5						41
<i>Ctenotus uber</i>	4	20	4	8	4	1	2	10	2	1	9	1	9	13	5	93

	Sites																
<i>Egernia depressa</i>	5	3			1	2					2	5	3			21	
<i>Eremiascincus richardsonii</i>				2					1	11					1	15	
<i>Lerista desertorum</i>	3			3			1	5	2	5					1	20	
<i>Lerista muelleri</i>	3	1			1		1		2	1					2	11	
<i>Menetia greyii</i>					2					1	1	1	1	3	1	10	
<i>Morethia butleri</i>	1	5	2	11	1		8	4	12	8				1	2	55	
<i>Varanus caudolineatus</i>	1					2				2					1	3	9
<i>Varanus panoptes</i>						1					1		1	1		4	
Total	44	56	24	67	35	27	46	61	76	85	31	22	44	39	38	695	

Appendix L.

Avifauna records

Level 2 Vertebrate Fauna Assessment
King of the Hills Project



L.1 AVIFAUNA RECORDS BY SITE FOR NOVEMBER 2019 - SITES 1-24

Family	Species	Common Name	Sites																							
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Accipitridae	<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk								1																
	<i>Aquila audax</i>	Wedge-tailed Eagle													1											
Columbidae	<i>Ocyphaps lophotes</i>	Crested Pigeon											1	6		1										
	<i>Phaps chalcoptera</i>	Common Bronzewing						1																		
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater	2							1																
Falconidae	<i>Falco cenchroides</i>	Nankeen Kestrel					1																			
Acanthizidae	<i>Acanthiza</i>	Inland Thornbill	1				4																			
	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill																		1						
	<i>Acanthiza robustirostris</i>	Slaty-backed Thornbill				1						2												2		
	<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill	3	3		2	3	1	3	1		5	6	3		3	2			2		1	2	2		
	<i>Aphelocephala leucopsis</i>	Southern Whiteface																						5		
	<i>Pyrrholaemus brunneus</i>	Redthroat														1	1									
	<i>Smicronis brevirostris</i>	Weebill	2				5	2																		
Artamidae	<i>Artamus cinereus</i>	Black-faced Woodswallow									2															
	<i>Gymnorhina tibicen</i>	Australian Magpie							1								2									
Climacteridae	<i>Climacteris affinis</i>	White-browed Treecreeper														2							1			
Corvidae	<i>Corvus bennetti</i>	Little Crow																3								
	<i>Corvus orru</i>	Torresian Crow	1					2												1						

L.2 AVIFAUNA RECORDS BY SITE FOR NOVEMBER 2019 - SITES 25-48

Family	Species	Common Name	Sites																							
			25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
Accipitridae	<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk																	1							
	<i>Aquila audax</i>	Wedge-tailed Eagle				1																				
Columbidae	<i>Ocyphaps lophotes</i>	Crested Pigeon				12																				
	<i>Phaps chalcoptera</i>	Common Bronzewing																		1						
Halcyonidae	<i>Todiramphus pyrrhopygius</i>	Red-backed Kingfisher																		1						
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater																	1	2						
Acanthizidae	<i>Acanthiza</i>	Inland Thornbill												1	1											
	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill		2																						
	<i>Acanthiza robustirostris</i>	Slaty-backed Thornbill	1																							
	<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill			3		1	2		3	1	2		2	5	4	1			2	3	2	3	3		
	<i>Aphelocephala leucopsis</i>	Southern Whiteface					2													1						
	<i>Pyrrholaemus brunneus</i>	Redthroat																	1							
	<i>Smicrornis brevirostris</i>	Weebill																		1	4					
Artamidae	<i>Artamus cinereus</i>	Black-faced Woodswallow		4																			1			
	<i>Cracticus nigrogularis</i>	Pied Butcherbird																							1	
Climacteridae	<i>Climacteris affinis</i>	White-browed Treecreeper	1									1														
Corvidae	<i>Corvus orru</i>	Torresian Crow																						1		
Maluridae	<i>Malurus leucopterus</i>	White-winged Fairywren																		3						

			Sites																														
	<i>Malurus splendens</i>	Splendid Fairywren	1		2		5									1	2	1											2				
Meliphagidae	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater																												1			
	<i>Lichenostomus virescens</i>	Singing Honeyeater	1	1		1		1		1				1	2	1	1	1	2					2		1		1		1	1		
	<i>Manorina flavigula</i>	Yellow-throated Miner				1																						1		1			
Motacillidae	<i>Anthus novaeseelandiae</i>	Australasian Pipit																											1				
Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella																						4									
Pachycephalidae	<i>Colluricincla harmonica</i>	Grey Shrike-thrush																											1				
	<i>Oreoica gutturalis</i>	Crested Bellbird			1				1	1				1	1								1										
	<i>Pachycephala rufiventris</i>	Rufous Whistler													1		1									1						1	
Pardalotidae	<i>Pardalotus striatus</i>	Striated Pardalote																											1				
Petroicidae	<i>Melanodryas cucullata</i>	Hooded Robin			1																												
	<i>Petroica goodenovii</i>	Red-capped Robin	2					1							1																1		
Pomatostomidae	<i>Pomatostomus superciliosus</i>	White-browed Babbler					4																										
Ptilinorhynchidae	<i>Ptilinorhynchus guttatus</i>	Western Bowerbird																											1				
Rhipiduridae	<i>Rhipidura albiscapa</i>	Grey Fantail																															
	<i>Rhipidura leucophrys</i>	Willie Wagtail			1																						1	2			1		
Psittacidae	<i>Barnardius zonarius</i>	Australian Ringneck														1																	
		Total	6	9	6	15	13	4	1	4	1	3	3	7	10	8	2	7	5	10	21	2	5	6	2	3							

L.3 AVIFAUNA RECORDS BY SITE FOR MARCH 2020 - SITES 49-73

Family	Species	Common Name	Sites																							
			49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72
Accipitridae	<i>Accipiter fasciatus</i>	Brown Goshawk																				2				
	<i>Aquila audax</i>	Wedge-tailed Eagle													1											
Columbidae	<i>Ocyphaps lophotes</i>	Crested Pigeon				3				3																
	<i>Phaps chalcoptera</i>	Common Bronzewing		1																						
Cuculidae	<i>Chalcites basalis</i>	Horsfield's Bronze Cuckoo																		1						
Falconidae	<i>Falco berigora</i>	Brown Falcon													1											
Acanthizidae	<i>Acanthiza</i>	Inland Thornbill					2															1				
	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill						1														2				
	<i>Acanthiza robustirostris</i>	Slaty-backed Thornbill					3						1										1		4	
	<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill				1		2	6	1		4		3				2		2		3	2	2	2	4
	<i>Aphelocephala leucopsis</i>	Southern Whiteface					2						1								2		1			
	<i>Gerygone fusca</i>	Western Gerygone																								
	<i>Pyrrholaemus brunneus</i>	Redthroat							1						1					1		1				
Artamidae	<i>Artamus cinereus</i>	Black-faced Woodswallow									1															
	<i>Cracticus nigrogularis</i>	Pied Butcherbird																								1
Climacteridae	<i>Climacteris affinis</i>	White-browed Treecreeper						2															1			
Corvidae	<i>Corvus orru</i>	Torresian Crow	1										1					1						1		
Estrildidae	<i>Taeniopygia guttata</i>	Zebra Finch																							1	

		Sites																									
Maluridae	<i>Malurus splendens</i>	Splendid Fairywren	1				3	2	2												1	1		3			
Meliphagidae	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater	1				2	1	1	1			1	1	6	1		1			1	1	2	1	2	1	1
	<i>Lichenostomus virescens</i>	Singing Honeyeater	1	2	1	2	1	2		1	2	1	1	1	1	2	1	2	2	1	1	1	1		2	1	2
	<i>Purnella albifrons</i>	White-fronted Honeyeater									1							1						2			
Pachycephalidae	<i>Colluricincla harmonica</i>	Grey Shrike-thrush	1	1																	1						1
	<i>Oreoica gutturalis</i>	Crested Bellbird	2	2	2		1	1	1	1	1	1	1	1	1	1	1	1	1	1				1	1		1
	<i>Pachycephala rufiventris</i>	Rufous Whistler	2	1	1		1	1					1		1				1		1	2	1	1	1	1	1
Petroicidae	<i>Melanodryas cucullata</i>	Hooded Robin						2																		1	
	<i>Petroica goodenovii</i>	Red-capped Robin	1	1		1	2	2	1			1			3	1	1		1			1	1	2		1	
Pomatostomidae	<i>Pomatostomus superciliosus</i>	White-browed Babbler			3				2					3				2		3		2					
Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail									1				1			1							1		1
Psittacidae	<i>Barnardius zonarius</i>	Australian Ringneck	1																								
	<i>Neopsephotus bourkii</i>	Bourke's Parrot		1			1			1														1			
		Total	11	9	7	7	18	16	14	4	10	7	4	4	20	6	6	5	12	1	11	9	16	13	11	15	11

L.4 AVIFAUNA RECORDS BY SITE FOR MARCH 2020 - SITES 74-87

Family	Species	Common Name	Sites													
			74	75	76	77	78	79	80	81	82	83	84	85	86	87
Aegothelidae	<i>Aegotheles cristatus</i>	Australian Owlet-nightjar										1				
Columbidae	<i>Phaps chalcoptera</i>	Common Bronzewing											1			
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater			2											
Falconidae	<i>Falco berigora</i>	Brown Falcon			1											
	<i>Falco cenchroides</i>	Nankeen Kestrel							1							
Acanthizidae	<i>Acanthiza</i>	Inland Thornbill			2											
	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill			2											
	<i>Acanthiza robustirostris</i>	Slaty-backed Thornbill										1	1		1	
	<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill	2		2				3				2	1		
	<i>Aphelocephala leucopsis</i>	Southern Whiteface			3	1	2		2			6	1		1	
	<i>Gerygone fusca</i>	Western Gerygone			1											
	<i>Smicronis brevirostris</i>	Weebill			4											
Artamidae	<i>Cracticus nigrogularis</i>	Pied Butcherbird			1	2									1	
	<i>Gymnorhina tibicen</i>	Australian Magpie			1											
	<i>Strepera versicolor</i>	Grey Currawong				1										
Campephagidae	<i>Coracina maxima</i>	Ground Cuckoo-shrike							2							
	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike							1							
Corvidae	<i>Corvus orru</i>	Torresian Crow			1			1								

		Sites																										
Estrildidae	<i>Taeniopygia guttata</i>	Zebra Finch								2																		
Maluridae	<i>Malurus splendens</i>	Splendid Fairywren																								3		3
Meliphagidae	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater	1				1	1	2		1	2	1	1	1	1	1	1	2								2	2
	<i>Lichenostomus virescens</i>	Singing Honeyeater	1	1	2	2	2	1			1	1			3	1	2									1	2	2
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark					1																					
Pachycephalidae	<i>Oreoica gutturalis</i>	Crested Bellbird	1	1	1	1	1	1						1	1	1	1	1	1	1							1	1
	<i>Pachycephala rufiventris</i>	Rufous Whistler										1										1	1	1				
Pardalotidae	<i>Pardalotus striatus</i>	Striated Pardalote					1																					
Petroicidae	<i>Melanodryas cucullata</i>	Hooded Robin								2																		1
	<i>Petroica goodenovii</i>	Red-capped Robin										1	2	2	1										2	2	2	2
Rhipiduridae	<i>Rhipidura albiscapa</i>	Grey Fantail																										
	<i>Rhipidura leucophrys</i>	Willie Wagtail					1				2	1				1	1	3										
Cacatuidae	<i>Eolophus roseicapilla</i>	Galah					2																					
Psittacidae	<i>Barnardius zonarius</i>	Australian Ringneck					4																				1	2
	<i>Neopsephotus bourkii</i>	Bourke's Parrot											2													4		
		Total	5	2	33	8	12	11	3		16	4	9		19	15	8											15

L.5 AVIFAUNA RECORDED AT RAINBOW PIT

Species	Common Name	Number
<i>Anas gracilis</i>	Grey Teal	56
<i>Aythya australis</i>	Hardhead	1
<i>Chenonetta jubata</i>	Australian Wood Duck	4
<i>Cygnus atratus</i>	Black Swan	4
<i>Elsayornis melanops</i>	Black-fronted Dotterel	3
<i>Fulica atra</i>	Eurasian Coot	14
<i>Gavicalis virescens</i>	Singing Honeyeater	2
<i>Grallina cyanoleuca</i>	Magpie-lark	1
<i>Ocyphaps lophotes</i>	Crested Pigeon	2
<i>Oreoica gutturalis</i>	Crested Bellbird	1
<i>Tachybaptus novaehollandiae</i>	Australasian Grebe	3
<i>Tadorna tadornoides</i>	Australian Shelduck	4

Appendix M.

Camera trapping results

Level 2 Vertebrate Fauna Assessment
King of the Hills Project



M.1 CAMERA TRAP RESULTS FOR NOVEMBER 2019(A)

	Camera #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Cow	<i>Bos taurus</i>		x		x			x		x	x	x		x	x		x						x	x		x
Cat	<i>Felis catus</i>		x																			x				
Emu	<i>Domanius novaehollandiae</i>				x																	x				
Red kangaroo	<i>Osphranter rufus</i>					x	x	x												x	x				x	
Dog	<i>Canis lupus</i>								x				x	x	x				x		x					x
Echidna	<i>Tachyglossus aculeatus</i>									x				x												
Raven	<i>Corvus coronoides</i>									x		x	x	x					x		x					
Goat	<i>Carpus hircus</i>									x																
Lozenge-marked Dragon	<i>Ctenophorus scutulatus</i>																		x							
Crested Bellbird	<i>Oreoica gutturalis</i>																		x		x	x				
Black-faced Woodswallow	<i>Artamus cinereus</i>													x												

M.2 CAMERA TRAP RESULTS FOR NOVEMBER 2019(B)

	Camera #	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	
Cow	<i>Bos taurus</i>			x	x				x			x	x	x	x				x	x							x
Cat	<i>Felis catus</i>						x						x			x	x		x				x		x		
Emu	<i>Domanius novaehollandiae</i>													x													
Red kangaroo	<i>Osphranter rufus</i>						x		x					x	x								x				
Euro	<i>Osphranter robustus</i>																	x									
Dog	<i>Canis lupus</i>			x	x								x		x	x				x	x			x			
Raven	<i>Corvus coronoides</i>											x													x		x
Goat	<i>Carpus hircus</i>																			x							
Magpie	<i>Gymnorhina tibicen</i>	x																									
Yellow-spotted Goanna	<i>Varanus panoptes</i>								x			x							x				x			x	
Red-capped Robin	<i>Petroica goodenovii</i>				x																						
Willie Wagtail	<i>Rhipidura leucophrys</i>							x																			
Rabbit	<i>Oryctolagus cuniculus</i>										x		x													x	
Unknown bird																											x
Grey bird																											
Unknown Thornbill																											
Hooded Robin	<i>Melanodryas cucullata</i>																										x

M.3 CAMERA TRAP RESULTS FOR MARCH 2020

	Camera #	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Cow	<i>Bos taurus</i>		x	x	x	x		x	x	x	x	x		x	x	x	x	x	x	x	x	x		x	x	x
Cat	<i>Felis catus</i>	x		x			x	x					x	x		x	x			x			x			
Emu	<i>Domanius novaehollandiae</i>													x												
Red kangaroo	<i>Osphranter rufus</i>		x		x	x		x			x	x	x	x			x	x					x	x		x
Euro	<i>Osphranter robustus</i>	x																								
Dog	<i>Canis lupus</i>	x					x								x			x								
Echidna	<i>Tachyglossus aculeatus</i>													x												
Raven	<i>Corvus coronoides</i>			x				x									x	x	x		x	x		x	x	
Panoptes	<i>Varanus panoptes</i>										x															
Rabbit	<i>Oryctolagus cuniculus</i>						x	x	x																	
Black-faced Woodswallow	<i>Artamus cinereus</i>														x											
Western Bowerbird	<i>Ptilonorhynchus guttatus</i>							x										x								
Brown Goshawk	<i>Accipiter fasciatus</i>																	x								

Appendix N.

Bat records

Level 2 Vertebrate Fauna Assessment
King of the Hills Project



N.1 BAT RECORDS – NOVEMBER 2019

	<i>C. gouldii</i>	<i>O. kitcheneri</i>	<i>O. petersi</i>	<i>Nyctophilus sp.</i>	<i>S. balstoni</i>	<i>V. baverstocki</i>	<i>V. finlaysoni</i>
SM2BAT 7544							
20/11/2019	P	—	—	NC	P	—	—
SM2BAT 7548							
20/11/2019	—	—	—	NC	—	P	—
SM2BAT 7586							
20/11/2019	—	—	NC	NC	—	—	—
SM2BAT 10883							
20/11/2019	P	P	—	NC	—	—	P
21/11/2019	P	P		NC	P	—	P
22/11/2019	P	—	—	NC	P	—	P
23/11/2019	P	P	—	NC	—	—	P
24/11/2019	—	—	—	NC	—	—	—

Definition of confidence level codes

— Not detected.

P Unambiguous identification of the species at the site based on measured call characteristics and comparison with available reference material. Greater confidence in this ID would come only after capture and supported by morphological measurements or a DNA sequence.

NC Needs Confirmation. Either call quality was poor, or the species cannot be distinguished reliably from another that makes similar calls. Alternative identifications are indicated in the Comments on identifications section of this report. If this is a species of conservation significance, further survey work might be required to confirm the record.

N.2 BAT RECORDS – MARCH 2020

	<i>C. gouldii</i>	<i>O. kitcheneri</i>	<i>O. petersi</i>	<i>Nyctophilus</i> <i>sp.</i>	<i>S. balstoni</i>	<i>V. baverstocki</i>	<i>V. finlaysoni</i>
SM2BAT 7544							
12/3/2020	P	P	—	NC	P	—	P
15/3/2020	—	P	—	NC	P	—	—
SM2BAT 7548							
12/3/2020	P	P	—	NC	—	—	—
13/3/2020	P	P	—	—	P	—	—
14/3/2020	P	—	—	NC	P	—	P
15/3/2020	—	—	—	—	P	—	P
SM2BAT 7586							
13/3/2020	P	P	—	—	P	—	—
15/3/2020	P	P	—	NC	—	—	—
SM2 10856							
16/3/2020	—	—	NC	NC	—	—	—
SM2BAT 10883							—
12/3/2020	P	P	—	—	P	—	—
13/3/2020	P	P	—	NC	P	—	—
14/3/2020	—	—	—	—	P	—	—

Definition of confidence level codes

— Not detected.

P Unambiguous identification of the species at the site based on measured call characteristics and comparison with available reference material. Greater confidence in this ID would come only after capture and supported by morphological measurements or a DNA sequence.

NC Needs Confirmation. Either call quality was poor, or the species cannot be distinguished reliably from another that makes similar calls. Alternative identifications are indicated in the Comments on identifications section of this report. If this is a species of conservation significance, further survey work might be required to confirm the record.

Appendix O.

Vertebrate fauna recorded in biological surveys in the region

Level 2 Vertebrate Fauna Assessment
King of the Hills Project



Family	Species	Survey Common Name	1																	2																		
			Site 1E	Site 1W	Site SS18	Site SS21	Site SS1	Site 1W08	Site LL4	Site LL5	Site SS19	Site SS20	Site LL3	Site LL6	Site SS22	Site LL1	Site LL2	Site SS23	Site 2	Site 3	Site 6	Site 7	Site 8	Site 1	Site 4	Site 5	Pundin	Wells	Site 2	Site 10	Site 21	Site 18	Site 21a	Site 9	Weebo	Site 17	Opportunistic	
	<i>Strophurus strophurus</i>	Western Spiny-tailed Gecko	1				1																															
	<i>Strophurus wellingtonae</i>	Shield Spiny-tailed Gecko	1	1	1	1	1																															
Elapidae	<i>Brachyuropsis semifasciata</i>	Half-girdlerd Snake																									1	1										
	<i>Furina ornata</i>	Orange-naped Snake	2																																			
	<i>Pseudechis australis</i>	Mulga Snake	1																																			
	<i>Pseudonaja mengdeni</i>	Gwardar		1																									1									
	<i>Pseudonaja modesta</i>	Ringed Brown Snake																												1								
	<i>Simoselaps bertholdi</i>	Jan's Banded Snake	1																																			
Gekkonidae	<i>Gehyra purpurascens</i>	Purplish Dtella	1						1																		10									3		
	<i>Gehyra variegata</i>	Tree Dtella	25	2		1	8		1		1		1													5	7	3		3	2	1	3		1			
	<i>Heteronotia binoei</i>	Bynoe's Prickly Gecko	5	2			2																				3	1			1							
	<i>Rhynchoedura ornata</i>	Western Beaked Gecko	2	1			4																				2	2	6	3						1		
Pygopodidae	<i>Delma butleri</i>	Unbanded Delma			1			1																							1	1						
	<i>Delma nasuta</i>	Sharp-snouted Delma						1			1	3	1		1																							
	<i>Lialis burtonis</i>	Burton's Snake-lizard	1																												1	2	1			1		
	<i>Pygopus nigriceps</i>	Western Hooded Scaly-foot																													1							
Scincidae	<i>Cryptoblepharus buchananii</i>	Buchanan's Snake-eyed Skink	3											1																								
	<i>Ctenotus ariadnae</i>	Ariadna's Ctenotus				4																																
	<i>Ctenotus atlas</i>	Southern Mallee Ctenotus																										1										
	<i>Ctenotus calurus</i>	Blue-tailed Finesnout Ctenotus				1																																
	<i>Ctenotus grandis</i>	Grand Ctenotus		1																											1					1		
	<i>Ctenotus greeri</i>	Spotted-necked Ctenotus						2																														
	<i>Ctenotus helenae</i>	Clay-soil Ctenotus	3	1		2		3																				6	4	1								

Family	Species	Survey Common Name	1																	2																
			Site 1E	Site 1W	Site SS18	Site SS21	Site SS1	Site 1W08	Site LL4	Site LL5	Site SS19	Site SS20	Site LL3	Site LL6	Site SS22	Site LL1	Site LL2	Site SS23	Site 2	Site 3	Site 6	Site 7	Site 8	Site 1	Site 4	Site 5	Pundin	Wells	Site 2	Site 10	Site 21	Site 18	Site 21a	Site 9	Weebo	Site 17
	<i>Ctenotus leonhardii</i>	Leonhardi's Ctenotus	2	5	1				2																	2		1	5	16	1	1	2			
	<i>Ctenotus pantherinus</i>	Leopard Skink					1	6			1					1																				
	<i>Ctenotus quattuordecimlineatus</i>	Fourteen-lined Ctenotus					2						1															1		5						
	<i>Ctenotus schevilli</i>	Scheville's Ctenotus					2					1																								
	<i>Ctenotus schomburgkii</i>	Schomburgk's Ctenotus					3																						3							
	<i>Egernia depressa</i>	Pygmy Spiny-tailed Skink	1	6	2		3		3	1																2										
	<i>Egernia formosa</i>	Goldfields Crevice-skink	2							1																							2			
	<i>Eremiascincus richardsonii</i>	Broad-banded Sand Swimmer					2																													
	<i>Lerista bipes</i>	North-western Sandslider					1																													
	<i>Lerista desertorum</i>	Central Desert Robust Slider	1					1		1	1		1													4	2				2			5		
	<i>Lerista sp.</i>		4						1	1			1	1											1	4	2					2		1		
	<i>Liopholis inornata</i>	Desert Skink																											1	1						
	<i>Liopholis striata</i>	Nocturnal Desert Skink																										1								
	<i>Menetia greyii</i>	Common Dwarf Skink	2								1		1																	1						
	<i>Morethia butleri</i>	Woodland Morethia Skink	2	3	1		3																											1		
	<i>Tiliqua multifasciata</i>	Centralian Blue-tongued Lizard		2																																
	<i>Tiliqua occipitalis</i>	Western Blue-tongued Lizard	2			1																														
Typhlopidae	<i>Anilius hamatus</i>	Pale-headed Blind Snake					1					1																1	1	1	1	2				
	<i>Anilius waitii</i>	Waite's Blind Snake																										2								
Varanidae	<i>Varanus breviceauda</i>	Short-tailed Pygmy Monitor						1								1																				
	<i>Varanus caudolineatus</i>	Stripe-tailed Monitor	1	2					1	3																			2		1					
	<i>Varanus eremius</i>	Pygmy Desert Monitor																												4						
	<i>Varanus giganteus</i>	Perentie																								1										

Family	Species	Survey Common Name	1																	2																			
			Site 1E	Site 1W	Site SS18	Site SS21	Site SS1	Site 1W08	Site LL4	Site LL5	Site SS19	Site SS20	Site LL3	Site LL6	Site SS22	Site LL1	Site LL2	Site SS23	Site 2	Site 3	Site 6	Site 7	Site 8	Site 1	Site 4	Site 5	Pundin	Wells	Site 2	Site 10	Site 21	Site 18	Site 21a	Site 9	Weebo	Site 17	Opportunistic		
	<i>Varanus gouldii</i>	Gould's Goanna	1																										1	1									
	<i>Varanus panoptes</i>	Yellow-spotted Monitor					1																				1												
	<i>Varanus tristis</i>	Black-headed Monitor																									1												
Cheluidae	<i>Chelodina steindachneri</i>	Steindachner's Turtle																									1												
Birds																																							
Casuariidae	<i>Dromaius novaehollandiae</i>	Emu			1						2			1																							1		
Anatidae	<i>Tadorna tadornoides</i>	Australian Shelduck	1	1																								1	1					7					
	<i>Chenonetta jubata</i>	Australian Wood Duck	1																									37											
	<i>Malacorhynchus membranaceus</i>	Pink-eared Duck	1																																				
	<i>Anas gracilis</i>	Grey Teal	1	1																								41											
	<i>Anas superciliosa</i>	Pacific Black Duck	1																																				
Podicipedidae	<i>Poliiocephalus poliocephalus</i>	Hoary-headed Grebe	1																									2											
Columbidae	<i>Phaps chalcoptera</i>	Common Bronzewing				3		4																														54	
	<i>Phaps histrionica</i>	Flock Bronzewing																										22	38	21					33	1			
	<i>Ocyphaps lophotes</i>	Crested Pigeon		11	5		17	5	4	2				2																									
	<i>Geopelia cuneata</i>	Diamond Dove						8																															
Podargidae	<i>Podargus strigoides</i>	Tawny Frogmouth	1																																				
Caprimulgidae	<i>Eurostopodus argus</i>	Spotted Nightjar																											1	2									
Aegothelidae	<i>Aegotheles cristatus</i>	Australian Owlet-nightjar	1							1																				7	2					1	1		
Otididae	<i>Ardeotis australis</i>	Australian Bustard	1																																				
Phalacrocoracidae	<i>Microcarbo melanoleucos</i>	Little Pied Cormorant	1																																				
Ardeidae	<i>Ardea pacifica</i>	White-necked Heron	1	1																																			1
	<i>Egretta novaehollandiae</i>	White-faced Heron	1																									1											1

Family	Species	Survey Common Name	1																	2																				
			Site 1E	Site 1W	Site SS18	Site SS21	Site SS1	Site 1W08	Site LL4	Site LL5	Site SS19	Site SS20	Site LL3	Site LL6	Site SS22	Site LL1	Site LL2	Site SS23	Site 2	Site 3	Site 6	Site 7	Site 8	Site 1	Site 4	Site 5	Pundin	Wells	Site 2	Site 10	Site 21	Site 18	Site 21a	Site 9	Weebo	Site 17	Opportunistic			
Accipitridae	<i>Haliastur sphenurus</i>	Whistling Kite																											6	1										
	<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk																											5											
	<i>Circus assimilis</i>	Spotted Harrier	1																																					
	<i>Aquila audax</i>	Wedge-tailed Eagle																											1					1						
	<i>Hieraaetus morphnoides</i>	Little Eagle	1																										3											
Falconidae	<i>Falco cenchroides</i>	Nankeen Kestrel				3	3			1	1	2			1	2													1							1				
	<i>Falco berigora</i>	Brown Falcon			4		2					3	1																								1			
	<i>Falco longipennis</i>	Australian Hobby	1																																					
	<i>Falco peregrinus</i>	Peregrine Falcon																											1											
Rallidae	<i>Tribonyx ventralis</i>	Black-tailed Native-hen	1																																					
	<i>Fulica atra</i>	Eurasian Coot	1																																					
Burhinidae	<i>Burhinus grallarius</i>	Bush Stone-curlew		1																																				
Recurvirostridae	<i>Himantopus himantopus</i>	Black-winged Stilt	1																																					
Charadriidae	<i>Charadrius ruficapillus</i>	Red-capped Plover	1																																					
	<i>Euseyonis melanops</i>	Black-fronted Dotterel	1																																					
	<i>Vanellus tricolor</i>	Banded Lapwing	1				2																						1											
Scolopacidae	<i>Actitis hypoleucos</i>	Common Sandpiper	1																																					
Turnicidae	<i>Turnix velox</i>	Little Button-quail																																						
Cacatuidae	<i>Eolophus roseicapillus</i>	Galah					124		26	4	19				10														1	1		9						1	1	
	<i>Nymphicus hollandicus</i>	Cockatiel					21	4	15	12					20														9	1	1	1	1		1				1	
Psittacidae	<i>Barnardius zonarius</i>	Australian Ringneck			2		5		3	4	2	2	3		2													115		7	13							1		
	<i>Psephotus varius</i>	Mulga Parrot				4				9																														
	<i>Melopsittacus undulatus</i>	Budgerigar			16	18	5		6	9	5	29	6		5	8													1	1	1	1	1	1	1	1		1	1	

Family	Species	Survey Common Name	1																					2																																														
			Site 1E	Site 1W	Site SS18	Site SS21	Site SS1	Site 1W08	Site LL4	Site LL5	Site SS19	Site SS20	Site LL3	Site LL6	Site SS22	Site LL1	Site LL2	Site SS23	Site 2	Site 3	Site 6	Site 7	Site 8	Site 1	Site 4	Site 5	Pundin	Wells	Site 2	Site 10	Site 21	Site 18	Site 21a	Site 9	Weebo	Site 17	Opportunistic																																	
	<i>Neopsephotus bourkii</i>	Bourke's Parrot			2		3			6																					9						1																																	
Cuculidae	<i>Chalcites basal</i>	Horsfield's Bronze-cuckoo			2	3	1			1																			1	5		1		5			1																																	
	<i>Heteroscenes pallidus</i>	Pallid Cuckoo	1				1					1																		1		3						2																																
Halcyonidae	<i>Todiramphus pyrrophygius</i>	Red-backed Kingfisher	1				1																															1																																
Climacteridae	<i>Climacteris affinis</i>	White-browed Treecreeper	1		9																											3	13					2																																
Ptilonorhynchidae	<i>Ptilonorhynchus maculatus</i>	Spotted Bowerbird							2																						4						4	1																																
Maluridae	<i>Malurus leucopterus</i>	White-winged Fairy-wren									2	69			57															143								142		1																														
	<i>Malurus lamberti</i>	Variagated Fairy-wren							2																																																													
Acanthizidae	<i>Smicrornis brevirostris</i>	Weebill																																							71																													
	<i>Gerygone fusca</i>	Western Gerygone																																							1																													
	<i>Acanthiza robustirostris</i>	Slaty-backed Thornbill																																																																				
	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill										11		1																												1																												
	<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill										1	40	22	19		3	20	8		3																					2	1																											
	<i>Acanthiza apicalis</i>	Inland Thornbill																																								2																												
	<i>Aphelocephala leucopsis</i>	Southern Whiteface																																																																				
Pardalotidae	<i>Pardalotus striatus</i>	Striated Pardalote																																									2	188		1					4																			
Meliphagidae	<i>Certhionyx variegatus</i>	Pied Honeyeater																																												23	7			20	1																			
	<i>Gavicalis virescens</i>	Singing Honeyeater																																														1	1				2			6	1													
	<i>Lichenostomus penicillatus</i>	White-plumed Honeyeater																																																																				
	<i>Purnella albifrons</i>	White-fronted Honeyeater																																																	2																			
	<i>Manorina flavigula</i>	Yellow-throated Miner																																																				216	9	17			32	1										
	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater																																																		1	24	8					23											
	<i>Epthianura tricolor</i>	Crimson Chat																																																																			1	1

Family	Species	Survey Common Name	1																	2																	
			Site 1E	Site 1W	Site SS18	Site SS21	Site SS1	Site 1W08	Site LL4	Site LL5	Site SS19	Site SS20	Site LL3	Site LL6	Site SS22	Site LL1	Site LL2	Site SS23	Site 2	Site 3	Site 6	Site 7	Site 8	Site 1	Site 4	Site 5	Pundin	Wells	Site 2	Site 10	Site 21	Site 18	Site 21a	Site 9	Weebo	Site 17	Opportunistic
Petroicidae	<i>Microeca fascinans</i>	Jacky Winter							3			1																									
	<i>Petroica goodenovii</i>	Red-capped Robin			18	8	11			33	2		12															4	4	22	7			1		4	
	<i>Melanodryas cucullata</i>	Hooded Robin			3	4	3			5	9	6	3																								4
Megaluridae	<i>Cincloramphus mathewsi</i>	Rufous Songlark	1									1																									
	<i>Cincloramphus cruralis</i>	Brown Songlark	1									1																	23					18		1	
Hirundinidae	<i>Cheramoeca leucosterna</i>	White-backed Swallow	1																																		
	<i>Petrochelidon nigricans</i>	Tree Martin	1																																	1	
Nectariniidae	<i>Dicaeum hirundinaceum</i>	Mistletoebird				3	1		4	7																		1		1	4					1	
Estrildidae	<i>Taeniopygia guttata</i>	Zebra Finch			12		99			22	2	4																27		16	8		8		6	1	
Motacillidae	<i>Anthus novaeseelandiae</i>	Australasian Pipit			1					2	1	7	5				4												9					43		1	
Mammals																																					
Bovidae	<i>Bos taurus</i>	Cow		4																																	
	<i>Capra hircus</i>	Goat																									1	1	1	1	1	1	1	1	1		
	<i>Ovis aries</i>	Sheep		10																								1	1	1	1	1	1	1	1	1	
Camelidae	<i>Camelus dromedarius</i>	Dromedary	1		1					1					1																						
Felidae	<i>Felis catus</i>	House Cat	2																																		
Molossidae	<i>Austronomus australis</i>	White-striped Free-tail Bat																1	1	1	1	1															
	<i>Ozimops planiceps</i>	Southern Free-tail Bat	2	3														1		1	1		1														
Pteropodidae	<i>Syconycteris australis</i>	Common Blossom-bat	2	9																																	
Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	5	14			1				1							1	1	1		1	1	1	1	1	2							1			
	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat	5	13					4									1	1	1		1	1				28		4								
	<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat	6	21			1											1	1	1		1	1	1	1												
	<i>Scotorepens greyii</i>	Little Broad-nosed Bat																									10										

Family	Species	Survey Common Name	1																	2																	
			Site 1E	Site 1W	Site SS18	Site SS21	Site SS1	Site 1W08	Site LL4	Site LL5	Site SS19	Site SS20	Site LL3	Site LL6	Site SS22	Site LL1	Site LL2	Site SS23	Site 2	Site 3	Site 6	Site 7	Site 8	Site 1	Site 4	Site 5	Pundin	Wells	Site 2	Site 10	Site 21	Site 18	Site 21a	Site 9	Weebo	Site 17	Opportunistic
	<i>Vespadelus finlaysoni</i>	Finlayson's Cave Bat	3			1													1	1				1													
	<i>Vespadelus regulus</i>	Southern Forest Bat																								2											
Dasyuridae	<i>Antechinomys laniger</i>	Kultarr	2	6	3				2	3																									1		
	<i>Ningauai ridei</i>	Wongai Ningauai	1	2	3	1	5		1	1		1	7															7	2	8	2	4					
	<i>Pseudantechinus woolleyae</i>	Woolley's False Antechinus				1																															
	<i>Sminthopsis crassicaudata</i>	Fat-tailed Dunnart									1		4	7														3									
	<i>Sminthopsis dolichura</i>	Little Long-tailed Dunnart																								1			1								
	<i>Sminthopsis hirtipes</i>	Hairy-footed Dunnart										2	8		1												1			1							
	<i>Sminthopsis macroura</i>	Stripe-faced Dunnart			10			3	7	10	2				1														2			1					
	<i>Sminthopsis ooldea</i>	Ooldea Dunnart				2	2	2		2		1		1													1	2									
Macropodidae	<i>Osphranter robustus</i>	Euro	3	12	1		7		1	1		1													1	1		1	1		1						
	<i>Osphranter rufus</i>	Red Kangaroo	38	24	4			1	1	1	2	1	4												1	1		1	1		1	1	1	1	1		
Leporidae	<i>Oryctolagus cuniculus</i>	European Rabbit	3										1													1											
Tachyglossidae	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna	1			1																															
Equidae	<i>Equus caballus</i>	Domestic Horse							1																												
Muridae	<i>Mus musculus</i>	House Mouse						2	3		1	3		3	8												2	3									
	<i>Notomys alexis</i>	Spinifex Hopping Mouse				1	1		3			1	9		2														1	1							
	<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse	1	1	5	6	2	8	1	14	9	6	1	2	1													7	3		3					7	

- (1) McKenzie, N. L., Rolfe, J. K. and Youngson, K. (1994) Vertebrate fauna In: The Biological Survey of the Eastern Goldfields of Western Australia Part 10, Sandstone-Sir Samuel and Laverton-Leonara Study Areas. Records of the Western Australian Museum Supplement No. 47:166.
- (2) How, R. A. and Dell, J. (1992) Vertebrate fauna. In: The Biological Survey of the Eastern Goldfields of Western Australia Part 7. Duketon - Sir Samuel Study Area. Records of the Western Australian Museum; Supplement 40, 90-109.

