Prepared for
Wajarri Enterprises Limited
ABN: 631 275 968



Ecological Assessment - November 2022

Square Kilometre Array

24-Feb-2023
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Ecological Assessment - November 2022

Client: Wajarri Enterprises Limited

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Prepared by

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Executive Summary

AECOM Australia Pty Ltd (AECOM) were engaged by Wajarri Enterprises Limited (WEL) to conduct a flora, vegetation and fauna assessment for the Square Kilometre Array Low Project (SKA1-Low) on Boolardy Station in the Murchison region.

The survey area includes numerous small areas covering a total of 56.44 ha. The field survey was undertaken in November 2022 by Botanist [redacted] and Ecologist [redacted]. Numerous surveys have been undertaken on Boolardy Station for the Project. Results from these informed the survey sample plan and determined potential environmentally significant values that required targeted searches. A summary of the results is presented below:

- No Threatened or Priority Ecological Communities were considered likely to occur and none were recorded.
- Three native vegetation communities were mapped. These were consistent with vegetation communities mapped in previous surveys.
- Nine Priority flora species were considered likely to occur, of which three were confirmed to occur in the survey area: *Eremophila muelleriana* (listed as Priority 3 [P3] by Department of Biodiversity Conservation and Attractions [DBCA]), *Gunniopsis divisa* (P3) and *Hemigenia tysonii* (P3), with 33, 305 and 15 individuals recorded respectively.
- Three fauna habitats were defined and mapped, Channels and Creek lines and Hardpan plains with Intermittent Sandplains. The habitat was in good condition despite historical impacts from grazing and remaining infrastructure. The habitat types are well represented outside the survey area.
- Four conservation significant fauna species were observed:
    - Grey Falcon *Falco hypoleucos* (listed as Vulnerable under the *Environmental Protection and Biodiversity Conservation Act 1999* [EPBC Act]and *Biodiversity Conservation Act 2016* [BC Act]).
    - Northern Shield-backed Trapdoor Spider *Idiosoma clypeatum* (listed as Priority 3 by DBCA).
    - Welcome Swallow *Hirundo neoxena* (listed as Marine under EPBC Act).
    - Black-faced Cuckooshrike *Coracina novae-hollandiae* (listed as Marine under EPBC Act). Note, species listed as Marine are only considered protected under the EPBC Act in relation to activities on or in a Commonwealth area, or action outside Commonwealth land which may significantly affect the environment or species within Commonwealth land.
- Marginal suitable habitat for the Western Spiny-tailed Skinks *Egernia stokesii badia* (listed as Endangered under EPBC Act and as Vulnerable under BC Act) was recorded, consisting of small granite boulders and rocks. Crevices were shallow and do not represent critical habitat. No evidence of use by Western Spiny-tailed Skinks was identified and it is unlikely that the species would utilise the habitat.
- Nine Northern Shield-backed Trapdoor Spider *Idiosoma clypeatum* burrows were recorded, including three presumed to be active.

The survey was completed successfully. No limitations were identified that may influence the results of the survey.

1.0 Introduction

1.1 Background

The Square Kilometre Array (SKA) Project is a large international radio telescope project which aims to answer key cosmological questions using radio waves from across the universe to look back into the cosmic dark ages. As with all big science projects, the SKA project will draw on the skills, experiences and support of 14 countries working collaboratively to construct and operate elements of the SKA project, with the first phase of the project being hosted by South Africa and Australia. Australia will host the SKA1-Low Frequency Aperture Array (SKA1-Low) (the Project).

SKA1-Low is an entirely new array and will consist of up to 512 array stations. Each array station will consist of up to 256 individual antennas, representing more than 130,000 antennas in total. The majority of array stations will be in a densely populated core and the remainder located in groups of six stations at multiple locations along three spiral arms.

The Project was referred under Part IV of the *Environmental Protection Act 1986* (EP Act) and was 'not assessed by the Environmental Protection Authority (EPA). It was also referred under the Commonwealth EPBC Act and considered not a controlled action.

In 2014 the original array footprint was surveyed, including a detailed flora and vegetation assessment, basic fauna assessment and targeted fauna searches. During the 2014 survey several significant environmental values were recorded and mapped including significant flora species (such as Eremophila muelleriana [P3], Gunniopsis divisa [P3] and Hemigenia tysonii [P3]) and fauna species (including the Western Spiny-tailed Skink *Egernia stokesii badia* [E under the EPBC Act and VU under the BC Act] and the Northern Shield-backed Trapdoor Spider *Idiosoma clypeatum* [P3]). Following this, an additional survey was undertaken in 2020 for areas that were not incorporated in the 2014 survey, targeting areas such as granite outcrops and domes.

In 2022 additional areas were identified where vegetation clearing is required. Flora, vegetation, and fauna surveys were required to inform an environmental impact assessment and support the environmental approval process.

1.2 Location

The SKA Project will be constructed within the Murchison Radio Astronomy Observatory (MRO) envelope, that will expand to encompass Boolardy Pastoral Station. The survey area is approximately 350 km northeast of Geraldton, and 770 km north of Perth (Figure 1) by road in the Murchison LGA.

The following areas will require clearing of native vegetation to support the Project (referred to as the survey area):

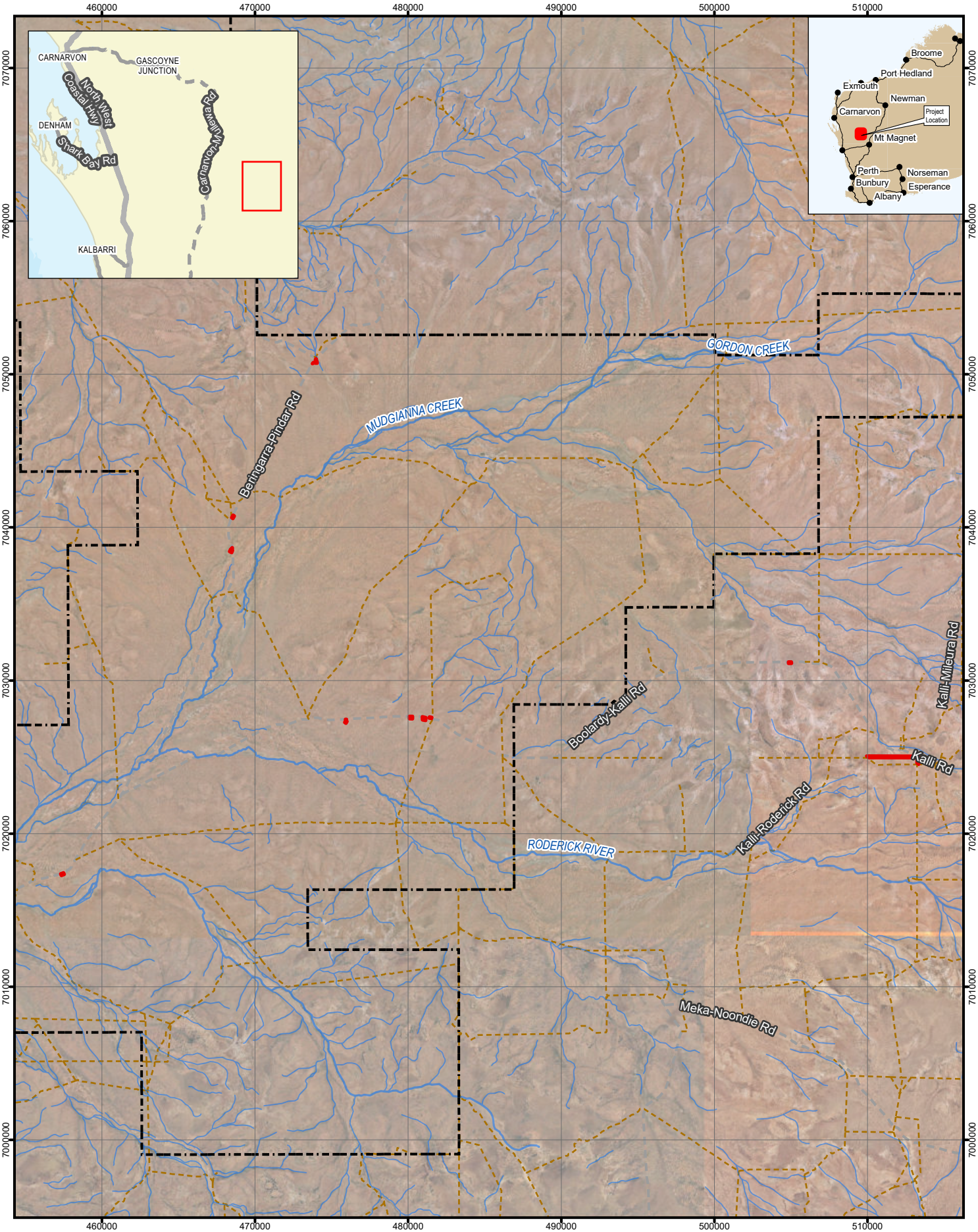
- Kalli Amended Corridor route - 35.57 ha
- BP01 boundary - 2.44 ha
- BP01 access road - 0.27 ha
- BP05 - 1.26 ha
- BP05 access road - 0.35 ha
- BP06 - 3.28 ha
- BP07 - 4.25ha
- TN Kalli road east - 1.70 ha
- TN BP road construction camp - 2.06 ha
- TN BP road ASKAP turnoff - 1.81 ha
- Dorothie's boundary - 1.43 ha
- Dorothie's access road (option#1) - 0.37 ha
- Dorothie's access road (option #2) - 0.48 ha
- Pia Bubba boundary - 1.20 ha

1.3 Objectives

The objective of the November assessment was to describe the flora, vegetation and fauna habitat values present within the survey area. The outcome of the assessment will characterise the flora, vegetation communities and fauna habitat present, and identify significant environmental values that may require additional management or avoidance. Specifically, the scope included:

- reconnaissance flora and vegetation assessment in accordance with the EPA (2016) *Flora and Vegetation Survey Technical Guide*
- targeted significant flora searches
- basic fauna assessment in accordance with the EPA (2020) *Fauna Survey Technical Guide*
- targeted searches for conservation significant fauna and their habitat
- preparation of a report describing the existing environment, methodology and results.

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LEGEND
- Survey Area
- Boolardy Station

Survey Area

DEPARTMENT OF INDUSTRY, SCIENCE, ENERGY AND RESOURCES

ECOLOGICAL ASSESSMENT – NOVEMBER 2022 - SQUARE KILOMETRE ARRAY

Figure 1

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2.0 Existing Environment

2.1 Climate

The Shire of Murchison receives an arid climate with a mean annual rainfall of 190-240 mm (Curry et al., 1994). Rainfall varies significantly depending on the occurrence of sporadic significant rainfall events that are driven by cyclonic weather from the north and cold fronts from the southwest. The summer months are hot and consist of long periods where the temperature exceeds 37.5 degrees Celsius. Winters are cool and sunny with cold evenings and mild days.

The nearest weather station with comprehensive rainfall data is Boolardy (station 007007) located 1 km from the survey area, while temperature data is from Murchison (station 006099) located approximately 55 km west of the survey area.

The survey was undertaken in November 2022 following higher than average rainfall in the preceding 12 months as a result of significant rainfall events in March and August 2022. Total rainfall for the 12 months preceding the survey was 410.6 mm which was 197.1 mm above the annual average (BoM, 2022). The higher-than-average rainfall preceding the survey created ideal conditions for germination and growth of annual plant species and promoted flowering of perennial species. High numbers of annual plants can increase the presence of numerous insect species, which would also result in a rise in the presence of bird species to prey upon the insects.

Average maximum temperatures peak between December and February, with the highest recorded daily temperature of 47.2˚C in January 2022 and the lowest recorded daily temperature of -0.1˚C in August 2021. The maximum and minimum temperatures do not always coincide with rainfall averages due to the high variability in rainfall for this region (BoM, 2022).

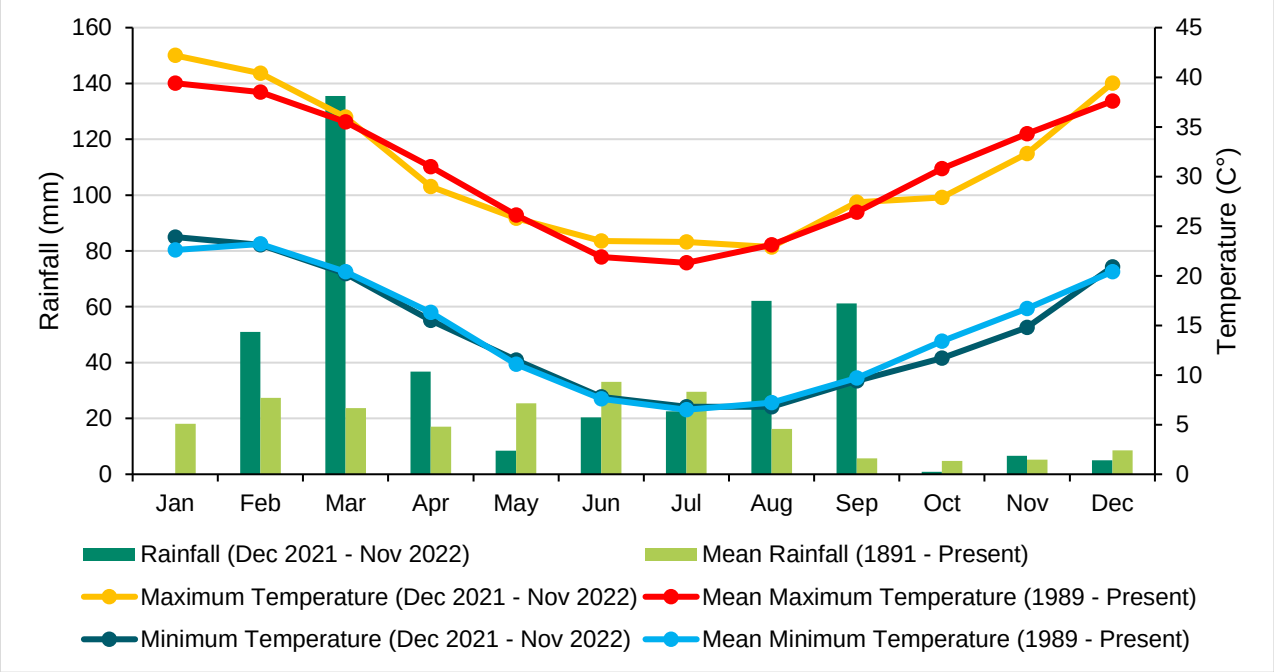


Figure 2 Rainfall Data for Boolardy Station (Station 007007 BoM, 2022) and Temperature Data for Murchison Station (Station 006099 BoM, 2022) for the 12 Months Preceding the Survey

2.2 IBRA Region

There are 89 recognised Interim Biogeographical Regions of Australia (IBRA) that have been defined based on climate, geology, landforms and characteristic vegetation and fauna (CALM, 2002). The SKA project is located in the Murchison IBRA bioregion, in the centre of the Western Murchison Subregion. The Murchison bioregion is on the northern part of the Yilgarn Craton which is divided into the Eastern and Western Murchison. There are six wetlands (lakes) of national importance in the bioregion including Ballard, Barlee, Marmion, Wooleen, Breberle and Anneen Lakes. None of these six wetlands intersect with the survey area.

The Western Murchison subregion, described by Desmond *et al.* (2001), supports low Mulga woodlands with bunch grasses and ephemerals (annuals). Landscape features include outcrop and extensive fine-textured hardpan washplains. Quaternary sandplains support hummock grasslands, calcareous soils support Saltbush and saline alluvia support *Halosarcia* low shrublands. The subregion contains the headwaters of the Murchison and Wooramel Rivers which drain westwards to the coast. Rare features of the area include calcrete aquifers with short-range endemics, rare fauna, and flora. The land use is predominantly grazing native pastures (96%) and Crown Reserves (2.8%).

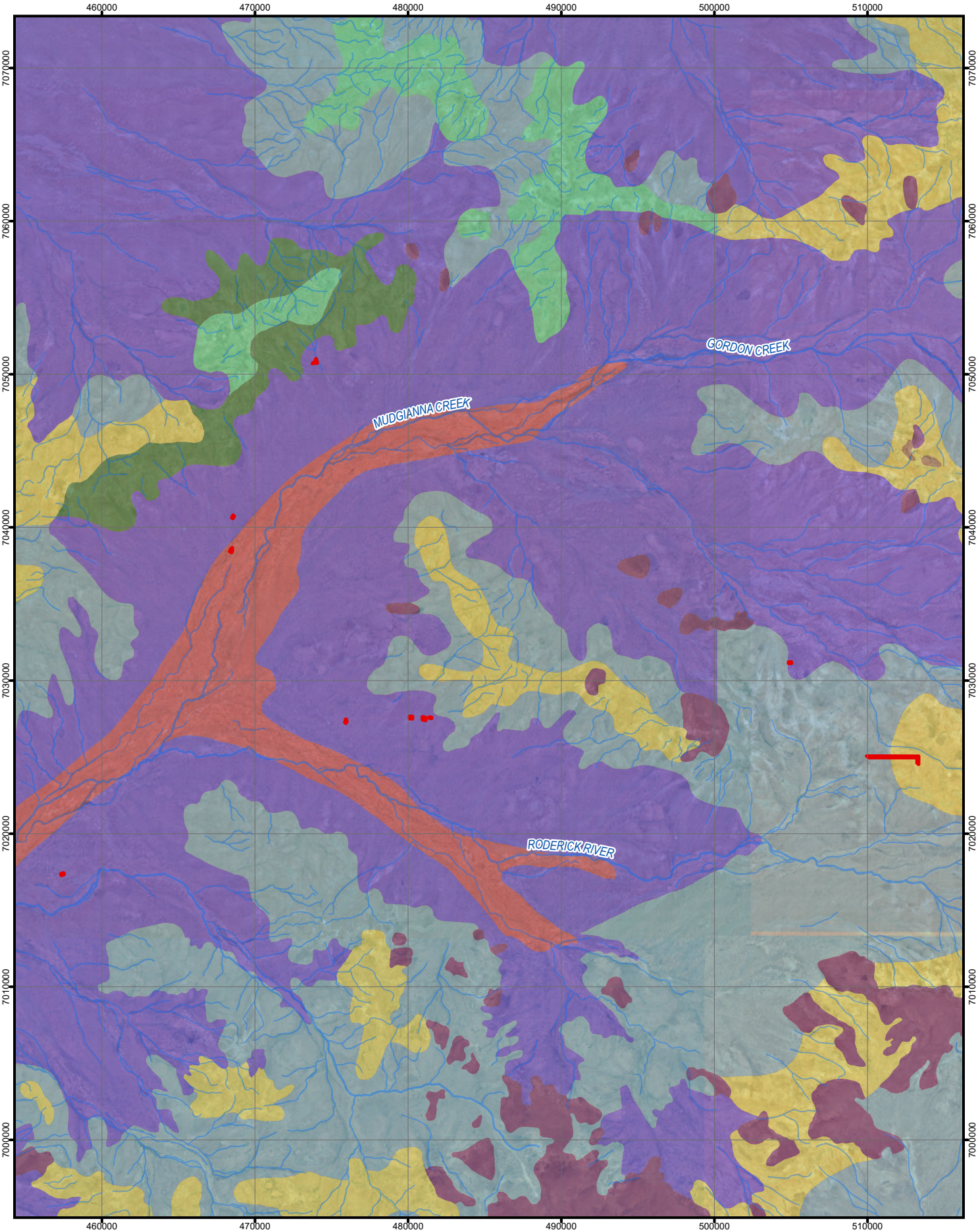
2.3 Vegetation

The survey area intersects with four pre-European vegetation associations mapped by Beard et al. (1976) (Table 1; Figure 3). All four vegetation associations have more than 90% remaining within the Murchison IBRA region and the Shire of Murchison (Govt. of WA, 2019).

Table 1 Pre-European Vegetation Associations That Intersect With the Survey Area

Veg. Assoc.	Description	Area (ha)	% Remaining	
			Murchison IBRA Region	Shire of Murchison
18	Low woodland, open low woodland or sparse woodland. Mulga, *Acacia aneura* and associated species.	14.0	99.68	100.00
29	Sparse low woodland; Mulga, discontinuous in scattered groups	18.2	99.98	100.00
39	Scrub, open scrub or sparse scrub. Wattle, teatree & other species *Acacia* spp. *Melaleuca* spp.	21.6	99.10	99.99
204	Succulent steppe with open scrub; scattered mulga & *Acacia sclerosperma* over saltbush & bluebush	2.7	99.60	100.00

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LEGEND
- Survey Area

Pre-European Vegetation (DPIRD-006) selection
Vegetation Association & Description
- 18 - *Mulga Acacia aneura* and associated species
- 29 - *Mulga Acacia aneura* and associated species.
- 39 - Wattle, teatree and other species *Acacia spp. Melaleuca spp.*
- 128 - Rock
- 183 - *Mulga Acacia aneura* and associated species.
- 184 - Wattle, teatree & other species *Acacia spp. Melaleuca spp.*
- 204 - *Mulga*, other wattle *Atriplex spp, Maireana spp.* with *Acacia aneura* and other *Acacia spp.*
- 341 - *Mulga Acacia aneura* and associated species.
- 2081 - Wattle, teatree and other species *Acacia spp. Melaleuca spp.*

Pre-European Vegetation

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Figure 3

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2.4 Land Systems

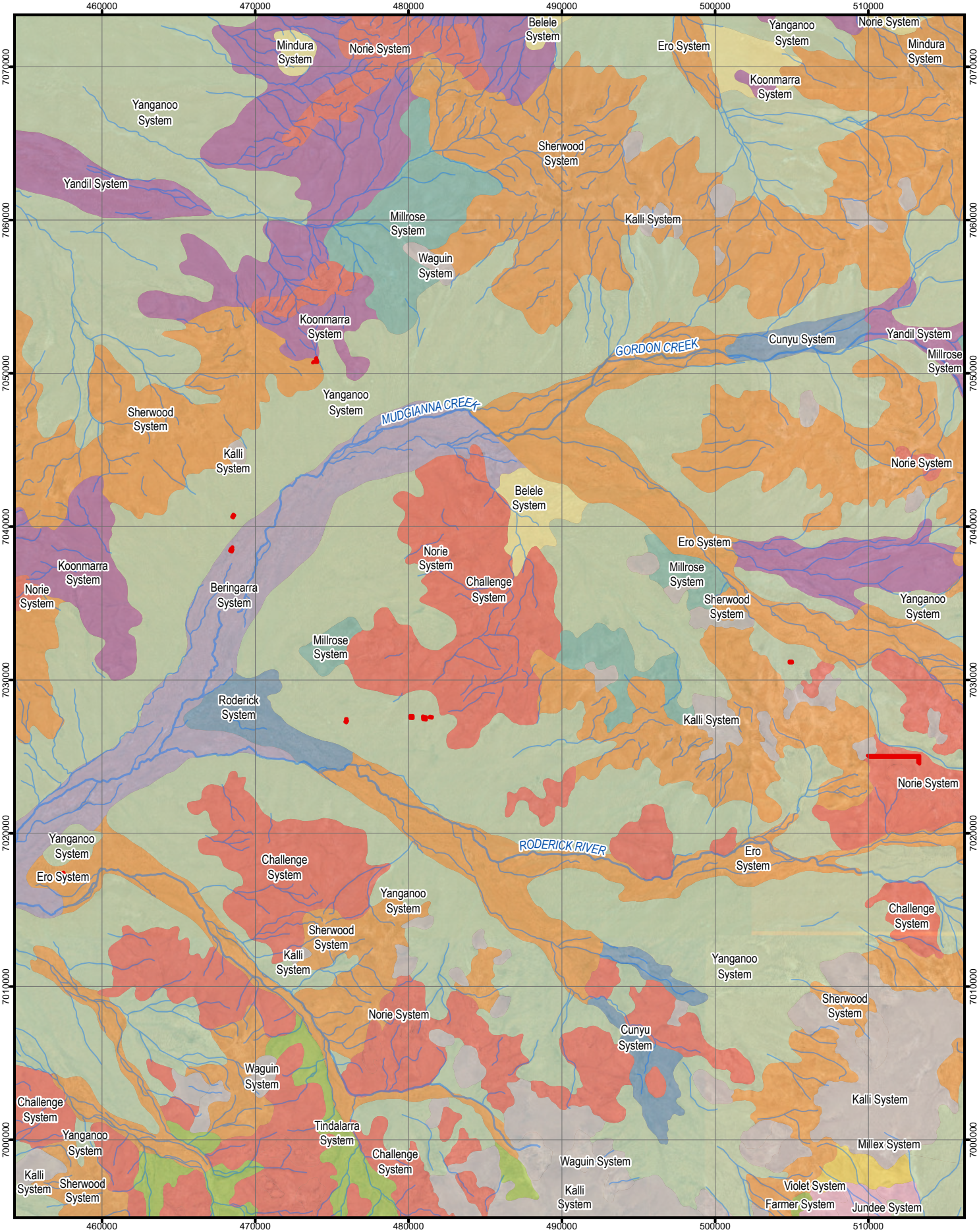
The mapping of soils, landscapes and vegetation in the Rangelands of Western Australia was conducted in the Wiluna-Meekatharra region in 1963 (Tille, 2006). This became the responsibility of the Department of Agriculture using a procedure developed by the CSIRO. The survey adopted the land system approach, where a land system is defined as an area or group of areas throughout which there is a recurring pattern of topography, soils and vegetation (Tille, 2006).

There are six land systems that intersect with the survey area, described in Table 2 and mapped in Figure 4.

Table 2 Land Systems of the Survey Area

Land System	Description	Area (ha)
Beringarra	Riverine plains with floodplains and channels, supporting halophytic shrublands, mixed *Acacia* shrublands and low woodlands with minor perennial grasses.	2.71
Challenge	Gently undulating gritty and sandy surfaced plains, occasional granite hills, tors and low breakaways, supporting *Acacia* shrublands and occasional halophytic shrublands.	34.41
Ero	Tributary floodplains with shallow, erodible duplex soils on red-brown hardpan, more or less saline and supporting *Acacia* shrublands with halophytic and non-halophytic undershrubs.	2.06
Kalli	Elevated gently undulating red sandplains edged by stripped surfaces on laterite and granite, supporting *Acacia* tall shrublands with wanderrie grass understoreys.	1.17
Koonmarra	Quartz-strewn stony plains and low rises with outcropping granite, gneiss and schist, supporting scattered Mulga shrublands and other mainly non-saline shrubs.	0.23
Sherwood	Breakaways, kaolinised footslopes and extensive gently sloping plains on granite supporting Mulga shrublands and minor halophytic shrublands.	2.05
Yanganoo	Almost flat hardpan wash plains, with or without small Wanderrie banks and weak grooving; supporting Mulga shrublands and Wanderrie grasses on banks.	13.83
Total Area (ha)		**56.44**

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LEGEND

- Survey Area
- Soil Landscape Mapping - Systems (DPIRD-064)
- Belele System
- Beringarra System
- Challenge System
- Cunyu System
- Ero System
- Farmer System
- Jundee System
- Kalli System
- Koonmarra System
- Millex System
- Millrose System
- Mindura System
- Norie System
- Roderick System
- Sherwood System
- Tindalarra System
- Violet System
- Waguin System
- Yandil System
- Yanganoo System

Land Systems

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Figure 4

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3.0 Legislative Framework

3.1 Overview

Table 3 summarises the key legislation governing the protection and management of Western Australia's significant species and communities, which are further discussed below.

