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BUILDING A BETTER WORLD

Geko Level 1 Flora, Vegetation and Fauna Assessment and Targeted Survey for Malleefowl (Leipoa ocellata)

Prepared for Golden Eagle Mining Ltd

25 August 2016

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Executive Summary

Golden Eagle Mining Limited (Golden Eagle) are in the process of developing the Geko Gold Project (the Project). The Project is located approximately 25 kilometres (km) north-west of Coolgardie and approximately 500 km from Perth, Western Australia. The Study Area is approximately 610 hectares (ha) in size and encompasses the three main areas: the Infrastructure Area, the Pipeline Corridor and the Haul Road Corridor.

The overarching objective of this study was to undertake a Level 1 Flora, Vegetation and Fauna assessment and a Targeted Survey for Malleefowl *(Leipoa ocellata)* over the Study Area (the Survey), and to assess potential impacts of the Project to the vegetation, flora and fauna occurring, and with the potential to occur, within the Study Area. The specific objectives of the Survey were to:

- complete a desktop review of relevant literature and databases for the Study Area;
- describe vegetation communities, fauna habitats and their condition by means of a field survey;
- delineate and map vegetation communities, condition and fauna habitats in the Study Area; and
- assess potential impacts of the Project against the 10 Native Vegetation Clearing Principals

The objectives were addressed by way of a desktop study and a two phase field Survey. Phase 1 was conducted from 12th to the 15th April 2016 and Phase 2 was conducted from 26th to the 29th of April 2016. Flora and vegetation was sampled using unbounded sites (relevés) and opportunistic collections and searches. Terrestrial fauna and fauna habitat was sampled via standardised habitat assessments, active searching and opportunistic sightings. A total of 37 sites were sampled in total over both survey phases.

The vegetation condition ranged from Very Good to Excellent, with the majority considered to be Excellent. Areas that were slightly degraded were mostly a result of the historical exploration and drilling activities. A total of 15 vegetation units were recorded across the Study Area. The vegetation of the Study Area was broadly comprised of Eucalypt Woodlands, Mallee Woodlands, and Shrublands that are representative of the dominant vegetation types throughout the region. No vegetation units are considered analogous to any TEC or PEC's, and none are considered locally or regionally significant.

A total of 133 flora taxa (including subspecies and variants) from 25 families and 58 genera were recorded within the Study Area. The most frequently occurring families were Myrtaceae, Fabaceae, Scrophulariaceae and Proteacea. The flora composition recorded was typical of the region with high numbers of both *Eucalyptus* and *Acacia* species.

No Threatened Flora species were recorded from the desktop study or during the Survey and none are likely to occur. One species, *Acacia cylindrica* listed as a Priority 3 species by DPaW was potentially identified from the survey, however the specimen could not be conclusively identified due to a lack of flowering and/or fruiting material. Additionally, a specimen of *Hakea* collected during the survey did not key out to other known species from the region and represents an anomaly. Additional material during

flowering and/or fruiting season would be required to determine the taxonomic status of this specimen. An additional 10 Priority flora species were assessed as possible or likely to occur. Each of these species was targeted during the Survey but was not recoded.

Four broad fauna habitat types were identified within the Study Area; Eucalypt woodland, Mallee Woodland, Shrubland and Vegetated Claypan. All habitat types are considered relatively widespread and common throughout the region and none are considered to be of local or regional significance. A total of 48 vertebrate fauna species were recorded during the field survey, comprising four mammals (one native), 38 birds and six reptile species.

One species of conservation significance, the Malleefowl listed as vulnerable under the EPBC Act and WC Act, was detected within and in close proximity to the Study Area via the presence of nesting mounds. In total seven mounds were detected, of which three appeared to have been active in recent years and may again be used by the birds in the upcoming breeding season (August - February).

Additionally, one fauna species, the Rainbow Bee-eater was considered Very Likely to occur and three fauna species (Central Long-eared Bat, Peregrine Falcon and Fork-tailed Swift) were considered Likely to occur. Five species of migratory-listed wading birds are known from the vicinity. Of these, the Sharp-tailed Sandpiper and Wood Sandpiper are likely to intermittently utilise a claypan discharge site to the east of the Study Area after rainfall. None of these conservation significant fauna species are likely to be significantly impacted by the Project as none are dependent on the Study Area or habitats contained within it.

Footprints for the Project are indicative and may still be refined, and as such, it is not clear how much native vegetation clearing will be required for the Project. Consequently, assessment against the Ten Clearing Principals was based on a precautionary approach that assumed all habitats within the Study Area may be exposed to clearing. Based on this assumption, the proposed Project is not at variance to principles (d), (e), (g), (i) and (j). Clearing associated with the project may be at variance to the following principals:

a) *Native vegetation should not be cleared if it comprises a high level of biological diversity*. Clearing may be at variance to this principal as the region as a whole has a high level of biodiversity. However, the level of biodiversity within the Study Area is unlikely to differ substantially from that in the immediate surrounds.

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*. Clearing may be at variance to this principal as the habitats within the Study Area are known to support Malleefowl. Clearing of Malleefowl mounds or clearing of habitat in the vicinity of mounds that may become active during the breeding season is likely to be at variance to this principal.

c) *Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.* Clearing may be at variance to this principal as one Priority 3 flora (*Acacia*

cylindrical) was potentially collected from the Haul Road Corridor and a specimen of *Hakea* with an undetermined taxonomic status was collected from the Haul Road Corridor. Both specimens lacked flowering or fruiting bodies and further sampling would be required to determine whether the Project is at variance to this principal.

Golden Eagle Mining Limited

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1.1 Project Background and Location

Golden Eagle Mining Limited (Golden Eagle) are in the process of developing the Geko Gold Project (the Project). The Project is located approximately 25 kilometres (km) north-west of Coolgardie and approximately 500 km from Perth, Western Australia (**Figure 1-1**). The Study Area for this Survey is approximately 610 hectares (ha) in size and encompasses the three main areas (**Figure 1-2**):

- Infrastructure Area (pit, waste landform, evaporation pond etc.),
- Pipeline Corridor – 10 m buffer, either side of a central line; and
- Haul Road Corridor – 50 m buffer, either side of a central line.

An indicative Project layout is presented in **Figure 1-3**.

To assist with environmental approvals of the Project, Golden Eagle contracted MWH Australia Pty Ltd (MWH) to complete a Level 1 Flora, Vegetation and Fauna Assessment and a Targeted Survey for Malleefowl (*Leipoa ocellata*) over the Study Area, including an assessment against the 10 Native Vegetation Clearing Principals (DER 2014). The purpose of the work was to support a clearing permit application for an infrastructure area, pipeline and haul road associated with the Project.

1.2 Report Scope and Objectives

The overarching objectives for this assessment were to undertake a Level 1 Flora, Vegetation and Fauna assessment and a Targeted Survey for Malleefowl over the Study Area (the Survey) and to assess potential impacts of the Project. The purpose was to gather background information on the Study Area involving a search of all sources for literature, data and map-based information. The specific objectives of the Survey were to:

- complete a desktop review of the Study Area using relevant literature and databases;
- describe vegetation communities, fauna habitats and their condition by means of a field survey;
- delineate and map vegetation communities, fauna habitats and their condition;
- undertake a targeted survey for Malleefowl over proposed disturbance footprints within the Study Area; and
- assess potential impacts of the Project against the 10 Native Vegetation Clearing Principals

The objectives and survey methods adopted for this survey were aligned with relevant regulatory guidelines including:

- Environmental Protection Authority (EPA) Position Statement No. 2 *Environmental Protection of Native Vegetation in Australia* (EPA 2000)*;*

- EPA Position Statement No. 3 *Terrestrial Biological Surveys as an Element of Biodiversity Protection* (EPA 2002);
- EPA Guidance Statement No. 51 *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA 2004b);
- EPA Guidance Statement No. 56 *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia* (EPA 2004a)*;*
- EPA and Department of Environment and Conservation (DEC) *Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA and DEC 2010); and
- EPA and Department of Parks and Wildlife (DPaW) *Technical Guide – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA and DPaW 2015)

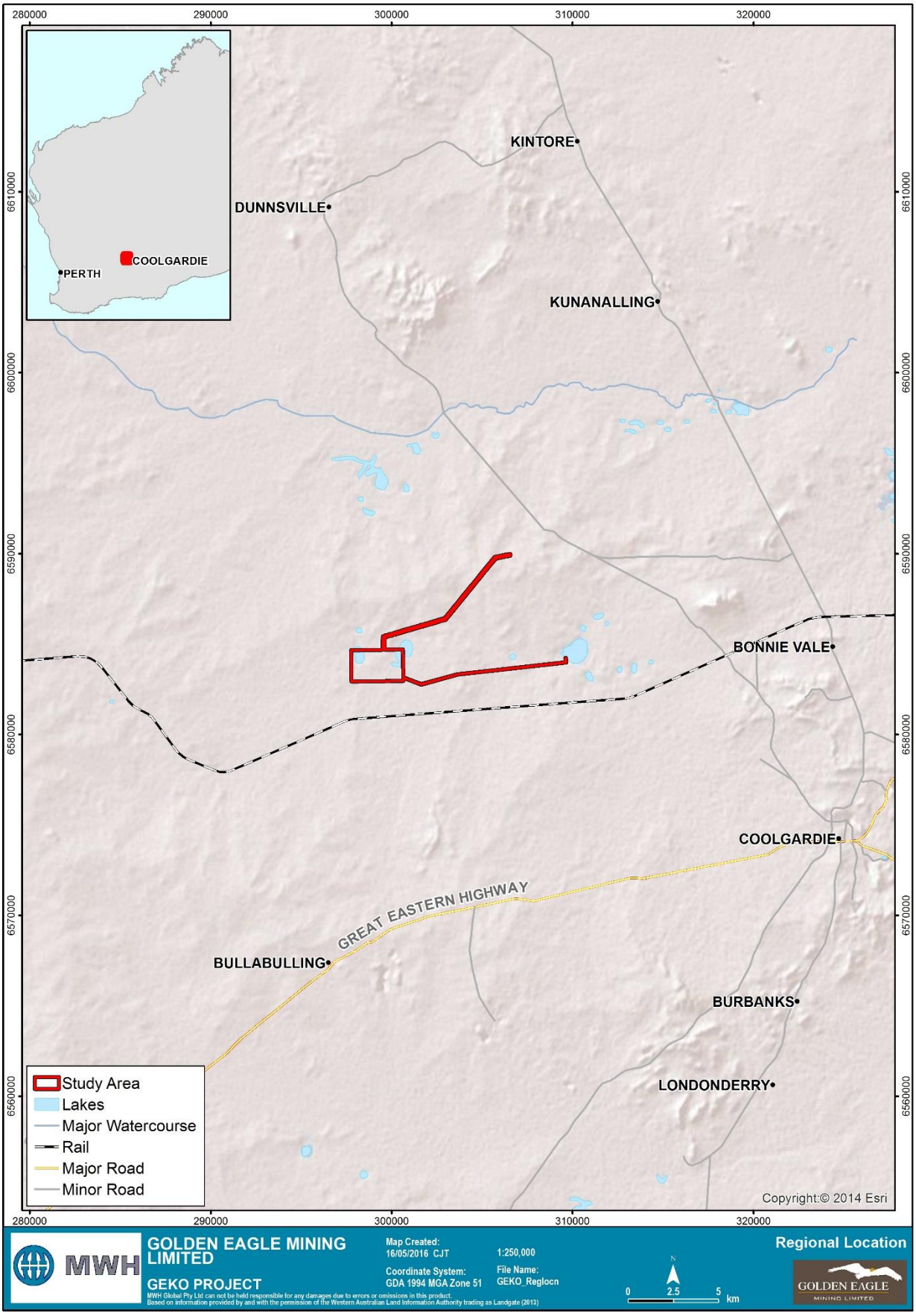

Figure 1-1: Regional Location of the Geko Study Area

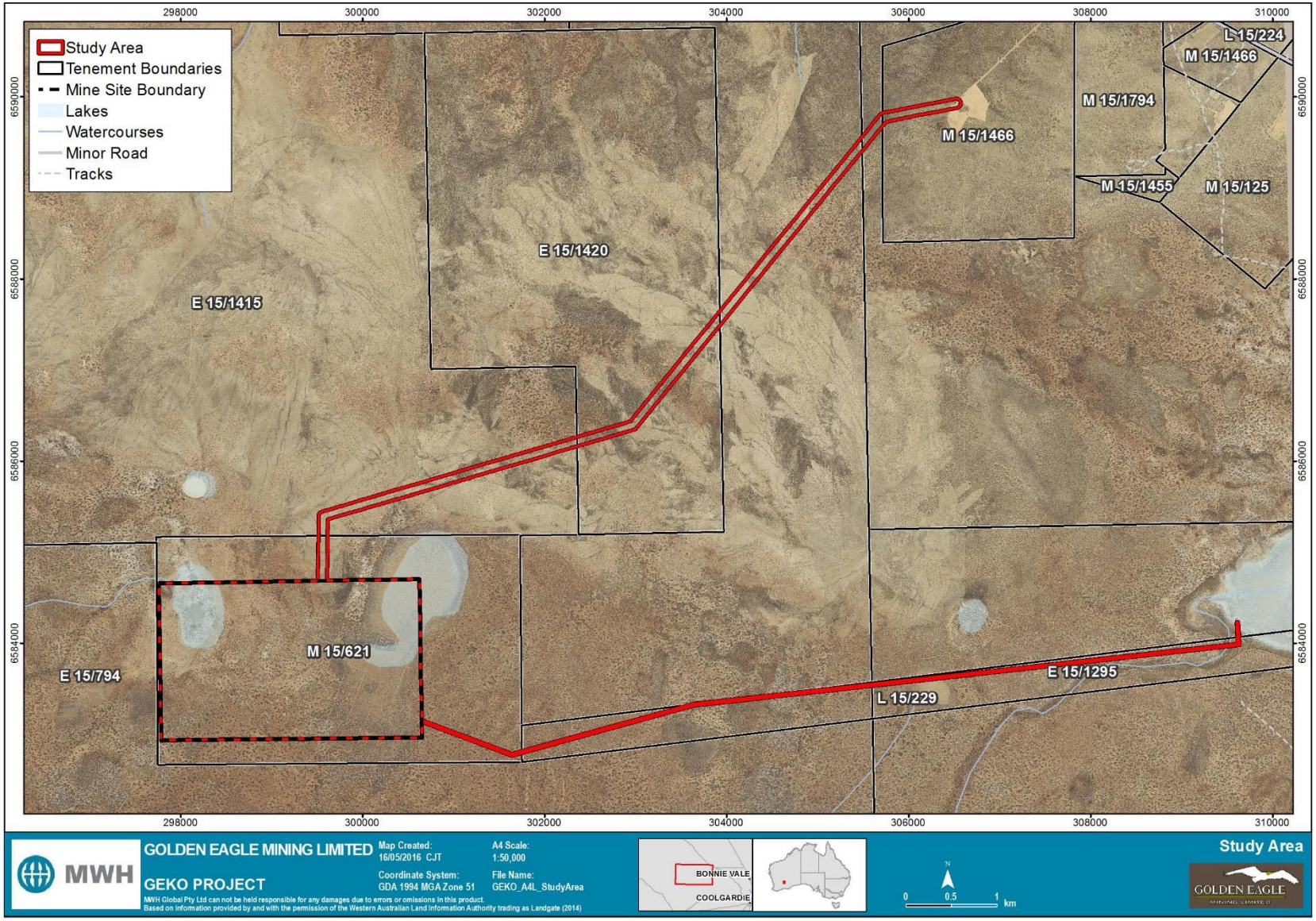

Figure 1-2: The Study Area

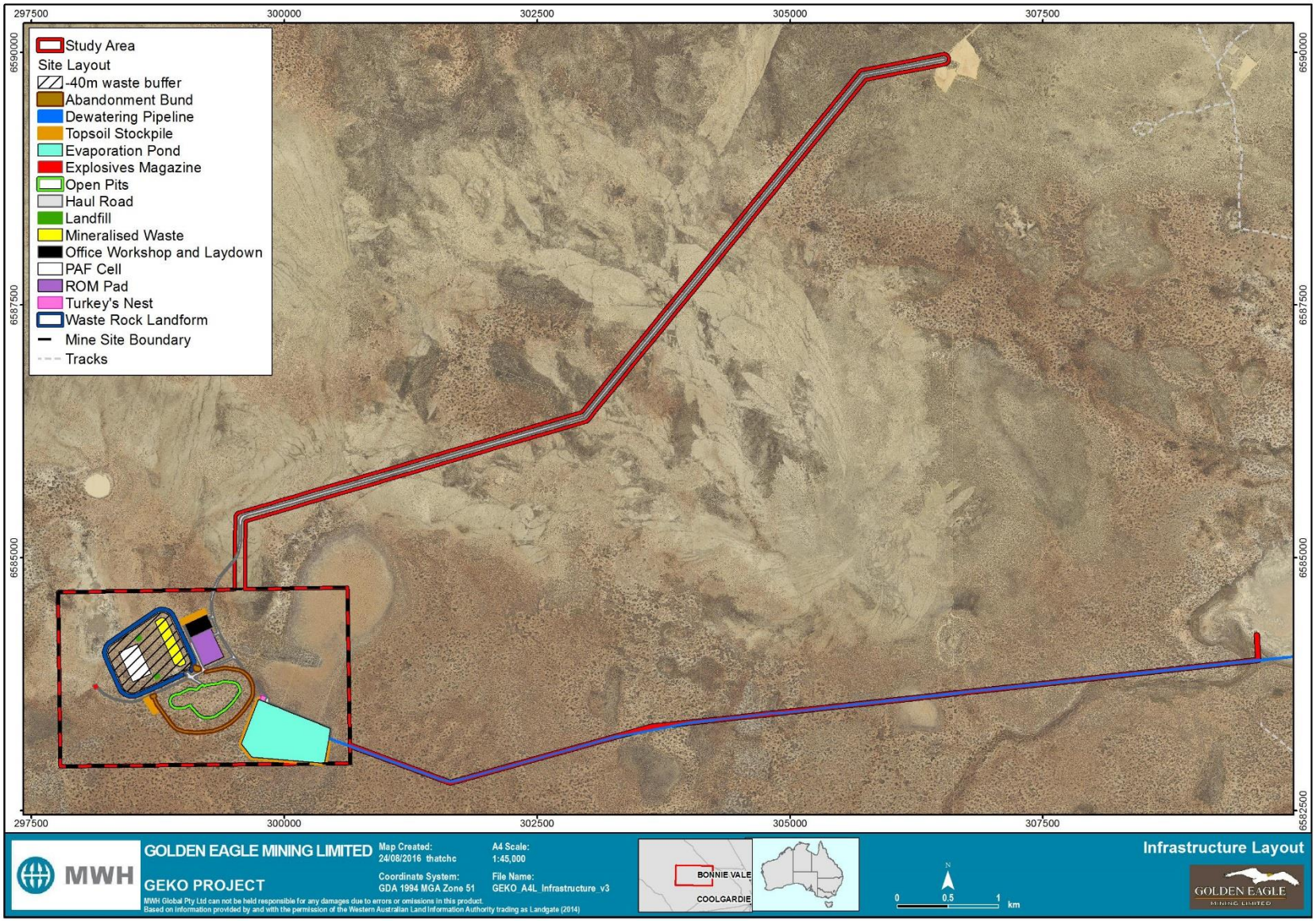

Figure 1-3: Indicative Project Layout

2 Existing Environment

2.1 Bioregion

The Study Area is located within the Coolgardie bioregion as defined by the Interim Biogeographic Regionalisation for Australia (IBRA) classification system (Thackway and Cresswell 1995) (**Figure 2-1**). The Coolgardie bioregion is typified by granite rocky outcrops, low greenstone hills, laterite uplands and broad plains with numerous salt lakes (Thackway and Cresswell 1995).

Within the Coolgardie bioregion, the Study Area is located within the Eastern Goldfields subregion (COO3). The Eastern Goldfields subregion is characterised by gently undulating plains interrupted in the west by low hills and ridges of Archaean greenstones and in the east by a horst of Proterozoic basic granulite. The underlying strata are eroded flat and covered with Tertiary sand and gravel soils, scattered exposures of bedrock, and plains of calcareous earths (McKenzie *et al.* 2003).

Vegetation of the Eastern Goldfields subregion is characterised by Mallees, *Acacia* thickets and shrubheaths on sandplains. Diverse eucalyptus woodlands occur around salt lakes, on ranges, and in valleys, and salt lakes support dwarf shrublands of samphire (Beard 1990, Cowan 2001). The Subregion occurs within the Goldfields Woodlands which has an exceptional high diversity of Eucalypt species with as many as 170 species naturally occurring (Cowan 2001). The subregion also has high species and ecosystem diversity of Eucalyptus Woodlands, high diversity in *Acacia* species and high diversity of ephemeral flora communities of tertiary sandplain shrublands and of valley floor woodlands (Cowan 2001). Additionally, the Study Area occurs within the broader Great Western Woodlands which is highly diverse and supports more than 3,000 species of flowering plants representing 20 % of Australia's known flora (DEC 2010).

2.2 Land Systems

An assessment of land systems provides an indication of the occurrence and distribution of fauna habitats and vegetation within and surrounding the Study Area. Land systems across the Eastern Goldfields have been mapped by the Natural Resources Assessment Group of the Department of Agriculture (Pringle *et al.* 1994) and provide a comprehensive description of biophysical resources within the area (**Table 2-1**, **Figure 2-2**). There are three land systems present within the Study Area.

Table 2-1: Land systems mapped over the Study Area

Land system	Description	Portion of Study Area	
		Hectares	%
Study Area			
SV15	Salt lakes and their associated areas	2.9	0.5
Mx43	Gently undulating valley plains and pediments; some outcrop of basic rock	596.5	97.8
AC1	Gently sloping to gently undulating plateau areas, or uplands, on granites, gneisses, and allied rocks, with long gentle slopes and, in places, abrupt erosional scarps.	10.5	1.7
Total		**609.8**	**100**

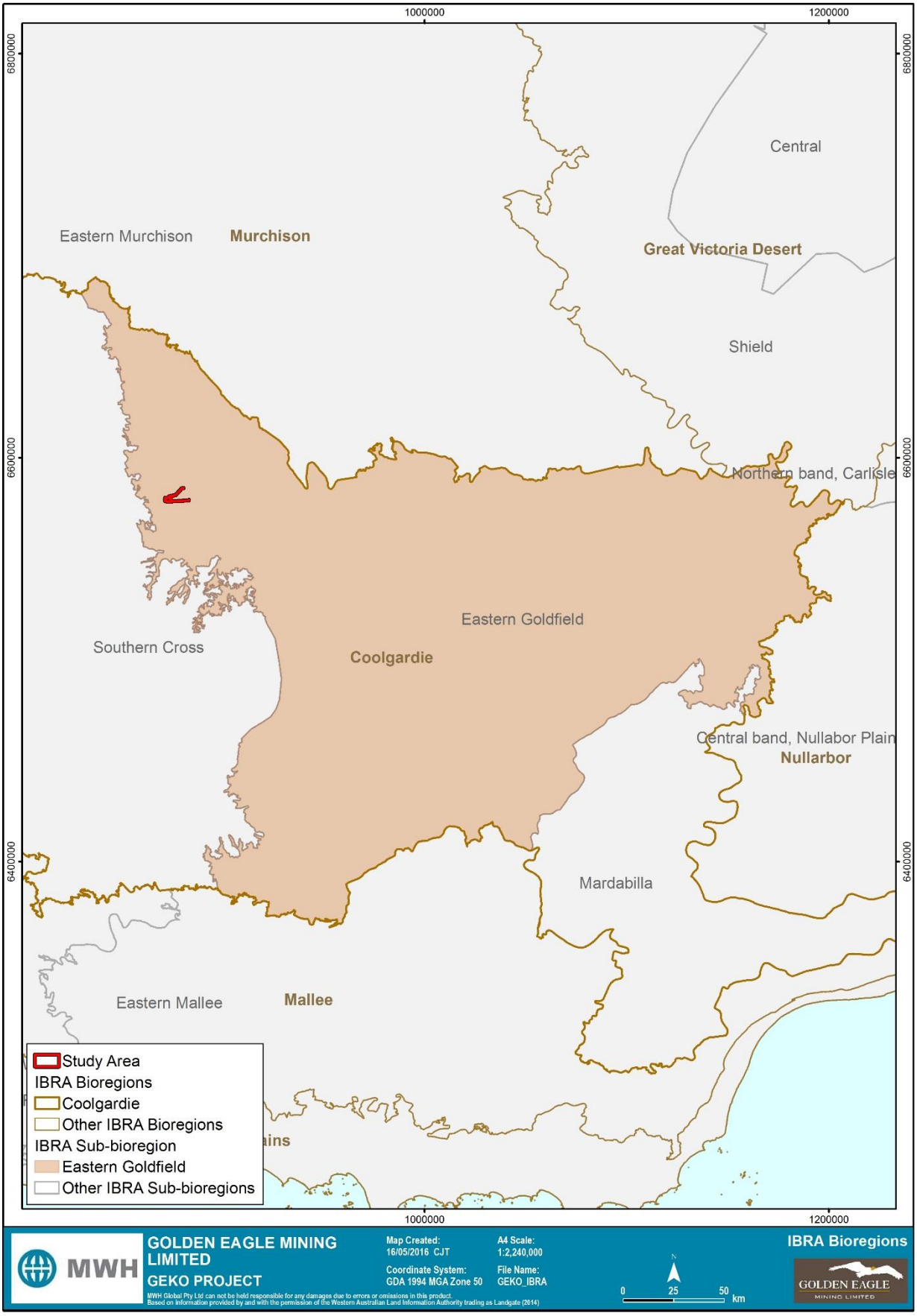

Figure 2-1: Location of the Study Area in relation to IBRA regions and subregions

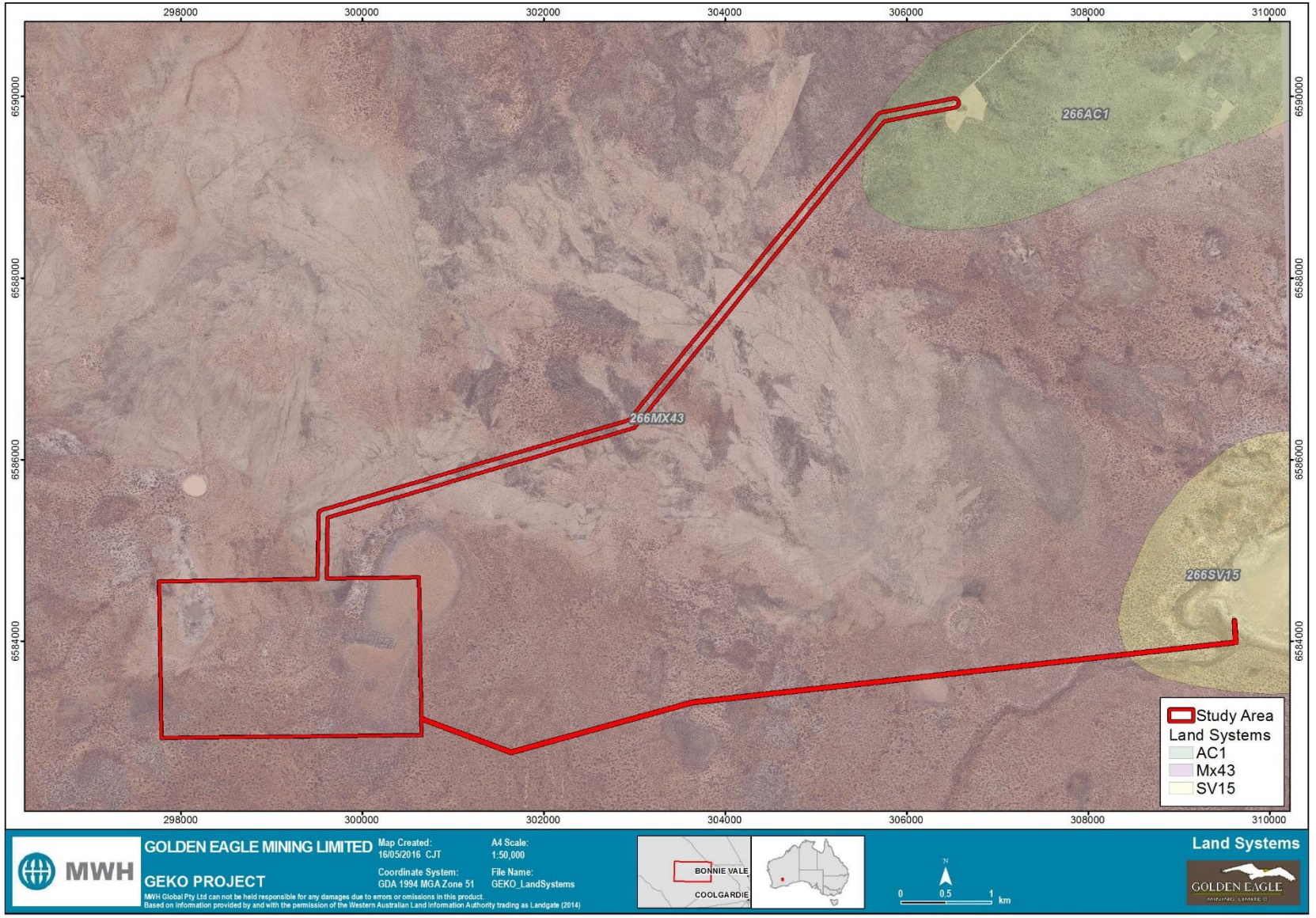

Figure 2-2: Land Systems of the Study Area

2.3 Pre-European Vegetation

Vegetation mapping of Western Australia was completed on a broad scale (1:1,000,000 and 1:250,000) by Beard (1975), who classified vegetation into broad vegetation types. These vegetation types were re-assessed by Shepherd *et al.* (2002) to account for clearing in the intensive land use zone, and to divide some larger vegetation units into smaller units. Vegetation Types described by Shepherd *et al.* (2002) correspond with that of Beard (1975).