O.2 VERTEBRATE FAUNA RECORDED IN BIOLOGICAL SURVEYS IN THE REGION

Family	Species	Survey Common Name	1									2									3												
			MME1	MME2	MME3	MME4	MME5	MME6	MME7	MME8	MME9	Opportunistic	Site 11	Site 11a	Site 14	Site 14a	Site 14b	Site 17a	Site 19	Site 1a	Site 20a	Site 21	Site 21a	Site 5a	Site 8	Site 9	Site 9a	CM001	CM002	CM003	CM004	CM005	Opportunistic
Frogs																																	
Hylidae	<i>Cyclorana maini</i>	Sheep Frog								1																							
Limnodynastidae	<i>Neobatrachus sutor</i>	Shoemaker Frog	1	1																						5	10						
	<i>Neobatrachus wilmorei</i>	Goldfields Bullfrog																		2					11					3			
	<i>Platyplectrum spenceri</i>	Spencer's Burrowing Frog											8																				
Myobatrachidae	<i>Pseudophryne occidentalis</i>	Orange-crowned Toadlet																					2										
Reptiles																																	
Agamidae	<i>Ctenophorus caudicinctus</i>	Ring-tailed Dragon																			12												
	<i>Ctenophorus fordi</i>	Mallee Dragon																						2									
	<i>Ctenophorus inermis</i>	Military Dragon														1																	
	<i>Ctenophorus isolepis</i>	Crested Dragon	1																														
	<i>Ctenophorus reticulatus</i>	Western Netted Dragon		1	1		1		3	1	1			2	1	2				4			4	13		2	1						
	<i>Ctenophorus salinarum</i>	Saltpan Dragon										5	1											1	2								
	<i>Ctenophorus vadnappa</i>	Red-barred Dragon																				1	7	2			2	1					
	<i>Moloch horridus</i>	Thorny Devil																						1				1					
	<i>Pogona minor</i>	Dwarf Bearded Dragon								1		2	1	1				2					2	1		2	2						
	<i>Tympanocryptis cephalus</i>	Pebble Dragon											1																			1	
	Carphodactylidae	<i>Nephurus vertebralis</i>	Midline Knob-tail									1													2							2	
		<i>Underwoodisaurus milii</i>	Barking Gecko						2								9							2									
Diplodactylidae	<i>Diplodactylus granariensis</i>	Wheat-belt Stone Gecko																				2	1						7				
	<i>Diplodactylus pulcher</i>	Fine-faced Gecko							1					4	3	1							3						2	1		1	

Family	Species	Survey Common Name	1									2									3																
			MME1	MME2	MME3	MME4	MME5	MME6	MME7	MME8	MME9	Opportunistic	Site 11	Site 11a	Site 14	Site 14a	Site 14b	Site 17a	Site 19	Site 1a	Site 20a	Site 21	Site 21a	Site 5a	Site 8	Site 9	Site 9a	CM001	CM002	CM003	CM004	CM005	Opportunistic				
	<i>Lucasium maini</i>	Main's Ground Gecko																			1																
	<i>Lucasium squarrosom</i>	Mottled Ground Gecko										1	3		1		3												6	3			2				
	<i>Strophurus assimilis</i>	Goldfields Spiny-tailed Gecko																										1						1			
	<i>Strophurus ciliaris</i>	Spiny-tailed Gecko													2		1						2														
	<i>Strophurus strophurus</i>	Western Spiny-tailed Gecko																							7									4			
	<i>Strophurus wellingtonae</i>	Western Shield Spiny-tailed Gecko										1																						1			
Elapidae	<i>Brachyuropis fasciolata</i>	Narrow-banded Burrowing Snake																				1															
	<i>Parasuta monachus</i>	Monk Snake										1			1		3											1						1			
	<i>Pseudechis butleri</i>	Spotted Mulga Snake										1																									
	<i>Simoselaps bertholdi</i>	Jan's Banded Snake																																			
	<i>Suta fasciata</i>	Rosen's Snake																																			
Gekkonidae	<i>Gehyra variegata</i>	Tree Dtella	3	9	3	16	3	9	2		3	1							15	1	1	1		2	15	1			1		5	2					
	<i>Heteronotia binoei</i>	Bynoe's Prickly Gecko		3		1						1					34							2	7									1	1		
	<i>Rhynchoedura ornata</i>	Western Beaked Gecko																					1				2		1						1		
Pygopodidae	<i>Pygopus nigriceps</i>	Western Hooded Scaly-foot																1					1	1													
Scincidae	<i>Cryptoblepharus buchananii</i>	Buchanan's Snake-eyed Skink		2								1			1									1	1												
	<i>Ctenotus calurus</i>	Blue-tailed Finesnout Ctenotus																																			
	<i>Ctenotus greeri</i>	Spotted-necked Ctenotus																																			
	<i>Ctenotus helenae</i>	Clay-soil Ctenotus																																			
	<i>Ctenotus leonhardii</i>	Leonhardi's Ctenotus				1						5	4															2		5	9						
	<i>Ctenotus pantherinus</i>	Leopard Skink																																			
	<i>Ctenotus quattuordecimlineatus</i>	Fourteen-lined Ctenotus																																			

Family	Species	Survey Common Name	1									2									3												
			MME1	MME2	MME3	MME4	MME5	MME6	MME7	MME8	MME9	Opportunistic	Site 11	Site 11a	Site 14	Site 14a	Site 14b	Site 17a	Site 19	Site 1a	Site 20a	Site 21	Site 21a	Site 5a	Site 8	Site 9	Site 9a	CM001	CM002	CM003	CM004	CM005	Opportunistic
	<i>Ctenotus schomburgkii</i>	Schomburgk's Ctenotus	1							2	1	3					11		2	3			15	1									
	<i>Ctenotus severus</i>	Stern Ctenotus													6		1																
	<i>Ctenotus uber</i>	Spotted Ctenotus											3	2					6	1	1												
	<i>Egernia depressa</i>	Pygmy Spiny-tailed Skink					1												4	2													
	<i>Egernia formosa</i>	Goldfields Crevice-skink																				3											
	<i>Eremiascincus richardsonii</i>	Broad-banded Sand Swimmer											1	1															1	1			
	<i>Lerista desertorum</i>	Central Desert Robust Slider					1			1	1				6	6		2												5			
	<i>Lerista macropisthopus</i>	Unpatterned Robust Slider																			2												
	<i>Lerista muelleri</i>	Wood Mulch-slider																									1		2				
	<i>Lerista picturata</i>	Southern Robust Slider																				2											
	<i>Lerista sp.</i>						2			1	1					9	1			1		5											
	<i>Liopholis inornata</i>	Desert Skink																			1	1											
	<i>Liopholis striata</i>	Nocturnal Desert Skink																			2												
	<i>Menetia greyii</i>	Common Dwarf Skink	4							1	1										1	4		1						2			
	<i>Morethia butleri</i>	Woodland Morethia Skink		2		4	2	3	1	1	1	1		2		6						2	4										
Typhlopidae	<i>Anilius hamatus</i>	Pale-headed Blind Snake											1										1										
	<i>Anilius margaretae</i>	Buff-snouted Blind Snake																															
	<i>Anilius waitii</i>	Waite's Blind Snake											2										1										
Varanidae	<i>Varanus caudolineatus</i>	Stripe-tailed Monitor	1				1						1						6		2		1	1		1							
	<i>Varanus giganteus</i>	Perentie																				1											
	<i>Varanus gouldii</i>	Gould's Goanna													1						2	2	1		1	1							
	<i>Varanus panoptes</i>	Yellow-spotted Monitor					1			1	1	1		2														1	4	2			
Birds																																	

Family	Species	Survey Common Name	1									2										3												
			MME1	MME2	MME3	MME4	MME5	MME6	MME7	MME8	MME9	Opportunistic	Site 11	Site 11a	Site 14	Site 14a	Site 14b	Site 17a	Site 19	Site 1a	Site 20a	Site 21	Site 21a	Site 5a	Site 8	Site 9	Site 9a	CM001	CM002	CM003	CM004	CM005	Opportunistic	
Casuariidae	<i>Dromaius novaehollandiae</i>	Emu	1	1				1	1	1	1	2		1	5	2					1	2			1				1					
Megapodiidae	<i>Leipoa ocellata</i>	Malleefowl									1																							
Phasianidae	<i>Coturnix pectoralis</i>	Stubble Quail													1																			
Anatidae	<i>Cygnus atratus</i>	Black Swan									1																							
	<i>Tadorna tadornoides</i>	Australian Shelduck									1																							
	<i>Malacorhynchus membranaceus</i>	Pink-eared Duck									1																							
	<i>Anas gracilis</i>	Grey Teal									1																							
	<i>Anas superciliosa</i>	Pacific Black Duck									1																							
Columbidae	<i>Phaps chalcoptera</i>	Common Bronzewing									1										1			1										
	<i>Ocyphaps lophotes</i>	Crested Pigeon	2					2		3	1		1	5	2	11		7			6	9		6				2		1				
Podargidae	<i>Podargus strigoides</i>	Tawny Frogmouth								2								1																
Caprimulgidae	<i>Eurostopodus argus</i>	Spotted Nightjar																2			2													
Aegothelidae	<i>Aegotheles cristatus</i>	Australian Owlet-nightjar											3	3	2								1											
Otididae	<i>Ardeotis australis</i>	Australian Bustard										1		4																				
Ardeidae	<i>Ardea pacifica</i>	White-necked Heron									1																							
	<i>Egretta novaehollandiae</i>	White-faced Heron									1																							
Accipitridae	<i>Haliaeetus albicilla</i>	White-bellied Sea-eagle	1		2	1	1	1		1																								
	<i>Accipiter fasciatus</i>	Brown Goshawk																3																
	<i>Circus assimilis</i>	Spotted Harrier													1						1													
	<i>Aquila audax</i>	Wedge-tailed Eagle											6	2		2							3					2						
	<i>Hieraetus morphnoides</i>	Little Eagle		1														3		1														
Falconidae	<i>Falco cenchroides</i>	Nankeen Kestrel								1			5	2	3						4	2							1					
	<i>Falco berigora</i>	Brown Falcon								1			3	1	2	5		3				3							2					
	<i>Falco longipennis</i>	Australian Hobby			1					1												1												

Family	Species	Survey Common Name	1									2									3																
			MME1	MME2	MME3	MME4	MME5	MME6	MME7	MME8	MME9	Opportunistic	Site 11	Site 11a	Site 14	Site 14a	Site 14b	Site 17a	Site 19	Site 1a	Site 20a	Site 21	Site 21a	Site 5a	Site 8	Site 9	Site 9a	CM001	CM002	CM003	CM004	CM005	Opportunistic				
	<i>Falco peregrinus</i>	Peregrine Falcon	1																																		
Rallidae	<i>Tribonyx ventralis</i>	Black-tailed Native-hen								1																											
Recurvirostridae	<i>Himantopus himantopus</i>	Black-winged Stilt								1																											
	<i>Recurvirostra novaehollandiae</i>	Red-necked Avocet								1																											
Charadriidae	<i>Charadrius ruficapillus</i>	Red-capped Plover								1																											
	<i>Elsyornis melanops</i>	Black-fronted Dotterel								1																											
	<i>Vanellus tricolor</i>	Banded Lapwing								9				4	4							1															
Turnicidae	<i>Turnix velox</i>	Little Button-quail												5						2																	
Cacatuidae	<i>Eolophus roseicapillus</i>	Galah				15				1	1	44	908	8	2	5		7	62	7	4								3								
	<i>Nymphicus hollandicus</i>	Cockatiel									6		2	4	3			4	35													10					
Psittacidae	<i>Barnardius zonarius</i>	Australian Ringneck	1		4	3	2	2	1			25	31	36	16		3	3	1	9	10																
	<i>Psephotus varius</i>	Mulga Parrot		1		5	5		1					11	2	14	2				3																
	<i>Melopsittacus undulatus</i>	Budgerigar									20	11	9	15	2	29	17	38		170												6					
	<i>Neopsephotus bourkii</i>	Bourke's Parrot							1								4																				
Cuculidae	<i>Chalcites basalis</i>	Horsfield's Bronze-cuckoo									3				3			2		1	1																
	<i>Chalcites osculans</i>	Black-eared Cuckoo													1	2																					
	<i>Heteroscenes pallidus</i>	Pallid Cuckoo							1		2				1	1	4		1										1								
Halcyonidae	<i>Todiramphus pyrrhopygius</i>	Red-backed Kingfisher												1	6			1																			
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater													3	3																					
Climacteridae	<i>Climacteris affinis</i>	White-browed Treecreeper					2		1									4	1	1																	
Maluridae	<i>Malurus splendens</i>	Splendid Fairy-wren					9		1																												
	<i>Malurus leucopterus</i>	White-winged Fairy-wren	3						8	3	76		1	2								40	17														
Acanthizidae	<i>Pyrrholaemus brunneus</i>	Redthroat			1				1					2				2	1	2																	
	<i>Smicronis brevirostris</i>	Weebill				10			1						98	7	2	2																			

Family	Species	Survey Common Name	1									2									3												
			MME1	MME2	MME3	MME4	MME5	MME6	MME7	MME8	MME9	Opportunistic	Site 11	Site 11a	Site 14	Site 14a	Site 14b	Site 17a	Site 19	Site 1a	Site 20a	Site 21	Site 21a	Site 5a	Site 8	Site 9	Site 9a	CM001	CM002	CM003	CM004	CM005	Opportunistic
	<i>Acanthiza robustirostris</i>	Slaty-backed Thornbill							2		1								3	6													
	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill	5	6		6	17	2	4		1							4	8				9	4									
	<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill	8	30	2	10	14	15	50		1			3	5	88	126		10	3	53	27											
	<i>Acanthiza apicalis</i>	Inland Thornbill	2					2	6		1					3	2	1	2														
	<i>Aphelocephala leucopsis</i>	Southern Whiteface				4		6	20		1				8	5	52	12		4													
Pardalotidae	<i>Pardalotus striatus</i>	Striated Pardalote					3				1				1	2																	
Meliphagidae	<i>Certhionyx variegatus</i>	Pied Honeyeater										2	2																				
	<i>Gavicalis virescens</i>	Singing Honeyeater		4	2		1	1	1	1	1	1	3	11		3	2	2	3		1	8	4				7	6	2				
	<i>Lichenostomus plumulus</i>	Grey-fronted Honeyeater					7						56			3	2																
	<i>Purnella albifrons</i>	White-fronted Honeyeater	80	100	12	40	8	1	10	6	6	1	1	3		1	4		7	6		2	16										
	<i>Manorina flavigula</i>	Yellow-throated Miner	10	5	7		2	10		2	2	1		10	15	98	1	13	41	3		21	109					1	12		6		
	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater	25	20		1	6	2	1	1	2	1		11	2	2	5	8	10	6	4	2	9	7				1	2				
	<i>Anthochaera carunculata</i>	Red Wattlebird									3							2	3					1									
	<i>Conopophila whitei</i>	Grey Honeyeater													18						17		1										
	<i>Epthianura tricolor</i>	Crimson Chat											18	154	24		6		29				75										
	<i>Epthianura aurifrons</i>	Orange Chat										5																					
Pomatostomidae	<i>Pomatostomus temporalis</i>	Grey-crowned Babbler																													12		
	<i>Pomatostomus superciliosus</i>	White-browed Babbler									1					3				3	2												
Psophodidae	<i>Cinlosoma castaneothorax</i>	Chestnut-breasted Quail-thrush											2						3												1		
Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella													2	6																	
Campephagidae	<i>Coracina maxima</i>	Ground Cuckoo-shrike											4		31	2	3																
	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike		2		1					1		4	5	6	1	9	10				7	3				1						
	<i>Lalage tricolor</i>	White-winged Triller													3	9			34	6	39	2											

Family	Species	Survey Common Name	1									2									3														
			MME1	MME2	MME3	MME4	MME5	MME6	MME7	MME8	MME9	Opportunistic	Site 11	Site 11a	Site 14	Site 14a	Site 14b	Site 17a	Site 19	Site 1a	Site 20a	Site 21	Site 21a	Site 5a	Site 8	Site 9	Site 9a	CM001	CM002	CM003	CM004	CM005	Opportunistic		
Pachycephalidae	<i>Pachycephala rufiventris</i>	Rufous Whistler				1	1	1	1	1								8			1														
	<i>Colluricincla harmonica</i>	Grey Shrike-thrush					1	2		1							5			1															
	<i>Oreoica gutturalis</i>	Crested Bellbird	1	3	1	2	1	1	2		1	3	14	5	1	15	2	10	2	6	2							4							
Artamidae	<i>Artamus personatus</i>	Masked Woodswallow									2	2		31	2	72																			
	<i>Artamus superciliosus</i>	White-browed Woodswallow			4		1	1			1						3																		
	<i>Artamus cinereus</i>	Black-faced Woodswallow									7	55	25	6	11		1	1	12								9	2				6			
	<i>Cracticus torquatus</i>	Grey Butcherbird	1	1	1		2	1	1	2	1		2	4	7	8	8			4	1						1	1	3						
	<i>Cracticus nigrogularis</i>	Pied Butcherbird	2	1	1					1	1		6	23	1	4	1		2	4	13	14						2	2						
	<i>Gymnorhina tibicen</i>	Australian Magpie	3							3	1			3	9		1								5			1	5		2				
	<i>Strepera versicolor</i>	Grey Currawong			1									2	3	2			1			4													
Rhipiduridae	<i>Rhipidura albiscapa</i>	Grey Fantail						1																											
	<i>Rhipidura leucophrys</i>	Willie Wagtail	1							1				2	2	1						12	1				1							1	
Corvidae	<i>Corvus bennetti</i>	Little Crow		2			6	1		1	11	29	50	21	12	24	6		7	36	149							7	4						
	<i>Corvus orru</i>	Torresian Crow		1	2		1	1	2	1	2			2															2						
Monarchidae	<i>Gallina cyanoleuca</i>	Magpie-lark		1	2			2		2	1			12	7	2					3														
Petroicidae	<i>Microeca fascinans</i>	Jacky Winter												1		22	1																		
	<i>Petroica goodenovii</i>	Red-capped Robin	1	2		1	2	6		1		1	5	3	1	29	3	47	4	3	3	4											1		
	<i>Melanodryas cucullata</i>	Hooded Robin			3					1	1	2	1				1	1	2								2								
Megaluridae	<i>Cincloramphus mathewsi</i>	Rufous Songlark													3							2													
	<i>Cincloramphus cruralis</i>	Brown Songlark									7	7	3	7	8		1																		
Hirundinidae	<i>Cheramoeca leucosterna</i>	White-backed Swallow			2					1					2																				
	<i>Hirundo rustica</i>	Barn Swallow						5																											
	<i>Petrochelidon ariel</i>	Fairy Martin																										6							
Nectariniidae	<i>Dicaeum hirundinaceum</i>	Mistletoebird												4					1		5	4													

Family	Species	Survey Common Name	1									2									3														
			MME1	MME2	MME3	MME4	MME5	MME6	MME7	MME8	MME9	Opportunistic	Site 11	Site 11a	Site 14	Site 14a	Site 14b	Site 17a	Site 19	Site 1a	Site 20a	Site 21	Site 21a	Site 5a	Site 8	Site 9	Site 9a	CM001	CM002	CM003	CM004	CM005	Opportunistic		
Estrildidae	<i>Taeniopygia guttata</i>	Zebra Finch								1		9	12			4	5								36				6						
Motacillidae	<i>Anthus novaeseelandiae</i>	Australasian Pipit			4					1	7	18		16	1	36									2			4	1						
Mammals																																			
Bovidae	<i>Capra hircus</i>	Goat								1			1				1								1										
	<i>Ovis aries</i>	Sheep												1			1			1	1						1	1							
Camelidae	<i>Camelus dromedarius</i>	Dromedary									1																								
Canidae	<i>Canis familiaris</i>	Dog									1																								
	<i>Canis lupus</i>	Dingo								1																									
	<i>Vulpes vulpes</i>	Red Fox								1											1			1	1										
Felidae	<i>Felis catus</i>	House Cat									1																								
Molossidae	<i>Austronomus australis</i>	White-striped Free-tail Bat																							1										
	<i>Ozimops planiceps</i>	Southern Free-tail Bat																							1										
Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat												1											3										
	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat												4		9									3										
	<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat												6											1										
Dasyuridae	<i>Ningai ridei</i>	Wongai Ningai																			5														
	<i>Sminthopsis crassicaudata</i>	Fat-tailed Dunnart			1		1					5												7	1		1								
	<i>Sminthopsis fuliginosus</i>	Grey-bellied Dunnart																																	
	<i>Sminthopsis dolichura</i>	Little Long-tailed Dunnart										1		2			1			1	1	1	1	1	2										
	<i>Sminthopsis macroura</i>	Stripe-faced Dunnart																										2		2					
Macropodidae	<i>Macropus fuliginosus</i>	Western Grey Kangaroo									1																								
	<i>Osphranter robustus</i>	Euro				1					1										1	1		1	1					1	1				
Leporidae	<i>Oryctolagus cuniculus</i>	European Rabbit				1					1	1									1										2	1			1

Family	Species	Survey Common Name	1									2									3															
			MME1	MME2	MME3	MME4	MME5	MME6	MME7	MME8	MME9	Opportunistic	Site 11	Site 11a	Site 14	Site 14a	Site 14b	Site 17a	Site 19	Site 1a	Site 20a	Site 21	Site 21a	Site 5a	Site 8	Site 9	Site 9a	CM001	CM002	CM003	CM004	CM005	Opportunistic			
Tachyglossidae	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna		1								1																						1	3	1
Equidae	<i>Equus asinus</i>	Donkey										1																								
Muridae	<i>Mus musculus</i>	House Mouse	1	2	2	1	2	2				2				1	3						2													
	<i>Notomys alexis</i>	Spinifex Hopping Mouse	7						2													2		1												
	<i>Notomys mitchellii</i>	Mitchell's Hopping Mouse																				1														
	<i>Pseudomys bolami</i>	Bolam's Mouse																																		
	<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse						1		4	1		1		1		7	2					1													

- (3) Ninox Wildlife Consulting (1998) A Vertebrate Fauna Survey of the Murrin Murrin Expansion Project. Unpublished report for Anaconda Nickel Ltd, Perth.
- (4) Dell, J. and How, R. A. (1988) Vertebrate fauna. In: The biological survey of the Eastern Goldfields of Western Australia, Part 5, Edjudina - Menzies Study Area. Records of the Western Australian Museum, Supplement No 31, 38-77.
- (5) Biota Environmental Sciences (2004b) Cosmos Nickel Mine Extension Fauna Survey. Unpublished report for Sir Samuel Mines NL and URS, Perth.

O.3 VERTEBRATE FAUNA RECORDED IN BIOLOGICAL SURVEYS IN THE REGION

Family	Species	Survey Common Name	1													2	3																							
			Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Opportunistic	Granny Deeps	Agnew Gold	BKBO1	BKBO4	BKBO5	BKBO7	BKBO9	BKBS04	BKBO2	BKBO3	BKBO12	BKBO8	BKBO6	BKBO10	BKBO11	BKBS01	BKBHarp01	BKBS03						
Frogs																																								
Hylidae	<i>Cyclorana maini</i>	Sheep Frog	1							11	5	1																												
	<i>Cyclorana platycephala</i>	Water-holding Frog	1	1						5	2		1	1																										
	<i>Litoria rubella</i>	Desert Tree Frog																																						
Limnodynastidae	<i>Neobatrachus kunapalari</i>	Kunapalari Frog							1																															
	<i>Neobatrachus sudelli</i>	Sudell's Frog																																						
	<i>Neobatrachus sutor</i>	Shoemaker Frog	8	2	5	3	1		1	13	2		1																											
Reptiles																																								
Agamidae	<i>Ctenophorus caudicinctus</i>	Ring-tailed Dragon																																						
	<i>Ctenophorus isolepis</i>	Crested Dragon																																						
	<i>Ctenophorus reticulatus</i>	Western Netted Dragon																																						
	<i>Ctenophorus scutulatus</i>	Lozenge-marked Dragon																																						
	<i>Diporiphora amphiboluroides</i>	Mulga Dragon				2	1	1																																
	<i>Pogona minor</i>	Dwarf Bearded Dragon																																						
	<i>Tympanocryptis cephalus</i>	Pebble Dragon				2	3	1		1																														
Carphodactylidae	<i>Nephrurus vertebralis</i>	Midline Knob-tail																																						
Diplodactylidae	<i>Diplodactylus granariensis</i>	Wheat-belt Stone Gecko								1																														
	<i>Diplodactylus pulcher</i>	Fine-faced Gecko	2			1	4	3	1		2	1		1																										
	<i>Strophurus assimilis</i>	Goldfields Spiny-tailed Gecko																																						
	<i>Strophurus strophurus</i>	Western Spiny-tailed Gecko																																						
	<i>Strophurus wellingtonae</i>	Shield Spiny-tailed Gecko	4	2										1																										

Family	Species	Survey Common Name	1													2	3																			
			Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Opportunistic	Granny Deeps	Agnew Gold	BKBO1	BKBO4	BKBO5	BKBO7	BKBO9	BKBS04	BKBO2	BKBO3	BKBO12	BKBO8	BKBO6	BKBO10	BKBO11	BKBS01	BKBHarp01	BKBS03		
Elapidae	<i>Parasuta monachus</i>	Monk Snake					1	1																												
	<i>Suta fasciata</i>	Rosen's Snake																																		
Gekkonidae	<i>Gehyra variegata</i>	Tree Dtella	3	2	4		1	3		2	1	2				1																				
	<i>Heteronotia binoei</i>	Bynoe's Prickly Gecko	2				1			1	2	1	5			1																				
	<i>Rhynchoedura ornata</i>	Western Beaked Gecko	3					2		1							11	5			5	3					6	9	3	1						
Pygopodidae	<i>Pygopus nigriceps</i>	Western Hooded Scaly-foot																			1															
Scincidae	<i>Ctenotus leonhardii</i>	Leonhardi's Ctenotus	2	2				1	5	9	7	16	27				2	3				1			4	4										
	<i>Ctenotus schomburgkii</i>	Schomburgk's Ctenotus																				2		1	2	4	2									
	<i>Ctenotus severus</i>	Stern Ctenotus																																		
	<i>Ctenotus uber</i>	Spotted Ctenotus																				2														
	<i>Egernia depressa</i>	Pygmy Spiny-tailed Skink	1	1	2	2	3	9	6		1																									
	<i>Eremiascincus richardsonii</i>	Broad-banded Sand Swimmer				2									1																					
	<i>Lerista bipes</i>	North-western Sandslider																																		
	<i>Lerista desertorum</i>	Central Desert Robust Slider													2																		1		1	
	<i>Lerista distinguenda</i>	Orange-tailed Slider													1																					
	<i>Lerista sp.</i>																								2	1	1	1								
	<i>Menetia greyii</i>	Common Dwarf Skink										1											1													
	<i>Morethia butleri</i>	Woodland Morethia Skink	1		1		2			6	1		3																							
	<i>Tiliqua multifasciata</i>	Centralian Blue-tongued Lizard	1																																	
Typhlopidae	<i>Anilius australis</i>	Austral Blind Snake							1	1																										
	<i>Anilius bicolor</i>	Dark-spined Blind Snake			1																															
	<i>Anilius waitii</i>	Waite's Blind Snake																															1			
Varanidae	<i>Varanus caudolineatus</i>	Stripe-tailed Monitor	2		1	3	1	1			1	2									1	3	1		1						1	3				

Family	Species	Survey Common Name	1													2	3																		
			Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Opportunistic	Granny Deeps	Agnew Gold	BKBO1	BKBO4	BKBO5	BKBO7	BKBO9	BKBS04	BKBO2	BKBO3	BKBO12	BKBO8	BKBO6	BKBO10	BKBO11	BKBS01	BKSHarp01	BKBS03	
	<i>Varanus gouldii</i>	Gould's Goanna															1																		
	<i>Varanus panoptes</i>	Yellow-spotted Monitor	4		7																		2						2						1
Birds																																			
Casuariidae	<i>Dromaius novaehollandiae</i>	Emu																1				1													
Anatidae	<i>Biziura lobata</i>	Musk Duck																																	
	<i>Tadorna tadornoides</i>	Australian Shelduck																1																	
	<i>Chenonetta jubata</i>	Australian Wood Duck																1																	
	<i>Malacorhynchus membranaceus</i>	Pink-eared Duck																																	
	<i>Anas gracilis</i>	Grey Teal																																	
	<i>Anas superciliosa</i>	Pacific Black Duck																																	
	<i>Aythya australis</i>	Hardhead																																	
Podicipedidae	<i>Tachybaptus novaehollandiae</i>	Australasian Grebe																1																	
	<i>Poliiocephalus poliocephalus</i>	Hoary-headed Grebe																																	
Columbidae	<i>Phaps chalcoptera</i>	Common Bronzewing																1																	
Columbidae	<i>Ocyphaps lophotes</i>	Crested Pigeon																1	6			2							9						
Caprimulgidae	<i>Eurostopodus argus</i>	Spotted Nightjar																1																	
Ardeidae	<i>Egretta novaehollandiae</i>	White-faced Heron																																	
Accipitridae	<i>Elanus axillaris</i>	Black-shouldered Kite																1																	
	<i>Haliastur sphenurus</i>	Whistling Kite																									1								
	<i>Accipiter fasciatus</i>	Brown Goshawk																1																	
	<i>Aquila audax</i>	Wedge-tailed Eagle																1					3												
Falconidae	<i>Falco cenchroides</i>	Nankeen Kestrel																1					1						1						
	<i>Falco berigora</i>	Brown Falcon																1																	