Table 3 Relevant Legislation, Regulations and Guidance

Legislation	Purpose
Commonwealth of Australia	
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Provides for the protection of the environment and the conservation of biodiversity.
Western Australia	
Biodiversity Conservation Act 2016 (BC Act)	Provides for the conservation and protection of Western Australia's biodiversity and biodiversity components.
Environmental Protection Act 1986 (EP Act)	Preventing, controlling and abating environmental harm and conserving, preserving, protecting, enhancing and managing the environment.
Biosecurity and Agriculture Management Act 2007 (BAM Act)	Provides for the management, control and prevention of certain plants and animals, and for the protection of agriculture and related resources generally.
EPA Technical Guidance – Terrestrial Fauna Surveys for Environmental Impact Assessment, 2020	Provides guidance on the standard of survey required to assist in collecting the appropriate data for decision-making associated with the protection of Western Australia's terrestrial fauna.
EPA Technical Guidance – Flora and vegetation Surveys for Environmental Impact Assessment, 2016	Provides guidance to ensure adequate flora and vegetation data of an appropriate standard are obtained and used in EIA.

3.2 *Environment Protection and Biodiversity Conservation Act 1999*

3.2.1 Matters of National Environmental Significance

Matters of national environmental significance include:

- Listed threatened species and ecological communities.
- Migratory species protected under international agreements.
- Ramsar wetlands of international importance.
- The Commonwealth marine environment.
- World Heritage properties.
- National Heritage places.
- Great Barrier Reef Marine Park.
- A water resource, in relation to coal seam gas development and large coal mining development.
- Nuclear actions.

If an action is likely to have a significant impact on MNES this action must be referred to the Minister for the Environment for a decision on whether assessment and approval is required under the EPBC Act.

3.2.2 Flora and Fauna

The EPBC Act is the main piece of Federal legislation protecting biodiversity in Australia. Species at risk of extinction are recognised at a Commonwealth level and are categorised in one of six categories as outlined in Table 4, with an additional category for other specially protected fauna.

Table 4 Categories of Species Listed Under Schedule 179 of the EPBC Act

Code	Conservation Category
Ex	Extinct Taxa
ExW	Extinct in the Wild
CE	Critically Endangered
E	Endangered
V	Vulnerable
CD	Conservation Dependent

3.2.3 Vegetation Communities

Communities can be classified as Threatened Ecological Communities (TECs) under the EPBC Act. The EPBC Act protects Australia's ecological communities by providing for:

- identification and listing of ecological communities as threatened
- development of conservation advice and recovery plans for listed ecological communities
- recognition of key threatening processes
- reduction of the impact of these processes through threat abatement plans.

Categories of federally listed TECs are described in Table 5.

Table 5 Categories of TECs that are Listed Under the EPBC Act

Code	Conservation Category
CE	**Critically Endangered** If, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future.
E	**Endangered** If, at that time, it is not critically endangered and is facing a very high risk of extinction in the wild in the near future.
V	**Vulnerable** If, at that time, it is not critically endangered or endangered, and is facing a high risk of extinction in the wild in the medium-term future.

3.3 Western Australian Legislation

3.3.1 Flora and Fauna

Under the BC Act, flora and fauna can be listed as Threatened (T) or extinct (X). Threatened flora are plants which have been assessed as being at risk of extinction (DBCA, 2019). The Minister for the Environment may declare species of flora to be protected if they are considered to be in danger of extinction, rare or otherwise in need of special protection (WAH, 1998).

Plants and animals that are considered Threatened and need to be specially protected because they are under identifiable threat of extinction are listed under the BC Act. These categories are defined in Table 6.

Table 6 Conservation Codes for Flora and Fauna Listed Under the *Biodiversity Conservation Act 2016*

Code	Conservation Category
CR	**Critically Endangered Species** Threatened species considered to be facing an extremely high risk of extinction in the wild in the immediate future.
EN	**Endangered Species** Threatened species considered to be facing a very high risk of extinction in the wild in the near future.
VU	**Vulnerable Species** Threatened species considered to be facing a high risk of extinction in the wild in the medium-term future.
EX	**Extinct Species** Species where there is no reasonable doubt that the last member of species has died.
MI	**Migratory Species** Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth. Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.
CD	**Species of special conservation interest (conservation dependent fauna)** Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened.
OS	**Other specially protected species** Fauna otherwise in need of special protection to ensure their conservation.

Species that have not yet been adequately surveyed to warrant being listed under the BC Act, or are otherwise data deficient, are added to Priority Lists under Priorities 1, 2 or 3 by the State Minister for Environment. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. Categories and definitions of Priority Flora and Fauna species are provided in Table 7.

3.3.2 Vegetation Communities

TECs are naturally occurring biological assemblages that occur in a particular type of habitat and that may be subject to processes that threaten to destroy or significantly modify the assemblage across its range. TECs are listed by both State and Commonwealth legislation.

Vegetation communities in Western Australia are described as TECs if they have been endorsed by the Western Australian Minister for Environment following recommendations made by the Threatened Species Scientific Committee. Categories of TECs are defined in Table 8.

Department of Biodiversity, Conservation and Attractions (DBCA) maintains a database of state listed TECs which is available for online searches via their website. Possible TECs that do not meet survey criteria or are not adequately defined are listed as Priority Ecological Communities (PECs) under Priorities 1, 2 and 3. Ecological communities that are adequately known and are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. Conservation dependent communities are classified as Priority 5. PECs are endorsed by the Minister for Environment and are described in Table 9.

DBCA requires that all Priority and Threatened ecological communities are considered during environmental impact assessments and clearing permit applications.

Table 7 Conservation Codes for WA Flora and Fauna Listed by DBCA and Endorsed by the Minister for Environment

Code	Conservation Category
P1	**Priority One – Poorly Known Species** Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.
P2	**Priority Two – Poorly Known Species** Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.
P3	**Priority Three – Poorly Known Species** Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.
P4	**Priority Four – Rare, Near Threatened and other species in need of monitoring** a. Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. b. Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Table 8 Conservation Codes for State Listed Ecological Communities

Conservation Code	Category
PD	Presumed Totally Destroyed
CR	Critically Endangered
EN	Endangered
VU	Vulnerable

Table 9 Conservation Categories for Priority Ecological Communities

Code	Conservation Category
P1	Priority One: poorly-known ecological communities
P2	Priority Two: poorly-known ecological communities
P3	Priority Three: poorly known ecological communities
P4	Priority Four: ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list.
P5	Priority Five: conservation dependent ecological communities

3.3.3 Biosecurity and Agriculture Management Act 2007

Biosecurity is the management of the risk of animal and plant pests and diseases entering, emerging, establishing or spreading in WA to protect the economy, environment and community. Biosecurity is managed under the BAM Act which came into effect 1 May 2013. Exotic animals and plants can become an invasive species if they can establish in new areas where local conditions are favourable for their growth. Each organism listed under the BAM Act comes with certain legal / import requirements:

- Declared Pest, Prohibited - s12. Prohibited organisms are declared pests by virtue of section 22(1) and may only be imported and kept subject to permits.
- Permitted - s11. Permitted organisms may be subject to an import permit if they are potential carriers of high-risk organisms.
- Declared Pest - s22(2). Declared pests may be subject to an import permit if they are potential carriers of high-risk organisms and may also be subject to control and keeping requirements once within Western Australia.
- Permitted, Requires Permit - r73. Regulation 73 permitted organisms may only be imported subject to an import permit.

Declared pests can be assigned to a C1, C2 or C3 control category under the Biosecurity and Agriculture Management Regulations 2013:

- C1 Exclusion - Organisms which should be excluded from part or all of Western Australia.
- C2 Eradication - Organisms which should be eradicated from part or all of Western Australia.
- C3 Management - Organisms that should have some form of management applied that will alleviate the harmful impact of the organism, reduce the numbers or distribution of the organism or prevent or contain the spread of the organism.
- Unassigned - Declared pests that are recognised as having a harmful impact under certain circumstances, where their subsequent control requirements are determined by a Plan or other legislative arrangements under the BAM Act.

4.0 Methodology

4.1 Desktop Assessment

The desktop assessment included a review of the previous ecological reports undertaken for SKA, along with public databases and government records. Sources used to inform the assessment included:

- DBCA flora, fauna and communities database (searches obtained in 2020).
- Western Australian Herbarium (WAH) records.
- EPBC Act Protected Matters Search Tool (PMST) database.
- Alexander Holm & Associates (2008) Radio Astronomy Project Environmental Assessment.
- AECOM (2014) Square Kilometre Array Ecological Assessment.
- AECOM (2021) Square Kilometre Array Ecological Assessment.
- Atlas of Living Australia (2022).
- Birdlife Australia (2022).

Phoenix Environmental Sciences (2015). Reconnaissance survey for the Shield-backed Trapdoor Spider (*Idiosoma nigrum*) for the Square Kilometre Array. All flora and fauna of conservation significance identified in the desktop assessment were assessed for their likelihood of occurrence in the survey area (Table 10). Likelihood of occurrence was assessed systematically using a point-based system which takes into account proximity and date of known records, presence within the Local Government Area (LGA) and habitat suitability (Table 10).

Table 10 Categories of Likelihood of Occurrence for Conservation Significant Species and Communities Identified in the Desktop Assessment

Likelihood of Occurrence	Flora Species		Fauna	
	Score	Definition	Score	Definition
Known	6	Species is known to occur in the survey area.	5	Species is known to occur in the survey area
High (Likely)	5	Not known to occur in the survey area however there are records nearby and suitable habitat for the species is known or likely to be present within the survey area.	3,4	Not known to occur in the survey area but there are records within close proximity of the survey area and suitable habitat for the species is known to be, or likely to be, present within the survey area OR not known to occur within the survey area but there are recent records in close proximity of the survey area and suitable habitat for the species is known to be, or likely to be present within the survey area OR not known to occur within the survey area but there are recent records and suitable habitat for the species may be present.
Moderate (Possible)	3,4	Species is not known to occur within the survey area however there are nearby records AND/OR recent records OR records within the LGA AND suitable habitat for the species is	2,3	Not known to occur within the survey area but there are recent records in close proximity/within the LGA and suitable habitat for the species may be present

Likelihood of Occurrence	Flora Species		Fauna	
	Score	Definition	Score	Definition
		known or likely to be present within the survey area. OR not known to occur within the survey area but there are records nearby AND recent records AND records within the LGA, and suitable habitat for the species may be present (marginal habitat).		(marginal habitat) OR suitable habitat present.
Low (Unlikely)	2,3	Species is not known to occur within the survey area but there are records nearby OR recent records OR within the LGA AND suitable habitat for the species may be present (marginal habitat).	1,2	Records present within the LGA and marginal suitable habitat is present within the survey area, therefore the likelihood of the species occurring there is low OR marginal habitat present OR recent record within LGA
Negligible (Suitable Habitat not Present)	1,2,3	Despite records nearby OR being present within the LGA OR recent records, no suitable habitat is present within the survey area and therefore the likelihood of the species occurring is negligible.	0,1	No nearby records or suitable habitat OR recent record with no suitable habitat within the survey area OR records nearby with no suitable habitat within the survey area

4.2 Flora and Vegetation

Following numerous surveys undertaken on Boolardy Station, the flora and vegetation values are well understood. A reconnaissance level survey was implemented to assess the environmental values of the area. this survey focussed on targeting likely significant flora species and collecting floristic data from relevés to inform vegetation community and condition mapping.

A reconnaissance flora and vegetation survey was undertaken between 10 and 13 November 2022 utilising methods outlined in EPA (2016) Technical Guidance – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment. The assessment was completed by Celia Mitchell (collection permit FB62000077-2). Celia Mitchell has 3 years' experience undertaking flora and vegetation assessments and undertook the May and September 2022 SKA flora and vegetation survey.

Floristic data was sampled from 4 relevés, defined as unbounded quadrats, and 8 mapping notes. Relevés follow the guidance for a reconnaissance survey with low level sampling and were determined to be a better representation of vegetation due to the sparse foliage cover and isolated occurrence of many species.

Data collected at relevés included the presence of plant species, their cover abundance, structural composition of vegetation, physical environment, and presence/absence of disturbance. Each sample point location was given a unique site number, and the following parameters recorded:

- date
- location using hand-held GPS (accuracy of 5 m)
- photograph
- soil details (type, colour, moisture)
- topography
- vegetation condition using the Keighery (1994) scale.
- disturbance notes
- fire history
- species present: estimated height and estimated percentage cover.

Any species unable to be identified in the field were collected for identification in AECOM's in-house herbarium and the specimens and taxonomic references and keys at the Western Australian Herbarium (WAH). Naming of species followed the convention of the WAH.

4.2.1 Vegetation Mapping

Vegetation communities were described and mapped based on changes in dominant species composition and landform. The November 2022 dataset was compared to the 2020 and 2014 datasets to analyse floristic similarity of sample point locations (see survey effort in Figure 5). Only data collected from within the survey area is included in this report.

Vegetation community descriptions were based on the National Vegetation Information System (NVIS) framework at level V Association (DotEE, 2021). This is consistent with the AECOM (2014) and AECOM (2021) vegetation mapping.

Vegetation condition was determined using the Keighery (1994) condition scale (Table 11). The scale is based on disturbance (e.g. grazing, erosion), degree of alteration to community and habitat structure and site ecology.

Table 11 Bushland Condition Ratings (Keighery, 1994)

Descriptor	Explanation
Pristine	Pristine or nearly so, no obvious signs of disturbance
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species
Very Good	Vegetation structure altered obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance of vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as "parkland cleared" with the flora comprising weed or crop species with isolated native trees or shrubs

4.2.2 Targeted Searches

Targeted searches were conducted for conservation significant flora species considered likely to occur in the survey area, including *Calandrinia* sp. Boolardy Station (P. Jayasekara 719-JHR-01) P1, *Eremophila muelleriana* P3, *Gunniopsis divisa* P3, *Hemigenia tysonii* P3 and *Sauropus* sp. Woolgorong (M. Officer s.n. 10/8/94) P3.

Where Threatened or Priority Flora species were observed, the following data was collected:

- location using a hand-held GPS
- the number of individuals in the immediate population, or an estimate of the size (number) of the population with an estimated radius of its spatial extent
- vegetation condition
- associated dominant species
- soil type and colour
- topography

4.3 Fauna

The November 2022 basic fauna survey was conducted between 10 and 13 November 2022 by Ecologist Cassandra House. Cassandra has over 7 years' experience in the environmental industry and undertook the May and September 2022 SKA fauna surveys. The survey was conducted in accordance with Technical Guidance – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA, 2020).

The field survey primarily focused on verifying the findings of the desktop assessment and identifying and mapping (significant) fauna habitat. Signs of threatened fauna species with potential to utilise the habitats of the survey area were searched for during the basic fauna survey.

Fauna habitats were assessed for specific habitat components, including consideration of structural diversity and refuge opportunities for fauna, in order to determine the potential for these habitats to support conservation significant species. The fauna habitat assessments included:

- location
- general habitat description
- habitat condition and disturbance types
- dominant / characteristic flora species and vegetation layers
- presence and abundance of key habitat features such as large mature trees, small and large hollows, fallen logs, course and fine litter, decorticating bark, bare ground, grass, stones and boulders, rock crevices, soil cracks, vines, dense shrubs, water bodies etc
- presence of fauna and secondary signs (e.g. scats, digging, tracks, burrows, eggshell, bones, feathers etc)
- connectivity of habitat

In addition to recording all observed fauna and birds identified from distinctive calls, details of indirect evidence such as scats, tracks and diggings was documented.

The taxonomy and nomenclature of vertebrate species for mammals, reptiles and amphibians is consistent with the Western Australian Museum's Checklist of Vertebrates of Western Australia (2022) and the Australian Faunal Directory (https://biodiversity.org.au/afd/home) for avian species.

4.4 Survey Limitations

The objective of the reconnaissance flora and vegetation and basic fauna assessment are considered to have been met. No limitations were identified that may influence the results of the survey.

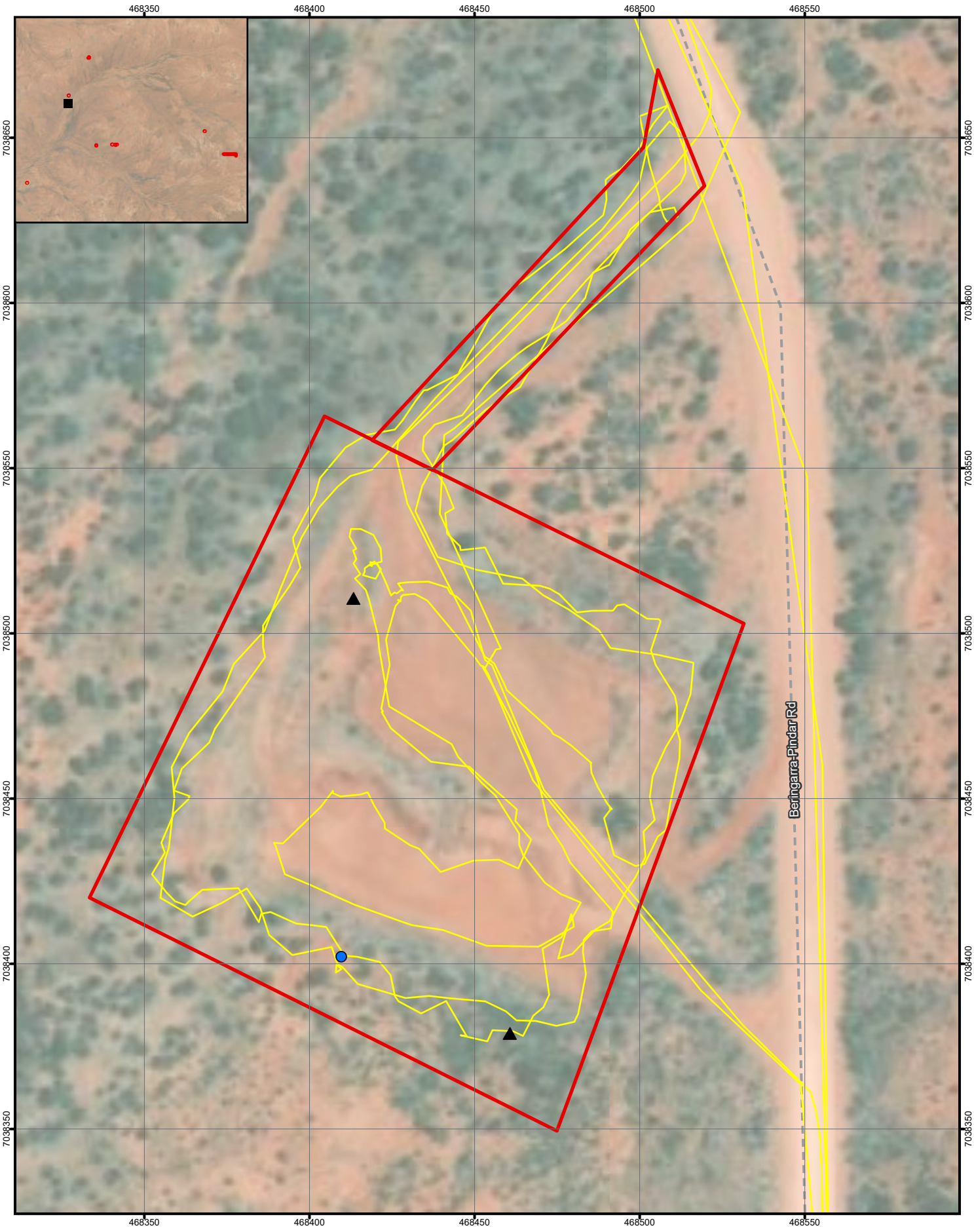
Seven limitations were considered as defined in the EPA Technical Guide (2016). These are discussed in Table 12.

Table 12 Limitations of the Ecological Survey

Limitation	Flora and Vegetation Assessment	Basic Fauna Survey
Availability of contextual information on the region	**Not a limitation** Sufficient resources were available to provide contextual information, in particular the detailed flora and vegetation assessments undertaken specifically for the SKA Project (AECOM, 2014; 2021) and DBCA database search results from 2020.	**Not a limitation** Sufficient resources were available to provide contextual information. These included the DBCA database, AoLA EPBC Act PMST, Alexander Holm & Associates (2008), AECOM (2014; 2021), Phoenix Environmental Sciences (Phoenix, 2015) and various field guides.
Competency/experience of consultant conducting survey	**Not a limitation** The flora and vegetation assessment was led by Celia Mitchell who has 3 years' experience conducting surveys of similar scope. Celia had guidance from Floora de Wit who has conducted the 2014 and 2020 flora and vegetation assessments at Boolardy Station. The extent of knowledge for the Project through historical surveys provided adequate context for informing the sample plan and targeted flora searches.	**Not a limitation** The fauna survey was undertaken by Ecologist Cassandra House who has more than 7 years' experience in the environmental industry in WA, including two previous visits to Boolardy Station in May and September 2022.
Proportion of flora/fauna identified, recorded and/or collected (based on sampling, timing and intensity)	**Not a limitation** Survey effort was over 2 days in mid-November 2022. Flora data was collected at 4 relevés and 8 mapping notes while targeted searches were undertaken by walking meandering foot traverses. Survey effort is shown in Figure 5. The dataset was supplemented by the 2014 and 2020 SKA Project datasets to inform vegetation community mapping. This includes 32 relevés and 65 quadrats.	**Not a limitation** The survey was conducted in November 2022 over a two-day period and included 16 habitat assessments.
Completion (is further work needed)	**Not a limitation** The reconnaissance flora and vegetation assessment objective was met. The survey was undertaken during the ideal survey season (spring), as such, annual species were present. Samples considered likely to represent significant flora was submitted to the WA Herbarium for formal identification. This provides confidence in the determination of significant species.	**Not a limitation** The objectives of the basic fauna survey were met. The entirety of the survey area was traversed on foot.
Remoteness and/or access problems	**Not a limitation** Survey areas were easily accessible by vehicle and on foot.	**Not a limitation** The survey area was accessed by vehicle and traversed on foot.

Limitation	Flora and Vegetation Assessment	Basic Fauna Survey
Timing, weather, season, cycle	**Minor limitation** Rainfall in the months preceding the survey was adequate to promote germination of annual species. Annuals were present and in flower, although were often at the end of their life cycle. The two priority *Calandrinia* spp might not have been in flower during the time of survey and therefore overlooked.	**Not a limitation** The survey was conducted during the hours of 0700 and 1700, meeting the requirements for the basic fauna survey.
Disturbances (e.g. fire flood, accidental human intervention) which affected results of the survey	**Not a limitation** No disturbances were observed that may have influenced the outcome of the survey.	**Not a limitation** The fauna survey was not disrupted or impacted.

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LEGEND
- Survey Area
- Tracklog
- Flora Sample Sites
- Fauna Habitat Assessment Sites

Survey Effort - BP01

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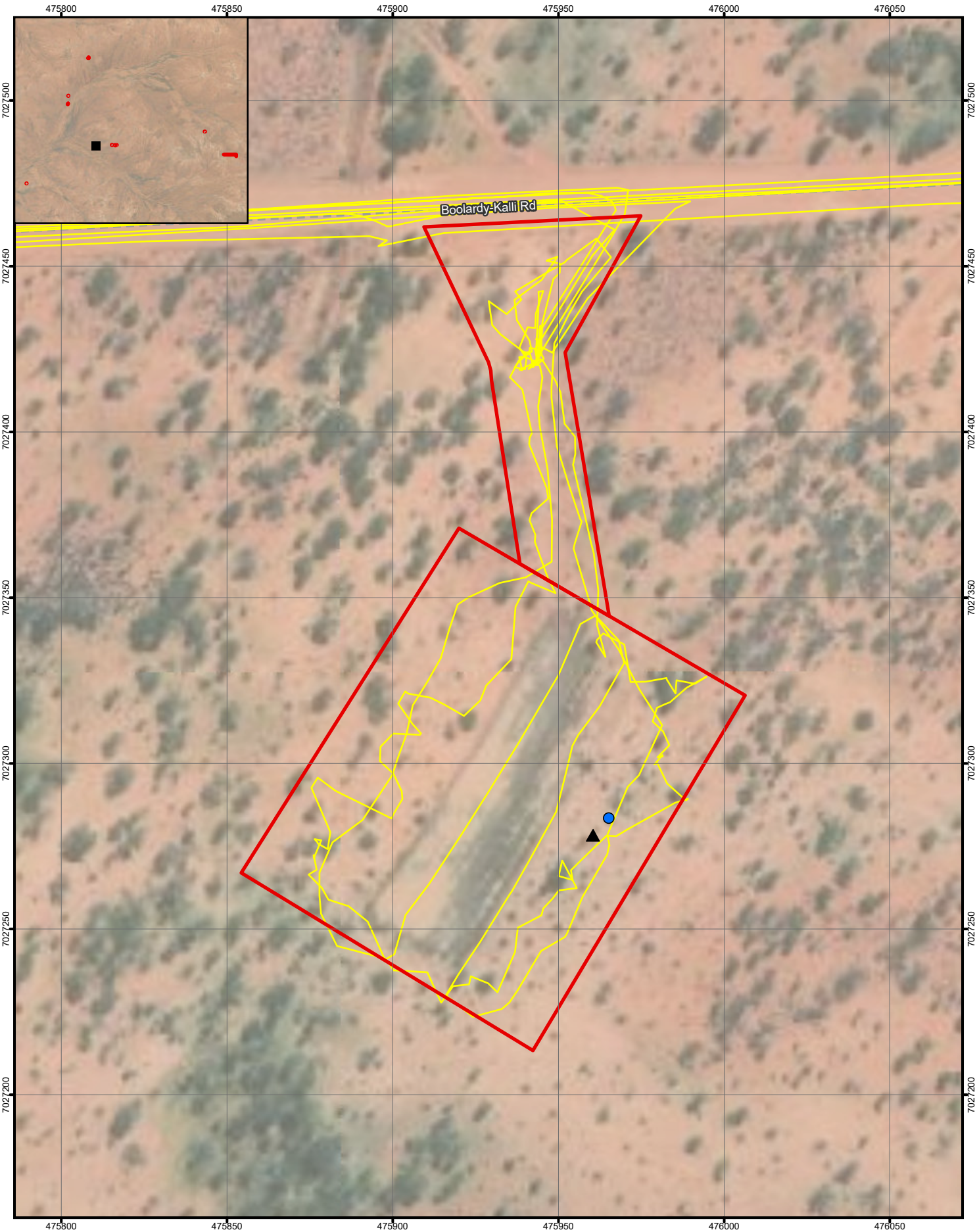
ECOLOGICAL ASSESSMENT – NOVEMBER 2022 - SQUARE KILOMETRE ARRAY