Western Australia can be divided into three broad climatic regions based on Beard (1990); the Northern, Eremaean and South West Botanical Provinces. The Study Area occurs within the Coolgardie Botanical District of the South Western Interzone (Beard 1990). The Coolgardie Botanical District corresponds broadly to the Coolgardie region which was mapped by Beard (1978) at a 1:1,000,000 scale. Three vegetation associations that intersect the Study Area (**Table 2-2**, **Figure 2-3**). The current remaining extent of these vegetation associations within the Coolgardie Bioregion is more than the advised threshold for biodiversity conservation of 30% remaining (EPA 2000, Government of Western Australia 2014). The area also corresponds with the Great Western Woodlands, an area that is highly diverse and supports more than 3,000 species of flowering plants representing 20 % of Australia's known flora, including 160 species of Eucalyptus and a diversity of fauna (DEC 2010).

Table 2-2: Pre-European vegetation associations of the Study Area

Vegetation association (Beard code)	Description	Portion of Study Area		Remaining extent (%)	
		Ha	%	Pre-European	Protected
8 (sl)	Medium woodland; salmon gum & gimlet	483.39	79.27	98.3	9.0
1413 (e8,34Mi)	Shrublands; acacia, casuarina & melaleuca thicket	106.13	17.40	98.2	16.8
125 (acmSc)	Bare areas; salt lakes	20.3	3.33	92.9	4.4

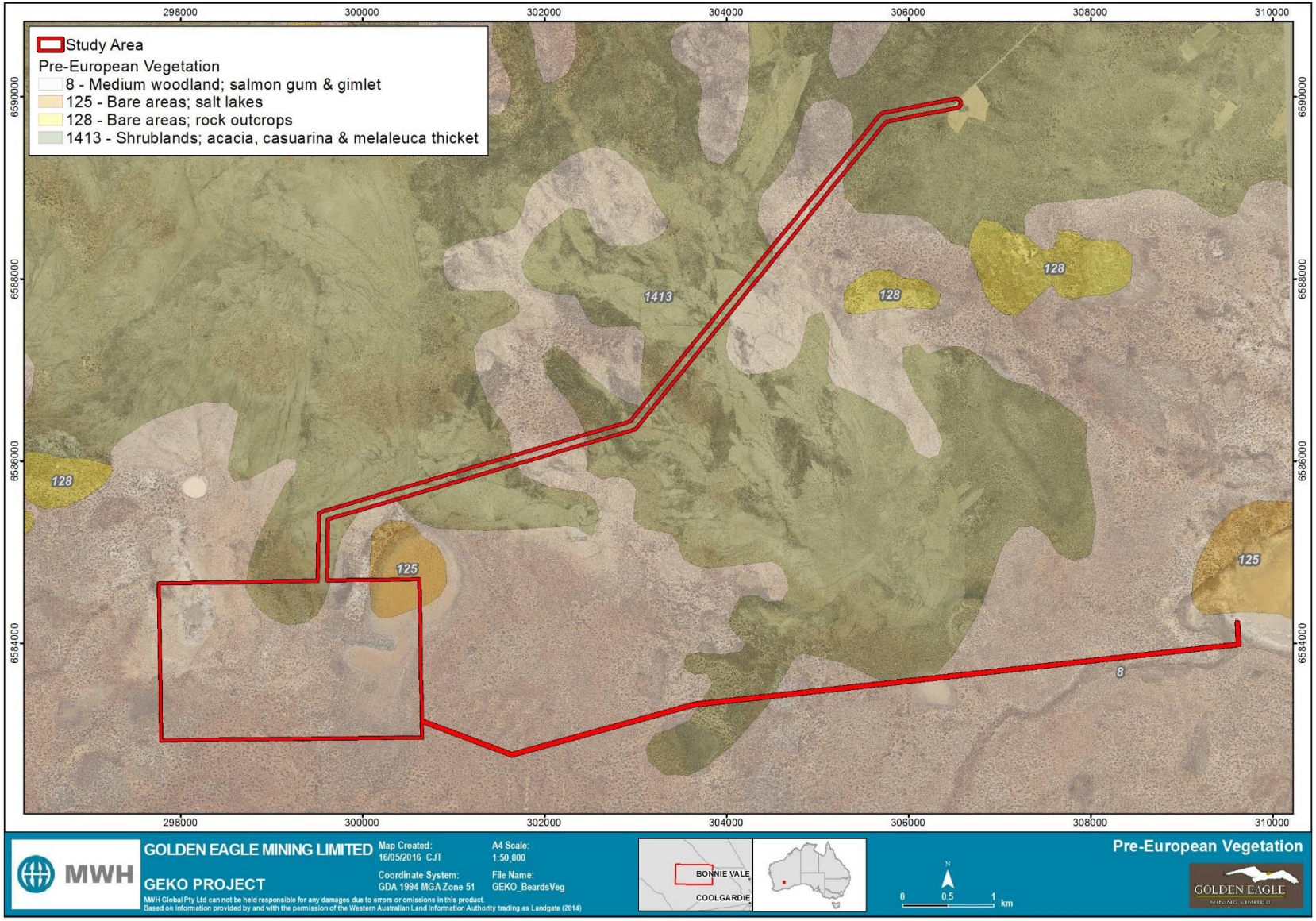

Figure 2-3: Pre-European vegetation associations of the Study Area

2.4 Land Use

The Eastern Goldfields subregion consists mainly of Unallocated Crown Land (UCL) and Crown reserves, as well as grazing of native pastures (37.8%) and freehold land (7.15%) (Cowan 2001). The Eastern Goldfields subregion is generally extensively degraded by pastoral activities (McKenzie *et al.* 2003). Frequent fire within scrubs and mallees on sandy and laterite surfaces is a key threat to flora of the region increasing weeds abundance and distribution problem (McKenzie *et al.* 2003).

Although the Coolgardie Bioregion has 11.3% of its area in conservation reserves there is considerable bias at the subregional level, with only 4.35% of the Eastern Goldfields subregion area in the reserve system. The current reserve system is highly biased at the subregional level and is not comprehensive or representative in terms of ecosystem representation (McKenzie *et al.* 2003).

2.5 Climate

The Study Area is located within the Eastern Goldfields subregion which is characterised by arid to semi-arid warm Mediterranean climate (McKenzie *et al.* 2003).

The nearest Bureau of Meteorology (BoM) weather station to the Study Area, which documents long term climate data, is Coolgardie (station number 012018), located approximately 25 km to the south east (BoM 2016). The mean annual rainfall recorded at Coolgardie is 271 mm, with May and June recording the most rainfall (**Figure 2-4**). The hottest maximum temperatures occur between November and March, with the coldest minimums occurring between May and August (BoM 2016) (**Figure 2-4**).

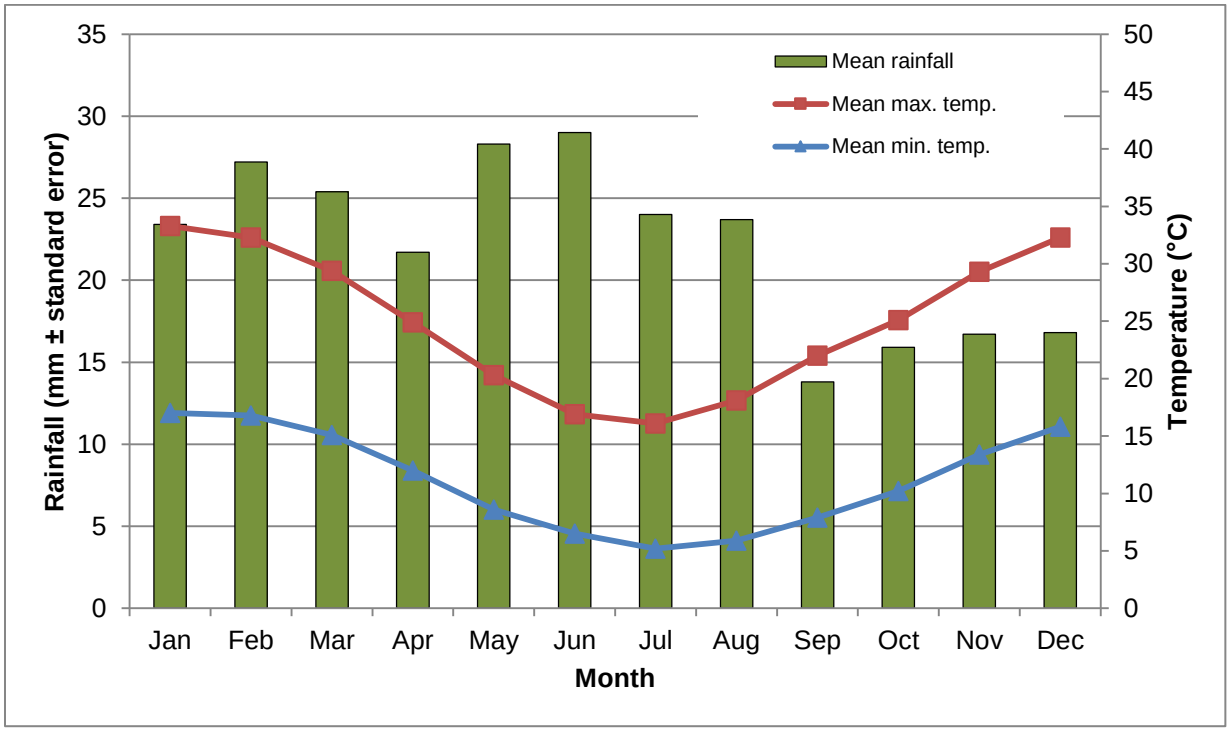

Figure 2-4: Long-term climate data recorded at Coolgardie (BoM 2016)

3 Desktop Study

A desktop study, comprising database searches and a literature review, was undertaken prior to the field survey to identify flora, vegetation and terrestrial fauna potentially occurring in the Study Area, and in particular species of conservation significance. Conservation significance and conservation rankings under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), *Wildlife Conservation Act 1950* (WC Act), and the Department of Parks and Wildlife's (DPaW) Priority list are defined in **Appendix A**.

3.1 Database Searches

Database searches were undertaken to generate a list of vascular flora and vertebrate fauna previously recorded within, and within the vicinity of, the Study Area - specifically species of conservation significance and introduced species. Six database searches were conducted around a central coordinate (51J, 299211 mE, 6583809 mS), with varying buffers as deemed appropriate. Search buffers differed due to the technical capabilities of individual databases, as well as features surrounding the Study Area relevant to different species groups. For example a larger search area was used for threatened and priority fauna to their greater mobility across the landscape.

Table 3-1: Databse searches conducted for the desktop study

Custodian	Database	Taxonomic group	Reference	Buffer (km)
DoE	Protected Matters	Flora and Fauna	(DoE 2016)	50
DPaW	NatureMap	Flora and Fauna	(DPaW 2016a)	20
DPaW	Threatened and Priority Ecological Communities	Flora and Fauna	(DPaW 2016b)	20
DPaW	Threatened and Priority Flora	Flora	(DPaW 2016d)	20
DPaW	Threatened and Priority Fauna	Fauna	(DPaW 2016c)	100
Birdlife Australia	Birdlife Birdata	Fauna	(Birdlife Australia 2016)	30

3.2 Literature Review

The literature review considered two previous surveys of relevance to the Study Area, in respect to both flora (**Table 3-2**) and fauna (**Table 3-3**). Surveys considered were those that were publically available, recently conducted and in close proximity to the Study Area. Additionally, regional documents were also considered as part of this assessment including:

- Biological survey of the eastern Goldfields of Western Australia Part 3: vertebrate fauna (Dell and How 1985).
- Biological survey of the eastern Goldfields of Western Australia Part 5: vertebrate fauna (Dell and How 1988).

Table 3-2: Key findings of flora studies conducted within the vicinity of the Study Area

Reference	Study Details	Proximity to Study Area	Vegetation Units	Flora Recorded	Vegetation condition	Species and communities of conservation significance
ecologia Environment (1999)	Location: Bullabulling Gold Project Study Type: Level 1 Flora and Vegetation Survey Survey Date: September 1998	Coincident with Study Area	11 vegetation units comprising mostly Eucalypt woodlands.	• 217 taxa • 43 families • 110 genera	Vegetation condition ranged from 'Pristine' to 'Excellent-Good' Disturbances included grazing by rabbits, exploration tracks, weeds	• *Juncus* sp. 1 (undescribed sedge species) recorded from the claypan in the north west of the Study Area.
GHD (2004)	Location: Mungari Industrial Estate Study Type: Level 1 Flora and Vegetation Survey Survey Date: November 2004	30 km east of the Study Area	4 vegetation units, comprising: • Open *Eucalyptus griffithsii/ Eucalyptus yilgarnensis* woodlands over mixed shrubs and spinifex; • Open Chenopod plains interspersed with stands of Gimlet and *Eremophila*'s; • Small woodlands of *Eucalyptus salmonophloia* and *Eucalyptus transcontinentalis* over *Eremophila* species; and • Small woodlands of *Eucalyptus clelandii* over low chenopods.	• 69 taxa • 20 families	Good condition overall. Disturbances included scattered weeds	• nil

Table 3-3: Key findings of fauna studies conducted within the vicinity of the Study Area

Reference	Study details	Proximity to Study Area	Broad habitats	Fauna assemblage recorded	Species of conservation significance	Notes
ecologia Environment (1999)	Location: Bullabulling Gold Project Study Type: Level 1 Fauna Survey Survey Date: September 1998	Coincident with Study Area	Five broad fauna habitats: • Salmon Gum Woodland (undulating plain) • *Callistemon* shrublands (claypan) • Low Mallee Woodland (hill slope) • *Acacia* shrubland (sandplain); and • *Eucalyptus* over *Muehlenbeckia* (gilgai claypan).	77 taxa: • 3 mammals (3 intr.) • 57 birds • 16 reptiles • 1 amphibian	nil	The current Study Area is slightly larger than survey area for this assessment
GHD (2004)	Location: Mungari Industrial Estate Study Type: Level 1 Fauna Survey Survey Date: November 2004	30 km east of the Study Area	Not specified	17 taxa: • 2 mammal (1 intr.) • 12 birds • 3 reptile	nil	Likely to contain similar habitats and species as what exists within the Study Area

Reference	Study details	Proximity to Study Area	Broad habitats	Fauna assemblage recorded	Species of conservation significance	Notes
McKenzie and Rolfe (1995)	Location: Conservation reserves of the Boorabbin-Southern Cross Study Area: Jilbadji Nature Reserve, Boorabbin National Park, Goldfields Woodlands National Park (Woolgangie) Study Type: Level 2 Fauna Survey Survey Date: February 1980, May 1981, October 1981	50-150 km east of the Study Area	Only the main vegetation types of the most extensive landforms were surveyed: • Broad Valleys; • Salt Lake Features; • Sandplains;and • Granite Exposures.	169 taxa: • 20 mammal (4 intr.) • 92 birds • 54 reptile • 3 amphibian	• Grey Falcon (*Falco hypoleucos*) • Peregrine Falcon (*Falco peregrinus*) • Malleefowl (*Leipoa ocellata*) • Rainbow Bee-eater (*Merops ornatus*) • Australian Pipit (*Anthus australis*) • Western Rosella (inland ssp.) (*Platycercus icterotis xanthogenys*) • Greater Long-eared Bat (*Nyctophilus major tor*) • *Cyclodomorphus branchialis*	Large scale surveys within conservation reserves over repeated trapping campaigns

3.3 Desktop Results

3.3.1 Flora

A total of 15 conservation significant flora taxa (those listed under the EPBC Act, WC Act, or DPaW's Priority Flora List) were identified from the database search (**Table 3-4**). Two of these, *Gastrolobium graniticum* and *Ricinocarpos brevis,* are listed as Threatened under the WC Act. The remaining 13 are Priority listed flora taxa, comprising: six Priority 1, two Priority 2 and five Priority 3 flora taxa.

Table 3-4: Flora species of conservation significace identified by DPaW (2016d) during the dektop assessment

Species	Conservation Code			DPaW (2016d)	DPaW (2016a)	DoE (2016)
	EPBC Act	WC Act	DPaW Priority Code			
Acacia crenulata			P3	x	x	
Acacia epedunculata			P1	x	x	
Acacia sclerophylla var. *teretiuscula*			P1	x	x	
Acacia websteri			P1	x	x	
Allocasuarina eriochlamys subsp. *grossa*			P3	x	x	
Baeckea sp. Bulla Bulling (D.J.E. Whibley 4648)			P1	x	x	
Diocirea microphylla			P3	x	x	
Elachanthus pusillus			P2		x	
Eremophila veronica			P3	x	x	
Gastrolobium graniticum	En	Vu		x	x	
Hakea rigida			P2	x	x	
Melichrus sp. Coolgardie (K.R. Newbey 8698)			P1	x	x	
Phebalium appressum			P1	x	x	
Styphelia sp. Bullfinch (M. Hislop 3574)			P3	x	x	
Ricinocarpos brevis	En	En				x

3.3.2 Threatened Ecological Communities

No Threatened Ecological Communities (TECs) or Priority Ecological Communities PECs) were identified from the DPaW Threatened and Priority Ecological Community database or the Department of Environment's (DoE) Protected Matters Database Search (DoE 2016).

3.3.3 Fauna

The desktop study identified a total of 233 species of vertebrate fauna, which have been recorded and/or have the potential to occur within the Study Area. This total comprises 26 native mammal, four introduced mammal, 136 native bird, two introduced bird, 61 reptile and four amphibian species. Many of these species are unlikely to occur in the Study Area because, as leading practice, these records have been collected from a large area encompassing a wide range of habitats, many of which do not occur within the Study Area. Furthermore, some small, common, ground-dwelling reptile and mammal species tend to be patchily distributed even where appropriate habitats are present, and many species of bird occur only as migrants, occasional visitors or vagrants.

Of the 233 species of vertebrate fauna identified during the desktop, twenty-two vertebrate species are listed as being of conservation significance, comprising, four mammals, one reptile and 17 birds (**Table 3-5**). In addition, three species of invertebrates listed as being of conservation significance were identified, including the aquatic crustacean *Branchinella denticulata* and two butterflies.

Table 3-5: Fauna species of conservation significace identified during the dektop assessment

Species	Conservation Code			DPaW (2016c)	DPaW (2016d)	DoE (2016)
	EPBC Act	WC Act	DPaW Priority Code			
Mammals						
Chuditch (*Dasyurus geoffroii*)	Vu	Vu		x		x
Greater Bilby (*Macrotis lagotis*)	Vu	Vu		x		
Numbat (*Myrmecobius fasciatus*)	Vu	En		x		
Central Long-eared Bat (*Nyctophilus major*)			P4	x		
Reptiles						
Western Spiny-tailed Skink (*Egernia stokesii badia*)	En	Vu		x		
Birds						
Night Parrot (*Pezoporus occidentalis*)	En	En				x
Malleefowl (*Leipoa ocellata*)	Vu	Vu		x	x	x
Blue-billed Duck (*Oxyura australis*)			P4			
Western Rosella (inland ssp) (*Platycercus icterotis*)			P4			
Peregrine Falcon (*Falco peregrinus*)		S7				
Fork-tailed Swift (*Apus pacificus*)	Mi	Mi		x		x
Rainbow Bee-eater (*Merops ornatus*)	Mi	Mi		x		x
Grey Wagtail (*Motacilla cinerea*)	Mi	Mi				x
Great Egret (*Ardea alba*)	Mi	Mi				x
Cattle Egret (*Ardea ibis*)	Mi	Mi		x		x
Glossy Ibis (*Plegadis falcinellus*)	Mi	Mi		x		
Curlew Sandpiper (*Calidris ferruginea*)	Cr	Vu		x	x	
Sharp-tailed Sandpiper (*Calidris acuminata*)	Mi	Mi		x	x	
Red-necked Stint (*Calidris ruficollis*)	Mi	Mi		x	x	

Species	Conservation Code			DPaW (2016c)	DPaW (2016d)	DoE (2016)
	EPBC Act	WC Act	DPaW Priority Code			
Common Greenshank (*Tringa nebularia*)	Mi	Mi		x	x	x
Wood Sandpiper (*Tringa glareola*)	Mi	Mi		x		
Hooded Plover (*Charadrius rubricollis*)	Mi		P4	x		
Invertebrates						
Arid Bronze Azure (*Ogyris subterrestris petrina*)	Cr	Cr		x		
Desert Blue Butterfly (*Jalmenus aridus*)		P1		x		
Crustacean (*Branchinella denticulata*)		P1		x		

4 Field Methodology

4.1 Survey Timing and Weather

The combined flora and fauna field surveys were conducted over two phases:

- Phase 1: from the 12th to the 15th April 2016 focusing on the Infrastructure Area and Pipeline Corridor; and
- Phase 2: from the 26th to the 29th of April 2016 focusing on the Haul Road Corridor.

Temperatures during the surveys were considered mild, with maxima temperatures in the mid-twenties. Some drizzle was experienced on two of the eight days, and rain was experience on 27th April (**Table 4-1**). (Note: **Table 4-1** presents rainfall from the Coolgardie BoM station and temperatures from Kalgoorlie-Boulder BoM station - as Coolgardie does not currently record temperatures).

Table 4-1: Daily weather observations during the survey period

Date	Temperature (°C)		Rainfall (mm)
	Min	Max	
Phase 1			
12/04/2016	16.7	27.4	0
13/04/2016	16.2	20.1	0.8
14/04/2016	14.4	28.4	0
15/04/2016	16.2	28.3	0
Phase 2			
26/04/2016	19.3	21.5	2.0
27/04/2016	8.4	18.5	8.8
28/04/2016	-	21.0	0
29/04/2016	10.9	22.1	0

In the six months preceding the Survey, significant rainfall was experienced in December and January (**Figure 4-1**), with Coolgardie recording over 70 mm in January 2016, compared to the long term average of 6.9 mm (BoM 2016). Despite the above average rainfall, however, few flora taxa were flowering, nor was there a large presence of annuals. This reduced the ability to identify some species, and to record seasonal species, but did not limit the ability to identify the majority of dominant flora taxa.

The purposes of the fauna component of the Survey (representing a reconnaissance survey) was to verify the accuracy of the desktop study, characterise the fauna habitats and opportunistically record the faunal assemblages present, assess the potential presence of fauna species of conservation significance, and to identify potential impacts. Weather conditions prior to and during the survey did not the hamper ability to record and characterise habitats and vertebrate fauna, particularly fauna of conservation significance.

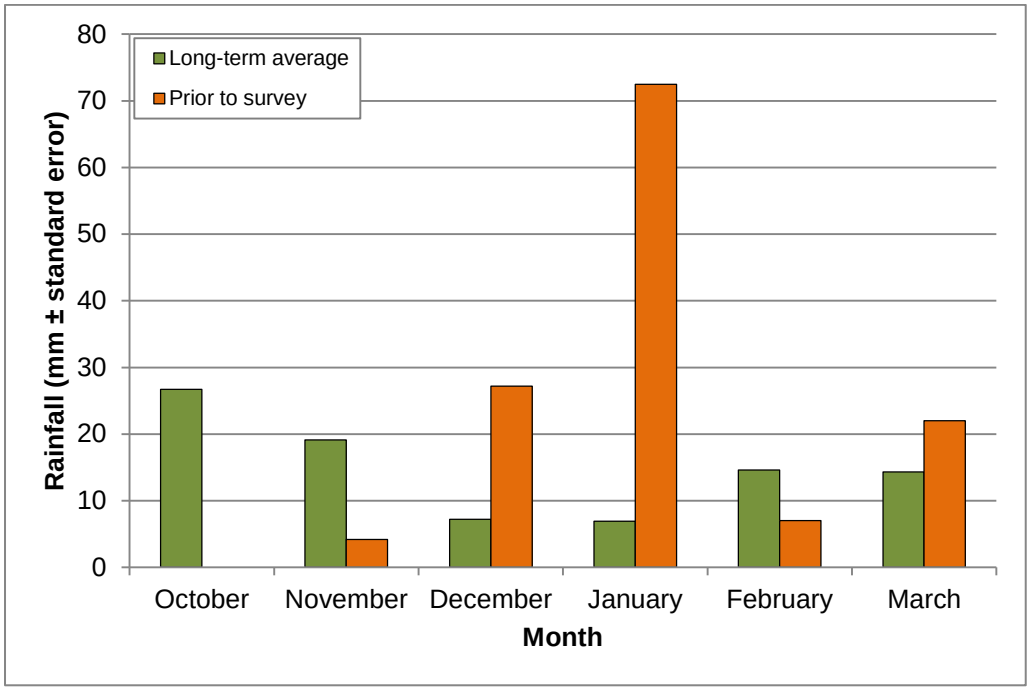

Figure 4-1: Rainfall recorded at Coolgardie six months prior to the Survey (BoM 2016)

4.2 Survey Team and Licensing

The field Survey was conducted by experienced zoologists/botanists of MWH Australia. The Phase 1 Survey was undertaken by Zoologist Briana Wingfield and Botanist Megan Stone. The Phase 2 survey was undertaken by Zoologists Briana Wingfield and Paul Bolton, and Senior Botanist Alex Sleep. All plant collections were made under flora collecting permit SL011485 and SL011064 pursuant to the WC Act Section 23C and Section 23F.