Family	Species	Survey Common Name	1													2	3																			
			Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Opportunistic	Granny Deeps	Agnew Gold	BKBO1	BKBO4	BKBO5	BKBO7	BKBO9	BKBS04	BKBO2	BKBO3	BKBO12	BKBO8	BKBO6	BKBO10	BKBO11	BKBS01	BKBHarp01	BKBS03		
Rallidae	<i>Fulica atra</i>	Eurasian Coot														21																				
Recurvirostridae	<i>Himantopus himantopus</i>	Black-winged Stilt														5																				
	<i>Cladorhynchus leucocephalus</i>	Banded Stilt														14																				
Charadriidae	<i>Elseyornis melanops</i>	Black-fronted Dotterel														1	1																			
Cacatuidae	<i>Eolophus roseicapillus</i>	Galah																															8			
Psittacidae	<i>Barnardius zonarius</i>	Australian Ringneck															1	1	2				1													
	<i>Psephotus varius</i>	Mulga Parrot															8			2		2														
	<i>Melopsittacus undulatus</i>	Budgerigar																1																		
Cuculidae	<i>Chalcites basalis</i>	Horsfield's Bronze-cuckoo																		1							1		1							
	<i>Heteroscenes pallidus</i>	Pallid Cuckoo															2																			
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater																1																		
Ptilonorhynchidae	<i>Ptilonorhynchus guttatus</i>	Western Bowerbird															2	5	1																	
Maluridae	<i>Malurus splendens</i>	Splendid Fairy-wren															12						8													
	<i>Malurus leucopterus</i>	White-winged Fairy-wren															1	3																		
Maluridae	<i>Malurus lamberti</i>	Variegated Fairy-wren																1																		
Acanthizidae	<i>Gerygone fusca</i>	Western Gerygone																					2						1							
	<i>Acanthiza robustirostris</i>	Slaty-backed Thornbill																																		
	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill															1				2	3	2													
	<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill																	16	7	4	23	11	33		2	11		3	9						
	<i>Acanthiza apicalis</i>	Inland Thornbill															12	1	4			5	11			3			2							
	<i>Aphelocephala leucopsis</i>	Southern Whiteface															13	1	1		1	5	4													
Pardalotidae	<i>Pardalotus striatus</i>	Striated Pardalote															1																			
Meliphagidae	<i>Certhionyx variegatus</i>	Pied Honeyeater															2				4															

Family	Species	Survey Common Name	1													2	3																	
			Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Opportunistic	Granny Deeps	Agnew Gold	BKBO1	BKBO4	BKBO5	BKBO7	BKBO9	BKBS04	BKBO2	BKBO3	BKBO12	BKBO8	BKBO6	BKBO10	BKBO11	BKBS01	BKBHarp01	BKBS03
	<i>Gavicalis virescens</i>	Singing Honeyeater														68	1	8	9	7	2	1					2	4	3	1				
	<i>Lichenostomus flavicollis</i>	Yellow-throated Honeyeater																3	4	3	15	4		4		5	9		3	4				
	<i>Manorina flavigula</i>	Yellow-throated Miner													3	38	1																	
	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater														44	1		2	4			2											
	<i>Epthianura tricolor</i>	Crimson Chat														4			9	1								1						
	<i>Epthianura albifrons</i>	White-fronted Chat															1																	
Pomatostomidae	<i>Pomatostomus superciliosus</i>	White-browed Babbler														14	1				4													
Psophodidae	<i>Cinlosoma castanotum</i>	Chestnut Quail-thrush																3																
	<i>Cinlosoma castaneothorax</i>	Chestnut-breasted Quail-thrush																	2															
Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella																	2															
Campephagidae	<i>Coracina maxima</i>	Ground Cuckoo-shrike														2	5												2					
	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike															7			1							2		1					
	<i>Lalage tricolor</i>	White-winged Triller														4		1																
Pachycephalidae	<i>Pachycephala rufiventris</i>	Rufous Whistler														22	1		1	3		6		1				2						
	<i>Colluricincla harmonica</i>	Grey Shrike-thrush														3	1					1												
	<i>Oreica gutturalis</i>	Crested Bellbird														1	45	1	6	1	4	2	2	6		1	5	1	4	1				
Artamidae	<i>Artamus personatus</i>	Masked Woodswallow														4	23	1																
	<i>Artamus cinereus</i>	Black-faced Woodswallow														6	1	5		9	2	2		1		7	7							
	<i>Artamus minor</i>	Little Woodswallow														2	1																	
	<i>Cracticus torquatus</i>	Grey Butcherbird														4	5	1	1										2	1				
	<i>Cracticus nigrogularis</i>	Pied Butcherbird														2	3	1	5		2	1	4				6	1						
	<i>Gymnorhina tibicen</i>	Australian Magpie														1	1									1								
Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail														5	5	1	1			1	2											

Family	Species	Survey Common Name	1													2	3																				
			Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Opportunistic	Granny Deeps	Agnew Gold	BKBO1	BKBO4	BKBO5	BKBO7	BKBO9	BKBS04	BKBO2	BKBO3	BKBO12	BKBO8	BKBO6	BKBO10	BKBO11	BKBS01	BKBHarp01	BKBS03			
Corvidae	<i>Corvus bennetti</i>	Little Crow													4	1	1			2							1	6	3								
	<i>Corvus orru</i>	Torresian Crow														2	1								3												
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark													6	11	1	3	1								1										
Petroicidae	<i>Petroica goodenovii</i>	Red-capped Robin													10	1	5	1	2	1	3			8		3	1	1									
	<i>Melanodryas cucullata</i>	Hooded Robin													7	1	2	4											1								
Hirundinidae	<i>Cheramoeca leucosterna</i>	White-backed Swallow													4	2																					
	<i>Hirundo neoxena</i>	Welcome Swallow													2	4	1																				
	<i>Petrochelidon nigricans</i>	Tree Martin													1	9	1																				
Nectariniidae	<i>Dicaeum hirundinaceum</i>	Mistletoebird													2	2																					
Estrildidae	<i>Taeniopygia guttata</i>	Zebra Finch													2	1											2										
Motacillidae	<i>Anthus novaeseelandiae</i>	Australasian Pipit													6	2	1																				
Mammals																																					
Bovidae	<i>Capra hircus</i>	Goat															1			1																	
Molossidae	<i>Ozimops planiceps</i>	Southern Free-tail Bat															1																				
Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat															1																				
	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat															1																2				
	<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat															1																				
	<i>Vespadelus baverstocki</i>	Inland Forest Bat															1																				
	<i>Vespadelus finlaysoni</i>	Finlayson's Cave Bat															1																				
Dasyuridae	<i>Antechinomys laniger</i>	Kultarr	2	1			3	3	3	2		2			1																						
	<i>Sminthopsis dolichura</i>	Little Long-tailed Dunnart	1	1	3	7	5	4	13	3	5	3		1	1																						
	<i>Sminthopsis hirtipes</i>	Hairy-footed Dunnart				1																															
	<i>Sminthopsis longicaudata</i>	Long-tailed Dunnart					1	1						1																							

Family	Species	Survey Common Name	1													2	3																			
			Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Opportunistic	Granny Deeps	Agnew Gold	BKBO1	BKBO4	BKBO5	BKBO7	BKBO9	BKBS04	BKBO2	BKBO3	BKBO12	BKBO8	BKBO6	BKBO10	BKBO11	BKBS01	BKBSHarp01	BKBS03		
	<i>Sminthopsis macroura</i>	Stripe-faced Dunnart	2	3		2	1	1	1	1	1	1	1	5	5	3	2				3						1	1	2	7						
	<i>Sminthopsis ooldea</i>	Ooldea Dunnart																	1																	
Macropodidae	<i>Macropus fuliginosus</i>	Western Grey Kangaroo																	1																	
	<i>Osphranter robustus</i>	Euro																	1			1						1	1					1		
	<i>Osphranter rufus</i>	Red Kangaroo																	1	4	2		4	1		2			3							
Leporidae	<i>Oryctolagus cuniculus</i>	European Rabbit																	1																	
Tachyglossidae	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna																	1			1							1	2				1		
Muridae	<i>Mus musculus</i>	House Mouse						1						5																						
	<i>Notomys alexis</i>	Spinifex Hopping Mouse	3																																	
	<i>Pseudomys desertor</i>	Desert Mouse																		1																
	<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse	1	1	1	3				1	2	2	5	6					1		1				1				1							

- (6) Terrestrial Ecosystems (2011a) Level 2 Fauna Risk Assessment for Granny Deeps Project Area. Unpublished report for Barrick Gold Corporation, Perth.
- (7) ENV Australia (2008) Agnew Prospects Fauna Assessment. Unpublished report for Agnew Gold Mining Company Pty Limited, Perth.
- (8) Biota Environmental Sciences (2007a) Bannockburn Fauna Habitat and Assemblage Survey. Unpublished report for Jubilee Mines NL, Perth.

O.4 VERTEBRATE FAUNA RECORDED IN BIOLOGICAL SURVEYS IN THE REGION

Family	Species	Common Name	Survey 1																																	
			REG Open spinifex 1	REG Open spinifex 2	REG Open spinifex 3	REG Open spinifex 4	REG Shrubs over spinifex 1	REG Shrubs over spinifex 2	REG Shrubs over spinifex 3	REG Shrubs over spinifex 4	REG Dogbolter 2	REG Mulga woodland 1	REG Mulga woodland 4	REG Eucalypt over spinifex 2	REG Eucalypt over spinifex 4	REG Eucalypt over spinifex 1	REG Dogbolter 1	REG Dogbolter 3	REG Dogbolter 4	REG Eucalypt over spinifex 3	REG Mulga woodland 2	REG Mulga woodland 3	REG Opportunistic	REG Open spinifex	REG Mulga woodland	REG Eucalypt over spinifex	REG Shrubs over spinifex	REG Mulga thicket 2	REG Turkeys	REG Mulga thicket 1	REG Dogbolter					
Reptiles																																				
Agamidae	<i>Ctenophorus isolepis</i>	Crested Dragon	1	10	8	2	3	5	1	1																										
	<i>Ctenophorus nuchalis</i>	Central Netted Dragon			1	1																														
	<i>Ctenophorus scutulatus</i>	Lozenge-marked Dragon									2	1	1																							
	<i>Diporiphora amphiboluroides</i>	Mulga Dragon									3	1																								
	<i>Moloch horridus</i>	Thorny Devil						1																												
	<i>Pogona minor</i>	Dwarf Bearded Dragon									1	3	1																							
Carphodactylidae	<i>Nephurus laevisimus</i>	Smooth Knob-tail					2	1																												
	<i>Nephurus vertebralis</i>	Midline Knob-tail										1		1																						
Diplodactylidae	<i>Diplodactylus pulcher</i>	Fine-faced Gecko									1	3				1																				
	<i>Lucasium squarrosom</i>	Mottled Ground Gecko					2	1	7	2																										
	<i>Strophurus elderi</i>	Jewelled Gecko	2	7						1																										
	<i>Strophurus strophurus</i>	Western Spiny-tailed Gecko					2	1	2	1																										
	<i>Strophurus wellingtonae</i>	Western Shield Spiny-tailed Gecko									3	9	1		1	7	3	1	1	1	4	2														
Elapidae	<i>Brachyuropsis semifasciata</i>	Half-girdlerd Snake			1				2			3	6	3																						
	<i>Furina ornata</i>	Orange-naped Snake						1		1																										
	<i>Parasuta monachus</i>	Monk Snake			1		1		2		1		1									1														
	<i>Pseudechis australis</i>	Mulga Snake												2																						

Family	Species	Survey Common Name	1																																				
			REG Open spinifex 1	REG Open spinifex 2	REG Open spinifex 3	REG Open spinifex 4	REG Shrubs over spinifex 1	REG Shrubs over spinifex 2	REG Shrubs over spinifex 3	REG Shrubs over spinifex 4	REG Dogbolter 2	REG Mulga woodland 1	REG Mulga woodland 4	REG Eucalypt over spinifex 2	REG Eucalypt over spinifex 4	REG Eucalypt over spinifex 1	REG Dogbolter 1	REG Dogbolter 3	REG Dogbolter 4	REG Eucalypt over spinifex 3	REG Mulga woodland 2	REG Mulga woodland 3	REG Opportunistic	REG Open spinifex	REG Mulga woodland	REG Eucalypt over spinifex	REG Shrubs over spinifex	REG Mulga thicket 2	REG Turkeys	REG Mulga thicket 1	REG Dogbolter								
	<i>Pseudonaja mengdeni</i>	Gwardar		2																																			
	<i>Pseudonaja modesta</i>	Ringed Brown Snake															1																						
	<i>Simoselaps bertholdi</i>	Jan's Banded Snake																																					
Gekkonidae	<i>Gehyra purpurascens</i>	Purplish Dtella		1											2						1																		
	<i>Gehyra variegata</i>	Tree Dtella	2			1									1	2					1	1	2																
	<i>Heteronotia binoei</i>	Bynoe's Prickly Gecko																																					
	<i>Rhynchoedura ornata</i>	Western Beaked Gecko																																					
Pygopodidae	<i>Delma butleri</i>	Unbanded Delma	1	2	2	1	2	1	3	1		1																											
	<i>Lialis burtonis</i>	Burton's Snake-lizard																																					
	<i>Pygopus nigriceps</i>	Western Hooded Scaly-foot																																					
Scincidae	<i>Ctenotus ariadnae</i>	Ariadna's Ctenotus	1		4	3	7	4	6	8																													
	<i>Ctenotus dux</i>	Fine Side-lined Ctenotus		2	2		6	2	13	2																													
	<i>Ctenotus grandis</i>	Grand Ctenotus	6	8	9	14	1	3	3	4																													
	<i>Ctenotus greeri</i>	Spotted-necked Ctenotus																																					
	<i>Ctenotus helenae</i>	Clay-soil Ctenotus	1	2			20	23	13	10																													
	<i>Ctenotus leonhardii</i>	Leonhardi's Ctenotus	1		4	6																																	
	<i>Ctenotus pantherinus</i>	Leopard Skink	9		6	3	12	11	1	1																													
	<i>Ctenotus piankai</i>	Coarse Sands Ctenotus	1	4	3	2																																	
	<i>Ctenotus quattuordecimlineatus</i>	Fourteen-lined Ctenotus	4	12	3	2	19	16	9	5	4																												
	<i>Ctenotus schomburgkii</i>	Schomburgk's Ctenotus				1																																	

Family	Species	Survey Common Name	1																																			
			REG Open spinifex 1	REG Open spinifex 2	REG Open spinifex 3	REG Open spinifex 4	REG Shrubs over spinifex 1	REG Shrubs over spinifex 2	REG Shrubs over spinifex 3	REG Shrubs over spinifex 4	REG Dogbolter 2	REG Mulga woodland 1	REG Mulga woodland 4	REG Eucalypt over spinifex 2	REG Eucalypt over spinifex 4	REG Eucalypt over spinifex 1	REG Dogbolter 1	REG Dogbolter 3	REG Dogbolter 4	REG Eucalypt over spinifex 3	REG Mulga woodland 2	REG Mulga woodland 3	REG Opportunistic	REG Open spinifex	REG Mulga woodland	REG Eucalypt over spinifex	REG Shrubs over spinifex	REG Mulga thicket 2	REG Turkeys	REG Mulga thicket 1	REG Dogbolter							
	<i>Ctenotus uber</i>	Spotted Ctenotus															2	7	18				1	10	7		8											
	<i>Egernia depressa</i>	Southern Pygmy Spiny-tailed Skink											1	1							1					4	1											
	<i>Egernia formosa</i>	Goldfields Crevice-skink											1	1		1	1										2											
	<i>Eremiascincus richardsonii</i>	Broad-banded Sand Swimmer													2	1											1											
	<i>Lerista bipes</i>	North-western Sandslider	35	37	10	17	5	11	48	56																												
	<i>Lerista desertorum</i>	Central Desert Robust Slider	1	2		1		1		1	1	1		3	1												3											
	<i>Lerista muelleri</i>	Wood Mulch-slider									2		1			1			1							1												
	<i>Liopholis inornata</i>	Desert Skink						2	10	14	5																											
	<i>Liopholis striata</i>	Nocturnal Desert Skink	2	2	5	4																																
	<i>Menetia greyii</i>	Common Dwarf Skink	2	4	12	8						2					1			1						2	1											
	<i>Morethia butleri</i>	Woodland Morethia Skink													1											1		1										
	<i>Tiliqua multifasciata</i>	Centralian Blue-tongued Lizard																																				
Typhlopidae	<i>Anilius bicolor</i>	Dark-spined Blind Snake																																				
	<i>Anilius hamatus</i>	Pale-headed Blind Snake	1	1		2	1			2	1										1	1																
	<i>Anilius waitii</i>	Waite's Blind Snake				1		1	1																													
Varanidae	<i>Varanus brevicauda</i>	Short-tailed Pygmy Monitor	1	2	3	3		1																														
	<i>Varanus caudolineatus</i>	Stripe-tailed Monitor									2	5		3	1	1	3	7	2																			
	<i>Varanus eremius</i>	Pygmy Desert Monitor	2			6	2		2																													
	<i>Varanus gouldii</i>	Gould's Goanna	6	8	3	1	15	15	12	8		1	1	2	2	1																						

Family	Species	Survey Common Name	1																																		
			REG Open spinifex 1	REG Open spinifex 2	REG Open spinifex 3	REG Open spinifex 4	REG Shrubs over spinifex 1	REG Shrubs over spinifex 2	REG Shrubs over spinifex 3	REG Shrubs over spinifex 4	REG Dogbolter 2	REG Mulga woodland 1	REG Mulga woodland 4	REG Eucalypt over spinifex 2	REG Eucalypt over spinifex 4	REG Eucalypt over spinifex 1	REG Dogbolter 1	REG Dogbolter 3	REG Dogbolter 4	REG Eucalypt over spinifex 3	REG Mulga woodland 2	REG Mulga woodland 3	REG Opportunistic	REG Open spinifex	REG Mulga woodland	REG Eucalypt over spinifex	REG Shrubs over spinifex	REG Mulga thicket 2	REG Turkeys	REG Mulga thicket 1	REG Dogbolter						
	<i>Varanus panoptes</i>	Yellow-spotted Monitor																4		2		1															
	<i>Varanus tristis</i>	Black-headed Monitor											2																								
Birds																																					
Casuariidae	<i>Dromaius novaehollandiae</i>	Emu																					5	3													
Columbidae	<i>Ocyphaps lophotes</i>	Crested Pigeon																					1		2												
Caprimulgidae	<i>Eurostopodus argus</i>	Spotted Nightjar																						1													
Aegothelidae	<i>Aegotheles cristatus</i>	Australian Owlet-nightjar																						1													
Apodidae	<i>Apus pacificus</i>	Fork-tailed Swift																								2											
Otididae	<i>Ardeotis australis</i>	Australian Bustard																						2													
Accipitridae	<i>Aquila audax</i>	Wedge-tailed Eagle																						3	1												
Falconidae	<i>Falco cenchroides</i>	Nankeen Kestrel																							2	1											
	<i>Falco berigora</i>	Brown Falcon																								2											
Charadriidae	<i>Elsayornis melanops</i>	Black-fronted Dotterel																							2												
Cacatuidae	<i>Eolophus roseicapillus</i>	Galah																							2												
Psittacidae	<i>Barnardius zonarius</i>	Australian Ringneck																							10		2	5									
	<i>Psephotus varius</i>	Mulga Parrot																							5												
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater																							1												
Ptilonorhynchidae	<i>Ptilonorhynchus guttatus</i>	Western Bowerbird																								3											
Maluridae	<i>Malurus splendens</i>	Splendid Fairy-wren																							4	2	8	13		5	10	5					
	<i>Malurus lamberti</i>	Variiegated Fairy-wren																										4									

Family	Species	Survey Common Name	1																															
			REG Open spinifex 1	REG Open spinifex 2	REG Open spinifex 3	REG Open spinifex 4	REG Shrubs over spinifex 1	REG Shrubs over spinifex 2	REG Shrubs over spinifex 3	REG Shrubs over spinifex 4	REG Dogbolter 2	REG Mulga woodland 1	REG Mulga woodland 4	REG Eucalypt over spinifex 2	REG Eucalypt over spinifex 4	REG Eucalypt over spinifex 1	REG Dogbolter 1	REG Dogbolter 3	REG Dogbolter 4	REG Eucalypt over spinifex 3	REG Mulga woodland 2	REG Mulga woodland 3	REG Opportunistic	REG Open spinifex	REG Mulga woodland	REG Eucalypt over spinifex	REG Shrubs over spinifex	REG Mulga thicket 2	REG Turkeys	REG Mulga thicket 1	REG Dogbolter			
	<i>Gymnorhina tibicen</i>	Australian Magpie																				2	3	2										
	<i>Strepera versicolor</i>	Grey Currawong																								1	2							
Rhipiduridae	<i>Rhipidura albiscapa</i>	Grey Fantail																															1	
	<i>Rhipidura leucophrys</i>	Willie Wagtail																					3			4								
Corvidae	<i>Corvus orru</i>	Torresian Crow																									3							
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark																						7	4			3		3				
Petroicidae	<i>Microeca fascinans</i>	Jacky Winter																									1	1						
	<i>Petroica goodenovii</i>	Red-capped Robin																										1						
	<i>Melanodryas cucullata</i>	Hooded Robin																										1					1	
Motacillidae	<i>Anthus novaeseelandiae</i>	Australasian Pipit																															1	
Mammals																																		
Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail Bat				1																												
Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat							1		1	1																						
	<i>Chalinolobus morio</i>	Chocolate Wattled Bat													1																			
	<i>Mormopterus sp.</i>	Free-tail Bat Sp.																																
	<i>Nyctophilus sp.</i>	Long-eared Bat Sp.																																
	<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat																																
Dasyuridae	<i>Dasyercus cristicauda</i>	Crest-tailed Mulgara				1																												
	<i>Ningau ridei</i>	Wongai Ningau	2	3	1	2	1	3	5	1	2				6	2	1			1	2													
	<i>Sminthopsis dolichura</i>	Little Long-tailed Dunnart	1												1	1	2			1	5	5	3	3	4		2	3						

Family	Species	Survey Common Name	1																															
			REG Open spinifex 1	REG Open spinifex 2	REG Open spinifex 3	REG Open spinifex 4	REG Shrubs over spinifex 1	REG Shrubs over spinifex 2	REG Shrubs over spinifex 3	REG Shrubs over spinifex 4	REG Dogbolter 2	REG Mulga woodland 1	REG Mulga woodland 4	REG Eucalypt over spinifex 2	REG Eucalypt over spinifex 4	REG Eucalypt over spinifex 1	REG Dogbolter 1	REG Dogbolter 3	REG Dogbolter 4	REG Eucalypt over spinifex 3	REG Mulga woodland 2	REG Mulga woodland 3	REG Opportunistic	REG Open spinifex	REG Mulga woodland	REG Eucalypt over spinifex	REG Shrubs over spinifex	REG Mulga thicket 2	REG Turkeys	REG Mulga thicket 1	REG Dogbolter			
	<i>Sminthopsis macroura</i>	Stripe-faced Dunnart		1							2	1					1																	
Muridae	<i>Mus musculus</i>	House Mouse	7	1	3	2	1	1																										
	<i>Notomys alexis</i>	Spinifex Hopping Mouse		1		1		4			1																							
	<i>Pseudomys desertor</i>	Desert Mouse	1			1	3	1									1	1	1															
	<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse	1		2					1			2								2													

(9) Coffey Environments (2008a) Level 2 Fauna Assessment for the Duketon Gold Project. Unpublished report for Regis Resources, Perth.

O.5 VERTEBRATE FAUNA RECORDED IN BIOLOGICAL SURVEYS IN THE REGION

Family	Species	Survey Common Name	1								2								Opportunistic Birds							
			Site 1	Site 2	Site 7	Site 5	Site 6	Site 3	Site 4	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9		Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	
Reptiles																										
Agamidae	<i>Ctenophorus reticulatus</i>	Western Netted Dragon	1																							
	<i>Diporiphora amphiboluroides</i>	Mulga Dragon								1	2				1	1								1	1	
	<i>Pogona minor</i>	Dwarf Bearded Dragon		1														1								
	<i>Tympanocryptis cephalus</i>	Pebble Dragon							2		2	1														
Boidae	<i>Antaresia stimsoni</i>	Stimson's Python			1																					
Carphodactylidae	<i>Underwoodisaurus milii</i>	Barking Gecko		1										1												
Diplodactylidae	<i>Diplodactylus pulcher</i>	Fine-faced Gecko				1				1	1	3			5	3	2	3	7	4	6	3	3			
	<i>Strophurus assimilis</i>	Goldfields Spiny-tailed Gecko		1																						
	<i>Strophurus wellingtonae</i>	Western Shield Spiny-tailed Gecko							1	2		3	1			3	4	5	1		2	4	1			
Elapidae	<i>Parasuta monachus</i>	Monk Snake																	1							
Gekkonidae	<i>Heteronotia binoei</i>	Bynoe's Prickly Gecko	1				1			1			1	7	1	1		3	7		7	1	1			
Pygopodidae	<i>Pygopus nigriceps</i>	Western Hooded Scaly-foot								1																
Scincidae	<i>Cryptoblepharus buchananii</i>	Buchanan's Snake-eyed Skink		1																						
	<i>Cryptoblepharus plagiocephalus</i>	Peron's Snake-eyed Skink																3					3			
	<i>Ctenotus schomburgkii</i>	Schomburgk's Ctenotus									1															

Family	Species	Survey Common Name	1								2																
			Site 1	Site 2	Site 7	Site 5	Site 6	Site 3	Site 4	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Opportunistic	Birds	
	<i>Ctenotus uber</i>	Spotted Ctenotus				1				3	1		8	4		2			1		1	2	2				
	<i>Egernia depressa</i>	Pygmy Spiny-tailed Skink			1		1	1	1				1			1				1	1		3				
	<i>Egernia formosa</i>	Goldfields Crevice-skink			1					1	1	1				2	2	4				1					
	<i>Eremiascincus richardsonii</i>	Broad-banded Sand Swimmer	1	1								2				1						1					
	<i>Lerista desertorum</i>	Central Desert Robust Slider		1											1		6	2	5		1	2					
	<i>Lerista muelleri</i>	Wood Mulch-slider							2						5				1	1		5	4				
	<i>Lerista sp.</i>					1	1		1																		
	<i>Liopholis striata</i>	Nocturnal Desert Skink					1																				
	<i>Menetia greyii</i>	Common Dwarf Skink	1	1		1									1							1					
	<i>Morethia butleri</i>	Woodland Morethia Skink							1							2	2		2	1	1	1	1				
Typhlopidae	<i>Anilius australis</i>	Austral Blind Snake																					1				
Varanidae	<i>Varanus caudolineatus</i>	Stripe-tailed Monitor		1						4		3		3			2		1	1		1					
	<i>Varanus panoptes</i>	Yellow-spotted Monitor													1		1					1					
	<i>Varanus panoptes rubidus</i>	Yellow-spotted Monitor	1	1	1	1	1	1	1																		
Cheluidae	<i>Chelodina steindachneri</i>	Steindachner's Turtle	1																								
Birds																											
Casuariidae	<i>Dromaius novaehollandiae</i>	Emu	1	1	1	1	1	1	1																1		
Columbidae	<i>Phaps chalcoptera</i>	Common Bronzewing	1	1		1	1		1															1	3		
Columbidae	<i>Ocyphaps lophotes</i>	Crested Pigeon	1	1	1	1	1	1																1	14		
Caprimulgidae	<i>Eurostopodus argus</i>	Spotted Nightjar																							1		

Family	Species	Survey Common Name	1								2															
			Site 1	Site 2	Site 7	Site 5	Site 6	Site 3	Site 4	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Opportunistic Birds	
Aegothelidae	<i>Aegotheles cristatus</i>	Australian Owlet-nightjar						1																		
Otididae	<i>Ardeotis australis</i>	Australian Bustard		1																						
Accipitridae	<i>Accipiter fasciatus</i>	Brown Goshawk	1																							
	<i>Aquila audax</i>	Wedge-tailed Eagle					1																			
	<i>Hieraaetus morphnoides</i>	Little Eagle		1																						
Falconidae	<i>Falco cenchroides</i>	Nankeen Kestrel		1	1	1		1	1																1	
	<i>Falco berigora</i>	Brown Falcon	1	1			1																			
Charadriidae	<i>Elseyonis melanops</i>	Black-fronted Dotterel	1																							
Charadriidae	<i>Vanellus tricolor</i>	Banded Lapwing					1																			
Turnicidae	<i>Turnix velox</i>	Little Button-quail							1																	
Cacatuidae	<i>Eolophus roseicapillus</i>	Galah	1	1	1	1	1	1																	1	1
Psittacidae	<i>Barnardius zonarius</i>	Australian Ringneck	1			1	1	1																		12
	<i>Psephotus varius</i>	Mulga Parrot	1			1	1																	1	3	
	<i>Melopsittacus undulatus</i>	Budgerigar	1	1		1	1	1	1																	
	<i>Neopsephotus bourkii</i>	Bourke's Parrot				1	1																			
Cuculidae	<i>Chalcites basalus</i>	Horsfield's Bronze-cuckoo	1	1			1		1																	
	<i>Chalcites osculans</i>	Black-eared Cuckoo		1			1																			
	<i>Heteroscenes pallidus</i>	Pallid Cuckoo	1					1	1																	
Halcyonidae	<i>Todiramphus pyrrhopygius</i>	Red-backed Kingfisher		1				1	1																	
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater	1					1																		

Family	Species	Survey Common Name	1								2																
			Site 1	Site 2	Site 7	Site 5	Site 6	Site 3	Site 4	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Opportunistic	Birds	
Climacteridae	<i>Climacteris affinis</i>	White-browed Treecreeper				1	1	1	1																	1	1
Ptilonorhynchidae	<i>Ptilonorhynchus maculatus</i>	Spotted Bowerbird	1					1																			
	<i>Ptilonorhynchus guttatus</i>	Western Bowerbird																							1	3	
Maluridae	<i>Malurus splendens</i>	Splendid Fairy-wren	1	1			1																				19
	<i>Malurus leucopterus</i>	White-winged Fairy-wren		1				1																			3
	<i>Malurus lamberti</i>	Variegated Fairy-wren	1	1			1																				
Acanthizidae	<i>Pyrrholaemus brunneus</i>	Redthroat		1																							
	<i>Smicronis brevirostris</i>	Weebill		1																							3
	<i>Gerygone fusca</i>	Western Gerygone	1	1																							
	<i>Acanthiza robustirostris</i>	Slaty-backed Thornbill	1		1	1	1	1	1	1																	34
	<i>Acanthiza chrysorrhoea</i>	Yellow-rumped Thornbill	1		1	1	1	1	1	1																	1
	<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill	1		1	1	1	1	1	1																	8
	<i>Acanthiza apicalis</i>	Inland Thornbill	1	1	1			1	1																		30
	<i>Aphelocephala leucopsis</i>	Southern Whiteface	1	1	1	1	1	1	1																		7
Meliphagidae	<i>Certhionyx variegatus</i>	Pied Honeyeater	1	1		1			1																		
	<i>Gavicalis virescens</i>	Singing Honeyeater	1	1	1	1	1	1	1	1																	24
	<i>Purnella albifrons</i>	White-fronted Honeyeater	1	1					1																		
	<i>Manorina flavigula</i>	Yellow-throated Miner	1	1	1	1	1	1	1	1															1	10	
	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater	1	1		1	1	1	1	1																	13
	<i>Epthianura tricolor</i>	Crimson Chat		1		1	1	1	1	1																	

Family	Species	Survey Common Name	1								2								Opportunistic Birds						
			Site 1	Site 2	Site 7	Site 5	Site 6	Site 3	Site 4	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9		Site 10	Site 11	Site 12	Site 13	Site 14	Site 15
	<i>Sugomel niger</i>	Black Honeyeater							1																
	<i>Lichmera indistincta</i>	Brown Honeyeater		1																					
Pomatostomidae	<i>Pomatostomus superciliosus</i>	White-browed Babbler	1				1																	1	8
Psophodidae	<i>Cinclosoma castaneothorax</i>	Chestnut-breasted Quail-thrush				1	1	1	1																
Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella		1																					
Campephagidae	<i>Coracina maxima</i>	Ground Cuckoo-shrike	1	1				1																	
	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	1	1		1		1	1																2
	<i>Lalage tricolor</i>	White-winged Triller		1			1																		
Pachycephalidae	<i>Pachycephala rufiventris</i>	Rufous Whistler	1	1	1	1	1	1	1																22
	<i>Colluricincla harmonica</i>	Grey Shrike-thrush	1	1	1	1	1	1	1																13
	<i>Oreoica gutturalis</i>	Crested Bellbird	1	1	1	1	1	1	1																40
Artamidae	<i>Artamus cinereus</i>	Black-faced Woodswallow	1	1		1		1	1															2	3
	<i>Cracticus torquatus</i>	Grey Butcherbird	1	1	1	1	1	1	1																
	<i>Cracticus nigrogularis</i>	Pied Butcherbird	1	1	1	1	1	1	1															1	2
	<i>Gymnorhina tibicen</i>	Australian Magpie	1		1		1																		
	<i>Strepera versicolor</i>	Grey Currawong	1																						
Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail	1	1			1		1																
Corvidae	<i>Corvus bennetti</i>	Little Crow			1	1	1		1																14
	<i>Corvus orru</i>	Torresian Crow	1	1	1		1	1	1															1	
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark	1	1																				1	

Family	Species	Survey Common Name	1								2																	
			Site 1	Site 2	Site 7	Site 5	Site 6	Site 3	Site 4	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Opportunistic	Birds		
Petroicidae	<i>Petroica goodenovii</i>	Red-capped Robin	1	1	1	1	1	1	1																			14
	<i>Melanodryas cucullata</i>	Hooded Robin	1	1	1		1	1	1																			3
Megaluridae	<i>Cincloramphus mathewsi</i>	Rufous Songlark		1				1																				
Hirundinidae	<i>Hirundo neoxena</i>	Welcome Swallow	1				1	1	1																			
	<i>Petrochelidon ariel</i>	Fairy Martin							1																			
	<i>Petrochelidon nigricans</i>	Tree Martin						1	1																			
Estrildidae	<i>Taeniopygia guttata</i>	Zebra Finch	1	1	1	1		1	1																			
Motacillidae	<i>Anthus novaeseelandiae</i>	Australasian Pipit		1				1																			1	
Mammals																												
Bovidae	<i>Bos taurus</i>	Cow	1	1	1	1	1	1	1																			
	<i>Capra hircus</i>	Goat	1	1																								
Canidae	<i>Canis lupus</i>	Dingo	1																									
	<i>Vulpes vulpes</i>	Red Fox	1																									
Felidae	<i>Felis catus</i>	House Cat	1	1																								
Vespertilionidae	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat																								4		
Dasyuridae	<i>Sminthopsis crassicaudata</i>	Fat-tailed Dunnart		1																								
	<i>Sminthopsis dolichura</i>	Little Long-tailed Dunnart							1	5		1	4	4	2		1		1	1	3	2						
	<i>Sminthopsis macroura</i>	Stripe-faced Dunnart				1				1	1			1	3	1	1											
Macropodidae	<i>Osphranter robustus</i>	Euro			1																							
	<i>Osphranter rufus</i>	Red Kangaroo	1	1				1																				

Family	Species	Survey Common Name	1								2																	
			Site 1	Site 2	Site 7	Site 5	Site 6	Site 3	Site 4	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10	Site 11	Site 12	Site 13	Site 14	Site 15	Opportunistic	Birds		
Leporidae	<i>Oryctolagus cuniculus</i>	European Rabbit	1			1																						
Tachyglossidae	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna			1																							
Equidae	<i>Equus caballus</i>	Domestic Horse		1				1																				
Muridae	<i>Mus musculus</i>	House Mouse	1	1		1		1	1																			

(10) Halpern Glick Maunsell (1999) Rosemont Gold Project Biological Assessment Survey - Phases 1 & 2. Unpublished report for Johnson's Well Mining NL. Perth.