Figure 5.1

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Survey Effort - BP05

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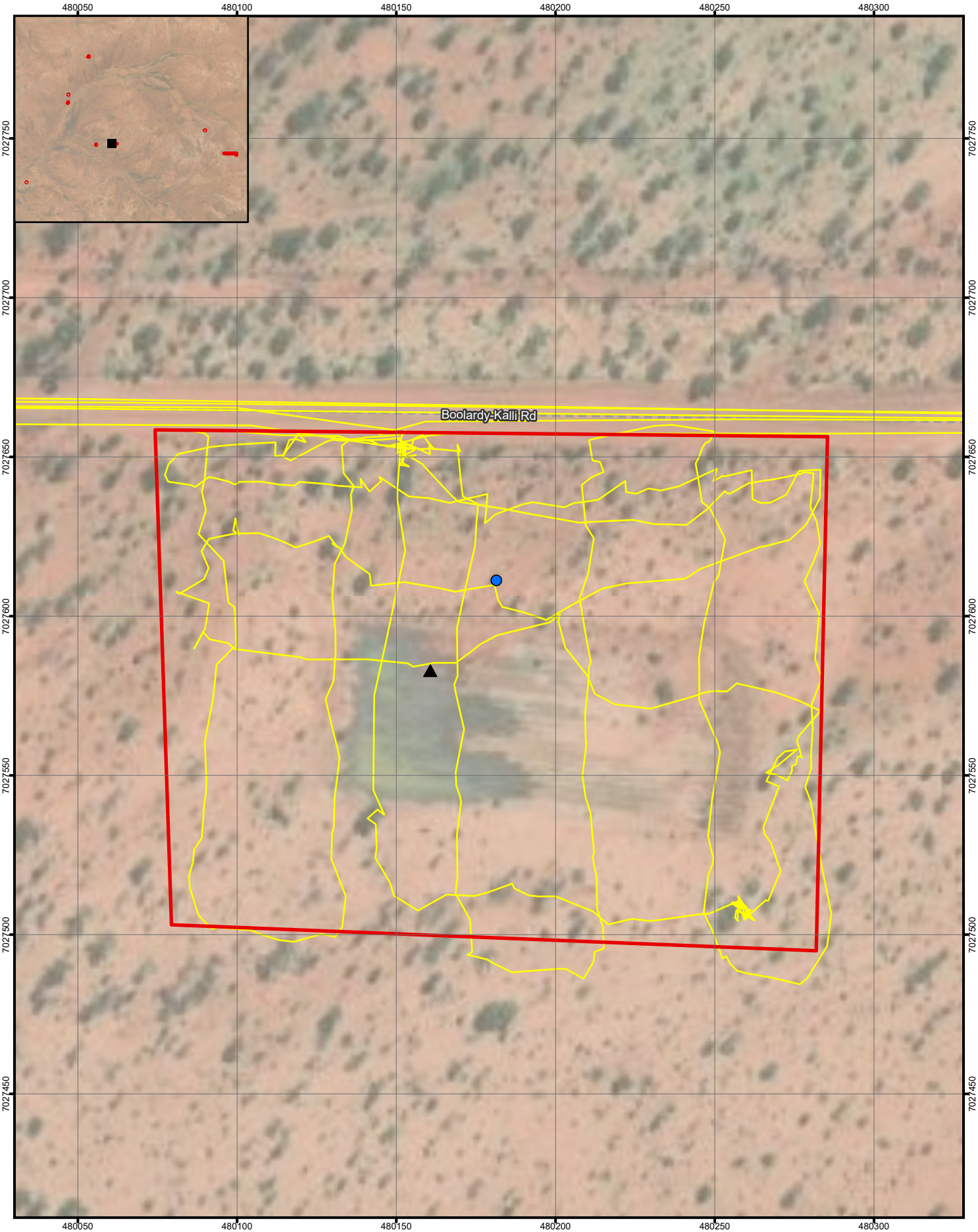
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Figure 5.2

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LEGEND
- Survey Area
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Survey Effort - BP06

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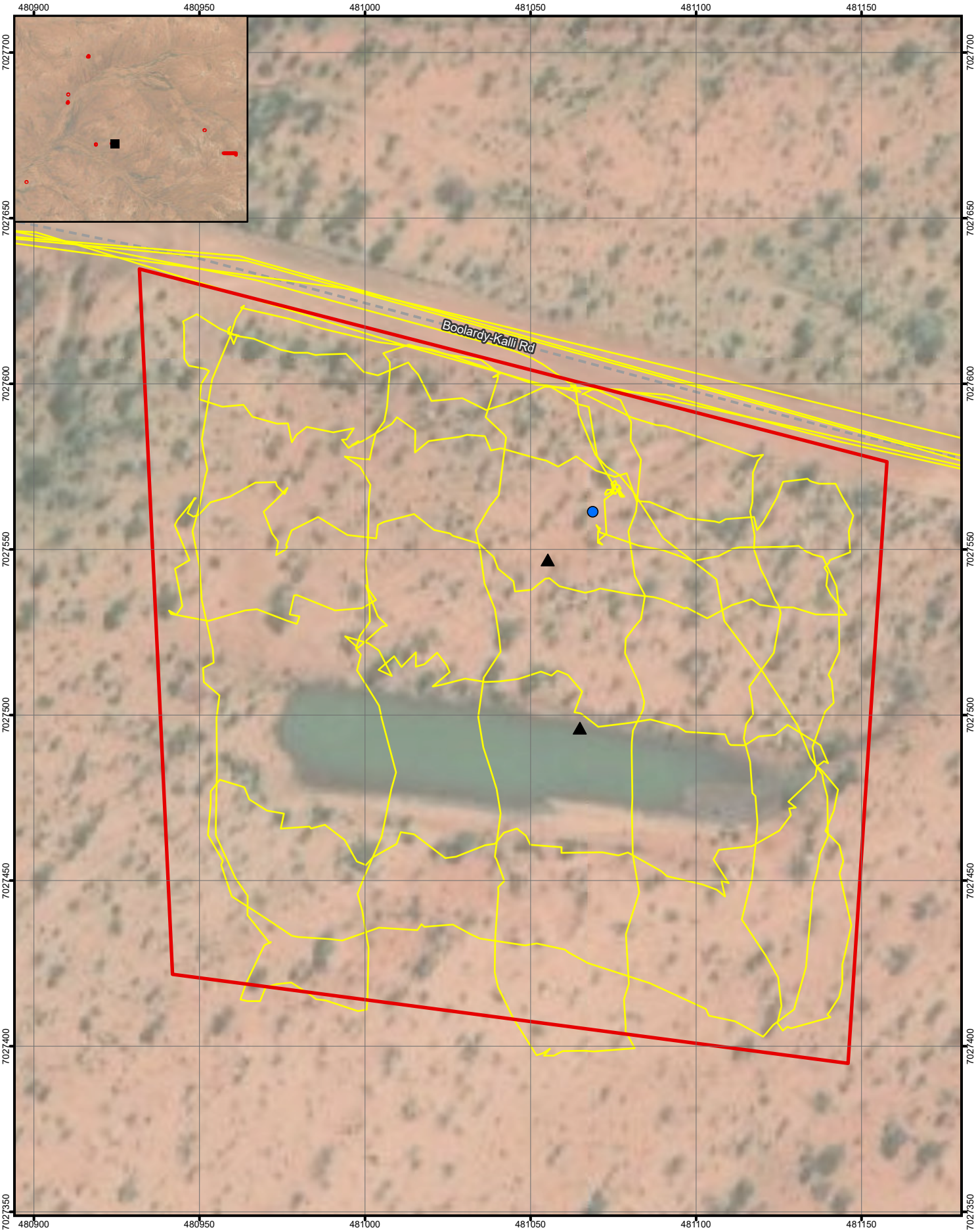
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Figure 5.3

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LEGEND
- Survey Area
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Survey Effort - BP07

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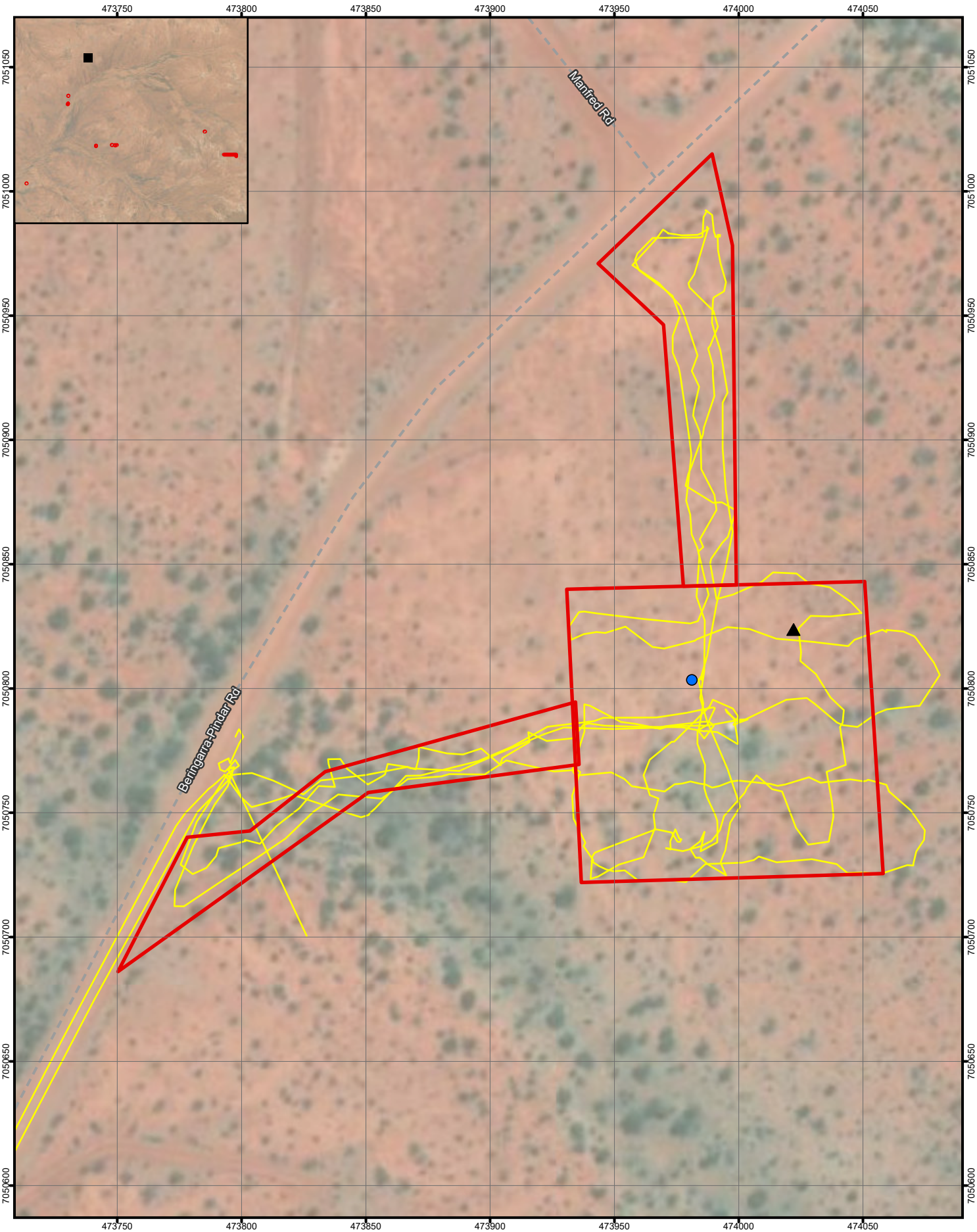
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Figure 5.4

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LEGEND
- Survey Area
- Tracklog
- Flora Sample Sites
- Fauna Habitat Assessment Sites

Survey Effort - Dorothie

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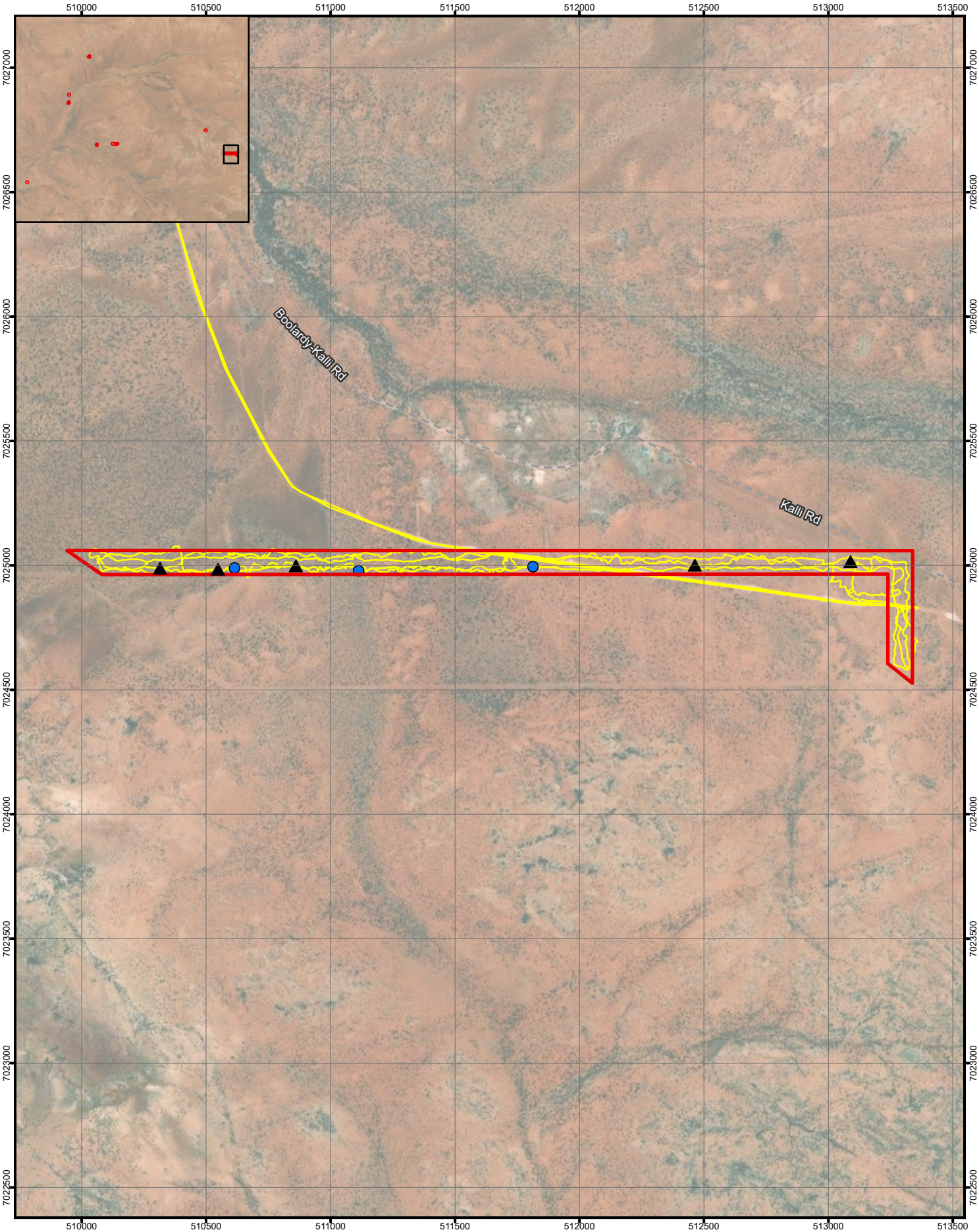
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Figure 5.5

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LEGEND
- Survey Area
- Tracklog
- Flora Sample Sites
- Fauna Habitat Assessment Sites

Survey Effort - Kalli Amended Corridor Route

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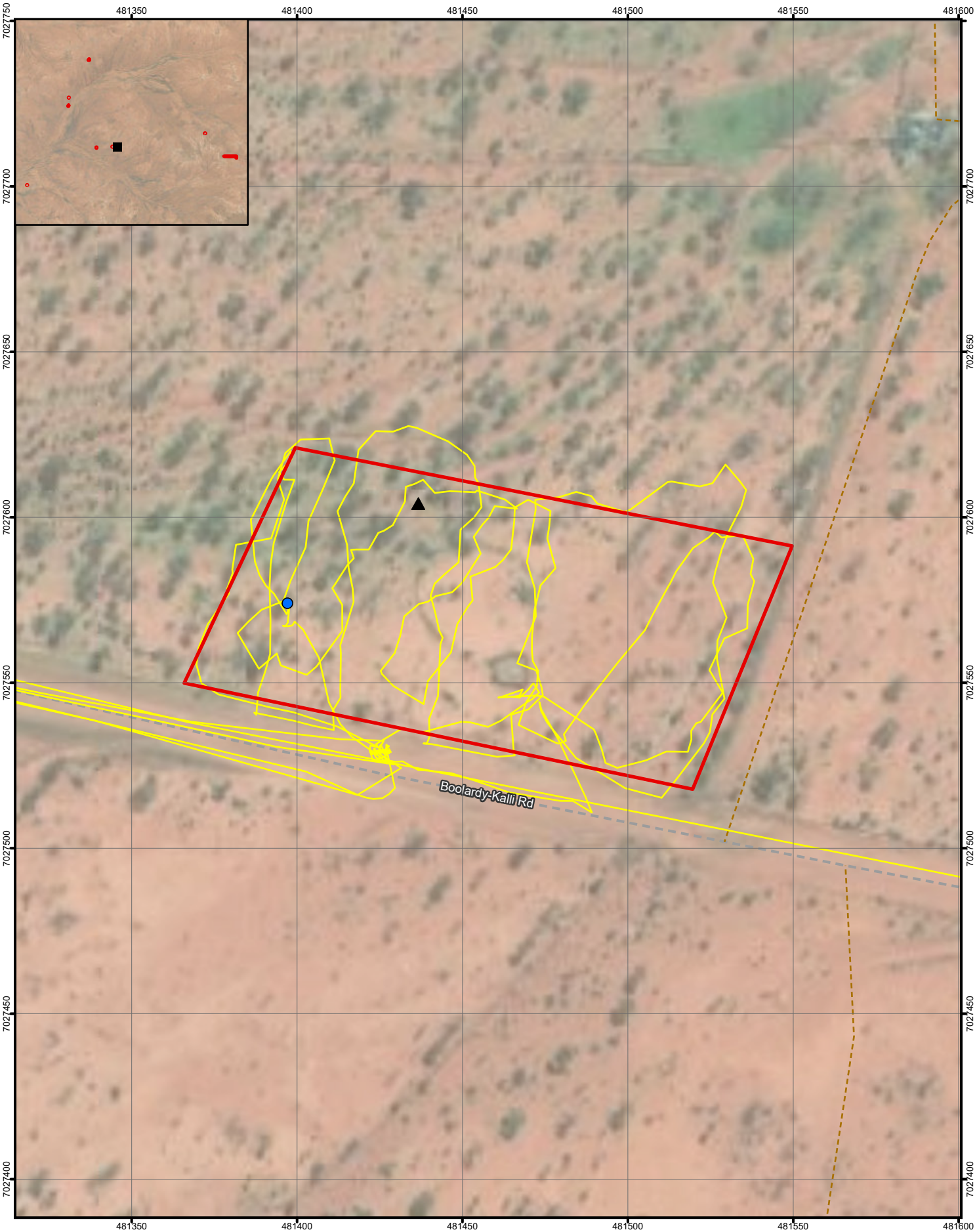
ECOLOGICAL ASSESSMENT – NOVEMBER 2022 - SQUARE KILOMETRE ARRAY

Figure 5.6

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LEGEND
- Survey Area
- Tracklog
- Flora Sample Sites
- Fauna Habitat Assessment Sites

Survey Effort - Pia Bubba

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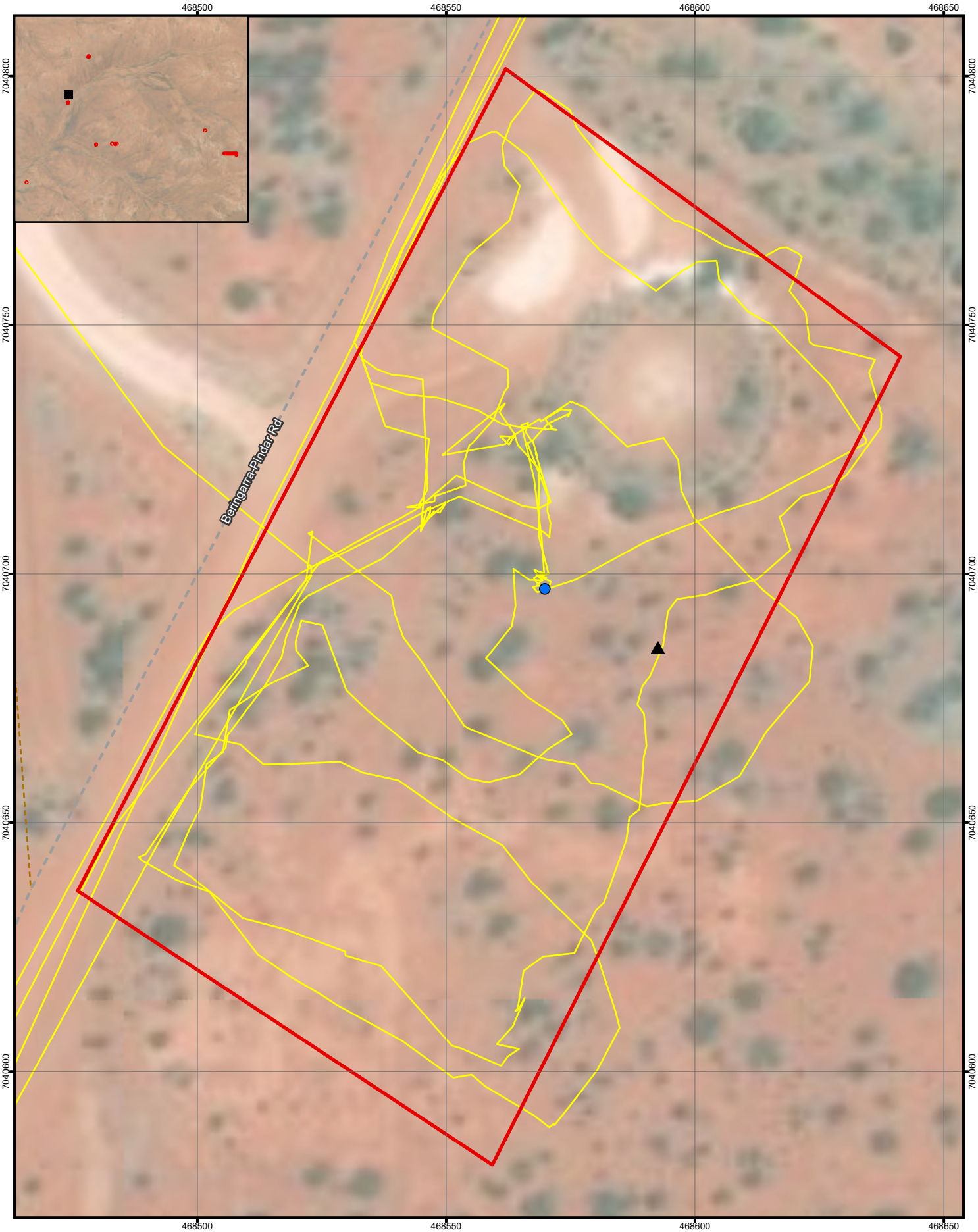
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Figure 5.7

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LEGEND
- Survey Area
- Tracklog
- Flora Sample Sites
- Fauna Habitat Assessment Sites

Survey Effort - TN BP Road ASKAP Turnoff

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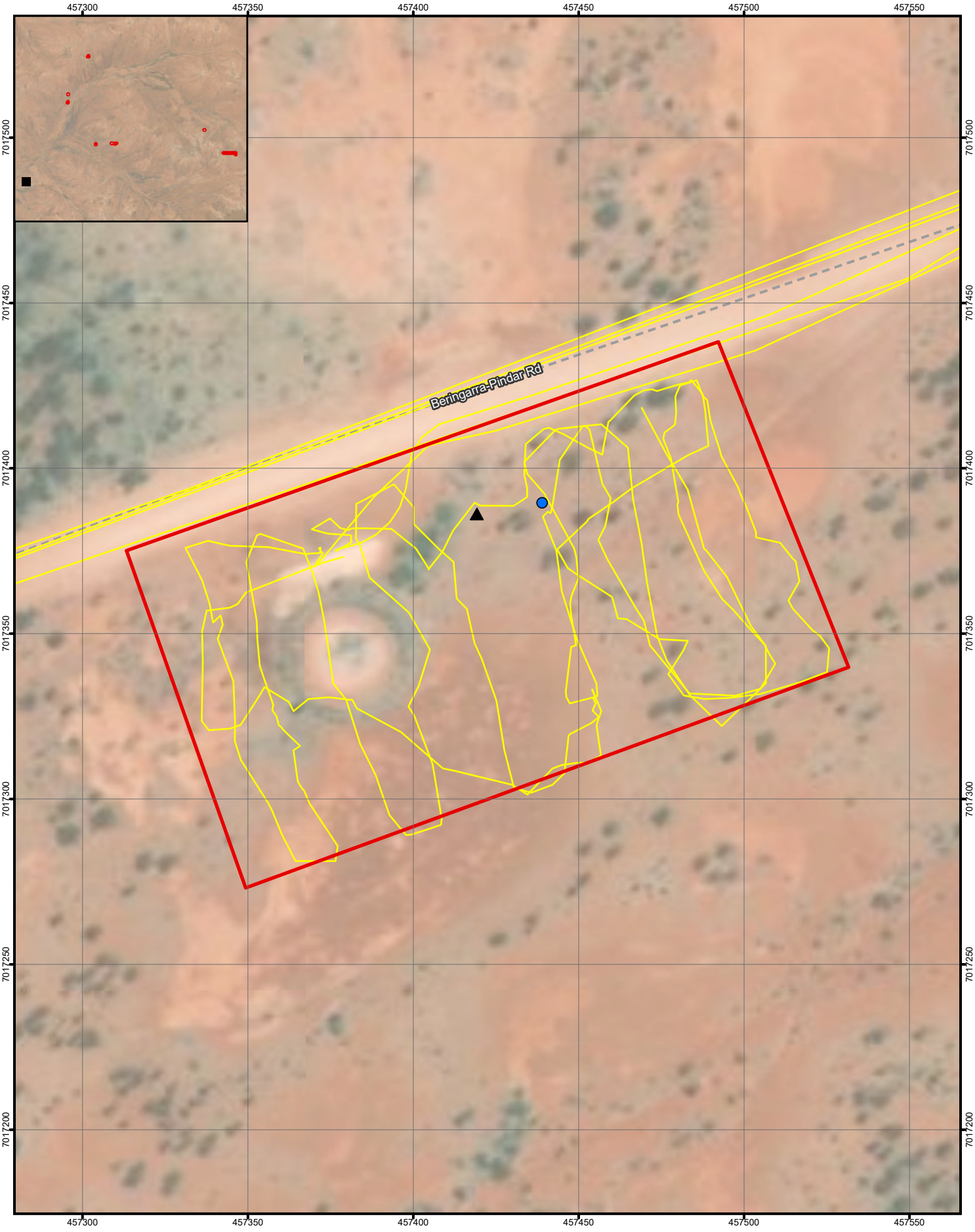
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Figure 5.8