4.3 Flora and Vegetation Assessment

Prior to the field survey, aerial photography (Scale 1:10,000) of the Study Area and Google Earth Pro©, were used to determine broad preliminary vegetation unit boundaries and indicative sample site locations. Relevés (unbounded floristic sampling sites) were conducted to characterise vegetation units and condition, and ensure appropriate representation of the flora and vegetation present.

At least one relevé was completed within each vegetation unit identified to ensure adequate representation of the flora and vegetation present. Dominant vascular flora taxa within each relevé were recorded, with their corresponding height and cover class. A brief summary of the vegetation assemblage at each site was also recorded to aid in the production of vegetation unit descriptions. A total of 37 relevés were sampled within the Study Area, with an additional nine mapping notes made to document changes in vegetation units within the Study Area (**Table 4-2**).

Table 4-2: Number of survey sites in each Project component

Study Area	Relevés	Mapping Notes	Total
Infrastructure Area	10	1	11
Pipeline Corridor	8	1	9
Haul Road Corridor	19	7	26
Total	**37**	**9**	**46**

An inventory of vascular flora taxa within the Study Area was developed by compiling records of flora taxa encountered at each of the 37 relevés, and opportunistically while traversing between sites. Flora taxa not identified in the field were collected for identification at the Western Australian Herbarium (WAH). Identifications were carried out by MWH sub-consultant Sharnya Thomson. The nomenclature and taxonomy of all vascular flora taxa in this report follows that of the WAH. All taxa were checked against FloraBase to ensure their currency and validity (WAH 2016).

Broad vegetation mapping was conducted in the field, with vegetation boundaries delineated over aerial photography, and later refined based on survey data. Vegetation condition was assessed based on the Keighery (1994) scale. The vegetation units were described based on the floristic data recorded from the relevés and visual observations while traversing the Study Area. Classifications were specifically based on NVIS hierarchical level V (Vegetation Association) (ESCAVI 2003).

In addition, the following information was recorded at each relevé:

- GPS Location (recorded in GDA94 UTM 50J);
- site photograph;
- soil characteristics (texture and colour);
- geology (type, size and nature of any rocks, stone, gravel, or outcropping;
- topography (landform type and aspect);
- vegetation condition (based on Keighery 1994); and
- disturbance including fire history (time since last fire),erosion, grazing and weed invasion.

Prior to the Survey, flora of conservation significance with potential to occur within the Study Area were determined (**Table 3-4**). Field personnel familiarised themselves with photographs, taxon descriptions, the habitat in which they might occur, and actively searched for them while traversing the Study Area. For any populations or individuals of taxa known to be conservation significant or thought to be similar, a GPS location and a count of the individuals present, or percentage foliar cover for a given area, were recorded. Targeted searches for flora of conservation significance were also conducted and were focused on areas likely to be disturbed by the Project (**Figure 4-2**).

4.4 Terrestrial Fauna Assessment

Fauna habitat assessments were undertaken at 37 locations throughout the Study Area concurrent with the flora relevés (**Figure 4-2**). At each location, the following key habitat parameters were recorded:

- description of broad vegetation community;
- hollow bearing trees and dead stag trees (average size and abundance);
- rocky outcrops (average rock size and extent);
- coarse woody debris, i.e. logs and fallen timber (abundance and size);
- substrate (description of composition, presence of algal crust and % cover of leaf litter);
- wetland habitats and water courses including drainage lines, billabongs, floodplains, etc.; and
- any nest, roosts or other evidence of breeding habitat present.

Searches were conducted for fauna taxa of conservation significance and to develop a species list. Additional survey effort focused on habitats in very good condition and more likely to support fauna of conservation significance. Searching methods included hand-searching for cryptic species, for example by overturning logs and stones, searching beneath the bark of dead trees, investigating crevices and searching for burrows, tracks, diggings, scats, and other signs of fauna. Aural surveys for avifauna were also carried out. All vertebrate fauna seen or heard, or whose presence was inferred from secondary evidence was documented.

Targeted searches for fauna of conservation significance, particularly mounds of the Malleefowl, were undertaken with a focus on areas likely to be disturbed by the project. Much of the Infrastructure Area and Pipeline Corridor comprised relatively open Eucalypt Woodland with good visibility for searches (20m+), however some long unburned areas of the Haul Road Corridor comprised dense Acacia thickets where visibility was limited, and at times as low as 3-4 m. Consequently, the Haul Road Corridor was traversed end to end three times by two people (six traverses) to gain relatively good coverage and confidence of the occurrence of Malleefowl mounds within this portion of the Study Area.

The nomenclature and taxonomy of mammals, birds, reptiles and amphibians within this report follows the Checklist of the Vertebrates of Western Australia (WAM 2015). Relevant texts, from which information on habitat preferences and general patterns of distribution are available, were also considered for:

- mammals (van Dyck *et al.* 2013, Woinarski *et al.* 2014);
- birds (Johnstone and Storr 1998b, 2004, Morcombe 2003, Pizzey and Knight 2007)
- reptiles (Cogger 2014, Storr *et al.* 1999, 2002, Wilson and Swan 2013); and
- amphibians (Cogger 2014, Tyler and Doughty 2009).

4.5 Likelihood of the Occurrence for Flora and Fauna

The likelihood of occurrence of each species of conservation significance in the Study Area was assessed and ranked. The rankings were assigned using the following definitions:

Confirmed – the presence of the species in the Study Area has been recorded unambiguously during the last ten years (i.e. during recent surveys of the Study Area or from reliable records obtained via database searches);

Very likely – the Study Area lies within the known distribution of the species and is likely to contain suitable habitat(s), plus the species generally occurs in suitable habitat and has been recorded nearby within the last 20 years;

Likely – the Study Area lies within the known distribution of the species and the species has been recorded nearby within the last 20 years; however, either:

a. the Study Area is likely to contain only a small area of suitable habitat, or habitat that is only marginally suitable; or
b. the species is generally rare and patchily distributed in suitable habitat;

Possible – there is an outside chance of occurrence, because:

a. the Study Area is just outside the known distribution of the species, but is likely to contain suitable and sufficient habitat (the species may be common, rare, or patchily distributed); or
b. the Study Area lies within the known distribution of the species, but the species is very rare and/or patchily distributed; or
c. the Study Area lies on the edge of, or within, the known distribution and is likely to contain suitable habitat, but the species has not been recorded in the area for over 20 years.

Unlikely – the Study Area lies outside the known distribution of the species, the Study Area is unlikely to contain suitable habitat, and the species has not been recorded in the area for over 20 years.

Figure 4-2: Survey effort across the Study Area

5 Results and Discussion

5.1 Vegetation

5.1.1 Vegetation Condition

Vegetation condition across the Study Area generally ranged from Very Good to Excellent. However, small areas within the Infrastructure Area and Pipeline Corridor were compromised due to historical exploration activities such as clearing for drill lines and access tracks. The Haul Road Corridor had only a few old intersecting vehicle tracks present. Areas of the Haul Road Corridor were in various stages of regeneration post fire. Based on the aerial imagery, these fires all appear to have started in largely inaccessible areas, presumably as a result of lighting strike.

5.1.2 Vegetation Units

A total of 15 vegetation units were recorded across the Study Area (**Table 5-1**, **Appendix C**). The Infrastructure Area and Pipeline Corridor broadly comprised *Eucalyptus* woodlands, interspersed with valley floors and clayey basins. The Haul Road Corridor typically consisted of scrub heath with Mallee on deep red sands or sandplain, with small patches of *Eucalyptus* woodland. These vegetation types align with the vegetation types described by Cowan (2001); Mallees, *Acacia* thickets and shrub heaths on sandplains, and Woodlands of *Eucalyptus* species around salt lakes and valleys floors. Detailed descriptions for each relevé are provided in **Appendix D**.

The Sandplain vegetation, which compriseed large portions of the Haul Road Corridor, had been burnt several times, including quite recently. Post-fire regeneration of vegetation was consequently in various stages of pyric succession across the sandplains. This was evident with some areas dominated by *Grevillia excelsior*, a known pioneer species post fire (Beard 1990), whereas in other areas *Acacia resinimarginea* was in various ages post fire regeneration, sometimes forming dense thickets. Within some areas of *Acacia resinimarginea* and mallee, the presence of burnt *Allocasuarina* and *Callitris* nuts indicated that species from those genera had also once occurred and may regenerate at later stages of the successional sequence. Areas of *Allocasuarina* and *Callitris* were also observed in long unburned areas of the northern portion of the Haul Road Corridor.

Table 5-1: Vegetation association recorded within the Study Area

Vegetation unit code	Description	Relevés	Portion of Study Area	
			Area (ha)	%
AaApCp	*Acacia aptaneura*, *A. prainii* and *Callistemon phoeniceus* mid to low shrubland.	GI08	26.2	4.30%
AaLfPg	*Acacia aptaneura* tall shrubland over *Leptospermum fastigiatum* and *Prostanthera grylloana* mid open shrubland.	GI04	1.8	0.30%
ArAc	*Eucalyptus ? rigidula* isolated clumps of trees over *Acacia resinimarginea*, *Allocasuarina campestris, Allocasuarina corniculata* and *Callitris preissii* tall shrubland to closed shrubland over *Beyeria sulcata* var. *sulcata* and/or *Myrtaceous* spp. low open to sparse shrubland over *Triodia scariosa* sparse hummock grassland.	GR22, GR23, GR24, GR28	12.6	2.07%
ArTs	*Eucalyptus griffithsii* and/or *E. leptopoda* subsp. *leptopoda* open mallee woodland to isolated mallee trees over *Acacia resinimarginea* tall shrubland over *Phebalium filifolium* sparse low shrubland over *Triodia scariosa* hummock grassland.	GR01, GR03, GR07, GR10, GR11, GR15	37.4	6.13%
EcEiSs	*Eucalyptus celastroides* subsp. *virella* woodland over *Eremophila ionantha* mid sparse shrubland over *Scaevola spinescens* low open shrubland.	MSGR07	0.6	0.10%
EgAa	*Eucalyptus griffithsii* (*E. yilgarnensis*) low woodland to open woodland over *Acacia acuminata* (*Alyxia buxifolia* and *Allocasuarina helmsii*) tall to mid shrubland over *Senna artemisioides* and/or *Grevillea acuaria* low open shrubland.	MSGR06, GI10	46.5	7.62%
EgApTs	*Eucalyptus griffithsii* low open woodland over *Acacia prainii* mid open shrubland over *Triodia scariosa* open hummock grassland.	GI09	82.9	13.59%
ElAaMl	*Eucalyptus longissima*, *E. griffithsii* and *E. horistes* low open woodland over *Acacia acuminata* and *Melaleuca lanceolata* tall sparse shrubland.	MSGR1B	0.6	0.10%
EcMp	*Eucalyptus clelandii* (+/- *E. yilgarnensis, E. salmonophloia, E. urna*) open woodland over *Melaleuca pauperiflora* subsp. *fastigiata* scattered patches of closed shrubland (not continuous through the area) over *Scaevola spinescens*, *Alyxia buxifolia* and *Eremophila* spp. mid to low open shrubland.	GI01, MSGR05, MSGR09, GR18, GR20	39.4	6.46%

Vegetation unit code	Description	Relevés	Portion of Study Area	
			Area (ha)	%
EgEpEc	Mixed Eucalypts comprising *Eucalyptus griffithsii* and/or *E. platycorys*, and/or *E. celastroides* subsp. *virella* mid open mallee woodland over *Eremophila caperata*, *Acacia hemiteles* and *Scaevola spinescens* mid mixed shrubland with occasional patches of *Melaleuca ? hamata*.	GR12, GR19, GR26, GR29, GR30	12.3	2.02%
EgArTs	*Eucalyptus griffithsii* (+/- *E. horistes* / *E. platycorys* / *E. rigidula*) mid mallee woodland over *Acacia resinimarginea* tall shrubland over *Beyeria sulcata* var. *sulcata* low open to sparse shrubland over *Triodia scariosa* hummock grassland.	GR09, GR14, GR16, GR17, GR21, GR27, GR31	32.7	5.36%
EsAbAh	*Eucalyptus salmonophloia* low open woodland over *Acacia burkittii* tall sparse shrubland over *Acacia hemiteles* mid sparse shrubland over *Scaevola spinescens, Alyxia buxifolia* and *Senna artemisioides* subsp. *filifolia* low open shrubland.	GR13	2.7	0.44%
EsEcEyEgEm	Mixed Eucalypts comprising *Eucalyptus salubris* and/or *E. clelandii* and/or *E. yilgarnensis* and/or *E. griffithsii*, and/or *E. moderata* tall to mid open woodland over *Acacia* and *Eremophila* spp. mid open shrubland over *Scaevola spinescens* and *Olearia muelleri* mid to low open shrubland.	GI02, GI03, GI05, GI06, GI07, MSGR03, MSGR08	235.1	38.54%
MhOiPr	*Melaleuca hamata* tall closed shrubland over *Olearia incana* and *Psydrax rigidula* low sparse shrubland.	MSGR04	0.3	0.05%
EyMp	*Eucalyptus yilgarnensis* low isolated trees over *Melaleuca phoidophylla* tall to low shrubland over *Fabaceae* sp. low sparse shrubland.	GI11	78.1	12.80%

5.1.3 Vegetation of Conservation Significance

The status of native ecosystems and the level of protection represented in the National Reserve System is traditionally assessed using IBRA bioregions and subregions as a comparison (NRMMC 2009). IBRA is used to monitor progress in building a Comprehensive, Adequate and Representative (CAR) reserve system (DPaW 2014). Governments use this information to prioritise allocation of funding to meet national biodiversity protection targets. According to the National Reserve System, approximately 10.9 % of the Coolgardie bioregion is vested in the National Reserve System (DPaW 2014). Within the Eastern Goldfields subregion (COO3), approximately 12.8% of the current area is protected within IUCN Class I-IV Reserves (i.e. National Parks, Nature Reserves).

The Australian and New Zealand Environment and Conservation Council (ANZECC) published the *National Objectives and targets for Biodiversity Conservation 2001-2005*, which recognises that a retention of 30% or more of the pre-clearing extent of each ecological community is necessary if Australia's biological diversity is to be protected (ANZECC 2001). EPA (2000) defines the threshold level of vegetation preservation, below which species loss appears to accelerate exponentially at the ecosystem level, also as being 30% of the pre-clearing extent of the vegetation type. In addition to the ANZECC 30% retention target, the EPA has adopted a 10% level of pre-clearing extent as representing 'endangered' (EPA 2000). The broad vegetation associations of the Study Area have between 4.4% and 16.8% of their areas protected within IUCN Class I-IV Reserves. However, all vegetation associations have 92% or greater of their pre-European extent remaining within the Coolgardie bioregion (**Table 2-2**). Therefore, the vegetation associations in the bioregion and subregion are not considered to be at threat of exponential biodiversity and species loss.

The vegetation units described from the Study Area are not considered to represent any TECs or PECs known to occur in close proximity to the Study Area or the wider Eastern Goldfields subregion. Vegetation Units AsLfPg, EcEiSs, ElAaMl, EsAbAh and MhOiPr have limited representation across the Study Area (less than 1 % of total area), however, these are not considered to be significant at the local level due to their occurrence more broadly beyond the Study Area (based on examination of aerial imagery where they occur broadly but intersect a small portion of the Pipeline Corridor, Haul Road Corridor and far south-western corner of the Infrastructure Area).

5.2 Flora

5.2.1 Flora Assemblage

A total of 133 flora taxa (including subspecies and variants) from 25 families and 58 genera were recorded within the Study Area (**Appendix E**). The most frequently occurring families were Myrtaceae, Fabaceae, Scrophulariaceae and Proteaceae which together represented 60% of the species recorded. Thirty-four of the 58 genera recorded, were represented by single families, while the dominant four genera (*Eucalyptus* 19, *Acacia* 15, and *Eremophila* 11, *Melaleuca* 7) represented 40% of the total taxa recorded from the Study Area (**Table 5-2**).

The floral diversity and composition recorded from the Study Area is largely consistent with the Eastern Goldfields region, the landforms present, the season of the Survey, and the sampling intensity of the survey (i.e. Level 1, relevés; **Appendix E**). The region is known for having exceptionally high diversity of *Eucalyptus* species with as many as 170 species occurring in the bioregion, as well as a high diversity of *Acacia* species (Cowan 2001). This is reflected in the floral assemblage recorded within the Study Area, with *Eucalyptus* and *Acacia* being the genera with the highest number of species recorded.

Of the specimens collected, 20 (or 14%) were unable to be confidently identified to species or infraspecies level due to a lack of reproductive material. This is despite an above average amount of rainfall recorded in the months prior to the Survey (**Section 4.14.1**). Of these 20 specimens, one specimen of *Hakea* is of interest as it did not key out with known species from the region. Another specimen is likely to represent the P3 species *Acacia cylindrica*. Of the remaining specimens with tentative identifications, none are considered to be analogous with any of the 'Likely' or 'Possible' priority flora potentially occurring in the Study Area.

The Coolgardie subregion is regarded as having high species within Ephemeral flora communities of tertiary sandplain shrublands and of valley floor woodlands (Cowan 2001). Due to the timing of the survey, ephemeral species were present only in low numbers and it is likely that this diversity was underrepresented in the survey results. This was evident in the species list for this survey having relatively low numbers of Asteraceae (6), Aizoaceae (0) and Poaceae (3). Each of these genera is common to the Eastern Goldfields sub-region, and greater numbers would be expected to occur given that 165 Asteraceae, 104 Poaceae and 14 Aizoaceae species have previously been recorded (WAH 2016). However, of the ephemeral conservation significant flora with potential to occur within the Study Area (**Appendix F**), only *Elachanthus pusillus* (Asteraceae) has potential to occur (**Section 5.2.3**).

Table 5-2: Dominant families recorded from the Study Area

Family	Number of species in subregion (WAH 2016)	Species recorded in field Survey	
		Number	% of subregion
Myrtaceae	229	36	15.7
Fabaceae	214	20	9.3
Scrophulariaceae	68	11	16.2
Proteaceae	57	11	19.3

5.2.2 Introduced Flora

No introduced flora taxa were recorded from the Study Area during the field survey. Introduced taxa have potential to occur in the Study Area and may be detected following a more systematic survey after rainfall. Within the Study Area, introduced annuals and biennials are more likely to occur in areas that have been degraded by previous exploration activities.

5.2.3 Flora of Conservation Significance

No Threatened flora species were recorded within the Study Area. The desktop study identified one Threatened taxa, *Ricinocarpos brevis* ranked as Endangered under the WC Act and the EPBC Act as having previously been recorded within the database search area. *Ricinocarpos brevis* was not considered likely to occur in the Study Area due to the lack of suitable habitat (rocky hillslopes and rock outcrops).

One priority species, *Acacia cylindrica* (Priority 3) was potentially identified from the survey (**Table 5-3**, **Figure 5-1**), however the specimen could not be conclusively identified due to a lack of flowering and/or fruiting material. The species was not recorded from the desktop with the majority of previous records occurring 135 km west of the Study Area. Only one single record of the species has been recorded within the East Goldfields subregion, recorded near Widgiemooltha, approximately 95 km south southeast of the Study Area. Although previous records of the species are some distance from the Study Area, the species has the potential to occur on the basis of preferred habitat occurring within the Study Area, namely yellow/brown sand and gravelly soils on undulating plains and flats.

Additionally, a specimen of *Hakea* collected during the survey (**Table 5-3**, **Figure 5-1**) did not key out to other known species from the region. This specimen is of interest as it represents an anomaly, however, additional material during flowering and/or fruiting season would be required to confirm its taxonomic status.

The likelihood of occurrence, for flora species of conservation significance identified from the desktop were assessed and ranked (**Appendix F**). The rankings were assigned following definitions described in **Section 4.5**. Based on these rankings (including WAH records and habitat preferences), 11 taxa were assessed as Possible or Likely to occur within the Study Area (**Appendix F**). *Acacia crenulata* (P3), *Acacia cylindrica* (P3), *Acacia epedunculata* (P1), *Acacia sclerophylla* var. *teretiuscula* (P1), *Acacia websteri* (P1), *Baeckea sp.* Bulla Bulling (D.J.E. Whibley 4648) (P1), *Diocirea microphylla* (P3), *Elachanthus pusillus* (P2), *Hakea rigida* (P2), *Melichrus sp.* Coolgardie (K.R. Newbey 8698) (P1), *Phebalium appressum* (P1). Each of these was targeted during the Survey but were not recoded. Most of these species are readily identifiable from vegetative material. Specimens not readily identifiable do not show similarities to any of the unidentified species recorded.

One species, *Scaevola bursariifolia* was recorded during the survey outside of its normal distribution. The species has not previously been recorded within the Eastern Goldfields subregion, but has been recorded within the broader Coolgardie bioregion. *Scaevola bursariifolia* is most commonly found in the Mallee bioregion with the closest confirmed record being approximately 175 km to the south of the Study Area (DPaW 2016a, WAH 2016).

Table 5-3: Flora of conservation significance recorded within the Study Area

Species	Conservation ranking	Coordinates (51J)	
		Easting	Northing
Acacia ? cylindrica	P3	305761	6589759
Hakea sp	unknown	306285	6589860

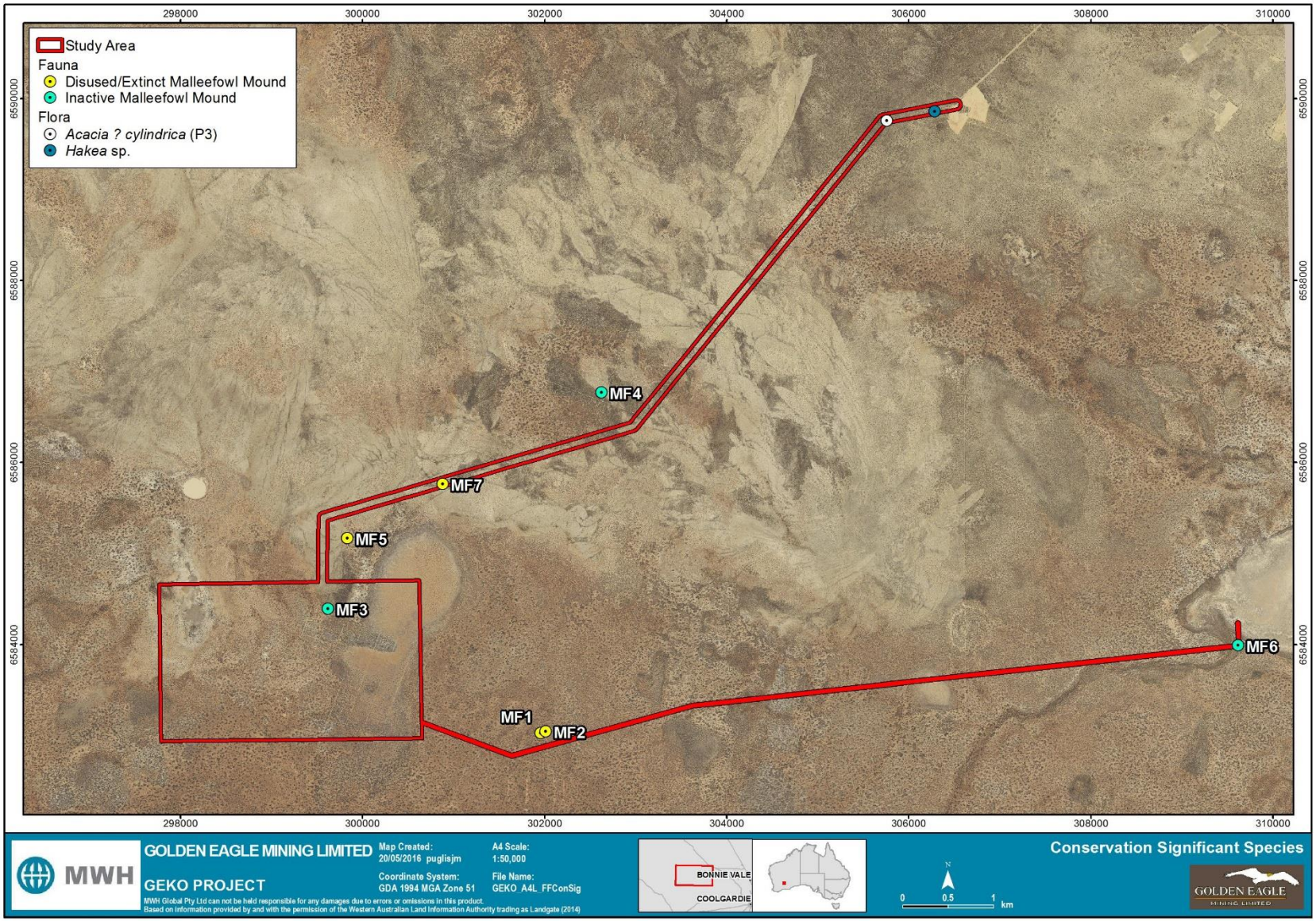

Figure 5-1: Flora and Fauna of conservation significance recorded during the Survey

5.3 Terrestrial Fauna

5.3.1 Fauna habitats

Broad fauna habitats were identified and delineated form fauna habitat assessments conducted across the Study Area (**Figure 4-2**; **Appendix D**). Four broad fauna habitat types were identified within the Study Area (**Table 5-4**, **Figure 5-2**).

- Eucalypt woodland
- Mallee Woodland
- Shrubland
- Vegetated Claypan

These habitats differed in the composition of substrate (i.e. loam, sand or alluvial based), as well as vegetation density and structure. Variability in the middle and upper strata in particular differed significantly between the habitats and their age post fire. No instances of rocky outcrops were recorded. Soil types across the Study Area either comprised of deep yellow sands supporting shrublands or Mallee Woodlands; or red/orange clay loams supporting Eucalyptus woodlands. Low lying depressions supported Vegetated Claypans.

The habitat types in the Study Area were assessed on their extents and levels of significance according to the following criteria:

- Distribution: those habitats widespread and common within the surrounding regions were categorised as widespread; otherwise they were categorised as limited. All habitat types within the Study Area were considered widespread; and
- Significance: those habitats considered important to species of conservation significance or distinct fauna assemblages are deemed significant; otherwise they were categorised as limited significance. Long unburned areas of the Shrubland habitat area likely to form significant nesting/mound building habitat for the Malleefowl (*Leipoa ocellata*) which is listed as Vulnerable under the EPBC Act and WC Act.