(11) Terrestrial Ecosystems (2010b) Level 2 Fauna Risk Assessment for the Garden Well Project Area. Unpublished report for Regis Resources, Perth.

O.6 VERTEBRATE FAUNA RECORDED IN BIOLOGICAL SURVEYS IN THE REGION

Family	Species	Survey Common Name	1										
			TM1	JS2	WM2	WS2	WM1	WS1	JS3	JS1	JS4	HB1	
Frogs													
Limnodynastidae	<i>Neobatrachus wilsmorei</i>	Goldfields Bullfrog	3	1									
Reptiles													
Agamidae	<i>Ctenophorus inermis</i>	Military Dragon			1								
	<i>Ctenophorus maculatus</i>	Spotted Dragon				2							
	<i>Ctenophorus reticulatus</i>	Western Netted Dragon					1						
	<i>Ctenophorus salinarum</i>	Saltpan Dragon				2		1					
	<i>Pogona minor</i>	Dwarf Bearded Dragon	1		2				2	1	1		
Carphodactylidae	<i>Nephrurus vertebralis</i>	Midline Knob-tail					1		1				
Diplodactylidae	<i>Lucasium squarrosum</i>	Mottled Ground Gecko	2	1	5	2	1					2	
	<i>Strophurus elderi</i>	Jewelled Gecko		1					1	2			
Elapidae	<i>Simoselaps bertholdi</i>	Jan's Banded Snake	1										
Gekkonidae	<i>Gehyra xenopus</i>	Crocodile-faced Dtella		1			1			1	1		
	<i>Heteronotia binoei</i>	Bynoe's Prickly Gecko	1				2				2	3	
Pygopodidae	<i>Delma nasuta</i>	Sharp-snouted Delma										1	
	<i>Pygopus nigriceps</i>	Western Hooded Scaly-foot										1	
Scincidae	<i>Ctenotus helenae</i>	Clay-soil Ctenotus		2						2	1		
	<i>Ctenotus leonhardii</i>	Leonhardi's Ctenotus	6	3	3	6	7					2	
	<i>Lerista desertorum</i>	Central Desert Robust Slider	4	1	1				1	2	1		
	<i>Lerista kingi</i>	King's Slider					1						
	<i>Menetia greyii</i>	Common Dwarf Skink				1	1						
Typhlopidae	<i>Anilius hamatus</i>	Pale-headed Blind Snake					1					1	
Varanidae	<i>Varanus caudolineatus</i>	Stripe-tailed Monitor			1								
	<i>Varanus gouldii</i>	Gould's Goanna					1		1				
Dasyuridae	<i>Ningui ridei</i>	Wongai Ningai							1				
Muridae	<i>Notomys alexis</i>	Spinifex Hopping Mouse							1				

(12) Dunlop, J.N. and Payne, W. (1999) A vertebrate fauna survey of the North Lake Carey region, Unpublished report for Placer (Granny Smith) and Homestake.

Appendix P. Species lists from regional survey data

Level 2 Vertebrate Fauna Assessment
King of the Hills Project



P.1 BIRDS POTENTIALLY FOUND NEAR THE PROJECT AREA

Family	Species	Common Name
Accipitridae	<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk
	<i>Accipiter fasciatus</i>	Brown Goshawk
	<i>Aquila audax</i>	Wedge-tailed Eagle
	<i>Aviceda subcristata</i>	Pacific Baza
	<i>Circus approximans</i>	Swamp Harrier
	<i>Elanus axillaris</i>	Black-shouldered Kite
	<i>Haliastur sphenurus</i>	Whistling Kite
	<i>Hamirostra melanosternon</i>	Black-breasted Buzzard
	<i>Hieraetus morphnoides</i>	Little Eagle
	<i>Lophoictinia isura</i>	Square-tailed Kite
Anatidae	<i>Milvus migrans</i>	Black Kite
	<i>Anas gracilis</i>	Grey Teal
	<i>Anas superciliosa</i>	Pacific Black Duck
	<i>Aythya australis</i>	Hardhead
	<i>Chenonetta jubata</i>	Australian Wood Duck
	<i>Cygnus atratus</i>	Black Swan
	<i>Dendrocygna eytoni</i>	Plumed Whistling-duck
Aegothelidae	<i>Malacorhynchus membranaceus</i>	Pink-eared Duck
	<i>Aegotheles cristatus</i>	Australian Owlet-nightjar

Family	Species	Common Name
Podargidae	<i>Podargus strigoides</i>	Tawny Frogmouth
Casuariidae	<i>Dromaius novaehollandiae</i>	Emu
Burhinidae	<i>Burhinus grallarius</i>	Bush Stone-curlew
Charadriidae	<i>Charadrius ruficapillus</i>	Red-capped Plover
	<i>Charadrius veredus</i>	Oriental Plover
	<i>Euseyonis melanops</i>	Black-fronted Dotterel
	<i>Erythronys cinctus</i>	Red-kneed Dotterel
	<i>Vanellus tricolor</i>	Banded Lapwing
Glareolidae	<i>Glareola maldivarum</i>	Oriental Pratincole
Laridae	<i>Chlidonias hybrida</i>	Whiskered Tern
	<i>Gelochelidon macrotarsa</i>	Australian Gull-billed Tern
Recurvirostridae	<i>Cladorhynchus leucocephalus</i>	Banded Stilt
	<i>Himantopus leucocephalus</i>	Pied Stilt
	<i>Recurvirostra novaehollandiae</i>	Red-necked Avocet
Scolopacidae	<i>Calidris acuminata</i>	Sharp-tailed Sandpiper
	<i>Calidris alba</i>	Sanderling
	<i>Calidris melanotos</i>	Pectoral Sandpiper
	<i>Calidris ruficollis</i>	Red-necked Stint
	<i>Calidris subminuta</i>	Long-toed Stint

Family	Species	Common Name
	<i>Tringa glareola</i>	Wood Sandpiper
	<i>Tringa nebularia</i>	Common Greenshank
Turnicidae	<i>Turnix velox</i>	Little Button-quail
Ardeidae	<i>Ardea alba</i>	Great Egret
	<i>Ardea pacifica</i>	White-necked Heron
	<i>Egretta novaehollandiae</i>	White-faced Heron
	<i>Pelecanus conspicillatus</i>	Australian Pelican
Threskiornithidae	<i>Platalea flavipes</i>	Yellow-billed Spoonbill
Columbidae	<i>Geopelia cuneata</i>	Diamond Dove
	<i>Ocyphaps lophotes</i>	Crested Pigeon
	<i>Phaps chalcoptera</i>	Common Bronzewing
Halcyonidae	<i>Todiramphus pyrrhopygius</i>	Red-backed Kingfisher
	<i>Todiramphus sanctus</i>	Sacred Kingfisher
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater
Cuculidae	<i>Chalcites basalis</i>	Horsfield's Bronze-cuckoo
	<i>Chalcites osculans</i>	Black-eared Cuckoo
	<i>Heteroscenes pallidus</i>	Pallid Cuckoo
Caprimulgidae	<i>Eurostopodus argus</i>	Spotted Nightjar
Falconidae	<i>Falco berigora</i>	Brown Falcon
	<i>Falco cenchroides</i>	Nankeen Kestrel
	<i>Falco longipennis</i>	Australian Hobby

Family	Species	Common Name
Megapodiidae	<i>Leipoa ocellata</i>	Malleefowl
Phasianidae	<i>Coturnix pectoralis</i>	Stubble Quail
Otididae	<i>Ardeotis australis</i>	Australian Bustard
Rallidae	<i>Fulica atra</i>	Eurasian Coot
	<i>Tribonyx ventralis</i>	Black-tailed Nativehen
Acanthizidae	<i>Acanthiza apicalis</i>	Inland Thornbill
	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill
	<i>Acanthiza robustirostris</i>	Slaty-backed Thornbill
	<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill
	<i>Aphelocephala leucopsis</i>	Southern Whiteface
	<i>Aphelocephala nigricincta</i>	Banded Whiteface
	<i>Calamanthus fuliginosus</i>	Striated Fieldwren
	<i>Gerygone fusca</i>	Western Gerygone
	<i>Pyrrholaemus brunneus</i>	Redthroat
	<i>Sericornis magnirostra</i>	Large-billed Scrubwren
	<i>Smicronis brevirostris</i>	Weebill
Artamidae	<i>Artamus cinereus</i>	Black-faced Woodswallow
	<i>Artamus cyanopterus</i>	Dusky Woodswallow
	<i>Artamus minor</i>	Little Woodswallow
	<i>Artamus personatus</i>	Masked Woodswallow
	<i>Artamus superciliosus</i>	White-browed Woodswallow

Family	Species	Common Name
	<i>Cracticus nigrogularis</i>	Pied Butcherbird
	<i>Cracticus torquatus</i>	Grey Butcherbird
	<i>Gymnorhina tibicen</i>	Australian Magpie
	<i>Strepera versicolor</i>	Grey Currawong
Campephagidae	<i>Coracina maxima</i>	Ground Cuckoo-shrike
	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike
	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike
	<i>Lalage tricolor</i>	White-winged Triller
Cisticolidae	<i>Cisticola exilis</i>	Golden-headed Cisticola
	<i>Cisticola juncidis</i>	Zitting Cisticola
Climacteridae	<i>Climacteris affinis</i>	White-browed Treecreeper
Corvidae	<i>Corvus bennetti</i>	Little Crow
	<i>Corvus orru</i>	Torresian Crow
Estrildidae	<i>Lonchura castaneothorax</i>	Chestnut-breasted Mannikin
	<i>Taeniopygia guttata</i>	Zebra Finch
Hirundinidae	<i>Cheramoeca leucosterna</i>	White-backed Swallow
	<i>Hirundo neoxena</i>	Welcome Swallow
	<i>Petrochelidon ariel</i>	Fairy Martin
	<i>Petrochelidon nigricans</i>	Tree Martin
Maluridae	<i>Amytornis striatus</i>	Striated Grasswren
	<i>Malurus lamberti</i>	Variagated Fairy-wren

Family	Species	Common Name
	<i>Malurus leucopterus</i>	White-winged Fairy-wren
	<i>Malurus splendens</i>	Splendid Fairy-wren
	<i>Stipiturus ruficeps</i>	Rufous-crowned Emu-wren
Megaluridae	<i>Cincloramphus cruralis</i>	Brown Songlark
	<i>Megalurus timoriensis</i>	Tawny Grassbird
Meliphagidae	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater
	<i>Certhionyx variegatus</i>	Pied Honeyeater
	<i>Conopophila whitei</i>	Grey Honeyeater
	<i>Epthianura aurifrons</i>	Orange Chat
	<i>Epthianura tricolor</i>	Crimson Chat
	<i>Gavicalis virescens</i>	Singing Honeyeater
	<i>Lichenostomus flavicollis</i>	Yellow-throated Honeyeater
	<i>Lichenostomus leucotis</i>	White-eared Honeyeater
	<i>Lichenostomus ornatus</i>	Yellow-plumed Honeyeater
	<i>Lichenostomus plumulus</i>	Grey-fronted Honeyeater
	<i>Lichmera indistincta</i>	Brown Honeyeater
	<i>Manorina flavigula</i>	Yellow-throated Miner
	<i>Ptilotula keartlandi</i>	Grey-headed Honeyeater
	<i>Ptilotula penicillata</i>	White-plumed Honeyeater
	<i>Purnella albifrons</i>	White-fronted Honeyeater
	<i>Sugomel nigrum</i>	Black Honeyeater

Family	Species	Common Name
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark
Motacillidae	<i>Anthus novaeseelandiae</i>	Australasian Pipit
Nectariniidae	<i>Dicaeum hirundinaceum</i>	Mistletoebird
Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella
Pachycephalidae	<i>Colluricincla harmonica</i>	Grey Shrike-thrush
	<i>Colluricincla harmonica</i>	Grey Shrike-thrush
	<i>Oreoica gutturalis</i>	Crested Bellbird
	<i>Pachycephala rufiventris</i>	Rufous Whistler
Pardalotidae	<i>Pardalotus rubricatus</i>	Red-browed Pardalote
	<i>Pardalotus striatus</i>	Striated Pardalote
Petroicidae	<i>Melanodryas cucullata</i>	Hooded Robin
	<i>Microeca fascinans</i>	Jacky Winter
	<i>Petroica goodenovii</i>	Red-capped Robin
Pomatostomidae	<i>Pomatostomus superciliosus</i>	White-browed Babbler
	<i>Pomatostomus temporalis</i>	Grey-crowned Babbler
Psophodidae	<i>Cinclosoma castaneothorax</i>	Chestnut-breasted Quail-thrush
Psophodidae	<i>Cinclosoma castanotum</i>	Chestnut Quail-thrush
	<i>Cinclosoma cinnamomeum</i>	Cinnamon Quail-thrush

Family	Species	Common Name
	<i>Cinclosoma marginatum</i>	Western Quail-thrush
	<i>Psophodes occidentalis</i>	Chiming Wedgebill
Ptilonorhynchidae	<i>Ptilonorhynchus guttatus</i>	Western Bowerbird
	<i>Ptilonorhynchus maculatus</i>	Spotted Bowerbird
Rhipiduridae	<i>Rhipidura albiscapa</i>	Grey Fantail
	<i>Rhipidura leucophrys</i>	Willie Wagtail
Phalacrocoracidae	<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant
	<i>Phalacrocorax varius</i>	Pied Cormorant
Podicipedidae	<i>Poliocephalus poliocephalus</i>	Hoary-headed Grebe
Cacatuidae	<i>Cacatua sanguinea</i>	Little Corella
	<i>Eolophus roseicapilla</i>	Galah
	<i>Nymphicus hollandicus</i>	Cockatiel
Psittacidae	<i>Barnardius zonarius</i>	Australian Ringneck
	<i>Melopsittacus undulatus</i>	Budgerigar
	<i>Neopsephotus bourkii</i>	Bourke's Parrot
	<i>Psephotus varius</i>	Mulga Parrot
Strigidae	<i>Ninox boobook</i>	Southern Boobook

P.2 AMPHIBIANS POTENTIALLY FOUND NEAR THE PROJECT AREA

Family	Species	Common Name
Hylidae	<i>Cyclorana maini</i>	Main's Frog
	<i>Cyclorana occidentalis</i>	Western Water-holding Frog
	<i>Litoria rubella</i>	Desert Tree Frog

P.3 MAMMALS POTENTIALLY FOUND NEAR THE PROJECT AREA

Family	Species	Common Name
Bovidae	<i>Bos taurus</i>	Cow
	<i>Capra hircus</i>	Goat
Camelidae	<i>Camelus dromedarius</i>	Dromedary
Canidae	<i>Canis lupus</i>	Dingo
	<i>Vulpes vulpes</i>	Red Fox
Felidae	<i>Felis catus</i>	Cat
Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail Bat
Emballonuridae	<i>Taphozous hilli</i>	Hill's Sheath-tail Bat
Molossidae	<i>Austronomus australis</i>	White-striped Freetail Bat
	<i>Mormopterus lumsdenae</i>	Northern Free-tail Bat
	<i>Mormopterus planiceps</i>	Southern Free-tail Bat
Pteropodidae	<i>Syconycteris australis</i>	Common Blossom-bat
Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat
	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat
	<i>Nyctophilus major</i>	Greater Long-eared Bat
	<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat
	<i>Vespadelus baverstocki</i>	Inland Forest Bat
	<i>Vespadelus finlaysoni</i>	Finlayson's Cave Bat
Dasyuridae	<i>Antechinomys laniger</i>	Kultarr

Family	Species	Common Name
	<i>Dasycercus blythi</i>	Brush-tailed Mulgara
	<i>Dasycercus cristicauda</i>	Crest-tailed Mulgara
	<i>Ningai ridei</i>	Wongai Ningai
	<i>Pseudantechinus woolleyae</i>	Woolley's False Antechinus
	<i>Sminthopsis crassicaudata</i>	Fat-tailed Dunnart
	<i>Sminthopsis dolichura</i>	Little Long-tailed Dunnart
	<i>Sminthopsis hirtipes</i>	Hairy-footed Dunnart
	<i>Sminthopsis longicaudata</i>	Long-tailed Dunnart
	<i>Sminthopsis macroura</i>	Stripe-faced Dunnart
	<i>Sminthopsis ooldea</i>	Ooldea Dunnart
	<i>Sminthopsis youngsoni</i>	Lesser Hairy-footed Dunnart
Macropodidae	<i>Macropus fuliginosus</i>	Western Grey Kangaroo
	<i>Osphranter robustus</i>	Euro
	<i>Osphranter rufus</i>	Red Kangaroo
Potoroidae	<i>Bettongia lesueur</i>	Burrowing Bettong
Leporidae	<i>Oryctolagus cuniculus</i>	Rabbit
Tachyglossidae	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna
Thylacomyidae	<i>Macrotis lagotis</i>	Bilby
Equidae	<i>Equus asinus</i>	Donkey



Family	Species	Common Name
	<i>Equus caballus</i>	Horse
Muridae	<i>Mus musculus</i>	House Mouse
	<i>Notomys alexis</i>	Spinifex Hopping Mouse

Family	Species	Common Name
	<i>Notomys mitchellii</i>	Mitchell's Hopping Mouse
	<i>Pseudomys desertor</i>	Desert Mouse
	<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse

P.4 REPTILES POTENTIALLY FOUND NEAR THE PROJECT AREA

Family	Species	Common Name
Agamidae	<i>Ctenophorus caudicinctus</i>	Ring-tailed Dragon
	<i>Ctenophorus chapmani</i>	Chapman's Dragon
	<i>Ctenophorus graafi</i>	Ring-tailed Dragon
	<i>Ctenophorus inermis</i>	Military Dragon
	<i>Ctenophorus isolepis</i>	Central Military Dragon
	<i>Ctenophorus isolepis</i>	Military Dragon
	<i>Ctenophorus nuchalis</i>	Central Netted Dragon
	<i>Ctenophorus reticulatus</i>	Western Netted Dragon
	<i>Ctenophorus salinarum</i>	Saltpan Dragon
	<i>Ctenophorus scutulatus</i>	Lozenge-marked Dragon
	<i>Diporiphora amphiboluroides</i>	Mulga Dragon
	<i>Diporiphora paraconvergens</i>	Grey-striped Western Desert Dragon
	<i>Diporiphora winneckei</i>	Canegrass Dragon
	<i>Gowidon longirostris</i>	Long-nosed Dragon
	<i>Moloch horridus</i>	Thorny Devil
<i>Pogona minor</i>	Western Bearded Dragon	
<i>Tympanocryptis cephalus</i>	Pebble Dragon	
Carphodactylidae	<i>Nephrurus laevisimus</i>	Smooth Knob-tail
	<i>Nephrurus vertebralis</i>	Midline Knob-tail
	<i>Nephrurus wheeleri</i>	Banded Knob-tail
	<i>Underwoodisaurus milii</i>	Barking Gecko
Diplodactylidae	<i>Diplodactylus conspicillatus</i>	Fat-tailed Gecko

Family	Species	Common Name
	<i>Diplodactylus granariensis</i>	Wheatbelt Stone Gecko
	<i>Diplodactylus pulcher</i>	Beautiful Gecko
	<i>Diplodactylus vittata</i>	Wood Gecko
	<i>Lucasium damaeum</i>	Beaded Gecko
	<i>Lucasium squarrosus</i>	Mottled Ground Gecko
	<i>Lucasium stenodactylum</i>	Crowned Gecko
	<i>Rhynchoedura ornata</i>	Beaked Gecko
	<i>Strophurus assimilis</i>	Goldfields Spiny-tailed Gecko
	<i>Strophurus ciliaris</i>	Spiny-tailed Gecko
	<i>Strophurus elderi</i>	Jewelled Gecko
	<i>Strophurus strophurus</i>	Western Spiny-tailed Gecko
	<i>Strophurus wellingtonae</i>	Western Shield Spiny-tailed Gecko
Elapidae	<i>Brachyuropis approximans</i>	North-western Shovel-nosed Snake
	<i>Brachyuropis fasciolata</i>	Narrow-banded Burrowing Snake
	<i>Brachyuropis semifasciata</i>	Half-girdled Snake
	<i>Demansia psammophis</i>	Yellow-faced Whipsnake
	<i>Furina ornata</i>	Orange-naped Snake
	<i>Parasuta monachus</i>	Hooded Snake
	<i>Pseudechis australis</i>	Mulga Snake
	<i>Pseudonaja mengdeni</i>	Western Brown Snake
	<i>Pseudonaja modesta</i>	Ringed Brown Snake
	<i>Simoselaps bertholdi</i>	Jan's Banded Snake

Family	Species	Common Name
	<i>Suta fasciata</i>	Rosen's Snake
Gekkonidae	<i>Gehyra purpurascens</i>	
	<i>Gehyra variegata</i>	Tree Dtella
	<i>Heteronotia binoei</i>	Bynoe's Gecko
Pygopodidae	<i>Aprasia picturata</i>	Black-headed Worm-lizard
	<i>Delma butleri</i>	Unbanded Delma
	<i>Delma nasuta</i>	Sharp-snouted Delma
	<i>Lialis burtonis</i>	Burton's Legless Lizard
	<i>Pygopus nigriceps</i>	Western Hooded Scaly-foot
Pythonidae	<i>Antaresia perthensis</i>	Pygmy Python
	<i>Antaresia stimsoni</i>	Stimson's Python
Scincidae	<i>Cryptoblepharus buchananii</i>	Buchanan's Snake-eyed Skink
	<i>Cryptoblepharus pulcher</i>	Elegant Snake-eyed Skink
	<i>Ctenotus ariadnae</i>	Ariadna's Ctenotus
	<i>Ctenotus atlas</i>	Southern Mallee Ctenotus
	<i>Ctenotus calurus</i>	Blue-tailed Finesnout Ctenotus
	<i>Ctenotus dux</i>	Fine Side-lined Ctenotus
	<i>Ctenotus grandis</i>	Grand Ctenotus
	<i>Ctenotus halysis</i>	Chained Ctenotus
	<i>Ctenotus hebetior</i>	Stout Ctenotus
	<i>Ctenotus helenae</i>	Clay-soil Ctenotus
	<i>Ctenotus leonhardii</i>	Leonhardi's Ctenotus
	<i>Ctenotus pantherinus</i>	Leopard Ctenotus
	<i>Ctenotus pantherinus</i>	Leopard Skink

Family	Species	Common Name
	<i>Ctenotus quattuordecimlineatus</i>	Fourteen-lined Ctenotus
	<i>Ctenotus schomburgkii</i>	Barred Wedgesnout Ctenotus
	<i>Ctenotus severus</i>	Stern Ctenotus
	<i>Ctenotus uber</i>	Spotted Ctenotus
	<i>Egernia depressa</i>	Southern Pygmy Spiny-tailed Skink
	<i>Egernia formosa</i>	Goldfields Crevice Skink
	<i>Eremiascincus richardsonii</i>	Broad-banded Sand-swimmer
	<i>Lerista bipes</i>	North-western Sandslider
	<i>Lerista desertorum</i>	Central Desert Robust Slider
	<i>Lerista muelleri</i>	Wood Mulch-slider
	<i>Lerista rhodonoides</i>	
	<i>Lerista timida</i>	Timid Slider
	<i>Liopholis inornata</i>	Desert Skink
	<i>Liopholis striata</i>	Nocturnal Desert Skink
	<i>Menetia greyii</i>	Common Dwarf Skink
	<i>Morethia butleri</i>	Woodland Morethia Skink
	<i>Morethia ruficauda</i>	Lined Fire-tailed Skink
	<i>Tiliqua multifasciata</i>	Central Blue-tongue
	<i>Tiliqua occipitalis</i>	Western Blue-tongued Lizard
Typhlopidae	<i>Anilius bituberculatus</i>	Prong-snouted Blind Snake
	<i>Anilius hamatus</i>	Pale-headed Blind Snake
	<i>Anilius waitii</i>	Waite's Blind Snake
Varanidae	<i>Varanus breviceauda</i>	Short-tailed Pygmy Monitor
	<i>Varanus caudolineatus</i>	Stripe-tailed Monitor



Family	Species	Common Name
	<i>Varanus eremius</i>	Pygmy Desert Monitor
	<i>Varanus giganteus</i>	Perentie
	<i>Varanus gouldii</i>	Gould's Goanna

Family	Species	Common Name
	<i>Varanus panoptes</i>	Yellow-spotted Monitor
	<i>Varanus tristis</i>	Black-headed Monitor
Chelidae	<i>Chelodina steindachneri</i>	Flat-shelled Turtle

Appendix Q. Definitions of Significant Fauna under the Biodiversity Conservation Act 2016 and Priority Species

**Level 2 Vertebrate Fauna Assessment
King of the Hills Project**



Q.1 DEFINITIONS OF SIGNIFICANT FAUNA UNDER THE WA BIODIVERSITY CONSERVATION ACT 2016

Threatened, Extinct and Specially Protected fauna or flora¹ are species² which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such. The *Wildlife Conservation (Specially Protected Fauna) Notice 2018* and the *Wildlife Conservation (Rare Flora) Notice 2018* have been transitioned under regulations 170, 171 and 172 of the *Biodiversity Conservation Regulations 2018* to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the *Biodiversity Conservation Act 2016*. Categories of Threatened, Extinct and Specially Protected fauna and flora are:

T Threatened Species

Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for Threatened Fauna.

Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the *Wildlife Conservation (Rare Flora) Notice 2018* for Threatened Flora.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

CR Critically endangered species

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. Published under schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.

¹ The definition of flora includes algae, fungi and lichens

² Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).

EN Endangered species

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. Published under schedule 2 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for endangered flora.

VU Vulnerable species

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. Published under schedule 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora.

Extinct Species

Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.

EX Extinct species

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).

Published as presumed extinct under schedule 4 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for extinct fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for extinct flora.

EW Extinct in the wild species

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).

Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

Specially Protected Species

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

MI Migratory birds protected under an international agreement

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.

Published as migratory birds protected under an international agreement under schedule 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

CD Species of special conservation interest (conservation dependant fauna)

Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).

Published as conservation dependent fauna under schedule 6 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

OS Other specially protected species

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).

Published as other specially protected fauna under schedule 7 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

P Priority species

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora.

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

P1 Priority 1: Poorly-known species

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.

Appendix R.

Acoustic analysis and bat call identification from near Laverton, Western Australia

**Level 2 Vertebrate Fauna Assessment
King of the Hills Project**



Acoustic analysis and bat call identification from near Laverton, Western Australia

Prepared for **Terrestrial Ecosystems Pty Ltd**

Version **14 April 2020**

SZ project reference **SZ527**

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Specialised Zoological (2020). Acoustic analysis and bat call identification from near Laverton, Western Australia. Unpublished report by Specialised Zoological for Terrestrial Ecosystems Pty Ltd, 14 April 2020, project reference SZ527.

Summary

Bat identifications from acoustic recordings are provided from near Laverton, Western Australia. The identification of bat species from full spectrum WAV-format recordings of their echolocation calls was based on measurements of characteristic frequency, observation of pulse shape, and the pattern of harmonics. At least seven species of bat were identified as being present across two survey periods (**Tables 1 – 3**). Representative echolocation calls for each identification are illustrated (**Figure 1**), as recommended by the Australasian Bat Society (ABS 2006). Further details are available should verification be required.

Methods

The data provided were recorded in full spectrum WAV format with Wildlife Acoustics Song Meter SM2BAT+ bat detectors (sampling rate 384 kHz, set to turn on automatically at sunset and off at sunrise).

A multi-step acoustic analysis procedure developed to process large full spectrum echolocation recording datasets from insectivorous bats (Armstrong and Aplin 2014; Armstrong et al. 2016) was applied to the recordings made on the survey. Firstly, the WAV files were scanned for bat echolocation calls using several parameter sets in the software SCAN'R version 1.8.3 (Binary Acoustic Technology), which also provides measurements (SCAN'R parameters) from each putative bat pulse.

The outputs were then used to determine if putative bat pulses measured in SCAN'R could be identified to species. This was done using a custom [R] language script that performed three tasks: 1. undertook a Discriminant Function Analysis on training data from representative calls from southern Australia; 2. from the measurements of each putative bat pulse from SCAN'R, calculated values for the first two Discriminant Functions that could separate the echolocation call types derived from the analysis of training data, and plotted these resulting coordinates over confidence regions for the defined call types; and 3. facilitated an inspection in a spectrogram of multiple examples of each call type for each recording night by opening the original WAV files containing pulses of interest in Adobe Audition CS6 version 5.0.2.

Species were identified based on information in Churchill (2008) and the author's own unpublished material; and nomenclature follows Jackson and Groves (2015).

Comments on ambiguous identifications

Most species were identified unambiguously, but some call types have more than one possibility for their source. It is difficult to make an unambiguous species-level identification of long-eared bats *Nyctophilus* spp., and call sequences attributable to this genus in the present dataset could have derived from either the Lesser Long-eared Bat *Nyctophilus geoffroyi*, or the Central Long-eared Bat *Nyctophilus major tor*. Short broadband calls typical of *Nyctophilus* spp. were reasonably common in the recordings, and most of those observed had a characteristic frequency of c. 40 kHz, suggestive of the larger species (*N. m. tor*). Several examples had pulses more than 5 kHz higher, suggestive of either *N. geoffroyi* or clutter calls of the Inland Forest Bat *Vespdaelus baverstocki*.

A few sequences had characteristics typical of the Inland Free-tailed Bat *Ozimops petersi*, but alternatively, they might have instead derived from Gould's Wattled Bat *Chalinolobus gouldii*.