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LEGEND
- Survey Area
- Tracklog
- Flora Sample Sites
- Fauna Habitat Assessment Sites

Survey Effort - TN BP Road Constuction Camp

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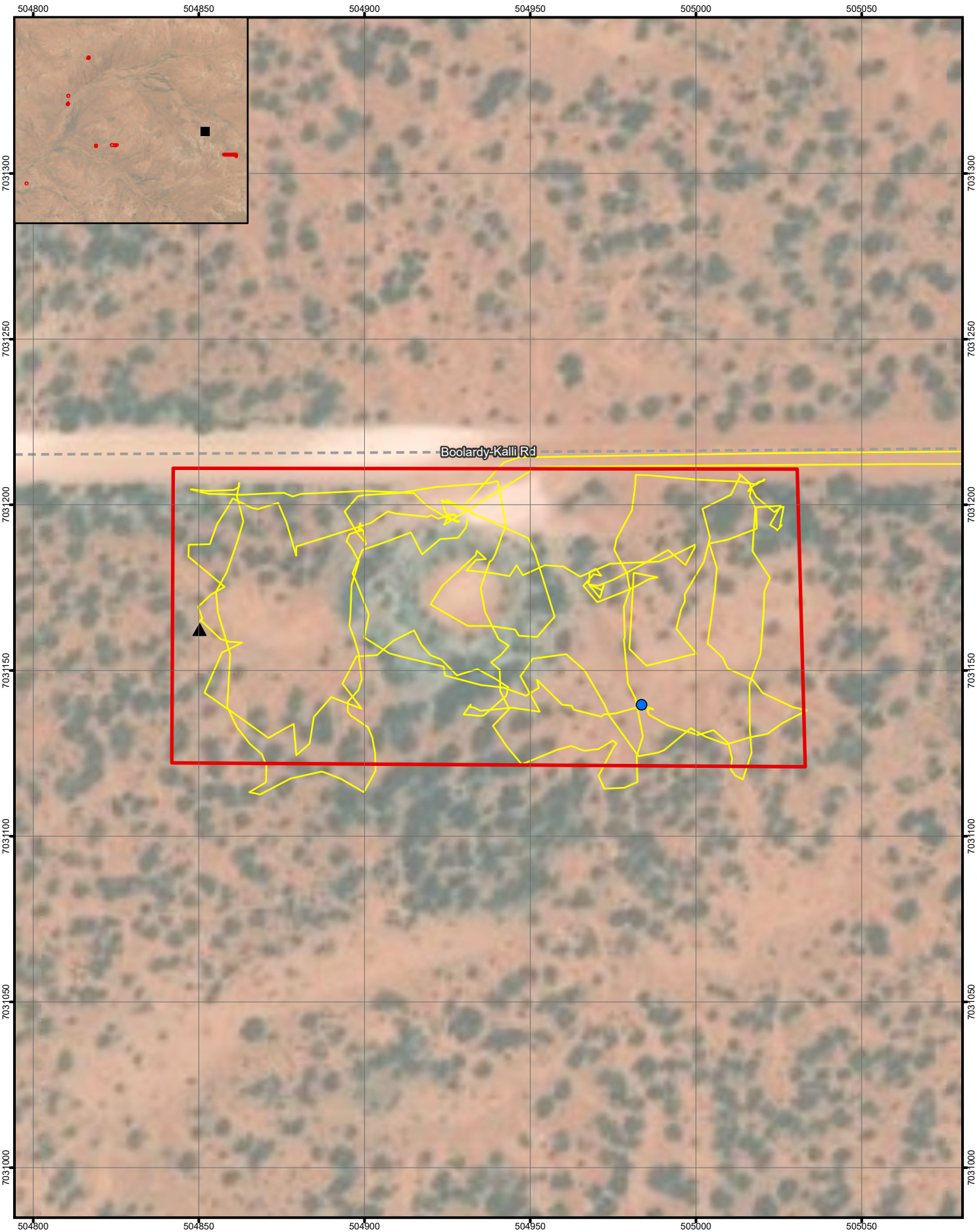
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Figure 5.9

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LEGEND
- Survey Area
- Tracklog
- Flora Sample Sites
- Fauna Habitat Assessment Sites

Survey Effort - TN Kalli Road East

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ECOLOGICAL ASSESSMENT – NOVEMBER 2022 - SQUARE KILOMETRE ARRAY

Figure 5.10

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5.0 Desktop Assessment Results

5.1 Conservation Significant Communities

No Threatened Ecological Communities (TECs) listed under the EPBC Act or BC Act were identified in the desktop assessment.

5.2 Conservation Significant Flora

No flora species listed as Threatened under the EPBC Act or BC Act were identified in the desktop assessment as potentially occurring in the survey area. Sixty-five Priority flora species were determined to potentially occur. Of these, nine species are considered likely to occur, six species may occur, and the remaining 50 species are unlikely to occur. Species considered likely to, or may occur, are detailed in Table 13.

Numerous species considered unlikely to occur are associated with Mt Weld and Weld Ranges. As such, suitable habitat is not present within the survey area. The comprehensive desktop results are presented in Appendix A and mapped on Figure 6.

Table 13 Significant Flora Considered Likely or May Occur in the Survey Area

Species	WA Cons. Code	Habitat	Likelihood of Occurrence	Justification
Angianthus microcephalus	P2	Sandy or clayey soils. Salt swamps & pans.	May	Suitable habitat may be present. Recorded adjacent to survey area, very old record (1953)
Baeckea sp. Mount Barloweerie (J.Z. Weber 5079)	P1	Sandy clay.	May	Suitable habitat present. Recorded adjacent to survey area.
Calandrinia butcherensis	P1	Red sands on flats	Likely	Suitable habitat present. Recorded adjacent to survey area.
Calandrinia sp. Boolardy Station (P. Jayasekara 719-JHR-01)	P1	Flat. Low plain. Red/orange sand/clay.	Likely	Suitable habitat present. Recorded adjacent to survey area.
Eremophila muelleriana	P3	Red sand, sandy clay, lateritic sand. Flats, sand dunes, hills.	Likely	Suitable habitat present. Recorded adjacent to survey area.
Eremophila simulans subsp. *megacalyx*	P3	Found on rangeland plains road verge with red, sandy gravel laterite.	Likely	Suitable habitat may be present. Recorded adjacent to survey area.
Frankenia confusa	P4	Wet pale brown sand, brown clay, grey soil. Banks of rivers & waterholes, river floodplains.	May	Suitable habitat unlikely to be present. Recorded adjacent to survey area during 2014 surveys.
Goodenia neogoodenia	P4	Red loam or clay. Near water.	May	Suitable habitat may be present. Recorded adjacent to survey area.
Gunniopsis divisa	P3	Loam, quartz. Roadsides. In the Murchison, Yalgoo IBRA regions	Likely	Suitable habitat present. Recorded adjacent to survey area during 2014 surveys.

Species	WA Cons. Code	Habitat	Likelihood of Occurrence	Justification
Hemigenia tysonii	P3	Red Sands, plains and gently undulating dunes.	Likely	Suitable habitat may be present. Recorded adjacent to survey area during 2014 surveys.
Micromyrtus placoides	P3	Red-orange sandy clay, orange-yellow sandy clay to clayey loam, coarse gravel, banded ironstone, laterite, quartz, basalt. Gently undulating plains, dry creek beds, hillcrests, ridges	May	Suitable habitat may be present. Recorded adjacent to survey area.
Prostanthera tysoniana	P3	Red sandy soils in the Murchison LGA	May	Suitable habitat may be present. Recorded adjacent to survey area.
Ptilotus beardii	P3	Clayey soils. Saline flats, low breakaways.	Likely	Suitable habitat present. Recorded adjacent to survey area.
Sauropus sp. Woolgorong (M. Officer s.n. 10/8/94)	P3	Red sand. Plains.	Likely	Suitable habitat present. Recorded adjacent to survey area during 2014 and 2020 surveys
Verticordia jamiesonii	P3	Sandy clay soils. Lateritic breakaways.	Likely	Suitable habitat present. Recorded adjacent to survey area during 2014 surveys

Priority Species Department of Biodiversity, Conservation and Attraction's Priority Species List: Priority 1, P2, P3, P4

5.3 Conservation Significant Fauna

The desktop fauna assessment identified 27 conservation significant fauna species that could potentially occur within the survey area.

The likelihood assessment determined that:

- Three species have an assessed score of high and are 'likely' to occur.
- Four species received a score of moderate and are considered 'possible'.
- 18 species are assessed as low and are 'unlikely' to occur.
- Three species are considered to be negligible in their likelihood of occurrence.

The two species considered as high and four species assessed as moderate include three bird, two reptile and one invertebrate species (Table 14).

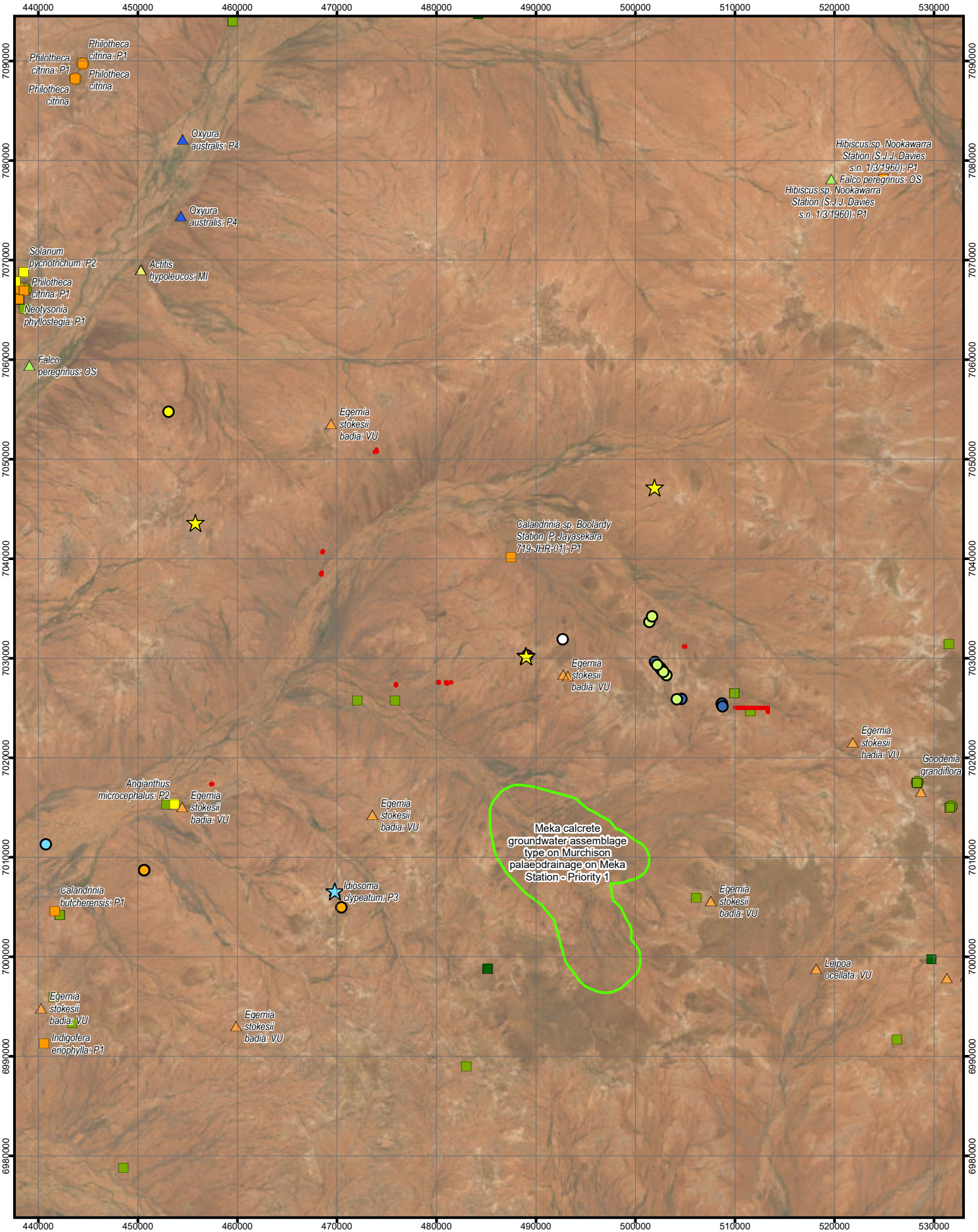
Of note, four fauna species were incorporated as per DBCA guidance received as part of the database results. These species included Golden Gudgeon *Hypseleotris aurea* (Priority 2), Night Parrot *Pezoporus occidentalis* (Critically Endangered under the BC Act, Endangered under the EPBC Act), Woma *Aspidites ramsayi* [southwest subpop] (Critically Endangered under the BC Act, Endangered under the EPBC Act), Long-tailed Dunnart *Sminthopsis longicaudata* (Priority 4) and the Arid bronze azure butterfly *Ogyris subterrestris petrina* (Critically Endangered). None of these species are known to occur in the area and are not considered likely to occur.

The comprehensive fauna desktop assessment is presented in Appendix A2.

Table 14 Conservation Significant Fauna Species that are High (likely) and Moderate (possible) to Occur in the Survey Area

Scientific Name	Common Name	Conservation Status		Likelihood of Occurrence	Ecology
		State	EBPC Act		
Birds					
Falco hypoleucos	Grey Falcon	VU	V	Moderate (Possible)	The Grey Falcon is a rare, pale grey inland falcon that inhabits inland plains, gibber deserts, pastoral lands and timbered watercourses (Pizzey & Knight, 2007).
Falco peregrinus	Peregrine Falcon	OS	-	Moderate (Possible)	A well-known falcon, the Peregrine inhabits a vast array of environs in Australia. Usually uncommon and migratory (Pizzey & Knight, 2007). This species lays its eggs in recesses of cliff faces, tree hollows or large abandoned nests (Bamford, 2009)
Rostratula australis	Australian Painted Snipe	EN	E	Moderate (Possible)	The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains.
Invertebrates					
Idiosoma clypeatum	Northern Shield-backed Trapdoor Spider	P3	-	High (Likely)	*Idiosoma clypeatum* has a widespread distribution in Western Australia's inland arid zone, principally throughout the Yalgoo and Murchison bioregions where it is the only known species in the nigrum-group. This distribution seems to be strongly correlated with annual rainfall of less than 250 mm (Rix *et al.*, 2018).
Reptiles					
Egernia stokesii badia	Western Spiny-tailed Skink	VU	E	High (Likely)	The Western Spiny-tailed Skink occupies rock crevices in large, isolated rocky outcrops, typically granite (Duffield & and Bull, 2002). Crevices are usually identifiable by a "latrine" or scat pile, resulting from regular defecation of all family members, in close proximity to the entrance (Chapple, 2003).
Aspidites ramsayi	Woma	P1	E	Moderate (Possible)	The south-west Woma subpopulation is distributed from North to Yuna, south to Boddington, inland to Menzies and east to the western edge of the Nullarbor Plain (Cogger et al., 1993). The species is nocturnal and primarily inhabits sandplains characterised by woodlands, shrublands, or heath, often with spinifex. but may also inhabit rocky areas as well.

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Survey Area

Threatened Fauna database (DBCA)
- Vulnerable
- Migratory Species
- Specially Protected
- Priority 3
- Priority 4

Threatened and Priority Flora database (TPFL)
- P1
- P3

TEC / PEC
- Priority 1

WA Herbarium database (WAHERB)
- P1
- P2
- P3
- P4
- Western Spiny Tailed Skink
- Trapdoor Spider

Conservation Significant Flora (all P3)
- *Eremophila simulans*
- *Gunniopsis divisa*
- *Hemigenia tysonii*
- *Petrophile pauciflora*
- *Ptilotus beardii*
- *Sauropus* sp. Woolgorong (M. Officer s.n. 10/8/94)
- *Verticordia jamiesonii*

Desktop Significant Flora, Fauna and Community Results

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ECOLOGICAL ASSESSMENT – NOVEMBER 2022 - SQUARE KILOMETRE ARRAY

Figure 6

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6.0 Field Survey Results and Discussion

6.1 Vegetation

6.1.1 Vegetation Communities

No TECs or PECs were anticipated to occur, and none were recorded in the survey area. Three native vegetation communities were defined and mapped by comparing floristic data from 4 relevés, 8 mapping notes and vegetation mapping completed for the SKA Project (Table 15). The vegetation was homogenous, characterised by Mulga Open Woodlands with various understorey components, reflected in the three vegetation communities. The terrain was flat with clays, clay loams and clay sands on flat terrain, sometimes with quartz on the surface.

Vegetation communities are mapped in Figure 7.

Table 15 Vegetation Communities Recorded in the Survey Area

Description	Site details	Photo
AiAtEf Acacia Woodland *Acacia incurvaneura*, *Acacia craspedocarpa* and *Acacia fuscaneura* low open woodland over *Acacia tetragonophylla*, *Acacia kempeana* and *Acacia oswaldii* sparse tall shrubland over *Eremophila fraseri* subsp. *parva*, *Senna artemisioides* subsp. *helmsii* and *Eremophila macmillaniana* sparse mid shrubland.	Flat terrain with red clay with a variable soil profile reflecting erosion. Alluvial sands found close to drainage channels transition to clay loams on flats. Extent (ha): 47.58 Species richness: • 32 native species	
AvEp Acacia Woodland *Acacia victoriae* subsp. *victoriae*, *Acacia sclerosperma* subsp. *sclerosperma* and *Acacia tetragonophylla* tall shrubland over *Eremophila pterocarpa* subsp. *pterocarpa*, *Senna* sp. *Meekatharra* (E. Bailey 1-26) and *Atriplex amnicola* mixed chenopod shrubland	Hardwash plains with red-brown sandy loam clay soils. Extent (ha): 1.68 Species richness: • 16 native species	

Description	Site details	Photo
ApAgEf Acacia Woodland *Acacia pteraneura* low woodland to open woodland over *Acacia grasbyi* and *Acacia tetragonophylla* tall sparse shrubland over *Eremophila forrestii* subsp*. forrestii, Senna artemisioides* subsp*. helmsii* and *Eremophila fraseri* subsp*. parva* mid shrubland*.*	Undulating flat terrain with red-brown sandy loam soils. Extent (ha): 3.24 Species richness: • 11 native species	

6.1.2 Condition

Boolardy Station has been used for sheep and cattle grazing since 1876 and was destocked more than four years ago. The impact of this, combined with a drying climate, is prevalent across the survey area (Plate 1). It has resulted in a loss of total biomass, erosion of the surface, and soil compaction, as well as the introduction of non-native weed species. The increased rainfall in the month preceding the survey has resulted in an increase of biomass across the survey area, although the 'native vegetation' currently present is unlikely to be a good reflection of pre-European vegetation. Lacking a suitable reference of condition, the entire survey area has been considered in 'Very Good' condition. Vegetation condition is mapped in Figure 7.





Plate 1 Typical Vegetation Condition of the Survey Area

6.2 Flora

6.2.1 Diversity

A total of 41 native flora species from 20 genera and 12 families were recorded. No weed species were recorded during the survey.

The complete species list is provided in Appendix B. All site data is presented in Appendix C.

6.2.2 Conservation Significant Flora

No Threatened flora species listed under the EPBC Act or BC Act were recorded. Three Priority flora species listed by DBCA were recorded: *Eremophila muelleriana* (P3), *Gunniopsis divisa* (P3), and *Hemigenia tysonii* (P3). Their distribution is shown on Figure 7 and discussed below.

***Eremophila muelleriana* (P3)**

Eremophila muelleriana is a perennial upright shrub that varies in height from 0.5 to 2.8 m high with dark purple-red/purple-black flowers (Plate 2). The branches and leaves are covered in a dense yellow or occasionally grey tomentum of short woolly hairs. This species has not been recorded during previous surveys of Boolardy Station conducted by AECOM, but DBCA records show it has been recorded within 10 km of the survey area.

E. muelleriana was recorded on vegetation community AiAtEf, mixed shrubland on alluvial sands found close to drainage channels transition to clay loams on flats. This corresponds to descriptions of habitat in the DBCA database results. 17 individuals of *E. muelleriana* were recorded at one location within the survey area and confirmed by taxonomist Mike Hislop at the WA Herbarium.



Plate 2 *Eremophila muelleriana* (P3) Habit (left) and Flower (right) During the November Survey

***Gunniopsis divisa* (P3)**

Gunniopsis divisa is a prostrate annual succulent herb that grows up to 10 cm high. The stems radiate from the base and are fleshy and hairless. The flowers are a pale yellow, fading to white and flowers occur in August. This species is commonly found on colluvial outwash associated with banded ironstone formations. Where the species was recorded it was considered locally common, as it was found in high concentrations in an adjacent area during the September 2022 survey. At the time of survey 305 *G. divisa* individuals were recorded. As this is an annual species, the population count is likely to be flexible rather than constant and is more a representation of extent. This species was observed in flower (Plate 3) at the time.



Plate 3 *Gunniopsis divisa* (P3) in Flower During the November Survey

Hemigenia tysonii (P3)

Hemigenia tysonii is a perennial woody upright shrub that grows up to 0.5 m high with purple-blue-pink/white flowers (Plate 4). This species is commonly found on red sand, sandy clay, lateritic sands on flats, sand dunes and hills.

H. tysonii was recorded on vegetation community AiAtEf, mixed shrubland on alluvial sands found close to drainage channels transition to clay loams on flats. This corresponds to descriptions of habitat in the DBCA database results. 17 individuals of *E. muelleriana* were recorded at one location within the survey area and confirmed by taxonomist Mike Hislop at the WA Herbarium.



Plate 4 ***Hemigenia tysonii*** **(P3) in Flower During the November Survey**

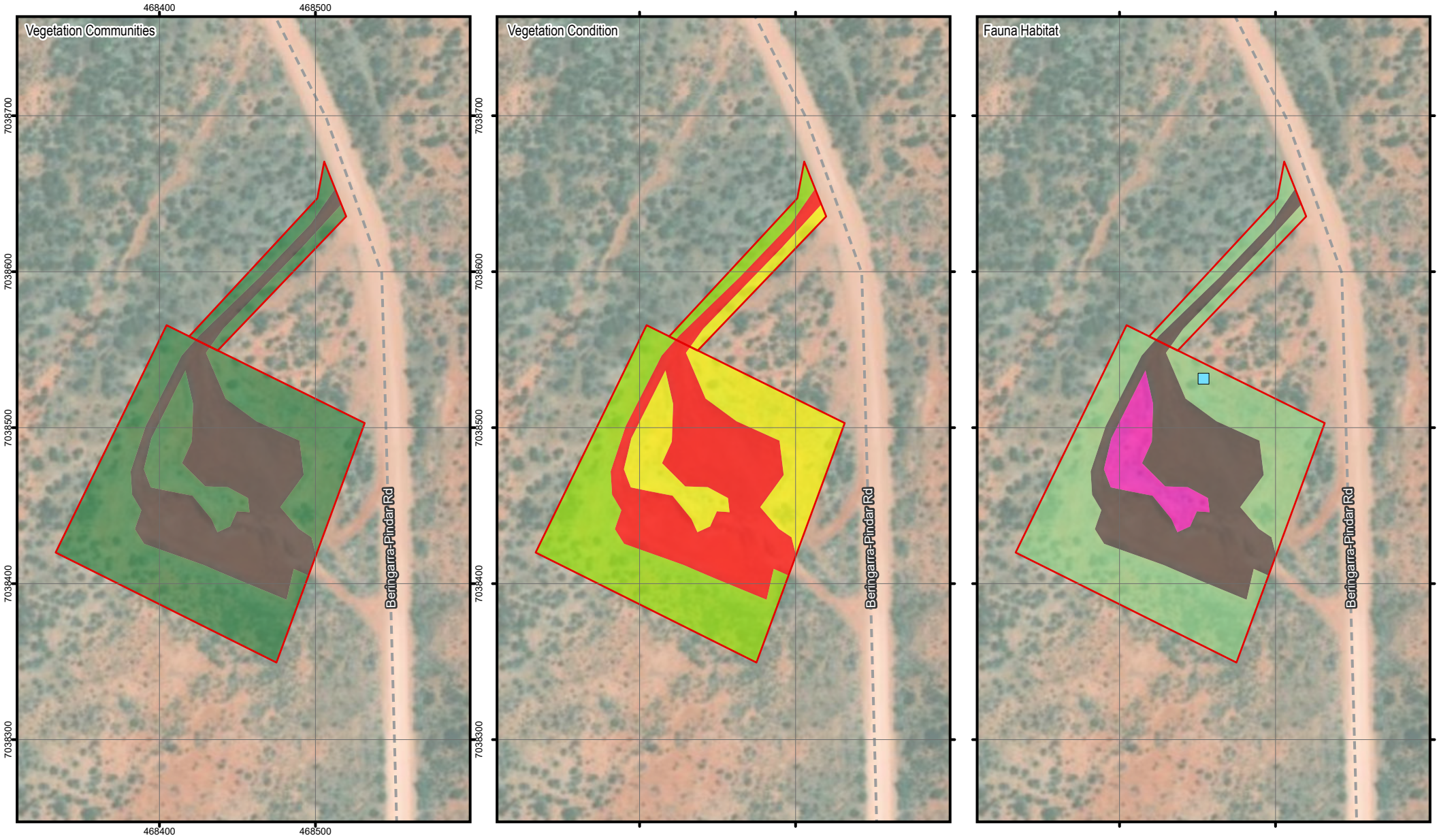
6.2.3 Desktop Review Post-survey

Significant flora species from the desktop study were reviewed. Their likelihood of occurrence was adjusted based on habitat observed in the survey area with results presented in Table 16.

Table 16 Rationale for the Absence of Priority Flora Considered Likely to or May Occur in the Initial Desktop Assessment

Species	WA Cons. Code	Habitat	Pre-survey Likelihood	Post-survey Likelihood	Justification
Baeckea sp. Mount Barloweerie (J.Z. Weber 5079)	P1	Sandy clay.	May	Unlikely	Suitable habitat is present. This species is a perennial and would have been detected if present.
Calandrinia butcherensis	P1	Red sands on flats	Likely	May	Records in the vicinity are associated with Mulga woodlands on red fine sand on undulating plains. This species is a small annual species that may not have been in flower during time of survey and consequently overlooked. The likelihood has been reduced to "May".
Calandrinia sp. Boolardy Station (P. Jayasekara 719-JHR-01)	P1	Flat. Low plain. Red/orange sand/clay.	Likely	May	Suitable habitat is present. This species has an annual life cycle, detectability is likely to be limited to the flowering period. A flowering sample of *C.* sp. Boolardy Station was recorded during September 2022 surveys (AECOM, 2023). This suggest that its life cycle may have concluded, or flowering material may have been absent during the November surveys. The species therefore remains as 'may occur'
Eremophila simulans subsp*. megacalyx*	P3	Found on rangeland plains road verge with red, sandy gravel laterite.	Likely	Unlikely	Suitable habitat is present. This species has been recorded during previous surveys on Boolardy Station and requires suitable flowering material to be confidently identified to this subspecies. This species is a perennial and would have been detected if present.
Frankenia confusa	P4	*F. confusa* has been recorded during previous surveys in major drainage channels (AECOM, 2014; 2020).	May	Unlikely	No suitable habitat.
Goodenia neogoodenia	P4	Red loam or clay. Near water.	May	Unlikely	No suitable habitat.
Micromyrtus placoides	P3	Red-orange sandy clay, orange-yellow sandy clay to clayey loam, coarse gravel, banded ironstone, laterite, quartz, basalt. Gently	May	Unlikely	Suitable habitat is present. This species is a perennial and would have been detected if present.