Table 5-4: Fauna habitats identified from the Study Area

Broad Habitat	Area Ha (%)	Vegetation units	Condition	Value to fauna
Eucalyptus Woodland	400.31 (65.64%)	EsEcEyEgEm EgApTs EgAa EcMp MhOiPr EcEiSs EsAbAh	Historic clearing for mining exploration (drill lines and tracks). Some evidence of rabbit.	Characterised by tall to medium open mixed Eucalyptus species (*E. yilgarnensis*, *E. moderata* and/or *E. salubris*) over a mixed open low shrubland comprising *Acacia*, *Eremophila* and *Scaevola* species on orange sandy loam. The tall Eucalypts provided hollows suitable for hollow nesting birds and shelter for reptiles, high foraging potential for nectivorous birds when in flower, and large branches for larger nesting birds. Woody debris and leaf litter accumulation was common, providing suitable foraging microhabitats for small ground-dwelling mammals and reptiles. The substrate and areas of leaf litter accumulation also suitable burrowing and fossorial species. Malleefowl mounds were recorded in this habitat, indicating that this habitat, particularly areas with a dense midstorey, is suitable for the species.
Mallee Woodland	33.71 (5.53%)	EgAa EgArTs EgEpEc EcMp	Access/exploration tracks – mostly historic and overgrown.	The Mallee Woodland habitat comprised *Eucalyptus griffithsii* mallee over a mixed *Acacia* shrubland, often dominated by *Acacia resinimarginea*. The height of the mallee depended on the time since last fire and the subsequent regeneration from lignotuber. Occasionally this habitat contained spinifex (*Triodia scariosa*), however its occurrence was patchy and transitioned in the landscape. Substrate comprised of yellow/orange sand to sandy loam and was highly suitable for burrowing species. Dead branches, woody debris and peeling bark were often present and provided suitable habitat for small reptiles. The dense vegetation supports a large, and often unique assemblage of bird species. Malleefowl mounds were recorded in this habitat indicating that this habitat is suitable for the species.
Shrubland	70.70 (11.59%)	ArTs ArAc EcMp ElAaMl EgArTs	Access/exploration tracks – mostly historic and overgrown.	The shrubland habitat was common on the sandy plains that were present throughout much of the Haul Road Corridor. This habitat was a patchwork of numerous fire scares and the vegetation was at various stages of regeneration post fire. The most dominant vegetation was *Acacia resinimarginea* which varied in age from small shrubs through to tall (3-4m high) dense thickets. Other species including *Grevillia excelsior* were also present and in flower providing a food source for nectivorous birds. Other long unburned areas in the north had a high proportion of *Allocasuarina* and *Callitris* not present in more frequently burned areas. Leaf litter and accumulation of woody debris in these long unburned areas created a habitat for burrowing and fossorial species of mammal and reptile. Dense areas of shrubland provided protective cover for small bird species. Malleefowl mounds were recorded in this habitat indicating that this habitat is suitable for the species. Denser Acacia thickets within this habitat would provide shelter for the species and young regeneration provide suitable foraging habitat for the species.

Broad Habitat	Area Ha (%)	Vegetation units	Condition	Value to fauna
Vegetated Claypan	104.33 (17.11%)	EyMp AaApCp	Minor access/exploration tracks	The vegetated claypan habitat comprised low lying areas in the Study Area that were prone to ponding. The vegetation within this habitat was made up of low to moderately tall open shrubland of *Acacia*, *Callistemon* or *Melaleuca phoidophylla* on sandy or clay loams. Due to the potential for intermittent flooding, this habitat had limited potential to support burrowing species and the dense shrubland would have provided cover and foraging habitat for small bird species.
Cleared	0.77 (0.13%)	-	Area cleared to provide access to sand quarry	Areas cleared in association with the Sand Quarry at the northern end of the proposed Haul Road Corridor. No value to fauna.

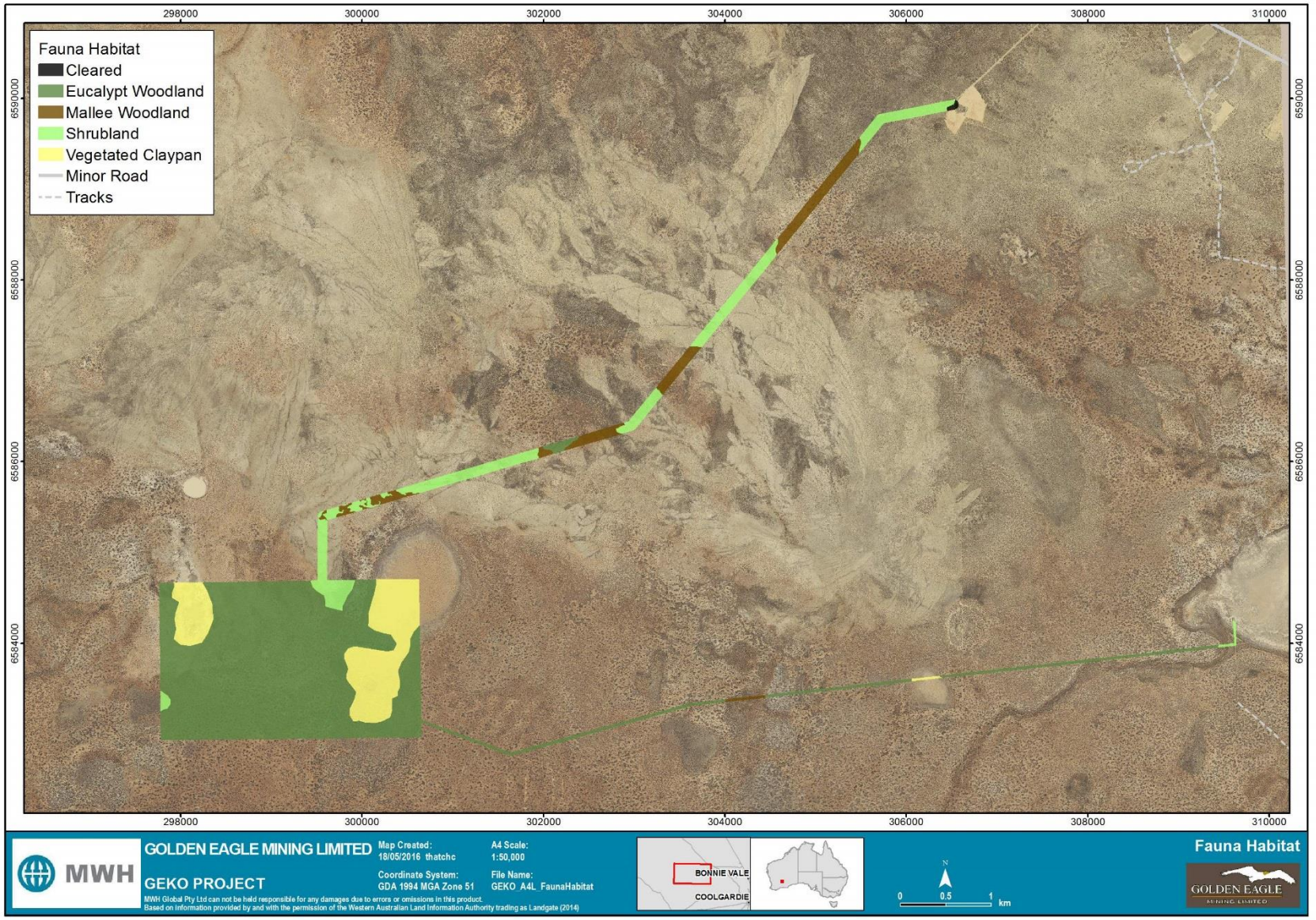

Figure 5-2: Broad fauna habitats of the Study Area

5.3.1 Fauna assemblage

The desktop study identified a total of 233 species of vertebrate fauna, which have been recorded and/or have the potential to occur within the Study Area. This total comprises 26 native mammal, four introduced mammal, 136 native bird, two introduced species, 61 reptile and four amphibian species.

A total of 48 vertebrate fauna species were recorded during the field survey (**Table 5-5**), comprising four mammals (one native), 38 birds and six reptile species. Four introduced vertebrate fauna species were recorded during the Survey, Dog (*Canis familiaris*), Cat (*Felis catus*) and Rabbit (*Oryctolagus cuniculus*). All species recorded during the Survey were identified during the desktop study (**Appendix B**). One species of conservation significance, the Malleefowl, was recorded via secondary evidence during the survey. Malleefowl mounds were recorded at seven locations within and in close proximity to the Study Area.

Table 5-5: Vertebrate fauna species recorded during the Survey

Family and Species name	Common name	Conservation status		Number recorded
		EPBC Act	In WA	
Mammals				
Canidae				
* *Canis familiaris*	Dog			x
Felidae				
* *Felis catus*	Cat			x
Leporidae				
* *Oryctolagus cuniculus*	Rabbit			x
Macropodidae				
Osphranter robustus	Euro			x
Birds				
Acanthizidae				
Acanthiza apicalis	Inland Thornbill			1
Acanthiza uropygialis	Chestnut-rumped Thornbill			x
Gerygone fusca	Western Gerygone			x
Accipitridae				
Accipiter fasciatus	Brown Goshawk			x
Artamidae				
Artamus cinereus	Black-faced Woodswallow			x
Campephagidae				
Coracina novaehollandiae	Black-faced Cuckoo-shrike			x
Lalage tricolor	White-winged Triller			x
Cinclosomatidae				
Cinclosoma clarum	Western Chestnut Quail-thrush			1
Columbidae				
Ocyphaps lophotes	Crested Pigeon			1
Phaps chalcoptera	Common Bronzewing			1
Corvidae				
Corvus coronoides	Australian Raven			1

Family and Species name	Common name	Conservation status		Number recorded
		EPBC Act	In WA	
Cracticidae				
Cracticus nigrogularis	Pied Butcherbird			x
Cuculidae				
Cacomantis pallidus	Pallid Cuckoo			x
Chrysococcyx basalis	Horsfield's Bronze Cuckoo			x
Dicruridae				
Grallina cyanoleuca	Magpie-lark			1
Rhipidura albiscapa	Grey Fantail			1
Rhipidura leucophrys	Willie Wagtail			x
Dromaiidae				
Dromaius novaehollandiae	Emu			x
Hirundinidae				
Petrochelidon nigricans	Tree Martin			x
Maluridae				
Malurus leucopterus	White-winged Fairy-wren			x
Megapodiidae				
Leipoa ocellata	Malleefowl	Vu	S3	x
Meliphagidae				
Acanthagenys rufogularis	Spiny-cheeked Honeyeater			x
Anthochaera carunculata	Red Wattlebird			x
Manorina flavigula	Yellow-throated Miner			x
Purnella albifrons	White-fronted Honeyeater			1
Motacillidae				
Anthus australis	Australian Pipit			1
Oreoicidae				
Oreoica gutturalis	Crested Bellbird			x
Pachycephalidae				
Colluricincla harmonica	Grey Shrike-thrush			x
Pachycephala rufiventris	Rufous Whistler			x
Petroicidae				
Melanodryas cucullata	Hooded Robin			1
Microeca fascinans	Jacky Winter			x
Petroica goodenovii	Red-capped Robin			x
Podargidae				
Podargus strigoides	Tawny Frogmouth			1
Pomatostomidae				
Pomatostomus superciliosus	White-browed Babbler			x
Psittacidae				
Cacatua roseicapilla	Galah			2
Parvipsitta porphyrocephala	Purple-crowned Lorikeet			2
Platycercus zonarius	Australian Ringneck			2
Sylviidae				
Megalurus mathewsi	Rufous Songlark			x
Reptiles				
Agamidae				

Family and Species name	Common name	Conservation status		Number recorded
		EPBC Act	In WA	
Ctenophorus isolepis	Military Dragon			1
Ctenophorus reticulatus	Western Netted Dragon			1
Moloch horridus	Thorny Devil			1
Tympanocryptis cephalus	Pebble Dragon			1
Egerniidae				
Tiliqua occipitalis	Western Blue-tongue			1
Sphenomorphidae				
Ctenotus schomburgkii	-			1

5.3.2 Fauna of conservation significance

Of the 233 species of vertebrate fauna identified during the desktop and field survey, 22 species are listed as being of conservation significance, comprising, four mammals, 17 birds and one reptile (**Table 3-5**). In addition, three invertebrate species of conservation significance were identified: two butterflies and an aquatic crustacean. A summary of conservation codes used in Western Australia is provided in **Appendix A**.

Of the vertebrate species of conservation significance identified as potentially occurring over the Study Area:

- Seven species are listed as Threatened under the *EPBC Act* and/or *WC Act* (Table 3-5). Legislation has been developed at national (*EPBC Act*) and state (*WC Act*) levels to protect species of fauna that have been formally recognised as rare, threatened with extinction or having high conservation value (**Appendix A**).
- Four are recognised by DPaW as Priority fauna. DPaW recognises several species that are not listed under the *WC Act* or the *EPBC Act* but for which there is some conservation concern, and has produced a supplementary list of Priority fauna (**Appendix A**);
- One species is recognised by state (*WC Act*) legislation to be in need of special protection; and
- Twelve species are listed as Migratory under the *EPBC Act* and/or the *WC Act.* Many species of migratory bird are listed under international agreements (**Appendix A**).

Note that some of the species referred to above, listed as Threated, Migratory and/or Priority fauna, may be included in multiple groups (**Table 3-5**). The likelihood for each species of conservation significance potentially occurring over the Study Area was assessed and ranked (**Table 5-6**) using the following criteria outlined in **Section 4.5**.

Of the 22 conservation listed species identified, 10 were waterfowl, waterbirds, or migratory shorebirds that favour aquatic environments such as shorelines, tidal flats, lakes (including salt lakes) or wetlands. Many of the regional records for these species are from Rowles Lagoon and Carnage Lake approximately 45 kms north of the Study Area, but within the data base search area. The only corresponding marginal habitat over the Study Area is the claypan proposed as a water discharge site at the end of the Pipeline Corridor (**Figure 1-2**).

The three ground dwelling mammals (Chuditch, Greater Bilby and Numbat) are all within the critical weight range that makes them particularly vulnerable to fox and cat predation (Burbidge and McKenzie 1989) and all are now regionally extinct or rarely recorded in the goldfields. Other species were assessed as unlikely to occur because the Study Area lies outside of their current range (e.g. Western Spiny-tailed Skink and Western Rosella), or there is a lack of suitable habitat and recent regional records (e.g. Grey Wagtail and Night Parrot). The Study Area is well outside the known distributions of the Desert Blue Butterfly and the Arid Bronze Azure butterfly, and the latter may now be regionally extinct. The aquatic Fairy Shrimp, *Branchinella denticulate,* is discussed in a separate aquatic report (MWH 2016) and will not be considered here. In addition, most of the migratory waders and shorebirds are found in wetland / tidal habitats not found over the Study Area.

An analysis of the likelihood of the species presented in **Table 3-5 i**s given in **Section 5.3.**

Of the species remaining:

- Presence of the Malleefowl (Vulnerable) was confirmed during the Survey;
- The Rainbow Bee-eater (Migratory) was assessed as 'Very Likely' to occur; and
- The Central Long-eared Bat (Priority 4), Peregrine Falcon (Specially Protected), and Fork-tailed Swift (Migratory) were assessed as 'Likely' to occur (**Table 5-6**)
- Individual species of Migratory wading birds were assessed as 'likely' or 'possible' to occur

These species are discussed further in the following section.

Table 5-6: Likelihood of fauna species of conservation significace occurring within the Study Area

Common name (*Scientific name*)	Status		Background / Broad habitat type	Likelihood of occurrence
	EPBC Act	In WA		
Mammals				
Greater Bilby *(Macrotis lagotis)*	Vu	Vu	Both species are within the critical weight range that makes them particularly vulnerable to fox and cat predation (Burbidge and McKenzie 1989) and are now regionally extinct. The Numbat is now largely confined to the south-west and the Greater Bilby is now restricted to the arid deserts.	**Unlikely** Species are regionally extinct with historical records only within database searches
Numbat *(Myrmecobius fasciatus)*	Vu	En		
Chuditch *(Dasyurus geoffroii)*	Vu	Vu	The Chuditch is within the critical weight range that makes it particularly vulnerable to fox and cat predation (Burbidge and McKenzie 1989). The Chuditch predominantly occurs within the contiguous forest of south-west with very occasional records from the goldfields (DEC 2012). Translocations have been undertaken to Kalbarri and Lake Magenta. The lack of records in area suggests this species is locally, and possibly regionally, extinct. It is unlikely that a population of this species exists in or near the Study Area.	**Unlikely** Just two records from the region; one from 1974 and one from 2008, over 75km from the Study Area.
Central Long-eared Bat *(Nyctophilus major)*		P4	The Study Area is within the distribution of the species. The species has been recorded from tree hollows, fissures in branches, and under bark (Churchill 2008). The eucalypt woodland over the Study Area offers habitat for the species that is generally rare and patchily distributed.	**Likely** Recent record from 2013. Within the species distribution and suitable habitat is present.
Reptiles				
Western Spiny-tailed Skink *(Egernia stokesii badia)*	En	Vu	*Egernia stokesii badia* was once widely distributed in south-western WA through semi-arid areas from Minnivale (150 km ENE of Perth) north to Mullewa and east to Perenjori and south of the Yalgoo (Pearson 2012). The Study Area is east of, and well outside the species known distribution.	**Unlikely** Study Area is outside of the species known distribution. The one historical record from database searches, over 75 kms east of the Study Area, is an anomaly
Birds				
Night Parrot *(Pezoporus occidentalis)*	En	En	Known to inhabit treeless, or sparsely wooded, long unburnt spinifex hummock plains often interspersed with chenopods (Davis and Metcalf 2008, Pyke and Ehrlich 2014).	**Unlikely** Recognised habitat not present over the Study Area and a lack of recent records from the region
Malleefowl *(Leipoa ocellata)*	Vu	Vu	The Malleefowl is found in semi-arid to arid shrublands and low woodlands, especially those dominated by mallee and/or acacias. A sandy substrate and abundance of leaf litter are required for breeding. The Study Area is within its known distribution with numerous records obtained from database searches and three records from (DPaW) within 18kms of the Study Area with the most recent from 2009.	**Confirmed** Malleefowl mounds confirmed by survey. Three additional records from (DPaW) within 18kms of Study Area

Common name (*Scientific name*)	Status		Background / Broad habitat type	Likelihood of occurrence
	EPBC Act	In WA		
Blue-billed Duck *(Oxyura australis)*		P4	The Blue-billed Duck is a diving duck (as opposed to dabbling duck) that favours deep freshwater lakes where it dives underwater to filter food from soft mud. No lakes or wetlands occur over the Study Area. The Claypan discharge site does not provide deep freshwater habitat required. Regional records are from Rowles Lagoon and Carnage Lake.	**Unlikely** Suitable habitat not present over the Study Area.
Western Rosella (inland ssp) *(Platycercus icterotis)*		P4	Occurs predominantly in the south west forests of WA but the inland sub-species (*xanthogenys*) occurs in the wheatbelt and western woodlands. The Study Area lies north and east of the species known range. There are two DPaW database record for this species in the area, the closest 65km to the southwest of the Study area, but these are old records from the 1980's. The Study Area is outside of the currently documented range of this sub-species and it is therefore considered unlikely to frequent the area.	**Unlikely** Study Area is outside of the species known distribution.
Peregrine Falcon *(Falco peregrinus)*		S7	This species is broad-ranging and widespread in Australia, but requires specific nesting sites (Johnstone and Storr 1998b). It does not build a nest and requires cliffs, rocky outcrops, or large tree hollows often along wooded watercourses and lakes (Johnstone and Storr 1998b). The Peregrine prefers to be near water, and in the arid zone breeding is restricted to rocky ranges. Suitable nesting habitat of cliffs and large hollows trees along watercourses are not present however the species has been recorded within 70 kms of the Study Area.	**Likely** The Study Area is within the known distribution. Breeding habitat is not present or marginal, however, the species may forage and/or overfly the area.
Fork-tailed Swift *(Apus pacificus)*	M	M	The Fork-tailed Swift is a migratory aerial species that forages high above the tree canopy and is not common in the Goldfields. However it has the potential to overfly the entire Study Area without specifically utilising any particular habitat present.	**Likely** Widespread and broad-ranging species.
Rainbow Bee-eater *(Merops ornatus)*	M	M	The Rainbow Bee-eater occurs in numerous habitats including open woodlands, sand ridges, riverbanks, road cuttings, beaches, dunes, cliffs, mangroves and rainforests (Johnstone and Storr 1998b).	**Very Likely** Numerous records within 50 km exist (Birdlife Australia 2016, DPaW 2016c). Sandy areas may provide suitable breeding habitat for the species.
Grey Wagtail *(Motacilla cinerea)*	M	M	Grey Wagtails are listed as rare vagrants to the Australian continent from the North. The Grey Wagtail was identified by the DoE Protected Matters database as species, or species habitat, that may occur within the search area. However, no records were obtained from DPaW (2016c) or Birdlife Australia (2016) search results. Grey Wagtails are usually found along watercourses such as fast-flowing creeks.	**Unlikely** Outside of known distribution. Lack of habitat No regional records

Common name (*Scientific name*)	Status		Background / Broad habitat type	Likelihood of occurrence
	EPBC Act	In WA		
Great Egret *(Ardea alba)*	M	M	Within its range occurs in a wide range of wetland habitats including inland and coastal, freshwater and saline, permanent and ephemeral, open and vegetated, large and small, natural and artificial. The Great Egret was identified by the DoE Protected Matters database as species, or species habitat, that may occur within the search area. However, no records were obtained from DPaW (2016c) or Birdlife Australia (2016) search results.	**Unlikely** Outside of known distribution. No regional records
Cattle Egret *(Ardea ibis)*	M	M	Within its range occurs in a wide range of habitats including, marshes, reservoirs, lakes, swamps, and riverside woodlands and often forage in fields with grazing livestock (Johnstone and Storr 1998b). However, the Goldfields is outside its recognised distribution and it is considered a vagrant Just one historical record from 1981 is recorded from database searches.	**Unlikely** Outside of recognised distribution. No regional records
Glossy Ibis *(Plegadis falcinellus)*	M	M	Glossy ibises feed in very shallow water and nest in freshwater or brackish wetlands with tall dense stands of emergent vegetation such as reeds or rushes. However, the Goldfields is outside its recognised distribution it is considered a vagrant (Johnstone and Storr 1998b). Just two historical record from 1981 is recorded from database searches.	**Unlikely** Outside of recognised distribution. No regional records
Hooded Plover *(Charadrius rubricollis)*	M		Hooded Plovers favour sandy ocean beaches where they feed near the water's edge and lay their eggs in shallow scrapes in the sand. In Western Australia they also forage around large salt lakes, sometimes hundreds of kilometres from the coast. Three records were identified from salt lakes to the south but the Study Area is outside of its recognised distribution and suitable habitat is not present.	**Unlikely** Outside of recognised distribution. Lack of suitable habitat
Curlew Sandpiper *(Calidris ferruginea)*	CR	Vu	The Curlew Sandpiper frequents coastal areas such as shallow estuaries mudflats, shorelines and lagoons, as well as near coastal saltlakes (Marchant and Higgins 1993). It is transient or casual in the interior (Johnstone and Storr 1998b) only occurring rarely (SPRAT). Two records occur in the Database searches; the closest within 16 km of the Study Area in 2006. Although, the discharge claypan site does not provide the typical habitat requirements utilised by this species it may be present at least intermittently during the summer non-breeding period.	**Possible** Outside of typical distribution. Transients and vagrants occur in the region. Marginal habitat available at the discharge claypan site
Sharp-tailed Sandpiper *(Calidris acuminata)*	M	M	The Sharp-tailed Sandpiper frequents fresh water more so than the coastal shores, but also brackish waters and estuaries and will visit well-watered parts of the interior (Johnstone and Storr 1998b). Eight records, including recent, occur in the Database searches; the closest within 16 km of the Study Area in 2006. The discharge claypan site would provide habitat for this species at least intermittently during the summer non-breeding period.	**Likely** Within known distribution. Small area of suitable habitat at the discharge claypan site. Species generally rare and patchily distributed

Common name (*Scientific name*)	Status		Background / Broad habitat type	Likelihood of occurrence
	EPBC Act	In WA		
Red-necked Stint *(Calidris ruficollis)*	M	M	The Red-necked Stint frequents coastal areas, shorelines and estuaries (Johnstone and Storr 1998b). However birds move across the continent and may visit well-watered parts of the interior as transients (Blakers *et al.* 1984). Two records, including recent, occur in the Database searches; the closest within 16 km of the Study Area. The discharge claypan site does not provide the typical habitat requirements utilised by this species. However it is possible that the site could be used intermittently during the summer non-breeding period.	**Possible** Outside of typical distribution. Marginal habitat available at the discharge claypan site.
Common Greenshank *(Tringa nebularia)*	M	M	The Common Greenshank frequents coastal areas such as shallow estuaries and mudflats but will also visit well-watered parts of the interior (Johnstone and Storr 1998b). Five records, including recent, occur in the Database searches the closest within 16 km of the Study Area. The discharge claypan site does not provide the typical habitat requirements utilised by this species, however it is possible that the site could be used intermittently during the summer non-breeding period.	**Possible** Outside of typical distribution and habitat. Marginal habitat available at the discharge claypan site.
Wood Sandpiper *(Tringa glareola)*	M	M	The Wood Sandpiper prefers shallow margins of freshwater lagoons and swamps, often fringed with River Red Gums, and more records are made from the inland than on the coast (Blakers *et al.* 1984). Three records, including recent, occur in the Database searches the closest within 50 km of the Study Area. The discharge claypan site would provide habitat for this species at least intermittently during the summer non-breeding period.	**Likely** Within known distribution. Small area of suitable habitat at the discharge claypan site. Species generally rare and patchily distributed
Invertebrates				
Arid Bronze Azure Butterfly *(Ogyris subterrestris petrina)*	CR	CR	The only goldfields population is/was within a recreation reserve at Lake Douglas, 44 km east of the Study Area but is believed to have become extinct in 1993 (Bradby 2000). All DPaW (2016c) records obtained are prior to this date. An associated ant *(Camponotus terebrans)* on which the species relies on for its survival is sporadically distributed, and both species are unlikely to occur.	**Unlikely** Outside of known distribution. Recognised habitat not present over the Study Area
Desert Blue Butterfly *(Jalmenus aridus)*		P1	All DPaW (2016c) records are from two locations near Lake Douglas, 44 km east of the Study Area, south west of Kalgoorlie. Caterpillars feed on the leaves and flowers of *Senna nemophila* and *Acacia tetragonophylla,* and are attended by the ant species *Froggatella kirbii*. Neither of these species were recorded as occurring within the Study Area during the survey.	**Unlikely** Outside of known distribution. Recognised habitat not present over the Study Area

5.3.3 Fauna of conservation significance likely to occur over the Study Area

Malleefowl *(Leipoa ocellata):* Vulnerable under the *WC Act* and the *EPBC Act*

As with many species, the Malleefowl was originally common, but is now rare to uncommon and patchily distributed within its previous distribution (Johnstone and Storr 1998b). Its current distribution is mainly southern arid and semi-arid areas north to Shark Bay, east to Earnest Giles Range, and west and south to Cockleshell Gully and Stirling Range (Johnstone and Storr 1998b). Preferred habitat for the species consists mainly scrubs and thickets of mallee (*Eucalyptus* spp.), *Melaleuca lanceolata / Melaleuca uncinata* and bowgada (*Acacia linophylla),* as well as any other dense litter-forming shrublands (Benshemesh 2007). Malleefowl incubate their eggs within large mounds of loose sands / gravel and vegetation. Mound building by the male commences in late winter, eggs are laid between August and February, and incubation takes about 60 days (Benshemesh 2007). Once chicks emerge unaided from the mound they receive no parental assistance, and mortality of chicks is about 80% over the first 10 days (Priddel 1989), predominantly through fox and cat predation. Malleefowl will often reuse 'old' mounds (Priddel and Wheeler 2003).