Limitations

The identifications presented in this report have been made within the following context:

1. The identifications made herein were based on the ultrasonic acoustic data recorded and provided by a 'third party' (the client named on the front of this report).
2. The scope of this report extended to providing information on the identification of bat species in bulk ultrasonic recordings. Further comment on these species and the possible impacts of a planned project on bat species were not part of the scope.
3. In the case of the present report, the recording equipment was not set up and supplied by Specialised Zoological. The equipment was operated by the third party during the survey.
4. Other than the general location of the study area, Specialised Zoological has not been provided with detailed information of the survey area, has not made a visit to observe the habitats available for bats, nor have we visited the specific project areas on a previous occasion.
5. Specialised Zoological has had no input into the overall design and timing of this bat survey, recording site placement, nor the degree of recording site replication.
6. While Specialised Zoological has made identifications to the best of our ability given the available materials, and reserves the right to re-examine the data and revise any identification following a query, it is the client's and / or proponent's responsibility to provide supporting evidence for any identification, which might require follow-up trapping effort or non-invasive methods such as video recordings. Specialised Zoological bears no liability for any follow-up work that may be required to support an identification based initially on the analysis of acoustic recordings undertaken and reported on here.
7. There are a variety of factors that affect the 'detectability' of each bat species, given the frequency, power and shape characteristics of their calls. Further information on the analysis and the various factors that can impinge on the reliability of identifications can be provided upon request.
8. The analysis of ultrasonic recordings is one of several methods that can be used to survey for bats, and comprehensive surveys typically employ more than one method. If an identification in the present report is ambiguous or in question, a trapping programme would help to resolve the presence of the possibilities in the project area.

References

- ABS (2006). Recommendations of the Australasian Bat Society Inc for reporting standards for insectivorous bat surveys using bat detectors. *The Australasian Bat Society Newsletter* 27: 6–9. [ISSN 1448-5877]
- Armstrong, K.N. and Aplin, K.P. (2014). Identifying bats in an unknown acoustic realm using a semi-automated approach to the analysis of large full spectrum datasets. Oral presentation at the 16th Australasian Bat Society Conference 22–25 April 2014, Townsville, Queensland. *The Australasian Bat Society Newsletter* 42: 35–36.
- Armstrong, K.N., Aplin, K.P. and Crotty, S. (2016). A pipeline and app for massive filtering, and assisted inspection of enormous acoustic datasets. Poster presentation at the 17th Australasian Bat Society Conference, 29 March-1 April 2016, Hobart, Tasmania, Australia. *The Australasian Bat Society Newsletter* 46: 51.
- Churchill, S.K. (2008). *Australian bats*. 2nd ed. Allen and Unwin, Crows Nest, NSW.
- Jackson, S.M. and Groves, C.P. (2015). *Taxonomy of Australian mammals*. CSIRO Publishing, Victoria.

Table 1. Species identified in the present survey from all sites combined.

VESPERTILIONIDAE	
Gould’s Wattled Bat	<i>Chalinolobus gouldii</i>
Inland Broad-nosed Bat	<i>Scotorepens balstoni</i>
Inland Forest Bat	<i>Vespadelus baverstocki</i>
Finlayson’s Cave Bat	<i>Vespadelus finlaysoni</i>
Ambiguous identifications	
Unidentified long-eared bat	<i>Nyctophilus</i> sp.
MOLOSSIDAE	
Western Free-tailed Bat	<i>Ozimops kitcheneri</i>
Inland Free-tailed Bat	<i>Ozimops petersi</i>

Table 2. Species identifications from November 2019, with the degree of confidence indicated by a code. Date and recording unit number correlates with site; see *Table 1* for full species names. Note that dates for which recordings failed are not listed.

	<i>C. gouldii</i>	<i>O. kitcheneri</i>	<i>O. petersi</i>	<i>Nyctophilus</i> sp.	<i>S. balstoni</i>	<i>V. baverstocki</i>	<i>V. finlaysoni</i>
SM2BAT 7544							
20/11/2019	◆	—	—	NC	◆	—	—
SM2BAT 7548							
20/11/2019	—	—	—	NC	—	◆	—
SM2BAT 7586							
20/11/2019	—	—	—	—	—	—	—
SM2BAT 10856							
20/11/2019	—	—	NC	NC	—	—	—
SM2BAT 10883							
20/11/2019	◆	◆	—	NC	—	—	◆
21/11/2019	◆	◆	NC	NC	◆	—	◆
22/11/2019	◆	—	—	NC	◆	—	◆
23/11/2019	◆	◆	—	NC	—	—	◆
24/11/2019	—	—	—	NC	—	—	—

Definition of confidence level codes

— Not detected.

◆ Unambiguous identification of the species at the site based on measured call characteristics and comparison with available reference material. Greater confidence in this ID would come only after capture and supported by morphological measurements or a DNA sequence.

NC Needs Confirmation. Either call quality was poor, or the species cannot be distinguished reliably from another that makes similar calls. Alternative identifications are indicated in the *Comments on identifications* section of this report. If this is a species of conservation significance, further survey work might be required to confirm the record.

Table 3. Species identifications from March 2020, with the degree of confidence indicated by a code. Date and recording unit number correlates with site; see *Table 1* for full species names. Note that dates for which recordings failed or did not contain bats are not listed. See *Table 2* for confidence level codes.

	<i>C. gouldii</i>	<i>O. kitcheneri</i>	<i>O. petersi</i>	<i>Nyctophilus</i> sp.	<i>S. balstoni</i>	<i>V. baverstocki</i>	<i>V. finlaysoni</i>
SM2BAT 7544							
12/03/2020	◆	◆	—	NC	◆	—	◆
15/03/2020	—	◆	—	NC	◆	—	—
SM2BAT 7548							
12/03/2020	◆	◆	—	NC	—	—	—
13/03/2020	◆	◆	—	—	◆	—	—
14/03/2020	◆	—	—	NC	◆	—	◆
15/03/2020	—	—	—	—	◆	—	◆
SM2BAT 7586							
13/03/2020	◆	◆	—	—	◆	—	—
15/03/2020	◆	◆	—	NC	—	—	—
SM2BAT 10856							
16/03/2020	—	—	NC	NC	—	—	—
SM2BAT 10883							
12/03/2020	◆	◆	—	—	◆	—	—
13/03/2020	◆	◆	—	NC	◆	—	—
14/03/2020	—	—	—	—	◆	—	—

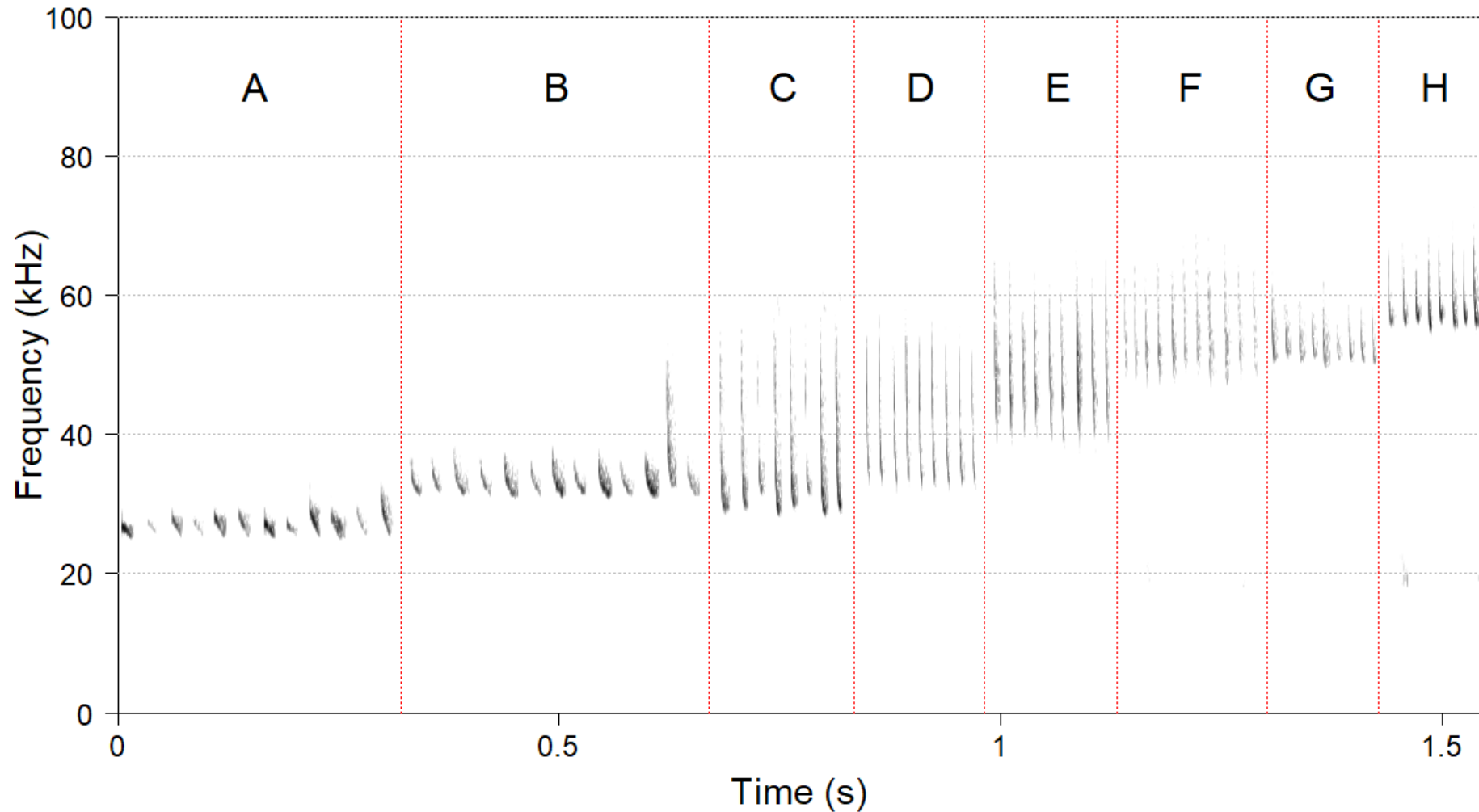


Figure 1. Representative echolocation call sequence portions of the species identified (**A:** *Ozimops kitcheneri*; **B:** *Ozimops petersi*?; **C:** *Chalinolobus gouldii*; **D:** *Scotorepens balstoni*; **E:** *Nyctophilus* sp. (40 kHz example); **F:** *Nyctophilus* sp. (45 kHz example); **G:** *Vespadelus baverstocki*; **H:** *Vespadelus finlaysoni*; time between pulses has been compressed).

Appendix S. Rapid habitat assessment locations

Level 2 Vertebrate Fauna Assessment
King of the Hills Project



Date: 22/11/2019

Habitat Assessment #: 1

Observer: ST & JMS

Zone: 51J

Easting: 316698 mE

Northing: 6837900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 2

Observer: ST & JMS

Zone: 51J

Easting: 317198 mE

Northing: 6837900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 3

Observer: ST & JMS

Zone: 51J

Easting: 315198 mE

Northing: 6837400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 4

Observer: ST & JMS

Zone: 51J

Easting: 315698 mE

Northing: 6837400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 5

Observer: ST & JMS

Zone: 51J

Easting: 316198 mE

Northing: 6837400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 6

Observer: ST & JMS

Zone: 51J

Easting: 316698 mE

Northing: 6837400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 7

Observer: ST & JMS

Zone: 51J

Easting: 317198 mE

Northing: 6837400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 8

Observer: ST & JMS

Zone: 51J

Easting: 315198 mE

Northing: 6836900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 9

Observer: ST & JMS

Zone: 51J

Easting: 315698 mE

Northing: 6836900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 22/11/2019

Habitat Assessment #: 10

Observer: ST & JMS

Zone: 51J

Easting: 316198 mE

Northing: 6836900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 22/11/2019

Habitat Assessment #: 11

Observer: ST & JMS

Zone: 51J

Easting: 316698 mE

Northing: 6836900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 12

Observer: ST & JMS

Zone: 51J

Easting: 317198 mE

Northing: 6836900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 22/11/2019

Habitat Assessment #: 13

Observer: ST & JMS

Zone: 51J

Easting: 315198 mE

Northing: 6836400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 14

Observer: ST & JMS

Zone: 51J

Easting: 315698 mE

Northing: 6836400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 15

Observer: ST & JMS

Zone: 51J

Easting: 316198 mE

Northing: 6836400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 16

Observer: ST & JMS

Zone: 51J

Easting: 316698 mE

Northing: 6836400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 17

Observer: ST & JMS

Zone: 51J

Easting: 317198 mE

Northing: 6836400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 18

Observer: ST & JMS

Zone: 51J

Easting: 315198 mE

Northing: 6835900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 19

Observer: ST & JMS

Zone: 51J

Easting: 315698 mE

Northing: 6835900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 20

Observer: ST & JMS

Zone: 51J

Easting: 316198 mE

Northing: 6835900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 21

Observer: ST & JMS

Zone: 51J

Easting: 316698 mE

Northing: 6835900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 22

Observer: ST & JMS

Zone: 51J

Easting: 317198 mE

Northing: 6835900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 23

Observer: ST & JMS

Zone: 51J

Easting: 315198 mE

Northing: 6835400 mN

Fire History: >5 years

Landform: Rocky rise

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 24

Observer: ST & JMS

Zone: 51J

Easting: 315698 mE

Northing: 6835400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 25

Observer: ST & JMS

Zone: 51J

Easting: 316198 mE

Northing: 6835400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 26

Observer: ST & JMS

Zone: 51J

Easting: 316698 mE

Northing: 6835400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 27

Observer: ST & JMS

Zone: 51J

Easting: 317200 mE

Northing: 6835400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 28

Observer: ST & JMS

Zone: 51J

Easting: 315198 mE

Northing: 6834900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 29

Observer: ST & JMS

Zone: 51J

Easting: 315698 mE

Northing: 6834900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 30

Observer: ST & JMS

Zone: 51J

Easting: 316198 mE

Northing: 6834900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 31

Observer: ST & JMS

Zone: 51J

Easting: 316698 mE

Northing: 6834900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 32

Observer: ST & JMS

Zone: 51J

Easting: 317200 mE

Northing: 6834900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 33

Observer: ST & JMS

Zone: 51J

Easting: 317700 mE

Northing: 6834900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 13/03/2020

Habitat Assessment #: 34

Observer: RT & GF

Zone: 51J

Easting: 318200 mE

Northing: 6834900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 13/03/2020

Habitat Assessment #: 35

Observer: RT & GF

Zone: 51J

Easting: 318700 mE

Northing: 6834900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 36

Observer: RT & GF

Zone: 51J

Easting: 319200 mE

Northing: 6834900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 22/11/2019

Habitat Assessment #: 37

Observer: ST & JMS

Zone: 51J

Easting: 315200 mE

Northing: 6834400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 38

Observer: ST & JMS

Zone: 51J

Easting: 315698 mE

Northing: 6834400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 39

Observer: ST & JMS

Zone: 51J

Easting: 316198 mE

Northing: 6834400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 40

Observer: ST & JMS

Zone: 51J

Easting: 316698 mE

Northing: 6834400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 41

Observer: ST & JMS

Zone: 51J

Easting: 317200 mE

Northing: 6834400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 42

Observer: ST & JMS

Zone: 51J

Easting: 317700 mE

Northing: 6834400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 13/03/2020

Habitat Assessment #: 43

Observer: RT & GF

Zone: 51J

Easting: 318200 mE

Northing: 6834400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 13/03/2020

Habitat Assessment #: 44

Observer: RT & GF

Zone: 51J

Easting: 318700 mE

Northing: 6834400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 45

Observer: RT & GF

Zone: 51J

Easting: 319198 mE

Northing: 6834400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 46

Observer: RT & GF

Zone: 51J

Easting: 319698 mE

Northing: 6834400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 47

Observer: RT & GF

Zone: 51J

Easting: 320198 mE

Northing: 6834400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 48

Observer: ST & CS

Zone: 51J

Easting: 320700 mE

Northing: 6834400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 12/03/2020

Habitat Assessment #: 49

Observer: ST & CS

Zone: 51J

Easting: 321200 mE

Northing: 6834400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 20/11/2019

Habitat Assessment #: 50

Observer: RT & JMS

Zone: 51J

Easting: 311700 mE

Northing: 6833900 mN

Fire History: >5 years

Landform: Flat//Undulatng

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Stones



Date: 20/11/2019

Habitat Assessment #: 51

Observer: RT & JMS

Zone: 51J

Easting: 312198 mE

Northing: 6833900 mN

Fire History: >5 years

Landform: Rocky rise

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 20/11/2019

Habitat Assessment #: 52

Observer: RT & JMS

Zone: 51J

Easting: 312698 mE

Northing: 6833900 mN

Fire History: >5 years

Landform: Flat//Undulatng

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 20/11/2019

Habitat Assessment #: 53

Observer: RT & JMS

Zone: 51J

Easting: 313198 mE

Northing: 6833900 mN

Fire History: >5 years

Landform: Flat//Undulatng

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 20/11/2019

Habitat Assessment #: 54

Observer: RT & JMS

Zone: 51J

Easting: 313698 mE

Northing: 6833900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 20/11/2019

Habitat Assessment #: 55

Observer: RT & JMS

Zone: 51J

Easting: 314200 mE

Northing: 6833900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 56

Observer: ST & JMS

Zone: 51J

Easting: 316198 mE

Northing: 6833900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 57

Observer: ST & JMS

Zone: 51J

Easting: 316698 mE

Northing: 6833900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 58

Observer: ST & JMS

Zone: 51J

Easting: 317200 mE

Northing: 6833900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 59

Observer: ST & JMS

Zone: 51J

Easting: 317700 mE

Northing: 6833900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 13/03/2020

Habitat Assessment #: 60

Observer: RT & GF

Zone: 51J

Easting: 318200 mE

Northing: 6833900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 61

Observer: RT & GF

Zone: 51J

Easting: 318699 mE

Northing: 6833900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 62

Observer: RT & GF

Zone: 51J

Easting: 319198 mE

Northing: 6833900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 63

Observer: RT & GF

Zone: 51J

Easting: 319698 mE

Northing: 6833900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 64

Observer: RT & GF

Zone: 51J

Easting: 320200 mE

Northing: 6833900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 12/03/2020

Habitat Assessment #: 65

Observer: ST & CS

Zone: 51J

Easting: 320700 mE

Northing: 6833900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 66

Observer: ST & CS

Zone: 51J

Easting: 321200 mE

Northing: 6833900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 20/11/2019

Habitat Assessment #: 67

Observer: RT & JMS

Zone: 51J

Easting: 311700 mE

Northing: 6833400 mN

Fire History: >5 years

Landform: Flat//Undulatng

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 20/11/2019

Habitat Assessment #: 68

Observer: RT & JMS

Zone: 51J

Easting: 312200 mE

Northing: 6833400 mN

Fire History: >5 years

Landform: Flat/Gentle Slope

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 20/11/2019

Habitat Assessment #: 69

Observer: RT & JMS

Zone: 51J

Easting: 312700 mE

Northing: 6833400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 20/11/2019

Habitat Assessment #: 70

Observer: RT & JMS

Zone: 51J

Easting: 313198 mE

Northing: 6833400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 20/11/2019

Habitat Assessment #: 71

Observer: RT & JMS

Zone: 51J

Easting: 313698 mE

Northing: 6833400 mN

Fire History: >5 years

Landform: Flat//Undulatng

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 20/11/2019

Habitat Assessment #: 72

Observer: RT & JMS

Zone: 51J

Easting: 314198 mE

Northing: 6833400 mN

Fire History: >5 years

Landform: Rocky rise

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 73

Observer: ST & JMS

Zone: 51J

Easting: 316198 mE

Northing: 6833400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 74

Observer: ST & JMS

Zone: 51J

Easting: 316698 mE

Northing: 6833400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 75

Observer: ST & JMS

Zone: 51J

Easting: 317200 mE

Northing: 6833400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 76

Observer: ST & JMS

Zone: 51J

Easting: 317700 mE

Northing: 6833400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 13/03/2020

Habitat Assessment #: 77

Observer: RT & GF

Zone: 51J

Easting: 318200 mE

Northing: 6833400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 78

Observer: RT & GF

Zone: 51J

Easting: 318698 mE

Northing: 6833400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 79

Observer: RT & GF

Zone: 51J

Easting: 319198 mE

Northing: 6833400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 80

Observer: RT & GF

Zone: 51J

Easting: 319698 mE

Northing: 6833400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 13/03/2020

Habitat Assessment #: 81

Observer: RT & GF

Zone: 51J

Easting: 320200 mE

Northing: 6833400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 12/03/2020

Habitat Assessment #: 82

Observer: ST & CS

Zone: 51J

Easting: 320700 mE

Northing: 6833400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 83

Observer: ST & CS

Zone: 51J

Easting: 321198 mE

Northing: 6833400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 22/11/2019

Habitat Assessment #: 84

Observer: ST & JMS

Zone: 51J

Easting: 313200 mE

Northing: 6832900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 22/11/2019

Habitat Assessment #: 85

Observer: ST & JMS

Zone: 51J

Easting: 313698 mE

Northing: 6832900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 86

Observer: ST & JMS

Zone: 51J

Easting: 314198 mE

Northing: 6832900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 87

Observer: ST & JMS

Zone: 51J

Easting: 316198 mE

Northing: 6832900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 88

Observer: ST & JMS

Zone: 51J

Easting: 316698 mE

Northing: 6832900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 23/11/2019

Habitat Assessment #: 89

Observer: ST & RT

Zone: 51J

Easting: 317200 mE

Northing: 6832900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 12/03/2020

Habitat Assessment #: 90

Observer: ST & CS

Zone: 51J

Easting: 317700 mE

Northing: 6832900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 13/03/2020

Habitat Assessment #: 91

Observer: RT & GF

Zone: 51J

Easting: 318200 mE

Northing: 6832900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 92

Observer: RT & GF

Zone: 51J

Easting: 318698 mE

Northing: 6832900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 93

Observer: RT & GF

Zone: 51J

Easting: 319198 mE

Northing: 6832900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 94

Observer: RT & GF

Zone: 51J

Easting: 319700 mE

Northing: 6832900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 95

Observer: RT & GF

Zone: 51J

Easting: 320200 mE

Northing: 6832900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 12/03/2020

Habitat Assessment #: 96

Observer: ST & CS

Zone: 51J

Easting: 320699 mE

Northing: 6832900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 97

Observer: ST & CS

Zone: 51J

Easting: 321198 mE

Northing: 6832900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 98

Observer: ST & JMS

Zone: 51J

Easting: 313200 mE

Northing: 6832400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 99

Observer: ST & JMS

Zone: 51J

Easting: 313698 mE

Northing: 6832400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 100

Observer: ST & JMS

Zone: 51J

Easting: 314198 mE

Northing: 6832400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 101

Observer: ST & JMS

Zone: 51J

Easting: 316198 mE

Northing: 6832400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 102

Observer: ST & JMS

Zone: 51J

Easting: 316698 mE

Northing: 6832400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 23/11/2019

Habitat Assessment #: 103

Observer: ST & RT

Zone: 51J

Easting: 317200 mE

Northing: 6832400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 12/03/2020

Habitat Assessment #: 104

Observer: ST & CS

Zone: 51J

Easting: 317700 mE

Northing: 6832400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 13/03/2020

Habitat Assessment #: 105

Observer: RT & GF

Zone: 51J

Easting: 318198 mE

Northing: 6832400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 106

Observer: RT & GF

Zone: 51J

Easting: 318698 mE

Northing: 6832400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 107

Observer: RT & GF

Zone: 51J

Easting: 319198 mE

Northing: 6832400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 108

Observer: RT & GF

Zone: 51J

Easting: 319700 mE

Northing: 6832400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 13/03/2020

Habitat Assessment #: 109

Observer: RT & GF

Zone: 51J

Easting: 320200 mE

Northing: 6832400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 110

Observer: ST & CS

Zone: 51J

Easting: 320698 mE

Northing: 6832400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 12/03/2020

Habitat Assessment #: 111

Observer: ST & CS

Zone: 51J

Easting: 321198 mE

Northing: 6832400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 20/11/2019

Habitat Assessment #: 112

Observer: RT & JMS

Zone: 51J

Easting: 309698 mE

Northing: 6831900 mN

Fire History: >5 years

Landform: Rocky rise

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 113

Observer: ST & JMS

Zone: 51J

Easting: 313200 mE

Northing: 6831900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 22/11/2019

Habitat Assessment #: 114

Observer: ST & JMS

Zone: 51J

Easting: 313700 mE

Northing: 6831900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 115

Observer: ST & JMS

Zone: 51J

Easting: 314198 mE

Northing: 6831900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 116

Observer: ST & JMS

Zone: 51J

Easting: 316198 mE

Northing: 6831900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 22/11/2019

Habitat Assessment #: 117

Observer: ST & JMS

Zone: 51J

Easting: 316698 mE

Northing: 6831900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 23/11/2019

Habitat Assessment #: 118

Observer: ST & RT

Zone: 51J

Easting: 317200 mE

Northing: 6831900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Highly disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 119

Observer: ST & CS

Zone: 51J

Easting: 317700 mE

Northing: 6831900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 120

Observer: RT & GF

Zone: 51J

Easting: 318198 mE

Northing: 6831900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 121

Observer: RT & GF

Zone: 51J

Easting: 318698 mE

Northing: 6831900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 122

Observer: RT & GF

Zone: 51J

Easting: 319200 mE

Northing: 6831900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 123

Observer: RT & GF

Zone: 51J

Easting: 319700 mE

Northing: 6831900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 13/03/2020

Habitat Assessment #: 124

Observer: RT & GF

Zone: 51J

Easting: 320198 mE

Northing: 6831900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 12/03/2020

Habitat Assessment #: 125

Observer: ST & CS

Zone: 51J

Easting: 320698 mE

Northing: 6831900 mN

Fire History: >5 years

Landform: Rocky rise

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Stones



Date: 12/03/2020

Habitat Assessment #: 126

Observer: ST & CS

Zone: 51J

Easting: 321200 mE

Northing: 6831900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Stones



Date: 20/11/2019

Habitat Assessment #: 127

Observer: RT & JMS

Zone: 51J

Easting: 309700 mE

Northing: 6831400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 128

Observer: ST & JMS

Zone: 51J

Easting: 313198 mE

Northing: 6831400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 129

Observer: ST & JMS

Zone: 51J

Easting: 313700 mE

Northing: 6831400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 130

Observer: ST & JMS

Zone: 51J

Easting: 314200 mE

Northing: 6831400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 131

Observer: ST & JMS

Zone: 51J

Easting: 316198 mE

Northing: 6831400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 132

Observer: ST & JMS

Zone: 51J

Easting: 316698 mE

Northing: 6831400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 23/11/2019

Habitat Assessment #: 133

Observer: ST & RT

Zone: 51J

Easting: 317200 mE

Northing: 6831400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 134

Observer: ST & CS

Zone: 51J

Easting: 317700 mE

Northing: 6831400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 135

Observer: RT & GF

Zone: 51J

Easting: 318198 mE

Northing: 6831400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 136

Observer: RT & GF

Zone: 51J

Easting: 318698 mE

Northing: 6831400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 137

Observer: RT & GF

Zone: 51J

Easting: 319200 mE

Northing: 6831400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 13/03/2020

Habitat Assessment #: 138

Observer: RT & GF

Zone: 51J

Easting: 319700 mE

Northing: 6831400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 13/03/2020

Habitat Assessment #: 139

Observer: RT & GF

Zone: 51J

Easting: 320198 mE

Northing: 6831400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 12/03/2020

Habitat Assessment #: 140

Observer: ST & CS

Zone: 51J

Easting: 320700 mE

Northing: 6831400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 12/03/2020

Habitat Assessment #: 141

Observer: ST & CS

Zone: 51J

Easting: 321200 mE

Northing: 6831400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 20/11/2019

Habitat Assessment #: 142

Observer: RT & JMS

Zone: 51J

Easting: 309698 mE

Northing: 6830900 mN

Fire History: >5 years

Landform: Flat//Undulatng

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 20/11/2019

Habitat Assessment #: 143

Observer: RT & JMS

Zone: 51J

Easting: 310200 mE

Northing: 6830900 mN

Fire History: >5 years

Landform: Flat//Undulatng

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 20/11/2019

Habitat Assessment #: 144

Observer: RT & JMS

Zone: 51J

Easting: 310700 mE

Northing: 6830900 mN

Fire History: >5 years

Landform: Rocky rise

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 20/11/2019

Habitat Assessment #: 145

Observer: RT & JMS

Zone: 51J

Easting: 313198 mE

Northing: 6830900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 20/11/2019

Habitat Assessment #: 146

Observer: RT & JMS

Zone: 51J

Easting: 313700 mE

Northing: 6830900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 20/11/2019

Habitat Assessment #: 147

Observer: RT & JMS

Zone: 51J

Easting: 314200 mE

Northing: 6830900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 148

Observer: ST & JMS

Zone: 51J

Easting: 314698 mE

Northing: 6830900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 149

Observer: ST & JMS

Zone: 51J

Easting: 315198 mE

Northing: 6830900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 150

Observer: ST & JMS

Zone: 51J

Easting: 315700 mE

Northing: 6830900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 22/11/2019

Habitat Assessment #: 151

Observer: ST & JMS

Zone: 51J

Easting: 316200 mE

Northing: 6830900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 152

Observer: ST & JMS

Zone: 51J

Easting: 316698 mE

Northing: 6830900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 23/11/2019

Habitat Assessment #: 153

Observer: ST & RT

Zone: 51J

Easting: 317200 mE

Northing: 6830900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 154

Observer: ST & CS

Zone: 51J

Easting: 317700 mE

Northing: 6830900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 155

Observer: RT & GF

Zone: 51J

Easting: 318198 mE

Northing: 6830900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 156

Observer: RT & GF

Zone: 51J

Easting: 318698 mE

Northing: 6830900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 13/03/2020

Habitat Assessment #: 157

Observer: RT & GF

Zone: 51J

Easting: 319200 mE

Northing: 6830900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 13/03/2020

Habitat Assessment #: 158

Observer: RT & GF

Zone: 51J

Easting: 319698 mE

Northing: 6830900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 159

Observer: RT & GF

Zone: 51J

Easting: 320198 mE

Northing: 6830900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 12/03/2020

Habitat Assessment #: 160

Observer: ST & CS

Zone: 51J

Easting: 320700 mE

Northing: 6830900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 12/03/2020

Habitat Assessment #: 161

Observer: ST & CS

Zone: 51J

Easting: 321200 mE

Northing: 6830900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 20/11/2019

Habitat Assessment #: 162

Observer: RT & JMS

Zone: 51J

Easting: 309700 mE

Northing: 6830430 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 20/11/2019

Habitat Assessment #: 163

Observer: RT & JMS

Zone: 51J

Easting: 310200 mE

Northing: 6830430 mN

Fire History: >5 years

Landform: Flat//Undulatng

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 20/11/2019

Habitat Assessment #: 164

Observer: RT & JMS

Zone: 51J

Easting: 310698 mE

Northing: 6830430 mN

Fire History: >5 years

Landform: Rocky rise

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 20/11/2019

Habitat Assessment #: 165

Observer: RT & JMS

Zone: 51J

Easting: 314200 mE

Northing: 6830400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 20/11/2019

Habitat Assessment #: 166

Observer: RT & JMS

Zone: 51J

Easting: 314699 mE

Northing: 6830400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 20/11/2019

Habitat Assessment #: 167

Observer: RT & JMS

Zone: 51J

Easting: 315198 mE

Northing: 6830400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 20/11/2019

Habitat Assessment #: 168

Observer: RT & JMS

Zone: 51J

Easting: 315700 mE

Northing: 6830400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 20/11/2019

Habitat Assessment #: 169

Observer: RT & JMS

Zone: 51J

Easting: 316200 mE

Northing: 6830400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 170

Observer: ST & JMS

Zone: 51J

Easting: 316698 mE

Northing: 6830400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 23/11/2019

Habitat Assessment #: 171

Observer: ST & RT

Zone: 51J

Easting: 317200 mE

Northing: 6830400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 172

Observer: ST & CS

Zone: 51J

Easting: 317700 mE

Northing: 6830400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 173

Observer: RT & GF

Zone: 51J

Easting: 318198 mE

Northing: 6830400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 174

Observer: RT & GF

Zone: 51J

Easting: 318700 mE

Northing: 6830400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 13/03/2020

Habitat Assessment #: 175

Observer: RT & GF

Zone: 51J

Easting: 319200 mE

Northing: 6830400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 176

Observer: RT & GF

Zone: 51J

Easting: 319698 mE

Northing: 6830400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 13/03/2020

Habitat Assessment #: 177

Observer: RT & GF

Zone: 51J

Easting: 320198 mE

Northing: 6830400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 178

Observer: ST & CS

Zone: 51J

Easting: 320700 mE

Northing: 6830400 mN

Fire History: >5 years

Landform: Flat//Undulatng

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 12/03/2020

Habitat Assessment #: 179

Observer: ST & CS

Zone: 51J

Easting: 321198 mE

Northing: 6830400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 12/03/2020

Habitat Assessment #: 180

Observer: ST & CS

Zone: 51J

Easting: 321698 mE

Northing: 6830400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 20/11/2019

Habitat Assessment #: 181

Observer: RT & JMS

Zone: 51J

Easting: 314200 mE

Northing: 6829900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 20/11/2019

Habitat Assessment #: 182

Observer: RT & JMS

Zone: 51J

Easting: 314700 mE

Northing: 6829900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 20/11/2019

Habitat Assessment #: 183

Observer: RT & JMS

Zone: 51J

Easting: 315198 mE

Northing: 6829900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 20/11/2019

Habitat Assessment #: 184

Observer: RT & JMS

Zone: 51J

Easting: 315700 mE

Northing: 6829900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 20/11/2019

Habitat Assessment #: 185

Observer: RT & JMS

Zone: 51J

Easting: 316200 mE

Northing: 6829900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 186

Observer: ST & JMS

Zone: 51J

Easting: 316698 mE

Northing: 6829900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 23/11/2019