Species	WA Cons. Code	Habitat	Pre-survey Likelihood	Post-survey Likelihood	Justification
		undulating plains, dry creek beds, hillcrests, ridges.			
Prostanthera tysoniana	P3	Red sandy soils in the Murchison LGA.	May	Unlikely	Marginal habitat was identified for this species as soils in the survey area are clay dominated. This species is a perennial and would have been detected if present.
Ptilotus beardii	P3	This species has been recorded during previous surveys on Boolardy Station where it was associated with saline flats and breakaways (AECOM, 2014).	Likely	Unlikely	No suitable habitat.
Sauropus sp. Woolgorong (M. Officer s.n. 10/8/94)	P3	This species has been recorded on Boolardy Station during previous surveys where it was associated with mixed Mulga and *Eremophila* shrubland over sand (AECOM, 2014).	Likely	Unlikely	This species has been recorded on Boolardy Station during previous surveys where it was associated with mixed mulga and *Eremophila* shrubland over sand. This habitat was present in the survey area. As a perennial species it is anticipated that it would have been present.
Verticordia jamiesonii	P3	Sandy clay soils. Lateritic breakaways.	Likely	Unlikely	Suitable habitat present. This species is a perennial and would have been detected if present.



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LEGEND

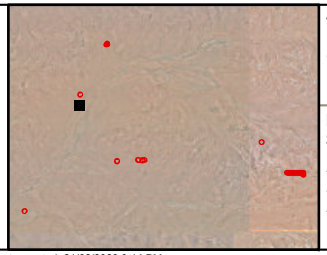
Survey Area

Vegetation Communities
- Cleared
- AvEp

Vegetation Condition
- Very Good
- Good
- Completely Degraded

Potential Conservation Significant Fauna Species

Fauna Habitat
- Cleared
- Hardpan plain with intermittent sandplain
- Granite boulders and heaps



Vegetation Communities, Condition and Fauna Habitat - BP01

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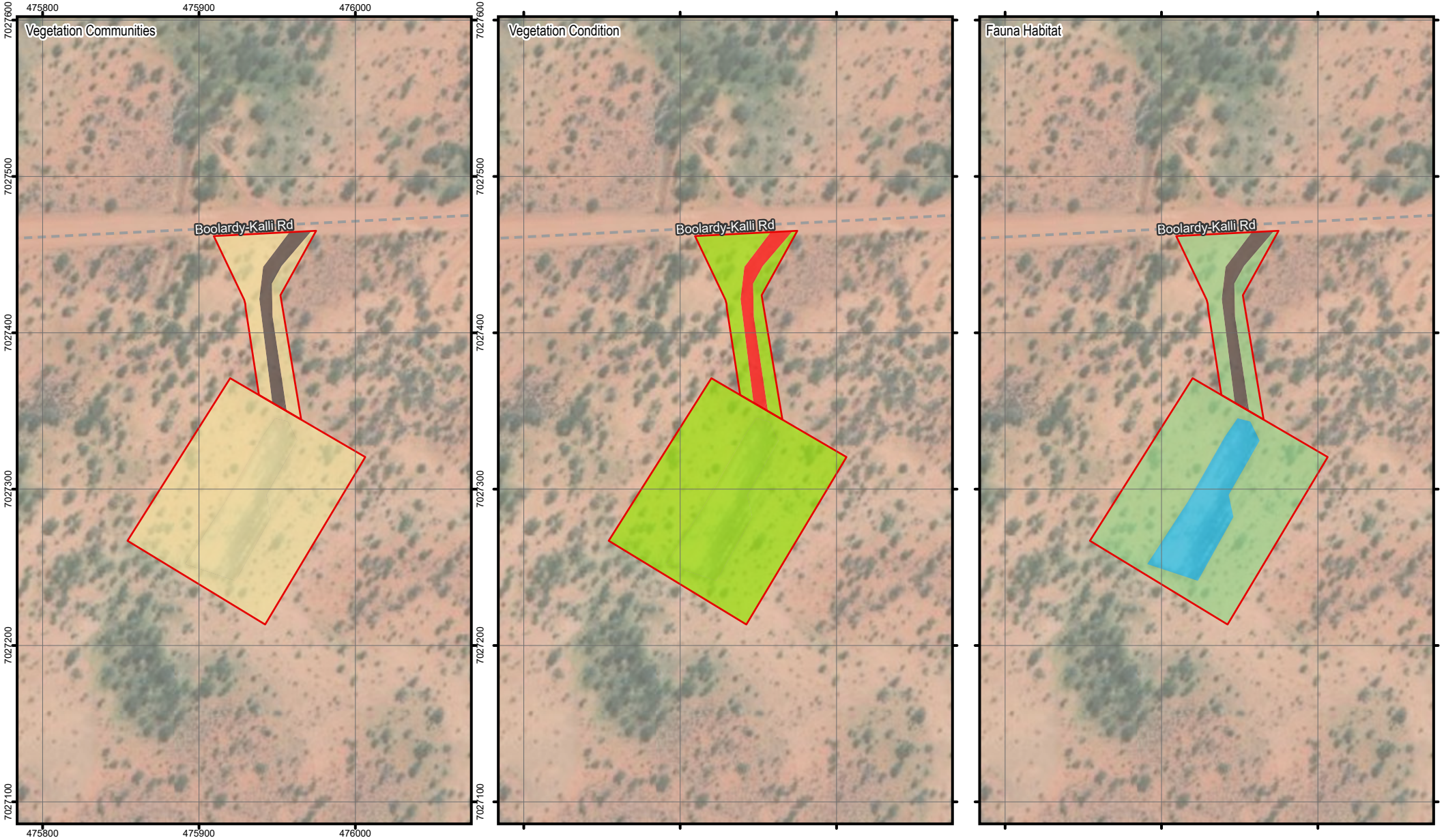
ECOLOGICAL ASSESSMENT – NOVEMBER 2022 - SQUARE KILOMETRE ARRAY

Figure 7.1

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Datum: GDA2020 MGA Zone 50

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(when printed at A4)

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metres

Data sources:

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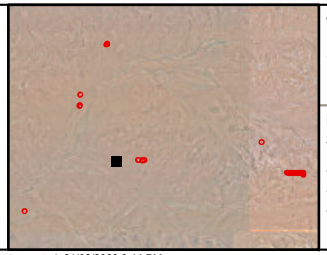
LEGEND

Survey Area

Vegetation Communities
- Cleared
- AiAtEf

Vegetation Condition
- Very Good
- Completely Degraded

Fauna Habitat
- Channels and creek line
- Cleared
- Hardpan plain with intermittent sandplain



Vegetation Communities, Condition and Fauna Habitat - BP05

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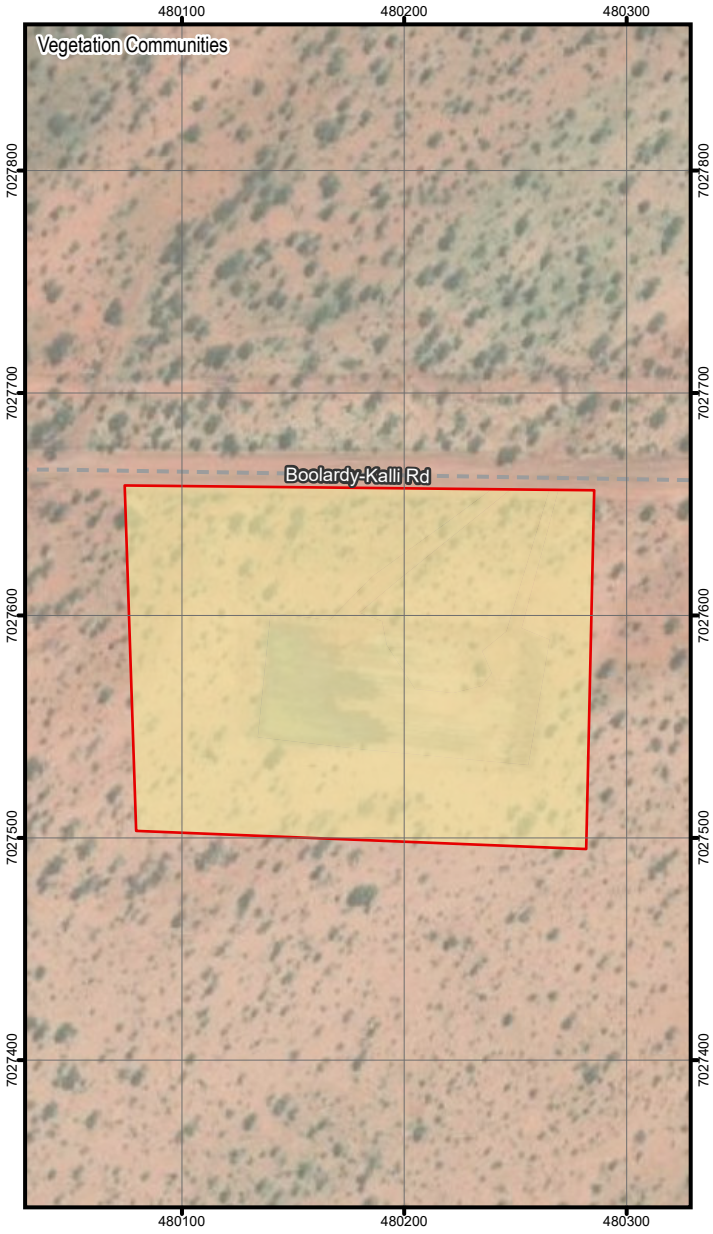
ECOLOGICAL ASSESSMENT – NOVEMBER 2022 - SQUARE KILOMETRE ARRAY

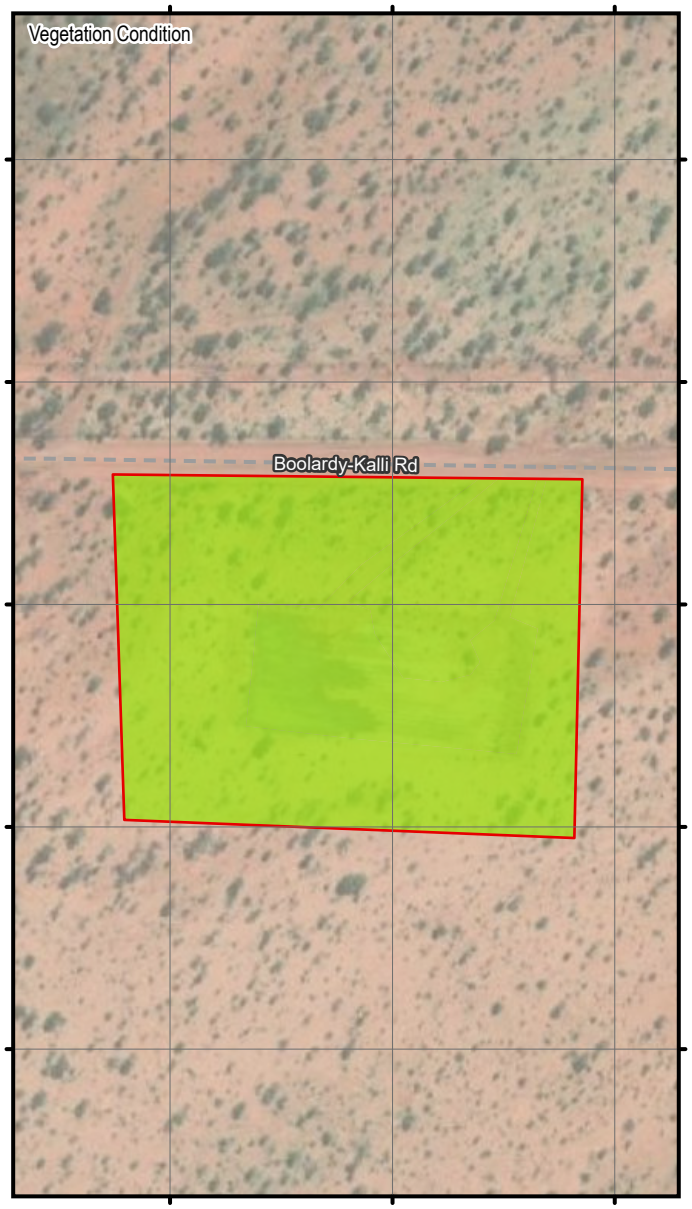
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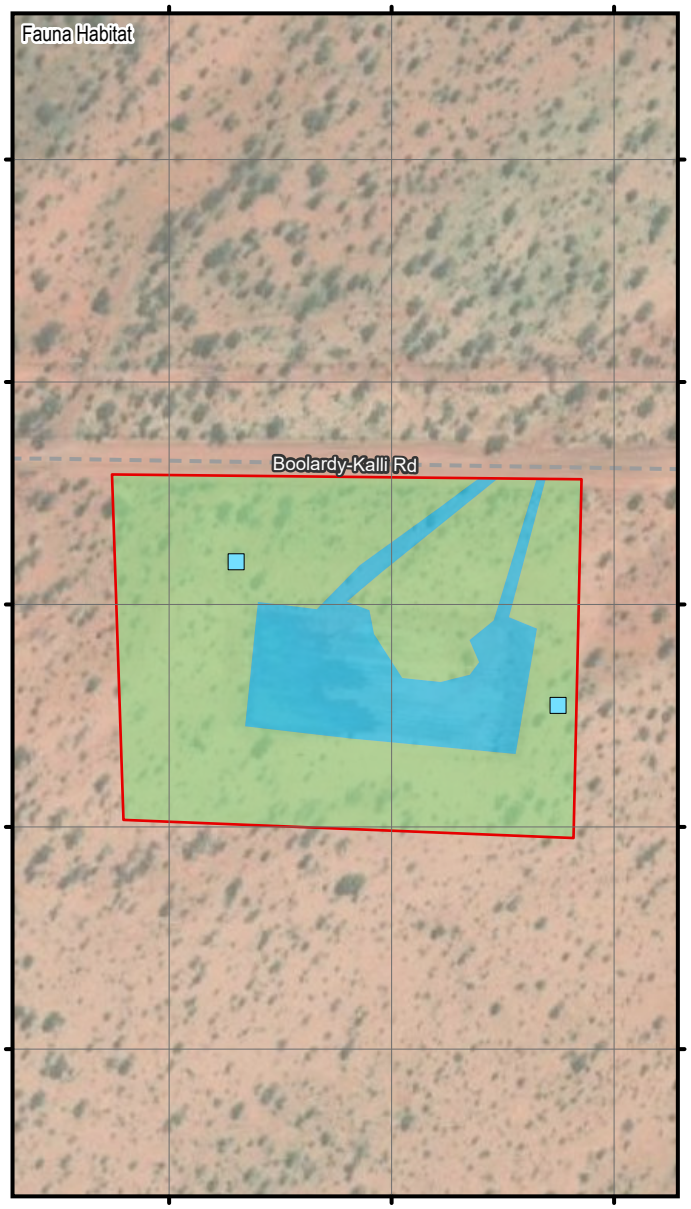
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metres

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LEGEND

Survey Area

Vegetation Communities

AiAtEf

Vegetation Condition

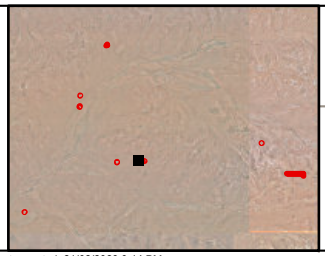
Very Good

Potential Conservation Significant Fauna Species

Fauna Habitat

Channels and creek line

Hardpan plain with intermittent sandplain



Vegetation Communities, Condition and Fauna Habitat - BP06

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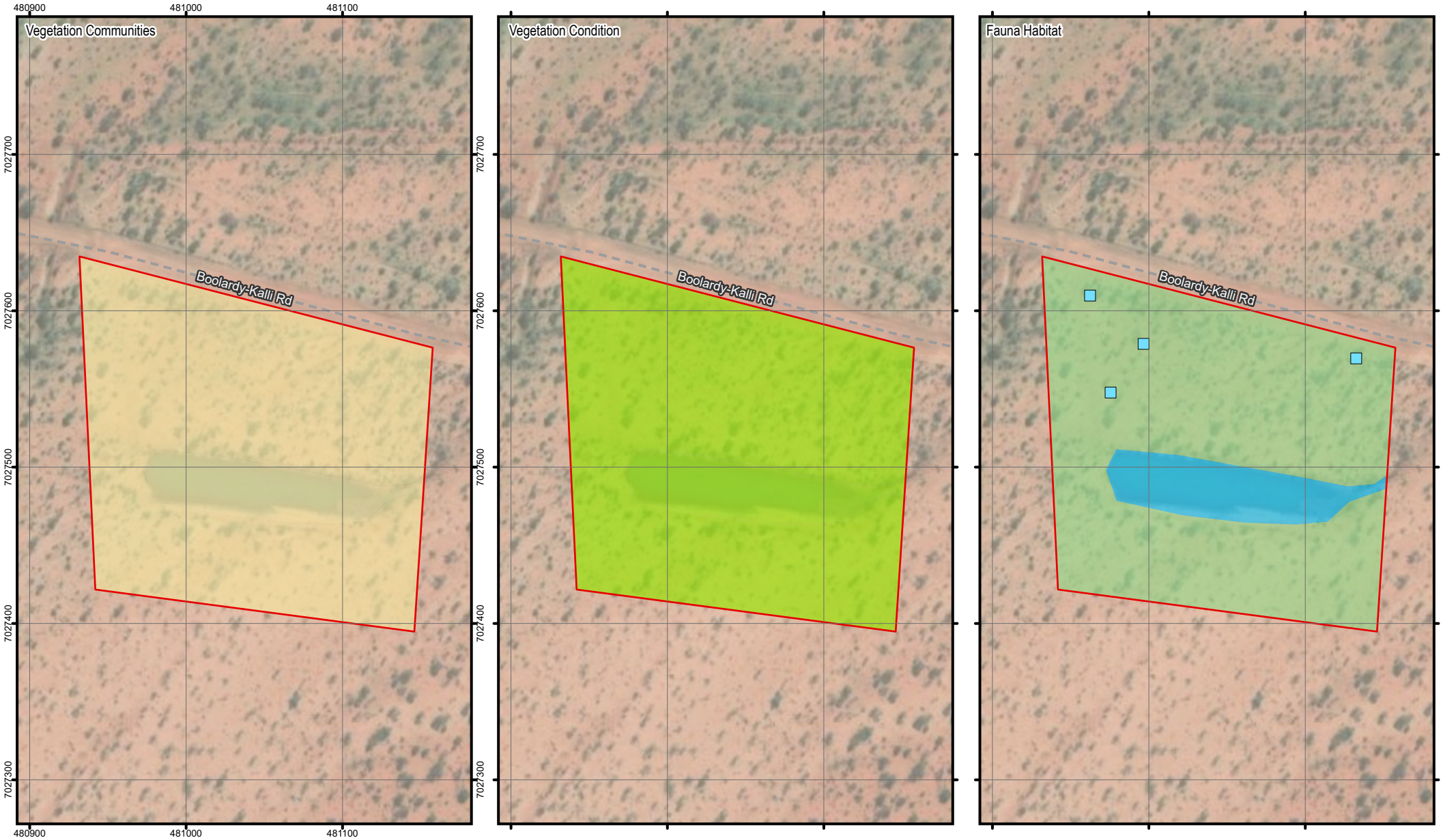
ECOLOGICAL ASSESSMENT – NOVEMBER 2022 - SQUARE KILOMETRE ARRAY

Figure 7.3

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Datum: GDA2020 MGA Zone 50

0 10 20 30 40
metres

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LEGEND

Survey Area

Vegetation Communities
- AiAtEf

Vegetation Condition
- Very Good

Potential Conservation Significant Fauna Species

Fauna Habitat
- Channels and creek line
- Hardpan plain with intermittent sandplain

Vegetation Communities, Condition and Fauna Habitat - BP07

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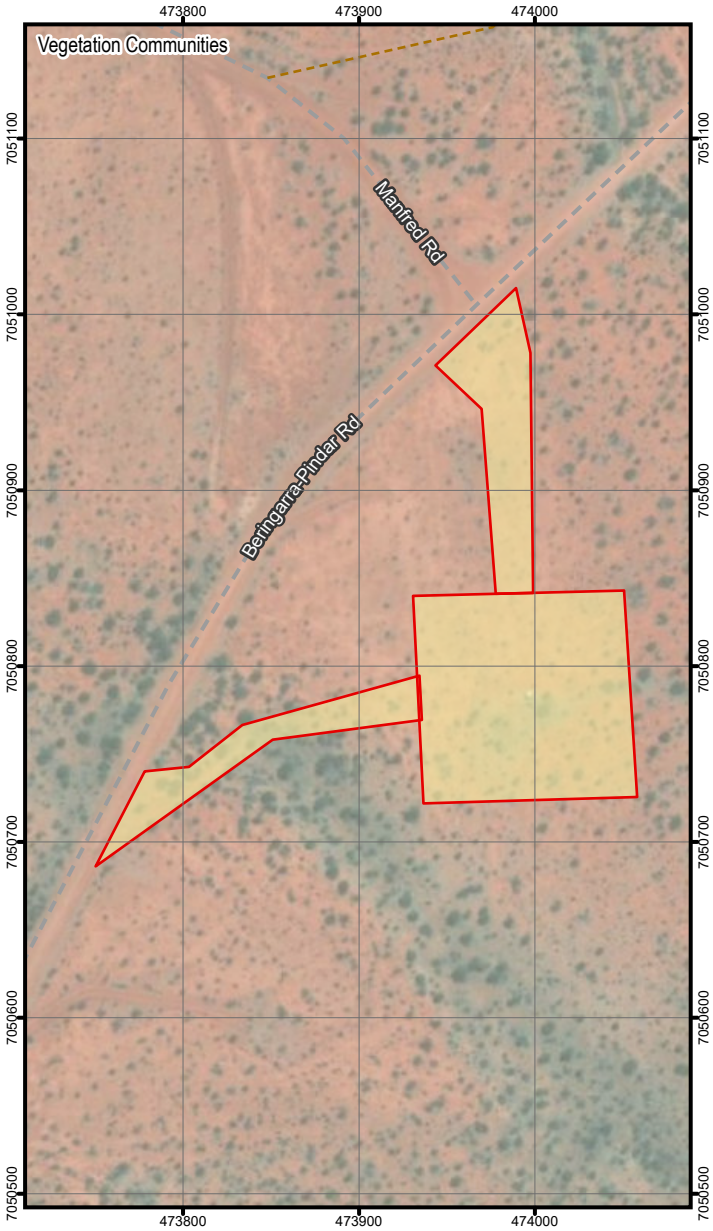
ECOLOGICAL ASSESSMENT – NOVEMBER 2022 - SQUARE KILOMETRE ARRAY

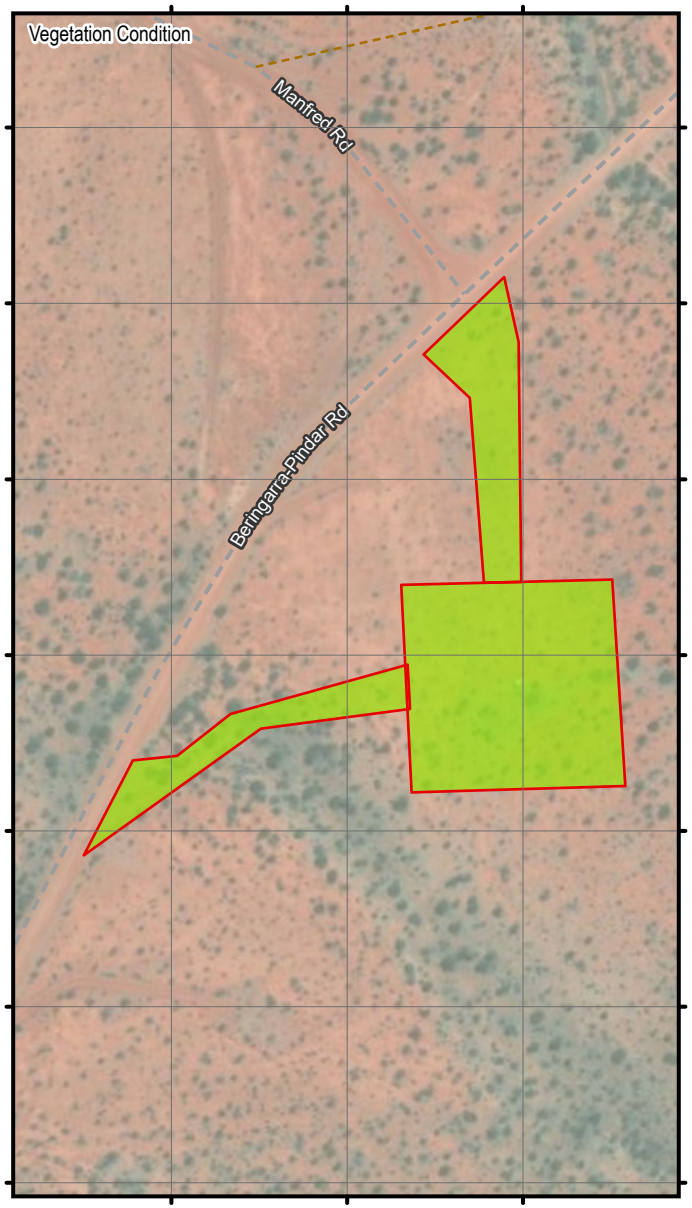
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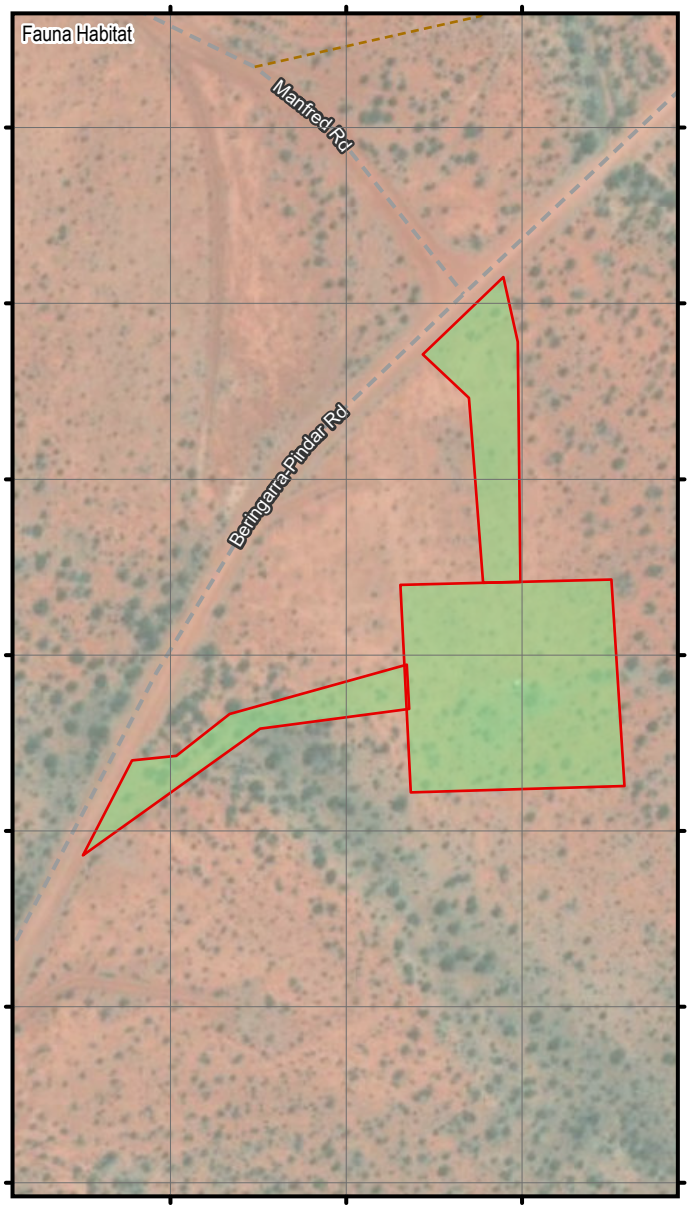
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Datum: GDA2020 MGA Zone 50