Seventy-seven records of the Malleefowl were identified from database searches within 100 km of the Study Area, including from Jubilee mine, Yerilla Sandalwood Reserve, Jaurdi Station, Woolibar Station, Yallari Timber Reserve, and Ora Banda, as well as nine records from 'Bullabulling' within 25 km of the Study Area (DPaW 2016c). Most of the nine Bullabulling records are recent, with all but one recorded between 2006 and 2013 (DPaW 2016c).

During the survey, presence of the Malleefowl was determined by the occurrence of their distinctive mounds. The survey occurred outside the time of year when mounds were actively being attended, consequently, mounds encountered during the survey were categorised into one of two categories:

- Inactive: crater rim apparent. Mound likely to been used within the last few breeding seasons.
- Disused/Extinct: mound has weathered and eroded. Mound unlikely to have been used in some years.

During the survey a total of seven Malleefowl mounds were recorded within or in close proximity to the Study Area. Each mound was categorised as either 'inactive' or 'disused/extinct' (**Table 5-7**). Photographs of each mound are presented in **Appendix G**.

Table 5-7: Malleefowl mound records within and in close proximity to the Study Area

Mound	Category	Description	Coordinates (GDA 94) Mapping Grid 51J	
			Easting	Northing
MF1	Disused/extinct	Crater rim eroded and flattened	301954	6583028
MF2	Disused/extinct	Crater rim eroded and flattened. Small varanid burrow present.	302009	6583044
MF3	Inactive	Small amount of leaf litter accumulated in crater and egg shell present.	299616	6584393
MF4	Inactive	Leaf litter on surface of mound	302622	6586773
MF5	Disused/extinct	Crater rim present with minimal erosion.	299831	6585171
MF6	Inactive	Leaf litter on surface and outside of mound. Egg shells present.	309618	6583993
MF7	Disused/extinct	Crater rim eroded and flattened. Small varanid digging present.	300878	6585766

Peregrine Falcon *(Falco peregrinus):* Other specially protected fauna under the *WC Act*

This Peregrine Falcon is broad-ranging and very widespread in Australia, however, it requires very specific nesting sites and prefers to be near water (Johnstone and Storr 1998b). It does not build a nest and requires cliffs, rocky outcrops, or very large tree hollows often located along wooded watercourses and lakes within which to incubate eggs and raise chicks (Johnstone and Storr 1998b).

Suitable nesting habitat of cliffs and/or large hollows trees along watercourses are not present over the Study Area. However, the desktop survey confirmed the species with nine records, some of which were within 75 km of the Study Area, and the Peregrine Falcon is likely to hunt and/or overfly the area at least intermittently.

Central Long-eared Bat *(Nyctophilus major tor):* Priority

Nyctophilus major tor was separated from the previously recognised *Nyctophilus timorensis* in 2008 (Jackson and Groves 2015) and known as the Central Long-eared Bat. The type location of the species is 75 km west of the Study Area and the Study Area is within the distribution of the species. These bats are rarely caught and little is known of their ecology, but they are usually captured alone. They can be found in wet and dry sclerophyll forest, woodlands, mallee and open savannah (Churchill 2008). Central Long-eared Bats have been recorded from tree hollows, fissures in branches, and under bark (Churchill 2008) and the eucalypt woodland over the Study Area in particular offers habitat for this species.

Fork-tailed Swift *(Apus pacificus):* Migratory listed under the *WC Act* and the *EPBC Act*

The Fork-tailed Swift is an aerial specialist that overflies numerous habitats (Johnstone and Storr 1998a). It is a migratory species that is a non-breeding visitor to all states and territories of Australia (Higgins 1999). Although not common in the Goldfields it was recorded in the region and has the potential to overfly the entire Study Area without specifically utilising any particular habitat present.

Rainbow Bee-eater *(Merops ornatus):* Migratory listed under the *WC Act* and the *EPBC Act*

The Rainbow Bee-eater migrates between Australia and north as far as Japan (Pizzey and Knight 2007). It is a common bird that occupies numerous habitats including open woodlands with sandy loamy soil, sandridges, sandpits, riverbanks, road cuttings, beaches, dunes, cliffs, mangroves and rainforests. Although more common in the south west, the Rainbow Bee-eater is well known from the Goldfields (Blakers *et al.* 1984), with over 70 records identified in database searches, and is likely to utilise habitats over the Study Area, particularly during the summer breeding period.

Migratory Shorebirds listed under the *WC Act* and the *EPBC Act* – Curlew Sandpiper, Sharp-tailed Sandpiper, Red-necked Stint, Common Greenshank, Wood Sandpiper

Five migratory waders within the family Scolopacidae have the potential to utilise the Study Area. Migratory waders arrive from the northern hemisphere during the Australian summer period and depart during the winter to breed in northern latitudes. All these birds utilise tidal or wetland habitats and the vast majority are coastal, however, some species will also utilise inland waters when available (Johnstone and Storr 1998b). The only habitat of relevance to these birds is the proposed water discharge site which is a relatively small claypan that fills with water intermittently (MWH 2016). The Vegetated Claypan habitat of shrublands of Acacia, Callistemon and Melaleuca on sandy or clay loams does not provide the recognised habitat variables utilisd by these species.

Of the five species identified (**Table 5-6**) the Sharp-tailed Sandpiper and Wood Sandpiper are much more likely to utilise fresh inland waters than coastal environments, and therefore may utilise the claypan site when it fills with water. These two species are as common, or more common, in the inland regions than in coastal areas, utilising fresh water rather than (or in conjunction with) salt water (Marchant and Higgins 1993).

In contrast, the threatened Curlew Sandpiper, and migratory Red-necked Stint and Common Greenshank are primarily coastal shorebirds that are transient or vagrant throughout the interior of the Australian continent (Blakers *et al.* 1984, Johnstone and Storr 1998b, Marchant and Higgins 1993). These three species are less likely to utilise the small claypan site. Although not typical habitat for these species, given recent records within 16 kms, the discharge claypan site may provide habitat at least intermittently during the summer non-breeding period.

5.4 Survey Limitations and Constraints

There are a number of possible limitations and constraints that can impinge on the adequacy of vegetation, flora and fauna surveys (EPA 2004a, b). These are discussed below (**Table 5-8**), with respect to the Survey of the Study Area.

Table 5-8: Potential limitations and constraints of the field survey

Factor	Constraint	Comments
Competency and experience of consultants	No	The field personal have appropriate qualifications and several years' experience undertaking flora and fauna surveys of this nature. The vegetation and flora surveys were conducted by Megan Stone and Alex Sleep who have over five and seven years' experience, respectively, conducting flora surveys within this region of Western Australia. The fauna component of the Survey was conducted by Paul Bolton Team Leader of the MWH Terrestrial Ecology Group who has over ten years' experience, and Briana Wingfield who has four years of experience undertaking fauna surveys within this region of Western Australia and.
Scope	No	The scope was well defined. Flora and fauna were surveyed using standardised and well-established techniques, including a targeted search for Malleefowl. Relevant databases and previous studies surrounding the Study Area were reviewed prior to the survey.
Proportion of species identified	Partial	The desktop and field species inventories are comparable to counts obtained during previous surveys of a similar size and scope. Of the 133 flora taxa detected during this survey, 20 (14%) could not be identified with confidence, largely due to the lack of reproductive material. Of these 20 specimens, one specimen of an unknown *Hakea* is of interest as it did not key out with known species from the region; and one specimen is likely to represent the P3 *Acacia cylindrica*. Of the remaining specimens with tentative identifications, none are considered to be analogous with any of the 'Likely' or 'Possible' priority flora potentially occurring in the Study Area. All vertebrate fauna encountered were identified. Database records are comprehensive and fulfil the requirements for a Level 1 Survey.
Information sources (e.g. historic or recent)	No	The Study Area is located in a relatively well-surveyed region. Database searches produced a number of recent records from the surrounds.
Proportion of task achieved, and further work which might be needed	Partial	Planned survey works were conducted and completed according to scope. Access issues along the Haul Road Corridor were overcome by allocating additional time (Phase 2) to the Survey so that this corridor could be traversed on foot. Areas along the Haul Road Corridor with long unburned vegetation were particularly dense. This limited targeted searches for Mallee mounds to a visibility range of 3-4 m. To counteract this limitation, the Haul Road Corridor was traversed end to end three times by two people 2 (6 traverses) (**Figure 4-2**). Although unlikely, it is possible that Malleefowl mounds could have occurred in close proximity to the lines walked without being sighted, particularly dense in sections of vegetation. If control measures (such as a 250 m buffer) is to be implemented around active Malleefowl mounds, it may be necessary for additional surveys to be undertaken in a wider buffer zone of the haul road.

Factor	Constraint	Comments
Timing / weather / season / cycle	Partial	Rainfall prior to the Survey was above average, although very few flora taxa were flowering, nor was there a large presence of annuals. Despite this, fauna habitats and vegetation associations were delineated, and targeted searches for flora and fauna taxa of conservation significance were not hampered.
Disturbances	No	The majority of the vegetation within the Study Area was considered to be Very Good or Excellent condition. Disturbance, in the form of historic exploration/drilling tracks, was limited to the Infrastructure Area and Pipeline Corridor.
Intensity	Possible	Based on relevant guidance and position statements (EPA 2002, 2004a, b), a Level 1 flora and fauna survey with a targeted survey for Malleeefowl is appropriate to inform approvals for the Project given that impacts are likely to be 'Moderate' with consideration to the scale of the project and the receiving environment. It is understood, however, that the Project footprints are still being refined. Thirty-seven relevés within the Study Area were sampled for flora and assessed for their value to fauna. This level of on-ground survey effort is appropriate for a Level 1 flora, vegetation and fauna assessment.
Completeness	Partial	The survey was conducted at 46 sites (including 37 relevés and 9 mapping notes), to ensure adequate representative coverage of the Study Area. A large proportion of the Study Area was sampled on foot and all proposed disturbance footprints planned infrastructure areas were searched for the presence of Malleefowl. A small section of the haul road (approximately 500m) extends outside the Study Area in the vicinity of the southern portion of the Haul Road Corridor; and a small section of the Dewatering Pipeline extends to the east outside the Pipeline Corridor. These areas were not surveyed by an on-ground botanist or zoologist and this may be considered an incomplete component of the assessment. However, the areas are small relative to the size of the project and the probability of conservation significant flora and/or fauna occurring within this area is considered low based on the likelihood of occurrence for fauna (**Section 5.3.2**) and for flora (**Section 5.2.3** and **Appendix F**). This is with the exception of the Malleefowl which has been confirmed within and surrounding the Study Area and, therefore having potential for mounds to occur in these unsurveyed portions. Two conservation significant flora were recorded within the Study Area, however both of these records were from the northern portion of the Haul Road corridor in habitat (yellow/brown sand) that does not occur in the southern portion of the Haul Road Corridor or Pipeline Corridor (clay loam). Consequently, these conservation significant flora species are unlikely to occur within the unsurveyed portions of the footprint.
Resources	No	Resources were adequate to carry out the survey and the survey participants were competent in identification of species present. WAH specimens, taxonomic guides, DPaW database searches and the *FloraBase* database were all used to prepare for the survey and used for the confirmation of any flora species where identification was uncertain.
Remoteness / access problems	No	Access tracks were overgrown. However, access issues were overcome by allocating additional time to the Survey to allow remote areas to be traversed on foot.

Factor	Constraint	Comments
Availability of contextual information	No	The data available for the Eastern Goldfields subregion was adequate for the level of survey work undertaken during this assessment.

6 Assessment Against the 10 Clearing Principals

Footprints for the Project are indicative and may still be refined (**Figure 1-2**), as such, it is not yet certain to what extent of native vegetation clearing will be required for the Project. Consequently, assessment against the Ten Clearing Principals was based on a precautionary approach that assumed all habitats within the Study Areas may be exposed to clearing.

Principle (a) Native vegetation should not be cleared if it comprises a high level of biological diversity

A total of 133 flora taxa (including subspecies and variants) were recorded from 15 vegetation units within the Study Area. The floral diversity and composition recorded from the Study Area is consistent with the Coolgardie bioregion, the landforms, the season of Survey, and the level of sampling intensity. Native vegetation of the Study Area was comprised broadly of Eucalypt Woodlands, Mallee Woodlands, and Shrublands. The Study Area largely occurs within Beard vegetation associations: Medium Woodland (salmon gum and gimlet) and Shrublands (Acacia, Casuarina and Melaleuca thicket) which is widespread and well represented within the Eastern Goldfields bioregion. The area also corresponds with the Great Western Woodlands, an area that is highly diverse and supports more than 3,000 species of flowering plants representing 20 % of Australia's known flora, including 160 species of Eucalyptus and a diversity of fauna (DEC 2010).

None of the vegetation units described within the Study Area represent any known TEC's or PEC's. However, the Study Area occurs within the Goldfields Woodlands which has an exceptional high diversity of Eucalypt species (Cowan 2001). The subregion also has high species and ecosystem diversity of: Eucalyptus Woodlands; high diversity in Acacia species; and high diversity of ephemeral flora communities of tertiary sandplain shrublands and of valley floor woodlands (Cowan 2001). This diversity was reflected in the floral assemblage recorded within the Study Area, particularly where *Eucalyptus* and *Acacia* being the genera with the highest number of species recorded. The condition of vegetation within the Study Area was generally Very Good to Excellent and comparable to that in the surrounds. Therefore it would be anticipated that biological diversity in the Study Area would be comparable to that in the surrounding region.

A total of 48 vertebrate fauna species were recorded from four broad fauna habitats within the Study Area. The faunal habitats and assemblage recorded from the Study Area are consistent with the Coolgardie bioregion, the landforms present, the season of Survey, and the level of sampling intensity. The habitats identified within the Study Area are common, widespread within the Coolgardie Bioregion. The fauna assemblage expected to occur within these habitats, consists of largely generalist species that are widely distributed throughout the region.

Clearing may be at variance to this principal as the region has a high level of biodiversity. However, the level of biodiversity within the Study Area is unlikely to differ substantially from that in the immediate

surrounds. The current remaining extent of vegetation associations within the Coolgardie Bioregion based on the mapping of Beard (1990) is over 90% and therefore more than the advised threshold for biodiversity conservation of 30% remaining (EPA 2000, Government of Western Australia 2014).

The proposed clearing *may* be at variance with this principal

Principle (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***

The habitat types recorded within the Study Area are typical of the Coolgardie bioregion and are well represented within the bioregion. However, the native vegetation within and in close proximity to the Study Area is known to form important habitat for the Malleefowl listed as Vulnerable under the EPBC Act and WC Act. Mounds of the Malleefowl were recorded at seven locations across all three habitats within the Study Area. Three of these mounds appeared to have been active in recent years and may again be used by the birds in the upcoming breeding season. Vegetation in the vicinity of these mounds is likely to form important habitat for the species, particularly during the breeding season and therefore clearing of habitat in the vicinity of these mounds may be at variance to this principle.

Although other habitats recorded may be suitable for other fauna of conservation significance (such as Fork-tailed Swift, Peregrine Falcon, Rainbow Bee-eater, Central Long-eared Bat), none of these species are reliant on the habitats present in the Study Area. Additionally, none of these habitats form a significant proportion of the suitable habitat for these species within the region. The Fork-tailed Swift, would overfly the Study Area only, there is no breeding habitat for the Peregrine Falcon (large Eucalypts or cliffs), the Rainbow Bee-eater is a common migratory bird that occupies numerous habitats within the Study Area including the Eucalypt Woodlands; and the Central Long-eared Bat may roost in tree hollows, fissures in branches within the Eucalypt Woodland habitat. Some birds of conservation significance may utilise the claypan located at the end of the Pipeline Corridor after periods of rainfall (Sharp-tailed Sandpiper, Common Greenshank and Wood Sandpiper), however none of these species would be reliant on this claypan and it is not proposed to be cleared.

The clearing of native vegetation within the Study Area may impact habitat used by the Malleefowl, specifically areas within the vicinity of existing Malleefowl mounds which have the potential to be reused. However, the clearing of native vegetation within the Study Area is unlikely to significantly affect other fauna of conservation significance, or significant habitat for fauna more broadly.

The proposed clearing *may* be at variance with this principal.

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

No Threatened flora listed under the WC Act 1950, or listed under the EPBC Act 1999, have previously been recorded within the Study Area, nor were any recorded during the Survey. No species listed as Threatened flora taxa are Likely to occur within the Study Area.

One Priority 3 flora, *Acacia cylindrical* was potentially collected from the Haul Road Corridor during the survey, however the specimen could not be conclusively identified due to a lack of flowering and/or fruiting material. Additionally, a specimen of *Hakea* collected from the Haul Road Corridor did not key out to other known species from the region, however, additional material collected during flowering and/or fruiting season would be required to confirm the taxonomic status of this species. No other Priority listed flora taxa are Likely or Highly Likely to occur within the Study Area. Further sampling would be required during Spring to determine whether the proposal is at variance to this principal.

The proposed clearing *may* be at variance with this principal.

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.***

No Threatened Ecological Communities listed under the WC Act 1950, or Threatened under the EPBC Act 1999 were recorded during the survey nor are any likely to occur. No Threatened Ecological Communities, relevant to terrestrial environments, were identified as occurring within the 20 km search areas surrounding the Study Area.

The proposed clearing is *not* at variance with this principal.

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 Project will likely require the clearing of native vegetation consistent with Beard's vegetation associations: Medium woodland (salmon gum & gimlet); Shrublands (*Acacia, Casuarina* & *Melaleuca* thicket); and Bare areas (salt lakes). These associations are well represented in the Coolgardie bioregion with greater than 92% of pre-European extent (Government of Western Australia 2014). Consequently, clearing associated with the Project will not cause current extent of the vegetation associations to fall below the 30% threshold where species loss increases exponentially (EPA 2004b).

The proposed clearing is *not* at variance with this principal.

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.***

Two vegetated claypans occur in the Study Area within the Infrastructure Area. Neither claypan contains vegetation communities or species that are confined to watercourses or wetlands, nor are they groundwater dependent. The vegetated claypans within the Study Area are not considered regionally prominent and are not listed within the *Directory of Important Wetlands in Australia* (DoE 2015) or listed as an ESA under *the Environmental Protection Act 1986*. An additional claypan occurs at the eastern end point of the Pipeline Corridor and is the proposed dewatering point for the mine. This claypan is naturally clear of vegetation.

The proposed clearing is *not* at variance with this principal.

Principle (g) ***Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.***

The terrain of the Study Area is relatively level and the soil substrate is comprised of firm clay loam (Infrastructure Area and Pipeline Corridor) or well-draining sandy loam (Haul Road Corridor). Any clearing of native vegetation is unlikely to increase soil erosion or nutrient export within the landscape due to the properties of the soil structure and presence of vegetation which would limit erosion. The Study Area is not within a salinity risk area and the site would not be expected to be vulnerable to salinity even following proposed clearing.

The proposed clearing is *not* at variance with this principal.

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***

The nearest National Park, Goldfields Woodlands National Park is located approximately 40 km southwest of the Study Area. The nearest Conservation Park, Goldfields Woodlands Conservation Park is located approximately 30 km southwest of the Study Area. The nearest Nature Reserve, Kurrawang Nature Reserve is located approximately 30 km east of the Study Area, and the nearest DPaW managed land is ex-Credo station, currently UCL but managed by DPaW for conservation purposes located approximately 30 km north of the Study Area. The Study Area does not overlap with any National Parks or any conservation areas. The Study Area is not in close proximity to any Environmentally Sensitive Areas (ESA) or Nationally Important Wetlands. The nearest ESA is located at Rowles Lagoon Nature Reserve approximately 40 km north of the Study Area.

The proposed clearing is *not* at variance with this principal.

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***

No permanent surface water features were observed in the Study Area however there are two vegetated claypans present within the Infrastructure Area. Clearing and/or construction should not impact on surface water quality in these vegetated claypans (when water may be present after substantial rainfall events), provided sediments are controlled during construction and operation by implementing standard management procedures. The Study Area occurs on relatively flat terrain and it is unlikely that there would be substantial concerns regarding water runoff as a result of clearing.

Currently, no information is available on the extent and quality of the groundwater and whether the Project will require any groundwater drawdown and release into the natural environment. Potentially, water will be dewatered to the claypan at the eastern end of the Pipeline Corridor. Dewatering discharge to this claypan and water quality within this claypan will be addressed within a separate report on aquatic ecology (MWH 2016).

The proposed clearing is *not* at variance with this principal.

Principle (j) ***Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding***

The incidence of flooding in the Study Area is not anticipated to be exacerbated by clearing of the vegetation due to the fact that the Study Area occurs on relatively flat terrain. The implementation of standard surface water management strategies during construction and operations will mitigate any likelihood of flooding.

The proposed clearing is *not* at variance with this principal.

7 Conclusions

The vegetation condition within the Study Area ranged from Very Good to Excellent, with the majority of the vegetation considered to be Excellent. Any areas that were slightly degraded were mostly a result of historic exploration and drilling activities. A total of 15 vegetation units were recorded across the Study Area. The vegetation of the Study Area was broadly comprised of Eucalypt Woodlands, Mallee Woodlands, and Shrublands that are representative of the dominant vegetation types throughout the region. No vegetation units are considered analogous to any TEC or PEC's, and none are considered locally or regionally significant.

A total of 133 flora taxa (including subspecies and variants) from 25 families and 58 genera were recorded within the Study Area. The most frequently occurring families were Myrtaceae, Fabaceae, Scrophulariaceae and Proteacea. The flora composition recorded was typical of the region with high numbers of both *Eucalyptus* and *Acacia* species. No Threatened Flora species were recorded from the desktop study or during the Survey and none are likely to occur.

One species, *Acacia cylindrica* listed as a Priority 3 species by DPaW was potentially identified from the survey, however the specimen could not be conclusively identified due to a lack of flowering and/or fruiting material. Additionally, a specimen of *Hakea* collected during the survey did not key out with other known species from the region. Additional material during flowering and/or fruiting season would be required for confirmation of the taxonomic status of this specimen. An additional 10 Priority flora species were assessed as Possible or Likely to occur. Each of these species was targeted during the Survey but was not recoded.

No introduced taxa were recorded within the Study Area, although some may occur within areas disturbed by previous exploration activities.

Four broad fauna habitat types were identified within the Study Area; Eucalypt woodland, Mallee Woodland, Shrubland and Vegetated Claypan. All habitat types are considered relatively widespread and common throughout the region and none are considered to be of local or regional significance. A total of 48 vertebrate fauna species were recorded during the field survey, comprising four mammals (one native), 38 birds and six reptile species.

One species of conservation significance, the Malleefowl listed as Vulnerable under the EPBC Act and WC Act, was detected within and in close proximity to the Study Area via the presence of nesting mounds. In total seven mounds were detected, of which three appeared to have been active in recent years and may again be used by the birds in the upcoming breeding season (August - February).

Additionally, one fauna species, the Rainbow Bee-eater was considered Very Likely to occur and three fauna species (Central Long-eared Bat, Peregrine Falcon and Fork-tailed Swift) were considered Likely

to occur. The Rainbow Bee-eater is listed as Migratory under the EPBC Act and Schedule 5 (Migratory) under the WC Act and may utilise numerous habitats including the Eucalypt Woodlands habitat within the Study Area. The Central long-eared Bat is a Priority 4 species listed by DPaW and may roost in tree hollows, fissures in branches within the Eucalypt Woodland habitat. The Fork-tailed Swift is listed as Migratory under the EPBC Act and Schedule 5 (Migratory) under the WC Act, would overfly the Study Area only without dependent on any particular habitat. The Peregrine Falcon is listed as Schedule 7 (Special Protection) under the WC Act, would fly over the Study Area when hunting but would not be dependent on any particular habitat due to the lack of suitable nesting locations. Five species migratory-listed wading birds within the family Scolopacidae are known from the vicinity. Of these, the Sharp-tailed Sandpiper and Wood Sandpiper are likely to intermittently utilise the claypan discharge site to the east of the Study Area after rainfall in the summer months. With the exception of the Malleefowl, none of these conservation significant fauna species are likely to be significantly impacted by the Project as none are dependent on the Study Area or habitats contained within it.

Footprints for the Project are indicative and may still be refined, as such, it is not yet clear to what extent of native vegetation clearing will be required for the Project. Consequently, assessment against the Ten Clearing Principals was based on a precautionary approach that assumed all habitats within the Study Area may be exposed to clearing. Based on this assumption, the proposed Project is not at variance to principles (d), (e), (g), (i) and (j). Clearing associated with the project may be at variance to the following principals:

a) *Native vegetation should not be cleared if it comprises a high level of biological diversity*. Clearing may be at variance to this principal as the region has a high level of biodiversity. However, the level of biodiversity within the Study Area is unlikely to differ substantially from that in the immediate surrounds and the remaining extent of relevant vegetation associations within the Bioregion based on the mapping of Beard (1990) is over 90%.

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*. Clearing may be at variance to this principal as the habitats within the Study Area are known to support Malleefowl. Clearing of Malleefowl mounds or clearing of habitat in the vicinity of mounds that may become active during the breeding season is likely to be at variance to this principal.

c) *Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.* Clearing may be at variance to this principal as one Priority 3 flora (*Acacia cylindrical*) was potentially collected from the Haul Road Corridor as well as a specimen of an unknown *Hakea*. Both specimens lacked flowering or fruiting bodies and further sampling would be required to determine whether the Project is at variance to this principal.