Habitat Assessment #: 187

Observer: ST & RT

Zone: 51J

Easting: 317200 mE

Northing: 6829900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 188

Observer: ST & CS

Zone: 51J

Easting: 317700 mE

Northing: 6829900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 189

Observer: RT & GF

Zone: 51J

Easting: 318198 mE

Northing: 6829900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 190

Observer: RT & GF

Zone: 51J

Easting: 318700 mE

Northing: 6829900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 191

Observer: RT & GF

Zone: 51J

Easting: 319200 mE

Northing: 6829900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 13/03/2020

Habitat Assessment #: 192

Observer: RT & GF

Zone: 51J

Easting: 319698 mE

Northing: 6829900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 13/03/2020

Habitat Assessment #: 193

Observer: RT & GF

Zone: 51J

Easting: 320200 mE

Northing: 6829900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 12/03/2020

Habitat Assessment #: 194

Observer: ST & CS

Zone: 51J

Easting: 320700 mE

Northing: 6829900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 12/03/2020

Habitat Assessment #: 195

Observer: ST & CS

Zone: 51J

Easting: 321198 mE

Northing: 6829900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 12/03/2020

Habitat Assessment #: 196

Observer: ST & CS

Zone: 51J

Easting: 321700 mE

Northing: 6829900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Stones



Date: 12/03/2020

Habitat Assessment #: 197

Observer: ST & CS

Zone: 51J

Easting: 322199 mE

Northing: 6829900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 12/03/2020

Habitat Assessment #: 198

Observer: ST & CS

Zone: 51J

Easting: 323698 mE

Northing: 6829900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Stones



Date: 12/03/2020

Habitat Assessment #: 199

Observer: ST & CS

Zone: 51J

Easting: 324198 mE

Northing: 6829900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 20/11/2019

Habitat Assessment #: 200

Observer: RT & JMS

Zone: 51J

Easting: 314198 mE

Northing: 6829400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 20/11/2019

Habitat Assessment #: 201

Observer: RT & JMS

Zone: 51J

Easting: 314700 mE

Northing: 6829400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 20/11/2019

Habitat Assessment #: 202

Observer: RT & JMS

Zone: 51J

Easting: 315198 mE

Northing: 6829400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Highly disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 20/11/2019

Habitat Assessment #: 203

Observer: RT & JMS

Zone: 51J

Easting: 315698 mE

Northing: 6829400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 20/11/2019

Habitat Assessment #: 204

Observer: RT & JMS

Zone: 51J

Easting: 316200 mE

Northing: 6829400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 205

Observer: ST & JMS

Zone: 51J

Easting: 316698 mE

Northing: 6829400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 23/11/2019

Habitat Assessment #: 206

Observer: ST & RT

Zone: 51J

Easting: 317200 mE

Northing: 6829400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 207

Observer: ST & CS

Zone: 51J

Easting: 317700 mE

Northing: 6829400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 208

Observer: ST & CS

Zone: 51J

Easting: 318198 mE

Northing: 6829400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 209

Observer: ST & CS

Zone: 51J

Easting: 318700 mE

Northing: 6829400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 210

Observer: ST & CS

Zone: 51J

Easting: 319199 mE

Northing: 6829400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 211

Observer: ST & CS

Zone: 51J

Easting: 319698 mE

Northing: 6829400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 212

Observer: ST & CS

Zone: 51J

Easting: 320200 mE

Northing: 6829400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 12/03/2020

Habitat Assessment #: 213

Observer: ST & CS

Zone: 51J

Easting: 320698 mE

Northing: 6829400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 12/03/2020

Habitat Assessment #: 214

Observer: ST & CS

Zone: 51J

Easting: 321198 mE

Northing: 6829400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 12/03/2020

Habitat Assessment #: 215

Observer: ST & CS

Zone: 51J

Easting: 321700 mE

Northing: 6829400 mN

Fire History: >5 years

Landform: Rocky rise

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Stones



Date: 12/03/2020

Habitat Assessment #: 216

Observer: ST & CS

Zone: 51J

Easting: 322198 mE

Northing: 6829400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 217

Observer: ST & CS

Zone: 51J

Easting: 322700 mE

Northing: 6829400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 12/03/2020

Habitat Assessment #: 218

Observer: ST & CS

Zone: 51J

Easting: 323200 mE

Northing: 6829400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 12/03/2020

Habitat Assessment #: 219

Observer: ST & CS

Zone: 51J

Easting: 323698 mE

Northing: 6829400 mN

Fire History: >5 years

Landform: Rocky rise

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Stones



Date: 12/03/2020

Habitat Assessment #: 220

Observer: ST & CS

Zone: 51J

Easting: 324200 mE

Northing: 6829400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 20/11/2019

Habitat Assessment #: 221

Observer: RT & JMS

Zone: 51J

Easting: 313200 mE

Northing: 6828900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 20/11/2019

Habitat Assessment #: 222

Observer: RT & JMS

Zone: 51J

Easting: 314198 mE

Northing: 6828900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 20/11/2019

Habitat Assessment #: 223

Observer: RT & JMS

Zone: 51J

Easting: 314700 mE

Northing: 6828900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 20/11/2019

Habitat Assessment #: 224

Observer: RT & JMS

Zone: 51J

Easting: 315198 mE

Northing: 6828900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 20/11/2019

Habitat Assessment #: 225

Observer: RT & JMS

Zone: 51J

Easting: 315698 mE

Northing: 6828900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 20/11/2019

Habitat Assessment #: 226

Observer: RT & JMS

Zone: 51J

Easting: 316200 mE

Northing: 6828900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 227

Observer: ST & JMS

Zone: 51J

Easting: 316698 mE

Northing: 6828900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 23/11/2019

Habitat Assessment #: 228

Observer: ST & RT

Zone: 51J

Easting: 317200 mE

Northing: 6828900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 23/11/2019

Habitat Assessment #: 229

Observer: ST & RT

Zone: 51J

Easting: 317700 mE

Northing: 6828900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 230

Observer: ST & CS

Zone: 51J

Easting: 318198 mE

Northing: 6828900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 231

Observer: ST & CS

Zone: 51J

Easting: 318700 mE

Northing: 6828900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 232

Observer: ST & CS

Zone: 51J

Easting: 319198 mE

Northing: 6828900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 233

Observer: ST & CS

Zone: 51J

Easting: 319698 mE

Northing: 6828900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 234

Observer: ST & CS

Zone: 51J

Easting: 320200 mE

Northing: 6828900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Stones



Date: 12/03/2020

Habitat Assessment #: 235

Observer: ST & CS

Zone: 51J

Easting: 320698 mE

Northing: 6828900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 12/03/2020

Habitat Assessment #: 236

Observer: ST & CS

Zone: 51J

Easting: 321200 mE

Northing: 6828900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Stones



Date: 12/03/2020

Habitat Assessment #: 237

Observer: ST & CS

Zone: 51J

Easting: 321698 mE

Northing: 6828900 mN

Fire History: >5 years

Landform: Rocky rise

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Stones



Date: 12/03/2020

Habitat Assessment #: 238

Observer: ST & CS

Zone: 51J

Easting: 322198 mE

Northing: 6828900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Stones



Date: 12/03/2020

Habitat Assessment #: 239

Observer: ST & CS

Zone: 51J

Easting: 322700 mE

Northing: 6828900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 12/03/2020

Habitat Assessment #: 240

Observer: ST & CS

Zone: 51J

Easting: 323198 mE

Northing: 6828900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 241

Observer: ST & CS

Zone: 51J

Easting: 323700 mE

Northing: 6828900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 12/03/2020

Habitat Assessment #: 242

Observer: ST & CS

Zone: 51J

Easting: 324198 mE

Northing: 6828900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Stones



Date: 12/03/2020

Habitat Assessment #: 243

Observer: ST & CS

Zone: 51J

Easting: 324698 mE

Northing: 6828900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 20/11/2019

Habitat Assessment #: 244

Observer: RT & JMS

Zone: 51J

Easting: 313198 mE

Northing: 6828400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 20/11/2019

Habitat Assessment #: 245

Observer: RT & JMS

Zone: 51J

Easting: 313650 mE

Northing: 6828400 mN

Fire History: >5 years

Landform: Flat//Undulatng

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 20/11/2019

Habitat Assessment #: 246

Observer: RT & JMS

Zone: 51J

Easting: 314700 mE

Northing: 6828400 mN

Fire History: >5 years

Landform: Flat/Gentle Slope

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 20/11/2019

Habitat Assessment #: 247

Observer: RT & JMS

Zone: 51J

Easting: 315200 mE

Northing: 6828400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 20/11/2019

Habitat Assessment #: 248

Observer: RT & JMS

Zone: 51J

Easting: 315698 mE

Northing: 6828400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 20/11/2019

Habitat Assessment #: 249

Observer: RT & JMS

Zone: 51J

Easting: 316200 mE

Northing: 6828400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 22/11/2019

Habitat Assessment #: 250

Observer: ST & JMS

Zone: 51J

Easting: 316698 mE

Northing: 6828400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 22/11/2019

Habitat Assessment #: 251

Observer: ST & JMS

Zone: 51J

Easting: 317200 mE

Northing: 6828400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 23/11/2019

Habitat Assessment #: 252

Observer: ST & RT

Zone: 51J

Easting: 317700 mE

Northing: 6828400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 253

Observer: ST & CS

Zone: 51J

Easting: 318198 mE

Northing: 6828400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 254

Observer: ST & CS

Zone: 51J

Easting: 318700 mE

Northing: 6828400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 255

Observer: ST & CS

Zone: 51J

Easting: 319198 mE

Northing: 6828400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 256

Observer: ST & CS

Zone: 51J

Easting: 319700 mE

Northing: 6828400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 257

Observer: ST & CS

Zone: 51J

Easting: 320200 mE

Northing: 6828400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 12/03/2020

Habitat Assessment #: 258

Observer: ST & CS

Zone: 51J

Easting: 322698 mE

Northing: 6828400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 259

Observer: ST & CS

Zone: 51J

Easting: 323198 mE

Northing: 6828400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 12/03/2020

Habitat Assessment #: 260

Observer: ST & CS

Zone: 51J

Easting: 323700 mE

Northing: 6828400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 12/03/2020

Habitat Assessment #: 261

Observer: ST & CS

Zone: 51J

Easting: 324198 mE

Northing: 6828400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Stones



Date: 12/03/2020

Habitat Assessment #: 262

Observer: ST & CS

Zone: 51J

Easting: 324700 mE

Northing: 6828400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Stones



Date: 20/11/2019

Habitat Assessment #: 263

Observer: RT & JMS

Zone: 51J

Easting: 313198 mE

Northing: 6827900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 20/11/2019

Habitat Assessment #: 264

Observer: RT & JMS

Zone: 51J

Easting: 313700 mE

Northing: 6827900 mN

Fire History: >5 years

Landform: Rocky rise

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 23/11/2019

Habitat Assessment #: 265

Observer: ST & RT

Zone: 51J

Easting: 314698 mE

Northing: 6827900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 23/11/2019

Habitat Assessment #: 266

Observer: ST & RT

Zone: 51J

Easting: 315200 mE

Northing: 6827900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 23/11/2019

Habitat Assessment #: 267

Observer: ST & RT

Zone: 51J

Easting: 315698 mE

Northing: 6827900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 23/11/2019

Habitat Assessment #: 268

Observer: ST & RT

Zone: 51J

Easting: 316200 mE

Northing: 6827900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 23/11/2019

Habitat Assessment #: 269

Observer: ST & RT

Zone: 51J

Easting: 316698 mE

Northing: 6827900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 23/11/2019

Habitat Assessment #: 270

Observer: ST & RT

Zone: 51J

Easting: 317200 mE

Northing: 6827900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 23/11/2019

Habitat Assessment #: 271

Observer: ST & RT

Zone: 51J

Easting: 317700 mE

Northing: 6827900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 272

Observer: ST & CS

Zone: 51J

Easting: 318198 mE

Northing: 6827900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 12/03/2020

Habitat Assessment #: 273

Observer: ST & CS

Zone: 51J

Easting: 318700 mE

Northing: 6827900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 12/03/2020

Habitat Assessment #: 274

Observer: ST & CS

Zone: 51J

Easting: 319198 mE

Northing: 6827900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 21/11/2019

Habitat Assessment #: 275

Observer: ST & GF

Zone: 51J

Easting: 323200 mE

Northing: 6827900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 276

Observer: ST & GF

Zone: 51J

Easting: 323698 mE

Northing: 6827900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Very good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 277

Observer: ST & GF

Zone: 51J

Easting: 324200 mE

Northing: 6827900 mN

Fire History: >5 years

Landform: Flat/Gentle Slope

Habitat Quality: Very good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 21/11/2019

Habitat Assessment #: 278

Observer: ST & GF

Zone: 51J

Easting: 324698 mE

Northing: 6827900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 21/11/2019

Habitat Assessment #: 279

Observer: ST & GF

Zone: 51J

Easting: 325200 mE

Northing: 6827900 mN

Fire History: >5 years

Landform: Rocky rise

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 20/11/2019

Habitat Assessment #: 280

Observer: RT & JMS

Zone: 51J

Easting: 313199 mE

Northing: 6827400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 20/11/2019

Habitat Assessment #: 281

Observer: RT & JMS

Zone: 51J

Easting: 313698 mE

Northing: 6827400 mN

Fire History: >5 years

Landform: Rocky rise

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Stones



Date: 23/11/2019

Habitat Assessment #: 282

Observer: ST & RT

Zone: 51J

Easting: 315200 mE

Northing: 6827400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 23/11/2019

Habitat Assessment #: 283

Observer: ST & RT

Zone: 51J

Easting: 315698 mE

Northing: 6827400 mN

Fire History: >5 years

Landform: Flat//Undulatng

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 23/11/2019

Habitat Assessment #: 284

Observer: ST & RT

Zone: 51J

Easting: 316200 mE

Northing: 6827400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Highly disturbed

Habitat Structure: Disturbed habitat

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 23/11/2019

Habitat Assessment #: 285

Observer: ST & RT

Zone: 51J

Easting: 316698 mE

Northing: 6827400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 23/11/2019

Habitat Assessment #: 286

Observer: ST & RT

Zone: 51J

Easting: 317200 mE

Northing: 6827400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 23/11/2019

Habitat Assessment #: 287

Observer: ST & RT

Zone: 51J

Easting: 317700 mE

Northing: 6827400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 23/11/2019

Habitat Assessment #: 288

Observer: ST & RT

Zone: 51J

Easting: 318198 mE

Northing: 6827400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 21/11/2019

Habitat Assessment #: 289

Observer: ST & GF

Zone: 51J

Easting: 323698 mE

Northing: 6827400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 290

Observer: ST & GF

Zone: 51J

Easting: 324200 mE

Northing: 6827400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 21/11/2019

Habitat Assessment #: 291

Observer: ST & GF

Zone: 51J

Easting: 324698 mE

Northing: 6827400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 292

Observer: ST & GF

Zone: 51J

Easting: 325200 mE

Northing: 6827400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 23/11/2019

Habitat Assessment #: 293

Observer: ST & RT

Zone: 51J

Easting: 315200 mE

Northing: 6826900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 23/11/2019

Habitat Assessment #: 294

Observer: ST & RT

Zone: 51J

Easting: 315698 mE

Northing: 6826900 mN

Fire History: >5 years

Landform: Flat//Undulatng

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 23/11/2019

Habitat Assessment #: 295

Observer: ST & RT

Zone: 51J

Easting: 316200 mE

Northing: 6826900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 23/11/2019

Habitat Assessment #: 296

Observer: ST & RT

Zone: 51J

Easting: 316699 mE

Northing: 6826900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 23/11/2019

Habitat Assessment #: 297

Observer: ST & RT

Zone: 51J

Easting: 317199 mE

Northing: 6826900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 23/11/2019

Habitat Assessment #: 298

Observer: ST & RT

Zone: 51J

Easting: 317700 mE

Northing: 6826900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Highly disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 23/11/2019

Habitat Assessment #: 299

Observer: ST & RT

Zone: 51J

Easting: 318198 mE

Northing: 6826900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Rock

Soil surface: Rock



Date: 23/11/2019

Habitat Assessment #: 300

Observer: ST & RT

Zone: 51J

Easting: 318700 mE

Northing: 6826900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 21/11/2019

Habitat Assessment #: 301

Observer: ST & GF

Zone: 51J

Easting: 323198 mE

Northing: 6826900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Very good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 21/11/2019

Habitat Assessment #: 302

Observer: ST & GF

Zone: 51J

Easting: 323700 mE

Northing: 6826900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 303

Observer: ST & GF

Zone: 51J

Easting: 324198 mE

Northing: 6826900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 304

Observer: ST & GF

Zone: 51J

Easting: 324700 mE

Northing: 6826900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 305

Observer: ST & GF

Zone: 51J

Easting: 325198 mE

Northing: 6826900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 306

Observer: ST & GF

Zone: 51J

Easting: 325700 mE

Northing: 6826900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 23/11/2019

Habitat Assessment #: 307

Observer: ST & RT

Zone: 51J

Easting: 315200 mE

Northing: 6826400 mN

Fire History: >5 years

Landform: Flat//Undulatng

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 23/11/2019

Habitat Assessment #: 308

Observer: ST & RT

Zone: 51J

Easting: 315699 mE

Northing: 6826400 mN

Fire History: >5 years

Landform: Flat//Undulatng

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 23/11/2019

Habitat Assessment #: 309

Observer: ST & RT

Zone: 51J

Easting: 316200 mE

Northing: 6826400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 23/11/2019

Habitat Assessment #: 310

Observer: ST & RT

Zone: 51J

Easting: 316699 mE

Northing: 6826400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 23/11/2019

Habitat Assessment #: 311

Observer: ST & RT

Zone: 51J

Easting: 317198 mE

Northing: 6826400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 23/11/2019

Habitat Assessment #: 312

Observer: ST & RT

Zone: 51J

Easting: 317700 mE

Northing: 6826400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 23/11/2019

Habitat Assessment #: 313

Observer: ST & RT

Zone: 51J

Easting: 318198 mE

Northing: 6826400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 23/11/2019

Habitat Assessment #: 314

Observer: ST & RT

Zone: 51J

Easting: 318700 mE

Northing: 6826400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Disturbed habitat

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 21/11/2019

Habitat Assessment #: 315

Observer: ST & GF

Zone: 51J

Easting: 323198 mE

Northing: 6826400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 21/11/2019

Habitat Assessment #: 316

Observer: ST & GF

Zone: 51J

Easting: 323699 mE

Northing: 6826400 mN

Fire History: >5 years

Landform: Flat//Undulatng

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 317

Observer: ST & GF

Zone: 51J

Easting: 324200 mE

Northing: 6826400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 318

Observer: ST & GF

Zone: 51J

Easting: 324699 mE

Northing: 6826400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 319

Observer: ST & GF

Zone: 51J

Easting: 325200 mE

Northing: 6826400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 23/11/2019

Habitat Assessment #: 320

Observer: ST & RT

Zone: 51J

Easting: 315198 mE

Northing: 6825950 mN

Fire History: >5 years

Landform: Flat//Undulatng

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 23/11/2019

Habitat Assessment #: 321

Observer: ST & RT

Zone: 51J

Easting: 317198 mE

Northing: 6825900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 23/11/2019

Habitat Assessment #: 322

Observer: ST & RT

Zone: 51J

Easting: 317700 mE

Northing: 6825900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 23/11/2019

Habitat Assessment #: 323

Observer: ST & RT

Zone: 51J

Easting: 318198 mE

Northing: 6825900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 23/11/2019

Habitat Assessment #: 324

Observer: ST & RT

Zone: 51J

Easting: 318699 mE

Northing: 6825900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 325

Observer: ST & JMS

Zone: 51J

Easting: 320698 mE

Northing: 6825900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 326

Observer: ST & JMS

Zone: 51J

Easting: 321200 mE

Northing: 6825900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Highly disturbed

Habitat Structure: Disturbed habitat

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 327

Observer: ST & JMS

Zone: 51J

Easting: 321698 mE

Northing: 6825900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Highly disturbed

Habitat Structure: Disturbed habitat

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 328

Observer: ST & JMS

Zone: 51J

Easting: 322200 mE

Northing: 6825900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Highly disturbed

Habitat Structure: Disturbed habitat

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 329

Observer: ST & JMS

Zone: 51J

Easting: 322698 mE

Northing: 6825900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 330

Observer: ST & GF

Zone: 51J

Easting: 323200 mE

Northing: 6825900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 21/11/2019

Habitat Assessment #: 331

Observer: ST & GF

Zone: 51J

Easting: 323698 mE

Northing: 6825900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 332

Observer: ST & GF

Zone: 51J

Easting: 324200 mE

Northing: 6825900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 333

Observer: ST & GF

Zone: 51J

Easting: 324698 mE

Northing: 6825900 mN

Fire History: >5 years

Landform: Flat/Gentle Slope

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 23/11/2019

Habitat Assessment #: 334

Observer: ST & RT

Zone: 51J

Easting: 317198 mE

Northing: 6825400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 23/11/2019

Habitat Assessment #: 335

Observer: ST & RT

Zone: 51J

Easting: 317700 mE

Northing: 6825400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 336

Observer: ST & JMS

Zone: 51J

Easting: 318200 mE

Northing: 6825400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 337

Observer: ST & JMS

Zone: 51J

Easting: 318698 mE

Northing: 6825400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 338

Observer: ST & JMS

Zone: 51J

Easting: 319200 mE

Northing: 6825400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 339

Observer: ST & JMS

Zone: 51J

Easting: 319698 mE

Northing: 6825400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 340

Observer: ST & JMS

Zone: 51J

Easting: 320200 mE

Northing: 6825400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 24/11/2019

Habitat Assessment #: 341

Observer: ST & JMS

Zone: 51J

Easting: 320698 mE

Northing: 6825400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 24/11/2019

Habitat Assessment #: 342

Observer: ST & JMS

Zone: 51J

Easting: 321200 mE

Northing: 6825400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 24/11/2019

Habitat Assessment #: 343

Observer: ST & JMS

Zone: 51J

Easting: 321698 mE

Northing: 6825400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 24/11/2019

Habitat Assessment #: 344

Observer: ST & JMS

Zone: 51J

Easting: 322200 mE

Northing: 6825400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 24/11/2019

Habitat Assessment #: 345

Observer: ST & JMS

Zone: 51J

Easting: 322698 mE

Northing: 6825400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 346

Observer: ST & GF

Zone: 51J

Easting: 323200 mE

Northing: 6825400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Very good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 21/11/2019

Habitat Assessment #: 347

Observer: ST & GF

Zone: 51J

Easting: 323700 mE

Northing: 6825400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 348

Observer: ST & GF

Zone: 51J

Easting: 324198 mE

Northing: 6825400 mN

Fire History: >5 years

Landform: Rocky rise

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 21/11/2019

Habitat Assessment #: 349

Observer: ST & GF

Zone: 51J

Easting: 324700 mE

Northing: 6825400 mN

Fire History: >5 years

Landform: Flat/Gentle Slope

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 23/11/2019

Habitat Assessment #: 350

Observer: ST & RT

Zone: 51J

Easting: 317198 mE

Northing: 6824900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 23/11/2019

Habitat Assessment #: 351

Observer: ST & RT

Zone: 51J

Easting: 317700 mE

Northing: 6824900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 352

Observer: ST & JMS

Zone: 51J

Easting: 318200 mE

Northing: 6824900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 353

Observer: ST & JMS

Zone: 51J

Easting: 318698 mE

Northing: 6824900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 354

Observer: ST & JMS

Zone: 51J

Easting: 319200 mE

Northing: 6824900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 355

Observer: ST & JMS

Zone: 51J

Easting: 319698 mE

Northing: 6824900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 356

Observer: ST & JMS

Zone: 51J

Easting: 320200 mE

Northing: 6824900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 357

Observer: ST & JMS

Zone: 51J

Easting: 320698 mE

Northing: 6824900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 358

Observer: ST & JMS

Zone: 51J

Easting: 321200 mE

Northing: 6824900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 24/11/2019

Habitat Assessment #: 359

Observer: ST & JMS

Zone: 51J

Easting: 321698 mE

Northing: 6824900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 24/11/2019

Habitat Assessment #: 360

Observer: ST & JMS

Zone: 51J

Easting: 322198 mE

Northing: 6824900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 24/11/2019

Habitat Assessment #: 361

Observer: ST & JMS

Zone: 51J

Easting: 322700 mE

Northing: 6824900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 362

Observer: ST & GF

Zone: 51J

Easting: 323198 mE

Northing: 6824900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 363

Observer: ST & GF

Zone: 51J

Easting: 323700 mE

Northing: 6824900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 364

Observer: ST & GF

Zone: 51J

Easting: 324198 mE

Northing: 6824900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 21/11/2019

Habitat Assessment #: 365

Observer: ST & GF

Zone: 51J

Easting: 324700 mE

Northing: 6824900 mN

Fire History: >5 years

Landform: Flat/Gentle Slope

Habitat Quality: Disturbed

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 24/11/2019

Habitat Assessment #: 366

Observer: ST & JMS

Zone: 51J

Easting: 316700 mE

Northing: 6824400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 367

Observer: ST & JMS

Zone: 51J

Easting: 317198 mE

Northing: 6824400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 368

Observer: ST & JMS

Zone: 51J

Easting: 317700 mE

Northing: 6824400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 24/11/2019

Habitat Assessment #: 369

Observer: ST & JMS

Zone: 51J

Easting: 318200 mE

Northing: 6824400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 370

Observer: ST & JMS

Zone: 51J

Easting: 318698 mE

Northing: 6824400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 371

Observer: ST & JMS

Zone: 51J

Easting: 319200 mE

Northing: 6824400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 21/11/2019

Habitat Assessment #: 372

Observer: ST & GF

Zone: 51J

Easting: 319698 mE

Northing: 6824400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 21/11/2019

Habitat Assessment #: 373

Observer: ST & GF

Zone: 51J

Easting: 320200 mE

Northing: 6824400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 374

Observer: ST & GF

Zone: 51J

Easting: 320698 mE

Northing: 6824400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 21/11/2019

Habitat Assessment #: 375

Observer: ST & GF

Zone: 51J

Easting: 321198 mE

Northing: 6824400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 376

Observer: ST & GF

Zone: 51J

Easting: 321700 mE

Northing: 6824400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Highly disturbed

Habitat Structure: Disturbed habitat

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 21/11/2019

Habitat Assessment #: 377

Observer: ST & GF

Zone: 51J

Easting: 322198 mE

Northing: 6824400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 378

Observer: ST & GF

Zone: 51J

Easting: 322700 mE

Northing: 6824400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 379

Observer: ST & GF

Zone: 51J

Easting: 323198 mE

Northing: 6824400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 380

Observer: ST & GF

Zone: 51J

Easting: 323698 mE

Northing: 6824400 mN

Fire History: >5 years

Landform: Rocky rise

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 21/11/2019

Habitat Assessment #: 381

Observer: ST & GF

Zone: 51J

Easting: 324200 mE

Northing: 6824400 mN

Fire History: >5 years

Landform: Flat/Gentle Slope

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 24/11/2019

Habitat Assessment #: 382

Observer: ST & JMS

Zone: 51J

Easting: 316700 mE

Northing: 6823900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 383

Observer: ST & JMS

Zone: 51J

Easting: 317198 mE

Northing: 6823900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 384

Observer: ST & JMS

Zone: 51J

Easting: 317700 mE

Northing: 6823900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Highly disturbed

Habitat Structure: Claypan

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 385

Observer: ST & JMS

Zone: 51J

Easting: 318200 mE

Northing: 6823900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 386

Observer: ST & JMS

Zone: 51J

Easting: 318698 mE

Northing: 6823900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 387

Observer: ST & JMS

Zone: 51J

Easting: 319200 mE

Northing: 6823900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 21/11/2019

Habitat Assessment #: 388

Observer: ST & GF

Zone: 51J

Easting: 319698 mE

Northing: 6823900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 21/11/2019

Habitat Assessment #: 389

Observer: ST & GF

Zone: 51J

Easting: 320199 mE

Northing: 6823900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 21/11/2019

Habitat Assessment #: 390

Observer: ST & GF

Zone: 51J

Easting: 320700 mE

Northing: 6823900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 391

Observer: ST & GF

Zone: 51J

Easting: 321198 mE

Northing: 6823900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 21/11/2019

Habitat Assessment #: 392

Observer: ST & GF

Zone: 51J

Easting: 321700 mE

Northing: 6823900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 393

Observer: ST & GF

Zone: 51J

Easting: 322198 mE

Northing: 6823900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Very good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 394

Observer: ST & GF

Zone: 51J

Easting: 322698 mE

Northing: 6823900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 395

Observer: ST & GF

Zone: 51J

Easting: 323200 mE

Northing: 6823900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 21/11/2019

Habitat Assessment #: 396

Observer: ST & GF

Zone: 51J

Easting: 323698 mE

Northing: 6823900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Very good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 397

Observer: ST & GF

Zone: 51J

Easting: 324200 mE

Northing: 6823900 mN

Fire History: >5 years

Landform: Flat/Gentle Slope

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 21/11/2019

Habitat Assessment #: 398

Observer: ST & GF

Zone: 51J

Easting: 324700 mE

Northing: 6823900 mN

Fire History: >5 years

Landform: Flat/Gentle Slope

Habitat Quality: Disturbed

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 24/11/2019

Habitat Assessment #: 399

Observer: ST & JMS

Zone: 51J

Easting: 316700 mE

Northing: 6823400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 400

Observer: ST & JMS

Zone: 51J

Easting: 317198 mE

Northing: 6823400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 401

Observer: ST & JMS

Zone: 51J

Easting: 317700 mE

Northing: 6823400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 402

Observer: ST & JMS

Zone: 51J

Easting: 318200 mE

Northing: 6823400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 403

Observer: ST & JMS

Zone: 51J

Easting: 318698 mE

Northing: 6823400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 404

Observer: ST & JMS

Zone: 51J

Easting: 319200 mE

Northing: 6823400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 405

Observer: ST & GF

Zone: 51J

Easting: 319698 mE

Northing: 6823400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 21/11/2019

Habitat Assessment #: 406

Observer: ST & GF

Zone: 51J

Easting: 320198 mE

Northing: 6823400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 407

Observer: ST & GF

Zone: 51J

Easting: 320700 mE

Northing: 6823400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Very good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 21/11/2019

Habitat Assessment #: 408

Observer: ST & GF

Zone: 51J

Easting: 322200 mE

Northing: 6823400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 409

Observer: ST & GF

Zone: 51J

Easting: 322698 mE

Northing: 6823400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 21/11/2019

Habitat Assessment #: 410

Observer: ST & GF

Zone: 51J

Easting: 324700 mE

Northing: 6823400 mN

Fire History: >5 years

Landform: Flat/Gentle Slope

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 21/11/2019

Habitat Assessment #: 411

Observer: ST & GF

Zone: 51J

Easting: 325200 mE

Northing: 6823400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 24/11/2019

Habitat Assessment #: 412

Observer: ST & JMS

Zone: 51J

Easting: 316700 mE

Northing: 6822900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 413

Observer: ST & JMS

Zone: 51J

Easting: 317200 mE

Northing: 6822900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 414

Observer: ST & JMS

Zone: 51J

Easting: 317700 mE

Northing: 6822900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 415

Observer: ST & JMS

Zone: 51J

Easting: 318200 mE

Northing: 6822900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Highly disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 24/11/2019

Habitat Assessment #: 416

Observer: ST & JMS

Zone: 51J

Easting: 318698 mE

Northing: 6822900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 24/11/2019

Habitat Assessment #: 417

Observer: ST & JMS

Zone: 51J

Easting: 319200 mE

Northing: 6822900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 418

Observer: ST & GF

Zone: 51J

Easting: 319700 mE

Northing: 6822900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 419

Observer: ST & GF

Zone: 51J

Easting: 320198 mE

Northing: 6822900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 21/11/2019

Habitat Assessment #: 420

Observer: ST & GF

Zone: 51J

Easting: 320700 mE

Northing: 6822900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 21/11/2019

Habitat Assessment #: 421

Observer: ST & GF

Zone: 51J

Easting: 321178 mE

Northing: 6822900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Very good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 21/11/2019

Habitat Assessment #: 422

Observer: ST & GF

Zone: 51J

Easting: 322200 mE

Northing: 6822900 mN

Fire History: >5 years

Landform: Flat/Gentle Slope

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 423

Observer: ST & GF

Zone: 51J

Easting: 325398 mE

Northing: 6822900 mN

Fire History: >5 years

Landform: Rocky rise

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Stones



Date: 24/11/2019

Habitat Assessment #: 424

Observer: ST & JMS

Zone: 51J

Easting: 317200 mE

Northing: 6822400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 425

Observer: ST & JMS

Zone: 51J

Easting: 317700 mE

Northing: 6822400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 24/11/2019

Habitat Assessment #: 426

Observer: ST & JMS

Zone: 51J

Easting: 320700 mE

Northing: 6821400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 21/11/2019

Habitat Assessment #: 427

Observer: ST & GF

Zone: 51J

Easting: 321200 mE

Northing: 6821400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 21/11/2019

Habitat Assessment #: 428

Observer: ST & GF

Zone: 51J

Easting: 321699 mE

Northing: 6821400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 429

Observer: ST & GF

Zone: 51J

Easting: 321198 mE

Northing: 6820900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 21/11/2019

Habitat Assessment #: 430

Observer: ST & GF

Zone: 51J

Easting: 318200 mE

Northing: 6822400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 21/11/2019