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Data sources:

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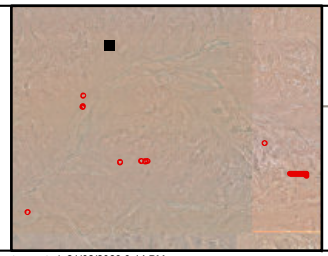
LEGEND

Survey Area

Vegetation Communities
AiAtEf

Vegetation Condition
Very Good

Fauna Habitat
Hardpan plain with intermittent sandplain



Vegetation Communities, Condition and Fauna Habitat - Dorothie

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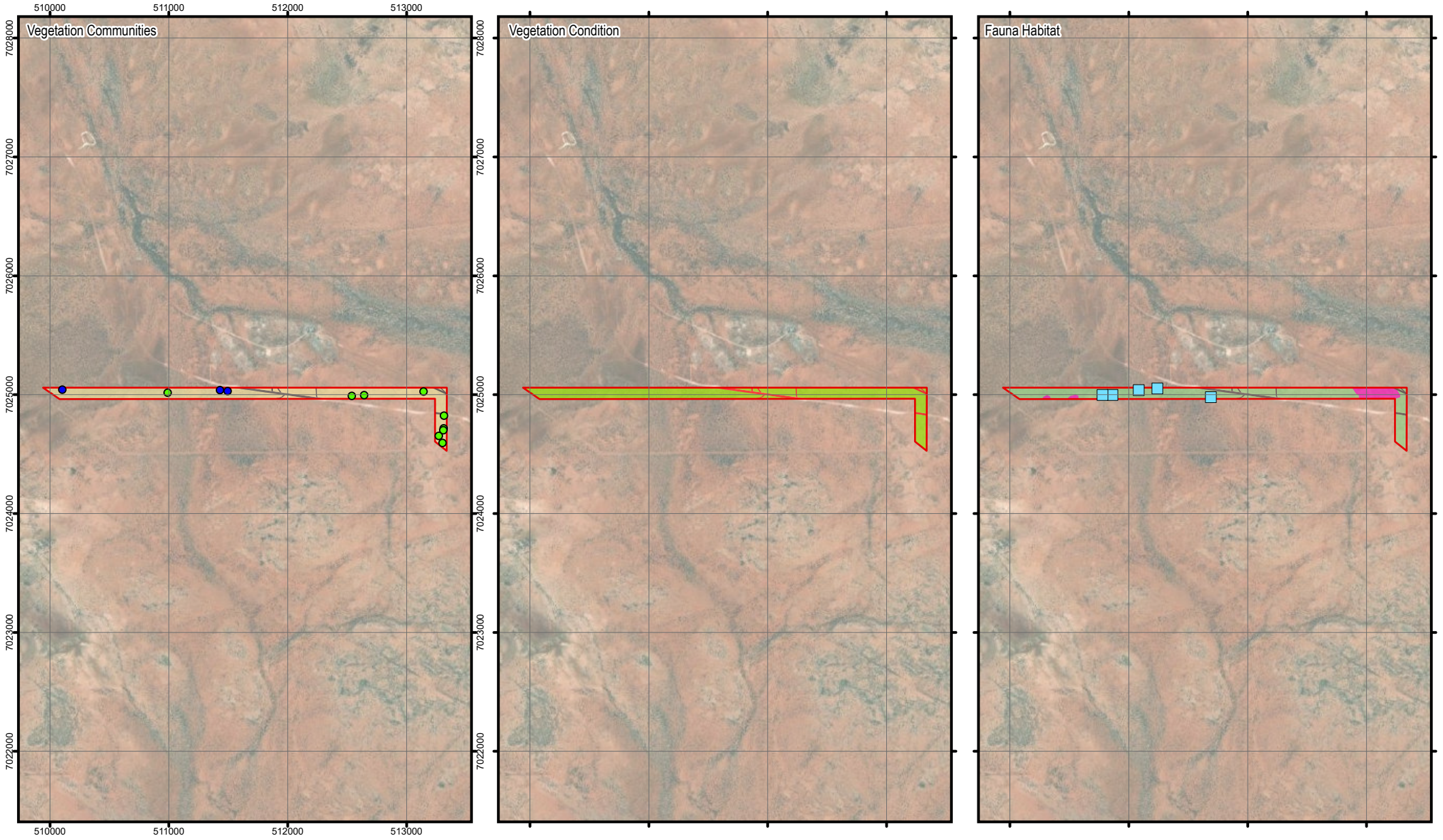
ECOLOGICAL ASSESSMENT – NOVEMBER 2022 - SQUARE KILOMETRE ARRAY

Figure 7.5

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(when printed at A4)

Datum: GDA2020 MGA Zone 50
0 250 500 750 1,000
metres

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LEGEND

Survey Area

Priority Flora
- *Eremophila muelleriana*
- *Hemigenia tysonii*

Vegetation Communities
- Cleared
- AiAtEf

Vegetation Condition
- Very Good
- Completely Degraded

Potential Conservation Significant Fauna Species

Fauna Habitat
- Cleared
- Hardpan plain with intermittent sandplain
- Granite boulders and heaps

Vegetation Communities, Condition and Fauna Habitat - Kalli Amended Corridor Route

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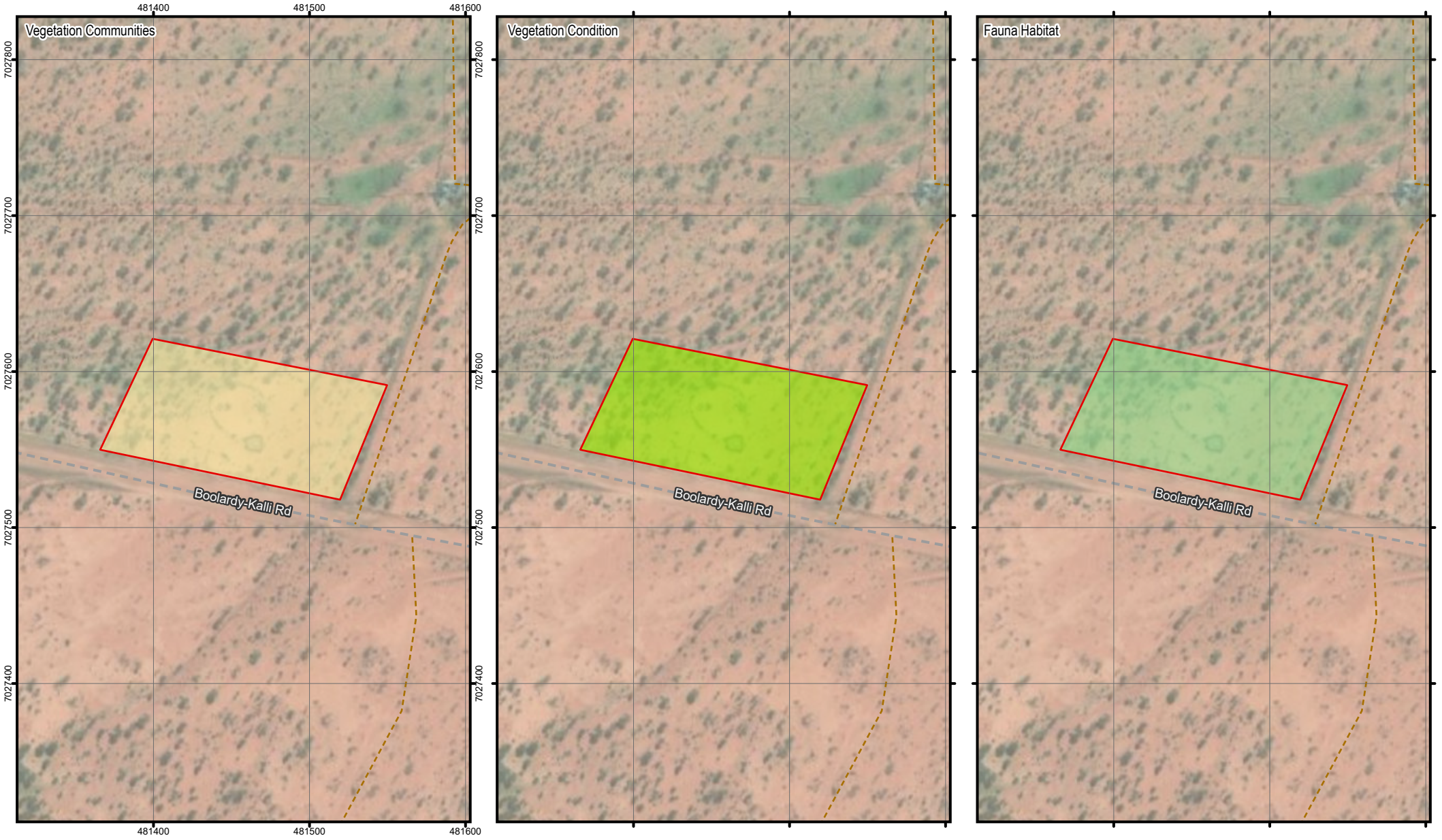
ECOLOGICAL ASSESSMENT – NOVEMBER 2022 - SQUARE KILOMETRE ARRAY

Figure 7.6

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(when printed at A4)

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Data sources:

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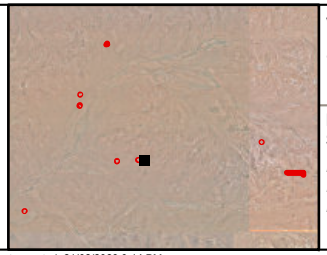
LEGEND

Survey Area

Vegetation Communities
AiAtEf

Vegetation Condition
Very Good

Fauna Habitat
Hardpan plain with intermittent sandplain



Vegetation Communities, Condition and Fauna Habitat - Pia Bubba

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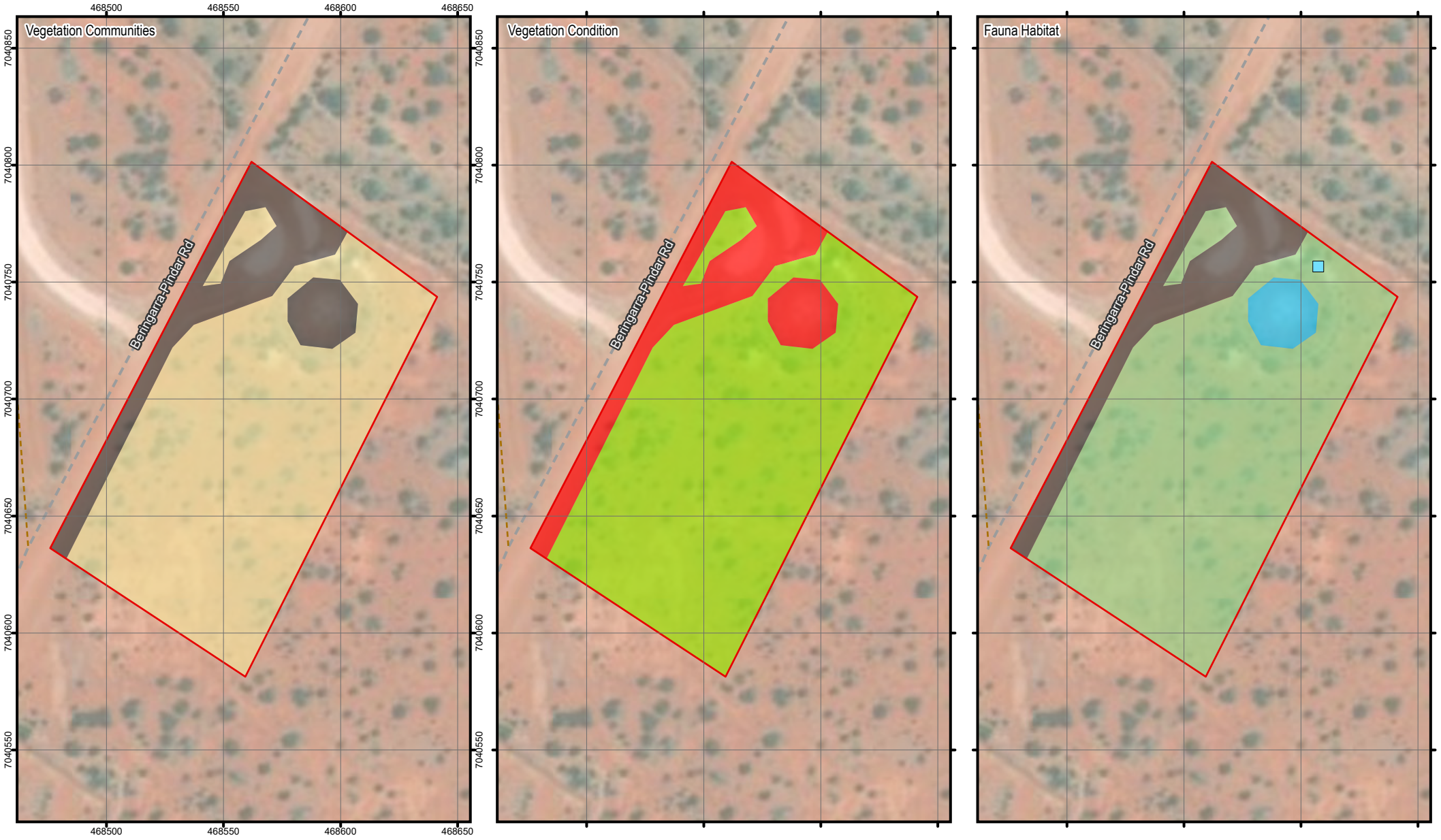
ECOLOGICAL ASSESSMENT – NOVEMBER 2022 - SQUARE KILOMETRE ARRAY

Figure 7.7

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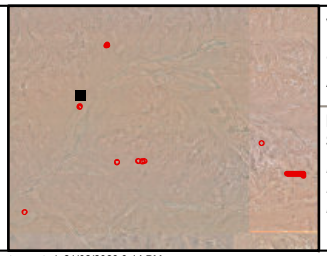
Survey Area

Vegetation Communities
- Cleared
- AiAtEf

Vegetation Condition
- Very Good
- Completely Degraded

Potential Conservation Significant Fauna Species

Fauna Habitat
- Channels and creek line
- Cleared
- Hardpan plain with intermittent sandplain



Vegetation Communities, Condition and Fauna Habitat - TN BP Road ASKAP Turnoff

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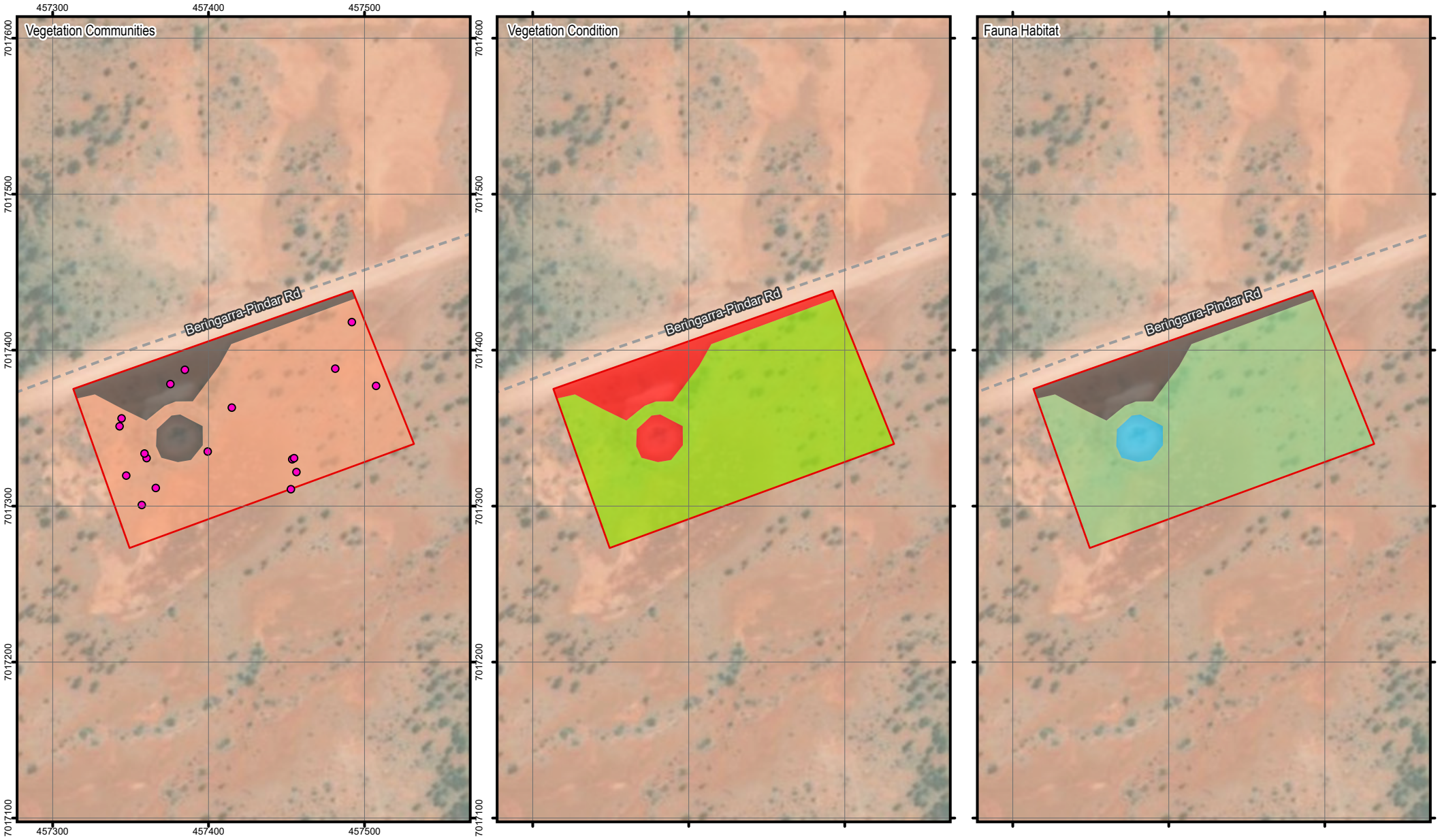
ECOLOGICAL ASSESSMENT – NOVEMBER 2022 - SQUARE KILOMETRE ARRAY

Figure 7.8

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Data sources:

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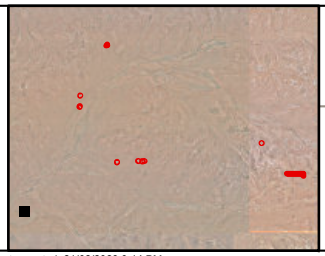
Survey Area

Priority Flora
- *Gunniopsis divisa*

Vegetation Communities
- ApAgEf
- Cleared

Vegetation Condition
- Very Good
- Completely Degraded

Fauna Habitat
- Channels and creek line
- Cleared
- Hardpan plain with intermittent sandplain



Vegetation Communities, Condition and Fauna Habitat - TN BP Road Constuction Camp

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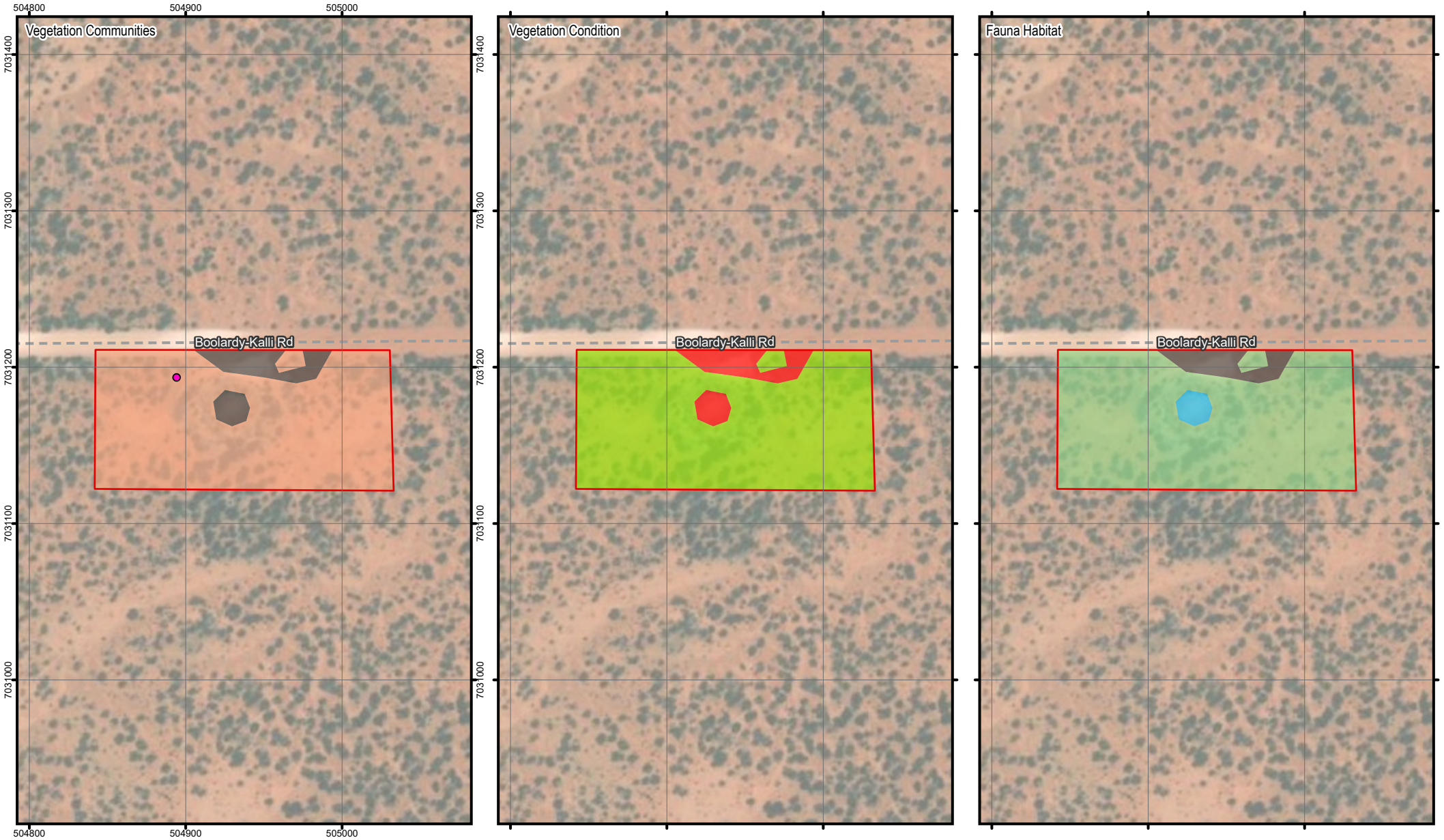
ECOLOGICAL ASSESSMENT – NOVEMBER 2022 - SQUARE KILOMETRE ARRAY

Figure 7.9

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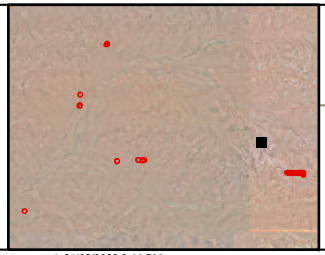
LEGEND
- Survey Area

Priority Flora
- *Gunniopsis divisa*

Vegetation Communities
- ApAgEf
- Cleared

Vegetation Condition
- Very Good
- Completely Degraded

Fauna Habitat
- Channels and creek line
- Cleared
- Hardpan plain with intermittent sandplain



Vegetation Communities, Condition and Fauna Habitat - TN Kalli Road East

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ECOLOGICAL ASSESSMENT – NOVEMBER 2022 - SQUARE KILOMETRE ARRAY

Figure 7.10

Project: \\na.aecomnet.com\lfs\APAC\Perth-AUPER1\Legacy\Projects\606X\60697524_SKA_Bio_Nov_2022\900_CAD_GIS\920_GIS\01_GIS\02_MXD_APRX\60697524_SKA_2022_Flora_Fauna_Survey.aprx (wyattk2), Layout: G60697524_Fig7_VegCommCondFauna_A4L_v1, Last exported: 21/02/2023 9:14 PM

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6.3 Fauna

6.3.1 Fauna Inventory

Fifty-nine fauna species were recorded during the November 2022 field survey comprising 46 bird, two mammal (including one introduced), three invertebrate, seven reptile and one amphibian species. The complete faunal species inventory is presented in Appendix D.

6.3.2 Conservation Significant Fauna

Four conservation significant fauna species were recorded during the survey. These include:

- Grey Falcon *Falco hypoleucos* (listed as Vulnerable under the EPBC and the BC Acts).
- Northern Shield-backed Trapdoor Spider *Idiosoma clypeatum* (listed as Priority 3 by the DBCA).
- Welcome Swallow *Hirundo neoxena*. (listed as Marine under the EPBC Act).
- Black-faced Cuckooshrike *Coracina novae-hollandiae* (listed as Marine under the EPBC Act).

6.3.2.1 Grey Falcon

The Grey Falcon *Falco hypoleucos* is listed under the EPBC Act and the BC Act as Vulnerable. One individual was observed gliding over low, open *Acacia* shrublands and woodlands within the Kalli Amended Corridor route. Distinctive colouring and identifiable features for the species were clearly observable; the Grey Falcon is characterised by a pale grey body, dark wing tips (visible from beneath) with bright yellow beak, legs, toes, eye-ring and cere (Marchant and Higgins, 1993; Morcombe, 2004). These features match the individual observed and are not comparable with any other bird of prey which occurs within Western Australia.