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Appendix A Codes and Terms Used to Describe Species of Conservation Significance

Categories used under the EPBC Act		
Status	**Code**	**Description**
Critically Endangered	Cr	Taxa that is considered to be facing an extremely high risk of extinction in the wild in the immediate future
Endangered	En	Taxa that is considered to be facing a very high risk of extinction in the wild in the near future
Vulnerable	Vu	Taxa that is considered to be facing a high risk of extinction in the wild in the medium-term future
Migratory	Mi	Species that migrate to, over and within Australia and its external territories

Schedules used under the WC Act			
Status	**Code**	**Schedule**	**Description**
Critically Endangered	Cr	S1	Taxa that is rare or likely to become extinct, as critically endangered taxa
Endangered	En	S2	Taxa that is rare or likely to become extinct, as endangered taxa
Vulnerable	Vu	S3	Taxa that is rare or likely to become extinct, as vulnerable taxa
Presumed Extinct	Ex	S4	Taxa that is presumed to be extinct
Migratory	Mi	S5	Birds that are subject to international agreements relating to the protection of migratory birds
Conservation Dependent	CD	S6	Taxa that are of special conservation need being species dependent on ongoing conservation intervention
Special Protection	SP	S7	Taxa that is in need of special protection

Priorities assigned under the DPaW Priority Taxa List		
Priority 1	P1	Taxa with few, poorly known populations on threatened lands. These are known from few specimens or sight records from one or a few localities on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, active mineral leases. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened taxa
Priority 2	P2	Taxa with few, poorly known populations on conservation lands. These are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened taxa
Priority 3	P3	Taxa with several, poorly known populations, some on conservation lands. These are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened taxa
Priority 4	P4	Taxa in need of monitoring. These are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands
Priority 5	P5	Taxa in need of monitoring. These are not considered threatened but are subject to a specific conservation programme, the cessation of which would result in the species becoming threatened within five years

Appendix B Vertebrate Fauna Identified from the Desktop Study

Code	Source
a.	Geko Level 1 Fauna Survey
b.	DPaW Threatened and Priority Fauna
c.	Naturemap
d.	Birdlife Australia
e.	Protected Matters
f.	The biological survey of the Eastern Goldfields of Western Australia Part 11: vertebrate fauna
g.	Nexus Minerals: Bullabulling Biological Survey
h.	Mungari Industrial Estate: Flora and Fauna Assessment

Species	Common Name	Conservation Status		a.	b.	c.	d.	e.	f.	g.	h.
		EPBC Act	WA Status								
Amphibians											
Limnodynastidae											
Neobatrachus kunapalari	Kunapalari Frog								x	x	
Neobatrachus pelobatoides	Humming Frog								x		
Neobatrachus sutor	Shoemaker Frog					x					
Myobatrachidae											
Pseudophryne occidentalis	Western Toadlet					x			x		
Birds											
Acanthizidae											
Acanthiza apicalis	Inland Thornbill			x		x	x		x	x	
Acanthiza chrysorrhoa	Yellow-rumped Thornbill					x	x		x	x	
Acanthiza uropygialis	Chestnut-rumped Thornbill			x		x	x		x	x	
Aphelocephala leucopsis	Southern Whiteface					x	x		x		
Calamanthus cauta	Shy Heathwren								x	x	
Gerygone fusca	Western Gerygone			x			x			x	
Pyrrholaemus brunneus	Redthroat					x	x		x	x	
Smicrornis brevirostris	Weebill					x	x		x	x	
Accipitridae											
Accipiter cirrocephalus	Collared Sparrowhawk								x		
Accipiter fasciatus	Brown Goshawk			x			x			x	
Aquila audax	Wedge-tailed Eagle						x		x	x	
Circus assimilis	Spotted Harrier						x				
Elanus axillaris	Black-shouldered Kite						x				
Hamirostra isura	Square-tailed Kite								x		
Hamirostra melanosternon	Black-breasted Buzzard						x		x		
Hieraaetus morphnoides	Little Eagle								x		
Aegothelidae											

Species	Common Name	Conservation Status		a.	b.	c.	d.	e.	f.	g.	h.
		EPBC Act	WA Status								
Aegotheles cristatus	Australian Owlet-nightjar						x		x	x	
Anatidae											
Anas gracilis	Grey Teal					x	x		x		
Anas superciliosa	Pacific Black Duck						x				
Aythya australis	Hardhead						x				
Biziura lobata	Musk Duck						x				
Chenonetta jubata	Australian Wood Duck						x		x		
Cygnus atratus	Black Swan					x	x				
Malacorhynchus membranaceus	Pink-eared Duck						x				
Oxyura australis	Blue-billed Duck		P4		x						
Tadorna tadornoides	Australian Shelduck						x		x		
Anhingidae											
Anhinga novaehollandiae	Australiasian Darter						x				
Apodidae											
Apus pacificus	Fork-tailed Swift	Mi	S5		x			x			
Ardeidae											
Ardea ibis	Cattle Egret	Mi	S5		x			x			
Ardea novaehollandiae	White-faced Heron						x				
Ardea pacifica	White-necked Heron						x				
Artamidae											
Artamus cinereus	Black-faced Woodswallow			x					x		
Artamus cyanopterus	Dusky Woodswallow						x		x	x	
Artamus personatus	Masked Woodswallow						x		x		
Campephagidae											
Coracina novaehollandiae	Black-faced Cuckoo-shrike			x			x		x	x	
Lalage tricolor	White-winged Triller			x					x		
Caprimulgidae											

Species	Common Name	Conservation Status		a.	b.	c.	d.	e.	f.	g.	h.
		EPBC Act	WA Status								
Eurostopodus argus	Spotted Nightjar						x		x	x	
Charadriidae											
Charadrius melanops	Black-fronted Dotterel						x				
Charadrius ruficapillus	Red-capped Plover						x				
Thinornis cucullatus	Hooded Plover		P4		x			x			
Vanellus tricolor	Banded Lapwing								x		
Cinclosomatidae											
Cinclosoma clarum	Western Chestnut Quail-thrush			x		x	x		x	x	
Climacteridae											
Climacteris rufa	Rufous Treecreeper					x	x		x	x	
Columbidae											
*Columba livia**	Domestic Pigeon						x				
Ocyphaps lophotes	Crested Pigeon			x		x	x		x		x
Phaps chalcoptera	Common Bronzewing			x			x		x		
*Streptopelia senegalensis**	Laughing Turtle-Dove						x				
Corvidae											
Corvus bennetti	Little Crow					x	x		x		
Corvus coronoides	Australian Raven			x		x	x		x	x	x
Corvus orru	Torresian Crow									x	
Cracticidae											
Cracticus nigrogularis	Pied Butcherbird			x		x	x		x	x	
Cracticus tibicen	Australian Magpie					x	x		x	x	x
Cracticus torquatus	Grey Butcherbird					x	x		x	x	
Strepera versicolor	Grey Currawong					x	x		x	x	
Cuculidae											
Cacomantis pallidus	Pallid Cuckoo			x			x		x	x	
Chrysococcyx basalis	Horsfield's Bronze Cuckoo			x			x		x	x	

Species	Common Name	Conservation Status		a.	b.	c.	d.	e.	f.	g.	h.
		EPBC Act	WA Status								
Chrysococcyx osculans	Black-eared Cuckoo						x		x	x	
Dicaeidae											
Dicaeum hirundinaceum	Mistletoebird					x	x		x	x	
Dicruridae											
Grallina cyanoleuca	Magpie-lark			x		x	x				
Rhipidura albiscapa	Grey Fantail			x			x		x		
Rhipidura leucophrys	Willie Wagtail			x		x	x		x	x	
Dromaiidae											
Dromaius novaehollandiae	Emu			x		x	x		x	x	x
Estrildidae											
Taeniopygia guttata	Zebra Finch						x				
Falconidae											
Falco berigora	Brown Falcon						x		x	x	
Falco cenchroides	Australian Kestrel					x	x		x	x	
Falco hypoleucos	Grey Falcon		S3						x		
Falco longipennis	Australian Hobby						x				
Falco peregrinus	Peregrine Falcon		S7		x		x		x		
Halcyonidae											
Todiramphus pyrrhopygius	Red-backed Kingfisher						x		x		
Hirundinidae											
Cheramoeca leucosternus	White-backed Swallow						x				
Hirundo neoxena	Welcome Swallow					x	x				
Petrochelidon ariel	Fairy Martin						x				
Petrochelidon nigricans	Tree Martin						x		x	x	
Maluridae											
Malurus leucopterus	White-winged Fairy-wren			x		x	x		x	x	
Malurus pulcherrimus	Blue-breasted Fairy-wren					x	x		x	x	

Species	Common Name	Conservation Status		a.	b.	c.	d.	e.	f.	g.	h.
		EPBC Act	WA Status								
Malurus splendens	Splendid Fairy-wren					x	x			x	x
Megapodiidae											
Leipoa ocellata	Malleefowl	Vu	S3	x	x	x	x	x	x		
Meliphagidae											
Acanthagenys rufogularis	Spiny-cheeked Honeyeater			x		x	x		x	x	
Anthochaera carunculata	Red Wattlebird			x		x	x		x	x	x
Certhionyx variegatus	Pied Honeyeater								x		
Epthianura albifrons	White-fronted Chat						x		x	x	
Epthianura tricolor	Crimson Chat								x		
Gavicalis virescens	Singing Honeyeater						x		x		
Glyciphila melanops	Tawny-crowned Honeyeater								x		
Lichenostomus leucotis	White-eared Honeyeater					x	x		x	x	
Lichmera indistincta	Brown Honeyeater					x	x		x	x	x
Manorina flavigula	Yellow-throated Miner			x		x	x		x	x	x
Melithreptus brevirostris	Brown-headed Honeyeater					x	x		x	x	
Ptilotula ornatus	Yellow-plumed Honeyeater					x	x		x	x	
Ptilotula plumulus	Grey-fronted Honeyeater						x				
Purnella albifrons	White-fronted Honeyeater			x		x	x		x	x	
Sugomel niger	Black Honeyeater						x				
Meropidae											
Merops ornatus	Rainbow Bee-eater	Mi	S5		x		x	x	x		
Motacillidae											
Anthus australis	Australian Pipit			x			x		x	x	
Motacilla cinerea	Grey Wagtail	Mi	S5					x			
Neosittidae											
Daphoenositta chrysoptera	Varied Sittella					x	x		x	x	
Oreoicidae											

Species	Common Name	Conservation Status		a.	b.	c.	d.	e.	f.	g.	h.
		EPBC Act	WA Status								
Oreoica gutturalis	Crested Bellbird			x		x	x		x	x	
Pachycephalidae											
Colluricincla harmonica	Grey Shrike-thrush			x		x	x		x	x	x
Pachycephala inornata	Gilbert's Whistler					x	x		x		
Pachycephala pectoralis	Golden Whistler						x		x		
Pachycephala rufiventris	Rufous Whistler			x			x		x	x	
Pardalotidae											
Pardalotus punctatus	Spotted Pardalote						x				
Pardalotus striatus	Striated Pardalote					x	x		x	x	
Petroicidae											
Drymodes brunneopygia	Southern Scrub-robin						x		x	x	
Eopsaltria australis griseogularis	Western Yellow Robin						x		x	x	
Melanodryas cucullata	Hooded Robin			x					x	x	
Microeca fascinans	Jacky Winter					x	x		x	x	
Petroica goodenovii	Red-capped Robin			x		x	x		x	x	
Phasianidae											
Coturnix pectoralis	Stubble Quail					x	x				
Podargidae											
Podargus strigoides	Tawny Frogmouth			x			x		x		
Podicipedidae											
Poliocephalus poliocephalus	Hoary-headed Grebe						x		x		
Tachybaptus novaehollandiae	Australasian Grebe						x		x		
Pomatostomidae											
Pomatostomus superciliosus	White-browed Babbler			x		x	x		x	x	
Psittacidae											
Cacatua roseicapilla	Galah			x			x			x	x
Cacatua sanguinea	Little Corella						x				

Species	Common Name	Conservation Status		a.	b.	c.	d.	e.	f.	g.	h.
		EPBC Act	WA Status								
Neophema elegans	Elegant Parrot								x		
Nymphicus hollandicus	Cockatiel								x		
Parvipsitta porphyrocephala	Purple-crowned Lorikeet			x		x	x		x	x	
Pezoporus occidentalis	Night Parrot	En	S1					x			
Platycercus icterotis xanthogenys	Western Rosella (inland ssp.)		P4		x				x		
Platycercus varius	Mulga Parrot						x		x	x	
Platycercus zonarius	Australian Ringneck			x		x	x		x		x
Polytelis anthopeplus	Regent Parrot						x		x		
Rallidae											
Fulica atra	Eurasian Coot						x		x		
Tribonyx ventralis	Black-tailed Native-hen						x				
Recurvirostridae											
Himantopus himantopus	Black-winged Stilt						x				
Scolopacidae											
Calidris acuminata	Sharp-tailed Sandpiper	Mi	S5		x	x	x				
Calidris ferruginea	Curlew Sandpiper	Cr; Mi	S3; S5		x	x	x				
Calidris ruficollis	Red-necked Stint	Mi	S5		x	x	x				
Tringa glareola	Wood Sandpaper	Mi	S5		x						
Tringa nebularia	Common Greenshank	Mi	S5		x	x	x	x			
Strigidae											
Ninox boobook	Boobook Owl						x		x	x	
Sylviidae											
Megalurus cruralis	Brown Songlark						x				
Megalurus mathewsi	Rufous Songlark			x							
Threskiornithidae											
Plegadis falcinellus	Glossy Ibis	Mi	S5		x						
Threskiornis spinicollis	Straw-necked Ibis						x				

Species	Common Name	Conservation Status		a.	b.	c.	d.	e.	f.	g.	h.
		EPBC Act	WA Status								
Turnicidae											
Turnix varia	Painted Button-quail								x		
Zosteropidae											
Zosterops lateralis	Silvereye						x				
Mammals											
Burramyidae											
Cercartetus concinnus	Western Pygmy-possum					x			x		
Canidae											
Canis familiaris	Dog*			x					x		
Dasyuridae											
Antechinomys laniger	Kultarr								x		
Dasyurus geoffroii	Chuditch	Vu	S3		x			x			
Ningaui yvonneae	Southern Ningaui								x		x
Sminthopsis crassicaudata	Fat-tailed Dunnart								x		
Sminthopsis dolichura	Little long-tailed Dunnart								x		
Sminthopsis granulipes	White-tailed Dunnart								x		
Sminthopsis hirtipes	Hairy-footed Dunnart								x		
Felidae											
Felis catus	Cat*			x					x	x	
Leporidae											
Oryctolagus cuniculus	Rabbit*			x					x	x	x
Macropodidae											
Macropus fuliginosus	Western Grey Kangaroo								x	x	x
Osphranter robustus	Euro			x							
Molossidae											
Austronomus australis	White-striped Freetail-bat								x	x	
Ozimops petersi	Inland Free-tailed Bat								x		

Species	Common Name	Conservation Status		a.	b.	c.	d.	e.	f.	g.	h.
		EPBC Act	WA Status								
Muridae											
Mus musculus	House Mouse*					x			x	x	
Notomys mitchellii	Mitchell's Hopping-mouse					x			x	x	
Pseudomys albocinereus	Ash-grey Mouse								x		
Pseudomys bolami	Bolam's Mouse								x		
Pseudomys hermannsburgensis	Sandy Inland Mouse								x		
Myrmecobiidae											
Myrmecobius fasciatus	Numbat	Vu	S2		x						
Tachyglossidae											
Tachyglossus aculeatus	Short-beaked Echidna								x		
Thylacomyidae											
Macrotis lagotis	Bilby	Vu	S3		x						
Vespertilionidae											
Chalinolobus gouldii	Gould's Wattled Bat					x			x		
Chalinolobus morio	Chocolate Wattled Bat								x		
Nyctophilus geoffroyi	Lesser Long-eared Bat					x			x		
Nyctophilus major	Greater Long-eared Bat				x						
Nyctophilus major tor	Greater Long-eared Bat		P4						x		
Scotorepens balstoni	Inland Broad-nosed Bat								x		
Vespadelus regulus	Southern Forest Bat					x			x		
Reptiles											
Agamidae											
Ctenophorus cristatus	Bicycle Dragon					x			x	x	x
Ctenophorus fordi	Mallee Sand Dragon					x				x	
Ctenophorus isolepis	Military Dragon			x		x			x		
Ctenophorus maculatus	Spotted Military Dragon								x		
Ctenophorus ornatus	Ornate Crevice Dragon								x		

Species	Common Name	Conservation Status		a.	b.	c.	d.	e.	f.	g.	h.
		EPBC Act	WA Status								
Ctenophorus reticulatus	Western Netted Dragon			x		x			x	x	
Ctenophorus salinarum	Salt Pan Dragon								x		
Ctenophorus scutulatus									x		
Moloch horridus	Thorny Devil			x		x			x		
Pogona minor						x			x	x	
Tympanocryptis cephalus	Pebble Dragon			x		x			x		
Boidae											
Morelia spilota	Carpet Python					x					
Carphodactylidae											
Nephrurus stellatus									x		
Underwoodisaurus milii	Southern Barking Gecko								x		x
Diplodactylidae											
Crenadactylus ocellatus	Clawless Gecko								x		
Diplodactylus granariensis						x			x		
Diplodactylus pulcher						x			x		x
Hesperoedura reticulata						x			x	x	x
Lucasium maini						x			x		
Strophurus assimilis	Goldfields Spiny-tailed Gecko					x			x		
Egerniidae											
Cyclodomorphus branchialis			S3						x		
Egernia formosa						x			x	x	
Egernia richardi						x			x		
Egernia stokesii badia	Western Spiny-tailed Skink	En	S3		x						
Liopholis inornata						x			x		
Liopholis multiscutata									x		
Tiliqua multifasciata	Central Blue-tongue										
Tiliqua occipitalis	Western Bluetongue			x					x		

Species	Common Name	Conservation Status		a.	b.	c.	d.	e.	f.	g.	h.
		EPBC Act	WA Status								
Tiliqua rugosa									x	x	x
Elapidae											
Brachyurophis semifasciatus									x		
Demansia psammophis	Yellow-faced Whipsnake					x				x	
Parasuta gouldii									x		
Parasuta monachus											x
Pseudonaja mengdeni	Western Brown Snake								x		
Pseudonaja modesta	Ringed Brown Snake								x		
Simoselaps bertholdi	Jan's Banded Snake								x		
Suta fasciata	Rosen's Snake								x		
Eugongylidae											
Cryptoblepharus plagiocephalus									x		
Menetia greyii									x	x	x
Morethia butleri						x			x	x	
Morethia obscura						x			x		
Gekkonidae											
Gehyra variegata						x			x	x	
Heteronotia binoei	Bynoe's Gecko					x			x	x	x
Pygopodidae											
Delma australis						x			x	x	x
Delma butleri									x		
Lialis burtonis									x		
Pygopus lepidopodus	Common Scaly Foot								x		
Sphenomorphidae											
Ctenotus atlas						x			x	x	
Ctenotus brooksi						x					
Ctenotus pantherinus	Leopard Ctenotus								x		

Species	Common Name	Conservation Status		a.	b.	c.	d.	e.	f.	g.	h.
		EPBC Act	WA Status								
Ctenotus schomburgkii				x		x			x	x	
Ctenotus uber						x			x	x	
Ctenotus xenopleura									x		
Eremiascincus richardsonii	Broad-banded Sand Swimmer					x					
Hemiergis initialis						x			x	x	x
Lerista gerrardii									x		
Lerista kingi						x			x	x	x
Lerista picturata						x			x	x	
Lerista timida						x					
Typhlopidae											
Anilios australis									x		
Varanidae											
Varanus gouldii	Sand Monitor								x		

Appendix C Vegetation Associations of the Study Area

Appendix D Survey sites

D.1 Infrastructure Area

Site	**GI01**
Type	Relevé
Recorder	Megan Stone Briana Wingfield
Date	13/04/2016
Co-ordinates	-30.8689605 120.9125804

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Sandy loam	**Exposed Bedrock (%)**	0
Soil (%)	30	**Soil Colour**	Orange		
Leaf Litter (%)	60	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	50	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Moderate	**Tree Hollows (<10 cm)**	None
Peeling Bark	Moderate	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	Moderate
Termite Mound Presence	None		

Vegetation Condition

Condition	Very Good
Disturbances	Logging, Tracks

Fire

Time-since Last Fire (years)	Unknown
Evidence of Fire	n/a

Species Composition

Species Name	Form	Height (m)	Cover (%)
Melaleuca pauperiflora subsp. fastigiata	Shrub	2	1
Melaleuca phoidophylla	Shrub	1.5	0.1
Fabaceae sp.	Shrub	0.6	31
Eremophila maculata subsp. *brevifolia*	Shrub	0.6	0.1
Eremophila alternifolia	Shrub	0.5	1
Eucalyptus yilgarnensis	Mallee		10
Eucalyptus ? salmonophloia	Tree		10

Site	**GI02**
Type	Relevé
Recorder	Megan Stone Briana Wingfield
Date	13/04/2016
Co-ordinates	-30.8626969 120.9002002

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Sandy loam	**Exposed Bedrock (%)**	0
Soil (%)	30	**Soil Colour**	Orange		
Leaf Litter (%)	60	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	50	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Moderate	**Tree Hollows (<10 cm)**	None
Peeling Bark	Moderate	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	Moderate
Termite Mound Presence	None		

Vegetation Condition

Condition	Very Good	**Time-since Last Fire (years)**	Unknown
Disturbances	Clearing, Logging, Tracks	**Evidence of Fire**	n/a

Species Composition

Species Name	Form	Height (m)	Cover (%)
Eucalyptus moderata	Tree	10	5
Eucalyptus salubris	Tree	10	1
Eucalyptus yilgarnensis	Mallee	6	15
Exocarpos aphyllus	Shrub	2	1
Santalum accuminatum	Shrub	2	0.1
Acacia colletioides	Shrub	2	0.1
Acacia ligulata	Shrub	1.5	5
Eremophila caperata	Shrub	1.2	5
Scaevola spinescens	Shrub	0.8	0.1
Senna artemisioides subsp. *filifolia*	Shrub	0.6	0.1
Ereomphila scoparia	Shrub	0.6	0.1
Austrostipa platychaeta	Tussock grass	0.6	0.1
Scaevola bursariifolia	Shrub	0.4	0.1
Olearia sp. Eremicola (Diels + Pritzel s.n. Perth 00449628)	Shrub	0.4	0.1
Olearia muelleri	Shrub	0.4	0.1
Grevillea acuaria	Shrub	0.4	0.1

Site	**GI03**
Type	Relevé
Recorder	Megan Stone Briana Wingfield
Date	13/04/2016
Co-ordinates	-30.8678315 120.8948345

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Sandy loam	**Exposed Bedrock (%)**	0
Soil (%)	30	**Soil Colour**	Orange		
Leaf Litter (%)	60	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	50	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Rare	**Tree Hollows (<10 cm)**	None
Peeling Bark	Rare	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	Moderate
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent
Disturbances	Tracks

Fire

Time-since Last Fire (years)	Unknown
Evidence of Fire	n/a

Species Composition

Species Name	Form	Height (m)	Cover (%)
Eucalyptus salubris	Tree	15	15
Santalum spicatum	Shrub	2.2	0.1
Acacia ligulata	Shrub	1.8	10
Eremophila ionantha	Shrub	1.6	10
Senna artemisioides subsp. *filifolia*	Shrub	1.6	0.1
Exocarpos aphyllus	Shrub	1.2	0.1
Eucalyptus ? salmonophloia	Tree	1.2	0.1
Acacia colletioides	Shrub	1.2	0.1
Eremophila scoparia	Shrub	0.6	0.1
Atriplex nummularia	Chenopod shrub	0.6	0.1
Maireana tomentosa	Chenopod shrub	0.3	0.1
Atriplex vesicaria	Chenopod shrub	0.3	0.1
Olearia muelleri	Shrub	0.2	0.1
Rhagodia drummondii	Shrub		0.1
Cratystylis microphylla	Shrub		0.1

Site	**GI04**
Type	Relevé
Recorder	Megan Stone Briana Wingfield
Date	13/04/2016
Co-ordinates	-30.8668946 120.8825738

Landforms

Type	Slope	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Sandy loam	**Exposed Bedrock (%)**	0
Soil (%)	20	**Soil Colour**	Orange		
Leaf Litter (%)	30	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	80	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Moderate	**Tree Hollows (<10 cm)**	None
Peeling Bark	Rare	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	Moderate
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent
Disturbances	Tracks

Fire

Time-since Last Fire (years)	Unknown
Evidence of Fire	n/a

Species Composition

Species Name	Form	Height (m)	Cover (%)
Acacia aptaneura	Shrub	3	31
Acacia acuminata	Shrub	2	0.1
Leptospermum fastigiatum	Shrub	1.8	10
Beyeria sulcata var. *? sulcata*	Forb	1.2	19
Thryptomene kochii	Shrub	1.2	0.1
Philotheca tomentella	Shrub	1.2	0.1
Grevillea nematophylla subsp. nematophylla	Shrub	1.2	0.1
Eremophila ? drummondii	Shrub	1.2	0.1
Prostanthera grylloana	Shrub	0.6	10
Olearia pimelioides	Shrub	0.5	0.1
Euryomyrtus maidenii	Shrub	0.5	0.1
Dampiera tenuicaulis var. *curvula*	Shrub	0.5	0.1

Site	**GI05**
Type	Relevé
Recorder	Megan Stone Briana Wingfield
Date	13/04/2016
Co-ordinates	-30.8677003 120.8849327

Landforms

Type	Slope	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Sandy loam	**Exposed Bedrock (%)**	0
Soil (%)	60	**Soil Colour**	Orange		
Leaf Litter (%)	30	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	40	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Moderate	**Tree Hollows (<10 cm)**	None
Peeling Bark	Moderate	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	Moderate
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent	**Time-since Last Fire (years)**	Unknown
Disturbances	Tracks	**Evidence of Fire**	n/a

Species Composition

Species Name	Form	Height (m)	Cover (%)
Eucalyptus salubris	Tree	6	2
Eucalyptus griffithsii	Mallee	4	10
Santalum acuminatum	Shrub	2.5	0.1
Acacia acuminata	Shrub	2	20
Exocarpos aphyllus	Shrub	2	0.1
Alyxia buxifolia	Shrub	1.8	0.1
Acacia colletioides	Shrub	1.8	0.1
Eremophila ionantha	Shrub	1.6	5
Acacia ligulata	Shrub	1.6	5
Eremophila scoparia	Shrub	1.6	1
Scaevola spinescens	Shrub	0.6	1
Grevillea acuaria	Shrub	0.5	0.1
Scaevola bursariifolia	Shrub	0.4	0.1
Senna artemisioides subsp. x *artemisioides*	Shrub	0.3	0.1
Grevillea nematophylla subsp. *nematophylla*	Shrub	0.3	0.1
Olearia muelleri	Shrub	0.2	0.1
Westringia rigida	Forb		0.1

Site	**GI06**
Type	Relevé
Recorder	Megan Stone Briana Wingfield
Date	13/04/2016
Co-ordinates	-30.868385 120.8868044

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Sandy loam	**Exposed Bedrock (%)**	0
Soil (%)	50	**Soil Colour**	Orange		
Leaf Litter (%)	70	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	40	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Common	**Tree Hollows (<10 cm)**	None
Peeling Bark	Common	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	Moderate
Termite Mound Presence	None		

Vegetation Condition

Condition	Very Good
Disturbances	Tracks, Logging, Rabbit Grazing

Fire

Time-since Last Fire (years)	Unknown
Evidence of Fire	n/a

Species Composition

Species Name	Form	Height (m)	Cover (%)
Eucalyptus sp.	Mallee	10	35
Eucalyptus salubris	Tree	10	0.1
Eucalyptus yilgarnensis	Mallee	6	0.1
Acacia ligulata	Shrub	2	0.5
Santalum acuminatum	Shrub	2	0.1
Santalum accuminatum	Shrub	2	0.1
Eremophila caperata	Shrub	1.8	5
Eremophila scoparia	Shrub	1.8	1
Exocarpos aphyllus	Shrub	1.8	0.1
Acacia colletioides	Shrub	1.8	0.1
Eremophila ionantha	Shrub	1.6	1
Eremophila decipiens	Shrub	1.2	0.1
Senna artemisioides subsp. *filifolia*	Shrub	0.6	0.1
Senna artemisioides subsp. *filifolia*	Shrub	0.6	0.1
Acacia merrallii	Shrub	0.6	0.1
Senna artemisioides subsp. x *artemisioides*	Shrub	0.5	0.1
Grevillea acuaria	Shrub	0.5	0.1
Olearia muelleri	Shrub	0.2	1

Site	**GI07**
Type	Relevé
Recorder	Megan Stone Briana Wingfield
Date	13/04/2016
Co-ordinates	-30.8674383 120.9039945

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Sandy loam	**Exposed Bedrock (%)**	0
Soil (%)	50	**Soil Colour**	Orange		
Leaf Litter (%)	40	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	40	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Moderate	**Tree Hollows (<10 cm)**	None
Peeling Bark	Common	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	Moderate
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent
Disturbances	Tracks