Habitat Assessment #: 431

Observer: ST & GF

Zone: 51J

Easting: 319200 mE

Northing: 6822400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 21/11/2019

Habitat Assessment #: 432

Observer: ST & GF

Zone: 51J

Easting: 319700 mE

Northing: 6822400 mN

Fire History: >5 years

Landform: Flat/Gentle Slope

Habitat Quality: Very good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 21/11/2019

Habitat Assessment #: 433

Observer: ST & GF

Zone: 51J

Easting: 320198 mE

Northing: 6822400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Very good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 21/11/2019

Habitat Assessment #: 434

Observer: ST & GF

Zone: 51J

Easting: 320700 mE

Northing: 6822400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 21/11/2019

Habitat Assessment #: 435

Observer: ST & GF

Zone: 51J

Easting: 321178 mE

Northing: 6822400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 436

Observer: ST & GF

Zone: 51J

Easting: 319700 mE

Northing: 6821900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 437

Observer: ST & GF

Zone: 51J

Easting: 320198 mE

Northing: 6821900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 438

Observer: ST & GF

Zone: 51J

Easting: 320700 mE

Northing: 6821900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 21/11/2019

Habitat Assessment #: 439

Observer: ST & GF

Zone: 51J

Easting: 321178 mE

Northing: 6821900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 24/11/2019

Habitat Assessment #: 440

Observer: ST & JMS

Zone: 51J

Easting: 318629 mE

Northing: 6822596 mN

Fire History: >5 years

Landform: Riverbed

Habitat Quality: Good

Habitat Structure: Sullivan Creek

Soil Type: Riversand

Soil surface: Riversand and Rock



Date: 24/11/2019

Habitat Assessment #: 441

Observer: ST & JMS

Zone: 51J

Easting: 318467 mE

Northing: 6822900 mN

Fire History: >5 years

Landform: Riverbed

Habitat Quality: Good

Habitat Structure: Sullivan Creek

Soil Type: Riversand

Soil surface: Riversand and Rock



Date: 24/11/2019

Habitat Assessment #: 442

Observer: ST & JMS

Zone: 51J

Easting: 318277 mE

Northing: 6823400 mN

Fire History: >5 years

Landform: Riverbed

Habitat Quality: Good

Habitat Structure: Sullivan Creek

Soil Type: Riversand

Soil surface: Riversand and Rock



Date: 24/11/2019

Habitat Assessment #: 443

Observer: ST & JMS

Zone: 51J

Easting: 318391 mE

Northing: 6823900 mN

Fire History: >5 years

Landform: Riverbed

Habitat Quality: Good

Habitat Structure: Sullivan Creek

Soil Type: Riversand

Soil surface: Riversand and Rock



Date: 24/11/2019

Habitat Assessment #: 444

Observer: ST & JMS

Zone: 51J

Easting: 318464 mE

Northing: 6824400 mN

Fire History: >5 years

Landform: Riverbed

Habitat Quality: Good

Habitat Structure: Sullivan Creek

Soil Type: Riversand

Soil surface: Riversand and Rock



Date: 24/11/2019

Habitat Assessment #: 445

Observer: ST & JMS

Zone: 51J

Easting: 318615 mE

Northing: 6824900 mN

Fire History: >5 years

Landform: Riverbed

Habitat Quality: Good

Habitat Structure: Sullivan Creek

Soil Type: Riversand

Soil surface: Riversand and Rock



Date: 24/11/2019

Habitat Assessment #: 446

Observer: ST & JMS

Zone: 51J

Easting: 318455 mE

Northing: 6825400 mN

Fire History: >5 years

Landform: Riverbed

Habitat Quality: Good

Habitat Structure: Sullivan Creek

Soil Type: Riversand

Soil surface: Riversand and Rock



Date: 23/11/2019

Habitat Assessment #: 447

Observer: ST & RT

Zone: 51J

Easting: 318450 mE

Northing: 6825900 mN

Fire History: >5 years

Landform: Riverbed

Habitat Quality: Good

Habitat Structure: Sullivan Creek

Soil Type: Riversand

Soil surface: Riversand and Rock



Date: 23/11/2019

Habitat Assessment #: 448

Observer: ST & RT

Zone: 51J

Easting: 318395 mE

Northing: 6826400 mN

Fire History: >5 years

Landform: Riverbed

Habitat Quality: Good

Habitat Structure: Sullivan Creek

Soil Type: Riversand

Soil surface: Riversand and Rock



Date: 23/11/2019

Habitat Assessment #: 449

Observer: ST & RT

Zone: 51J

Easting: 318226 mE

Northing: 6826900 mN

Fire History: >5 years

Landform: Riverbed

Habitat Quality: Good

Habitat Structure: Sullivan Creek

Soil Type: Riversand

Soil surface: Riversand and Rock



Date: 23/11/2019

Habitat Assessment #: 450

Observer: ST & RT

Zone: 51J

Easting: 318098 mE

Northing: 6827400 mN

Fire History: >5 years

Landform: Riverbed

Habitat Quality: Good

Habitat Structure: Sullivan Creek

Soil Type: Riversand

Soil surface: Riversand and Rock



Date: 23/11/2019

Habitat Assessment #: 451

Observer: ST & RT

Zone: 51J

Easting: 317889 mE

Northing: 6827900 mN

Fire History: >5 years

Landform: Riverbed

Habitat Quality: Good

Habitat Structure: Sullivan Creek

Soil Type: Riversand

Soil surface: Riversand and Rock



Date: 23/11/2019

Habitat Assessment #: 452

Observer: ST & RT

Zone: 51J

Easting: 317955 mE

Northing: 6828400 mN

Fire History: >5 years

Landform: Riverbed

Habitat Quality: Good

Habitat Structure: Sullivan Creek

Soil Type: Riversand

Soil surface: Riversand and Rock



Date: 23/11/2019

Habitat Assessment #: 453

Observer: ST & RT

Zone: 51J

Easting: 317819 mE

Northing: 6828900 mN

Fire History: >5 years

Landform: Riverbed

Habitat Quality: Good

Habitat Structure: Sullivan Creek

Soil Type: Riversand

Soil surface: Riversand and Rock



Date: 23/11/2019

Habitat Assessment #: 454

Observer: ST & RT

Zone: 51J

Easting: 317676 mE

Northing: 6829400 mN

Fire History: >5 years

Landform: Riverbed

Habitat Quality: Good

Habitat Structure: Sullivan Creek

Soil Type: Riversand

Soil surface: Riversand and Rock



Date: 23/11/2019

Habitat Assessment #: 455

Observer: ST & RT

Zone: 51J

Easting: 317321 mE

Northing: 6829900 mN

Fire History: >5 years

Landform: Riverbed

Habitat Quality: Good

Habitat Structure: Sullivan Creek

Soil Type: Riversand

Soil surface: Riversand and Rock



Date: 23/11/2019

Habitat Assessment #: 456

Observer: ST & RT

Zone: 51J

Easting: 317420 mE

Northing: 6830400 mN

Fire History: >5 years

Landform: Riverbed

Habitat Quality: Good

Habitat Structure: Sullivan Creek

Soil Type: Riversand

Soil surface: Riversand and Rock



Date: 23/11/2019

Habitat Assessment #: 457

Observer: ST & RT

Zone: 51J

Easting: 317508 mE

Northing: 6830900 mN

Fire History: >5 years

Landform: Riverbed

Habitat Quality: Good

Habitat Structure: Sullivan Creek

Soil Type: Riversand

Soil surface: Riversand and Rock



Date: 23/11/2019

Habitat Assessment #: 458

Observer: ST & RT

Zone: 51J

Easting: 317325 mE

Northing: 6831400 mN

Fire History: >5 years

Landform: Riverbed

Habitat Quality: Good

Habitat Structure: Sullivan Creek

Soil Type: Riversand

Soil surface: Riversand and Rock



Date: 23/11/2019

Habitat Assessment #: 459

Observer: ST & RT

Zone: 51J

Easting: 317461 mE

Northing: 6831900 mN

Fire History: >5 years

Landform: Riverbed

Habitat Quality: Good

Habitat Structure: Sullivan Creek

Soil Type: Riversand

Soil surface: Riversand and Rock



Date: 23/11/2019

Habitat Assessment #: 460

Observer: ST & RT

Zone: 51J

Easting: 317633 mE

Northing: 6832400 mN

Fire History: >5 years

Landform: Riverbed

Habitat Quality: Good

Habitat Structure: Sullivan Creek

Soil Type: Riversand

Soil surface: Riversand and Rock



Date: 23/11/2019

Habitat Assessment #: 461

Observer: ST & RT

Zone: 51J

Easting: 317544 mE

Northing: 6832900 mN

Fire History: >5 years

Landform: Riverbed

Habitat Quality: Good

Habitat Structure: Sullivan Creek

Soil Type: Riversand

Soil surface: Riversand and Rock



Date: 22/11/2019

Habitat Assessment #: 462

Observer: ST & JMS

Zone: 51J

Easting: 317730 mE

Northing: 6833400 mN

Fire History: >5 years

Landform: Riverbed

Habitat Quality: Good

Habitat Structure: Sullivan Creek

Soil Type: Riversand

Soil surface: Riversand and Rock



Date: 22/11/2019

Habitat Assessment #: 463

Observer: ST & JMS

Zone: 51J

Easting: 317981 mE

Northing: 6833900 mN

Fire History: >5 years

Landform: Riverbed

Habitat Quality: Good

Habitat Structure: Sullivan Creek

Soil Type: Riversand

Soil surface: Riversand and Rock



Date: 22/11/2019

Habitat Assessment #: 464

Observer: ST & JMS

Zone: 51J

Easting: 318062 mE

Northing: 6834400 mN

Fire History: >5 years

Landform: Riverbed

Habitat Quality: Good

Habitat Structure: Sullivan Creek

Soil Type: Riversand

Soil surface: Riversand and Rock



Date: 22/11/2019

Habitat Assessment #: 465

Observer: ST & JMS

Zone: 51J

Easting: 317999 mE

Northing: 6834900 mN

Fire History: >5 years

Landform: Riverbed

Habitat Quality: Good

Habitat Structure: Sullivan Creek

Soil Type: Riversand

Soil surface: Riversand and Rock



Date: 16/03/2020

Habitat Assessment #: 466

Observer: RT & CS

Zone: 51J

Easting: 316200 mE

Northing: 6822900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 15/03/2020

Habitat Assessment #: 467

Observer: ST & RT

Zone: 51J

Easting: 315700 mE

Northing: 6822400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 16/03/2020

Habitat Assessment #: 468

Observer: RT & CS

Zone: 51J

Easting: 316200 mE

Northing: 6822400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 469

Observer: RT & CS

Zone: 51J

Easting: 316700 mE

Northing: 6822400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 16/03/2020

Habitat Assessment #: 470

Observer: RT & CS

Zone: 51J

Easting: 318700 mE

Northing: 6822400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 16/03/2020

Habitat Assessment #: 471

Observer: RT & CS

Zone: 51J

Easting: 314700 mE

Northing: 6821900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 472

Observer: RT & CS

Zone: 51J

Easting: 315200 mE

Northing: 6821900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 473

Observer: ST & RT

Zone: 51J

Easting: 315700 mE

Northing: 6821900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 17/03/2020

Habitat Assessment #: 474

Observer: ST & GF

Zone: 51J

Easting: 316200 mE

Northing: 6821900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 17/03/2020

Habitat Assessment #: 475

Observer: ST & GF

Zone: 51J

Easting: 316700 mE

Northing: 6821900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 17/03/2020

Habitat Assessment #: 476

Observer: ST & GF

Zone: 51J

Easting: 317200 mE

Northing: 6821900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 16/03/2020

Habitat Assessment #: 477

Observer: RT & CS

Zone: 51J

Easting: 317700 mE

Northing: 6821900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 16/03/2020

Habitat Assessment #: 478

Observer: RT & CS

Zone: 51J

Easting: 318200 mE

Northing: 6821900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 16/03/2020

Habitat Assessment #: 479

Observer: RT & CS

Zone: 51J

Easting: 313700 mE

Northing: 6821400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 480

Observer: RT & CS

Zone: 51J

Easting: 314200 mE

Northing: 6821400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 481

Observer: RT & CS

Zone: 51J

Easting: 314700 mE

Northing: 6821400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 482

Observer: RT & CS

Zone: 51J

Easting: 315200 mE

Northing: 6821400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 483

Observer: ST & RT

Zone: 51J

Easting: 315700 mE

Northing: 6821400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 17/03/2020

Habitat Assessment #: 484

Observer: ST & GF

Zone: 51J

Easting: 316200 mE

Northing: 6821400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 17/03/2020

Habitat Assessment #: 485

Observer: ST & GF

Zone: 51J

Easting: 316700 mE

Northing: 6821400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 17/03/2020

Habitat Assessment #: 486

Observer: ST & GF

Zone: 51J

Easting: 317200 mE

Northing: 6821400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 17/03/2020

Habitat Assessment #: 487

Observer: ST & GF

Zone: 51J

Easting: 317700 mE

Northing: 6821400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 16/03/2020

Habitat Assessment #: 488

Observer: RT & CS

Zone: 51J

Easting: 313200 mE

Northing: 6820900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 489

Observer: RT & CS

Zone: 51J

Easting: 313700 mE

Northing: 6820900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 490

Observer: RT & CS

Zone: 51J

Easting: 314200 mE

Northing: 6820900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 491

Observer: RT & CS

Zone: 51J

Easting: 314700 mE

Northing: 6820900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 492

Observer: RT & CS

Zone: 51J

Easting: 315200 mE

Northing: 6820900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 493

Observer: ST & RT

Zone: 51J

Easting: 315700 mE

Northing: 6820900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 17/03/2020

Habitat Assessment #: 494

Observer: ST & GF

Zone: 51J

Easting: 316200 mE

Northing: 6820900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 17/03/2020

Habitat Assessment #: 495

Observer: ST & GF

Zone: 51J

Easting: 316700 mE

Northing: 6820900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 17/03/2020

Habitat Assessment #: 496

Observer: ST & GF

Zone: 51J

Easting: 317200 mE

Northing: 6820900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 17/03/2020

Habitat Assessment #: 497

Observer: ST & GF

Zone: 51J

Easting: 317700 mE

Northing: 6820900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 498

Observer: RT & CS

Zone: 51J

Easting: 312200 mE

Northing: 6820400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Stones



Date: 16/03/2020

Habitat Assessment #: 499

Observer: RT & CS

Zone: 51J

Easting: 312700 mE

Northing: 6820400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 500

Observer: RT & CS

Zone: 51J

Easting: 313200 mE

Northing: 6820400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 501

Observer: RT & CS

Zone: 51J

Easting: 313700 mE

Northing: 6820400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 502

Observer: RT & CS

Zone: 51J

Easting: 314200 mE

Northing: 6820400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 503

Observer: RT & CS

Zone: 51J

Easting: 314700 mE

Northing: 6820400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 16/03/2020

Habitat Assessment #: 504

Observer: RT & CS

Zone: 51J

Easting: 315200 mE

Northing: 6820400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 505

Observer: ST & RT

Zone: 51J

Easting: 315700 mE

Northing: 6820400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 17/03/2020

Habitat Assessment #: 506

Observer: ST & GF

Zone: 51J

Easting: 316200 mE

Northing: 6820400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 17/03/2020

Habitat Assessment #: 507

Observer: ST & GF

Zone: 51J

Easting: 316700 mE

Northing: 6820400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 17/03/2020

Habitat Assessment #: 508

Observer: ST & GF

Zone: 51J

Easting: 317200 mE

Northing: 6820400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 14/03/2020

Habitat Assessment #: 509

Observer: RT & GF

Zone: 51J

Easting: 311200 mE

Northing: 6819900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 14/03/2020

Habitat Assessment #: 510

Observer: RT & GF

Zone: 51J

Easting: 311700 mE

Northing: 6819900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 511

Observer: RT & CS

Zone: 51J

Easting: 312200 mE

Northing: 6819900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 512

Observer: RT & CS

Zone: 51J

Easting: 312700 mE

Northing: 6819900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 513

Observer: RT & CS

Zone: 51J

Easting: 313200 mE

Northing: 6819900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 514

Observer: RT & CS

Zone: 51J

Easting: 313700 mE

Northing: 6819900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 515

Observer: RT & CS

Zone: 51J

Easting: 314200 mE

Northing: 6819900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 516

Observer: RT & CS

Zone: 51J

Easting: 314700 mE

Northing: 6819900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 517

Observer: RT & CS

Zone: 51J

Easting: 315200 mE

Northing: 6819900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 518

Observer: ST & RT

Zone: 51J

Easting: 315700 mE

Northing: 6819900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 17/03/2020

Habitat Assessment #: 519

Observer: ST & GF

Zone: 51J

Easting: 316200 mE

Northing: 6819900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 17/03/2020

Habitat Assessment #: 520

Observer: ST & GF

Zone: 51J

Easting: 316700 mE

Northing: 6819900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 14/03/2020

Habitat Assessment #: 521

Observer: RT & GF

Zone: 51J

Easting: 310700 mE

Northing: 6819400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 14/03/2020

Habitat Assessment #: 522

Observer: RT & GF

Zone: 51J

Easting: 311200 mE

Northing: 6819400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 14/03/2020

Habitat Assessment #: 523

Observer: RT & GF

Zone: 51J

Easting: 311700 mE

Northing: 6819400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 524

Observer: RT & CS

Zone: 51J

Easting: 312200 mE

Northing: 6819400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 525

Observer: RT & CS

Zone: 51J

Easting: 312700 mE

Northing: 6819400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Cobbles



Date: 16/03/2020

Habitat Assessment #: 526

Observer: RT & CS

Zone: 51J

Easting: 313200 mE

Northing: 6819400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 527

Observer: RT & CS

Zone: 51J

Easting: 313700 mE

Northing: 6819400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 528

Observer: RT & CS

Zone: 51J

Easting: 314200 mE

Northing: 6819400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 529

Observer: RT & CS

Zone: 51J

Easting: 314700 mE

Northing: 6819400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 530

Observer: RT & CS

Zone: 51J

Easting: 315200 mE

Northing: 6819400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 531

Observer: ST & RT

Zone: 51J

Easting: 315700 mE

Northing: 6819400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 17/03/2020

Habitat Assessment #: 532

Observer: ST & GF

Zone: 51J

Easting: 316200 mE

Northing: 6819400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 17/03/2020

Habitat Assessment #: 533

Observer: ST & GF

Zone: 51J

Easting: 316700 mE

Northing: 6819400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 14/03/2020

Habitat Assessment #: 534

Observer: RT & GF

Zone: 51J

Easting: 309700 mE

Northing: 6818900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 14/03/2020

Habitat Assessment #: 535

Observer: RT & GF

Zone: 51J

Easting: 310200 mE

Northing: 6818900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 14/03/2020

Habitat Assessment #: 536

Observer: RT & GF

Zone: 51J

Easting: 310700 mE

Northing: 6818900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 14/03/2020

Habitat Assessment #: 537

Observer: RT & GF

Zone: 51J

Easting: 311200 mE

Northing: 6818900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 14/03/2020

Habitat Assessment #: 538

Observer: RT & GF

Zone: 51J

Easting: 311700 mE

Northing: 6818900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 539

Observer: RT & CS

Zone: 51J

Easting: 312200 mE

Northing: 6818900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 540

Observer: RT & CS

Zone: 51J

Easting: 312700 mE

Northing: 6818900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 16/03/2020

Habitat Assessment #: 541

Observer: RT & CS

Zone: 51J

Easting: 313200 mE

Northing: 6818900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 542

Observer: RT & CS

Zone: 51J

Easting: 313700 mE

Northing: 6818900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 16/03/2020

Habitat Assessment #: 543

Observer: RT & CS

Zone: 51J

Easting: 314200 mE

Northing: 6818900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 16/03/2020

Habitat Assessment #: 544

Observer: RT & CS

Zone: 51J

Easting: 314700 mE

Northing: 6818900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 16/03/2020

Habitat Assessment #: 545

Observer: RT & CS

Zone: 51J

Easting: 315200 mE

Northing: 6818900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 546

Observer: ST & RT

Zone: 51J

Easting: 315700 mE

Northing: 6818900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 17/03/2020

Habitat Assessment #: 547

Observer: ST & GF

Zone: 51J

Easting: 316200 mE

Northing: 6818900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 14/03/2020

Habitat Assessment #: 548

Observer: RT & GF

Zone: 51J

Easting: 308700 mE

Northing: 6818400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 14/03/2020

Habitat Assessment #: 549

Observer: RT & GF

Zone: 51J

Easting: 309200 mE

Northing: 6818400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 14/03/2020

Habitat Assessment #: 550

Observer: RT & GF

Zone: 51J

Easting: 309700 mE

Northing: 6818400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 14/03/2020

Habitat Assessment #: 551

Observer: RT & GF

Zone: 51J

Easting: 310200 mE

Northing: 6818400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 14/03/2020

Habitat Assessment #: 552

Observer: RT & GF

Zone: 51J

Easting: 310700 mE

Northing: 6818400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 14/03/2020

Habitat Assessment #: 553

Observer: RT & GF

Zone: 51J

Easting: 311200 mE

Northing: 6818400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 15/03/2020

Habitat Assessment #: 554

Observer: ST & RT

Zone: 51J

Easting: 311700 mE

Northing: 6818400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 15/03/2020

Habitat Assessment #: 555

Observer: ST & RT

Zone: 51J

Easting: 312200 mE

Northing: 6818400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 15/03/2020

Habitat Assessment #: 556

Observer: ST & RT

Zone: 51J

Easting: 312700 mE

Northing: 6818400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 15/03/2020

Habitat Assessment #: 557

Observer: ST & RT

Zone: 51J

Easting: 313200 mE

Northing: 6818400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 15/03/2020

Habitat Assessment #: 558

Observer: ST & RT

Zone: 51J

Easting: 313700 mE

Northing: 6818400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 559

Observer: ST & RT

Zone: 51J

Easting: 314200 mE

Northing: 6818400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 560

Observer: ST & RT

Zone: 51J

Easting: 314700 mE

Northing: 6818400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 561

Observer: ST & RT

Zone: 51J

Easting: 315200 mE

Northing: 6818400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 562

Observer: ST & RT

Zone: 51J

Easting: 315700 mE

Northing: 6818400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 14/03/2020

Habitat Assessment #: 563

Observer: RT & GF

Zone: 51J

Easting: 308700 mE

Northing: 6817900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 14/03/2020

Habitat Assessment #: 564

Observer: RT & GF

Zone: 51J

Easting: 309200 mE

Northing: 6817900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Disturbed

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 14/03/2020

Habitat Assessment #: 565

Observer: RT & GF

Zone: 51J

Easting: 309700 mE

Northing: 6817900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 14/03/2020

Habitat Assessment #: 566

Observer: RT & GF

Zone: 51J

Easting: 310200 mE

Northing: 6817900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 14/03/2020

Habitat Assessment #: 567

Observer: RT & GF

Zone: 51J

Easting: 310700 mE

Northing: 6817900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 14/03/2020

Habitat Assessment #: 568

Observer: RT & GF

Zone: 51J

Easting: 311200 mE

Northing: 6817900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 15/03/2020

Habitat Assessment #: 569

Observer: ST & RT

Zone: 51J

Easting: 311700 mE

Northing: 6817900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 15/03/2020

Habitat Assessment #: 570

Observer: ST & RT

Zone: 51J

Easting: 312200 mE

Northing: 6817900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 15/03/2020

Habitat Assessment #: 571

Observer: ST & RT

Zone: 51J

Easting: 312700 mE

Northing: 6817900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 15/03/2020

Habitat Assessment #: 572

Observer: ST & RT

Zone: 51J

Easting: 313200 mE

Northing: 6817900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 573

Observer: ST & RT

Zone: 51J

Easting: 313700 mE

Northing: 6817900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 574

Observer: ST & RT

Zone: 51J

Easting: 314200 mE

Northing: 6817900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 575

Observer: ST & RT

Zone: 51J

Easting: 314700 mE

Northing: 6817900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 576

Observer: ST & RT

Zone: 51J

Easting: 315200 mE

Northing: 6817900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 14/03/2020

Habitat Assessment #: 577

Observer: RT & GF

Zone: 51J

Easting: 309700 mE

Northing: 6817400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 14/03/2020

Habitat Assessment #: 578

Observer: RT & GF

Zone: 51J

Easting: 310200 mE

Northing: 6817400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 14/03/2020

Habitat Assessment #: 579

Observer: RT & GF

Zone: 51J

Easting: 310700 mE

Northing: 6817400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 14/03/2020

Habitat Assessment #: 580

Observer: RT & GF

Zone: 51J

Easting: 311200 mE

Northing: 6817400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 581

Observer: ST & RT

Zone: 51J

Easting: 311700 mE

Northing: 6817400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: Pebbles



Date: 15/03/2020

Habitat Assessment #: 582

Observer: ST & RT

Zone: 51J

Easting: 312200 mE

Northing: 6817400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 583

Observer: ST & RT

Zone: 51J

Easting: 312700 mE

Northing: 6817400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 584

Observer: ST & RT

Zone: 51J

Easting: 313200 mE

Northing: 6817400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 585

Observer: ST & RT

Zone: 51J

Easting: 313700 mE

Northing: 6817400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 586

Observer: ST & RT

Zone: 51J

Easting: 314200 mE

Northing: 6817400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 587

Observer: ST & RT

Zone: 51J

Easting: 314700 mE

Northing: 6817400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 588

Observer: ST & RT

Zone: 51J

Easting: 315200 mE

Northing: 6817400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 14/03/2020

Habitat Assessment #: 589

Observer: RT & GF

Zone: 51J

Easting: 310200 mE

Northing: 6816900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 14/03/2020

Habitat Assessment #: 590

Observer: RT & GF

Zone: 51J

Easting: 310700 mE

Northing: 6816900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 14/03/2020

Habitat Assessment #: 591

Observer: RT & GF

Zone: 51J

Easting: 311200 mE

Northing: 6816900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 592

Observer: ST & RT

Zone: 51J

Easting: 311700 mE

Northing: 6816900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 593

Observer: ST & RT

Zone: 51J

Easting: 312200 mE

Northing: 6816900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 594

Observer: ST & RT

Zone: 51J

Easting: 312700 mE

Northing: 6816900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 595

Observer: ST & RT

Zone: 51J

Easting: 313200 mE

Northing: 6816900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 596

Observer: ST & RT

Zone: 51J

Easting: 313700 mE

Northing: 6816900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 597

Observer: ST & RT

Zone: 51J

Easting: 314200 mE

Northing: 6816900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 598

Observer: ST & RT

Zone: 51J

Easting: 314700 mE

Northing: 6816900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 14/03/2020

Habitat Assessment #: 599

Observer: RT & GF

Zone: 51J

Easting: 311200 mE

Northing: 6816400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 600

Observer: ST & RT

Zone: 51J

Easting: 311700 mE

Northing: 6816400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 601

Observer: ST & RT

Zone: 51J

Easting: 312200 mE

Northing: 6816400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 602

Observer: ST & RT

Zone: 51J

Easting: 312700 mE

Northing: 6816400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 603

Observer: ST & RT

Zone: 51J

Easting: 313200 mE

Northing: 6816400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 604

Observer: ST & RT

Zone: 51J

Easting: 313700 mE

Northing: 6816400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 605

Observer: ST & RT

Zone: 51J

Easting: 314200 mE

Northing: 6816400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 606

Observer: ST & RT

Zone: 51J

Easting: 311700 mE

Northing: 6815900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 607

Observer: ST & RT

Zone: 51J

Easting: 312200 mE

Northing: 6815900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 608

Observer: ST & RT

Zone: 51J

Easting: 312700 mE

Northing: 6815900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 609

Observer: ST & RT

Zone: 51J

Easting: 313200 mE

Northing: 6815900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 610

Observer: ST & RT

Zone: 51J

Easting: 313700 mE

Northing: 6815900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 611

Observer: ST & RT

Zone: 51J

Easting: 312700 mE

Northing: 6815400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 612

Observer: ST & RT

Zone: 51J

Easting: 313200 mE

Northing: 6815400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Open Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 613

Observer: ST & RT

Zone: 51J

Easting: 313700 mE

Northing: 6815400 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks



Date: 15/03/2020

Habitat Assessment #: 614

Observer: ST & RT

Zone: 51J

Easting: 313200 mE

Northing: 6814900 mN

Fire History: >5 years

Landform: Flat Plain

Habitat Quality: Good

Habitat Structure: Mulga woodland over mixed shrubland and scattered grasses

Soil Type: Sandy clay

Soil surface: No pebbles or rocks





KING OF THE HILLS GAS PIPELINE

Native Vegetation Clearing Permit Supporting Document



APPENDIX 4: PROJECT LAND CLEARING PROCEDURE



MCCONNELL DOWELL CONSTRUCTORS (AUST) PTY LTD
MCD Management System
ABN NO. 71 002 929 017

CONSTRUCTION EXECUTION PROCEDURE

Clear and Grade (ROW Preparation)

Document No: 1855-0000-CON-PRO-0003

Client: APA OPERATIONS PTY LTD

Project: AGNEW PIPELINE & MURRIN MURRIN LOOPING

Location: LEONORA, WA

Project No: 1855

Revision History

Rev	Date	Description	Author	Reviewer	Approver
0.1	07/02/2019	Issued for Review	C. Kellar	P. Toon	P. Modak
0.2	26/02/2019	Re-Issued for Review	A. Tsitas	P. Toon	P. Modak
1.0	02/03/2019	Issued for Use, comments incorporated	C. Kellar	P. Toon	P. Modak

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1 PURPOSE

The purpose of this Construction Execution Procedure (CEP) is to provide specific instruction for the following scope of work to ensure the works are adequately planned and constructed in accordance with Drawings, Specifications and Codes.

2 SCOPE

The scope of work applicable to this Construction Execution Procedure includes work associated with access track preparation, fencing and Right of Way (ROW) preparation for the Agnew Gas Pipeline (AGE) and Murrin Murrin Looping Pipeline (MUE).

3 ACRONYMS

AGE	Agnew Gas Pipeline
APA	APA Operations Pty Limited
CEP	Construction Execution Procedure
CEMP	Construction Environmental Management Plan
COP	Code of Practice
DBYD	Dial Before You Dig
ENV	Environment
EPI	Environmental Protection Instruction
ESC	Environmental Sediment Control
EWS	Extra Work Space
IFC	Issued for Construction
ITC	Inspection and Test Checklist
ITP	Inspection and Test Plan
IVMS	In Vehicle Monitoring System
JSEA	Job Safety and Environmental Analysis
LLL	Landowner Line List
MML	Murrin Murrin Lateral
MUE	Murrin Murrin Looping Pipeline
OHS	Occupational Health and Safety
PTW	Permit to Work
ROW	Right of Way
SOP	Safe Operating Procedures

SWI	Safe Work Instructions
SWMS	Safe Work Method Statement
TMP	Traffic Management Plan

4 RESPONSIBILITIES

Responsibility	Who
Final approval of this CEP.	Project Manager
Nominated responsible "Owner" of this CEP. They are required to ensure regular review of this document when aspects of the document need amending.	Project Engineer
Nominated as responsible for managing the construction works associated with this CEP.	Superintendent
Nominated as responsible for managing the quality control associated with this CEP.	Quality Manager

NOTE: Refer to Document Distribution Matrix.

5 REFERENCES

Client References
Pipeline Construction Scope of Work – Pipelines – Agnew Gas Pipeline (AGE); 18122-SOW-CN-1001 Rev 2.0, 5/02/2019.
Pipeline Construction Scope of Work – Pipelines – Murrin Murrin Looping Project (MUE); 18085-SOW-L-0011 Rev 1.0, 17/12/2018.
Contract References
Construction Agreement – Agnew Gas Pipeline - 18122-CON-CN-003
Construction Agreement – Murrin Murrin Looping - 18085-CON-CN-002
Construction Codes & Standards
Australian Standards 2885 pipelines – Gas and Liquid Petroleum AS2885.1:2012; AS2885.2:2016; AS2885.5:2012
Construction Drawings & Specifications
Pipeline Construction Specification – Agnew Gas Pipeline; AGE.2373-SP-L-1006 Rev 1.0, 5/02/2019
Pipeline Construction Specification – Murrin Murrin Looping Project (MUE); MUE.2373-SP-L-0010 Rev 1.0, 17/12/2018.