The species is known to frequent *Acacia* shrublands for hunting, particularly those that are crossed by seasonal tree-lined water courses (Schoenjahn, 2013, 2018; Morcombe, 2004). *Acacia* shrublands and woodlands were present and observed to contain many potential prey species, with water courses and dams occurring nearby. Water levels were lower and also in many locations completely absent within these water courses during the survey due to the gradually drying conditions.

The Grey Falcon is considered uncommon below the 26th parallel (TSSC, 2020). Despite this, there are several records on the Birdlife Australia and Atlas of Living Australia database (AoLA, 2023). It is likely that this species is an uncommon visitor, taking advantage of the optimal hunting conditions following high rainfall in the months preceding the survey. The high rainfall encouraged prolific growth of seed-bearing annual plants and increased numbers of insects within the region. This has in turn encouraged large numbers of small bird species, as evidenced by the 46 bird species recorded during the course of the survey, although this number had decreased from the September survey (AECOM, 2023). Smaller birds are the preferred prey of the Grey Falcon, the falcons gliding low across the shrublands to flush them out (Janse et al., 2015; Marchant and Higgins, 1993).

6.3.2.2 Northern Shield-backed Trapdoor Spider

Previous surveys by AECOM (2014, 2021) and a targeted survey by Phoenix (2015) recorded a trapdoor spider species (considered at the time to be *Idiosoma nigrum)*. The *Idiosoma* populations recorded through the Murchison bioregion are now regarded as the Northern Shield-backed Trapdoor Spider *I. clypeatum* (Priority 3) following a taxonomic review (Rix *et al,* 2018). Exact habitat requirements for this species are unknown. However, it generally occurs near the bases of *Acacia* or *Eremophila* (Tim Moulds Invertebrate Solutions, pers comm., 2020).

The species was searched for during the field survey, with nine trapdoor burrows identified (Figure 7). Only three burrows were intact and potentially active at the time of the survey, the remaining six burrows had been disturbed and the occupants predated on by a goanna. The three intact trapdoor burrows are shown below in Plate 5.



Plate 5 Intact and Potentially Active Trapdoor Spider Burrows

6.3.2.3 Western Spiny-tailed Skink *Egernia stokesii badia*

Western Spiny-tailed Skinks *Egernia stokesii badia* (listed under the EPBC Act as Endangered and under the BC Act as Vulnerable) are saxicolous (rock dwelling), occupying rock crevices in large, isolated rocky outcrops, typically granite (Duffield & and Bull, 2002). No granite outcrops were recorded in the survey area representing suitable habitat for the Western Spiny-tailed Skink, however some small areas of granite boulders and heaps were recorded.

The skink prefers deep rock crevices found in rocky outcrops, generally characterised by big boulders. These outcrops are generally isolated occurrences and have been recorded sporadically on Boolardy Station (AECOM, 2014; 2020). Due to the shallow depth of the crevices found within the granite boulders and heaps, at this time this habitat is unlikely to be considered suitable for the Western Spiny-tailed Skink.

6.3.2.4 Marine Species

Two species listed as Marine species were also observed during the field survey, Welcome Swallow *Hirundo neoxena* and Black-faced Cuckooshrike *Coracina novaehollandiae*. This status is given to species associated with coastal or marine environments that are not listed as threatened or migratory but are otherwise protected under the EPBC Act.

These “Other Matters” are protected under the EPBC Act in relation to activities on or in a Commonwealth area, or action outside Commonwealth land which may significantly affect the environment or species within Commonwealth land.

Both species are widespread and common, found in a broad range of habitat types throughout the country.

6.3.3 Introduced Fauna

One introduced fauna species was recorded, European Cattle *Bos primigenius taurus,* through indirect evidence such as scats and tracks.

6.3.4 Fauna Habitats

Fauna habitats throughout the survey area consisted of three habitat types; Hardpan Plains with Intermittent Sandplains, Channels and Creek Line and Granite Boulders and Heaps.

The dominant habitat type is Hardpan Plains with Intermittent Sandplains, is common throughout the surrounding landscape. Vegetation within this habitat is generally comprised of sparse Mulga woodlands, with no large trees and minimal dense understory. Small areas of dense thickets occur sporadically, with leaf litter accumulating beneath shrubs and trees. These locations provide refuges for small burrowing lizard species and nesting birds. Large areas of open shrublands also occur within this habitat type, providing suitable habitat for macropods and hunting grounds for predatory bird species.

The Channels and Creek Line habitat type includes both man-made and natural watercourses, containing varying levels of water at the time of the survey. These waterbodies provide an important resource within a dry landscape, attracting many different common bird, mammal and reptile species. Waterbodies were often surrounded by medium to large rocks, logs and low vegetation, providing a wider range of habitat complexity and microhabitats than the open areas of the surrounding landscape.

Granite Boulders and Heaps was restricted to small areas within the survey area. These small rocky areas provide suitable habitat for common reptile species in shallow crevices, however it is considered unsuitable for the Western Spiny-tailed Skink due to the lack of suitable shelter.

Fauna habitat types are mapped in Figure 7. Their descriptions and suitability for significant fauna species are presented in Table 17.

Table 17 Fauna Habitats of the Survey Area

Fauna Habitat	Habitat for Conservation Significant Fauna	Survey Area		Representative Photo
		Ha	%	
Hardpan Plain with Intermittent Sandplain The habitat type contained varying types and densities of vegetation, primarily of intermittent Mulga woodlands with open shrublands. The presence of logs (<30 cm in diameter) was sporadic, with occasional surface leaf litter and small stones. Mulga trees and compact shrubs facilitated dense litter under their canopy These islands of leaf litter provided suitable habitat for Trapdoor Spiders, evident in the nine occurrences recorded during the survey.	Suitable habitat for the Northern Shield-backed Trapdoor Spider *Idiosoma clypeatum,* with nine burrows (including 3 active) identified within this habitat type. May provide hunting habitat for Peregrine Falcon *Falco peregrinus.* Suitable hunting habitat for Grey Falcon *Falco peregrinus.* This species was observed flying over acacia shrublands within the hardpan plain with intermittent sandplain habitat type.	47.08	83.4	
Granite Boulders and Heaps Low hills of emergent granite and small rock piles of various sizes with scattered *Acacia* sp. and *Eremophila* sp. This habitat contains some leaf litter beneath vegetation, but does not contain a dense understorey, large trees, significant hollows or logs > 300 mm diameter. Granite mounds are low to the ground and only contain shallow crevices.	Unlikely to be suitable habitat for the Western Spiny-tailed Skink *Egernia stokesii badia*. Possible marginal habitat for the Northern Shield-backed Trapdoor Spider *Idiosoma clypeatum*.	3.93	7.0	

Fauna Habitat	Habitat for Conservation Significant Fauna	Survey Area		Representative Photo
		Ha	%	
Channels and Creek Line This habitat type includes waterbodies both man-made and natural within the survey area subject to seasonal flooding. Few of the waterbodies contained shallow standing water at the time of the survey. In this dried state, they share similar features with bare hardpan plains. The boundaries of the waterbodies generally included logs, rocks and low shrubs. Those still containing water were visited by small flocks of birds and had a greater abundance of plant species. Due to the ephemeral nature of these water bodies, their habitat value is strongly linked to the presence of water following rainfall events.	This habitat may seasonally provide marginal habitat for wading waterbird species including: • Curlew Sandpiper *Calidris ferruginea* • Long-toed Stint *Calidris subminuta* • Gull-billed Tern *Gelochelidon nilotica* • Australian Painted Snipe *Rostratula australis* • Wood Sandpiper *Tringa glareola* • Common Greenshank *Tringa nebularia*. These species are unlikely to permanently reside in the area and would not be dependent on this habitat type due to the small size and ephemeral nature of the waterbodies.	1.67	3.0	
TOTAL Area (including Cleared – 3.76 ha)		**56.44**	**100**	

7.0 Conclusions

Ecological assessments including a reconnaissance flora and vegetation and basic fauna assessment were undertaken within several discreet survey areas on Boolardy Station for the SKA Project in November 2022. The assessment included a desktop assessment, field surveys and data analysis. A summary of the of the results is presented below:

- No Threatened or Priority Ecological Communities were anticipated to occur and none were recorded.
- Three native vegetation communities were recorded and mapped. None are considered regionally significant as vegetation communities were widespread and common in the area. The area comprises largely of Acacia open woodland.
- The region was noted previously to be very dry and has been impacted from extensive historical grazing, despite being destocked more than four years ago. This has led to a reduced biomass, significant erosion, and compacted soil profile.
- Three Priority flora species were recorded, including *Eremophila muelleriana* P3, *Gunniopsis divisa* P3 and *Hemigenia tysonii* P3, with 33, 305 and 15 individuals recorded respectively.
- Three broad fauna habitats were defined and mapped; Granite Boulders and Heaps, Channels and Creek Lines and Hardpan Plains with Intermittent Sandplains.
- Four conservation significant fauna species were observed during the field survey:
    - Grey Falcon *Falco hypoleucos* (listed as Vulnerable under the EPBC Act and BC Act).
    - Northern Shield-backed Trapdoor Spider *Idiosoma clypeatum* (listed as Priority 3 by the DBCA).
    - Welcome Swallow *Hirundo neoxena* (listed as Marine under the EPBC Act).
    - Black-faced Cuckooshrike *Coracina novae-hollandiae* (listed as Marine under the EPBC Act).
- Marginal suitable habitat for the Western Spiny-tailed Skinks *Egernia stokesii badia* (listed under the EPBC Act as Endangered and under the BC Act as Vulnerable) was recorded, consisting of small granite boulders and rocks. Crevices within this habitat type are shallow and unlikely to represent critical habitat. No evidence of use by Western Spiny-tailed Skinks was identified.
- Nine Northern Shield-backed Trapdoor Spider *Idiosoma clypeatum* burrows were recorded, including three presumed to be active.

The Project was completed successfully with no limitations identified that may influence the results of the survey.

8.0 References

Atlas of Living Australia (AoLA), 2023. Online Resource. Available at: https://www.ala.org.au/. Accessed January 2023.

AECOM, 2014. Square Kilometre Array Ecological Assessment. Unpublished report prepared for Department of Industry.

AECOM, 2021. Square Kilometre Array Ecological Assessment. Unpublished report prepared for Department of Industry

AECOM, 2023. Ecological Assessment - November 2022 – Square Kilometre Array. Unpublished report prepared for Wajarri Enterprises Limited.

Alexander Holm & Associates, 2008. Environmental Assessment - Radio Astronomy Project, Murchison Region, Western Australia. Unpublished report prepared for Department of Industry and Resources.

Anonymous, 2010. Idiosoma nigrum. Form to nominate a Western Australian species for listing as threatened, change of category or delisting. Available from: http://www.smcl.com.au/pdf/TA%2015_B%20Weld%20Range%20I_%20nigrum%20DEC%20Nomination%202010.pdf.

Australian Faunal Directory (https://biodiversity.org.au/afd/home). Accessed 2022.

Bamford Consulting Ecologists. 2009. Three Springs to Eneabba Transmission Line Fauna Assessment. Unpublished report prepared for Western Power.

Beard JS, 1976, *Murchison 1:1 000,000 vegetation series: explanatory notes to sheet 6: the vegetation of the Murchison region*. Nedlands, WA University of Western Australia Press with assistance from the Interim Council for the Australian Biological Resource Study.

Benshemesh, J, 2007. National Recovery Plan for Malleefowl. Department for Environment and Heritage, South Australia.

BirdLife Australia, 2023. Find A Bird. Available at www.birdlife.org.au/all-about-birds/australias-birds/find-a-bird. Accessed January 2023.

BOM, 2022. Climate Statistics for Australian Locations. http://www.bom.gov.au/climate. Accessed December 2022.

CALM, 2002. Bioregional Summary of the 2002 Biodiversity Audit for Western Australia. Department of Conservation and Land Management, Perth, Western Australia.

Chapple DG, 2003. Ecology, Life-History, and Behavior in the Australian Scincid Genus Egernia, with Comments on the Evolution of Complex Sociality in Lizards. Herptological Monographs. 17:145-180.

Cogger H, Cameron E, Sadler & Eggler P, 1993. The Action Plan for Australian Reptiles. Australian Nature Conservation Agency, pp.254.

Curry PJ., Payne AL, Leighton KA, Hennig P, Blood DA, 1994, An Inventory and Condition Survey of the Murchison River Catchment, Western Australia. Technical Bulletin No. 84. Department of Agriculture, South Perth Western Australia.

Department of Agriculture, 1991, *Land Systems of the Murchison River Catchment and Surrounds*. Department of Land Administration, Western Australia.

Desmond A, Cowan M, Chant A, 2001, 'Murchison 2 (MUR2 – Western Murchison subregion)' in CALM 2002. Bioregional Summary of the 2002 Biodiversity Audit for Western Australia. Department of Conservation and Land Management, Perth, Western Australia.

DCCEEW, 2022. Species Profile and Threats Database. Available online at http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl. Accessed December 2022.

DotEE, 2021. National Vegetation Information System (NVIS). Online resource: https://www.environment.gov.au/land/native-vegetation/national-vegetation-information-system. Accessed January 2023.

Duffield GA, & Bull CM, 2002. Stable social aggregations in an Australian lizard, *Egernia stokesii*. Naturwissenschafte 89, 424–427.

Ecologia Environment, 2009. Shield-back spider *Idiosoma nigrum* Survey. Weld Range Iron Ore Project. Sinosteel Midwest Corporation. Available from: http://www.smcl.com.au/pdf/TA_15_The_Shieldback_Spider_Idiosoma_nigrum_Survey_2009.pdf.

EPA, 2020. Technical Guidance – Terrestrial Fauna Surveys for Environmental Impact Assessment. EPA, Western Australia.

EPA, 2016. Technical Guidance – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment. EPA, Western Australia.

Gibson, DF, 1986. A Biological Survey of the Tanami Desert in the Northern Territory. Technical Report. 30. Alice Springs, Northern Territory, Conservation Commission of the Northern Territory.

Govt. of WA, 2019. 2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report). Current as of March 2019. WA Department of Biodiversity, Conservation and Attractions, Perth.

Higgins PJ & Davies SJJF, eds, 1996. Handbook of Australian, New Zealand and Antarctic Birds. Volume Three - Snipe to Pigeons. Melbourne, Victoria: Oxford University Press.

IBRA7, 2012. Interim Biogeographic Regionalisation for Australia, Version 7. Available at http://www.environment.gov.au/system/files/pages/5b3d2d31-2355-4b60-820c-e370572b2520/files/bioregions-new.pdf.

Keighery BJ, 1994. Bushland Plant Survey - A Guide to Plant Community Survey for the Wildflower Society of WA (inc) Nedlands WA.

Janse, I., Kloecker, U., Roshier, D. and Witte, I, 2015. Breeding diet and behaviour of a pair of Grey Falcons Falco hypoleucos and their offspring in north-western New South Wales. Corella 39: 46–51

Longmore, N.W, 1978. Avifauna of the Rockhampton area, Queensland. Sunbird. 9:25-53.

Marchant, S. & Higgins, P, 1990. Handbook of Australian, New Zealand and Antarctic Birds. Volume One - Ratites to Ducks. Melbourne, Victoria: Oxford University Press.

Morcombe, M, 2004. Field Guide to Australian Birds. Steve Parish Publishing.

Office of Environment and Heritage (OoEH), 2018.

Parsons, 2008. Malleefowl in the fragmented Western Australian wheatbelt: spatial and temporal analysis of a threatened species. PhD Thesis. School of Animal Biology. University of Western Australia, Perth.

Phoenix Environmental Sciences (Phoenix), 2015. Reconnaissance survey for the Shield-backed Trapdoor Spider (*Idiosoma nigrum*) for the Square Kilometre Array. Prepared for AECOM Pty Ltd. February 2015.

Pizzey G, & Knight F, 2007. The Field Guide to Birds of Australia. Ed. P. Menkhorst. HarperCollinsPublishers Australia Pty Ltd.

Rix MG, Huey JA, Cooper SJ, Austin AD, & Harvey MS, 2018. Conservation systematics of the shield-backed trapdoor spiders of the nigrum-group (Mygalomorphae, Idiopidae, Idiosoma): integrative taxonomy reveals a diverse and threatened fauna from south-western Australia. ZooKeys, (756), 1.

Schoenjahn, J, 2013. A hot environment and one type of prey: investigating why the Grey Falcon (*Falco hypoleucos*) is Australia's rarest falcon. Emu 113: 19–25.

Schoenjahn, J., 2018. Adaptations of the rare endemic Grey Falcon *Falco hypoleucos* that enable its permanent residence in the arid zone of Australia. PhD Thesis. University of Queensland

Storr, G.M, 1977. Birds of the Northern Territory. Special Publications of the Western Australian Museum. 7:1-130.

Tille P, 2006, *Soil Landscapes of Western Australia's Rangelands and Arid Interior*. Department of Agriculture and Food, State of Western Australia.

Van Dyck S, & Strahan R, 2008. The Mammals of Australia Third Edition. Reed New Holland: Chatswood, New South Wales.

WA Herbarium, 1998-. Florabase – The Western Australian Flora. Online resource available at https://florabase.dpaw.wa.gov.au/ Accessed June 2022.

Western Australian Museum, 2022. Checklist of the Terrestrial Vertebrate Fauna of Western Australia, Department of Terrestrial Zoology: Western Australian Museum.

Woinarski JCZ, Tidemann SC, Kerin S, 1988. Birds in a tropical mosaic: the distribution of bird species in relation to vegetation patterns. Wildlife Research. 15:171-96.

Appendix A

Desktop Results
A1 Flora Desktop
A2 Fauna Desktop

Appendix A1 - Flora Desktop Results

Species	WA Cons. Code	Habitat[1]	Likelihood	Justification	Count Date
Acacia atopa	P3	Red clay & red loam. Sometimes in rocky situations. Distributed in the Canarvon, Gascoyne and Murchison IBRA Regions	Unlikely	Located 38 km from SW arm of survey corridor, habitat may be present in survey area	1/10/2011
Acacia dilloniorum	P1	Found on red clay loam over exposed dolerite outcropping in Weld Range	Unlikely	Located on adjacent BIF range, located outside project area	25/08/2011
Acacia sp. Jack Hills (R. Meissner & Y. Caruso 4)	P1	Tall shrub to 2 m high, found on rocky banded iron formation on Jack Hills within the Shire of Meekatharra	Unlikely	Located 47 km from N arm of survey corridor, on BIF outcropping	21/11/2013
Acacia sp. Muggon Station (S. Patrick & D. Edinger SP 3235)	P2	Erect, single-stemmed tuberous, perennial, herb (with succulent green leaves), to 0.1 m high. Fl. white, Sep. Sand patches inside rocks, brown sandy clay, granite. Depressions in rock outcrops, breakaways, flats.	Unlikely	Located 37 km from survey area, habitat may be present	24/08/2008
Acacia speckii	P4	Decumbent or ascending annual, herb, 0.06-0.1(-0.21) m high. Fl. yellow, Sep to Dec. Sandy or clayey soils. Salt swamps & pans. More records towards coast i.e. Shark Bay	Unlikely	Habitat may be present, but located a substantial distance from Survey Area	15/07/2010
Anacampseros sp. Eremaean (F. Hort, J. Hort & J. Shanks 3248)	P1	Low rounded shrub, to 1 m high. Fl. pink, Aug. Brown loam. Breakaway. 400+ km west of Wiluna.	Unlikely	Recorded long distance from survey area, only one record	19/08/2008
Angianthus microcephalus	P2	Decumbent or ascending annual, herb, 0.06-0.1(-0.21) m high. Fl. yellow, Sep to Dec. Sandy or clayey soils. Salt swamps & pans.	May	Recorded in survey area, very old record	28/10/1953
Baeckea sp. Mount Barloweerie (J.Z. Weber 5079)	P1	Shrub, 0.4-0.75 m high. Fl. pink/white, Aug or Oct. Sandy clay.	May	Recorded close to suvey area, habitat present	30/08/2008
Beyeria lapidicola	P1	Shrub to 1 m high, found on ironstone outcrops/breakaways on the midslopes of ranges. Found in three disjointed areas across the midwest of Western Australia (inlcuding Weld Range)	Unlikely	Located on Weld Range, far from survey area.	10/03/2009
Calandrinia butcherensis	P1	Red sands on flats	Likely	Located directly adjacent to survey area, habitat present	18/10/2016
Calandrinia sp. Boolardy Station (P. Jayasekara 719-JHR-01)	P1	Flat. Low plain. Red/orange sand/clay.	Likely	Recorded close to survey area between the two southern arms.	18/10/2006
Calotis sp. Perrinvale Station (R.J. Cranfield 7096)	P3	Red Loam and red-orange sand clay-loam over banded ironstone formation	Unlikely	Long distance >30km from survey area, habitat may be present	9/09/2016
Calytrix verruculosa	P3	Sandy clay.	Unlikely	Unlikely, habitat 30 km from survey area	15/09/2009
Chamelaucium sp. Yalgoo (Y. Chadwick 1816)	P1	Granite outcrops	Unlikely	Far from survey area >60 km	12/09/2009
Chthonocephalus muellerianus	P2	Red sand.	Unlikely	Unlikely, habitat 30 km from survey area	11/09/2016
Dicrastylis linearifolia	P3	Red sand. Sandplain.	Unlikely	Old record, >30 km from survey area	4/11/1997
Dicrastylis sp. Cue (A.A. Mitchell 764)	P1	Drainage area, near granite. Located in the Cue Local Government Area	Unlikely	Old record, >30 km from survey area	17/10/1980
Dodonaea amplisemina	P4	Red-brown sandy clay on basalt and gabbro and banded ironstone or on dolerite and quartzite. Rocky hills.	Unlikely	Located on Weld Range, far from survey area.	16/08/2009
Drosera eremaea	P1	Prostrate annual, herb, flowers minute. Fl. brown/brown &yellow, Aug to Sep. Red loam or clay. Near water.	Unlikely	Located on Weld Range, far from survey area, old record	21/07/1981
Eleocharis papillosa	P3	Red clay over granite, open clay flats. Claypans.	Unlikely	Long distance from survey area, relatively old record	19/08/1999
Eremophila margarethae subsp. straight sepals (G. Cockerton & B. McLean LCH 31310)	P1	On top of banded ironstone hill found in one location on a banded ironstone hill, at Jack Hills, Meekatharra	Unlikely	Long distance >40 km from survey area	25/08/2011
Eremophila muelleriana	P3	Red sand, sandy clay, lateritic sand. Flats, sand dunes, hills.	Likely	Recorded within the Project area directly adjacent to the survey area, habitat present	7/10/2016
Eremophila obliquisepala	P3	Sand. Open hardpan plains in Meekatharra and Upper Gascoyne	Unlikely	Located >40 km from survey area	10/05/1995
Eremophila rhegos	P1	Skeletal stony loam over granite. Meekatharra and Upper Gascoyne	Unlikely	Only recorded at Mt Weld	2/08/1995
Eremophila shonae subsp. *diffusa*	P3	Stony yellow or red sandy soils. Found in the Gascoyne and Murchison IBRA regions	Unlikely	Only recorded at Mt Weld	11/06/2009
Eremophila simulans subsp. *megacalyx*	P3	Found on rangeland plains road verge with red, sandy gravel laterite.	Likely	Recorded within survey area	16/08/2009
Eremophila sp. Ironstone (G. Cockerton & B. McLean LCH 31311)	P1	Open, densely-leaved shrub, 0.3-0.6 m high. Laterite. Hills, salty places.	Unlikely	One record, over 50 km from survey area on BIF outcropping	25/08/2011
Eremophila sp. Murgoo (S.J.J. Davies s.n. 15/8/1960)	P3	Shrub, 0.5-2.3 m high, sometimes widely spreading with several stems or branches from the base. Red-orange sandy clay, orange-yellow sandy clay to clayey loam, coarse gravel, banded ironstone, laterite, quartz, basalt. Gently undulating plains, dry creek beds, hillcrests, ridges.	Unlikely	Old record, far from survey area	15/08/1960
Frankenia confusa	P4	Low, diffuse shrub, to 0.75 m high, to 0.75 wide. Fl. pink, Sep. Wet pale brown sand, brown clay, grey soil. Banks of rivers & waterholes, river floodplains.	May	Recorded during 2014 surveys however suitable habitat unlikely to be present.	19/09/1997
Goodenia berringbinensis	P4	Red sandy loam. Along watercourses.	Unlikely	Recorded >30 km from survey area	12/06/2009
Goodenia grandiflora	P1	Sandy, gravelly soils. Rocky slopes & breakaways.	Unlikely	Only recorded at Mt Weld	23/08/2006
Goodenia neogoodenia	P4	Red loam or clay. Near water.	May	Recorded near survey area, habitat may be present	19/08/1999