Fire

Time-since Last Fire (years)	Unknown
Evidence of Fire	n/a

Species Composition

Species Name	Form	Height (m)	Cover (%)
Eucalyptus yilgarnensis	Mallee	6	15
Melaleuca pauperiflora subsp. *fastigiata*	Shrub	2.5	31
Santalum acuminatum	Shrub	2	0.1
Exocarpos aphyllus	Shrub	1.6	0.1
Eremophila scoparia	Shrub	1.6	0.1
Senna artemisioides subsp. *filifolia*	Shrub	0.4	0.1
Grevillea acuaria	Shrub	0.1	0.1
Eucalyptus salubris	Tree	0.1	0.1

Site	**GI09**
Type	Relevé
Recorder	Megan Stone Briana Wingfield
Date	14/04/2016
Co-ordinates	-30.8582098 120.8941245

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No – Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Sandy loam	**Exposed Bedrock (%)**	0
Soil (%)	60	**Soil Colour**	Orange		
Leaf Litter (%)	30	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	40	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Moderate	**Tree Hollows (<10 cm)**	None
Peeling Bark	Moderate	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	Moderate
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent	**Time-since Last Fire (years)**	Unknown
Disturbances	Tracks, Rabbit Grazing	**Evidence of Fire**	n/a

Fire

Species Composition

Species Name	Form	Height (m)	Cover (%)
Eucalyptus griffithsii	Mallee	4	11
Acacia resinistipulea	Shrub	1.6	0.1
Acacia colletioides	Shrub	1.6	0.1
Acacia burkittii	Shrub	1.6	0.1
Acacia prainii	Shrub	1.5	11
Eremophila caperata	Shrub	1.5	1
Acacia ligulata	Shrub	1.5	0.1
Westringia cephalantha	Shrub	0.6	0.1
Senna artemisioides subsp. *filifolia*	Shrub	0.6	0.1
Olearia sp. Eremicola (Diels + Pritzel s.n. Perth 00449628)	Shrub	0.4	0.1
Olearia muelleri	Shrub	0.3	0.1
Triodia scariosa	Hummock grass	0.2	11

Site	**GI10**
Type	Relevé
Recorder	Megan Stone Briana Wingfield
Date	14/04/2016
Co-ordinates	-30.8600416 120.9077664

Landforms

Type	Stony Rise	**Aspect**	n/a
Water Presence	No – Never	**Slope**	3 - 5°

Ground Cover

Rock (%)	60	**Soil Type**	Loamy sand	**Exposed Bedrock (%)**	<2
Soil (%)	40	**Soil Colour**	Orange		
Leaf Litter (%)	40	**Rock Type**	Greenstone, Calcrete	**Coarse Fragment Size (mm)**	20 - 200
Perennial Veg (%)	40	**Rock Abundance (%)**	20 - 50		

Fauna Habitat Attributes

Woody Debris	Moderate	**Tree Hollows (<10 cm)**	None
Peeling Bark	Moderate	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	Low
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent	**Fire**	
Disturbances	Tracks, Rabbit Grazing	**Time-since Last Fire (years)**	Unknown
		Evidence of Fire	n/a

Species Composition

Species Name	Form	Height (m)	Cover (%)
Eucalyptus yilgarnensis	Mallee	3.5	10
Eucalyptus griffithsii	Mallee	3.5	10
Acacia acuminata	Shrub	2	5
Senna artemisioides subsp. *filifolia*	Shrub	1.6	5
Eremophila scoparia	Shrub	1.6	0.1
Acacia ligulata	Shrub	1.5	0.1
Melaleuca pauperiflora subsp. *fastigiata*	Shrub	1.2	0.1
Grevillea acuaria	Shrub	0.6	0.1
Acacia colletioides	Shrub	0.5	0.1
Westringia rigida	Shrub	0.4	0.1
Olearia muelleri	Shrub	0.4	0.1
Eremophila decipiens	Shrub	0.4	0.1
Cryptandra ? aridicola	Shrub		

Site	**GI11**
Type	Relevé
Recorder	Megan Stone Briana Wingfield
Date	14/04/2016
Co-ordinates	-30.8579114 120.9100125

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	Yes – Prone to Ponding	**Slope**	0 - 3°

Ground Cover

Rock (%)	5	**Soil Type**	Sandy loam	**Exposed Bedrock (%)**	<2
Soil (%)	60	**Soil Colour**	Orange		
Leaf Litter (%)	5	**Rock Type**	Calcrete	**Coarse Fragment Size (mm)**	2 – 10
Perennial Veg (%)	40	**Rock Abundance (%)**	<2		

Fauna Habitat Attributes

Woody Debris	Rare	**Tree Hollows (<10 cm)**	None
Peeling Bark	None	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	Moderate
Termite Mound Presence	None		

Vegetation Condition

Condition	Very Good	**Fire**	
Disturbances	Tracks, Rabbit Grazing	**Time-since Last Fire (years)**	Unknown
		Evidence of Fire	n/a

Species Composition

Species Name	Form	Height (m)	Cover (%)
Melaleuca phoidophylla	Shrub	1.6	69
Fabaceae sp.	Shrub	0.4	2
Eucalyptus yilgarnensis	Mallee	4	2

D.2 Pipeline Corridor

Site	**GP01**
Type	Relevé
Recorder	Megan Stone Briana Wingfield
Date	12/04/2016
Co-ordinates	-30.8699109 120.9236258

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Sandy loam	**Exposed Bedrock (%)**	0
Soil (%)	60	**Soil Colour**	Orange		
Leaf Litter (%)	60	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	50	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Moderate	**Tree Hollows (<10 cm)**	None
Peeling Bark	Common	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	Moderate
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent	**Time-since Last Fire (years)**	Unknown
Disturbances	Tracks	**Evidence of Fire**	n/a

Species Composition

Species Name	Form	Height (m)	Cover (%)
Eucalyptus salubris	Tree	6	0.1
Eucalyptus yilgarnensis	Mallee	4	25
Santalum acuminatum	Shrub	2.5	0.1
Acacia colletioides	Shrub	2.2	1
Acacia enervia subsp. *explicata*	Shrub	2.2	0.1
Austrostipa platychaeta	Tussock grass	2	0.1
Acacia ligulata	Shrub	1.5	5
Phebalium lepidotum	Shrub	1.5	0.1
Exocarpos aphyllus	Shrub	1.5	0.1
Senna artemisioides	Shrub	1.2	0.1
Eremophila scoparia	Shrub	1.2	0.1
Eremophila ionantha	Shrub	1.2	0.1
Eremophila decipiens	Shrub	0.6	0.1
Scaevola spinescens	Shrub	0.5	0.1
Prostanthera grylloana	Shrub	0.5	0.1
Triodia scariosa	Hummock grass	0.4	0.1
Olearia pimeleoides subsp. *pimeleoides*	Shrub	0.4	0.1
Westringia rigida	Shrub	0.3	0.1
Grevillea acuaria	Shrub	0.3	0.1
Chamaexeros macranthera	Shrub	0.3	0.1
Olearia sp. Eremicola (Diels + Pritzel s.n. Perth 00449628)	Shrub	0.2	0.1
Olearia muelleri	Shrub	0.2	0.1
Aristida contorta	Tussock grass	0.2	0.1
Zygophyllum glaucum		0.1	0.1
Maireana georgei	Chenopod shrub	0.1	0.1
Cratystylis microphylla	Shrub	0.1	0.1

Site	**GP02**
Type	Relevé
Recorder	Megan Stone Briana Wingfield
Date	12/04/2016
Co-ordinates	-30.8691565 120.9286739

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Sandy loam	**Exposed Bedrock (%)**	0
Soil (%)	40	**Soil Colour**	Orange		
Leaf Litter (%)	60	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	50	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Common	**Tree Hollows (<10 cm)**	None
Peeling Bark	Common	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	Moderate
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent
Disturbances	Tracks

Fire

Time-since Last Fire (years)	Unknown
Evidence of Fire	n/a

Species Composition

Species Name	Form	Height (m)	Cover (%)
Eucalyptus ? salmonophloia	Tree	11	10
Eucalyptus yilgarnensis	Mallee	6	5
Acacia ligulata	Shrub	5	1
Acacia enervia subsp. *explicata*	Shrub	2	5
Santalum acuminatum	Shrub	2	0.1
Melaleuca pauperiflora subsp. *fastigiata*	Shrub	2	0.1
Exocarpos aphyllus	Shrub	1.8	0.1
Eremophila ionantha	Shrub	1.6	7
Senna artemisioides subsp. *filifolia*	Shrub	1.6	0.1
Eremophila scoparia	Shrub	1.6	0.1
Eremophila alternifolia	Shrub	1.5	5
Acacia colletioides	Shrub	1.5	0.5
Austrostipa platychaeta	Tussock grass	1	0.1
Scaevola spinescens	Shrub	0.6	0.1
Scaevola bursariifolia	Shrub	0.6	0.1
Acacia merrallii	Shrub	0.5	0.1
Westringia rigida	Shrub	0.2	0.1
Westringia rigida	Shrub	0.2	0.1
Olearia muelleri	Shrub	0.2	0.1
Grevillea acuaria	Shrub	0.2	0.1
Alyxia buxifolia	Shrub	0.2	0.1
Lysiana casuarinae	Shrub	0	0.1

Site	**GP03**
Type	Relevé
Recorder	Megan Stone Briana Wingfield
Date	12/04/2016
Co-ordinates	-30.867348 120.9446332

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Sandy loam	**Exposed Bedrock (%)**	0
Soil (%)	80	**Soil Colour**	Orange		
Leaf Litter (%)	30	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	30	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Moderate	**Tree Hollows (<10 cm)**	None
Peeling Bark	Moderate	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	Moderate
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent	**Time-since Last Fire (years)**	Unknown
Disturbances	Tracks, Rabbit Grazing	**Evidence of Fire**	n/a

Species Composition

Species Name	Form	Height (m)	Cover (%)
Eucalyptus celastroides subsp. *virella*	Mallee	5	19
Eremophila alternifolia	Shrub	1.8	2
Exocarpos aphyllus	Shrub	1.8	0.1
Alyxia buxifolia	Shrub	1.2	0.1
Acacia ligulata	Shrub	1.2	0.1
Olearia incana	Shrub	0.6	1
Westringia cephalantha	Shrub	0.5	0.1
Olearia muelleri	Shrub	0.2	0.1

Site	**GP04**
Type	Relevé
Recorder	Megan Stone Briana Wingfield
Date	12/04/2016
Co-ordinates	-30.8672787 120.9455149

Landforms

Type	Slope	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Sandy loam	**Exposed Bedrock (%)**	0
Soil (%)	60	**Soil Colour**	Orange		
Leaf Litter (%)	30	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	50	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Rare	**Tree Hollows (<10 cm)**	None
Peeling Bark	Moderate	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	Moderate
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent	**Time-since Last Fire (years)**	Unknown
Disturbances	Tracks	**Evidence of Fire**	n/a

Species Composition

Species Name	Form	Height (m)	Cover (%)
Melaleuca hamata	Shrub	2	71
Psydrax rigidula	Shrub	0.4	0.1
Olearia incana	Shrub	0.2	0.1

Site	**GP05**
Type	Relevé
Recorder	Megan Stone Briana Wingfield
Date	14/04/2016
Co-ordinates	-30.8677003 120.8849327

Landforms

Type	Slope	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Sandy loam	**Exposed Bedrock (%)**	0
Soil (%)	60	**Soil Colour**	Orange		
Leaf Litter (%)	30	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	40	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Moderate	**Tree Hollows (<10 cm)**	None
Peeling Bark	Moderate	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	Moderate
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent
Disturbances	Tracks

Fire

Time-since Last Fire (years)	Unknown
Evidence of Fire	n/a

Species Composition

Species Name	Form	Height (m)	Cover (%)
Eucalyptus ? urna	Tree	11	7
Eucalyptus celastroides subsp. *virella*	Mallee	5	0.1
Melaleuca pauperiflora subsp. *fastigiata*	Shrub	2.5	2
Alyxia buxifolia	Shrub	2	0.5
Santalum accuminatum	Shrub	2	0.1
Acacia colletioides	Shrub	2	0.1
Acacia ligulata	Shrub	1.8	1
Eremophila scoparia	Shrub	1.8	0.5
Senna artemisioides subsp. *filifolia*	Shrub	1.6	0.5
Exocarpos aphyllus	Shrub	1.6	0.1
Eremophila oppositifolia	Shrub	1.6	0.1
Scaevola spinescens	Shrub	1.2	1
Eremophila ionantha	Shrub	0.7	0.5
Olearia incana	Shrub	0.5	0.1
Westringia rigida	Shrub	0.4	0.1
Olearia muelleri	Shrub	0.4	0.1
Grevillea acuaria	Shrub	0.3	0.1

Site	**GP06**
Type	Relevé
Recorder	Megan Stone Briana Wingfield
Date	14/04/2016
Co-ordinates	-30.8683855 120.8868044

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Sandy loam	**Exposed Bedrock (%)**	0
Soil (%)	50	**Soil Colour**	Orange		
Leaf Litter (%)	70	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	40	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Common	**Tree Hollows (<10 cm)**	None
Peeling Bark	Common	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	Moderate
Termite Mound Presence	None		

Vegetation Condition

Condition	Very Good
Disturbances	Tracks, Logging

Fire

Time-since Last Fire (years)	Unknown
Evidence of Fire	n/a

Species Composition

Species Name	Form	Height (m)	Cover (%)
Eucalyptus griffithsii	Mallee	5	0.1
Acacia acuminata	Shrub	2.5	35
Allocasuarina helmsii	Shrub	2.5	10
Alyxia buxifolia	Shrub	2	5
Phebalium tuberculosum	Shrub	1.8	2
Beyeria sulcata var. ? *sulcata*	Forb	1.6	0.1
Exocarpos aphyllus	Shrub	1.5	0.5
Senna artemisioides subsp. *filifolia*	Shrub	1.5	0.1
Eremophila oppositifolia	Shrub	1.2	0.1
Acacia ligulata	Shrub	1.2	0.1
Scaevola spinescens	Shrub	0.6	0.1
Prostanthera grylloana	Shrub	0.6	0.1
Eremophila decipiens	Shrub	0.4	0.1
Westringia rigida	Shrub	0.3	0.1
Triodia scariosa	Hummock grass	0.2	0.1
Grevillea acuaria	Shrub	0.2	0.1

Site	**GP07**
Type	Relevé
Recorder	Megan Stone Briana Wingfield
Date	14/04/2016
Co-ordinates	-30.8662288 120.9562895

Landforms

Type	Slope	**Aspect**	n/a
Water Presence	No – Never	**Slope**	3 - 5°

Ground Cover

Rock (%)	30	**Soil Type**	Loamy sand	**Exposed Bedrock (%)**	0
Soil (%)	20	**Soil Colour**	Grey		
Leaf Litter (%)	80	**Rock Type**	Calcrete	**Coarse Fragment Size (mm)**	2 - 20
Perennial Veg (%)	10	**Rock Abundance (%)**	10 - 20		

Fauna Habitat Attributes

Woody Debris	Common	**Tree Hollows (<10 cm)**	None
Peeling Bark	Common	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	Low
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent
Disturbances	Tracks

Fire

Time-since Last Fire (years)	Unknown
Evidence of Fire	n/a

Species Composition

Species Name	Form	Height (m)	Cover (%)
Eucalyptus griffithsii	Mallee	8	2
Santalum acuminatum	Shrub	2.2	0.1
Eremophila oppositifolia	Shrub	2	0.1
Stenanthemum stipulosum	Shrub	1.8	0.1
Exocarpos aphyllus	Shrub	1.6	0.1
Scaevola spinescens	Shrub	1.2	11
Senna artemisioides subsp. *filifolia*	Shrub	1.2	0.1
Alyxia buxifolia	Shrub	1.2	0.1
Acacia ligulata	Shrub	1.2	0.1
Austrostipa platychaeta	Tussock grass	0.6	0.1
Westringia rigida	Shrub	0.4	0.1
Melaleuca lanceolata	Shrub	-	-
Lysiana casuarinae	Shrub	-	-
Eucalyptus celastroides subsp. *virella*	Mallee	-	-
Eremophila ionantha	Shrub	-	-

Site	**GP08**
Type	Relevé
Recorder	Megan Stone Briana Wingfield
Date	14/04/2016
Co-ordinates	-30.8640666 120.9840948

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No – Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Sandy loam	**Exposed Bedrock (%)**	0
Soil (%)	40	**Soil Colour**	Orange		
Leaf Litter (%)	40	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	50	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Moderate	**Tree Hollows (<10 cm)**	None
Peeling Bark	Moderate	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	Moderate
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent	**Time-since Last Fire (years)**	Unknown
Disturbances	Tracks	**Evidence of Fire**	n/a

Species Composition

Species Name	Form	Height (m)	Cover (%)
Eucalyptus griffithsii	Shrub	7	30
Acacia colletioides	Shrub	1.8	0.1
Exocarpos aphyllus	Shrub	1.8	0.1
Santalum accuminatum	Shrub	1.8	0.1
Eremophila ionantha	Shrub	1.6	5
Eremophila scoparia	Shrub	1.6	0.1
Eremophila caperata	Shrub	1.2	5
Acacia ligulata	Shrub	1.2	0.1
Halgania andromedifolia	Shrub	1	0.1
Acacia merrallii	Shrub	0.5	0.1
Scaevola spinescens	Shrub	0.4	0.1
Olearia muelleri	Shrub	0.3	0.1
Triodia scariosa	Hummock grass	0.3	0.1
Westringia rigida	Shrub	0.3	0.1

D.3 Haul Road Corridor

Site	**GR03**
Type	Relevé
Recorder	Alex Sleep Briana Wingfield
Date	28/04/2016
Co-ordinates	-30.8512826 120.9034432

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	5	**Soil Type**	Loamy sand	**Exposed Bedrock (%)**	0
Soil (%)	60	**Soil Colour**	Yellow		
Leaf Litter (%)	20	**Rock Type**	Dolerite, Ironstone	**Coarse Fragment Size (mm)**	2 - 6
Perennial Veg (%)	25	**Rock Abundance (%)**	<2		

Fauna Habitat Attributes

Woody Debris	Rare	**Tree Hollows (<10 cm)**	None
Peeling Bark	None	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	High
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent	**Time-since Last Fire (years)**	1 - 3
Disturbances	Fire	**Evidence of Fire**	Bare Ground, Dead Branches

Species Composition

Species Name	Form	Height (m)	Cover (%)
Eucalyptus ? urna	Tree	11	7
Eucalyptus celastroides subsp. *virella*	Mallee	5	0.1
Melaleuca pauperiflora subsp. *fastigiata*	Shrub	2.5	2
Alyxia buxifolia	Shrub	2	0.5
Santalum acuminatum	Shrub	2	0.1
Acacia colletioides	Shrub	2	0.1
Acacia ligulata	Shrub	1.8	1
Eremophila scoparia	Shrub	1.8	0.5
Senna artemisioides subsp. *filifolia*	Shrub	1.6	0.5
Exocarpos aphyllus	Shrub	1.6	0.1
Eremophila oppositifolia	Shrub	1.6	0.1
Scaevola spinescens	Shrub	1.2	1
Eremophila ionantha	Shrub	0.7	0.5
Olearia incana	Shrub	0.5	0.1
Westringia rigida	Shrub	0.4	0.1
Olearia muelleri	Shrub	0.4	0.1
Grevillea acuaria	Shrub	0.3	0.1

Site	**GR07**
Type	Relevé
Recorder	Alex Sleep Briana Wingfield
Date	28/04/2016
Co-ordinates	-30.8468667 120.9082314

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Loamy sand	**Exposed Bedrock (%)**	0
Soil (%)	40	**Soil Colour**	Yellow		
Leaf Litter (%)	5	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	50	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Rare	**Tree Hollows (<10 cm)**	None
Peeling Bark	Rare	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	High
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent
Disturbances	Fire

Fire

Time-since Last Fire (years)	1 - 3
Evidence of Fire	Bare Ground, Dead Branches

Species Composition

Species Name	Form	Height (m)	Cover (%)
Eucalyptus griffithsii	Tree	3	2
Acacia resinimarginea	Shrub	1.3	50
Melaleuca ? hamata	Shrub	1	patches
Philotheca tomentella	Shrub	0.5	0.1
Thryptomene kochii	Shrub	0.5	0.1
Westringia cephalantha	Shrub	0.5	0.1
Phebalium filifolium	Shrub	0.4	40
Triodia scariosa	Hummock grass	0.4	10
Callitris preissii	Shrub	-	0.1

Site	**GR09**
Type	Relevé
Recorder	Alex Sleep Briana Wingfield
Date	28/04/2016
Co-ordinates	-30.8454921 120.9141055

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	5	**Soil Type**	Loamy sand	**Exposed Bedrock (%)**	0
Soil (%)	50	**Soil Colour**	Orange		
Leaf Litter (%)	25	**Rock Type**	Dolerite, Ironstone	**Coarse Fragment Size (mm)**	2 - 6
Perennial Veg (%)	40	**Rock Abundance (%)**	<2		

Fauna Habitat Attributes

Woody Debris	Moderate	**Tree Hollows (<10 cm)**	None
Peeling Bark	Moderate	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	High
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent	**Time-since Last Fire (years)**	5 - 15
Disturbances	Fire, Tracks	**Evidence of Fire**	Dead Branches

Species Composition

Species Name	Form	Height (m)	Cover (%)
Eucalyptus griffithsii	Tree	4	30
Acacia resinimarginea	Shrub	2	30
Beyeria sulcata var. *sulcata*	Forb	0.5	10
Triodia scariosa	Hummock grass	0.4	50
Eucalyptus leptopoda subsp. *leptopoda*	Mallee		0.1
Thryptomene kochii	Shrub		0.1

Site	**GR11**
Type	Relevé
Recorder	Alex Sleep Briana Wingfield
Date	28/04/2016
Co-ordinates	-30.841942 120.9288933

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Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Loamy sand	**Exposed Bedrock (%)**	0
Soil (%)	55	**Soil Colour**	Orange		
Leaf Litter (%)	20	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	55	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Rare	**Tree Hollows (<10 cm)**	None
Peeling Bark	Rare	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	High
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent	**Fire**	
Disturbances	Fire	**Time-since Last Fire (years)**	1 - 3
		Evidence of Fire	Dead Branches

Species Composition

Species Name	Form	Height (m)	Cover (%)
Eucalyptus griffithsii	Tree	3	2
Acacia resinimarginea	Shrub	1.8	60
Phebalium filifolium	Shrub	0.5	2
Beyeria sulcata var. *sulcata*	Forb		opp
Callitris preissii	Shrub		opp
Dampiera sp.	Shrub		opp
Dicrastylis parvifolia	Shrub		opp
Hakea francisiana	Shrub		opp
Lamiaceae sp.	Shrub		opp
Leptospermum fastigiatum	Shrub		opp
Melaleuca hamata	Shrub		opp
Philotheca tomentella	Shrub		opp
Triodia scariosa	Hummock grass		opp

Site	**GR12**
Type	Relevé
Recorder	Alex Sleep Briana Wingfield
Date	28/04/2016
Co-ordinates	-30.8417327 120.9295972

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Loamy sand	**Exposed Bedrock (%)**	0
Soil (%)	70	**Soil Colour**	Orange		
Leaf Litter (%)	10	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	30	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Rare	**Tree Hollows (<10 cm)**	None
Peeling Bark	Rare	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	High
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent
Disturbances	Fire

Fire

Time-since Last Fire (years)	3 - 5
Evidence of Fire	Dead Branches

Species Composition

Species Name	Form	Height (m)	Cover (%)
Eucalyptus griffithsii	Tree	4	5
Eucalyptus celastroides subsp. *virella*	Mallee	3	30
Eremophila caperata	Shrub	1.5	20
Acacia burkittii	Shrub	1.5	0.1
Acacia colletioides	Shrub	0.8	0.1
Eremophila caperata	Shrub	0.8	0.1
Olearia sp. Eremicola (Diels + Pritzel s.n. Perth 00449628)	Shrub	0.3	0.1

Site	**GR13**
Type	Relevé
Recorder	Alex Sleep Briana Wingfield
Date	28/04/2016
Co-ordinates	-30.8405976 120.9330763

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Loamy sand	**Exposed Bedrock (%)**	0
Soil (%)	65	**Soil Colour**	Orange		
Leaf Litter (%)	35	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	25	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Moderate	**Tree Hollows (<10 cm)**	None
Peeling Bark	Common	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	High
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent	**Time-since Last Fire (years)**	5 - 15
Disturbances	Fire, Tracks	**Evidence of Fire**	Dead Branches

Species Composition

Species Name	Form	Height (m)	Cover (%)
Eucalyptus salmonophloia	Tree	10	10
Acacia burkittii	Shrub	3	8
Eucalyptus griffithsii	Tree	3	0.1
Exocarpos aphyllus	Shrub	2.5	1
Alyxia buxifolia	Shrub	2	2
Santalum acuminatum	Shrub	2	0.1
Acacia hemiteles	Shrub	1.2	5
Eremophila scoparia	Shrub	1.2	0.1
Scaevola spinescens	Shrub	0.6	20
Senna artemisioides subsp. *filifolia*	Shrub	0.5	2
Amphipogon caricinus var. *caricinus*	Tussock grass	0.2	0.1
Eremophila granitica	Shrub		opp
Eremophila oppositifolia subsp. *angustifolia*	Shrub		opp
Eucalyptus ? celastroides subsp. *celastroides*	Mallee		opp
Eucalyptus clelandii	Tree		opp
Eucalyptus urna	Tree		opp

Site	**GR14**
Type	Relevé
Recorder	Alex Sleep Briana Wingfield
Date	28/04/2016
Co-ordinates	-30.8397118 120.9377049

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	50	**Soil Type**	Loamy sand	**Exposed Bedrock (%)**	0
Soil (%)	50	**Soil Colour**	Orange		
Leaf Litter (%)	35	**Rock Type**	Dolerite, Ironstone	**Coarse Fragment Size (mm)**	2 - 20
Perennial Veg (%)	30	**Rock Abundance (%)**	20 - 50		

Fauna Habitat Attributes

Woody Debris	Moderate	**Tree Hollows (<10 cm)**	None
Peeling Bark	Rare	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	High
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent	**Time-since Last Fire (years)**	5 - 15
Disturbances	Fire	**Evidence of Fire**	Dead Branches

Species Composition

Species Name	Form	Height (m)	Cover (%)
Eucalyptus griffithsii	Tree	6	2
Eucalyptus leptopoda subsp. *leptopoda*	Mallee	6	2
Acacia resinimarginea	Shrub	2.5	70
Phebalium tuberculosum	Shrub	1.3	60
Thryptomene kochii	Shrub	1.2	5
Prostanthera grylloana	Shrub	0.5	0.1
Amphipogon caricinus var. caricinus	Tussock grass	0.2	0.1
Allocasuarina corniculata	Shrub		opp
Beyeria sulcata var. *sulcata*	Forb		opp
Eremophila granitica	Shrub		opp
Thryptomene cuspidata	Shrub		opp

Site	**GR15**
Type	Relevé
Recorder	Alex Sleep Briana Wingfield
Date	28/04/2016
Co-ordinates	-30.8319745 120.9463434

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Loamy sand	**Exposed Bedrock (%)**	0
Soil (%)	40	**Soil Colour**	Yellow		
Leaf Litter (%)	50	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	35	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Moderate	**Tree Hollows (<10 cm)**	None
Peeling Bark	Rare	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	High
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent
Disturbances	Fire