Client References
AGE Alignment Sheets and Typical Drawings
MUE Alignment Sheets and Typical Drawings
Relevant Legislation / Code of Practice / Standards
<p>The construction works will be conducted under the Petroleum Pipelines Act 1969 and associated subordinate legislation, which includes the following Regulations:</p> <ul style="list-style-type: none"> • Petroleum Pipeline Regulations 1970 • Petroleum Pipelines (Management of Safety of Pipeline Operations) Regulation 2010 • Petroleum Pipelines (Occupational Safety and Health) Regulations 2010 • Petroleum Pipelines (Environment) Regulations 2012 <p>The Project Manager, Project H&S Manager and Project Env Manager shall be responsible for identifying the legislation, standards and other requirements relevant to health, safety and environment applicable to the activity.</p>
S51E of the EP Act 1986 – Clear Native Vegetation Permits – CPS 8146/1 & CPS 8246/1
Dept of Biodiversity Conservation & Attractions – Fauna Taking (Relocation) Licence – FR28000012
Project Documents
1855-0000-CON-PLN-0001 Project Management / Construction Execution Plan
Tender & Project Risk Register
1855-0000-ENV-PLN-0001 Construction Environmental Management Plan
1855-0000-OHS-PLN-0001 Construction Health and Safety Management Plan
1855-0000-QAC-PLN-0001 Quality Management Plan
1855-0000-OHS-PLN-0002 Emergency Response Plan
1855-0000-OHS-PLN-0003 Travel Management Plan
1855-0000-OHS-PLN-0004 Traffic Management Plan
1855-0000-ENV-PRO-0001 Cultural Heritage Management Procedure
1855-0000-ENV-PRO-0002 Weed and Seed Management Procedure
1855-0000-ENV-PRO-0004 Flora and Fauna Management Procedure
1855-0000-OHS-PRO-0007 Safe Work Around Overhead Powerlines - Procedure
1855-0000-OHS-SWI-0014 Safe Work Method Statement Clear and Grade
1855-0000-OHS-SWI-0017 Safe Work Method Statement Fencing

6 CONSTRUCTION PRELIMINARIES

6.1 APPROVALS / PERMITS

Table 6A – Approvals / Permit List

Required approvals / permits:			
Type:	Document No:	Approval Authority	When / Who
Legislative			
	Pipeline Licence; PL120	DIMRS	APA Approval
	Construction Environment Plan / Mining Proposal; 18122-PL-HSE-0001	DIMRS	APA Approval
	Native Vegetation Clearing Permit, CPS 8146/1	DIMRS	APA Approval
	Pipeline Licence; PL118	DIMRS	APA Approval
	Construction Environment Plan; 18085-PL-HSE-0001	DIMRS	APA Approval
	Mining Proposal; 18085-PL-HSE-0009	DIMRS	APA Approval
	Miscellaneous Licence; L39/278	DIMRS	APA Approval
	Native Vegetation Clearing Permit, CPS 8246/1	DIMRS	APA Approval
Client			
	Notice - Access to Site (inclusive of approval of requisite MCD documents)	APA	Prior to works commencing
	Project Management / Construction Execution Plan -1855-0000-CON-PLN-0001	APA	Prior to works commencing
	Construction Health and Safety Management Plan - 1855-0000-OHS-PLN-0001	APA	Prior to works commencing
	Emergency Response Plan - 1855-0000-OHS-PLN-0002	APA	Prior to works commencing
	Construction Environmental Management Plan - 1855-0000-ENV-PLN-0001	APA	Prior to works commencing
Project			
	Undertake Works in Road Reserve	MRWA	Prior to works commencing
	Bush Fire Exemption Permit	DFES	Prior to works commencing
	Fauna Educational Purposes Permit FR28000012	Parks & Wildlife Service, Dept of Biodiversity, Conservation	Prior to works commencing

Required approvals / permits:			
		and Attractions	
	Permit to traverse under the 66KV power line	TransAlta	Prior to works commencing

6.2 SURVEY & SET OUT

Survey benchmarks shall be set-out by a specialist licensed surveyor. The surveyor will have experience with pipeline work and approved work method procedures. Survey requirements are outlined in the relevant ITP and shall be in accordance with the AGE & MUE Pipeline Construction Specifications.

6.3 SITE ACCESS

Access to the AGE and MUE ROW will only be via the approved access points as detailed in the Traffic Management Plan; 1855-0000-OHS-PLN-0004.

Access to specific areas of the AGE and MUE ROWs shall require an APA Construction Permit to Work, prior to access and commencing works. These areas are identified in accordance with APA Construction Permit to Work Management Plans for AGE (18122-PL-HSE-0006) and MUE as:

Agnew		Murrin Murrin	
KP	Description	KP	Description
~50m U/S KP 0	Hot Tap Location area upstream of Kyarra Offtake Station - not part of AGE ROW / MCD work area but in close proximity	66.24*	Hot Tap Location
		79.925	EGP Offtake Station
* Location to be re-confirmed with APA prior to commencing works			

6.4 TEMPORARY WORKS

Temporary fencing, flagging and signage to be installed as required. In particular, this will be implemented at mini HDD sites on AGE (KP20.8, 22 & 24.3).

7 CONSTRUCTION METHODOLOGY

7.1 SUMMARY

A summary of the associated works for this CEP includes the following works to be carried out;

- Access Tracks
- Fencing Work
- Construction of Extra Work Spaces

- Clearing and Grade

7.2 ACCESS TRACKS

7.2.1 General

Access tracks to the ROW that require upgrading (if required) and maintenance (if required) shall be minimised, with the majority of travel to / from the ROW occurring on public roads. The selection of which existing roads to be utilised for construction traffic will be jointly decided by the APA representative, Construction Superintendent and Project Manager. The proposed accesses are identified in the Traffic Management Plan (1855-0000-OHS-PLN-0004).

Agnew		Murrin Murrin	
KP	Access	KP	Access
0	Goldfields Highway, GGP ROW	~67	Temp Access an existing WA Main Roads borrow pit (still has gravel in it)
~8.8	Agnew Sandstone Road, existing access track	~70.9	MUE Access #2
~23	Agnew Gold Mine Crossing Road	~74.3	MUE Access #3
~24.3	Kalgoorlie-Meekatharra Crossing Road	~74.5	MUE Access #4
		~79.9	Access off Murrin Murrin Mine Road, near Laverton Leonora Road

Dilapidation survey (undertaken by Fyfe) on all required roads shall be undertaken prior to access to site. An APA representative and WA Main Roads representative shall be invited to attend, with report / photos being subsequently provided.

7.2.2 Upgrading and Maintenance of Existing Tracks

All work shall comply with the requirements of the local authority specifications.

Gravel roads will be graded when required to maintain a reasonable surface. Any imported material required for upgrade or maintenance of roads/access tracks shall be certified "weed free". Water used for road maintenance shall comply with the requirements of the Construction Environmental Management Plan (1855-0000-ENV-PLN-0001).

MCD shall provide temporary approaches to and from crossings of public roads, private roads and entrances that may be opened for construction and maintain them in a safe condition.

MCD shall prevent undue tracking of mud onto public roadways. If mud is tracked onto any public road, it shall be promptly removed with a water cart so that it does not create a traffic hazard.

Access roads will be maintained during use to provide a safe access for construction traffic.

Vehicle and plant crossings of existing services on access tracks / ROW shall be completed as per crossing design that has been approved by APA and the service owner. Vehicle and plant crossings shall typically consist of an earthen ramp to protect the service, with appropriate signage to instruct all personnel to only cross at the designated points.

7.3 FENCING WORK

7.3.1 Foreign Service Location and Potholing

Prior to ROW Fencing work, all existing services shall be located and potholed in advance in accordance with the CEP for Foreign Service Locating, Potholing & Crossing; 1855-0000-CON-PRO-0002.

All services located both overhead and buried that are within the work area will be protected in accordance with the conditions of the third-party service owner prior to the commencement of fencing activities.

7.3.2 Fence and Gate Installation

Landowners will be notified in advance of any work to be carried out on their property and any removal or alteration of existing fences or gates as required by APA.

Permanent access gates and fencing shall be installing in accordance with the notes on the alignment sheets and APA standard drawing 530-DWG-L-6000 including installation of a single field gate, with fence posts a minimum of 1500mm away from the installed pipeline. Temporary boundary fencing/gates shall be installed at the commencement of clear and grade operations and shall be maintained until final clean up. Any damage caused by construction equipment or vehicles shall be repaired immediately.

A strainer post assembly will be installed on edges of ROW and tied into the existing fencing prior to removing the existing section. This is to ensure that the existing fence will be adequately supported at all times.

In areas in proximity to parallel overhead powerlines; the fence shall be earthed on each side of the construction ROW prior to cutting the fencing. The earthing shall be installed by the use of buried copper rods with clamps connected to jumper cables that are then clamped to the fence.

Note: There are no known parallel overhead powerlines adjacent to fencing on the AGE or MUE lines.

Once the existing section is cut and removed, the gate arrangement shall be installed as per the relevant typical drawing. Where existing fences cross ROW at oblique angle an additional fence shall be installed on the edge of the ROW with an offset strainer assembly to square the temporary fence gates to be able to cross the ROW at 90 degrees. This is done to reduce the length of the temporary gate and to ensure that the existing fence or fences are adequately strained to control any livestock in the area.

Where electric fences are encountered, temporary electric fence and gates shall be installed. An electric wire with an appropriate insulating sleeve (such as HDPE pipe) will be installed across the ROW access gate and buried with a temporary sign on the strainer post to alert the construction crews that this is an electric fence with a buried jumper cable installed. This bond facility allows for the gate to be left open if required and approved for construction purposes and still maintain current in the existing electric fence. Electric ribbon with insulated handles shall then be used across the width of the temporary ROW gate. The electric fence shall then be turned back on and the fence tested to ensure a complete power circuit. Note there are no known electric fences on the AGE or MUE lines.

Upon completion of the construction phase, all temporary fencing and gate shall be removed and reinstate any permanent fence or gate back to original or better condition.

All old and waste fencing materials shall be removed and segregated as per the Construction Environmental Management Plan (1855-0000-ENV-PLN-0001). Existing gates and fence posts to be re-used will be left stacked close to the original location to enable re-installation during reinstatement works.

Fences identified on AGE and MUE are listed below:

Agnew	Murrin Murrin
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KP	Fence Detail	KP	Fence Detail
3.156	Fence with Single Field Gate	70.820	Existing fence not to be reinstated
8.833	Fence with Single Field Gate	70.892	Existing fence not to be re-instated, but relocated to the north side of the existing DN200 Murrin Murrin Lateral
19.962	Fence with Single Field Gate	70.915	Existing fence not to be reinstated
		79.821	Fence with Single Field Gate
		79.912	Existing APA Fence access gate to be relocated so not over new pipeline

Note – fence relocation works on MUE at KP.70.892 to the north side of the existing Murrin Murrin Lateral (MML) shall require an APA Construction Permit to Work to complete works on the MML easement.

7.4 CONSTRUCTION OF EXTRA WORK SPACES

7.4.1 General

All temporary Extra Work Space (EWS) shall only be constructed in an approved location as agreed by APA. There may be number of EWSs along or in proximity of the pipeline route that will be constructed to support construction.

7.4.2 Construction of Extra Work Spaces

Prior to constructing the EWS, all existing services shall be confirmed, potholed and protected in accordance with Asset Owner requirements refer to the CEP for Foreign Service Locating, Potholing & Crossing (1855-0000-CON-PRO-0002). Full survey of the profile of the land shall be undertaken to determine the cross fall of the areas to ensure appropriate erosion and sediment controls are designed and implemented. The required space for EWS shall be clearly pegged out prior to clear and grade operations and flagged off any sensitive areas such as CH and environmental if it exists in the area. Clear and Grade operation to include removal of stumps. Surface soils/topsoil shall be stripped using either an excavator or grader and set aside in storage bunds or windrow around the compound for reinstatement on completion of project. Top-soils will be separated and managed in accordance with the Construction Environmental Management Plan (1855-0000-ENV-PLN-0001).

Any existing drainage ditches will be diverted around the extent of the EWS where necessary and in accordance with Construction Environmental Management Plan (1855-0000-ENV-PLN-0001).

7.5 CLEARING AND GRADING

7.5.1 Erect Signage

Prior to commencing clear and grade operation and after approval from the main roads or road owner, the crew shall erect the following signage but not limited to;

- Road/track access numbers

- AGE & MUE ROW access for signs at entry and exit points
- Project radio channel signs where radio communications utilised on the project
- Slow down signs (where reduced dust is required or at creek crossing approaches) as required
- General warning signs of dips, sharp bends etc where applicable
- Construction zone – unauthorised entry prohibited signs where there is public access to the ROW
- Signage clearly identifying the presence of the MML to the north of the construction ROW at 200m intervals.
- No Go zone flagging and signage shall be erected at the PPL boundary where it is adjacent to Native Title exclusion zones on the AGE

Access tracks that have not been granted permission for use will be clearly signposted as “NO PIPELINE ACCESS”.

Traffic Signage on public roads will be installed in accordance with the Traffic Management Plan (1855-0000-OHS-PLN-0004).

All signage will be printed, no hand written signs will be used.

7.5.2 Setting up Catenary Markers

All existing overhead powerlines within vicinity of the easement and above any access tracks will be surveyed for height and have catenaries and signage installed either side in accordance with Safe Work Around Overhead Powerlines Procedure (1855-0000-OHS-PRO-0007).

7.5.3 Protection of Foreign Services

All existing services shall be located and potholed. All services shall be located and protected in accordance with asset owner’s requirements. If required by either the asset owner or by internal confirmation on the register, protection may be placed over the Foreign Service to prevent damage caused by loading. Locating and protecting of existing services shall be carried out in accordance with the CEP for Foreign Service Locating, Potholing & Crossing (1855-0000-CON-PRO-0002). All work shall cease in the area of any identified foreign service is found until it is confirmed and protected.

- Positive identification (by potholing) of the existing parallel DN200 MML pipeline is required at interval not more than 200m and before and after changes in direction.
- Temporary signage clearly identifying the presence of the MML to the north of the MUE construction ROW shall be installed at no more than 200m intervals along the boundary of the Construction ROW.

7.5.4 Clearing Operations

Cultural Heritage clearance of work area shall be undertaken prior to construction by cultural heritage monitors in conjunction with APA representatives as required in accordance with the Cultural Heritage Management Procedure (1855-0000-ENV-PRO-0001). Where pre-clearance of an area has not been obtained, Cultural Heritage monitors (if required) are to be notified and present during clearing and soil disturbance activities.

No CH walkover or monitoring is required on the AGE line. A CH walkover prior to clear and grade works commencing is required for the MUE line, including the cultural awareness induction for the MUE.

Prior to clearing works being undertaken on the ROW/EWS, any vegetation identified as containing weeds or pests shall be managed in accordance with the Weed and Seed Management Procedure (1855-0000-ENV-PRO-0002).

Clearing shall be limited to the ROW and approved EWSs as identified with pegging installed in accordance with the CEP for Site Survey and Set Out (1855-0000-CON-PRO-0001). Areas within the ROW not to be cleared will be specifically identified by pegging in accordance CEP for Site Survey and Set Out (1855-0000-CON-PRO-0001).

If in dense vegetation running the shot line, the dozer operator will have a spotter and/or survey to ensure that the operator stays within the pegged ROW.

Special attention to Clearing Operations shall be taken in the following areas:

- Agnew – Construction ROW boundary on the northern side in areas adjacent to known Native Title area – approx. KP 21.607 – KP 22.007, KP 24.298 (sealed heavy vehicle road crossing).

Particular attention shall be taken in the area of the road crossing at KP 21.969, where there is a pinch point in the PPL area, which is only 30m wide.

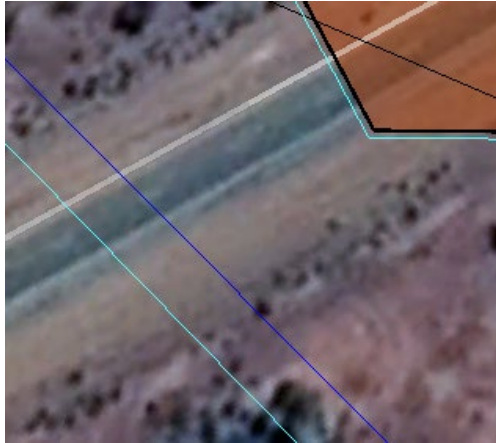


Figure 1: KP 21.969 - Agnew PPL pinch point at Road crossing ~30m wide

- Murrin Murrin – ROW boundary on northern side - adjacent to the existing operational MML lateral. Signage clearly identifying the presence of the MML to the north of the construction ROW shall be installed at no more than 200m intervals.

The ROW Survey Set out in these special areas need to be double checked prior to, and during clearing operations.

The ROW shall only be cleared for the 25m width required for AGE & MUE lines as noted below in Figures 2 & 3, noting there is a 14m wide ROW at end of the MUE line near the EGP Offtake facility.

Limiting the width of the ROW to 25m shall create an additional buffer where the PPL is adjacent to the Native Title exclusion zones on AGE line.

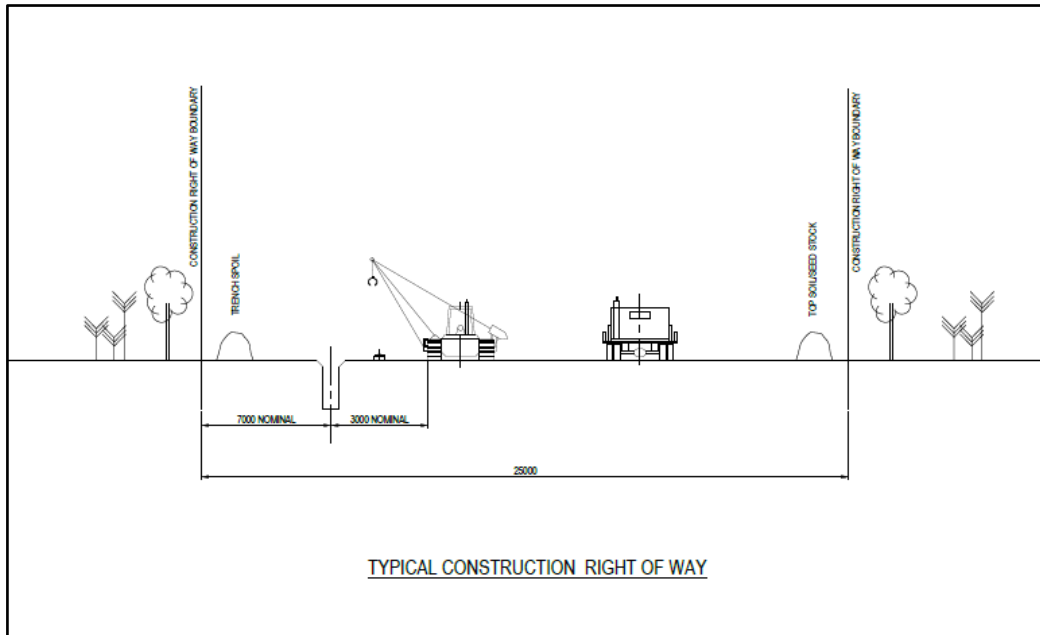


Figure 2: Agnew Gas Pipeline – Typical ROW extents & layout - RIGHT / LEFT BASED ON LOOKING DOWNSTREAM ALONG THE PIPELINE CENTRELINE WHICH IS NORMALLY TO THE WEST.

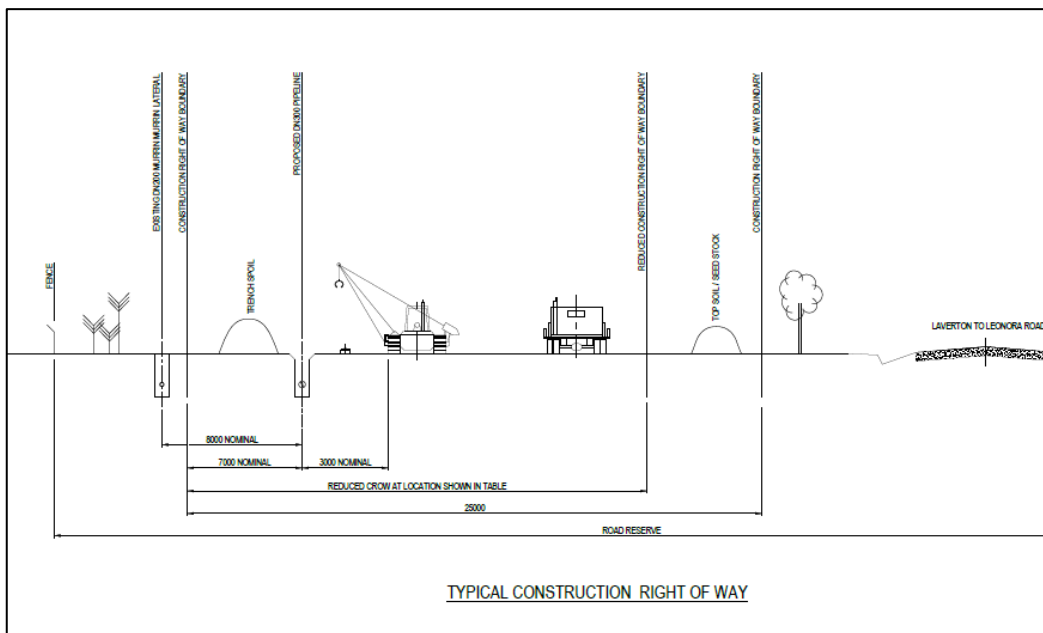


Figure 3: Murrin Murrin Looping Pipeline – Typical ROW extents & layout - RIGHT / LEFT BASED ON LOOKING DOWNSTREAM ALONG THE PIPELINE CENTRELINE WHICH IS NORMALLY TO THE WEST.

START KP (NOTE 6) (km)	END KP (km)	SPOIL SIDE LOCATION (NOTE 5)	CONSTRUCTION RIGHT OF WAY (CROW) RESTRICTIONS (m)		
			SPOIL SIDE	WORKING SIDE	TOTAL CROW
79.748	79.9	LEFT	7.0	7.0	14

NOTE 6: START AND FINISH IN TABLE IS APPROXIMATE. ROW BOUNDARY TO BE ESTABLISHED ON SITE. KP BASED ON ALIGNMENT DESCRIBED IN PIPELINE ALIGNMENT SHEET MUE.2373-DWG-L-0042 REV 1.0.

Plant such as Dozer, excavators or chainsaw (or combinations of the three) will be used to remove trees, brush, stumps and other obstacles on the ROW/EWS. All Vegetation must be felled inwards onto the ROW, if lodging does occur, all vegetation shall be pulled back onto the ROW with an excavator. Positive communication shall be maintained with the plant operator.

No vegetation outside of approved and marked out areas shall be removed or disturbed.

All Trees/vegetation shall be stockpiled for re-spreading during reinstatement works. No vegetation is to be burnt.

Habitat tree locations shall be inspected prior to clear and grade if required by a fauna spotter catcher. Stockpiling of vegetation along the route shall not interfere, interrupt or damage any bores, water points or dams or separate stock from feed, water or travel routes.

7.5.5 Topsoil Stripping

Vegetation remaining within the working width will be windrowed in accordance with the Construction Environmental Management Plan (1855-0000-ENV-PLN-0001)

ROW/EWS topsoil stripping and grading will follow the ROW clearing operations. Removal of topsoil shall be in accordance with the Construction Environmental Management Plan (1855-0000-ENV-PLN-0001), Pipeline Construction Specifications for AGE and MUE. Topsoil will be stripped on all areas where the soil surface is to be disturbed by construction traffic and equipment to a depth as indicated on the Soil and Water Management Plan (1855-0000-ENV-PLN-0003_B) The depth of topsoil to be removed shall be approximately 100mm where sufficient topsoil exists. Where the depth of topsoil is less than 100mm, remove topsoil to such depth as exists. Topsoil shall be stockpiled in such a way that it does not become contaminated with other material, including cleared vegetation.

Grading will be performed in such a manner as to minimise interference with existing natural drainage. Drains, ditches, culverts or streams will not be blocked off without making alternative provision for the flow of water. Gaps within the windrow will be left or alternative measures taken to allow for surface water drainage wherever necessary. Culverts or flume pipes will be installed where necessary with adequate fall. Berm to be installed where there is a reasonable slope on the ROW to prevent erosion from occurring across the ROW. Erosion and sediment controls for each water course and gaps of the stored topsoil will be installed in accordance with the Construction Environmental Management Plan (1855-0000-ENV-PLN-0001) and the Watercourse Crossing Procedure (1855-0000-ENV-PRO-0005).

Where required, topsoil may also need to be temporarily stored offsite in an approved extra workspace due to restricted ROW width in designated areas. Topsoil stockpiles shall not be located where they have the potential to contribute to sedimentation of land or surface water. After grading of the ROW the required sediment and erosion controls will be installed in accordance with the Construction Environmental Management Plan (1855-0000-ENV-PLN-0001). Topsoil stockpiles shall be monitored for the duration of construction for weeds and air pollution; this will be managed according to Weed and Seed Management Procedure (1855-0000-ENV-PRO-0002).

7.5.6 Profiling, Benching and Grading

The working width will be graded and benched where required with respect to the terrain encountered and to assist with subsequent construction operations.

For the Murrin Murrin Looping Pipeline an additional physical barrier shall be created to provide additional protection to the existing and operation MML line. The MUE trench line shall be boxed out and the subsoil placed on the northern ROW boundary to create the physical barrier. This barrier is in addition to the signage requirements at 200m intervals. If benching needs to be undertaken on the MML side of the MUE ROW, this work will need to be completed under an APA PTW.

Side slopes encountered along the pipeline route will be benched by cut method to form a level running track and level working width platform for welding and trenching operations. Where fill is required to create a level working platform this shall only take place on the running track.



Figure 4: Example of Benching

Steep cut slopes will be assessed by the Superintendent and benched with stepping nominally 1m rise with 600mm cut backs where the cut slope is deemed to otherwise potentially be unstable.

No filling of the ground over the pipeline centreline to achieve the minimum depth of cover shall be permitted without prior approval from APA. In locations where the ground is filled for access or other reason, the natural surface profile shall be surveyed to ensure that compliance with the minimum cover requirements can be demonstrated.

Surplus excavated rock material and surface boulders will be respread over the ROW, used for erosion and sediment controls or stockpiled in accordance with APA requirements. FOR MUE line, surplus rock shall be removed.

Ground truthing shall occur as part of the Clear & Grade works in any section where hard rock has been identified in preliminary geotesting. Ground truthing shall be undertaken by excavating holes on the ditch line along the ROW to confirm the type and depth of rock in the area for accurately determine the extent of rock excavation required.

8 ACTIVITY SCHEDULE / MILESTONES

As per latest Construction Program, 'Schedule of Works (Baseline)'; 1855-0000-PRM-SCH-0002.

9 CONSTRUCTION RESOURCES

9.1 KEY PROJECT PERSONNEL

The Project Manager will appoint a Supervisor to oversee each or a number of related activities. It will be ensured that the Supervisor will be experienced in the associated work, will be able to read drawings, be competent in reporting, and be conversant with the technical, safety and environmental specifications, guidelines or requirements.

Table 9A Personnel requirements

Function / Role	Name	Contact Details
Project Manager	Prashant Modak	prashant.modak@mcdgroup.com
Senior Project Engineer	Clint Kellar	clint.kellar@mcdgroup.com
Project Engineer	Patrick Toon	patrick.toon@mcdgroup.com

9.2 PERSONNEL & TRAINING REQUIREMENTS

All equipment shall be operated by suitably qualified and experienced personnel. Specialised labour requirements for the works will involve:

Table 9B Personnel & Training requirements

Function / Role	Qualification / licence Required	Activity specific Training Required
Plant Operator	Operator Licence	Verification of Competency
All site personnel	N/A	MUE Cultural Awareness Training, toolboxes & site specific induction

9.3 SUBCONTRACTORS & SUPPLIERS

Table 9C – Sub-contractors and suppliers

Scope of works	Name of Sub-contractor / Suppliers	Contact Person	Contact Details
Fencing material supply	Rural Fencing & Irrigation Supplies, WA	Sales Representative	sales@dcwent.com.au

9.4 PLANT & EQUIPMENT

Plant and equipment associated with the works will be in good working order and have the capacity to safely and efficiently do the work required. The type, size and number of machines used will depend on the quantity of material, scheduling and access restrictions. Necessary plant inspections and operator

competency assessments will be undertaken as part of the Construction Safety Management Plan. The following list outlines the plant and equipment expected for the associated scope:

Table 9D Powered Plant & Equipment required for the works

Powered Plant and Equipment required for the works:	Type of Works
Chainsaw	Clear & Grade activities
Dozer, Komastu D275A	Clear & Grade activities
Grader, Volvo / John Deere 770	Clear & Grade activities
Excavator, Cat 330	Clear & Grade activities
Water Trucks, 22,000 litre capacity	Dust Management
Auger machine to	Fencing – core holes for fence post installation

9.5 MATERIAL

Materials incorporated into the works will be compliant with the IFC drawings, technical specifications, relevant standards and manufacturer's instructions. The following list outlines materials expected to be incorporated in the associated scope:

Table 9E Materials required for the works

Specific Material required for the works:	Type of Works
(e.g. Pipes / piles / long lead items etc)	
Imported quarry materials	Access track construction and ROW construction as required
Fencing materials (Steel posts, strainers, wire & gates)	Fencing works

10 INSPECTION & TESTING

ITP(s) documents will be prepared to summarise inspection and testing protocols. At predetermined stages of works, the appropriate inspections or tests shall be undertaken and submitted as specified. Subsequent works will then proceed upon meeting the specified criteria. The following ITP(s) will be used to manage the quality of the works:

Table 10A Inspection & Test Plan List

ITP Number	Title / scope	Person or organisation responsible for preparation
1855-0000-QAC-PLN-0007	ROW Preparation (Clear & Grade)	Project Engineer
1855-0000-QAC-PLN-0001	Site Survey & Set Out	Project Engineer

11 OHS&E HAZARD IDENTIFICATION, RISK ASSESSMENT & CONTROL

Hazard identification, risk assessment and control will be principally managed and documented through use of the Project Risk Register (1855-0000-PRM-REG-0002). Relevant SWI's, SOPs and EPIs will be implemented and followed. JSEA / SWMS's will be prepared to cover specific risks associated with the works.

Development and implementation of the JSEA / SWMS and the associated documentation (SWI's; SOP's; EPIs; etc...) will be undertaken with the personnel involved in the works. These documents can then be viewed by the Client's representative prior to work commencement.

All personnel will complete the project site induction before being allowed access to the works. Operator competency will be recorded and plant inspections will be undertaken prior to any activity commencing. Daily start up meetings will be conducted and documented by Supervisors to ensure all safety measures are in place for the day's activities.

The **JSEA / SWMS Review Checklist** (HSEQ-HS-FRM001-GEN-AUS) will be used to assess and review all subcontractor JSEA / SWMS(s).

Table 11A OHS&E Hazard Identification, Risk assessment & Control

JSEA/SWMS Title / Activity description (What)	Development Responsibility (Role)	Due By
Clear & Grade - 1855-0000-OHS-SWI-0014	Supervisor/Site Crew	Before Commencement
Fencing & ROW - 1855-0000-OHS-SWI-0017	Supervisor/Site Crew	Before Commencement
Survey - 1855-0000-OHS-SWI-0013	Supervisor/Site Crew	Before Commencement

Table 11B Required SWI for Activities / Tasks

Activity description (What)	SWI (No. + Name)
Working Near Mobile Plant	REF-HSEQ-HS-SW096-GEN-ALL Mobile Plant Awareness SWI
Working Near Mobile Plant	REF-HSEQ-HS-SW097-GEN-ALL Att1 Mobile Plant Awareness SWI Att1
Working Near Mobile Plant	REF-HSEQ-HS-SW098-GEN-ALL Att2 Mobile Plant Awareness SWI Att2
Working With Mobile Plant	REF-HSEQ-HS-SW099-GEN-Mobile Plant Operation SWI
Manual Handling	REF-HSEQ-HS-SW117-GEN-ALL Manual Handling SWI
Wearing PPE	REF-HSEQ-HS-SW119-GEN-ALL Personal Protective Equipment SWI

Table 11C Environmental Aspects Identification, Risk Assessment & Controls

Aspect (What)	Control (How)	Implementation Responsibility (Role/Subcontractor)
Flora	As per the Flora and Fauna MP (1855-0000-ENV-PRO-0004)	Supervisor
Fauna	Cover all ends of pipes. Only approved Fauna monitor to remove any dangerous Fauna.	Supervisor
Weed and pest control	Incoming plant inspection for plant coming to site and wash down of plant leaving site.	Supplier of plant and Supervisor.
Water quality	As per the Construction Environmental Management Plan (1855-0000-ENV-PLN-0001)	Supervisor
Erosion and Sediment control	As per the Construction Environmental Management Plan (1855-0000-ENV-PLN-0001) and Watercourse Crossing Procedure 1855-0000-ENV-PRO-0005)	Supervisor
Noise	Acoustic covers on noisy items of plant and ensure access doors are correctly shut.	Supervisor
Dust	Dust suppression with water cart or hose.	Supervisor
Waste	Segregate waste and dispose of regularly.	Supervisor
Ground Contamination	Spill kits present. Clean spills immediately.	Supervisor
Cultural Heritage	As per the Cultural Heritage Management Procedure (1855-0000-ENV-PRO-0001) - stay within ROW limits	Supervisor

Note: the above list is not intended to be exhaustive and is limited to the scope of work as identified at the time of the Risk Register Workshop.

12 HAZARDOUS MATERIAL / SUBSTANCES

Table 12A Hazardous materials / Substance list

Hazardous Materials / Substance	Specific task / activity it is required for
Hydraulic/engine oil	Plant Maintenance
Diesel Fuel	Plant/Equipment

Note: the above list is not intended to be exhaustive and is limited to the scope of work as identified at the time of the Risk Register Workshop.

13 APPENDICES

- None required

14 REVIEW & APPROVAL

	Position	Name	Signature	Date
Author:	Engineer	Clint Kellar		
Reviewed By:	Snr Project Engineer	Clint Kellar		
Reviewed By:	Quality Mgt Rep	Mark Wheeler		
Reviewed By:	Safety Mgt Rep	Tony Green		
Reviewed By:	Environment Mgt Rep	Ben Hooper		
Reviewed By:	Superintendent	Ian Glass		
Approved By:	Project Manager	Prashant Modak		