Appendix A1 - Flora Desktop Results

Species	WA Cons. Code	Habitat[1]	Likelihood	Justification	Count Date
Grevillea inconspicua	P4	Erect shrub, 0.2-0.5 m high. Fl. white-cream, Sep. Red sandy soils.	Unlikely	Only recorded at Mt Weld	24/06/2011
Gunniopsis divisa	P3	Loam, quartz. Roadsides. IN the Murchison, Yalgoo IBRA regions	Likely	Recorded during 2014 surveys.	10/09/2016
Hemigenia exilis	P4	Prostrate herb. Fl. white, Sep to Oct. Sandy soils. Colluvial plains.	Unlikely	Recorded >40 km from survey area	24/08/2011
Hemigenia tysonii	P3	Red Sands, plains and gently undulating dunes.	Likely	Recorded during 2014 surveys, suitable habitat may be present.	8/09/2016
Hemigenia virescens	P3	Brown very rocky sand, on Beebyn and Madonga stations. In the Shire of Meekatharra	Unlikely	Recorded adjacent to Weld Range, long way from survey area	7/03/2011
Hibiscus krichauffianus	P3	Red sandy soils in disjointed populations recorded across the arid areas of Gascoyne, Wheatbelt and Nullabor Plain	Unlikely	Old record, far from survey area	/03/1981
Hibiscus sp. Nookawarra Station (S.J.J. Davies s.n. 1/3/1960)	P1	Found on breakaways in three locations within the Murchison Local Government Area	Unlikely	Recorded far from survey area, old record	26/03/1971
Homalocalyx echinulatus	P3	Shrub, to 1 m high, differs from other varieties in the linear acuminate leaves 6-20 mm long; cilia to 1.2 mm long. Fl. other, Sep to Oct. White sand, gravel. Open woodland. More common north east of Perth.	Unlikely	Recorded at Weld Range, far from survey area	13/09/2009
Indigofera eriophylla	P1	Sand on rises in the Canarvon and Murchison Local Governnement Areas	Unlikely	Recorded 25 km from survey area SW arm, habitat likely to be present	5/10/2016
Indigofera fractiflexa subsp. *augustensis*	P2	Crest of banded ironstone with shallow red brown sandy loam soils.	Unlikely	Recorded >50 km from survey area on BIF	24/08/2005
Lepidium scandens	P3	Red sand, clay.	Unlikely	Old records, far from survey area	23/08/1931
Maireana murrayana	P3	Red clayey sand, dissected sandstone in the Murchison, Meekatharra and Upper Gascoyne Local Government Areas	Unlikely	Old records, within 10 km of survey area	20/09/1971
Maireana prosthecochaeta	P3	Laterite. Hills, salty places in the Central Kimberley, Gascoyne and Murchison IBRA regions	Unlikely	Recorded within survey area, record date not available	-
Micromyrtus placoides	P3	Red-orange sandy clay, orange-yellow sandy clay to clayey loam, coarse gravel, banded ironstone, laterite, quartz, basalt. Gently undulating. In the Cue, Greater Geraldton and Murchison Local Government Areas	May	Recorded 11 km from survey area, suitable habitat may be present in survey area	27/08/2008
Neotysonia phyllostegia	P1	Found in 1908 and 1910 on Mount Narryer	Unlikely	Very old record	/09/1910
Petrophile pauciflora	P3	Decaying & dissected granite breakaways.In the inland semi-arid Midwest region of Western Australia	Unlikely	Recorded within 10 km of survey area, suitable habitat not present, old records	9/10/2016
Petrophile vana	P1	Shallow, white, gritty clay-soil pockets, laterite. Breakaways.	Unlikely	Recorded far from survey area, old records	17/09/1987
Philotheca citrina	P1	Granite breakaways in the Murchison LGA	Unlikely	Recorded within 10 km of survey area, habitat present	10/09/2016
Phyllanthus baeckeoides	P3	Red lateritic & sandy clay soils. Granite outcrops. In the Eastern Murchison, Shieldand Western Murchison IBRA subregions	Unlikely	Recorded at Weld Range, far from survey area	28/08/2005
Prostanthera ferricola	P3	Shallow red-brown skeletal sandy loam on banded ironstone, laterite, basalt or quartz. Gently inclined mid to upper slopes of hills, rocky crests, outcrops.	Unlikely	Recorded on Mt Weld and northern BIF hil, both far from survey area	29/08/2007
Prostanthera petrophila	P3	Lateritic soil	Unlikely	Recorded on BIF hills far from survey area,	10/09/2006
Prostanthera tysoniana	P3	Red sandy soils in the Murchison LGA	May	Recorded close to survey area. Suitable habitat may be present	8/09/2016
Psammomoya ephedroides	P3	Deep yellow or red sandy loams.	Unlikely	Recorded far from survey area	4/10/2016
Ptilotus beardii	P3	Clayey soils. Saline flats, low breakaways.	Likely	Recorded during 2014 surveys, suitable habitat present.	14/10/2016
Ptilotus crosslandii	P3	Sandy soils. Colluvial plains in the Murchison and Upper Gascoyne LGAs	Unlikely	Recorded in survey area, extremely old record	26/02/1905
Ptilotus lazaridis	P3	Clay loam. Floodplains.	Unlikely	Recorded >70 km from survey area	/08/1985
Sauropus sp. Woolgorong (M. Officer s.n. 10/8/94)	P3	Red sand. Plains.	Likely	Recorded during 2014 surveys, suitable habitat present.	13/10/2016
Solanum pycnotrichum	P2	Banded Iron outcrops and shallow dry creeklines forming shallow gully on rocky siltstone hills. Red silty clay soil.	Unlikely	Habitat present within survey area, recorded within 14 km of survey area	27/08/2008
Stackhousia clementii	P3	Skeletal soils. Sandstone hills. Sparsely distributed across Northern Western Australia north or Geraldton	Unlikely	Old record, >50 km from survey area	19/06/1985
Stenanthemum patens	P1	Rocky hillsides in the Murchison IBRA region	Unlikely	Recorded at Weld Range, far from survey area	24/08/2011
Verticordia jamiesonii	P3	Sandy clay soils. Lateritic breakaways.	Likely	Recorded during 2014 surveys, suitable habitat present.	15/08/2009
Wurmbea murchisoniana	P4	Clay, sandy clay, loam. Seasonally inundated clay hollows, rock pools.	May	Recorded 83 km from survey area	25/08/1988
Wurmbea sp. Muggon (T.D. Macfarlane & R. Davis TDM 3336)	P1	Stony slope of weathered sandstone.	Unlikely	Recorded 55 km from survey area	28/05/2014

1. Habitat derived from DCCEEW (2022) and Florabase (WAH, 1998-) unless otherwise cited

Appendix A2 - Fauna Desktop Assessment

Scientific Name	Common Name	Conservation Status		DBCA		PMST	Ecology	Assessment					Likelihood of Occurrence	Reasoning for likelihood or exclusion	Source
		State	Federal	Last Record	Total Records			Within Survey Area	Recent Record (<20 years)	Within 30 km	Suitable habitat (0,1,2)	Total Score			
Actitis hypoleucos	Common Sandpiper	MI	Ma, MI	1980	2	+	The Common Sandpiper is widespread throughout Australia, with few important sites on the continent. They visit Australia during the non-breeding season. Preferred habitat is coastal wetlands with muddy margins or rocky shores but has also been recorded in inland wetlands and dams (DCCEEW, 2022).	0	0	1	1	2	Low (Unlikely)	Marginal habitat and no recent records.	DBCA 2020
Aspidites ramsayi	Woma	P1	E	-	DBCA consideration requested	-	The south west Woma subpopulation is distributed from North to Yuna, south to Boddington, inland to Menzies and east to the western edge of the Nullarbor Plain (Cogger *et al* ., 1993). The species is nocturnal and primarily inhabits sandplains characterised by woodlands, shrublands, or heath, often with spinifex. but may also inhabit rocky areas as well.	0	0	0	2	2	Moderate (Possible)	Recent record of similar species (*Aspidites melanocephalus*) was reported in 2022 450km outside of known range on neighbouring station Wooleen. DBCA has also requested special consideration for this species.	DBCA 2020 (email)
Calidris acuminata	Sharp-tailed Sandpiper	MI	Ma, MI	1978	3	+	They are widespread in Western Australia from the Pilbara region to the south-west. They prefer muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation (DCCEEW, 2022).	0	0	1	1	2	Low (Unlikely)	Far inland, habitat present in riverine sections of survey area	DBCA 2020
Calidris ferruginea	Curlew Sandpiper	CR	CE	1978	2	+	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas and less often recorded inland around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand (DCCEEW, 2022).	0	0	1	1	2	Low (Unlikely)	Habitat present within survey area and the survey area is within the species known distribution.	DBCA 2020
Calidris melanotos	Pectoral Sandpiper	MI	Ma, MI	-	-	+	The Pectoral Sandpiper occupies shallow, fresh waters often containing low grass or other small herbs. It is also observed in swamp margins, flooded pastures and saltmarshes. This species breeds in the northern hemisphere and is a regular though uncommon summer visitor to Australia (Pizzey & Knight, 2007). Rarely recorded in Western Australia (DCCEEW, 2022).	0	0	0	1	1	Low (Unlikely)	No records, rare visitor to Australia	PMST
Calidris subminuta	Long-toed Stint	MI	Ma, MI	1978	3	-	In Western Australia this species is found mainly along the coast, with a few scattered inland records. It is distributed along most of the Australian coastline with large densities on the Victorian and Tasmanian coasts. The Red-necked Stint has been recorded in all coastal regions, and found inland in all states when conditions are suitable.	0	0	1	1	2	Low (Unlikely)	Habitat present within survey area and the survey area is within the species known distribution.	DBCA 2020
Chalcites osculans	Black-eared Cuckoo	MI	Ma, MI	-	-	+	The Black-eared Cuckoo is widespread on mainland Australia, but avoids the wet, heavily forested areas on the east coast and the south-west corner of Western Australia. It is an occasional vagrant to offshore islands and Tasmania. The Black-eared Cuckoo is found in drier country where species such as mulga and mallee form open woodlands and shrublands. It is often found in vegetation along creek beds (BirdLife, 2021).	0	0	0	1	1	Low (Unlikely)	Habitat present within survey area and the survey area is within the species known distribution. However, no records of the species within the search area	PMST
Egernia stokesii sub	Western Spiny-tailed Skink	VU	E	2013	45	+	The Western Spiny-tailed Skink occupies rock crevices in large, isolated rocky outcrops, typically granite (Duffield & and Bull, 2002). Crevices occupied by the black form of Western Spiny-tailed Skink are usually identifiable by a “latrine” or scat pile, resulting from regular defecation of all family members, in close proximity to the entrance (Chapple, 2003).	0	1	1	2	4	High (Likely)	Recorded in nearby locations during 2014 and 2020 surveys. Suitable habitat may be present in the survey area.	DBCA 2020
Falco hypoleucos	Grey Falcon	VU	V	-	-	+	The Grey Falcon is a rare, pale grey inland falcon that inhabits inland plains, gibber deserts, pastoral lands and timbered watercourses (Pizzey & Knight, 2007).	0	0	0	2	2	Moderate (Possible)	Habitat present within survey area and the survey area is within the species known distribution. However, no records of the species within the search area	PMST
Falco peregrinus	Peregrine Falcon	OS	-	2011	7	-	The Peregrine Falcon inhabits a vast array of environs in Australia. Usually uncommon and migratory (Pizzey & Knight, 2007). This species lays its eggs in recesses of cliff faces, tree hollows or large abandoned nests (Bamford, 2009)	0	0	1	2	3	Moderate (Possible)	Habitat present, relatively recent records	DBCA 2020
Gelochelidon nilotica	Gull-billed Tern	MI	MI	2006	12	-	Gull-billed Terns are found in freshwater swamps, brackish and salt lakes, beaches and estuarine mudflats, floodwaters, sewage farms, irrigated croplands and grasslands. They are only rarely found over the ocean (DCCEEW, 2022).	0	0	1	1	2	Low (Unlikely)	Relatively old records, few records, habitat sporadically present (dependent on cyclonic rainfall)	DBCA 2020
Hypseleotris aurea	Golden Gudgeon	P2	-	-	DBCA consideration requested	-	Inhabits rocky pools amongst dense clumps of submerged water weeds and dead branches. Presumably the species has a high tolerance to increased salinity levels and water temperatures, which typically occur in the habitat during drought periods. The species is found in the Murchison and Gascoyne Rivers of south-central Western Australia.	0	0	0	1	1	Low (Unlikely)	Habitat not likely to be present within survey area and the survey area is not within the species known distribution. DBCA has also requested special consideration for this species.	DBCA 2020 (email)
Idiosoma clypeatum	Northern Shield-backed Trapdoor Spider	P3	-	2014	847	-	*Idiosoma clypeatum* has a widespread distribution in Western Australia’s inland arid zone, principally throughout the Yalgoo and Murchison bioregions where it is the only known species in the nigrum-group. It extends from near Paynes Find, the Blue Hill Range, Kadji Kadji Nature Reserve, and Karara in the south, north and north-east to at least Coolcalalaya Homestead, Jack Hills, Albion Downs, Yakabindie, and Yeelirrie. This distribution seems to be strongly correlated with annual rainfall of less than 250 mm (Rix *et al.* , 2018).	0	1	1	2	4	High (Likely)	Many records, habitat present in survey area, within species distribution, recorded in survey area	DBCA 2020
Idiosoma nigrum	Shield-backed Trapdoor Spider, Black Rugose Trapdoor Spider	EN	V	-	-	+	The Shield-backed Trapdoor Spider is endemic to semi-arid south-west Western Australia (WA). It occurs in a number of severely fragmented populations in the central and northern Wheatbelt (e.g. Minnivale and East Yorkrakine). In the Wheatbelt, the Shield-backed Trapdoor Spider typically inhabits clay soils whereas the arid Midwest populations are associated with rocky habitats, primarily in positions with increased moisture retention properties like gullies and drainage lines on southern facing slopes (Anonymous, 2010; Ecologia Environment, 2009).	0	0	0	1	1	Negligible	Habitat present within survey area and the survey area is not within the species known distribution. No records of the species within the search area	PMST

Scientific Name	Common Name	Conservation Status		DBCA		PMST	Ecology	Assessment					Likelihood of Occurrence	Reasoning for likelihood or exclusion	Source
		State	Federal	Last Record	Total Records			Within Survey Area	Recent Record (<20 years)	Within 30 km	Suitable habitat (0,1,2)	Total Score			
Leipoa ocellata	Malleefowl	VU	VU	-	1	-	It is found principally in the semi-arid to arid zone in shrublands and low woodlands dominated by mallee and associated habitats such as such as Broombush (*Melaleuca uncinata*) and Scrub Pine (*Callitris verrucosa*). In WA Malleefowl distribution was associated with landscapes that had lower rainfall, greater amounts of mallee and shrubland that occur as large remnants, and lighter soil surface textures (Benshemesh, 2007). At a finer scale, malleefowl occurrence was associated with mallee/shrubland and thicket vegetation with woodland representing poor habitat for the species (Parsons, 2008).	0	0	0	1	1	Low (Unlikely)	Unlikely due to lack of records and no evidence of species presence during 2014 survey	DBCA 2020
Merops ornatus	Rainbow Bee-eater	MI	Ma, MI	-	-	+	The Rainbow Bee-eater occurs in open woodlands and shrublands, including mallee, and in open forests that are usually dominated by eucalypts. It also occurs in grasslands and, especially in arid or semi-arid areas, in riparian, floodplain or wetland vegetation assemblages (Gibson 1986; Longmore 1978; Storr 1977; Woinarski et al. 1988).	0	0	0	1	1	Low (Unlikely)	No recent records, seasonal visitor, suitable habitat may be present.	PMST
Motacilla cinerea	Grey Wagtail	MI	Ma, MI	-	-	+	The Grey Wagtail is a scarce but regular visitor to northern Australia, typically arriving in October and leaving in March. The species is most commonly associated with water and are found across a wide variety of wetlands, watercourses and on the banks of lakes and marshes (Referral guideline for 14 birds listed as migratory species under the EPBC Act, (DCCEEW, 2022).	0	0	0	1	1	Low (Unlikely)	On edge of the species distribution, habitat present within survey area, no records with search area	PMST
Motacilla flava	Yellow Wagtail	MI	Ma, MI	-	-	+	The yellow wagtail favours wet meadows, marshland, grassy and muddy lakeshores. Within WA the species is mostly found on the north coast (Birdlife, 2023; AoLA, 2023)	0	0	0	1	1	Low (Unlikely)	On edge of the species distribution, habitat not present within survey area, no records with search area	PMST
Ninox connivens subsp. connivens	Barking Owl (southwest pop P2), Barking Owl	P2	-	-	-	-	Barking Owls are nocturnal birds, although they may sometimes be seen hunting during the day (Birdlife Australia, 2021). Barking Owls are found in open woodlands and the edges of forests, often adjacent to farmland. They are less likely to use the interior of forested habitat. They are usually found in habitats that are dominated by eucalytpus species, and prefer woodlands and forests with a high density of large trees and particularly sites with hollows. *Ninox connivens* subsp. *connivens* occurs in eastern, south-eastern and south-western Australia (Birdlife Australia, 2023).	0	0	0	0	0	Negligible	Unlikely due to unsuitable habitat.	NatureMap
Ogyris subterrestris petrina	Arid Bronze Azure Butterfly	CR	CE	-	DBCA consideration requested	-	At the two known extant sites where this butterfly occurs, the vegetation is mature mixed gimlet *Eucalyptus salubris / E. salmonophloia* woodlands on red-brown loam soils, with an open understorey. In addition to gimlet and salmon gum, other smooth-barked eucalyptus at these sites which have basal ant colonies include *E. capilosa wandoo*, smooth-barked *E. loxophleba lissophloia* and *E. sheathiana*. The species is dependent on a host ant species (*Camponotus* sp. nr. *terebrans)* to raise its young (DCCEEW, 2022).	0	0	0	1	1	Low (Unlikely)	Host ant species may occur in the survey area, unlikely though given the limited records of this species. DBCA has also requested special consideration for this species.	DBCA 2020 (email)
Oxyura australis	Blue-billed Duck	P4	-	2009	2	-	The Blue-billed Duck is endemic to south eastern and south western Australia. It prefers deep water in large permanent wetlands and swamps with aquatic vegetation. This species of duck is fully aquatic and rarely comes onto land (DCCEEW, 2022).	0	0	1	1	2	Low (Unlikely)	Relatively old records, few records, habitat unlikely to be present. DBCA has also requested special consideration for this species.	DBCA 2020
Pezoporus occidentalis	Night Parrot	CR	E	-	-	-	Night parrot roosting and nesting sites are in clumps of dense vegetation, primarily old and large spinifex (Triodia) clumps, but sometimes other vegetation types including salt bushes. Often the vegetation in these habitats will be naturally fragmented and therefore well protected from fire. Little is known about foraging sites, but favoured sites are likely to vary across the range of the species.	0	0	0	0	0	Negligible	Survey area within the medium priority search area for this species, however suitable habitat is unlikely.	DBCA 2020 (email)
Plegadis falcinellus	Glossy Ibis	MI	Ma, MI	2006	4	-	Within Australia, the Glossy Ibis is generally located east of the Kimberley in Western Australia and Eyre Peninsula in South Australia. The species is also known to be patchily distributed in the rest of Western Australia. The Glossy Ibis' preferred habitat for foraging and breeding are fresh water marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. Glossy Ibis roost in trees or shrubs usually near, but sometimes far, from water bodies (Marchant & Higgins, 1990).	0	0	1	1	2	Low (Unlikely)	Seasonal Visitor, low likelihood of occurrence	DBCA 2020
Rostratula australis	Australian Painted Snipe	EN	EN	2015	5	+	The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains (DCCEEW, 2022).	0	1	0	1	2	Moderate (Possible)	Only one record >15km from survey area.	DBCA 2020
Sminthopsis longicaudata	Long-Tailed Dunnart	P4	-	-	DBCA consideration requested	-	The Long-tailed Dunnart inhabits exposed rock and stony soils with hummock grasses and shrubs. Flat-topped hills, lateritic plateaus, sandstone ranges and breakaways. Sparse mulga over spinifex. The species has been recorded in distjunct populations across arid Australia with populations recorded in the southern Canarvon Basin (DCCEEW, 2022).	0	0	0	1	1	Low (Unlikely)	The habitat for the species could be present within the survey area, the survey area falls within the species distribution, however the closest ALA records are >100km from the survey area	DBCA 2020 (email)
Tringa glareola	Wood Sandpiper	MI	Ma, MI	1978	2	-	The Wood Sandpiper uses well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes. They are typically associated with emergent, aquatic plants or grass, and dominated by taller fringing vegetation, such as dense stands of rushes or reeds, shrubs, or dead or live trees, especially Melaleuca and River Red Gums *Eucalyptus camaldulensis* and often with fallen timber. They also frequent inundated grasslands, short herbage or wooded floodplains, where floodwaters are temporary or receding, and irrigated crops. They are also found at some small wetlands only when they are drying. This species uses artificial wetlands, including open sewage ponds, reservoirs, large farm dams, and bore drains (Higgins & Davies, 1996).	0	0	1	1	2	Low (Unlikely)	Seasonal visitor - Habitat present, old records	DBCA 2020
Tringa nebularia	Common Greenshank	MI	Ma, MI	2004	1	-	The Common Greenshank is found in inland wetlands and sheltered coastal habitats where it forages at edges of wetlands, in soft mud on mudflats, in channels, or in shallows around the edges of water often among pneumatophores of mangroves or other sparse, emergent or fringing vegetation, such as sedges or saltmarsh (DCCEEW, 2022).	0	0	0	1	1	Low (Unlikely)	Seasonal visitor - Habitat may be present, only recorded once in search area	DBCA 2020

Appendix B

Flora Species by Family by Community Matrix

Appendix B - Flora Species by Family by Community Matrix

Family	Taxon	Vegetation Community		
		AiAtEf	ApAgEf	AvEp
Aizoaceae				
	Gunniopsis divisa P3		x	
Amaranthaceae				
	Ptilotus aervoides	x		
	Ptilotus exaltatus	x		
	Ptilotus gaudichaudii	x		
	Ptilotus obovatus	x	x	
	Ptilotus xerophilus	x	x	
Campanulaceae				
	Lobelia simulans	x		
Chenopodiaceae				
	Atriplex codonocarpa			x
	Chenopodium curvispicatum		x	
	Dissocarpus paradoxus		x	
	Maireana carnosa	x	x	x
	Maireana planifolia	x		
	Salsola australis	x	x	
	Sclerolaena densiflora	x		
Euphorbiaceae				
	Euphorbia boophthona	x		
Fabaceae				
	Acacia aneura	x		
	Acacia craspedocarpa	x		
	Acacia fuscaneura	x		
	Acacia incurvaneura	x	x	x
	Acacia kempeana	x		
	Acacia pruinocarpa	x		
	Acacia pteraneura		x	
	Acacia sclerosperma subsp. *sclerosperma*	x		
	Acacia synchronicia			x
	Acacia tetragonophylla	x	x	x
	Senna artemisioides subsp. *helmsii*	x		
	Senna artemisioides subsp. *oligophylla*	x		x
	Senna sp. Meekatharra (E. Bailey 1-26)	x	x	x
Goodeniaceae				
	Scaevola spinescens	x	x	x
Lamiaceae				
	Hemigenia tysonii P3	x		
Montiaceae				
	Calandrinia creethiae			x
	Calandrinia ptychosperma	x		
Poaceae				
	Aristida contorta	x	x	
	Eragrostis eriopoda		x	
	Tripogonella loliiformis	x		
Scrophulariaceae				
	Eremophila exilifolia	x		
	Eremophila forrestii subsp. *forrestii*	x	x	
	Eremophila fraseri subsp. *parva*	x		
	Eremophila muelleriana P3	x		
	Eremophila pterocarpa subsp. *pterocarpa*			x
Solanaceae				
	Solanum lasiophyllum	x	x	x

Appendix D

Fauna Inventory

Appendix D - Fauna Species List
SKA November 2022 Ecological Survey

Faunal Group	Species	Common Name	EPBC Act Status	BC Act / WA Status	BAM Act Status	Observation Method
Amphibian	*Litoria rubella*	Little Red Tree Frog	-	-	-	Directly observed and call heard
Bird	*Acanthagenys rufogularis*	Spiny-cheeked Honeyeater	-	-	-	Directly observed and call heard
	Acanthiza iredalei	Slender-billed Thornbill	-	-	-	Directly observed and call heard
	Acanthiza robustirostris	Slaty-backed Thornbill	-	-	-	Directly observed and call heard
	Anthus novaeseelandiae	Australian Pipit	-	-	-	Directly observed
	Aphelocephala leucopsis	Southern Whiteface	-	-	-	Directly observed and call heard
	Aquila audax	Wedge-tailed Eagle	-	-	-	Directly observed
	Artamus cinereus	Black-faced Woodswallow	-	-	-	Directly observed and call heard
	Artamus personatus	Masked Woodswallow	-	-	-	Directly observed and call heard
	Chlamydera guttata	Western Bowerbird	-	-	-	Directly observed and call heard
	Colluricincla harmonica	Grey Shrikethrush	-	-	-	Directly observed and call heard
	Coracina novaehollandiae	Black-faced Cuckooshrike	*Marine*	-	-	Directly observed and call heard
	Corvus bennetti	Little Crow	-	-	-	Directly observed and call heard
	Coturnix pectoralis	Stubble Quail	-	-	-	Directly observed and call heard
	Cracticus nigrogularis	Pied Butcherbird	-	-	-	Directly observed and call heard
	Dromaius novaehollandiae	Emu	-	-	-	Tracks
	Eolophus roseicapilla	Pink and Grey Galah	-	-	-	Directly observed and call heard
	Epthianura tricolor	Crimson Chat	-	-	-	Directly observed and call heard
	Falco berigora	Brown Falcon	-	-	-	Directly observed and call heard
	Falco cenchroides	Nankeen Kestrel	-	-	-	Directly observed and call heard
	Falco hypoleucos	Grey Falcon	V	VU	-	Directly observed
	Geopelia cuneata	Diamond Dove	-	-	-	Directly observed and call heard
	Hirundo neoxena	Welcome Swallow	*Marine*	-	-	Directly observed and call heard
	Hylacola cauta	Shy Heathwren	-	-	-	Directly observed and call heard
	Lalage tricolor	White-winged Triller	-	-	-	Directly observed and call heard
	Lichenostomus penicillatus	White-plumed Honeyeater	-	-	-	Directly observed and call heard
	Lichenostomus virescens	Singing Honeyeater	-	-	-	Directly observed and call heard
	Malurus leucopterus	White-winged Fairywren	-	-	-	Directly observed and call heard
	Malurus splendens	Splendid Fairywren	-	-	-	Heard only
	Manorina flavigula	Yellow-throated Miner	-	-	-	Directly observed and call heard
	Megalurus mathewsi	Rufous Songlark	-	-	-	Directly observed and call heard
	Melanodryas cucullata	Hooded Robin	-	-	-	Heard only
	Melopsittacus undulatus	Budgerigar	-	-	-	Heard only
	Nymphicus hollandicus	Cockatiel	-	-	-	Directly observed and call heard
	Ocyphaps lophotes	Crested Pigeon	-	-	-	Directly observed and call heard
	Oreoica gutturalis	Crested Bellbird	-	-	-	Directly observed and call heard
	Pachycephala rufiventris	Rufous Whistler	-	-	-	Heard only
	Petroica boodang	Scarlet Robin	-	-	-	Directly observed and call heard
	Petroica goodenovii	Red-capped Robin	-	-	-	Directly observed and call heard

Appendix D - Fauna Species List
SKA November 2022 Ecological Survey

Faunal Group	Species	Common Name	EPBC Act Status	BC Act / WA Status	BAM Act Status	Observation Method
Bird cont.	*Psephotellus varius*	Mulga Parrot	-	-	-	Directly observed and call heard
	Psophodes occidentalis	Chiming Wedgebill	-	-	-	Directly observed and call heard
	Pyrrholaemus brunneus	Redthroat	-	-	-	Directly observed and call heard
	Rhipidura leucophrys	Willie Wagtail	-	-	-	Directly observed and call heard
	Sugomel niger	Black Honeyeater	-	-	-	Heard only
	Taeniopygia castanotis	Australian Zebra Finch	-	-	-	Directly observed and call heard
	Todiramphus pyrrhopygius	Red-backed Kingfisher	-	-	-	Directly observed and call heard
	Turnix velox	Little Buttonquail	-	-	-	Directly observed
Mammal	*Bos primigenius taurus*	Cow	-	-	Permitted - s11	Scat and tracks
	Osphranter rufus	Red Kangaroo	-	-	-	Seen only
Invertebrate	*Idiosoma clypeatum*	Northern Shield-backed Trapdoor Spider	-	P3	-	Burrow seen only
	Ephutomorpha formicaria	Velvet ant	-	-	-	Seen only
	Homalictus dotatus	Small shiny native bee	-	-	-	Seen only
Reptile	*Ctenophorus caudicinctus*	Western Ring-tailed Dragon	-	-	-	Seen only
	Ctenophorus maculatus	Spotted Military Dragon	-	-	-	Seen only
	Ctenophorus scutulatus	Lozenge-marked Dragon	-	-	-	Seen only
	Ctenophorus nuchalis	Central Netted Dragon	-	-	-	Seen only
	Ctenophorus rubens	Reddening Sand Dragon	-	-	-	Seen only
	Ctenotus leonhardii	Leonhardi's Ctenotus	-	-	-	Seen only
	Varanus gouldii	Gould's Goanna	-	-	-	Directly observed and tracks recorded

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