Fire

Time-since Last Fire (years)	3 - 5
Evidence of Fire	Dead Branches

Species Composition

Species Name	Form	Height (m)	Cover (%)
Acacia resinimarginea	Shrub	3	30
Callitris preissii	Shrub	3	5
Verticordia helmsii	Shrub	1.5	5
Lamiaceae sp.	Shrub	1.2	30
Prostanthera campbellii	Shrub	1.2	5
Triodia scariosa	Hummock grass	1	1
Homalocalyx thryptomenoides	Shrub	0.5	0.1
Beyeria sulcata var. *sulcata*	Forb		opp
Grevillea acacioides	Shrub		opp

Site	**GR16**
Type	Relevé
Recorder	Alex Sleep Briana Wingfield
Date	29/04/2016
Co-ordinates	-30.8294454 120.9493534

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Loamy sand	**Exposed Bedrock (%)**	0
Soil (%)	55	**Soil Colour**	Yellow		
Leaf Litter (%)	30	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	40	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Moderate	**Tree Hollows (<10 cm)**	None
Peeling Bark	None	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	High
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent	**Time-since Last Fire (years)**	3 - 5
Disturbances	Fire	**Evidence of Fire**	Dead Branches

Species Composition

Species Name	Form	Height (m)	Cover (%)
Callitris preissii	Shrub	-	0.1
Eucalyptus ? rigidula	Mallee	4	10
Hakea francisiana	Shrub	4	0.1
Acacia resinimarginea	Shrub	1.5	40
Beyeria sulcata var. *sulcata*	Forb	0.5	35
Lamiaceae sp.	Shrub	0.5	5
Phebalium filifolium	Shrub	0.5	2
Philotheca tomentella	Shrub	0.5	0.1
Grevillea excelsior	Shrub	-	opp
Stylidium arenicola	Forb	-	opp
Triodia scariosa	Hummock grass	-	opp

Site	**GR18**
Type	Relevé
Recorder	Alex Sleep Briana Wingfield
Date	29/04/2016
Co-ordinates	-30.8209405 120.9577507

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	5	**Soil Type**	Sandy loam	**Exposed Bedrock (%)**	0
Soil (%)	75	**Soil Colour**	Orange		
Leaf Litter (%)	35	**Rock Type**	Calcrete	**Coarse Fragment Size (mm)**	2 - 60
Perennial Veg (%)	35	**Rock Abundance (%)**	2 - 10		

Fauna Habitat Attributes

Woody Debris	Moderate	**Tree Hollows (<10 cm)**	None
Peeling Bark	Common	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	High
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent
Disturbances	Fire

Fire

Time-since Last Fire (years)	>15
Evidence of Fire	n/a

Species Composition

Species Name	Form	Height (m)	Cover (%)
Eucalyptus clelandii	Tree	10	-
Eucalyptus horistes	Mallee	8	-
Eucalyptus eremophila	Mallee	6	-
Exocarpos aphyllus	Shrub	2.5	-
Alyxia buxifolia	Shrub	2	-
Acacia hemiteles	Shrub	2	-
Scaevola spinescens	Shrub	1.8	-
Eremophila caperata	Shrub	0.8	-
Olearia sp. Eremicola (Diels + Pritzel s.n. Perth 00449628)	Shrub	0.4	-
Podolepis capillaris	Forb	0.1	-
Acacia colletioides	Shrub	-	opp
Amphipogon caricinus var. *caricinus*	Tussock grass	-	opp
Eremophila caperata	Shrub	-	opp
Eucalyptus celastroides subsp. *virella*	Mallee	-	opp
Eucalyptus platycorys	Mallee	-	opp
Olearia muelleri	Shrub	-	opp
Santalum spicatum	Shrub	-	opp
Senna artemisioides subsp. *filifolia*	Shrub	-	opp

Site	**GR20**
Type	Relevé
Recorder	Alex Sleep Briana Wingfield
Date	29/04/2016
Co-ordinates	-30.8170973 120.9614683

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	Washout	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Loamy sand	**Exposed Bedrock (%)**	0
Soil (%)	75	**Soil Colour**	Orange		
Leaf Litter (%)	10	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	25	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Rare	**Tree Hollows (<10 cm)**	None
Peeling Bark	Moderate	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	Moderate
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent	**Time-since Last Fire (years)**	5 - 15
Disturbances	Fire	**Evidence of Fire**	Dead Branches

Species Composition

Species Name	Form	Height (m)	Cover (%)
Lysiana casuarinae	Vine	CR	0.1
Eucalyptus clelandii	Tree	12	5
Eucalyptus sp.	Tree	12	5
Eucalyptus horistes	Mallee	10	5
Melaleuca pauperiflora subsp. *fastigiata*	Shrub	6	5
Exocarpos aphyllus	Shrub	2.5	0.1
Alyxia buxifolia	Shrub	2	5
Eremophila oppositifolia subsp. *angustifolia*	Shrub	2	0.1
Santalum acuminatum	Shrub	2	0.1
Scaevola spinescens	Shrub	1.8	5
Eremophila scoparia	Shrub	1.2	1
Eremophila oppositifolia subsp. *angustifolia*	Shrub	0.8	0.1
Olearia sp. Eremicola (Diels + Pritzel s.n. Perth 00449628)	Shrub	0.3	2

Site	**GR21**
Type	Relevé
Recorder	Alex Sleep Briana Wingfield
Date	28/04/2016
Co-ordinates	-30.8129562 120.9657111

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Loamy sand	**Exposed Bedrock (%)**	0
Soil (%)	40	**Soil Colour**	Yellow		
Leaf Litter (%)	45	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	45	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Moderate	**Tree Hollows (<10 cm)**	None
Peeling Bark	Moderate	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	High
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent
Disturbances	Fire, Rabbit Grazing

Fire

Time-since Last Fire (years)	5 - 15
Evidence of Fire	Dead Branches

Species Composition

Species Name	Form	Height (m)	Cover (%)
Eucalyptus horistes	Mallee	5	5
Eucalyptus platycorys	Mallee	5	5
Acacia resinimarginea	Shrub	2.5	10
Callitris preissii	Shrub	2.5	0.1
Grevillea excelsior	Shrub	2.5	0.1
Leptomeria preissiana	Shrub	2.5	0.1
Allocasuarina campestris	Shrub	2	0.1
Beyeria sulcata var. *sulcata*	Forb	1.5	15
Triodia scariosa	Hummock grass	0.3	2
Eucalyptus ? rigidula	Mallee		opp
Marianthus bicolor	Shrub		opp
Micromyrtus monotaxis	Shrub		opp

Site	**GR22**
Type	Relevé
Recorder	Alex Sleep Briana Wingfield
Date	28/04/2016
Co-ordinates	-30.8093863 120.9695954

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Loamy sand	**Exposed Bedrock (%)**	0
Soil (%)	35	**Soil Colour**	Yellow		
Leaf Litter (%)	65	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	45	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Common	**Tree Hollows (<10 cm)**	None
Peeling Bark	Rare	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	High
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent
Disturbances	Fire, Rabbit Grazing

Fire

Time-since Last Fire (years)	5 - 15
Evidence of Fire	Dead Branches

Species Composition

Species Name	Form	Height (m)	Cover (%)
Allocasuarina campestris	Shrub	42463	10
Allocasuarina corniculata	Shrub	3	2
Callitris preissii	Shrub	3	2
Acacia resinimarginea	Shrub	2.5	20
Acacia ? cylindrica	Shrub	2.5	2
Persoonia coriacea	Shrub	2	0.1
Grevillea acacioides	Shrub	1.4	0.1
Calothamnus gilesii	Shrub	1.2	0.1
Philotheca tomentella	Shrub	1.2	0.1
Thryptomene kochii	Shrub	1.2	0.1

Site	**GR23**
Type	Relevé
Recorder	Alex Sleep Briana Wingfield
Date	28/04/2016
Co-ordinates	-30.8085645 120.9750898

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Loamy sand	**Exposed Bedrock (%)**	0
Soil (%)	50	**Soil Colour**	Yellow		
Leaf Litter (%)	35	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	40	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Rare	**Tree Hollows (<10 cm)**	None
Peeling Bark	Rare	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	High
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent	**Time-since Last Fire (years)**	5 - 15
Disturbances	Fire	**Evidence of Fire**	Dead Branches

Fire

Species Composition

Species Name	Form	Height (m)	Cover (%)
Eucalyptus ? rigidula	Mallee	6	2
Hakea francisiana	Shrub	4	occ d
Acacia yorkrakinensis subsp. *acrita*	Shrub	3	2
Allocasuarina corniculata	Shrub	2	10
Callitris preissii	Shrub	1.9	1
Hakea sp.	Shrub	1.8	10
Acacia desertorum var. *desertorum*	Shrub	1.5	5
Beyeria sulcata var. *sulcata*	Forb	1.5	5
Micromyrtus ? imbricata	Shrub	0.8	0.1
Melaleuca cordata	Shrub	0.5	0.1
Triodia scariosa	Hummock grass	0.3	20
Cryptandra ? aridicola	Shrub	0.3	0.1
Banksia elderiana	Shrub		opp
Petrophile seminuda	Shrub		opp

Site	**GR24**
Type	Relevé
Recorder	Alex Sleep Briana Wingfield
Date	28/04/2016
Co-ordinates	-30.8083171 120.9763329

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Loamy sand	**Exposed Bedrock (%)**	0
Soil (%)	55	**Soil Colour**	Yellow		
Leaf Litter (%)	45	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	55	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Moderate	**Tree Hollows (<10 cm)**	None
Peeling Bark	None	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	High
Termite Mound Presence	None		

Vegetation Condition

Condition	Very Good	**Time-since Last Fire (years)**	3 - 5
Disturbances	Clearing, Tracks, Fire	**Evidence of Fire**	Dead Branches

Species Composition

Species Name	Form	Height (m)	Cover (%)
Callitris preissii	Shrub	3	20
Allocasuarina corniculata	Shrub	2	50
Grevillea acacioides	Shrub	1.5	0.1
Calothamnus gilesii	Shrub	1.2	0.1
Leptospermum fastigiatum	Shrub	1.2	0.1
Beyeria sulcata var. sulcata	Forb	0.6	10
Triodia scariosa	Hummock grass	0.3	10
Melaleuca cordata	Shrub		opp
Micromyrtus ? imbricata	Shrub		opp
Platysace ? effusa	Shrub		opp

Site	**GR26**
Type	Relevé
Recorder	Alex Sleep Briana Wingfield
Date	28/04/2016
Co-ordinates	-30.8339183 120.9447015

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Loamy sand	**Exposed Bedrock (%)**	0
Soil (%)	60	**Soil Colour**	Orange		
Leaf Litter (%)	45	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	30	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Moderate	**Tree Hollows (<10 cm)**	None
Peeling Bark	Moderate	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	High
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent	**Time-since Last Fire (years)**	3 - 5
Disturbances	Fire	**Evidence of Fire**	Dead Branches

Species Composition

Species Name	Form	Height (m)	Cover (%)
Eucalyptus griffithsii	Tree	5	40
Acacia colletioides	Shrub	2	0.1
Eremophila caperata	Shrub	1.8	40
Acacia hemiteles	Shrub	1.2	1
Scaevola spinescens	Shrub	0.5	0.1
Olearia muelleri	Shrub	0.3	0.1
Acacia burkittii	Shrub		opp
Allocasuarina corniculata	Shrub		opp
Beyeria sulcata var. *sulcata*	Forb		opp
Prostanthera grylloana	Shrub		opp
Senna artemisioides subsp. *filifolia*	Shrub		opp

Site	**GR27**
Type	Relevé
Recorder	Alex Sleep Briana Wingfield
Date	29/04/2016
Co-ordinates	-30.8234808 120.9547552

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Loamy sand	**Exposed Bedrock (%)**	0
Soil (%)	60	**Soil Colour**	Yellow		
Leaf Litter (%)	35	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	40	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Moderate	**Tree Hollows (<10 cm)**	None
Peeling Bark	Rare	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	None
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent	**Time-since Last Fire (years)**	3 - 5
Disturbances	Fire, Tracks	**Evidence of Fire**	Dead Branches

Species Composition

Species Name	Form	Height (m)	Cover (%)
Acacia resinimarginea	Shrub	1.8-2	20
Callitris preissii	Shrub	?	?
Eucalyptus ? rigidula	Mallee	4	5
Eucalyptus platycorys	Mallee	4	2
Hakea francisiana	Shrub	3	0.1
Eremophila granitica	Shrub	1.5	0.1
Beyeria sulcata var. *sulcata*	Forb	0.4	40
Phebalium filifolium	Shrub	0.4	5
Triodia scariosa	Hummock grass	0.3	10

Site	**GR28**
Type	Relevé
Recorder	Alex Sleep Briana Wingfield
Date	29/04/2016
Co-ordinates	-30.8252002 120.9538321

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Loamy sand	**Exposed Bedrock (%)**	0
Soil (%)	30	**Soil Colour**	Yellow		
Leaf Litter (%)	30	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	50	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Moderate	**Tree Hollows (<10 cm)**	None
Peeling Bark	Rare	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	High
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent
Disturbances	Fire

Fire

Time-since Last Fire (years)	5 - 15
Evidence of Fire	Dead Branches

Species Composition

Species Name	Form	Height (m)	Cover (%)
Allocasuarina campestris	Shrub	5	20
Callitris preissii	Shrub	4	0.1
Acacia resinimarginea	Shrub	2.5	50
Allocasuarina corniculata	Shrub	2.5	20
Leptospermum fastigiatum	Shrub	2	0.1
Persoonia coriacea	Shrub	1.8	0.1
Homalocalyx thryptomenoides	Shrub	1.3	40
Grevillea acacioides	Shrub	1.2	0.1
Thryptomene kochii	Shrub	0.4	10
Triodia scariosa	Hummock grass	0.3	0.1
Verticordia helmsii	Shrub	0.3	0.1
Melaleuca ? hamata	Shrub		opp
Phebalium filifolium	Shrub		opp

Site	**GR29**
Type	Relevé
Recorder	Alex Sleep Briana Wingfield
Date	29/04/2016
Co-ordinates	-30.8226098 120.9559274

Landforms

Type	Plain	**Aspect**	n/a
Water Presence	No - Never	**Slope**	0 - 3°

Ground Cover

Rock (%)	0	**Soil Type**	Loamy sand	**Exposed Bedrock (%)**	0
Soil (%)	55	**Soil Colour**	Orange		
Leaf Litter (%)	25	**Rock Type**	n/a	**Coarse Fragment Size (mm)**	n/a
Perennial Veg (%)	35	**Rock Abundance (%)**	0		

Fauna Habitat Attributes

Woody Debris	Moderate	**Tree Hollows (<10 cm)**	None
Peeling Bark	Moderate	**Tree Hollows (>10 cm)**	None
Rock Crevices	None	**Burrowing Suitability**	None
Termite Mound Presence	None		

Vegetation Condition

Condition	Excellent
Disturbances	Fire

Fire

Time-since Last Fire (years)	5 - 15
Evidence of Fire	Dead Branches

Species Composition

Species Name	Form	Height (m)	Cover (%)
Eucalyptus platycorys	Mallee	5	up to 50
Melaluca ? hamata	Shrub	3.5	up to 40
Exocarpos aphyllus	Shrub	3	0.1
Eremophila caperata	Shrub	1.3	1
Westringia cephalantha	Shrub	1.3	1
Olearia sp. Eremicola (Diels + Pritzel s.n. Perth 00449628)	Shrub	0.4	1
Podolepis capillaris	Forb	0.1	0.1
Phebalium canaliculatum	Shrub	1.5	3

Appendix E Inventory of Vascular Flora Recorded

Family	Taxa
Apiaceae	*Platysace ? effusa*
Apocynaceae	*Alyxia buxifolia*
Asparagaceae	*Chamaexeros macranthera*
Asteraceae	*Cratystylis microphylla*
Asteraceae	*Olearia incana*
Asteraceae	*Olearia muelleri*
Asteraceae	*Olearia pimeleoides*
Asteraceae	*Olearia* sp. Eremicola (Diels & Pritzel s.n. Perth 00449628)
Asteraceae	*Podolepis capillaris*
Boraginaceae	*Halgania andromedifolia*
Casuarinaceae	*Allocasuarina campestris*
Casuarinaceae	*Allocasuarina corniculata*
Casuarinaceae	*Allocasuarina helmsii*
Chenopodiaceae	*Atriplex lindleyi subsp. inflata*
Chenopodiaceae	*Atriplex nummularia*
Chenopodiaceae	*Atriplex vesicaria*
Chenopodiaceae	*Maireana tomentosa*
Chenopodiaceae	*Rhagodia drummondii*
Cupressaceae	*Callitris preissii*
Euphorbiaceae	*Beyeria sulcata* var. ? sulcata
Euphorbiaceae	*Beyeria sulcata* var. brevipes
Euphorbiaceae	*Beyeria sulcata* var. sulcata
Fabaceae	*Acacia ? cylindrica*
Fabaceae	*Acacia acuminata*
Fabaceae	*Acacia aptaneura*
Fabaceae	*Acacia burkittii*
Fabaceae	*Acacia colletioides*
Fabaceae	*Acacia desertorum* var. *desertorum*
Fabaceae	*Acacia enervia* subsp. *explicata*
Fabaceae	*Acacia eremophila* var. *eremophila*
Fabaceae	*Acacia hemiteles*
Fabaceae	*Acacia ligulata*
Fabaceae	*Acacia merrallii*
Fabaceae	*Acacia prainii*
Fabaceae	*Acacia resinimarginea*
Fabaceae	*Acacia resinistipulea*
Fabaceae	*Acacia yorkrakinensis* subsp. *acrita*
Fabaceae	*Fabaceae* sp.

Fabaceae	*Mirbelia microphylla*
Fabaceae	*Senna artemisioides* subsp. *filifolia*
Fabaceae	*Senna artemisioides* subsp. x *artemisioides*
Fabaceae	*Swainsona canescens*
Goodeniaceae	*Dampiera* sp.
Goodeniaceae	*Dampiera tenuicaulis* var. *curvula*
Goodeniaceae	*Scaevola bursariifolia*
Goodeniaceae	*Scaevola spinescens*
Lamiaceae	*Dicrastylis parvifolia*
Lamiaceae	*Lamiaceae* sp.
Lamiaceae	*Prostanthera campbellii*
Lamiaceae	*Prostanthera grylloana*
Lamiaceae	*Westringia cephalantha*
Lamiaceae	*Westringia rigida*
Loranthaceae	*Amyema miquelii*
Loranthaceae	*Lysiana casuarinae*
Myrtaceae	*Callistemon phoeniceus*
Myrtaceae	*Calothamnus gilesii*
Myrtaceae	*Eucalyptus ? celastroides* subsp. *celastroides*
Myrtaceae	*Eucalyptus ? platycorys*
Myrtaceae	*Eucalyptus ? rigidula*
Myrtaceae	*Eucalyptus ? salmonophloia*
Myrtaceae	*Eucalyptus ? urna*
Myrtaceae	*Eucalyptus celastroides subsp. virella*
Myrtaceae	*Eucalyptus clelandii*
Myrtaceae	*Eucalyptus eremophila*
Myrtaceae	*Eucalyptus griffithsii*
Myrtaceae	*Eucalyptus horistes*
Myrtaceae	*Eucalyptus leptopoda subsp. leptopoda*
Myrtaceae	*Eucalyptus longissima*
Myrtaceae	*Eucalyptus moderata*
Myrtaceae	*Eucalyptus platycorys*
Myrtaceae	*Eucalyptus salmonophloia*
Myrtaceae	*Eucalyptus salubris*
Myrtaceae	*Eucalyptus sp.*
Myrtaceae	*Eucalyptus urna*
Myrtaceae	*Eucalyptus yilgarnensis*
Myrtaceae	*Euryomyrtus maidenii*
Myrtaceae	*Homalocalyx thryptomenoides*

Myrtaceae	*Leptospermum fastigiatum*
Myrtaceae	*Melaleuca ? hamata*
Myrtaceae	*Melaleuca cordata*
Myrtaceae	*Melaleuca hamata*
Myrtaceae	*Melaleuca lanceolata*
Myrtaceae	*Melaleuca pauperiflora subsp. fastigiata*
Myrtaceae	*Melaleuca phoidophylla*
Myrtaceae	*Melaluca ? hamata*
Myrtaceae	*Micromyrtus ? imbricata*
Myrtaceae	*Micromyrtus monotaxis*
Myrtaceae	*Thryptomene cuspidata*
Myrtaceae	*Thryptomene kochii*
Myrtaceae	*Verticordia helmsii*
Pittosporaceae	*? Marianthus bicolor*
Pittosporaceae	*Marianthus bicolor*
Poaceae	*Amphipogon caricinus var. caricinus*
Poaceae	*Aristida contorta*
Poaceae	*Austrostipa platychaeta*
Poaceae	*Triodia scariosa*
Proteaceae	*Banksia elderiana*
Proteaceae	*Grevillea ? huegelii*
Proteaceae	*Grevillea acacioides*
Proteaceae	*Grevillea acuaria*
Proteaceae	*Grevillea excelsior*
Proteaceae	*Grevillea nematophylla subsp. nematophylla*
Proteaceae	*Hakea francisiana*
Proteaceae	*Hakea minyma*
Proteaceae	*Hakea sp.*
Proteaceae	*Persoonia coriacea*
Proteaceae	*Petrophile seminuda*
Rhamnaceae	*Cryptandra ? aridicola*
Rhamnaceae	*Stenanthemum stipulosum*
Rubiaceae	*Psydrax rigidula*
Rutaceae	*Phebalium canaliculatum*
Rutaceae	*Phebalium filifolium*
Rutaceae	*Phebalium lepidotum*
Rutaceae	*Phebalium tuberculosum*
Rutaceae	*Philotheca tomentella*
Santalaceae	*Exocarpos aphyllus*

Santalaceae	*Leptomeria preissiana*
Santalaceae	*Santalum acuminatum*
Santalaceae	*Santalum spicatum*
Sapindaceae	*Dodonaea stenozyga*
Scrophulariaceae	*Eremophila ? drummondii*
Scrophulariaceae	*Eremophila ? glabra*
Scrophulariaceae	*Eremophila alternifolia*
Scrophulariaceae	*Eremophila caperata*
Scrophulariaceae	*Eremophila decipiens*
Scrophulariaceae	*Eremophila granitica*
Scrophulariaceae	*Eremophila ionantha*
Scrophulariaceae	*Eremophila maculata subsp. brevifolia*
Scrophulariaceae	*Eremophila oppositifolia*
Scrophulariaceae	*Eremophila oppositifolia subsp. angustifolia*
Scrophulariaceae	*Eremophila scoparia*
Stylidiaceae	*Stylidium arenicola*
Zygophyllaceae	*Zygophyllum glaucum*

Appendix F Likelihood of Flora of Conservation Significance

Taxa	Conservation Code			Habitat[1]	Nearest locality	Likelihood of occurrence: Reason of likelihood
	EPBC Act	WC Act	DPaW			
Acacia crenulata			P3	Rocky outcrops, heavy soils and sandy clay loam. Typically associated with *Eucalyptus wandoo* low woodland with *Melaleuca uncinata*, *Allocasuarina campestris* and other *Acacia* spp.	13 km SW	**Possible** The Study Area lies within the known distribution of the species and may contain suitable habitat
Acacia cylindrica			P3	Yellow-brown sand, gravelly soils. Undulating plains, flats.	Within Study Area	**Likely Confirmed** – Database search results did not identify *Acacia cylindrica* in the Study Area, however a vegetative specimen collected from the Haul Road Study Area is analogous to this Priority taxon. Collection of mature reproductive material will be needed to confirm.
Acacia epedunculata			P1	Sandplains in deep yellow sand in open shrubland.	15 km W	**Possible** The Study Area lies within the known distribution of the species and may contain suitable habitat
Acacia sclerophylla var. *teretiuscula*			P1	Well drained, light grey sand or brown clay loam in open shrub mallee woodland.	13 km S	**Possible** The Study Area lies within the known distribution of the species and may contain suitable habitat
Acacia websteri			P1	Red loam, sand and clay in drainage depressions, in shrubland and scrub.	10 km S	**Possible** The Study Area lies within the known distribution of the species and may contain suitable habitat
Allocasuarina eriochlamys subsp. *grossa*			P3	Stony loam, laterite clay. Granite outcrops.	12 km S	**Unlikely** The Study Area is unlikely to contain suitable habitat
Baeckea sp. Bulla Bulling (D.J.E. Whibley 4648)			P1	Yellow sandy loam.	12 km S	**Possible** The Study Area lies within the known distribution of the species and may contain suitable habitat
Diocirea microphylla			P3	Red brown clay loam. *Eucalyptus* woodland. Typically in association with *E. salubris*.	12 km S	**Possible** The Study Area lies within the known distribution of the species and may contain suitable habitat
Elachanthus pusillus			P2	*Eucalyptus* woodland, upper slopes, low plains and drainage flats in *Atriplex* shrubland. Red loam/red clay	> 30 km	**Possible** The Study Area lies within the known distribution of the species and may contain suitable habitat

Taxa	Conservation Code			Habitat[1]	Nearest locality	Likelihood of occurrence: Reason of likelihood
	EPBC Act	WC Act	DPaW			
Eremophila veronica			P3	Stony clay, clay loam. Lateritic breakaways.	12 km S	**Unlikely** The Study Area is unlikely to contain suitable habitat
Gastrolobium graniticum	En	Vu		Sand, sandy loam, granite. Margins of rock outcrops, along drainage lines.	15 km S	**Unlikely** The Study Area is unlikely to contain suitable habitat
Gompholobium cinereum			P3	Yellow sand, clayey sand, brown loam, sandy gravel, laterite. Well-drained open sites, slopes, plains, roadsides.	> 30 km	**Unlikely** The Study Area is unlikely to contain suitable habitat
Hakea rigida			P2	Sandy soils, yellow sand.	9 km E	**Possible** The Study Area lies within the known distribution of the species and may contain suitable habitat
Melichrus sp. Coolgardie (K.R. Newbey 8698)			P1	Shrublands, in association with *Casuarina*, *Thryptomene*, *Melaleuca* and/or *Acacia*. Yellow Sand/loamy sand. Plains.	14 km W	**Possible** The Study Area lies within the known distribution of the species and may contain suitable habitat
Phebalium appressum			P1	Yellow sand/sandy loam. Plains	9 km E	**Possible** The Study Area lies within the known distribution of the species and may contain suitable habitat
Styphelia sp. Bullfinch (M. Hislop 3574)			P3	Lateritic breakaways, granite outcropping.	16 km S	**Unlikely** The Study Area is unlikely to contain suitable habitat
Ricinocarpos brevis	En	En		Banded ironstone ranges, rocky hill slopes, rock outcrops.	> 30 km s	**Unlikely** The Study Area is unlikely to contain suitable habitat

Appendix G Malleefowl Mounds from in or within close proximity of the Study Area

Plate 1: Malleefowl Mound MF1

Plate 2: Malleefowl Mound MF2

Plate 3: Malleefowl Mound MF3

Plate 4: Malleefowl Mound MF4

Plate 5: Malleefowl Mound MF5

Plate 6: Malleefowl Mound MF6

Plate 7: Malleefowl Mound MF7